Ekati Diamond Mine

2013 Aquatic Effects Monitoring Program
Part 3 – Statistical Report




DOMINION DIAMOND

EKATI DIAMOND MINE

2013 AQUATIC EFFECTS MONITORING PROGRAM PART 3 - STATISTICAL REPORT

March 2014
Project #0211136-0001

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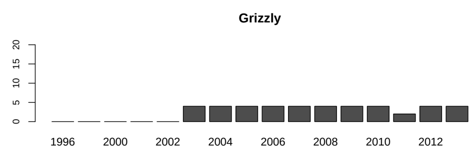
Analysis of April pH in Lakes of the Koala Watershed and Lac de Gras

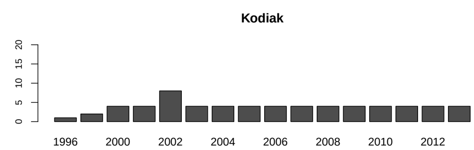
January 11, 2014

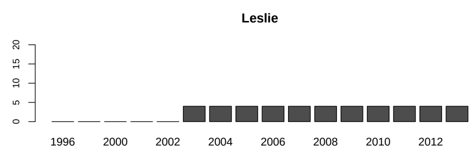
1 Censored Values:

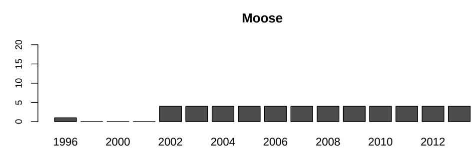
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

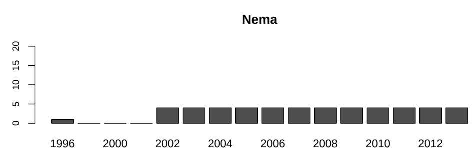
1.1 Monitored

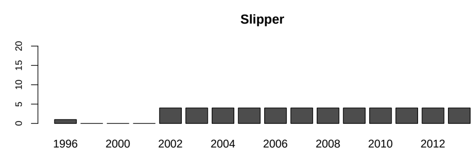


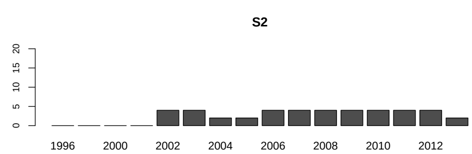


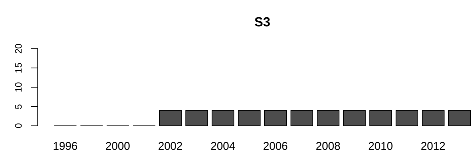




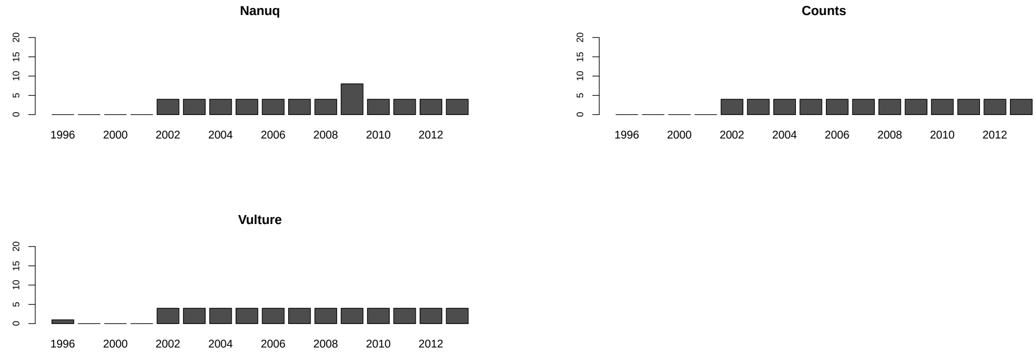






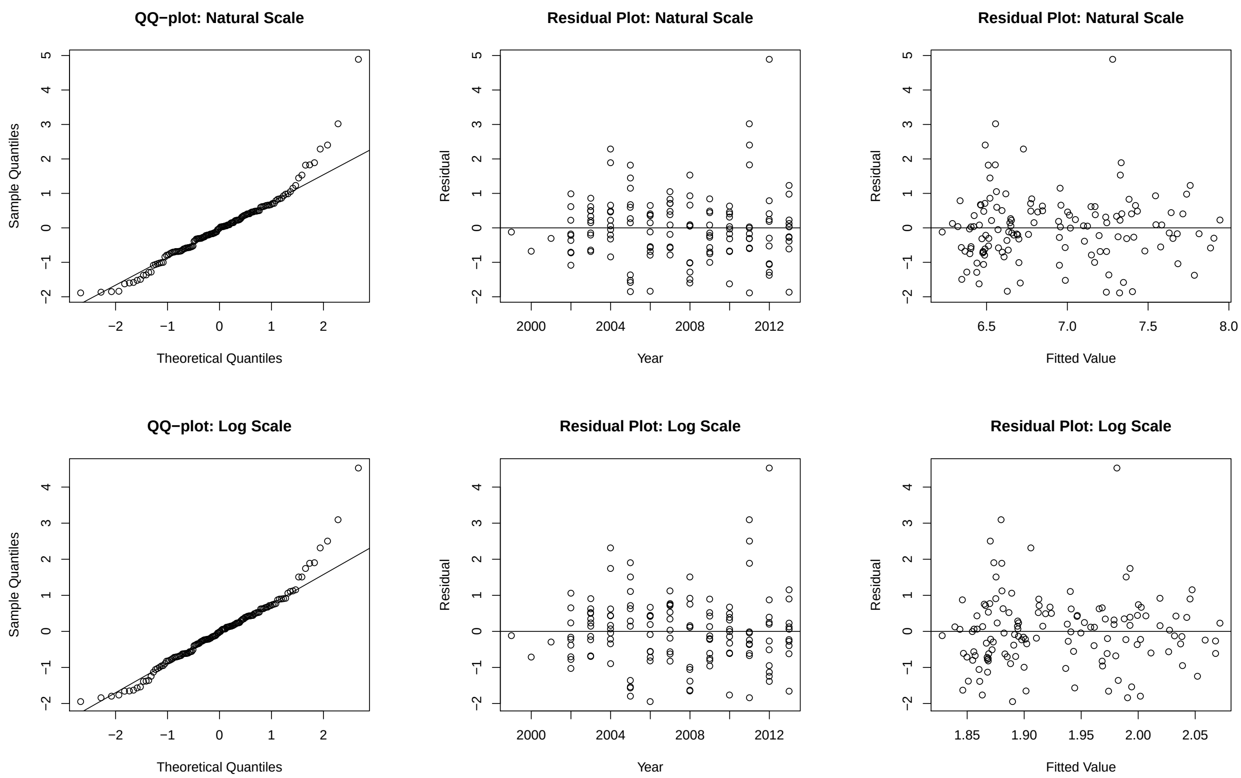


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
79	Kodiak	2012	8.30	7.28	4.89
238	Vulture	2011	7.18	6.56	3.02

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
79	Kodiak	2012	8.30	1.98	4.53
238	Vulture	2011	7.18	1.88	3.10

AIC weights and model comparison:

Natural Model	Log Model	Best Model
7.22E-113	1.00E+00	log model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. Although AIC reveals that the data is modeled best after log transformation, pH is already log scale and should not be transformed. Proceeding with analysis using untransformed, "natural" model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
2654.44	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
0.63	4.00	0.96

- Conclusions:
  The slopes do not differ significantly among reference lakes.

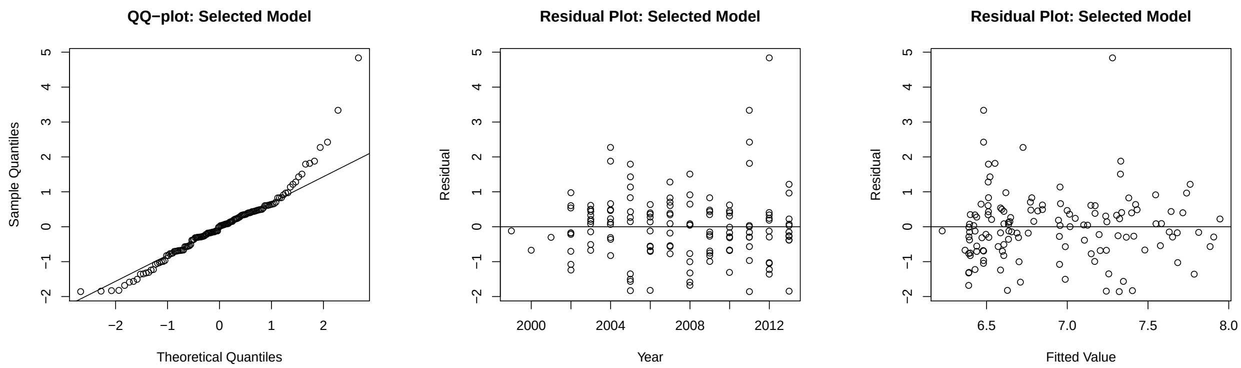
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.009	0.000	0.991	Ref. Model 3

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC reveals that the reference lakes are best modeled with a common slope and intercept, contrasts suggest reference lakes share only a common slope. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
79	Kodiak	2012	8.30	7.28	4.84
238	Vulture	2011	7.18	6.48	3.34

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	0.33	2.00	0.85
Kodiak	9.41	2.00	0.01
Leslie	8.44	2.00	0.01
Moose	11.83	2.00	0.00
Nema	6.35	2.00	0.04
Slipper	7.83	2.00	0.02
S2	5.46	2.00	0.07
S3	4.64	2.00	0.10

- Conclusions:
  All monitored lakes except Grizzly, S2, and S3 show significant deviation from the common slope of reference lakes.

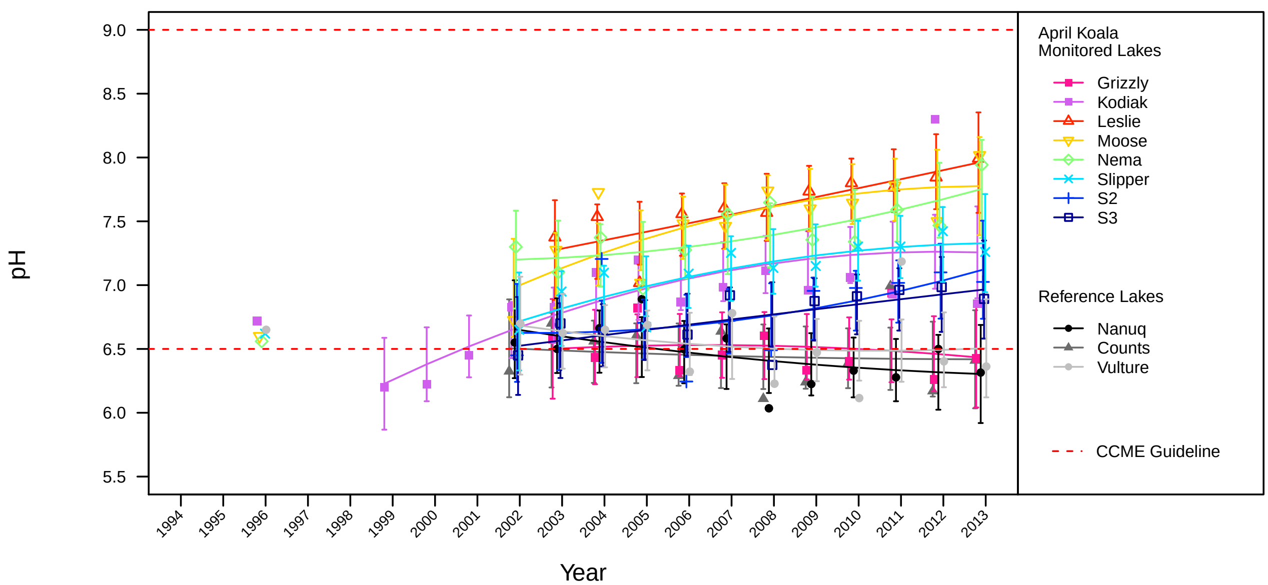
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0730
Monitored Lake	Grizzly	0.0210
Monitored Lake	Kodiak	0.5010
Monitored Lake	Leslie	0.6970
Monitored Lake	Moose	0.5710
Monitored Lake	Nema	0.5190
Monitored Lake	S2	0.3210
Monitored Lake	S3	0.4850
Monitored Lake	Slipper	0.6990

- Conclusions:
  Model fit for S2 and S3 is weak. Model fit for the reference lakes and Grizzly Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean pH for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	6.43E+00	6.44E+00	2.01E-01	6.04E+00	6.83E+00	5.87E-01
Kodiak	6.85E+00	7.26E+00	1.84E-01	6.90E+00	7.62E+00	5.37E-01
Leslie	7.99E+00	7.96E+00	2.01E-01	7.57E+00	8.35E+00	5.87E-01
Moose	8.02E+00	7.78E+00	1.96E-01	7.39E+00	8.16E+00	5.74E-01
Nema	7.94E+00	7.75E+00	1.96E-01	7.37E+00	8.14E+00	5.74E-01
Slipper	7.26E+00	7.33E+00	1.96E-01	6.94E+00	7.71E+00	5.74E-01
S2	7.03E+00	7.12E+00	1.96E-01	6.74E+00	7.50E+00	5.74E-01
S3	6.89E+00	6.97E+00	1.96E-01	6.58E+00	7.35E+00	5.74E-01
Nanuq	6.31E+00	6.30E+00	1.96E-01	5.92E+00	6.69E+00	
Counts	6.41E+00	6.42E+00	1.96E-01	6.03E+00	6.80E+00	
Vulture	6.36E+00	6.50E+00	1.96E-01	6.12E+00	6.89E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
pH	April	Koala	Lake	Water	none	none	linear mixed effects regression	#2 shared slopes	6.5/ 9	Kodiak Leslie Moose Nema Slipper

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

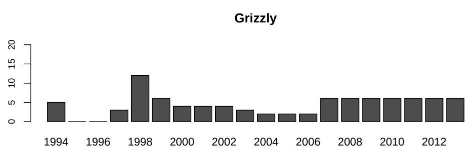
Analysis of August pH in Lakes of the Koala Watershed and Lac de Gras

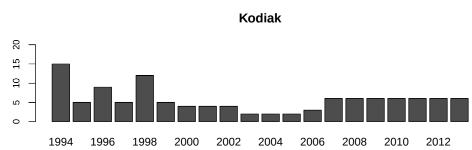
March 4, 2014

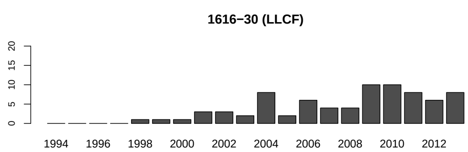
1 Censored Values:

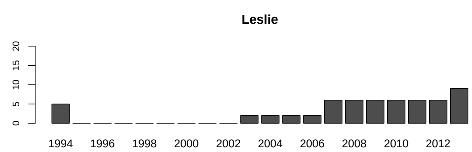
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

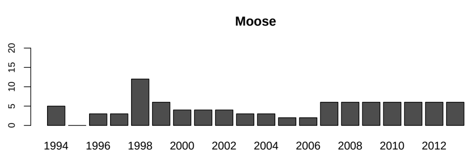
1.1 Monitored

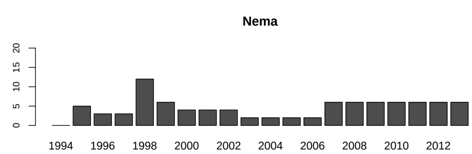


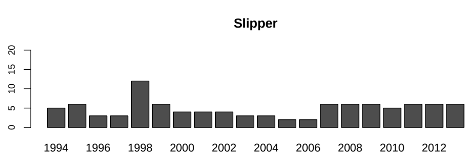


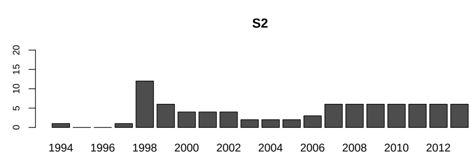




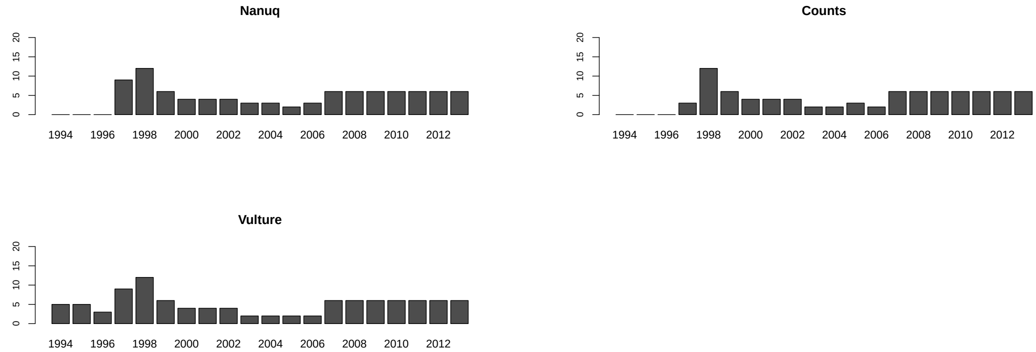






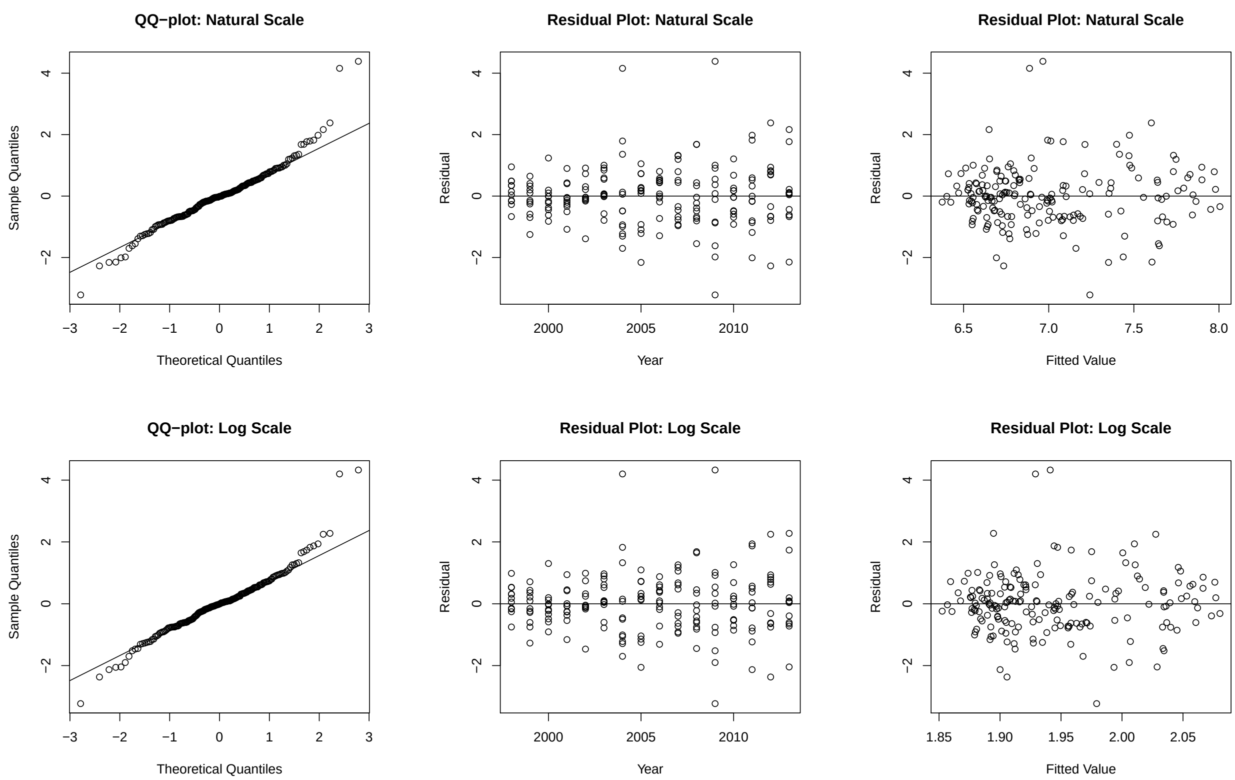


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
76	Kodiak	2009	7.51	6.97	4.39
171	S2	2004	7.40	6.89	4.16
216	Slipper	2009	6.84	7.24	-3.22

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
76	Kodiak	2009	7.51	1.94	4.33
171	S2	2004	7.40	1.93	4.20
216	Slipper	2009	6.84	1.98	-3.23

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. Although AIC reveals that the data is modeled best after log transformation, pH is already log scale and should not be transformed. Proceeding with analysis using untransformed, "natural" model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
3.34	6.00	0.76

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

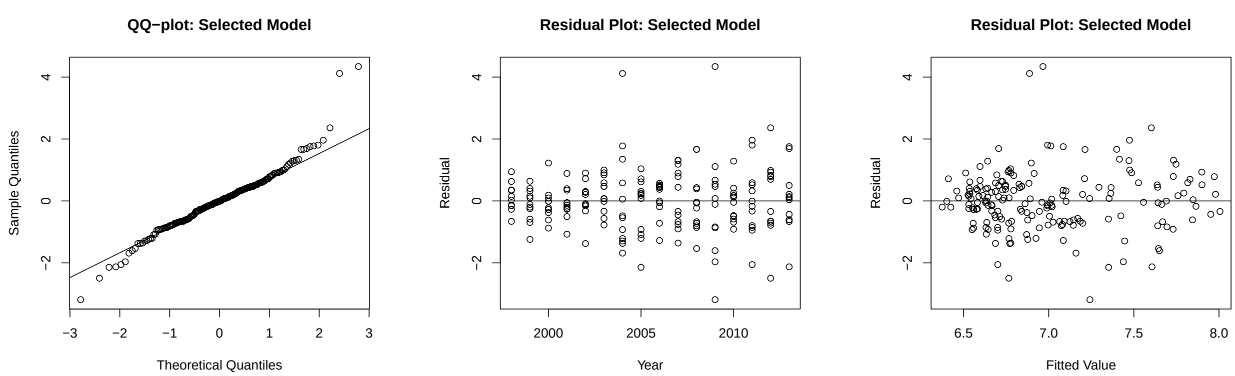
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.013	0.000	0.987	Ref. Model 3

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
76	Kodiak	2009	7.51	6.97	4.34
171	S2	2004	7.40	6.89	4.12
216	Slipper	2009	6.84	7.24	-3.19

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Lakes

Fitted model of the slope and intercept of each monitored lake compared to a common slope and intercept fitted for all reference lakes together (reference model 3).

- Results:

	Chi-squared	DF	P-value
Grizzly	10.2214	3	0.0168
Kodiak	100.7790	3	0.0000
1616-30 (LLCF)	147.9983	3	0.0000
Leslie	545.2542	3	0.0000
Moose	587.1466	3	0.0000
Nema	352.8599	3	0.0000
Slipper	203.0259	3	0.0000
S2	53.8350	3	0.0000
S3	27.0433	3	0.0000

- Conclusions:
  All monitored lakes show significant deviations from the common slope and intercept of reference lakes.

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	3.8028	2	0.1494
Kodiak	0.8584	2	0.6510
1616-30 (LLCF)	108.5130	2	0.0000
Leslie	17.7650	2	0.0001
Moose	109.7457	2	0.0000
Nema	89.2983	2	0.0000
Slipper	67.1831	2	0.0000
S2	21.2636	2	0.0000
S3	14.4155	2	0.0007

- Conclusions:
  When allowing for differences in intercept, all monitored lakes except Grizzly and Kodiak lakes show significant deviations from the common slope of reference lakes.

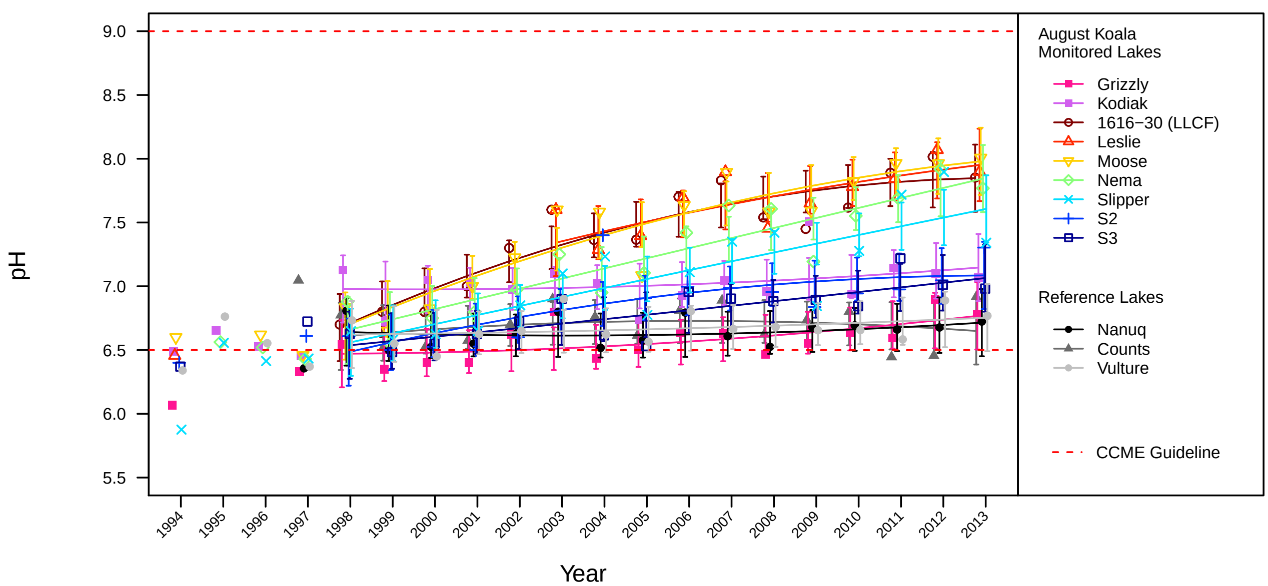
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0400
Monitored Lake	1616-30 (LLCF)	0.8530
Monitored Lake	Grizzly	0.3920
Monitored Lake	Kodiak	0.1020
Monitored Lake	Leslie	0.5950
Monitored Lake	Moose	0.8400
Monitored Lake	Nema	0.8310
Monitored Lake	S2	0.5350
Monitored Lake	S3	0.6450
Monitored Lake	Slipper	0.6830

- Conclusions:
  Model fit for reference lakes and Grizzly Lake is weak. Model fit for Kodiak Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean pH for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	6.78E+00	6.77E+00	1.34E-01	6.50E+00	7.03E+00	3.93E-01
Kodiak	7.07E+00	7.15E+00	1.34E-01	6.88E+00	7.41E+00	3.93E-01
Leslie	7.90E+00	7.95E+00	1.45E-01	7.67E+00	8.24E+00	4.24E-01
1616-30 (LLCF)	7.85E+00	7.85E+00	1.34E-01	7.58E+00	8.11E+00	3.93E-01
Moose	8.01E+00	7.98E+00	1.34E-01	7.72E+00	8.24E+00	3.93E-01
Nema	7.77E+00	7.84E+00	1.34E-01	7.58E+00	8.11E+00	3.93E-01
Slipper	7.34E+00	7.61E+00	1.34E-01	7.34E+00	7.87E+00	3.93E-01
S2	7.30E+00	7.09E+00	1.34E-01	6.82E+00	7.35E+00	3.93E-01
S3	6.98E+00	7.06E+00	1.34E-01	6.80E+00	7.33E+00	3.93E-01
Nanuq	6.72E+00	6.71E+00	1.34E-01	6.45E+00	6.98E+00	
Counts	6.92E+00	6.65E+00	1.34E-01	6.39E+00	6.91E+00	
Vulture	6.77E+00	6.75E+00	1.34E-01	6.49E+00	7.02E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
pH	August	Koala	Lake	Water	none	none	linear mixed effects regression	#3 shared intercept & slope	6.5/ 9	Grizzly Kodiak 1616-30 (LLCF) Leslie Moose Nema Slipper S2 S3

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

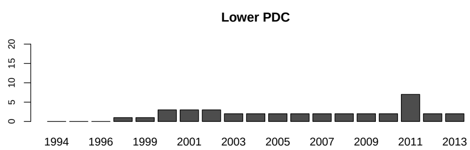
Analysis of August pH in Koala Watershed Streams

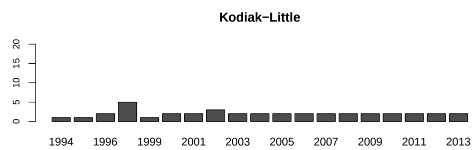
January 20, 2014

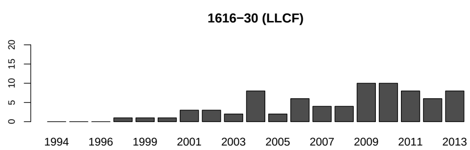
1 Censored Values:

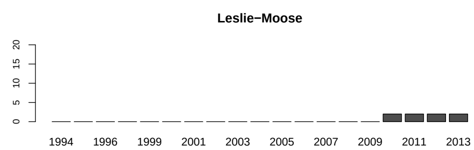
The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

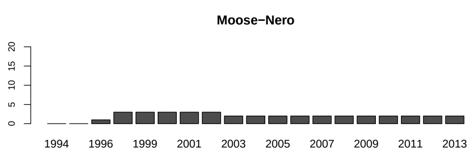
1.1 Monitored

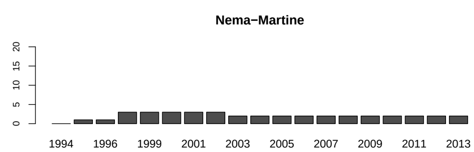


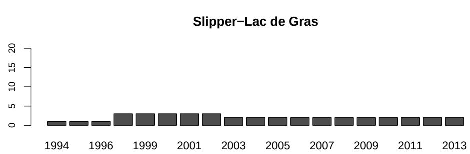




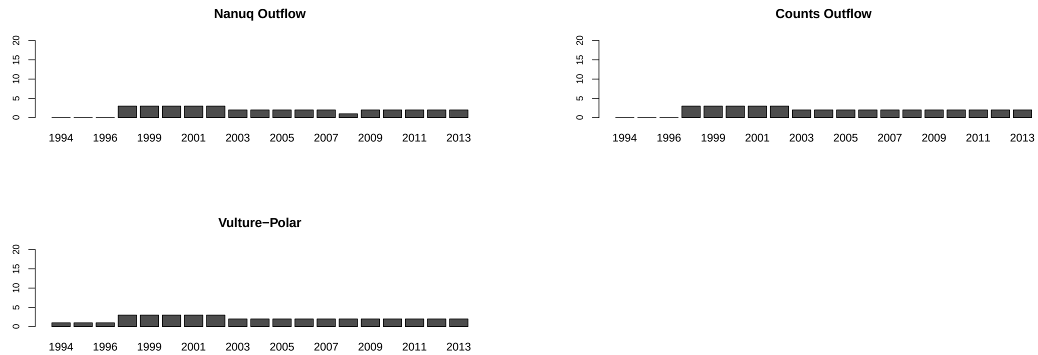






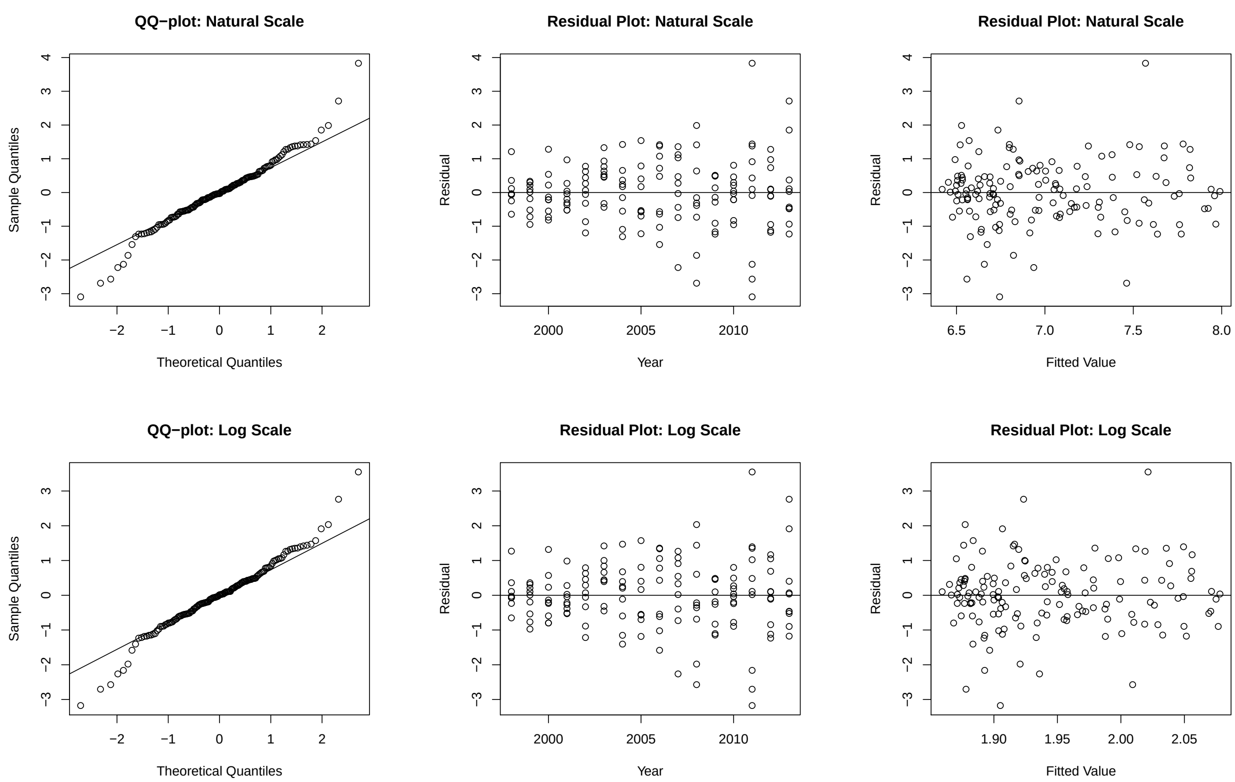


1.2 Reference



Comment:
None of the streams exhibited greater than 10% of data less than the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
38	Counts Outflow	2011	6.28	6.74	-3.09
178	Slipper-Lac de Gras	2011	8.15	7.57	3.83

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
38	Counts Outflow	2011	6.28	1.91	-3.17
178	Slipper-Lac de Gras	2011	8.15	2.02	3.55

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
Although AIC reveals that the data is modeled best after log transformation, pH is already log scale and should not be transformed. Proceeding with analysis using untransformed, "natural" model.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
19.81	6.00	0.00

- Conclusions:
The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
19.36	4.00	0.00

- Conclusions:
The slopes differ significantly among reference streams. Reference streams do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.040	0.000	0.960	Ref. Model 3

- Conclusions:
Results of AIC do not agree with reference model testing. Although AIC suggests that reference streams are best modeled with a common slope and intercept, contrasts suggest that slopes and intercepts differ among reference streams. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Lower PDC	5.9782	2	0.0503
Kodiak-Little	3.7611	2	0.1525
Leslie-Moose	0.7933	2	0.6726
1616-30 (LLCF)	71.9694	2	0.0000
Moose-Nero	48.5790	2	0.0000
Nema-Martine	49.7481	2	0.0000
Slipper-Lac de Gras	48.9924	2	0.0000

- Conclusions:
  Lower PDC, 1616-30 (LLCF), Moose-Nero, Nema-Martine, and Slipper-Lac de Gras show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each remaining monitored stream compared to the slope of each reference stream (reference model 1b).

- Results:

	Chi-squared	DF	P-value
Lower PDC-vs-Nanuq Outflow	36.0380	3	0.0000
Lower PDC-vs-Counts Outflow	21.8891	3	0.0001
Lower PDC-vs-Vulture-Polar	27.8250	3	0.0000
1616-30 (LLCF)-vs-Nanuq Outflow	21.3230	3	0.0001
1616-30 (LLCF)-vs-Counts Outflow	11.7877	3	0.0081
1616-30 (LLCF)-vs-Vulture-Polar	15.3728	3	0.0015
Moose-Nero-vs-Nanuq Outflow	248.6353	3	0.0000
Moose-Nero-vs-Counts Outflow	208.7290	3	0.0000
Moose-Nero-vs-Vulture-Polar	229.8579	3	0.0000
Nema-Martine-vs-Nanuq Outflow	190.1085	3	0.0000
Nema-Martine-vs-Counts Outflow	151.3557	3	0.0000
Nema-Martine-vs-Vulture-Polar	171.0901	3	0.0000
Slipper-Lac de Gras-vs-Nanuq Outflow	150.4199	3	0.0000
Slipper-Lac de Gras-vs-Counts Outflow	114.8538	3	0.0000
Slipper-Lac de Gras-vs-Vulture-Polar	133.0685	3	0.0000

- Conclusions:
  All remaining monitored streams show significant deviation from the slopes of individual reference streams.

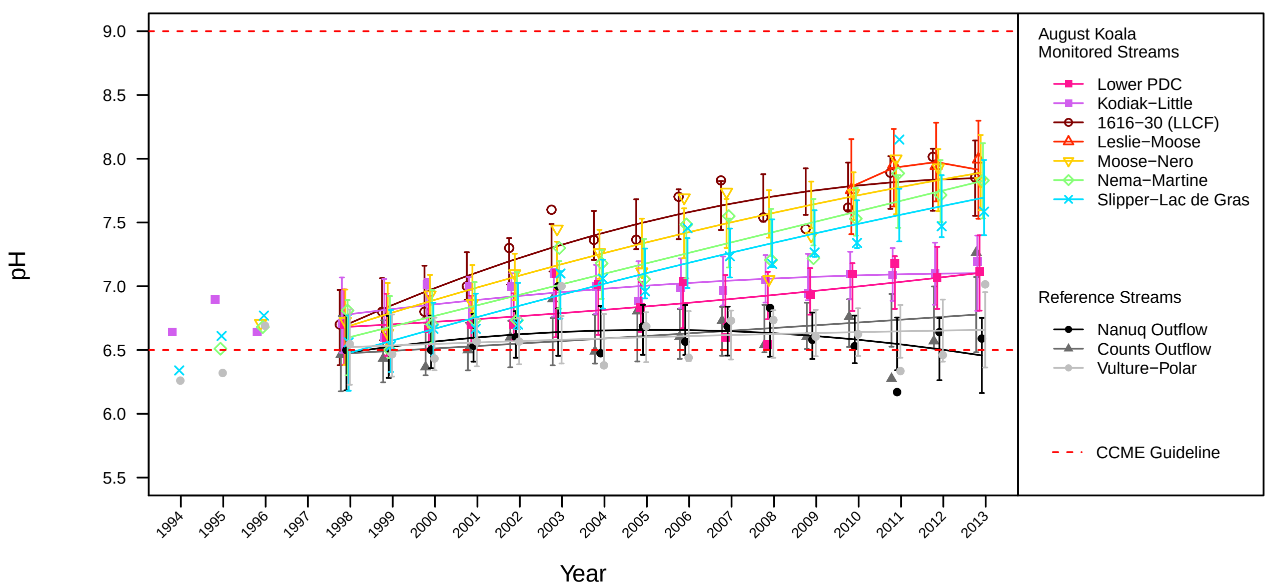
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Reference Stream	Counts Outflow	0.1680
Reference Stream	Nanuq Outflow	0.1410
Reference Stream	Vulture-Polar	0.0470
Monitored Stream	1616-30 (LLCF)	0.8530
Monitored Stream	Kodiak-Little	0.5130
Monitored Stream	Leslie-Moose	0.7090
Monitored Stream	Lower PDC	0.3740
Monitored Stream	Moose-Nero	0.7620
Monitored Stream	Nema-Martine	0.8170
Monitored Stream	Slipper-Lac de Gras	0.7840

- Conclusions:
  Model fit for Lower PDC is weak. Model fit for Counts Outflow, Nanuq Outflow, and Vulture-Polar is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean pH for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	7.12E+00	7.10E+00	1.51E-01	6.81E+00	7.40E+00	4.41E-01
Kodiak-Little	7.20E+00	7.10E+00	1.51E-01	6.81E+00	7.40E+00	4.41E-01
Leslie-Moose	8.00E+00	7.91E+00	1.96E-01	7.53E+00	8.30E+00	5.74E-01
1616-30 (LLCF)	7.85E+00	7.85E+00	1.51E-01	7.55E+00	8.14E+00	4.41E-01
Moose-Nero	7.82E+00	7.89E+00	1.51E-01	7.60E+00	8.19E+00	4.41E-01
Nema-Martine	7.83E+00	7.83E+00	1.51E-01	7.53E+00	8.12E+00	4.41E-01
Slipper-Lac de Gras	7.58E+00	7.70E+00	1.51E-01	7.40E+00	7.99E+00	4.41E-01
Nanuq Outflow	6.59E+00	6.46E+00	1.51E-01	6.16E+00	6.75E+00	
Counts Outflow	7.27E+00	6.78E+00	1.51E-01	6.48E+00	7.07E+00	
Vulture-Polar	7.02E+00	6.66E+00	1.51E-01	6.36E+00	6.95E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
pH	August	Koala	Stream	Water	none	none	linear mixed effects regression	#1b separate intercepts & slopes	6.5/ 9	Lower PDC 1616-30 (LLCF) Moose-Nero, Nema-Martine Slipper-Lac de Gras

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

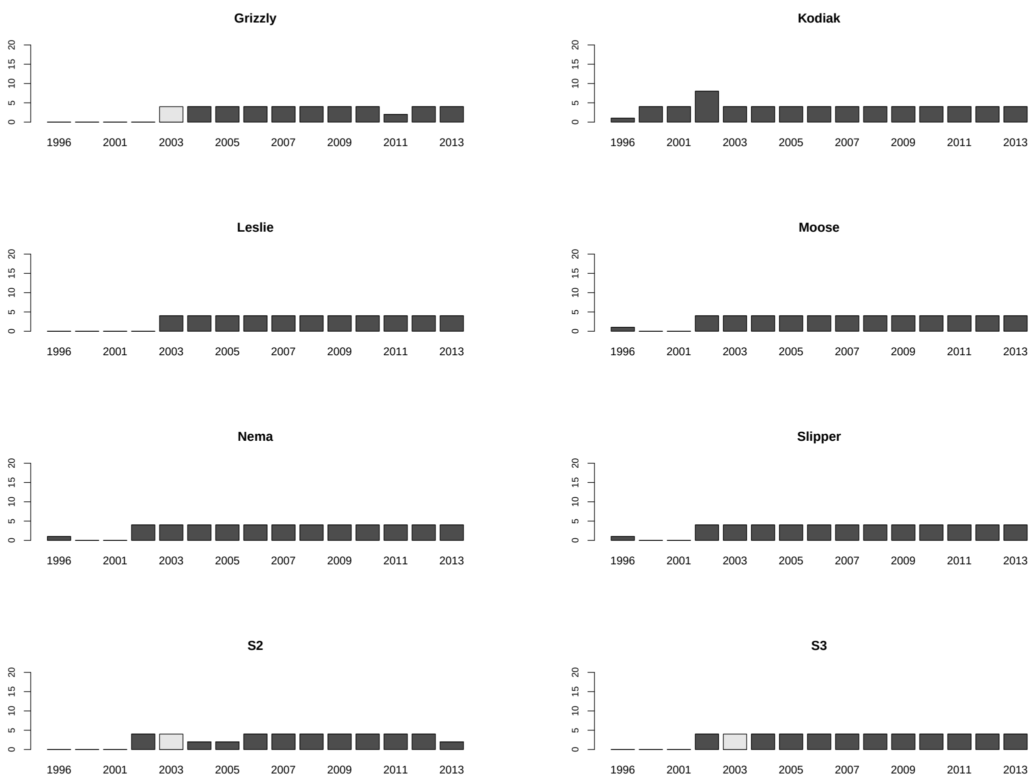
Analysis of April Total Alkalinity in Lakes of the Koala Watershed and Lac de Gras

January 11, 2014

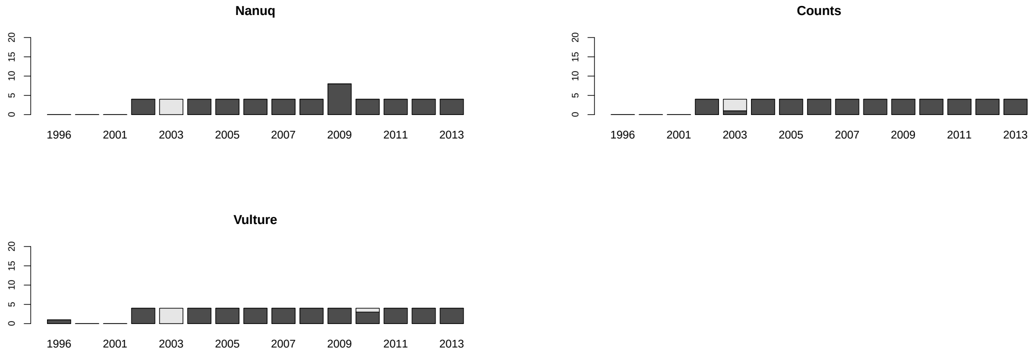
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

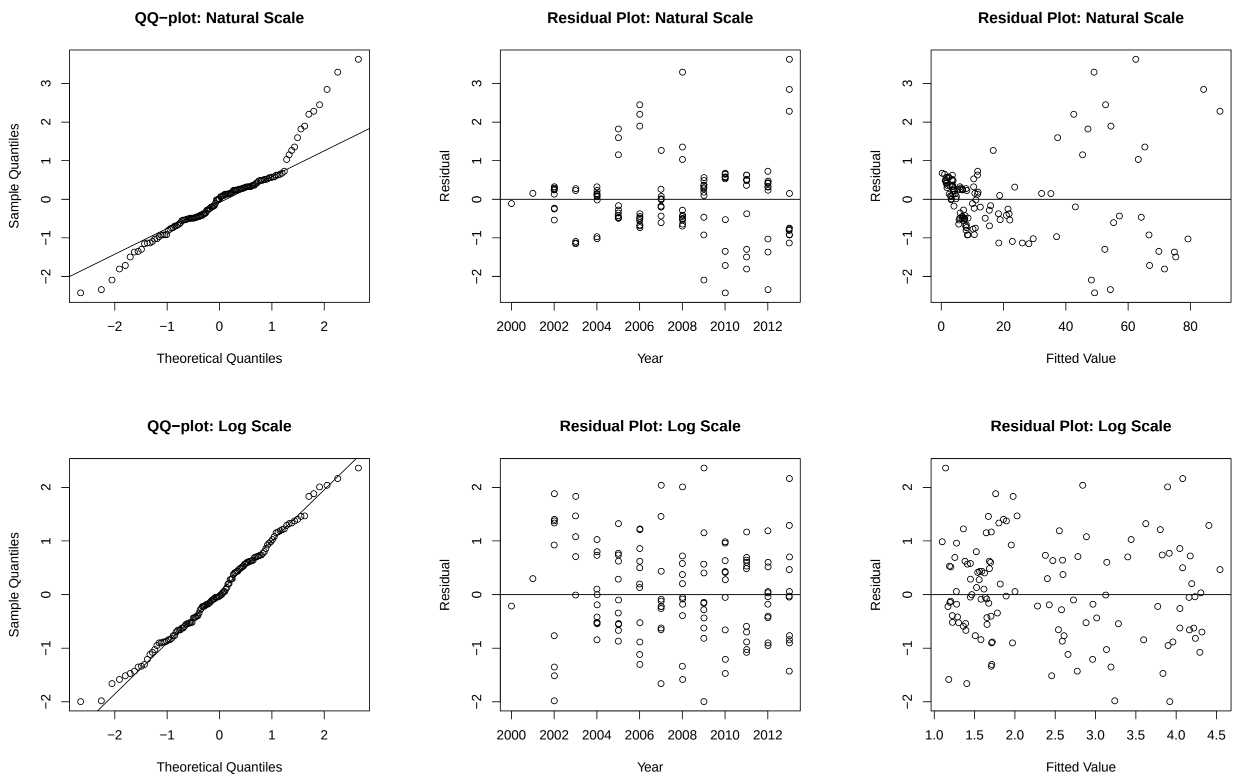


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
155	Nema	2008	64.35	49.06	3.29
160	Nema	2013	79.30	62.46	3.63

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
2.94E-200	1.00E+00	log model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
798.28	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
2.21	4.00	0.70

- Conclusions:
  The slopes do not differ significantly among reference lakes.

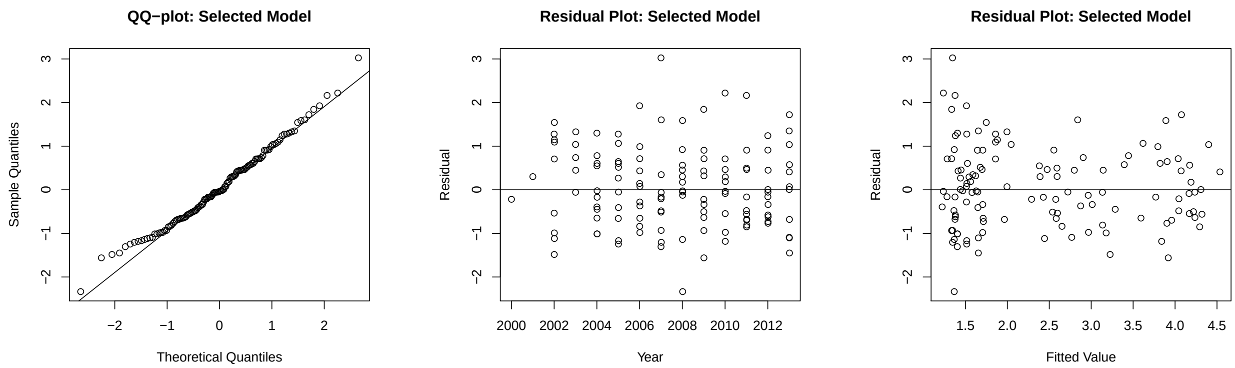
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
34	Counts	2007	6.47	1.35	3.02

No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	2.93	2.00	0.23
Kodiak	3.13	2.00	0.21
Leslie	17.42	2.00	0.00
Moose	34.46	2.00	0.00
Nema	22.86	2.00	0.00
Slipper	20.50	2.00	0.00
S2	1.43	2.00	0.49
S3	2.84	2.00	0.24

- Conclusions:
  Leslie, Moose, Nema, and Slipper lakes show significant deviation from the common slope of reference lakes.

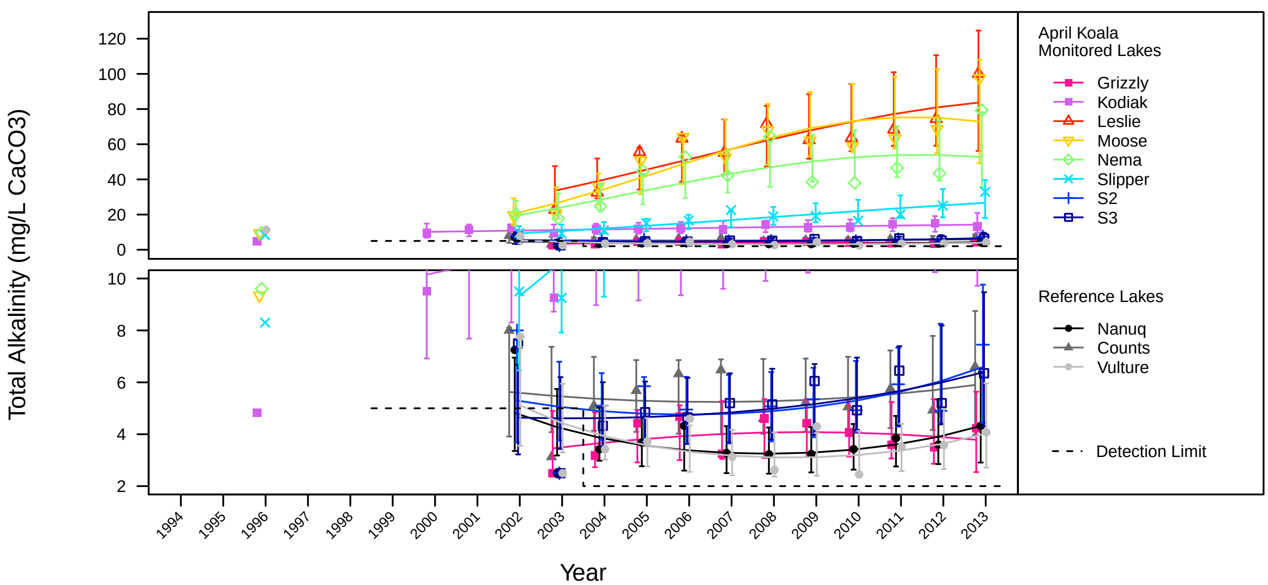
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0950
Monitored Lake	Grizzly	0.1200
Monitored Lake	Kodiak	0.6170
Monitored Lake	Leslie	0.7230
Monitored Lake	Moose	0.8540
Monitored Lake	Nema	0.6260
Monitored Lake	S2	0.1290
Monitored Lake	S3	0.1660
Monitored Lake	Slipper	0.8220

- Conclusions:
  Model fit for reference lakes, Grizzly, S2, and S3 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total alkalinity for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	4.22E+00	3.79E+00	7.70E-01	2.54E+00	5.64E+00	2.25E+00
Kodiak	1.32E+01	1.43E+01	2.78E+00	9.72E+00	2.09E+01	8.15E+00
Leslie	1.00E+02	8.37E+01	1.70E+01	5.62E+01	1.25E+02	4.98E+01
Moose	9.75E+01	7.29E+01	1.47E+01	4.92E+01	1.08E+02	4.29E+01
Nema	7.93E+01	5.27E+01	1.06E+01	3.56E+01	7.82E+01	3.10E+01
Slipper	3.29E+01	2.67E+01	5.36E+00	1.80E+01	3.95E+01	1.57E+01
S2	7.45E+00	6.58E+00	1.32E+00	4.44E+00	9.76E+00	3.87E+00
S3	6.35E+00	6.39E+00	1.28E+00	4.31E+00	9.47E+00	3.76E+00
Nanuq	4.33E+00	4.31E+00	8.67E-01	2.91E+00	6.40E+00	
Counts	6.60E+00	5.90E+00	1.19E+00	3.98E+00	8.75E+00	
Vulture	4.08E+00	4.02E+00	8.09E-01	2.71E+00	5.97E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Alkalinity	April	Koala	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	NA	Leslie Moose Nema Slipper

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

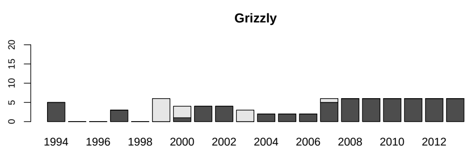
Analysis of August Total Alkalinity in Lakes of the Koala Watershed and Lac de Gras

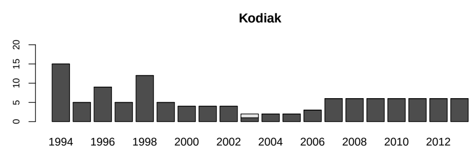
March 4, 2014

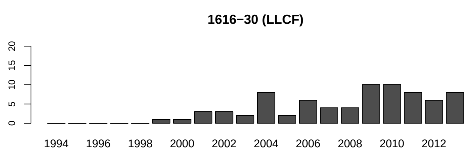
1 Censored Values:

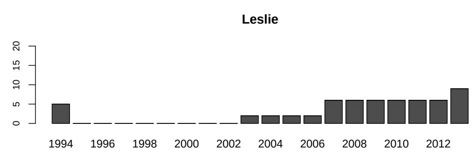
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

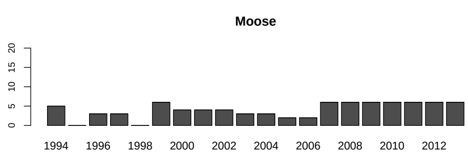
1.1 Monitored

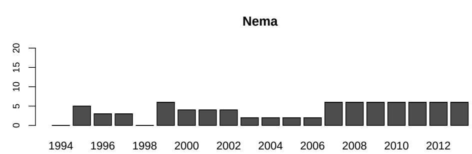


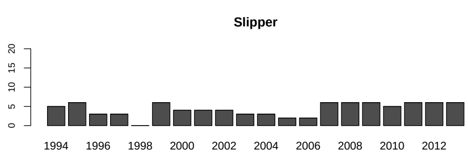


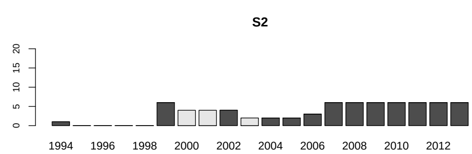


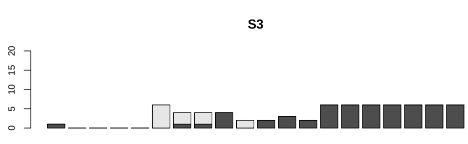




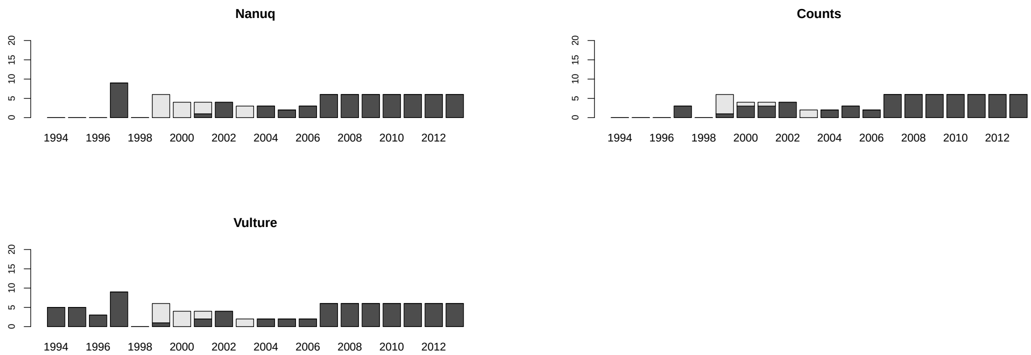






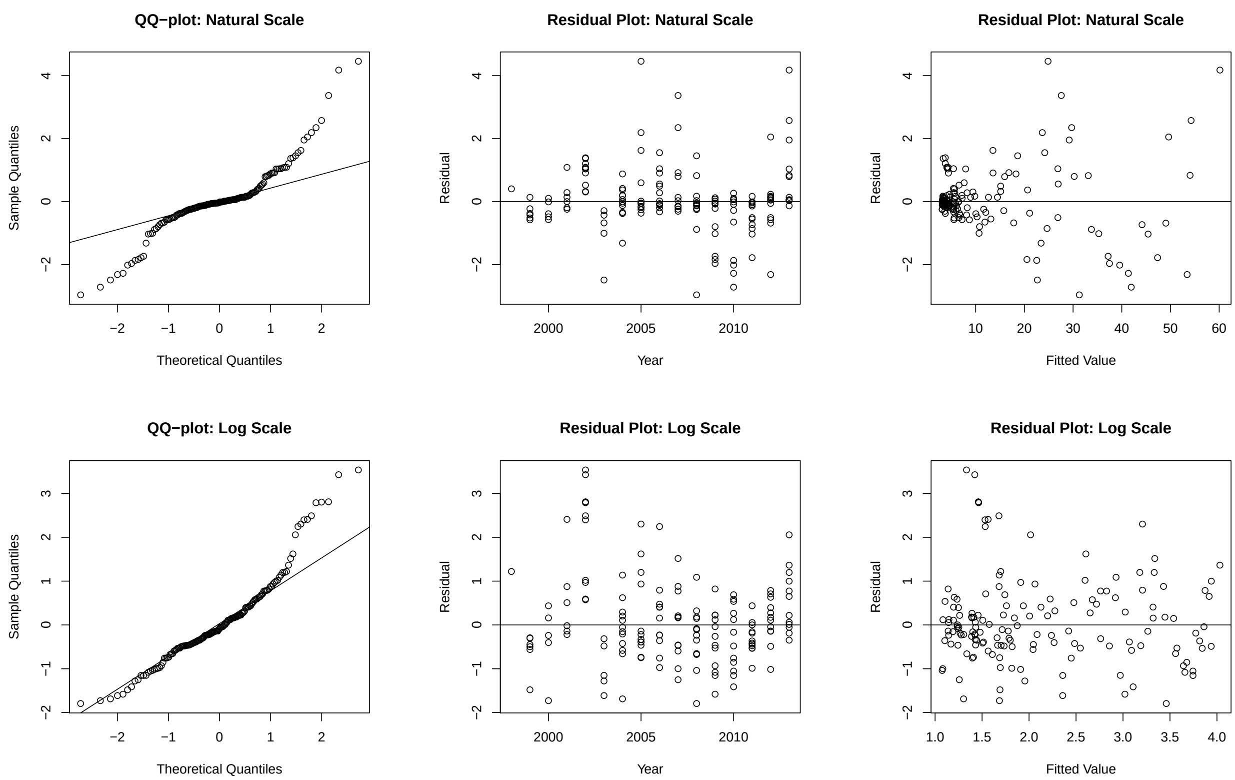


1.2 Reference



Comment:
10-60% of data in Counts, Nanuq, Vulture, Grizzly, S2, and S3 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
92	Leslie	2005	36.80	24.86	4.45
100	Leslie	2013	71.34	60.16	4.18
114	Moose	2007	36.62	27.59	3.37

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
129	Nanuq	2002	7.00	1.33	3.54
229	Vulture	2002	7.50	1.42	3.43

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
The natural and log-transformed models show dependence on year. The log-transformed model best meets the assumptions of normality and equal variance. AIC also reveals that the data is best modeled after log transformation. Proceeding with analysis using log transformed model. Results of statistical tests should be interpreted with caution.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
12.98	6.00	0.04

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
2.95	4.00	0.57

- Conclusions:
  The slopes do not differ significantly among reference lakes.

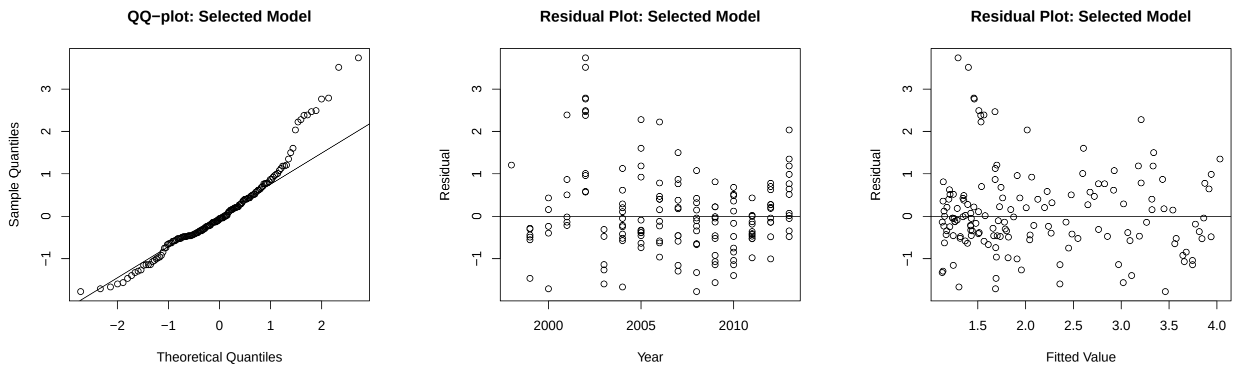
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.070	0.875	0.056	Ref. Model 2

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with a common slope. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
129	Nanuq	2002	7.00	1.29	3.74
229	Vulture	2002	7.50	1.40	3.51

Conclusion:
The model shows dependence on year. Results of statistical tests should be interpreted with caution.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	2.7638	2	0.2511
Kodiak	6.6359	2	0.0362
1616-30 (LLCF)	154.4577	2	0.0000
Leslie	35.5200	2	0.0000
Moose	153.4617	2	0.0000
Nema	108.3328	2	0.0000
Slipper	47.1485	2	0.0000
S2	12.7049	2	0.0017
S3	2.4683	2	0.2911

- Conclusions:
  All monitored lakes except Grizzly Lake and S3 show significant deviation from the common slope of reference lakes.

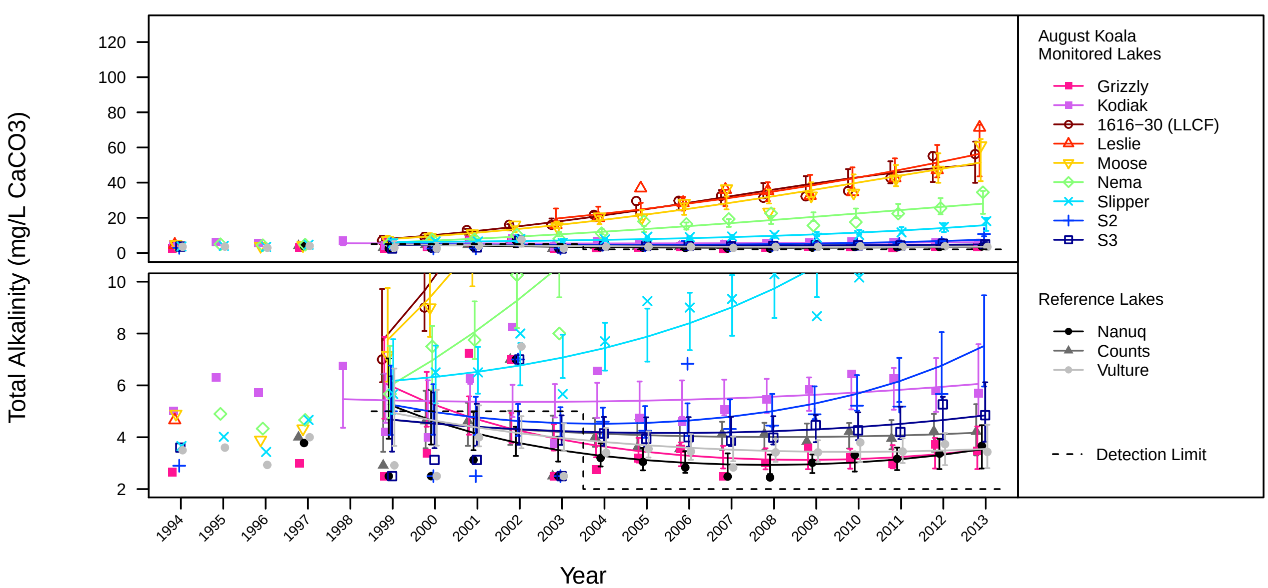
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.2510
Monitored Lake	1616-30 (LLCF)	0.9620
Monitored Lake	Grizzly	0.2900
Monitored Lake	Kodiak	0.0350
Monitored Lake	Leslie	0.7700
Monitored Lake	Moose	0.9450
Monitored Lake	Nema	0.8900
Monitored Lake	S2	0.2220
Monitored Lake	S3	0.1400
Monitored Lake	Slipper	0.8640

- Conclusions:
  Model fit for reference lakes, Grizzly Lake, S2, and S3 is weak Model fit for Kodiak Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total alkalinity for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	3.47E+00	3.50E+00	4.16E-01	2.77E+00	4.42E+00	1.22E+00
Kodiak	5.70E+00	6.05E+00	6.97E-01	4.83E+00	7.59E+00	2.04E+00
Leslie	7.13E+01	5.64E+01	7.42E+00	4.35E+01	7.30E+01	2.17E+01
1616-30 (LLCF)	5.62E+01	5.03E+01	5.92E+00	3.99E+01	6.33E+01	1.73E+01
Moose	6.11E+01	5.15E+01	6.06E+00	4.08E+01	6.48E+01	1.77E+01
Nema	3.45E+01	2.80E+01	3.30E+00	2.22E+01	3.53E+01	9.66E+00
Slipper	1.81E+01	1.58E+01	1.86E+00	1.26E+01	1.99E+01	5.45E+00
S2	1.07E+01	7.51E+00	8.89E-01	5.96E+00	9.47E+00	2.60E+00
S3	4.85E+00	4.84E+00	5.78E-01	3.83E+00	6.12E+00	1.69E+00
Nanuq	3.67E+00	3.53E+00	4.21E-01	2.80E+00	4.46E+00	
Counts	4.22E+00	4.17E+00	4.99E-01	3.30E+00	5.27E+00	
Vulture	3.43E+00	3.55E+00	4.23E-01	2.81E+00	4.48E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor- mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con- trasts*
Alkalinity	August	Koala	Lake	Water	none	log e	Tobit regression	#2 shared slopes	NA	Kodiak 1616-30 (LLCF) Leslie Moose Nema Slipper S2

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

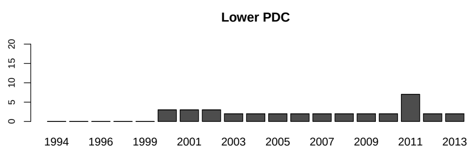
Analysis of August Total Alkalinity in Koala Watershed Streams

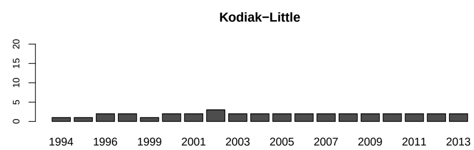
January 11, 2014

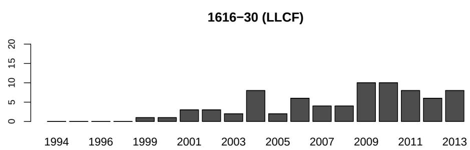
1 Censored Values:

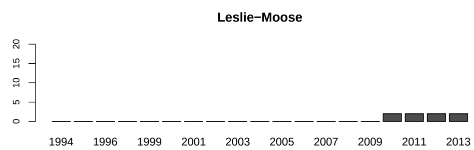
The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

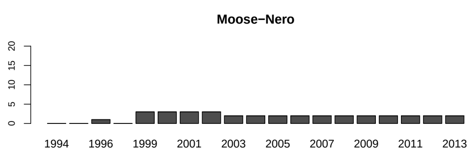
1.1 Monitored

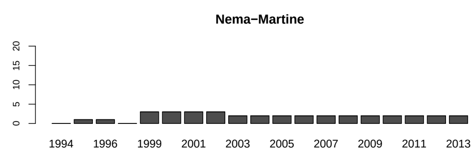


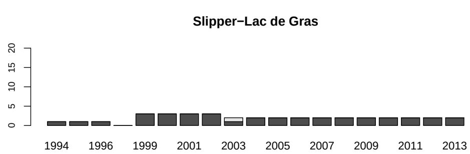




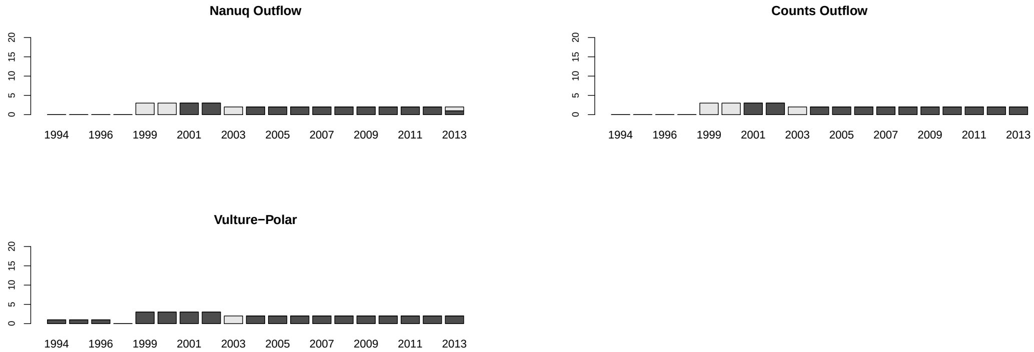






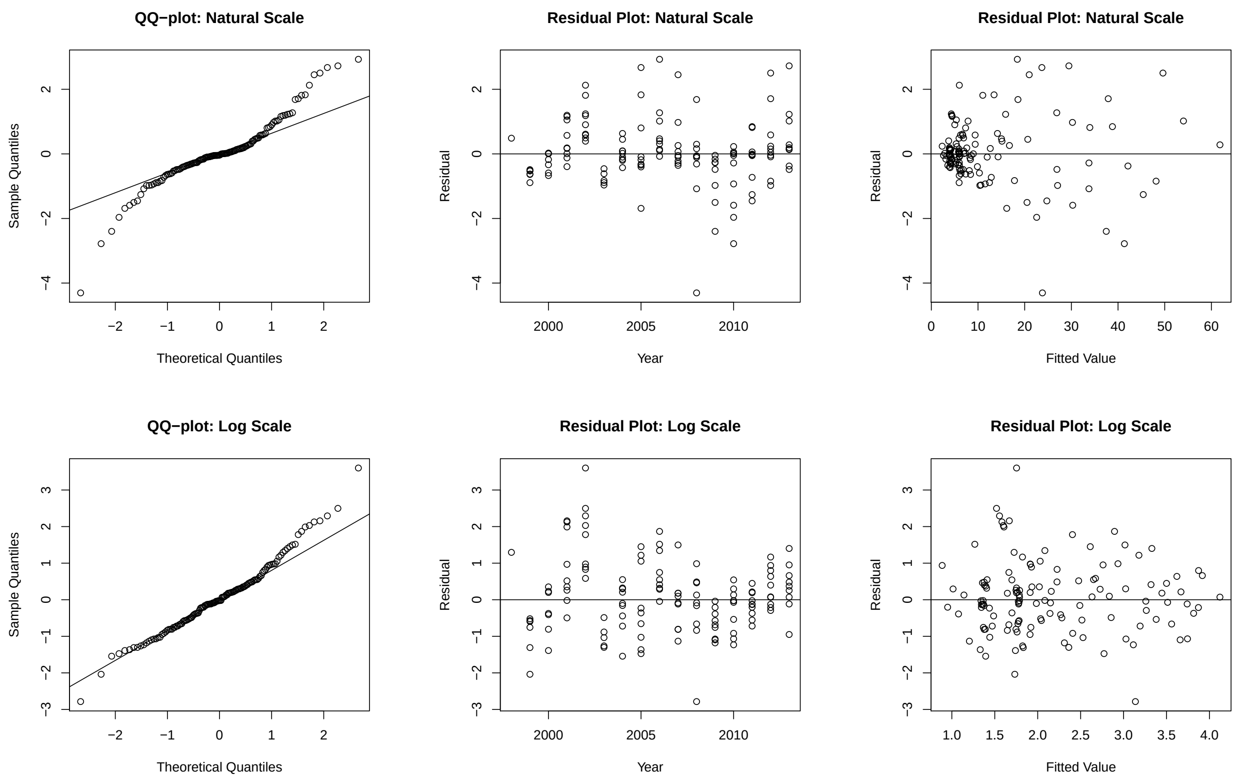


1.2 Reference



Comment:
10-60% of data in Counts Outflow and Nanuq Outflow was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
115	Moose-Nero	2008	14.35	23.80	-4.30

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
49	Kodiak-Little	2002	10.67	1.75	3.60

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
The natural and log transformed models show dependence on year or fitted value. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using the log transformed model. Results should be interpreted with caution.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
21.29	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
7.81	4.00	0.10

- Conclusions:
  The slopes do not differ significantly among reference streams.

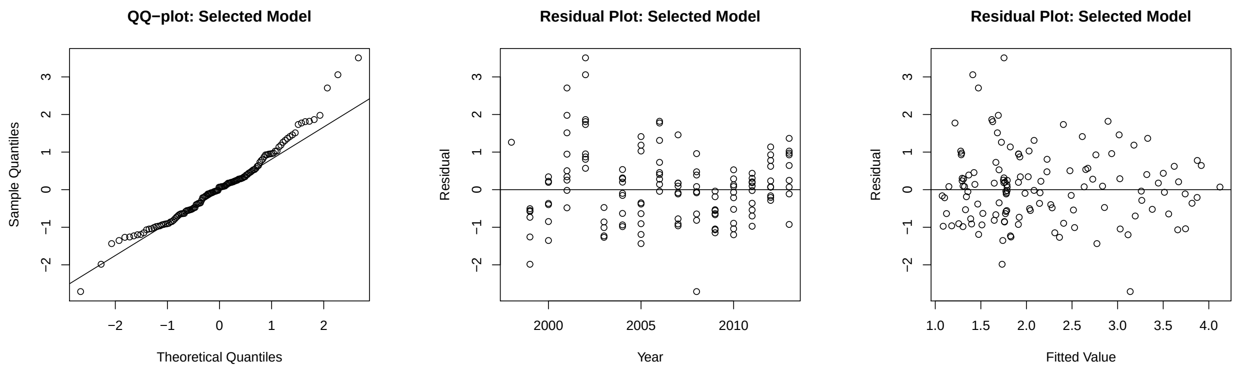
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.483	0.512	0.005	Indistinguishable support for 2 & 1; choose Model 2.

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with a common slope. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
49	Kodiak-Little	2002	10.67	1.75	3.51
129	Nanuq Outflow	2002	7.00	1.41	3.06

Conclusion:
The model shows dependence on year or fitted value. Results should be interpreted with caution.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
Lower PDC	4.6479	2	0.0979
Kodiak-Little	15.8211	2	0.0004
Leslie-Moose	7.0959	2	0.0288
1616-30 (LLCF)	207.0005	2	0.0000
Moose-Nero	172.6826	2	0.0000
Nema-Martine	152.8541	2	0.0000
Slipper-Lac de Gras	65.7619	2	0.0000

- Conclusions:
  All monitored streams except Lower PDC show significant deviation from the common slope of reference streams.

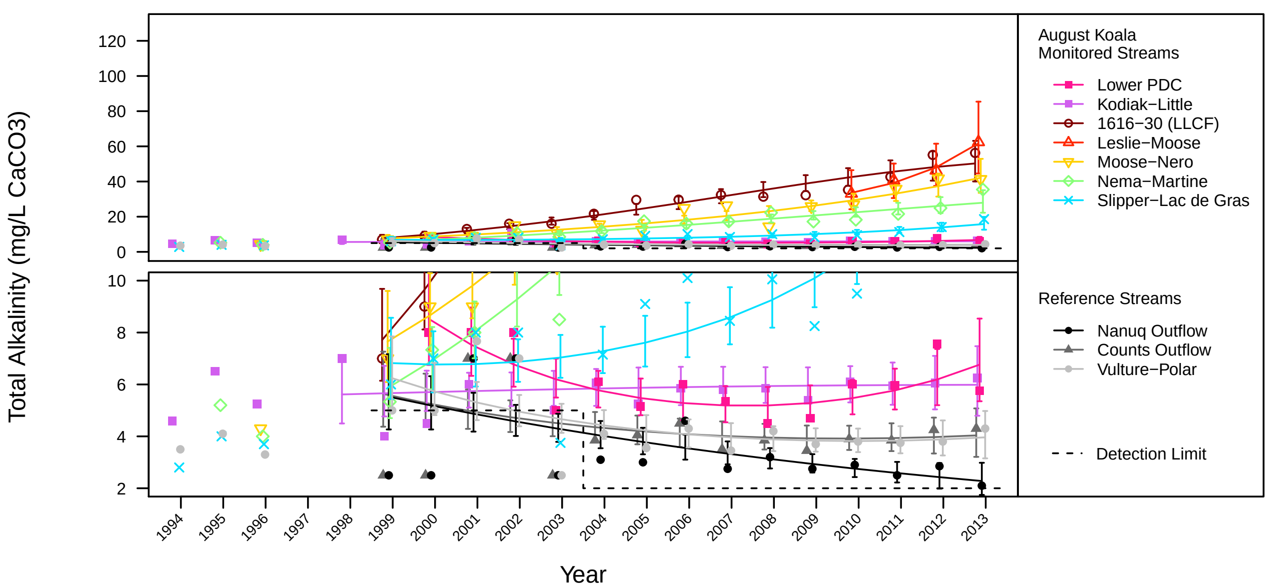
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.2990
Monitored Stream	1616-30 (LLCF)	0.9620
Monitored Stream	Kodiak-Little	0.0100
Monitored Stream	Leslie-Moose	0.9860
Monitored Stream	Lower PDC	0.5830
Monitored Stream	Moose-Nero	0.8690
Monitored Stream	Nema-Martine	0.9140
Monitored Stream	Slipper-Lac de Gras	0.6320

- Conclusions:
  Model fit for reference streams is weak. Model fit for Kodiak-Little is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total alkalinity for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	5.75E+00	6.76E+00	8.05E-01	5.35E+00	8.54E+00	2.36E+00
Kodiak-Little	6.25E+00	5.99E+00	6.78E-01	4.79E+00	7.47E+00	1.98E+00
Leslie-Moose	6.25E+01	6.17E+01	1.02E+01	4.46E+01	8.54E+01	3.00E+01
1616-30 (LLCF)	5.62E+01	5.03E+01	5.83E+00	4.00E+01	6.31E+01	1.71E+01
Moose-Nero	4.13E+01	4.21E+01	4.89E+00	3.36E+01	5.29E+01	1.43E+01
Nema-Martine	3.55E+01	2.79E+01	3.24E+00	2.22E+01	3.51E+01	9.48E+00
Slipper-Lac de Gras	1.86E+01	1.58E+01	1.84E+00	1.26E+01	1.99E+01	5.38E+00
Nanuq Outflow	2.10E+00	2.28E+00	3.12E-01	1.74E+00	2.98E+00	
Counts Outflow	4.30E+00	4.04E+00	4.72E-01	3.21E+00	5.08E+00	
Vulture-Polar	4.30E+00	3.96E+00	4.61E-01	3.15E+00	4.98E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Alkalinity	August	Koala	Stream	Water	none	log e	Tobit regression	#2 shared slopes	NA	Kodiak-Little Leslie-Moose 1616-30 (LLCF) Moose-Nero Nema-Martine Slipper-Lac de Gras

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

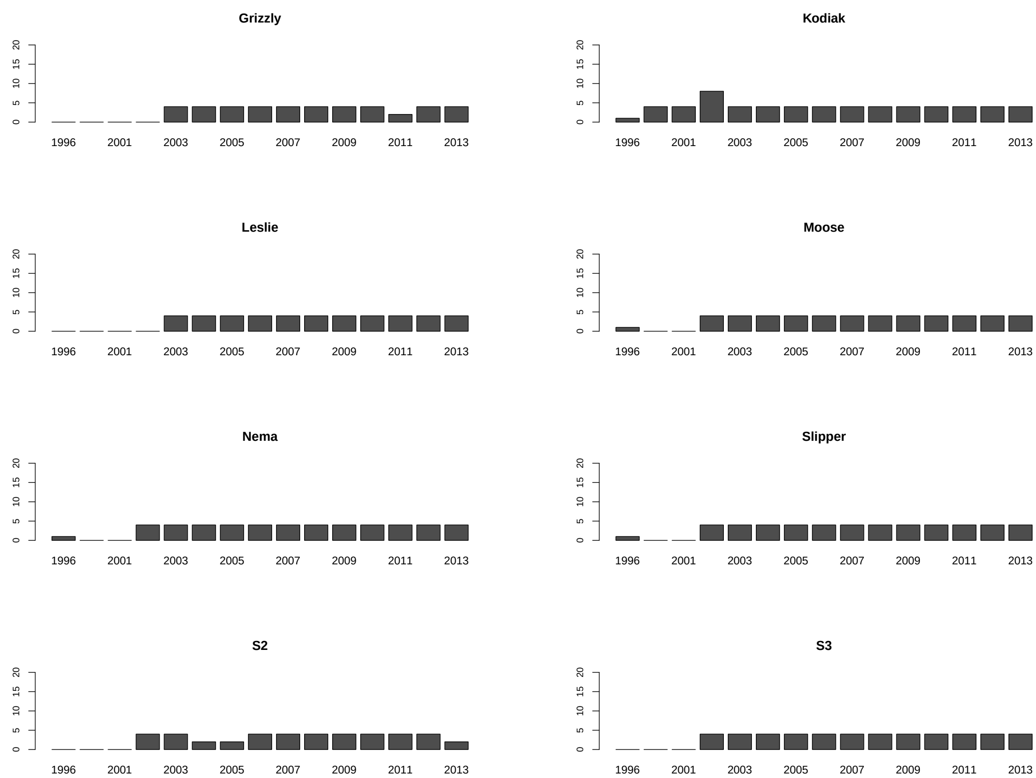
Analysis of April Hardness in Lakes of the Koala Watershed and Lac de Gras

January 20, 2014

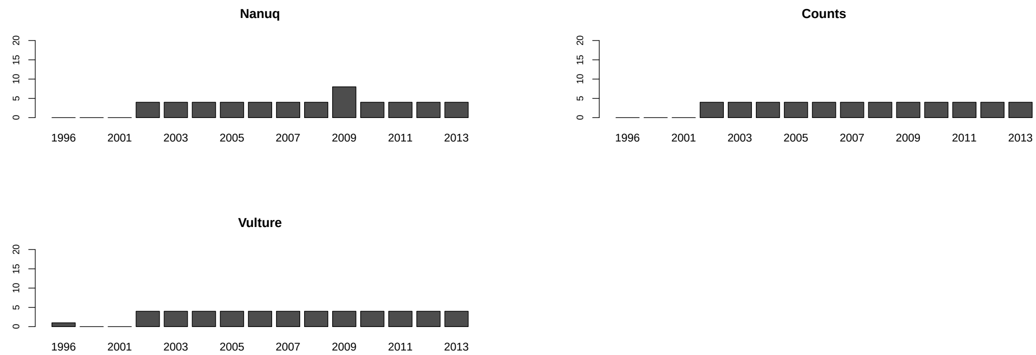
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

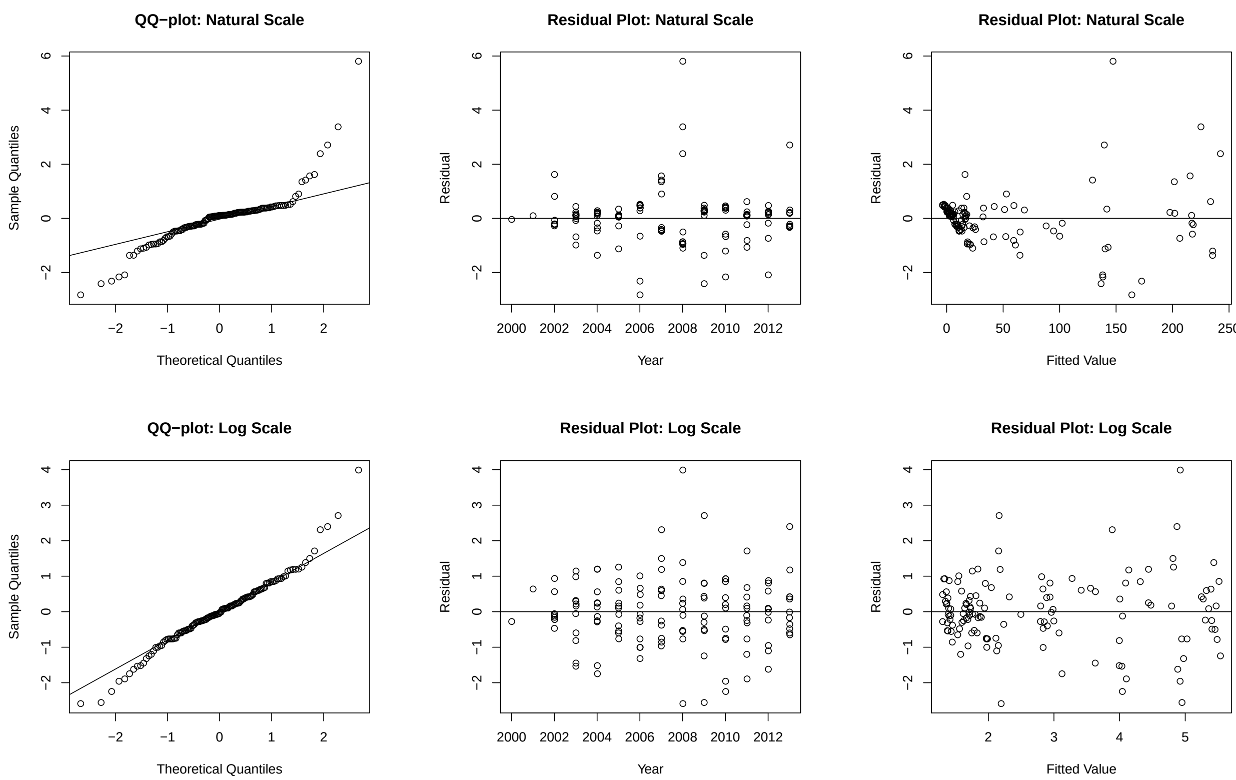


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
115	Moose	2008	276.25	225.14	3.38
155	Nema	2008	235.00	147.29	5.81

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
155	Nema	2008	235.00	4.92	3.99

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.03E-271	1.00E+00	log model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
767.55	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
0.11	4.00	1.00

The slopes do not differ significantly among reference lakes.

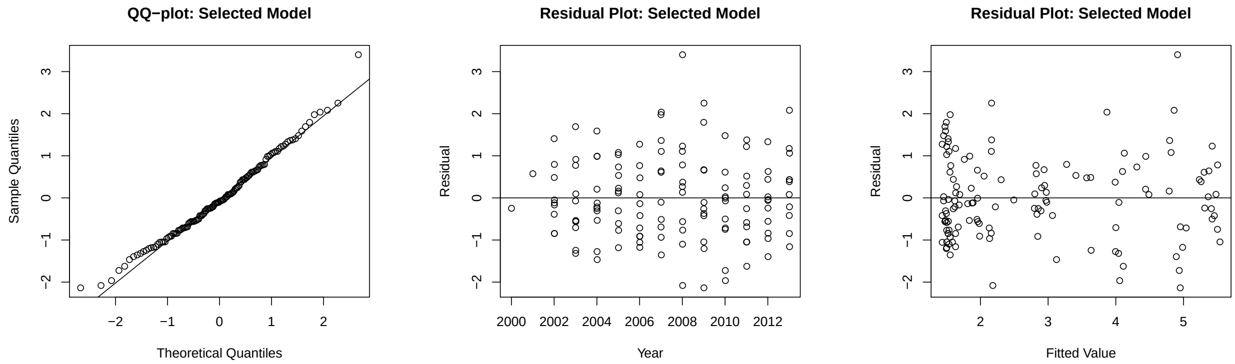
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
155	Nema	2008	235.00	4.91	3.40

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	0.13	2.00	0.94
Kodiak	0.41	2.00	0.81
Leslie	52.88	2.00	0.00
Moose	63.65	2.00	0.00
Nema	56.58	2.00	0.00
Slipper	53.39	2.00	0.00
S2	2.02	2.00	0.36
S3	4.88	2.00	0.09

- Conclusions:
  Leslie, Moose, Nema, and Slipper lakes show significant deviation from the common slope of reference lakes.

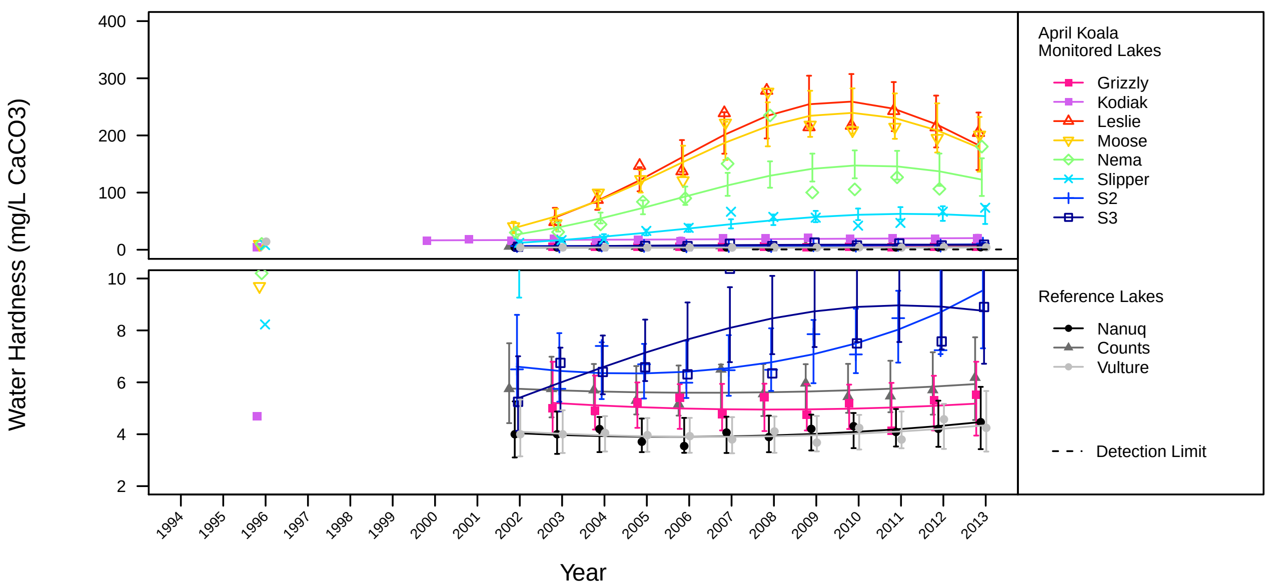
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0300
Monitored Lake	Grizzly	0.0380
Monitored Lake	Kodiak	0.4110
Monitored Lake	Leslie	0.9200
Monitored Lake	Moose	0.9360
Monitored Lake	Nema	0.7790
Monitored Lake	S2	0.6490
Monitored Lake	S3	0.4400
Monitored Lake	Slipper	0.8700

- Conclusions:
  Model fit for Kodiak and S3 is weak. Model fit for reference lakes and Grizzly lakes is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean hardness for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	5.51E+00	5.18E+00	7.17E-01	3.95E+00	6.79E+00	2.10E+00
Kodiak	2.00E+01	2.04E+01	2.64E+00	1.58E+01	2.62E+01	7.73E+00
Leslie	2.05E+02	1.83E+02	2.53E+01	1.40E+02	2.40E+02	7.41E+01
Moose	2.01E+02	1.78E+02	2.41E+01	1.37E+02	2.32E+02	7.06E+01
Nema	1.80E+02	1.23E+02	1.66E+01	9.41E+01	1.60E+02	4.86E+01
Slipper	7.35E+01	5.88E+01	7.97E+00	4.51E+01	7.67E+01	2.33E+01
S2	1.08E+01	9.53E+00	1.29E+00	7.31E+00	1.24E+01	3.78E+00
S3	8.90E+00	8.76E+00	1.19E+00	6.72E+00	1.14E+01	3.47E+00
Nanuq	4.46E+00	4.47E+00	6.05E-01	3.43E+00	5.83E+00	
Counts	6.18E+00	5.93E+00	8.03E-01	4.55E+00	7.74E+00	
Vulture	4.25E+00	4.34E+00	5.88E-01	3.33E+00	5.67E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Hardness	April	Koala	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	NA	Leslie Moose Nema Slipper

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

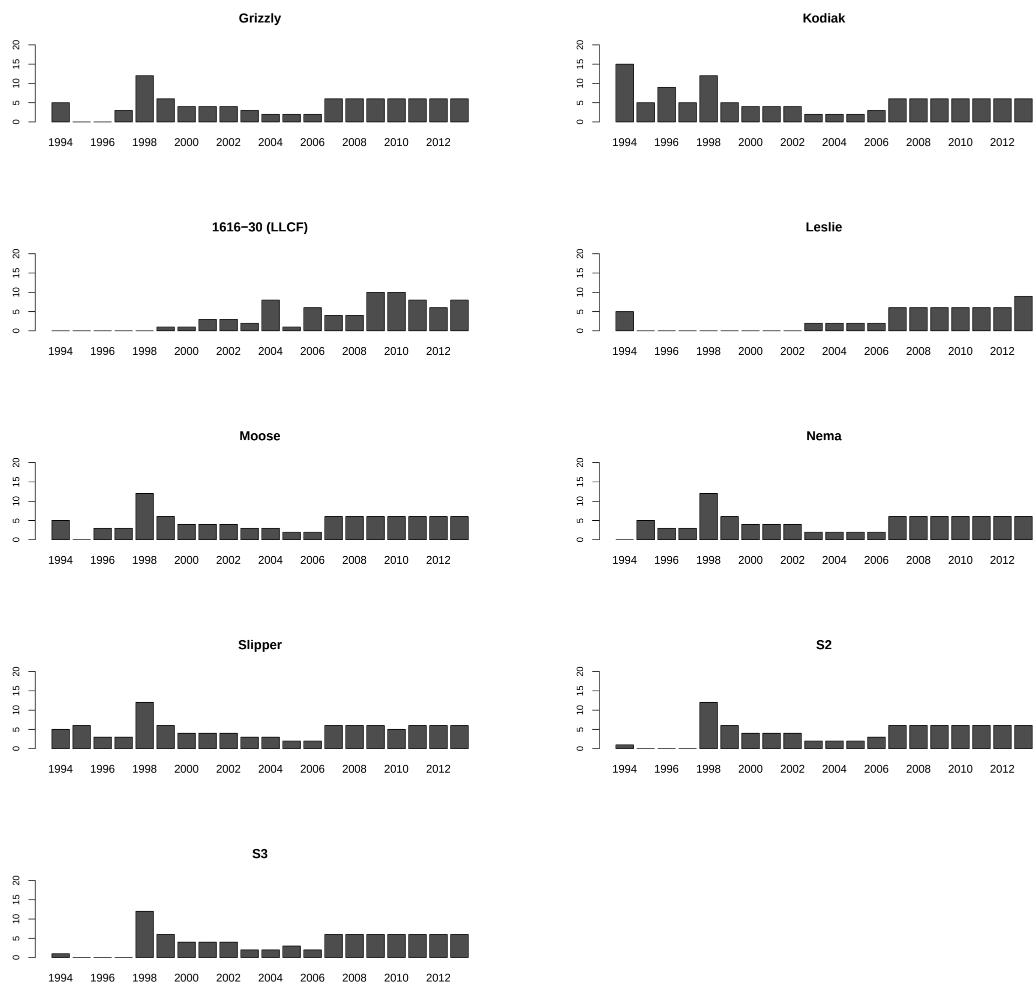
Analysis of August Hardness in Lakes of the Koala Watershed and Lac de Gras

March 4, 2014

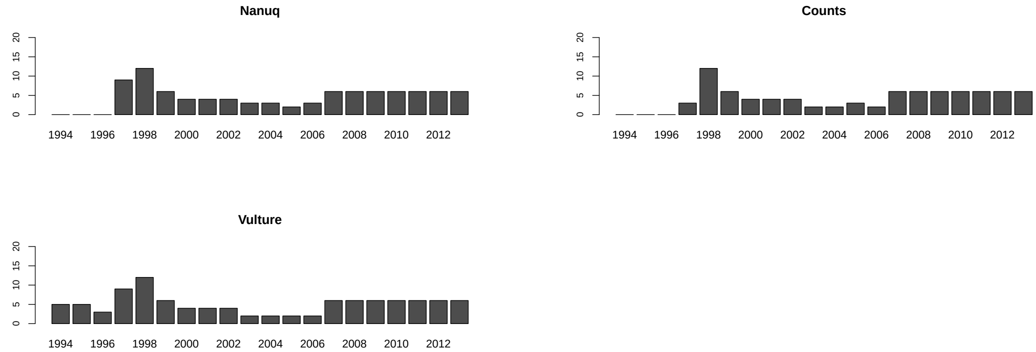
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

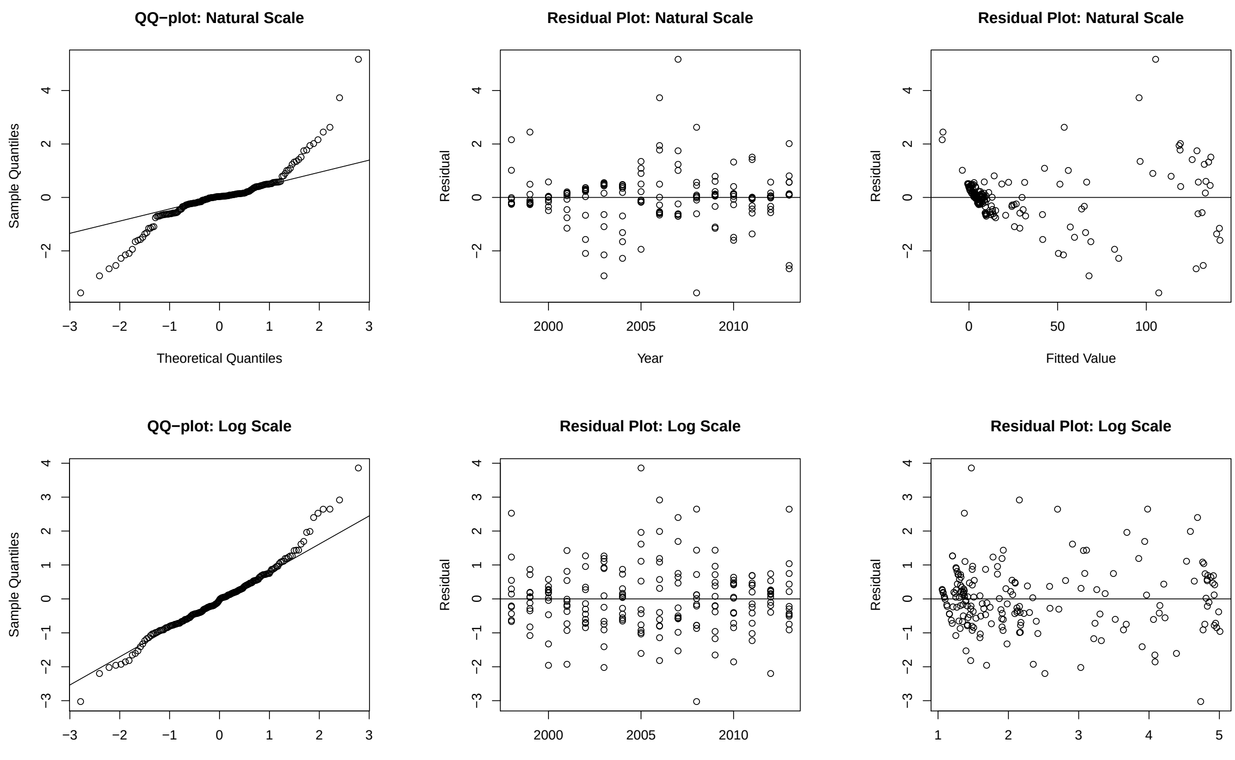


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
113	Moose	2006	130.50	95.93	3.73
114	Moose	2007	153.17	105.26	5.17
115	Moose	2008	73.92	107.03	-3.57

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
115	Moose	2008	73.92	4.73	-3.03
132	Nanuq	2005	7.57	1.47	3.86

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
2.24	6.00	0.90

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

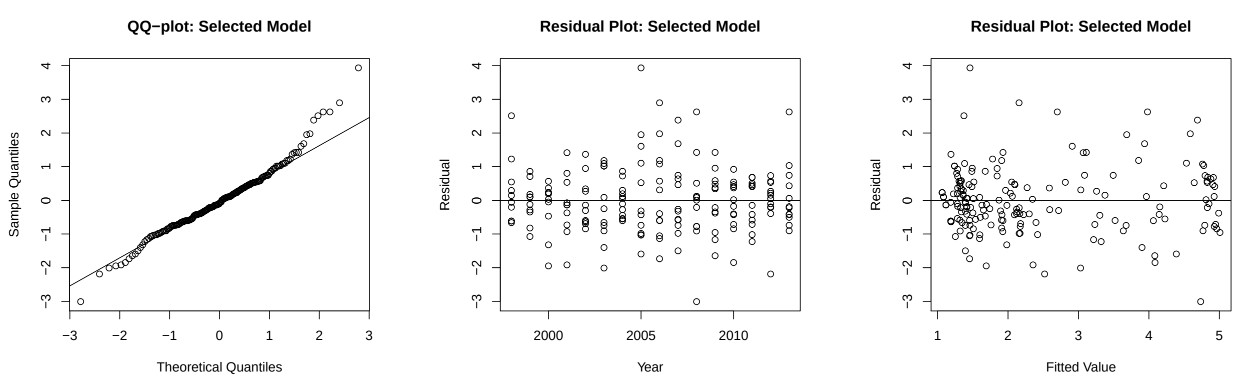
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.007	0.000	0.993	Ref. Model 3

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
115	Moose	2008	73.92	4.73	-3.01
132	Nanuq	2005	7.57	1.46	3.93

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Lakes

Fitted model of the slope and intercept of each monitored lake compared to a common slope and intercept fitted for all reference lakes together (reference model 3).

- Results:

	Chi-squared	DF	P-value
Grizzly	14.6533	3	0.0021
Kodiak	290.9355	3	0.0000
1616-30 (LLCF)	1177.8722	3	0.0000
Leslie	4517.1550	3	0.0000
Moose	4508.9380	3	0.0000
Nema	2758.3194	3	0.0000
Slipper	1301.8006	3	0.0000
S2	347.9525	3	0.0000
S3	138.5502	3	0.0000

- Conclusions:
  All monitored lakes show significant deviations from the common slope and intercept of reference lakes.

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	0.1476	2	0.9289
Kodiak	2.4942	2	0.2873
1616-30 (LLCF)	468.3298	2	0.0000
Leslie	69.7826	2	0.0000
Moose	604.1530	2	0.0000
Nema	418.9827	2	0.0000
Slipper	208.6540	2	0.0000
S2	62.0235	2	0.0000
S3	18.7527	2	0.0001

- Conclusions:
  When allowing for differences in intercept, all monitored lakes except Grizzly and Kodiak lakes show significant deviation from the common slope of reference lakes.

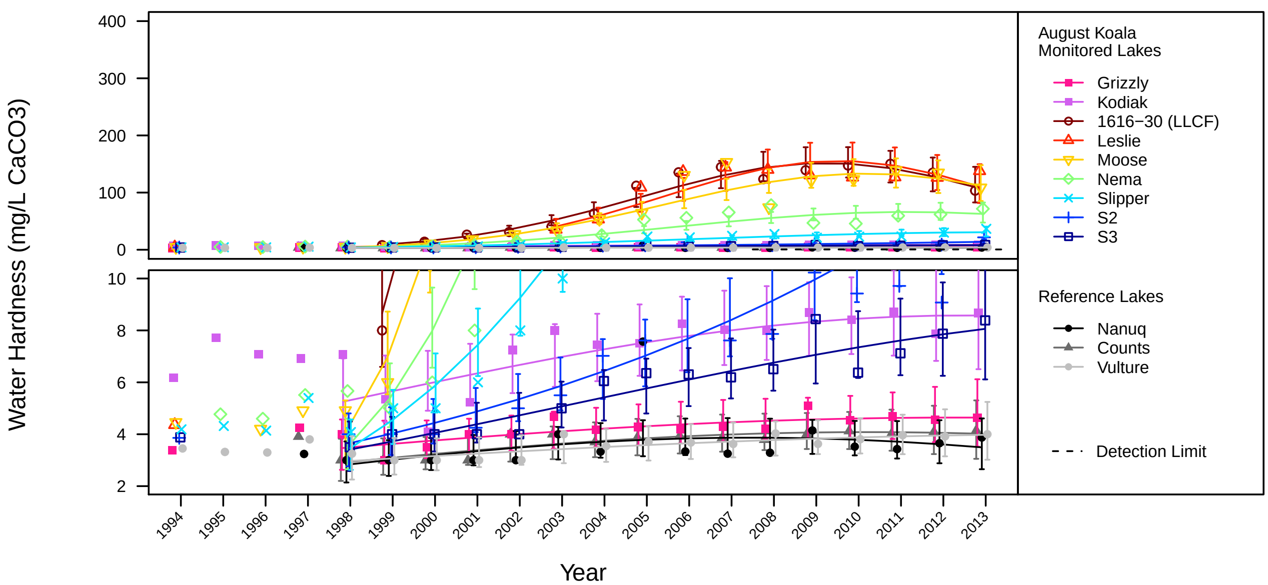
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.3470
Monitored Lake	1616-30 (LLCF)	0.9810
Monitored Lake	Grizzly	0.5890
Monitored Lake	Kodiak	0.5610
Monitored Lake	Leslie	0.8440
Monitored Lake	Moose	0.9680
Monitored Lake	Nema	0.9200
Monitored Lake	S2	0.7820
Monitored Lake	S3	0.9010
Monitored Lake	Slipper	0.9370

- Conclusions:
  Model fit for reference lakes is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean hardness for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	4.64E+00	4.64E+00	6.54E-01	3.52E+00	6.12E+00	1.91E+00
Kodiak	8.67E+00	8.58E+00	1.21E+00	6.51E+00	1.13E+01	3.54E+00
Leslie	1.38E+02	1.11E+02	1.70E+01	8.18E+01	1.50E+02	4.98E+01
1616-30 (LLCF)	1.03E+02	1.10E+02	1.57E+01	8.28E+01	1.45E+02	4.59E+01
Moose	1.08E+02	1.12E+02	1.58E+01	8.52E+01	1.48E+02	4.63E+01
Nema	7.17E+01	6.27E+01	8.84E+00	4.76E+01	8.26E+01	2.59E+01
Slipper	3.66E+01	3.06E+01	4.32E+00	2.32E+01	4.04E+01	1.26E+01
S2	2.17E+01	1.38E+01	1.95E+00	1.05E+01	1.82E+01	5.71E+00
S3	8.39E+00	8.06E+00	1.14E+00	6.11E+00	1.06E+01	3.32E+00
Nanuq	3.87E+00	3.50E+00	4.93E-01	2.65E+00	4.61E+00	
Counts	4.15E+00	4.02E+00	5.67E-01	3.05E+00	5.30E+00	
Vulture	4.00E+00	3.98E+00	5.61E-01	3.02E+00	5.24E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Hardness	August	Koala	Lake	Water	none	log e	linear mixed effects regression	#3 shared intercept & slope	NA	Grizzly Kodiak 1616-30 (LLCF) Leslie Moose Nema Slipper S2 S3

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

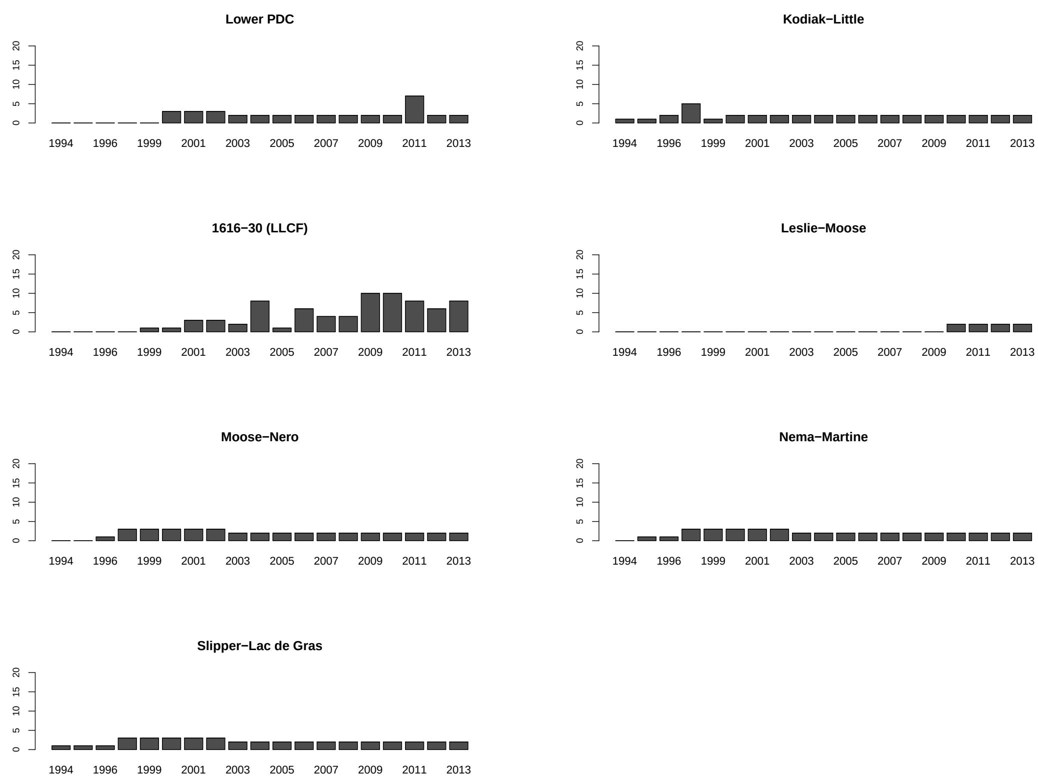
Analysis of August Hardness in Koala Watershed Streams

January 11, 2014

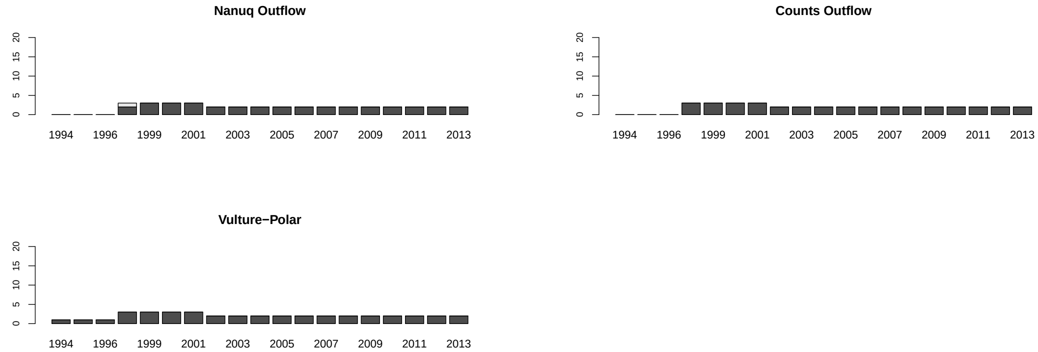
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

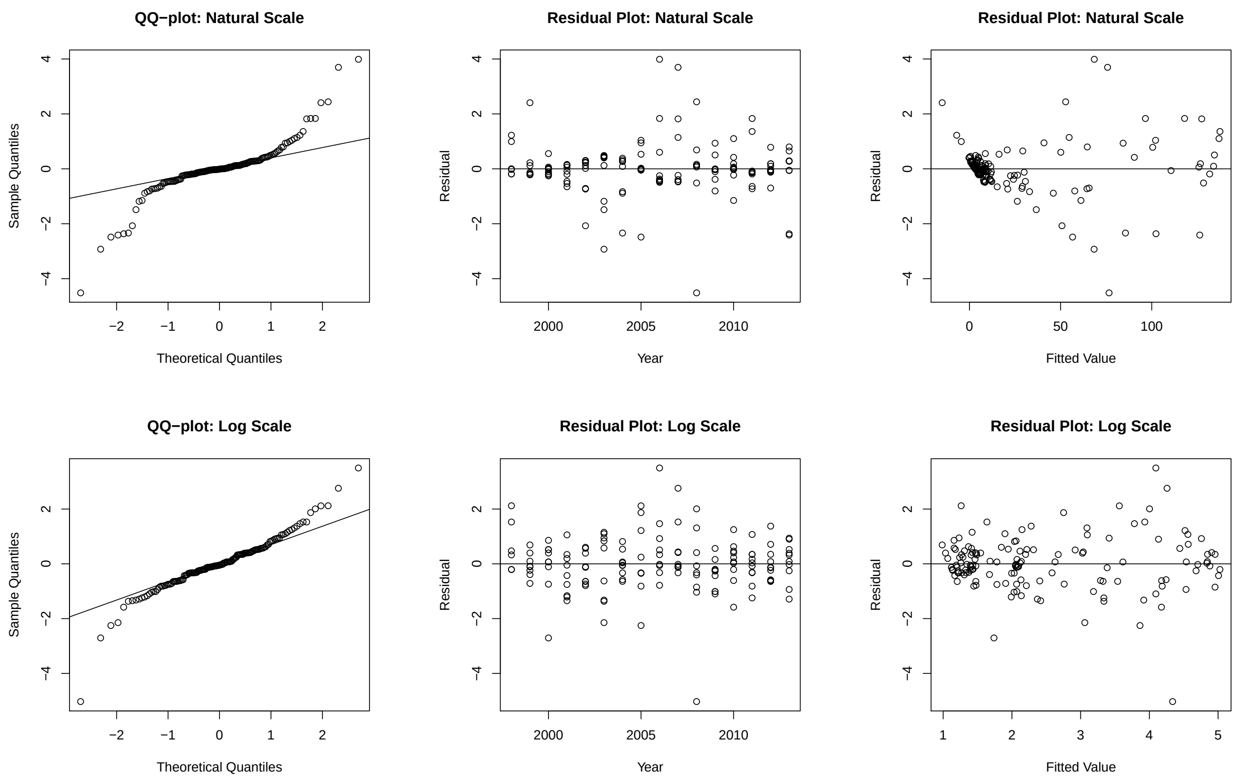


1.2 Reference



Comment:
None of the streams exhibited greater than 10% of data less than the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
113	Moose-Nero	2006	106.50	68.49	3.99
114	Moose-Nero	2007	111.00	75.79	3.69
115	Moose-Nero	2008	33.55	76.60	-4.52

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
113	Moose-Nero	2006	106.50	4.09	3.50
115	Moose-Nero	2008	33.55	4.34	-5.03

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
121.66	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
97.29	4.00	0.00

- Conclusions:
  The slopes differ significantly among reference streams. Reference streams do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.997	0.000	0.003	Ref. Model 1

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Lower PDC	2.8778	2	0.2372
Kodiak-Little	6.5737	2	0.0374
Leslie-Moose	0.6358	2	0.7277
1616-30 (LLCF)	450.6162	2	0.0000
Moose-Nero	236.4361	2	0.0000
Nema-Martine	212.0540	2	0.0000
Slipper-Lac de Gras	110.3163	2	0.0000

- Conclusions:
  All monitored streams except Lower PDC and Leslie-Moose show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored stream compared to slope of each reference stream (reference model 1b).

- Results:

	Chi-squared	DF	P-value
Kodiak-Little-vs-Nanuq Outflow	191.1030	3	0.0000
Kodiak-Little-vs-Counts Outflow	138.8210	3	0.0000
Kodiak-Little-vs-Vulture-Polar	85.2663	3	0.0000
1616-30 (LLCF)-vs-Nanuq Outflow	89.9604	3	0.0000
1616-30 (LLCF)-vs-Counts Outflow	84.5710	3	0.0000
1616-30 (LLCF)-vs-Vulture-Polar	95.0635	3	0.0000
Moose-Nero-vs-Nanuq Outflow	2010.8959	3	0.0000
Moose-Nero-vs-Counts Outflow	1844.6738	3	0.0000
Moose-Nero-vs-Vulture-Polar	1664.6992	3	0.0000
Nema-Martine-vs-Nanuq Outflow	1565.4662	3	0.0000
Nema-Martine-vs-Counts Outflow	1421.4549	3	0.0000
Nema-Martine-vs-Vulture-Polar	1269.2251	3	0.0000
Slipper-Lac de Gras-vs-Nanuq Outflow	753.9824	3	0.0000
Slipper-Lac de Gras-vs-Counts Outflow	652.7145	3	0.0000
Slipper-Lac de Gras-vs-Vulture-Polar	552.9304	3	0.0000

- Conclusions:
  All remaining monitored streams show significant deviations from the slopes of individual reference streams.

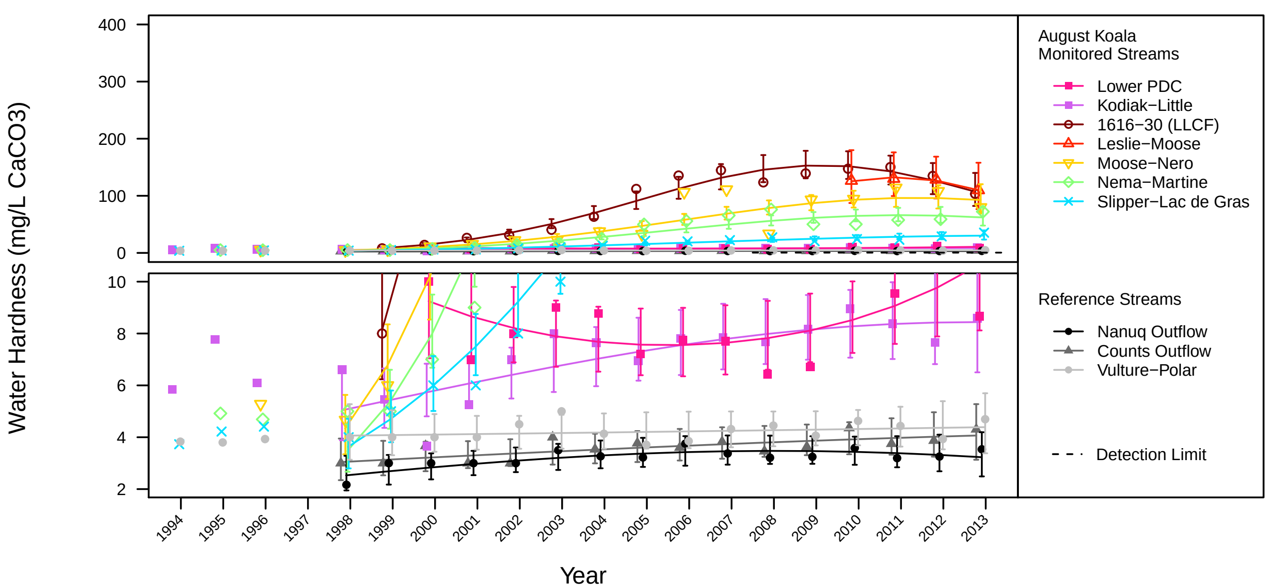
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Reference Stream	Counts Outflow	0.5660
Reference Stream	Nanuq Outflow	0.6320
Reference Stream	Vulture-Polar	0.0880
Monitored Stream	1616-30 (LLCF)	0.9820
Monitored Stream	Kodiak-Little	0.5430
Monitored Stream	Leslie-Moose	0.9700
Monitored Stream	Lower PDC	0.3230
Monitored Stream	Moose-Nero	0.9080
Monitored Stream	Nema-Martine	0.9410
Monitored Stream	Slipper-Lac de Gras	0.9510

- Conclusions:
  Model fit for Lower PDC is weak. Model fit for Vulture-Polar is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean hardness for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	8.66E+00	1.07E+01	1.48E+00	8.12E+00	1.40E+01	4.33E+00
Kodiak-Little	8.59E+00	8.44E+00	1.12E+00	6.50E+00	1.10E+01	3.28E+00
Leslie-Moose	1.10E+02	1.10E+02	2.03E+01	7.67E+01	1.58E+02	5.94E+01
1616-30 (LLCF)	1.03E+02	1.07E+02	1.46E+01	8.22E+01	1.40E+02	4.26E+01
Moose-Nero	7.98E+01	9.27E+01	1.23E+01	7.14E+01	1.20E+02	3.61E+01
Nema-Martine	7.22E+01	6.21E+01	8.26E+00	4.78E+01	8.06E+01	2.42E+01
Slipper-Lac de Gras	3.55E+01	3.03E+01	4.03E+00	2.33E+01	3.93E+01	1.18E+01
Nanuq Outflow	3.54E+00	3.23E+00	4.30E-01	2.49E+00	4.19E+00	
Counts Outflow	4.30E+00	4.07E+00	5.41E-01	3.13E+00	5.28E+00	
Vulture-Polar	4.70E+00	4.39E+00	5.84E-01	3.38E+00	5.70E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Hardness	August	Koala	Stream	Water	none	log e	linear mixed effects regression	#1b separate intercepts & slopes	NA	Kodiak-Little 1616-30 (LLCF) Moose-Nero Nema-Martine Slipper-Lac de Gras

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

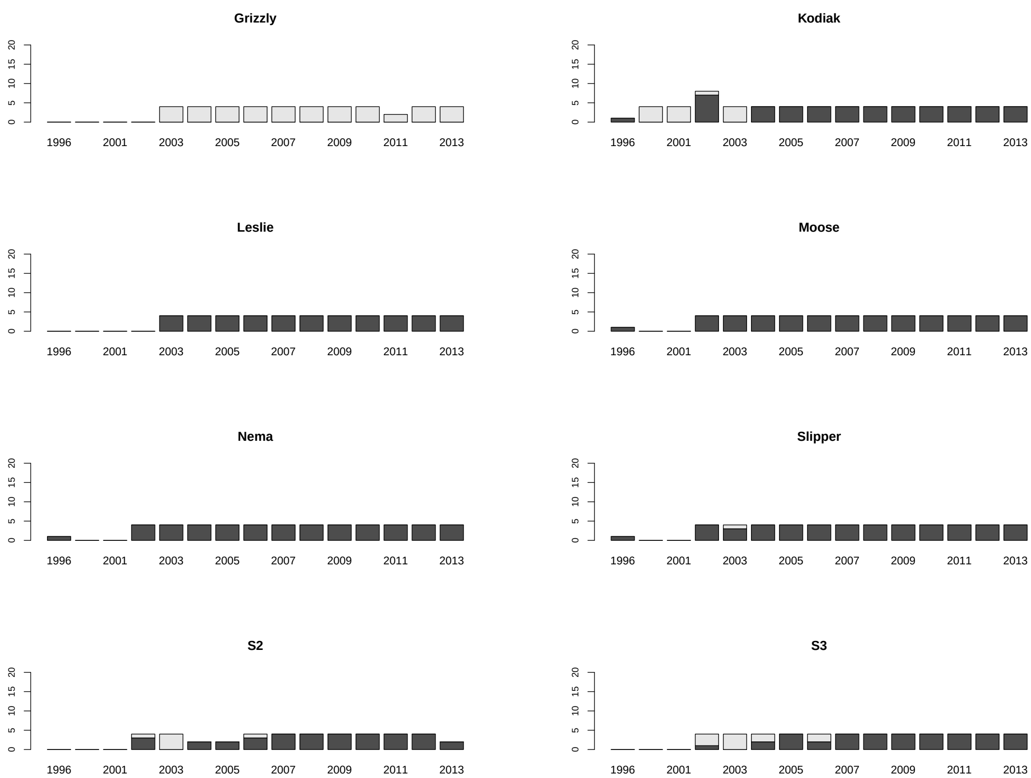
Analysis of April Chloride in Lakes of the Koala Watershed and Lac de Gras

January 11, 2014

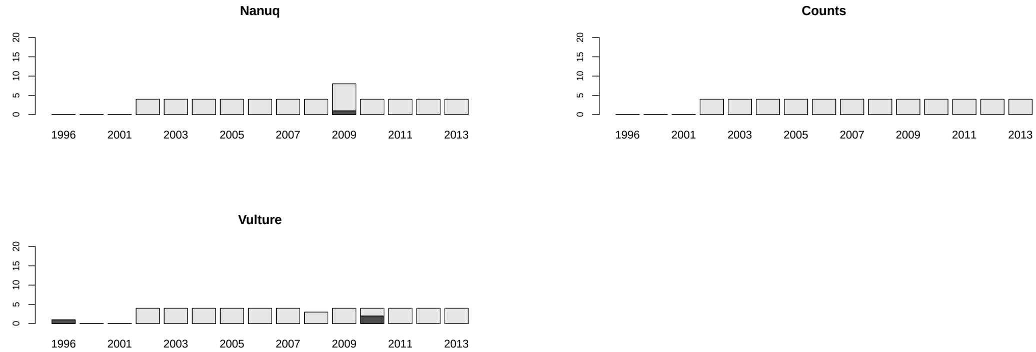
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

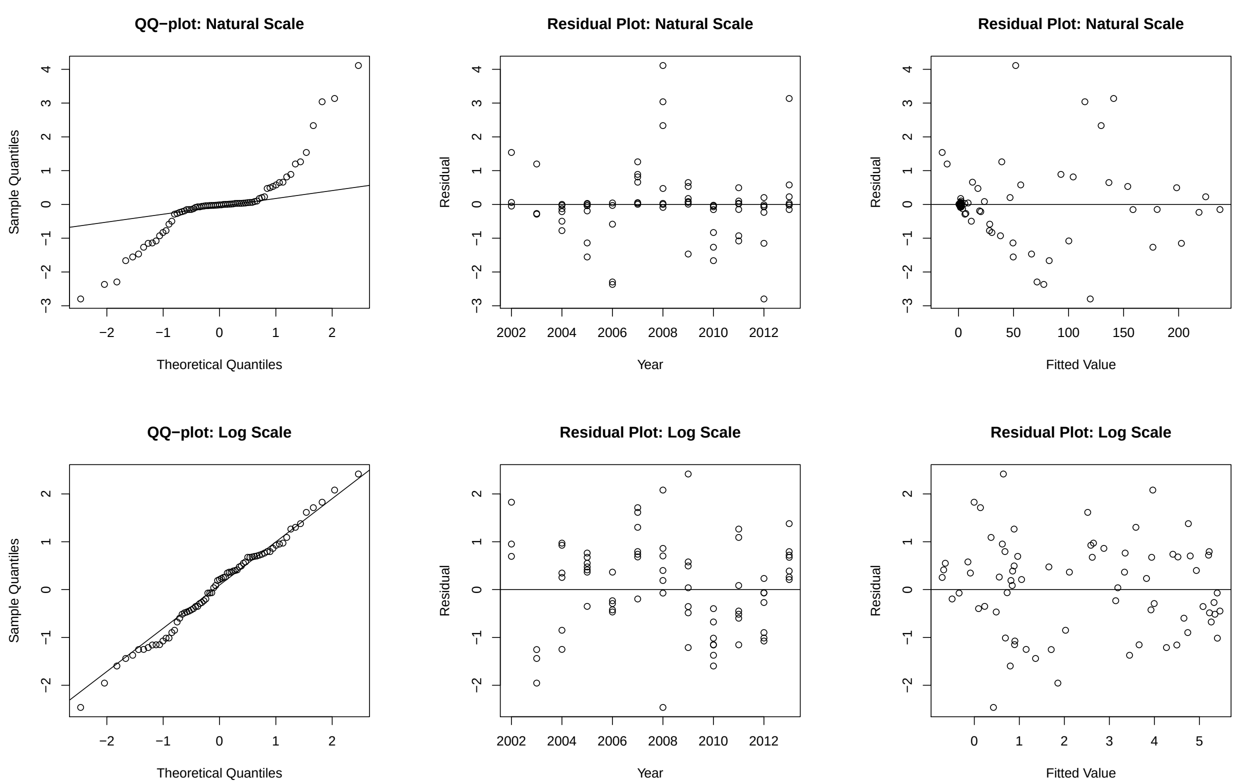


1.2 Reference



Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, and Grizzly lakes was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in Kodiak, S2, and S3 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
115	Moose	2008	150.50	114.82	3.04
155	Nema	2008	100.22	51.96	4.11
160	Nema	2013	177.75	140.94	3.14

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
3.75E-139	1.00E+00	log model

Conclusion:
The log transformed model best meets the assumptions of normality and equal variance. AIC also reveals that the data is modeled best after log transformation. Proceeding with analysis using the log transformed model.

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Kodiak	12.3872	2	0.0020
Leslie	173.1326	2	0.0000
Moose	258.7252	2	0.0000
Nema	230.1024	2	0.0000
Slipper	196.9059	2	0.0000
S2	35.0210	2	0.0000
S3	30.4006	2	0.0000

- Conclusions:
  All monitored lakes show significant deviations from a constant slope of zero.

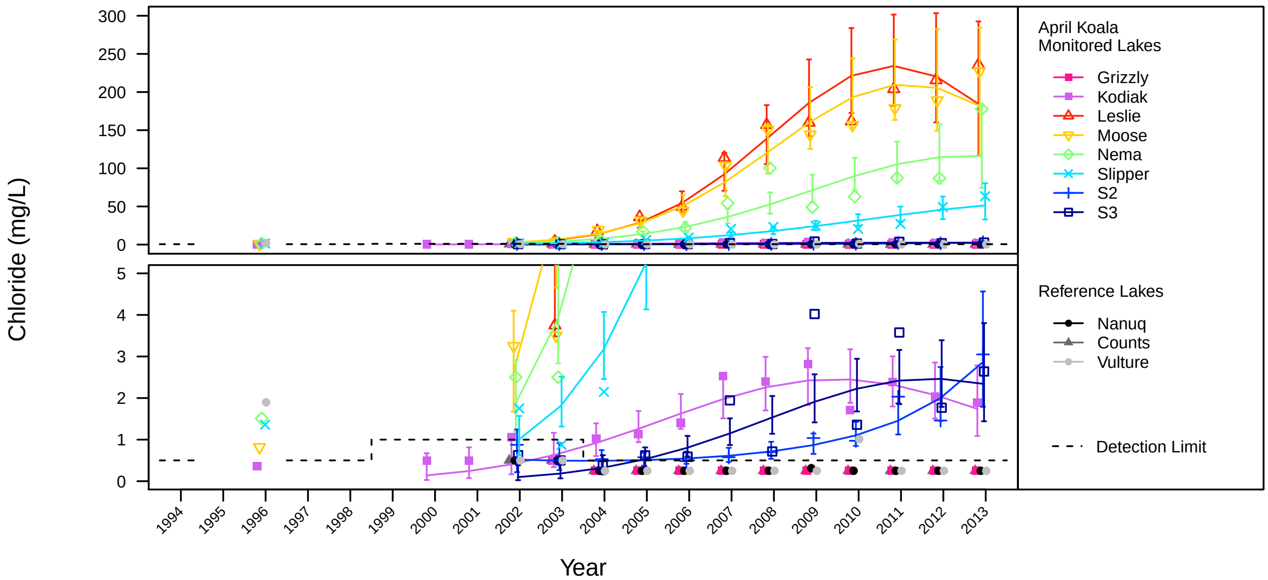
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	Kodiak	0.7780
Monitored Lake	Leslie	0.9670
Monitored Lake	Moose	0.9700
Monitored Lake	Nema	0.9350
Monitored Lake	S2	0.8750
Monitored Lake	S3	0.6860
Monitored Lake	Slipper	0.9180

- Conclusions:
  Models provide a good fit for all monitored lakes.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean chloride for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Kodiak	1.89E+00	1.74E+00	4.17E-01	1.09E+00	2.78E+00	1.22E+00
Leslie	2.36E+02	1.85E+02	4.34E+01	1.16E+02	2.93E+02	1.27E+02
Moose	2.27E+02	1.82E+02	4.15E+01	1.16E+02	2.85E+02	1.22E+02
Nema	1.78E+02	1.16E+02	2.65E+01	7.42E+01	1.82E+02	7.76E+01
Slipper	6.33E+01	5.14E+01	1.17E+01	3.29E+01	8.04E+01	3.43E+01
S2	3.05E+00	2.86E+00	6.83E-01	1.79E+00	4.56E+00	2.00E+00
S3	2.64E+00	2.34E+00	5.79E-01	1.44E+00	3.80E+00	1.70E+00
Nanuq	2.50E-01					
Counts	2.50E-01					
Vulture	2.50E-01					

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Chloride	April	Koala	Lake	Water	Counts Grizzly Nanuq Vulture	log e	Tobit regression	#1a slope of zero	NA	Kodiak Leslie Moose Nema Slipper S2 S3

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

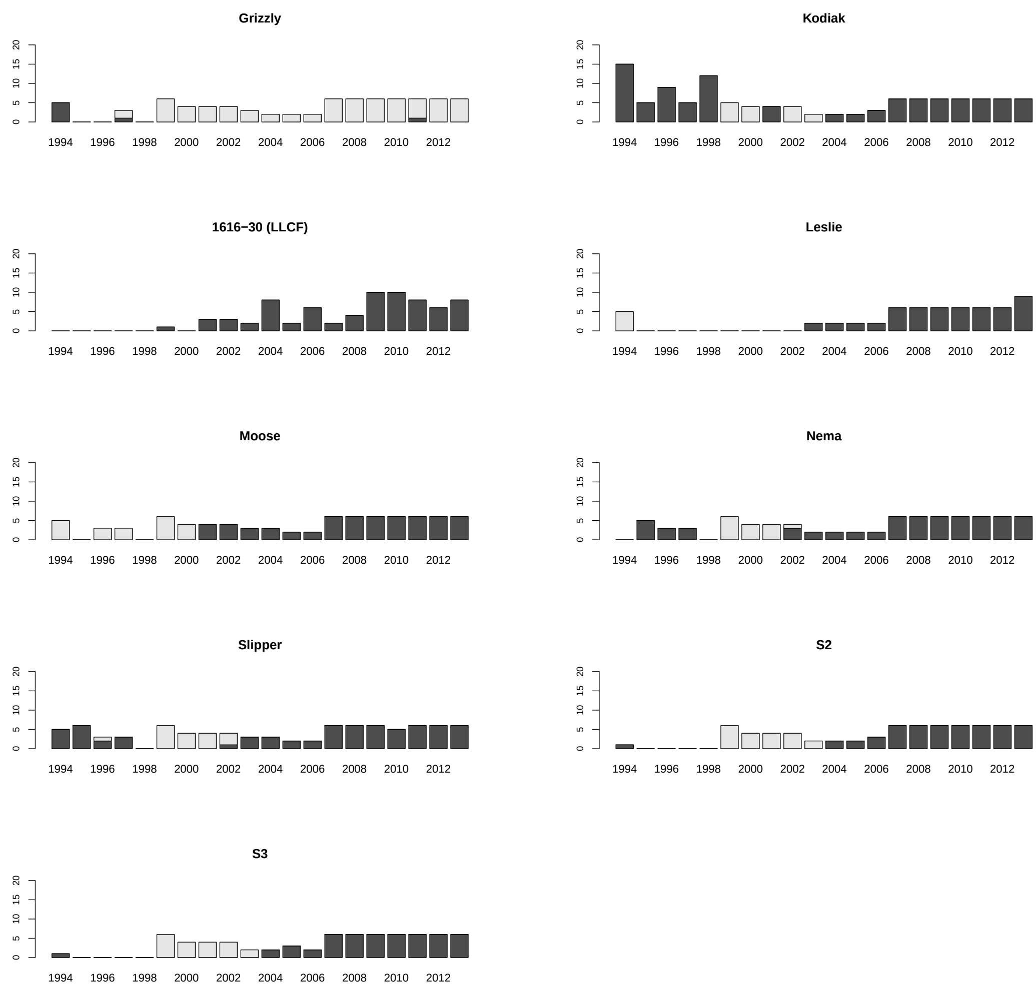
Analysis of August Chloride in Lakes of the Koala Watershed and Lac de Gras

March 4, 2014

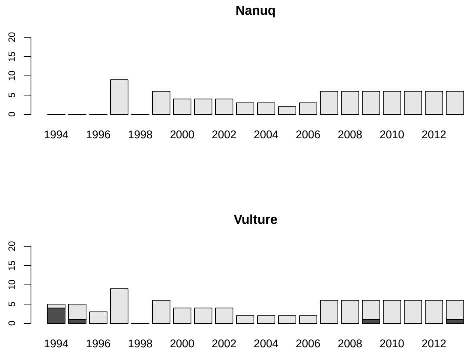
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

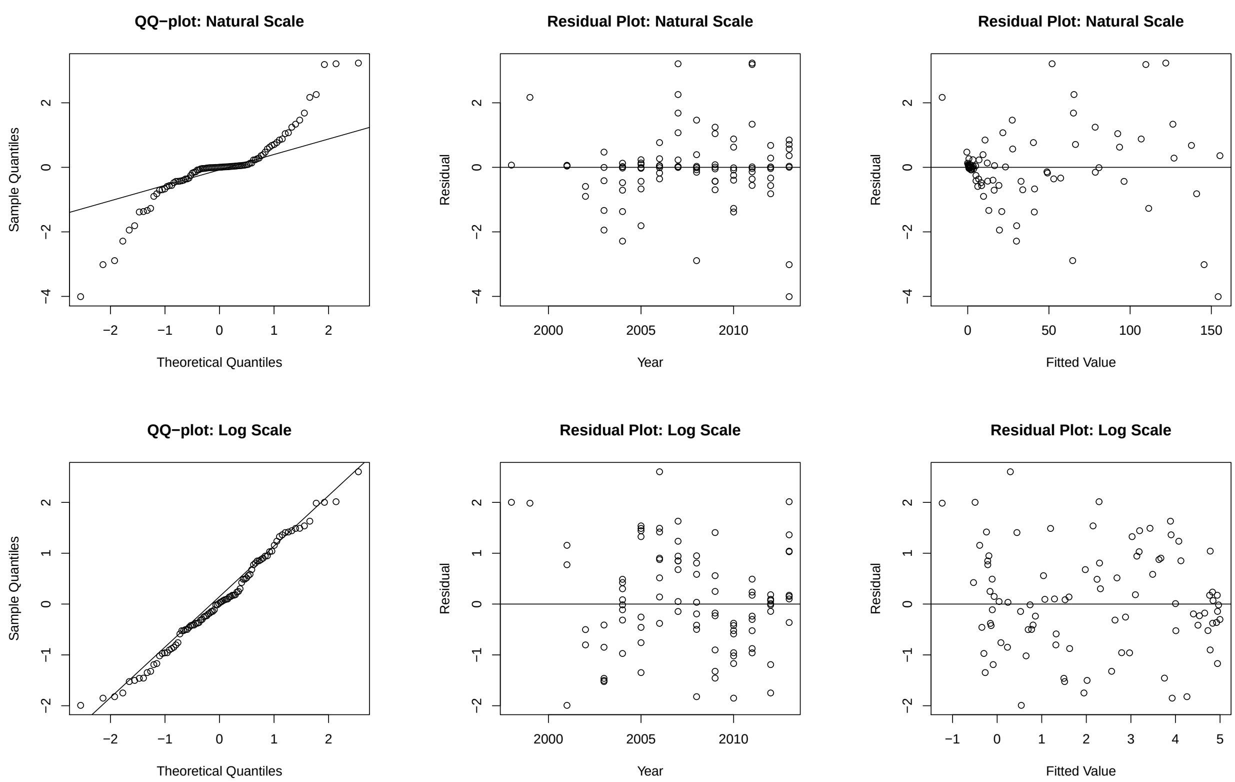


1.2 Reference



Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, and Grizzly lakes was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in Kodiak, Moose, Nema, Slipper, S2, and S3 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-30 (LLCF)	2011	146.12	121.96	3.23
20	1616-30 (LLCF)	2013	124.25	154.21	-4.01
114	Moose	2007	75.97	51.96	3.21
118	Moose	2011	133.50	109.67	3.19
120	Moose	2013	123.00	145.55	-3.02

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Kodiak	3.4041	2	0.1823
1616-30 (LLCF)	653.2933	2	0.0000
Leslie	195.1716	2	0.0000
Moose	477.5056	2	0.0000
Nema	242.0179	2	0.0000
Slipper	160.0848	2	0.0000
S2	96.3569	2	0.0000
S3	46.1471	2	0.0000

- Conclusions:
  All monitored lakes except Kodiak Lake shows significant deviation from a slope of zero.

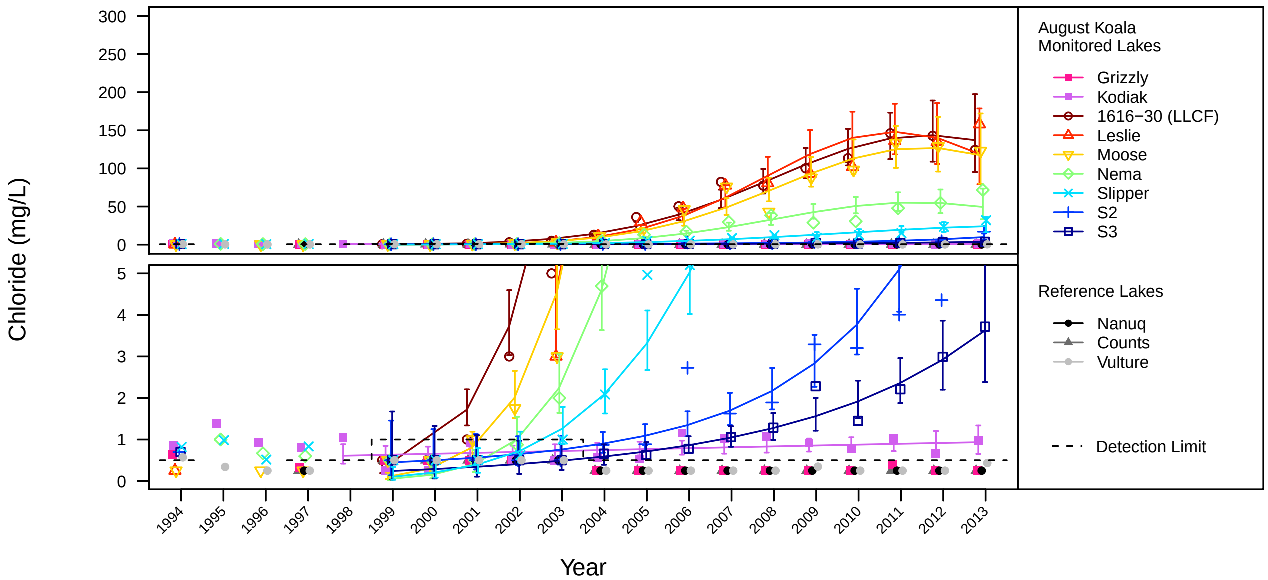
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	1616-30 (LLCF)	0.9770
Monitored Lake	Kodiak	0.1300
Monitored Lake	Leslie	0.9560
Monitored Lake	Moose	0.9550
Monitored Lake	Nema	0.9100
Monitored Lake	S2	0.9060
Monitored Lake	S3	0.8930
Monitored Lake	Slipper	0.9190

- Conclusions:
  Model fit for Kodiak Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean chloride for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Kodiak	9.73E-01	9.35E-01	1.71E-01	6.53E-01	1.34E+00	5.00E-01
Leslie	1.58E+02	1.19E+02	2.47E+01	7.93E+01	1.79E+02	7.22E+01
1616-30 (LLCF)	1.24E+02	1.37E+02	2.55E+01	9.53E+01	1.97E+02	7.46E+01
Moose	1.23E+02	1.17E+02	2.29E+01	8.00E+01	1.72E+02	6.71E+01
Nema	7.17E+01	4.95E+01	1.00E+01	3.33E+01	7.35E+01	2.93E+01
Slipper	3.20E+01	2.41E+01	4.93E+00	1.62E+01	3.60E+01	1.44E+01
S2	1.70E+01	9.83E+00	1.97E+00	6.64E+00	1.46E+01	5.77E+00
S3	3.72E+00	3.62E+00	7.70E-01	2.38E+00	5.49E+00	2.25E+00
Nanuq	2.50E-01					
Counts	2.50E-01					
Vulture	4.33E-01					

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Chloride	August	Koala	Lake	Water	Counts Grizzly Nanuq Vulture	log e	Tobit regression	#1a slope of zero	NA	1616-30 (LLCF) Leslie Moose Nema Slipper S2 S3

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

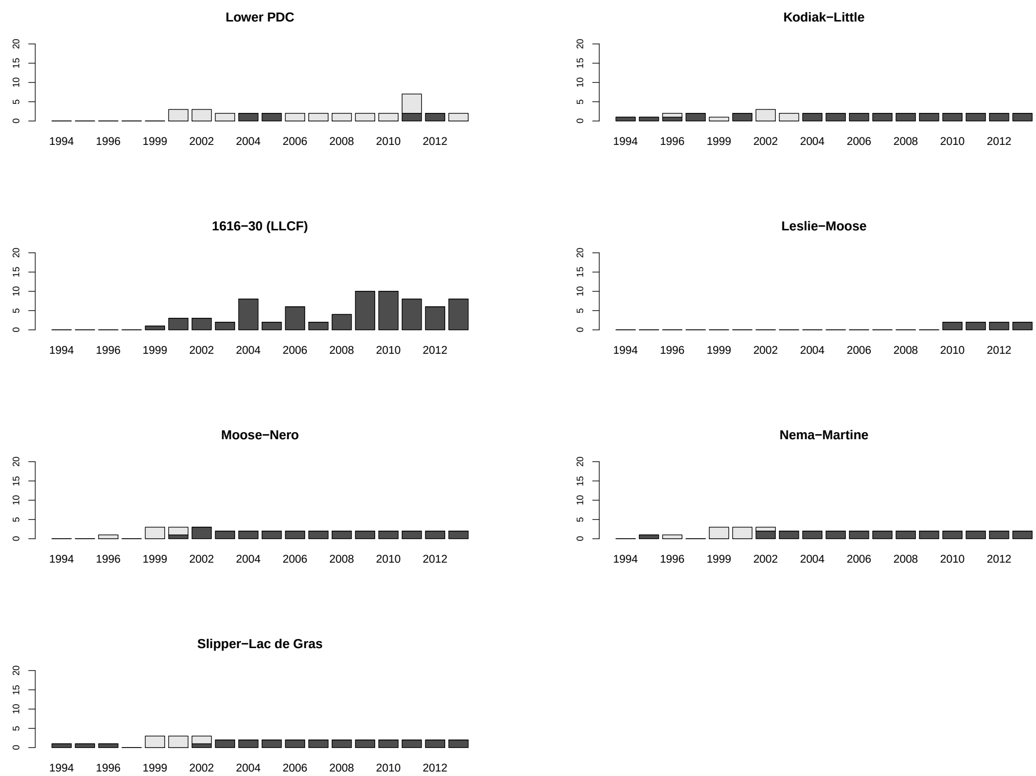
Analysis of August Chloride in Koala Watershed Streams

January 11, 2014

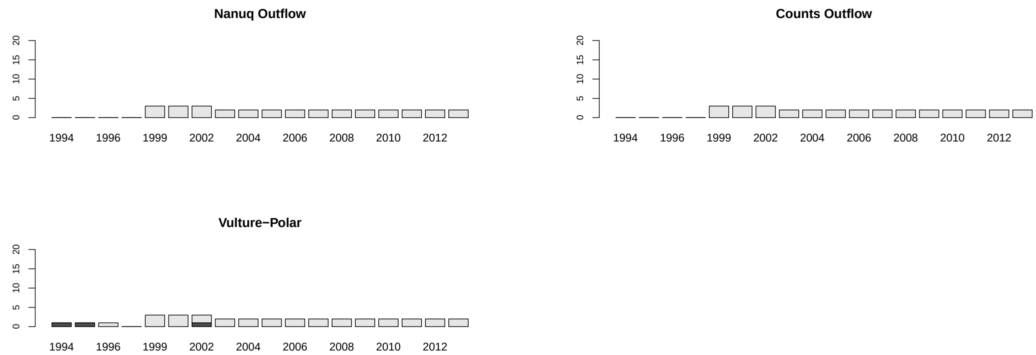
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

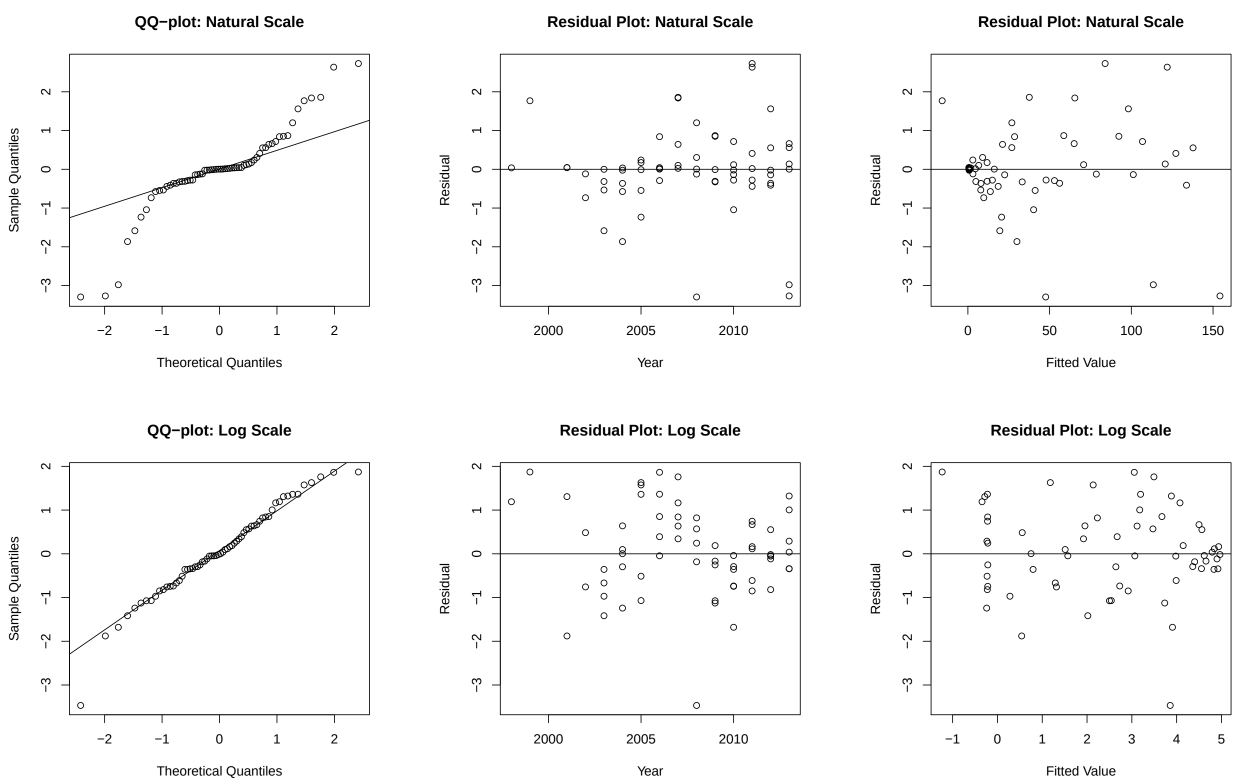


1.2 Reference



Comment:
Greater than 60% of data in Counts, Nanuq, and Vulture streams and the Lower PDC was less than the detection limit. These streams were excluded from further analyses. 10-60% of data in Kodiak-Little, Moose-Nero, Nema-Martine, and Slipper-Lac de Gras was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
20	1616-30 (LLCF)	2013	124.25	154.21	-3.27
115	Moose-Nero	2008	17.40	47.60	-3.29

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
115	Moose-Nero	2008	17.40	3.86	-3.47

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
The natural and log transformed models show dependence on year and fitted value. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using the log transformed model. Results should be interpreted with caution.

3 Comparisons within Reference Streams

All reference streams removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored stream against a slope of 0.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Kodiak-Little	0.2534	2	0.8810
Leslie-Moose	0.5451	2	0.7614
1616-30 (LLCF)	580.7143	2	0.0000
Moose-Nero	306.3878	2	0.0000
Nema-Martine	213.7386	2	0.0000
Slipper-Lac de Gras	126.9371	2	0.0000

- Conclusions:
  All monitored streams except Kodiak-Little and Leslie-Moose show significant deviation from a slope of zero.

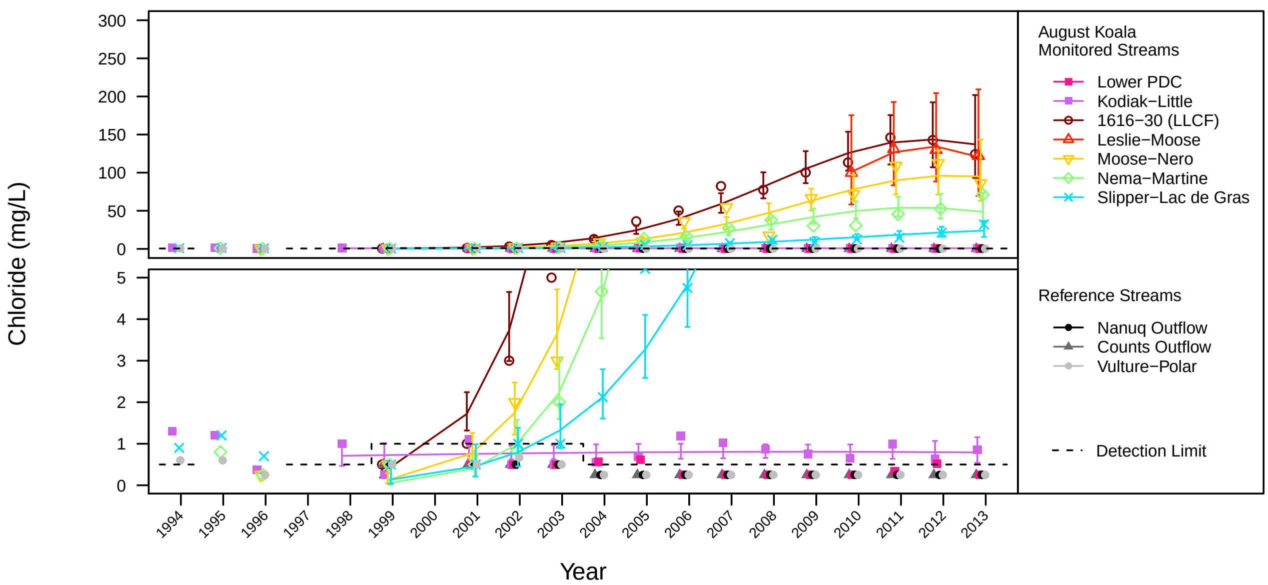
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Lake Type	Lake Name	R-squared
Monitored Lake	1616-30 (LLCF)	0.9770
Monitored Lake	Kodiak-Little	0.0510
Monitored Lake	Leslie-Moose	0.9480
Monitored Lake	Moose-Nero	0.9360
Monitored Lake	Nema-Martine	0.9100
Monitored Lake	Slipper-Lac de Gras	0.9320

- Conclusions:
  Model fit for Kodiak-Little is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean chloride for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	2.50E-01					
Kodiak-Little	8.60E-01	7.91E-01	1.53E-01	5.41E-01	1.16E+00	4.48E-01
Leslie-Moose	1.22E+02	1.21E+02	3.39E+01	6.95E+01	2.09E+02	9.92E+01
1616-30 (LLCF)	1.24E+02	1.37E+02	2.70E+01	9.32E+01	2.02E+02	7.91E+01
Moose-Nero	8.62E+01	9.50E+01	1.99E+01	6.30E+01	1.43E+02	5.83E+01
Nema-Martine	7.11E+01	4.86E+01	1.04E+01	3.19E+01	7.39E+01	3.05E+01
Slipper-Lac de Gras	3.20E+01	2.39E+01	5.20E+00	1.56E+01	3.66E+01	1.52E+01
Nanuq Outflow	2.50E-01					
Counts Outflow	2.50E-01					
Vulture-Polar	2.50E-01					

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Chloride	August	Koala	Stream	Water	Counts Outflow Lower PDC Nanuq Outflow Vulture-Polar	log e	Tobit regression	#1a slope of zero	NA	1616-30 (LLCF) Moose-Nero Nema-Martine Slipper-Lac de Gras

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

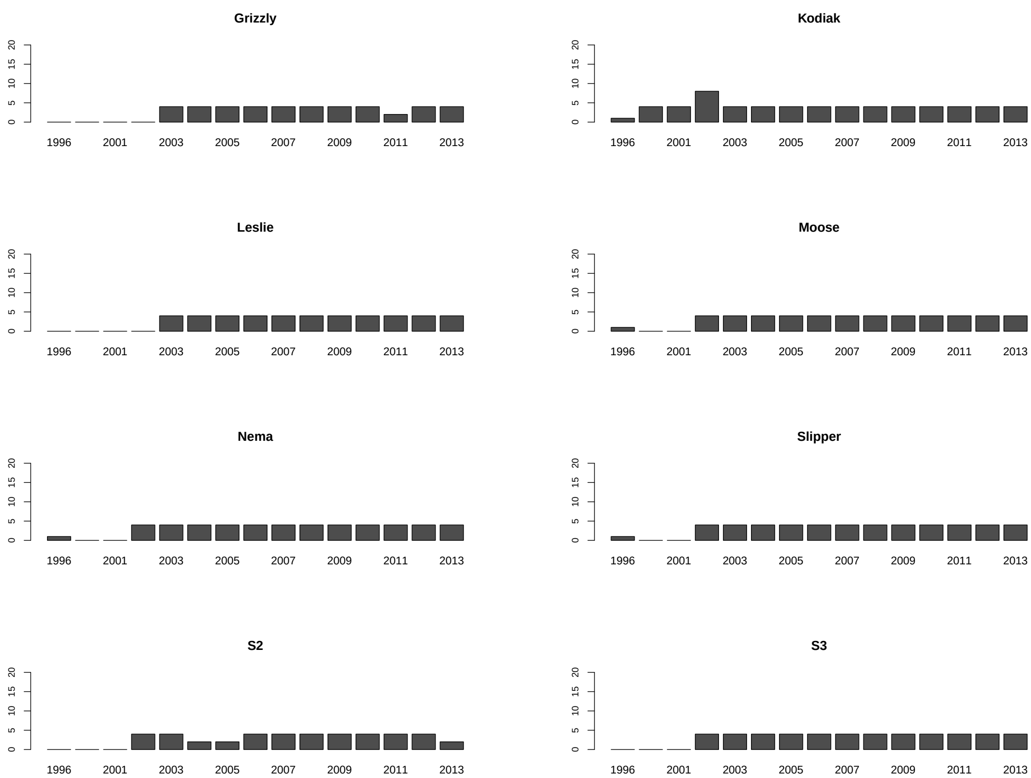
Analysis of April Sulphate in Lakes of the Koala Watershed and Lac de Gras

January 11, 2014

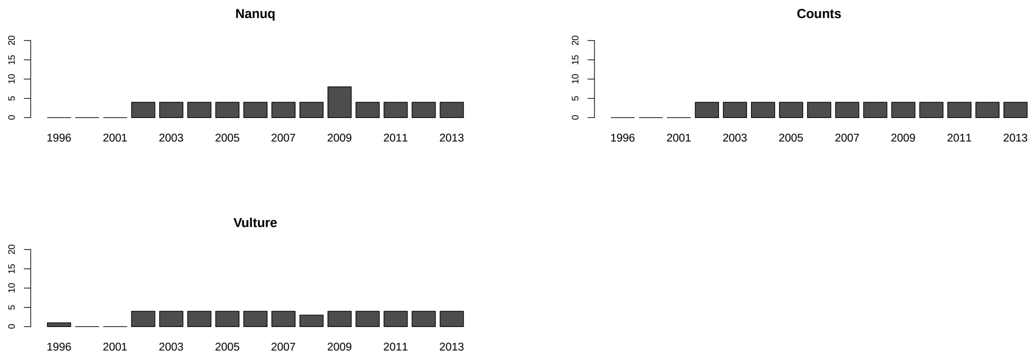
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

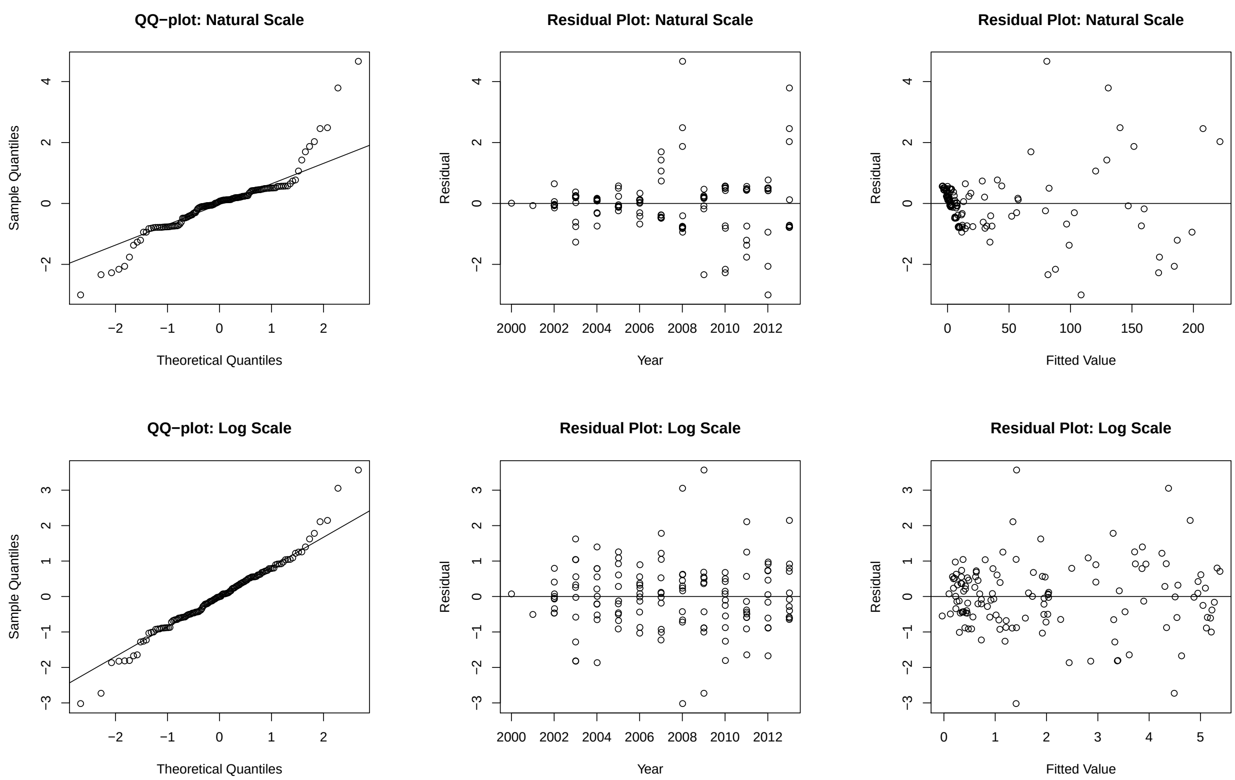


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
155	Nema	2008	124.75	80.74	4.67
159	Nema	2012	80.32	108.63	-3.00
160	Nema	2013	166.50	130.74	3.79

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
155	Nema	2008	124.75	4.38	3.05
195	S3	2008	2.62	1.41	-3.02
196	S3	2009	6.96	1.42	3.57

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.17E-237	1.00E+00	log model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
141.87	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
1.53	4.00	0.82

- Conclusions:
  The slopes do not differ significantly among reference lakes.

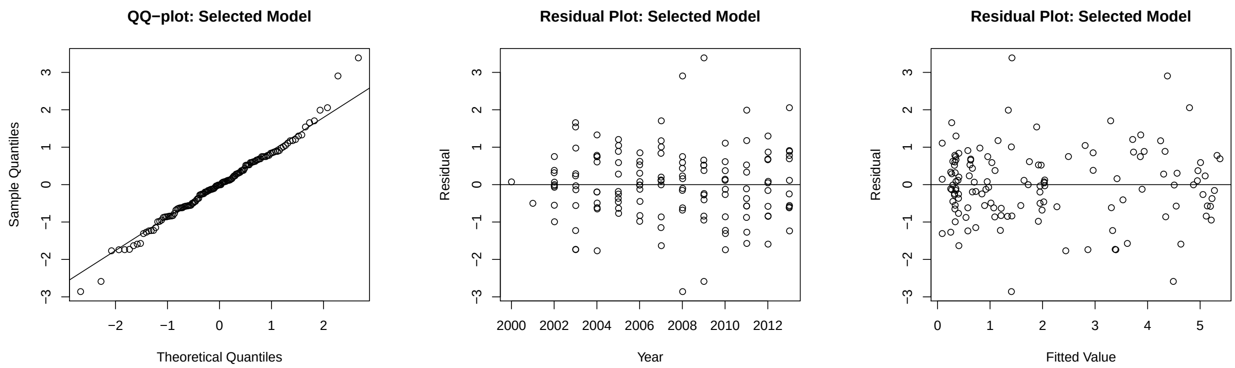
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.558	0.000	0.442	Indistinguishable support for 1 & 3; choose Model 3.

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using a common slope and intercept, contrasts suggest that intercepts differ among reference lakes. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes).

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
196	S3	2009	6.96	1.42	3.39

No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	0.08	2.00	0.96
Kodiak	0.12	2.00	0.94
Leslie	85.36	2.00	0.00
Moose	97.94	2.00	0.00
Nema	88.91	2.00	0.00
Slipper	77.48	2.00	0.00
S2	3.76	2.00	0.15
S3	10.17	2.00	0.01

- Conclusions:
  Leslie, Moose, Nema, Slipper, and S3 show significant deviation from the common slope of reference lakes.

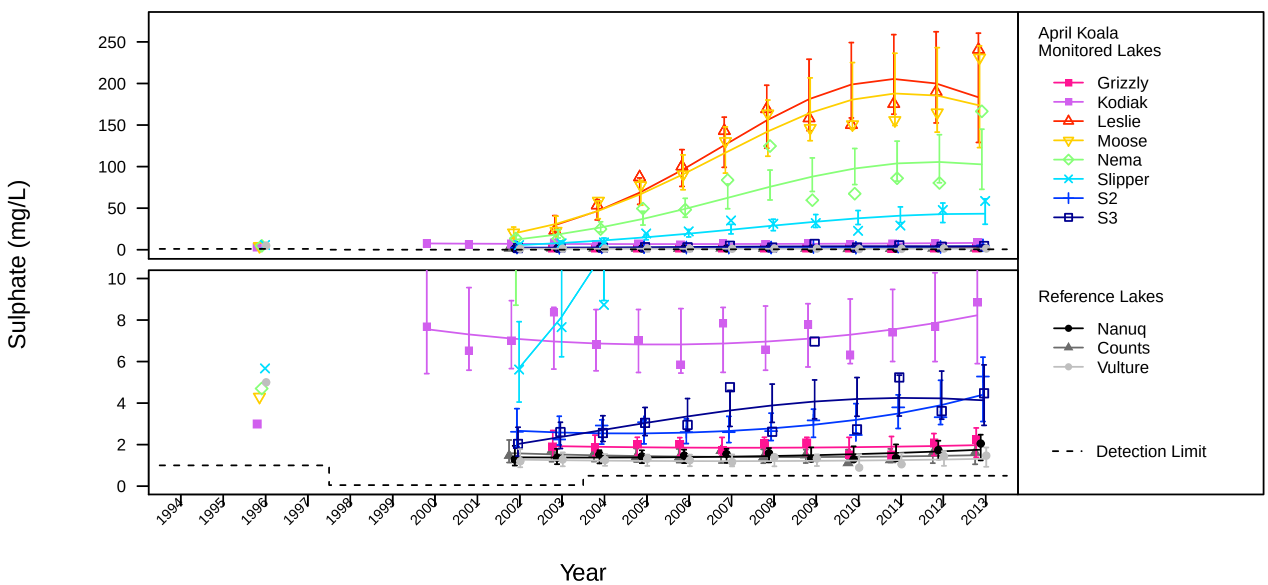
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0580
Monitored Lake	Grizzly	0.0280
Monitored Lake	Kodiak	0.2510
Monitored Lake	Leslie	0.9250
Monitored Lake	Moose	0.9440
Monitored Lake	Nema	0.8370
Monitored Lake	S2	0.6350
Monitored Lake	S3	0.4650
Monitored Lake	Slipper	0.8710

- Conclusions:
  Model fit for Kodiak and S3 is weak. Model fit for reference lakes and Grizzly Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean sulphate for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	2.24E+00	1.97E+00	3.54E-01	1.39E+00	2.80E+00	1.03E+00
Kodiak	8.85E+00	8.23E+00	1.40E+00	5.90E+00	1.15E+01	4.09E+00
Leslie	2.41E+02	1.83E+02	3.29E+01	1.29E+02	2.61E+02	9.61E+01
Moose	2.31E+02	1.74E+02	3.06E+01	1.23E+02	2.45E+02	8.95E+01
Nema	1.66E+02	1.03E+02	1.81E+01	7.27E+01	1.45E+02	5.29E+01
Slipper	5.86E+01	4.33E+01	7.63E+00	3.07E+01	6.12E+01	2.23E+01
S2	5.28E+00	4.40E+00	7.75E-01	3.11E+00	6.21E+00	2.27E+00
S3	4.47E+00	4.13E+00	7.29E-01	2.93E+00	5.84E+00	2.13E+00
Nanuq	2.05E+00	1.75E+00	3.09E-01	1.24E+00	2.48E+00	
Counts	1.62E+00	1.49E+00	2.62E-01	1.05E+00	2.10E+00	
Vulture	1.47E+00	1.32E+00	2.32E-01	9.33E-01	1.86E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor- mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con- trasts*
Sulphate	April	Koala	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	NA	Leslie Moose Nema Slipper S3

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

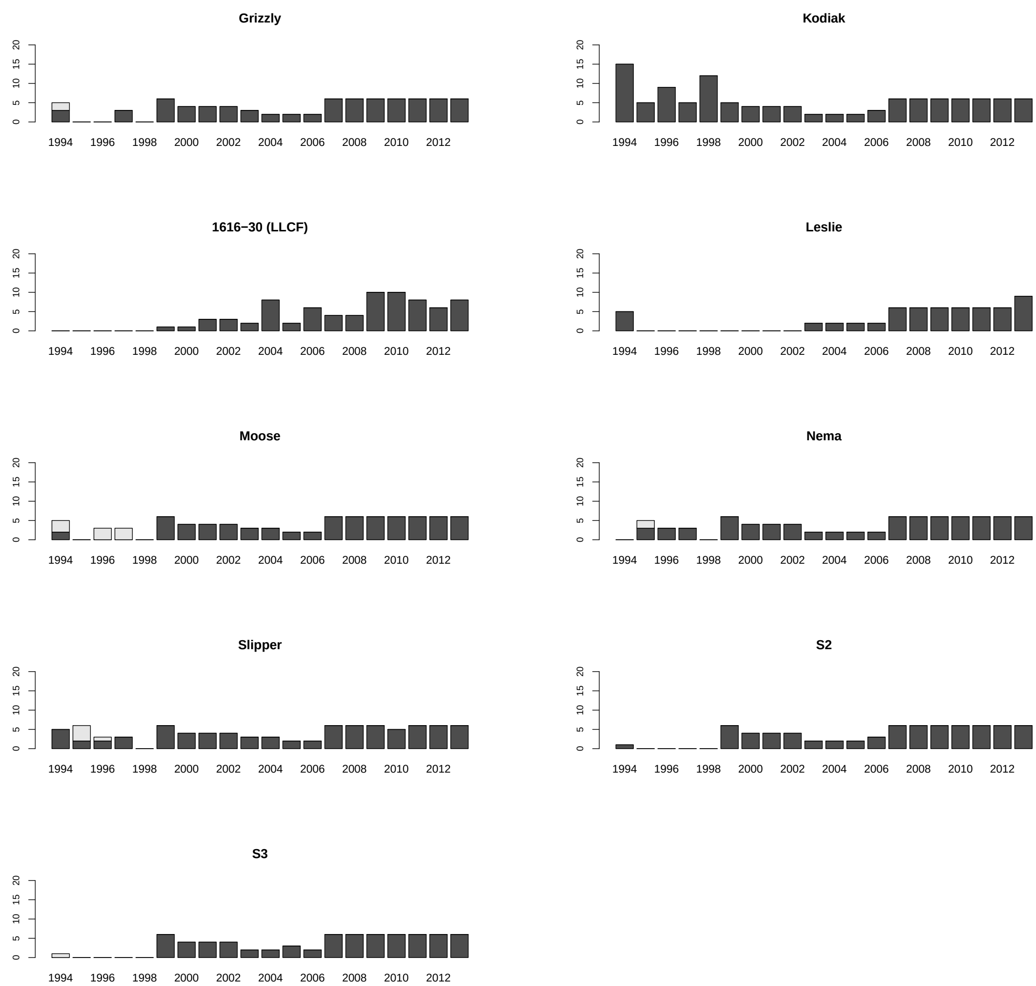
Analysis of August Sulphate in Lakes of the Koala Watershed and Lac de Gras

March 4, 2014

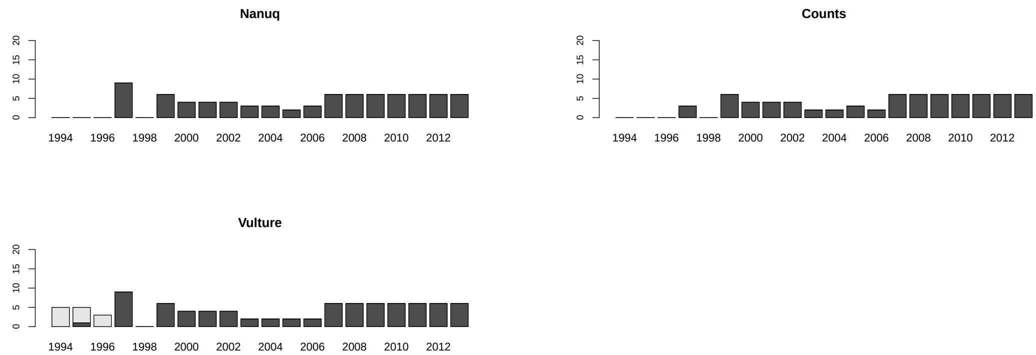
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

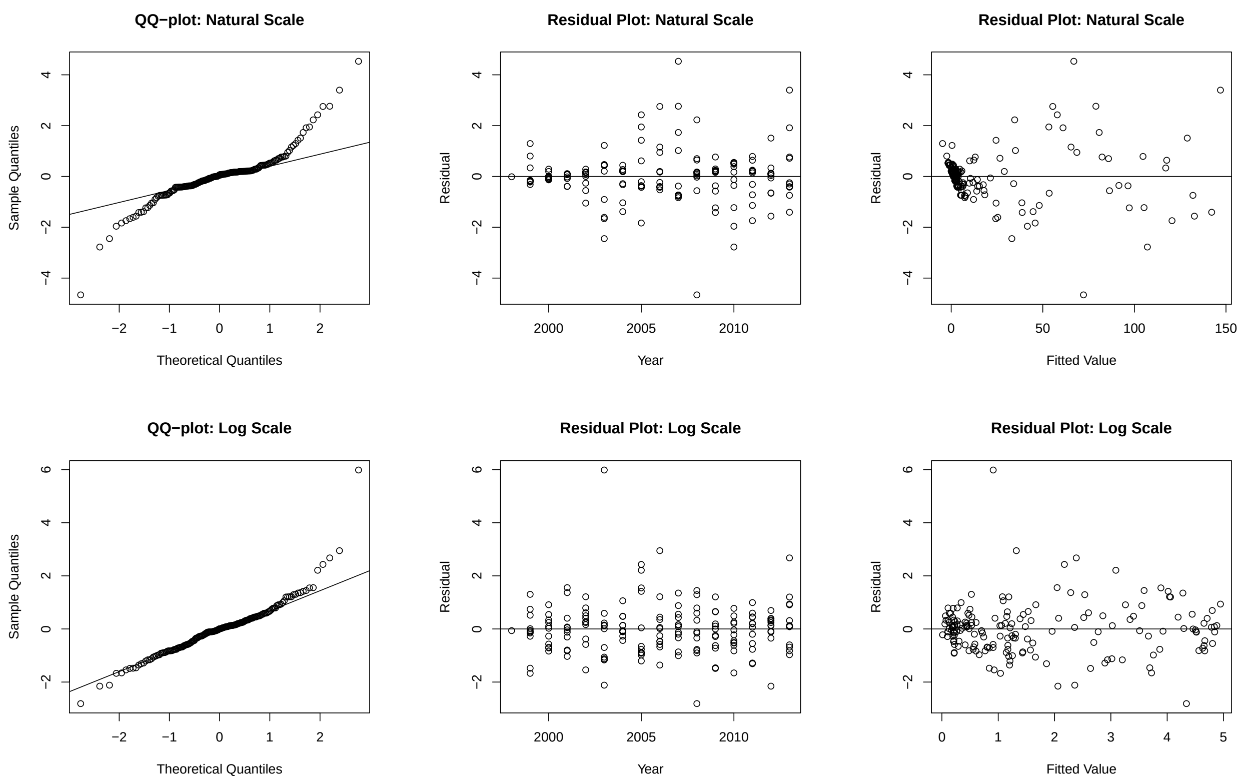


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
100	Leslie	2013	164.89	146.97	3.40
114	Moose	2007	90.82	66.91	4.53
115	Moose	2008	47.62	72.20	-4.66

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
190	S3	2003	6.88	0.91	5.99

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
5.52	6.00	0.48

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

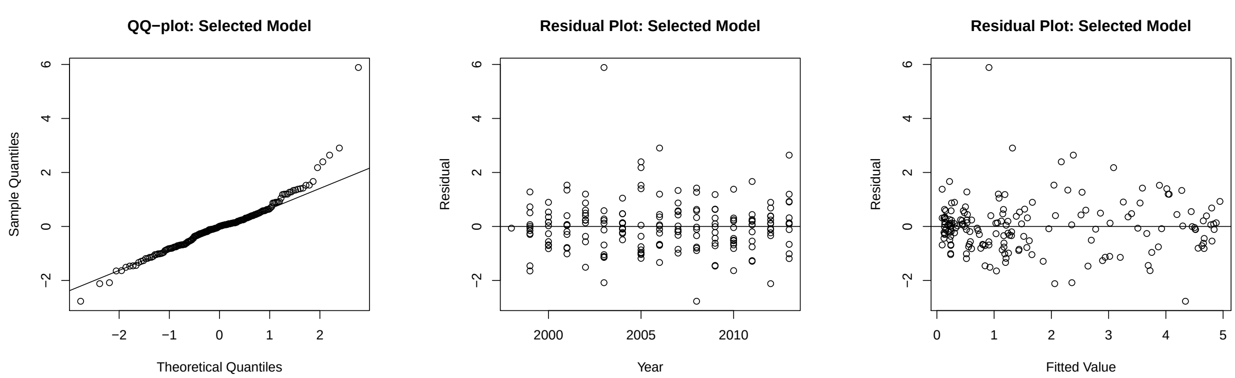
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.036	0.000	0.964	Ref. Model 3

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
190	S3	2003	6.88	0.91	5.89

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Lakes

Fitted model of the slope and intercept of each monitored lake compared to a common slope and intercept fitted for all reference lakes together (reference model 3).

- Results:

	Chi-squared	DF	P-value
Grizzly	32.1490	3	0.0000
Kodiak	323.0941	3	0.0000
1616-30 (LLCF)	150.4182	3	0.0000
Leslie	4712.9668	3	0.0000
Moose	4651.2005	3	0.0000
Nema	3078.9111	3	0.0000
Slipper	1572.4430	3	0.0000
S2	528.1146	3	0.0000
S3	299.6988	3	0.0000

- Conclusions:
  All monitored lakes show significant deviations from the common slope of reference lakes.

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	0.6147	2	0.7354
Kodiak	9.2700	2	0.0097
1616-30 (LLCF)	610.3853	2	0.0000
Leslie	97.2382	2	0.0000
Moose	538.6558	2	0.0000
Nema	417.9783	2	0.0000
Slipper	211.1920	2	0.0000
S2	83.0881	2	0.0000
S3	21.0422	2	0.0000

- Conclusions:
  When allowing for differences in intercept, all monitored lakes except Grizzly Lake show significant deviations from the common slope of reference lakes.

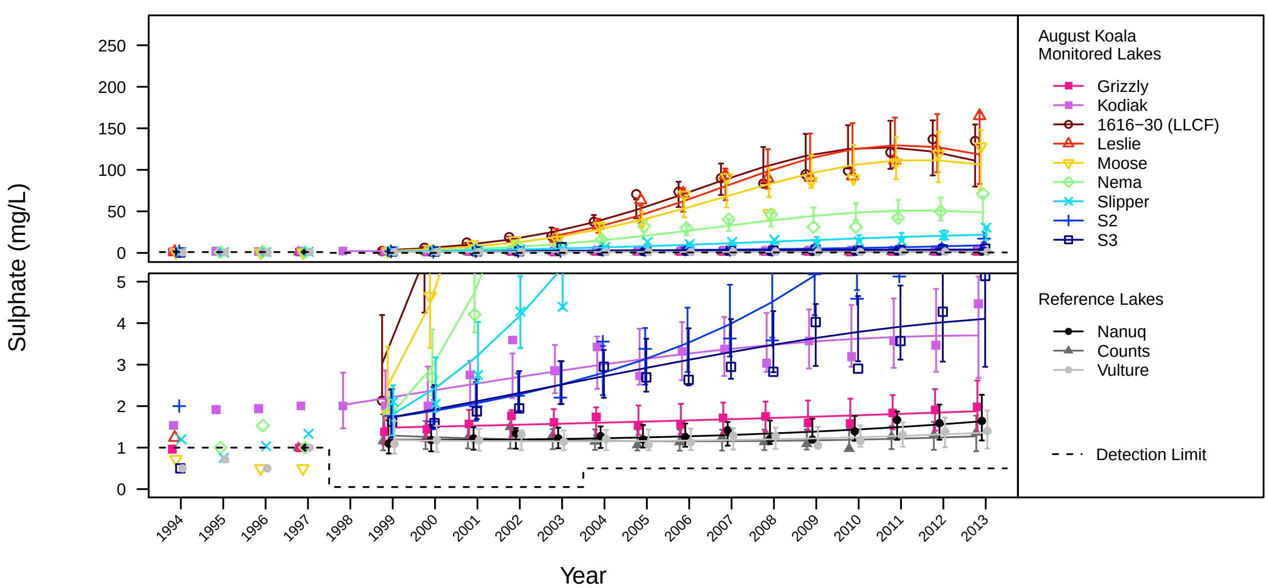
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.2320
Monitored Lake	1616-30 (LLCF)	0.9740
Monitored Lake	Grizzly	0.5520
Monitored Lake	Kodiak	0.7100
Monitored Lake	Leslie	0.8920
Monitored Lake	Moose	0.9640
Monitored Lake	Nema	0.9480
Monitored Lake	S2	0.7760
Monitored Lake	S3	0.4520
Monitored Lake	Slipper	0.9240

- Conclusions:
  Model fit for reference lakes and S3 is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean sulphate for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	1.98E+00	1.88E+00	3.17E-01	1.35E+00	2.61E+00	9.27E-01
Kodiak	4.46E+00	3.70E+00	6.14E-01	2.68E+00	5.12E+00	1.80E+00
Leslie	1.65E+02	1.18E+02	2.15E+01	8.30E+01	1.69E+02	6.30E+01
1616-30 (LLCF)	1.35E+02	1.11E+02	1.87E+01	7.98E+01	1.55E+02	5.48E+01
Moose	1.28E+02	1.06E+02	1.79E+01	7.64E+01	1.48E+02	5.25E+01
Nema	7.11E+01	4.88E+01	8.24E+00	3.51E+01	6.80E+01	2.41E+01
Slipper	3.04E+01	2.19E+01	3.70E+00	1.57E+01	3.05E+01	1.08E+01
S2	1.71E+01	9.16E+00	1.54E+00	6.58E+00	1.27E+01	4.52E+00
S3	5.14E+00	4.10E+00	6.92E-01	2.95E+00	5.71E+00	2.03E+00
Nanuq	1.64E+00	1.63E+00	2.75E-01	1.17E+00	2.27E+00	
Counts	1.36E+00	1.27E+00	2.15E-01	9.15E-01	1.77E+00	
Vulture	1.41E+00	1.36E+00	2.30E-01	9.79E-01	1.90E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Sulphate	August	Koala	Lake	Water	none	log e	linear mixed effects regression	#3 shared intercept & slope	NA	Grizzly Kodiak 1616-30 (LLCF) Leslie Moose Nema Slipper S2 S3

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

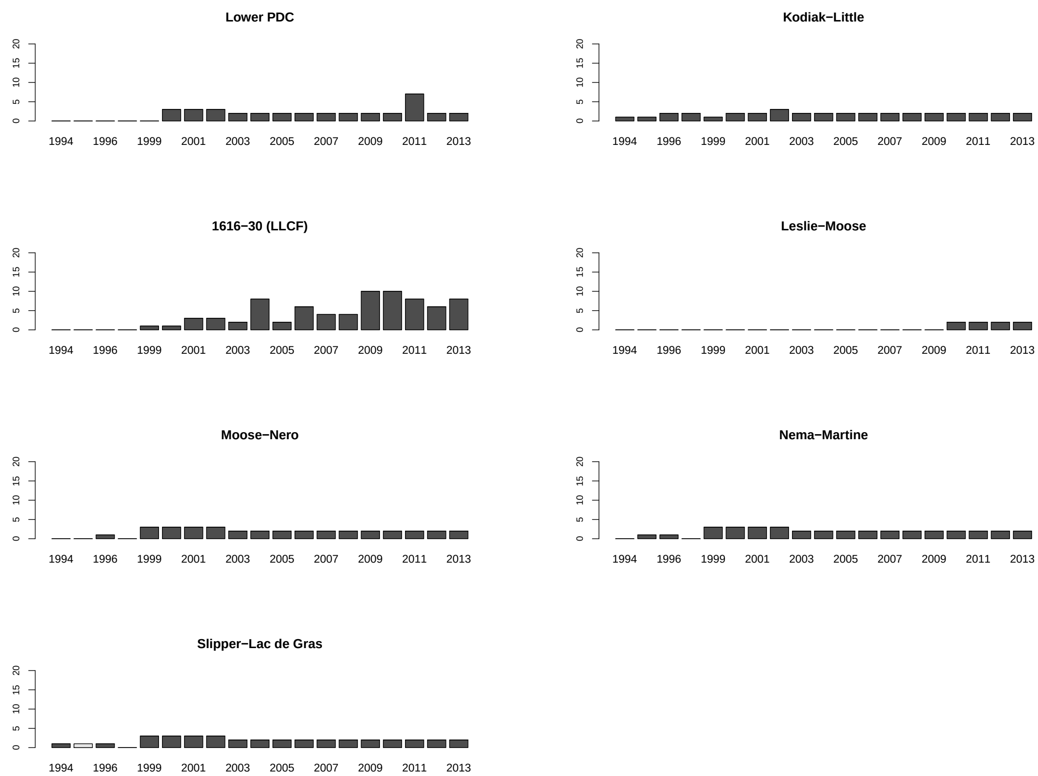
Analysis of August Sulphate in Koala Watershed Streams

January 11, 2014

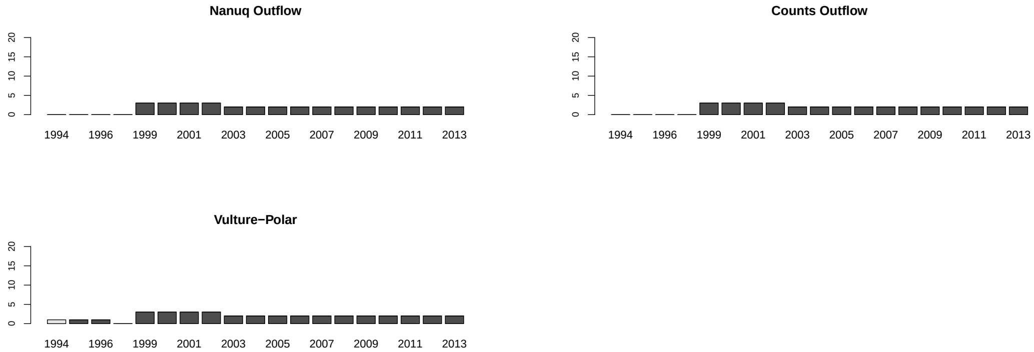
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

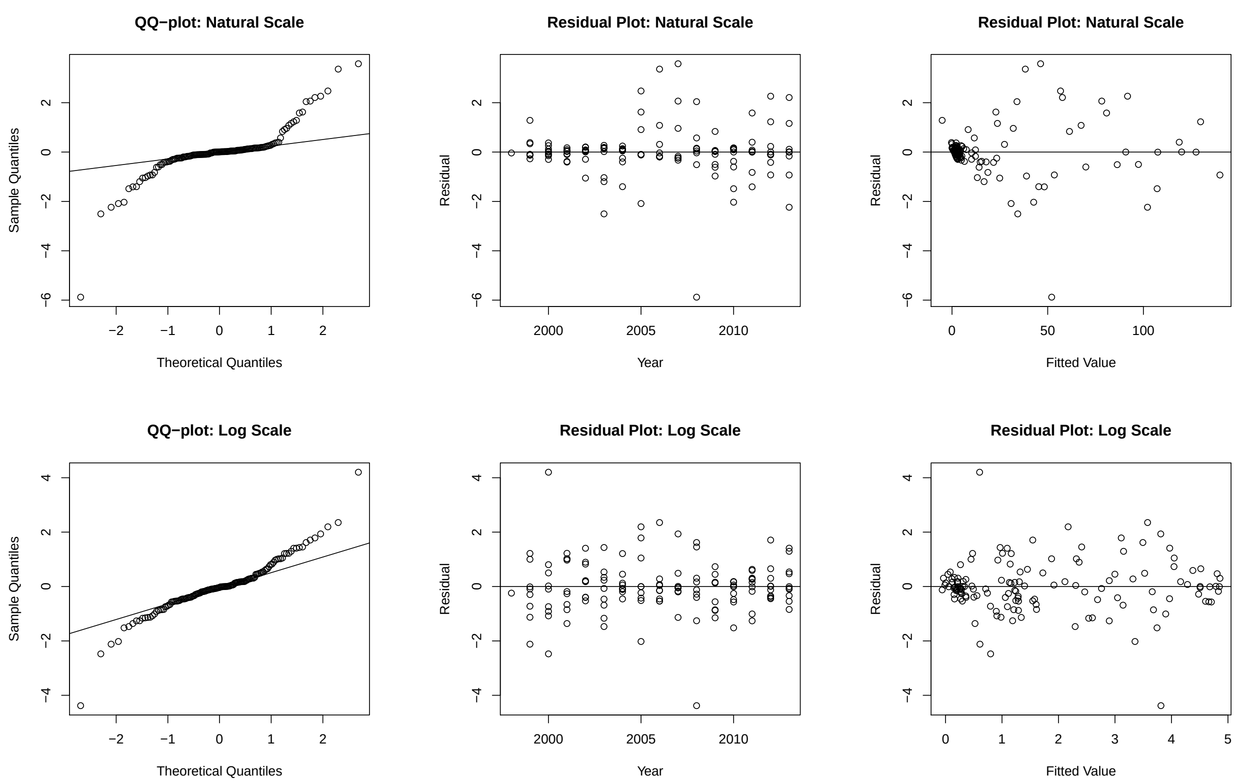


1.2 Reference



Comment:
None of the streams exhibited greater than 10% of data less than the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
113	Moose-Nero	2006	57.30	38.31	3.36
114	Moose-Nero	2007	66.50	46.28	3.58
115	Moose-Nero	2008	18.85	52.08	-5.88

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
115	Moose-Nero	2008	18.85	3.81	-4.38
187	Vulture-Polar	2000	4.24	0.60	4.20

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
131.91	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
131.62	4.00	0.00

- Conclusions:
  The slopes differ significantly among reference streams. Reference streams do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.489	0.000	0.511	Indistinguishable support for 3 & 1; choose Model 3.

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Lower PDC	10.2069	2	0.0061
Kodiak-Little	3.6349	2	0.1624
Leslie-Moose	0.1658	2	0.9205
1616-30 (LLCF)	429.2966	2	0.0000
Moose-Nero	244.0870	2	0.0000
Nema-Martine	217.6053	2	0.0000
Slipper-Lac de Gras	111.3862	2	0.0000

- Conclusions:
  All monitored streams except Kodiak-Little and Leslie-Moose show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored stream compared to slope of each reference stream (reference model 1b).

- Results:

	Chi-squared	DF	P-value
Lower PDC-vs-Nanuq Outflow	157.6151	3	0.0000
Lower PDC-vs-Counts Outflow	216.0399	3	0.0000
Lower PDC-vs-Vulture-Polar	179.0016	3	0.0000
1616-30 (LLCF)-vs-Nanuq Outflow	96.9049	3	0.0000
1616-30 (LLCF)-vs-Counts Outflow	112.0015	3	0.0000
1616-30 (LLCF)-vs-Vulture-Polar	133.1475	3	0.0000
Moose-Nero-vs-Nanuq Outflow	1826.0330	3	0.0000
Moose-Nero-vs-Counts Outflow	2018.9842	3	0.0000
Moose-Nero-vs-Vulture-Polar	1901.3183	3	0.0000
Nema-Martine-vs-Nanuq Outflow	1445.4744	3	0.0000
Nema-Martine-vs-Counts Outflow	1617.4694	3	0.0000
Nema-Martine-vs-Vulture-Polar	1519.2558	3	0.0000
Slipper-Lac de Gras-vs-Nanuq Outflow	704.4776	3	0.0000
Slipper-Lac de Gras-vs-Counts Outflow	827.1429	3	0.0000
Slipper-Lac de Gras-vs-Vulture-Polar	756.3031	3	0.0000

- Conclusions:
  All remaining monitored streams show significant deviations from the slopes of individual reference streams.

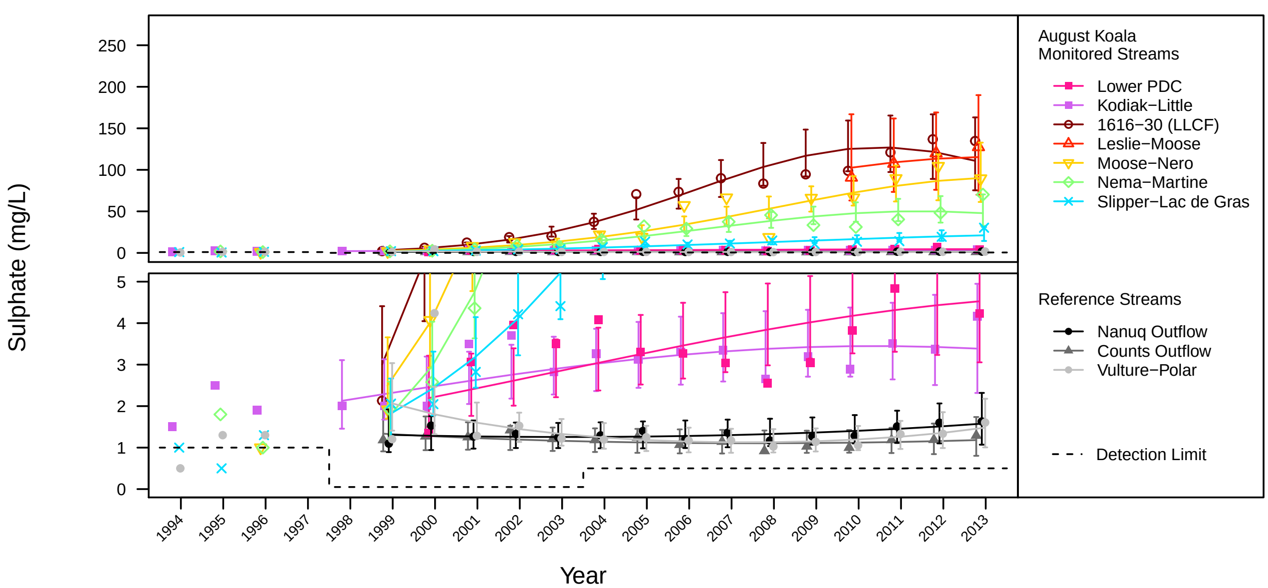
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Reference Stream	Counts Outflow	0.2760
Reference Stream	Nanuq Outflow	0.3870
Reference Stream	Vulture-Polar	0.2950
Monitored Stream	1616-30 (LLCF)	0.9740
Monitored Stream	Kodiak-Little	0.4990
Monitored Stream	Leslie-Moose	0.2230
Monitored Stream	Lower PDC	0.4080
Monitored Stream	Moose-Nero	0.9060
Monitored Stream	Nema-Martine	0.9500
Monitored Stream	Slipper-Lac de Gras	0.9210

- Conclusions:
  Model fit for Counts Outflow, Nanuq outflow, Vulture-Polar, Kodiak-Little, Leslie-Moose, and Lower PDC is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean sulphate for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	4.23E+00	4.53E+00	9.07E-01	3.06E+00	6.71E+00	2.66E+00
Kodiak-Little	4.17E+00	3.39E+00	6.55E-01	2.32E+00	4.95E+00	1.92E+00
Leslie-Moose	1.27E+02	1.15E+02	2.94E+01	7.00E+01	1.90E+02	8.59E+01
1616-30 (LLCF)	1.35E+02	1.11E+02	2.18E+01	7.54E+01	1.63E+02	6.39E+01
Moose-Nero	8.95E+01	9.02E+01	1.78E+01	6.13E+01	1.33E+02	5.20E+01
Nema-Martine	7.02E+01	4.79E+01	9.43E+00	3.25E+01	7.04E+01	2.76E+01
Slipper-Lac de Gras	3.03E+01	2.11E+01	4.17E+00	1.44E+01	3.11E+01	1.22E+01
Nanuq Outflow	1.63E+00	1.58E+00	3.11E-01	1.07E+00	2.32E+00	
Counts Outflow	1.29E+00	1.18E+00	2.33E-01	8.02E-01	1.74E+00	
Vulture-Polar	1.60E+00	1.48E+00	2.92E-01	1.01E+00	2.18E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Sulphate	August	Koala	Stream	Water	none	log e	linear mixed effects regression	#1b separate intercepts & slopes	NA	Lower PDC 1616-30 (LLCF) Moose-Nero Nema-Martine Slipper-Lac de Gras

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

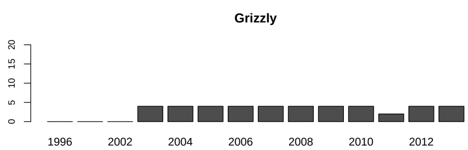
Analysis of April Potassium in Lakes of the Koala Watershed and Lac de Gras

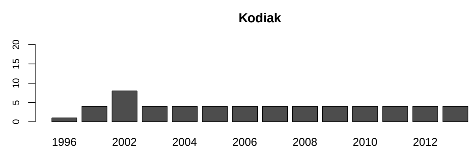
January 20, 2014

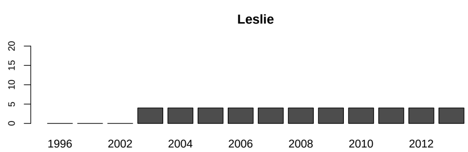
1 Censored Values:

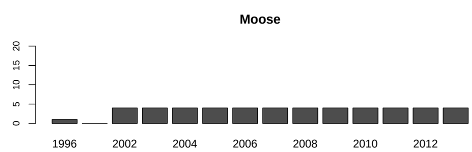
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

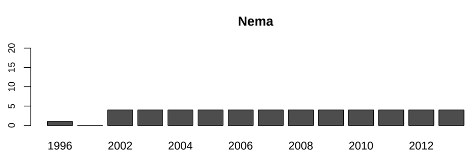
1.1 Monitored

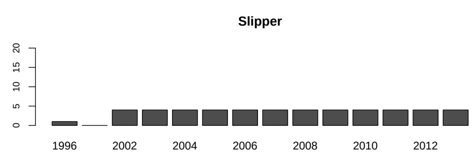




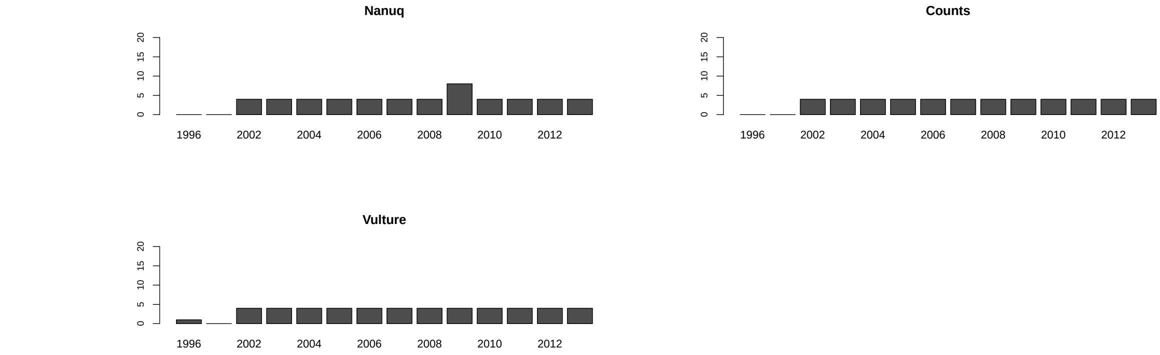






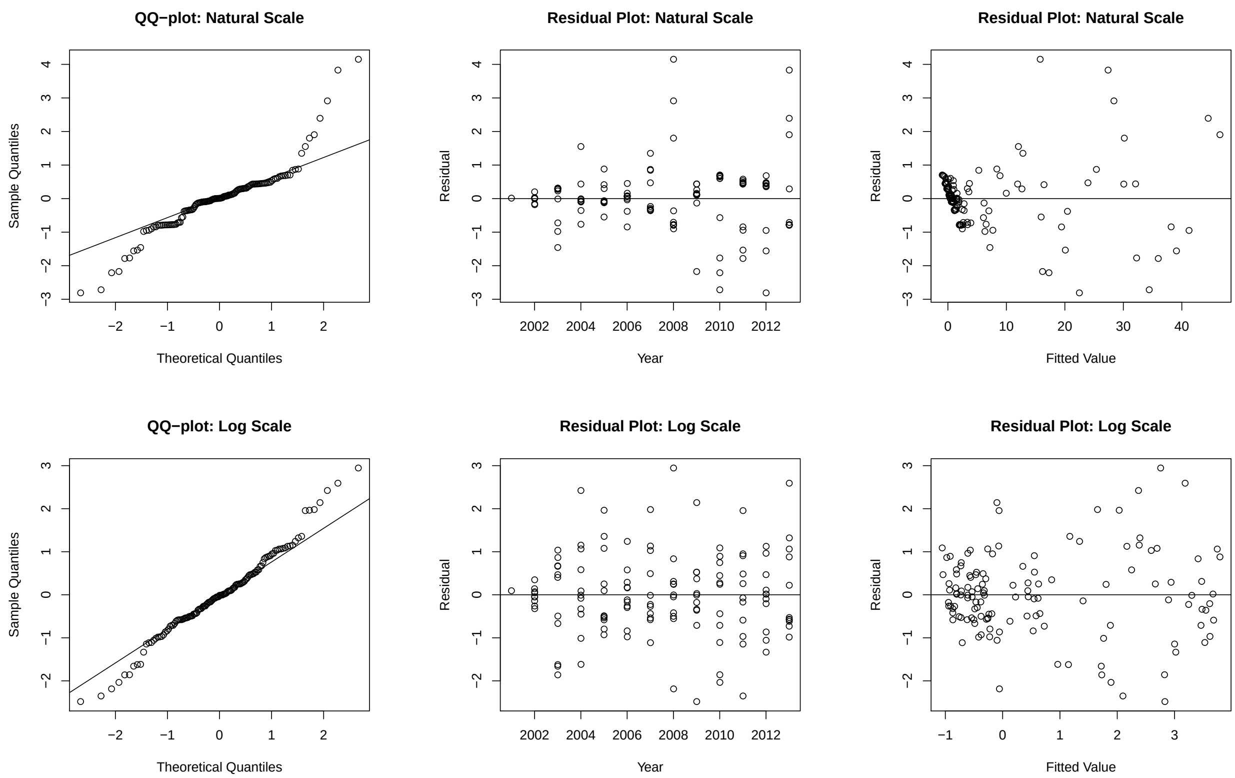


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
155	Nema	2008	23.93	15.79	4.15
160	Nema	2013	34.90	27.39	3.83

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
4.37E-149	1.00E+00	log model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
1.25	6.00	0.97

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

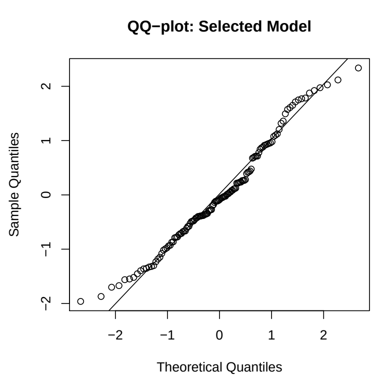
3.2 Compare Reference Models using AIC Weights

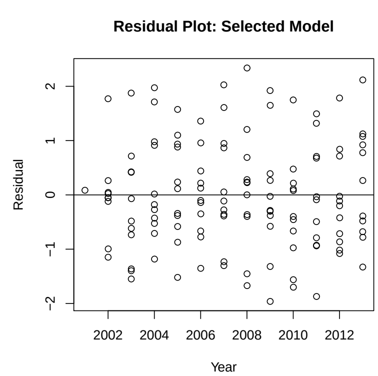
- Results:

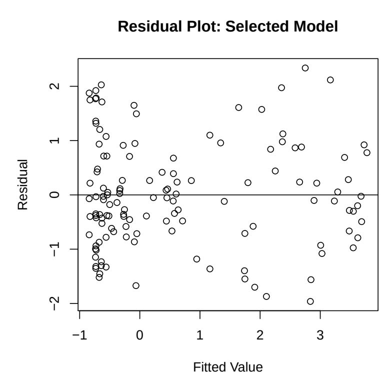
	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope and intercept. Proceeding with monitored contrasts using reference model 3 (fitting a common slope and intercept for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.3 Assess Fit of Reduced Model







Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Lakes

Fitted model of the slope and intercept of each monitored lake compared to a common slope and intercept fitted for all reference lakes together (reference model 3).

- Results:

	Chi-squared	DF	P-value
Grizzly	0.05	3.00	1.00
Kodiak	7.36	3.00	0.06
Leslie	75.10	3.00	0.00
Moose	78.86	3.00	0.00
Nema	73.15	3.00	0.00
Slipper	58.45	3.00	0.00
S2	4.06	3.00	0.26
S3	3.43	3.00	0.33

- Conclusions:
  All monitored lakes except Grizzly Lake, Kodiak Lake, S2, and S3 show significant deviation from the common slope of reference lakes.

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	0.00	2.00	1.00
Kodiak	0.16	2.00	0.92
Leslie	61.13	2.00	0.00
Moose	74.92	2.00	0.00
Nema	71.66	2.00	0.00
Slipper	57.92	2.00	0.00
S2	2.00	2.00	0.37
S3	3.43	2.00	0.18

- Conclusions:
  When allowing for differences in intercept, Leslie, Moose, Nema and Slipper lakes show significant deviation from the common slope of reference lakes.

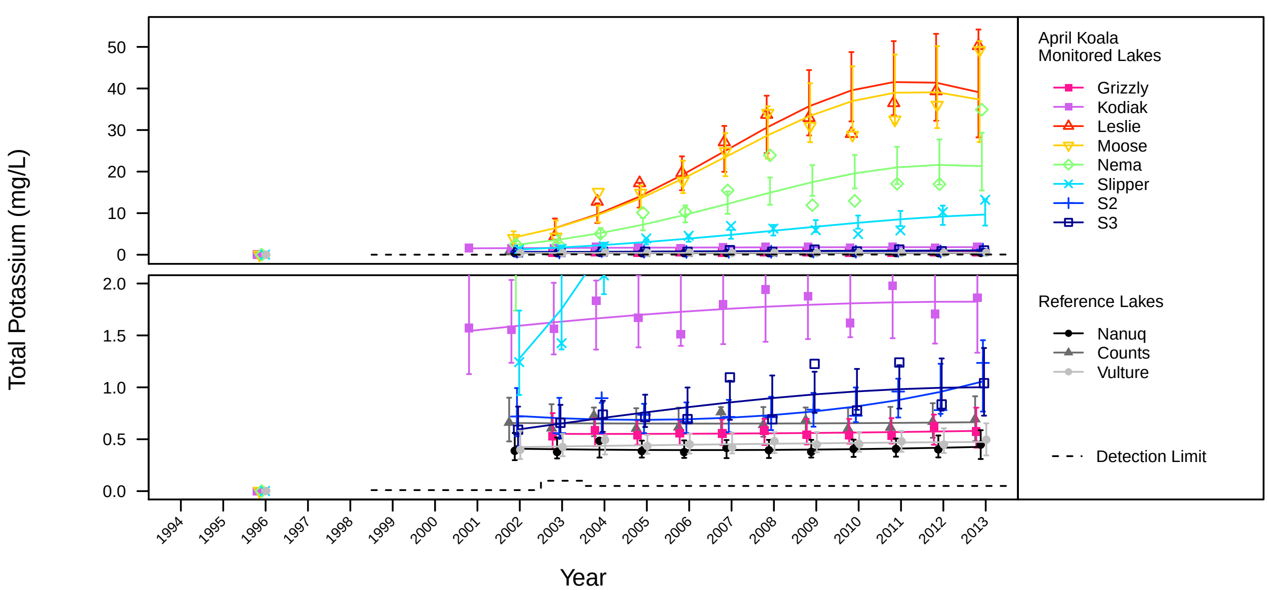
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0070
Monitored Lake	Grizzly	0.1310
Monitored Lake	Kodiak	0.3750
Monitored Lake	Leslie	0.9030
Monitored Lake	Moose	0.9170
Monitored Lake	Nema	0.8410
Monitored Lake	S2	0.5110
Monitored Lake	S3	0.4890
Monitored Lake	Slipper	0.8720

- Conclusions:
  Model fit for Kodiak and S3 is weak. Model fit for reference lakes and Grizzly lakes is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean potassium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	5.72E-01	5.80E-01	9.64E-02	4.19E-01	8.04E-01	2.82E-01
Kodiak	1.86E+00	1.82E+00	2.92E-01	1.33E+00	2.50E+00	8.55E-01
Leslie	5.02E+01	3.91E+01	6.50E+00	2.82E+01	5.42E+01	1.90E+01
Moose	4.92E+01	3.73E+01	6.09E+00	2.71E+01	5.14E+01	1.78E+01
Nema	3.49E+01	2.13E+01	3.48E+00	1.55E+01	2.93E+01	1.02E+01
Slipper	1.32E+01	9.67E+00	1.58E+00	7.02E+00	1.33E+01	4.62E+00
S2	1.23E+00	1.06E+00	1.72E-01	7.67E-01	1.45E+00	5.04E-01
S3	1.04E+00	1.00E+00	1.63E-01	7.27E-01	1.38E+00	4.78E-01
Nanuq	4.48E-01	4.26E-01	6.96E-02	3.10E-01	5.87E-01	
Counts	6.94E-01	6.64E-01	1.08E-01	4.82E-01	9.14E-01	
Vulture	4.95E-01	4.74E-01	7.74E-02	3.44E-01	6.53E-01	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Potassium	April	Koala	Lake	Water	none	log e	linear mixed effects regression	#3 shared intercept & slope	NA	Leslie Moose Nema Slipper

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

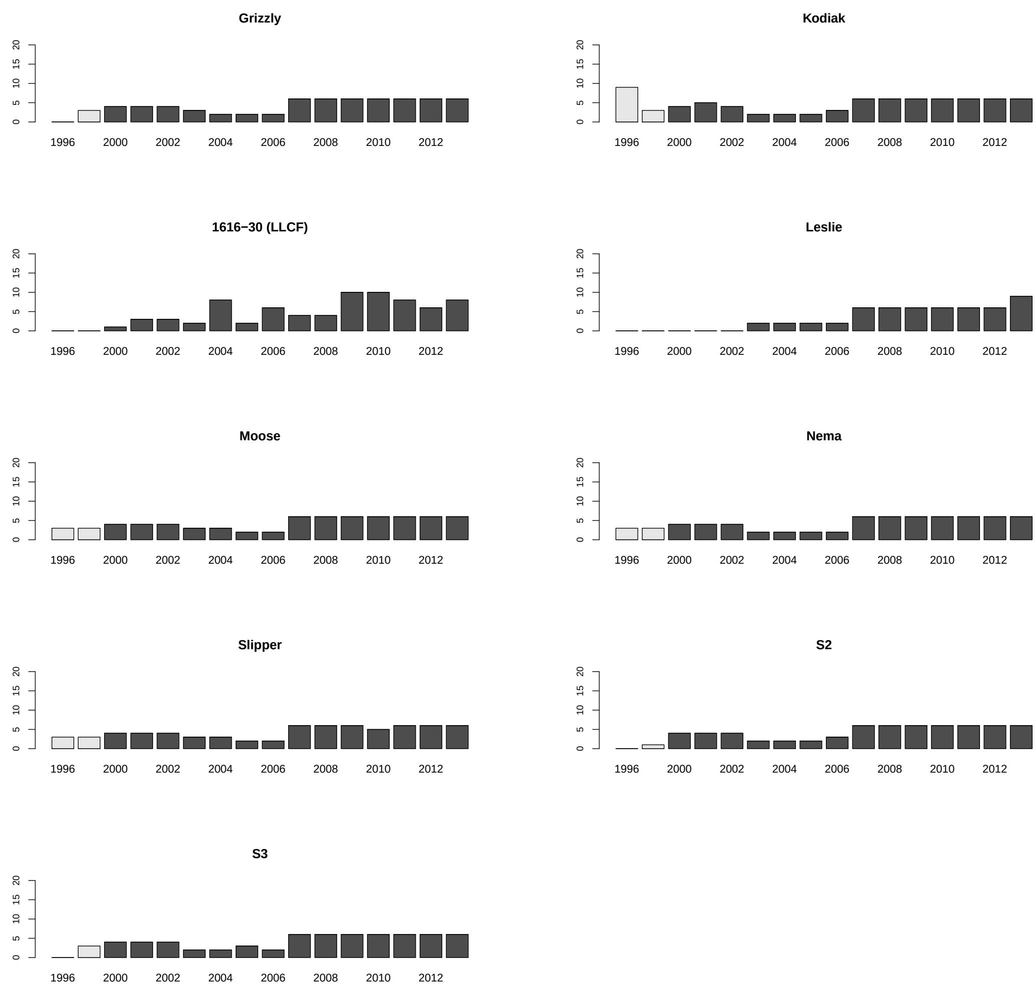
Analysis of August Potassium in Lakes of the Koala Watershed and Lac de Gras

March 4, 2014

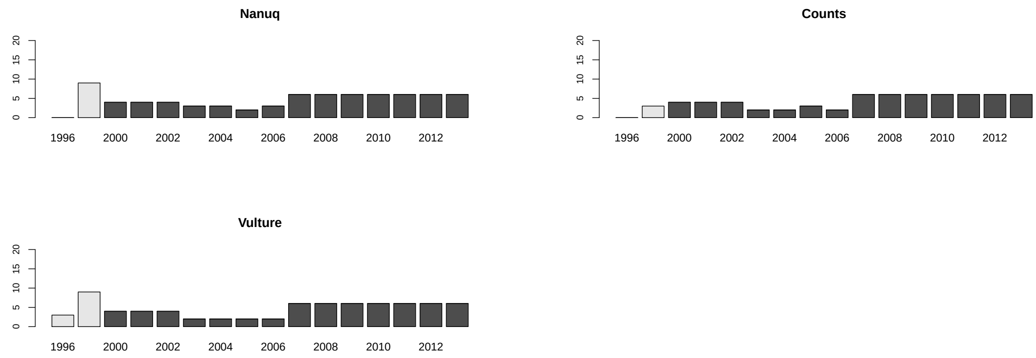
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

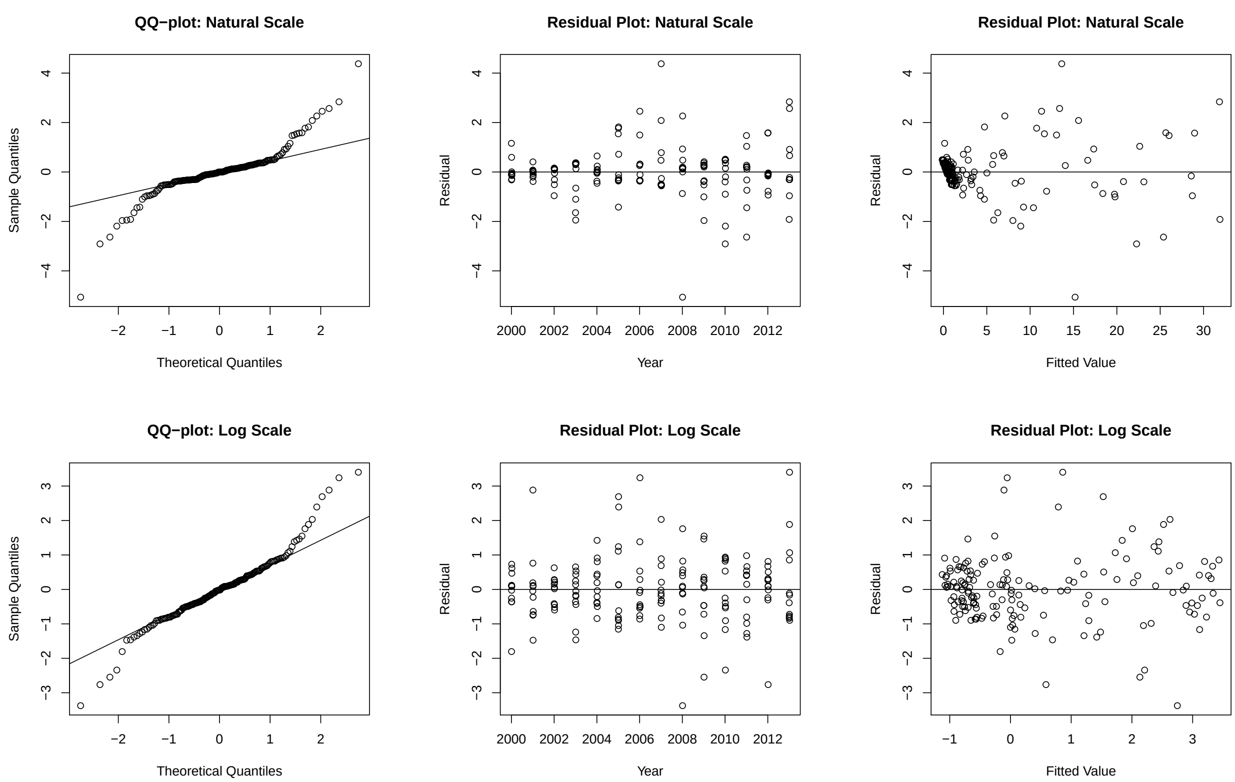


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
114	Moose	2007	18.33	13.65	4.38
115	Moose	2008	9.77	15.19	-5.07

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
115	Moose	2008	9.77	2.75	-3.37
173	S2	2006	1.49	-0.05	3.24
180	S2	2013	3.79	0.86	3.40

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
42.66	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
1.07	4.00	0.90

- Conclusions:
  The slopes do not differ significantly among reference lakes.

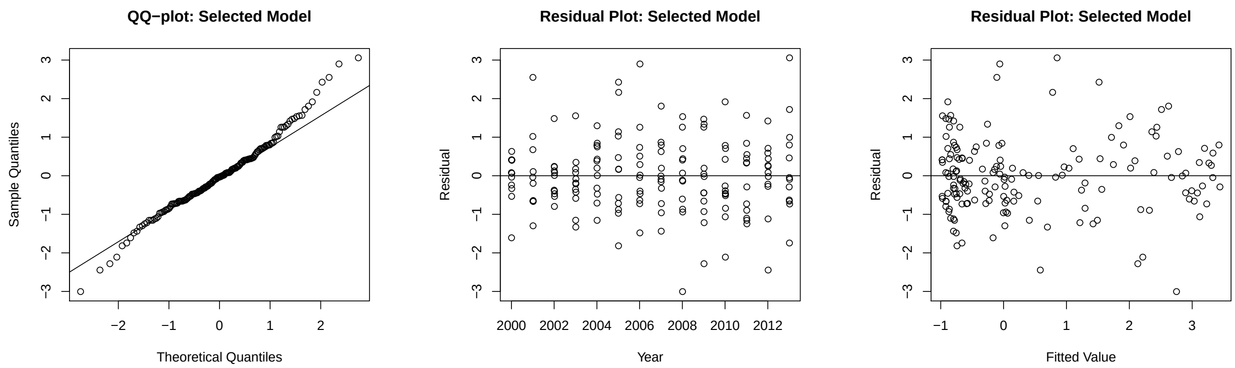
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
115	Moose	2008	9.77	2.75	-3.00
180	S2	2013	3.79	0.85	3.06

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	0.0453	2	0.9776
Kodiak	0.0137	2	0.9932
1616-30 (LLCF)	104.2175	2	0.0000
Leslie	107.5316	2	0.0000
Moose	399.7189	2	0.0000
Nema	317.8521	2	0.0000
Slipper	160.5418	2	0.0000
S2	70.7630	2	0.0000
S3	20.1334	2	0.0000

- Conclusions:
  All monitored lakes except Grizzly and Kodiak Lake show significant deviation from the common slope of reference lakes.

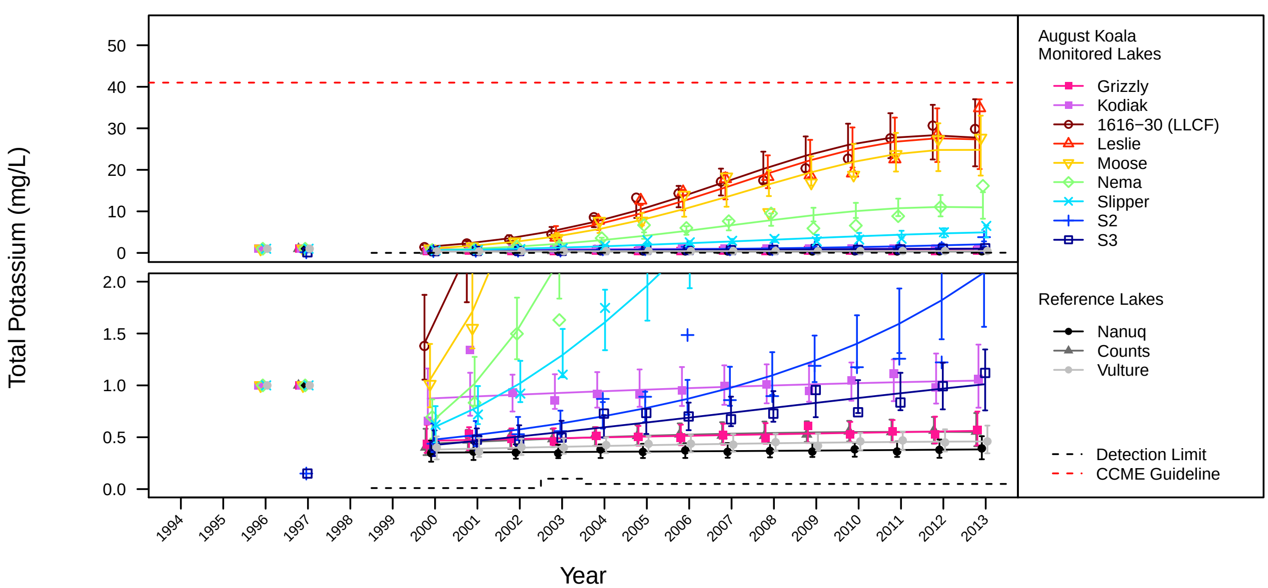
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.1200
Monitored Lake	1616-30 (LLCF)	0.9850
Monitored Lake	Grizzly	0.4910
Monitored Lake	Kodiak	0.1420
Monitored Lake	Leslie	0.9010
Monitored Lake	Moose	0.9590
Monitored Lake	Nema	0.9200
Monitored Lake	S2	0.7390
Monitored Lake	S3	0.8630
Monitored Lake	Slipper	0.9220

- Conclusions:
  Model fit for Grizzly lake is weak. Model fit for reference lakes and Kodiak Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean potassium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	5.72E-01	5.61E-01	8.21E-02	4.21E-01	7.48E-01	2.40E-01
Kodiak	1.06E+00	1.05E+00	1.53E-01	7.85E-01	1.39E+00	4.48E-01
Leslie	3.49E+01	2.73E+01	4.22E+00	2.02E+01	3.70E+01	1.23E+01
1616-30 (LLCF)	2.98E+01	2.78E+01	4.06E+00	2.08E+01	3.70E+01	1.19E+01
Moose	2.77E+01	2.48E+01	3.63E+00	1.86E+01	3.30E+01	1.06E+01
Nema	1.61E+01	1.10E+01	1.60E+00	8.23E+00	1.46E+01	4.70E+00
Slipper	6.50E+00	4.95E+00	7.24E-01	3.72E+00	6.59E+00	2.12E+00
S2	3.79E+00	2.08E+00	3.05E-01	1.56E+00	2.78E+00	8.92E-01
S3	1.12E+00	1.01E+00	1.48E-01	7.59E-01	1.35E+00	4.33E-01
Nanuq	3.93E-01	3.83E-01	5.60E-02	2.87E-01	5.10E-01	
Counts	5.55E-01	5.50E-01	8.05E-02	4.13E-01	7.33E-01	
Vulture	4.60E-01	4.60E-01	6.73E-02	3.45E-01	6.12E-01	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Potassium	August	Koala	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	NA	1616-30 (LLCF) Leslie Moose Nema Slipper S2 S3

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

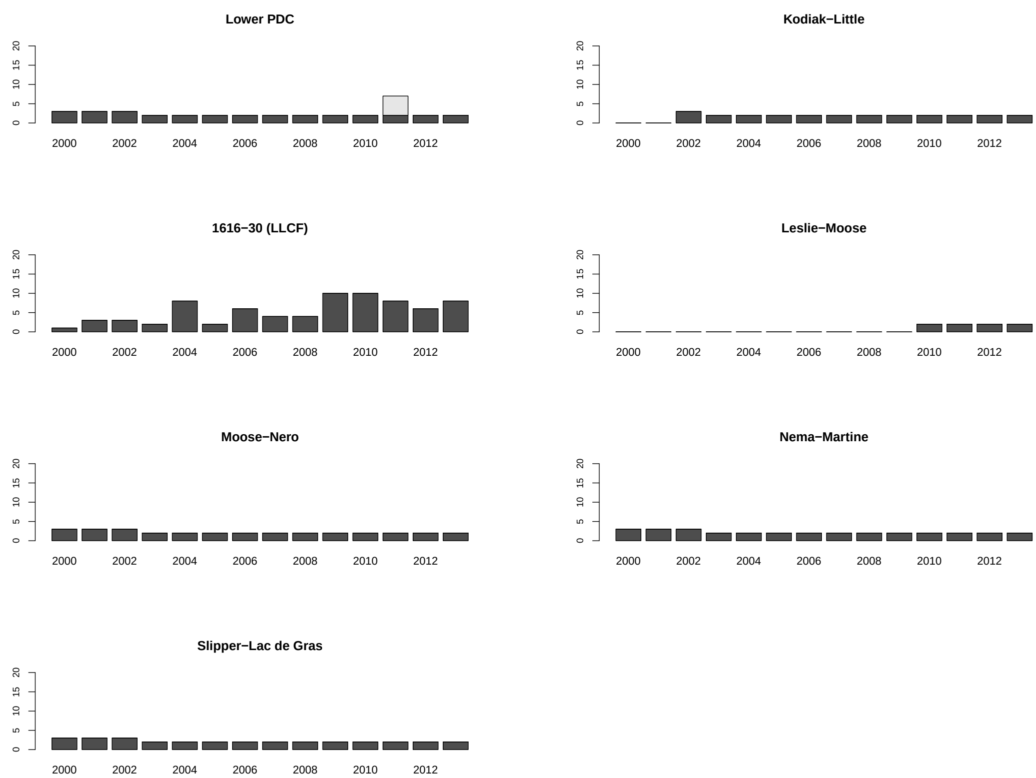
Analysis of August Potassium in Koala Watershed Streams

January 11, 2014

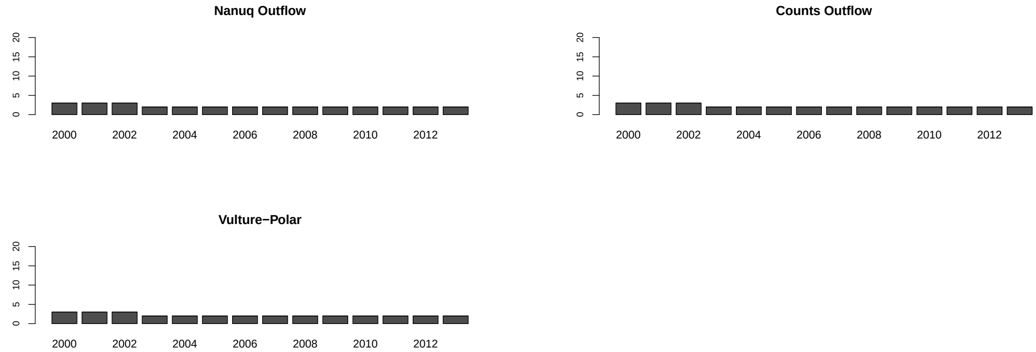
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

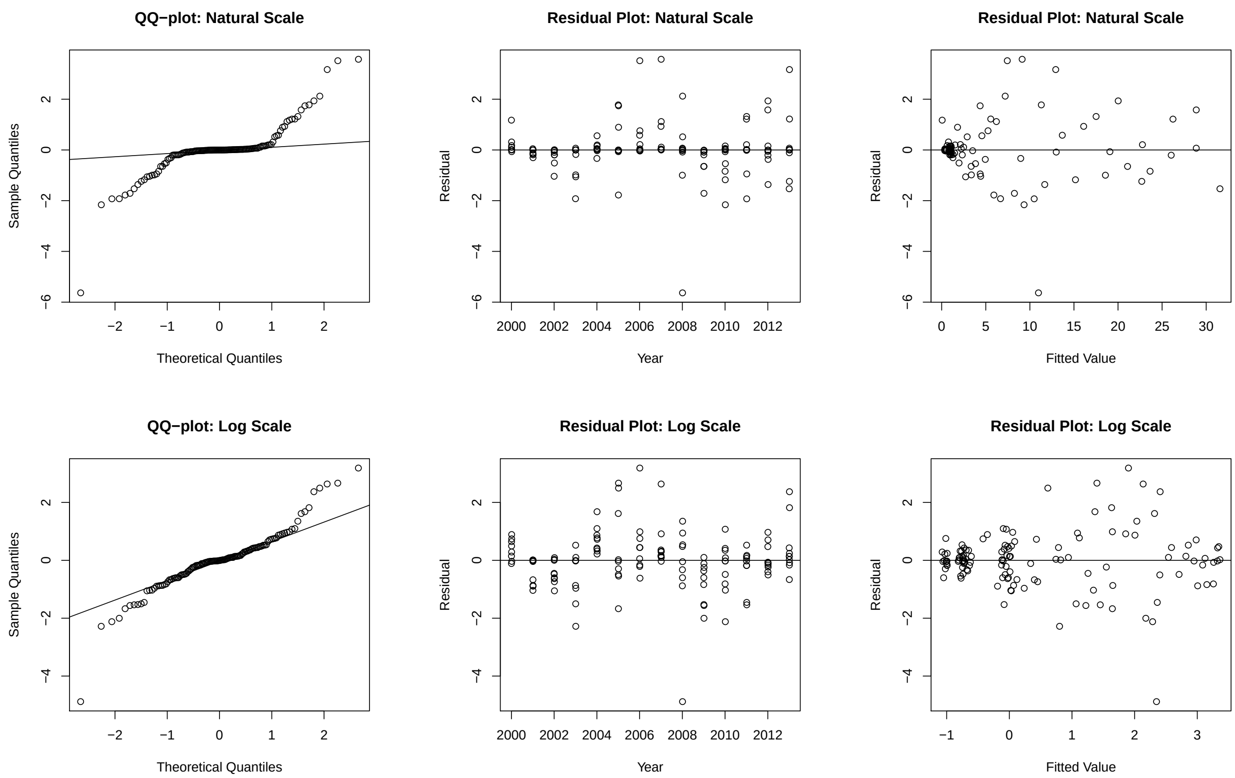


1.2 Reference



Comment:
10-60% of data in Lower PDC was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
113	Moose-Nero	2006	11.40	7.44	3.52
114	Moose-Nero	2007	13.15	9.13	3.57
115	Moose-Nero	2008	4.64	10.98	-5.64
160	Nema-Martine	2013	16.50	12.94	3.17

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
113	Moose-Nero	2006	11.40	1.90	3.19
115	Moose-Nero	2008	4.64	2.35	-4.88

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
The natural and log transformed models show dependence on year and fitted value. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using the log transformed model. Results should be interpreted with caution.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
30.12	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
0.16	4.00	1.00

- Conclusions:
  The slopes do not differ significantly among reference streams.

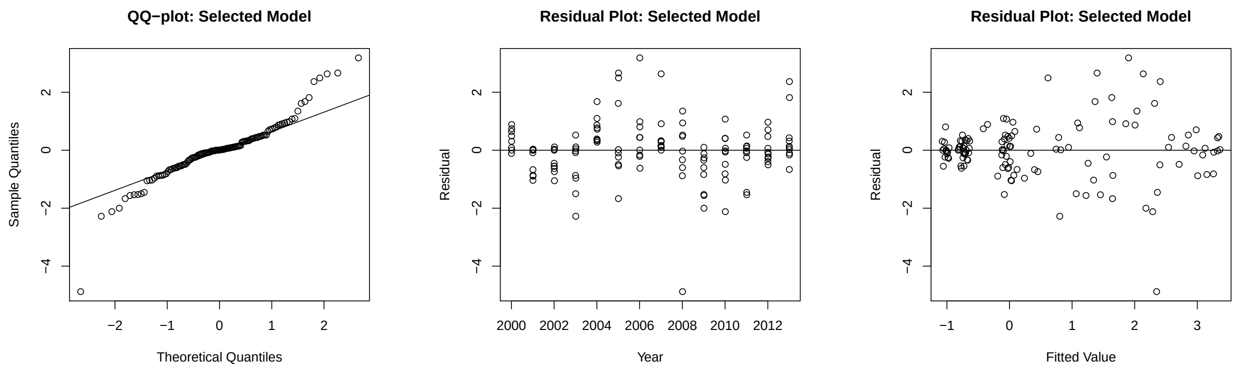
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.019	0.981	0.000	Ref. Model 2

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with a common slope. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
113	Moose-Nero	2006	11.40	1.90	3.19
115	Moose-Nero	2008	4.64	2.35	-4.88

Conclusion:
The reduced model shows dependence on year. Results should be interpreted with caution.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
Lower PDC	2.4973	2	0.2869
Kodiak-Little	0.0713	2	0.9650
Leslie-Moose	2.9037	2	0.2341
1616-30 (LLCF)	332.8490	2	0.0000
Moose-Nero	323.0714	2	0.0000
Nema-Martine	277.2374	2	0.0000
Slipper-Lac de Gras	139.6492	2	0.0000

- Conclusions:
  All monitored streams except Kodiak-Little, Lower PDC, and Leslie-Moose show significant deviation from the common slope of reference streams.

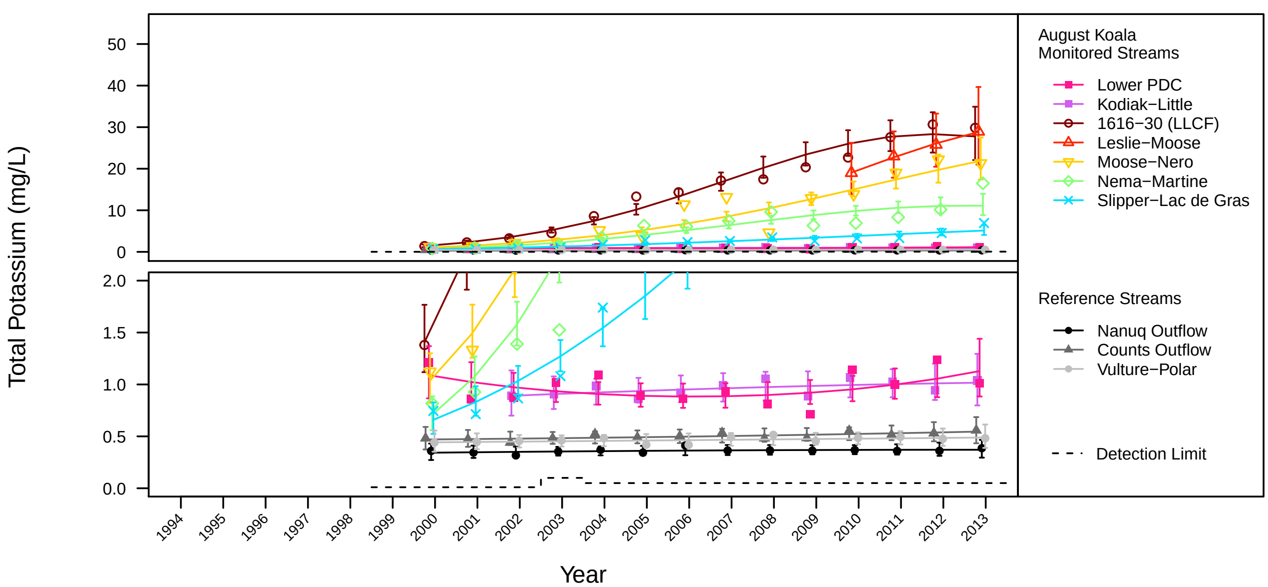
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.8950
Monitored Stream	1616-30 (LLCF)	0.9850
Monitored Stream	Kodiak-Little	0.3470
Monitored Stream	Leslie-Moose	0.9970
Monitored Stream	Lower PDC	0.2600
Monitored Stream	Moose-Nero	0.9020
Monitored Stream	Nema-Martine	0.9190
Monitored Stream	Slipper-Lac de Gras	0.9100

- Conclusions:
  Model fit for Kodiak-Little and Lower PDC is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean potassium for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	1.01E+00	1.13E+00	1.40E-01	8.84E-01	1.44E+00	4.11E-01
Kodiak-Little	1.04E+00	1.02E+00	1.25E-01	7.98E-01	1.29E+00	3.67E-01
Leslie-Moose	2.89E+01	2.88E+01	4.69E+00	2.10E+01	3.97E+01	1.37E+01
1616-30 (LLCF)	2.98E+01	2.78E+01	3.24E+00	2.21E+01	3.49E+01	9.49E+00
Moose-Nero	2.13E+01	2.19E+01	2.55E+00	1.74E+01	2.75E+01	7.48E+00
Nema-Martine	1.65E+01	1.11E+01	1.30E+00	8.84E+00	1.40E+01	3.79E+00
Slipper-Lac de Gras	6.94E+00	5.12E+00	5.97E-01	4.07E+00	6.43E+00	1.75E+00
Nanuq Outflow	3.86E-01	3.71E-01	4.33E-02	2.95E-01	4.66E-01	
Counts Outflow	5.58E-01	5.45E-01	6.36E-02	4.34E-01	6.85E-01	
Vulture-Polar	4.82E-01	4.89E-01	5.70E-02	3.89E-01	6.14E-01	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Potassium	August	Koala	Stream	Water	none	log e	Tobit regression	#2 shared slopes	NA	1616-30 (LLCF) Moose-Nero Nema-Martine Slipper-Lac de Gras

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

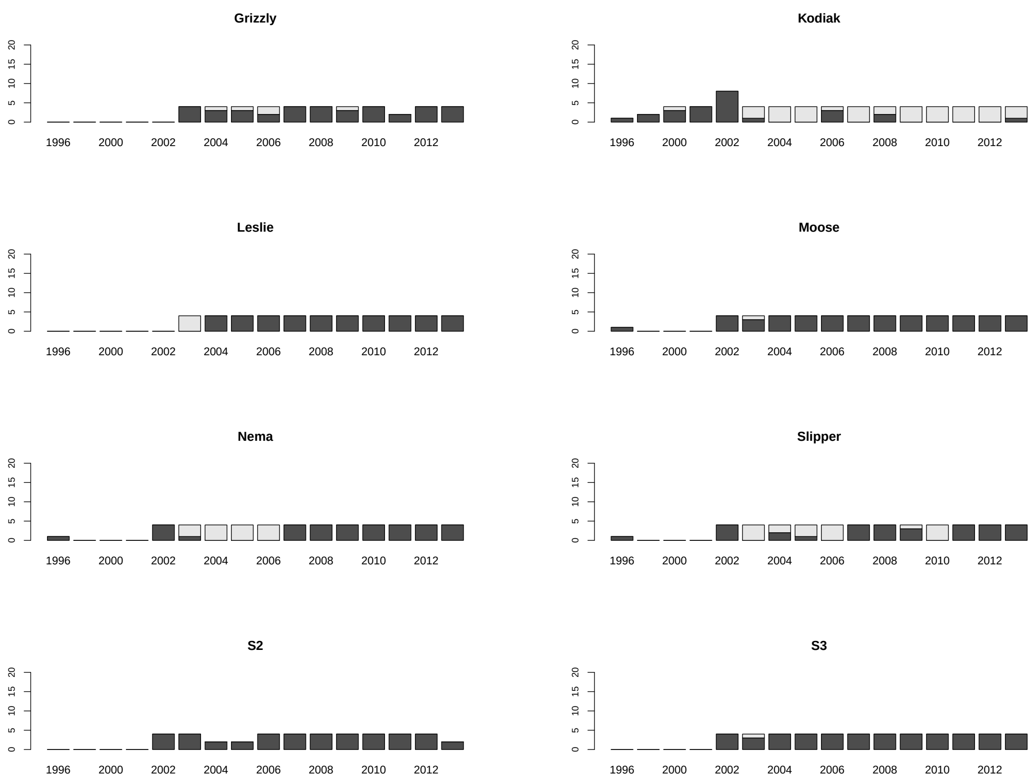
Analysis of April Total Ammonia-N in Lakes of the Koala Watershed and Lac de Gras

January 9, 2014

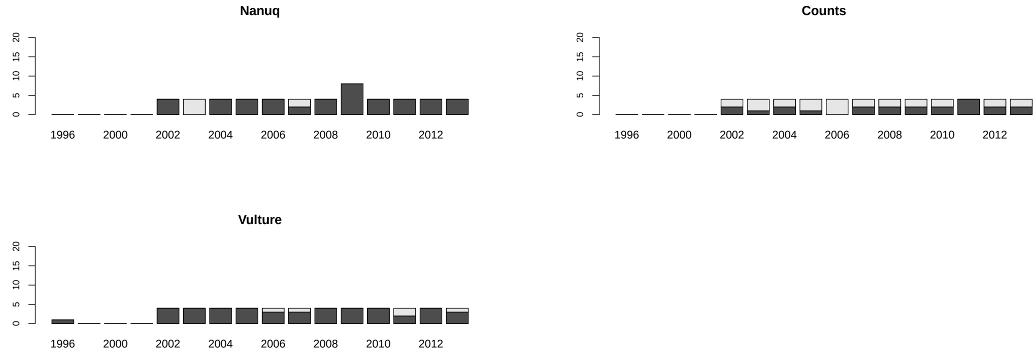
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

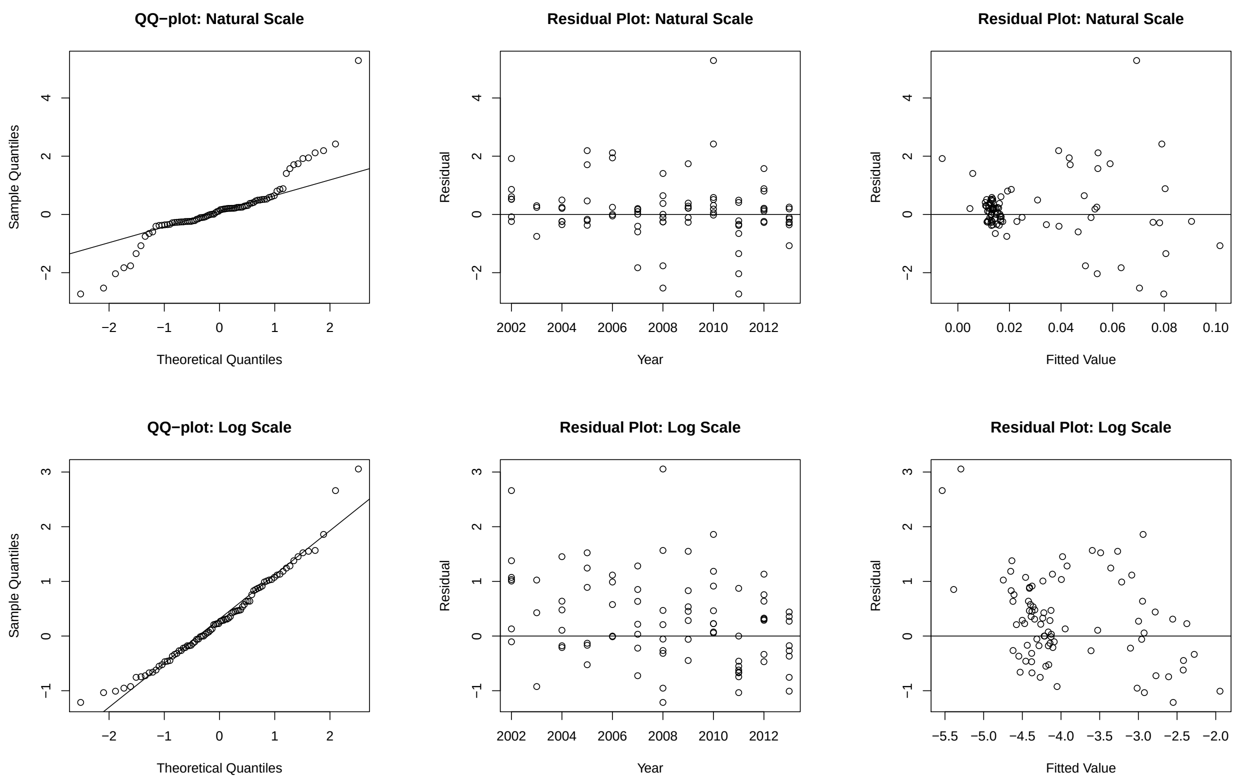


1.2 Reference



Comment:
Greater than 60% of data in Kodiak Lake was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in Counts, Nanuq, Grizzly, Nema, and Slipper lakes was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
157	Nema	2010	0.12	0.07	5.29

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
215	Slipper	2008	0.02	-5.29	3.06

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	2.00E-107	natural model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
108192.32	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
108744.96	4.00	0.00

- Conclusions:
  The slopes differ significantly among reference lakes. Reference lakes do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.895	0.105	0.000	Ref. Model 1

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Grizzly	1.1149	2	0.5727
Leslie	24.1879	2	0.0000
Moose	6.2010	2	0.0450
Nema	68.6440	2	0.0000
Slipper	15.3835	2	0.0005
S2	1.7796	2	0.4107
S3	0.1438	2	0.9306

- Conclusions:
  Leslie, Moose, Nema, and Slipper lakes show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored lake compared to slope of each reference lake (reference model 1b).

- Results:

	Chi-squared	DF	P-value
Leslie-vs-Nanuq	64.9313	3	0.0000
Leslie-vs-Counts	33002.4286	3	0.0000
Leslie-vs-Vulture	76.0592	3	0.0000
Moose-vs-Nanuq	43.4026	3	0.0000
Moose-vs-Counts	57614.2999	3	0.0000
Moose-vs-Vulture	50.9104	3	0.0000
Nema-vs-Nanuq	48.3029	3	0.0000
Nema-vs-Counts	56663.5906	3	0.0000
Nema-vs-Vulture	57.9909	3	0.0000
Slipper-vs-Nanuq	12.7700	3	0.0052
Slipper-vs-Counts	55582.3290	3	0.0000
Slipper-vs-Vulture	11.2487	3	0.0105

- Conclusions:
  Leslie, Moose, Nema, and Slipper lakes show significant deviations from the slopes of individual reference lakes.

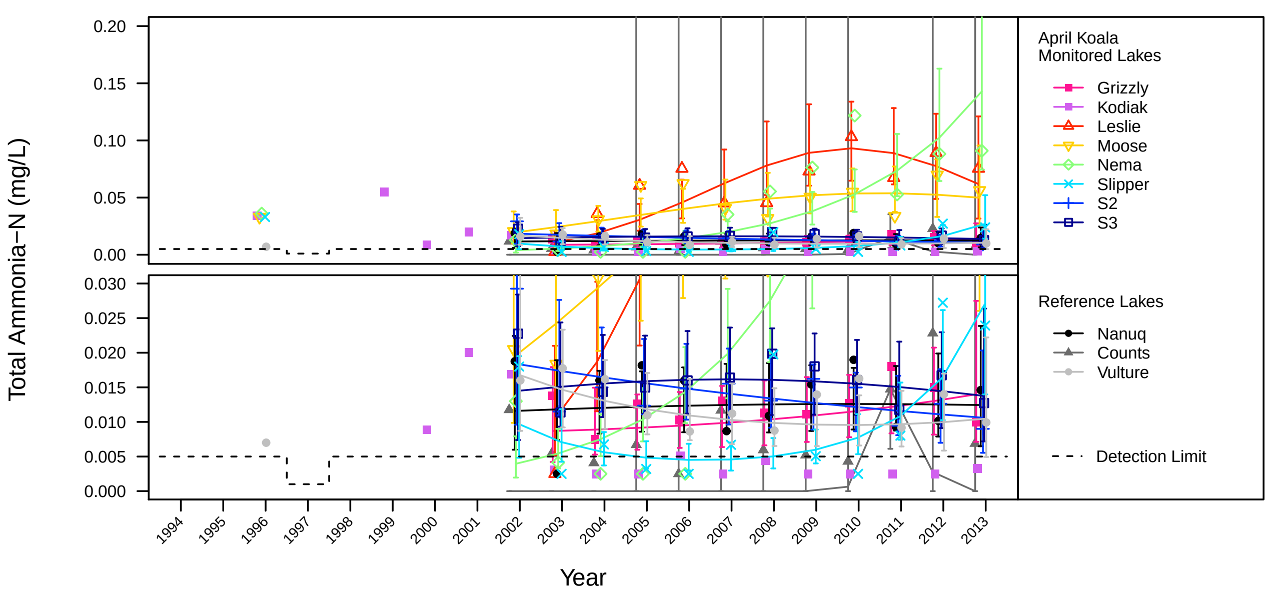
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Reference Lake	Counts	0.5000
Reference Lake	Nanuq	0.0060
Reference Lake	Vulture	0.4060
Monitored Lake	Grizzly	0.3680
Monitored Lake	Leslie	0.5810
Monitored Lake	Moose	0.5470
Monitored Lake	Nema	0.6040
Monitored Lake	S2	0.3560
Monitored Lake	S3	0.0700
Monitored Lake	Slipper	0.3790

- Conclusions:
  Model fit for Vulture, Grizzly, Slipper and S2 is weak. Model fit for Nanuq and S3 Lake is poor.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total ammonia-N for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	9.97e-03	1.40e-02	4.82e-03	7.13e-03	2.75e-02	1.41e-02
Kodiak	3.25e-03	NA	NA	NA	NA	NA
Leslie	7.54e-02	6.19e-02	2.12e-02	3.16e-02	1.21e-01	6.20e-02
Moose	5.63e-02	4.99e-02	1.65e-02	2.60e-02	9.56e-02	4.84e-02
Nema	9.09e-02	1.43e-01	4.75e-02	7.45e-02	2.74e-01	1.39e-01
Slipper	2.39e-02	2.70e-02	9.05e-03	1.40e-02	5.21e-02	2.65e-02
S2	9.00e-03	1.06e-02	3.52e-03	5.54e-03	2.03e-02	1.03e-02
S3	1.27e-02	1.38e-02	4.57e-03	7.19e-03	2.64e-02	1.34e-02
Nanuq	1.46e-02	1.24e-02	4.13e-03	6.49e-03	2.39e-02	NA
Counts	6.88e-03	4.25e-06	6.84e-04	3.62e-143	4.98e+131	NA
Vulture	9.92e-03	1.05e-02	4.02e-03	4.94e-03	2.22e-02	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
AmmoniaN	April	Koala	Lake	Water	Kodiak	log e	Tobit regression	#1b separate intercepts & slopes	NA	Leslie Moose Nema Slipper

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

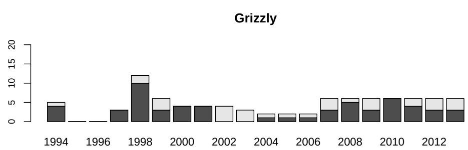
Analysis of August Total Ammonia-N in Lakes of the Koala Watershed and Lac de Gras

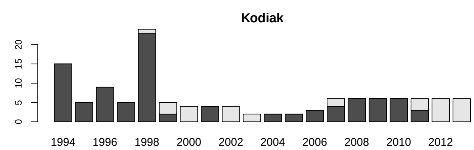
January 9, 2014

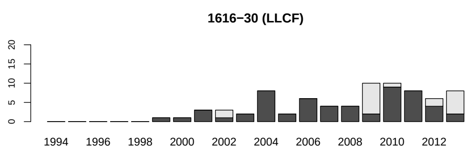
1 Censored Values:

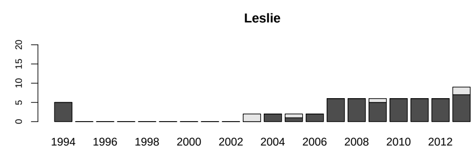
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

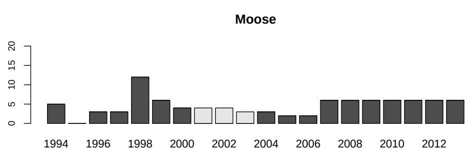
1.1 Monitored

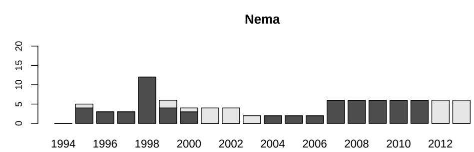


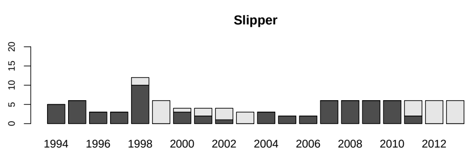


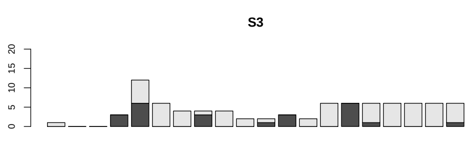




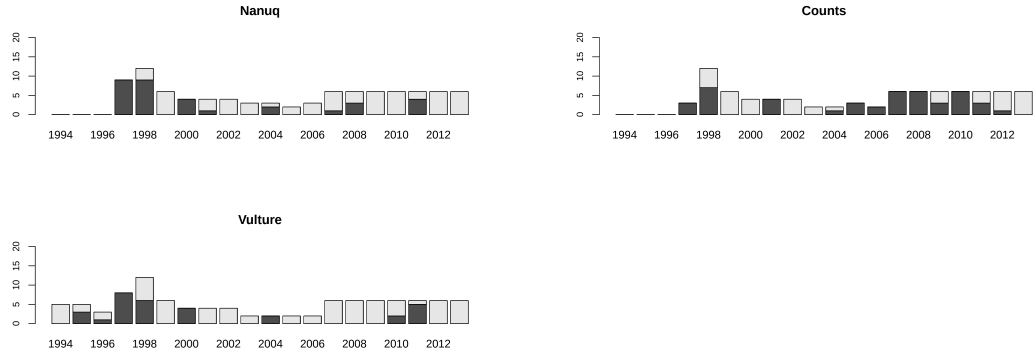






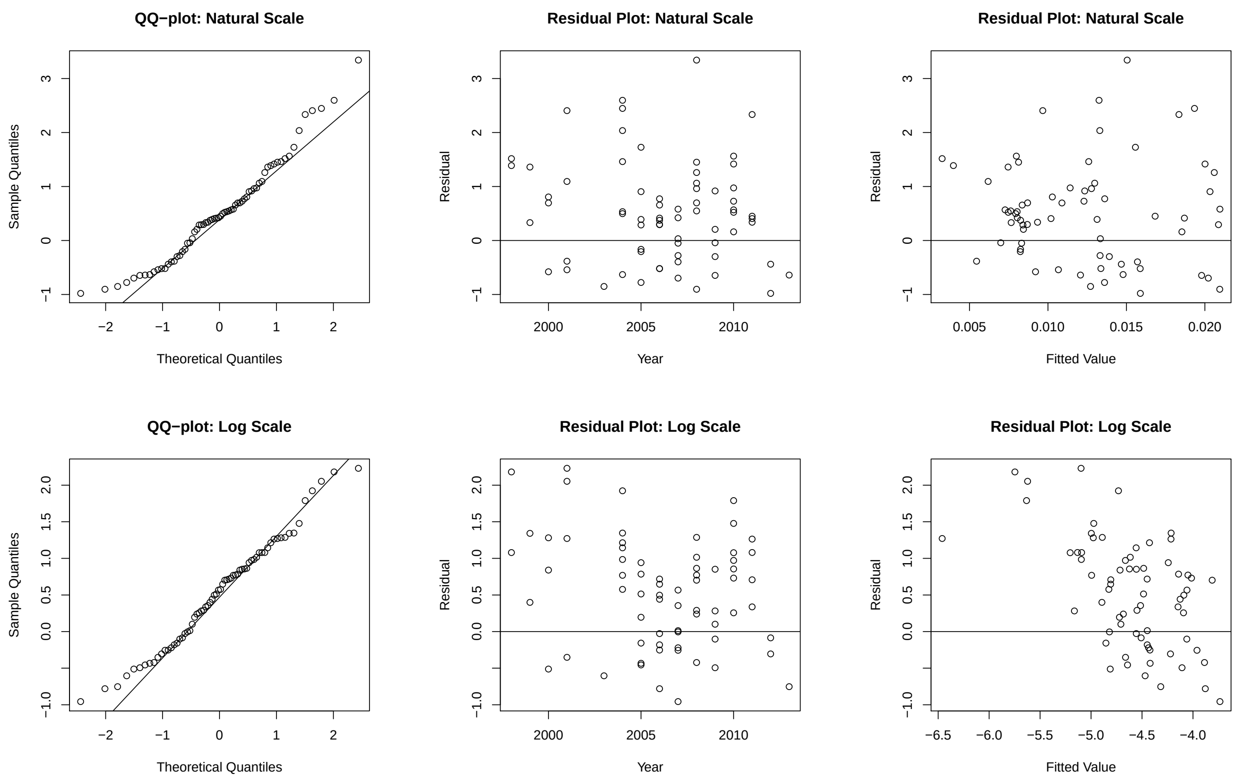


1.2 Reference



Comment:
Greater than 60% of data in Nanuq, Vulture, and S3 was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data inGrizzly, Kodiak, Leslie, Moose, Nema, Slipper, and S2 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
215	Slipper	2008	0.03	0.02	3.34

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The natural model best meets the assumptions of normality and equal variance. AIC also reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Lakes

Two of three reference lakes were removed from the analysis. Tests could not be performed. Proceeding with analysis using reference model 1.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Grizzly	0.9047	2	0.6361
Kodiak	2.4251	2	0.2974
1616-30 (LLCF)	2.9341	2	0.2306
Leslie	4.7056	2	0.0951
Moose	12.5990	2	0.0018
Nema	4.5802	2	0.1013
Slipper	11.5367	2	0.0031
S2	2.0386	2	0.3608

- Conclusions:
  Moose and Slipper lakes show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored lake compared to slope of each reference lake (reference model 1b).

- Results:

	Chi-squared	DF	P-value
Moose-vs-Counts	24.8499	3	0.0000
Slipper-vs-Counts	6.7890	3	0.0789

- Conclusions:
  Moose Lake shows significant deviation from the slope of the reference lake.

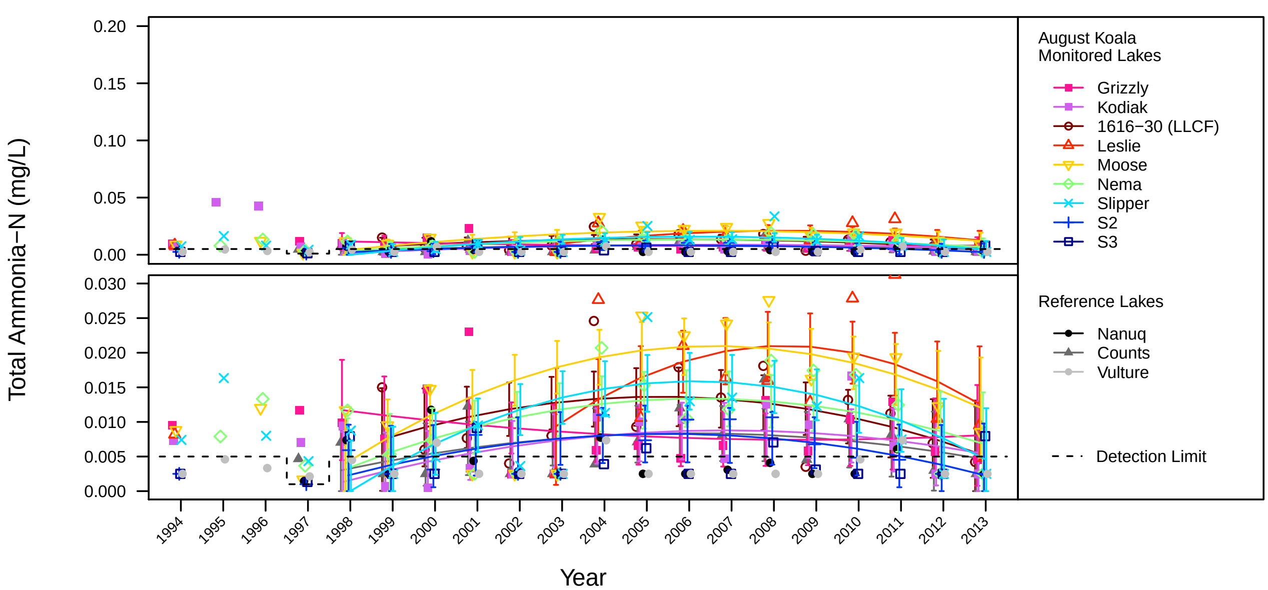
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Reference Lake	Counts	0.1430
Monitored Lake	1616-30 (LLCF)	0.1740
Monitored Lake	Grizzly	0.0660
Monitored Lake	Kodiak	0.2140
Monitored Lake	Leslie	0.1820
Monitored Lake	Moose	0.2940
Monitored Lake	Nema	0.2210
Monitored Lake	S2	0.3900
Monitored Lake	Slipper	0.3150

- Conclusions:
  Model fit for Kodiak, Moose, Nema, Slipper, and S2 is weak. Model fit for Counts, 1616-30 (LLCF), Grizzly, and Leslie Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total ammonia-N for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	4.57e-03	8.05e-03	3.71e-03	7.76e-04	1.53e-02	1.09e-02
Kodiak	2.50e-03	5.54e-03	3.78e-03	0.00e+00	1.30e-02	1.11e-02
Leslie	9.52e-03	1.26e-02	4.23e-03	4.34e-03	2.09e-02	1.24e-02
1616-30 (LLCF)	4.21e-03	5.60e-03	3.82e-03	0.00e+00	1.31e-02	1.12e-02
Moose	8.53e-03	1.21e-02	3.69e-03	4.85e-03	1.93e-02	1.08e-02
Nema	2.50e-03	6.88e-03	3.77e-03	0.00e+00	1.43e-02	1.10e-02
Slipper	2.50e-03	4.57e-03	3.78e-03	0.00e+00	1.20e-02	1.11e-02
S2	2.50e-03	2.34e-03	3.79e-03	0.00e+00	9.77e-03	1.11e-02
Nanuq	2.50e-03	NA	NA	NA	NA	NA
Counts	2.50e-03	4.80e-03	3.77e-03	0.00e+00	1.22e-02	NA
Vulture	2.50e-03	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
AmmoniaN	August	Koala	Lake	Water	Nanuq Vulture S3	none	Tobit regression	#1b separate intercepts & slopes	NA	Moose

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

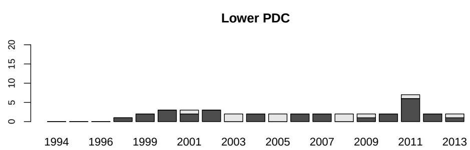
Analysis of August Total Ammonia-N in Koala Watershed Streams

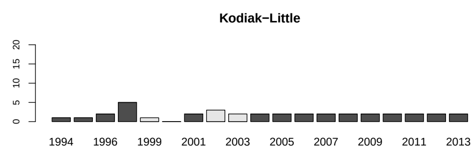
January 11, 2014

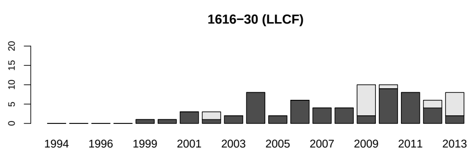
1 Censored Values:

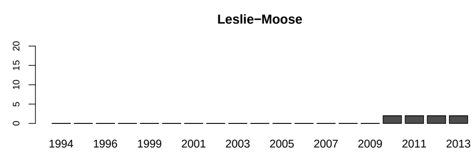
The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

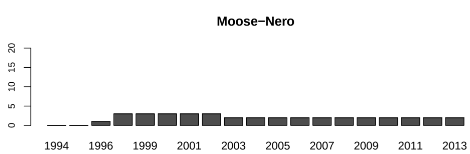
1.1 Monitored

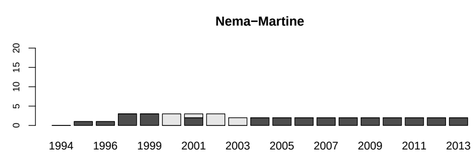


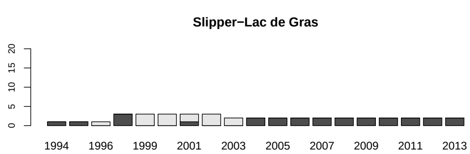




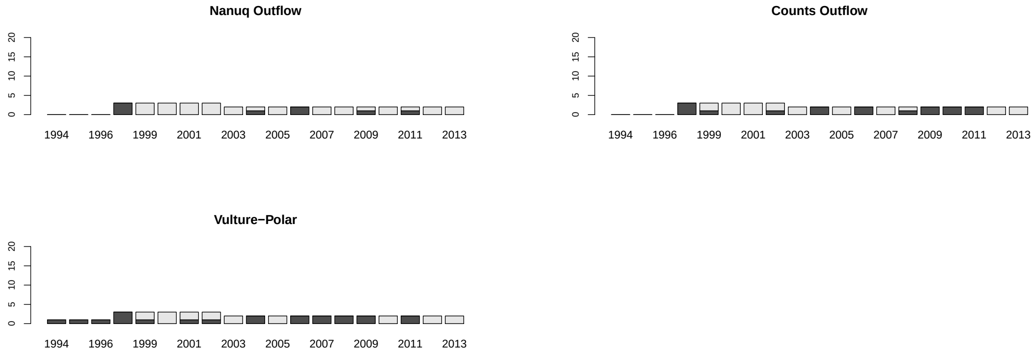






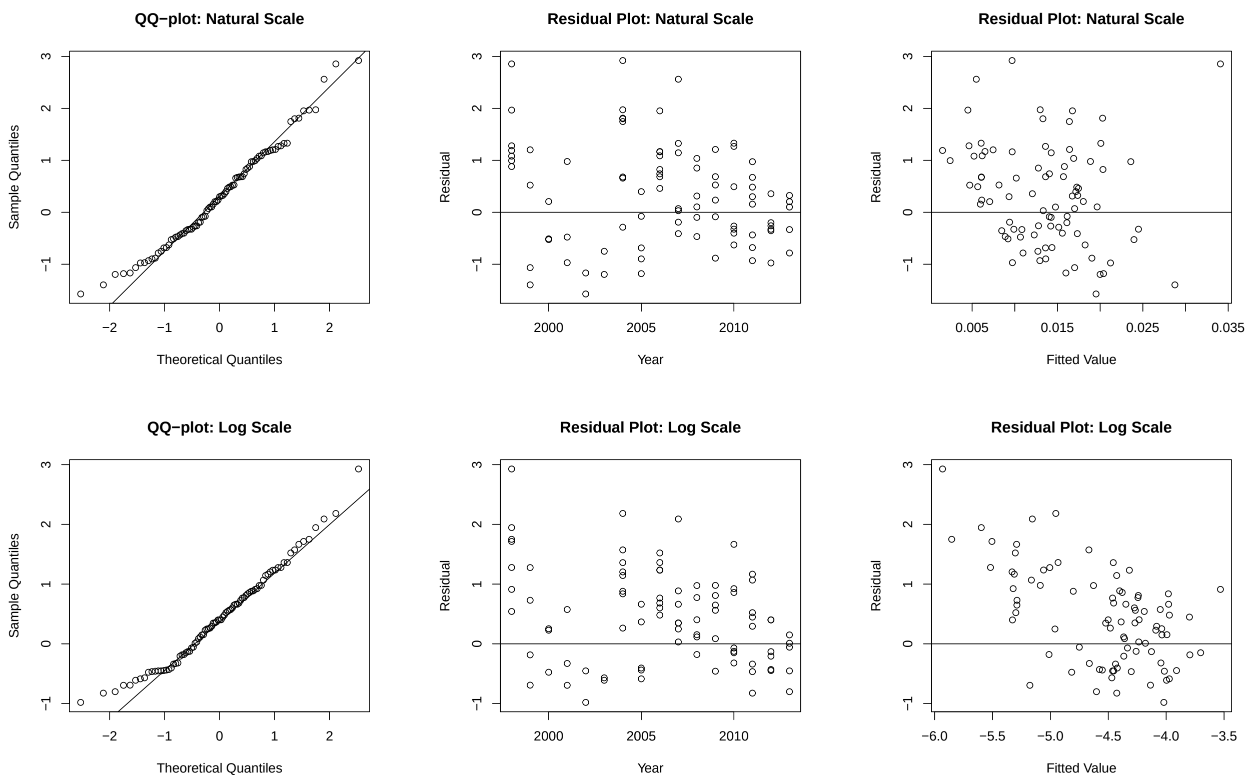


1.2 Reference



Comment:
Greater than 60% of data in Nanuq Outflow was less than the detection limit. This stream was excluded from further analyses. 10-60% of data in Counts Outflow, Vulture-Polar, 1616-30 (LLCF), Kodiak-Little, Lower PDC, Nema-Martine, and Slipper-Lac de Gras was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The natural and log transformed models show dependence on year and fitted value. AIC reveals that the data is modeled best without transformation. Proceeding with analysis using the natural, untransformed model. Results should be interpreted with caution.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
1.21	3.00	0.75

- Conclusions:
  The slopes and intercepts do not differ significantly among reference streams.

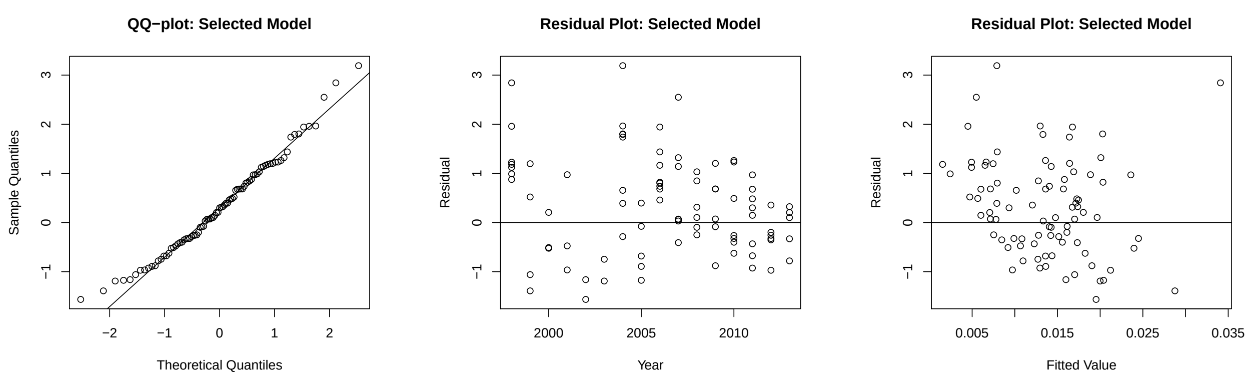
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.072	0.140	0.788	Ref. Model 3

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
191	Vulture-Polar	2004	0.03	0.01	3.19

Conclusion:
Reduced model shows dependence on year and fitted value. Results should be interpreted with caution.

4 Test Results for Monitored Streams

Fitted model of the slope and intercept of each monitored stream compared to a common slope and intercept fitted for all reference streams together (reference model 3).

- Results:

	Chi-squared	DF	P-value
Lower PDC	33.7896	3	0.0000
Kodiak-Little	7.5908	3	0.0553
Leslie-Moose	1.3926	3	0.7073
1616-30 (LLCF)	4.6226	3	0.2016
Moose-Nero	36.7780	3	0.0000
Nema-Martine	13.0459	3	0.0045
Slipper-Lac de Gras	12.4099	3	0.0061

- Conclusions:
  All monitored streams except 1616-30 (LLCF) and Leslie-Moose show significant deviation from the common slope and intercept of reference streams.

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
Lower PDC	23.4551	2	0.0000
Kodiak-Little	1.3483	2	0.5096
Leslie-Moose	0.3611	2	0.8348
1616-30 (LLCF)	0.5591	2	0.7561
Moose-Nero	0.1059	2	0.9484
Nema-Martine	3.8874	2	0.1432
Slipper-Lac de Gras	3.2597	2	0.1960

- Conclusions:
  When allowing for differences in intercept, Lower PDC shows significant deviation from the common slope of reference streams.

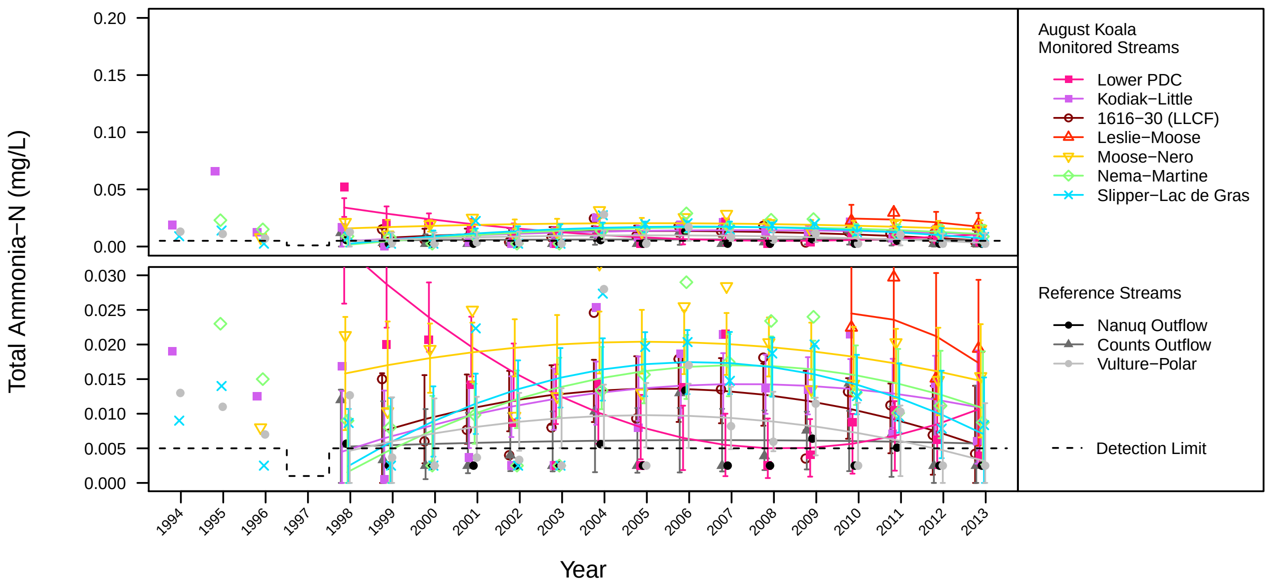
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.0380
Monitored Stream	1616-30 (LLCF)	0.1730
Monitored Stream	Kodiak-Little	0.1330
Monitored Stream	Leslie-Moose	0.2680
Monitored Stream	Lower PDC	0.5450
Monitored Stream	Moose-Nero	0.0740
Monitored Stream	Nema-Martine	0.3510
Monitored Stream	Slipper-Lac de Gras	0.3230

- Conclusions:
  Model fit for Leslie-Moose, Nema-Martine, and Slipper-Lac de Gras is weak. Model fit for reference streams, 1616-30 (LLCF), Kodiak-Little, and Moose-Nero is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total ammonia-N for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	3.95e-03	1.07e-02	4.19e-03	2.48e-03	1.89e-02	1.23e-02
Kodiak-Little	6.05e-03	1.10e-02	4.17e-03	2.78e-03	1.91e-02	1.22e-02
Leslie-Moose	1.94e-02	1.74e-02	6.11e-03	5.38e-03	2.93e-02	1.79e-02
1616-30 (LLCF)	4.21e-03	5.59e-03	4.31e-03	0.00e+00	1.40e-02	1.26e-02
Moose-Nero	1.54e-02	1.48e-02	4.17e-03	6.59e-03	2.29e-02	1.22e-02
Nema-Martine	8.75e-03	1.08e-02	4.17e-03	2.65e-03	1.90e-02	1.22e-02
Slipper-Lac de Gras	8.35e-03	7.06e-03	4.17e-03	0.00e+00	1.52e-02	1.22e-02
Nanuq Outflow	2.50e-03	NA	NA	NA	NA	NA
Counts Outflow	2.50e-03	5.70e-03	4.25e-03	0.00e+00	1.40e-02	NA
Vulture-Polar	2.50e-03	3.18e-03	4.26e-03	0.00e+00	1.15e-02	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
AmmoniaN	August	Koala	Stream	Water	Nanuq Outflow	none	Tobit regression	#3 shared intercept & slope	NA	Lower PDC Moose-Nero Nema-Martine Slipper-Lac de Gras

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

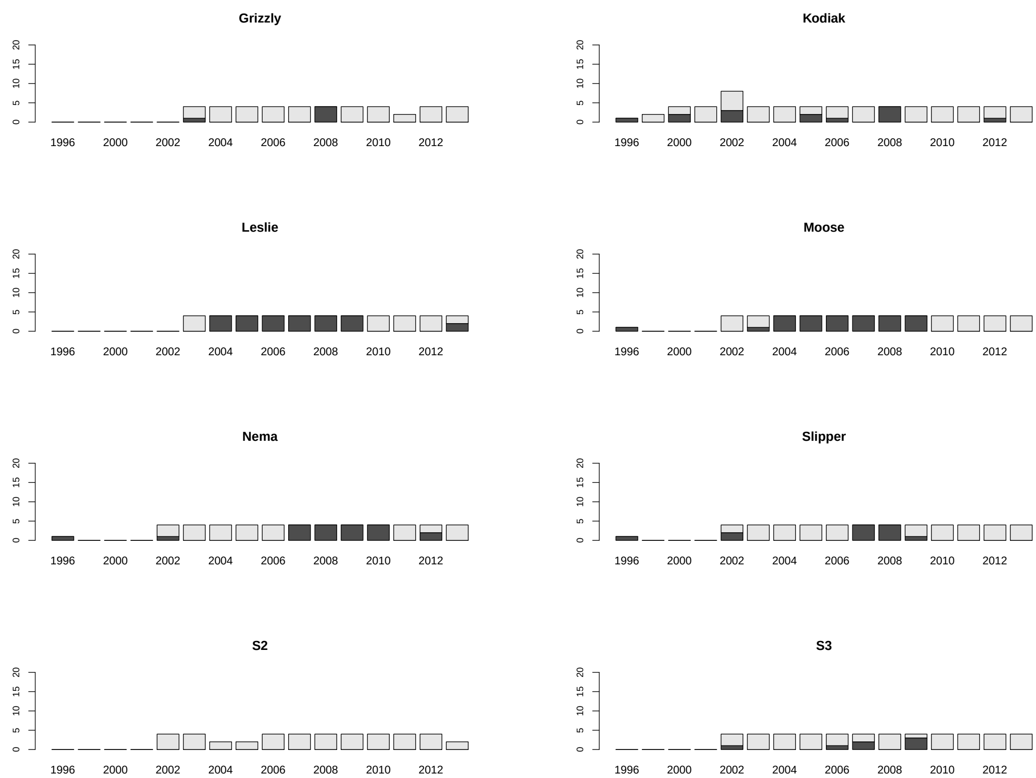
Analysis of April Nitrite-N in Lakes of the Koala Watershed and Lac de Gras

January 11, 2014

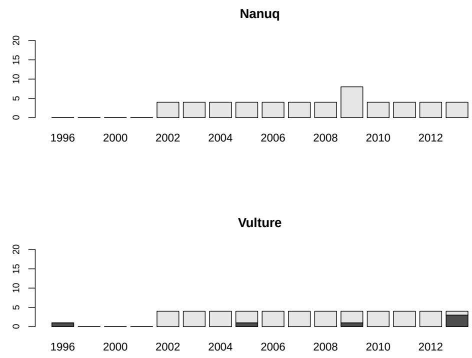
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

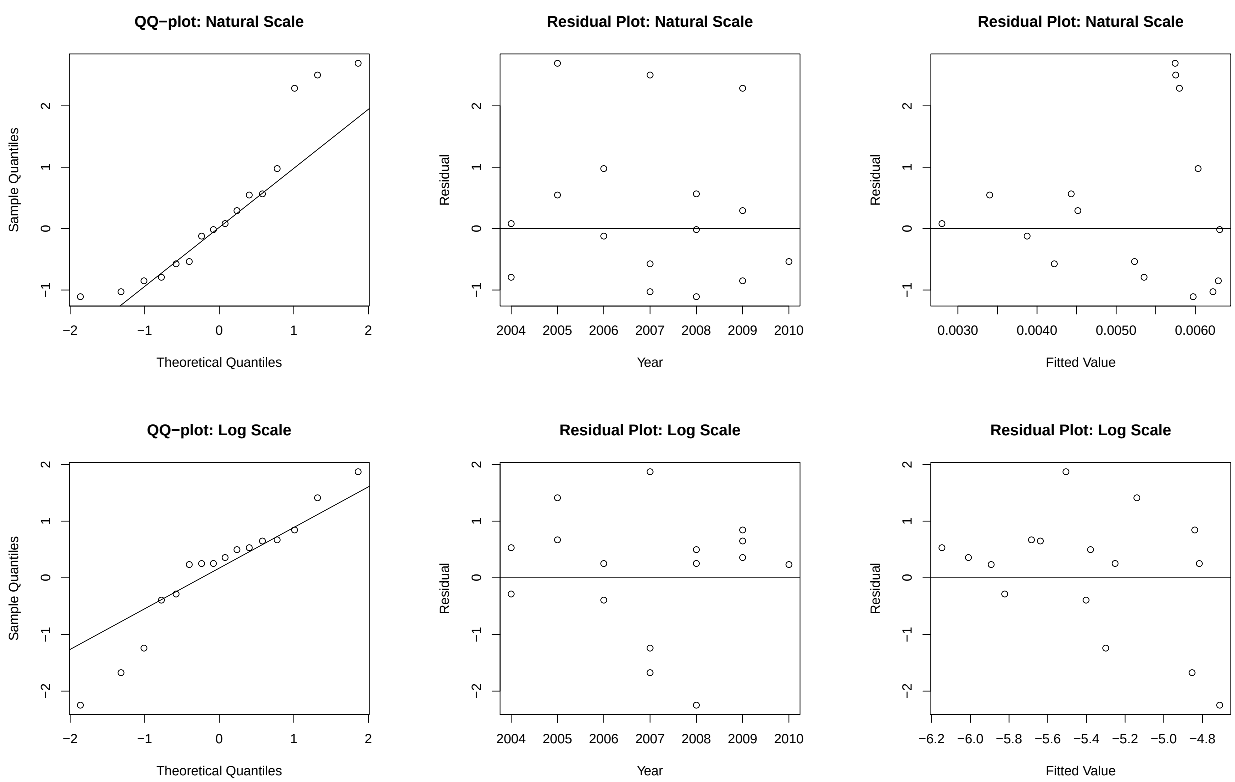


1.2 Reference



Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, Grizzly, Kodiak, Slipper, S2, and S3 was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in Leslie, Moose, and Nema Lakes was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	3.90E-24	natural model

Conclusion:
AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Leslie	0.1627	2	0.9219
Moose	0.8567	2	0.6516
Nema	4.0886	2	0.1295

- Conclusions:
  No significant deviations were found when comparing monitored lakes to a constant slope of zero.

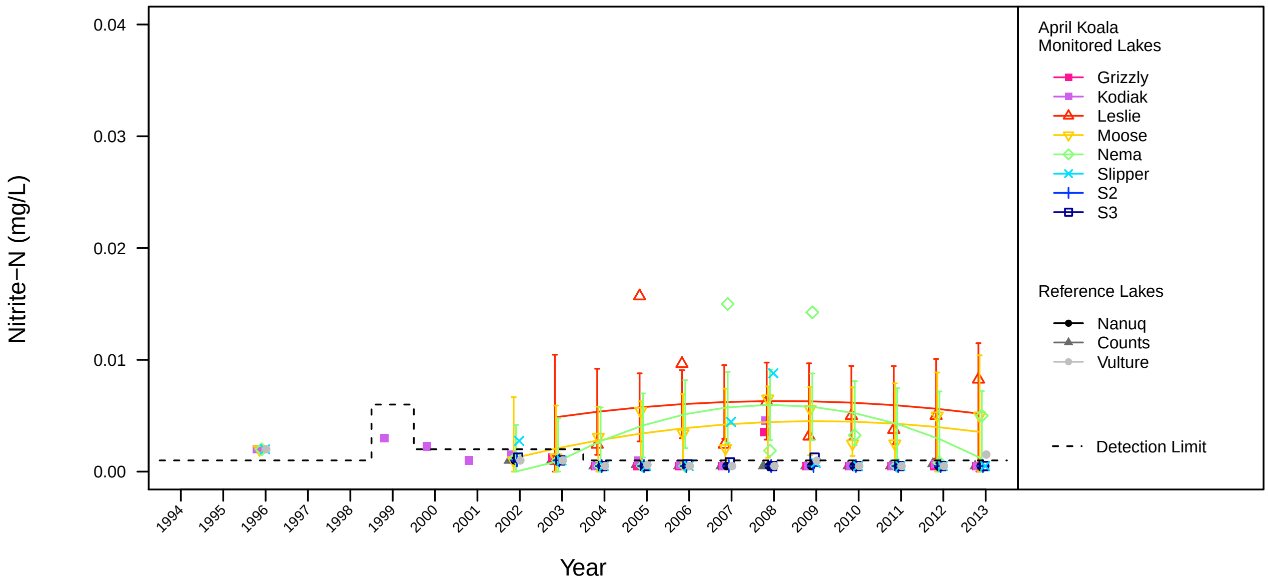
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	Leslie	0.0140
Monitored Lake	Moose	0.3250
Monitored Lake	Nema	0.1860

- Conclusions:
  Model fit for Moose Lake is weak. Model fit for Leslie and Nema lakes is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean nitrite-N for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	5.00e-04	NA	NA	NA	NA	NA
Kodiak	5.00e-04	NA	NA	NA	NA	NA
Leslie	8.25e-03	5.20e-03	3.21e-03	0e+00	1.15e-02	9.39e-03
Moose	5.00e-03	3.56e-03	3.50e-03	0e+00	1.04e-02	1.02e-02
Nema	5.00e-03	1.17e-03	3.08e-03	0e+00	7.20e-03	9.01e-03
Slipper	5.00e-04	NA	NA	NA	NA	NA
S2	5.00e-04	NA	NA	NA	NA	NA
S3	5.00e-04	NA	NA	NA	NA	NA
Nanuq	5.00e-04	NA	NA	NA	NA	NA
Counts	5.00e-04	NA	NA	NA	NA	NA
Vulture	1.52e-03	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
NitriteN	April	Koala	Lake	Water	Counts Grizzly Kodiak Nanuq S2 S3 Slipper Vulture	none	Tobit regression	#1a slope of zero	0.06	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

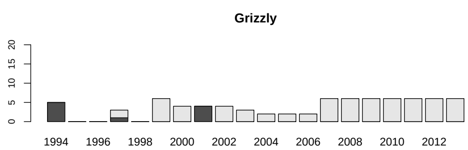
Analysis of August Nitrite-N in Lakes of the Koala Watershed and Lac de Gras

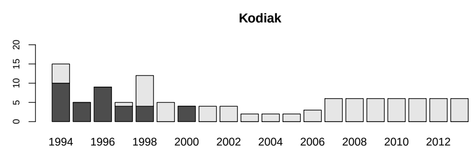
January 11, 2014

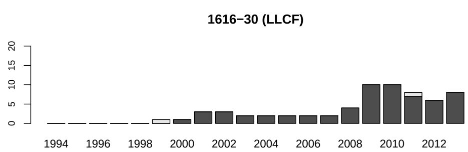
1 Censored Values:

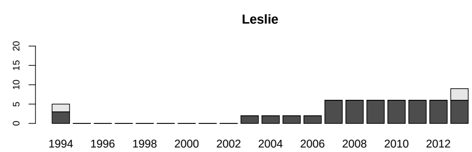
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

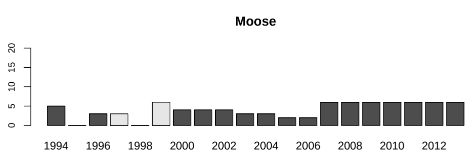
1.1 Monitored

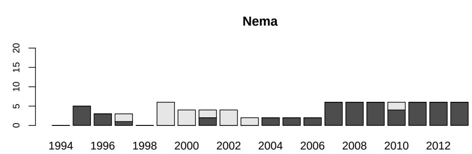


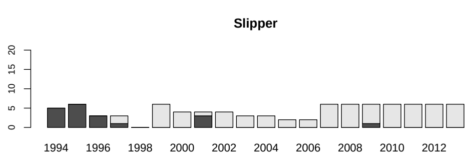


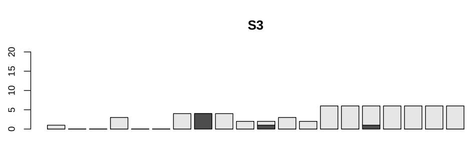




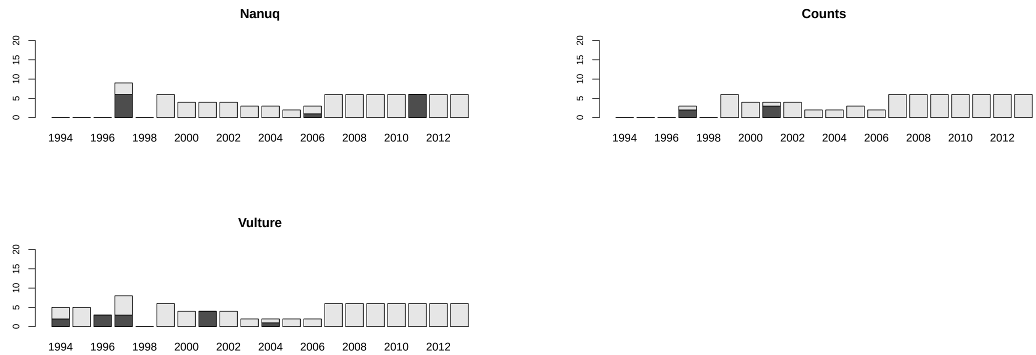






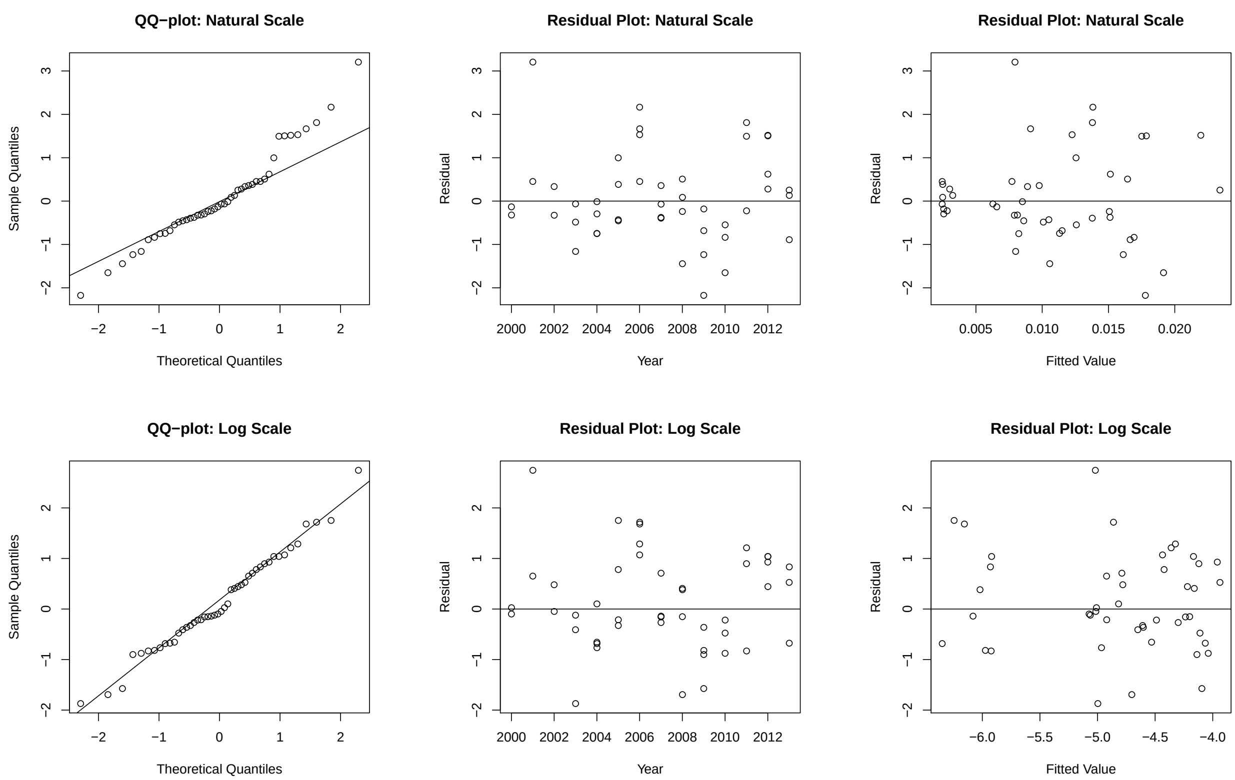


1.2 Reference



Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, Grizzly, Kodiak, Slipper, S2, and S3 was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in Nema Lake was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
108	Moose	2001	0.02	0.01	3.20

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis uisng reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-30 (LLCF)	24.2595	2	0.0000
Leslie	8.6977	2	0.0129
Moose	6.2091	2	0.0448
Nema	0.0826	2	0.9595

- Conclusions:
  Leslie and Moose lakes show significant deviation from a slope of zero.

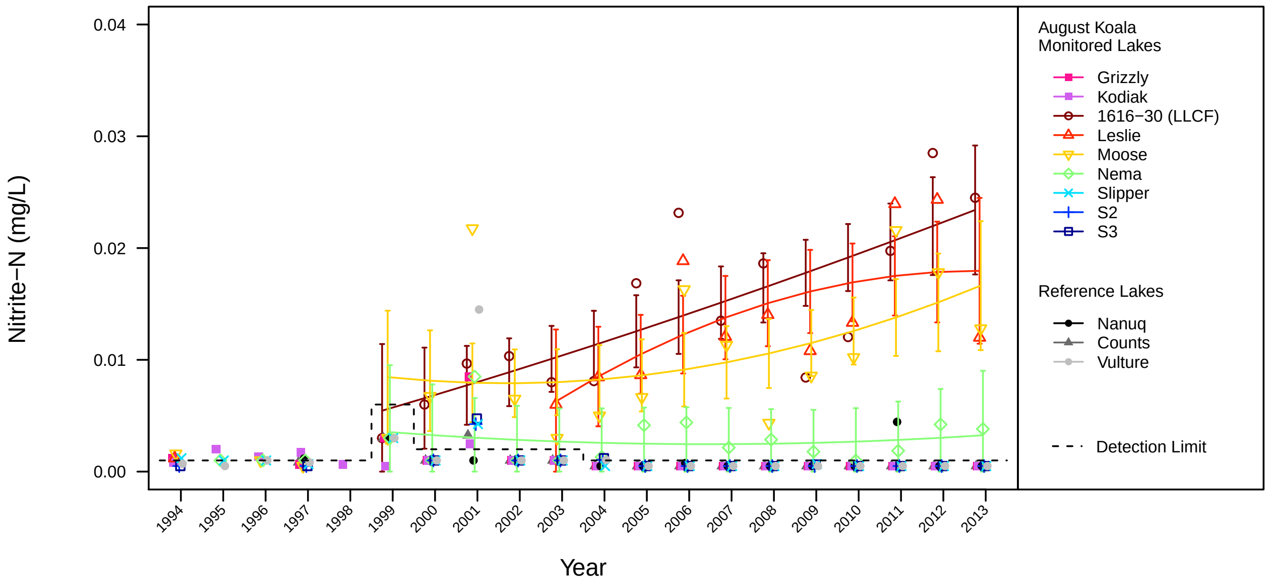
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	1616-30 (LLCF)	0.5890
Monitored Lake	Leslie	0.4340
Monitored Lake	Moose	0.2040
Monitored Lake	Nema	0.0280

- Conclusions:
  Model fit for Leslie Lake is weak. Model fit for Moose and Nema lakes is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean nitrite-N for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Leslie	1.20e-02	1.80e-02	3.33e-03	1.14e-02	2.45e-02	9.73e-03
1616-30 (LLCF)	2.45e-02	2.34e-02	2.94e-03	1.76e-02	2.92e-02	8.61e-03
Moose	1.28e-02	1.66e-02	2.94e-03	1.09e-02	2.24e-02	8.61e-03
Nema	3.82e-03	3.25e-03	2.94e-03	0.00e+00	9.02e-03	8.61e-03
Nanuq	5.00e-04	NA	NA	NA	NA	NA
Counts	5.00e-04	NA	NA	NA	NA	NA
Vulture	5.00e-04	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
NitriteN	August	Koala	Lake	Water	Nanuq Counts Vulture Grizzly Kodiak Slipper S2 S3	none	Tobit regression	#1a slope of zero	0.06	1616-30 (LLCF) Leslie Moose

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

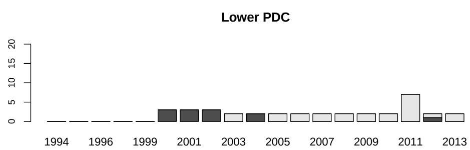
Analysis of August Nitrite-N in Koala Watershed Streams

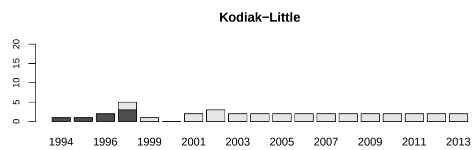
January 11, 2014

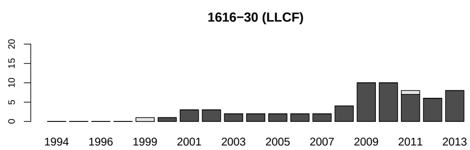
1 Censored Values:

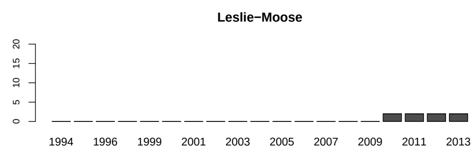
The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

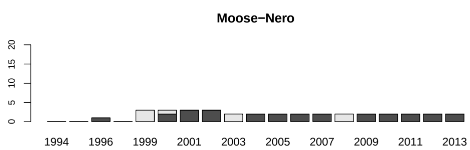
1.1 Monitored

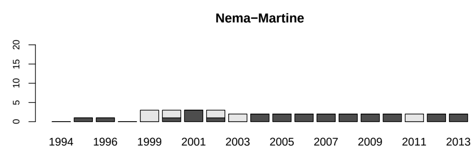


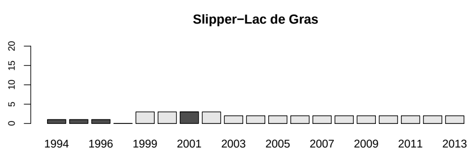




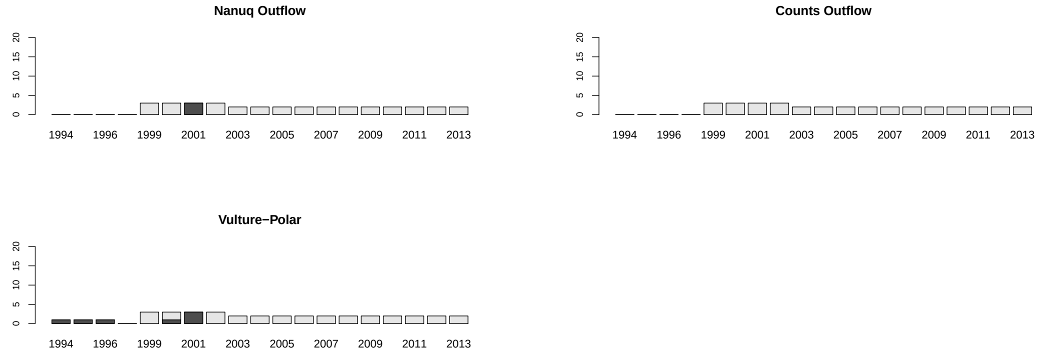






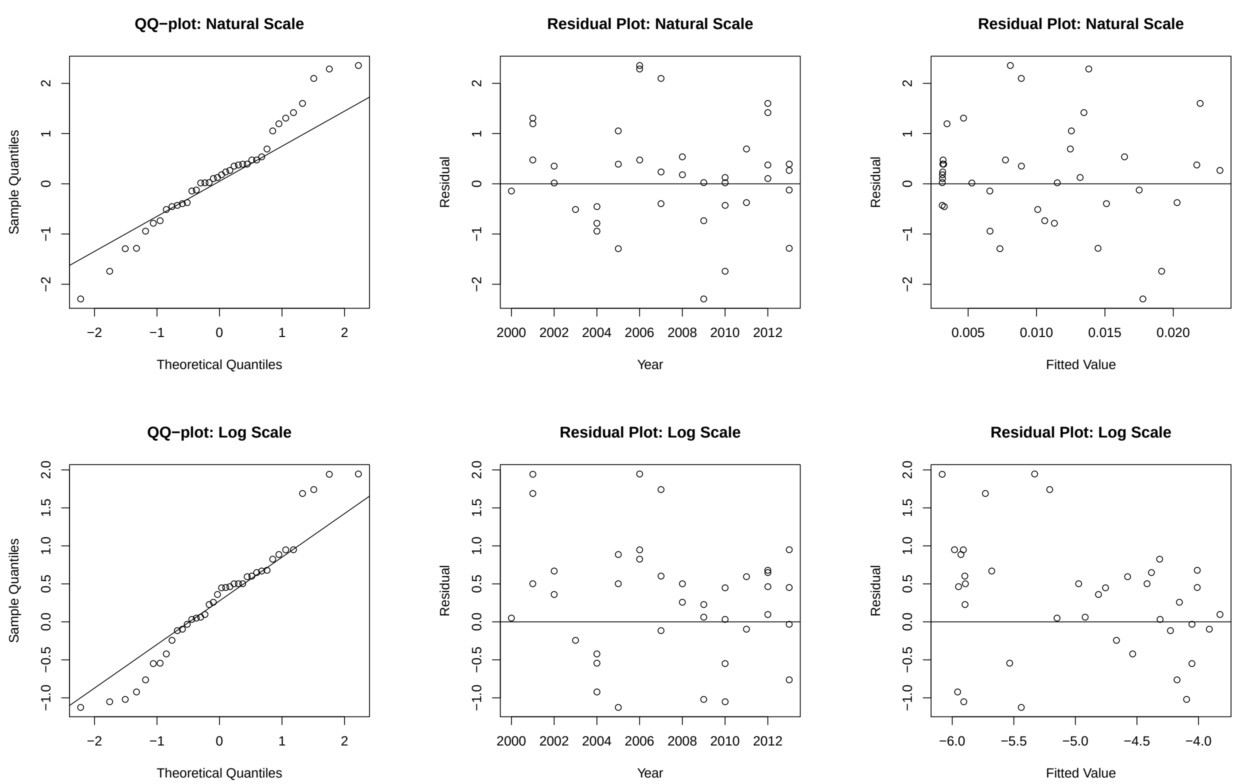


1.2 Reference



Comment:
Greater than 60% of data in Counts Outflow, Nanuq Outflow, Vulture-Polar, Kodiak-Little, Lower PDC, and Slipper-Lac de Gras streams was less than the detection limit. These streams were excluded from further analyses. 10-60% of data in Moose-Nero and Nema-Martine was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Streams

All reference streams removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored stream against a slope of 0.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Leslie-Moose	2.5374	2	0.2812
1616-30 (LLCF)	26.8932	2	0.0000
Moose-Nero	10.0838	2	0.0065
Nema-Martine	0.0238	2	0.9882

- Conclusions:
  1616-30 (LLCF) and Moose-Nero show significant deviations from a constant slope of zero.

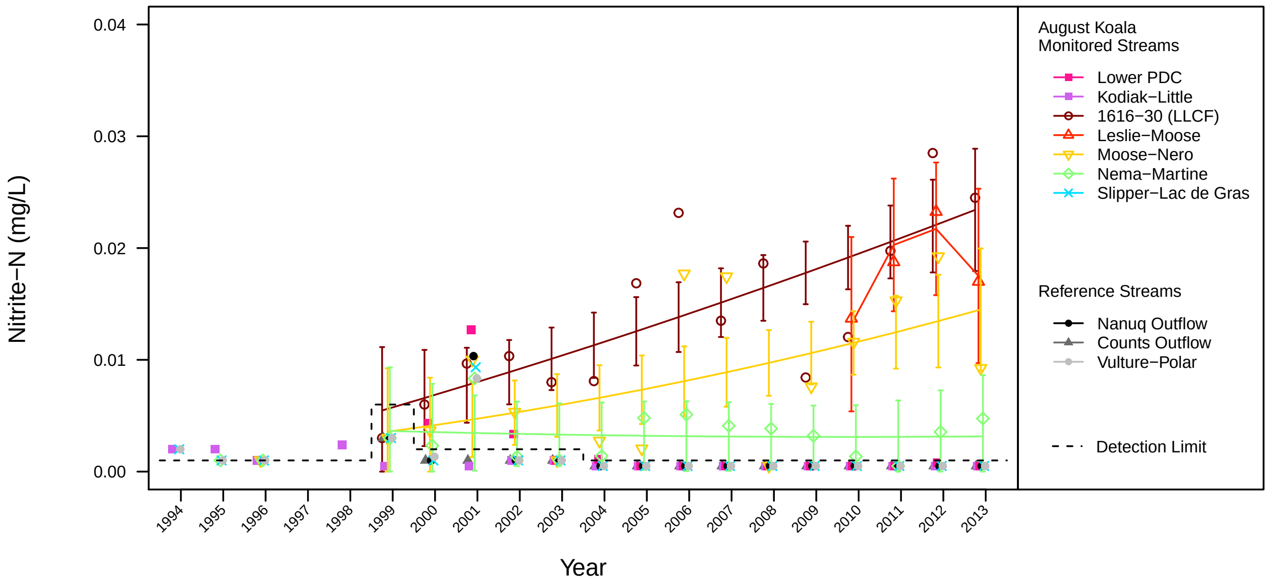
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Lake Type	Lake Name	R-squared
Monitored Lake	1616-30 (LLCF)	0.5880
Monitored Lake	Leslie-Moose	0.8900
Monitored Lake	Moose-Nero	0.2890
Monitored Lake	Nema-Martine	0.0070

- Conclusions:
  Model fit for Moose-Nero is weak. Model fit for Nema-Martine is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean nitrite-N for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Leslie-Moose	1.70e-02	1.75e-02	3.98e-03	9.71e-03	2.53e-02	1.16e-02
1616-30 (LLCF)	2.45e-02	2.34e-02	2.79e-03	1.79e-02	2.89e-02	8.17e-03
Moose-Nero	9.25e-03	1.45e-02	2.79e-03	9.03e-03	2.00e-02	8.17e-03
Nema-Martine	4.75e-03	3.15e-03	2.79e-03	0.00e+00	8.62e-03	8.17e-03
Nanuq Outflow	5.00e-04	NA	NA	NA	NA	NA
Counts Outflow	5.00e-04	NA	NA	NA	NA	NA
Vulture-Polar	5.00e-04	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
NitriteN	August	Koala	Stream	Water	Counts Outflow Nanuq Outflow Vulture-Polar Kodiak-Little Lower PDC Slipper-Lac de Gras	none	Tobit regression	#1a slope of zero	0.06	1616-30 (LLCF) Moose-Nero

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

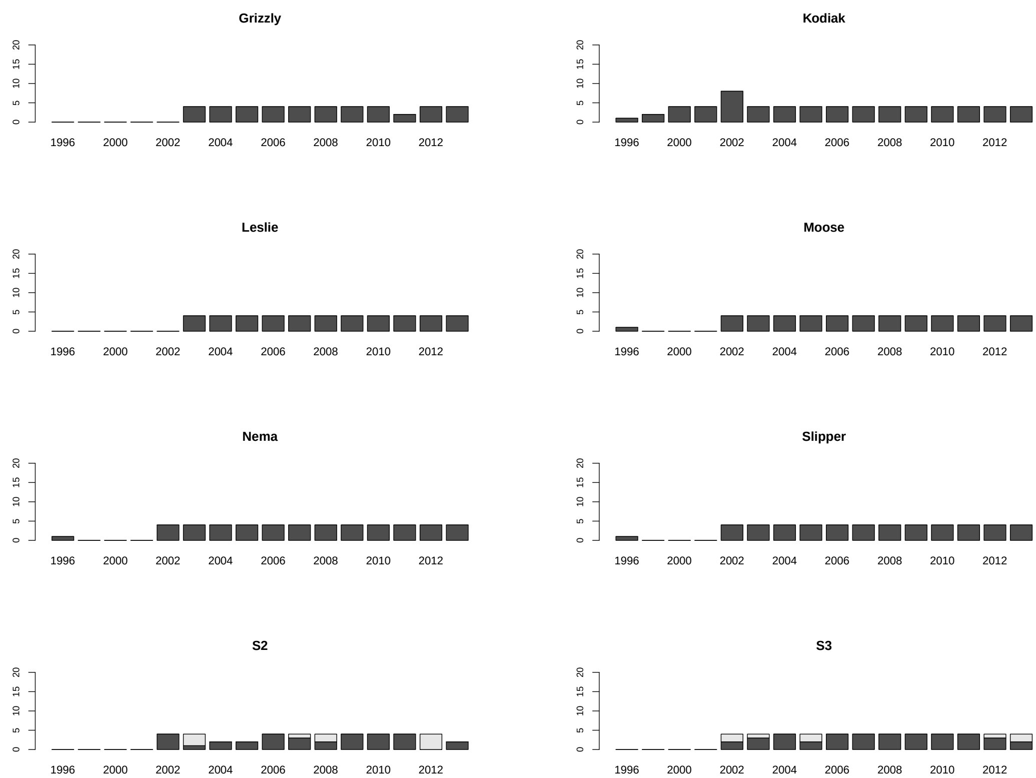
Analysis of April Nitrate-N in Lakes of the Koala Watershed and Lac de Gras

January 20, 2014

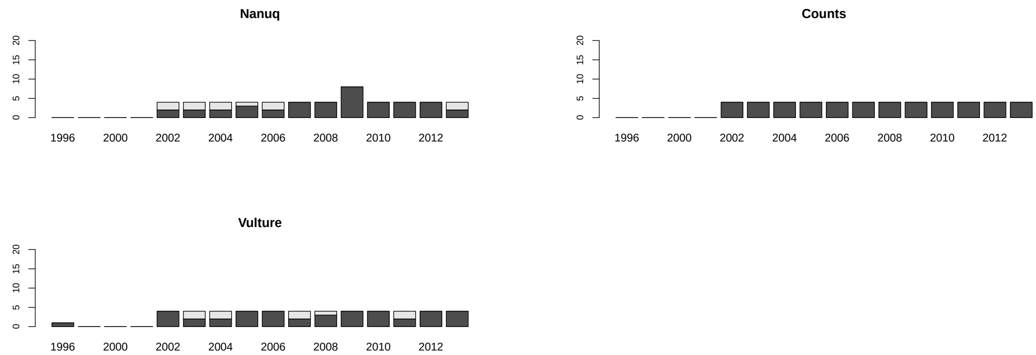
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

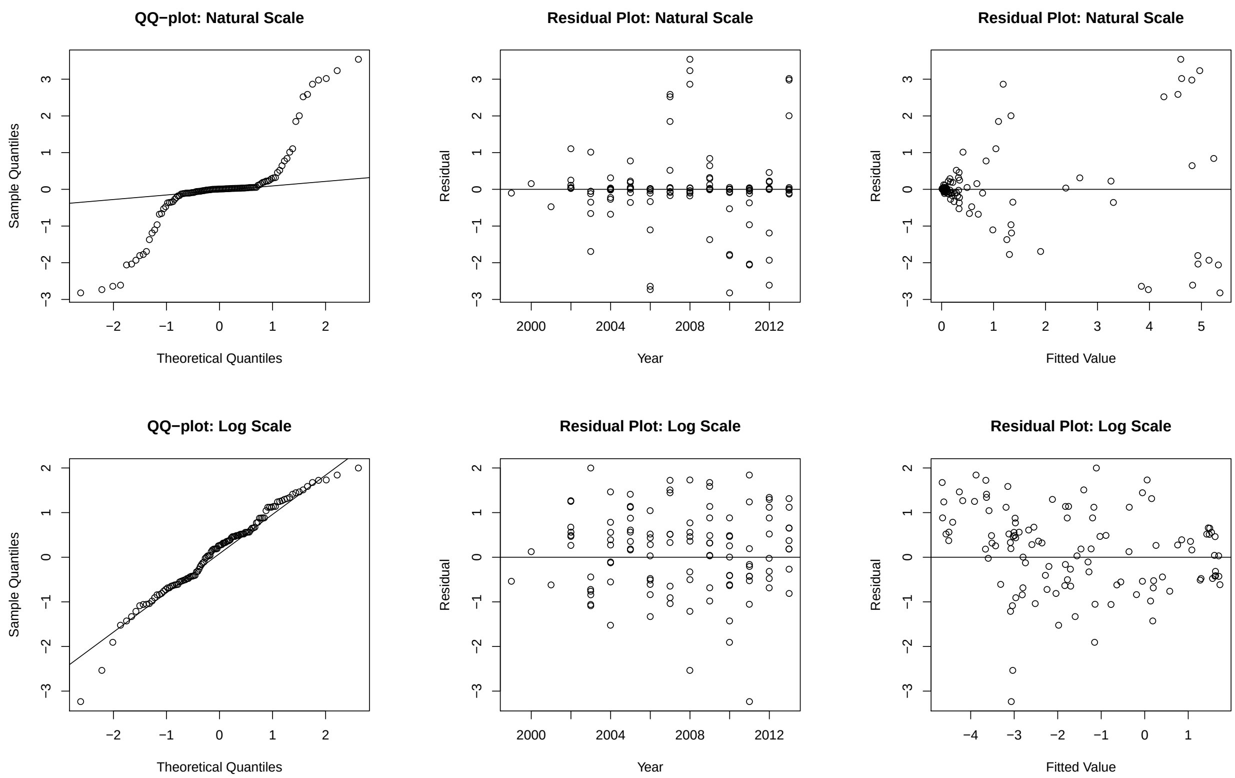


1.2 Reference



Comment:
10-60% of data in Nanuq, Vulture, S2, and S3 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
95	Leslie	2008	6.17	4.97	3.23
115	Moose	2008	5.92	4.60	3.54
120	Moose	2013	5.74	4.62	3.02

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
58	Grizzly	2011	0.01	-3.07	-3.23

AIC weights and model comparison:

Natural Model	Log Model	Best Model
3.94E-44	1.00E+00	log model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
14.09	6.00	0.03

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
12.91	4.00	0.01

- Conclusions:
  The slopes differ significantly among reference lakes. Reference lakes do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  AIC results are in agreement with reference mode testing and reveal that the reference lakes are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Grizzly	0.2683	2	0.8744
Kodiak	25.1978	2	0.0000
Leslie	10.0252	2	0.0067
Moose	11.9580	2	0.0025
Nema	10.2289	2	0.0060
Slipper	13.0883	2	0.0014
S2	1.2213	2	0.5430
S3	21.0420	2	0.0000

- Conclusions:
  Kodiak, Leslie, Moose, Nema, Slipper, and S3 show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored lake compared to slope of each reference lake (reference model 1b).

- Results:

	Chi-squared	DF	P-value
Kodiak-vs-Nanuq	19.2921	3	0.0002
Kodiak-vs-Counts	42.2501	3	0.0000
Kodiak-vs-Vulture	141.9559	3	0.0000
Leslie-vs-Nanuq	39.8439	3	0.0000
Leslie-vs-Counts	422.8911	3	0.0000
Leslie-vs-Vulture	647.7299	3	0.0000
Moose-vs-Nanuq	40.0129	3	0.0000
Moose-vs-Counts	436.0789	3	0.0000
Moose-vs-Vulture	674.4815	3	0.0000
Nema-vs-Nanuq	23.0277	3	0.0000
Nema-vs-Counts	168.4749	3	0.0000
Nema-vs-Vulture	342.4058	3	0.0000
Slipper-vs-Nanuq	13.3719	3	0.0039
Slipper-vs-Counts	28.4592	3	0.0000
Slipper-vs-Vulture	125.2804	3	0.0000
S3-vs-Nanuq	8.5304	3	0.0362
S3-vs-Counts	64.2841	3	0.0000
S3-vs-Vulture	12.6326	3	0.0055

- Conclusions:
  All of the remaining monitored lakes show significant deviations from the slopes of individual reference lakes.

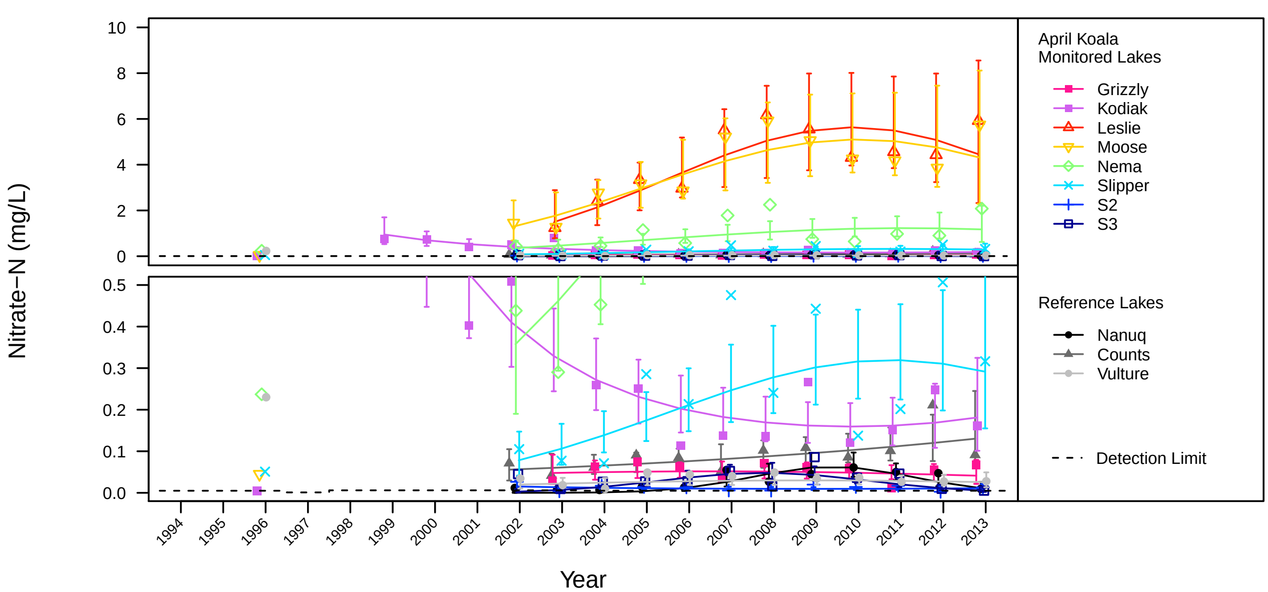
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Reference Lake	Counts	0.4550
Reference Lake	Nanuq	0.5890
Reference Lake	Vulture	0.1520
Monitored Lake	Grizzly	0.0160
Monitored Lake	Kodiak	0.7160
Monitored Lake	Leslie	0.8210
Monitored Lake	Moose	0.8170
Monitored Lake	Nema	0.4190
Monitored Lake	S2	0.0460
Monitored Lake	S3	0.5120
Monitored Lake	Slipper	0.4870

- Conclusions:
  Model fit for Counts, Nema, and Slipper lakes is weak. Model fit for Vulture, Grizzly, and S2 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean nitrate-N for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	6.73e-02	4.13e-02	1.37e-02	2.15e-02	7.92e-02	4.02e-02
Kodiak	1.61e-01	1.81e-01	5.39e-02	1.01e-01	3.25e-01	1.58e-01
Leslie	5.92e+00	4.46e+00	1.48e+00	2.32e+00	8.55e+00	4.34e+00
Moose	5.74e+00	4.31e+00	1.39e+00	2.29e+00	8.11e+00	4.07e+00
Nema	2.08e+00	1.17e+00	3.78e-01	6.23e-01	2.21e+00	1.11e+00
Slipper	3.16e-01	2.92e-01	9.41e-02	1.55e-01	5.49e-01	2.75e-01
S2	1.30e-02	1.11e-02	3.64e-03	5.80e-03	2.11e-02	1.06e-02
S3	5.25e-03	5.09e-03	2.18e-03	2.20e-03	1.18e-02	6.39e-03
Nanuq	9.38e-03	1.13e-02	4.82e-03	4.92e-03	2.61e-02	NA
Counts	9.13e-02	1.30e-01	4.20e-02	6.92e-02	2.45e-01	NA
Vulture	2.78e-02	2.57e-02	8.51e-03	1.35e-02	4.92e-02	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
NitrateN	April	Koala	Lake	Water	none	log e	Tobit regression	#1b separate intercepts & slopes	NA	Kodiak Leslie Moose Nema Slipper S3

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

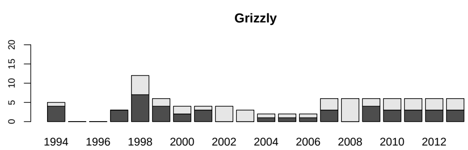
Analysis of August Nitrate-N in Lakes of the Koala Watershed and Lac de Gras

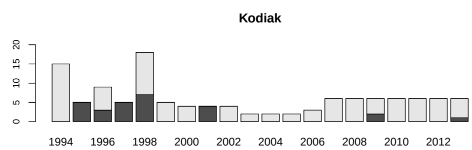
January 11, 2014

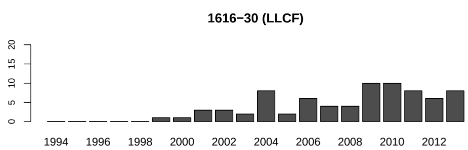
1 Censored Values:

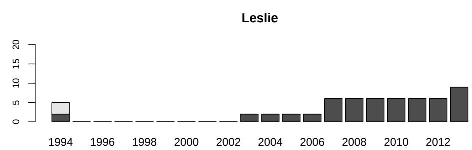
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

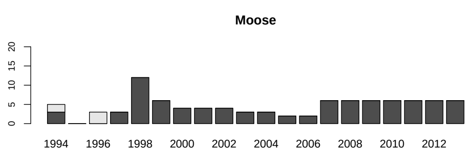
1.1 Monitored

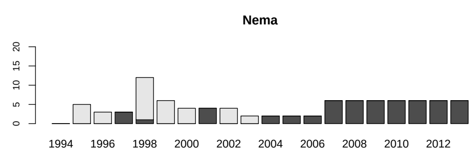


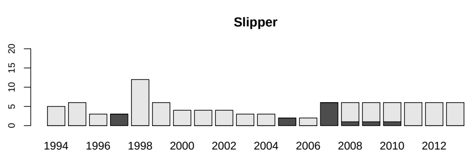


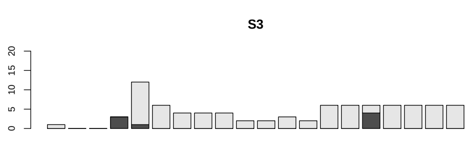




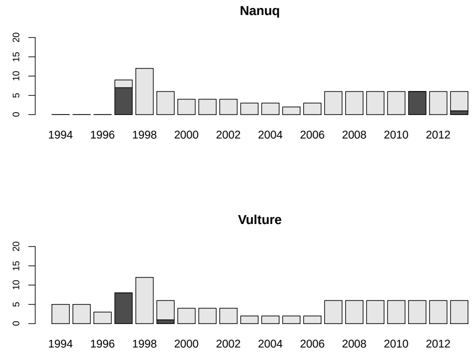






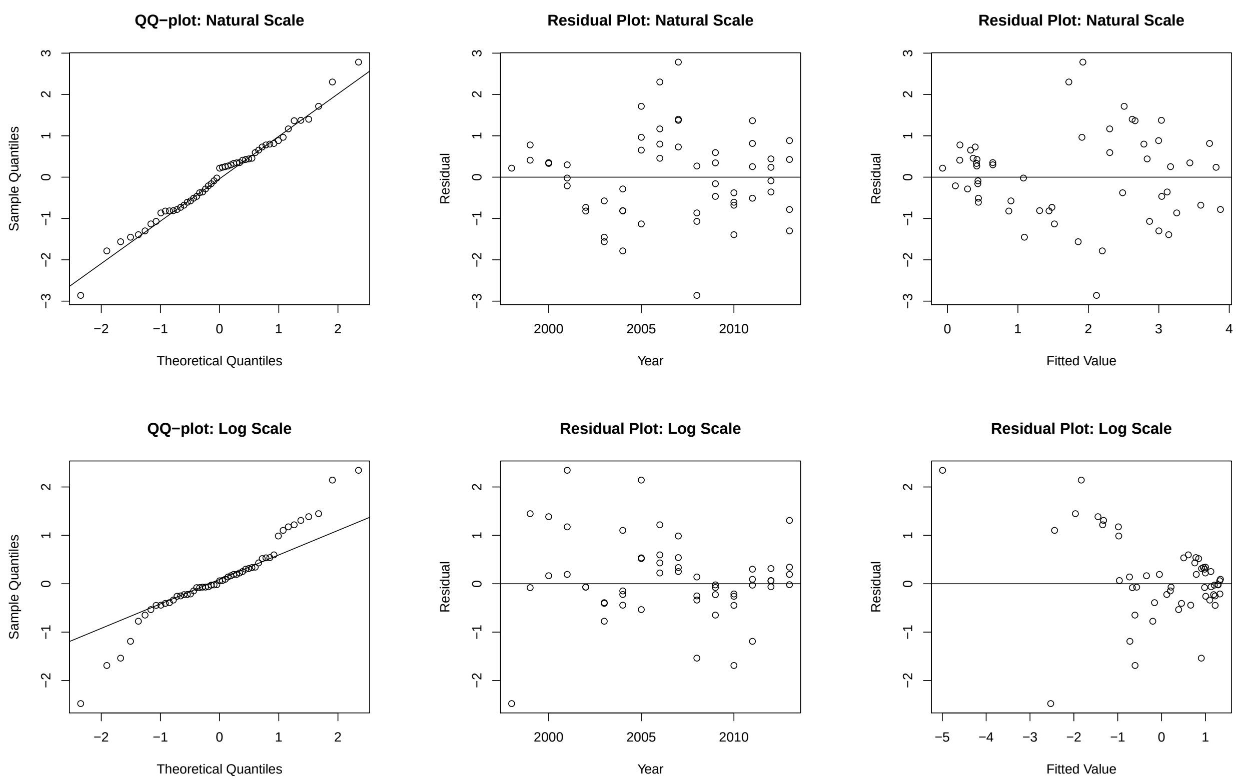


1.2 Reference



Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, Grizzly, Kodiak, Slipper, S2, and S3 was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in Nema Lake was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.059	0.941	Log-transformed Model

Conclusion:
The natural and log-transformed models show dependence on year and fitted value. We are proceeding with the remaining analyses using the untransformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-30 (LLCF)	127.9736	2	0.0000
Leslie	37.3608	2	0.0000
Moose	89.0438	2	0.0000
Nema	3.2340	2	0.1985

- Conclusions:
  Leslie and Moose lakes show significant deviations from a slope of zero.

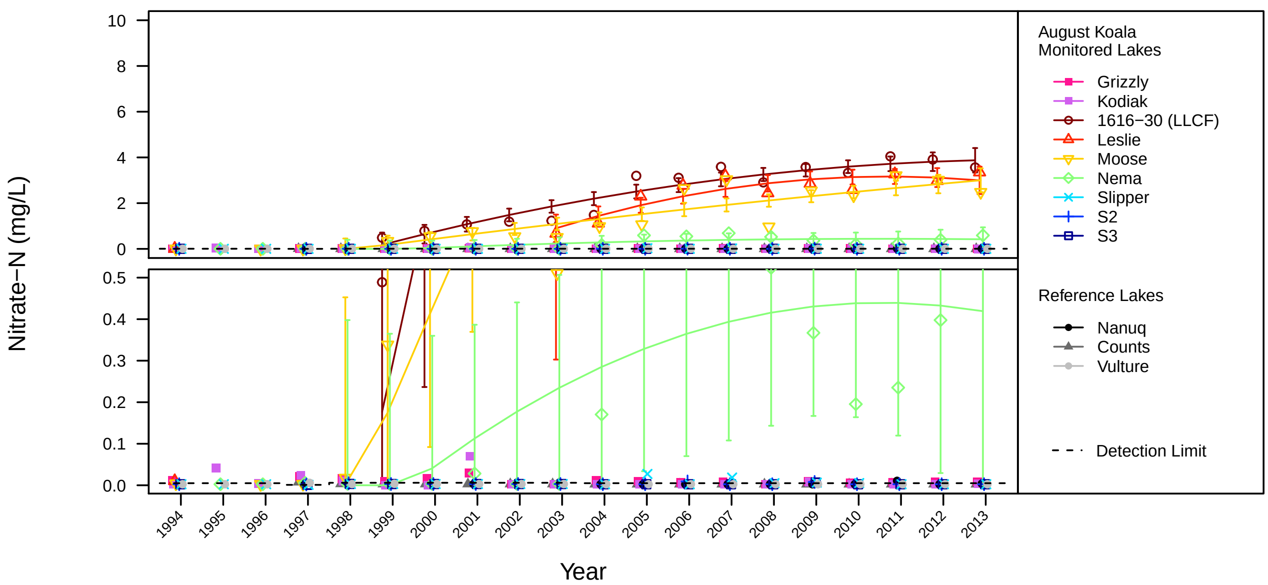
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	1616-30 (LLCF)	0.8950
Monitored Lake	Leslie	0.7970
Monitored Lake	Moose	0.7440
Monitored Lake	Nema	0.5310

- Conclusions:
  Models provide a good fit for all monitored lakes.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean nitrate-N for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Leslie	3.35e+00	3.00e+00	3.05e-01	2.40e+00	3.60e+00	8.93e-01
1616-30 (LLCF)	3.56e+00	3.87e+00	2.73e-01	3.34e+00	4.41e+00	7.99e-01
Moose	2.48e+00	3.00e+00	2.66e-01	2.48e+00	3.52e+00	7.80e-01
Nema	5.91e-01	4.19e-01	2.66e-01	0.00e+00	9.42e-01	7.80e-01
Nanuq	3.75e-03	NA	NA	NA	NA	NA
Counts	2.50e-03	NA	NA	NA	NA	NA
Vulture	2.50e-03	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
NitrateN	August	Koala	Lake	Water	Counts Nanuq Vulture Grizzly Kodiak Slipper S2 S3	none	Tobit regression	#1a slope of zero & slopes	NA	1616-30 (LLCF) Leslie Moose

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

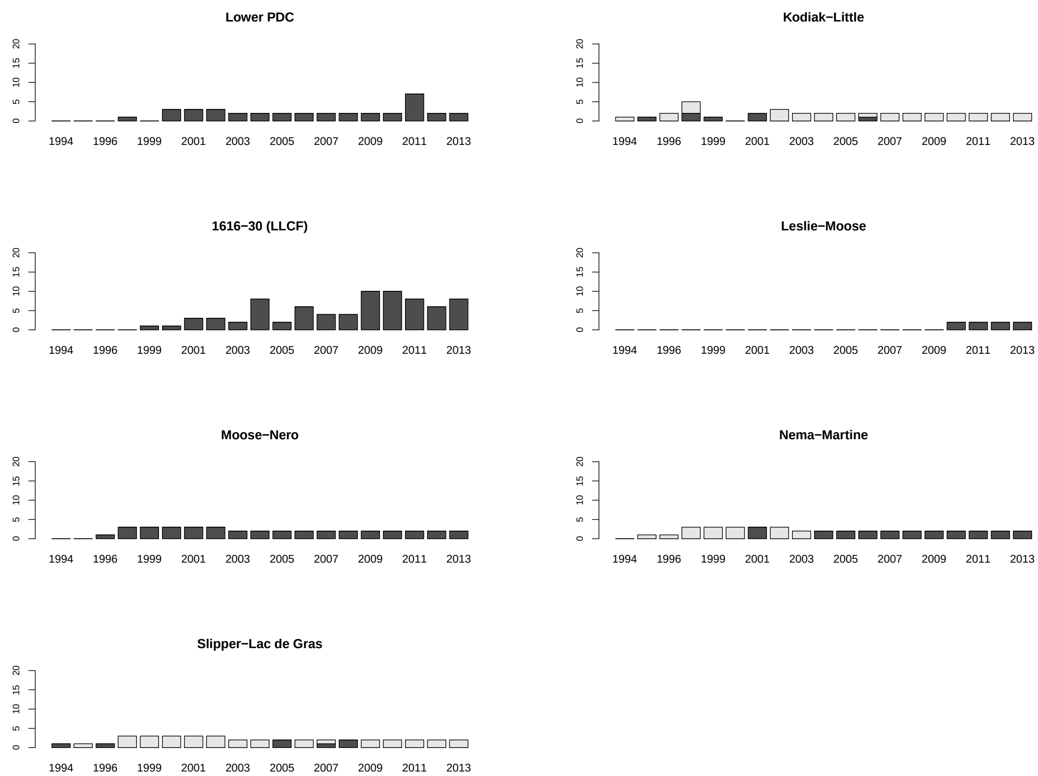
Analysis of August Nitrate-N in Koala Watershed Streams

January 11, 2014

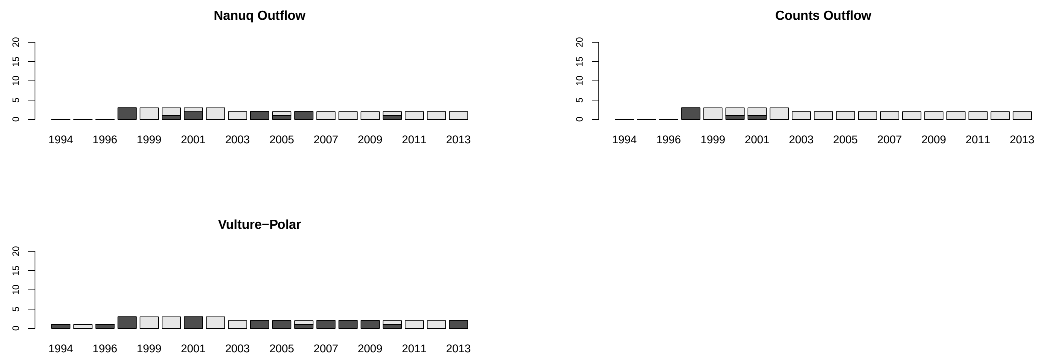
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

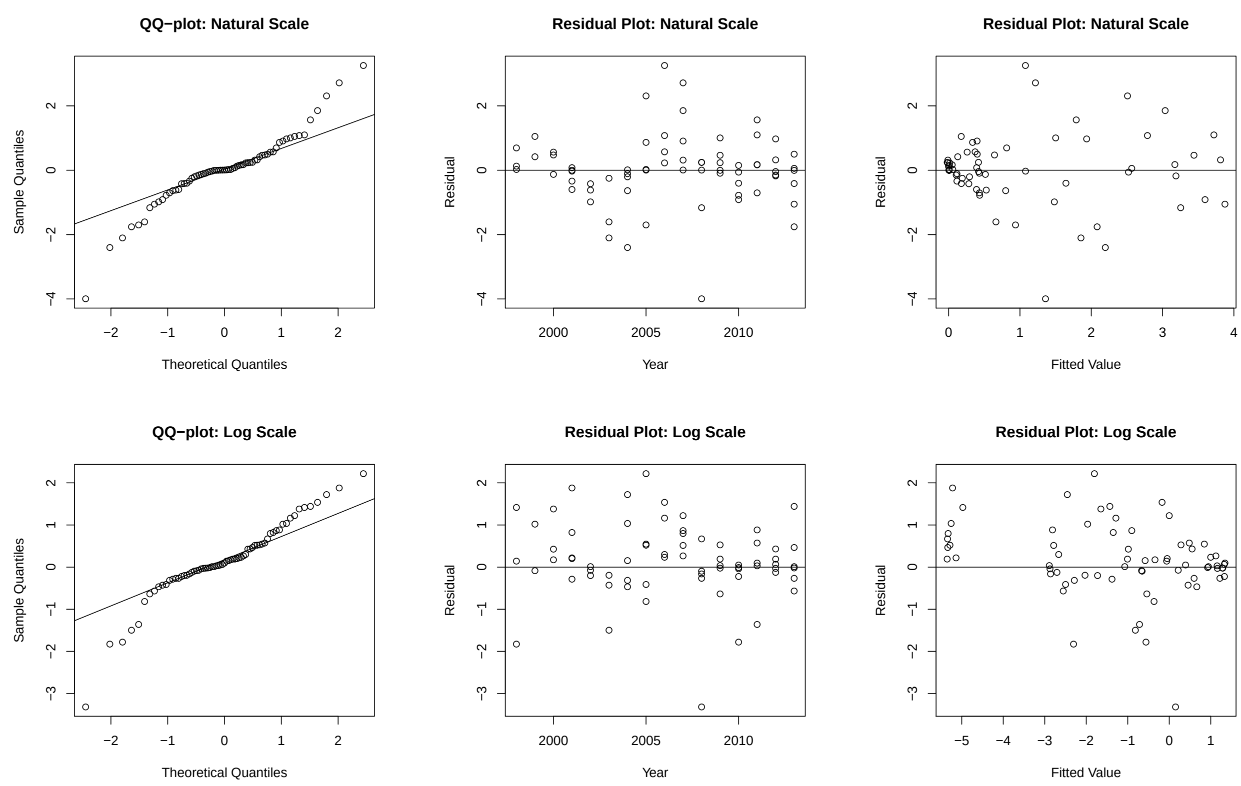


1.2 Reference



Comment:
Greater than 60% of data in Counts Outflow, Nanuq Outflow, Kodiak-Little, and Slipper-Lac de Gras was less than the detection limit. These streams were excluded from further analyses. 10-60% of data in Nema-Martine and Vulture-Polar was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
113	Moose-Nero	2006	2.04	1.08	3.26
115	Moose-Nero	2008	0.17	1.36	-3.99

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
115	Moose-Nero	2008	0.17	0.15	-3.32

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Streams

Two of three reference streams were removed from the analysis. Tests could not be performed. Proceeding with analysis using reference model 1.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Lower PDC	29.1914	2	0.0000
Leslie-Moose	0.1493	2	0.9281
1616-30 (LLCF)	18.6935	2	0.0001
Moose-Nero	40.0347	2	0.0000
Nema-Martine	83.3682	2	0.0000

- Conclusions:
  All monitored streams except Leslie-Moose show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored stream compared to slope of each reference stream (reference model 1b).

- Results:

	Chi-squared	DF	P-value
Lower PDC-vs-Vulture-Polar	203.5793	3	0.0000
1616-30 (LLCF)-vs-Vulture-Polar	711.0341	3	0.0000
Moose-Nero-vs-Vulture-Polar	483.2541	3	0.0000
Nema-Martine-vs-Vulture-Polar	241.3735	3	0.0000

- Conclusions:
  All remaining monitored streams show significant deviation from the slope of the individual reference stream.

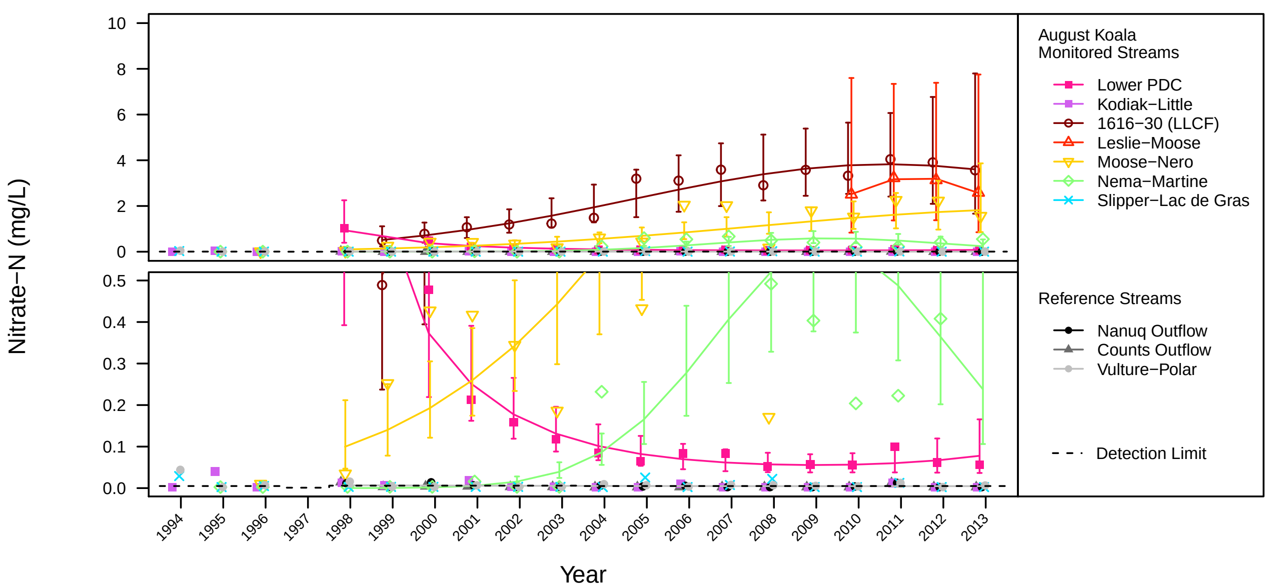
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Reference Stream	Vulture-Polar	0.0470
Monitored Stream	1616-30 (LLCF)	0.9470
Monitored Stream	Leslie-Moose	0.9870
Monitored Stream	Lower PDC	0.9320
Monitored Stream	Moose-Nero	0.6100
Monitored Stream	Nema-Martine	0.7880

- Conclusions:
  Model fit for Vulture-Polar is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean nitrate-N for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	5.61e-02	7.78e-02	3.00e-02	3.65e-02	1.66e-01	8.78e-02
Kodiak-Little	2.50e-03	NA	NA	NA	NA	NA
Leslie-Moose	2.58e+00	2.57e+00	1.45e+00	8.52e-01	7.75e+00	4.24e+00
1616-30 (LLCF)	3.56e+00	3.60e+00	1.42e+00	1.66e+00	7.80e+00	4.15e+00
Moose-Nero	1.56e+00	1.82e+00	6.99e-01	8.57e-01	3.86e+00	2.05e+00
Nema-Martine	5.50e-01	2.39e-01	9.89e-02	1.06e-01	5.38e-01	2.89e-01
Slipper-Lac de Gras	2.50e-03	NA	NA	NA	NA	NA
Nanuq Outflow	2.50e-03	NA	NA	NA	NA	NA
Counts Outflow	2.50e-03	NA	NA	NA	NA	NA
Vulture-Polar	6.30e-03	4.81e-03	2.17e-03	1.99e-03	1.16e-02	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
NitrateN	August	Koala	Stream	Water	Counts Outflow Kodiak-Little Nanuq Outflow Slipper-Lac de Gras	log e	Tobit regression	#1b separate intercepts & slopes	NA	Lower PDC 1616-30 (LLCF) Moose-Nero Nema-Martine

* Monitored streams are contrasted a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

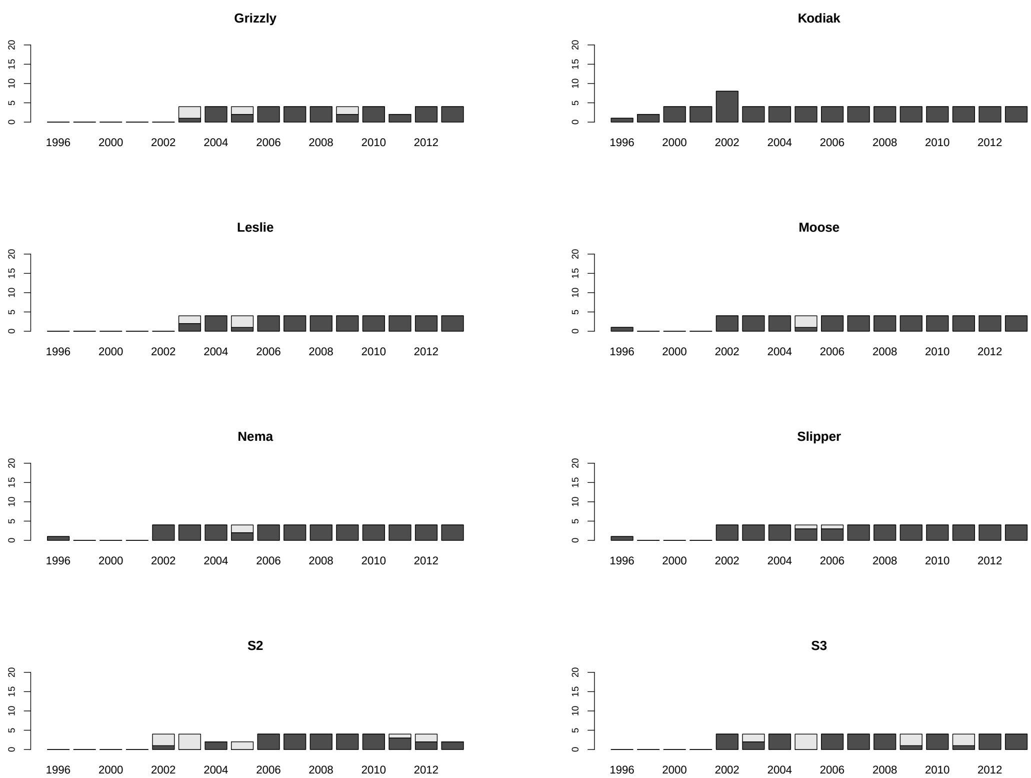
Analysis of April Total Phosphate-P in Lakes of the Koala Watershed and Lac de Gras

January 20, 2014

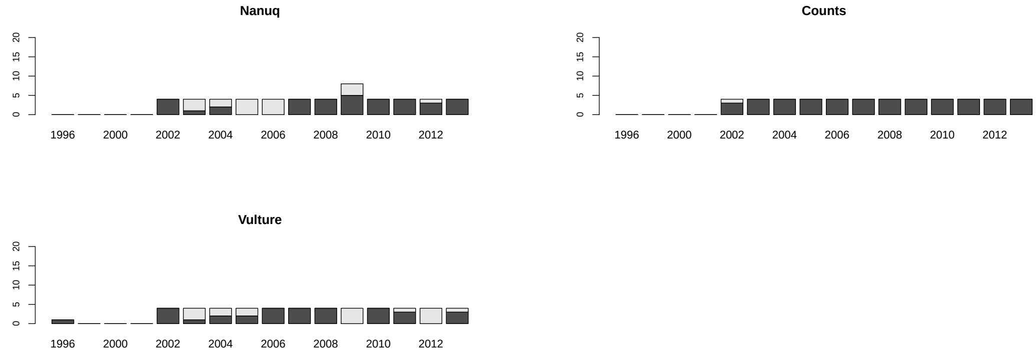
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

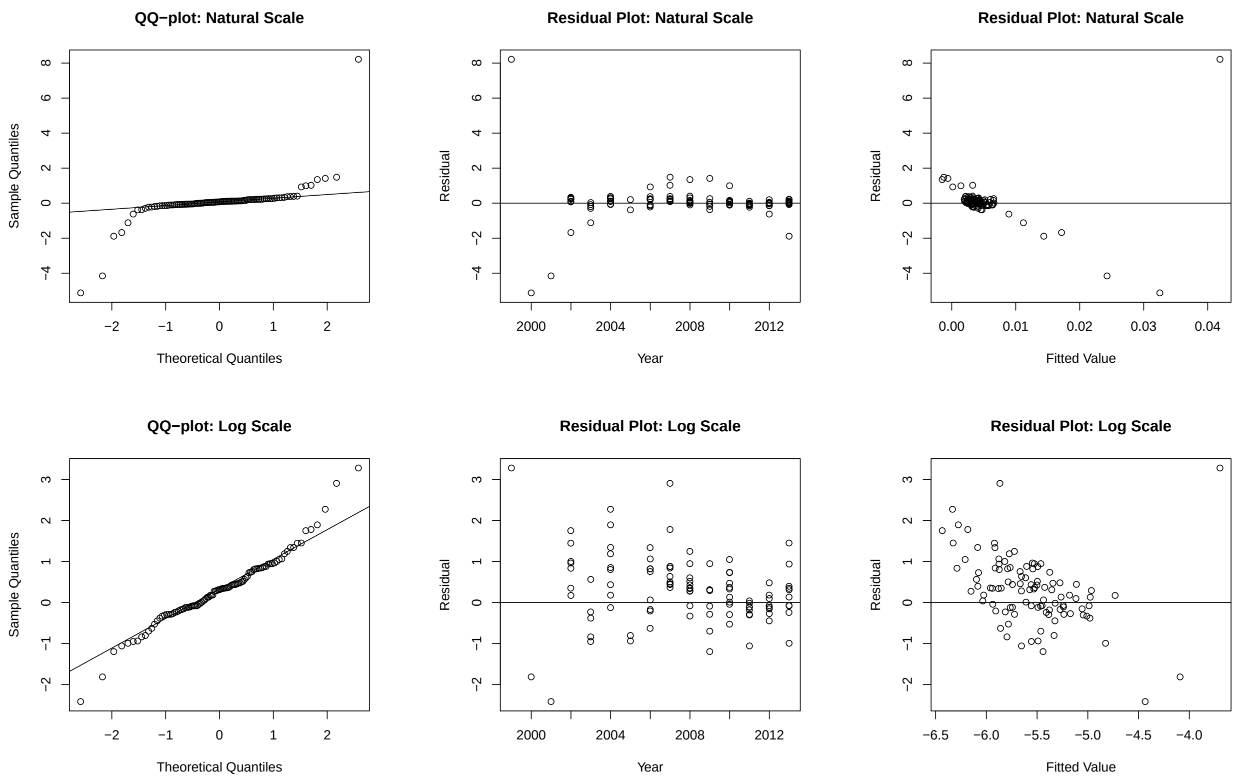


1.2 Reference



Comment:
10-60% of data in Nanuq, Vulture, Grizzly, Leslie, S2, and S3 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
66	Kodiak	1999	0.08	0.04	8.22
67	Kodiak	2000	0.01	0.03	-5.13
68	Kodiak	2001	0.00	0.02	-4.16

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
66	Kodiak	1999	0.08	-3.70	3.28

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	9.25E-160	natural model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
42.01	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
10.60	4.00	0.03

- Conclusions:
  The slopes differ significantly among reference lakes. Reference lakes do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.870	0.130	0.000	Ref. Model 1

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Grizzly	6.1840	2	0.0454
Kodiak	32.7499	2	0.0000
Leslie	7.7757	2	0.0205
Moose	6.6072	2	0.0368
Nema	0.8602	2	0.6504
Slipper	1.7973	2	0.4071
S2	7.3593	2	0.0252
S3	0.4237	2	0.8091

- Conclusions:
  Grizzly, Kodiak, Leslie, Moose, and S2 show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored lake compared to slope of each reference lake (reference model 1b).

- Results:

	Chi-squared	DF	P-value
Grizzly-vs-Nanuq	5.0110	3	0.1710
Grizzly-vs-Counts	14.1153	3	0.0028
Grizzly-vs-Vulture	6.4359	3	0.0922
Kodiak-vs-Nanuq	43.3490	3	0.0000
Kodiak-vs-Counts	31.2822	3	0.0000
Kodiak-vs-Vulture	43.6361	3	0.0000
Leslie-vs-Nanuq	11.9812	3	0.0074
Leslie-vs-Counts	6.5746	3	0.0868
Leslie-vs-Vulture	12.6853	3	0.0054
Moose-vs-Nanuq	18.5298	3	0.0003
Moose-vs-Counts	6.5197	3	0.0889
Moose-vs-Vulture	18.0775	3	0.0004
S2-vs-Nanuq	4.3981	3	0.2216
S2-vs-Counts	22.6502	3	0.0000
S2-vs-Vulture	3.8755	3	0.2752

- Conclusions:
  Of the remaining monitored lakes, Kodiak, Leslie, and Moose show significant deviations from the slopes of individual reference lakes. However, the trend in Grizzly and S2 differs from the slope in only one reference lake (i.e. Counts Lake).

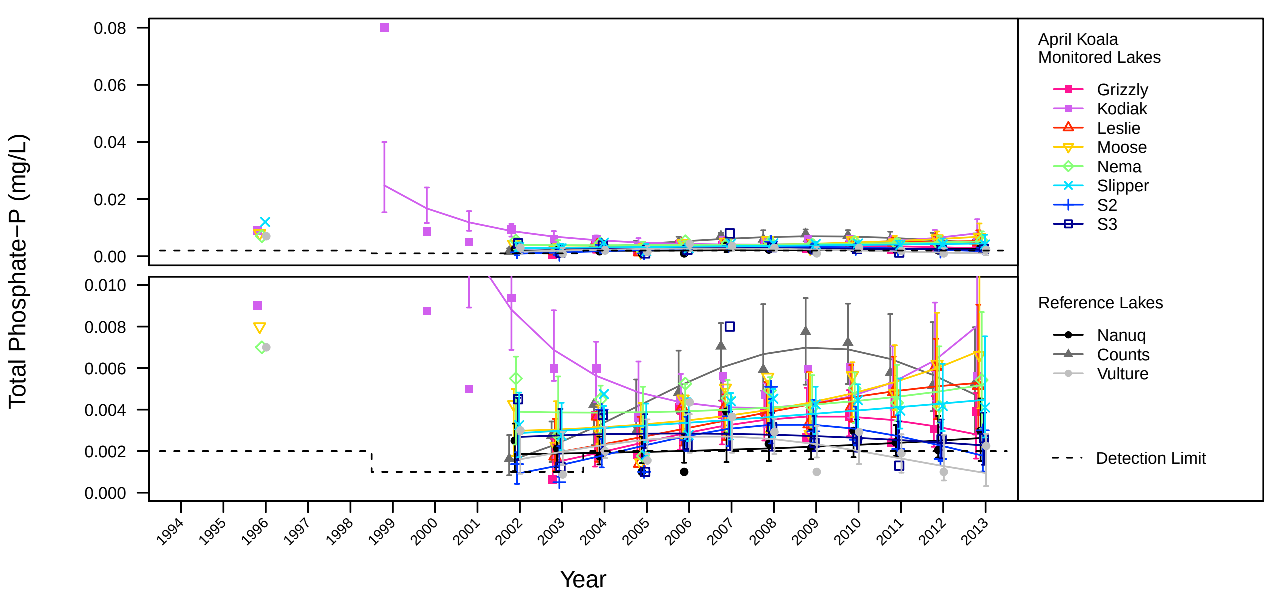
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Reference Lake	Counts	0.8850
Reference Lake	Nanuq	0.0860
Reference Lake	Vulture	0.2640
Monitored Lake	Grizzly	0.3420
Monitored Lake	Kodiak	0.5760
Monitored Lake	Leslie	0.5770
Monitored Lake	Moose	0.3810
Monitored Lake	Nema	0.0960
Monitored Lake	S2	0.3610
Monitored Lake	S3	0.0260
Monitored Lake	Slipper	0.2480

- Conclusions:
  Model fit for Vulture, Grizzly, Moose, Slipper, and S2 is weak. Model fit for Nanuq, Nema and S3 Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total phosphate-P for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	3.92e-03	2.81e-03	7.68e-04	1.64e-03	4.80e-03	2.25e-03
Kodiak	5.62e-03	8.03e-03	1.96e-03	4.98e-03	1.29e-02	5.73e-03
Leslie	5.15e-03	5.29e-03	1.45e-03	3.09e-03	9.05e-03	4.25e-03
Moose	6.62e-03	6.82e-03	1.81e-03	4.06e-03	1.15e-02	5.29e-03
Nema	5.43e-03	5.18e-03	1.37e-03	3.08e-03	8.70e-03	4.01e-03
Slipper	4.10e-03	4.47e-03	1.19e-03	2.66e-03	7.53e-03	3.48e-03
S2	3.00e-03	1.79e-03	5.13e-04	1.02e-03	3.14e-03	1.50e-03
S3	2.62e-03	2.28e-03	6.11e-04	1.35e-03	3.85e-03	1.79e-03
Nanuq	2.97e-03	2.63e-03	7.31e-04	1.52e-03	4.53e-03	NA
Counts	5.28e-03	4.72e-03	1.26e-03	2.80e-03	7.97e-03	NA
Vulture	2.25e-03	9.46e-04	5.30e-04	3.16e-04	2.83e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Phosphorus	April	Koala	Lake	Water	none	log e	Tobit regression	#1b separate intercepts & slopes	NA	Kodiak Leslie Moose

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

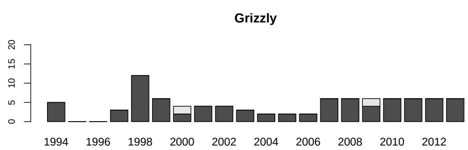
Analysis of August Total Phosphate-P in Lakes of the Koala Watershed and Lac de Gras

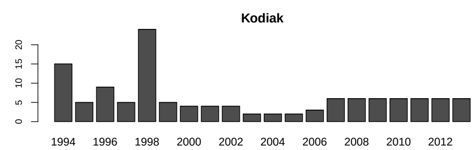
January 11, 2014

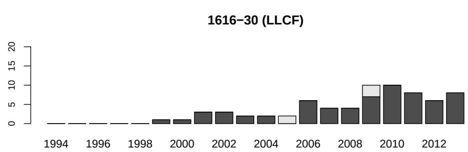
1 Censored Values:

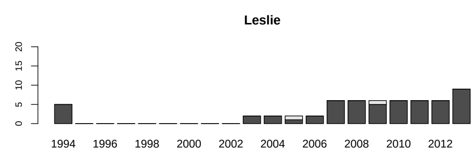
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

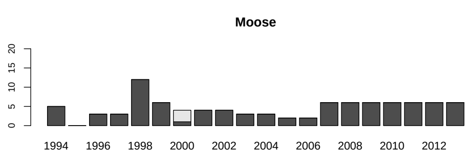
1.1 Monitored

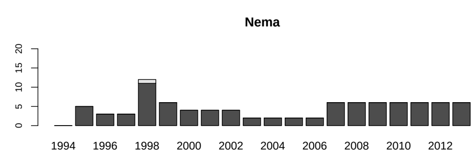


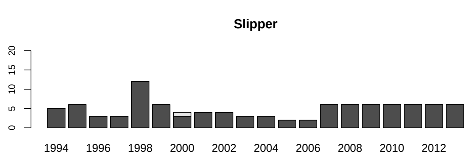


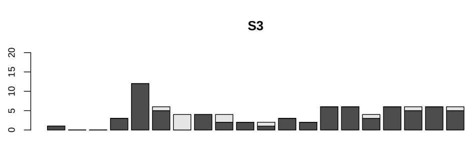




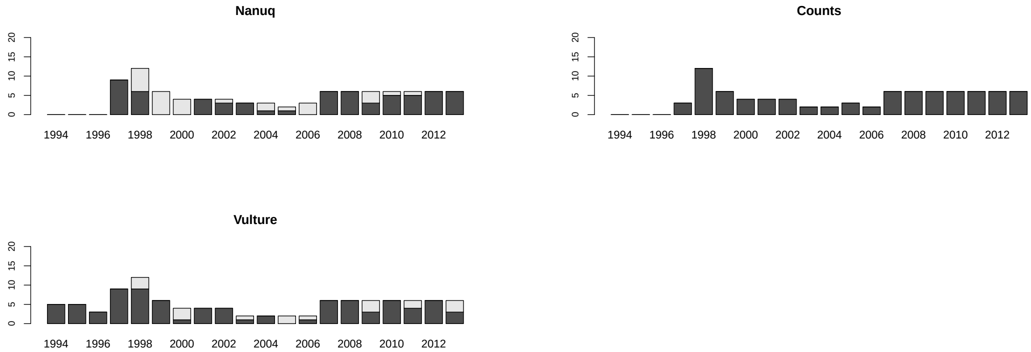






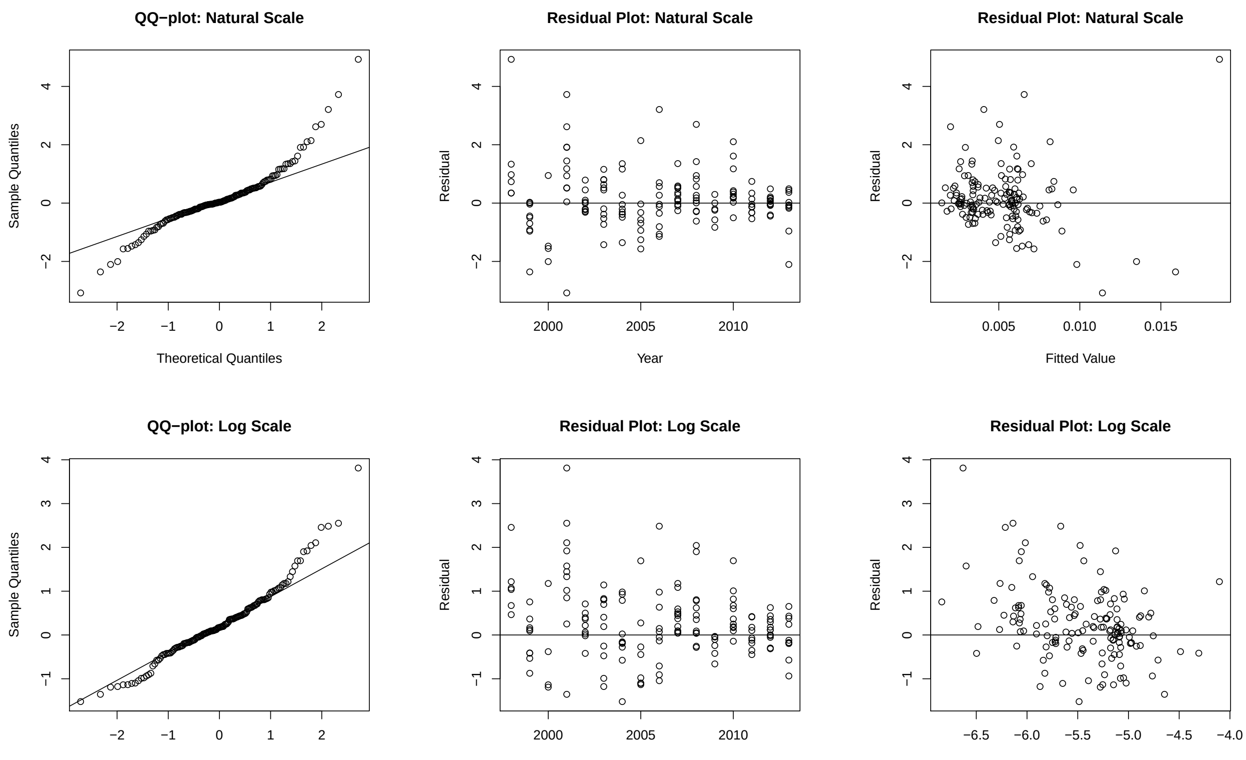


1.2 Reference



Comment:
10-60% of data in Nanuq, Vulture, and S3 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
13	1616-30 (LLCF)	2006	0.01	0.00	3.21
28	Counts	2001	0.01	0.01	3.72
65	Kodiak	1998	0.03	0.02	4.93
68	Kodiak	2001	0.01	0.01	-3.08

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
128	Nanuq	2001	0.01	-6.63	3.81

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
91.56	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
1.00	4.00	0.91

- Conclusions:
  The slopes do not differ significantly among reference lakes.

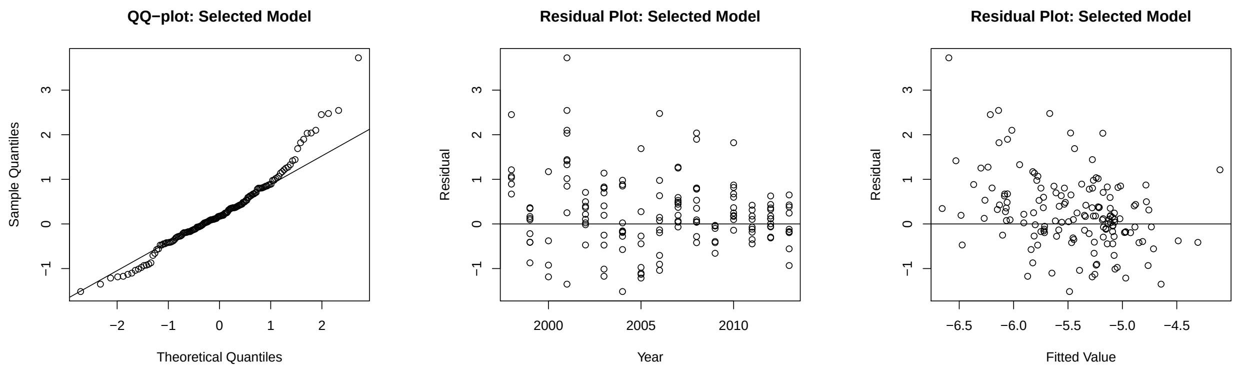
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.029	0.971	0.000	Ref. Model 2

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with a common slope. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
128	Nanuq	2001	0.01	-6.60	3.72

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	0.4511	2	0.7981
Kodiak	12.2917	2	0.0021
1616-30 (LLCF)	0.4771	2	0.7878
Leslie	0.3112	2	0.8559
Moose	0.0452	2	0.9777
Nema	1.2926	2	0.5240
Slipper	1.1110	2	0.5738
S2	0.5068	2	0.7762
S3	1.2820	2	0.5268

- Conclusions:
  Kodiak lake shows significant deviation from the common slope of reference lakes.

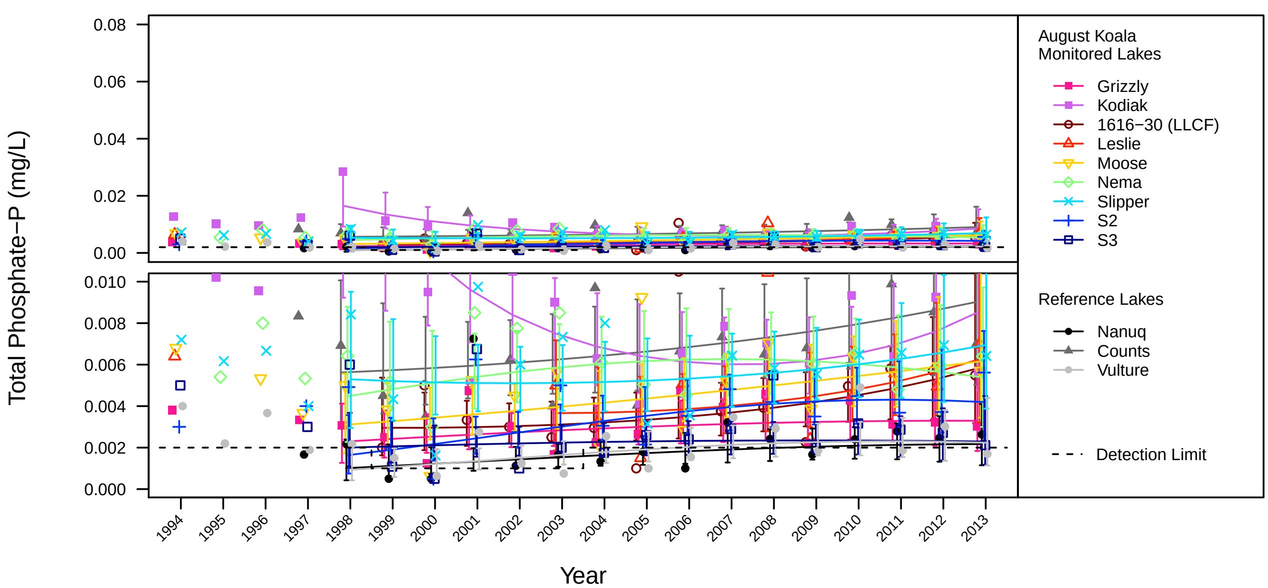
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.6540
Monitored Lake	1616-30 (LLCF)	0.1660
Monitored Lake	Grizzly	0.1040
Monitored Lake	Kodiak	0.4890
Monitored Lake	Leslie	0.1280
Monitored Lake	Moose	0.1270
Monitored Lake	Nema	0.1340
Monitored Lake	S2	0.2390
Monitored Lake	S3	0.0100
Monitored Lake	Slipper	0.0500

- Conclusions:
  Model fit for Kodiak Lake and S2 is weak. Model fit for 616-30 (LLCF), Grizzly, Leslie, Moose, Nema, Slipper, and S3 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total phosphate-P for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	3.02e-03	3.29e-03	9.81e-04	1.84e-03	5.90e-03	2.87e-03
Kodiak	5.62e-03	8.53e-03	2.54e-03	4.77e-03	1.53e-02	7.42e-03
Leslie	6.98e-03	6.26e-03	2.13e-03	3.21e-03	1.22e-02	6.24e-03
1616-30 (LLCF)	5.49e-03	5.79e-03	1.77e-03	3.18e-03	1.05e-02	5.17e-03
Moose	5.70e-03	6.16e-03	1.83e-03	3.44e-03	1.10e-02	5.35e-03
Nema	6.40e-03	5.39e-03	1.62e-03	2.99e-03	9.72e-03	4.74e-03
Slipper	6.42e-03	6.94e-03	2.06e-03	3.88e-03	1.24e-02	6.04e-03
S2	5.62e-03	4.20e-03	1.28e-03	2.31e-03	7.62e-03	3.74e-03
S3	2.12e-03	2.30e-03	7.84e-04	1.18e-03	4.48e-03	2.29e-03
Nanuq	2.63e-03	2.17e-03	7.06e-04	1.15e-03	4.11e-03	NA
Counts	6.98e-03	9.02e-03	2.68e-03	5.04e-03	1.61e-02	NA
Vulture	1.70e-03	2.24e-03	7.71e-04	1.14e-03	4.40e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Phosphorus	August	Koala	Lake	Water	none	log e	Tobit regression	#2 shared slopes	NA	Kodiak

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

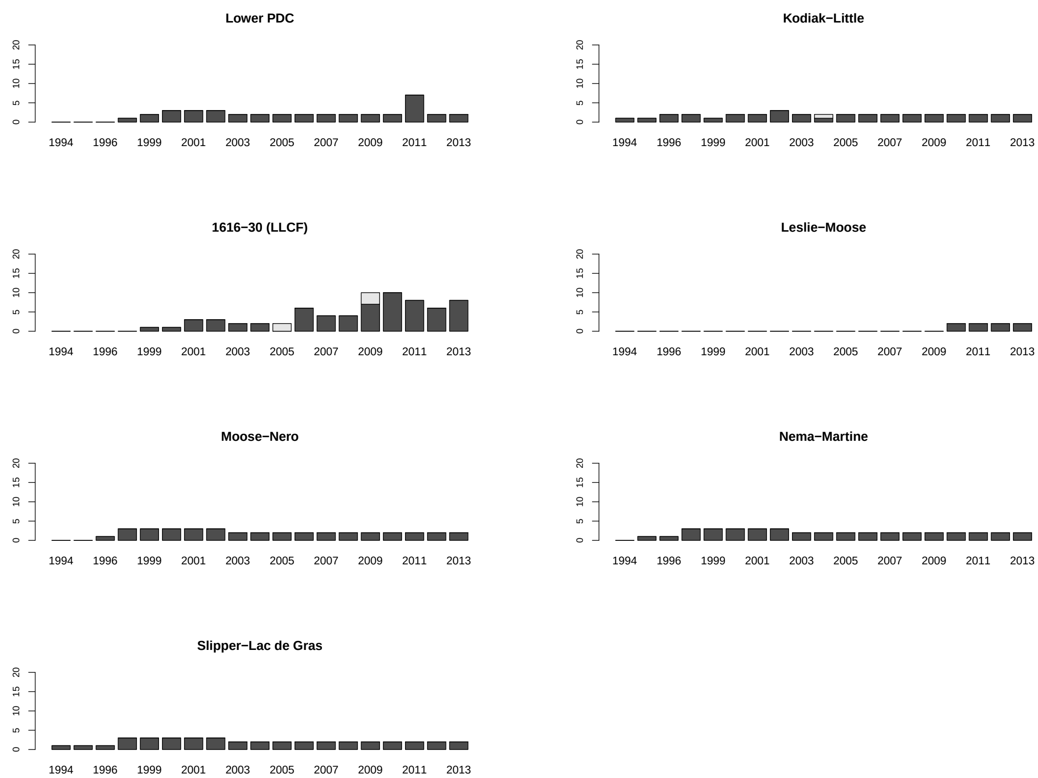
Analysis of August Total Phosphate-P in Koala Watershed Streams

January 11, 2014

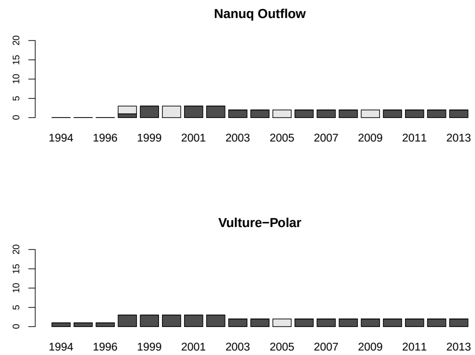
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

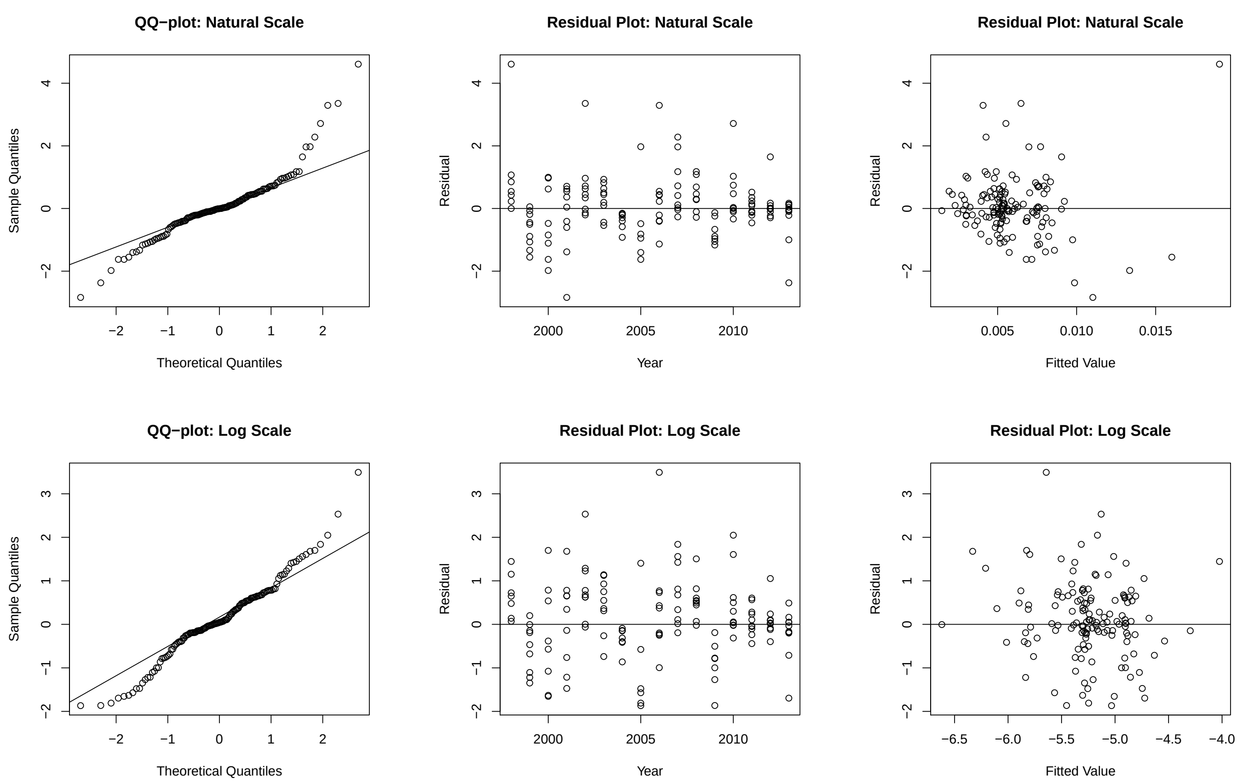


1.2 Reference



Comment:
10-60% of data in Nanuq Outflow was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
13	1616-30 (LLCF)	2006	0.01	0.00	3.29
45	Kodiak-Little	1998	0.03	0.02	4.61
149	Nema-Martine	2002	0.01	0.01	3.35

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
13	1616-30 (LLCF)	2006	0.01	-5.64	3.49

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
114.51	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
9.71	4.00	0.05

- Conclusions:
  The slopes differ significantly among reference streams. Reference streams do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.755	0.245	0.000	Ref. Model 1

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Lower PDC	0.1632	2	0.9216
Kodiak-Little	23.0357	2	0.0000
Leslie-Moose	0.0946	2	0.9538
1616-30 (LLCF)	7.2535	2	0.0266
Moose-Nero	3.4146	2	0.1814
Nema-Martine	2.7815	2	0.2489
Slipper-Lac de Gras	0.8718	2	0.6467

- Conclusions:
  Kodiak-Little and 1616-30 (LLCF) show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored stream compared to slope of each reference stream (reference model 1b).

- Results:

	Chi-squared	DF	P-value
Kodiak-Little-vs-Nanuq Outflow	119.4712	3	0.0000
Kodiak-Little-vs-Counts Outflow	7.2320	3	0.0649
Kodiak-Little-vs-Vulture-Polar	22.2422	3	0.0001
1616-30 (LLCF)-vs-Nanuq Outflow	17.3825	3	0.0006
1616-30 (LLCF)-vs-Counts Outflow	40.8155	3	0.0000
1616-30 (LLCF)-vs-Vulture-Polar	7.6569	3	0.0537

- Conclusions:
  Of the remaining streams, Kodiak-Little and 1616-30 (LLCF) show significant deviations from the slopes of individual reference streams.

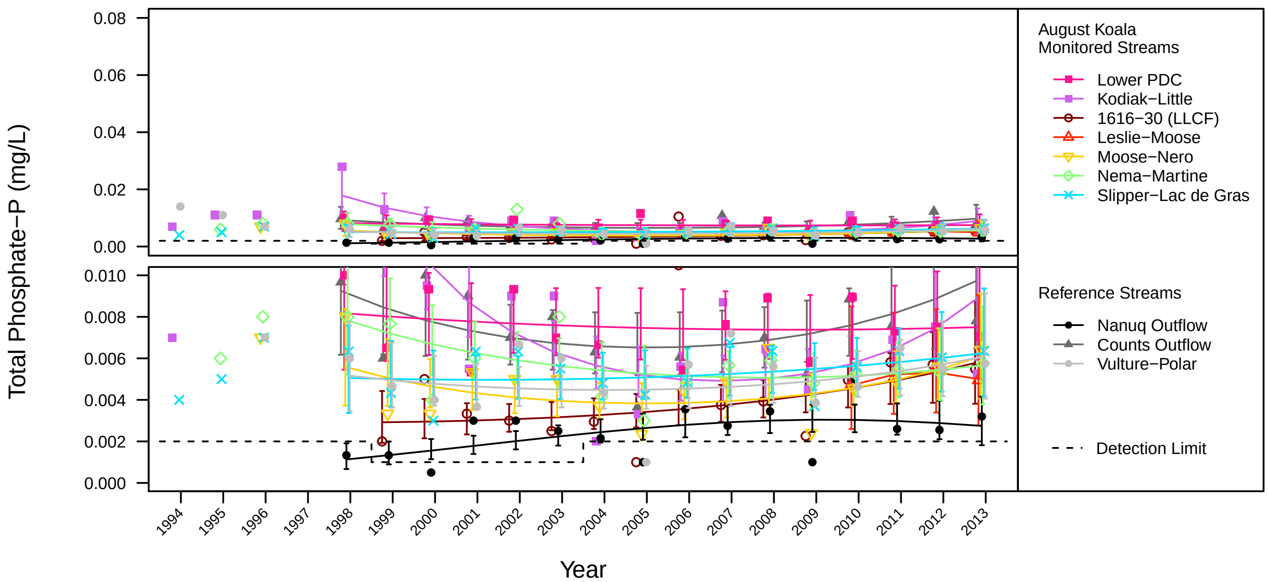
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Reference Stream	Counts Outflow	0.1880
Reference Stream	Nanuq Outflow	0.2770
Reference Stream	Vulture-Polar	0.0480
Monitored Stream	1616-30 (LLCF)	0.1680
Monitored Stream	Kodiak-Little	0.4260
Monitored Stream	Leslie-Moose	0.7980
Monitored Stream	Lower PDC	0.0210
Monitored Stream	Moose-Nero	0.1890
Monitored Stream	Nema-Martine	0.1570
Monitored Stream	Slipper-Lac de Gras	0.1010

- Conclusions:
  Model fit for Nanuq Outflow and Kodiak-Little is weak. Model fit for Counts Outflow, Vulture-Polar, 1616-30 (LLCF), Lower PDC, Moose-Nero, Nema-Martine, and Slipper-Lac de Gras is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total phpsphate-P for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	7.05e-03	7.50e-03	1.55e-03	5.00e-03	1.12e-02	4.54e-03
Kodiak-Little	5.25e-03	8.89e-03	1.84e-03	5.93e-03	1.33e-02	5.38e-03
Leslie-Moose	4.95e-03	5.00e-03	1.51e-03	2.76e-03	9.06e-03	4.43e-03
1616-30 (LLCF)	5.49e-03	5.78e-03	1.23e-03	3.81e-03	8.76e-03	3.59e-03
Moose-Nero	6.40e-03	6.08e-03	1.26e-03	4.06e-03	9.12e-03	3.68e-03
Nema-Martine	5.75e-03	5.67e-03	1.17e-03	3.78e-03	8.49e-03	3.43e-03
Slipper-Lac de Gras	6.35e-03	6.25e-03	1.29e-03	4.17e-03	9.37e-03	3.78e-03
Nanuq Outflow	3.20e-03	2.75e-03	5.80e-04	1.82e-03	4.16e-03	NA
Counts Outflow	7.80e-03	9.73e-03	2.01e-03	6.49e-03	1.46e-02	NA
Vulture-Polar	5.75e-03	6.09e-03	1.26e-03	4.06e-03	9.13e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Phosphorus	August	Koala	Stream	Water	none	log e	Tobit regression	#1b separate intercepts & slopes	NA	Kodiak-Little 1616-30 (LLCF)

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

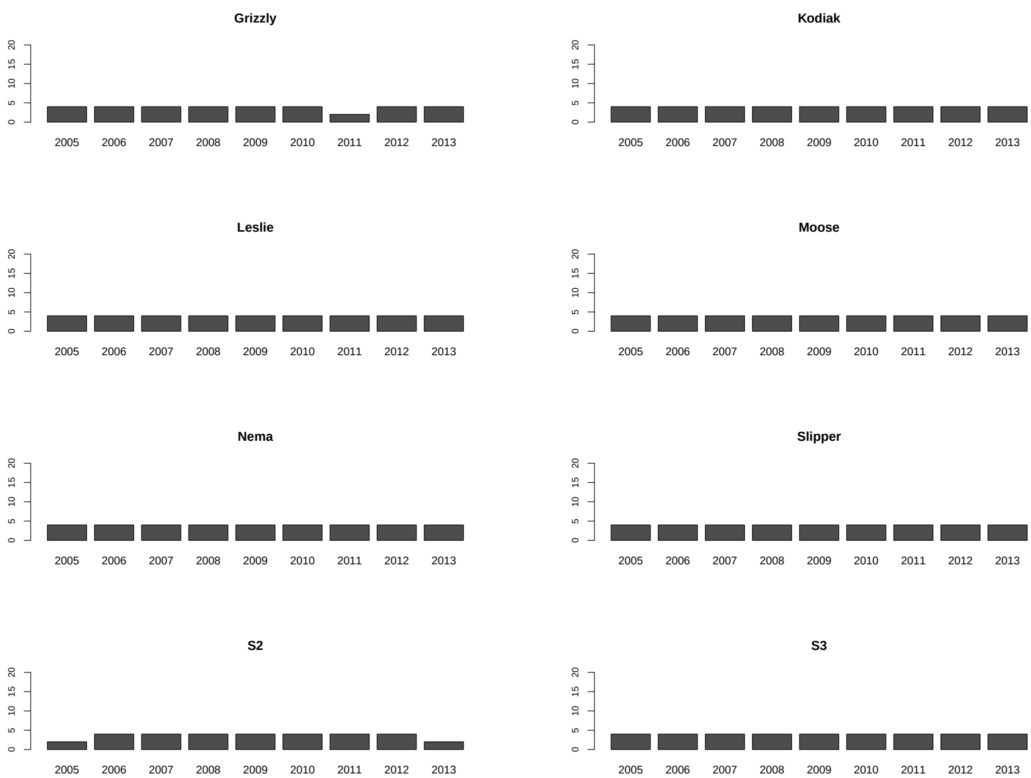
Analysis of April Total Organic Carbon in Lakes of the Koala Watershed and Lac de Gras

January 11, 2014

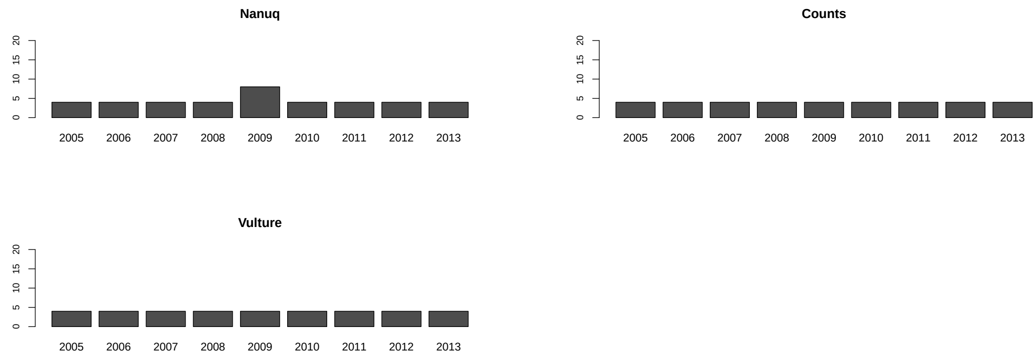
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

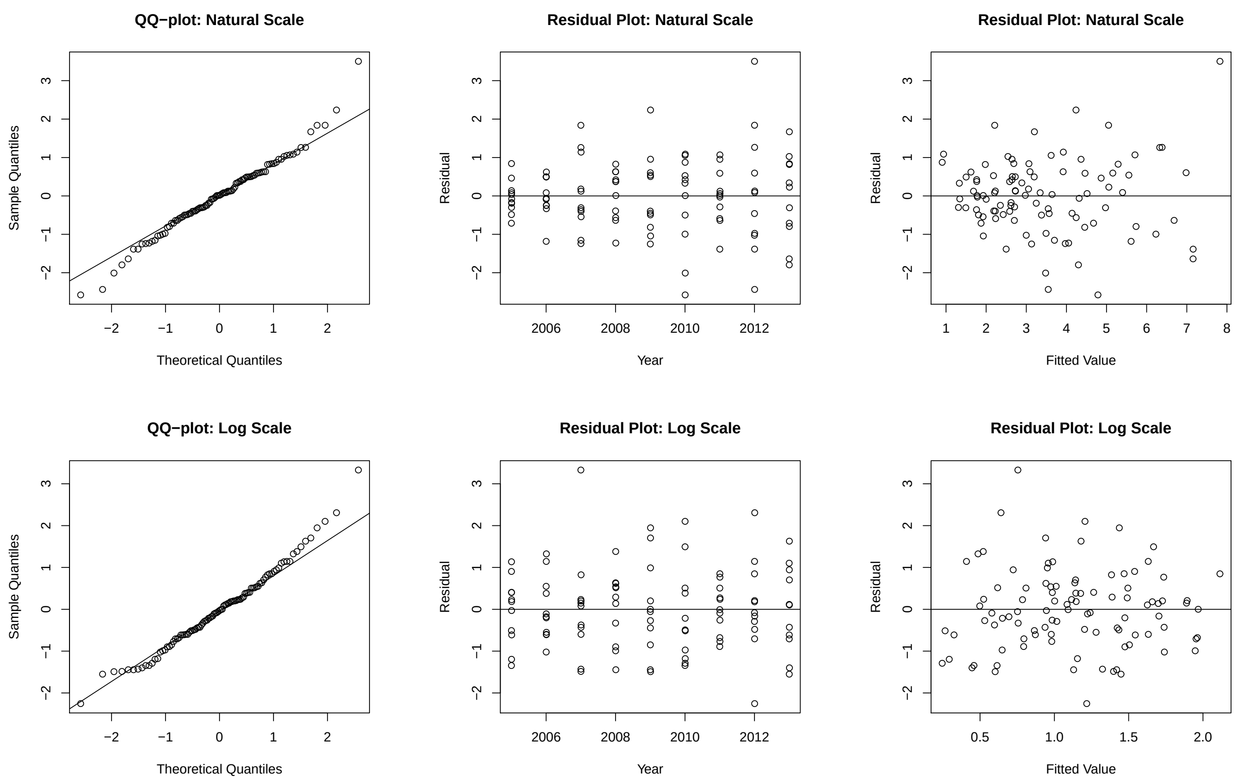


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
79	Kodiak	2012	8.84	7.83	3.50

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
34	Counts	2007	2.75	0.75	3.33

AIC weights and model comparison:

Natural Model	Log Model	Best Model
5.17E-57	1.00E+00	log model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
135.17	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
12.23	4.00	0.02

The slopes differ significantly among reference lakes. Reference lakes do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Grizzly	4.85	2.00	0.09
Kodiak	11.32	2.00	0.00
Leslie	16.10	2.00	0.00
Moose	19.98	2.00	0.00
Nema	15.13	2.00	0.00
Slipper	14.19	2.00	0.00
S2	6.99	2.00	0.03
S3	8.59	2.00	0.01

- Conclusions:
  All monitored lakes except Grizzly Lake show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored lake compared to slope of each reference lake (reference model 1b).

- Results:

	Chi-squared	DF	P-value
Kodiak-vs-Nanuq	2.4734	3	0.4801
Kodiak-vs-Counts	48.3189	3	0.0000
Kodiak-vs-Vulture	78.4089	3	0.0000
Leslie-vs-Nanuq	6.0717	3	0.1082
Leslie-vs-Counts	130.4324	3	0.0000
Leslie-vs-Vulture	20.4854	3	0.0001
Moose-vs-Nanuq	2.4765	3	0.4796
Moose-vs-Counts	154.1000	3	0.0000
Moose-vs-Vulture	10.8187	3	0.0127
Nema-vs-Nanuq	3.2811	3	0.3503
Nema-vs-Counts	89.3689	3	0.0000
Nema-vs-Vulture	40.0884	3	0.0000
Slipper-vs-Nanuq	0.7405	3	0.8636
Slipper-vs-Counts	127.7455	3	0.0000
Slipper-vs-Vulture	21.0808	3	0.0001
S2-vs-Nanuq	3.8027	3	0.2836
S2-vs-Counts	167.5984	3	0.0000
S2-vs-Vulture	18.6291	3	0.0003
S3-vs-Nanuq	0.7900	3	0.8518
S3-vs-Counts	202.1348	3	0.0000
S3-vs-Vulture	7.3317	3	0.0620

- Conclusions:
  All of the remaining lakes except S3 show significant deviation from the slopes of individual reference lakes.

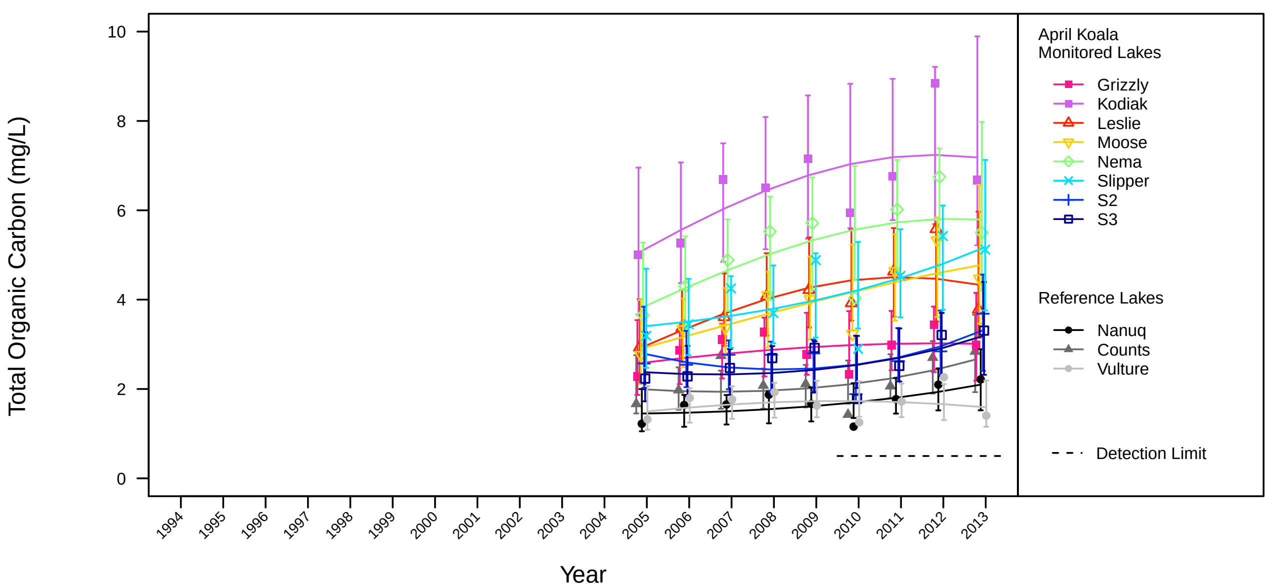
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Reference Lake	Counts	0.2280
Reference Lake	Nanuq	0.3550
Reference Lake	Vulture	0.0650
Monitored Lake	Grizzly	0.1730
Monitored Lake	Kodiak	0.5860
Monitored Lake	Leslie	0.6900
Monitored Lake	Moose	0.6790
Monitored Lake	Nema	0.5440
Monitored Lake	S2	0.3460
Monitored Lake	S3	0.3320
Monitored Lake	Slipper	0.4250

- Conclusions:
  Model fit for Counts, Nanuq, Slipper, S2, and S3 is weak. Model fit for Vulture and Grizzly lakes is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total organic carbon for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	2.99E+00	3.02E+00	4.92E-01	2.19E+00	4.15E+00	1.44E+00
Kodiak	6.68E+00	7.19E+00	1.17E+00	5.22E+00	9.89E+00	3.43E+00
Leslie	3.78E+00	4.34E+00	7.08E-01	3.15E+00	5.97E+00	2.07E+00
Moose	4.47E+00	4.77E+00	7.79E-01	3.47E+00	6.57E+00	2.28E+00
Nema	5.50E+00	5.79E+00	9.46E-01	4.21E+00	7.98E+00	2.77E+00
Slipper	5.12E+00	5.18E+00	8.45E-01	3.76E+00	7.13E+00	2.47E+00
S2	3.68E+00	3.31E+00	5.41E-01	2.41E+00	4.56E+00	1.58E+00
S3	3.31E+00	3.19E+00	5.21E-01	2.32E+00	4.40E+00	1.52E+00
Nanuq	2.21E+00	2.10E+00	3.43E-01	1.52E+00	2.89E+00	
Counts	2.84E+00	2.66E+00	4.34E-01	1.93E+00	3.66E+00	
Vulture	1.40E+00	1.59E+00	2.60E-01	1.15E+00	2.19E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
TOC	April	Koala	Lake	Water	none	log e	linear mixed effects regression	#1b separate intercepts & slopes	NA	Kodiak Leslie Moose Nema Slipper S2

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

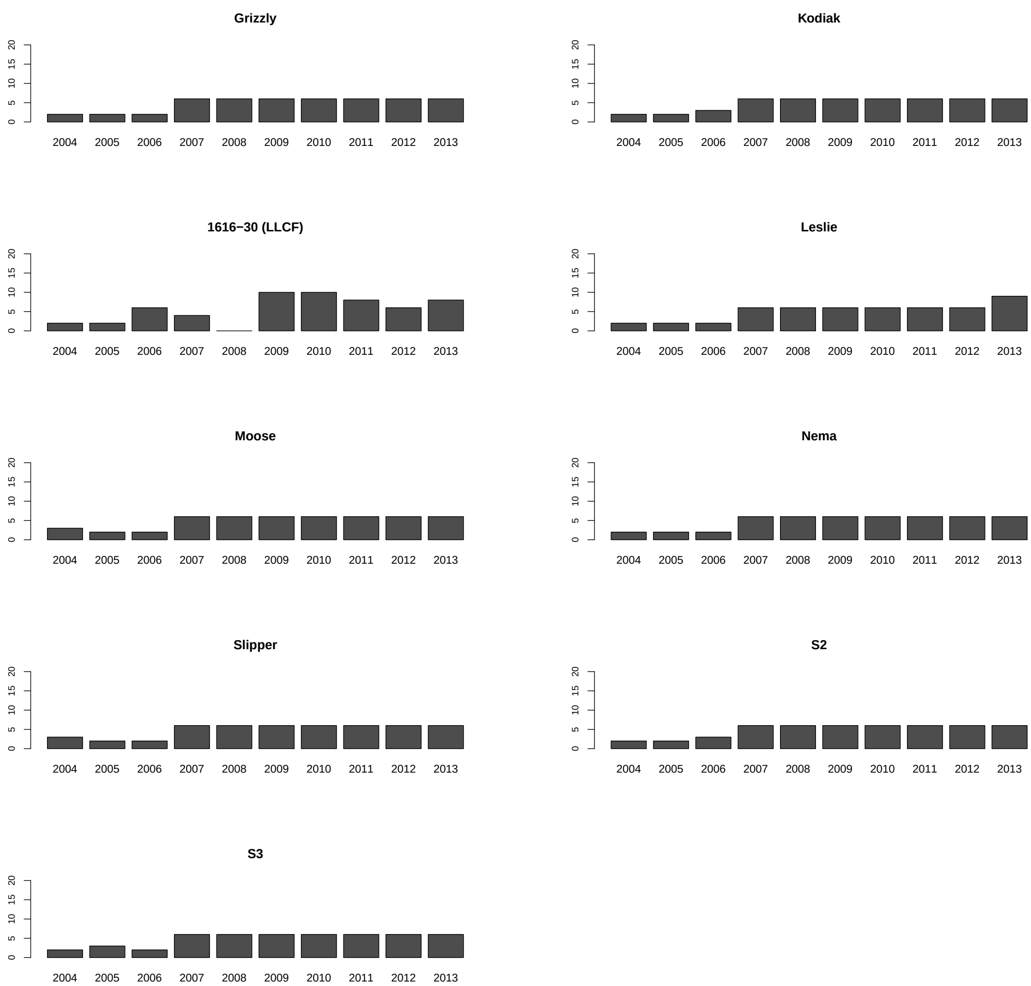
Analysis of August Total Organic Carbon in Lakes of the Koala Watershed and Lac de Gras

January 11, 2014

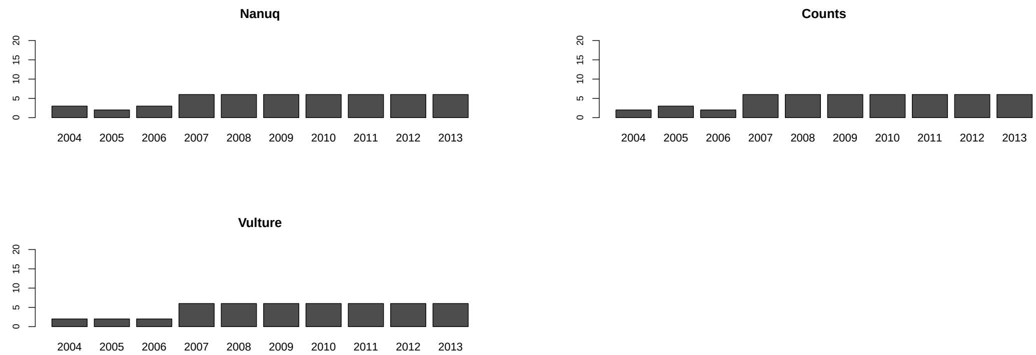
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

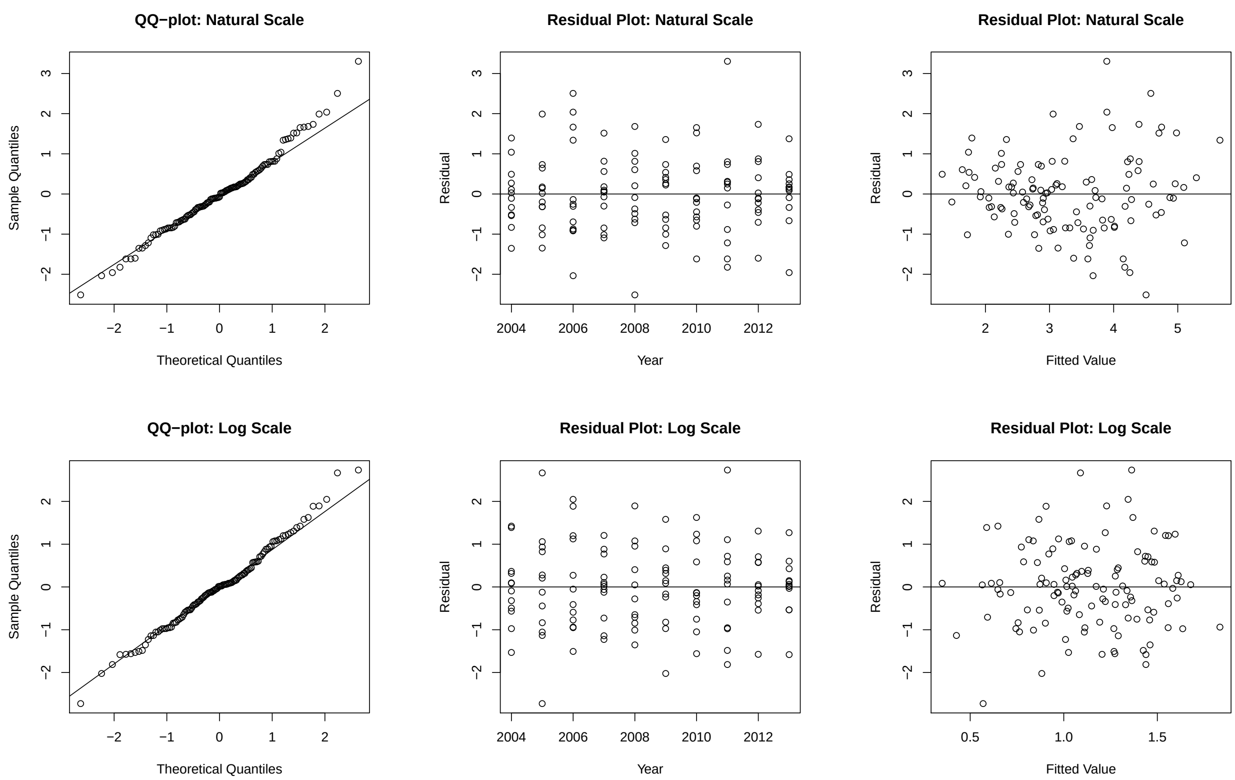


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-30 (LLCF)	2011	4.57	3.89	3.30

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
39.90	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
14.41	4.00	0.01

- Conclusions:
  The slopes differ significantly among reference lakes. Reference lakes do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Grizzly	5.1718	2	0.0753
Kodiak	6.3151	2	0.0425
1616-30 (LLCF)	31.3465	2	0.0000
Leslie	41.6787	2	0.0000
Moose	19.2850	2	0.0001
Nema	27.2242	2	0.0000
Slipper	15.1068	2	0.0005
S2	6.1415	2	0.0464
S3	0.6382	2	0.7268

- Conclusions:
  All lakes except Grizzly Lake and S3 show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored lake compared to slope of each reference lake (reference model 1b).

- Results:

	Chi-squared	DF	P-value
Kodiak-vs-Nanuq	189.9163	3	0.0000
Kodiak-vs-Counts	66.3951	3	0.0000
Kodiak-vs-Vulture	134.6414	3	0.0000
1616-30 (LLCF)-vs-Nanuq	3.8274	3	0.2807
1616-30 (LLCF)-vs-Counts	11.2973	3	0.0102
1616-30 (LLCF)-vs-Vulture	16.3980	3	0.0009
Leslie-vs-Nanuq	47.9729	3	0.0000
Leslie-vs-Counts	3.5975	3	0.3083
Leslie-vs-Vulture	16.3096	3	0.0010
Moose-vs-Nanuq	80.1726	3	0.0000
Moose-vs-Counts	11.8776	3	0.0078
Moose-vs-Vulture	50.9712	3	0.0000
Nema-vs-Nanuq	82.3896	3	0.0000
Nema-vs-Counts	11.8546	3	0.0079
Nema-vs-Vulture	49.3653	3	0.0000
Slipper-vs-Nanuq	85.8979	3	0.0000
Slipper-vs-Counts	13.0511	3	0.0045
Slipper-vs-Vulture	51.1306	3	0.0000
S2-vs-Nanuq	74.7827	3	0.0000
S2-vs-Counts	11.8326	3	0.0080
S2-vs-Vulture	31.3203	3	0.0000

- Conclusions:
  All remaining monitored lakes show significant deviations from the slopes of individual reference lakes.

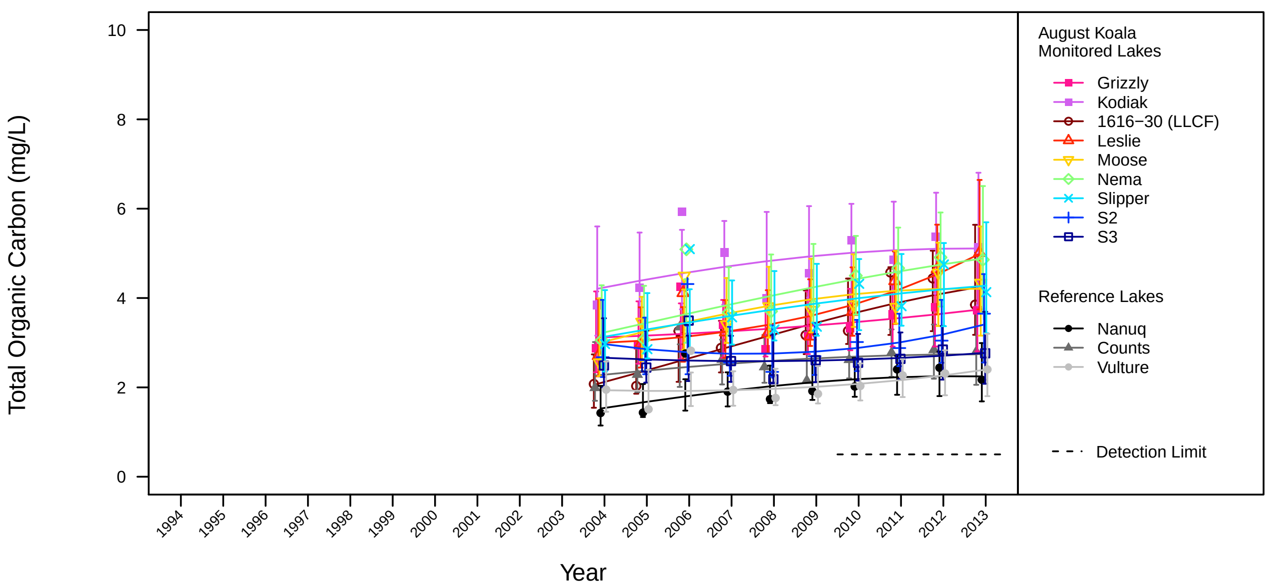
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Reference Lake	Counts	0.1940
Reference Lake	Nanuq	0.3900
Reference Lake	Vulture	0.1970
Monitored Lake	1616-30 (LLCF)	0.8040
Monitored Lake	Grizzly	0.2150
Monitored Lake	Kodiak	0.2370
Monitored Lake	Leslie	0.7110
Monitored Lake	Moose	0.4980
Monitored Lake	Nema	0.5480
Monitored Lake	S2	0.1450
Monitored Lake	S3	0.0340
Monitored Lake	Slipper	0.2940

- Conclusions:
  Model fit for Nanuq, Grizzly, Kodiak, Moose, and Slipper is weak. Model fit for Counts, Vulture, S3, and S3 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total organic carbon for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	3.73E+00	3.74E+00	5.46E-01	2.81E+00	4.98E+00	1.60E+00
Kodiak	5.13E+00	5.11E+00	7.47E-01	3.84E+00	6.80E+00	2.19E+00
Leslie	5.01E+00	4.99E+00	7.29E-01	3.75E+00	6.64E+00	2.13E+00
1616-30 (LLCF)	3.85E+00	4.23E+00	6.20E-01	3.18E+00	5.64E+00	1.81E+00
Moose	4.34E+00	4.21E+00	6.15E-01	3.16E+00	5.60E+00	1.80E+00
Nema	4.86E+00	4.89E+00	7.14E-01	3.67E+00	6.51E+00	2.09E+00
Slipper	4.13E+00	4.28E+00	6.25E-01	3.21E+00	5.70E+00	1.83E+00
S2	3.65E+00	3.41E+00	4.98E-01	2.56E+00	4.54E+00	1.46E+00
S3	2.76E+00	2.77E+00	4.05E-01	2.08E+00	3.69E+00	1.19E+00
Nanuq	2.17E+00	2.25E+00	3.28E-01	1.69E+00	2.99E+00	
Counts	2.80E+00	2.74E+00	4.01E-01	2.06E+00	3.65E+00	
Vulture	2.40E+00	2.40E+00	3.51E-01	1.80E+00	3.20E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
TOC	August	Koala	Lake	Water	none	log e	linear mixed effects regression	#1b separate intercepts & slopes	NA	Kodiak 1616-30 (LLCF) Leslie Moose Nema Slipper S2

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

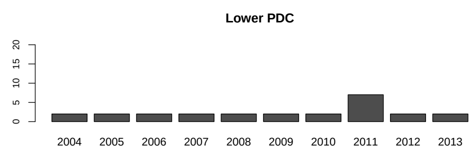
Analysis of August Total Organic Carbon in Koala Watershed Streams

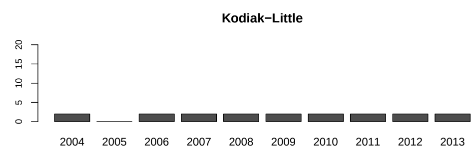
January 11, 2014

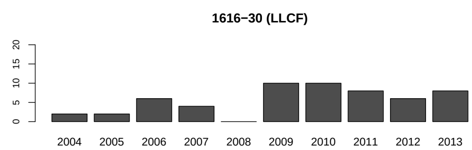
1 Censored Values:

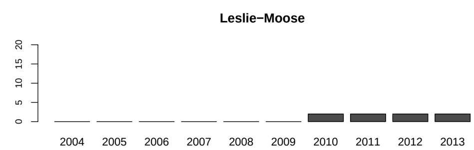
The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

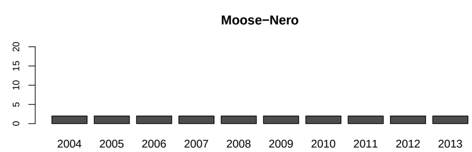
1.1 Monitored

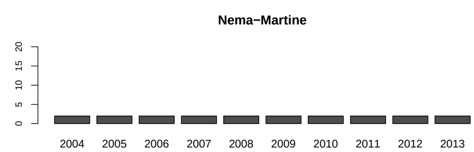


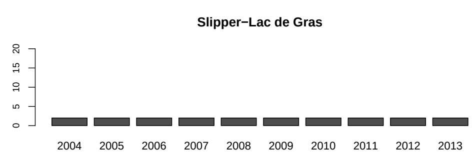




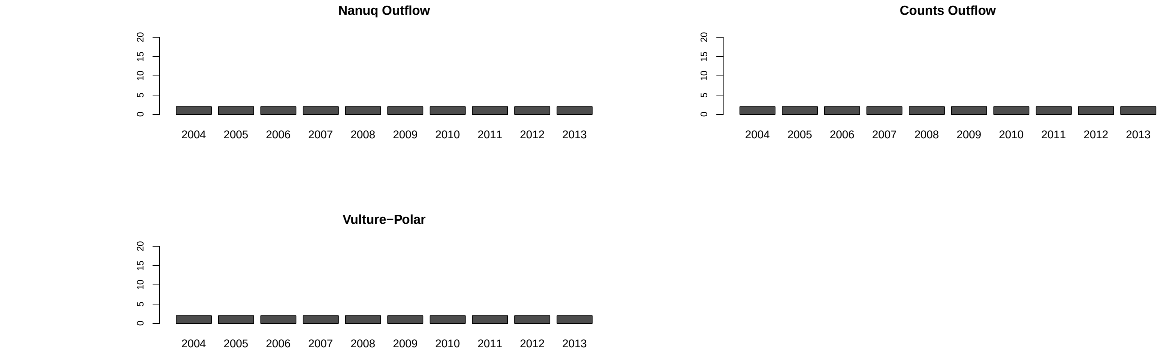






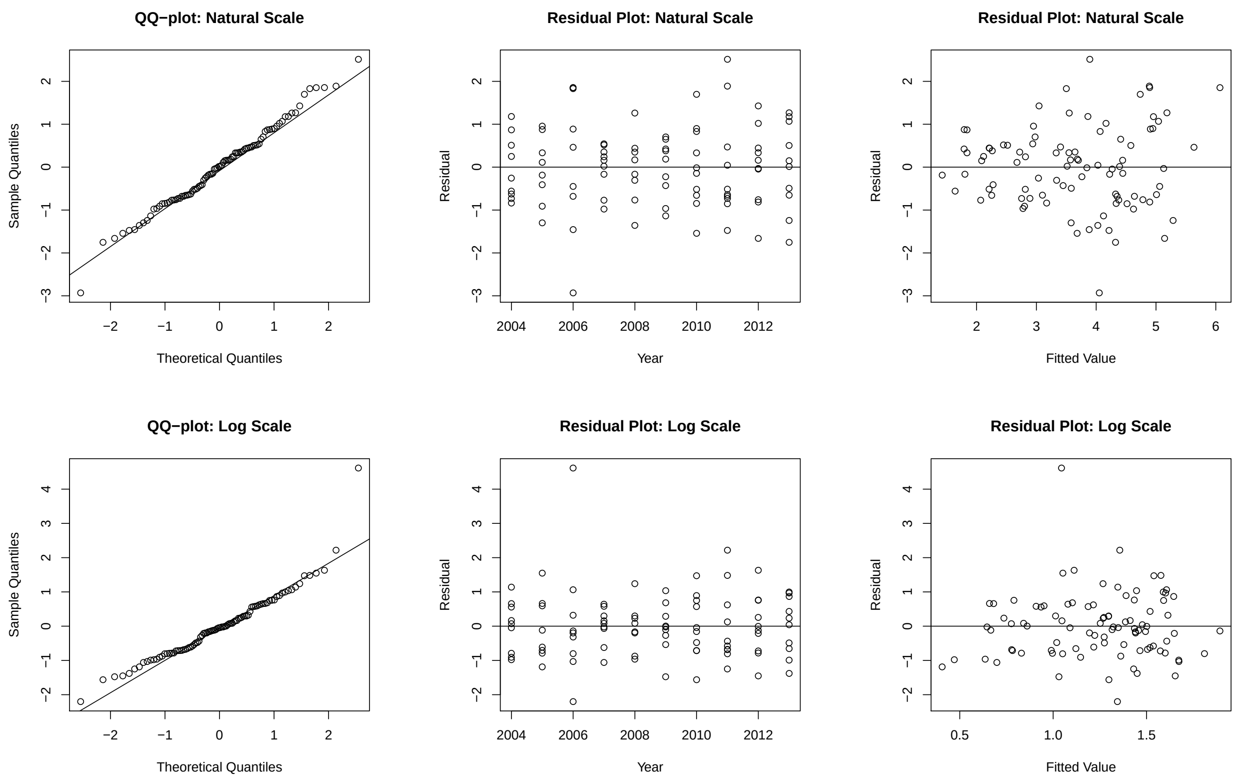


1.2 Reference



Comment:
None of the streams exhibited greater than 10% of data less than the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
133	Nanuq Outflow	2006	4.00	1.04	4.62

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
20.52	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
7.04	4.00	0.13

- Conclusions:
  The slopes do not differ significantly among reference streams.

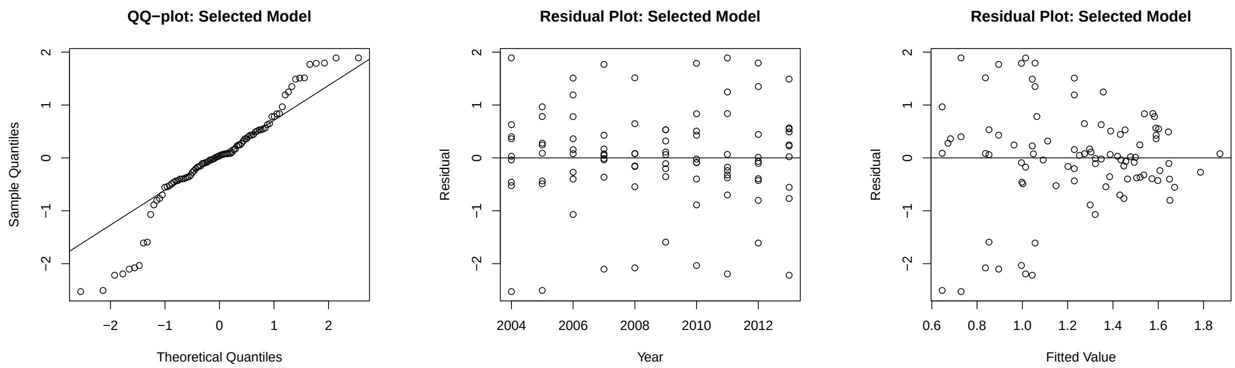
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference streams are best modeled using separate slopes and intercepts, contrasts suggest that reference streams share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference streams) to avoid defaulting to comparing trends in monitored streams against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference stream slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
Lower PDC	0.4887	2	0.7832
Kodiak-Little	0.3764	2	0.8285
Leslie-Moose	0.1819	2	0.9131
1616-30 (LLCF)	2.2309	2	0.3278
Moose-Nero	0.7950	2	0.6720
Nema-Martine	3.8298	2	0.1474
Slipper-Lac de Gras	0.6962	2	0.7060

- Conclusions:
  No significant deviations were found when comparing monitored streams to reference streams.

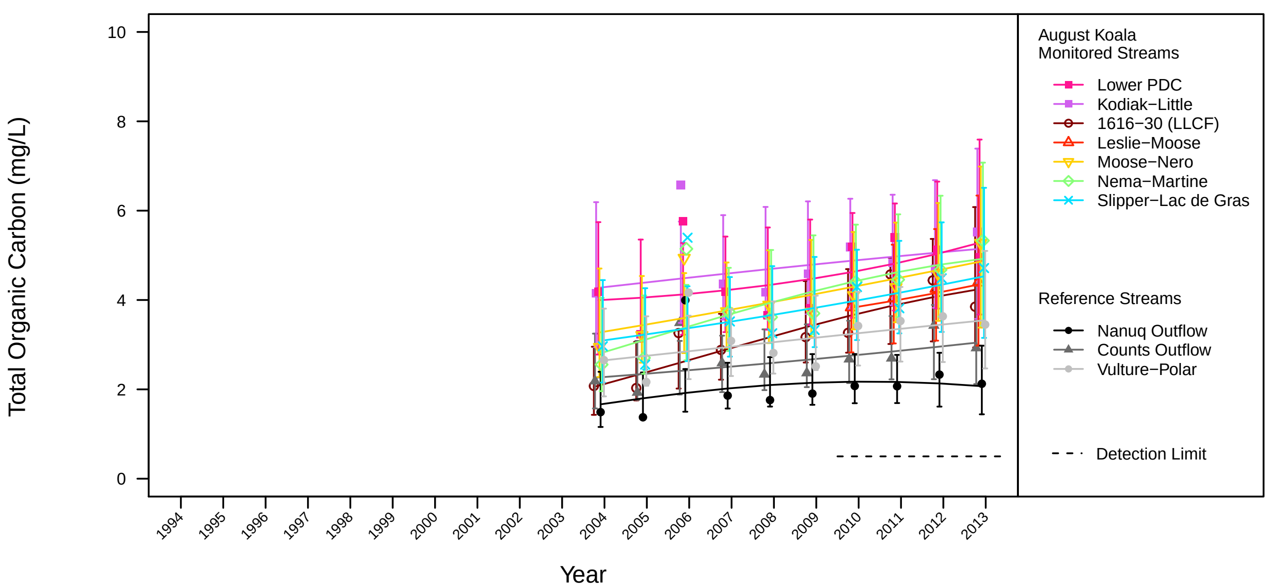
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.0980
Monitored Stream	1616-30 (LLCF)	0.8050
Monitored Stream	Kodiak-Little	0.1460
Monitored Stream	Leslie-Moose	0.9240
Monitored Stream	Lower PDC	0.2470
Monitored Stream	Moose-Nero	0.5380
Monitored Stream	Nema-Martine	0.5840
Monitored Stream	Slipper-Lac de Gras	0.3120

- Conclusions:
  Model fit for Lower PDC and Slipper-Lac de Gras is weak. Model fit for reference streams and Kodiak-Little is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total organic carbon for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	4.95E+00	5.28E+00	9.78E-01	3.67E+00	7.59E+00	2.86E+00
Kodiak-Little	5.53E+00	5.14E+00	9.52E-01	3.58E+00	7.39E+00	2.78E+00
Leslie-Moose	4.39E+00	4.35E+00	8.37E-01	2.98E+00	6.34E+00	2.45E+00
1616-30 (LLCF)	3.85E+00	4.23E+00	7.84E-01	2.94E+00	6.08E+00	2.29E+00
Moose-Nero	5.28E+00	4.86E+00	9.00E-01	3.38E+00	6.99E+00	2.63E+00
Nema-Martine	5.33E+00	4.92E+00	9.11E-01	3.42E+00	7.08E+00	2.67E+00
Slipper-Lac de Gras	4.71E+00	4.53E+00	8.38E-01	3.15E+00	6.51E+00	2.45E+00
Nanuq Outflow	2.12E+00	2.07E+00	3.83E-01	1.44E+00	2.98E+00	
Counts Outflow	2.92E+00	3.04E+00	5.64E-01	2.12E+00	4.38E+00	
Vulture-Polar	3.45E+00	3.55E+00	6.57E-01	2.47E+00	5.10E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
TOC	August	Koala	Stream	Water	none	log e	linear mixed effects regression	#2 shared slopes	NA	none

* Monitored streams are contrasted a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

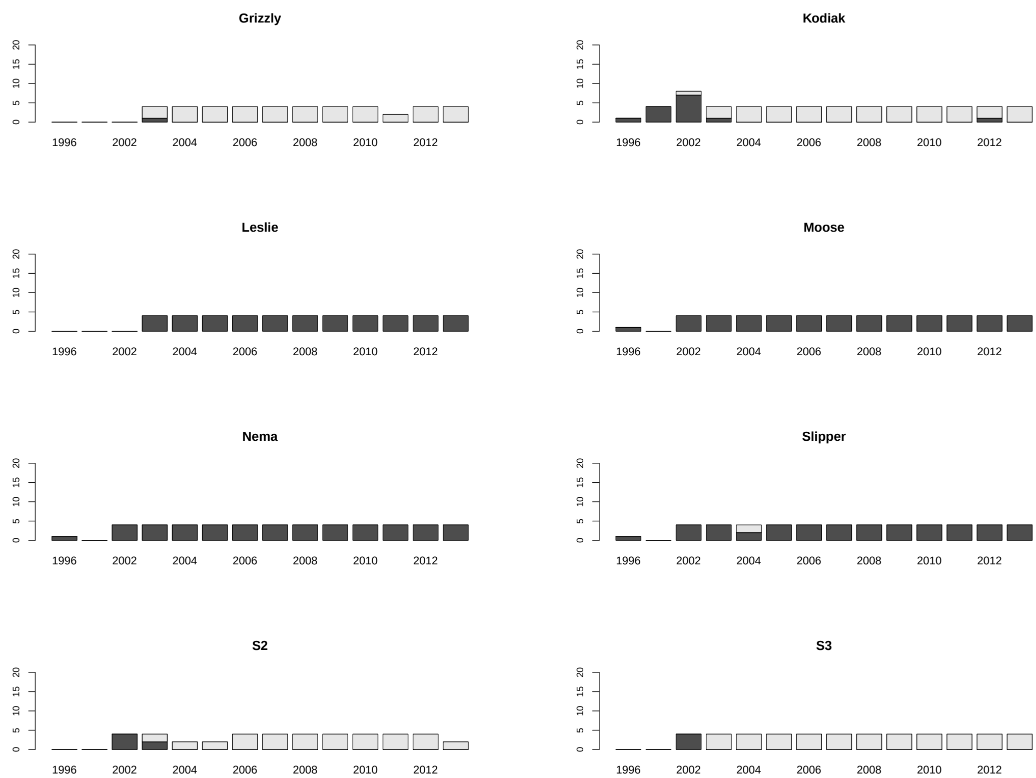
Analysis of April Total Antimony in Lakes of the Koala Watershed and Lac de Gras

January 11, 2014

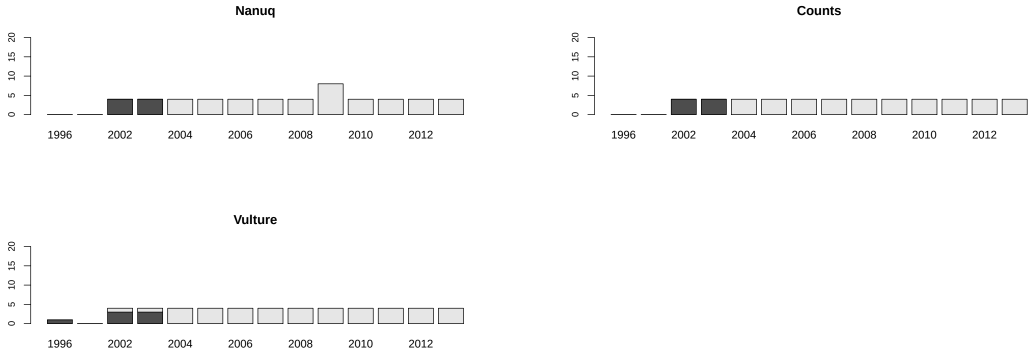
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

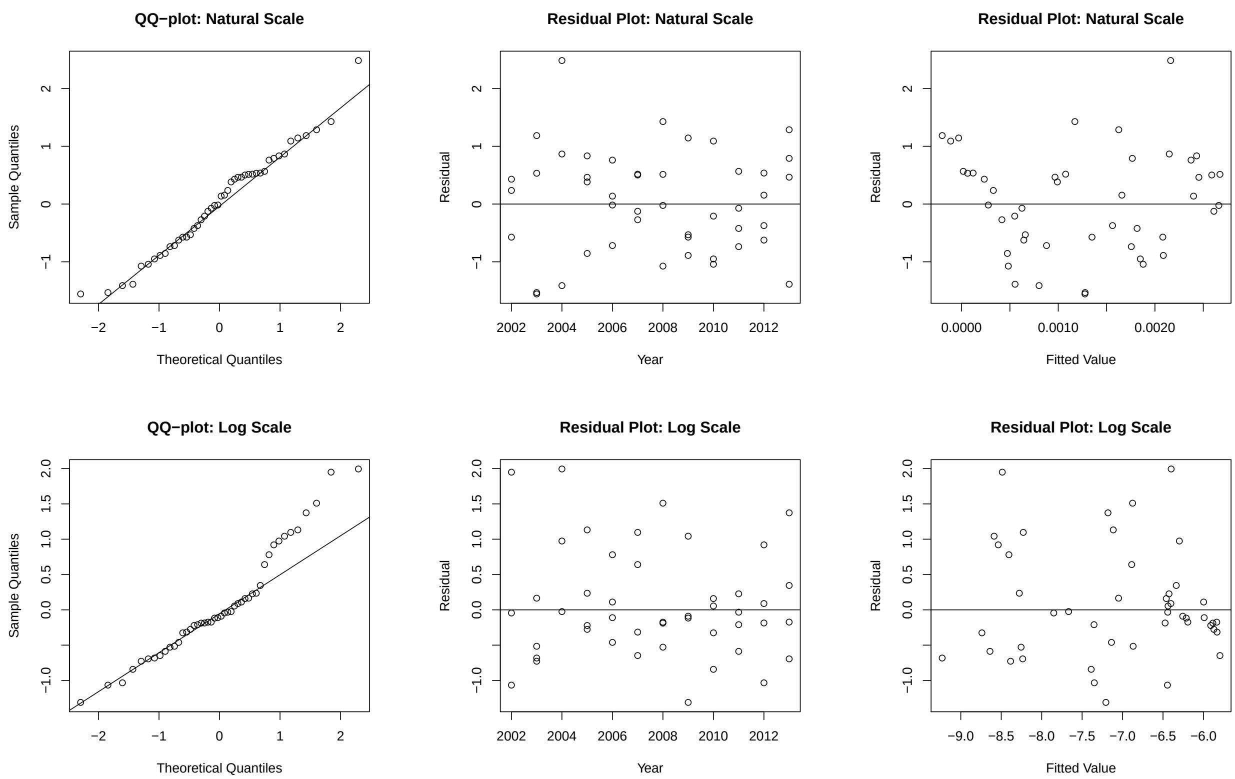


1.2 Reference



Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, Grizzly, Kodiak, S2, and S3 was less than the detection limit. These lakes were excluded from further analyses. None of the remaining lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	6.45E-143	natural model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Leslie	9.40	2.00	0.01
Moose	13.13	2.00	0.00
Nema	2.23	2.00	0.33
Slipper	0.01	2.00	1.00

- Conclusions:
  Leslie and Moose lakes show significant deviation from a constant slope of zero.

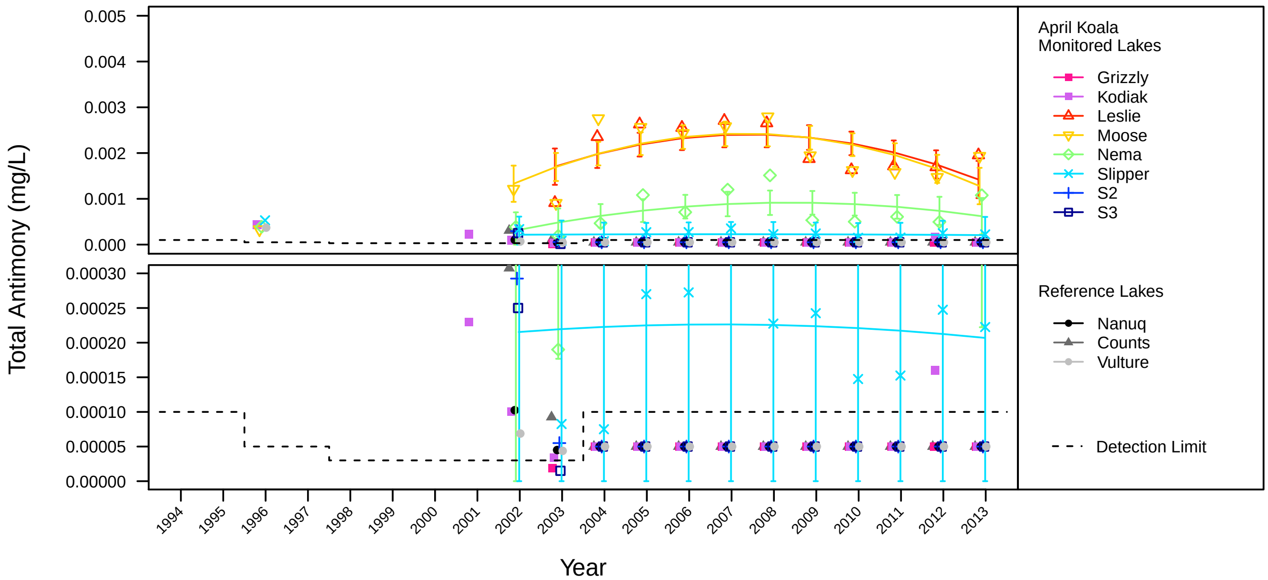
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	Leslie	0.3380
Monitored Lake	Moose	0.4170
Monitored Lake	Nema	0.2380
Monitored Lake	Slipper	0.0090

- Conclusions:
  Model fit for Leslie, Moose, and Nema lakes is weak. Model fit for Slipper Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total antimony for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	5.00e-05	NA	NA	NA	NA	NA
Kodiak	5.00e-05	NA	NA	NA	NA	NA
Leslie	1.96e-03	1.42e-03	2.07e-04	1.02e-03	1.83e-03	6.07e-04
Moose	1.93e-03	1.28e-03	2.03e-04	8.81e-04	1.68e-03	5.94e-04
Nema	1.08e-03	6.20e-04	2.03e-04	2.22e-04	1.02e-03	5.94e-04
Slipper	2.23e-04	2.07e-04	2.03e-04	0.00e+00	6.05e-04	5.94e-04
S2	5.00e-05	NA	NA	NA	NA	NA
S3	5.00e-05	NA	NA	NA	NA	NA
Nanuq	5.00e-05	NA	NA	NA	NA	NA
Counts	5.00e-05	NA	NA	NA	NA	NA
Vulture	5.00e-05	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Antimony	April	Koala	Lake	Water	Counts Grizzly Kodiak Nanuq S2 S3 Vulture	none	linear mixed effects regression	#1a slope of zero	NA	Leslie Moose

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

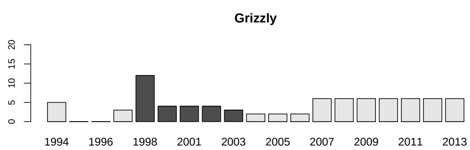
Analysis of August Total Antimony in Lakes of the Koala Watershed and Lac de Gras

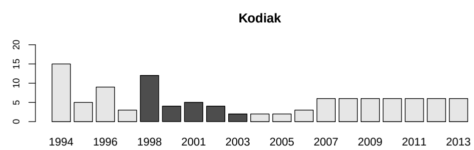
January 11, 2014

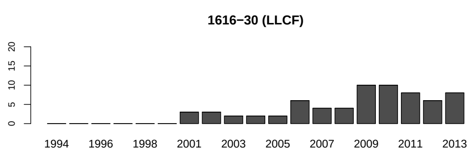
1 Censored Values:

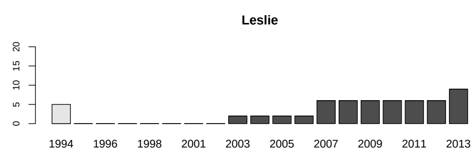
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

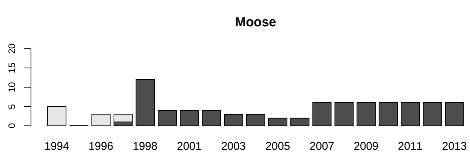
1.1 Monitored

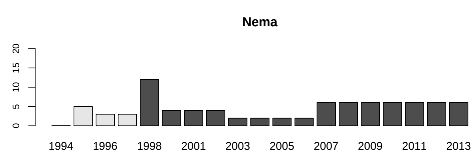


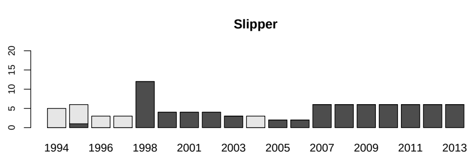


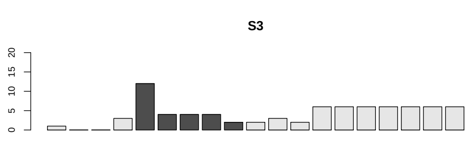




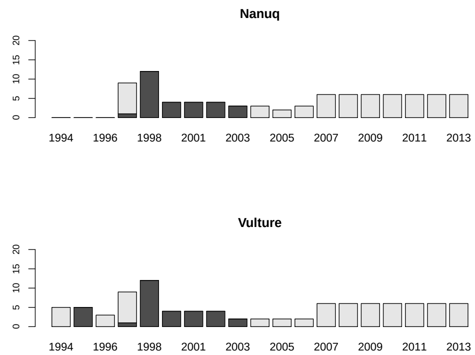






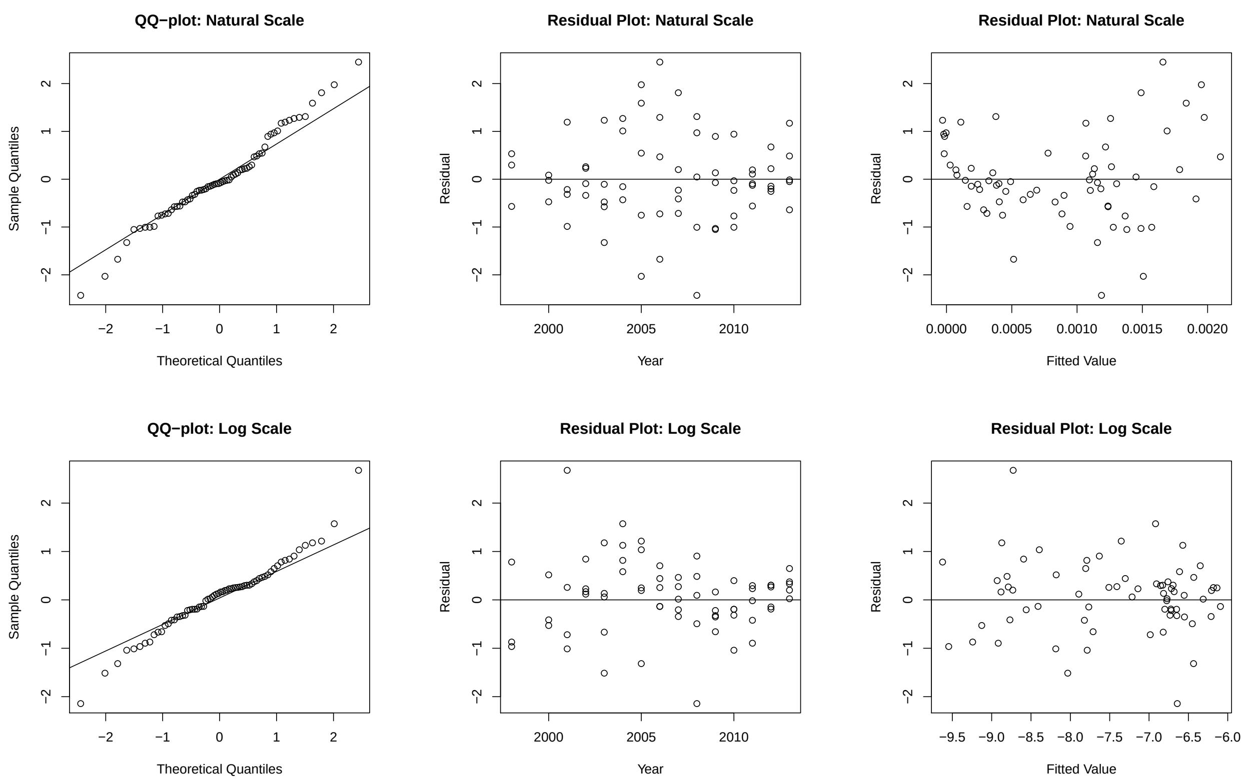


1.2 Reference



Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, Grizzly, Kodiak, S2, and S3 was less than the detection limit. These lakes were excluded from further analyses. No other lakes showed greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The natural model best meets the assumptions of normality and equal variance. AIC also reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis uisng reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-30 (LLCF)	22.6610	2	0.0000
Leslie	9.9509	2	0.0069
Moose	12.1641	2	0.0023
Nema	2.1828	2	0.3357
Slipper	0.1225	2	0.9406

- Conclusions:
  All monitored lakes except Nema and Slipper lakes show significant deviation from a slope of zero.

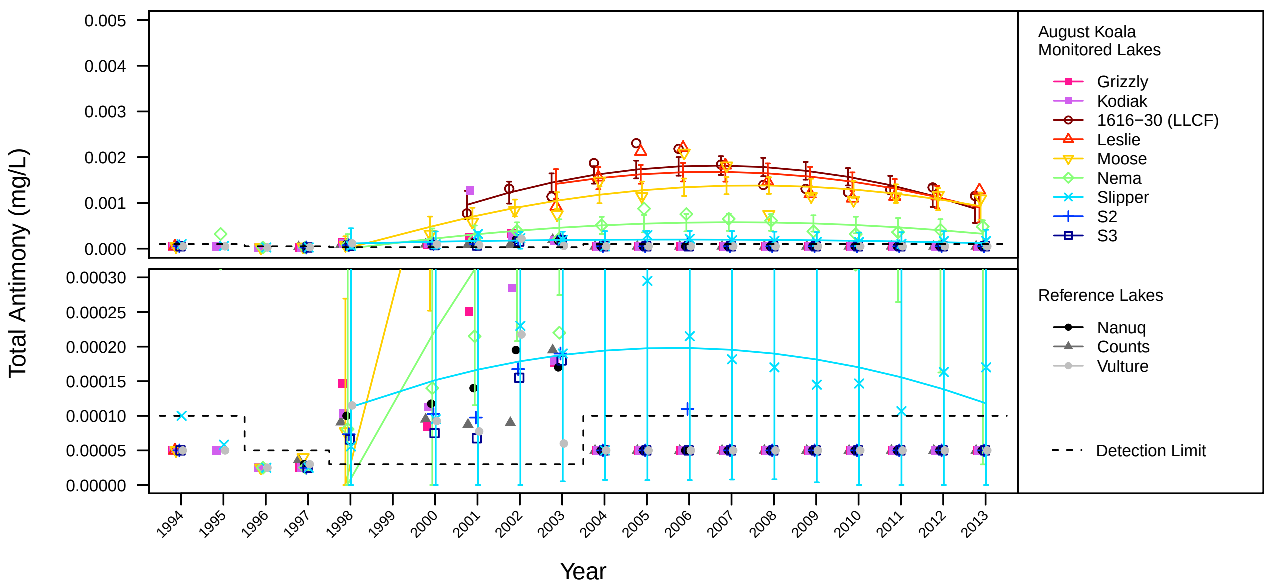
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	1616-30 (LLCF)	0.4770
Monitored Lake	Leslie	0.3170
Monitored Lake	Moose	0.5940
Monitored Lake	Nema	0.5290
Monitored Lake	Slipper	0.1350

- Conclusions:
  Model fit for 1616-30 (LLCF) and Leslie Lake is weak. Model fit for Slipper Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total antimony for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Leslie	1.28e-03	9.00e-04	1.67e-04	5.73e-04	1.23e-03	4.88e-04
1616-30 (LLCF)	1.15e-03	8.75e-04	1.59e-04	5.63e-04	1.19e-03	4.66e-04
Moose	1.09e-03	9.28e-04	1.50e-04	6.33e-04	1.22e-03	4.40e-04
Nema	4.82e-04	3.25e-04	1.50e-04	2.98e-05	6.20e-04	4.40e-04
Slipper	1.70e-04	1.18e-04	1.50e-04	0.00e+00	4.13e-04	4.40e-04
Nanuq	5.00e-05	NA	NA	NA	NA	NA
Counts	5.00e-05	NA	NA	NA	NA	NA
Vulture	5.00e-05	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Antimony	August	Koala	Lake	Water	Counts Grizzly Kodiak Nanuq S2 S3 Vulture	none	linear mixed effects regression	#1a slope of zero	NA	1616-30 (LLCF) Leslie Moose

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

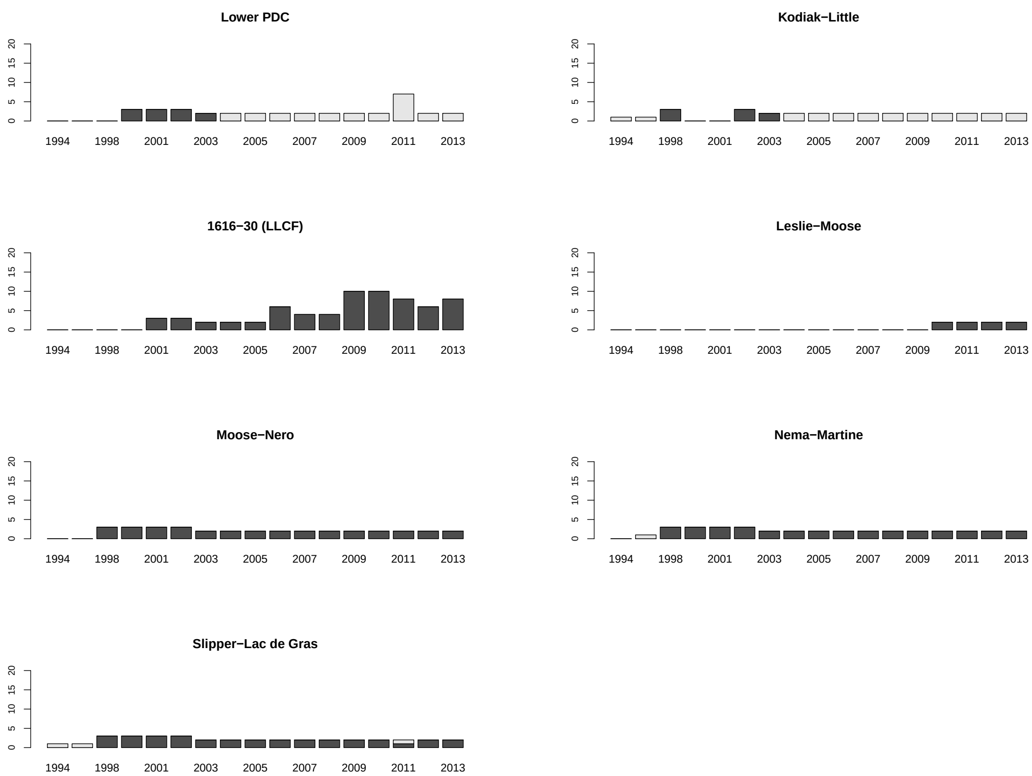
Analysis of August Total Antimony in Koala Watershed Streams

January 11, 2014

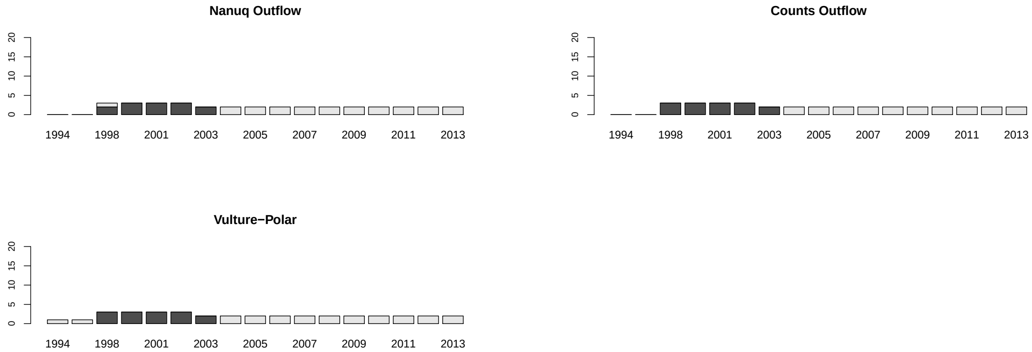
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

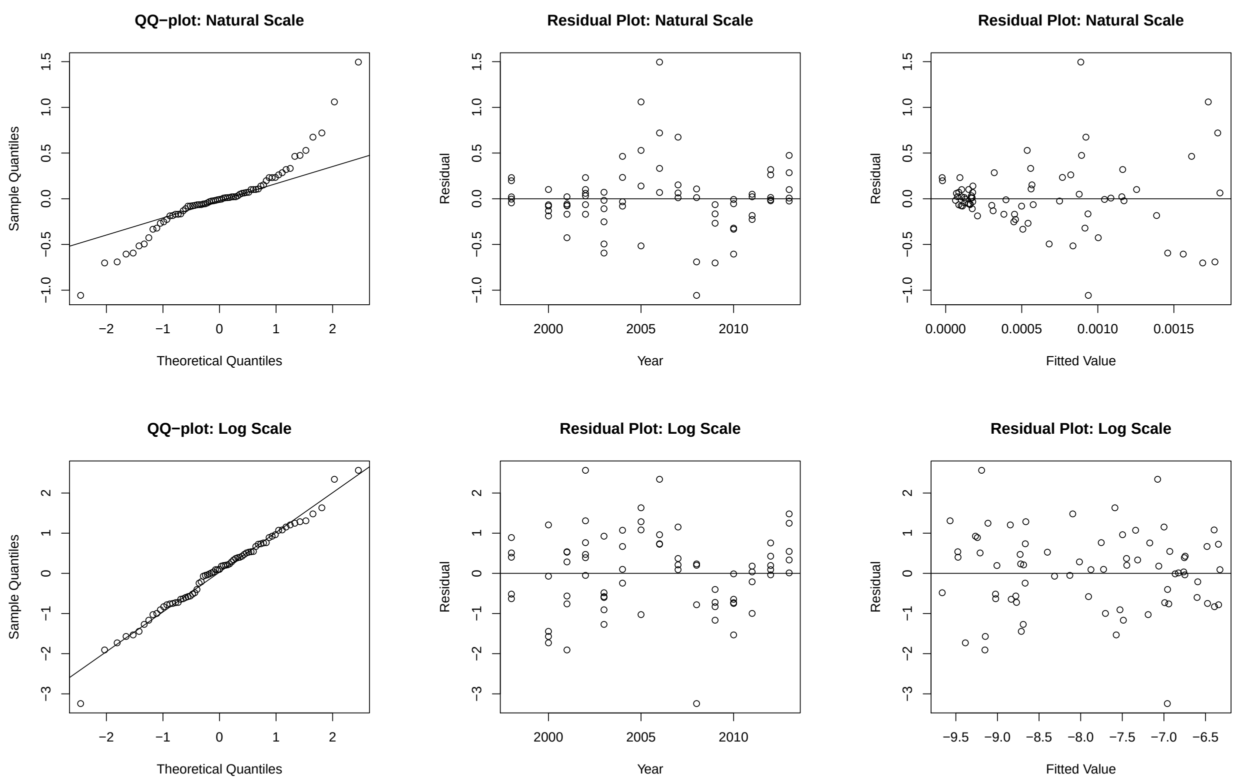


1.2 Reference



Comment:
Greater than 60% of data in Kodiak-Little, Lower PDC, and Nanuq Outflow was less than the detection limit. These streams were excluded from further analyses. 10-60% of data in Counts Outflow and Vulture-Polar was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
115	Moose-Nero	2008	0.00	-6.96	-3.24

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
2.99	3.00	0.39

- Conclusions:
  The slopes and intercepts do not differ significantly among reference streams.

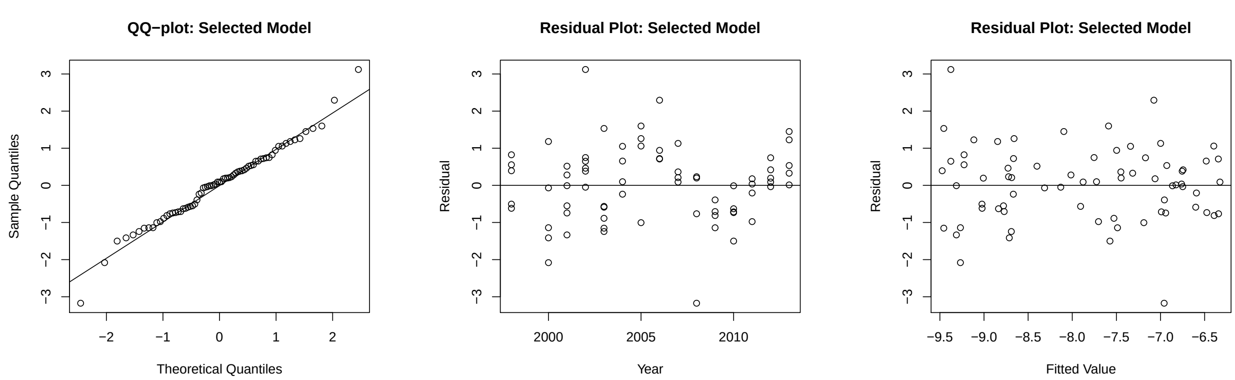
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.135	0.255	0.610	Indistinguishable support for 3 & 2; choose Model 3.

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
29	Counts Outflow	2002	0.00	-9.38	3.12
115	Moose-Nero	2008	0.00	-6.96	-3.17

Conclusion:
The reduced model shows dependence on year. Proceeding with remaining analyses using reference model 3. Results of statistical tests and MDD should be interpreted with caution.

4 Test Results for Monitored Streams

Fitted model of the slope and intercept of each monitored stream compared to a common slope and intercept fitted for all reference streams together (reference model 3).

- Results:

	Chi-squared	DF	P-value
Leslie-Moose	0.9759	3	0.8071
1616-30 (LLCF)	292.1293	3	0.0000
Moose-Nero	153.6230	3	0.0000
Nema-Martine	101.1409	3	0.0000
Slipper-Lac de Gras	25.1343	3	0.0000

- Conclusions:
  All monitored streams except Leslie-Moose show significant deviation from the common slope and intercept of reference streams.

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
Leslie-Moose	0.6582	2	0.7196
1616-30 (LLCF)	8.1756	2	0.0168
Moose-Nero	31.4034	2	0.0000
Nema-Martine	32.6935	2	0.0000
Slipper-Lac de Gras	4.0976	2	0.1289

- Conclusions:
  When allowing for differences in intercept, all monitored streams except Leslie-Moose and Slipper-Lac de Gras show significant deviation from the common slope of reference streams.

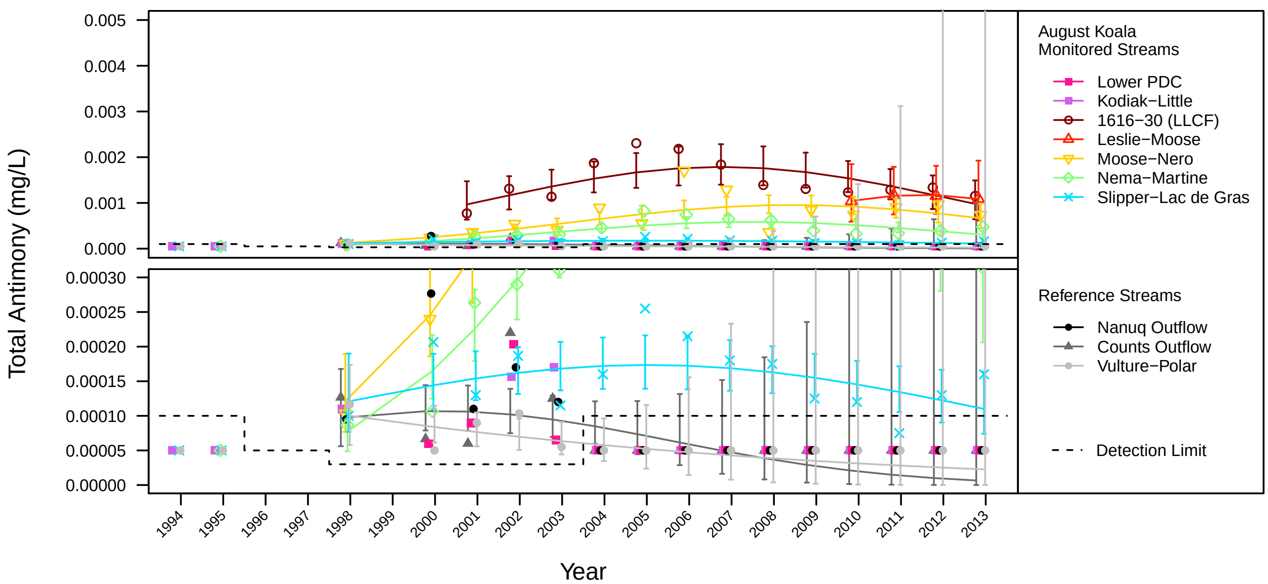
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.5670
Monitored Stream	1616-30 (LLCF)	0.5320
Monitored Stream	Leslie-Moose	0.9710
Monitored Stream	Moose-Nero	0.7110
Monitored Stream	Nema-Martine	0.7870
Monitored Stream	Slipper-Lac de Gras	0.2090

- Conclusions:
  Model fit for Slipper-Lac de Gras is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total antimony for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	5.00e-05	NA	NA	NA	NA	NA
Kodiak-Little	5.00e-05	NA	NA	NA	NA	NA
Leslie-Moose	1.09e-03	1.09e-03	3.17e-04	6.13e-04	1.92e-03	9.27e-04
1616-30 (LLCF)	1.15e-03	9.79e-04	2.11e-04	6.42e-04	1.49e-03	6.16e-04
Moose-Nero	7.35e-04	6.65e-04	1.33e-04	4.50e-04	9.84e-04	3.89e-04
Nema-Martine	4.75e-04	3.05e-04	6.09e-05	2.06e-04	4.51e-04	1.78e-04
Slipper-Lac de Gras	1.60e-04	1.10e-04	2.23e-05	7.40e-05	1.64e-04	6.52e-05
Nanuq Outflow	5.00e-05	NA	NA	NA	NA	NA
Counts Outflow	5.00e-05	6.63e-06	1.69e-05	4.47e-08	9.83e-04	NA
Vulture-Polar	5.00e-05	2.26e-05	7.84e-05	2.53e-08	2.02e-02	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Antimony	August	Koala	Stream	Water	Kodiak-Little Lower PDC Nanuq Outflow	log e	Tobit regression	#3 shared intercept & slope	NA	1616-30 (LLCF) Moose-Nero Nema-Martine Slipper-Lac de Gras

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

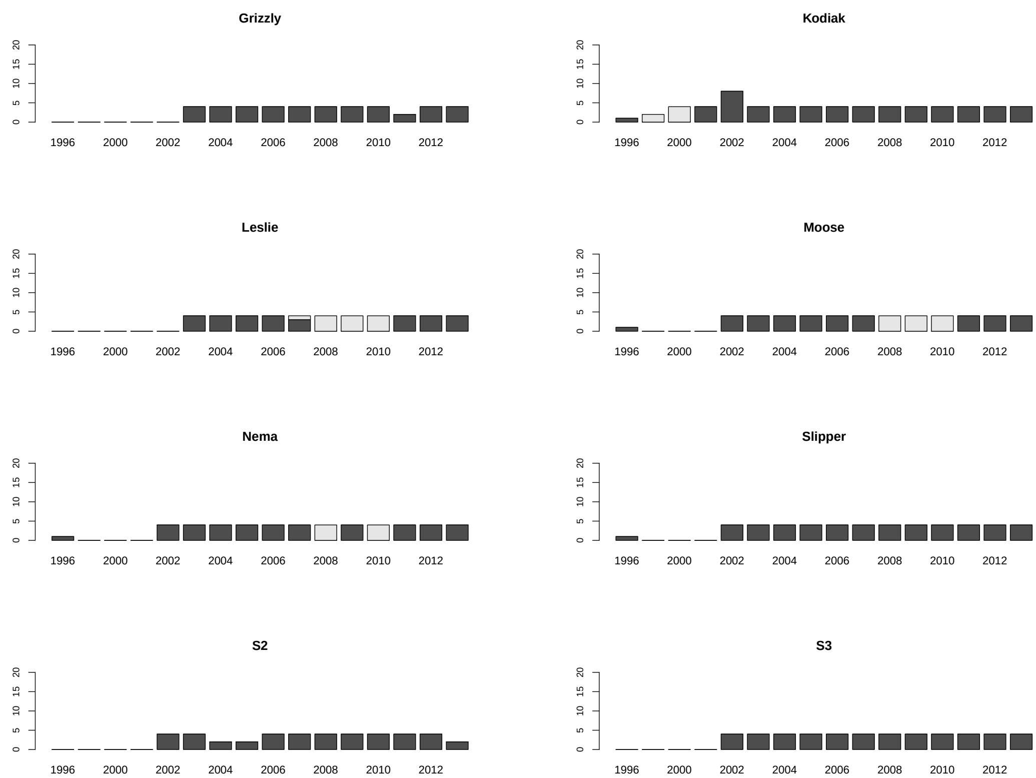
Analysis of April Total Arsenic in Lakes of the Koala Watershed and Lac de Gras

January 10, 2014

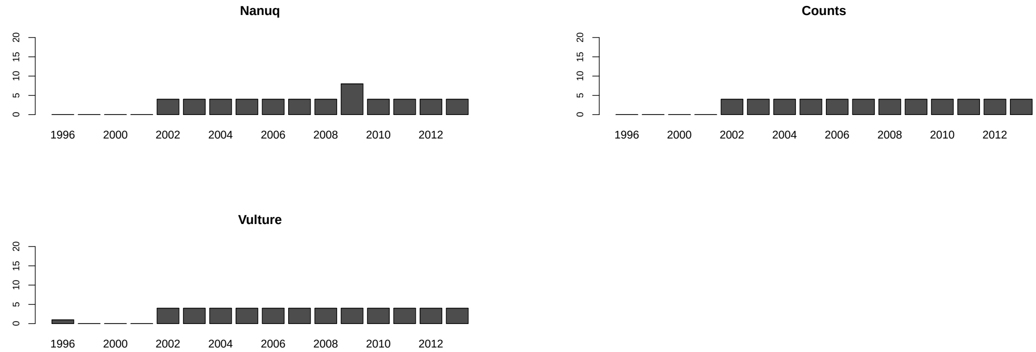
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

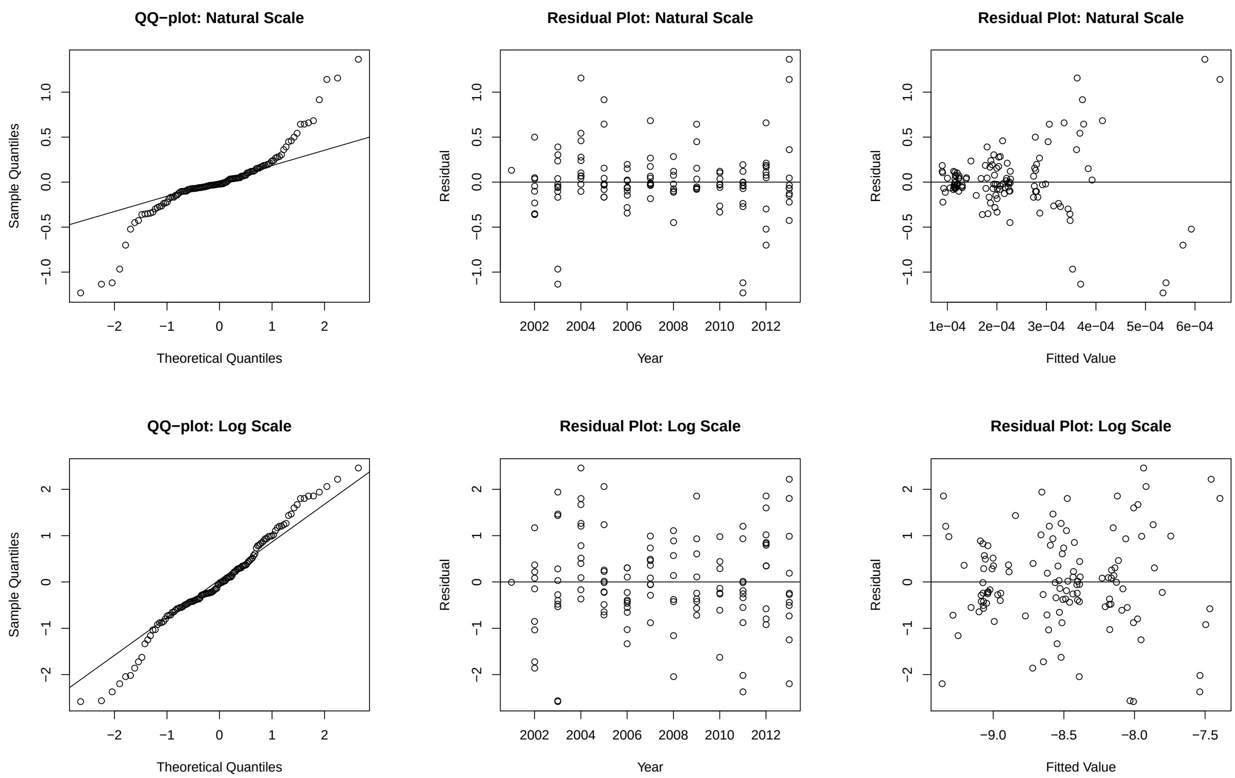


1.2 Reference



Comment:
10-60% of data in Leslie, Moose, and Nema lakes was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	0.00E+00	natural model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
105.81	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
27.36	4.00	0.00

- Conclusions:
  The slopes differ significantly among reference lakes. Reference lakes do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  AIC results are in agreement with reference mode testing and reveal that the reference lakes are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Grizzly	0.2432	2	0.8855
Kodiak	2.9988	2	0.2233
Leslie	20.4752	2	0.0000
Moose	20.5645	2	0.0000
Nema	4.3127	2	0.1157
Slipper	3.6515	2	0.1611
S2	3.5860	2	0.1665
S3	2.4877	2	0.2883

- Conclusions:
  Leslie and Moose lakes show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored lake compared to slope of each reference lake (reference model 1b).

- Results:

	Chi-squared	DF	P-value
Leslie-vs-Nanuq	492.5487	3	0.0000
Leslie-vs-Counts	195.8745	3	0.0000
Leslie-vs-Vulture	370.2797	3	0.0000
Moose-vs-Nanuq	548.7301	3	0.0000
Moose-vs-Counts	220.7667	3	0.0000
Moose-vs-Vulture	419.8712	3	0.0000

- Conclusions:
  Leslie and Moose lakes show significant deviations from the slopes of individual reference lakes.

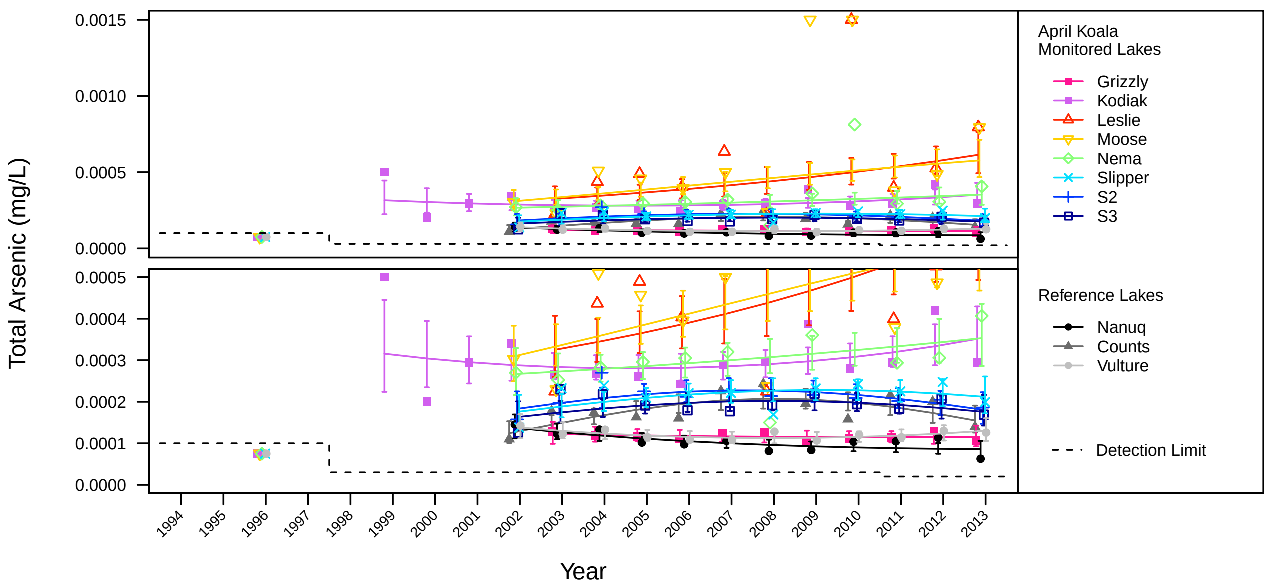
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Reference Lake	Counts	0.5310
Reference Lake	Nanuq	0.4850
Reference Lake	Vulture	0.5260
Monitored Lake	Grizzly	0.0970
Monitored Lake	Kodiak	0.0950
Monitored Lake	Leslie	0.1890
Monitored Lake	Moose	0.1680
Monitored Lake	Nema	0.0660
Monitored Lake	S2	0.4170
Monitored Lake	S3	0.1810
Monitored Lake	Slipper	0.2330

- Conclusions:
  Model fit for Nanuq, Slipper, and S2 is weak. Model fit for Gizzly, Kodiak, Leslie, Moose, Nema, and S3 Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total arsenic for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	1.07e-04	1.15e-04	1.26e-05	9.29e-05	1.43e-04	3.68e-05
Kodiak	2.94e-04	3.51e-04	3.60e-05	2.87e-04	4.30e-04	1.05e-04
Leslie	7.95e-04	6.14e-04	6.87e-05	4.93e-04	7.65e-04	2.01e-04
Moose	7.94e-04	5.77e-04	6.20e-05	4.68e-04	7.13e-04	1.81e-04
Nema	4.07e-04	3.53e-04	3.79e-05	2.86e-04	4.36e-04	1.11e-04
Slipper	1.99e-04	2.12e-04	2.25e-05	1.72e-04	2.61e-04	6.58e-05
S2	1.86e-04	1.81e-04	1.92e-05	1.47e-04	2.23e-04	5.62e-05
S3	1.69e-04	1.76e-04	1.86e-05	1.43e-04	2.16e-04	5.46e-05
Nanuq	6.28e-05	8.60e-05	9.12e-06	6.99e-05	1.06e-04	NA
Counts	1.40e-04	1.55e-04	1.64e-05	1.26e-04	1.91e-04	NA
Vulture	1.26e-04	1.30e-04	1.38e-05	1.06e-04	1.60e-04	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Arsenic	April	Koala	Lake	Water	none	log e	Tobit regression	#1b separate intercepts & slopes	0.005	Leslie Moose

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

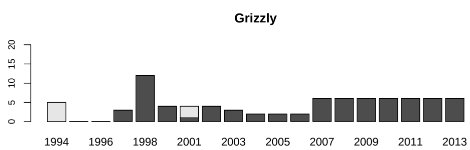
Analysis of August Total Arsenic in Lakes of the Koala Watershed and Lac de Gras

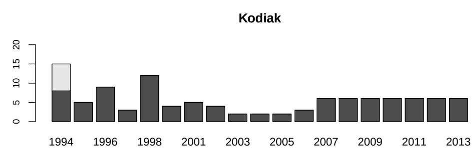
January 11, 2014

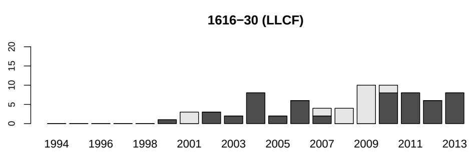
1 Censored Values:

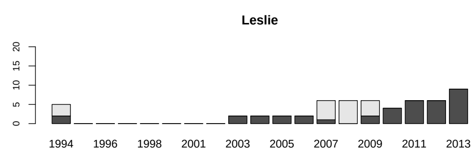
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

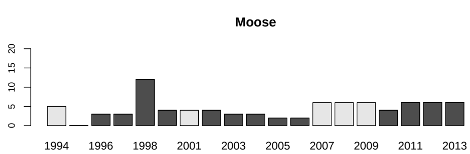
1.1 Monitored

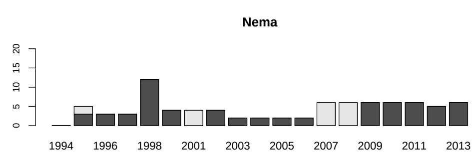




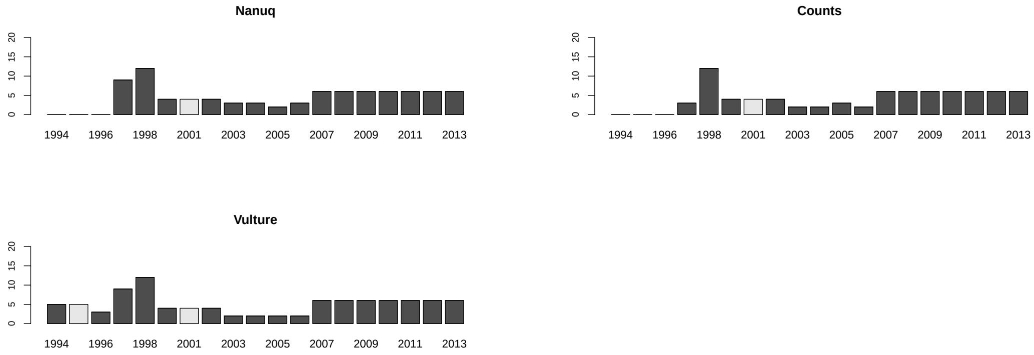






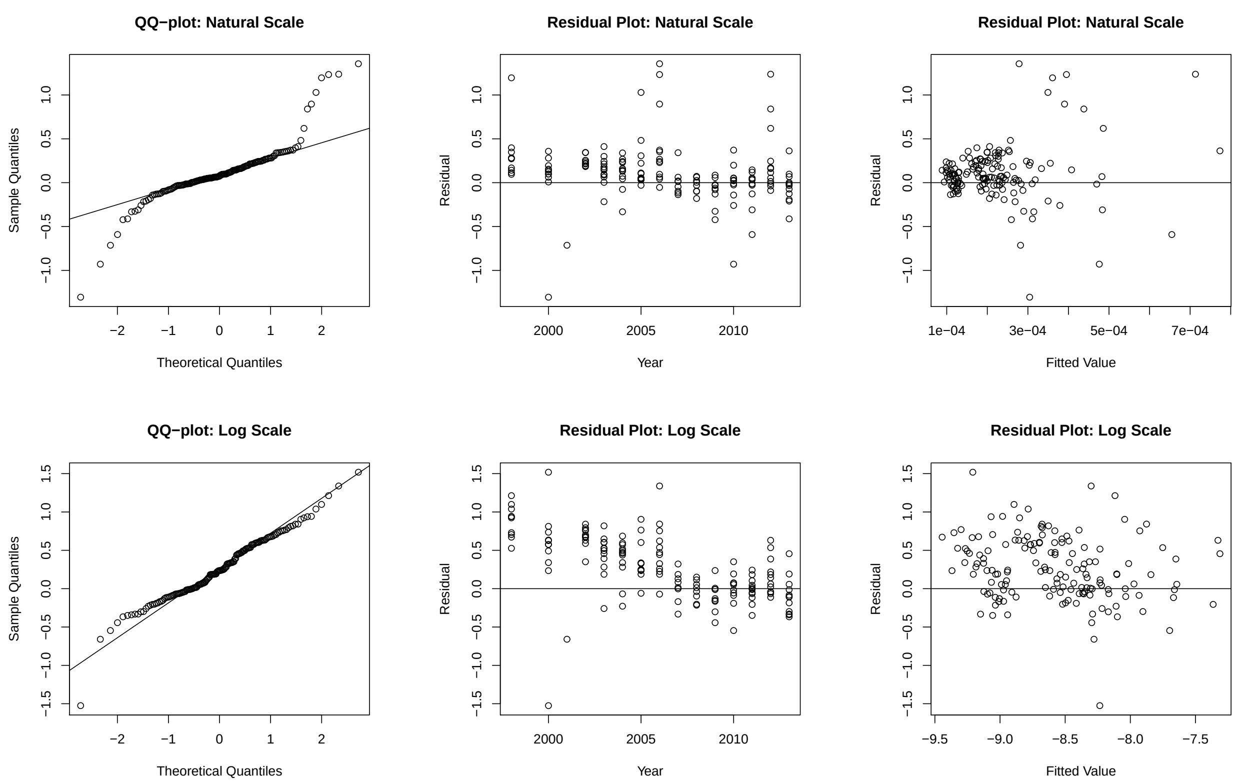


1.2 Reference



Comment:
10-60% of data in 1616-30 (LLCF), Leslie, Moose, and Nema lakes was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The natural and log transformed models show dependence on year or fitted value. The natural model best meets the assumptions of normality and equal variance. AIC also reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model". However, results of statistical analyses should be interpreted with caution.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
4.84	6.00	0.56

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

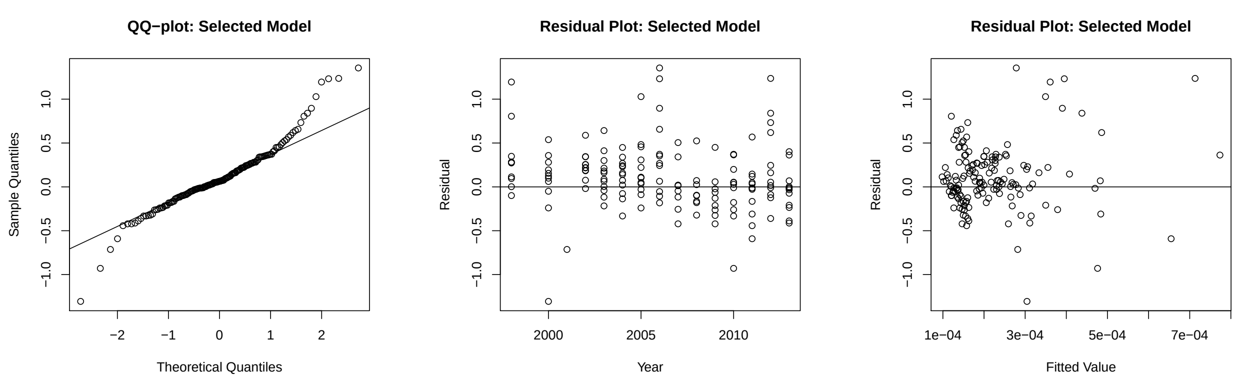
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.011	0.585	0.404	Indistinguishable support for 2 & 3; choose Model 3.

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
The reduced model shows dependence on year and fitted value. Results of statistical analyses should be interpreted with caution.

4 Test Results for Monitored Lakes

Fitted model of the slope and intercept of each monitored lake compared to a common slope and intercept fitted for all reference lakes together (reference model 3).

- Results:

	Chi-squared	DF	P-value
Grizzly	0.4732	3	0.9247
Kodiak	10.7258	3	0.0133
1616-30 (LLCF)	61.7281	3	0.0000
Leslie	27.1973	3	0.0000
Moose	17.6562	3	0.0005
Nema	5.7108	3	0.1266
Slipper	9.9555	3	0.0189
S2	1.8450	3	0.6052
S3	0.6742	3	0.8792

- Conclusions:
  All monitored lakes except Grizzly, Nema, S2, and S3 show significant deviation from the common slope and intercept of reference lakes.

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	0.0018	2	0.9991
Kodiak	1.1757	2	0.5555
1616-30 (LLCF)	19.9681	2	0.0000
Leslie	2.0161	2	0.3649
Moose	4.6941	2	0.0957
Nema	0.4809	2	0.7863
Slipper	0.7483	2	0.6879
S2	0.0868	2	0.9575
S3	0.0149	2	0.9926

- Conclusions:
  When allowing for differences in intercept 1616-30 (LLCF) shows significant deviation from the common slope of reference lakes.

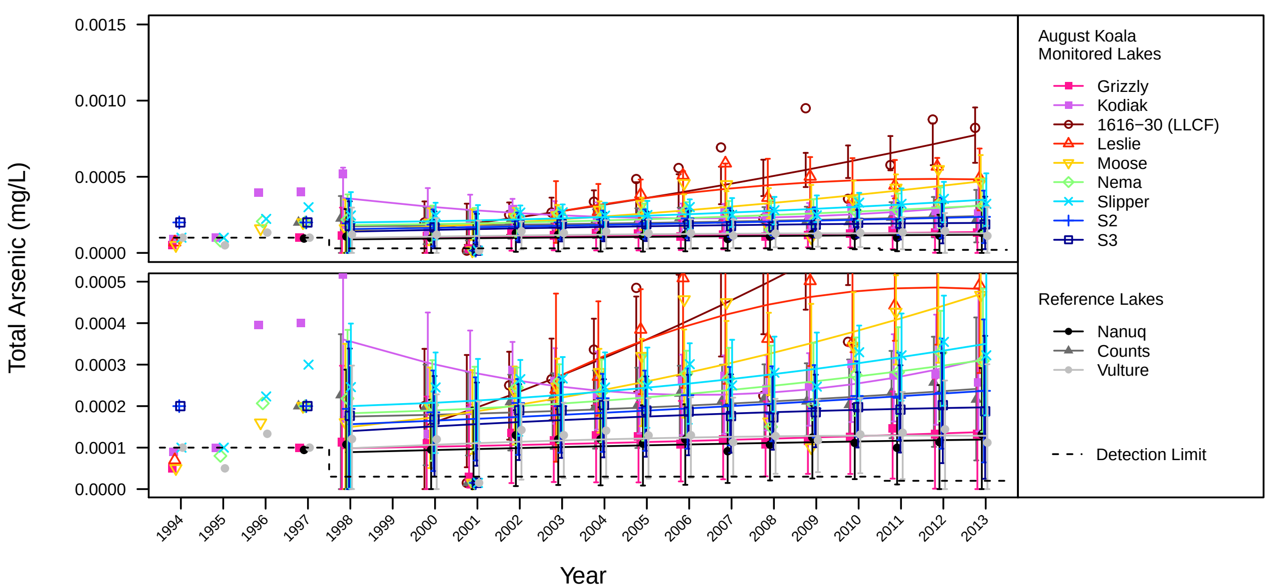
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0480
Monitored Lake	1616-30 (LLCF)	0.5340
Monitored Lake	Grizzly	0.2050
Monitored Lake	Kodiak	0.2200
Monitored Lake	Leslie	0.4300
Monitored Lake	Moose	0.4220
Monitored Lake	Nema	0.2880
Monitored Lake	S2	0.2220
Monitored Lake	S3	0.1470
Monitored Lake	Slipper	0.3770

- Conclusions:
  Model fit for Grizzly, Kodiak, Leslie, Moose, Nema, Slipper, and S2 is weak. Model fit for S3 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total arsenic for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	1.33e-04	1.37e-04	8.79e-05	0.00e+00	3.09e-04	2.57e-04
Kodiak	2.57e-04	3.11e-04	8.79e-05	1.39e-04	4.84e-04	2.57e-04
Leslie	4.92e-04	4.83e-04	1.03e-04	2.80e-04	6.85e-04	3.03e-04
1616-30 (LLCF)	8.21e-04	7.73e-04	9.27e-05	5.92e-04	9.55e-04	2.71e-04
Moose	4.68e-04	4.70e-04	8.81e-05	2.97e-04	6.42e-04	2.58e-04
Nema	3.09e-04	3.11e-04	8.80e-05	1.38e-04	4.83e-04	2.57e-04
Slipper	3.22e-04	3.50e-04	8.79e-05	1.78e-04	5.22e-04	2.57e-04
S2	2.37e-04	2.37e-04	8.79e-05	6.43e-05	4.09e-04	2.57e-04
S3	1.88e-04	1.97e-04	8.79e-05	2.48e-05	3.69e-04	2.57e-04
Nanuq	1.32e-04	1.19e-04	8.79e-05	0.00e+00	2.92e-04	NA
Counts	2.16e-04	2.41e-04	8.79e-05	6.91e-05	4.14e-04	NA
Vulture	1.12e-04	1.29e-04	8.79e-05	0.00e+00	3.01e-04	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Arsenic	August	Koala	Lake	Water	none	none	Tobit regression	#3 shared intercept & slope	0.005	Kodiak 1616-30 (LLCF) Leslie Moose Slipper

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

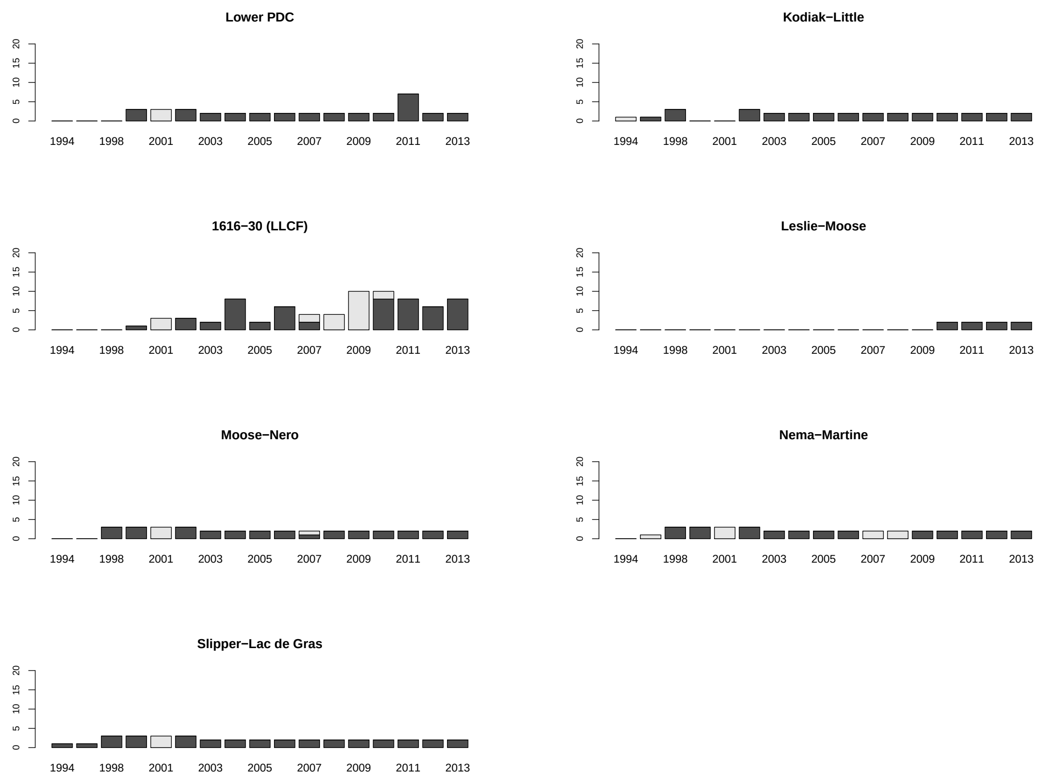
Analysis of August Total Arsenic in Koala Watershed Streams

January 11, 2014

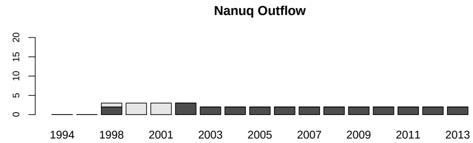
1 Censored Values:

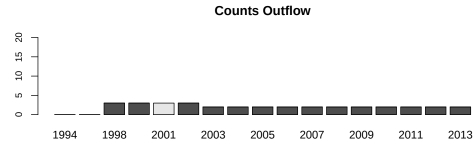
The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

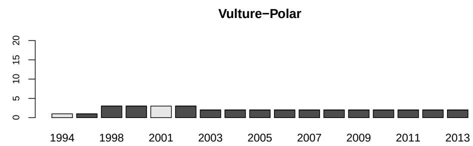
1.1 Monitored



1.2 Reference

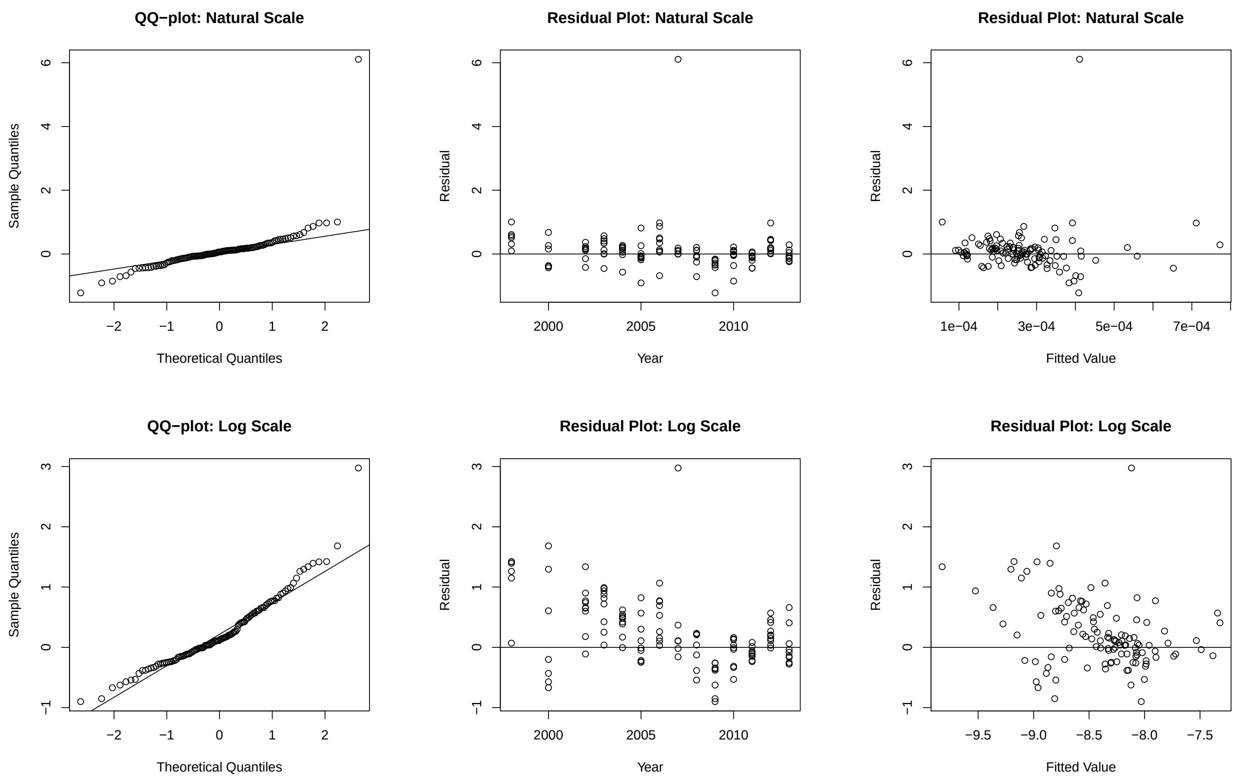






Comment:
10-60% of data in 1616-30 (LLCF), Moose-Nero, Nanuq Outflow, and Nema-Martine was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
34	Counts Outflow	2007	0.00	0.00	6.11

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The natural model best meets the assumptions of normality and equal variance. AIC also reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
15.71	6.00	0.02

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
2.46	4.00	0.65

- Conclusions:
  The slopes do not differ significantly among reference streams.

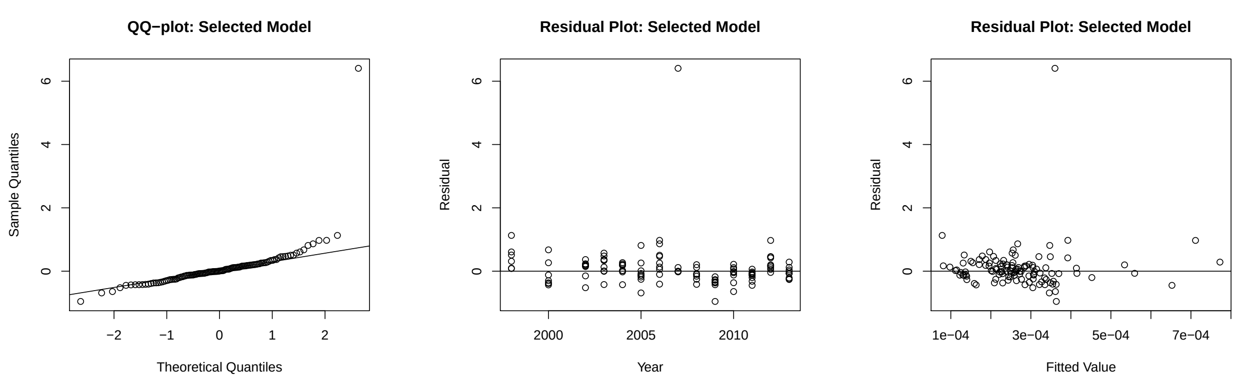
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.058	0.932	0.009	Ref. Model 2

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with a common slope. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
34	Counts Outflow	2007	0.00	0.00	6.41

Conclusion:
The reduced model shows dependence on year or fitted value. Results should be interpreted with caution.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
Lower PDC	0.3520	2	0.8386
Kodiak-Little	2.5040	2	0.2859
Leslie-Moose	1.4326	2	0.4886
1616-30 (LLCF)	10.8284	2	0.0045
Moose-Nero	1.3277	2	0.5149
Nema-Martine	0.4940	2	0.7811
Slipper-Lac de Gras	0.4397	2	0.8026

- Conclusions:
  1616-30 shows significant deviation from the common slope of reference streams.

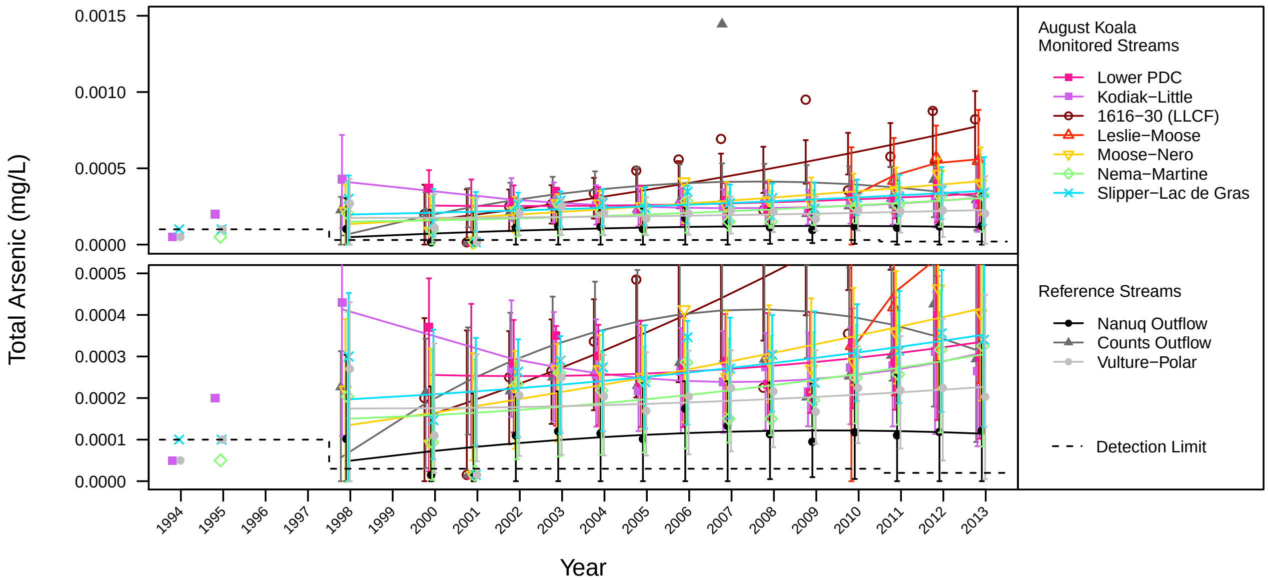
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.2430
Monitored Stream	1616-30 (LLCF)	0.5310
Monitored Stream	Kodiak-Little	0.7830
Monitored Stream	Leslie-Moose	0.9350
Monitored Stream	Lower PDC	0.0890
Monitored Stream	Moose-Nero	0.5670
Monitored Stream	Nema-Martine	0.3460
Monitored Stream	Slipper-Lac de Gras	0.3140

- Conclusions:
  Model fit for reference streams, 1616-30 (LLCF), Nema-Martine, and Slipper-Lac de Gras is weak. Model fit for Lower PDC is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total arsenic for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	2.99e-04	3.34e-04	1.18e-04	1.02e-04	5.67e-04	3.47e-04
Kodiak-Little	2.64e-04	3.06e-04	1.13e-04	8.40e-05	5.28e-04	3.31e-04
Leslie-Moose	5.48e-04	5.59e-04	1.65e-04	2.36e-04	8.83e-04	4.83e-04
1616-30 (LLCF)	8.21e-04	7.72e-04	1.19e-04	5.39e-04	1.01e-03	3.49e-04
Moose-Nero	4.03e-04	4.15e-04	1.13e-04	1.94e-04	6.37e-04	3.31e-04
Nema-Martine	3.25e-04	3.05e-04	1.13e-04	8.33e-05	5.26e-04	3.31e-04
Slipper-Lac de Gras	3.40e-04	3.52e-04	1.13e-04	1.31e-04	5.74e-04	3.31e-04
Nanuq Outflow	1.21e-04	1.14e-04	1.13e-04	0.00e+00	3.36e-04	NA
Counts Outflow	2.94e-04	3.16e-04	1.13e-04	9.44e-05	5.37e-04	NA
Vulture-Polar	2.03e-04	2.27e-04	1.13e-04	5.39e-06	4.48e-04	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Arsenic	August	Koala	Stream	Water	none	none	Tobit regression	#2 shared slopes	0.005	1616-30 (LLCF)

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

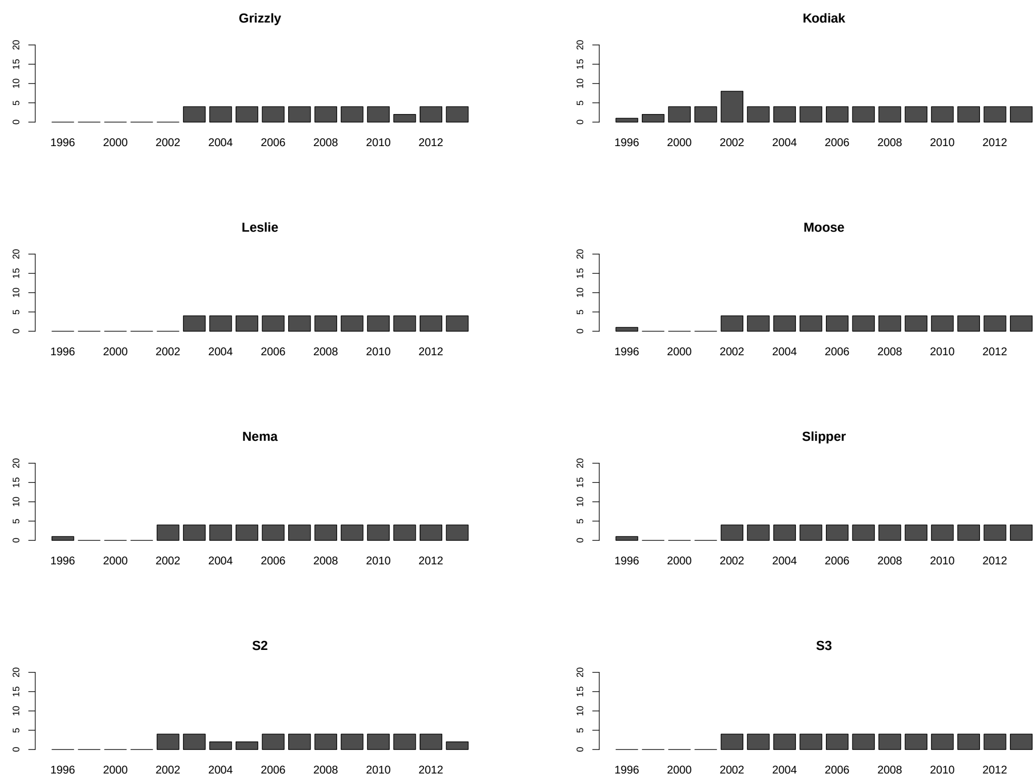
Analysis of April Total Barium in Lakes of the Koala Watershed and Lac de Gras

January 11, 2014

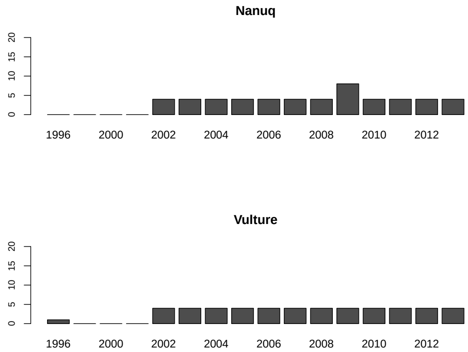
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

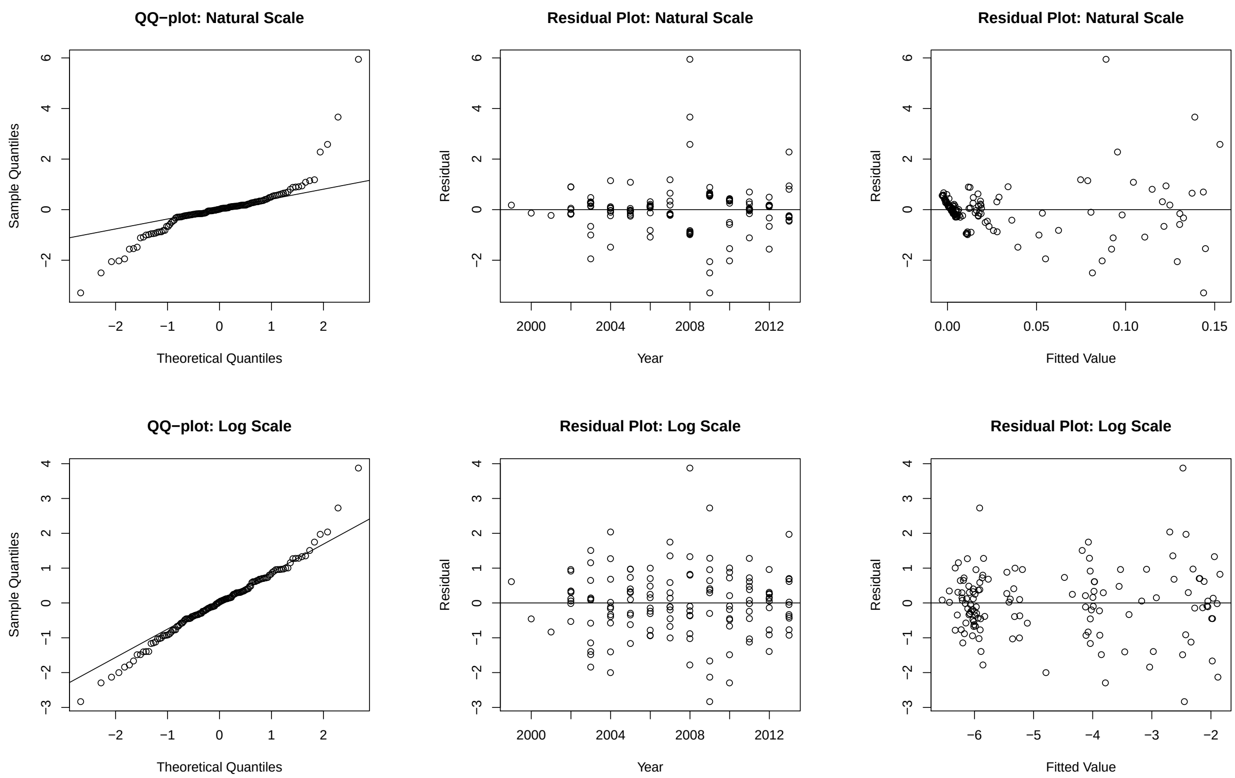


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
96	Leslie	2009	0.11	0.14	-3.29
115	Moose	2008	0.17	0.14	3.66
155	Nema	2008	0.14	0.09	5.94

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
155	Nema	2008	0.14	-2.47	3.88

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	9.23E-158	natural model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
6490.43	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
2.59	4.00	0.63

- Conclusions:
  The slopes do not differ significantly among reference lakes.

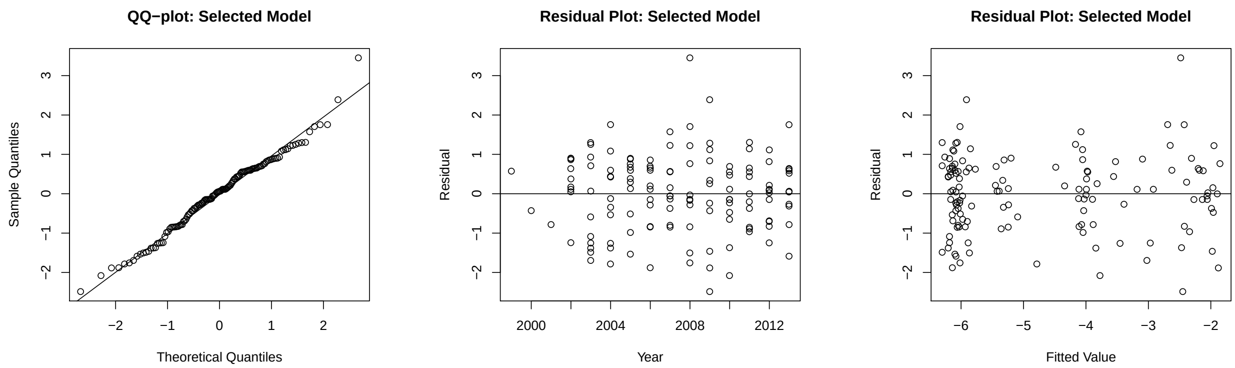
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
155	Nema	2008	0.14	-2.48	3.45

No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	1.31	2.00	0.52
Kodiak	0.92	2.00	0.63
Leslie	18.13	2.00	0.00
Moose	23.29	2.00	0.00
Nema	52.96	2.00	0.00
Slipper	57.40	2.00	0.00
S2	1.06	2.00	0.59
S3	1.04	2.00	0.60

- Conclusions:
  Leslie, Moose, Nema, and Slipper lakes show significant deviation from the common slope of reference lakes.

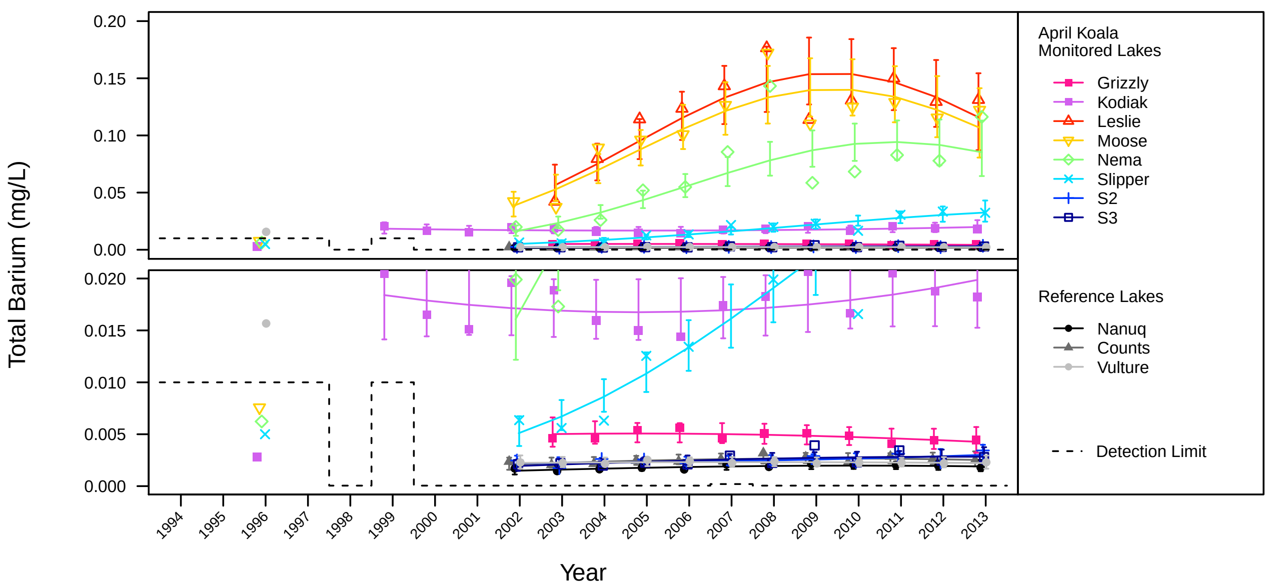
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.1180
Monitored Lake	Grizzly	0.3830
Monitored Lake	Kodiak	0.1850
Monitored Lake	Leslie	0.7820
Monitored Lake	Moose	0.8420
Monitored Lake	Nema	0.7920
Monitored Lake	S2	0.3210
Monitored Lake	S3	0.3570
Monitored Lake	Slipper	0.8980

- Conclusions:
  Model fit for Grizzly, S2, and S3 is weak. Model fit for reference lakes and Kodiak Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total barium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	4.46e-03	4.28e-03	6.25e-04	3.21e-03	5.69e-03	1.83e-03
Kodiak	1.82e-02	1.99e-02	2.67e-03	1.53e-02	2.59e-02	7.82e-03
Leslie	1.31e-01	1.16e-01	1.69e-02	8.71e-02	1.54e-01	4.96e-02
Moose	1.22e-01	1.07e-01	1.53e-02	8.06e-02	1.41e-01	4.47e-02
Nema	1.16e-01	8.53e-02	1.22e-02	6.44e-02	1.13e-01	3.57e-02
Slipper	3.23e-02	3.25e-02	4.65e-03	2.46e-02	4.31e-02	1.36e-02
S2	3.43e-03	3.01e-03	4.30e-04	2.27e-03	3.98e-03	1.26e-03
S3	2.79e-03	2.83e-03	4.05e-04	2.14e-03	3.75e-03	1.19e-03
Nanuq	1.78e-03	1.90e-03	2.72e-04	1.44e-03	2.52e-03	NA
Counts	2.48e-03	2.53e-03	3.62e-04	1.91e-03	3.35e-03	NA
Vulture	2.30e-03	2.23e-03	3.18e-04	1.68e-03	2.95e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Barium	April	Koala	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	1	Leslie Moose Nema Slipper

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

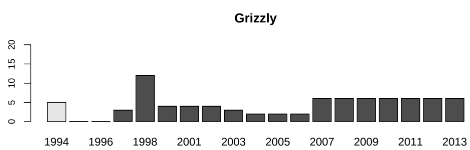
Analysis of August Barium in Lakes of the Koala Watershed and Lac de Gras

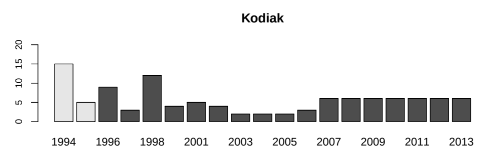
January 11, 2014

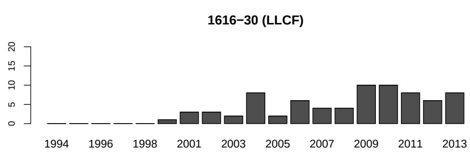
1 Censored Values:

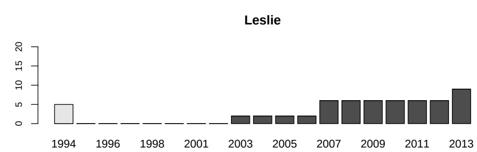
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

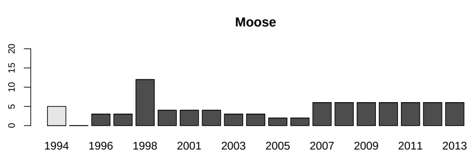
1.1 Monitored

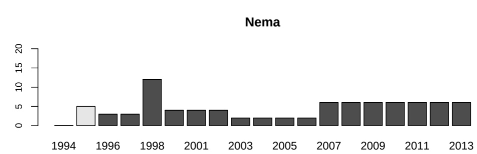


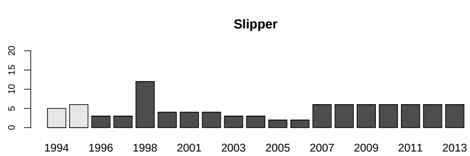




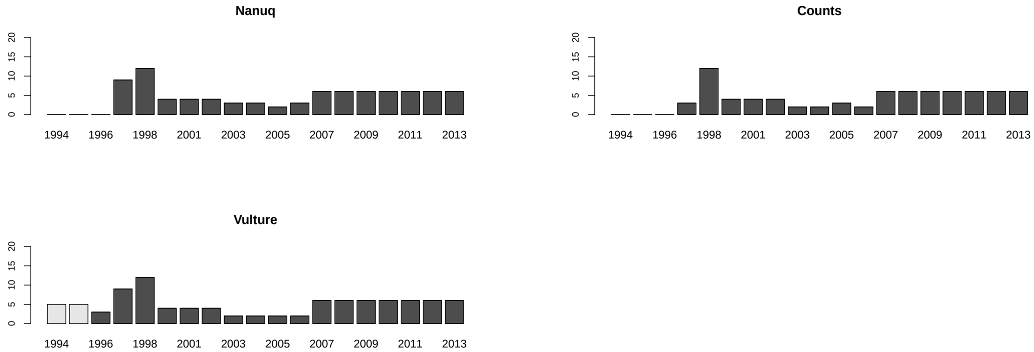






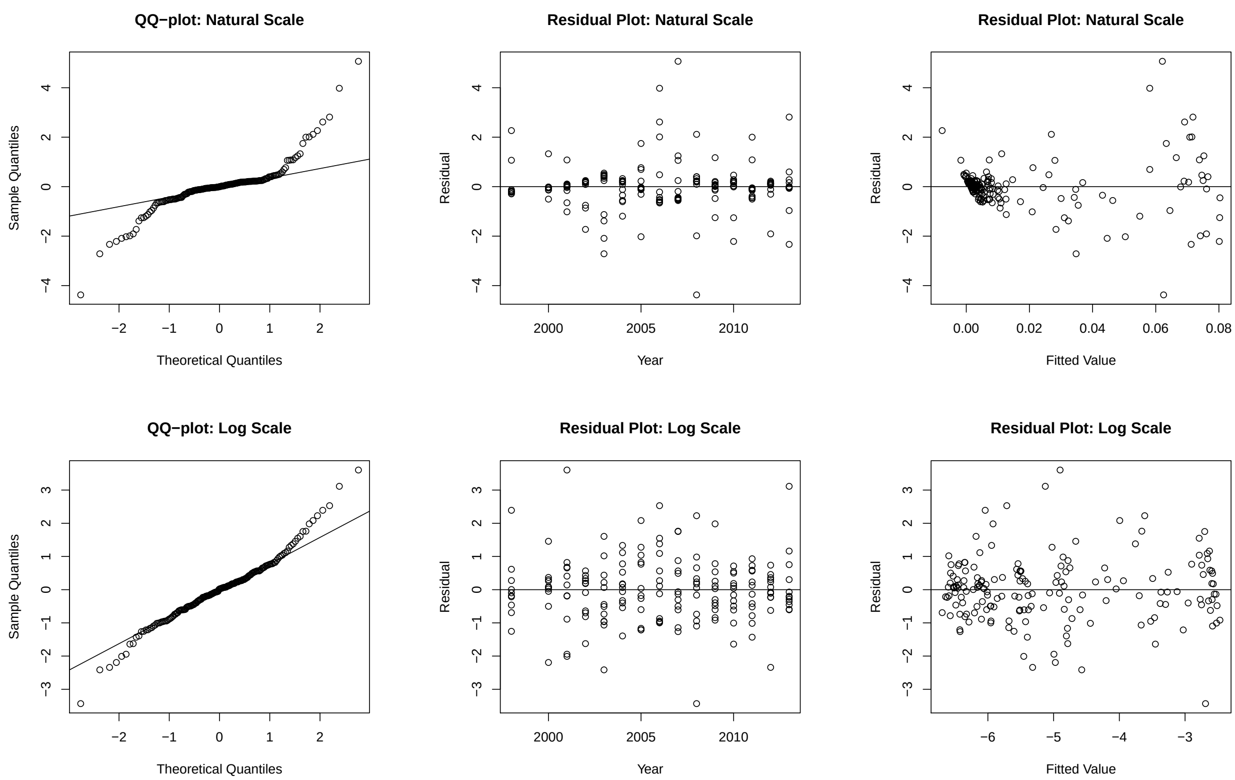


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
113	Moose	2006	0.08	0.06	3.98
114	Moose	2007	0.09	0.06	5.07
115	Moose	2008	0.04	0.06	-4.38

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
68	Kodiak	2001	0.01	-4.90	3.60
115	Moose	2008	0.04	-2.69	-3.43
180	S2	2013	0.01	-5.13	3.11

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
77.26	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
0.34	4.00	0.99

- Conclusions:
  The slopes do not differ significantly among reference lakes.

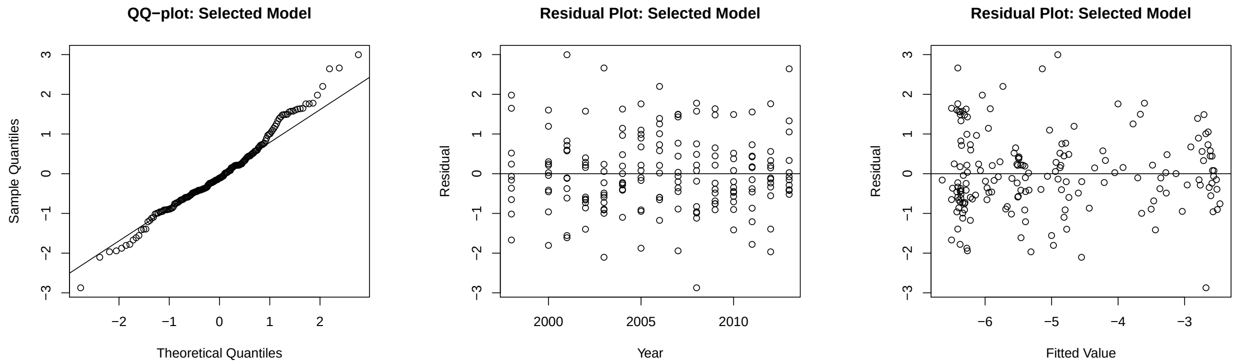
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
The reduced model shows dependence on year. Results of statistical analyses should be interpreted with caution.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	0.1156	2	0.9438
Kodiak	0.1597	2	0.9232
1616-30 (LLCF)	21.3776	2	0.0000
Leslie	30.0135	2	0.0000
Moose	261.9642	2	0.0000
Nema	227.8341	2	0.0000
Slipper	102.8393	2	0.0000
S2	51.2972	2	0.0000
S3	16.2030	2	0.0003

- Conclusions:
  All monitored lakes except Grizzly and Kodiak lakes show significant deviation from the common slope of reference lakes.

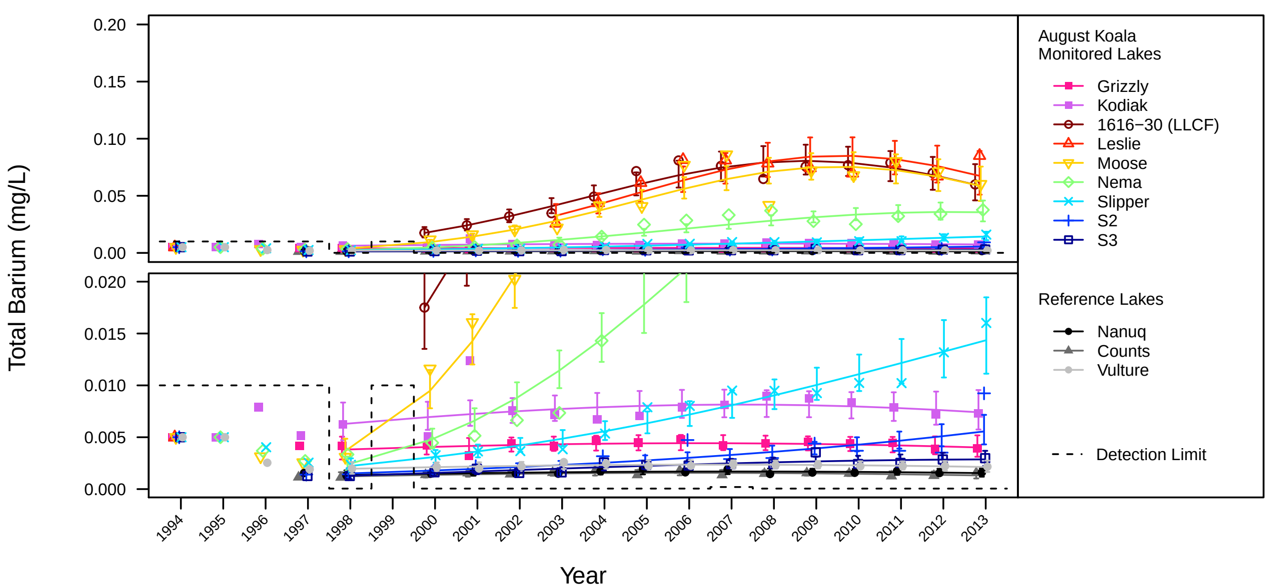
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0780
Monitored Lake	1616-30 (LLCF)	0.9570
Monitored Lake	Grizzly	0.2090
Monitored Lake	Kodiak	0.1380
Monitored Lake	Leslie	0.7790
Monitored Lake	Moose	0.9450
Monitored Lake	Nema	0.9150
Monitored Lake	S2	0.7230
Monitored Lake	S3	0.7720
Monitored Lake	Slipper	0.9520

- Conclusions:
  Model fit for Grizzly Lake is weak. Model fit for reference lakes and Kodiak Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total barium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	3.95e-03	4.02e-03	5.20e-04	3.12e-03	5.18e-03	1.52e-03
Kodiak	7.29e-03	7.41e-03	9.59e-04	5.75e-03	9.55e-03	2.81e-03
Leslie	8.51e-02	6.75e-02	9.62e-03	5.10e-02	8.92e-02	2.81e-02
1616-30 (LLCF)	5.99e-02	5.98e-02	8.00e-03	4.60e-02	7.77e-02	2.34e-02
Moose	6.02e-02	5.86e-02	7.59e-03	4.55e-02	7.56e-02	2.22e-02
Nema	3.77e-02	3.56e-02	4.60e-03	2.76e-02	4.58e-02	1.35e-02
Slipper	1.60e-02	1.43e-02	1.86e-03	1.11e-02	1.85e-02	5.43e-03
S2	9.23e-03	5.55e-03	7.19e-04	4.31e-03	7.16e-03	2.10e-03
S3	2.98e-03	2.86e-03	3.71e-04	2.22e-03	3.69e-03	1.09e-03
Nanuq	1.60e-03	1.55e-03	2.00e-04	1.20e-03	1.99e-03	NA
Counts	1.58e-03	1.32e-03	1.71e-04	1.03e-03	1.71e-03	NA
Vulture	2.17e-03	2.13e-03	2.76e-04	1.65e-03	2.75e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Barium	August	Koala	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	1	1616-30 (LLCF) Leslie Moose Nema Slipper S2 S3

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

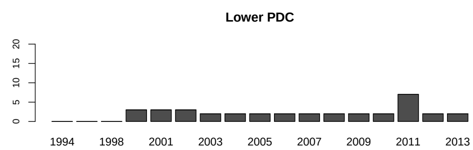
Analysis of August Total Barium in Koala Watershed Streams

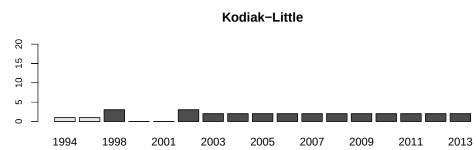
January 11, 2014

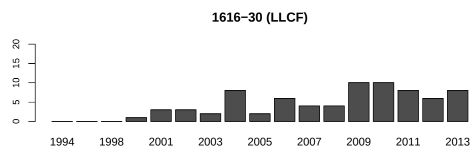
1 Censored Values:

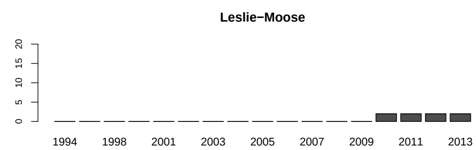
The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

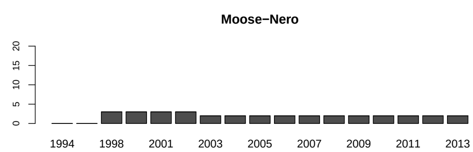
1.1 Monitored

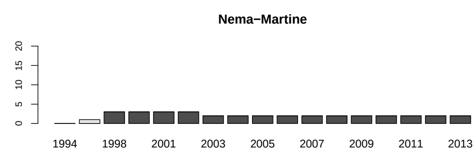


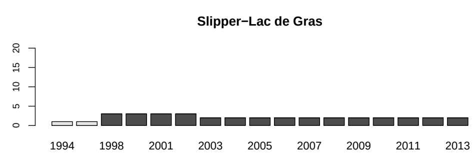




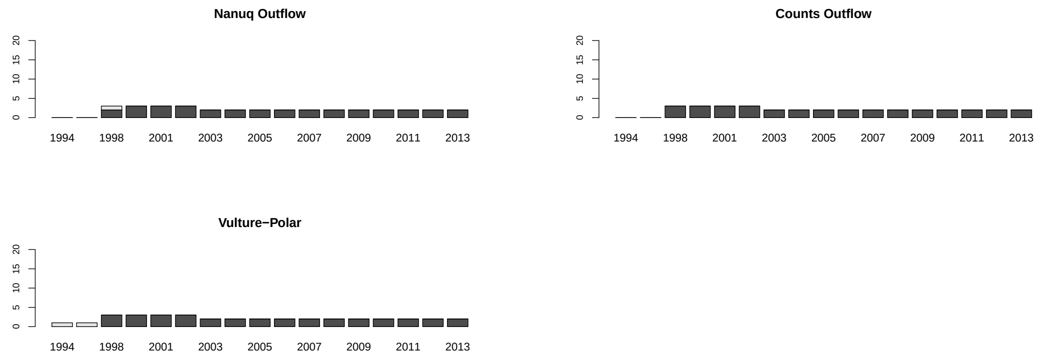






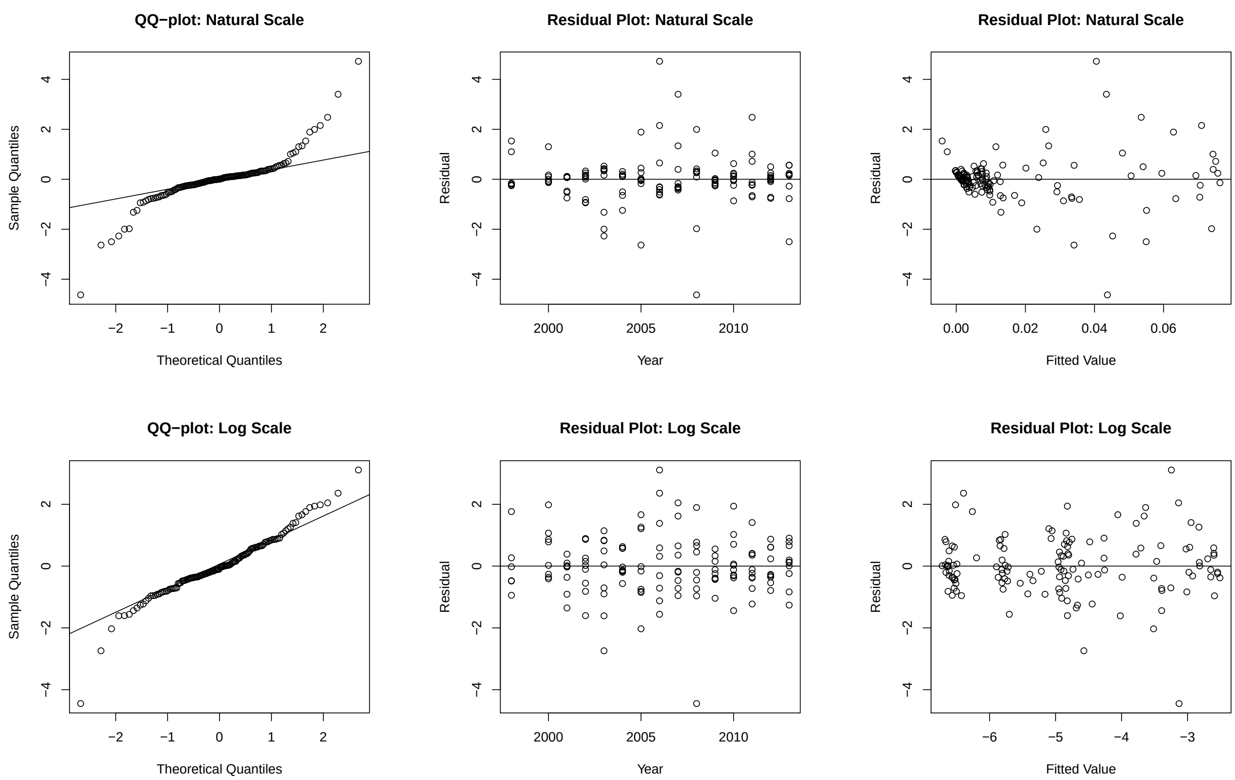


1.2 Reference



Comment:
None of the streams exhibited greater than 10% of data less than the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
113	Moose-Nero	2006	0.06	0.04	4.72
114	Moose-Nero	2007	0.06	0.04	3.40
115	Moose-Nero	2008	0.02	0.04	-4.63

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
113	Moose-Nero	2006	0.06	-3.24	3.11
115	Moose-Nero	2008	0.02	-3.13	-4.45

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
231.21	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
28.67	4.00	0.00

- Conclusions:
  The slopes differ significantly among reference streams. Reference streams do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Lower PDC	3.1677	2	0.2052
Kodiak-Little	2.7149	2	0.2573
Leslie-Moose	1.2292	2	0.5409
1616-30 (LLCF)	124.7655	2	0.0000
Moose-Nero	150.7147	2	0.0000
Nema-Martine	166.6570	2	0.0000
Slipper-Lac de Gras	81.0391	2	0.0000

- Conclusions:
  All monitored lakes except Lower PDC, Kodiak-Little, and Leslie-Moose show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored stream compared to slope of each reference stream (reference model 1b).

- Results:

	Chi-squared	DF	P-value
1616-30 (LLCF)-vs-Nanuq Outflow	156.9447	3	0.0000
1616-30 (LLCF)-vs-Counts Outflow	102.0902	3	0.0000
1616-30 (LLCF)-vs-Vulture-Polar	52.7214	3	0.0000
Moose-Nero-vs-Nanuq Outflow	2965.4784	3	0.0000
Moose-Nero-vs-Counts Outflow	3008.0136	3	0.0000
Moose-Nero-vs-Vulture-Polar	1705.5306	3	0.0000
Nema-Martine-vs-Nanuq Outflow	2095.3629	3	0.0000
Nema-Martine-vs-Counts Outflow	2137.6494	3	0.0000
Nema-Martine-vs-Vulture-Polar	1096.0776	3	0.0000
Slipper-Lac de Gras-vs-Nanuq Outflow	861.9491	3	0.0000
Slipper-Lac de Gras-vs-Counts Outflow	878.0216	3	0.0000
Slipper-Lac de Gras-vs-Vulture-Polar	286.9687	3	0.0000

- Conclusions:
  All of the remaining monitored streams show significant deviations from the slopes of individual reference streams.

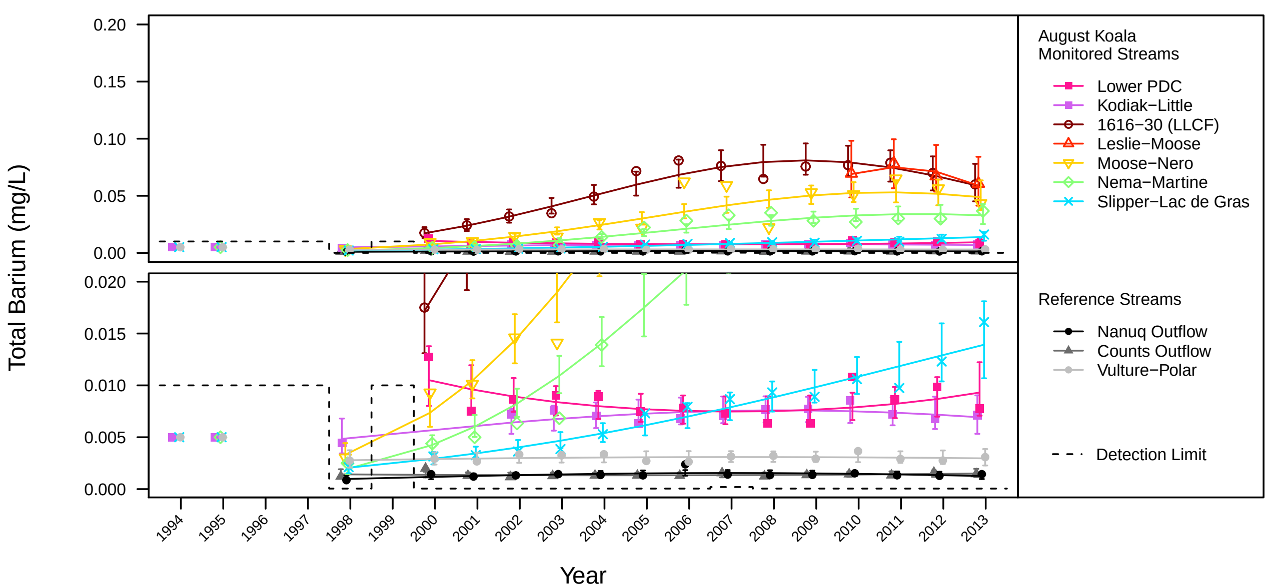
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Reference Stream	Counts Outflow	0.0770
Reference Stream	Nanuq Outflow	0.4050
Reference Stream	Vulture-Polar	0.0860
Monitored Stream	1616-30 (LLCF)	0.9570
Monitored Stream	Kodiak-Little	0.6640
Monitored Stream	Leslie-Moose	0.8410
Monitored Stream	Lower PDC	0.3010
Monitored Stream	Moose-Nero	0.8870
Monitored Stream	Nema-Martine	0.9360
Monitored Stream	Slipper-Lac de Gras	0.9620

- Conclusions:
  Model fit for Nanuq Outflow and Lower PDC is weak. Model fit for Counts Outflow and Vulture-Polar is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total barium for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	7.76e-03	9.30e-03	1.30e-03	7.08e-03	1.22e-02	3.80e-03
Kodiak-Little	7.15e-03	6.94e-03	9.35e-04	5.33e-03	9.04e-03	2.74e-03
Leslie-Moose	6.06e-02	5.90e-02	1.07e-02	4.13e-02	8.42e-02	3.13e-02
1616-30 (LLCF)	5.99e-02	5.93e-02	8.27e-03	4.51e-02	7.80e-02	2.42e-02
Moose-Nero	4.34e-02	4.88e-02	6.57e-03	3.75e-02	6.35e-02	1.92e-02
Nema-Martine	3.67e-02	3.29e-02	4.43e-03	2.53e-02	4.28e-02	1.30e-02
Slipper-Lac de Gras	1.61e-02	1.39e-02	1.87e-03	1.07e-02	1.81e-02	5.48e-03
Nanuq Outflow	1.44e-03	1.27e-03	1.70e-04	9.73e-04	1.65e-03	NA
Counts Outflow	1.46e-03	1.50e-03	2.02e-04	1.15e-03	1.95e-03	NA
Vulture-Polar	3.09e-03	2.97e-03	3.99e-04	2.28e-03	3.86e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Barium	August	Koala	Stream	Water	none	log e	linear mixed effects regression	#1b separate intercepts & slopes	1.0	1616-30 (LLCF) Moose-Nero Nema-Martine Slipper-Lac de Gras

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

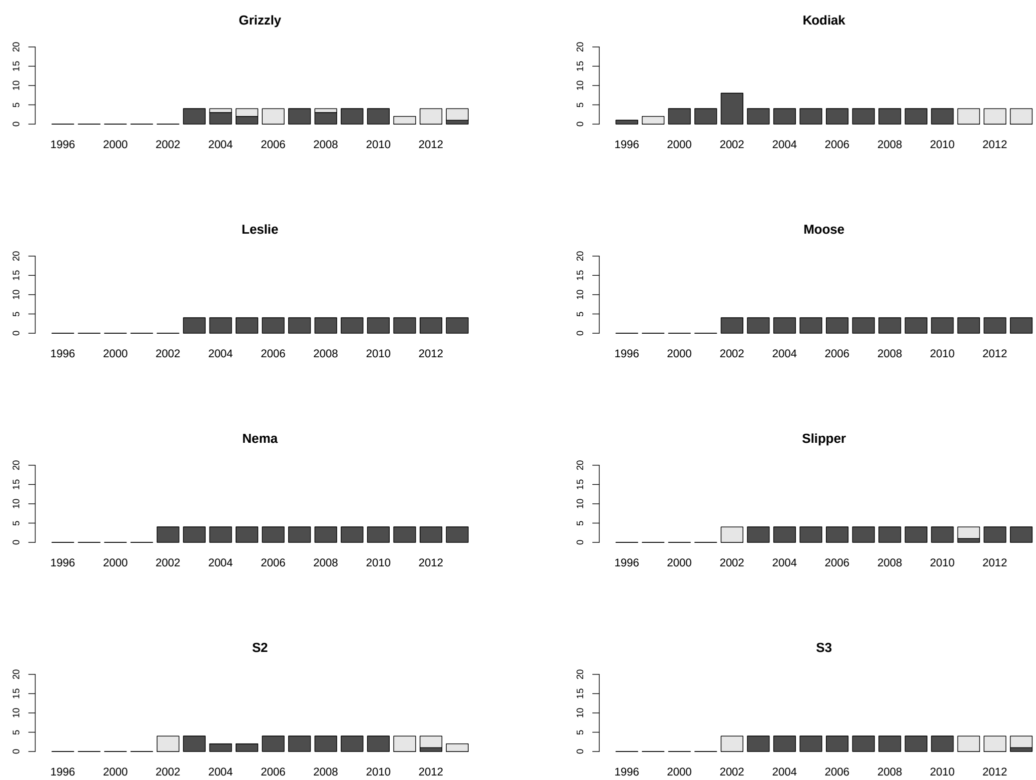
Analysis of April Total Boron in Lakes of the Koala Watershed and Lac de Gras

January 11, 2014

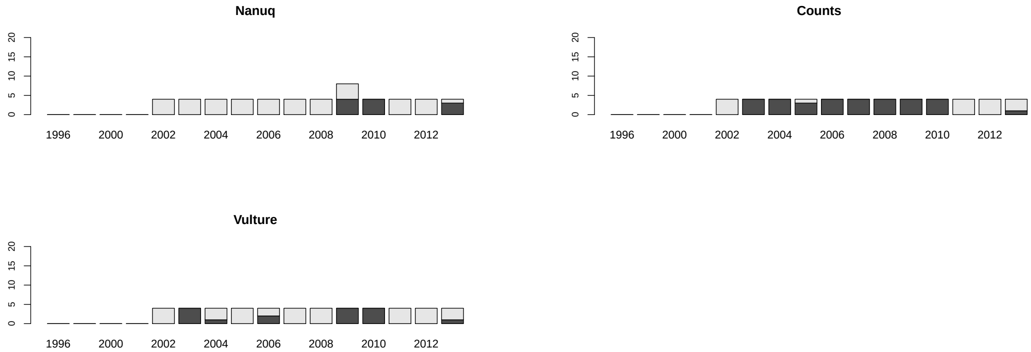
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

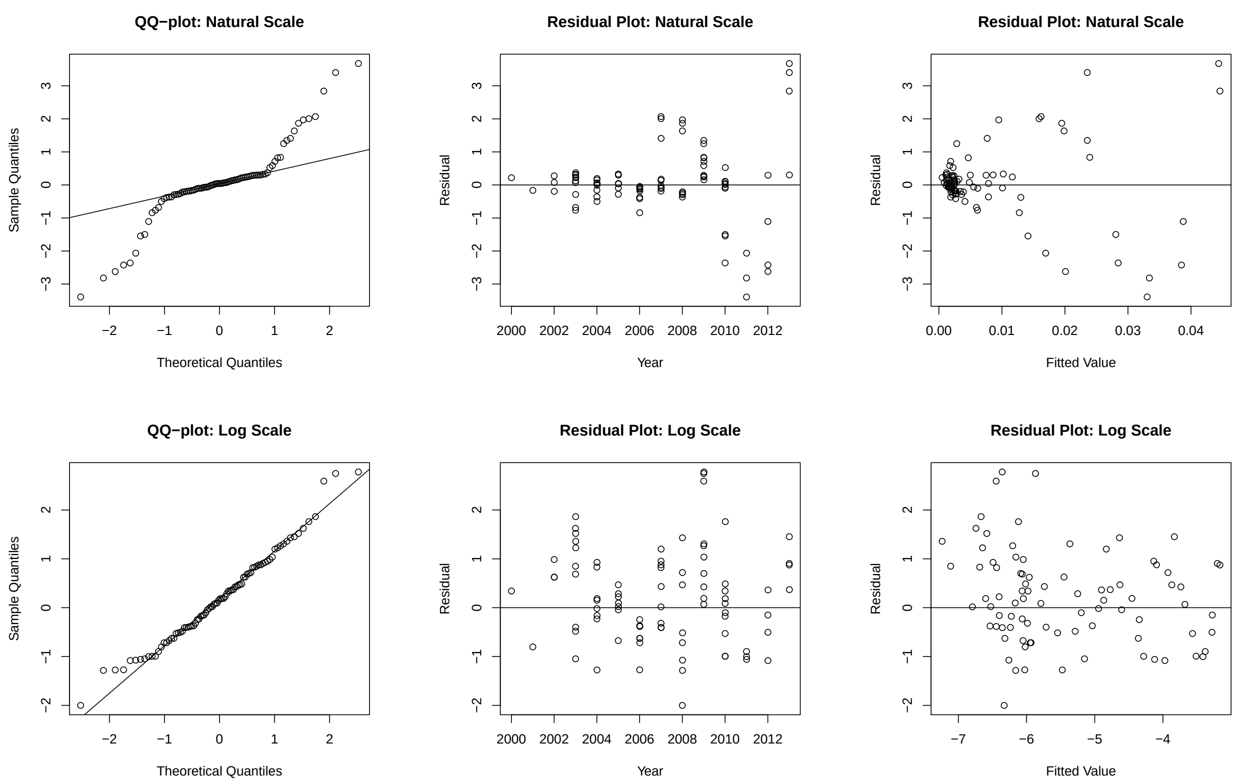


1.2 Reference



Comment:
Greater than 60% of data in Nanuq Lake was less than the detection limit. This lake was excluded from further analyses. 10-60% of data in Counts, Grizzly, Kodiak, Slipper, S2, and S3 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
118	Moose	2011	0.03	0.03	-3.39
120	Moose	2013	0.05	0.04	3.67
160	Nema	2013	0.03	0.02	3.40

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	3.41E-161	natural model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
7.70	3.00	0.05

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

- Results:

Chi-square	DF	p-value
2.91	2.00	0.23

- Conclusions:
  The slopes do not differ significantly among reference lakes.

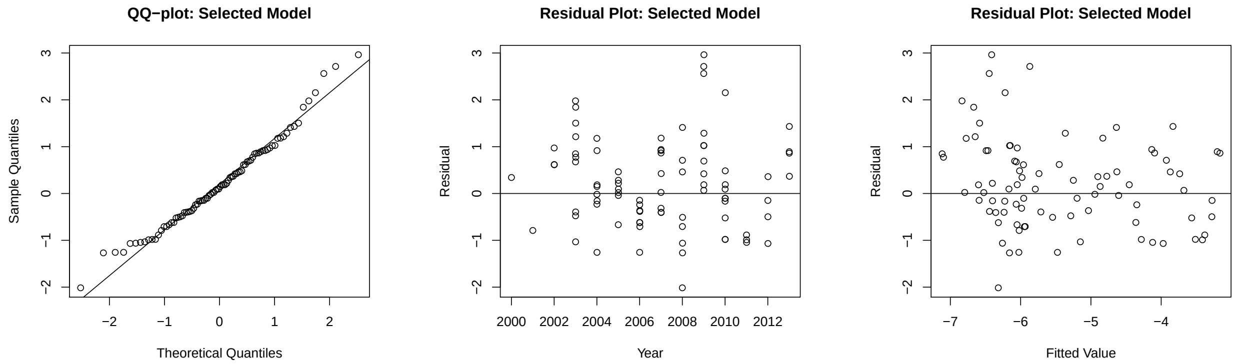
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.535	0.278	0.188	Indistinguishable support for 1 & 2; choose Model 2.

- Conclusions:
  Results of AIC do not agree with reference model testing. Although results of contrasts suggest that reference lakes share a common slope and intercept, AIC suggests that the reference lakes are best modeled with separate intercepts. Proceeding with monitored contrasts using reference model 2 (fitting separate intercepts and a common slope for reference lakes).

3.3 Assess Fit of Reduced Model



Outliers:

None

No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	0.2153	2	0.8980
Kodiak	9.0863	2	0.0106
Leslie	10.5029	2	0.0052
Moose	10.4129	2	0.0055
Nema	6.4669	2	0.0394
Slipper	6.2728	2	0.0434
S2	2.3336	2	0.3114
S3	1.4240	2	0.4907

- Conclusions:
  All monitored lakes except Grizzly, S2, and S3 show significant deviation from the common slope of reference lakes.

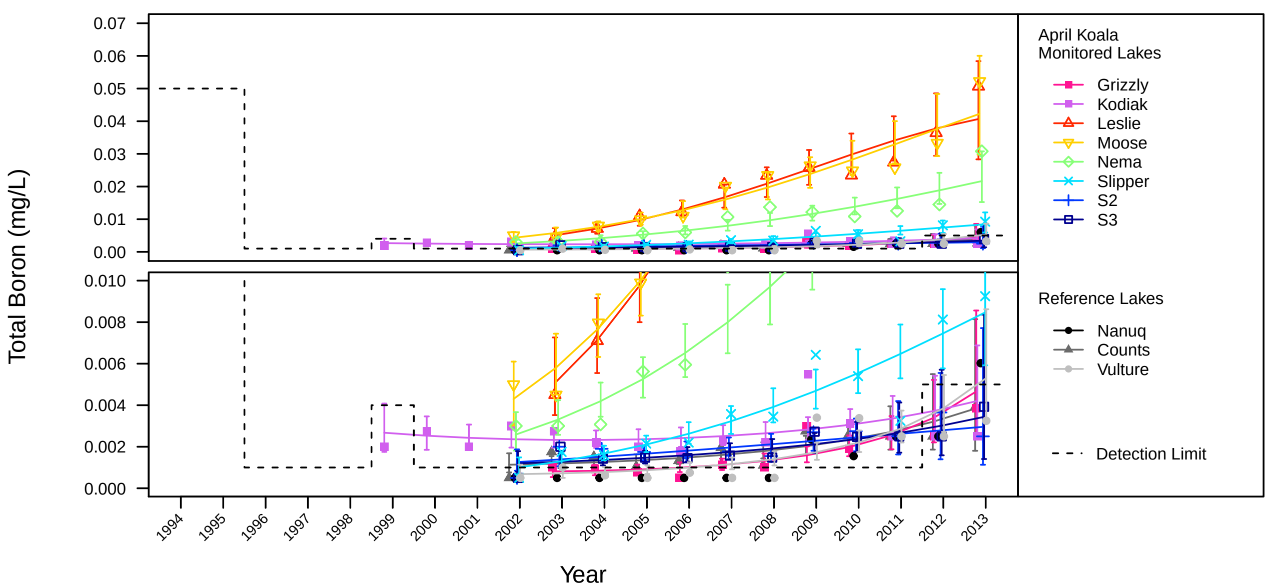
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.5920
Monitored Lake	Grizzly	0.7610
Monitored Lake	Kodiak	0.3040
Monitored Lake	Leslie	0.9530
Monitored Lake	Moose	0.9490
Monitored Lake	Nema	0.8900
Monitored Lake	S2	0.4010
Monitored Lake	S3	0.5340
Monitored Lake	Slipper	0.8180

- Conclusions:
  Model fit for Kodiak and S2 is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total boron for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	3.85e-03	4.66e-03	1.45e-03	2.54e-03	8.56e-03	4.23e-03
Kodiak	2.50e-03	4.20e-03	1.06e-03	2.57e-03	6.88e-03	3.09e-03
Leslie	5.07e-02	4.07e-02	7.51e-03	2.83e-02	5.84e-02	2.20e-02
Moose	5.22e-02	4.23e-02	7.57e-03	2.97e-02	6.00e-02	2.21e-02
Nema	3.08e-02	2.17e-02	3.88e-03	1.53e-02	3.08e-02	1.14e-02
Slipper	9.25e-03	8.46e-03	1.54e-03	5.92e-03	1.21e-02	4.50e-03
S2	2.50e-03	2.96e-03	1.45e-03	1.13e-03	7.71e-03	4.23e-03
S3	3.93e-03	3.43e-03	1.56e-03	1.41e-03	8.36e-03	4.56e-03
Nanuq	6.02e-03	NA	NA	NA	NA	NA
Counts	3.90e-03	3.83e-03	1.47e-03	1.80e-03	8.14e-03	NA
Vulture	3.25e-03	5.29e-03	1.32e-03	3.24e-03	8.62e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Boron	April	Koala	Lake	Water	Nanuq	log e	Tobit regression	#2 shared slopes	1.5	Kodiak Leslie Moose Nema Slipper

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

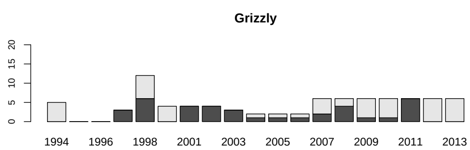
Analysis of August Total Boron in Lakes of the Koala Watershed and Lac de Gras

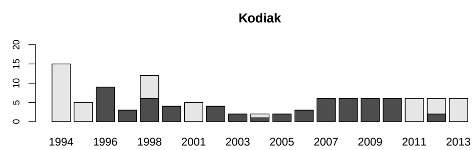
January 11, 2014

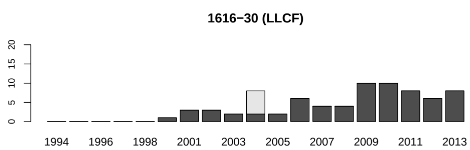
1 Censored Values:

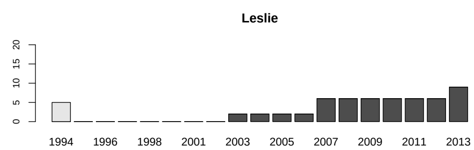
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

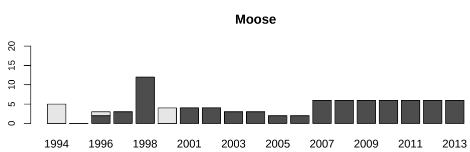
1.1 Monitored

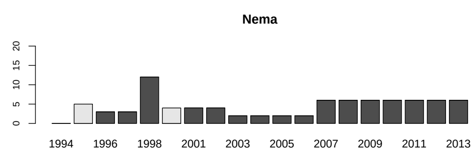


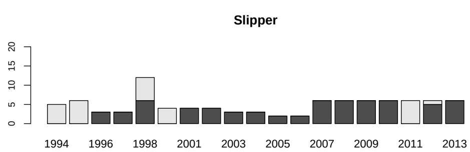




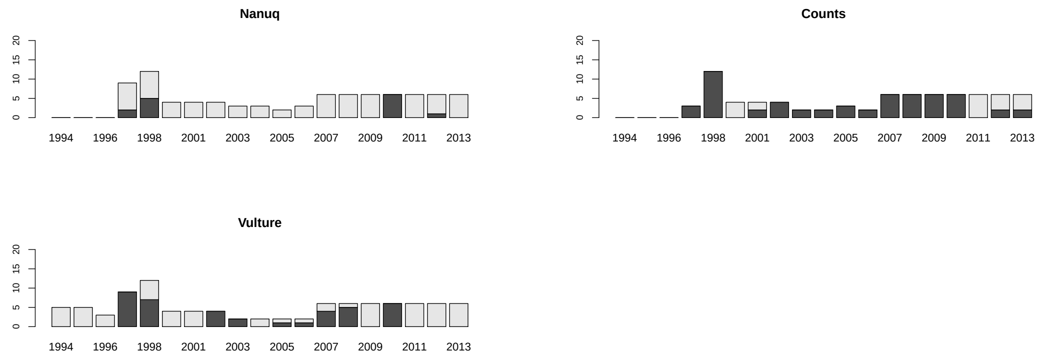






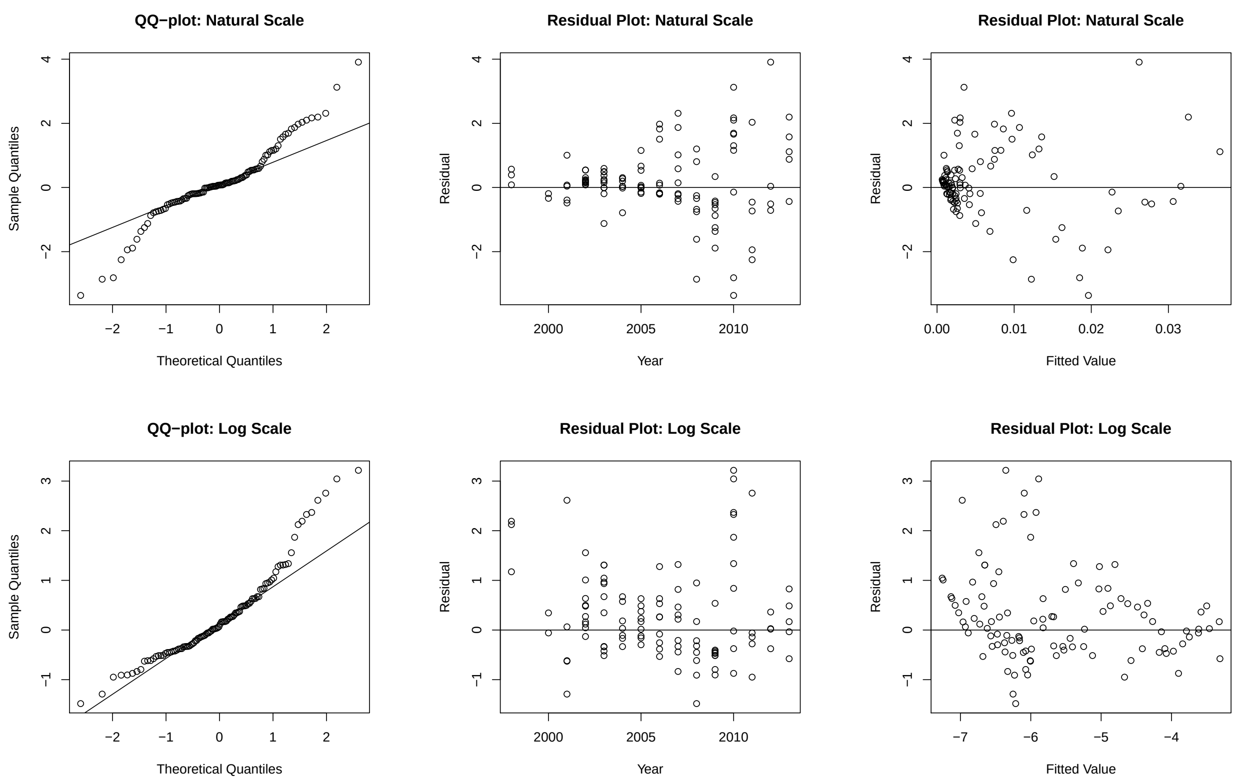


1.2 Reference



Comment:
Greater than 60% of data in Nanuq Lake was less than the detection limit. This lake was excluded from further analyses. 10-60% of data in Counts, Vulture, Grizzly, Kodiak, Slipper, S2, and S3 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
37	Counts	2010	0.01	0.00	3.13
97	Leslie	2010	0.02	0.02	-3.36
119	Moose	2012	0.03	0.03	3.91

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
37	Counts	2010	0.01	-5.89	3.04
237	Vulture	2010	0.01	-6.35	3.22

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
12.42	3.00	0.01

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
0.41	2.00	0.82

- Conclusions:
  The slopes do not differ significantly among reference lakes.

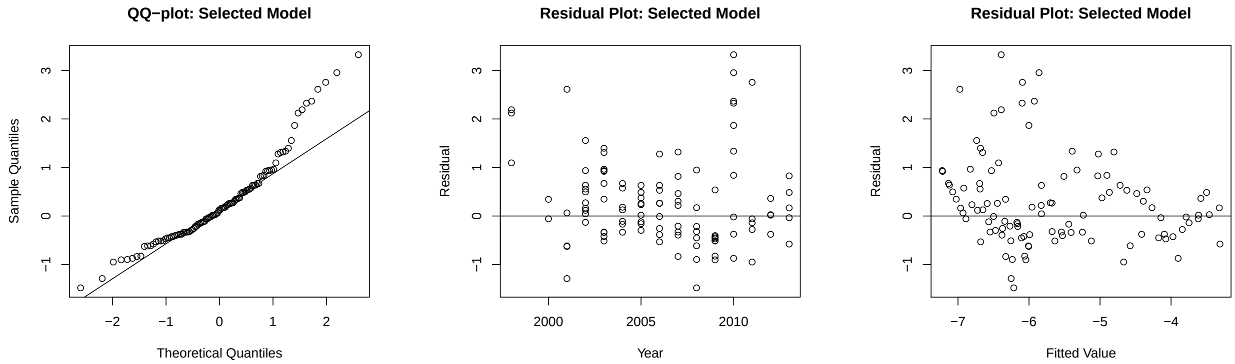
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.307	0.684	0.009	Indistinguishable support for 2 & 1; choose Model 2.

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with a common slope. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
237	Vulture	2010	0.01	-6.39	3.33

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	1.3004	2	0.5219
Kodiak	1.8572	2	0.3951
1616-30 (LLCF)	26.2988	2	0.0000
Leslie	5.8870	2	0.0527
Moose	21.7259	2	0.0000
Nema	5.3176	2	0.0700
Slipper	8.6659	2	0.0131
S2	2.7645	2	0.2510
S3	1.6964	2	0.4282

- Conclusions:
  1616-30 (LLCF), Leslie, Moose, and Slipper lakes show significant deviation from the common slope and intercept of reference lakes.

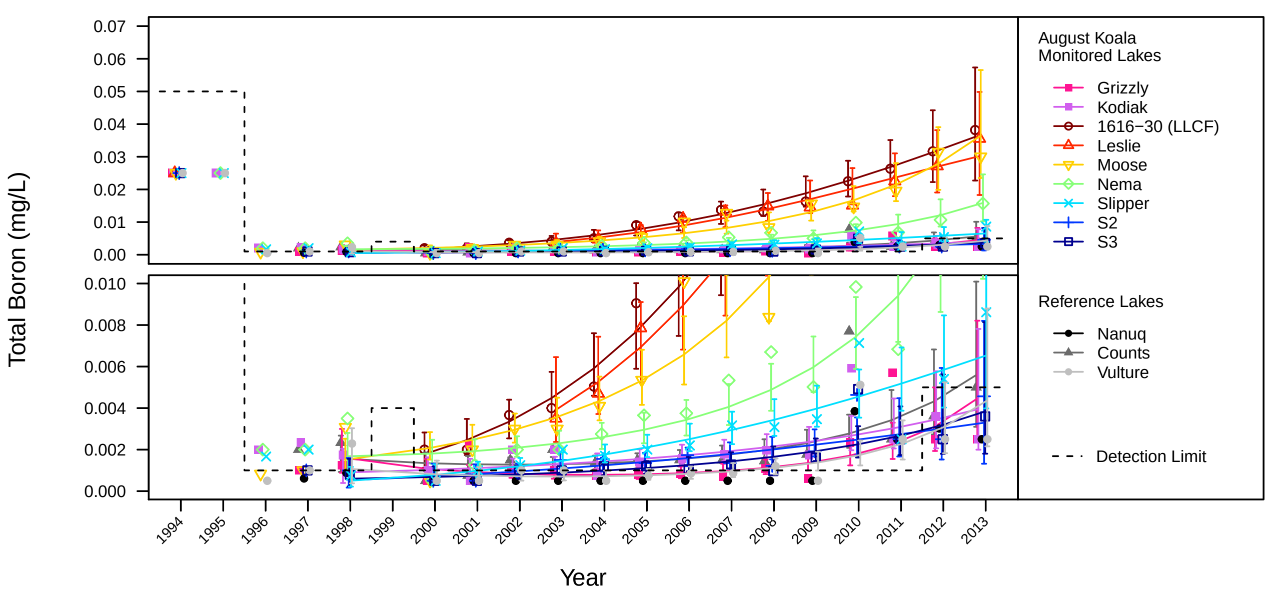
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.5800
Monitored Lake	1616-30 (LLCF)	0.9830
Monitored Lake	Grizzly	0.5290
Monitored Lake	Kodiak	0.5060
Monitored Lake	Leslie	0.9490
Monitored Lake	Moose	0.8120
Monitored Lake	Nema	0.7210
Monitored Lake	S2	0.7030
Monitored Lake	S3	0.7650
Monitored Lake	Slipper	0.8640

- Conclusions:
  Models provide a good fit for all monitored lakes.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total Boron for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	2.50e-03	4.46e-03	1.39e-03	2.42e-03	8.21e-03	4.06e-03
Kodiak	2.50e-03	3.95e-03	1.37e-03	2.00e-03	7.81e-03	4.02e-03
Leslie	3.55e-02	3.02e-02	7.72e-03	1.83e-02	4.98e-02	2.26e-02
1616-30 (LLCF)	3.82e-02	3.61e-02	8.53e-03	2.27e-02	5.73e-02	2.49e-02
Moose	3.00e-02	3.65e-02	8.17e-03	2.35e-02	5.65e-02	2.39e-02
Nema	1.57e-02	1.59e-02	3.55e-03	1.02e-02	2.46e-02	1.04e-02
Slipper	8.62e-03	6.53e-03	1.64e-03	3.98e-03	1.07e-02	4.81e-03
S2	4.57e-03	3.29e-03	1.53e-03	1.32e-03	8.20e-03	4.49e-03
S3	3.60e-03	3.83e-03	1.47e-03	1.80e-03	8.14e-03	4.31e-03
Nanuq	2.50e-03	NA	NA	NA	NA	NA
Counts	5.00e-03	5.59e-03	1.68e-03	3.10e-03	1.01e-02	NA
Vulture	2.50e-03	4.35e-03	1.56e-03	2.16e-03	8.79e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Boron	August	Koala	Lake	Water	Nanuq	log e	Tobit regression	#2 shared slopes	1.5	1616-30 (LLCF) Leslie Moose Slipper

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

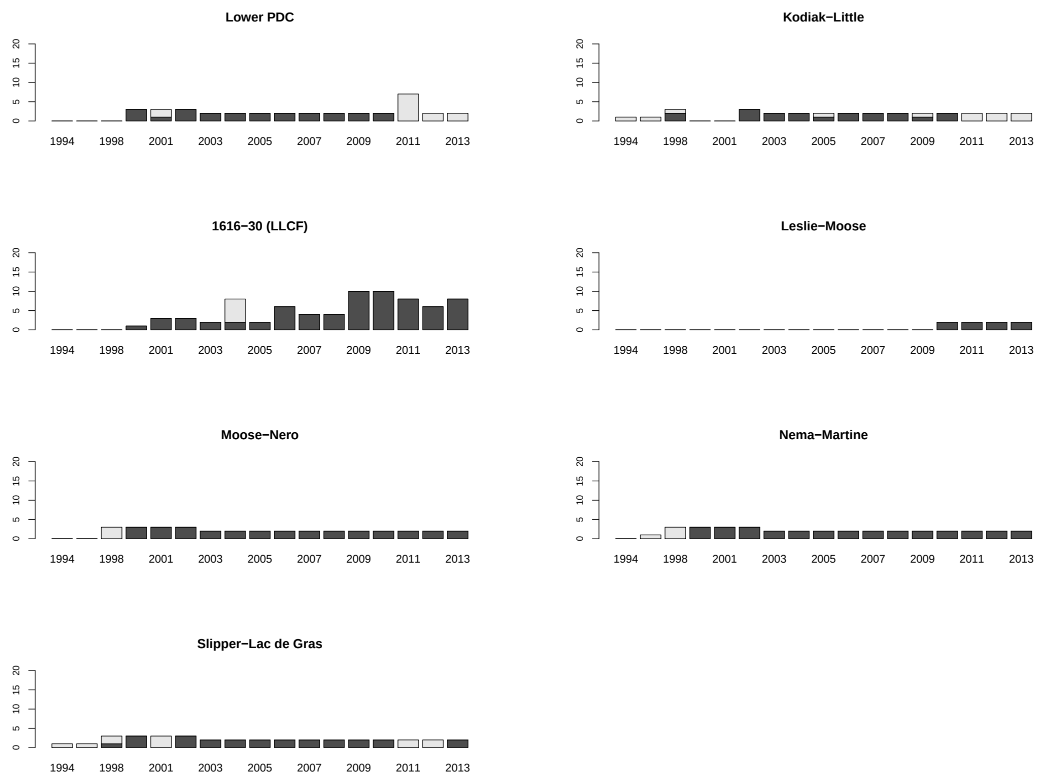
Analysis of August Total Boron in Koala Watershed Streams

January 11, 2014

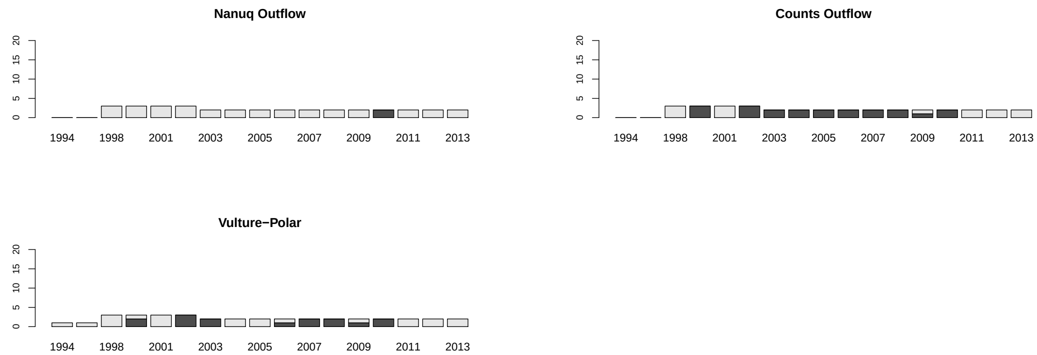
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

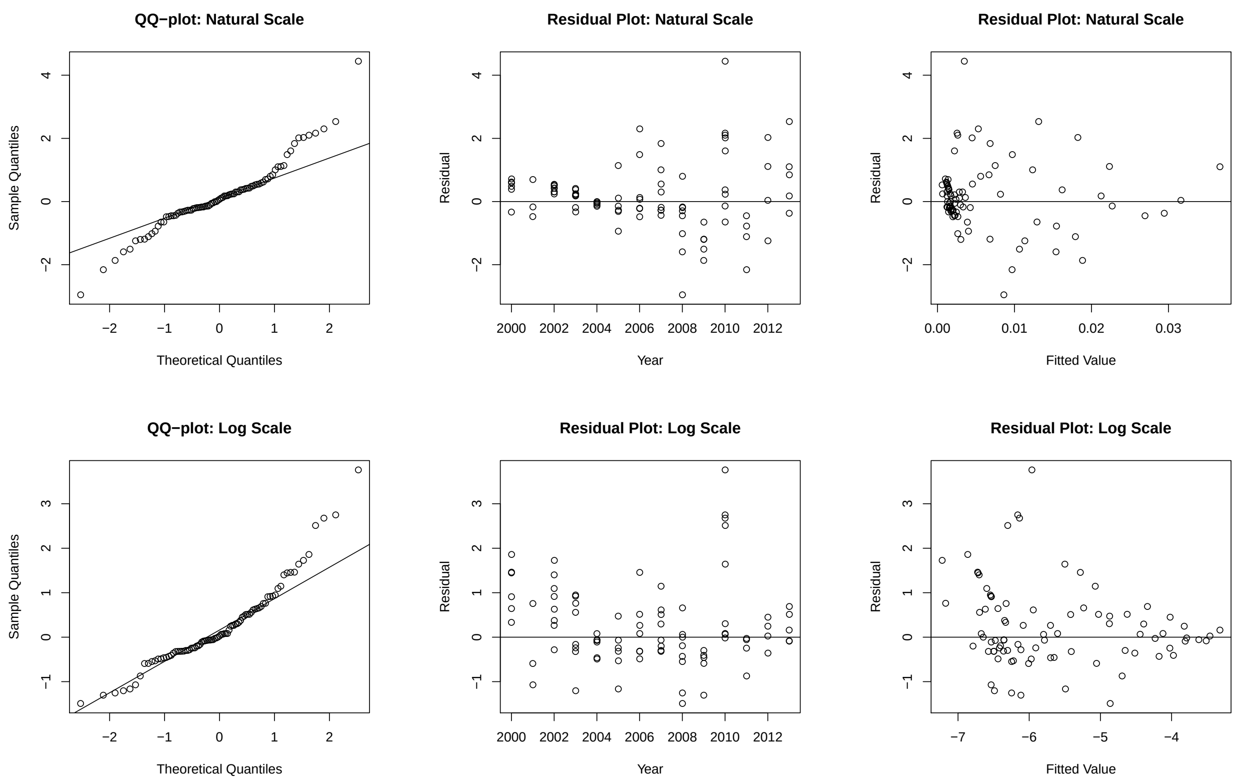


1.2 Reference



Comment:
Greater than 60% of data in Nanuq Outflow was less than the detection limit. These streams were excluded from further analyses. 10-60% of data in Counts Outflow, Vulture-Polar, Kodiak-Little, Lower PDC, and Slipper-Lac de Gras was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
97	Lower PDC	2010	0.01	0.00	4.44

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
97	Lower PDC	2010	0.01	-5.96	3.76

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
10.43	3.00	0.02

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
1.81	2.00	0.40

- Conclusions:
  The slopes do not differ significantly among reference streams.

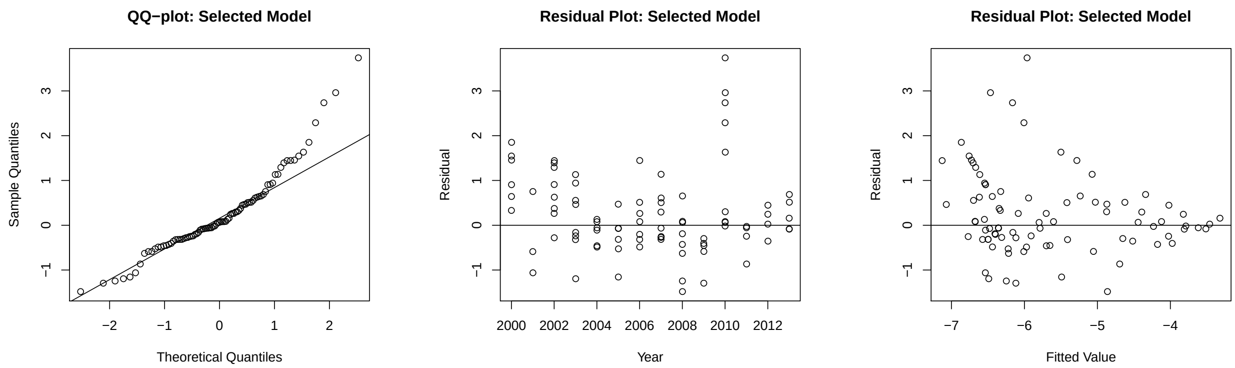
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.457	0.496	0.047	Indistinguishable support for 2 & 1; choose Model 2.

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with a common slope. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
97	Lower PDC	2010	0.01	-5.96	3.74

Conclusion:
Reduced model shows dependence on year and fitted value. Results should be interpreted with caution.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
Lower PDC	0.9881	2	0.6102
Kodiak-Little	0.6089	2	0.7375
Leslie-Moose	0.2820	2	0.8685
1616-30 (LLCF)	24.4239	2	0.0000
Moose-Nero	18.4609	2	0.0001
Nema-Martine	11.8861	2	0.0026
Slipper-Lac de Gras	3.5613	2	0.1685

- Conclusions:
  1616-30 (LLCF), Moose-Nero, and Nema-Martine show significant deviation from the common slope of reference streams.

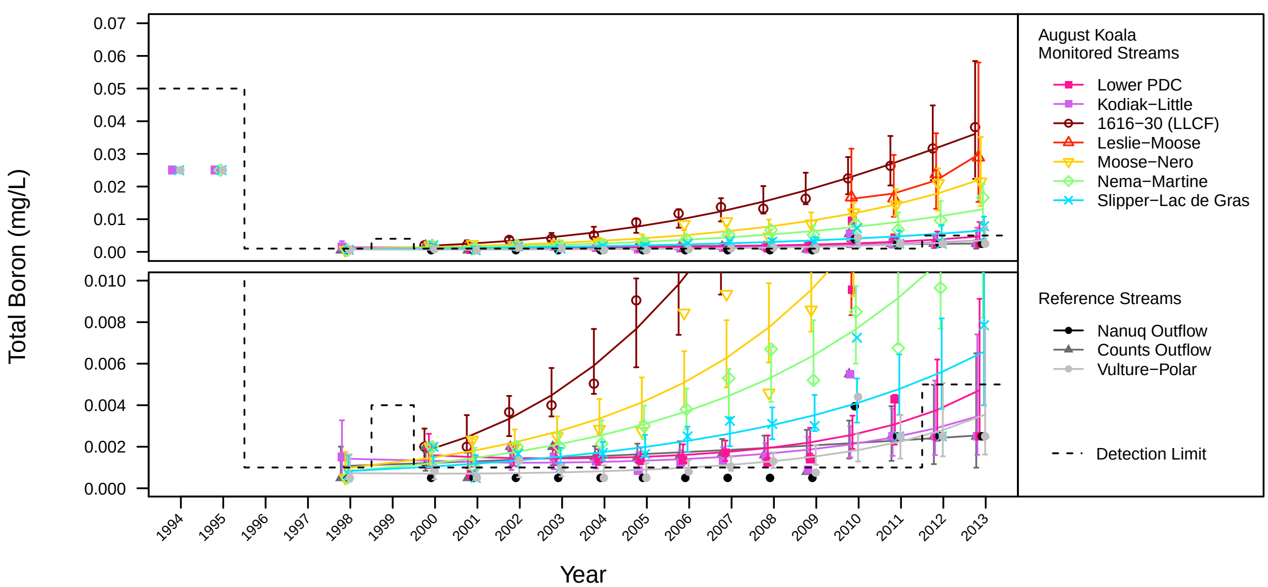
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.4450
Monitored Stream	1616-30 (LLCF)	0.9830
Monitored Stream	Kodiak-Little	0.4040
Monitored Stream	Leslie-Moose	0.9290
Monitored Stream	Lower PDC	0.3470
Monitored Stream	Moose-Nero	0.8940
Monitored Stream	Nema-Martine	0.9100
Monitored Stream	Slipper-Lac de Gras	0.6620

- Conclusions:
  Model fit for the reference streams, Kodiak-Little, and the Lower PDC is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total boron for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	2.50e-03	4.72e-03	1.59e-03	2.44e-03	9.12e-03	4.64e-03
Kodiak-Little	2.50e-03	3.45e-03	1.35e-03	1.61e-03	7.41e-03	3.94e-03
Leslie-Moose	2.90e-02	2.98e-02	1.01e-02	1.53e-02	5.80e-02	2.96e-02
1616-30 (LLCF)	3.82e-02	3.61e-02	8.86e-03	2.23e-02	5.84e-02	2.59e-02
Moose-Nero	2.15e-02	2.22e-02	5.21e-03	1.40e-02	3.52e-02	1.53e-02
Nema-Martine	1.66e-02	1.30e-02	3.08e-03	8.22e-03	2.07e-02	9.01e-03
Slipper-Lac de Gras	7.85e-03	6.56e-03	1.66e-03	4.00e-03	1.08e-02	4.86e-03
Nanuq Outflow	2.50e-03	NA	NA	NA	NA	NA
Counts Outflow	2.50e-03	2.54e-03	1.22e-03	9.93e-04	6.50e-03	NA
Vulture-Polar	2.50e-03	3.54e-03	1.41e-03	1.63e-03	7.72e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Boron	August	Koala	Stream	Water	Nanuq Outflow	log e	Tobit regression	#2 shared slopes	1.5	1616-30 (LLCF) Moose-Nero Nema-Martine

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

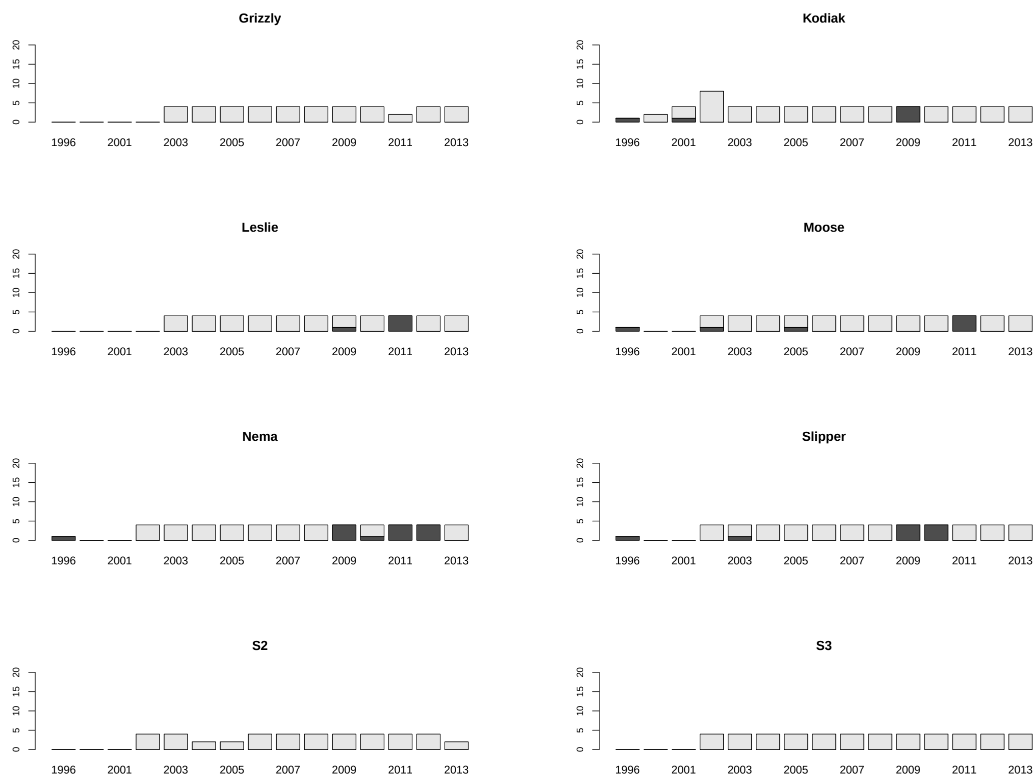
Analysis of April Total Cadmium in Lakes of the Koala Watershed and Lac de Gras

January 11, 2014

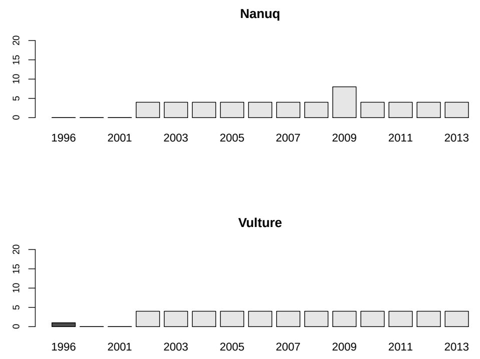
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

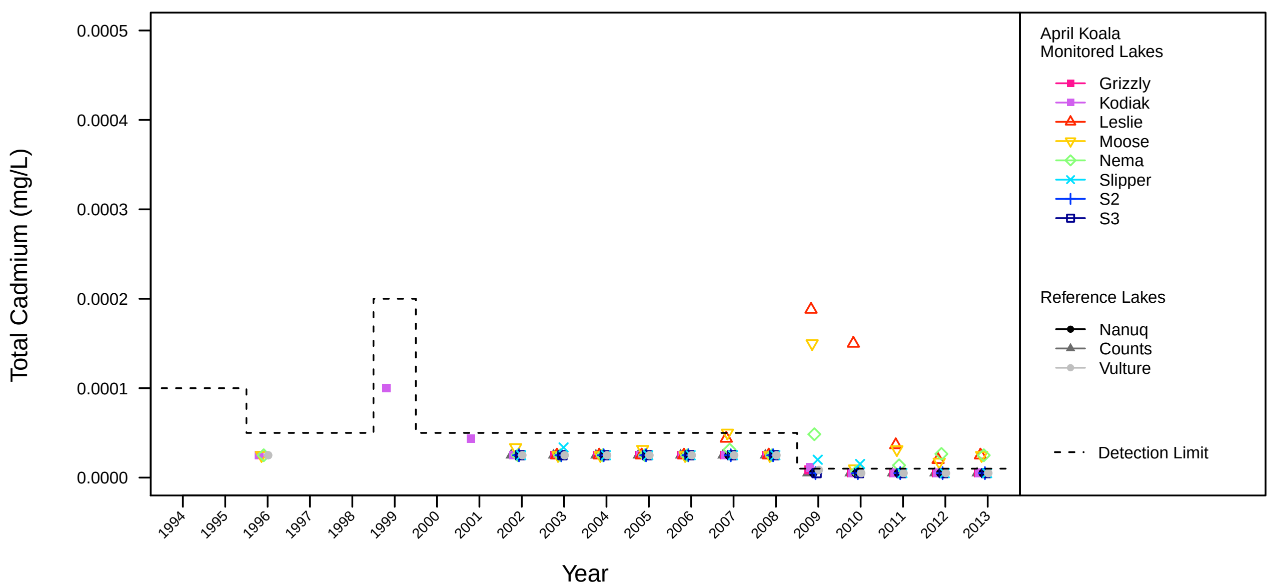


1.2 Reference



Comment:
Greater than 60% of data in all reference and monitored lakes was less than the detection limit. All lakes were excluded from further analyses. Statisical tests not performed. Note: 1616-30 (LLCF) was not monitored in April.

2 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only.

3 Minimum Detectable Differences

The estimated minimum detectable difference in mean total cadmium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	5.0e-06	NA	NA	NA	NA	NA
Kodiak	5.0e-06	NA	NA	NA	NA	NA
Leslie	2.5e-05	NA	NA	NA	NA	NA
Moose	2.5e-05	NA	NA	NA	NA	NA
Nema	2.5e-05	NA	NA	NA	NA	NA
Slipper	5.0e-06	NA	NA	NA	NA	NA
S2	5.0e-06	NA	NA	NA	NA	NA
S3	5.0e-06	NA	NA	NA	NA	NA
Nanuq	5.0e-06	NA	NA	NA	NA	NA
Counts	5.0e-06	NA	NA	NA	NA	NA
Vulture	5.0e-06	NA	NA	NA	NA	NA

4 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Cadmium	April	Koala	Lake	Water	ALL	NA	NA	NA	hardness-dependent	NA

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

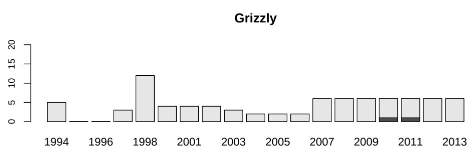
Analysis of August Total Cadmium in Lakes of the Koala Watershed and Lac de Gras

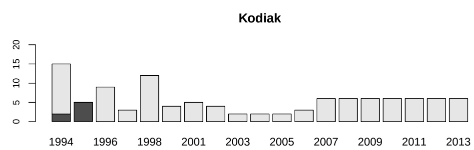
January 11, 2014

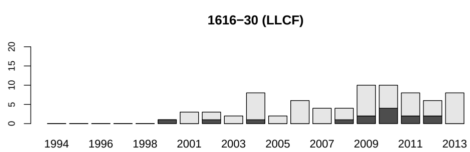
1 Censored Values:

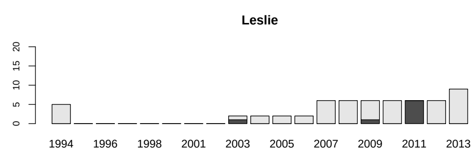
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

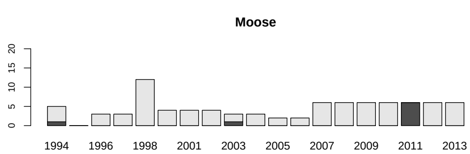
1.1 Monitored

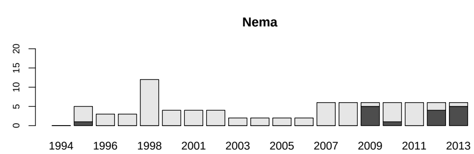


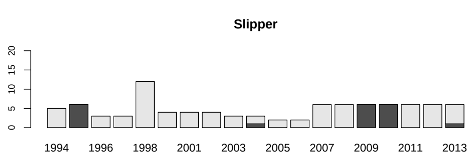


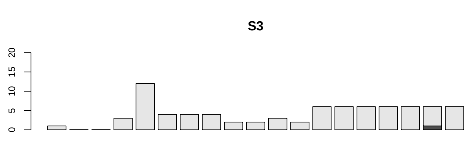




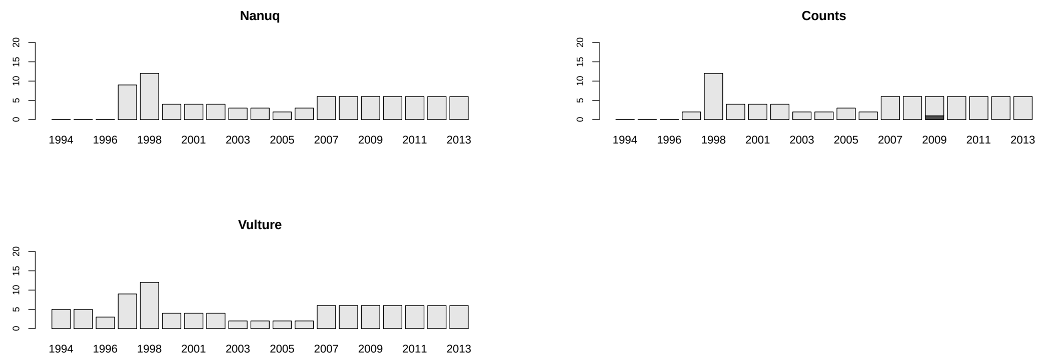






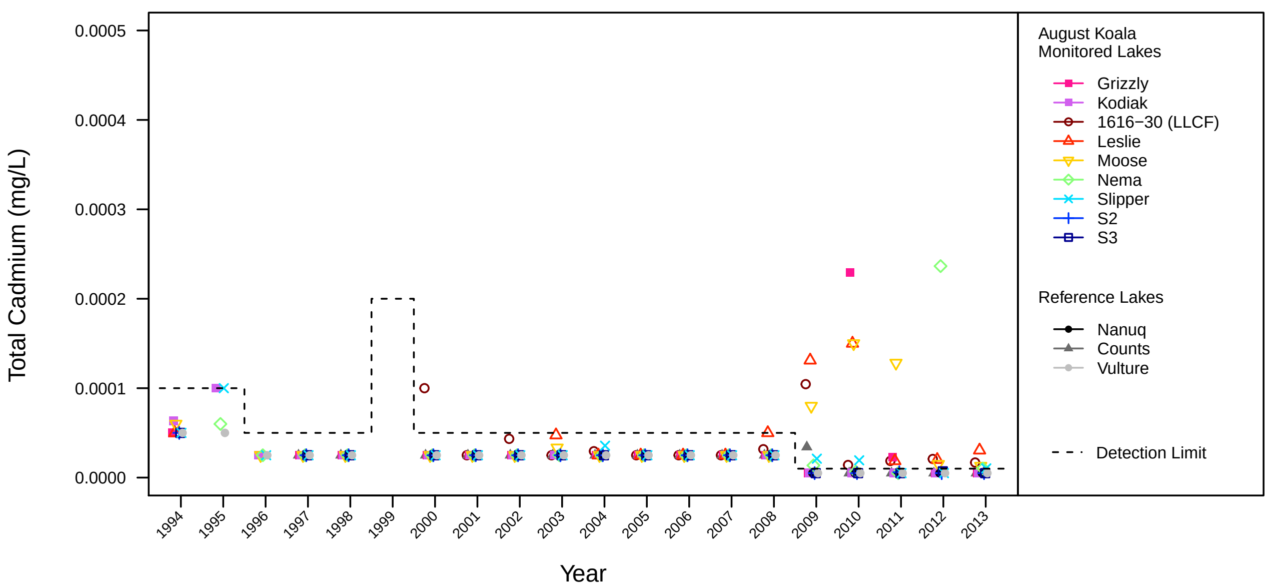


1.2 Reference



Comment:
Greater than 60% of data in all reference and monitored lakes was less than the detection limit. All lakes were excluded from further analyses. Tests not performed.

2 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only.

3 Minimum Detectable Differences

The estimated minimum detectable difference in mean total cadmium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	5.00e-06	NA	NA	NA	NA	NA
Kodiak	5.00e-06	NA	NA	NA	NA	NA
Leslie	3.06e-05	NA	NA	NA	NA	NA
1616-30 (LLCF)	1.69e-05	NA	NA	NA	NA	NA
Moose	1.29e-05	NA	NA	NA	NA	NA
Nema	1.02e-05	NA	NA	NA	NA	NA
Slipper	1.03e-05	NA	NA	NA	NA	NA
S2	5.00e-06	NA	NA	NA	NA	NA
S3	5.00e-06	NA	NA	NA	NA	NA
Nanuq	5.00e-06	NA	NA	NA	NA	NA
Counts	5.00e-06	NA	NA	NA	NA	NA
Vulture	5.00e-06	NA	NA	NA	NA	NA

4 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Cadmium	August	Koala	Lake	Water	ALL	NA	NA	NA	hardness-dependent	NA

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

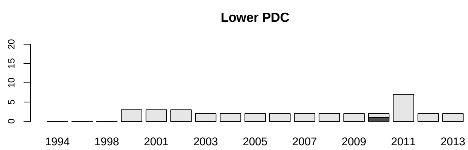
Analysis of August Total Cadmium in Koala Watershed Streams

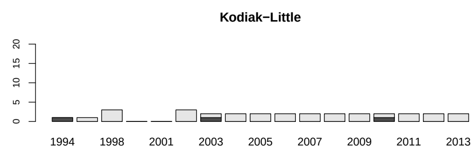
January 11, 2014

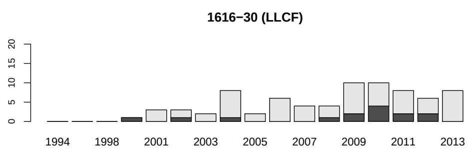
1 Censored Values:

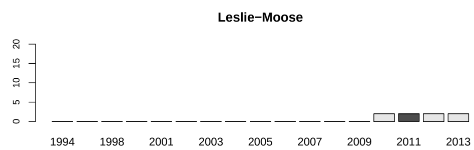
The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

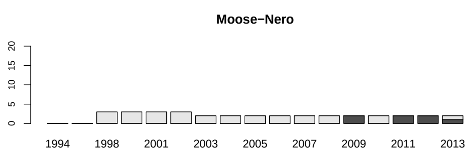
1.1 Monitored

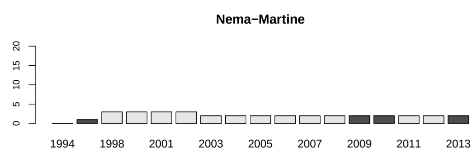


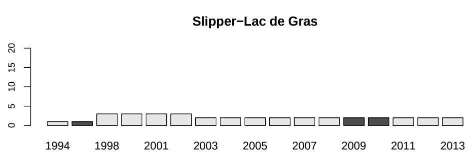




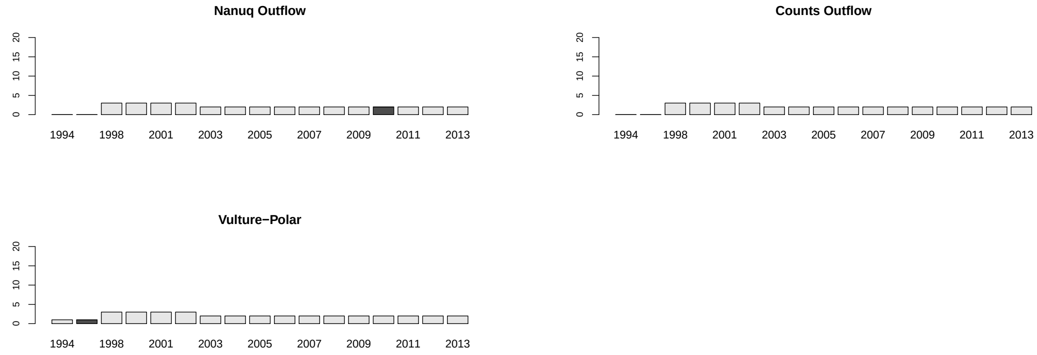






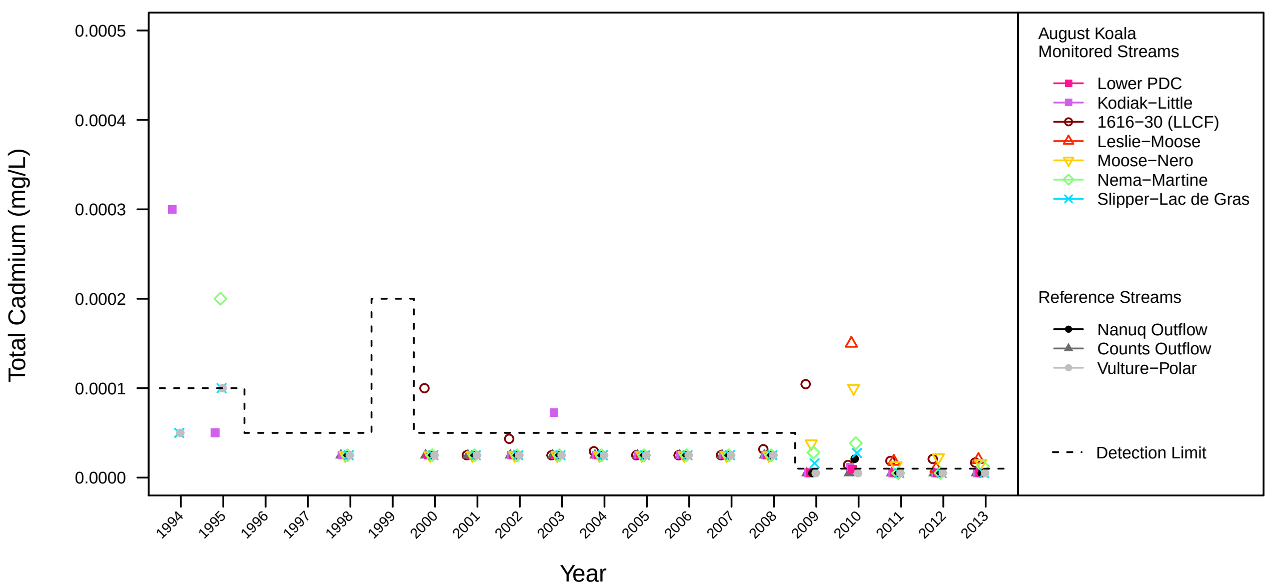


1.2 Reference



Comment:
Greater than 60% of data in all reference and monitored streams was less than the detection limit. All streams were excluded from further analyses. Tests not performed.

2 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only.

3 Minimum Detectable Differences

The estimated minimum detectable difference in mean varxxx for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	5.00e-06	NA	NA	NA	NA	NA
Kodiak-Little	5.00e-06	NA	NA	NA	NA	NA
Leslie-Moose	2.00e-05	NA	NA	NA	NA	NA
1616-30 (LLCF)	1.69e-05	NA	NA	NA	NA	NA
Moose-Nero	1.60e-05	NA	NA	NA	NA	NA
Nema-Martine	1.25e-05	NA	NA	NA	NA	NA
Slipper-Lac de Gras	5.00e-06	NA	NA	NA	NA	NA
Nanuq Outflow	5.00e-06	NA	NA	NA	NA	NA
Counts Outflow	5.00e-06	NA	NA	NA	NA	NA
Vulture-Polar	5.00e-06	NA	NA	NA	NA	NA

4 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor- mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con- trasts*
Cadmium	August	Koala	Stream	Water	ALL	NA	NA	NA	hardness- dependent	NA

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

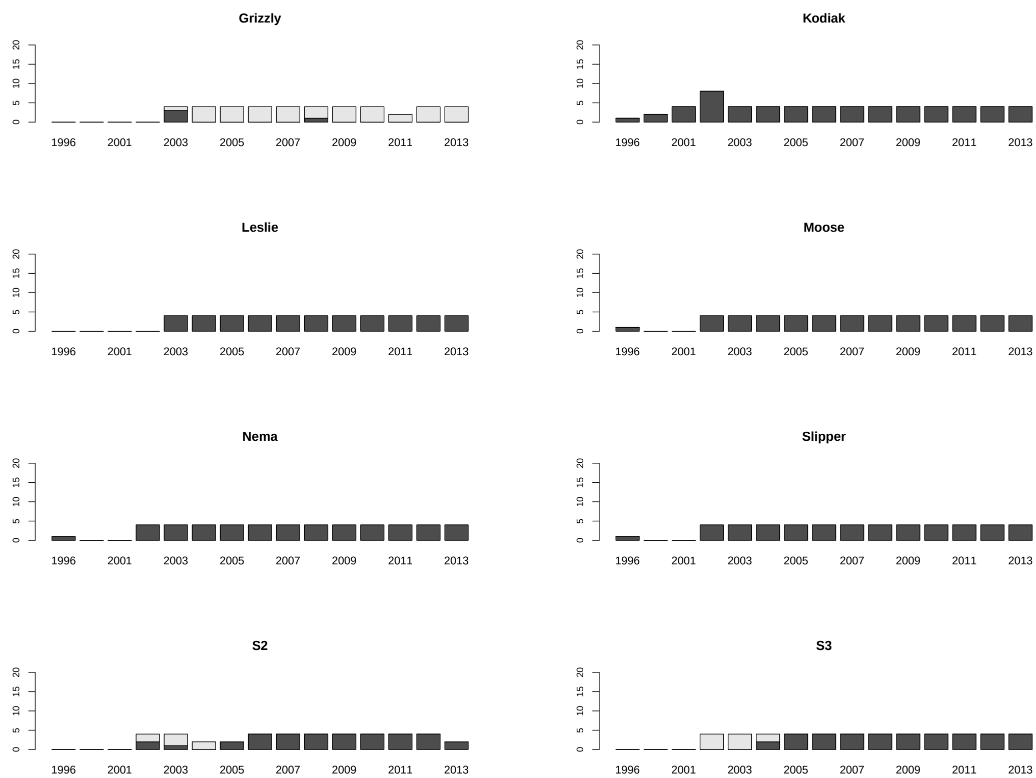
Analysis of April Total Molybdenum in Lakes of the Koala Watershed and Lac de Gras

January 11, 2014

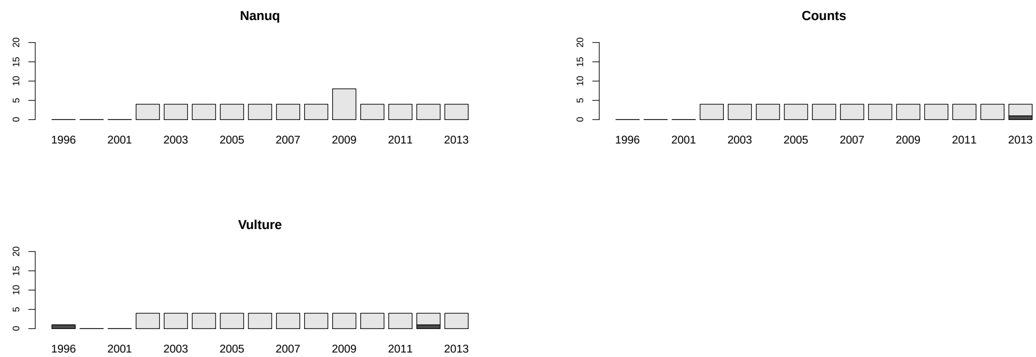
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

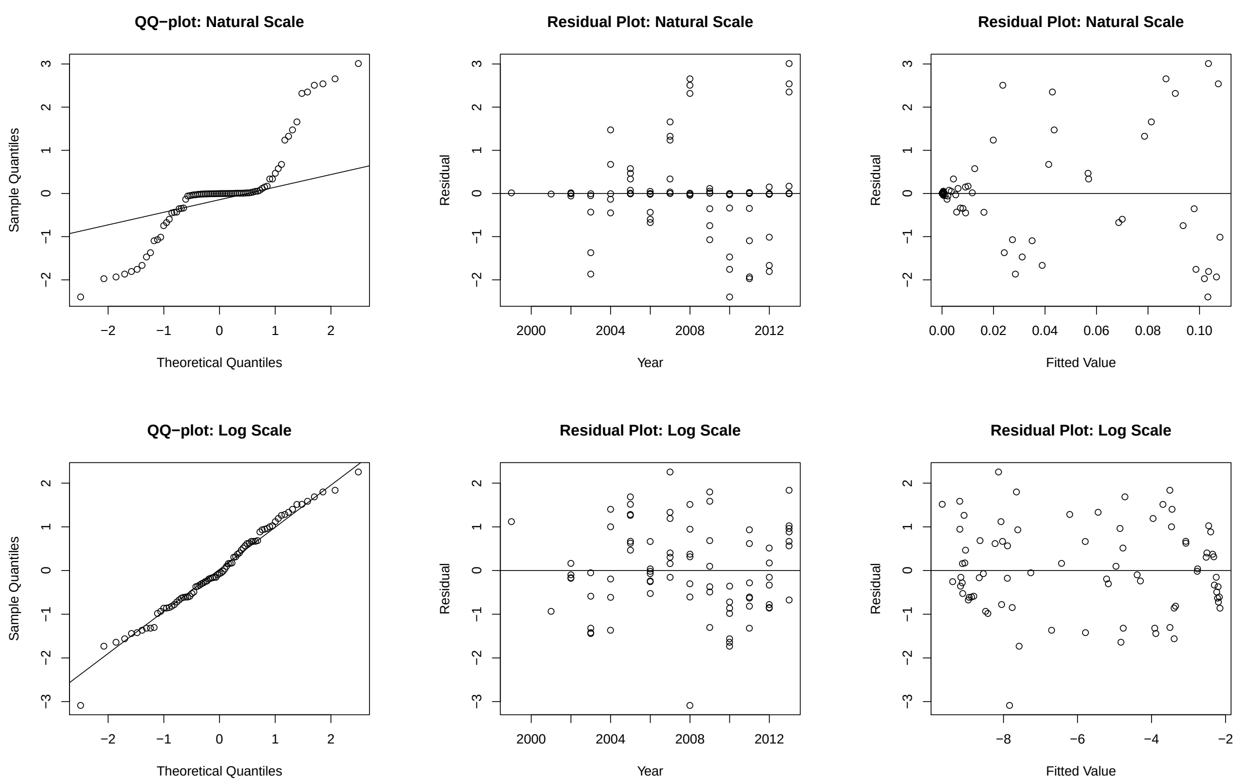


1.2 Reference



Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, and Grizzly lakes was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in S2 and S3 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
120	Moose	2013	0.13	0.10	3.01

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
195	S3	2008	0.00	-7.84	-3.09

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	1.38E-114	natural model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Kodiak	7.7361	2	0.0209
Leslie	19.9630	2	0.0000
Moose	33.6233	2	0.0000
Nema	69.2398	2	0.0000
Slipper	72.5824	2	0.0000
S2	26.2471	2	0.0000
S3	27.0084	2	0.0000

- Conclusions:
  All monitored lakes show significant deviation from a constant slope of zero.

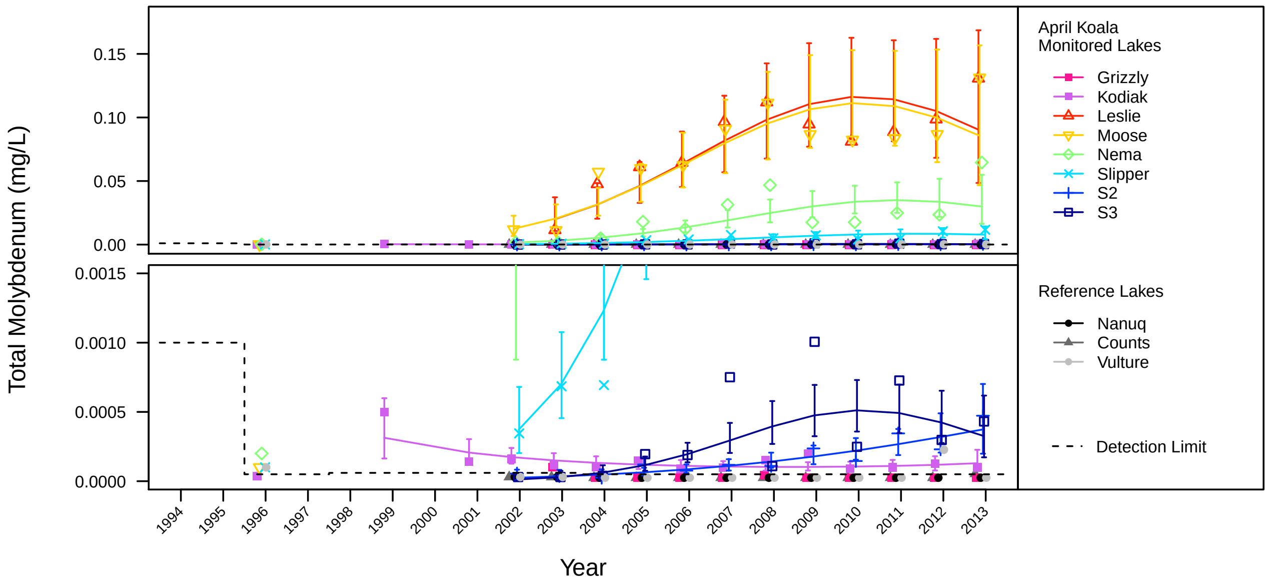
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	Kodiak	0.5080
Monitored Lake	Leslie	0.7840
Monitored Lake	Moose	0.8280
Monitored Lake	Nema	0.7970
Monitored Lake	S2	0.8140
Monitored Lake	S3	0.7630
Monitored Lake	Slipper	0.8630

- Conclusions:
  Models provide a good fit for all monitored lakes.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total molybdenum for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	2.50e-05	NA	NA	NA	NA	NA
Kodiak	9.77e-05	1.29e-04	3.69e-05	7.40e-05	2.27e-04	1.08e-04
Leslie	1.31e-01	9.04e-02	2.87e-02	4.85e-02	1.69e-01	8.41e-02
Moose	1.31e-01	8.56e-02	2.64e-02	4.67e-02	1.57e-01	7.73e-02
Nema	6.45e-02	3.00e-02	9.25e-03	1.64e-02	5.49e-02	2.71e-02
Slipper	1.17e-02	7.79e-03	2.41e-03	4.26e-03	1.43e-02	7.04e-03
S2	4.72e-04	3.73e-04	1.20e-04	1.99e-04	7.02e-04	3.52e-04
S3	4.31e-04	3.26e-04	1.06e-04	1.72e-04	6.18e-04	3.11e-04
Nanuq	2.50e-05	NA	NA	NA	NA	NA
Counts	5.30e-05	NA	NA	NA	NA	NA
Vulture	2.50e-05	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Molybdenum	April	Koala	Lake	Water	Counts Nanuq Vulture Grizzly	log e	Tobit regression	#1a slope of zero & slopes	19.38	Kodiak Leslie Moose Nema Slipper S2 S3

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

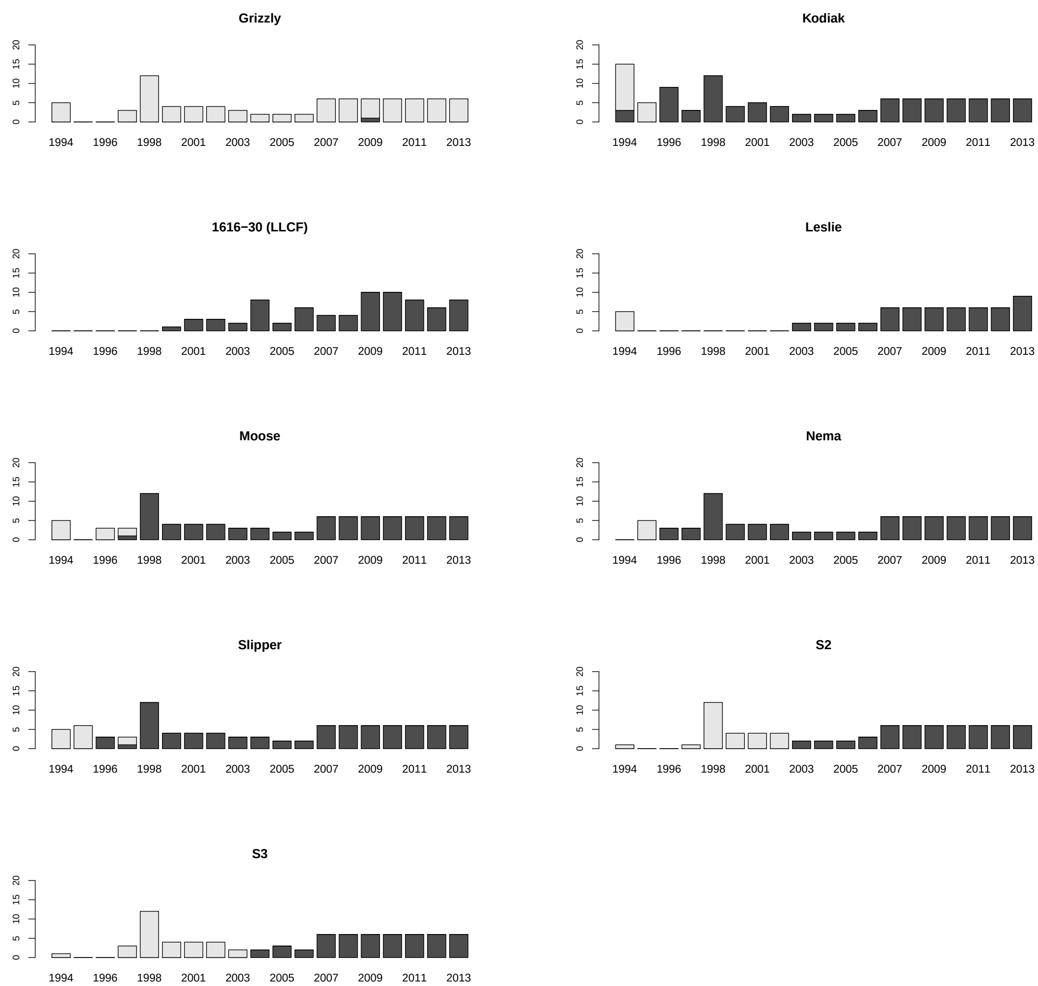
Analysis of August Total Molybdenum in Lakes of the Koala Watershed and Lac de Gras

January 20, 2014

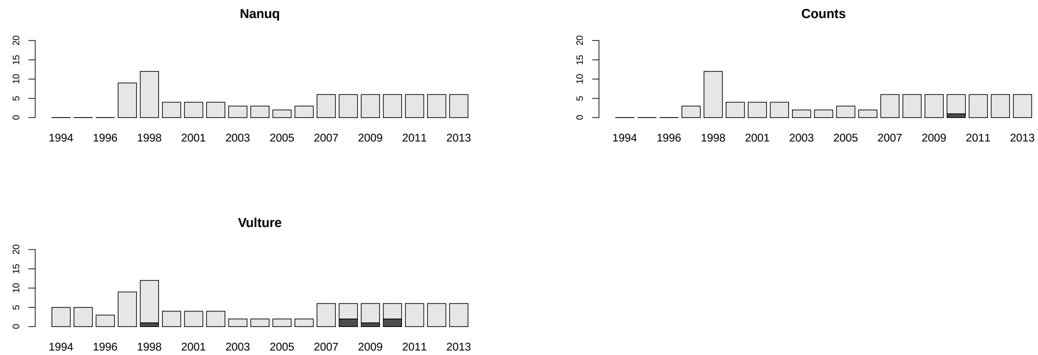
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

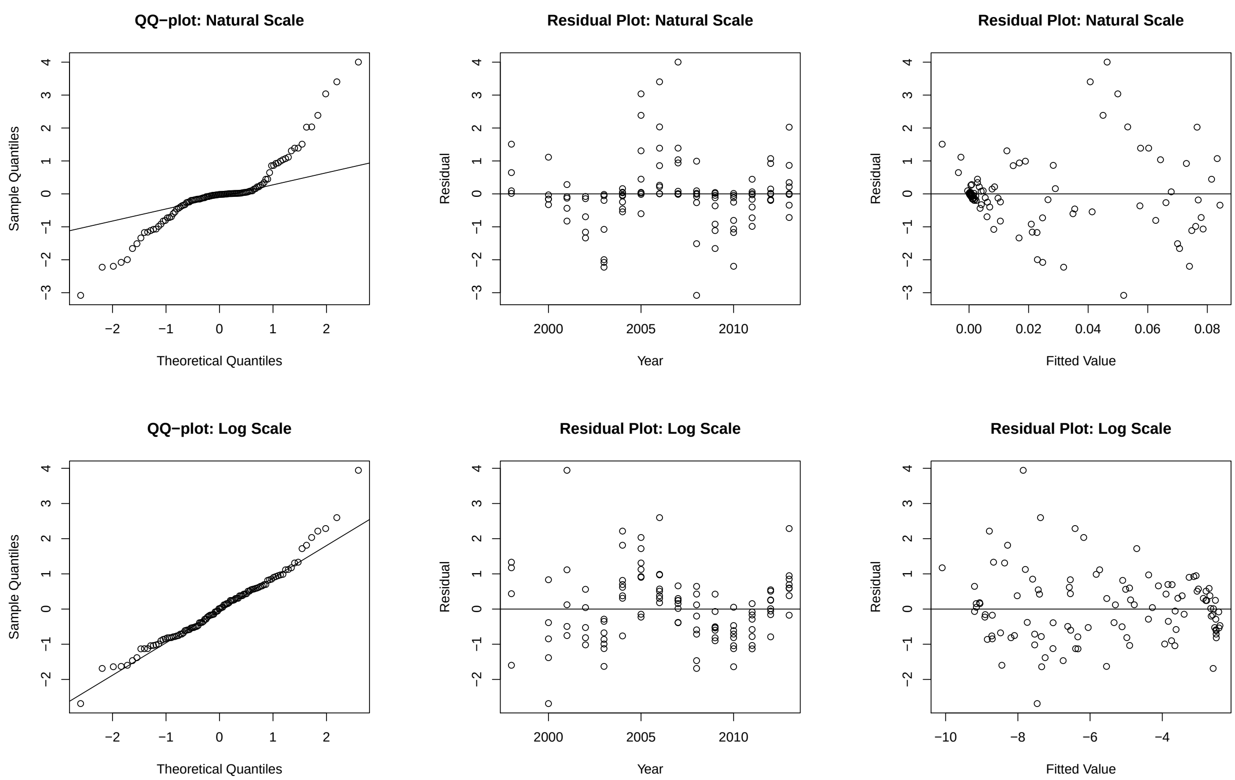


1.2 Reference



Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, and Grizzly lakes was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in S2 and S3 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
12	1616-30 (LLCF)	2005	0.07	0.05	3.04
113	Moose	2006	0.06	0.04	3.40
114	Moose	2007	0.07	0.05	4.00
115	Moose	2008	0.03	0.05	-3.08

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
68	Kodiak	2001	0.00	-7.85	3.94

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Kodiak	35.5038	2	0.0000
1616-30 (LLCF)	52.2032	2	0.0000
Leslie	9.9004	2	0.0071
Moose	190.3045	2	0.0000
Nema	146.3937	2	0.0000
Slipper	157.3587	2	0.0000
S2	65.2380	2	0.0000
S3	31.6431	2	0.0000

- Conclusions:
  All monitored lakes show significant deviation from a constant slope of zero.

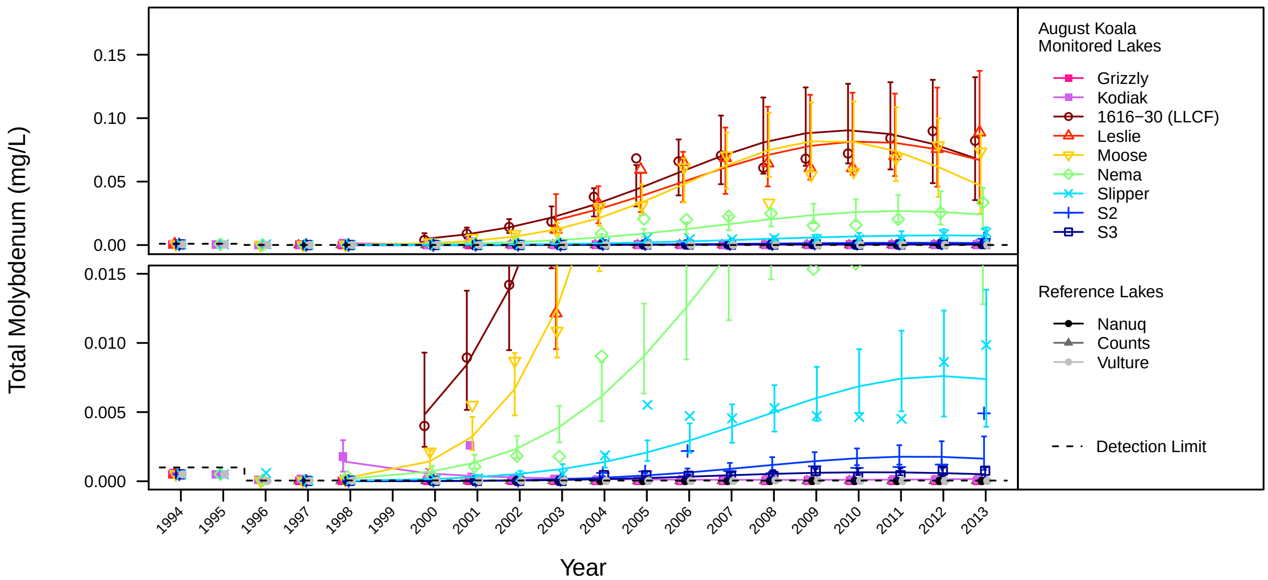
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	1616-30 (LLCF)	0.9550
Monitored Lake	Kodiak	0.5840
Monitored Lake	Leslie	0.7440
Monitored Lake	Moose	0.9460
Monitored Lake	Nema	0.9080
Monitored Lake	S2	0.8220
Monitored Lake	S3	0.7850
Monitored Lake	Slipper	0.9240

- Conclusions:
  Models provide a good fit for all monitored lakes.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total molybdenum for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	2.50e-05	NA	NA	NA	NA	NA
Kodiak	1.52e-04	1.65e-04	5.30e-05	8.82e-05	3.10e-04	1.55e-04
Leslie	8.88e-02	6.70e-02	2.45e-02	3.27e-02	1.37e-01	7.18e-02
1616-30 (LLCF)	8.22e-02	6.85e-02	2.30e-02	3.54e-02	1.32e-01	6.73e-02
Moose	7.36e-02	4.67e-02	1.50e-02	2.49e-02	8.75e-02	4.38e-02
Nema	3.35e-02	2.40e-02	7.70e-03	1.28e-02	4.50e-02	2.25e-02
Slipper	9.85e-03	7.39e-03	2.37e-03	3.94e-03	1.39e-02	6.93e-03
S2	4.91e-03	1.63e-03	5.71e-04	8.25e-04	3.24e-03	1.67e-03
S3	7.60e-04	5.05e-04	1.78e-04	2.53e-04	1.01e-03	5.22e-04
Nanuq	2.50e-05	NA	NA	NA	NA	NA
Counts	2.50e-05	NA	NA	NA	NA	NA
Vulture	2.50e-05	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Molybdenum	August	Koala	Lake	Water	Counts Grizzly Nanuq Vulture	log e	Tobit regression	#1a slope of zero	19.38	Kodiak 1616-30 (LLCF) Leslie Moose Nema Slipper S2 S3

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

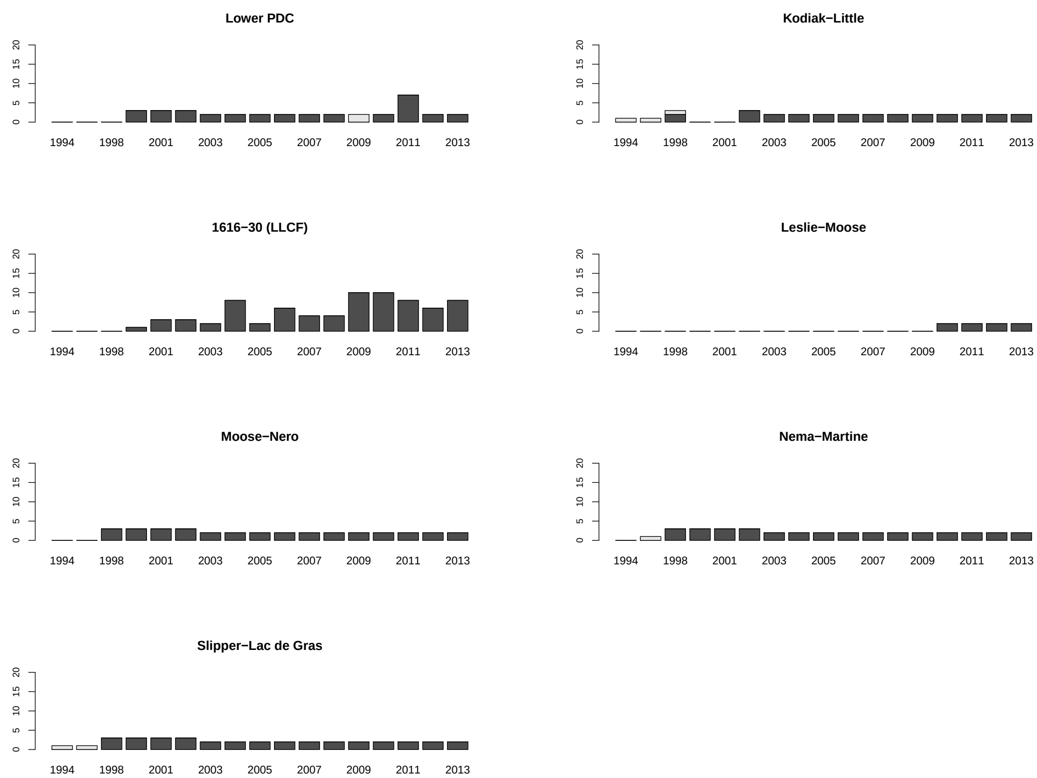
Analysis of August Total Molybdenum in Koala Watershed Streams

January 20, 2014

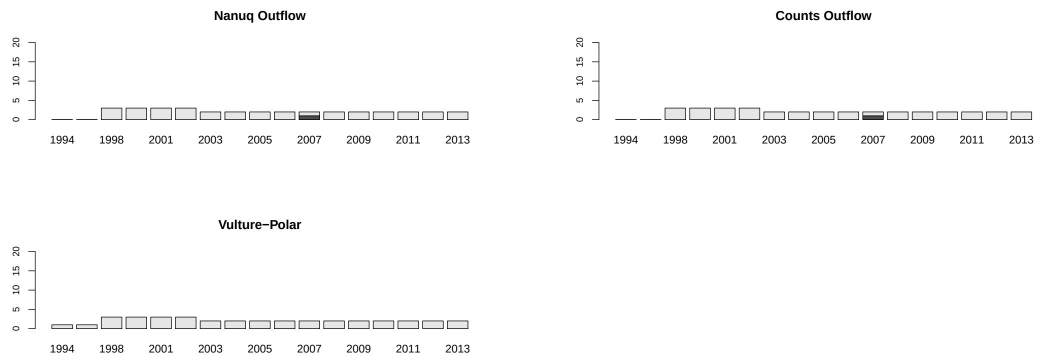
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

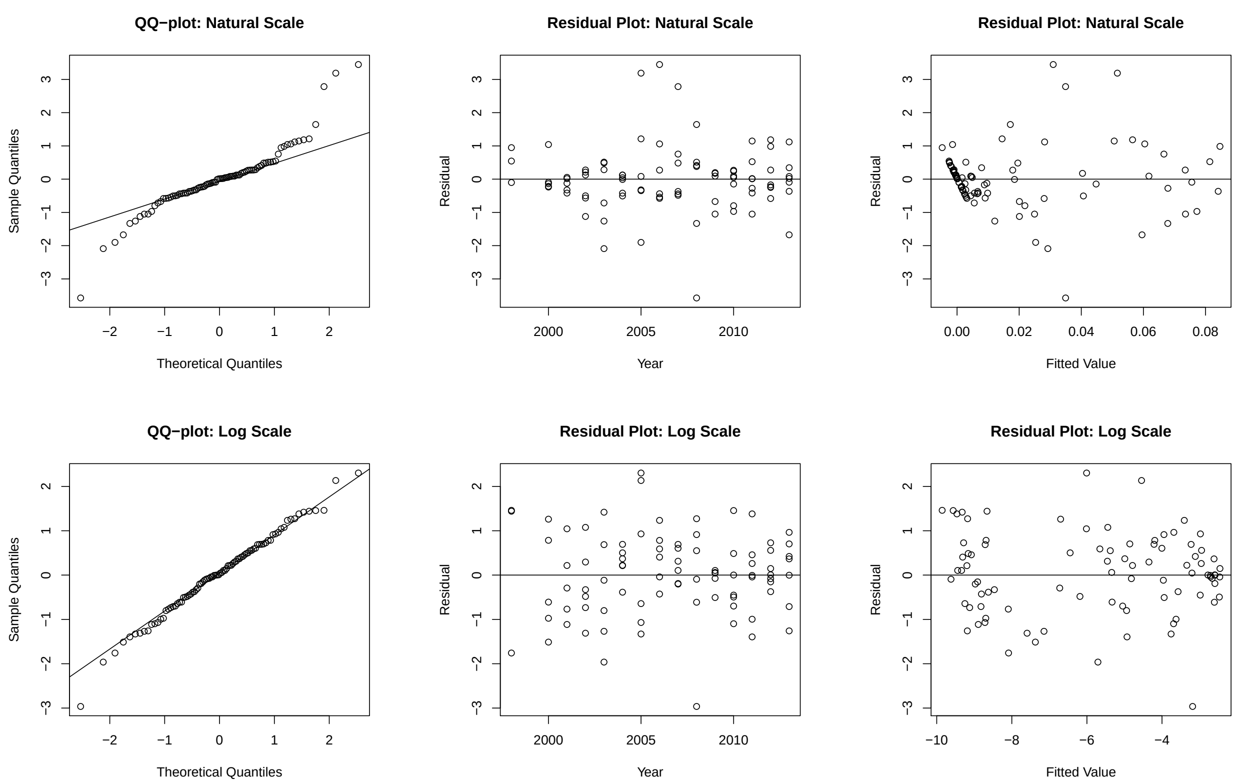


1.2 Reference



Comment:
Greater than 60% of data in Counts Outflow, Nanuq Outflow, and Vulture-Polar was less than the detection limit. These streams were excluded from further analyses. None of the remaining streams exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
12	1616-30 (LLCF)	2005	0.07	0.05	3.19
113	Moose-Nero	2006	0.05	0.03	3.45
115	Moose-Nero	2008	0.02	0.03	-3.57

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Streams

All reference streams removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored stream against a slope of 0.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Lower PDC	95.5659	2	0.0000
Kodiak-Little	122.0949	2	0.0000
Leslie-Moose	0.5025	2	0.7778
1616-30 (LLCF)	96.3529	2	0.0000
Moose-Nero	6.7535	2	0.0342
Nema-Martine	7.2118	2	0.0272
Slipper-Lac de Gras	9.0045	2	0.0111

- Conclusions:
  All monitored streams except Leslie-Moose show significant deviation from a constant slope of zero.

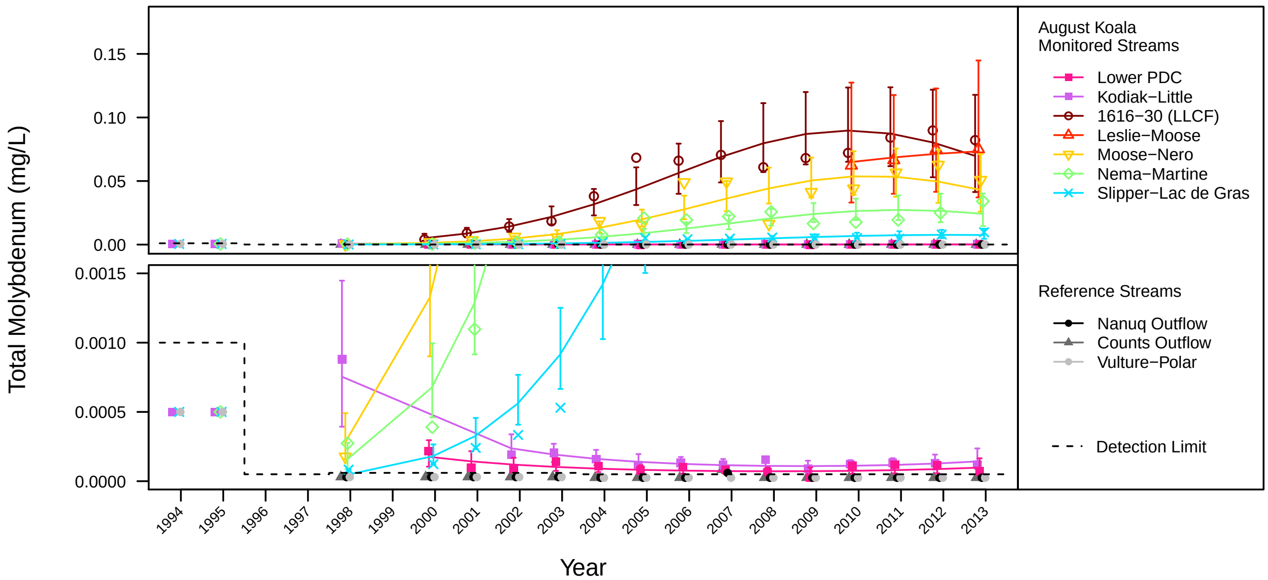
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Monitored Stream	1616-30 (LLCF)	0.9520
Monitored Stream	Kodiak-Little	0.9100
Monitored Stream	Leslie-Moose	0.3890
Monitored Stream	Lower PDC	0.3290
Monitored Stream	Moose-Nero	0.9390
Monitored Stream	Nema-Martine	0.9240
Monitored Stream	Slipper-Lac de Gras	0.9310

- Conclusions:
  Model fit for Leslie-Moose and Lower PDC is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total molybdenum for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	6.90e-05	9.78e-05	2.61e-05	5.80e-05	1.65e-04	7.65e-05
Kodiak-Little	1.18e-04	1.42e-04	3.68e-05	8.59e-05	2.36e-04	1.08e-04
Leslie-Moose	7.51e-02	7.33e-02	2.55e-02	3.71e-02	1.45e-01	7.45e-02
1616-30 (LLCF)	8.22e-02	6.98e-02	1.86e-02	4.13e-02	1.18e-01	5.45e-02
Moose-Nero	5.08e-02	4.30e-02	1.11e-02	2.59e-02	7.12e-02	3.24e-02
Nema-Martine	3.40e-02	2.43e-02	6.25e-03	1.46e-02	4.02e-02	1.83e-02
Slipper-Lac de Gras	9.71e-03	7.51e-03	1.94e-03	4.53e-03	1.24e-02	5.66e-03
Nanuq Outflow	2.50e-05	NA	NA	NA	NA	NA
Counts Outflow	2.50e-05	NA	NA	NA	NA	NA
Vulture-Polar	2.50e-05	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Molybdenum	August	Koala	Stream	Water	Counts Outflow Nanuq Outflow Vulture-Polar	log e	linear mixed effects regression	#1a slope of zero	19.38	Lower PDC Kodiak-Little 1616-30 (LLCF) Moose-Nero Nema-Martine Slipper-Lac de Gras

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

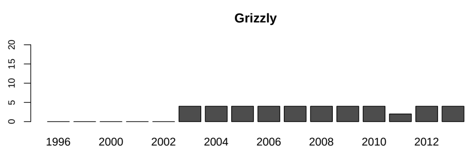
Analysis of April Total Nickel in Lakes of the Koala Watershed and Lac de Gras

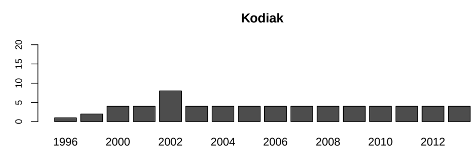
January 11, 2014

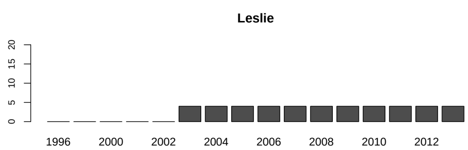
1 Censored Values:

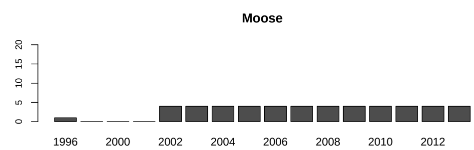
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

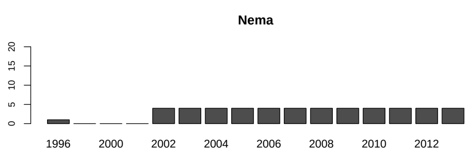
1.1 Monitored

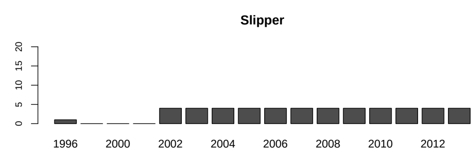


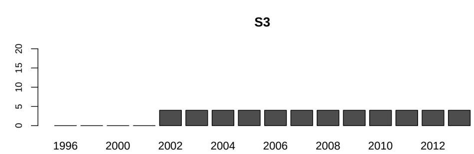




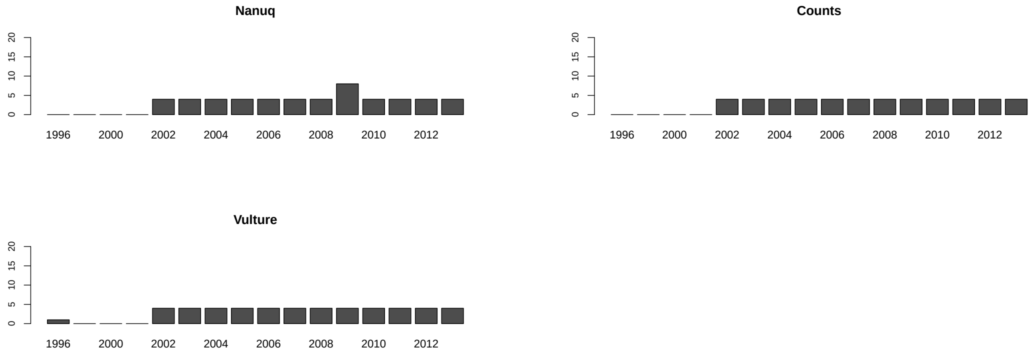






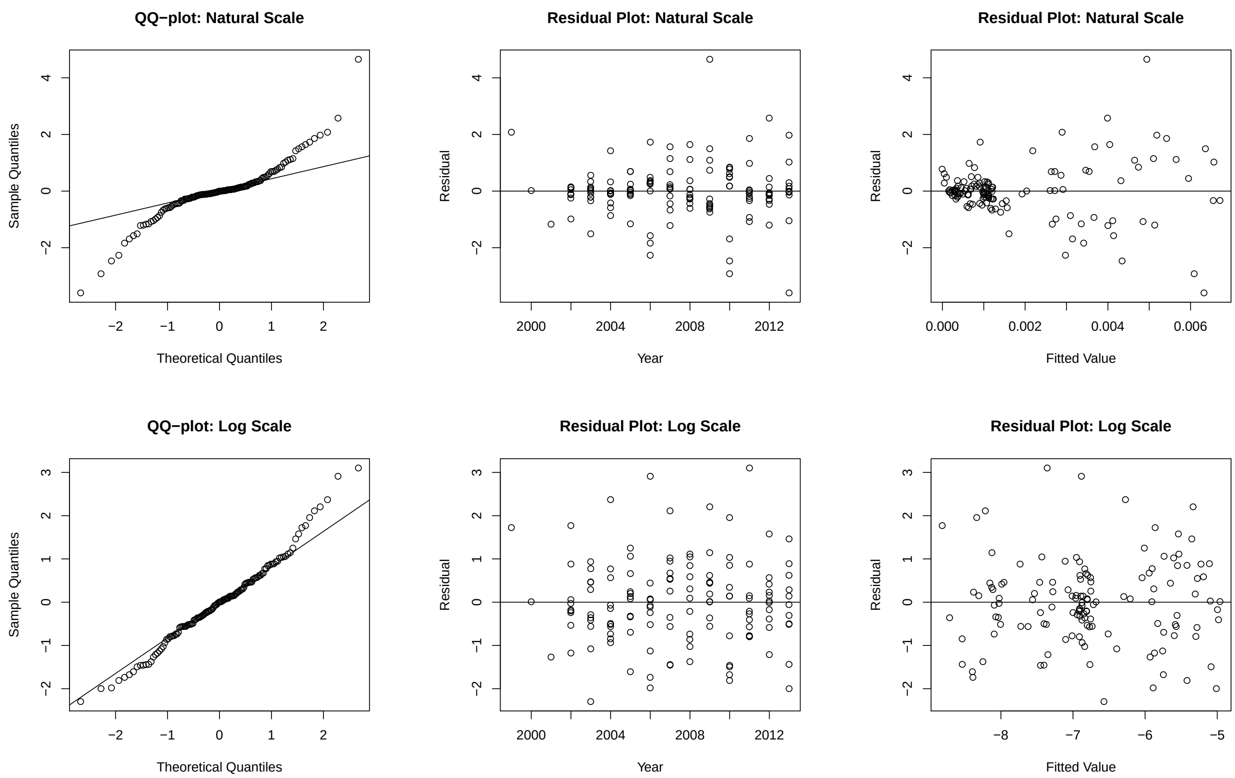


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
76	Kodiak	2009	0.01	0.00	4.65
80	Kodiak	2013	0.00	0.01	-3.59

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
38	Counts	2011	0.00	-7.36	3.10

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	0.00E+00	natural model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
5851.23	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
8.07	4.00	0.09

- Conclusions:
  The slopes do not differ significantly among reference lakes.

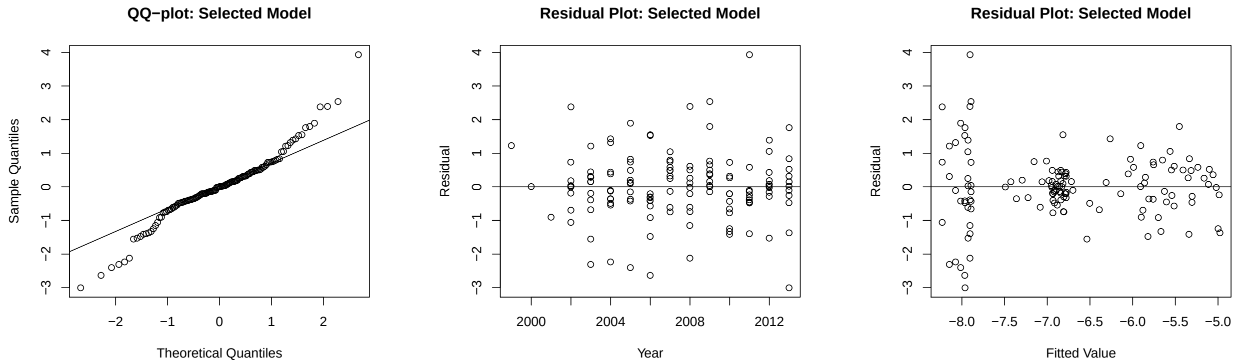
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
38	Counts	2011	0.00	-7.90	3.93
140	Nanuq	2013	0.00	-7.96	-3.00

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	0.66	2.00	0.72
Kodiak	3.81	2.00	0.15
Leslie	11.98	2.00	0.00
Moose	11.51	2.00	0.00
Nema	9.22	2.00	0.01
Slipper	2.24	2.00	0.33
S2	0.47	2.00	0.79
S3	1.22	2.00	0.54

- Conclusions:
  Leslie, Moose and Nema lakes show significant deviations from the common slope of reference lakes.

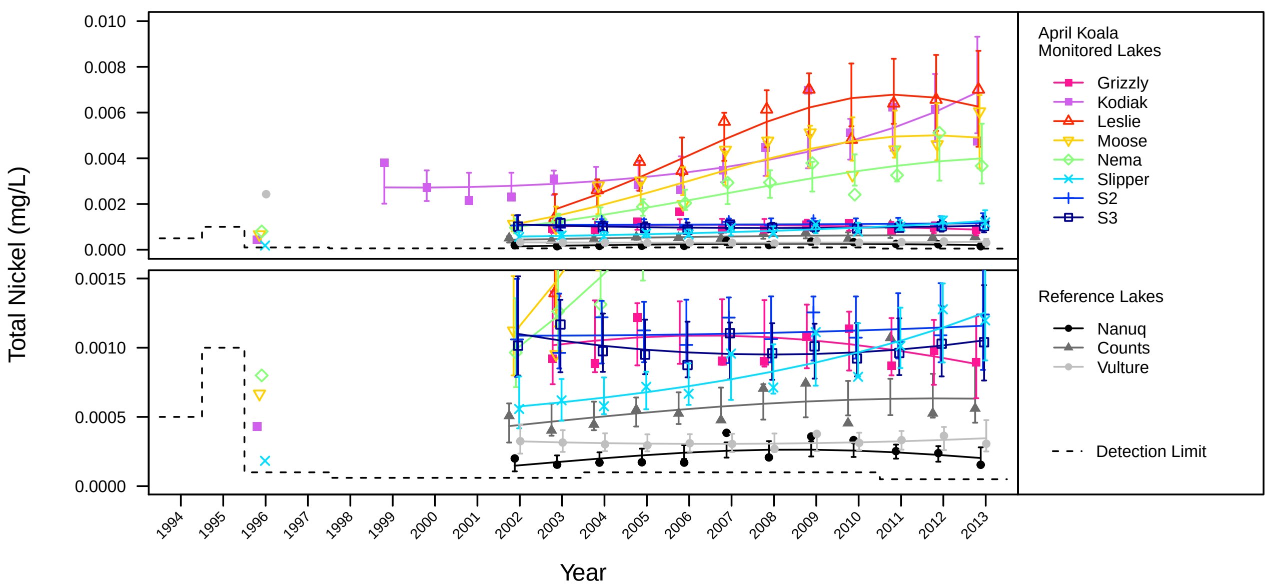
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0540
Monitored Lake	Grizzly	0.1670
Monitored Lake	Kodiak	0.6520
Monitored Lake	Leslie	0.8920
Monitored Lake	Moose	0.7830
Monitored Lake	Nema	0.8890
Monitored Lake	S2	0.0920
Monitored Lake	S3	0.1740
Monitored Lake	Slipper	0.7940

- Conclusions:
  Model fit for reference lakes, Grizzly, S2, and S3 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total nickel for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	8.93e-04	8.83e-04	1.48e-04	6.35e-04	1.23e-03	4.34e-04
Kodiak	4.76e-03	6.89e-03	1.06e-03	5.10e-03	9.32e-03	3.10e-03
Leslie	7.01e-03	6.26e-03	1.05e-03	4.51e-03	8.70e-03	3.07e-03
Moose	6.04e-03	4.90e-03	8.05e-04	3.56e-03	6.77e-03	2.36e-03
Nema	3.66e-03	4.00e-03	6.56e-04	2.90e-03	5.51e-03	1.92e-03
Slipper	1.20e-03	1.25e-03	2.06e-04	9.08e-04	1.73e-03	6.02e-04
S2	1.24e-03	1.16e-03	1.90e-04	8.40e-04	1.60e-03	5.56e-04
S3	1.04e-03	1.05e-03	1.73e-04	7.63e-04	1.45e-03	5.06e-04
Nanuq	1.54e-04	2.03e-04	3.34e-05	1.47e-04	2.81e-04	NA
Counts	5.61e-04	6.32e-04	1.04e-04	4.58e-04	8.72e-04	NA
Vulture	3.06e-04	3.46e-04	5.68e-05	2.51e-04	4.77e-04	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Nickel	April	Koala	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	NA	Leslie Moose Nema

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lakes in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

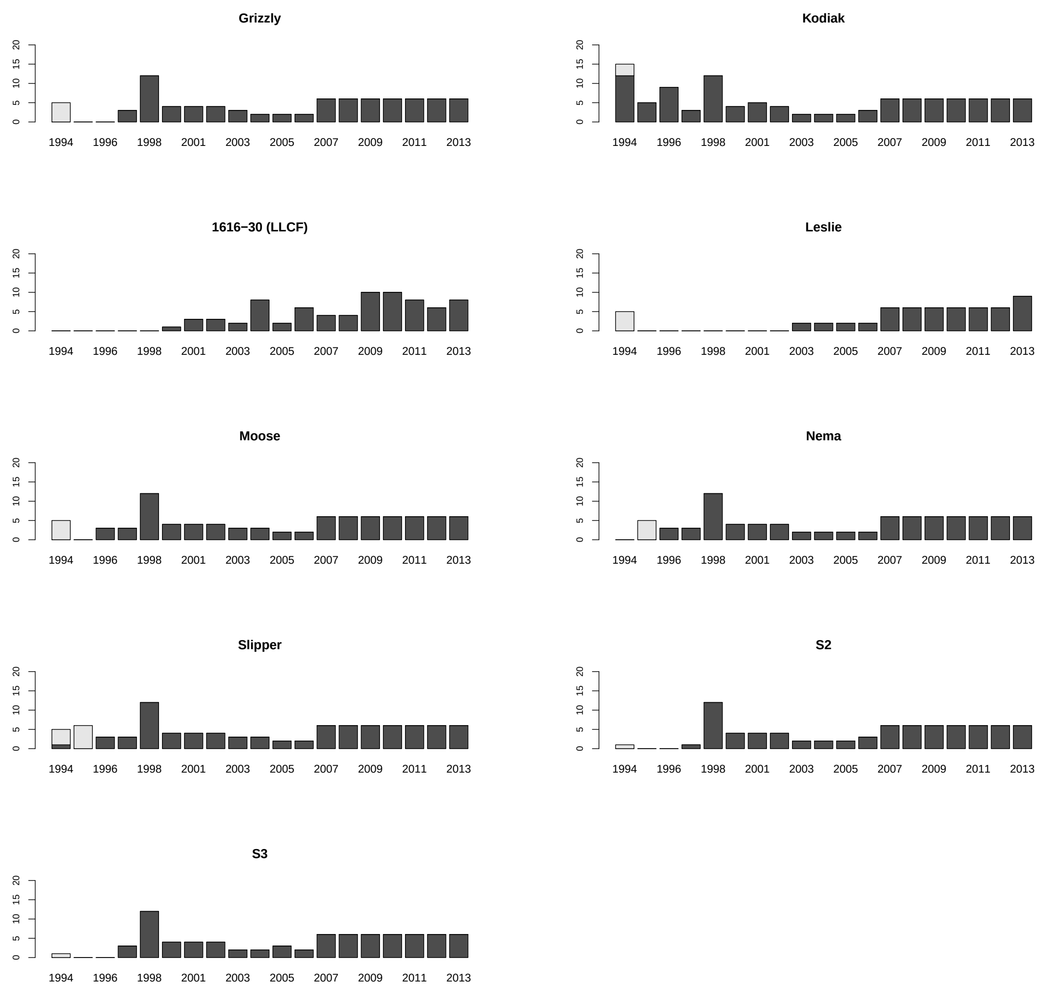
Analysis of August Total Nickel in Lakes of the Koala Watershed and Lac de Gras

January 11, 2014

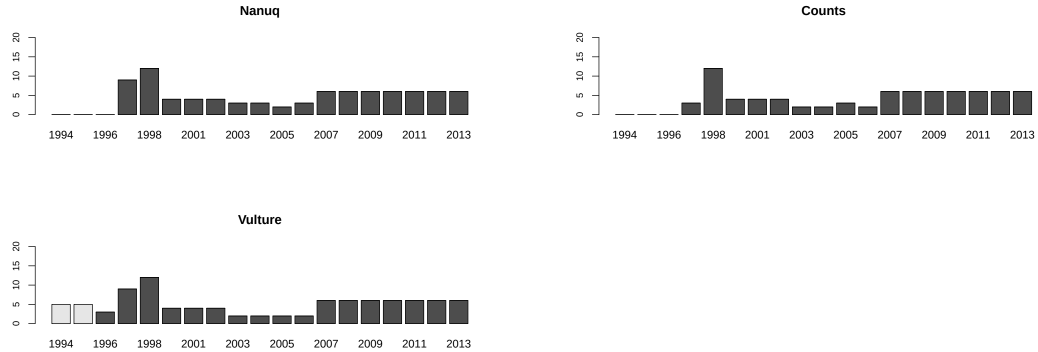
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

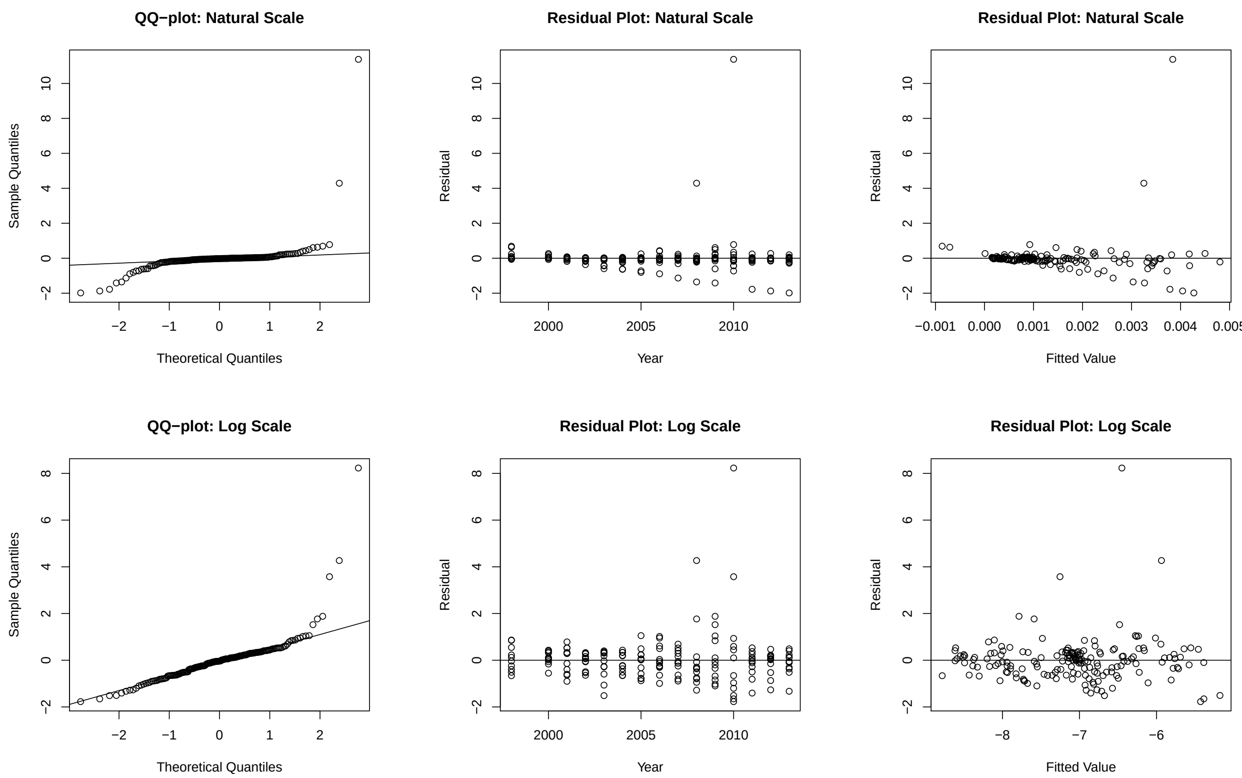


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
115	Moose	2008	0.01	0.00	4.29
217	Slipper	2010	0.02	0.00	11.38

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
115	Moose	2008	0.01	-5.94	4.27
217	Slipper	2010	0.02	-6.45	8.23
237	Vulture	2010	0.00	-7.25	3.58

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
33.37	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
0.76	4.00	0.94

- Conclusions:
  The slopes do not differ significantly among reference lakes.

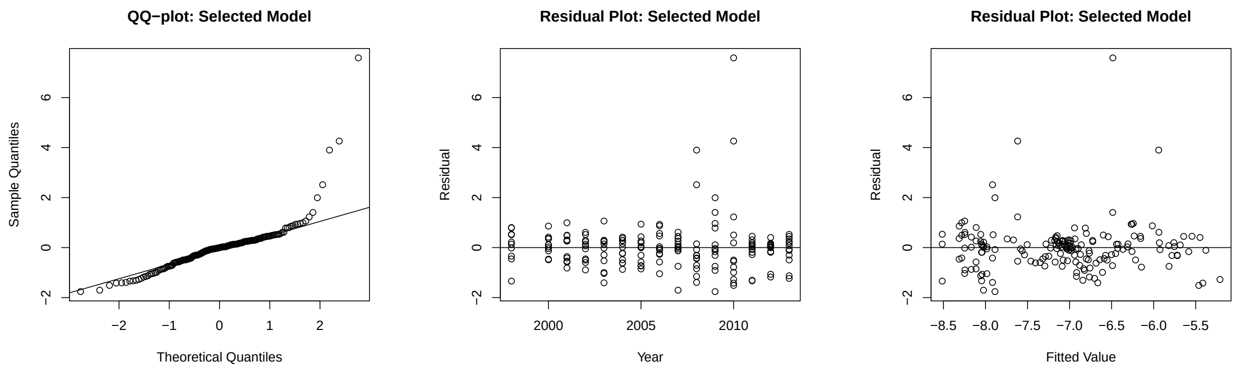
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
115	Moose	2008	0.01	-5.94	3.90
217	Slipper	2010	0.02	-6.49	7.59
237	Vulture	2010	0.00	-7.62	4.26

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	0.6188	2	0.7339
Kodiak	0.8594	2	0.6507
1616-30 (LLCF)	5.4502	2	0.0655
Leslie	9.8129	2	0.0074
Moose	27.6813	2	0.0000
Nema	8.8036	2	0.0123
Slipper	5.7405	2	0.0567
S2	0.2765	2	0.8709
S3	0.3770	2	0.8282

- Conclusions:
  Leslie, Moose, Nema, and Slipper lakes show significant deviation from the common slope of reference lakes.

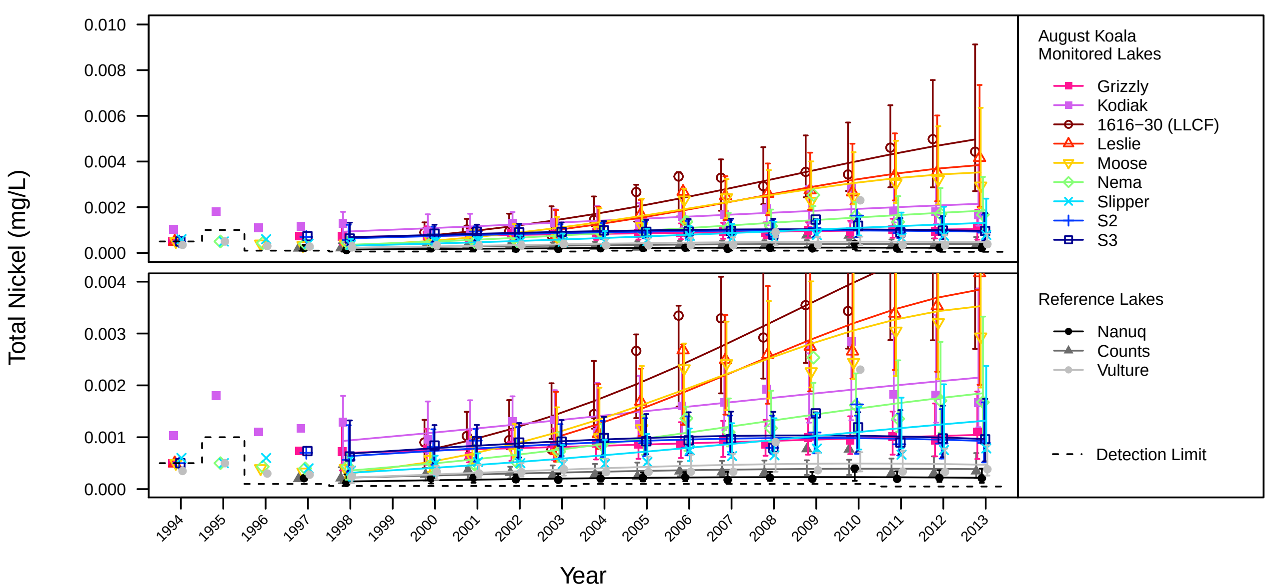
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.1360
Monitored Lake	1616-30 (LLCF)	0.8700
Monitored Lake	Grizzly	0.7430
Monitored Lake	Kodiak	0.5560
Monitored Lake	Leslie	0.8730
Monitored Lake	Moose	0.7410
Monitored Lake	Nema	0.8540
Monitored Lake	S2	0.3470
Monitored Lake	S3	0.4380
Monitored Lake	Slipper	0.1960

- Conclusions:
  Model fit for S2 and S3 is weak. Model fit for reference lakes and Slipper Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total nickel for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	1.10e-03	1.05e-03	3.14e-04	5.81e-04	1.88e-03	9.18e-04
Kodiak	1.67e-03	2.15e-03	6.45e-04	1.19e-03	3.87e-03	1.89e-03
Leslie	4.16e-03	3.85e-03	1.27e-03	2.01e-03	7.35e-03	3.72e-03
1616-30 (LLCF)	4.43e-03	4.97e-03	1.54e-03	2.70e-03	9.13e-03	4.51e-03
Moose	2.94e-03	3.53e-03	1.06e-03	1.96e-03	6.35e-03	3.10e-03
Nema	1.68e-03	1.85e-03	5.54e-04	1.03e-03	3.33e-03	1.62e-03
Slipper	7.85e-04	1.32e-03	3.96e-04	7.33e-04	2.38e-03	1.16e-03
S2	8.88e-04	9.29e-04	2.79e-04	5.16e-04	1.67e-03	8.16e-04
S3	9.59e-04	9.66e-04	2.90e-04	5.37e-04	1.74e-03	8.48e-04
Nanuq	2.10e-04	2.18e-04	6.55e-05	1.21e-04	3.93e-04	NA
Counts	3.46e-04	3.86e-04	1.16e-04	2.14e-04	6.94e-04	NA
Vulture	3.84e-04	4.70e-04	1.41e-04	2.61e-04	8.46e-04	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Nickel	August	Koala	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	NA	Leslie Moose Nema Slipper

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

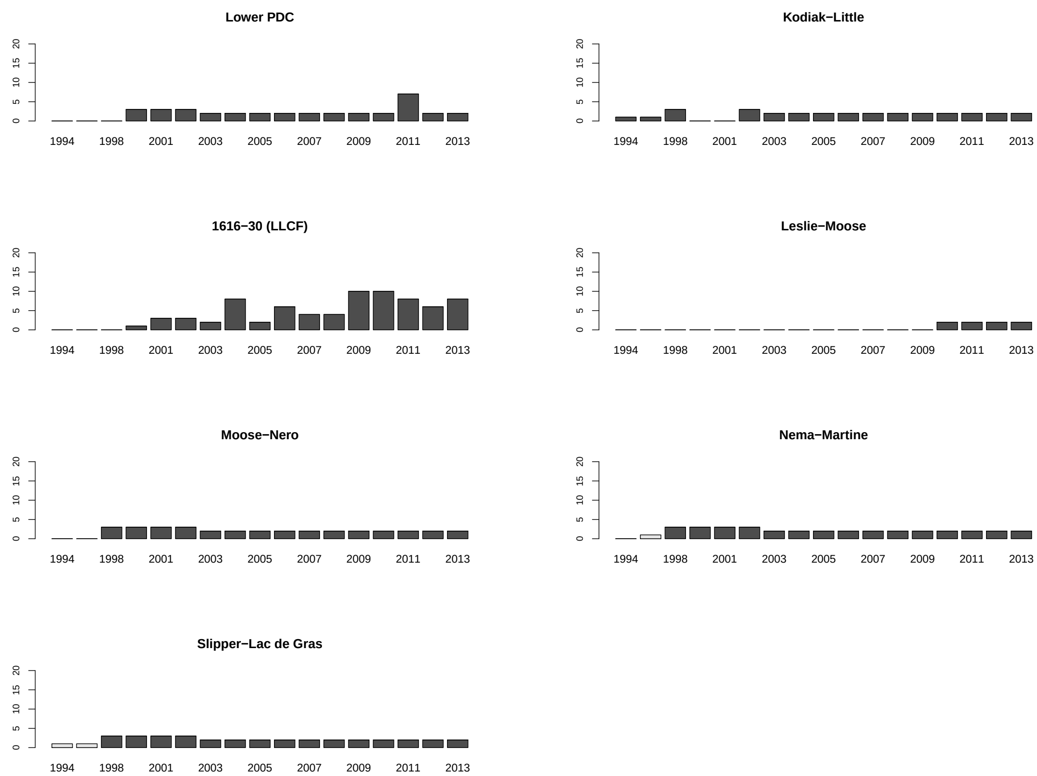
Analysis of August Total Nickel in Koala Watershed Streams

January 11, 2014

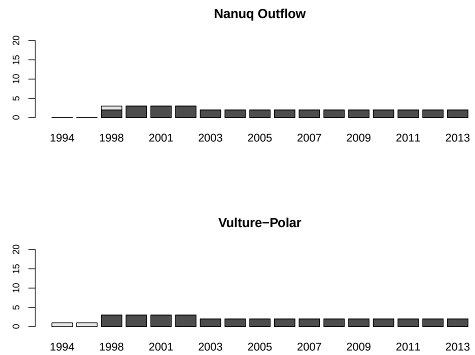
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

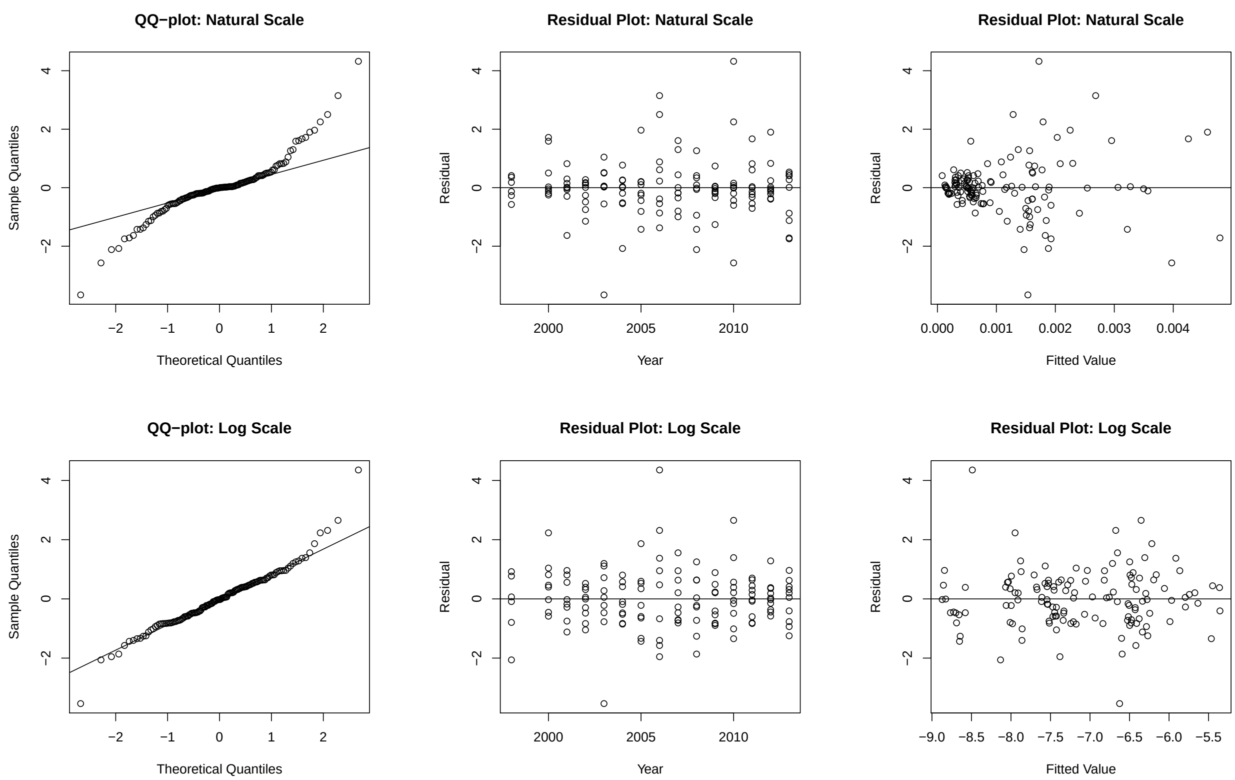


1.2 Reference



Comment:
None of the streams exhibited greater than 10% of data less than the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
10	1616-30 (LLCF)	2003	0.00	0.00	-3.66
13	1616-30 (LLCF)	2006	0.00	0.00	3.15
97	Lower PDC	2010	0.00	0.00	4.32

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
10	1616-30 (LLCF)	2003	0.00	-6.63	-3.54
133	Nanuq Outflow	2006	0.00	-8.49	4.35

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
530.66	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
46.82	4.00	0.00

- Conclusions:
  The slopes differ significantly among reference streams. Reference streams do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Lower PDC	1.7884	2	0.4089
Kodiak-Little	8.3536	2	0.0153
Leslie-Moose	2.8643	2	0.2388
1616-30 (LLCF)	190.4345	2	0.0000
Moose-Nero	76.7584	2	0.0000
Nema-Martine	50.5153	2	0.0000
Slipper-Lac de Gras	11.0607	2	0.0040

- Conclusions:
  All monitored streams except Lower PDC and Leslie-Moose show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored stream compared to slope of each reference stream (reference model 1b).

- Results:

	Chi-squared	DF	P-value
Kodiak-Little-vs-Nanuq Outflow	1374.7901	3	0.0000
Kodiak-Little-vs-Counts Outflow	594.6565	3	0.0000
Kodiak-Little-vs-Vulture-Polar	269.7478	3	0.0000
1616-30 (LLCF)-vs-Nanuq Outflow	112.2462	3	0.0000
1616-30 (LLCF)-vs-Counts Outflow	40.4714	3	0.0000
1616-30 (LLCF)-vs-Vulture-Polar	40.5367	3	0.0000
Moose-Nero-vs-Nanuq Outflow	1220.4835	3	0.0000
Moose-Nero-vs-Counts Outflow	494.6705	3	0.0000
Moose-Nero-vs-Vulture-Polar	225.2658	3	0.0000
Nema-Martine-vs-Nanuq Outflow	977.2242	3	0.0000
Nema-Martine-vs-Counts Outflow	343.2985	3	0.0000
Nema-Martine-vs-Vulture-Polar	129.5994	3	0.0000
Slipper-Lac de Gras-vs-Nanuq Outflow	514.9077	3	0.0000
Slipper-Lac de Gras-vs-Counts Outflow	91.2690	3	0.0000
Slipper-Lac de Gras-vs-Vulture-Polar	10.7719	3	0.0130

- Conclusions:
  All remaining monitored streams show significant deviations from the slopes of individual reference streams.

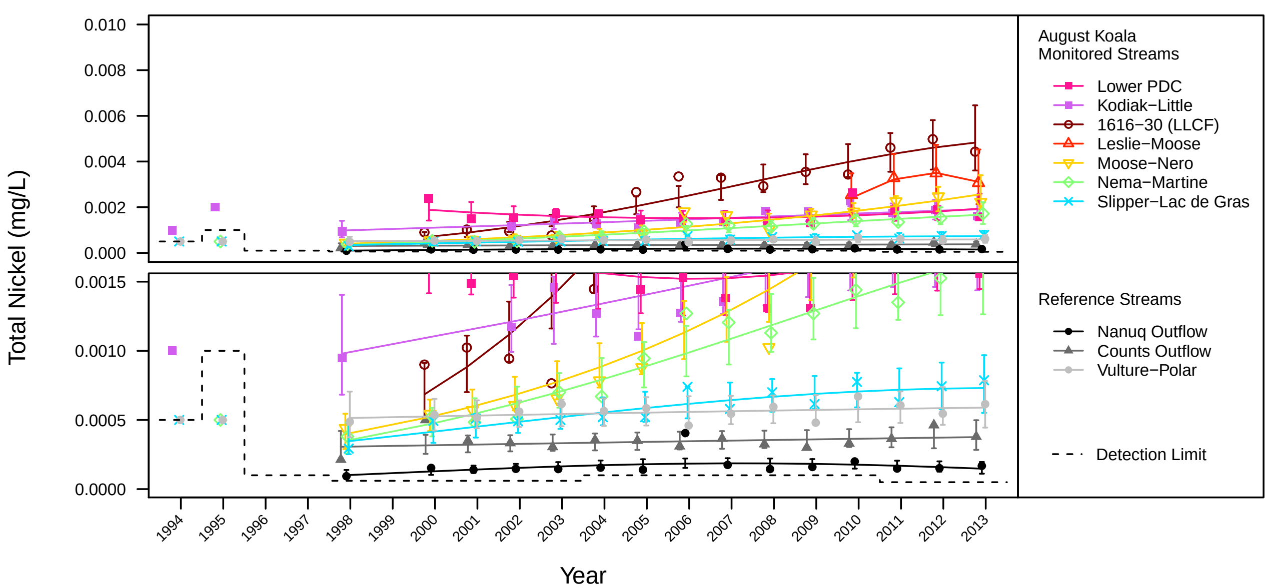
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Reference Stream	Counts Outflow	0.1040
Reference Stream	Nanuq Outflow	0.3140
Reference Stream	Vulture-Polar	0.1580
Monitored Stream	1616-30 (LLCF)	0.8760
Monitored Stream	Kodiak-Little	0.6400
Monitored Stream	Leslie-Moose	0.9570
Monitored Stream	Lower PDC	0.1560
Monitored Stream	Moose-Nero	0.8970
Monitored Stream	Nema-Martine	0.9410
Monitored Stream	Slipper-Lac de Gras	0.8010

- Conclusions:
  Model fit for Nanuq Outflow is weak. Model fit for Counts Outflow, Vulture-Polar, and Lower PDC is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total nickel for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	1.56e-03	1.94e-03	2.88e-04	1.45e-03	2.59e-03	8.43e-04
Kodiak-Little	1.61e-03	1.90e-03	2.74e-04	1.44e-03	2.52e-03	8.02e-04
Leslie-Moose	3.06e-03	3.11e-03	5.95e-04	2.14e-03	4.53e-03	1.74e-03
1616-30 (LLCF)	4.43e-03	4.83e-03	7.17e-04	3.61e-03	6.46e-03	2.10e-03
Moose-Nero	2.22e-03	2.56e-03	3.68e-04	1.94e-03	3.40e-03	1.08e-03
Nema-Martine	1.72e-03	1.67e-03	2.41e-04	1.26e-03	2.22e-03	7.04e-04
Slipper-Lac de Gras	7.87e-04	7.31e-04	1.05e-04	5.51e-04	9.68e-04	3.07e-04
Nanuq Outflow	1.68e-04	1.48e-04	2.13e-05	1.12e-04	1.96e-04	NA
Counts Outflow	3.79e-04	3.76e-04	5.40e-05	2.84e-04	4.98e-04	NA
Vulture-Polar	6.15e-04	5.89e-04	8.47e-05	4.45e-04	7.81e-04	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Nickel	August	Koala	Stream	Water	none	log e	linear mixed effects regression	#1b separate intercepts & slopes	hardness-dependent	Kodiak-Little 1616-30 (LLCF) Moose-Nero Nema-Martine Slipper-Lac de Gras

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

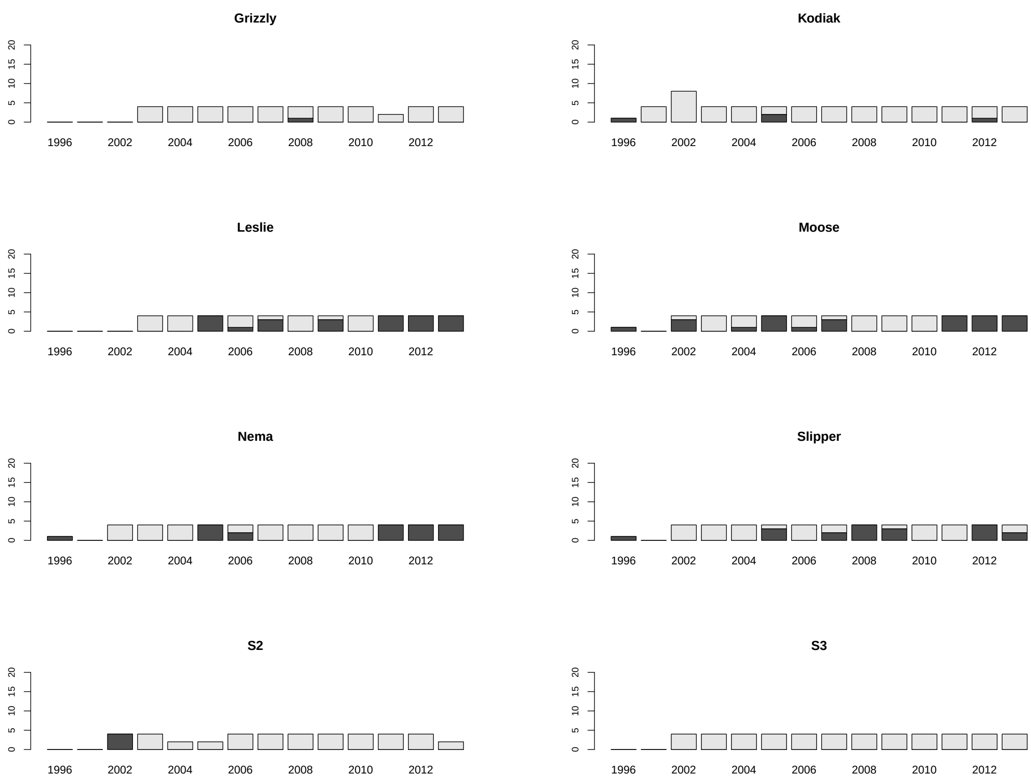
Analysis of April Total Selenium in Lakes of the Koala Watershed and Lac de Gras

January 11, 2014

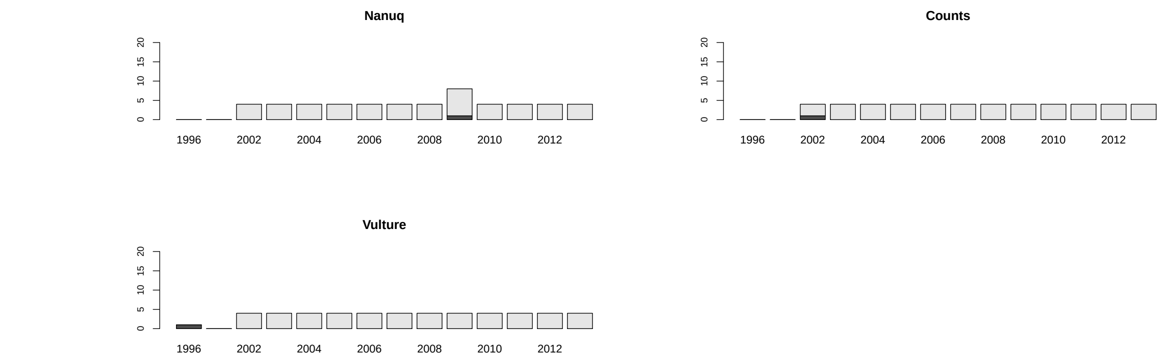
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

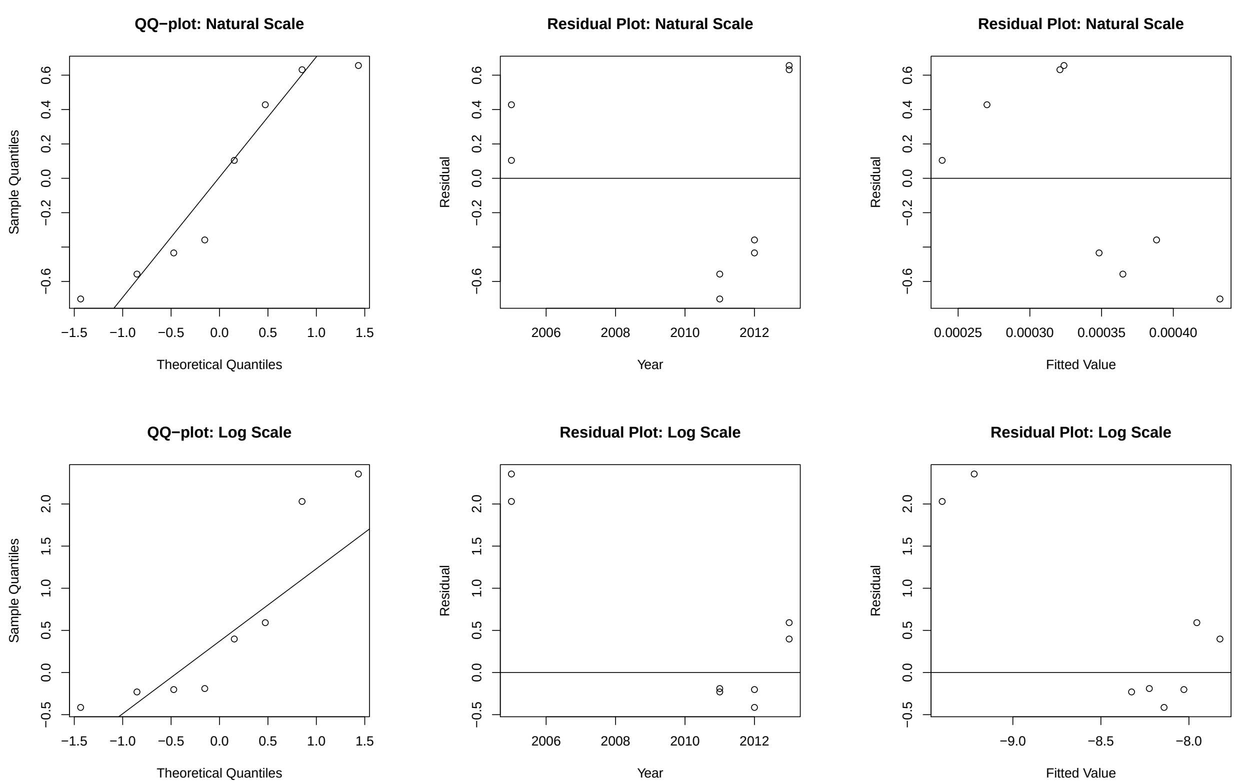


1.2 Reference



Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, Grizzly, Kodiak, Nema Slipper, S2, and S3 was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in Leslie and Moose lakes was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	2.82E-17	natural model

Conclusion:
AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Leslie	2.0618	2	0.3567
Moose	1.6933	2	0.4288

- Conclusions:
  No significant deviations were found when comparing monitored lakes to a constant slope of zero.

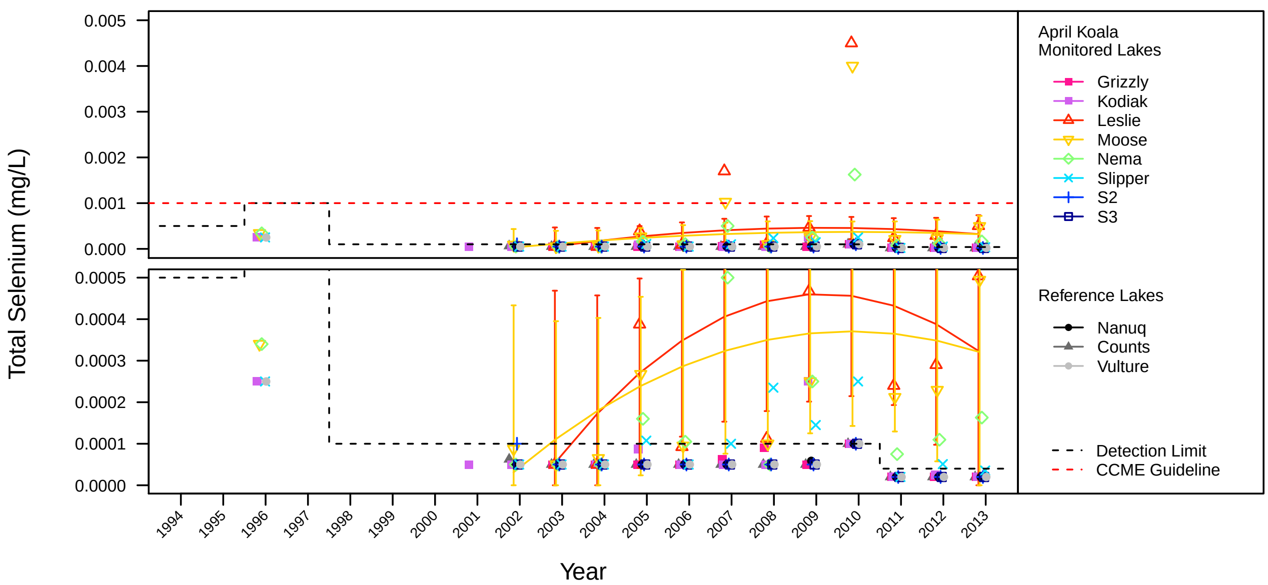
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	Leslie	0.1040
Monitored Lake	Moose	0.0800

- Conclusions:
  Model fit for Leslie and Moose lakes is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total selenium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	2.00e-05	NA	NA	NA	NA	NA
Kodiak	2.00e-05	NA	NA	NA	NA	NA
Leslie	5.04e-04	3.24e-04	2.10e-04	0e+00	7.36e-04	6.15e-04
Moose	4.94e-04	3.21e-04	2.04e-04	0e+00	7.22e-04	5.98e-04
Nema	1.63e-04	NA	NA	NA	NA	NA
Slipper	3.55e-05	NA	NA	NA	NA	NA
S2	2.00e-05	NA	NA	NA	NA	NA
S3	2.00e-05	NA	NA	NA	NA	NA
Nanuq	2.00e-05	NA	NA	NA	NA	NA
Counts	2.00e-05	NA	NA	NA	NA	NA
Vulture	2.00e-05	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Selenium	April	Koala	Lake	Water	Counts Grizzly Kodiak Nanuq Nema S2 S3 Slipper Vulture	none	Tobit regression	#1a slope of zero	0.001	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

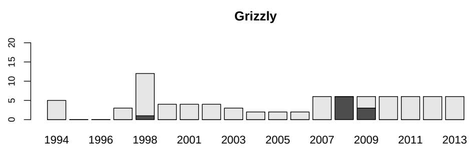
Analysis of August Total Selenium in Lakes of the Koala Watershed and Lac de Gras

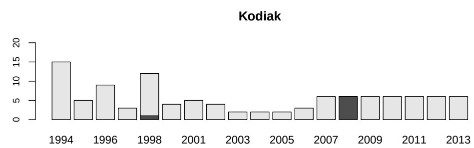
January 20, 2014

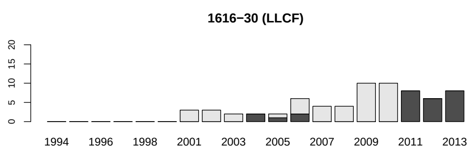
1 Censored Values:

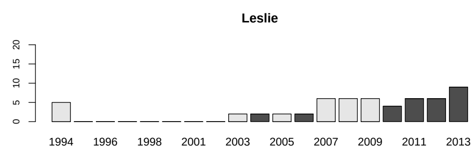
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

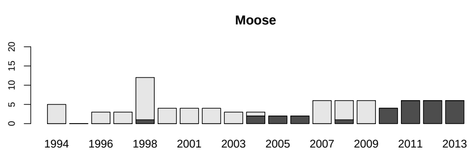
1.1 Monitored

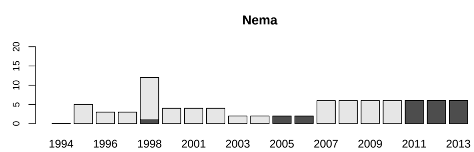


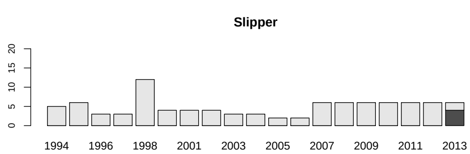


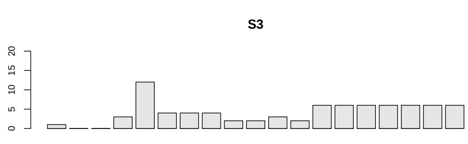




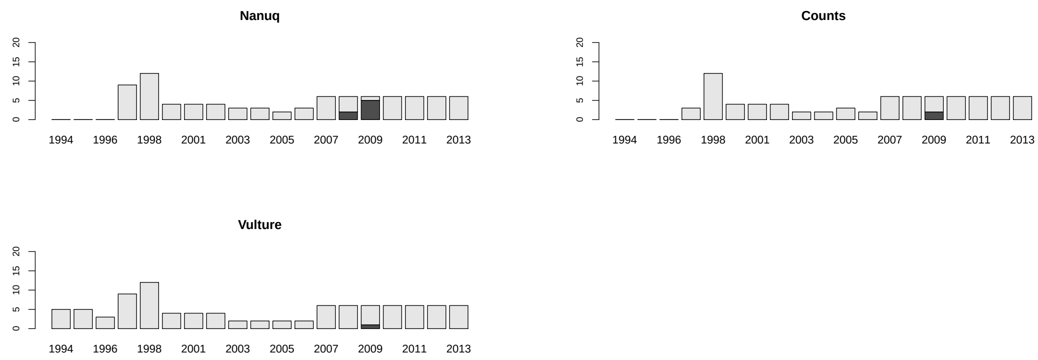






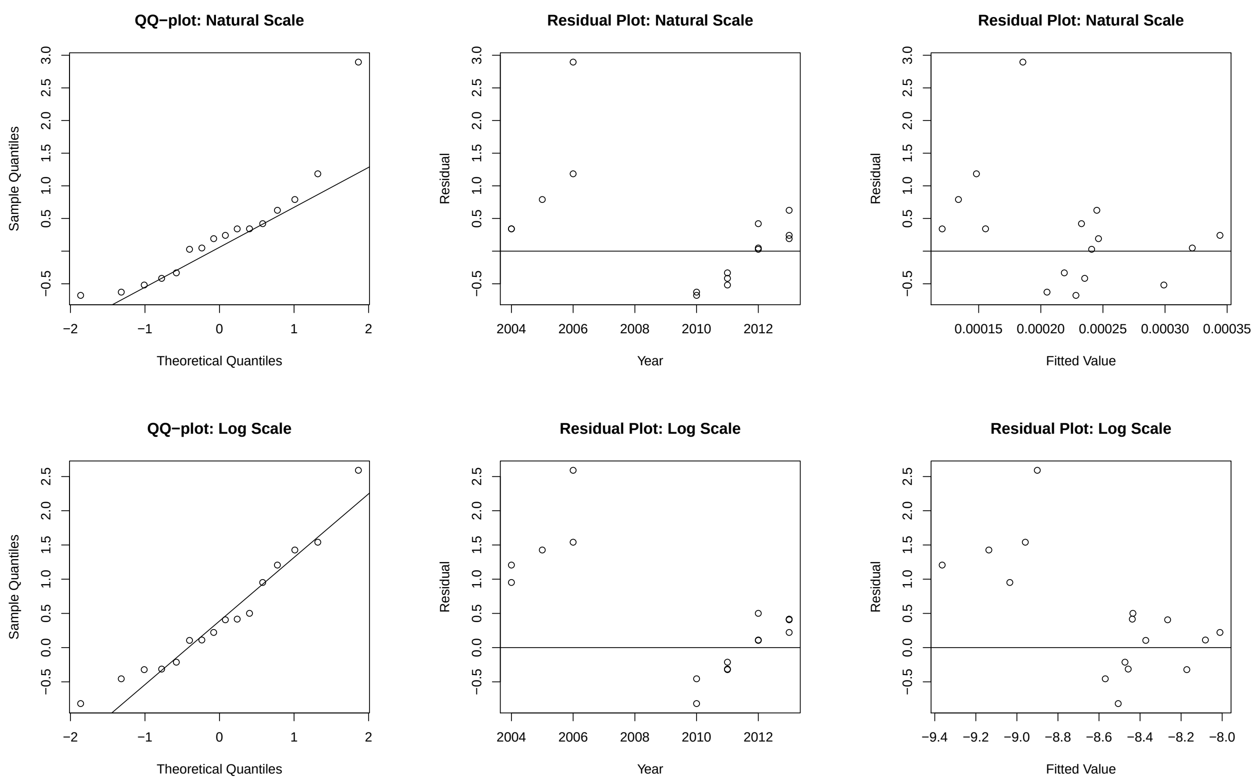


1.2 Reference



Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, Grizzly, Kodiak, Nema, Slipper, S2, and S3 was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in 1616-30 (LLCF), Leslie, and Moose lakes was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-30 (LLCF)	8.0748	2	0.0176
Leslie	0.9296	2	0.6283
Moose	4.3488	2	0.1137

- Conclusions:
  1616-30 (LLCF) shows significant deviation from a constant slope of zero.

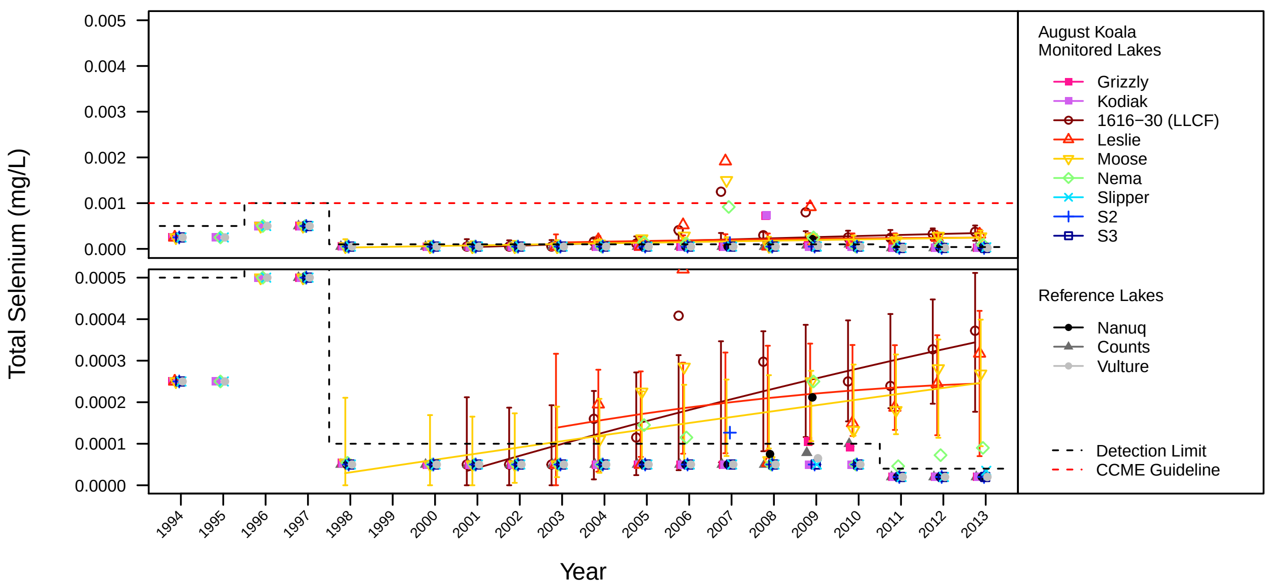
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	1616-30 (LLCF)	0.2030
Monitored Lake	Leslie	0.1270
Monitored Lake	Moose	0.0910

- Conclusions:
  Model fit for 1616-30 (LLCF), Leslie, and Moose lakes is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total selenium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	2.00e-05	NA	NA	NA	NA	NA
Kodiak	2.00e-05	NA	NA	NA	NA	NA
Leslie	3.17e-04	2.45e-04	8.93e-05	7.01e-05	4.20e-04	2.61e-04
1616-30 (LLCF)	3.72e-04	3.44e-04	8.53e-05	1.77e-04	5.11e-04	2.50e-04
Moose	2.68e-04	2.46e-04	7.78e-05	9.40e-05	3.99e-04	2.28e-04
Nema	9.00e-05	NA	NA	NA	NA	NA
Slipper	3.48e-05	NA	NA	NA	NA	NA
S2	2.00e-05	NA	NA	NA	NA	NA
S3	2.00e-05	NA	NA	NA	NA	NA
Nanuq	2.00e-05	NA	NA	NA	NA	NA
Counts	2.00e-05	NA	NA	NA	NA	NA
Vulture	2.00e-05	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Selenium	August	Koala	Lake	Water	Counts Nanuq Vulture Grizzly Kodiak Nema Slipper S2 S3	none	Tobit regression	#1a slope of zero	0.001	1616-30 (LLCF)

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

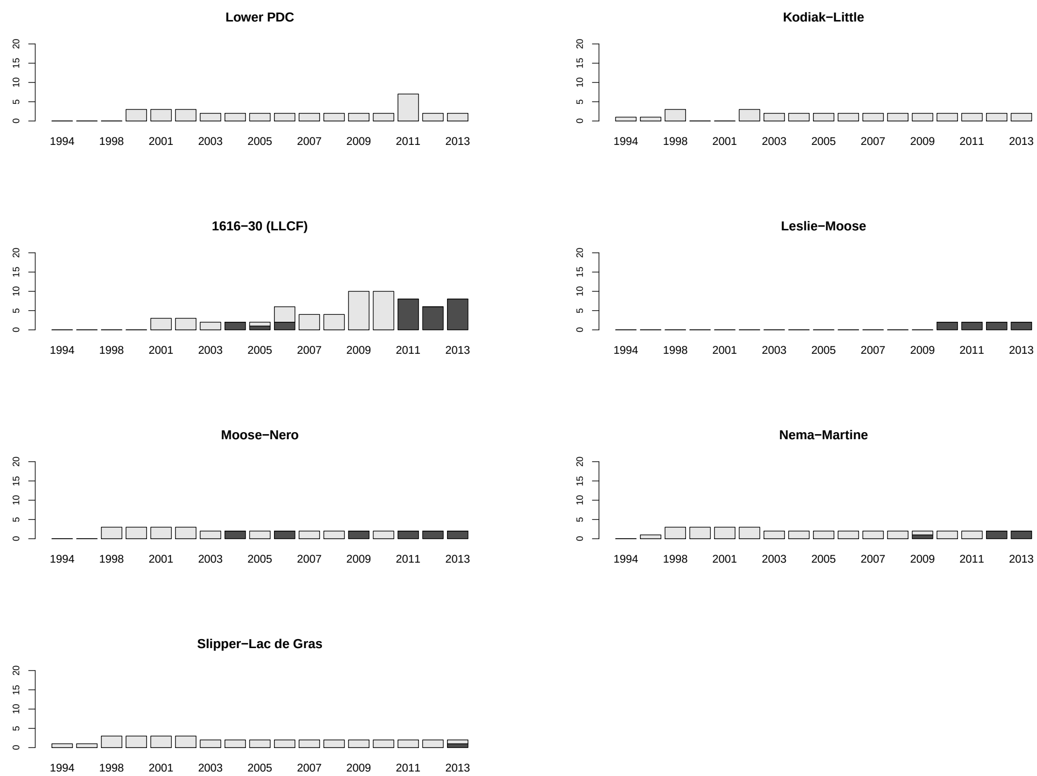
Analysis of August Total Selenium in Koala Watershed Streams

January 20, 2014

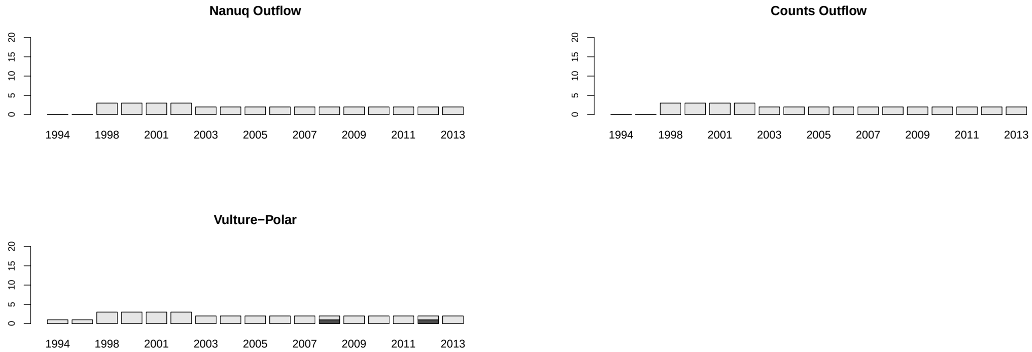
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

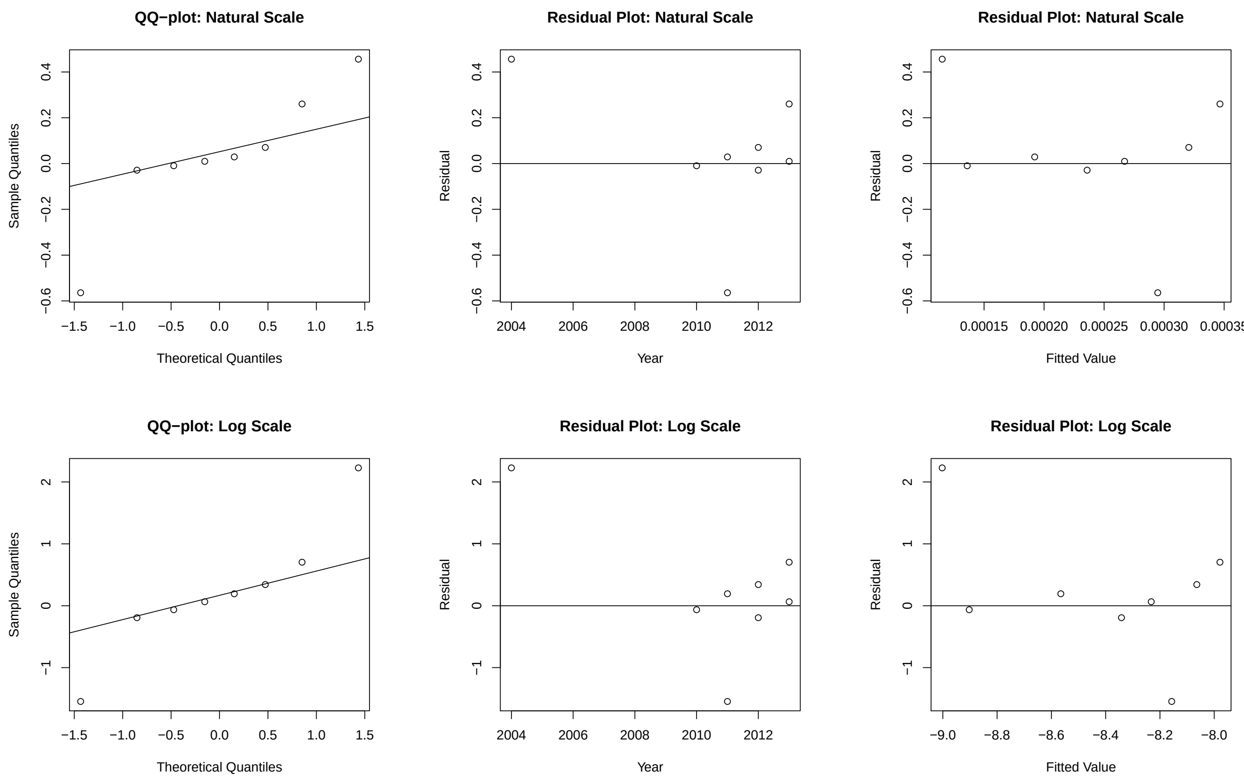


1.2 Reference



Comment:
Greater than 60% of data in Counts Outflow, Nanuq Outflow, Vulture-Polar, Lower PDC, Kodiak-Little, Moose-Nero, Nema-Martine, and Slipper-Lac de Gras was less than the detection limit. These streams were excluded from further analyses. 10-60% of data in 1616-30 (LLCF) was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Streams

All reference streams removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored stream against a slope of 0.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Leslie-Moose	1.0008	2	0.6063
1616-30 (LLCF)	10.8638	2	0.0044

- Conclusions:
  1616-30 (LLCF) shows significant deviation from a constant slope of zero.

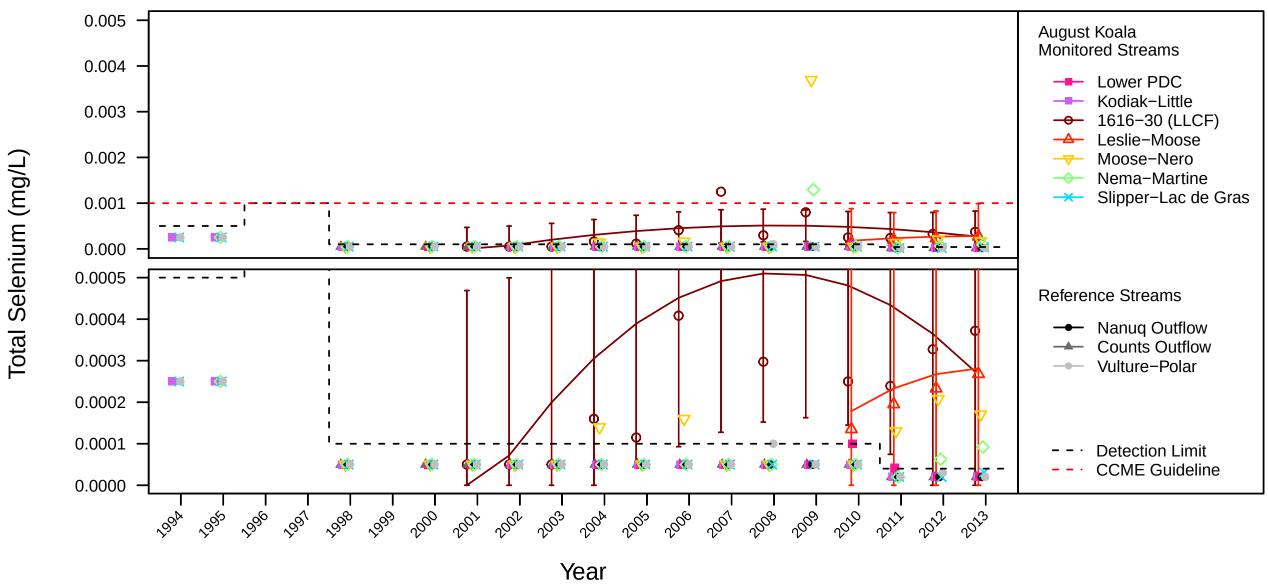
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Monitored Stream	1616-30 (LLCF)	0.2060
Monitored Stream	Leslie-Moose	0.9980

- Conclusions:
  Model fit for 1616-30 (LLCF) is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total selenium for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	2.00e-05	NA	NA	NA	NA	NA
Kodiak-Little	2.00e-05	NA	NA	NA	NA	NA
Leslie-Moose	2.68e-04	2.81e-04	3.60e-04	0e+00	9.88e-04	1.05e-03
1616-30 (LLCF)	3.72e-04	2.74e-04	2.82e-04	0e+00	8.26e-04	8.25e-04
Moose-Nero	1.70e-04	NA	NA	NA	NA	NA
Nema-Martine	9.20e-05	NA	NA	NA	NA	NA
Slipper-Lac de Gras	3.10e-05	NA	NA	NA	NA	NA
Nanuq Outflow	2.00e-05	NA	NA	NA	NA	NA
Counts Outflow	2.00e-05	NA	NA	NA	NA	NA
Vulture-Polar	2.00e-05	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Selenium	August	Koala	Stream	Water	Nanuq Outflow Counts Outflow Vulture-Polar Lower PDC Kodiak-Little Moose-Nero Nema-Martine Slipper-Lac de Gras	none	Tobit regression	#1a slope of zero	0.001	1616-30 (LLCF)

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

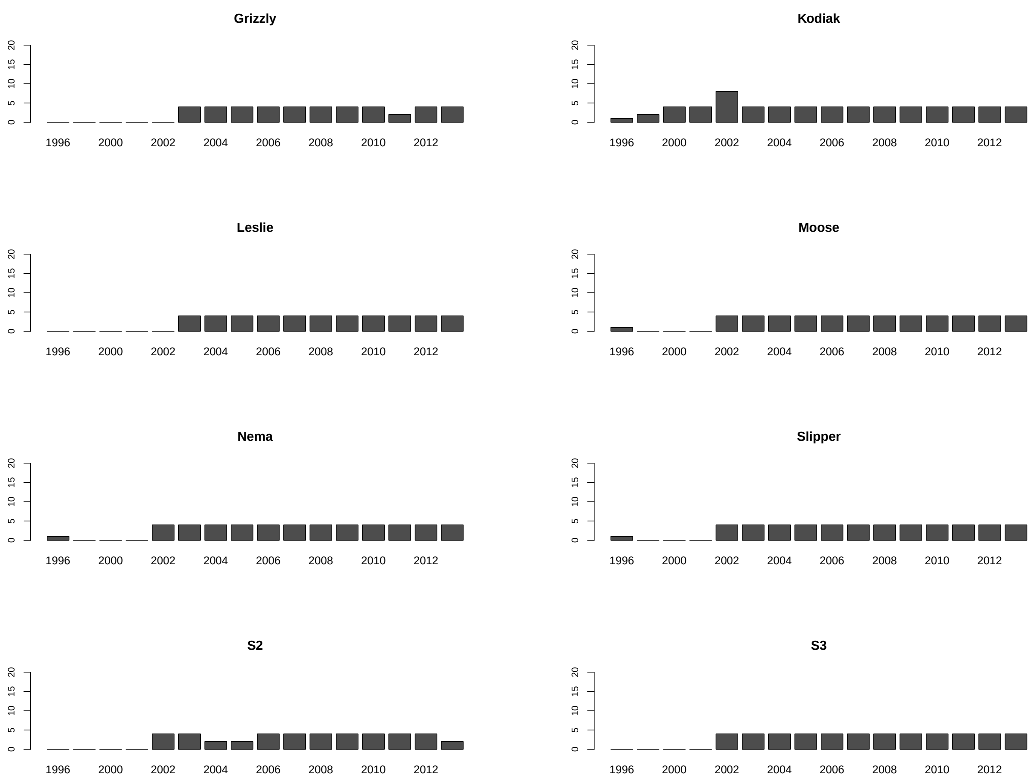
Analysis of April Total Strontium in Lakes of the Koala Watershed and Lac de Gras

January 20, 2014

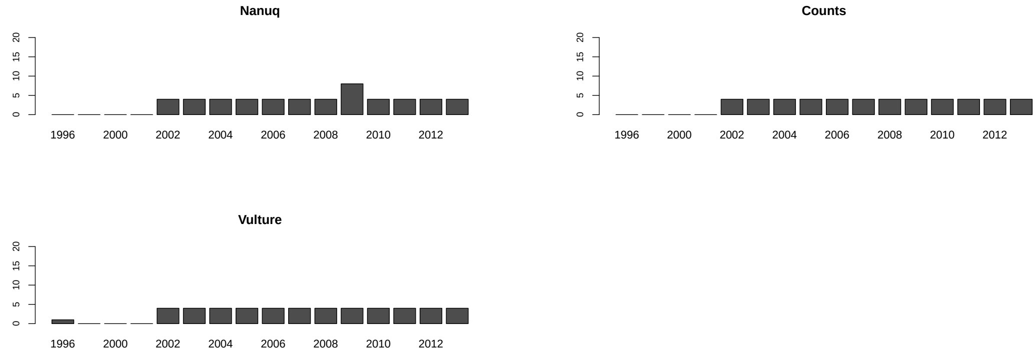
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

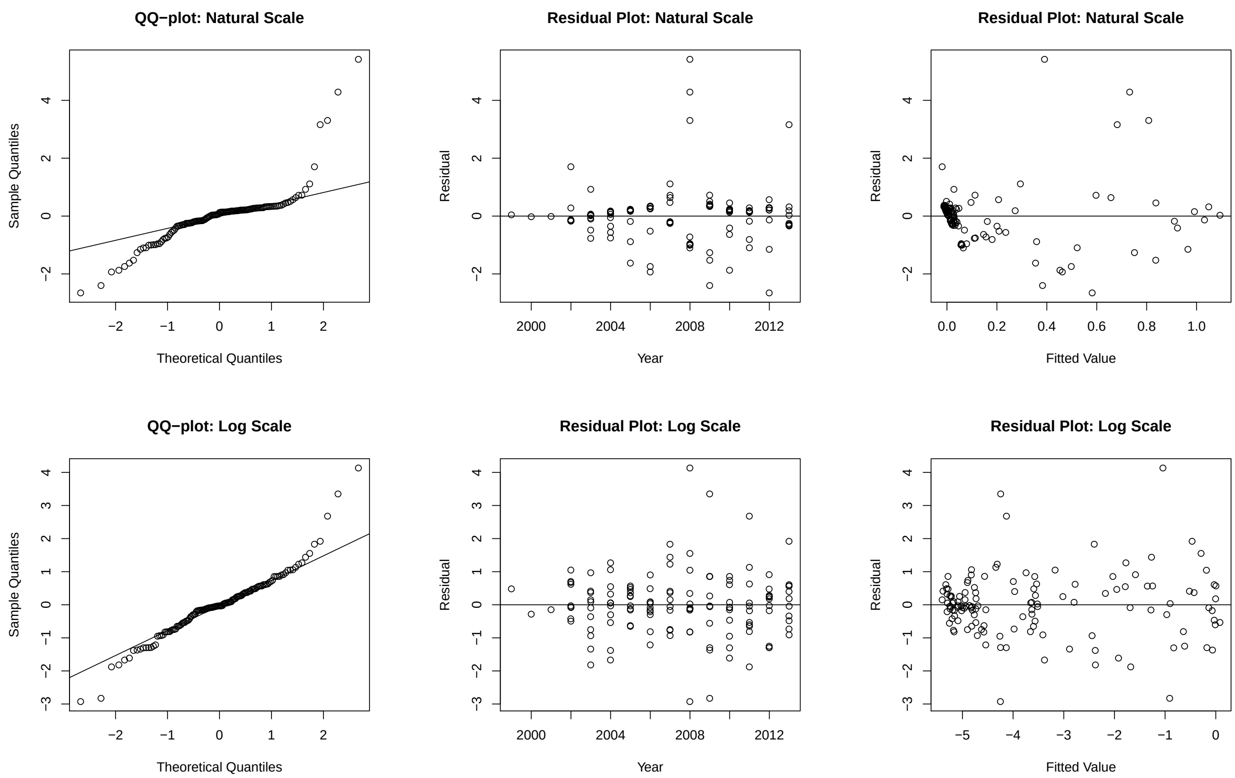


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
95	Leslie	2008	0.98	0.81	3.31
115	Moose	2008	0.95	0.73	4.29
155	Nema	2008	0.67	0.39	5.42
160	Nema	2013	0.84	0.68	3.16

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
155	Nema	2008	0.67	-1.04	4.13
196	S3	2009	0.02	-4.25	3.35

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	7.96E-65	natural model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
2491.33	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
0.22	4.00	0.99

- Conclusions:
  The slopes do not differ significantly among reference lakes.

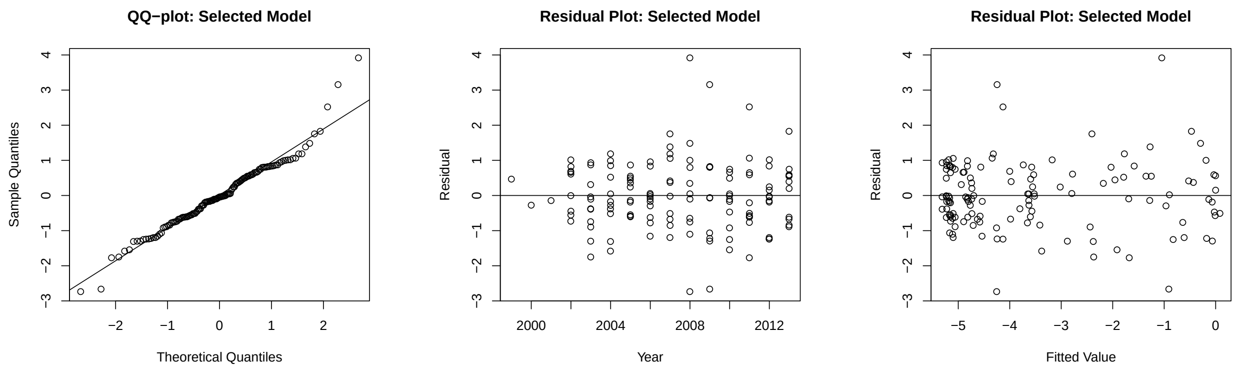
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.761	0.000	0.239	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
155	Nema	2008	0.67	-1.05	3.92
196	S3	2009	0.02	-4.25	3.16

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	0.53	2.00	0.77
Kodiak	0.10	2.00	0.95
Leslie	124.55	2.00	0.00
Moose	144.94	2.00	0.00
Nema	128.93	2.00	0.00
Slipper	117.12	2.00	0.00
S2	8.66	2.00	0.01
S3	12.68	2.00	0.00

- Conclusions:
  All monitored lakes except Grizzly and Kodiak lakes show significant deviation from the common slope of reference lakes.

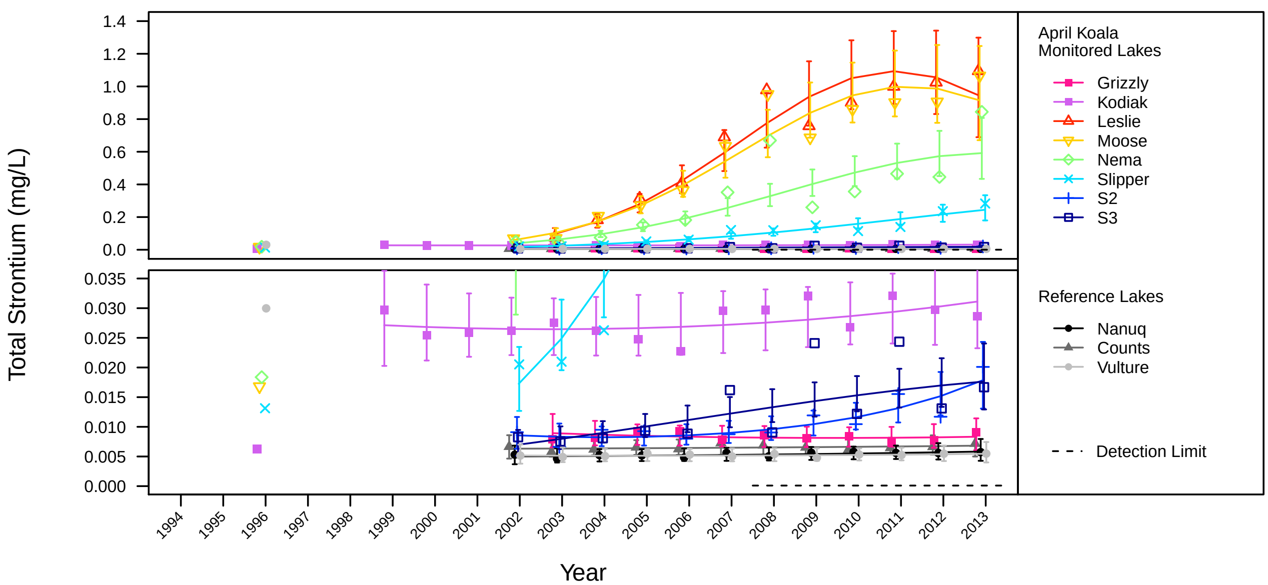
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0670
Monitored Lake	Grizzly	0.1170
Monitored Lake	Kodiak	0.2790
Monitored Lake	Leslie	0.9640
Monitored Lake	Moose	0.9600
Monitored Lake	Nema	0.8770
Monitored Lake	S2	0.7640
Monitored Lake	S3	0.5420
Monitored Lake	Slipper	0.9400

- Conclusions:
  Model fit for Kodiak Lake is weak. Model fit for reference lakes and Grizzly Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total strontium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	9.07e-03	8.32e-03	1.35e-03	6.06e-03	1.14e-02	3.94e-03
Kodiak	2.86e-02	3.11e-02	4.63e-03	2.32e-02	4.16e-02	1.35e-02
Leslie	1.09e+00	9.46e-01	1.53e-01	6.89e-01	1.30e+00	4.48e-01
Moose	1.06e+00	9.15e-01	1.45e-01	6.71e-01	1.25e+00	4.24e-01
Nema	8.45e-01	5.92e-01	9.37e-02	4.34e-01	8.07e-01	2.74e-01
Slipper	2.83e-01	2.45e-01	3.87e-02	1.79e-01	3.34e-01	1.13e-01
S2	2.01e-02	1.78e-02	2.82e-03	1.31e-02	2.43e-02	8.26e-03
S3	1.67e-02	1.76e-02	2.79e-03	1.29e-02	2.40e-02	8.16e-03
Nanuq	5.73e-03	5.83e-03	9.22e-04	4.27e-03	7.95e-03	NA
Counts	7.17e-03	6.81e-03	1.08e-03	5.00e-03	9.29e-03	NA
Vulture	5.48e-03	5.45e-03	8.63e-04	4.00e-03	7.43e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Strontium	April	Koala	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	6.242	Leslie Moose Nema Slipper S2 S3

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

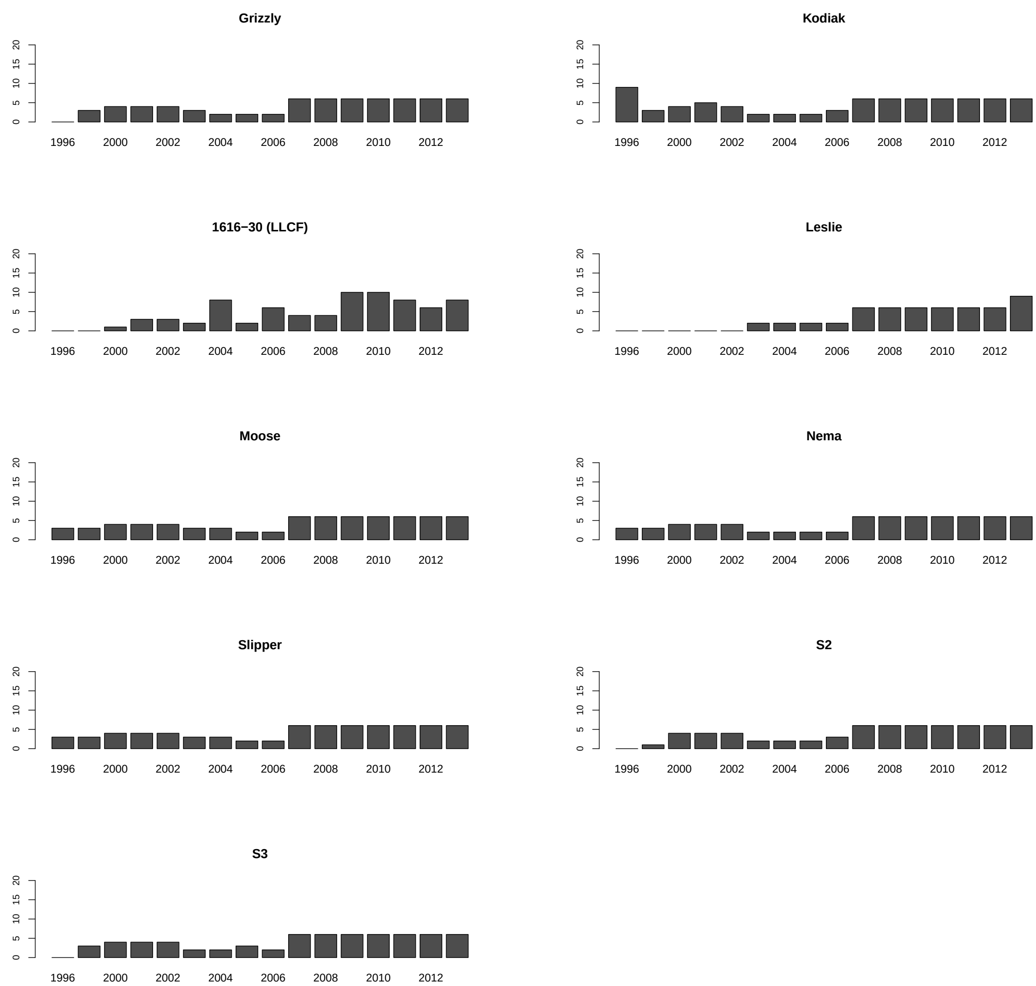
Analysis of August Total Strontium in Lakes of the Koala Watershed and Lac de Gras

January 11, 2014

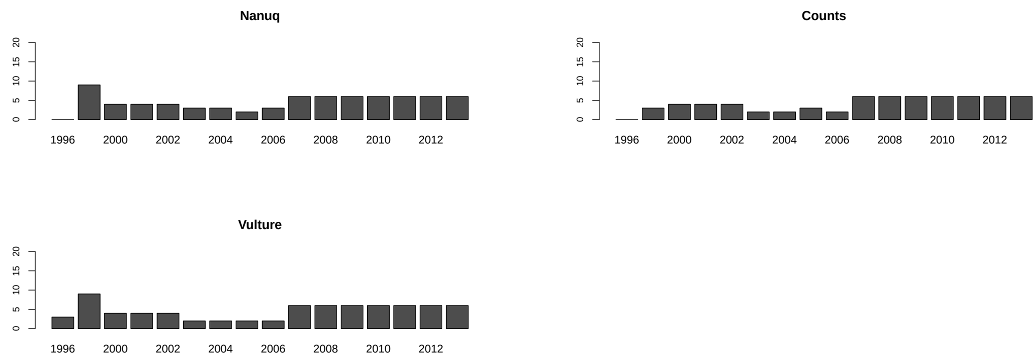
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

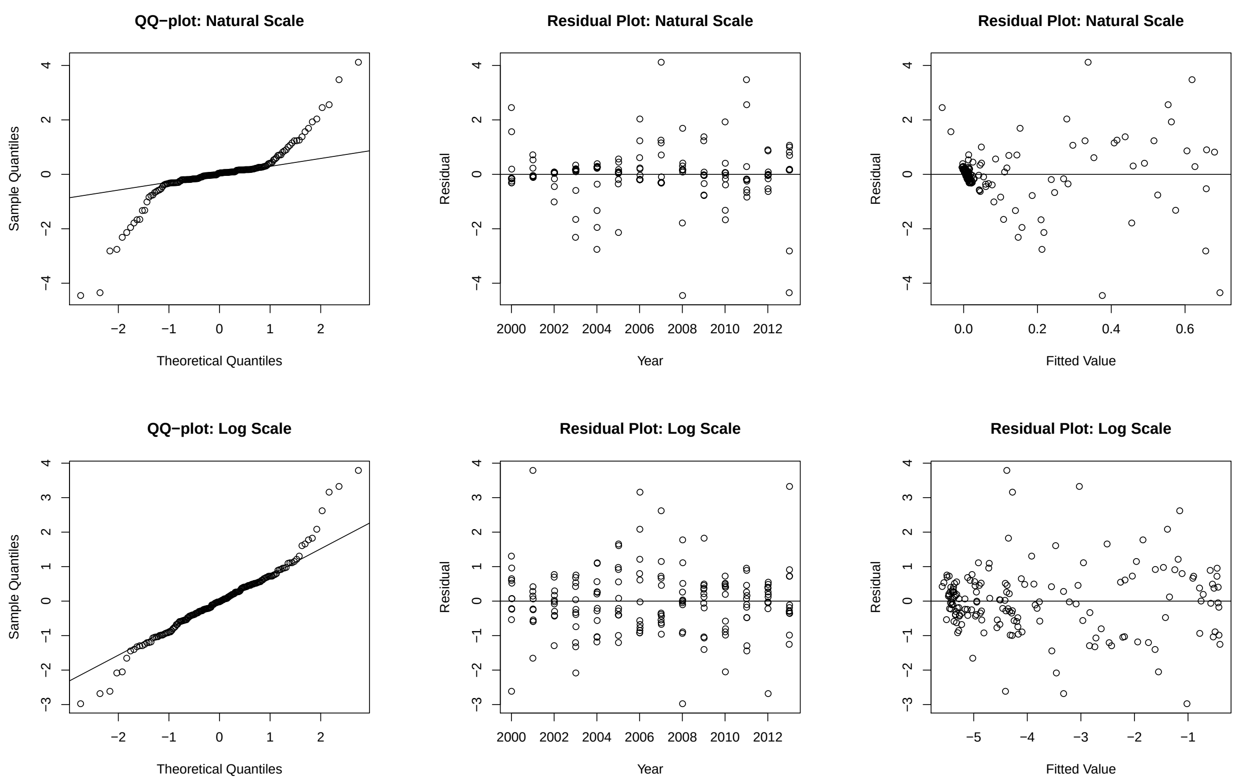


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-30 (LLCF)	2011	0.74	0.62	3.48
20	1616-30 (LLCF)	2013	0.55	0.69	-4.35
114	Moose	2007	0.48	0.34	4.12
115	Moose	2008	0.23	0.38	-4.45

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
68	Kodiak	2001	0.02	-4.38	3.79
173	S2	2006	0.02	-4.28	3.16
180	S2	2013	0.08	-3.03	3.33

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
2.26	6.00	0.89

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

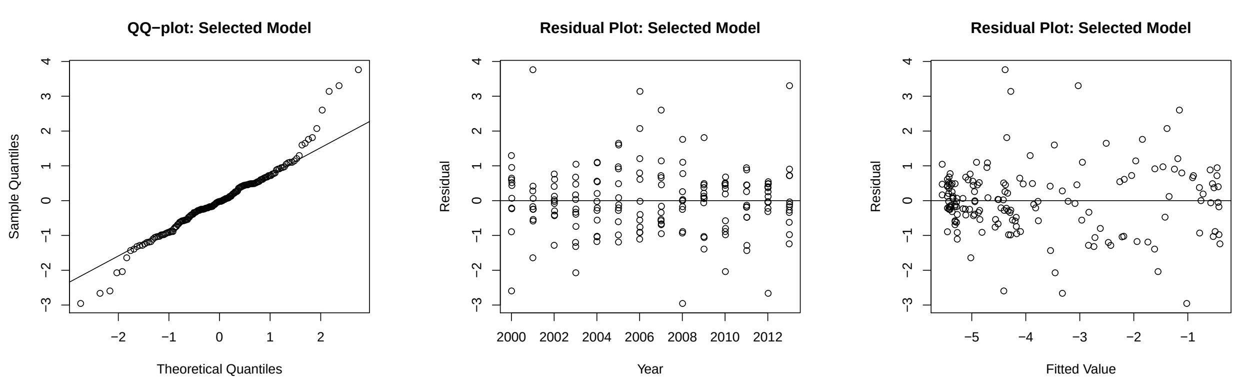
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.008	0.000	0.992	Ref. Model 3

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
68	Kodiak	2001	0.02	-4.38	3.76
173	S2	2006	0.02	-4.28	3.14
180	S2	2013	0.08	-3.03	3.30

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Lakes

Fitted model of the slope and intercept of each monitored lake compared to a common slope and intercept fitted for all reference lakes together (reference model 3).

- Results:

	Chi-squared	DF	P-value
Grizzly	78.9990	3	0.0000
Kodiak	435.7214	3	0.0000
1616-30 (LLCF)	148.7479	3	0.0000
Leslie	6241.8245	3	0.0000
Moose	6155.2180	3	0.0000
Nema	3982.7909	3	0.0000
Slipper	2061.7422	3	0.0000
S2	703.1086	3	0.0000
S3	310.0797	3	0.0000

- Conclusions:
  All monitored lakes except Grizzly and Kodiak lakes show significant deviations from the common slope and intercept of reference lakes.

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	0.2295	2	0.8916
Kodiak	0.0651	2	0.9680
1616-30 (LLCF)	148.4753	2	0.0000
Leslie	198.6977	2	0.0000
Moose	538.4983	2	0.0000
Nema	472.1338	2	0.0000
Slipper	284.9892	2	0.0000
S2	156.5920	2	0.0000
S3	62.9922	2	0.0000

- Conclusions:
  When allowing for differences in intercept, all monitored lakes show significant deviation from the common slope of reference lakes.

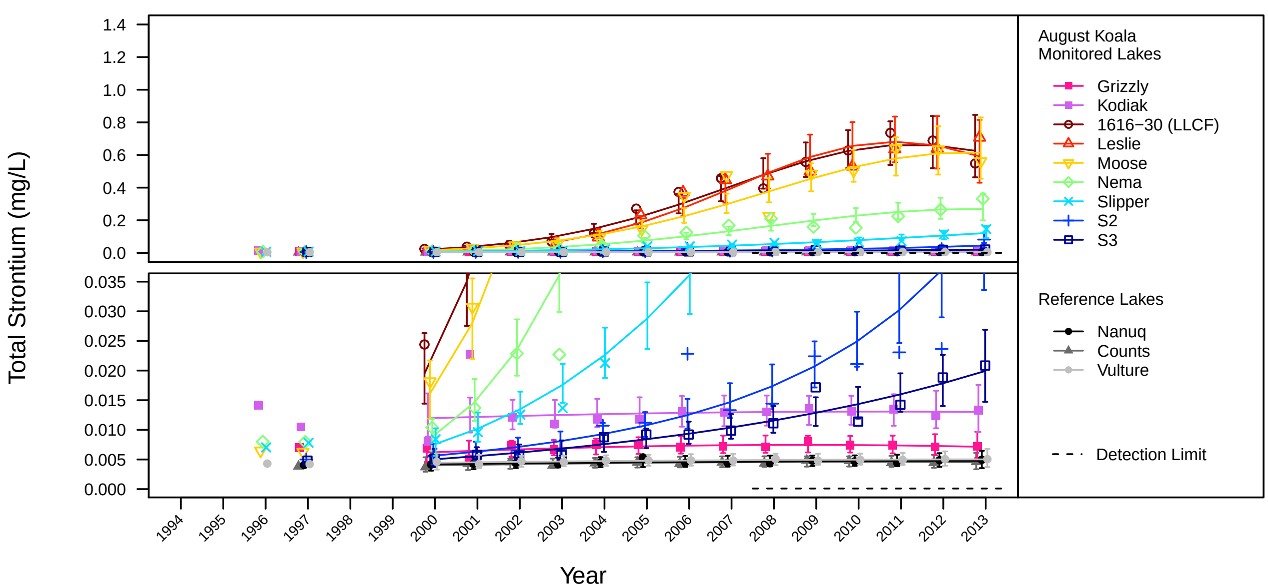
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.3380
Monitored Lake	1616-30 (LLCF)	0.9750
Monitored Lake	Grizzly	0.3310
Monitored Lake	Kodiak	0.0200
Monitored Lake	Leslie	0.9480
Monitored Lake	Moose	0.9560
Monitored Lake	Nema	0.9560
Monitored Lake	S2	0.8400
Monitored Lake	S3	0.9180
Monitored Lake	Slipper	0.9630

- Conclusions:
  Model fit for reference lakes and Grizzly Lake is weak. Model fit for Kodiak Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total strontium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	7.22e-03	7.15e-03	1.10e-03	5.29e-03	9.66e-03	3.21e-03
Kodiak	1.33e-02	1.30e-02	2.00e-03	9.63e-03	1.76e-02	5.85e-03
Leslie	7.07e-01	5.92e-01	9.65e-02	4.30e-01	8.15e-01	2.82e-01
1616-30 (LLCF)	5.48e-01	6.26e-01	9.61e-02	4.63e-01	8.46e-01	2.81e-01
Moose	5.61e-01	6.15e-01	9.43e-02	4.55e-01	8.30e-01	2.76e-01
Nema	3.32e-01	2.70e-01	4.14e-02	2.00e-01	3.64e-01	1.21e-01
Slipper	1.46e-01	1.22e-01	1.87e-02	9.03e-02	1.65e-01	5.48e-02
S2	8.17e-02	4.54e-02	6.96e-03	3.36e-02	6.13e-02	2.04e-02
S3	2.08e-02	1.99e-02	3.05e-03	1.47e-02	2.69e-02	8.94e-03
Nanuq	4.95e-03	4.78e-03	7.34e-04	3.54e-03	6.46e-03	NA
Counts	4.61e-03	4.53e-03	6.95e-04	3.35e-03	6.12e-03	NA
Vulture	5.06e-03	5.02e-03	7.70e-04	3.72e-03	6.78e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Strontium	August	Koala	Lake	Water	none	log e	linear mixed effects regression	#3 shared intercept & slope	6.242	Grizzly Kodiak 1616-30 (LLCF) Leslie Moose Nema Slipper S2 S3

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

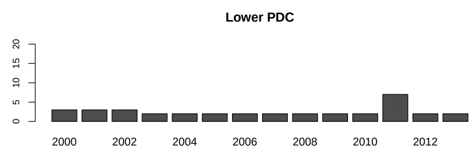
Analysis of August Total Strontium in Koala Watershed Streams

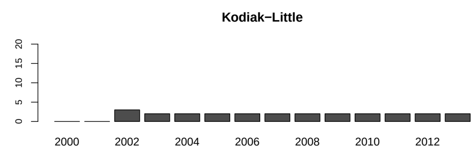
January 11, 2014

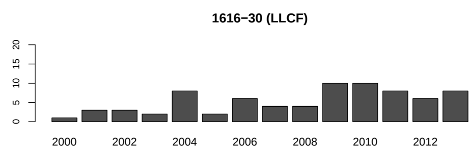
1 Censored Values:

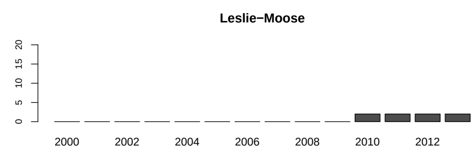
The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

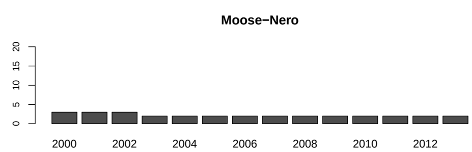
1.1 Monitored

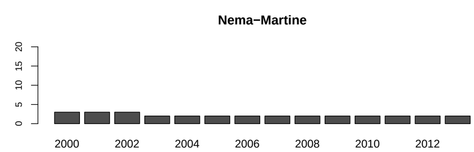


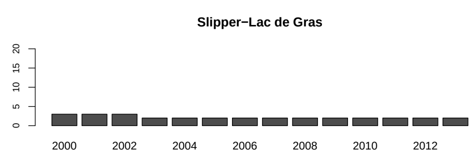




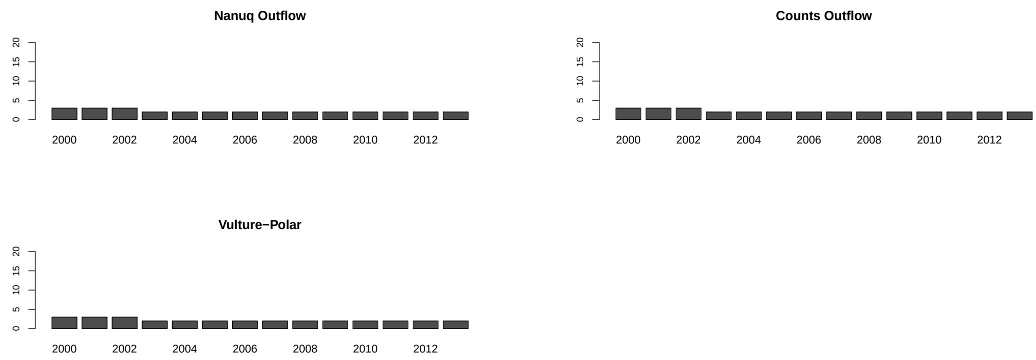






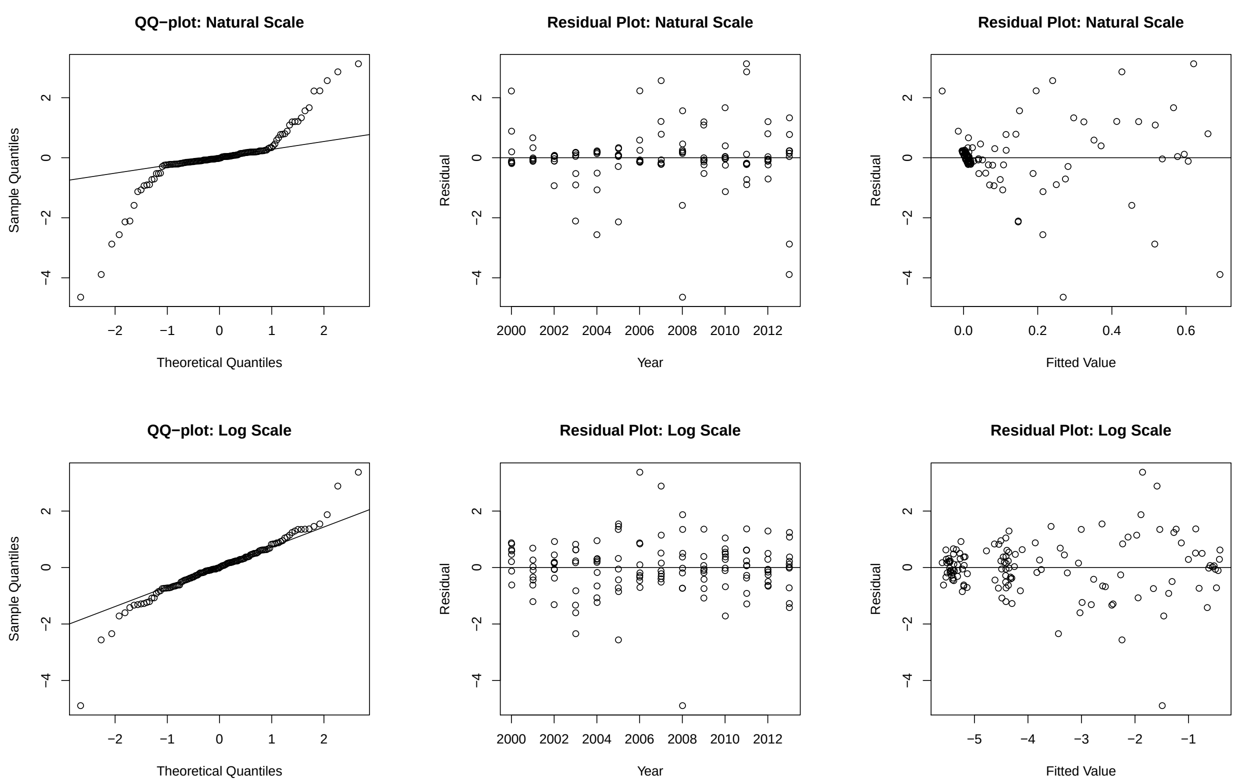


1.2 Reference



Comment:
None of the streams exhibited greater than 10% of data less than the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-30 (LLCF)	2011	0.74	0.62	3.13
20	1616-30 (LLCF)	2013	0.55	0.69	-3.89
115	Moose-Nero	2008	0.10	0.27	-4.65

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
113	Moose-Nero	2006	0.28	-1.86	3.38
115	Moose-Nero	2008	0.10	-1.49	-4.89

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
140.22	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
127.94	4.00	0.00

- Conclusions:
  The slopes differ significantly among reference streams. Reference streams do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.872	0.000	0.128	Ref. Model 1

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Lower PDC	1.1391	2	0.5658
Kodiak-Little	0.0976	2	0.9523
Leslie-Moose	0.4048	2	0.8168
1616-30 (LLCF)	539.4545	2	0.0000
Moose-Nero	297.6695	2	0.0000
Nema-Martine	288.3839	2	0.0000
Slipper-Lac de Gras	172.3148	2	0.0000

- Conclusions:
  All monitored streams except Lower PDC, Kodiak-Little, and Leslie-Moose show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored stream compared to slope of each reference stream (reference model 1b).

- Results:

	Chi-squared	DF	P-value
1616-30 (LLCF)-vs-Nanuq Outflow	122.5473	3	0.0000
1616-30 (LLCF)-vs-Counts Outflow	116.0330	3	0.0000
1616-30 (LLCF)-vs-Vulture-Polar	117.3337	3	0.0000
Moose-Nero-vs-Nanuq Outflow	3037.4462	3	0.0000
Moose-Nero-vs-Counts Outflow	3064.0212	3	0.0000
Moose-Nero-vs-Vulture-Polar	2700.8876	3	0.0000
Nema-Martine-vs-Nanuq Outflow	2346.2430	3	0.0000
Nema-Martine-vs-Counts Outflow	2368.8454	3	0.0000
Nema-Martine-vs-Vulture-Polar	2056.3528	3	0.0000
Slipper-Lac de Gras-vs-Nanuq Outflow	1215.4942	3	0.0000
Slipper-Lac de Gras-vs-Counts Outflow	1228.3300	3	0.0000
Slipper-Lac de Gras-vs-Vulture-Polar	1010.0450	3	0.0000

- Conclusions:
  All remaining monitored streams show significant deviations from the slopes of individual reference streams.

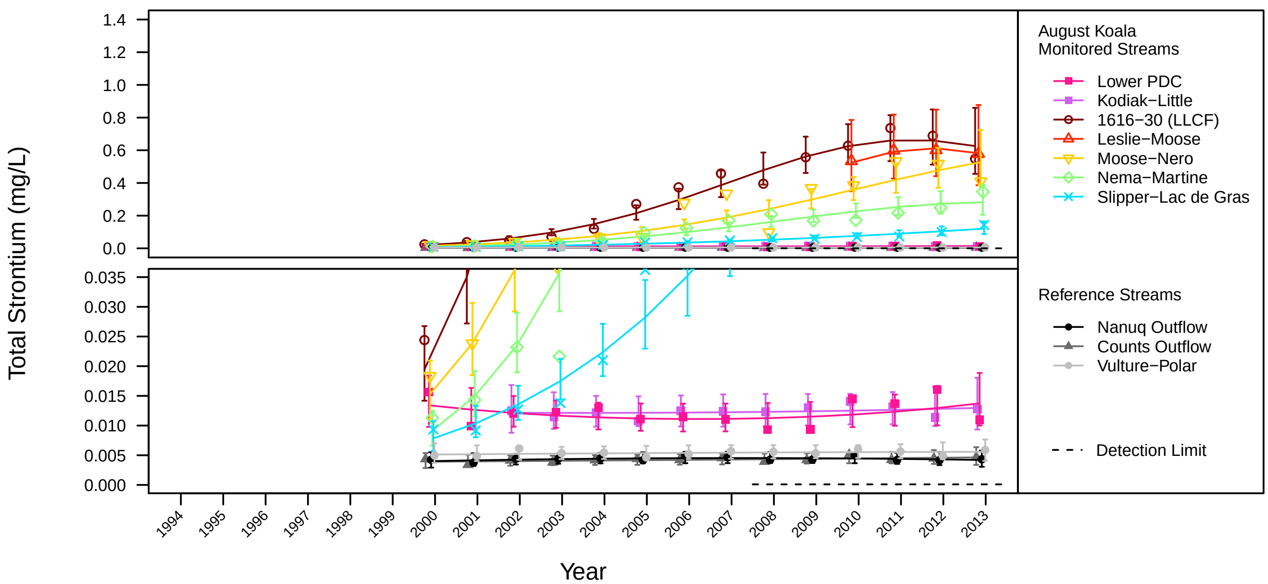
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Reference Stream	Counts Outflow	0.3220
Reference Stream	Nanuq Outflow	0.2520
Reference Stream	Vulture-Polar	0.1090
Monitored Stream	1616-30 (LLCF)	0.9750
Monitored Stream	Kodiak-Little	0.1020
Monitored Stream	Leslie-Moose	0.9350
Monitored Stream	Lower PDC	0.1650
Monitored Stream	Moose-Nero	0.8900
Monitored Stream	Nema-Martine	0.9560
Monitored Stream	Slipper-Lac de Gras	0.9700

- Conclusions:
  Model fit for Counts Outflow and Nanuq Outflow is weak. Model fit for Vulture-Polar, Kodiak-Little, and Lower PDC is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total strontium for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	1.09e-02	1.37e-02	2.22e-03	1.00e-02	1.89e-02	6.50e-03
Kodiak-Little	1.28e-02	1.30e-02	2.19e-03	9.32e-03	1.80e-02	6.40e-03
Leslie-Moose	5.79e-01	5.82e-01	1.22e-01	3.86e-01	8.77e-01	3.56e-01
1616-30 (LLCF)	5.48e-01	6.26e-01	1.01e-01	4.56e-01	8.60e-01	2.96e-01
Moose-Nero	4.09e-01	5.27e-01	8.53e-02	3.84e-01	7.24e-01	2.50e-01
Nema-Martine	3.46e-01	2.82e-01	4.57e-02	2.06e-01	3.88e-01	1.34e-01
Slipper-Lac de Gras	1.43e-01	1.20e-01	1.94e-02	8.74e-02	1.65e-01	5.68e-02
Nanuq Outflow	4.32e-03	4.21e-03	6.80e-04	3.06e-03	5.77e-03	NA
Counts Outflow	4.68e-03	4.63e-03	7.49e-04	3.37e-03	6.36e-03	NA
Vulture-Polar	5.88e-03	5.57e-03	9.02e-04	4.06e-03	7.66e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Strontium	August	Koala	Stream	Water	none	log e	linear mixed effects regression	#1b separate intercepts & slopes	6.242	1616-30 (LLCF) Moose-Nero Slipper-Lac de Gras

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

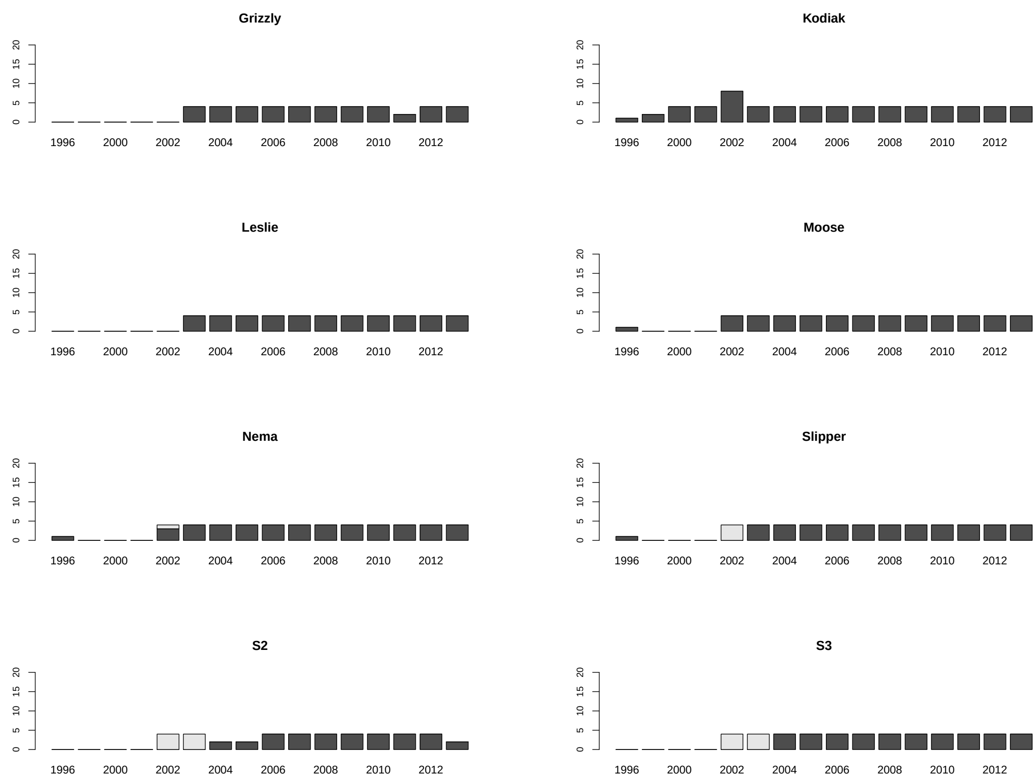
Analysis of April Total Uranium in Lakes of the Koala Watershed and Lac de Gras

January 11, 2014

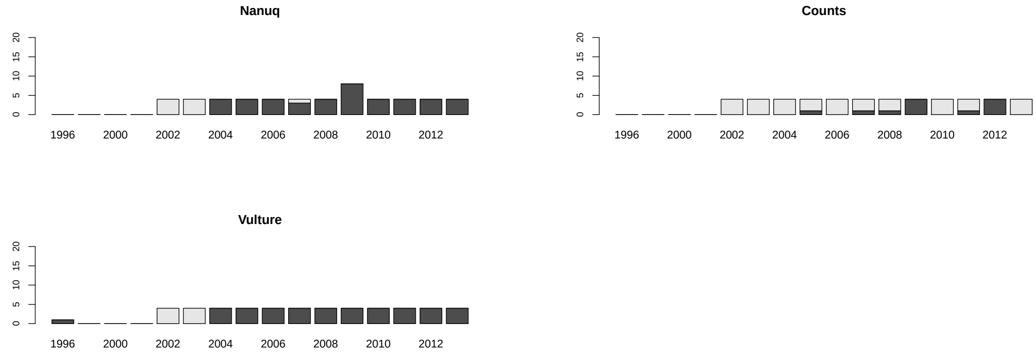
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

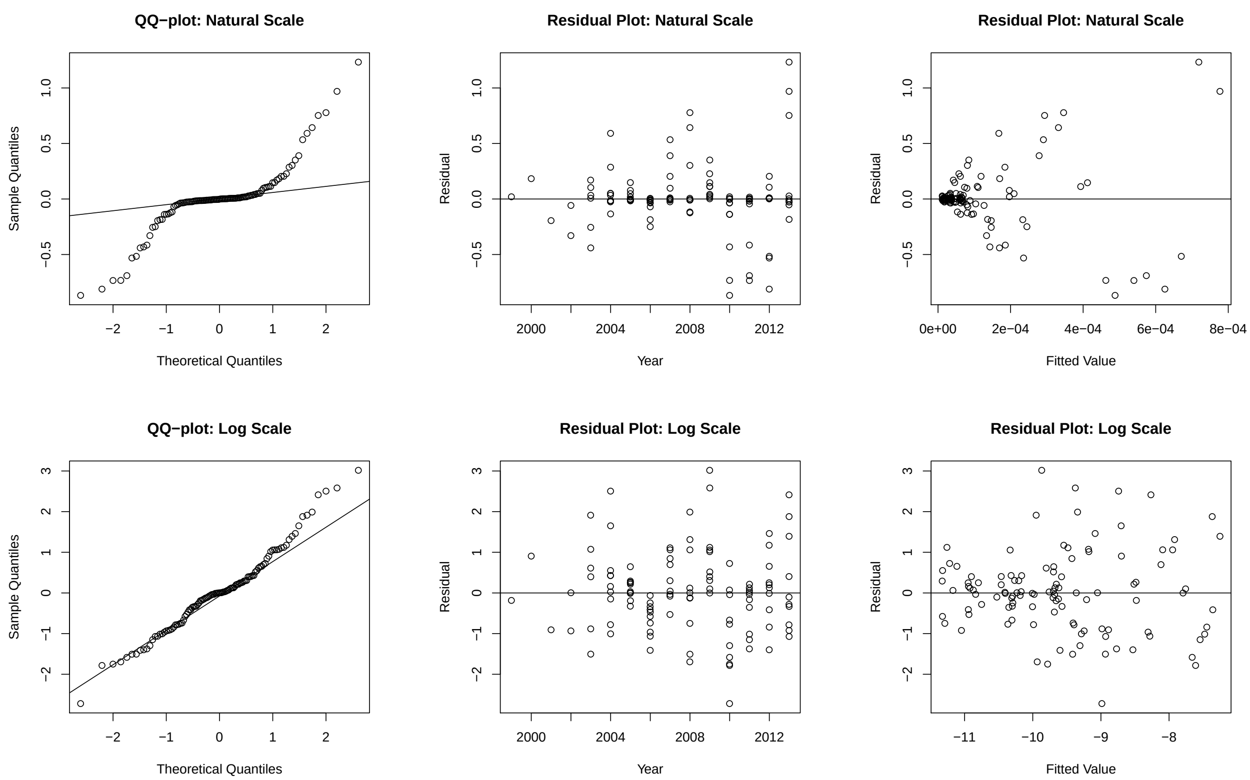


1.2 Reference



Comment:
Greater than 60% of data in Counts Lake was less than the detection limit. This lake was excluded from further analyses. 10-60% of data in Nanuq, Vulture, S2, and S3 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
216	Slipper	2009	0.00	-9.87	3.02

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	0.00E+00	natural model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
2.60	3.00	0.46

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
0.10	2.00	0.95

- Conclusions:
  The slopes do not differ significantly among reference lakes.

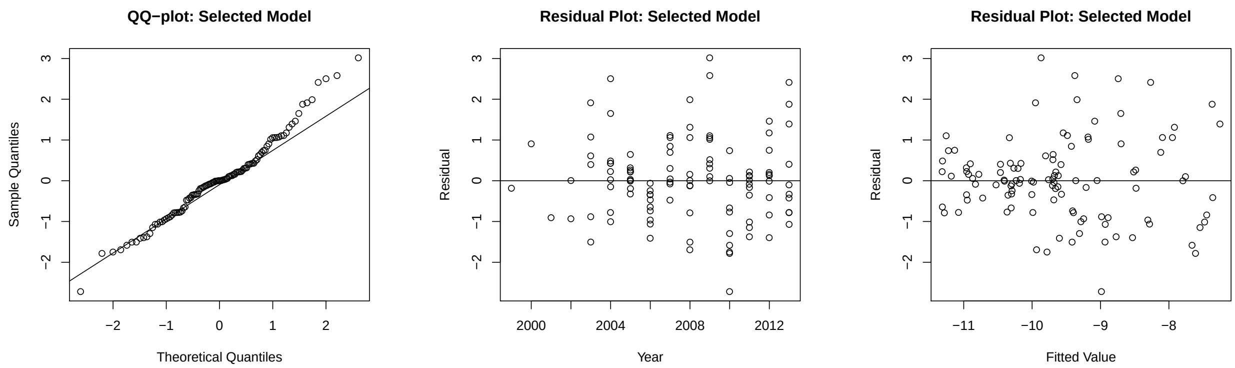
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.278	0.718	0.004	Indistinguishable support for 2 & 1; choose Model 2.

- Conclusions:
  Results of AIC do not agree with reference model testing. Although results of contrasts suggest that reference lakes share a common intercept, AIC reveals that reference lakes are best modelled with separate intercepts. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
216	Slipper	2009	0.00	-9.87	3.02

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	0.7157	2	0.6992
Kodiak	2.3055	2	0.3158
Leslie	32.9096	2	0.0000
Moose	34.6155	2	0.0000
Nema	30.4385	2	0.0000
Slipper	2.5972	2	0.2729
S2	5.3446	2	0.0691
S3	4.0183	2	0.1341

- Conclusions:
  Leslie, Moose, and Nema lakes show significant deviation from the common slope of reference lakes.

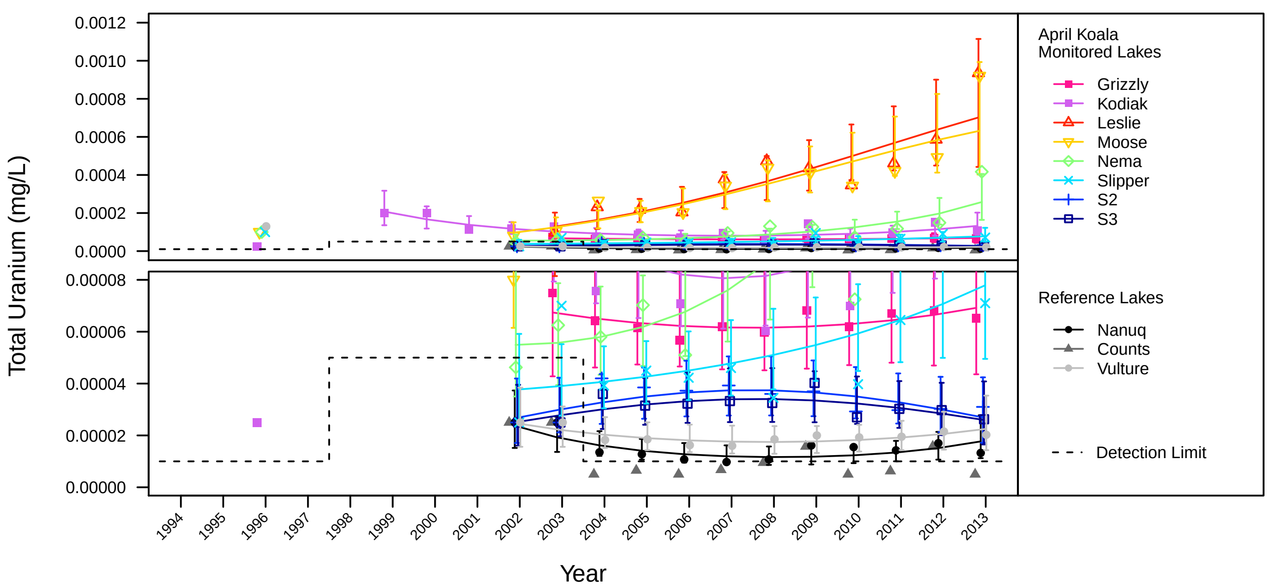
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.4230
Monitored Lake	Grizzly	0.3840
Monitored Lake	Kodiak	0.5980
Monitored Lake	Leslie	0.8360
Monitored Lake	Moose	0.8520
Monitored Lake	Nema	0.7400
Monitored Lake	S2	0.2870
Monitored Lake	S3	0.2820
Monitored Lake	Slipper	0.2530

- Conclusions:
  Model fit for reference lakes, Grizzly, Slipper, S2, and S3 is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total uranium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	6.52e-05	6.92e-05	1.63e-05	4.36e-05	1.10e-04	4.77e-05
Kodiak	1.07e-04	1.32e-04	2.86e-05	8.66e-05	2.02e-04	8.37e-05
Leslie	9.36e-04	7.02e-04	1.66e-04	4.42e-04	1.11e-03	4.84e-04
Moose	9.20e-04	6.32e-04	1.46e-04	4.02e-04	9.93e-04	4.26e-04
Nema	4.17e-04	2.58e-04	5.94e-05	1.64e-04	4.05e-04	1.74e-04
Slipper	7.10e-05	7.78e-05	1.79e-05	4.95e-05	1.22e-04	5.25e-05
S2	3.10e-05	2.70e-05	6.22e-06	1.72e-05	4.24e-05	1.82e-05
S3	2.63e-05	2.60e-05	5.99e-06	1.65e-05	4.08e-05	1.75e-05
Nanuq	1.32e-05	1.77e-05	4.07e-06	1.12e-05	2.78e-05	NA
Counts	5.00e-06	NA	NA	NA	NA	NA
Vulture	2.03e-05	2.25e-05	5.19e-06	1.43e-05	3.53e-05	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Uranium	April	Koala	Lake	Water	Counts	log e	Tobit regression	#2 shared slopes	0.015	Leslie Moose Nema

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

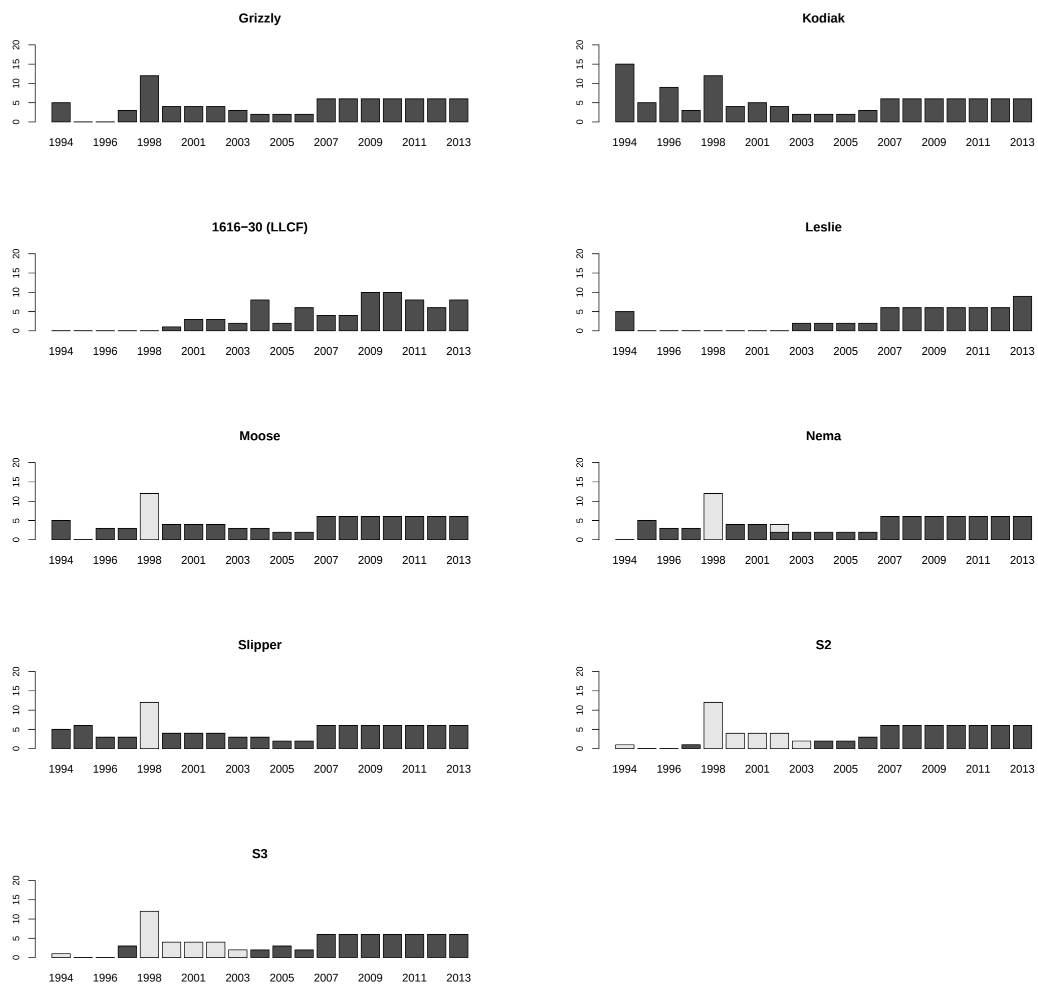
Analysis of August Total Uranium in Lakes of the Koala Watershed and Lac de Gras

January 11, 2014

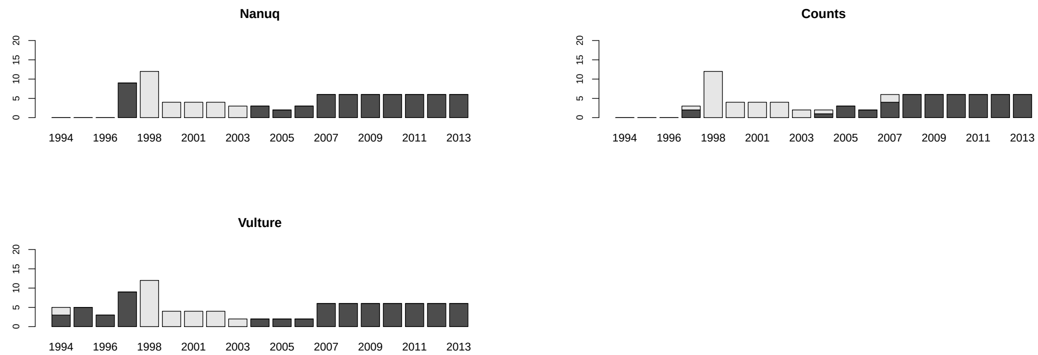
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

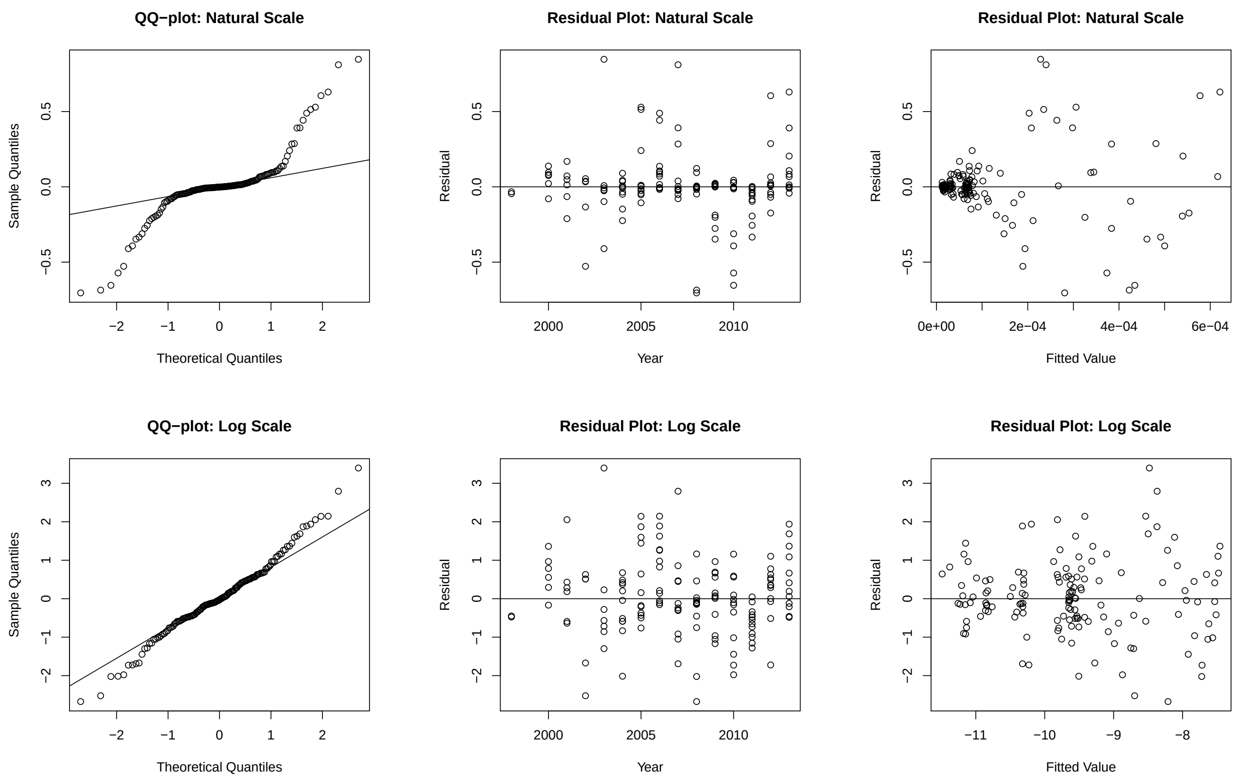


1.2 Reference



Comment:
10-60% of data in Counts, Nanuq, Vulture, Moose, Nema, Slipper, S2, and S3 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
10	1616-30 (LLCF)	2003	0.00	-8.48	3.40

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
12.98	6.00	0.04

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
4.31	4.00	0.37

- Conclusions:
  The slopes do not differ significantly among reference lakes.

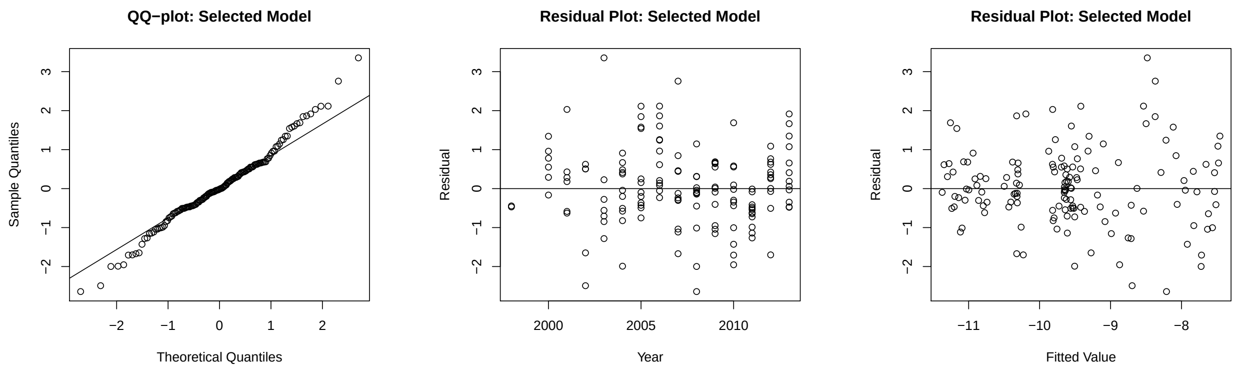
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.150	0.850	0.000	Ref. Model 2

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with a common slope. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
10	1616-30 (LLCF)	2003	0.00	-8.48	3.35

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Grizzly	1.8836	2	0.3899
Kodiak	2.6009	2	0.2724
1616-30 (LLCF)	25.8606	2	0.0000
Leslie	30.8564	2	0.0000
Moose	59.6194	2	0.0000
Nema	26.2108	2	0.0000
Slipper	0.7316	2	0.6937
S2	1.0226	2	0.5997
S3	5.0330	2	0.0807

- Conclusions:
  1616-30 (LLCF), Leslie, Moose, and Nema lakes show significant deviations from the common slope of reference lakes.

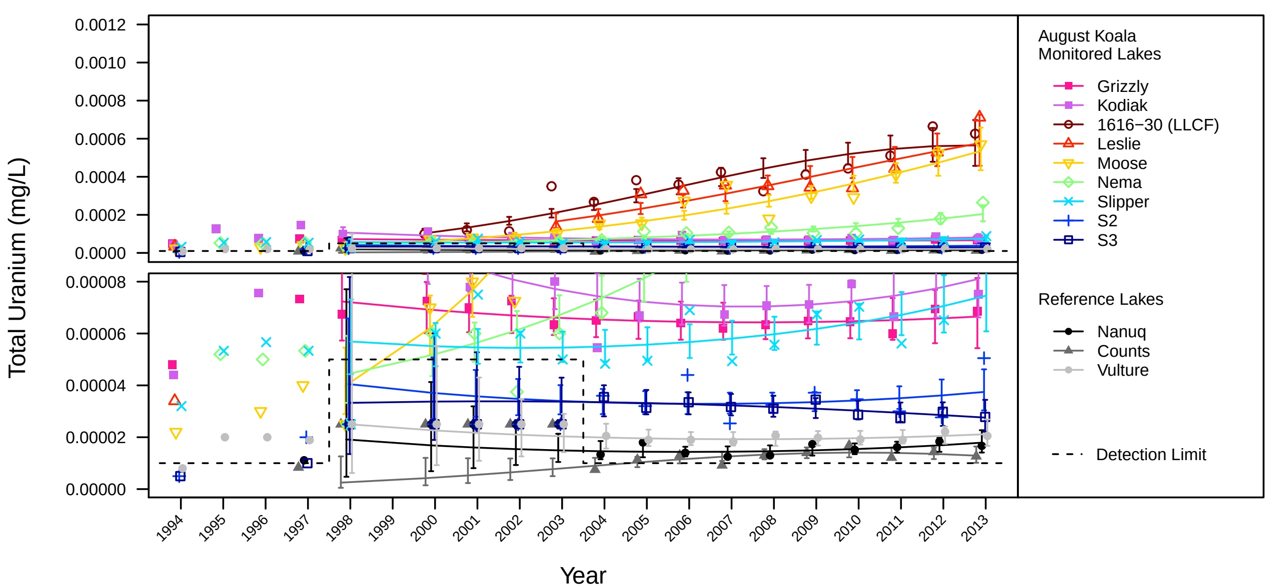
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.3530
Monitored Lake	1616-30 (LLCF)	0.8580
Monitored Lake	Grizzly	0.3430
Monitored Lake	Kodiak	0.4070
Monitored Lake	Leslie	0.8390
Monitored Lake	Moose	0.9100
Monitored Lake	Nema	0.7570
Monitored Lake	S2	0.2000
Monitored Lake	S3	0.3050
Monitored Lake	Slipper	0.1480

- Conclusions:
  Model fit for reference lakes, Grizzly, Kodiak, and S3 is weak. Model fit for Slipper and S2 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total uranium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	6.85e-05	6.65e-05	6.86e-06	5.43e-05	8.14e-05	2.01e-05
Kodiak	7.52e-05	8.10e-05	8.35e-06	6.62e-05	9.92e-05	2.44e-05
Leslie	7.12e-04	5.77e-04	6.78e-05	4.58e-04	7.26e-04	1.99e-04
1616-30 (LLCF)	6.26e-04	5.65e-04	6.10e-05	4.57e-04	6.98e-04	1.79e-04
Moose	5.70e-04	5.35e-04	5.67e-05	4.34e-04	6.58e-04	1.66e-04
Nema	2.64e-04	2.04e-04	2.14e-05	1.66e-04	2.50e-04	6.25e-05
Slipper	8.82e-05	7.46e-05	7.72e-06	6.09e-05	9.13e-05	2.26e-05
S2	5.05e-05	3.74e-05	4.01e-06	3.04e-05	4.62e-05	1.17e-05
S3	2.78e-05	2.76e-05	3.12e-06	2.21e-05	3.44e-05	9.12e-06
Nanuq	1.67e-05	1.79e-05	2.17e-06	1.41e-05	2.27e-05	NA
Counts	1.27e-05	1.29e-05	1.59e-06	1.01e-05	1.64e-05	NA
Vulture	2.05e-05	2.12e-05	2.57e-06	1.67e-05	2.69e-05	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Uranium	August	Koala	Lake	Water	none	log e	Tobit regression	#2 shared slopes	0.015	1616-30 (LLCF) Leslie Moose Nema

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

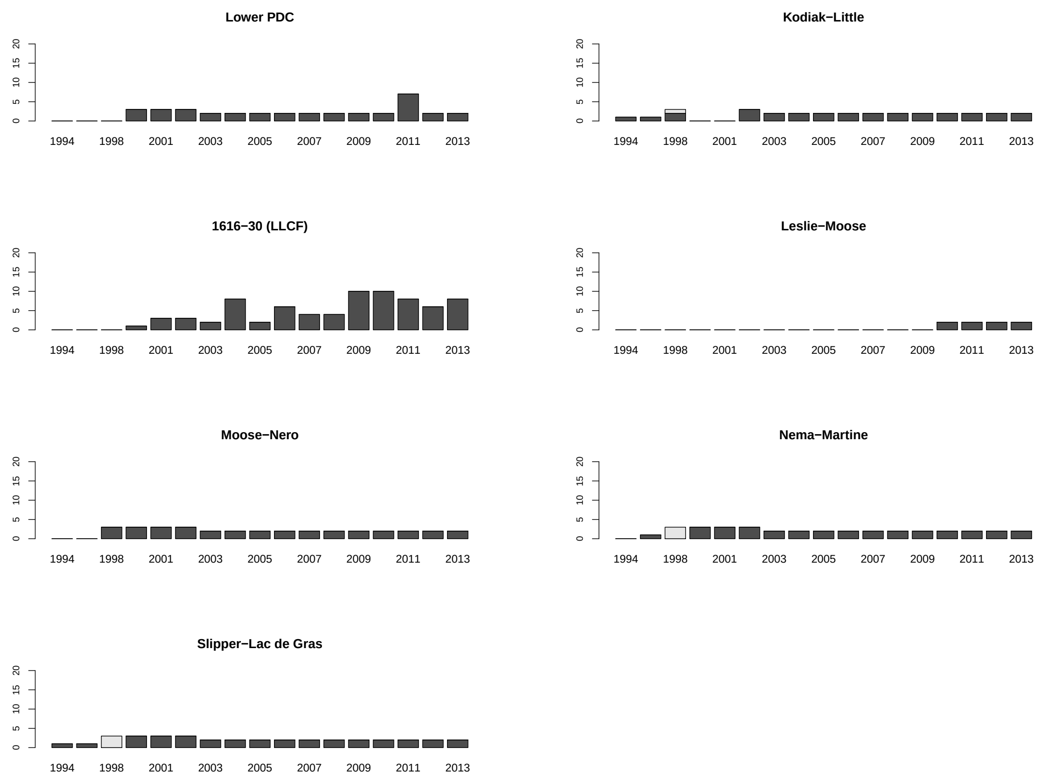
Analysis of August Total Uranium in Koala Watershed Streams

January 11, 2014

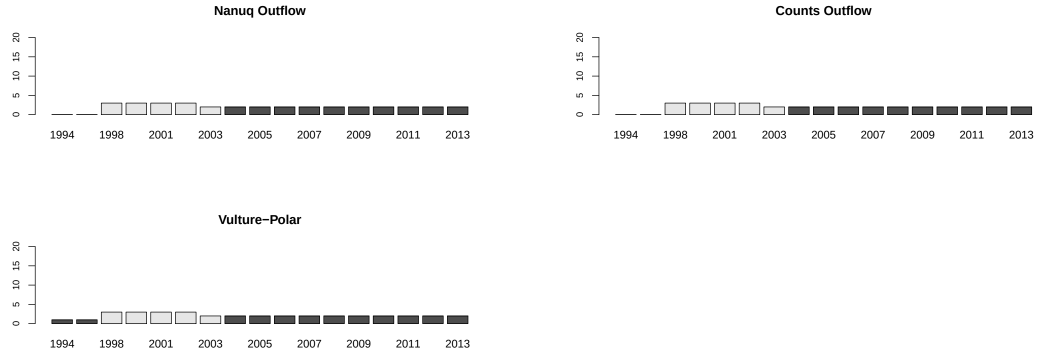
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

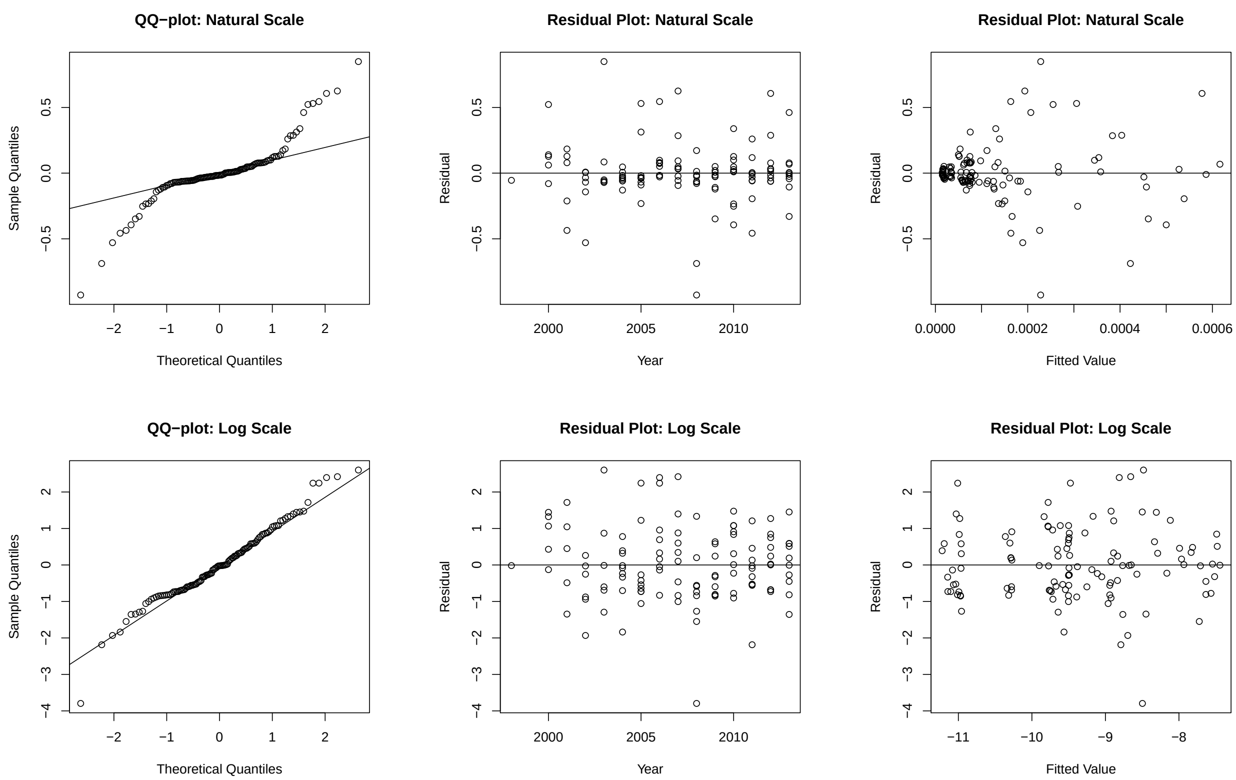


1.2 Reference



Comment:
10-60% of data in Counts Outflow, Nanuq Outflow, and Vulture-Polar was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
115	Moose-Nero	2008	0.00	-8.50	-3.80

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
11.96	6.00	0.06

- Conclusions:
  The slopes and intercepts do not differ significantly among reference streams.

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
1.37	4.00	0.85

- Conclusions:
  The slopes do not differ significantly among reference streams.

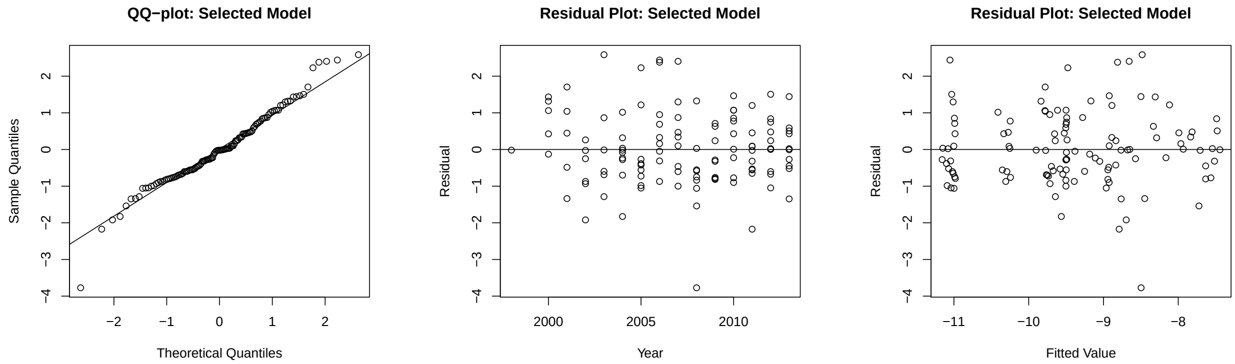
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.034	0.966	0.000	Ref. Model 2

- Conclusions:
  Results of AIC do not agree with reference model testing. Although results of contrasts suggest that reference streams share a common slope and intercept, AIC reveals that reference streams are best modeled with separate intercepts. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
115	Moose-Nero	2008	0.00	-8.50	-3.77

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference stream slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Streams

- Results:

	Chi-squared	DF	P-value
Lower PDC	7.5128	2	0.0234
Kodiak-Little	1.6756	2	0.4327
Leslie-Moose	4.0323	2	0.1332
1616-30 (LLCF)	15.9319	2	0.0003
Moose-Nero	44.7915	2	0.0000
Nema-Martine	21.8104	2	0.0000
Slipper-Lac de Gras	1.8984	2	0.3871

- Conclusions:
  All monitored streams except Kodiak-Little, Leslie-Moose, and Slipper-Lac de Gras show significant deviations from the common slope of reference streams.

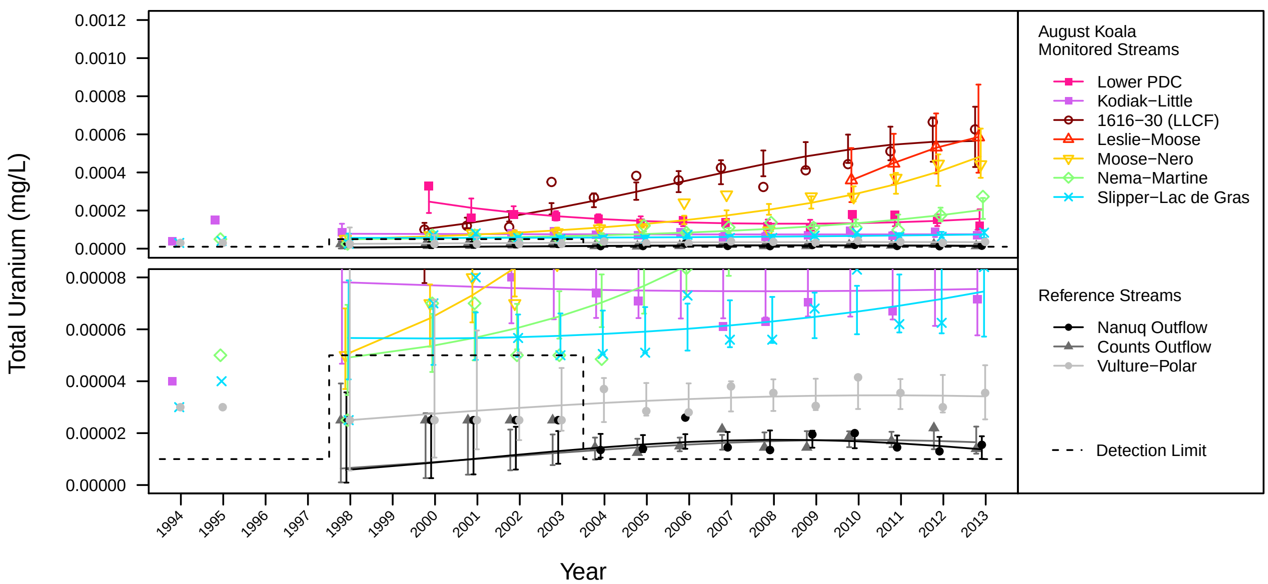
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.5260
Monitored Stream	1616-30 (LLCF)	0.8580
Monitored Stream	Kodiak-Little	0.0150
Monitored Stream	Leslie-Moose	1.0000
Monitored Stream	Lower PDC	0.5360
Monitored Stream	Moose-Nero	0.8500
Monitored Stream	Nema-Martine	0.6660
Monitored Stream	Slipper-Lac de Gras	0.1190

- Conclusions:
  Model fit for Kodiak-Little and Slipper-Lac de Gras is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total uranium for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	1.19e-04	1.56e-04	2.21e-05	1.19e-04	2.06e-04	6.46e-05
Kodiak-Little	7.15e-05	7.55e-05	1.04e-05	5.77e-05	9.89e-05	3.04e-05
Leslie-Moose	5.85e-04	5.86e-04	1.15e-04	3.99e-04	8.61e-04	3.37e-04
1616-30 (LLCF)	6.26e-04	5.65e-04	7.97e-05	4.29e-04	7.45e-04	2.33e-04
Moose-Nero	4.42e-04	4.84e-04	6.51e-05	3.72e-04	6.30e-04	1.91e-04
Nema-Martine	2.73e-04	2.04e-04	2.77e-05	1.56e-04	2.66e-04	8.10e-05
Slipper-Lac de Gras	8.40e-05	7.46e-05	1.01e-05	5.72e-05	9.72e-05	2.95e-05
Nanuq Outflow	1.55e-05	1.38e-05	2.18e-06	1.01e-05	1.88e-05	NA
Counts Outflow	1.40e-05	1.65e-05	2.62e-06	1.21e-05	2.25e-05	NA
Vulture-Polar	3.55e-05	3.42e-05	5.24e-06	2.53e-05	4.62e-05	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Uranium	August	Koala	Stream	Water	none	log e	Tobit regression	#2 shared slopes	0.015	Lower PDC 1616-30 (LLCF) Moose-Nero Nema-Martine

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

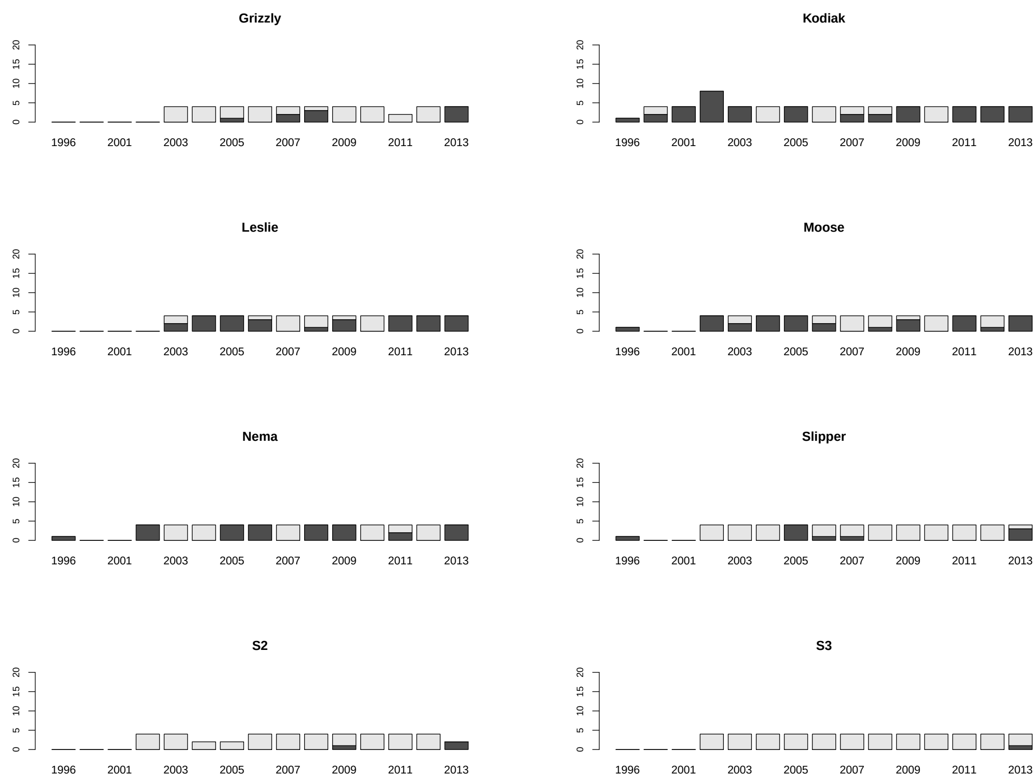
Analysis of April Total Vanadium Lakes of the Koala Watershed and Lac de Gras

January 11, 2014

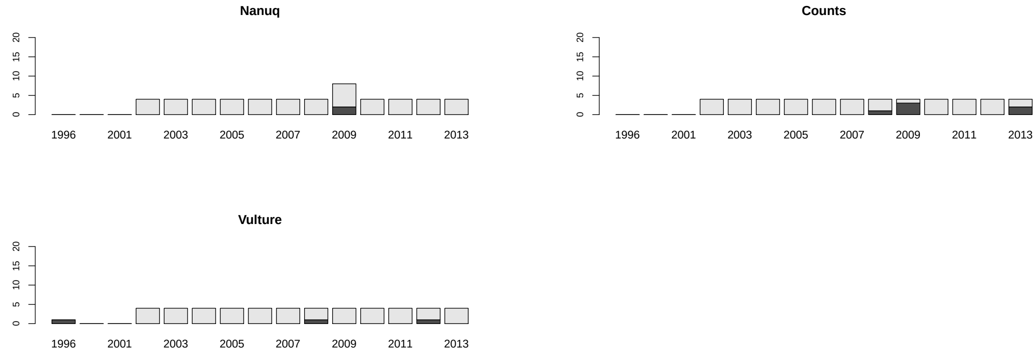
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

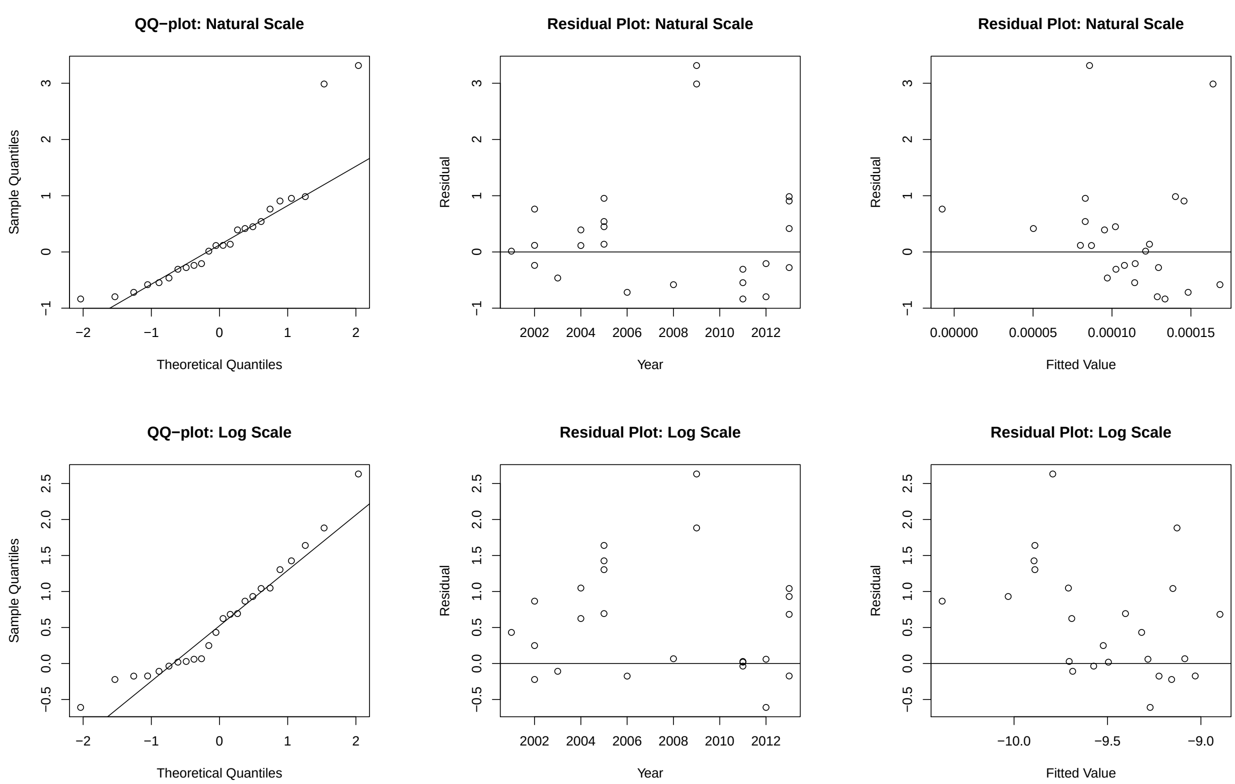


1.2 Reference



Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, Grizzly, Slipper, S2, and S3 was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in Kodiak, Leslie, Moose, and Nema was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-30 (LLCF) was not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
76	Kodiak	2009	0.00	0.00	3.32

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	8.70E-81	natural model

Conclusion:
AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Kodiak	0.6430	2	0.7251
Leslie	0.5888	2	0.7450
Moose	0.5712	2	0.7515
Nema	4.3801	2	0.1119

- Conclusions:
  No significant deviations were found when comparing monitored lakes to a constant slope of zero.

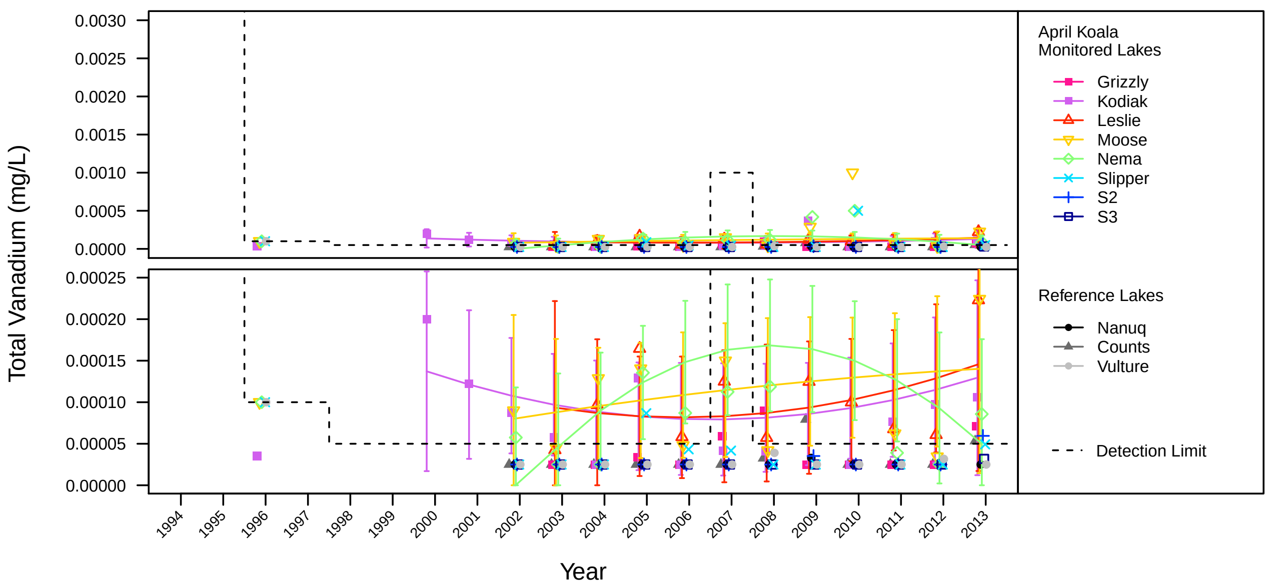
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	Kodiak	0.0440
Monitored Lake	Leslie	0.1460
Monitored Lake	Moose	0.0770
Monitored Lake	Nema	0.1650

- Conclusions:
  Model fit for Kodiak, Leslie, Moose and Nema lakes is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total vanadium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	7.12e-05	NA	NA	NA	NA	NA
Kodiak	1.06e-04	1.29e-04	5.99e-05	1.22e-05	2.47e-04	1.75e-04
Leslie	2.23e-04	1.46e-04	6.55e-05	1.72e-05	2.74e-04	1.92e-04
Moose	2.24e-04	1.40e-04	6.41e-05	1.46e-05	2.66e-04	1.88e-04
Nema	8.57e-05	5.02e-05	6.41e-05	0.00e+00	1.76e-04	1.88e-04
Slipper	4.93e-05	NA	NA	NA	NA	NA
S2	5.95e-05	NA	NA	NA	NA	NA
S3	3.17e-05	NA	NA	NA	NA	NA
Nanuq	2.50e-05	NA	NA	NA	NA	NA
Counts	5.32e-05	NA	NA	NA	NA	NA
Vulture	2.50e-05	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Vanadium	April	Koala	Lake	Water	Counts Nanuq Vulture Grizzly Slipper S2 S3	none	Tobit regression	#1a slope of zero	0.03	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

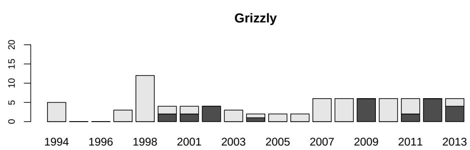
Analysis of August Total Vanadium in Lakes of the Koala Watershed and Lac de Gras

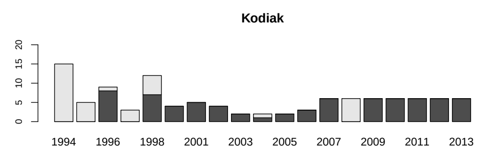
January 11, 2014

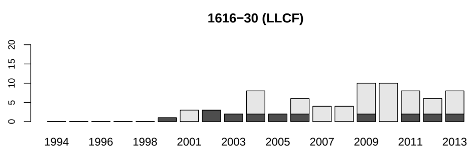
1 Censored Values:

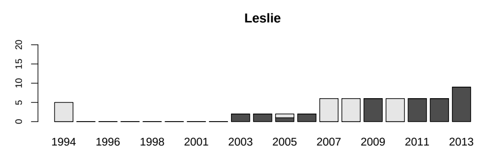
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

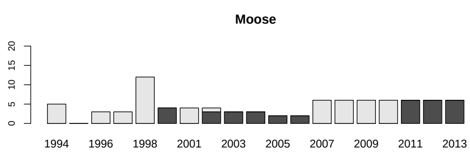
1.1 Monitored

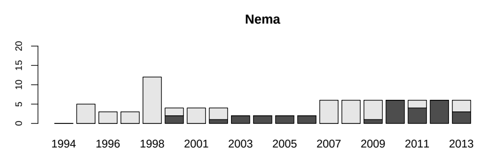


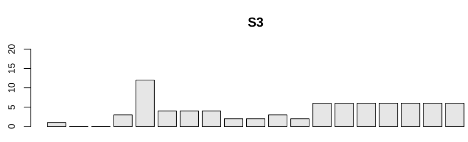




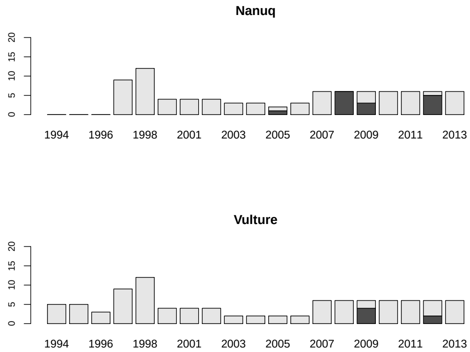






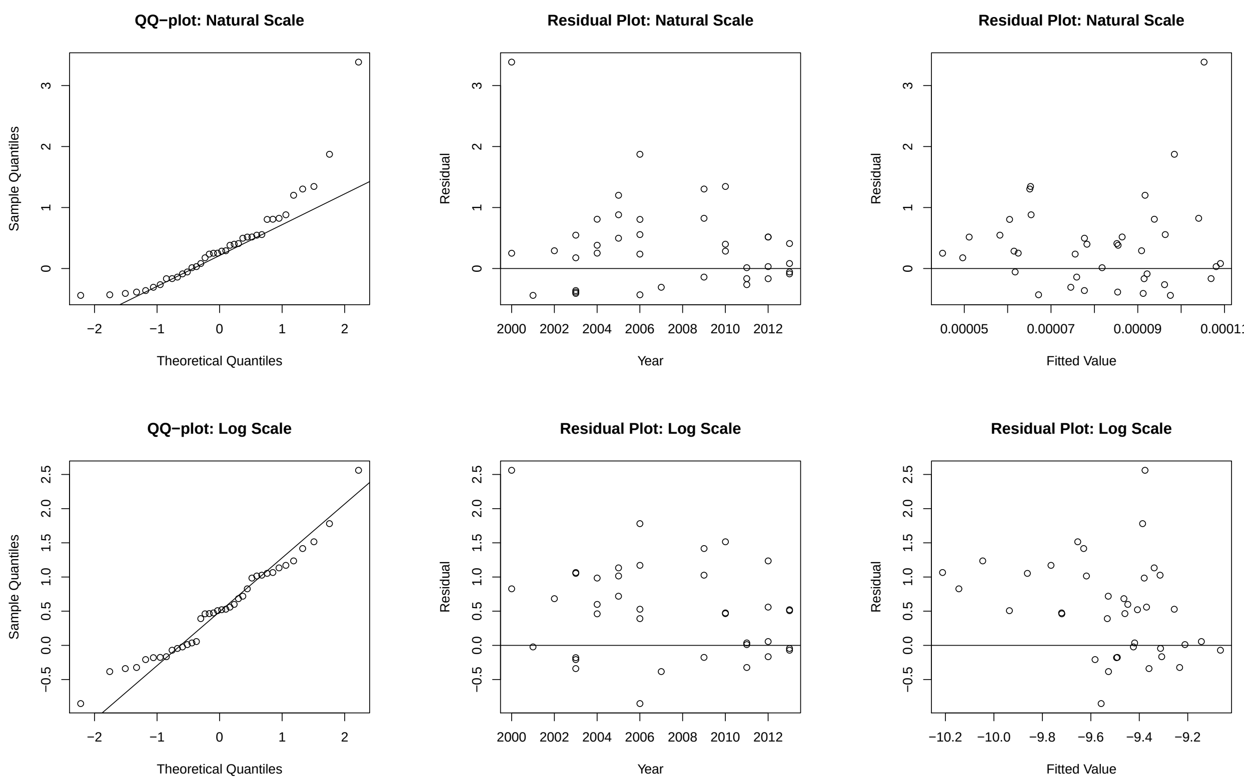


1.2 Reference



Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, Grizzly, 1616-30 (LLCF), S2, and S3 was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in Kodiak, Leslie, Moose, Nema, and Slipper was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
67	Kodiak	2000	0.00	0.00	3.38

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Kodiak	1.6489	2	0.4385
Leslie	0.2124	2	0.8992
Moose	4.1497	2	0.1256
Nema	1.4050	2	0.4953
Slipper	1.6518	2	0.4379

- Conclusions:
  No significant deviations were found when comparing monitored lakes to a constant slope of zero.

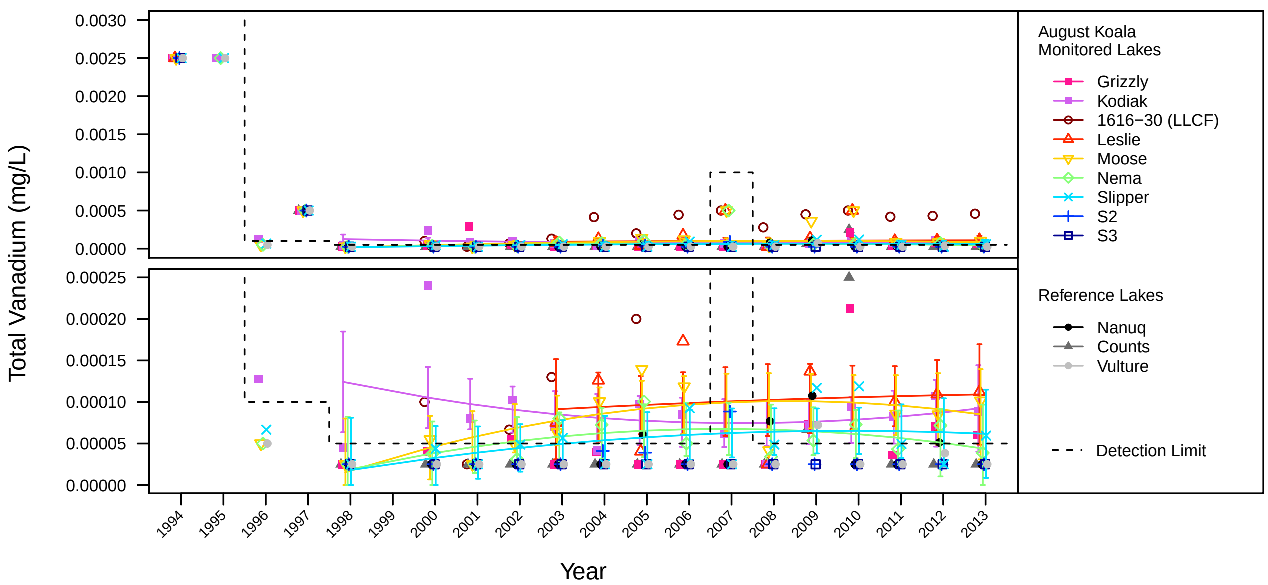
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	Kodiak	0.0810
Monitored Lake	Leslie	0.1440
Monitored Lake	Moose	0.1690
Monitored Lake	Nema	0.0680
Monitored Lake	Slipper	0.1880

- Conclusions:
  Model fit for Kodiak, Leslie, Moose, Nema, and Slipper lakes is poor.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total vanadium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Grizzly	6.00e-05	NA	NA	NA	NA	NA
Kodiak	8.87e-05	9.21e-05	2.66e-05	4.00e-05	1.44e-04	7.78e-05
Leslie	1.12e-04	1.09e-04	3.08e-05	4.86e-05	1.69e-04	9.02e-05
1616-30 (LLCF)	4.58e-04	NA	NA	NA	NA	NA
Moose	1.02e-04	8.52e-05	2.77e-05	3.09e-05	1.39e-04	8.11e-05
Nema	3.87e-05	4.41e-05	2.69e-05	0.00e+00	9.69e-05	7.88e-05
Slipper	5.95e-05	6.17e-05	2.71e-05	8.61e-06	1.15e-04	7.93e-05
S2	2.50e-05	NA	NA	NA	NA	NA
S3	2.50e-05	NA	NA	NA	NA	NA
Nanuq	2.50e-05	NA	NA	NA	NA	NA
Counts	2.50e-05	NA	NA	NA	NA	NA
Vulture	2.50e-05	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Vanadium	August	Koala	Lake	Water	Counts Nanuq Vulture 1616-30 (LLCF) Grizzly S2 S3	none	Tobit regression	#1a slope of zero	0.03	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

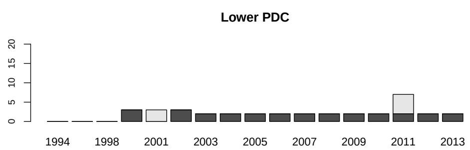
Analysis of August Total Vanadium in Koala Watershed Streams

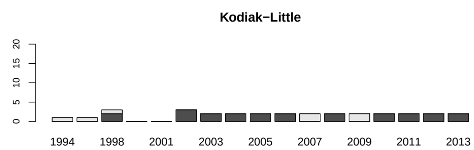
January 11, 2014

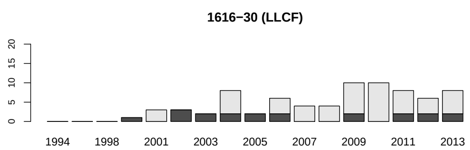
1 Censored Values:

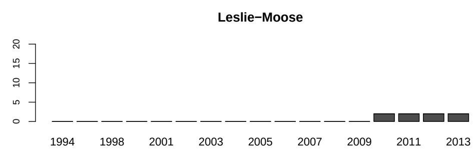
The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

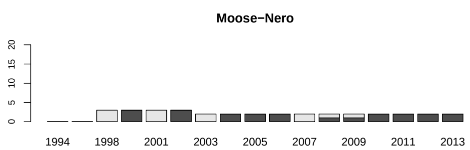
1.1 Monitored

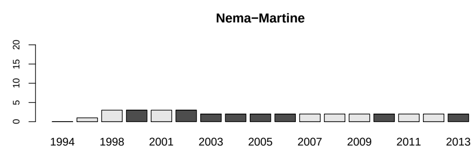


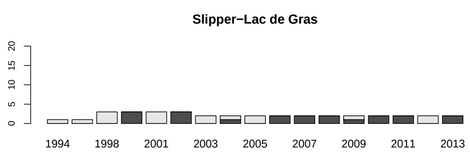




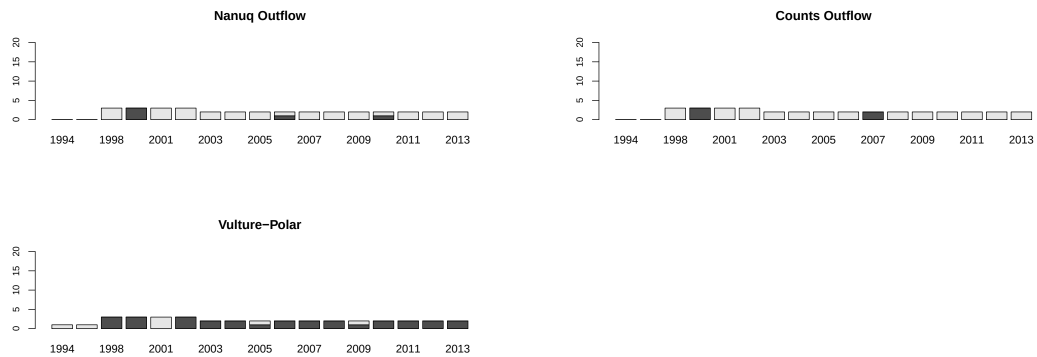






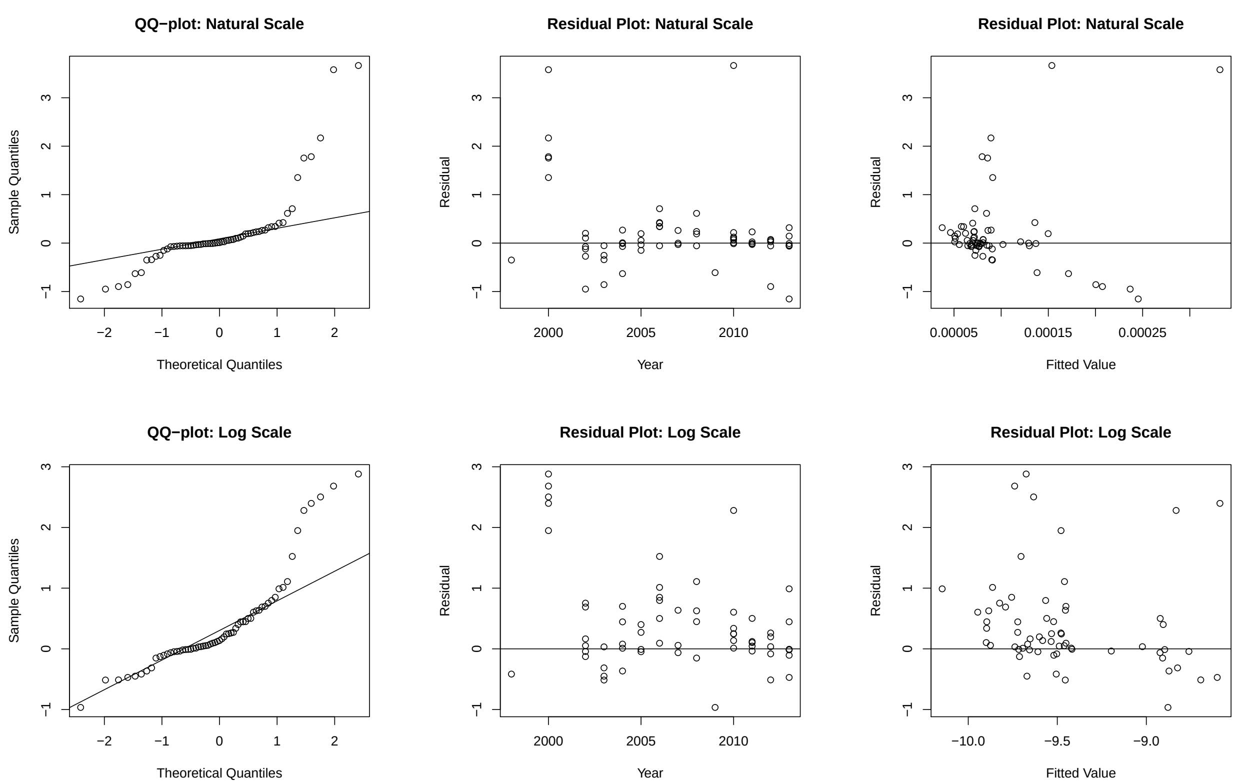


1.2 Reference



Comment:
Greater than 60% of data in Counts Outflow, Nanuq Outflow, and 1616-30 (LLCF) was less than the detection limit. These streams were excluded from further analyses. 10-60% of data in Kodiak-Little, Lower PDC, Moose-Nero, Nema-Martine, Slipper-Lac de Gras, and Vulture-Polar was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
87	Lower PDC	2000	0.00	0.00	3.58
97	Lower PDC	2010	0.00	0.00	3.67

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Streams

Two of three reference streams were removed from the analysis. Tests could not be performed. Proceeding with analysis using reference model 1.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Lower PDC	0.6550	2	0.7207
Kodiak-Little	1.1070	2	0.5749
Leslie-Moose	0.5776	2	0.7492
Moose-Nero	0.4497	2	0.7986
Nema-Martine	1.2535	2	0.5343
Slipper-Lac de Gras	0.1964	2	0.9065

- Conclusions:
  No significant deviations were found when comparing monitored streams to a constant slope of zero.

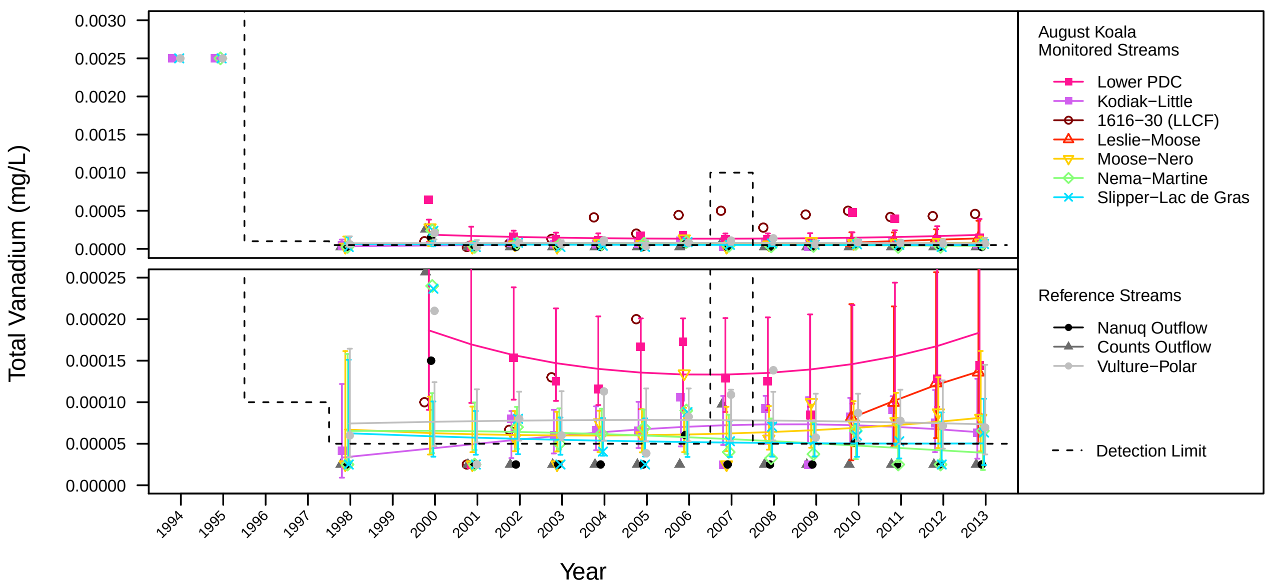
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Reference Stream	Vulture-Polar	0.0030
Monitored Stream	Kodiak-Little	0.1660
Monitored Stream	Leslie-Moose	0.9950
Monitored Stream	Lower PDC	0.0230
Monitored Stream	Moose-Nero	0.0240
Monitored Stream	Nema-Martine	0.0990
Monitored Stream	Slipper-Lac de Gras	0.0250

- Conclusions:
  Model fit for Vulture-Polar, Kodiak-Little, Lower PDC, Moose-Nero, Nema-Martine, and Slipper-Lac de Gras is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total vanadium for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Lower PDC	1.44e-04	1.84e-04	7.10e-05	8.62e-05	3.92e-04	2.08e-04
Kodiak-Little	6.35e-05	6.41e-05	2.27e-05	3.20e-05	1.28e-04	6.63e-05
Leslie-Moose	1.36e-04	1.37e-04	6.92e-05	5.08e-05	3.68e-04	2.02e-04
1616-30 (LLCF)	4.58e-04	NA	NA	NA	NA	NA
Moose-Nero	8.10e-05	8.13e-05	2.85e-05	4.09e-05	1.62e-04	8.35e-05
Nema-Martine	6.55e-05	3.92e-05	1.51e-05	1.84e-05	8.36e-05	4.43e-05
Slipper-Lac de Gras	6.35e-05	5.04e-05	1.87e-05	2.44e-05	1.04e-04	5.46e-05
Nanuq Outflow	2.50e-05	NA	NA	NA	NA	NA
Counts Outflow	2.50e-05	NA	NA	NA	NA	NA
Vulture-Polar	6.95e-05	7.34e-05	2.55e-05	3.71e-05	1.45e-04	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Vanadium	August	Koala	Stream	Water	1616-30 (LLCF) Counts Outflow Nanuq Outflow	log e	Tobit regression	#1b separate intercepts & slopes	0.03	Lower PDC

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

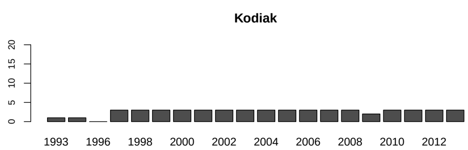
Analysis of Phytoplankton Biomass in Lakes of the Koala Watershed and Lac de Gras

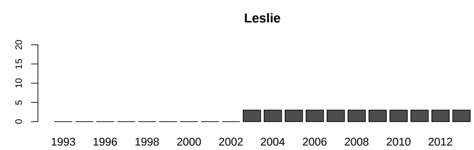
January 30, 2014

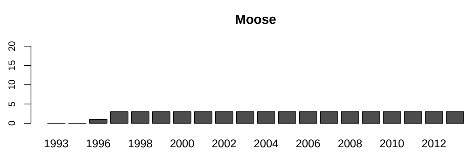
1 Censored Values:

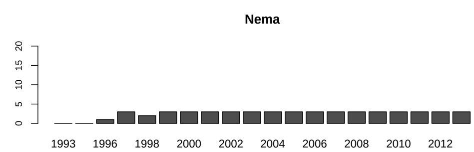
The following charts indicate the number of measurements taken in each year from each lake that were below the detection limit (grey) or above the detection limit (black).

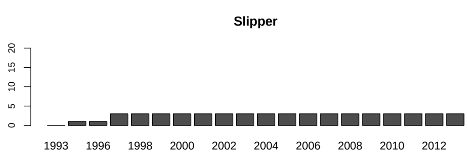
1.1 Monitored

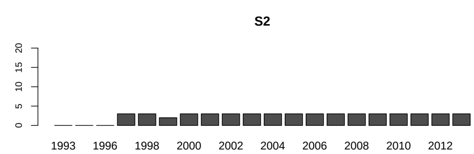


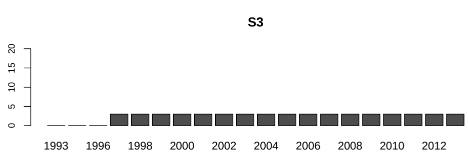




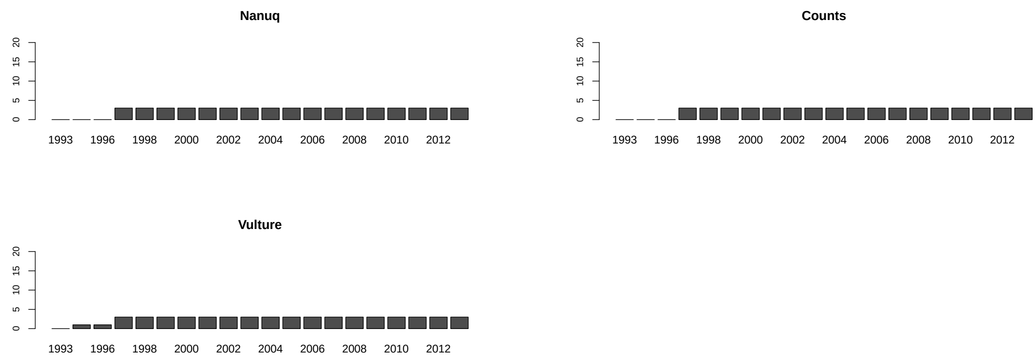






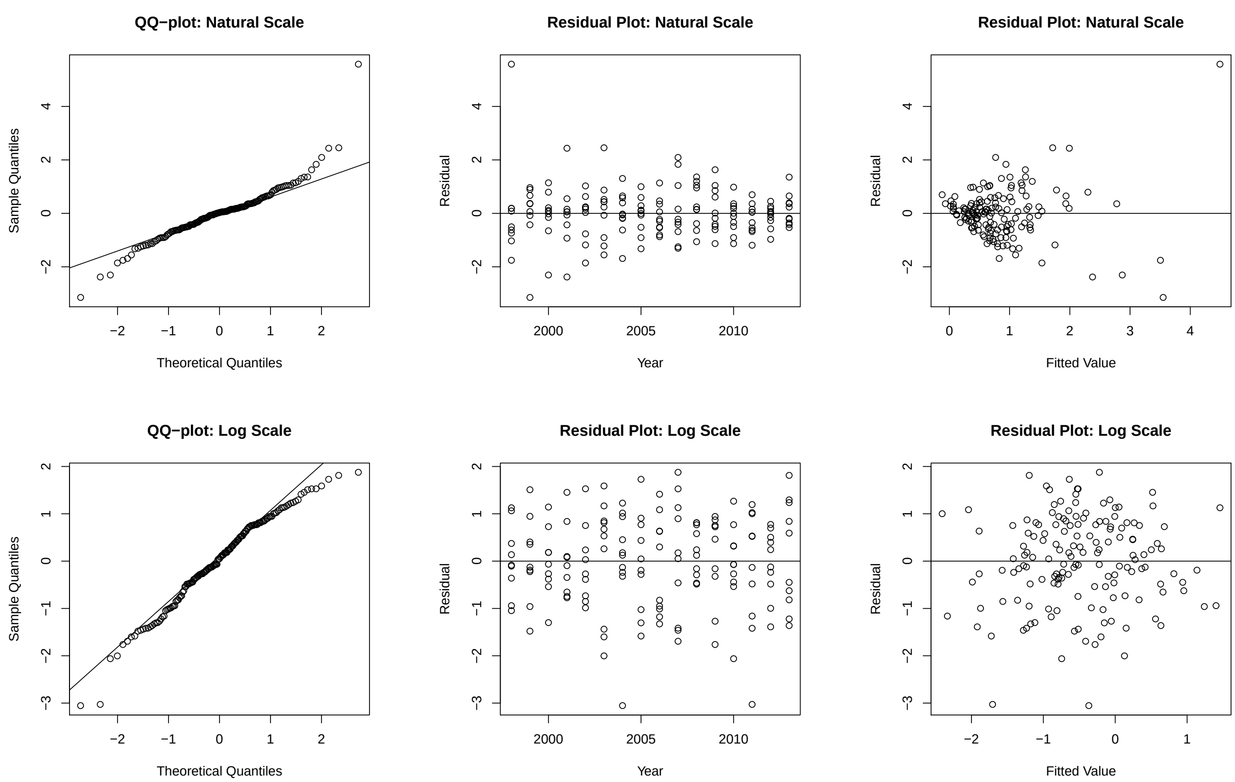


1.2 Reference



Comment:
None of the lakes exhibited greater than 60% of data below the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
65	Kodiak	1998	6.48	4.49	5.58
66	Kodiak	1999	2.43	3.55	-3.15

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
111	Moose	2004	0.23	-0.37	-3.05
198	S3	2011	0.06	-1.71	-3.03

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
9.56	6.00	0.14

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

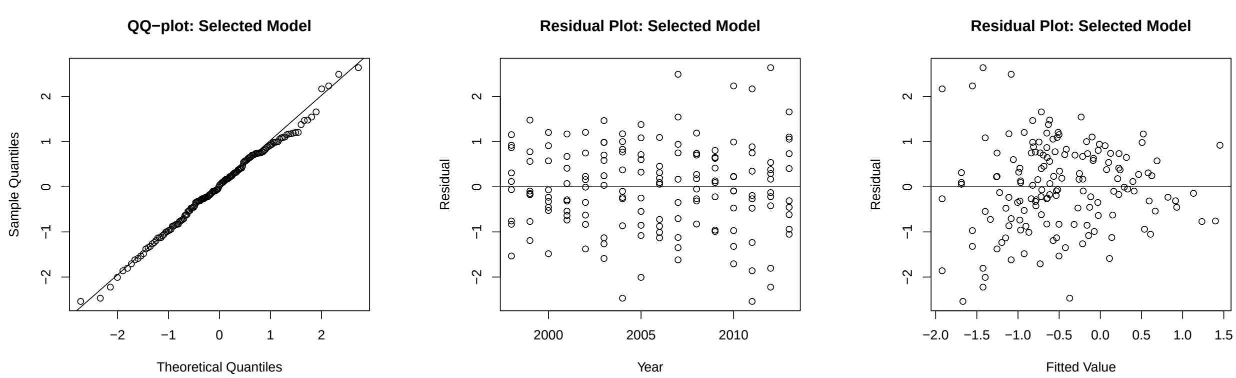
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 3 (fitting a common slope and intercept for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero and because AIC indicated that reference model 3 was a better fit to the data than reference model 2.

3.3 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Lakes

Fitted model of the slope and intercept of each monitored lake compared to a common slope and intercept fitted for all reference lakes together (reference model 3).

- Results:

	Chi-square	DF	P-value
Kodiak	15.2793	3	0.0016
Leslie	4.6285	3	0.2011
Moose	4.7801	3	0.1886
Nema	15.3820	3	0.0015
Slipper	6.8274	3	0.0776
S2	2.6760	3	0.4443
S3	0.3485	3	0.9507

- Conclusions:
  Kodiak and Nema lakes show significant deviation from the common slope and intercept of reference lakes.

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-square	DF	P-value
Kodiak	4.9093	2	0.0859
Leslie	3.0644	2	0.2161
Moose	0.8224	2	0.6629
Nema	1.0658	2	0.5869
Slipper	1.1768	2	0.5552
S2	2.4250	2	0.2974
S3	0.3068	2	0.8578

- Conclusions:
  When allowing for differences in intercept, no monitored lakes show significant deviation from the common slope of reference lakes.

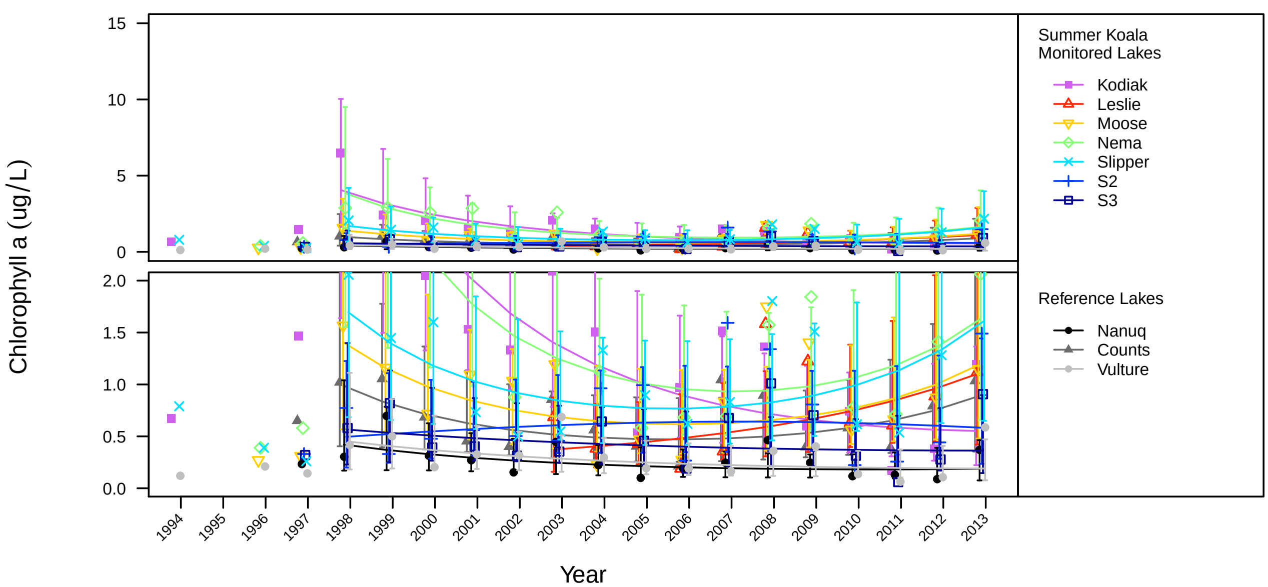
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.1040
Monitored Lake	Kodiak	0.6010
Monitored Lake	Leslie	0.3080
Monitored Lake	Moose	0.1990
Monitored Lake	Nema	0.5000
Monitored Lake	S2	0.0150
Monitored Lake	S3	0.0430
Monitored Lake	Slipper	0.2690

- Conclusions:
  Model fit for Leslie and Slipper is weak. Model fit for reference lakes, Moose, Slipper, S2, and S3 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively. For parameters where the slope (and intercept) for reference lakes were not statistically different, the regression line and associated 95% CI for the combined reference lake data is shown as Reference-Common. This corresponds to analyses using reference model 2 or 3 only.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean biomass for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Kodiak	1.19E+00	5.52E-01	2.55E-01	2.23E-01	1.37E+00	7.46E-01
Leslie	1.12E+00	1.10E+00	5.40E-01	4.21E-01	2.88E+00	1.58E+00
Moose	1.15E+00	1.19E+00	5.48E-01	4.80E-01	2.94E+00	1.60E+00
Nema	2.06E+00	1.63E+00	7.54E-01	6.59E-01	4.04E+00	2.21E+00
Slipper	2.17E+00	1.61E+00	7.43E-01	6.50E-01	3.98E+00	2.17E+00
S2	1.49E+00	5.83E-01	2.70E-01	2.36E-01	1.44E+00	7.89E-01
S3	9.07E-01	3.63E-01	1.68E-01	1.47E-01	8.97E-01	4.91E-01
Nanuq	3.70E-01	1.87E-01	8.66E-02	7.57E-02	4.64E-01	
Counts	1.03E+00	8.76E-01	4.05E-01	3.54E-01	2.17E+00	
Vulture	5.87E-01	1.90E-01	8.79E-02	7.69E-02	4.71E-01	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Biomass	Summer	Koala	Lake	Biology	Grizzly	log e	linear mixed effects regression	#3 shared intercept & slope	NA	Kodiak Nema

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

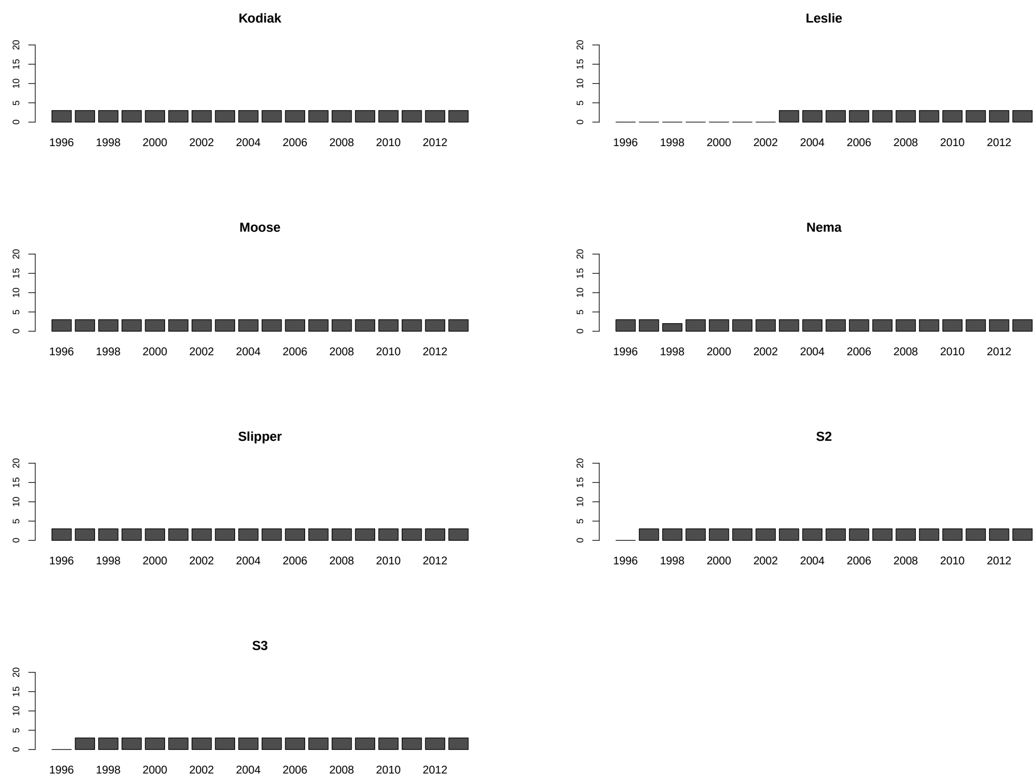
Analysis of Phytoplankton Density in Lakes of the Koala Watershed and Lac de Gras

January 22, 2014

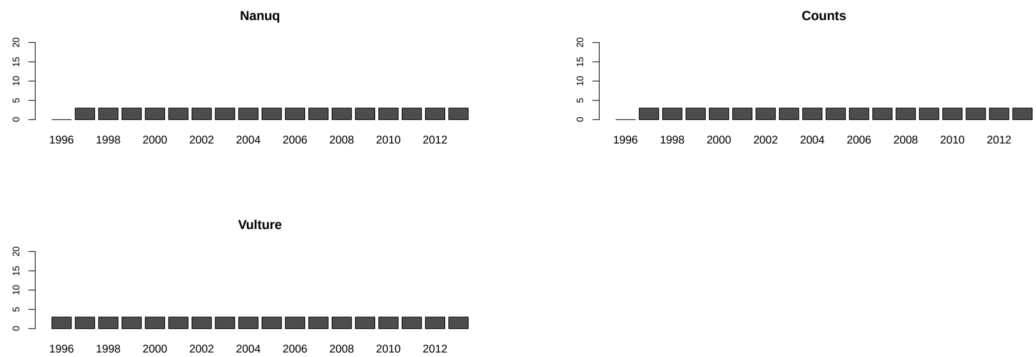
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were below the detection limit (grey) or above the detection limit (black).

1.1 Monitored

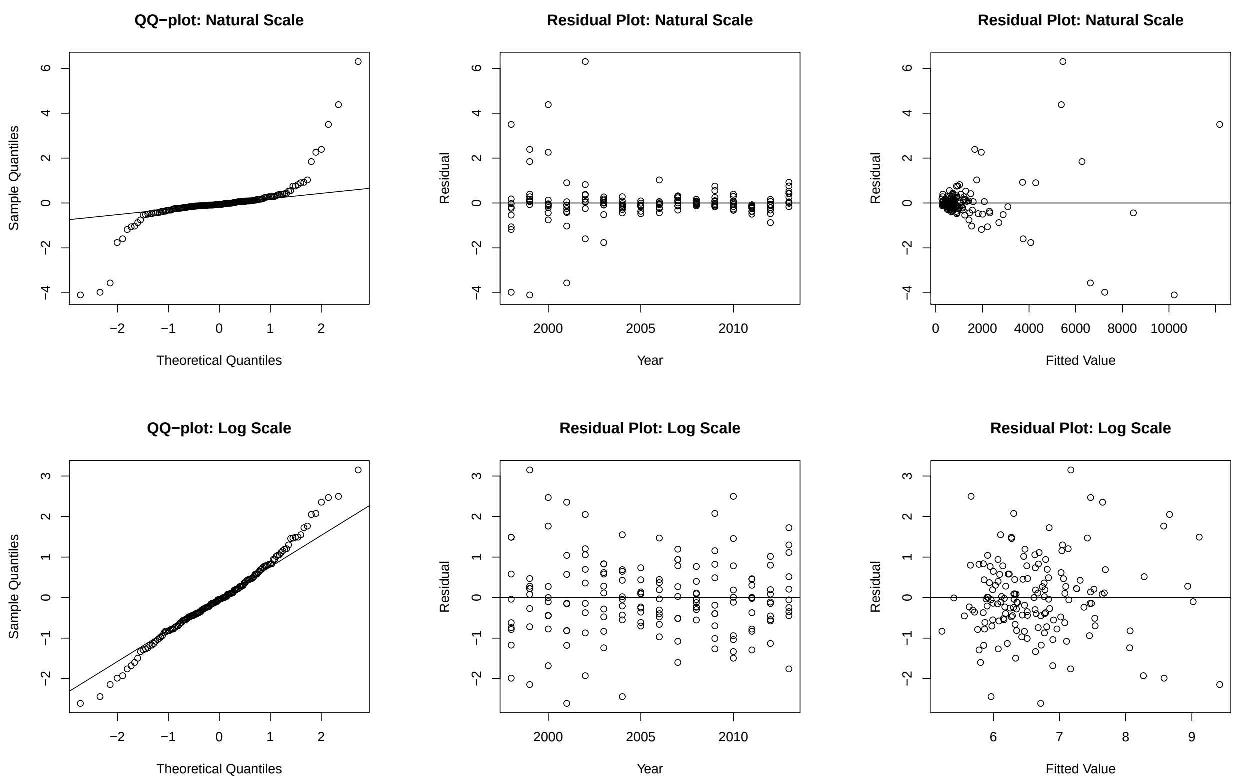


1.2 Reference



Comment:
None of the lakes exhibited greater than 60% of data below the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
65	Kodiak	1998	16434.15	12175.13	3.50
66	Kodiak	1999	5239.83	10223.66	-4.10
68	Kodiak	2001	2295.78	6629.61	-3.56
69	Kodiak	2002	13121.43	5452.48	6.30
145	Nema	1998	2406.95	7245.00	-3.98
147	Nema	2000	10712.63	5381.78	4.38

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
186	S3	1999	4577.67	7.17	3.15

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
4.14	6.00	0.66

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

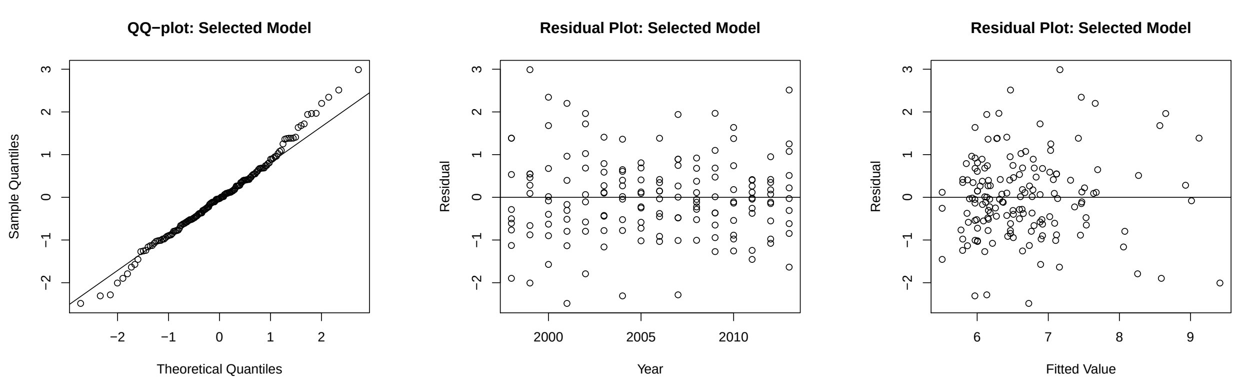
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.886	0.000	0.114	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope and intercept. Proceeding with monitored contrasts using reference model 3 (fitting a common slope and intercept for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero and because AIC suggests that reference model 3 is the second best model.

3.3 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Lakes

Fitted model of the slope and intercept of each monitored lake compared to a common slope and intercept fitted for all reference lakes together (reference model 3).

- Results:

	Chi-square	DF	P-value
Kodiak	32.6446	3	0.0000
Leslie	7.8532	3	0.0491
Moose	3.2786	3	0.3506
Nema	20.1206	3	0.0002
Slipper	1.1152	3	0.7734
S2	7.5636	3	0.0559
S3	1.9637	3	0.5800

- Conclusions:
  Kodiak, Leslie, Nema, and S2 show significant deviation from the common slope and intercept of reference lakes.

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-square	DF	P-value
Kodiak	3.4313	2	0.1798
Leslie	7.8283	2	0.0200
Moose	3.2681	2	0.1951
Nema	3.5098	2	0.1729
Slipper	0.0964	2	0.9529
S2	4.4412	2	0.1085
S3	1.3688	2	0.5044

- Conclusions:
  When allowing for differences in intercept, Leslie Lake shows significant deviation from the common slope of reference lakes.

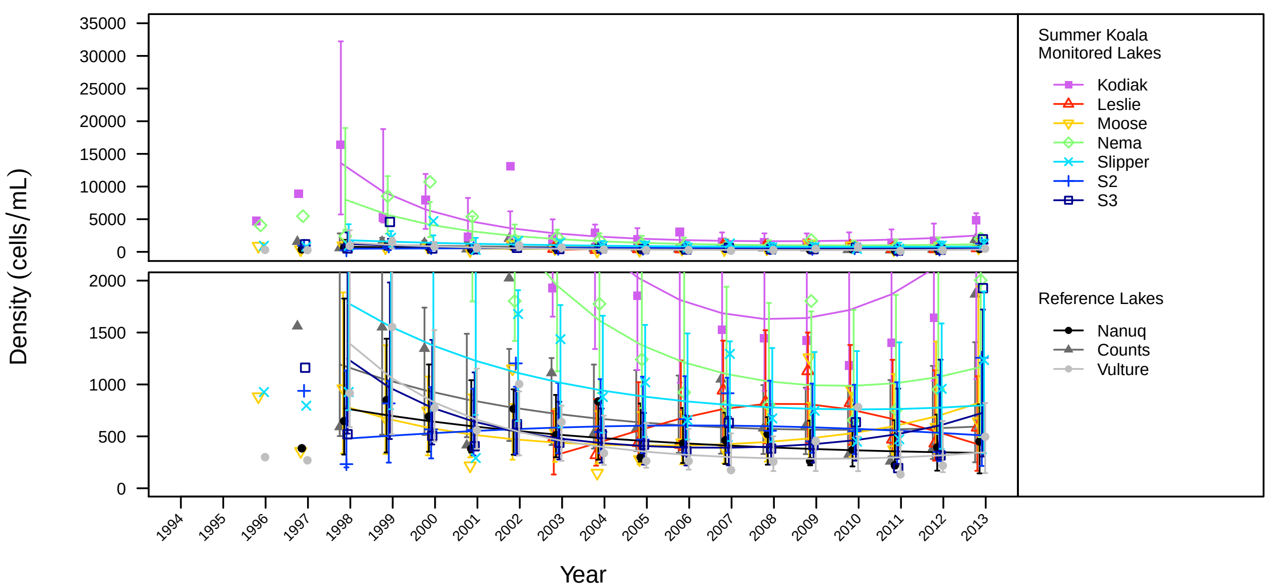
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.2830
Monitored Lake	Kodiak	0.6330
Monitored Lake	Leslie	0.4950
Monitored Lake	Moose	0.1530
Monitored Lake	Nema	0.6290
Monitored Lake	S2	0.0250
Monitored Lake	S3	0.2230
Monitored Lake	Slipper	0.1760

- Conclusions:
  Model fit for reference lakes, Leslie Lake, and S3 is weak. Model fit for Moose, Slipper, and S2 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively. For parameters where the slope (and intercept) for reference lakes were not statistically different, the regression line and associated 95% CI for the combined reference lake data is shown as Reference-Common. This corresponds to analyses using reference model 2 or 3 only.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean density for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Kodiak	4.84E+03	2.49E+03	1.10E+03	1.05E+03	5.91E+03	3.22E+03
Leslie	5.86E+02	4.26E+02	2.02E+02	1.68E+02	1.08E+03	5.92E+02
Moose	6.42E+02	8.20E+02	3.61E+02	3.46E+02	1.94E+03	1.06E+03
Nema	2.00E+03	1.17E+03	5.14E+02	4.92E+02	2.77E+03	1.50E+03
Slipper	1.23E+03	7.99E+02	3.52E+02	3.37E+02	1.90E+03	1.03E+03
S2	1.26E+03	5.10E+02	2.25E+02	2.15E+02	1.21E+03	6.57E+02
S3	1.93E+03	7.26E+02	3.20E+02	3.06E+02	1.72E+03	9.36E+02
Nanuq	4.50E+02	3.40E+02	1.50E+02	1.44E+02	8.07E+02	
Counts	1.87E+03	5.93E+02	2.61E+02	2.50E+02	1.41E+03	
Vulture	4.96E+02	3.46E+02	1.53E+02	1.46E+02	8.22E+02	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Density	Summer	Koala	Lake	Biology	none	log e	linear mixed effects regression	#3 shared intercept & slope	NA	Kodiak Leslie Nema S2

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

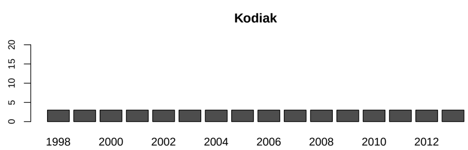
Analysis of August Zooplankton Biomass in Lakes of the Koala Watershed and Lac de Gras

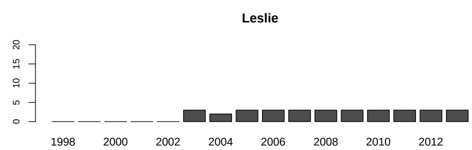
January 22, 2014

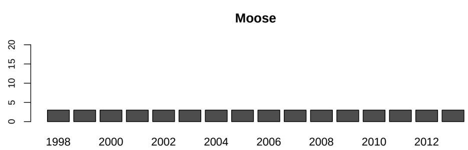
1 Censored Values:

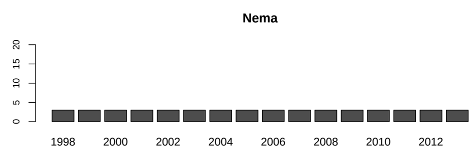
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

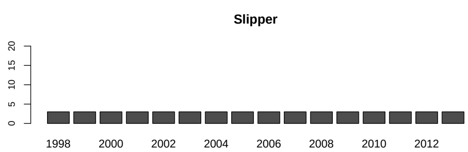
1.1 Monitored

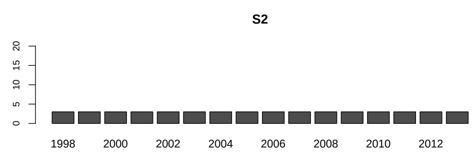


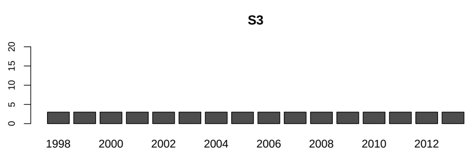




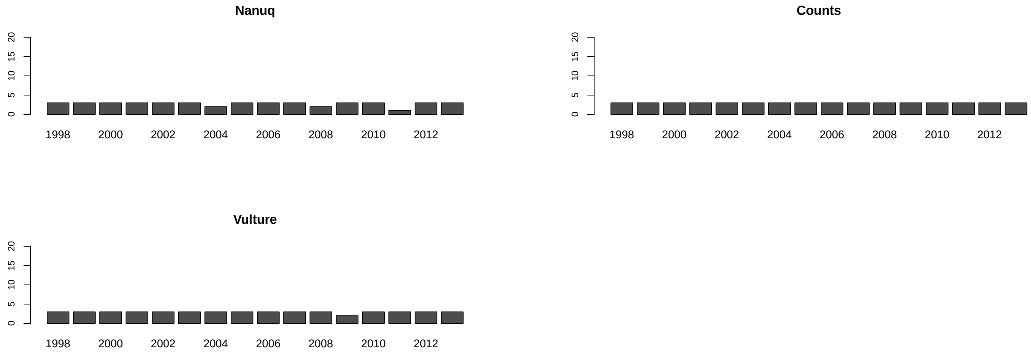






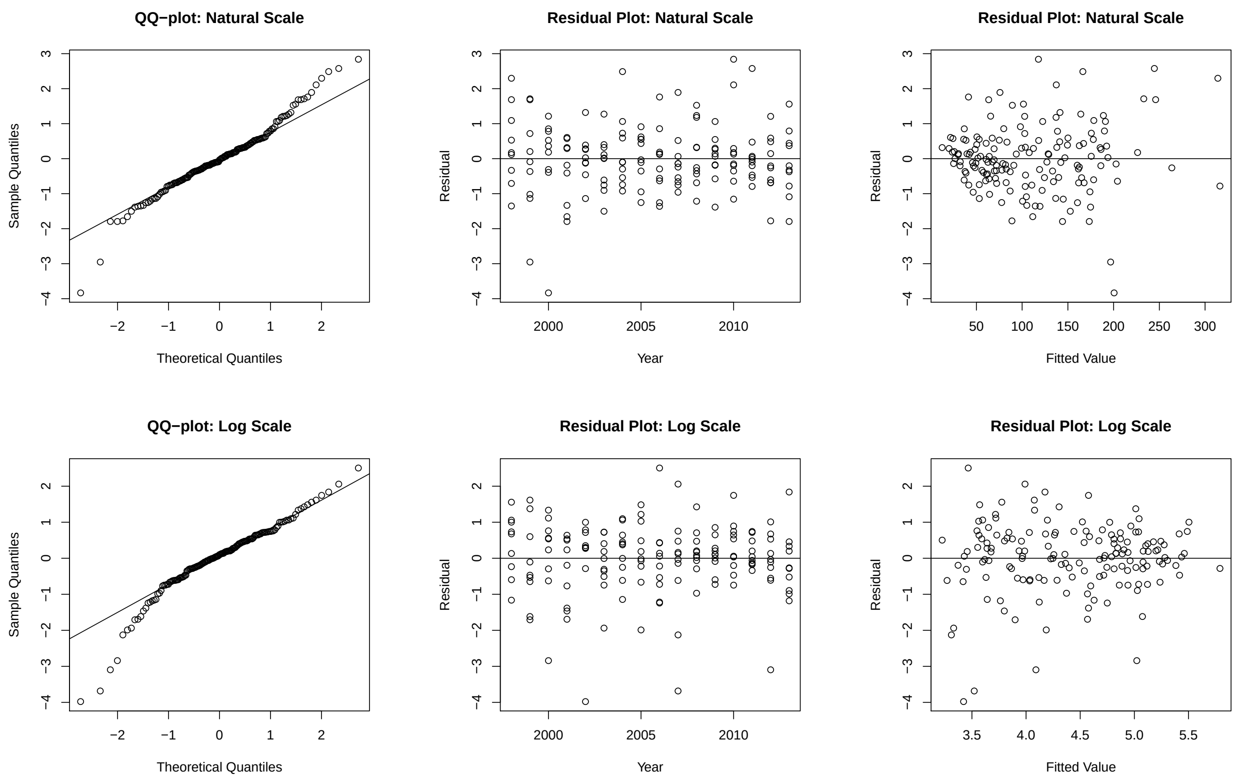


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
67	Kodiak	2000	34.65	200.58	-3.83

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
119	Moose	2012	11.96	4.09	-3.10
169	S2	2002	3.88	3.42	-3.98
194	S3	2007	4.99	3.52	-3.68

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
14.15	6.00	0.03

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
5.95	4.00	0.20

- Conclusions:
  The slopes do not differ significantly among reference lakes.

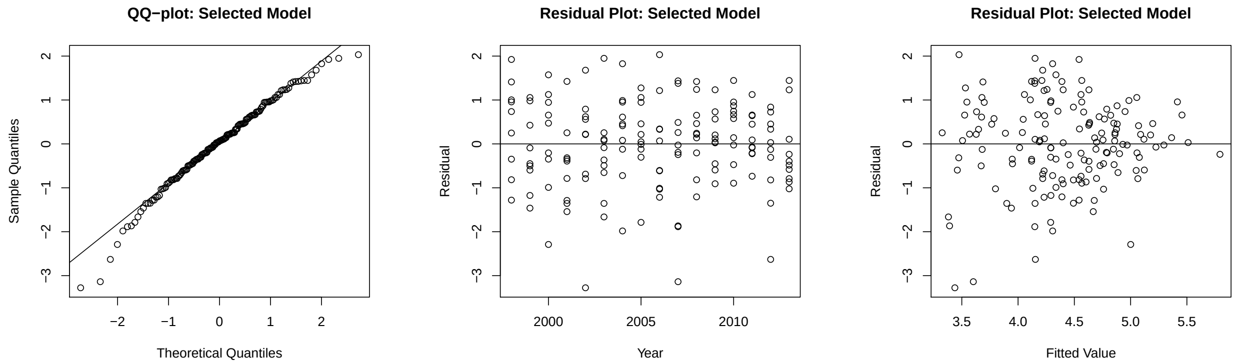
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
169	S2	2002	3.88	3.44	-3.28
194	S3	2007	4.99	3.60	-3.14

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-square	DF	P-value
Kodiak	0.5012	2	0.7783
Leslie	0.3706	2	0.8308
Moose	0.2006	2	0.9046
Nema	0.5287	2	0.7677
Slipper	0.5364	2	0.7648
S2	0.0149	2	0.9926
S3	0.3741	2	0.8294

- Conclusions:
  All monitored lakes show significant deviations from the common slope and intercept of reference lakes. No significant deviations were found when comparing monitored lakes to reference lakes.

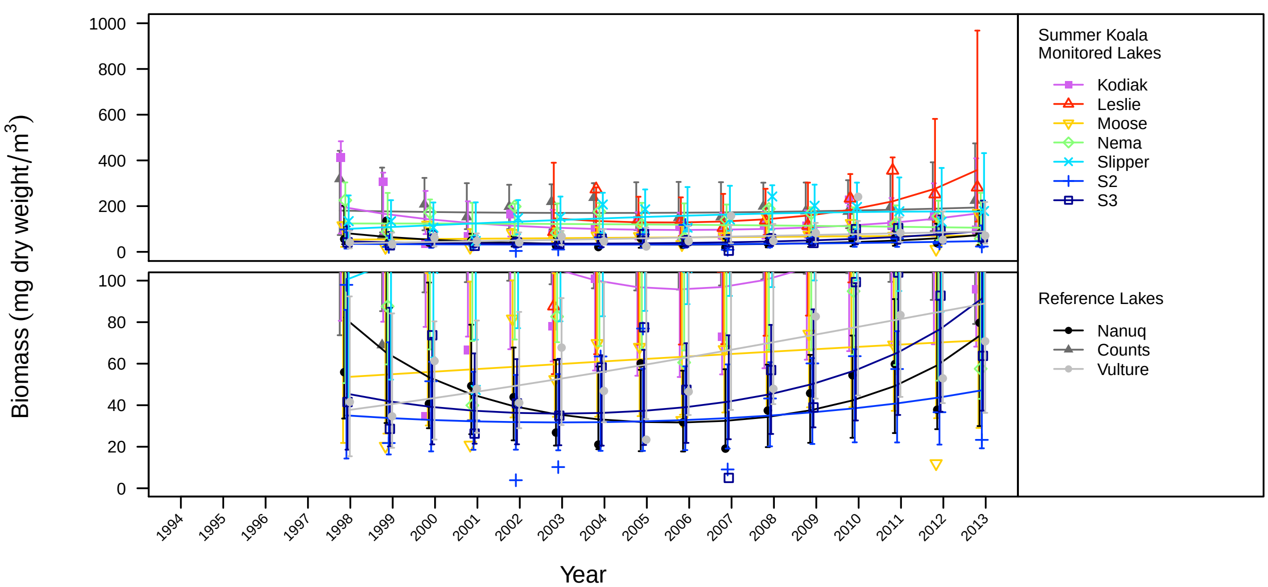
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0320
Monitored Lake	Kodiak	0.1420
Monitored Lake	Leslie	0.4670
Monitored Lake	Moose	0.0140
Monitored Lake	Nema	0.0110
Monitored Lake	S2	0.0170
Monitored Lake	S3	0.1540
Monitored Lake	Slipper	0.2340

- Conclusions:
  Model fit for Leslie and Slipper lakes is weak. Model fit for reference lakes, Kodiak, Moose, Nema, S2, and S3 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean zooplankton biomass for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Kodiak	9.58E+01	1.67E+02	7.63E+01	6.82E+01	4.09E+02	2.23E+02
Leslie	2.82E+02	3.58E+02	1.82E+02	1.33E+02	9.68E+02	5.32E+02
Moose	1.69E+02	7.12E+01	3.25E+01	2.91E+01	1.74E+02	9.52E+01
Nema	5.76E+01	1.05E+02	4.82E+01	4.30E+01	2.58E+02	1.41E+02
Slipper	1.79E+02	1.76E+02	8.06E+01	7.20E+01	4.32E+02	2.36E+02
S2	2.33E+01	4.71E+01	2.15E+01	1.93E+01	1.15E+02	6.31E+01
S3	6.38E+01	9.16E+01	4.18E+01	3.74E+01	2.24E+02	1.22E+02
Nanuq	7.97E+01	7.34E+01	3.35E+01	3.00E+01	1.80E+02	
Counts	2.24E+02	1.94E+02	8.86E+01	7.91E+01	4.75E+02	
Vulture	7.08E+01	8.90E+01	4.07E+01	3.63E+01	2.18E+02	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Biomass	Summer	Koala	Lake	Biology	none	log e	linear mixed effects regression	#2 shared slopes	NA	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

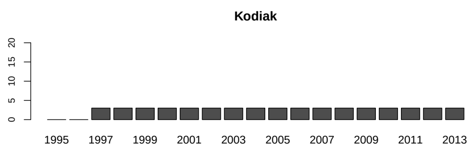
Analysis of August Zooplankton Density in Lakes of the Koala Watershed and Lac de Gras

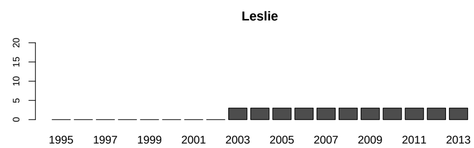
January 15, 2014

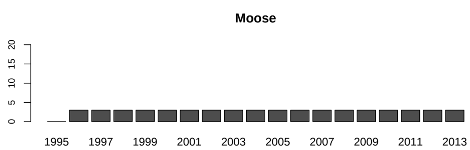
1 Censored Values:

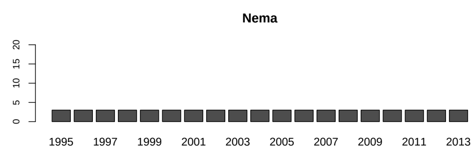
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

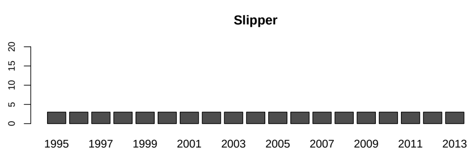
1.1 Monitored

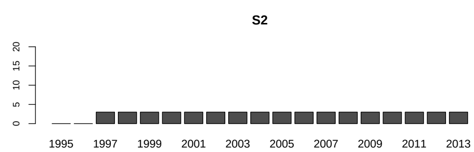




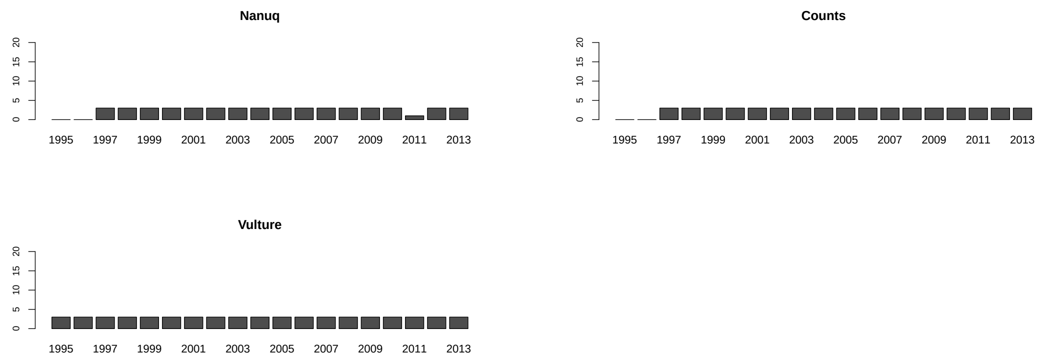






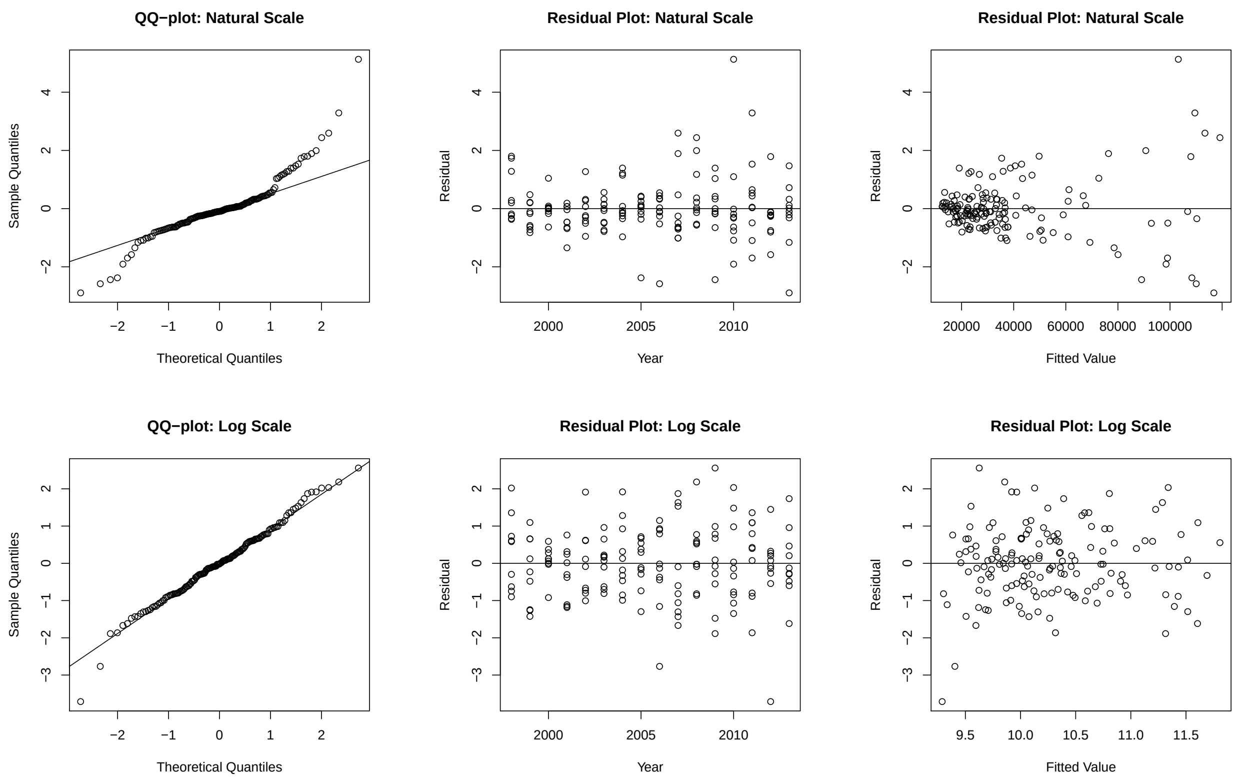


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
37	Counts	2010	219767.43	103184.12	5.13
78	Kodiak	2011	184244.35	109538.47	3.29

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
119	Moose	2012	1873.65	9.29	-3.71

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
4.68	6.00	0.59

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

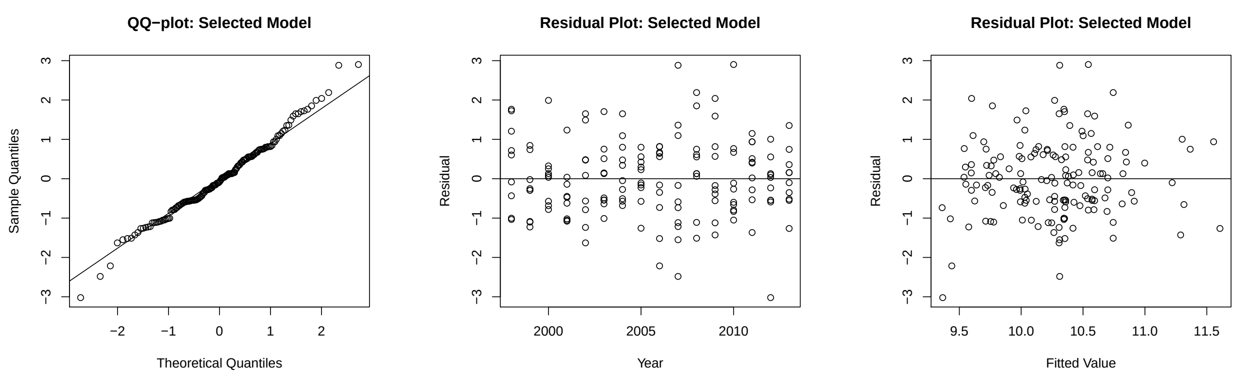
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope and intercept. Proceeding with monitored contrasts using reference model 3 (fitting a common slope and intercept for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.3 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
119	Moose	2012	1873.65	9.37	-3.02

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Lakes

Fitted model of the slope and intercept of each monitored lake compared to a common slope and intercept fitted for all reference lakes together (reference model 3).

- Results:

	Chi-square	DF	P-value
Kodiak	1.8334	3	0.6077
Leslie	2.0128	3	0.5698
Moose	1.5091	3	0.6802
Nema	1.6457	3	0.6491
Slipper	0.2034	3	0.9770
S2	0.6948	3	0.8744
S3	0.4351	3	0.9329

- Conclusions:
  No significant deviations were found when comparing monitored lakes to reference lakes.

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-square	DF	P-value
Kodiak	1.3601	2	0.5066
Leslie	1.9142	2	0.3840
Moose	0.8797	2	0.6441
Nema	1.5926	2	0.4510
Slipper	0.1535	2	0.9261
S2	0.6922	2	0.7075
S3	0.1186	2	0.9424

- Conclusions:
  When allowing for differences in intercept, no significant deviations were found when comparing monitored to the common slope of reference lakes.

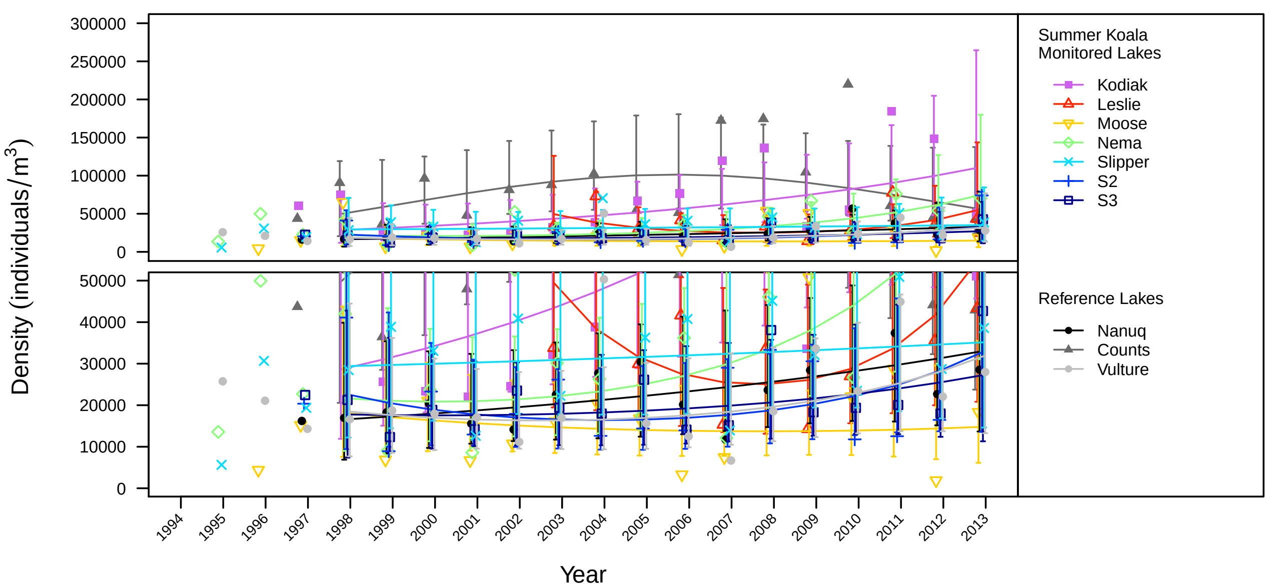
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0340
Monitored Lake	Kodiak	0.3620
Monitored Lake	Leslie	0.2420
Monitored Lake	Moose	0.0080
Monitored Lake	Nema	0.3600
Monitored Lake	S2	0.1340
Monitored Lake	S3	0.1880
Monitored Lake	Slipper	0.0160

- Conclusions:
  Model fit for Kodiak, Leslie, and Nema lakes is weak. Model fit for reference lakes, Moose, Slipper, S2, and S3 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean zooplankton density for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Kodiak	5.10E+04	1.10E+05	4.93E+04	4.57E+04	2.65E+05	1.44E+05
Leslie	4.35E+04	5.47E+04	2.69E+04	2.08E+04	1.44E+05	7.88E+04
Moose	1.83E+04	1.48E+04	6.61E+03	6.13E+03	3.55E+04	1.93E+04
Nema	7.02E+04	7.48E+04	3.35E+04	3.11E+04	1.80E+05	9.80E+04
Slipper	3.86E+04	3.51E+04	1.57E+04	1.46E+04	8.46E+04	4.61E+04
S2	7.40E+04	3.27E+04	1.46E+04	1.36E+04	7.86E+04	4.28E+04
S3	4.27E+04	2.72E+04	1.22E+04	1.13E+04	6.55E+04	3.57E+04
Nanuq	2.85E+04	3.29E+04	1.47E+04	1.37E+04	7.91E+04	
Counts	4.29E+04	5.71E+04	2.56E+04	2.38E+04	1.38E+05	
Vulture	2.80E+04	3.19E+04	1.43E+04	1.33E+04	7.68E+04	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Density	Summer	Koala	Lake	Biology	None	log e	linear mixed effects regression	#3 shared intercept & slope	NA	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

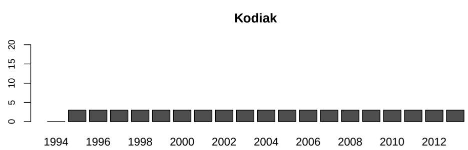
Analysis of August Benthos Density in Lakes of the Koala Watershed and Lac de Gras

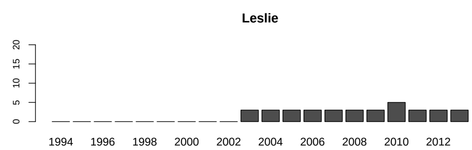
January 22, 2014

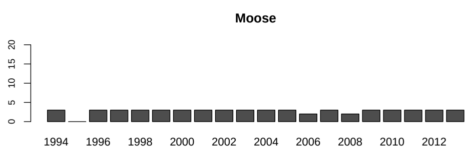
1 Censored Values:

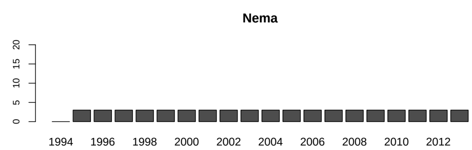
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

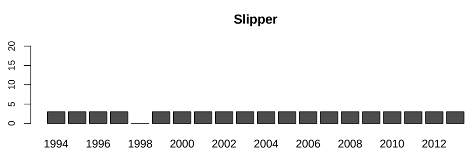
1.1 Monitored

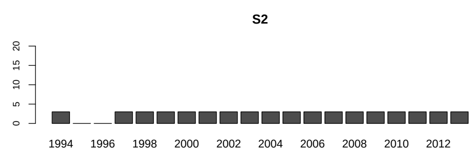




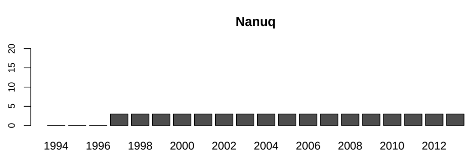


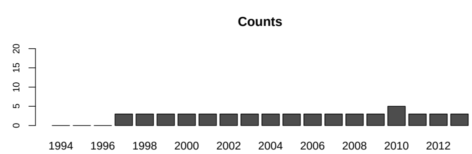


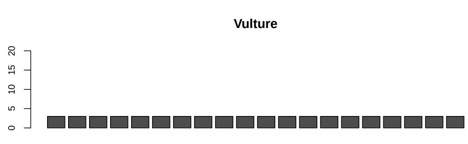




1.2 Reference

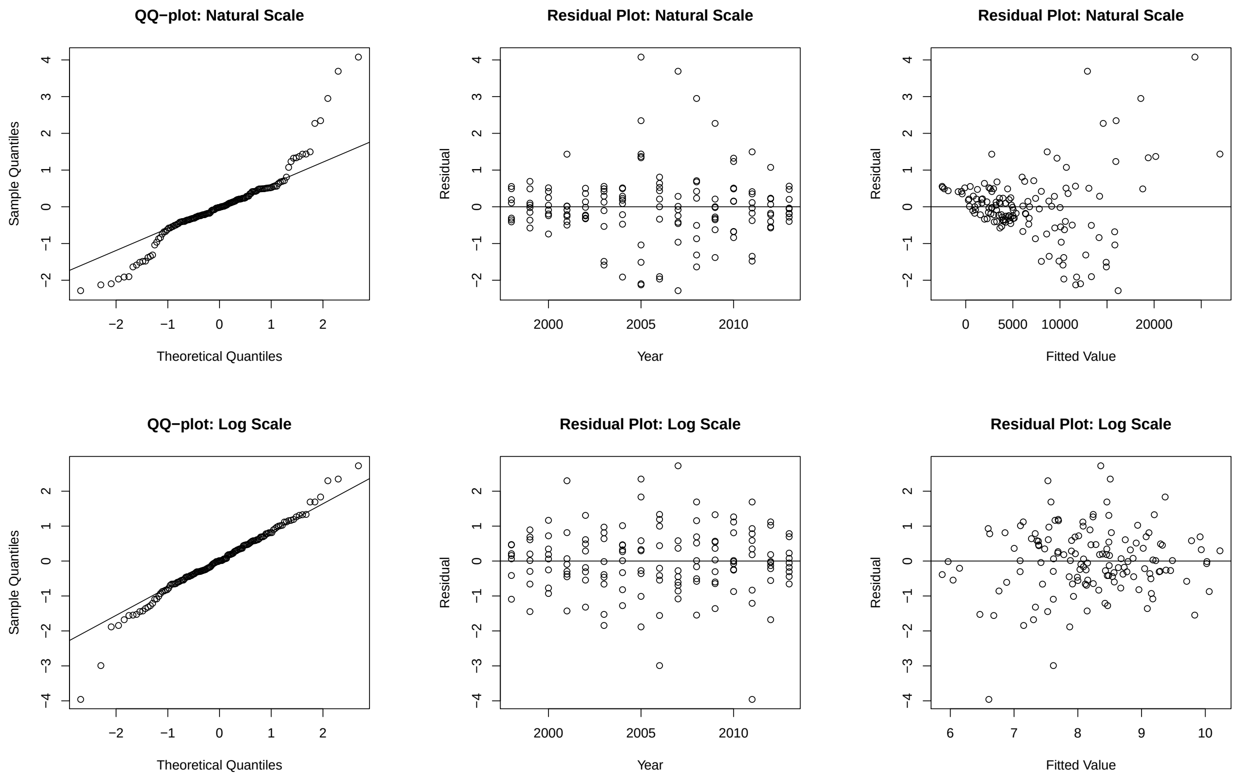






Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
112	Moose	2005	45466.67	24332.47	4.08
114	Moose	2007	32059.26	12923.10	3.69

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
218	Slipper	2011	39.51	6.60	-3.96

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
13.02	6.00	0.04

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
2.72	4.00	0.61

- Conclusions:
  The slopes do not differ significantly among reference lakes.

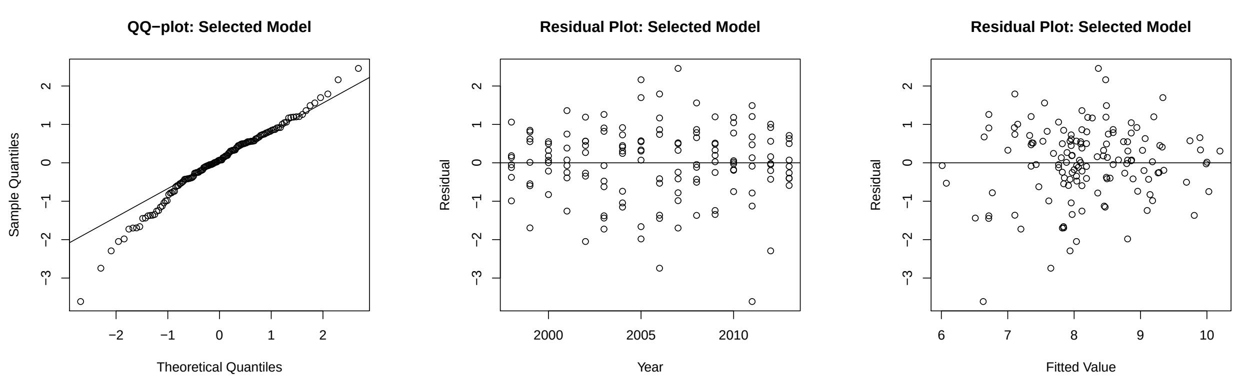
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.998	0.000	0.002	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
218	Slipper	2011	39.51	6.63	-3.61

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-square	DF	P-value
Kodiak	0.4458	2	0.8002
Leslie	0.1654	2	0.9206
Moose	0.0831	2	0.9593
Nema	1.3955	2	0.4977
Slipper	0.6621	2	0.7182
S2	2.2007	2	0.3328

- Conclusions:
  No significant deviations were found when comparing monitored lakes to reference lakes.

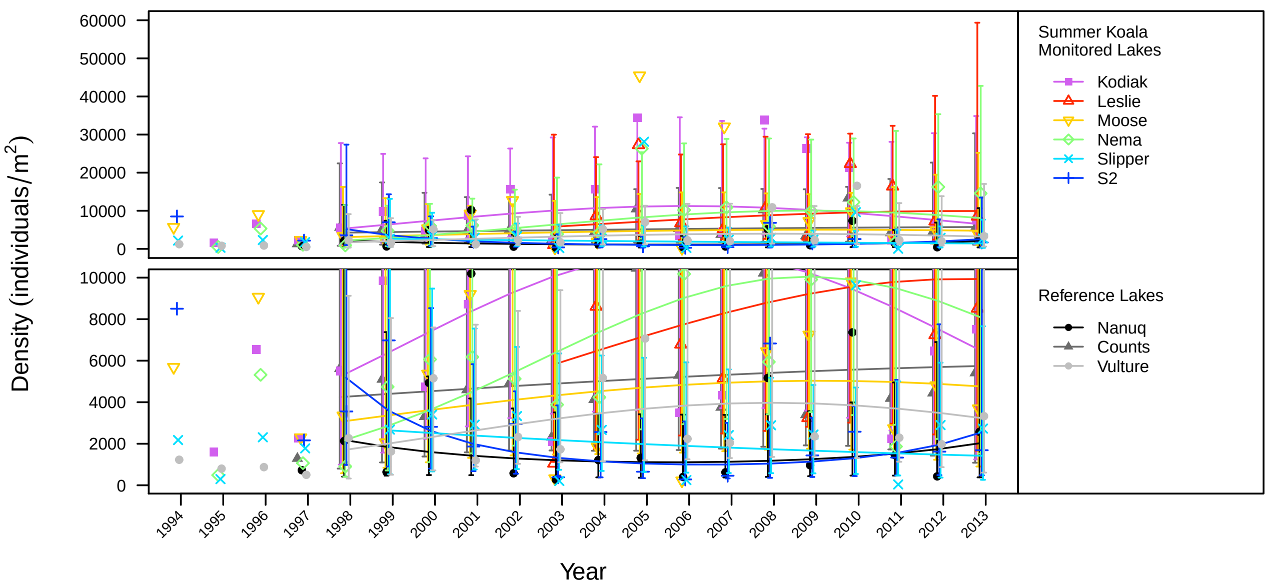
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0090
Monitored Lake	Kodiak	0.0670
Monitored Lake	Leslie	0.0530
Monitored Lake	Moose	0.0130
Monitored Lake	Nema	0.3370
Monitored Lake	S2	0.2720
Monitored Lake	Slipper	0.0160

- Conclusions:
  Model fit for Nema and S2 is weak. Model fit for reference lakes, Kodiak, Leslie, Moose, and Slipper lakes is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean benthos density for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Kodiak	7.51E+03	6.60E+03	5.60E+03	1.25E+03	3.49E+04	1.64E+04
Leslie	8.51E+03	9.93E+03	9.06E+03	1.66E+03	5.94E+04	2.65E+04
Moose	3.69E+03	4.77E+03	4.05E+03	9.02E+02	2.52E+04	1.19E+04
Nema	1.46E+04	8.09E+03	6.87E+03	1.53E+03	4.28E+04	2.01E+04
Slipper	2.73E+03	1.42E+03	1.22E+03	2.63E+02	7.66E+03	3.57E+03
S2	1.69E+03	2.55E+03	2.16E+03	4.82E+02	1.35E+04	6.33E+03
Nanuq	2.57E+03	2.02E+03	1.72E+03	3.83E+02	1.07E+04	
Counts	5.41E+03	5.74E+03	4.87E+03	1.09E+03	3.03E+04	
Vulture	3.33E+03	3.22E+03	2.74E+03	6.10E+02	1.70E+04	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Density	Summer	Koala	Lake	Biology	none	log e	linear mixed effects regression	#2 shared slopes	NA	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

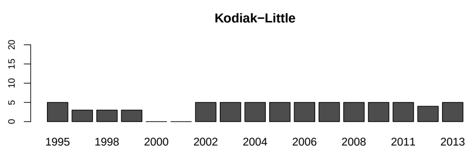
Analysis of Benthos Density in Streams of the Koala Watershed and Lac de Gras

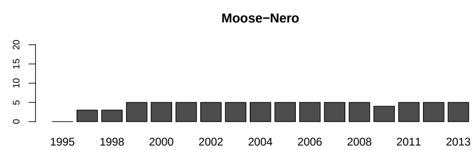
January 22, 2014

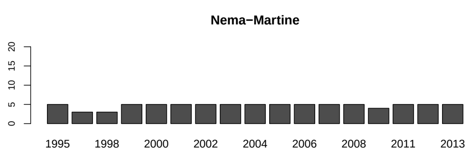
1 Censored Values:

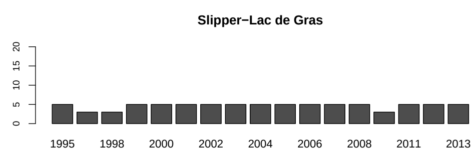
The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (grey) or above the detection limit (black).

1.1 Monitored

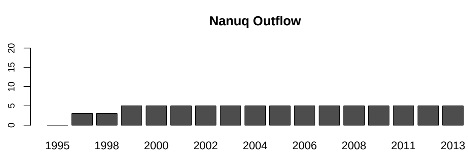


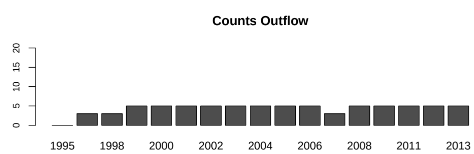


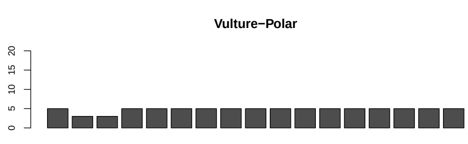




1.2 Reference

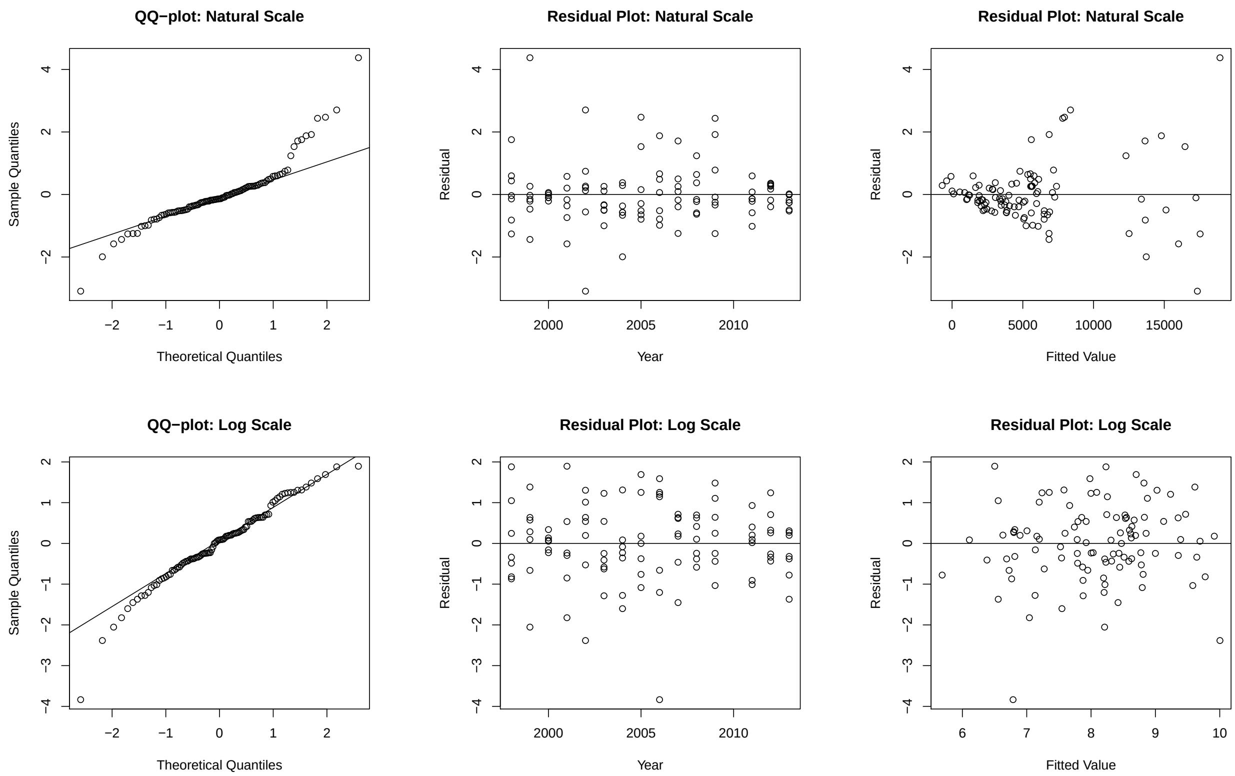






Comment:
None of the streams exhibited greater than 60% of data below the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
166	Slipper-Lac de Gras	1999	36813.20	18935.35	4.37
169	Slipper-Lac de Gras	2002	4686.40	17337.51	-3.09

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
113	Moose-Nero	2006	73.20	6.79	-3.84

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-square	DF	p-value
18.42	6.00	0.01

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-square	DF	p-value
4.03	4.00	0.40

- Conclusions:
  The slopes do not differ significantly among reference streams.

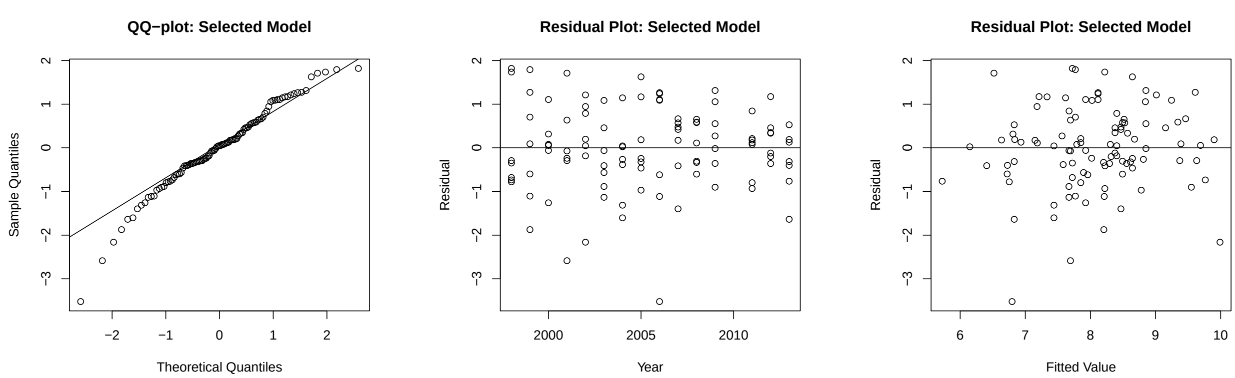
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.864	0.000	0.136	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference streams are best modeled using separate slopes and intercepts, contrasts suggest that reference streams share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference streams) to avoid defaulting to comparing trends in monitored streams against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
113	Moose-Nero	2006	73.20	6.80	-3.52

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference stream slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-square	DF	P-value
Kodiak-Little	5.0783	2	0.0789
Moose-Nero	0.1170	2	0.9432
Nema-Martine	0.3668	2	0.8324
Slipper-Lac de Gras	3.6542	2	0.1609

- Conclusions:
  No significant deviations were found when comparing monitored streams to reference streams.

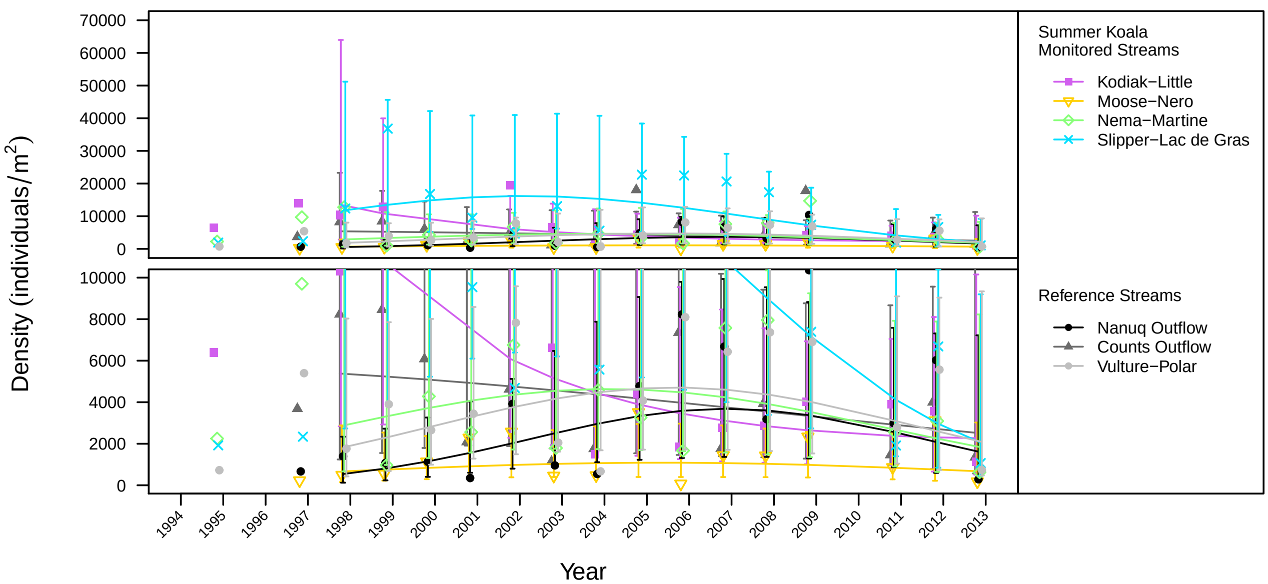
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.0750
Monitored Stream	Kodiak-Little	0.4850
Monitored Stream	Moose-Nero	0.0240
Monitored Stream	Nema-Martine	0.0990
Monitored Stream	Slipper-Lac de Gras	0.4680

- Conclusions:
  Model fit for Kodiak-Little and Slipper-Lac de Gras is weak. Model fit for reference lakes, Moose-Nero, and Nema-Martine is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively. For parameters where the slope (and intercept) for reference streams were not statistically different, the regression line and associated 95% CI for the combined reference stream data is shown as Reference-Common. This corresponds to analyses using reference model 2 or 3 only.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean stream benthos density for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Kodiak-Little	1.12E+03	2.27E+03	1.74E+03	5.08E+02	1.02E+04	5.08E+03
Moose-Nero	1.78E+02	6.78E+02	5.17E+02	1.52E+02	3.02E+03	1.51E+03
Nema-Martine	6.27E+02	1.84E+03	1.41E+03	4.14E+02	8.23E+03	4.12E+03
Slipper-Lac de Gras	1.07E+03	2.06E+03	1.57E+03	4.62E+02	9.20E+03	4.60E+03
Nanuq Outflow	2.89E+02	1.62E+03	1.24E+03	3.63E+02	7.22E+03	
Counts Outflow	1.35E+03	2.53E+03	1.93E+03	5.67E+02	1.13E+04	
Vulture-Polar	7.40E+02	2.09E+03	1.60E+03	4.69E+02	9.34E+03	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Density	Summer	Koala	Stream	Biology	none	log e	linear mixed effects regression	#2 shared slopes	NA	none

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

2. King-Cujo Watershed and Lac du Sauvage

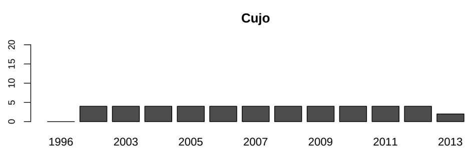
Analysis of April pH in Lakes of the King-Cujo Watershed and Lac du Sauvage

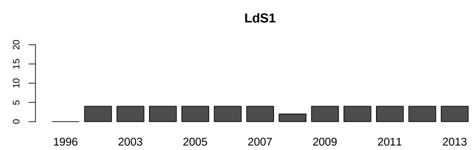
January 21, 2014

1 Censored Values:

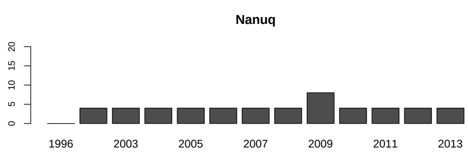
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

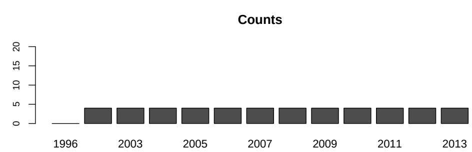
1.1 Monitored

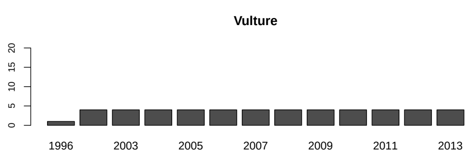




1.2 Reference

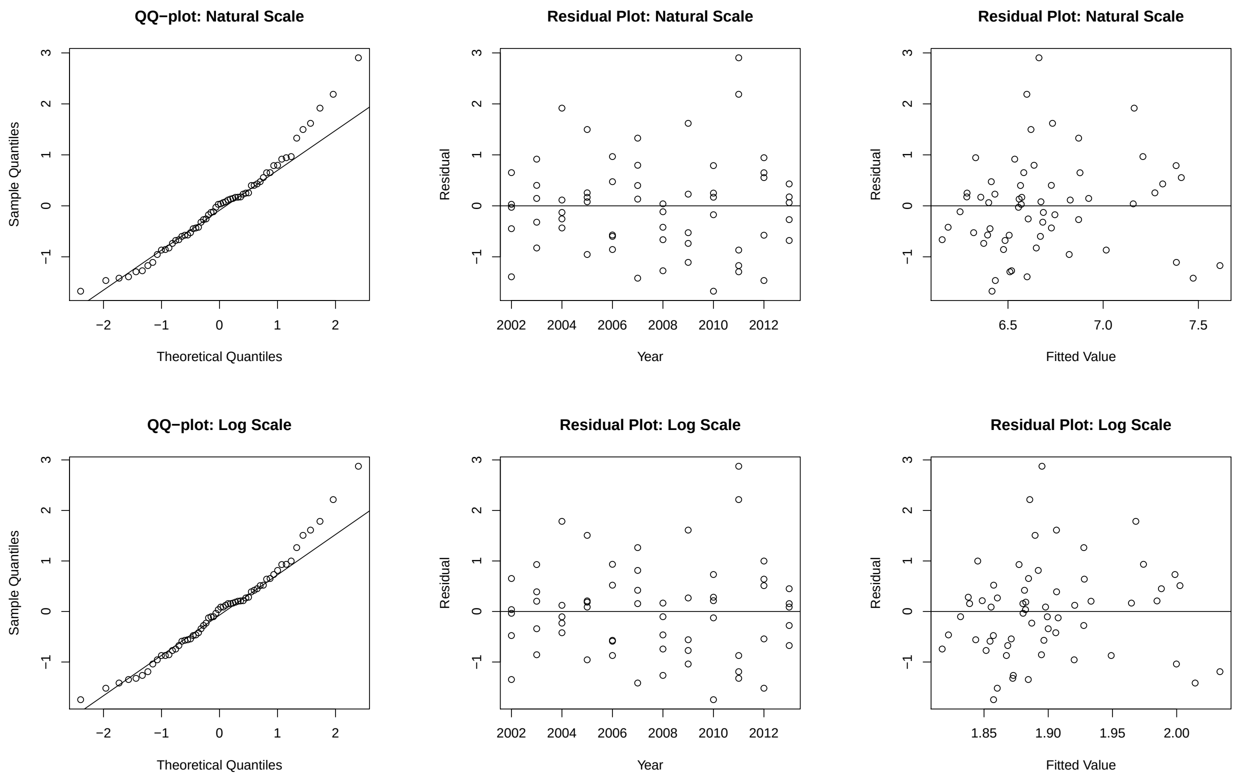






Comment:
None of the lakes exhibited greater than 10% of data was less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
2.77E-50	1.00E+00	log model

Conclusion:
Although AIC reveals that the data is modeled best after log transformation, pH is already log scale and should not be transformed. Proceeding with analysis using untransformed, "natural" model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
3393.40	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
0.82	4.00	0.94

- Conclusions:
  The slopes do not differ significantly among reference lakes.

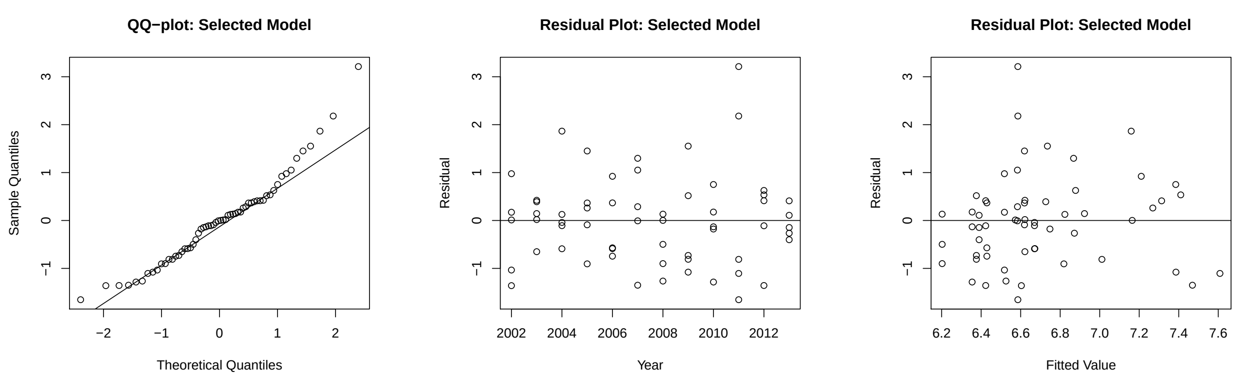
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.014	0.000	0.986	Ref. Model 3

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using a common slope and intercept, contrasts suggest that reference lakes do not share a common intercept. AIC also suggests that the second best model for reference lakes is separate slopes and intercepts, but contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
138	Vulture	2011	7.18	6.59	3.21

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Cujo	11.02	2.00	0.00
LdS1	2.20	2.00	0.33

- Conclusions:
  Cujo Lake shows significant deviation from the common slope of reference lakes.

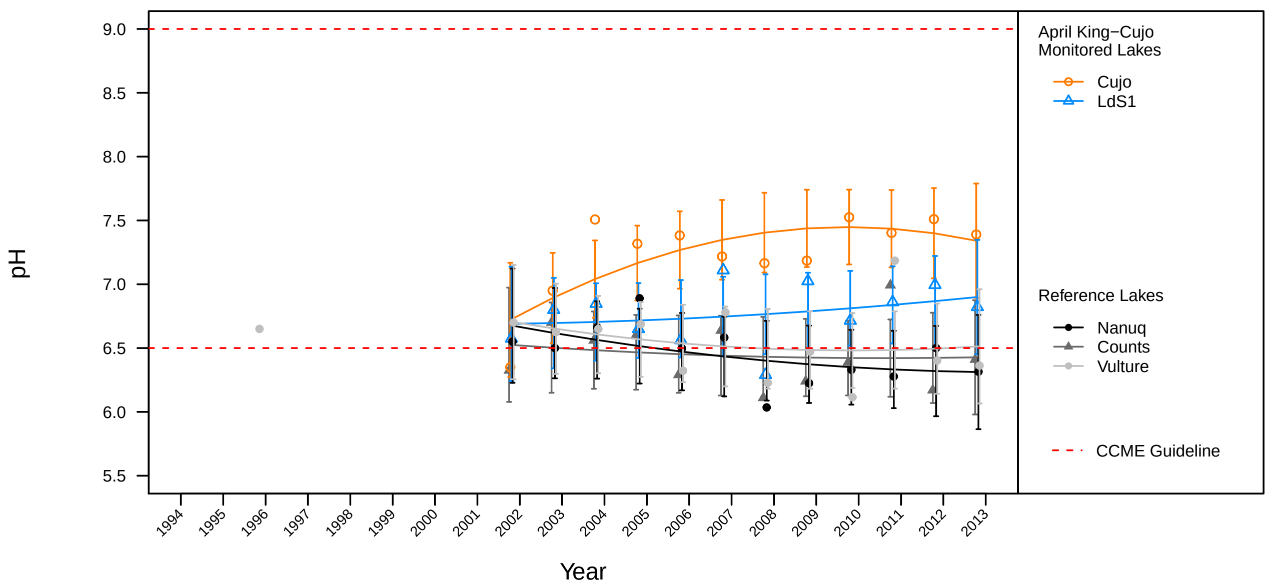
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0850
Monitored Lake	Cujo	0.5330
Monitored Lake	LdS1	0.0940

- Conclusions:
  Model fit for reference lakes and LdS1 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean pH for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	7.39E+00	7.34E+00	2.28E-01	6.89E+00	7.79E+00	6.68E-01
LdS1	6.82E+00	6.90E+00	2.28E-01	6.45E+00	7.35E+00	6.68E-01
Nanuq	6.31E+00	6.31E+00	2.28E-01	5.86E+00	6.76E+00	
Counts	6.41E+00	6.43E+00	2.28E-01	5.98E+00	6.88E+00	
Vulture	6.36E+00	6.51E+00	2.28E-01	6.07E+00	6.96E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
pH	April	King-Cujo	Lake	Water	none	none	linear mixed effects regression	#2 shared slopes	6.5/ 9	Cujo

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

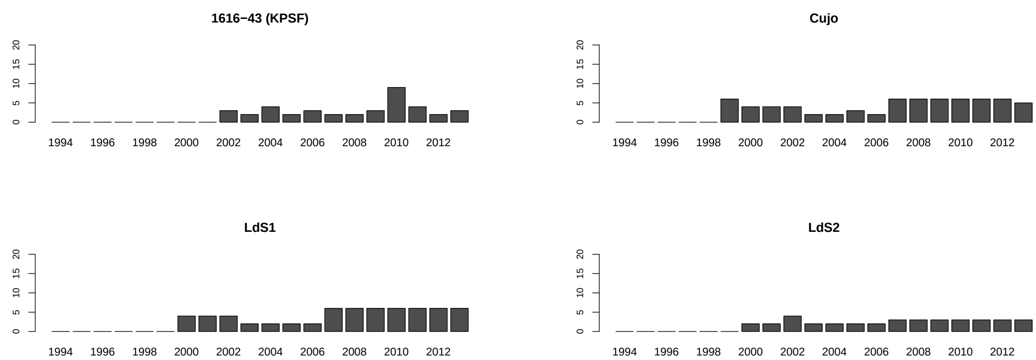
Analysis of August pH in Lakes of the King-Cujo Watershed and Lac du Sauvage

January 18, 2014

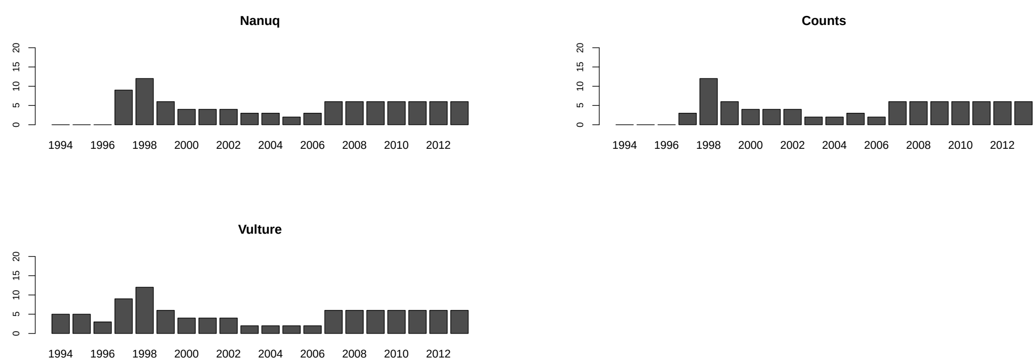
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

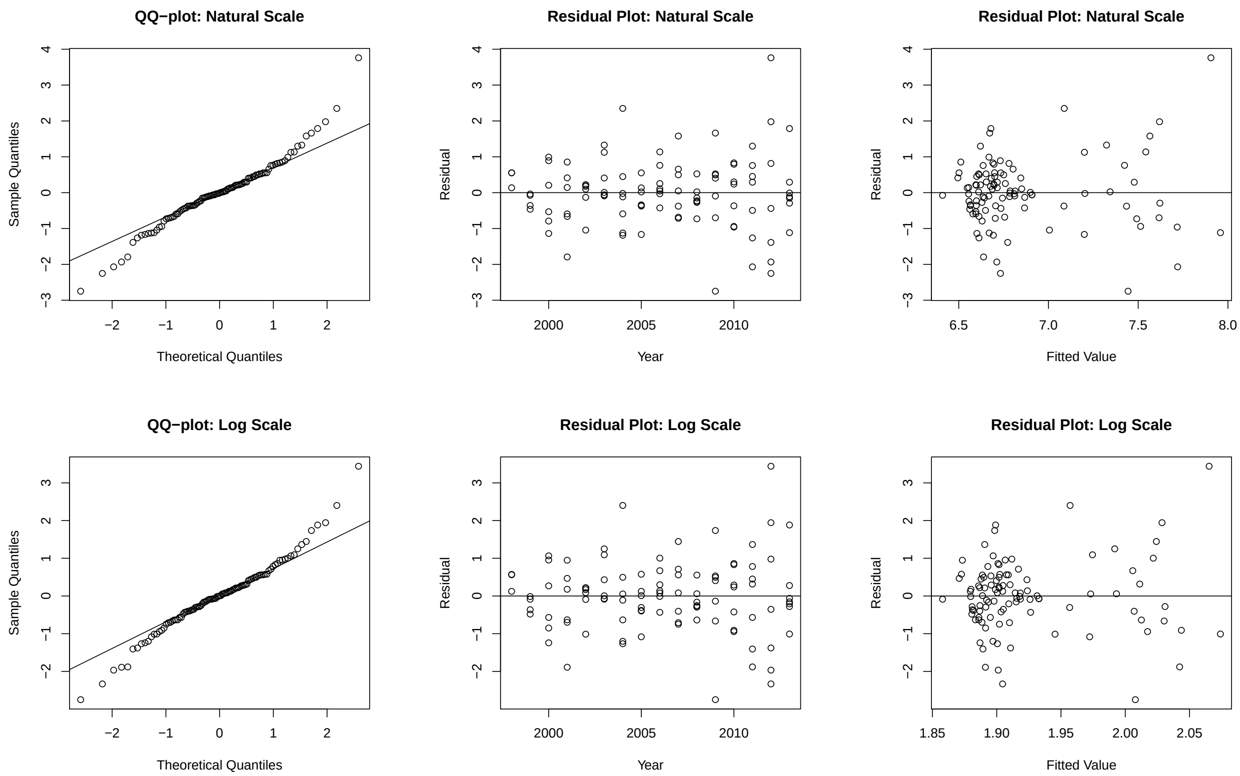


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
19	1616-43 (KPSF)	2012	8.41	7.91	3.76

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
19	1616-43 (KPSF)	2012	8.41	2.07	3.44

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. Although AIC reveals that the data is modeled best after log transformation, pH is already log scale and should not be transformed. Proceeding with analysis using untransformed, "natural" model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
2.88	6.00	0.82

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

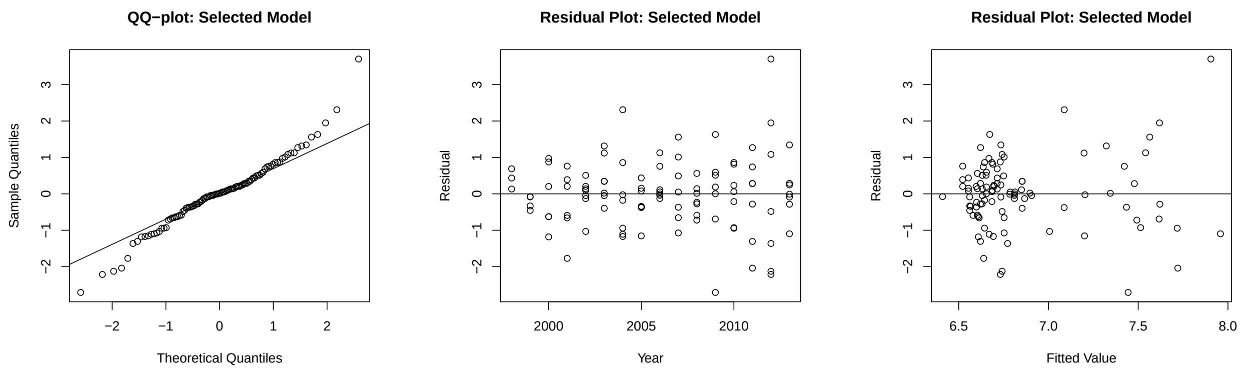
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.010	0.000	0.990	Ref. Model 3

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
19	1616-43 (KPSF)	2012	8.41	7.90	3.70

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Lakes

Fitted model of the slope and intercept of each monitored lake compared to a common slope and intercept fitted for all reference lakes together (reference model 3).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	10.5467	3	0.0144
Cujo	233.5748	3	0.0000
LdS1	1.4938	3	0.6837
LdS2	0.8896	3	0.8279

- Conclusions:
  1616-43 (KPSF) and Cujo Lake show significant deviation from the common slope and intercept of reference lakes.

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	9.7739	2	0.0075
Cujo	68.8862	2	0.0000
LdS1	0.8580	2	0.6512
LdS2	0.3754	2	0.8289

- Conclusions:
  When allowing for differences in intercept, 1616-43 (KPSF) and Cujo Lake show significant deviation from the common slope of reference lakes.

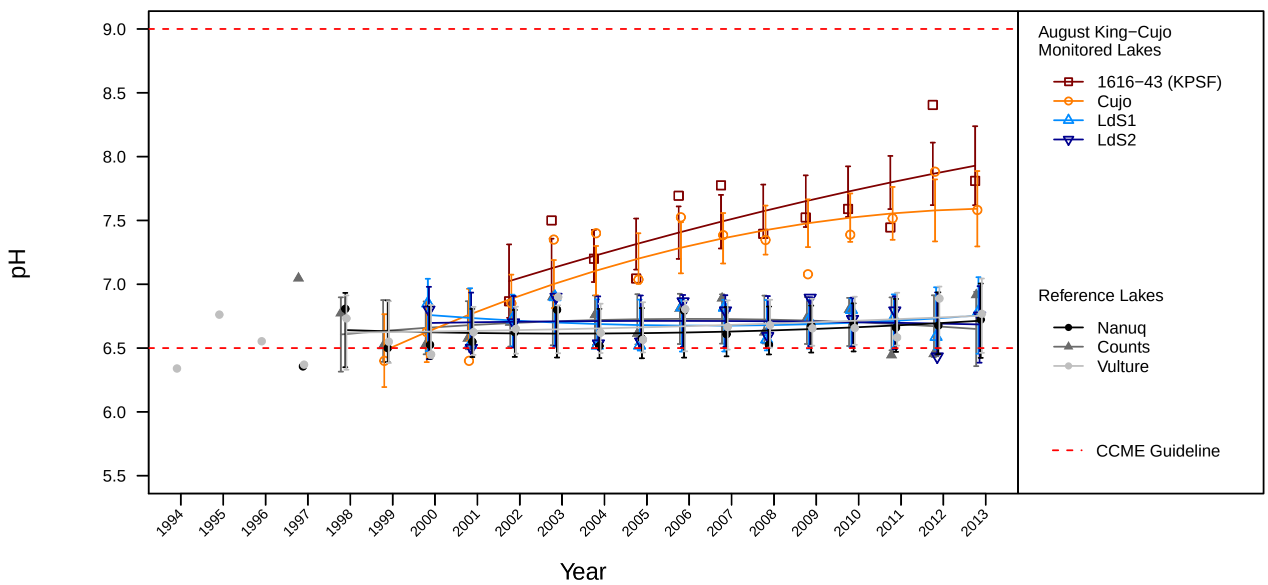
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0400
Monitored Lake	1616-43 (KPSF)	0.5190
Monitored Lake	Cujo	0.7260
Monitored Lake	LdS1	0.0450
Monitored Lake	LdS2	0.0030

- Conclusions:
  Model fit for reference lakes, LdS1, and LdS2 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean pH for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	7.81E+00	7.93E+00	1.58E-01	7.62E+00	8.24E+00	4.62E-01
Cujo	7.58E+00	7.59E+00	1.51E-01	7.30E+00	7.89E+00	4.41E-01
LdS2	6.75E+00	6.69E+00	1.53E-01	6.39E+00	6.99E+00	4.48E-01
LdS1	6.78E+00	6.76E+00	1.53E-01	6.46E+00	7.06E+00	4.48E-01
Nanuq	6.72E+00	6.71E+00	1.49E-01	6.42E+00	7.01E+00	
Counts	6.92E+00	6.65E+00	1.49E-01	6.36E+00	6.94E+00	
Vulture	6.77E+00	6.75E+00	1.49E-01	6.46E+00	7.04E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
pH	August	King-Cujo	Lake	Water	none	none	linear mixed effects regression	#3 shared intercept & slope	6.5/ 9	1616-43 (KPSF) Cujo

* Monitored lakes are contrasted to the slope of each individual reference lake in model 1a, a slope of 0 in reference model 1b, the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

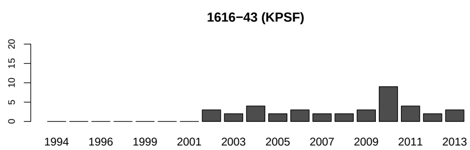
Analysis of August pH in King-Cujo Watershed Streams

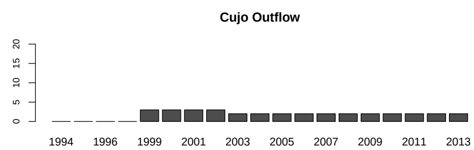
January 21, 2014

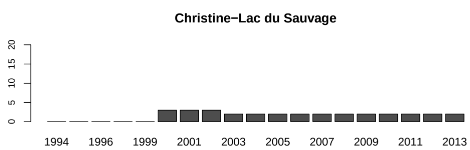
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

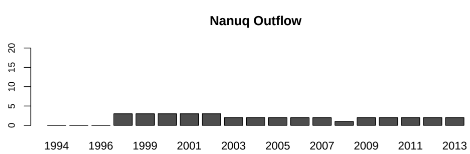
1.1 Monitored

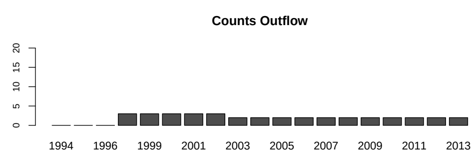


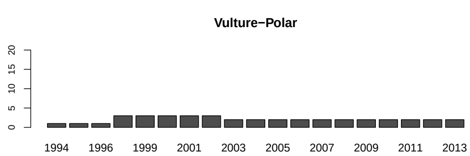




1.2 Reference

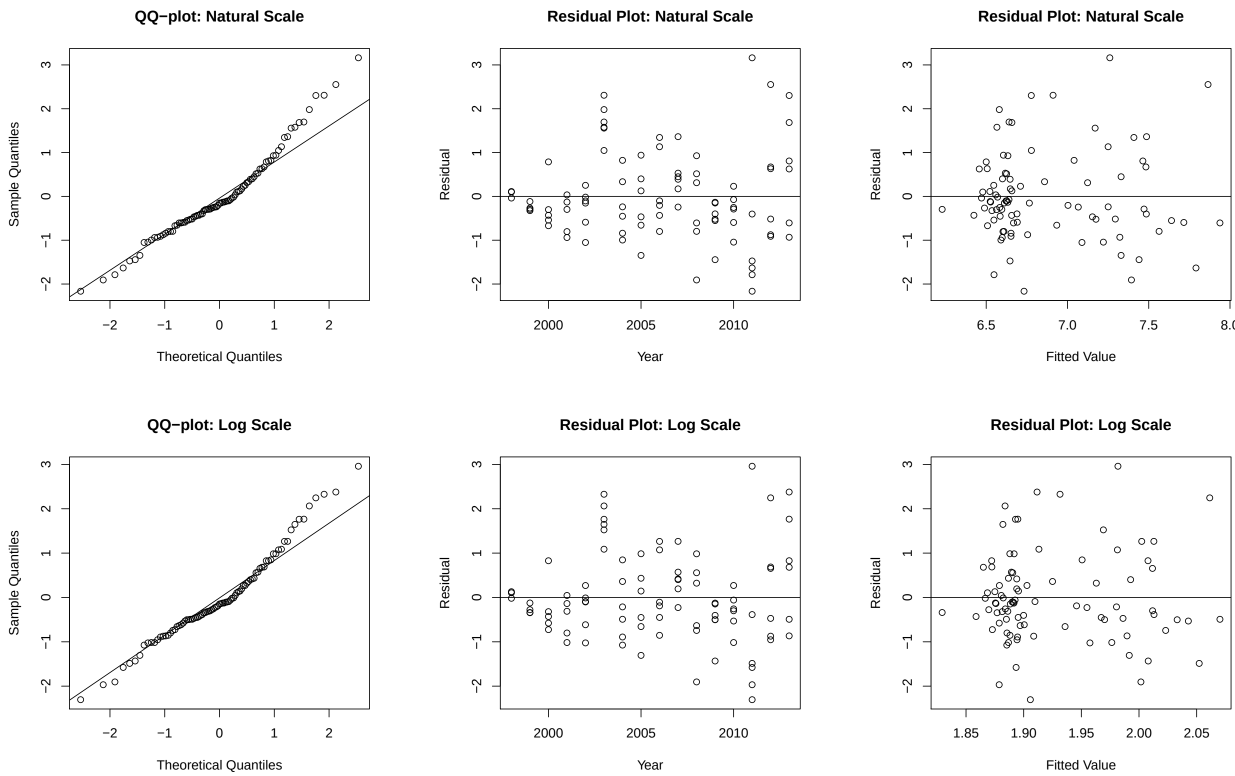






Comment:
None of the streams exhibited greater than 10% of data less than the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
38	Christine-Lac du Sauvage	2011	7.93	7.26	3.16

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
Although AIC reveals that the data is modeled best after log transformation, pH is already log scale and should not be transformed. Proceeding with analysis using untransformed, "natural" model.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
3.16	6.00	0.79

- Conclusions:
  The slopes and intercepts do not differ significantly among reference streams.

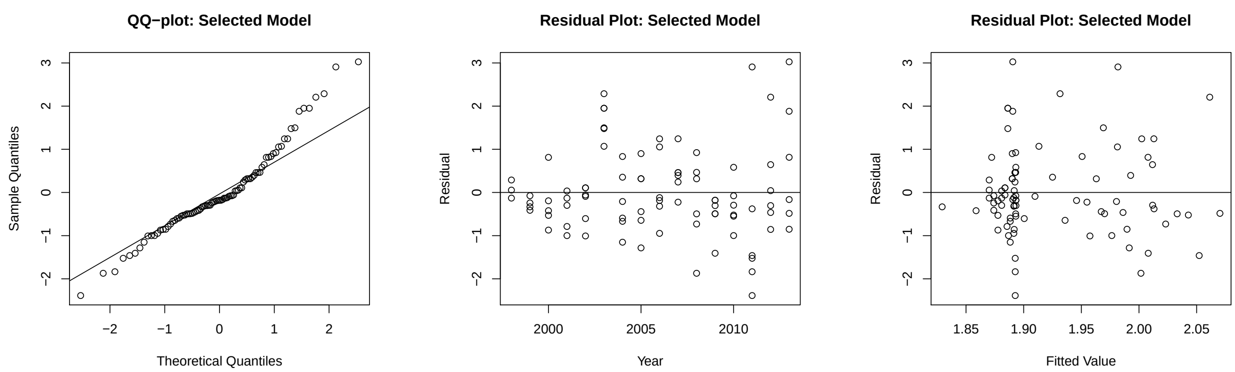
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.010	0.128	0.861	Ref. Model 3

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
60	Counts Outflow	2013	7.27	1.89	3.03

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference stream slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Streams

Fitted model of the slope and intercept of each monitored stream compared to a common slope and intercept fitted for all reference streams together (reference model 3).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	163.6109	3	0.0000
Cujo Outflow	92.7296	3	0.0000
Christine-Lac du Sauvage	44.8071	3	0.0000

- Conclusions:
  All monitored streams show significant deviations from the common slope and intercept of reference streams.

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	11.2013	2	0.0037
Cujo Outflow	36.5691	2	0.0000
Christine-Lac du Sauvage	12.8582	2	0.0016

- Conclusions:
  When allowing for differences in intercept, all monitored streams show significant deviation from the common slope of reference streams.

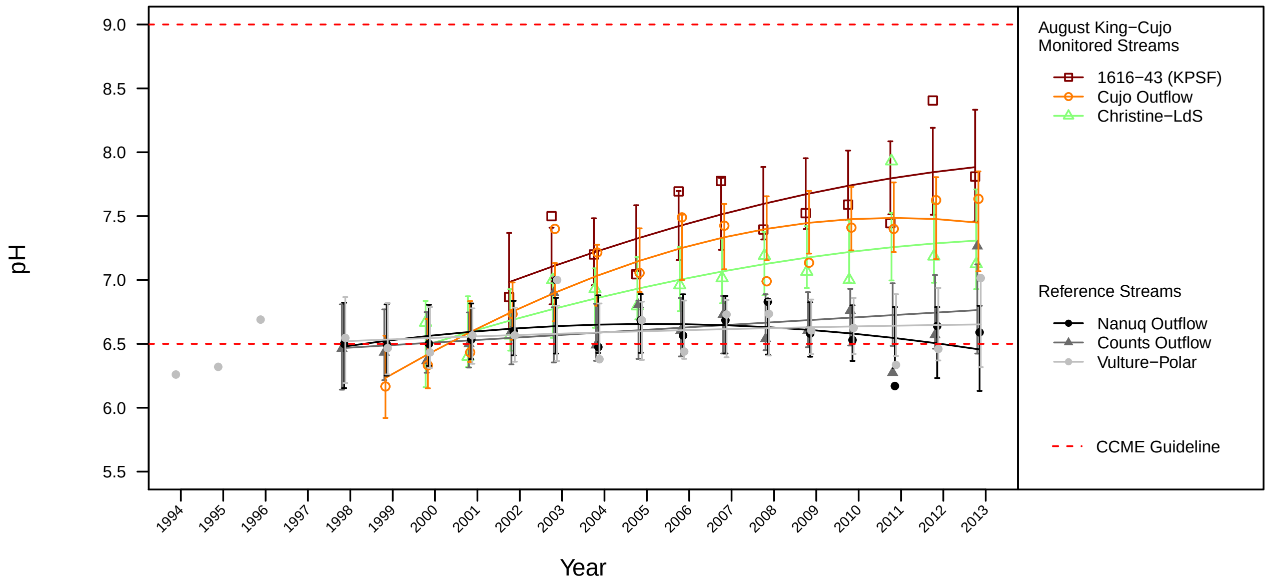
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.0580
Monitored Stream	1616-43 (KPSF)	0.4960
Monitored Stream	Christine-Lac du Sauvage	0.5850
Monitored Stream	Cujo Outflow	0.7870

- Conclusions:
  Model fit for reference streams is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean pH for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	7.81E+00	7.88E+00	2.23E-01	7.46E+00	8.33E+00	6.52E-01
Cujo Outflow	7.63E+00	7.45E+00	1.99E-01	7.07E+00	7.85E+00	5.83E-01
Christine-Lac du Sauvage	7.12E+00	7.31E+00	1.99E-01	6.93E+00	7.71E+00	5.83E-01
Nanuq Outflow	6.59E+00	6.46E+00	1.70E-01	6.13E+00	6.80E+00	
Counts Outflow	7.27E+00	6.76E+00	1.78E-01	6.42E+00	7.12E+00	
Vulture-Polar	7.02E+00	6.65E+00	1.75E-01	6.32E+00	7.00E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
pH	August	King-Cujo	Stream	Water	none	none	Tobit regression	#3 shared intercept & slope	6.5/ 9	1616-43 (KPSF) Cujo Outflow Christine-Lac du Sauvage

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

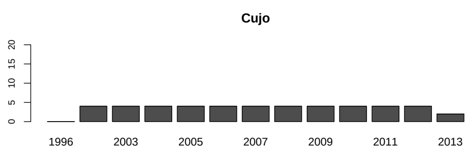
Analysis of April Total Alkalinity in Lakes of the King-Cujo Watershed and Lac du Sauvage

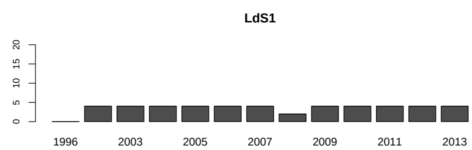
January 18, 2014

1 Censored Values:

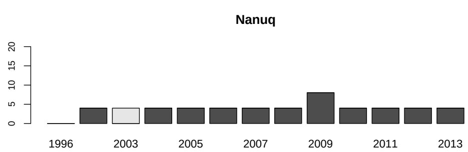
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

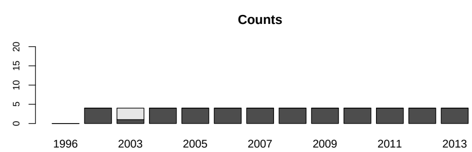
1.1 Monitored

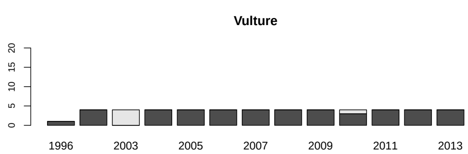




1.2 Reference

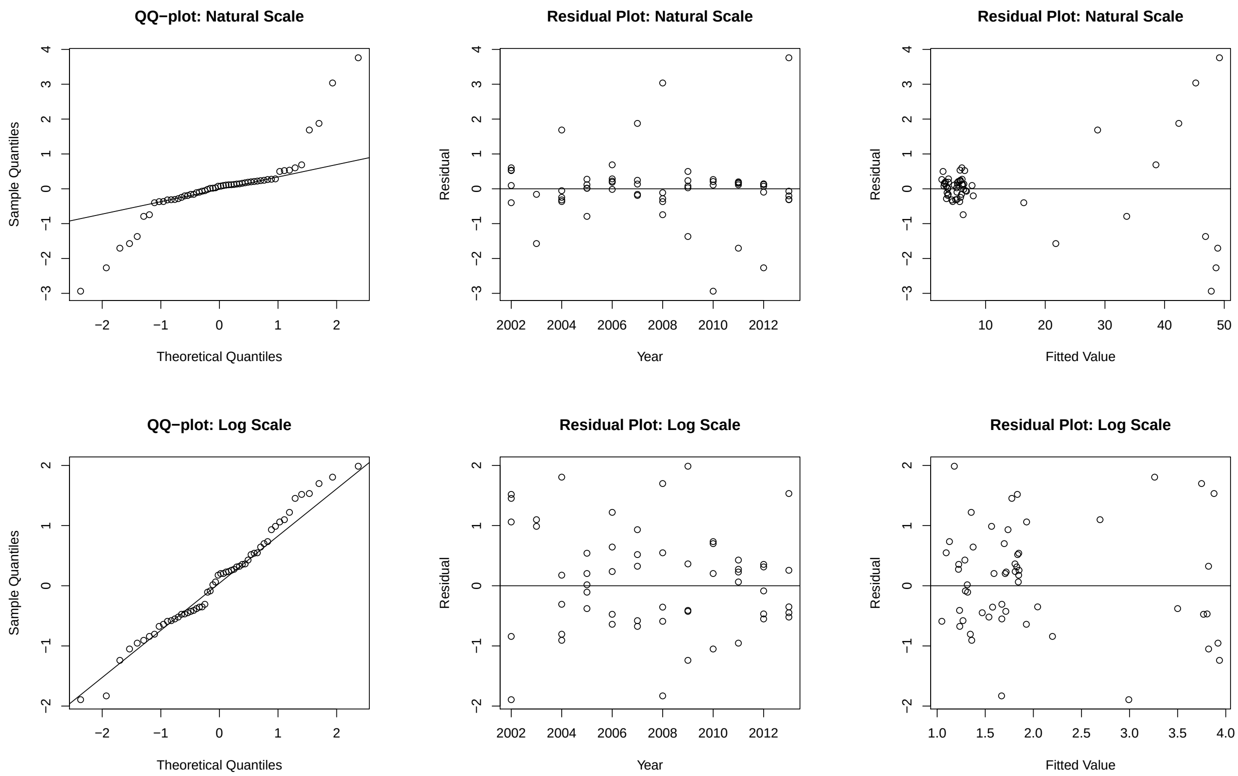






Comment:
None of the lakes exhibited greater than 10% of data was less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
55	Cujo	2008	53.95	45.22	3.04
60	Cujo	2013	60.00	49.19	3.76

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
2.28E-75	1.00E+00	log model

Conclusion:
AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
752.77	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
1.93	4.00	0.75

- Conclusions:
  The slopes do not differ significantly among reference lakes.

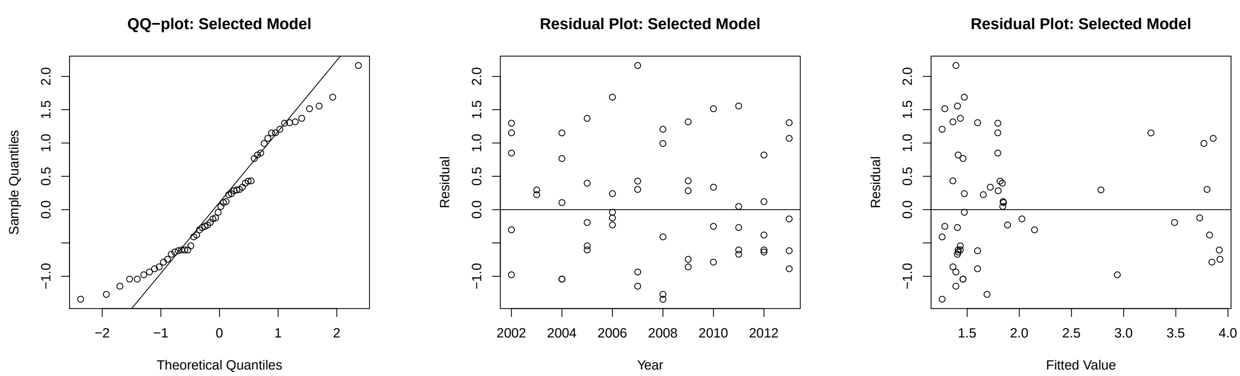
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Cujo	17.88	2.00	0.00
LdS1	0.07	2.00	0.97

- Conclusions:
  Cujo Lake shows significant deviation from the common slope of reference lakes.

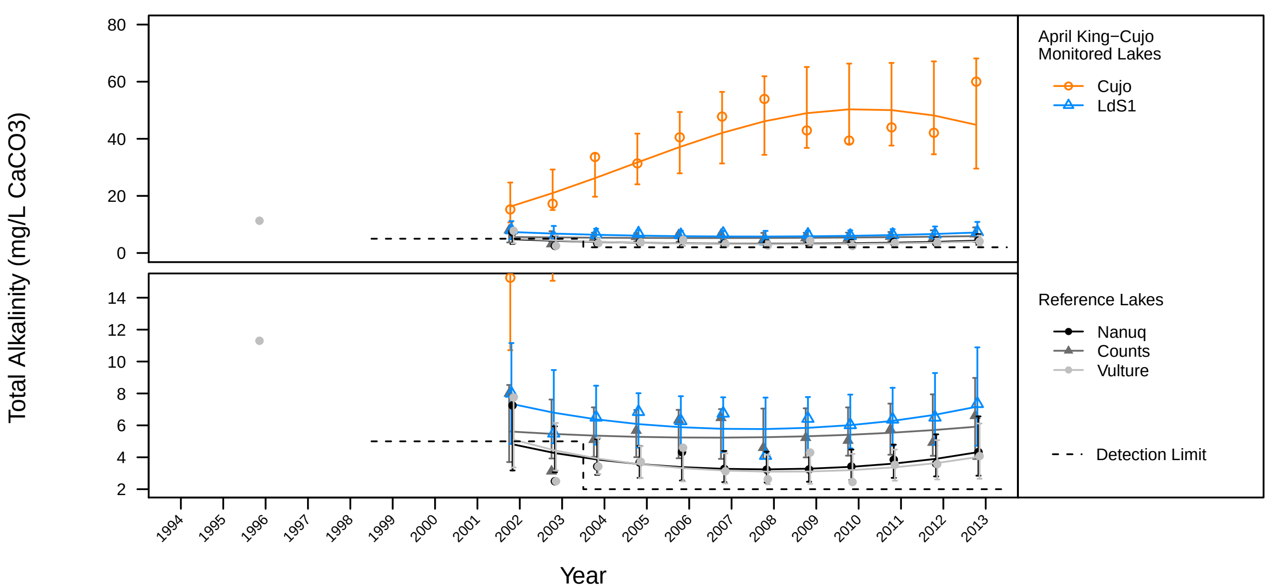
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0960
Monitored Lake	Cujo	0.8180
Monitored Lake	LdS1	0.2610

- Conclusions:
  Model fit for LdS1 is weak. Model fit for referenc lakes is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total alkalinity for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	6.00E+01	4.49E+01	9.56E+00	2.96E+01	6.81E+01	2.80E+01
LdS1	7.35E+00	7.17E+00	1.53E+00	4.73E+00	1.09E+01	4.47E+00
Nanuq	4.33E+00	4.32E+00	9.20E-01	2.85E+00	6.56E+00	
Counts	6.60E+00	5.91E+00	1.26E+00	3.89E+00	8.97E+00	
Vulture	4.08E+00	4.03E+00	8.58E-01	2.66E+00	6.12E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Alkalinity	April	King-Cujo	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	NA	Cujo

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

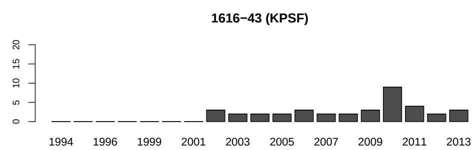
Analysis of August Total Alkalinity in Lakes of the King-Cujo Watershed and Lac du Sauvage

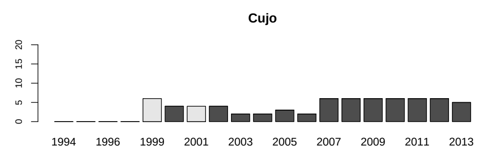
January 12, 2014

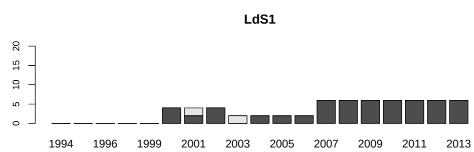
1 Censored Values:

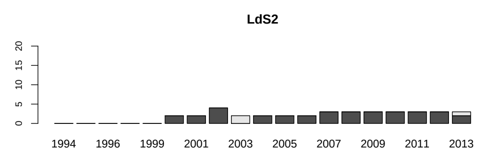
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

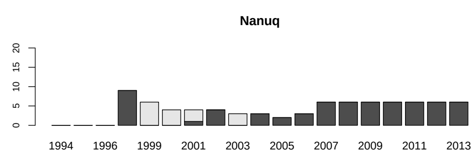


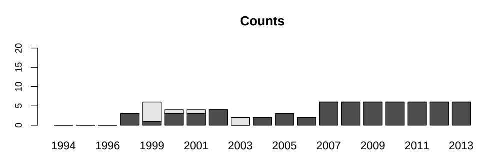


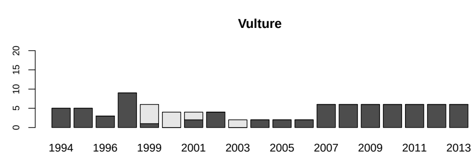




1.2 Reference

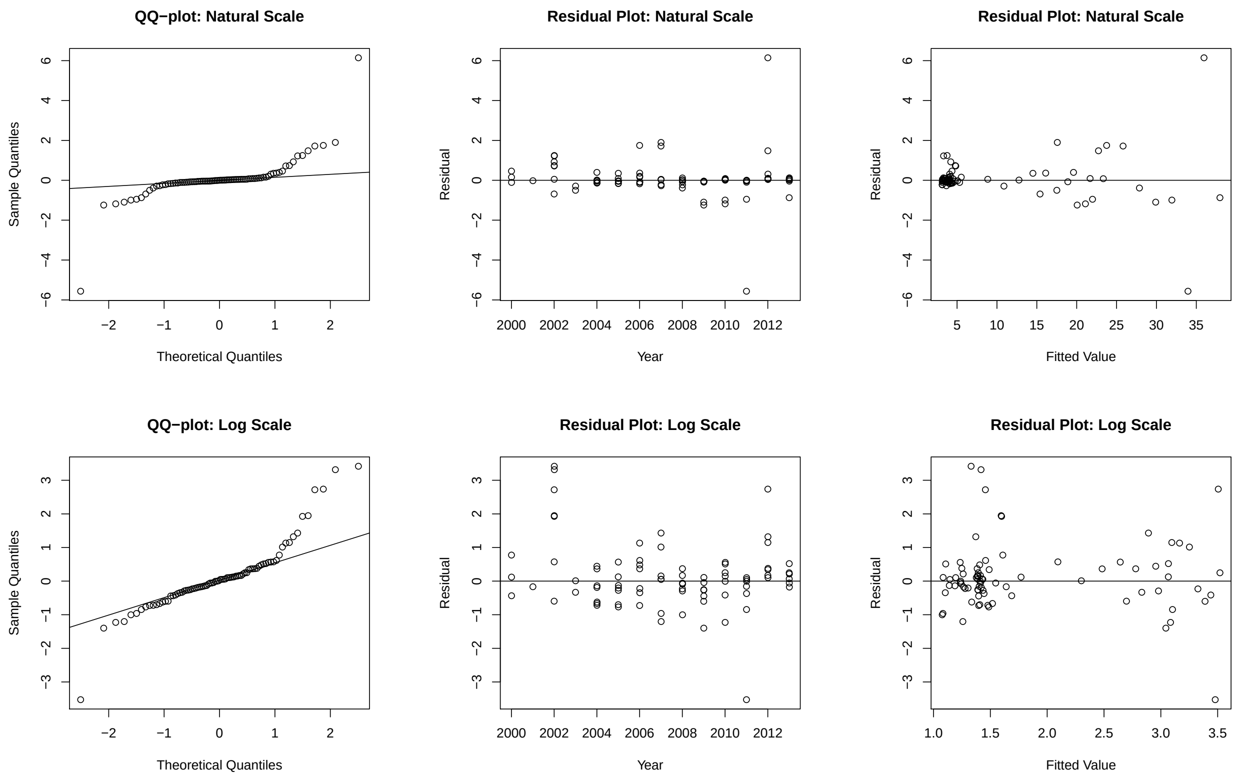






Comment:
10-60% of data in Counts, Nanuq, Vulture, and Cujo lakes was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-43 (KPSF)	2011	17.18	33.96	-5.56
19	1616-43 (KPSF)	2012	54.50	35.97	6.14

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-43 (KPSF)	2011	17.18	3.48	-3.53
109	Nanuq	2002	7.00	1.33	3.42
129	Vulture	2002	7.50	1.42	3.32

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
11.95	6.00	0.06

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
2.71	4.00	0.61

- Conclusions:
  The slopes do not differ significantly among reference lakes.

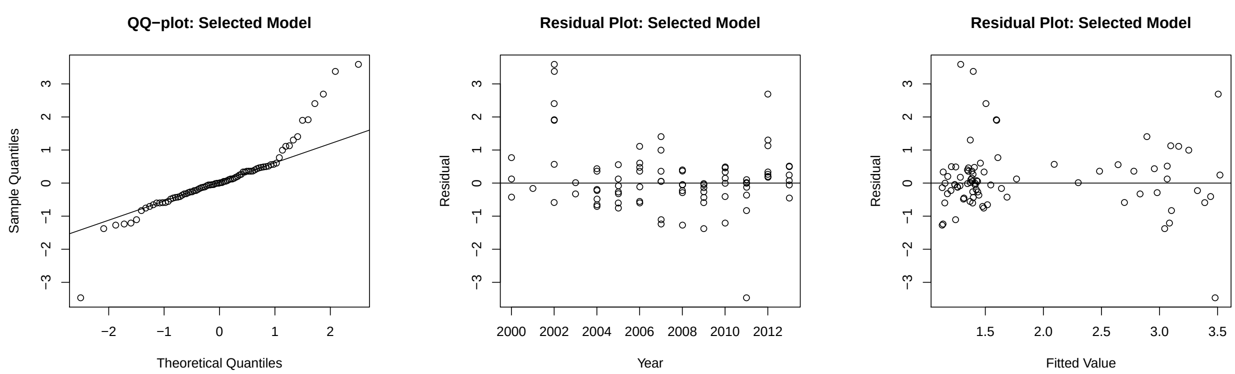
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.059	0.849	0.091	Ref. Model 2

- Conclusions:
  Results of AIC do not agree with reference model testing. Although contrasts suggest that reference lakes share a common slope and intercept, AIC suggests that reference lakes are best modeled with separate intercepts. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-43 (KPSF)	2011	17.18	3.48	-3.47
109	Nanuq	2002	7.00	1.29	3.59
129	Vulture	2002	7.50	1.40	3.38

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	26.9428	2	0.0000
Cujo	104.5013	2	0.0000
LdS1	0.3831	2	0.8257
LdS2	0.5931	2	0.7434

- Conclusions:
  1616-43 (KPSF) and Cujo Lake show significant deviation from the common slope of reference lakes.

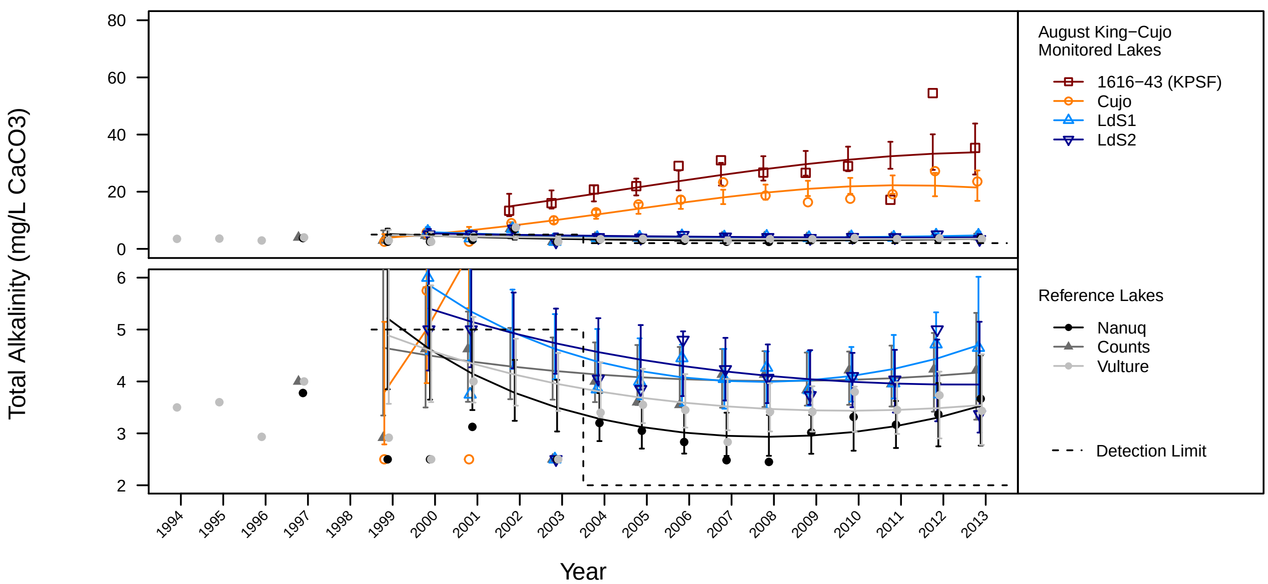
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.2450
Monitored Lake	1616-43 (KPSF)	0.5260
Monitored Lake	Cujo	0.7830
Monitored Lake	LdS1	0.2400
Monitored Lake	LdS2	0.1960

- Conclusions:
  Model fit for reference lakes and LdS1 is weak. Model fit for LdS2 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total alkalinity for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	3.53E+01	3.38E+01	4.50E+00	2.60E+01	4.39E+01	1.32E+01
Cujo	2.36E+01	2.15E+01	2.68E+00	1.68E+01	2.74E+01	7.85E+00
LdS2	3.37E+00	3.94E+00	5.38E-01	3.02E+00	5.15E+00	1.57E+00
LdS1	4.65E+00	4.70E+00	5.93E-01	3.67E+00	6.02E+00	1.74E+00
Nanuq	3.67E+00	3.53E+00	4.39E-01	2.77E+00	4.50E+00	
Counts	4.22E+00	4.17E+00	5.19E-01	3.26E+00	5.32E+00	
Vulture	3.43E+00	3.54E+00	4.41E-01	2.78E+00	4.52E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Alkalinity	August	King-Cujo	Lake	Water	none	log e	Tobit regression	#2 shared slopes	NA	1616-43 (KPSF) Cujo

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

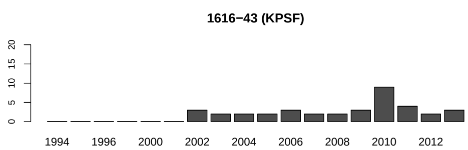
Analysis of August Total Alkalinity in King-Cujo Watershed Streams

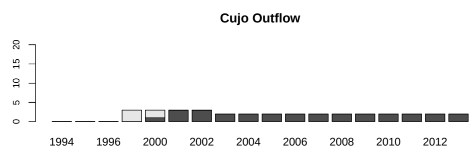
January 12, 2014

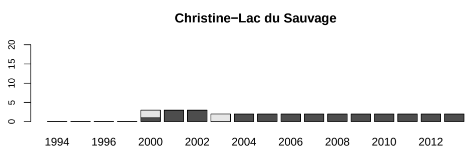
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

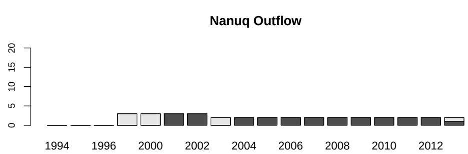
1.1 Monitored

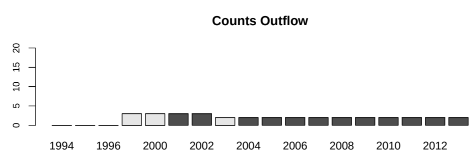


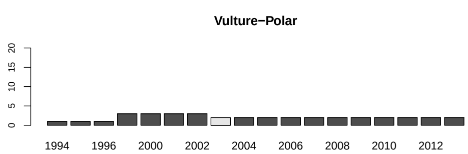




1.2 Reference

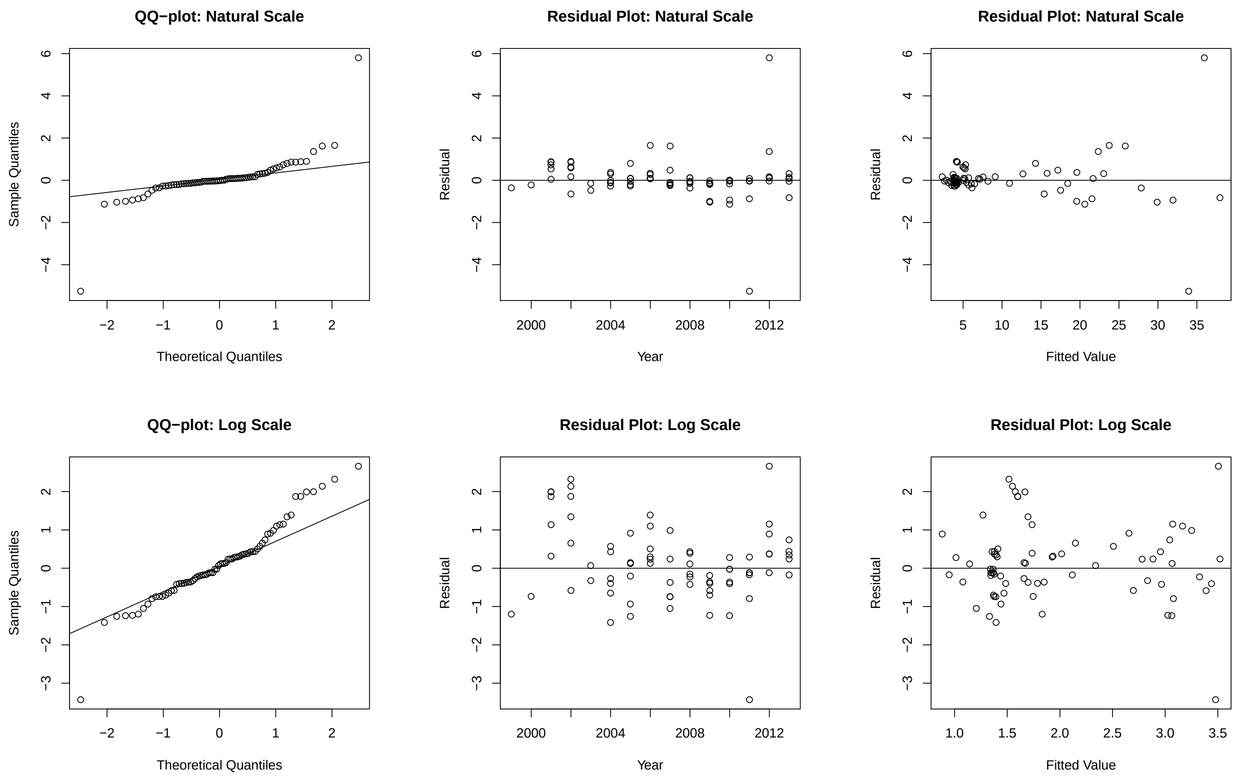






Comment:
10-60% of data in Counts Outflow, Nanuq Outflow, Cujo Outflow, and Christine-Lac du Sauvage was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-43 (KPSF)	2011	17.18	33.96	-5.25
19	1616-43 (KPSF)	2012	54.50	35.97	5.80

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-43 (KPSF)	2011	17.18	3.48	-3.43

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
18.37	6.00	0.01

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
6.76	4.00	0.15

- Conclusions:
  The slopes do not differ significantly among reference streams.

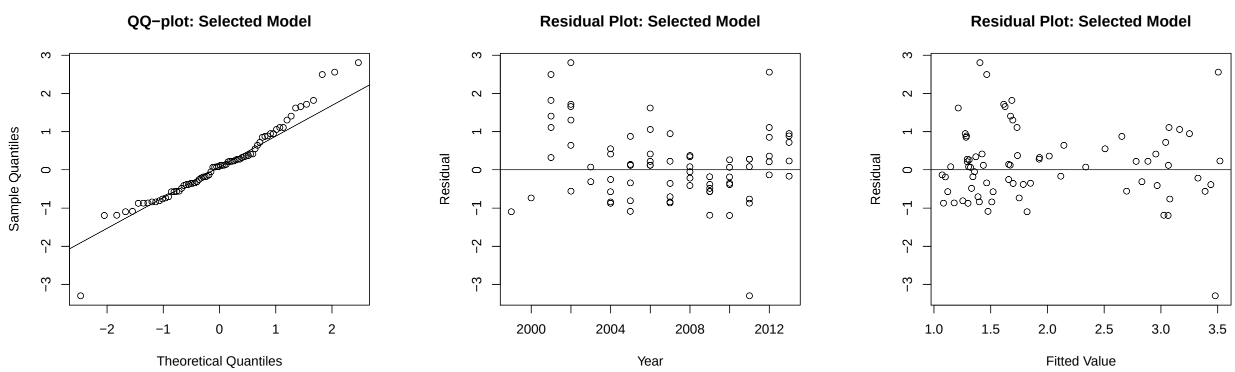
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.341	0.638	0.021	Indistinguishable support for 2 & 1; choose Model 2.

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with a common slope. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-43 (KPSF)	2011	17.18	3.48	-3.30

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference stream slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	37.3891	2	0.0000
Cujo Outflow	113.2314	2	0.0000
Christine-Lac du Sauvage	17.5110	2	0.0002

- Conclusions:
  All monitored streams show significant deviations from the common slope of reference streams.

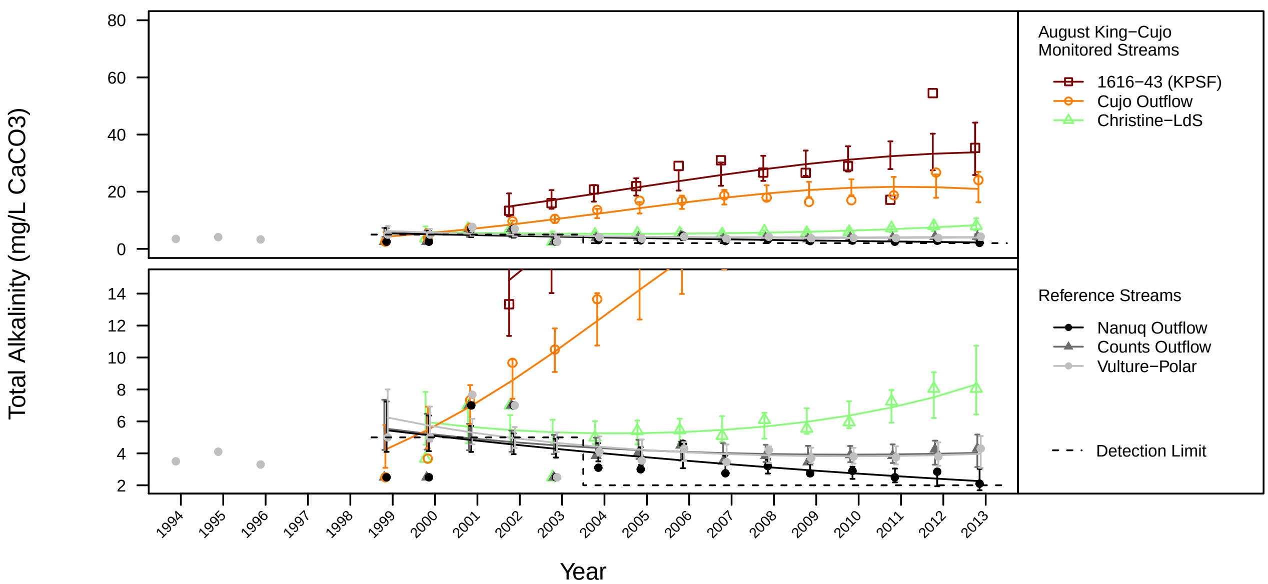
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.2960
Monitored Stream	1616-43 (KPSF)	0.5260
Monitored Stream	Christine-Lac du Sauvage	0.2500
Monitored Stream	Cujo Outflow	0.8610

- Conclusions:
  Model fit for reference streams and Christine-Lac du Sauvage is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total alkalinity for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	3.53E+01	3.38E+01	4.63E+00	2.58E+01	4.42E+01	1.35E+01
Cujo Outflow	2.41E+01	2.10E+01	2.69E+00	1.63E+01	2.70E+01	7.86E+00
Christine-Lac du Sauvage	8.05E+00	8.31E+00	1.08E+00	6.44E+00	1.07E+01	3.17E+00
Nanuq Outflow	2.10E+00	2.26E+00	3.36E-01	1.69E+00	3.03E+00	
Counts Outflow	4.30E+00	4.03E+00	5.13E-01	3.14E+00	5.17E+00	
Vulture-Polar	4.30E+00	3.97E+00	5.02E-01	3.09E+00	5.08E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Alkalinity	August	King-Cujo	Stream	Water	none	log e	Tobit regression	#2 shared slopes	NA	1616-43 (KPSF) Cujo Outflow Christine-Lac du Sauvage

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

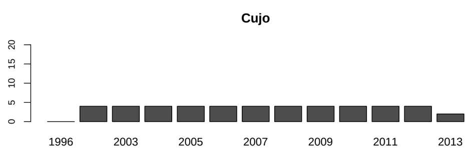
Analysis of April Hardness in Lakes of the King-Cujo Watershed and Lac du Sauvage

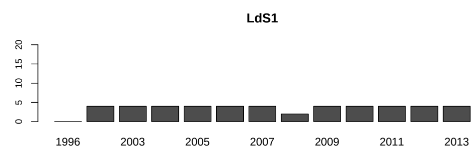
January 18, 2014

1 Censored Values:

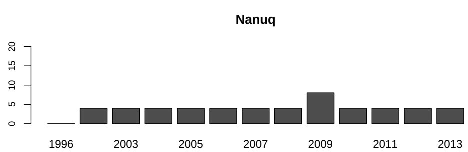
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

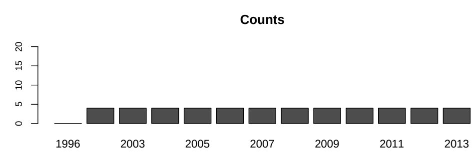
1.1 Monitored

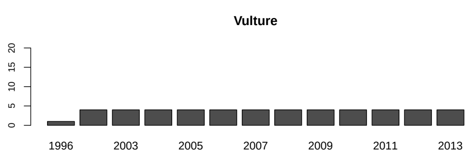




1.2 Reference

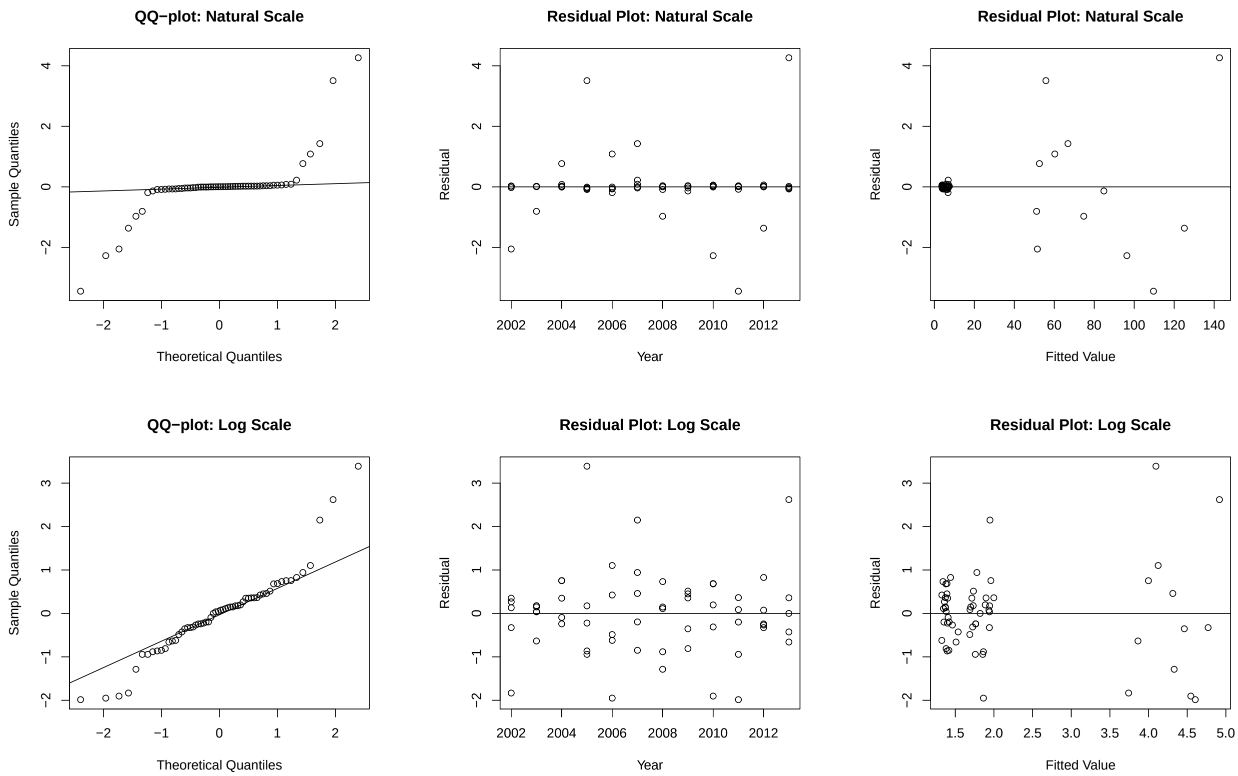






Comment:
None of the lakes exhibited greater than 10% of data was less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
52	Cujo	2005	83.67	55.82	3.51
58	Cujo	2011	82.28	109.64	-3.45
60	Cujo	2013	176.50	142.65	4.26

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
52	Cujo	2005	83.67	4.10	3.39

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.87E-113	1.00E+00	log model

Conclusion:
AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
1391.44	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
0.21	4.00	0.99

- Conclusions:
  The slopes do not differ significantly among reference lakes.

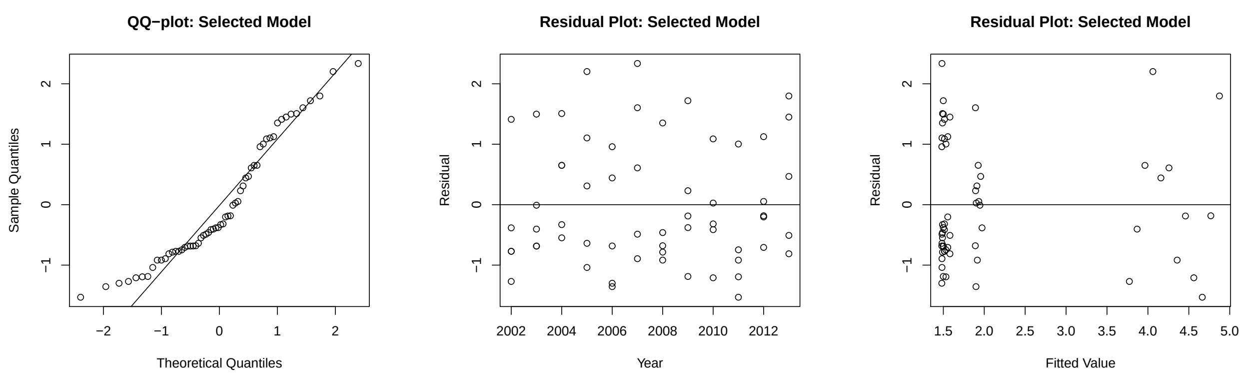
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Cujo	19.67	2.00	0.00
LdS1	0.13	2.00	0.94

- Conclusions:
  Cujo Lake shows significant deviation from the common slope of reference lakes.

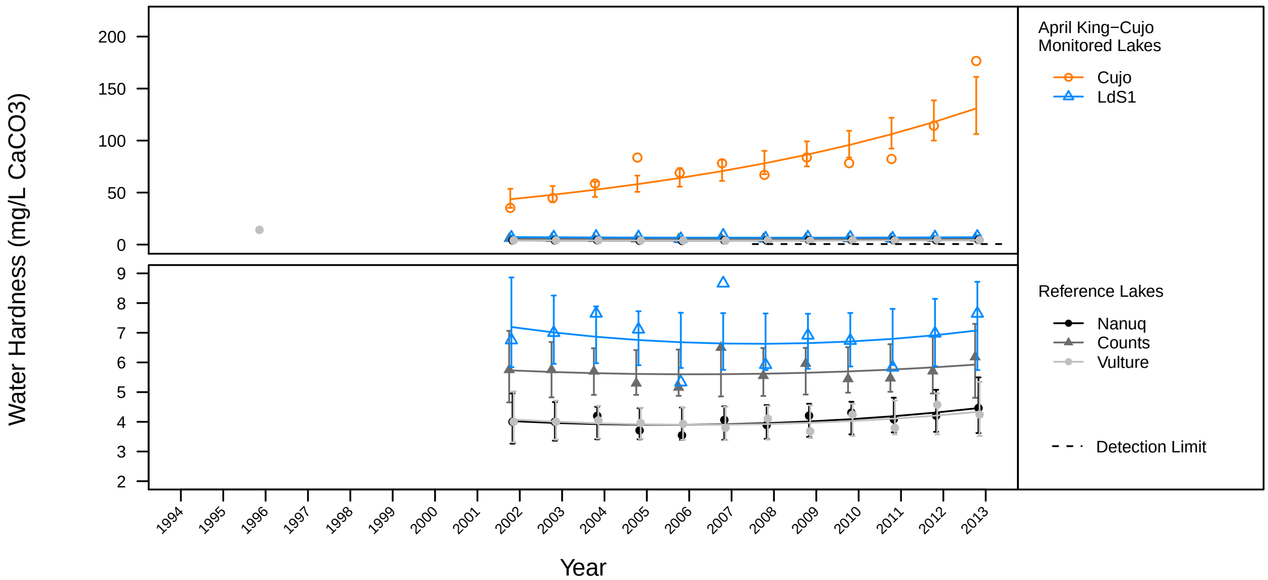
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0300
Monitored Lake	Cujo	0.7690
Monitored Lake	LdS1	0.0430

- Conclusions:
  Model fit for reference lakes and LdS1 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean hardness for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	1.76E+02	1.31E+02	1.39E+01	1.06E+02	1.61E+02	4.08E+01
LdS1	7.65E+00	7.08E+00	7.53E-01	5.74E+00	8.72E+00	2.20E+00
Nanuq	4.46E+00	4.46E+00	4.75E-01	3.62E+00	5.50E+00	
Counts	6.18E+00	5.92E+00	6.30E-01	4.81E+00	7.30E+00	
Vulture	4.25E+00	4.34E+00	4.62E-01	3.52E+00	5.35E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Hardness	April	King-Cujo	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	NA	Cujo

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

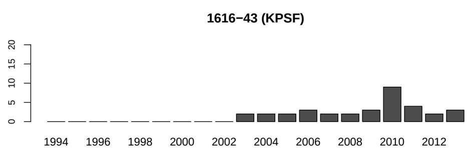
Analysis of August Hardness in Lakes of the King-Cujo Watershed and Lac du Sauvage

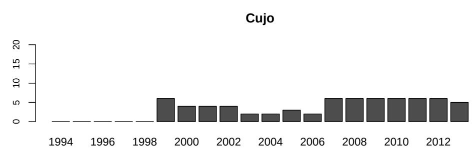
January 18, 2014

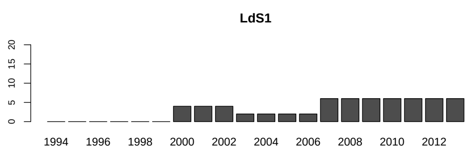
1 Censored Values:

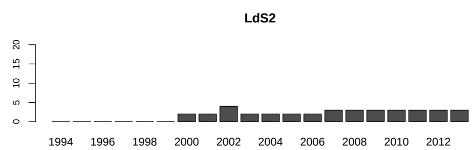
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

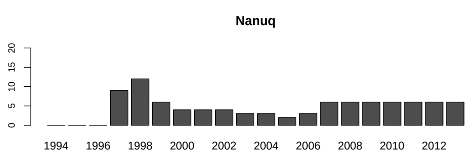


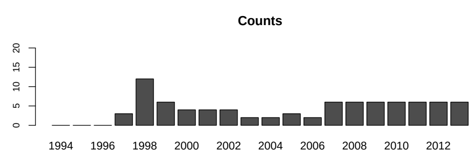


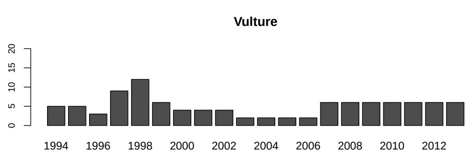




1.2 Reference

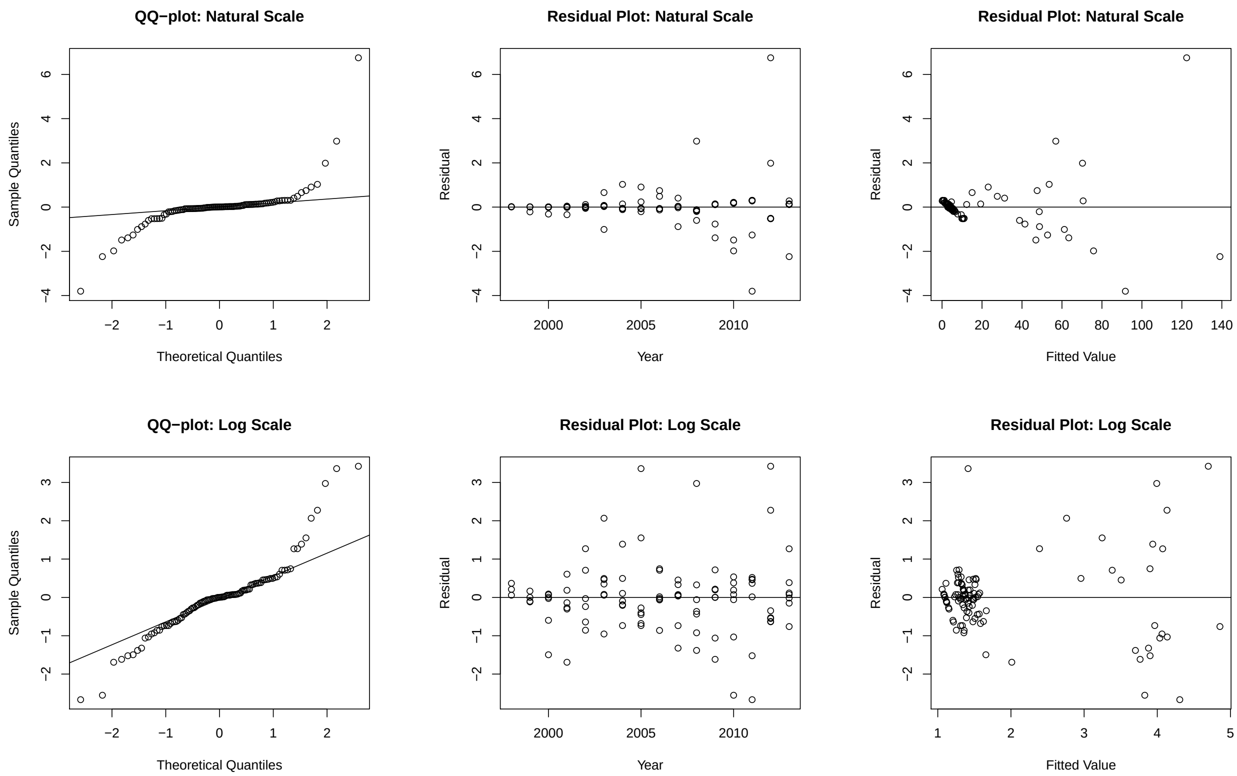






Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-43 (KPSF)	2011	45.77	91.73	-3.80
19	1616-43 (KPSF)	2012	204.00	122.40	6.75

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
19	1616-43 (KPSF)	2012	204.00	4.70	3.42
112	Nanuq	2005	7.57	1.41	3.36

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
1.38	6.00	0.97

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

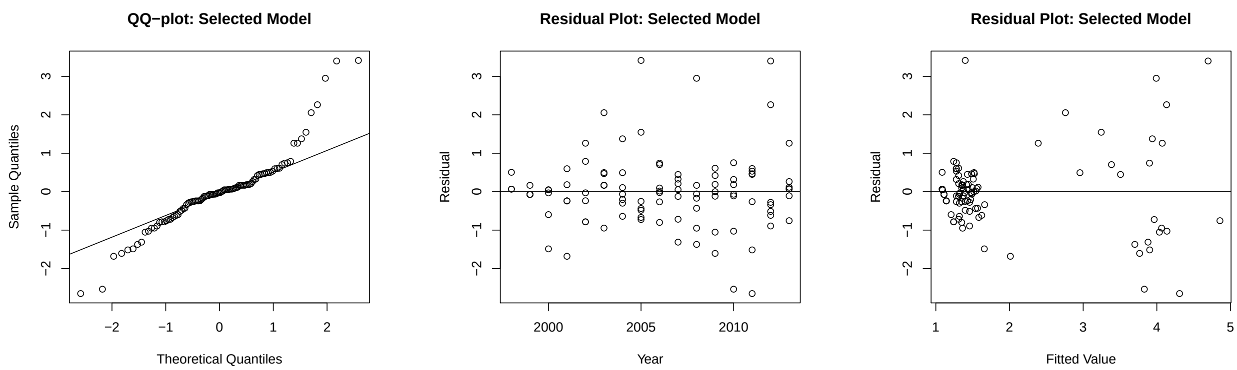
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.005	0.000	0.995	Ref. Model 3

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
19	1616-43 (KPSF)	2012	204.00	4.70	3.40
112	Nanuq	2005	7.57	1.40	3.42

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Lakes

Fitted model of the slope and intercept of each monitored lake compared to a common slope and intercept fitted for all reference lakes together (reference model 3).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	934.6538	3	0.0000
Cujo	1318.4516	3	0.0000
LdS1	8.6470	3	0.0344
LdS2	10.5986	3	0.0141

- Conclusions:
  All monitored lakes show significant deviation from the common slope and intercept of reference lakes.

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	6.3518	2	0.0418
Cujo	213.1093	2	0.0000
LdS1	0.3675	2	0.8321
LdS2	0.2725	2	0.8726

- Conclusions:
  When allowing for differences in intercept, 1616-43 (KPSF) and Cujo Lake show significant deviation from the common slope of reference lakes.

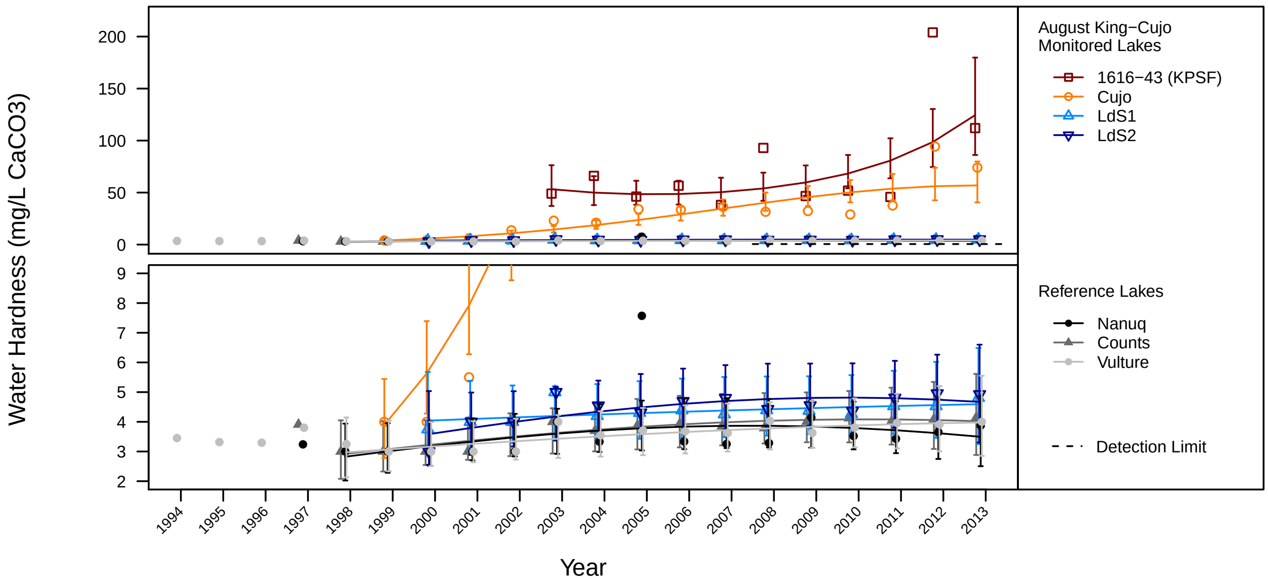
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.3470
Monitored Lake	1616-43 (KPSF)	0.4090
Monitored Lake	Cujo	0.8710
Monitored Lake	LdS1	0.3360
Monitored Lake	LdS2	0.5650

- Conclusions:
  Model fit for reference lakes, 1616-43 (KPSF) and LdS1 is weak.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean hardness for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	1.12E+02	1.24E+02	2.34E+01	8.62E+01	1.80E+02	6.83E+01
Cujo	7.40E+01	5.69E+01	9.85E+00	4.06E+01	7.99E+01	2.88E+01
LdS2	4.93E+00	4.67E+00	8.23E-01	3.31E+00	6.60E+00	2.41E+00
LdS1	4.81E+00	4.59E+00	8.10E-01	3.25E+00	6.49E+00	2.37E+00
Nanuq	3.87E+00	3.50E+00	5.94E-01	2.51E+00	4.88E+00	
Counts	4.15E+00	4.02E+00	6.84E-01	2.88E+00	5.61E+00	
Vulture	4.00E+00	3.98E+00	6.76E-01	2.85E+00	5.55E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Hardness	August	King-Cujo	Lake	Water	none	log e	linear mixed effects regression	#3 shared intercept & slope	NA	1616-43 (KPSF) Cujo LdS1 LdS2

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

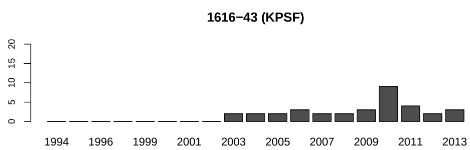
Analysis of August Hardness in King-Cujo Watershed Streams

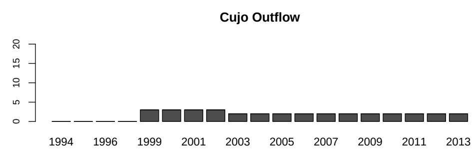
December 30, 2013

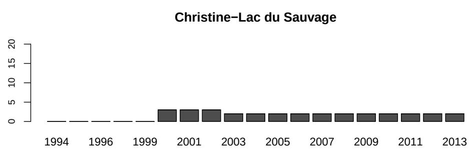
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

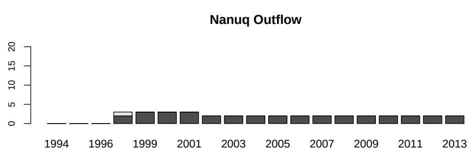
1.1 Monitored

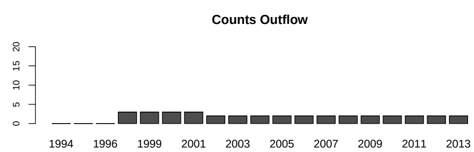


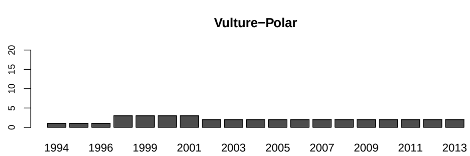




1.2 Reference

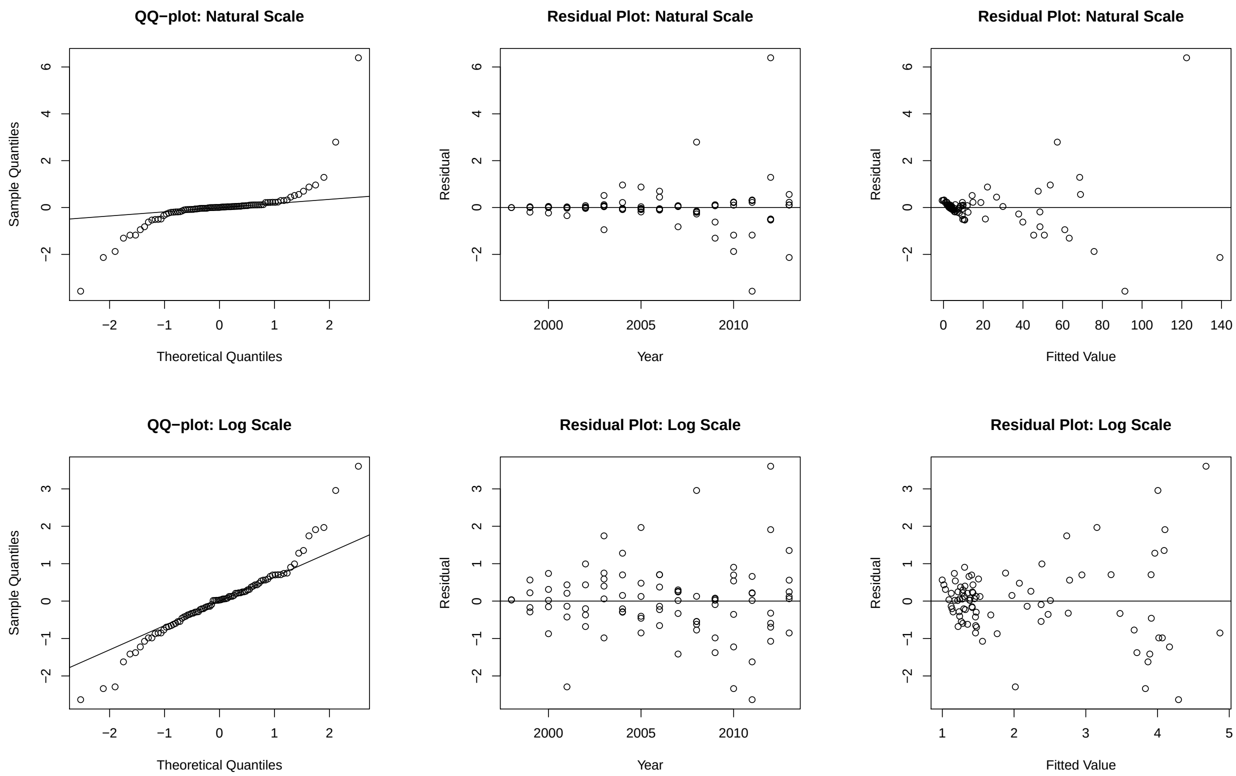






Comment:
None of the streams exhibited greater than 10% of data less than the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-43 (KPSF)	2011	45.77	91.36	-3.57
19	1616-43 (KPSF)	2012	204.00	122.42	6.39

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
19	1616-43 (KPSF)	2012	204.00	4.68	3.60

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
49.06	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
28.85	4.00	0.00

- Conclusions:
  The slopes differ significantly among reference streams. Reference streams do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.976	0.000	0.024	Ref. Model 1

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1a (fitting separate slopes and intercepts for reference streams).

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to slope of each reference stream (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)-vs-Nanuq Outflow	300.0732	3	0.0000
1616-43 (KPSF)-vs-Counts Outflow	252.8632	3	0.0000
1616-43 (KPSF)-vs-Vulture-Polar	211.9451	3	0.0000
Cujo Outflow-vs-Nanuq Outflow	1018.2532	3	0.0000
Cujo Outflow-vs-Counts Outflow	912.4483	3	0.0000
Cujo Outflow-vs-Vulture-Polar	808.4702	3	0.0000
Christine-Lac du Sauvage-vs-Nanuq Outflow	236.7053	3	0.0000
Christine-Lac du Sauvage-vs-Counts Outflow	187.1651	3	0.0000
Christine-Lac du Sauvage-vs-Vulture-Polar	146.0554	3	0.0000

- Conclusions:
  All monitored streams show significant deviations from the slopes of individual reference streams.

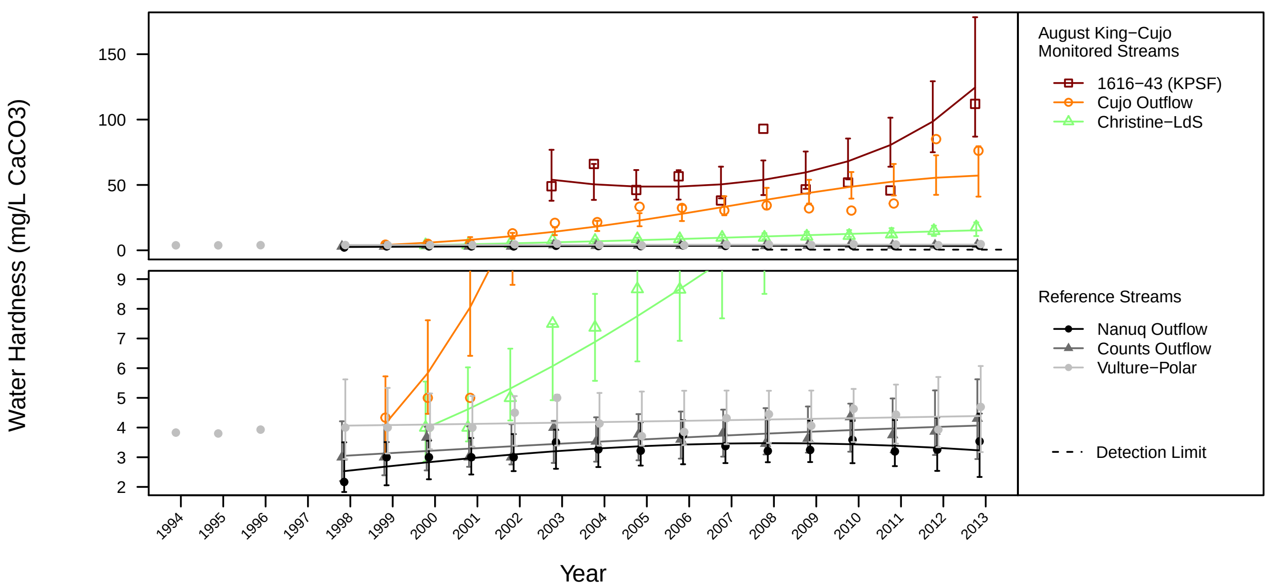
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Reference Stream	Counts Outflow	0.5660
Reference Stream	Nanuq Outflow	0.6320
Reference Stream	Vulture-Polar	0.0880
Monitored Stream	1616-43 (KPSF)	0.4060
Monitored Stream	Christine-Lac du Sauvage	0.9450
Monitored Stream	Cujo Outflow	0.8840

- Conclusions:
  Model fit for 1616-43 (KPSF) is weak. Model fit for Vulture-Polar is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean hardness for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	1.12E+02	1.25E+02	2.28E+01	8.70E+01	1.78E+02	6.67E+01
Cujo Outflow	7.62E+01	5.72E+01	9.64E+00	4.11E+01	7.96E+01	2.82E+01
Christine-Lac du Sauvage	1.77E+01	1.53E+01	2.63E+00	1.09E+01	2.14E+01	7.70E+00
Nanuq Outflow	3.54E+00	3.23E+00	5.35E-01	2.34E+00	4.47E+00	
Counts Outflow	4.30E+00	4.07E+00	6.73E-01	2.94E+00	5.63E+00	
Vulture-Polar	4.70E+00	4.39E+00	7.27E-01	3.17E+00	6.07E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Hardness	August	King-Cujo	Stream	Water	none	log e	linear mixed effects regression	#1a separate intercepts & slopes	NA	1616-43 (KPSF) Cujo Outflow Christine-Lac du Sauvage

* Monitored streams are contrasted to the slope of each individual reference stream in model 1a, a slope of 0 in reference model 1b, the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

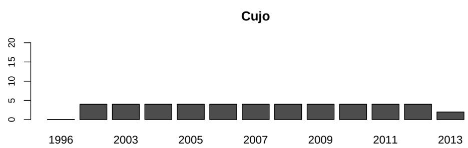
Analysis of April Chloride in Lakes of the King-Cujo Watershed and Lac du Sauvage

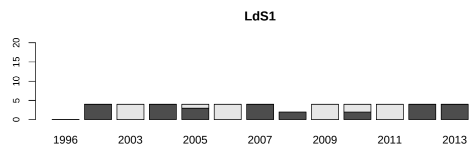
January 18, 2014

1 Censored Values:

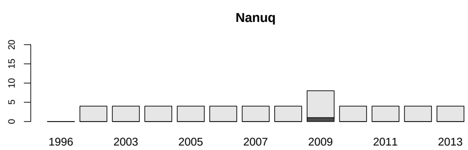
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

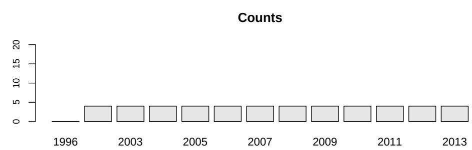
1.1 Monitored

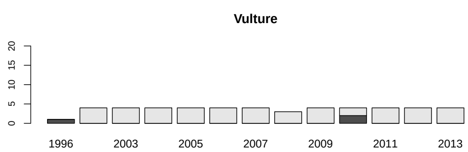




1.2 Reference

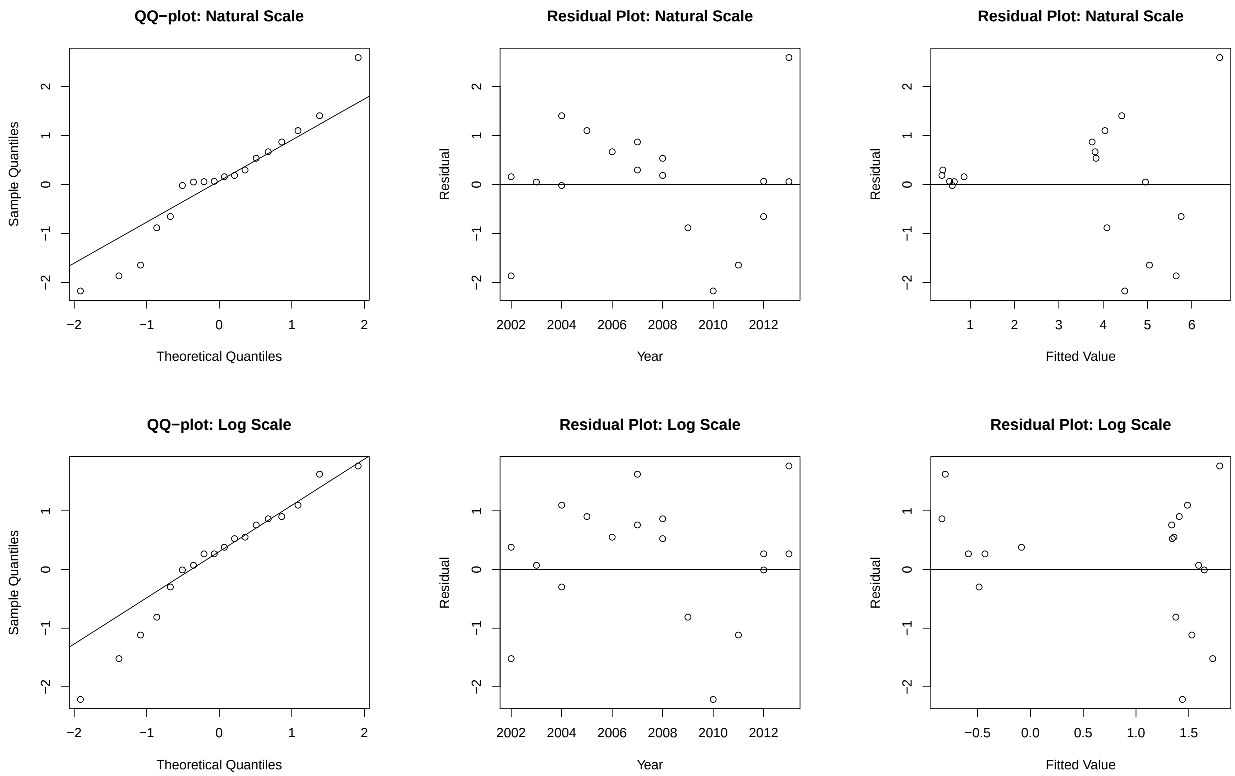






Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in LdS1 as less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
5.98E-16	1.00E+00	log model

Conclusion:
AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Cujo	5.2849	2	0.0712
LdS1	9.6706	2	0.0079

- Conclusions:
  LdS1 shows significant deviation from a constant slope of zero.

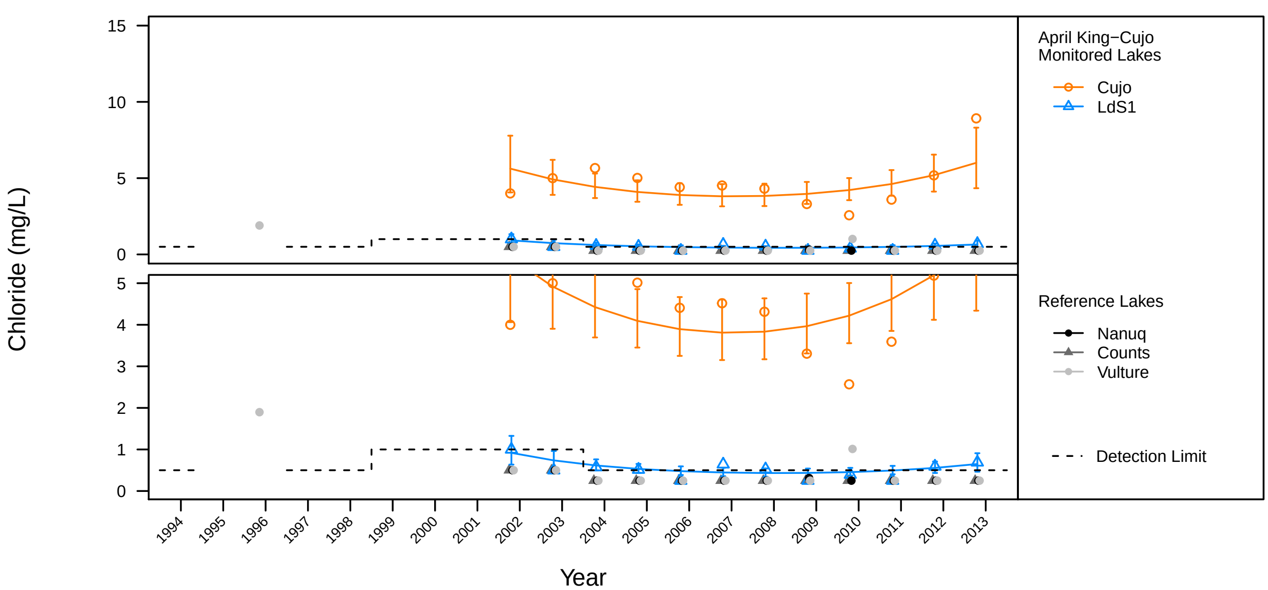
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	Cujo	0.2550
Monitored Lake	LdS1	0.3590

- Conclusions:
  Model fit for Cujo and LdS1 is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean chloride for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	8.92E+00	6.01E+00	9.95E-01	4.34E+00	8.31E+00	2.91E+00
LdS1	6.90E-01	6.50E-01	1.11E-01	4.65E-01	9.09E-01	3.26E-01
Nanuq	2.50E-01					
Counts	2.50E-01					
Vulture	2.50E-01					

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Chloride	April	King-Cujo	Lake	Water	Counts Nanuq Vulture	log e	Tobit regression	#1a slope of zero	hardness-dependent	LdS1

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

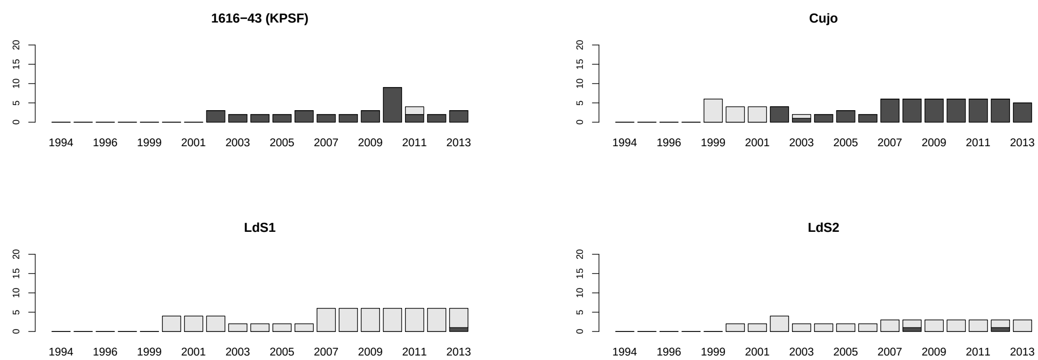
Analysis of August Total Chloride in Lakes of the King-Cujo Watershed and Lac du Sauvage

January 12, 2014

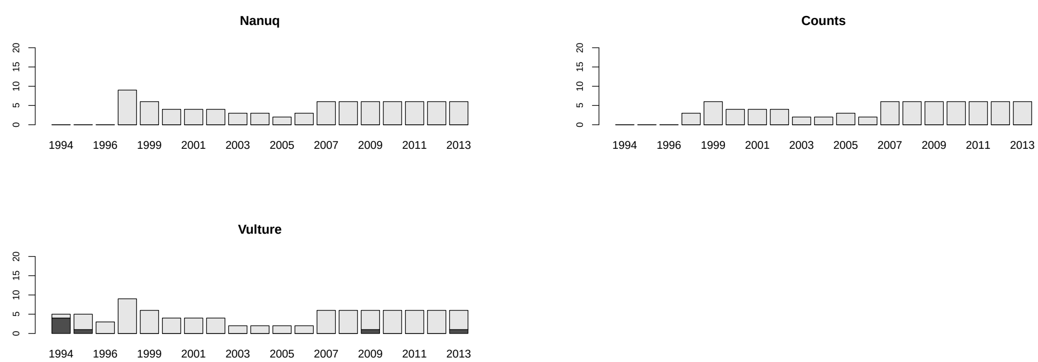
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

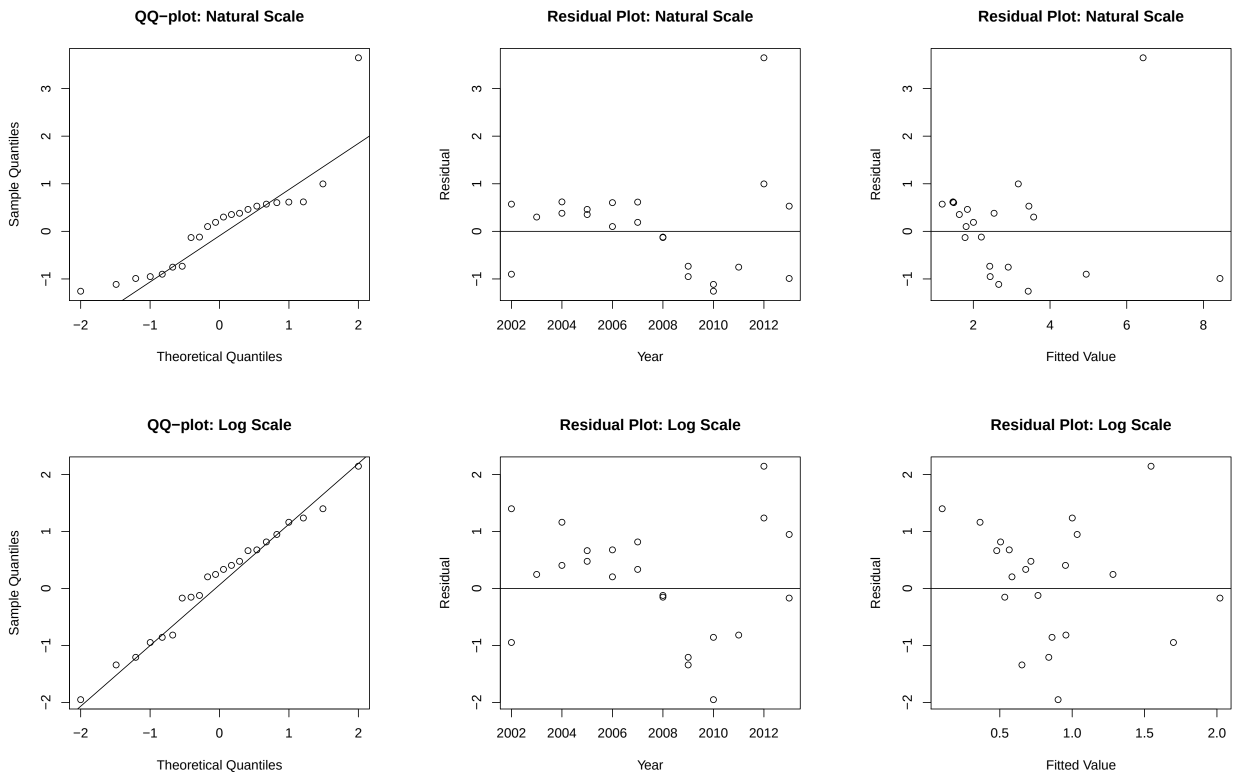


1.2 Reference



Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, LdS1, and LdS2 was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in Cujo Lake was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
19	1616-43 (KPSF)	2012	11.60	6.43	3.65

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	15.6089	2	0.0004
Cujo	10.6583	2	0.0048

- Conclusions:
All monitored lakes show significant deviation from a constant slope of zero.

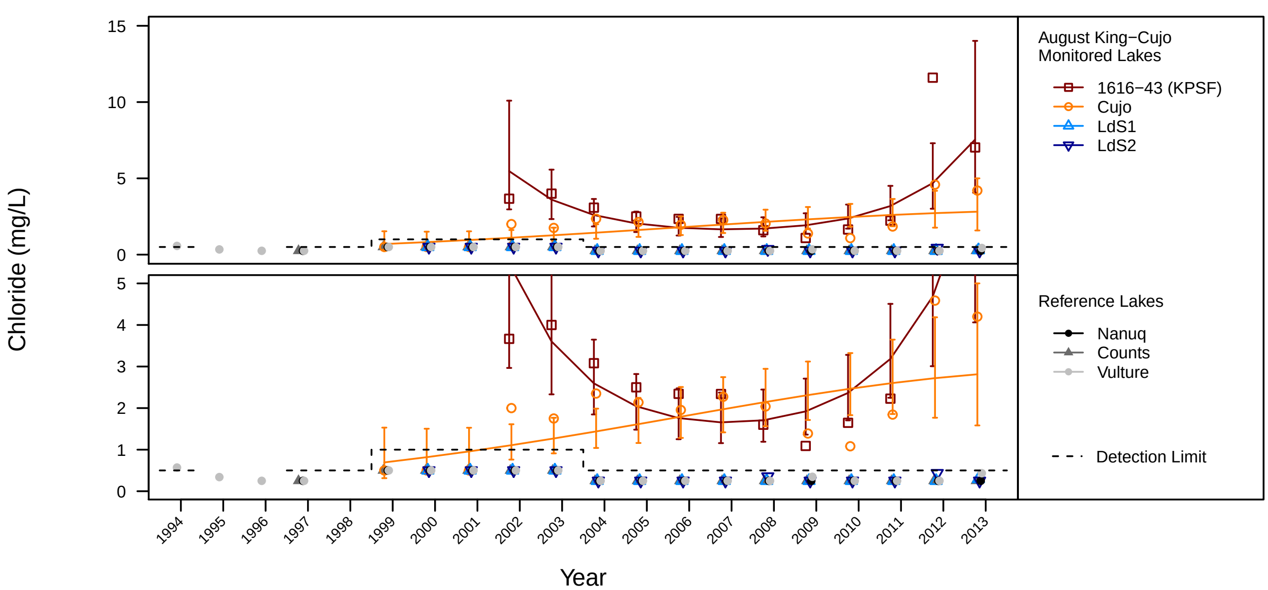
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	1616-43 (KPSF)	0.6010
Monitored Lake	Cujo	0.4880

- Conclusions:
Model fit for Cujo lake weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean chloride for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	7.03E+00	7.54E+00	2.38E+00	4.06E+00	1.40E+01	6.97E+00
Cujo	4.20E+00	2.81E+00	8.25E-01	1.58E+00	5.00E+00	2.42E+00
LdS2	2.50E-01					
LdS1	2.93E-01					
Nanuq	2.50E-01					
Counts	2.50E-01					
Vulture	4.33E-01					

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Chloride	August	King-Cujo	Lake	Water	Counts Nanuq Vulture LdS1 LdS2	log e	Tobit regression	#1a slope of zero	hardness-dependent	1616-43 (KPSF) Cujo

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

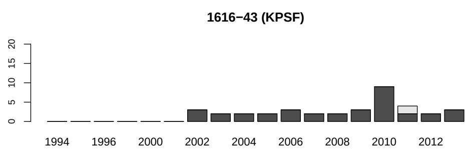
Analysis of August Chloride in King-Cujo Watershed Streams

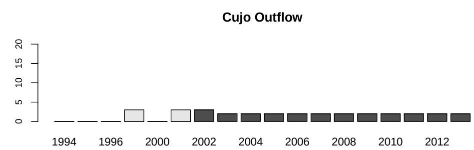
January 22, 2014

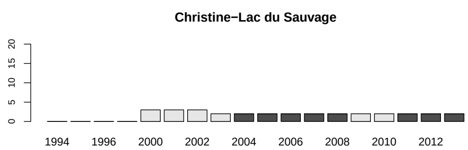
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

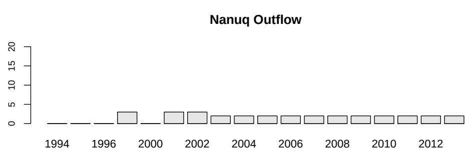
1.1 Monitored

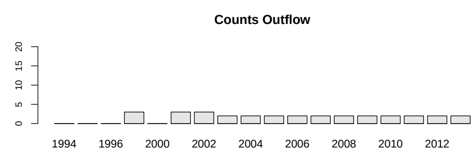


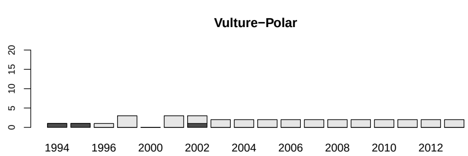




1.2 Reference

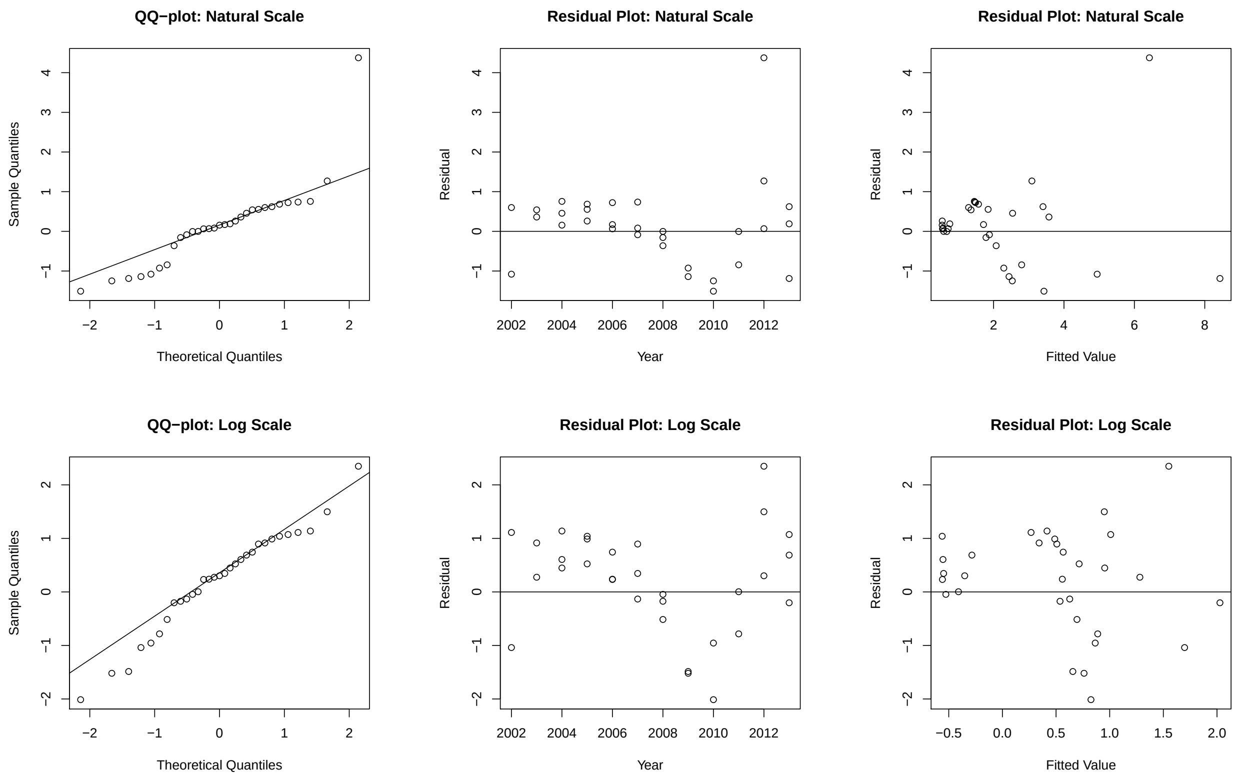






Comment:
Greater than 60% of data in Counts Outflow, Nanuq Outflow, and Vulture-Polar was less than the detection limit. These streams were excluded from further analyses. 10-60% of data in Cujo Outflow and Christine-Lac du Sauvage was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
19	1616-43 (KPSF)	2012	11.60	6.43	4.38

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
The natural and log transformed models show dependence on year and fitted value. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model. Results should be interpreted with caution.

3 Comparisons within Reference Streams

All reference streams removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored stream against a slope of 0.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	18.9725	2	0.0001
Cujo Outflow	6.8587	2	0.0324
Christine-Lac du Sauvage	0.5942	2	0.7430

- Conclusions:
  1616-43 (KPSF) and Cujo Outflow show significant deviation from a constant slope of zero.

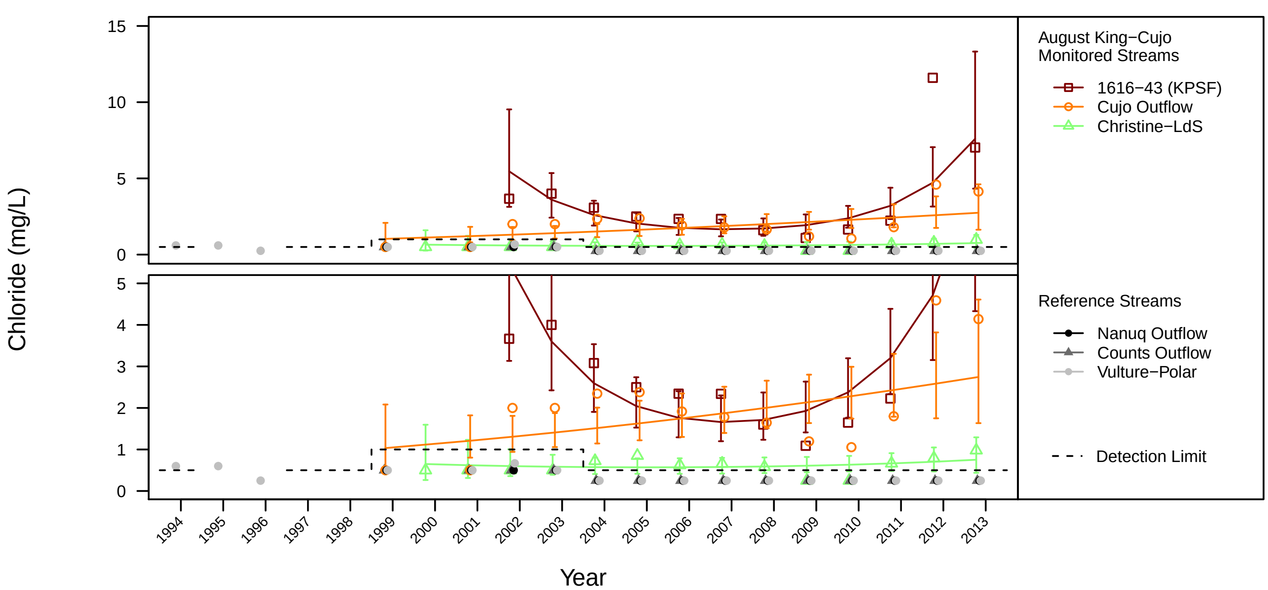
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Monitored Stream	1616-43 (KPSF)	0.6020
Monitored Stream	Christine-Lac du Sauvage	0.0990
Monitored Stream	Cujo Outflow	0.2570

- Conclusions:
  Model fit for Cujo Outfow is weak. Model fit for Christine-Lac du Sauvage is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total chloride for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	7.03E+00	7.60E+00	2.18E+00	4.33E+00	1.33E+01	6.37E+00
Cujo Outflow	4.14E+00	2.74E+00	7.26E-01	1.63E+00	4.61E+00	2.13E+00
Christine-Lac du Sauvage	9.80E-01	7.53E-01	2.08E-01	4.38E-01	1.29E+00	6.07E-01
Nanuq Outflow	2.50E-01					
Counts Outflow	2.50E-01					
Vulture-Polar	2.50E-01					

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Chloride	August	King-Cujo	Stream	Water	Counts Outflow Nanuq Outflow Vulture-Polar	log e	Tobit regression	#1a slope of zero	hardness-dependent	1616-43 (KPSF) Cujo Outflow

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

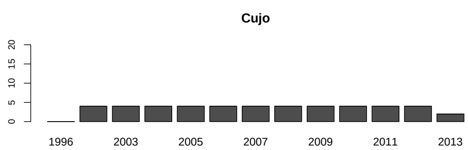
Analysis of April Sulphate in Lakes of the King-Cujo Watershed and Lac du Sauvage

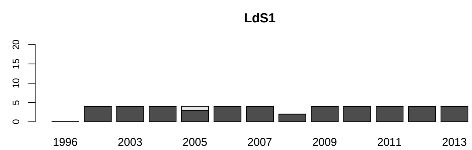
January 18, 2014

1 Censored Values:

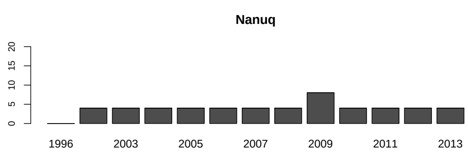
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

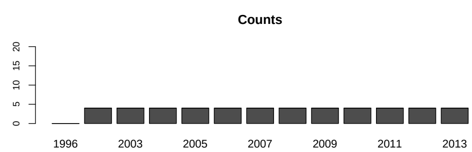
1.1 Monitored

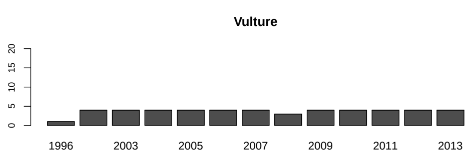




1.2 Reference

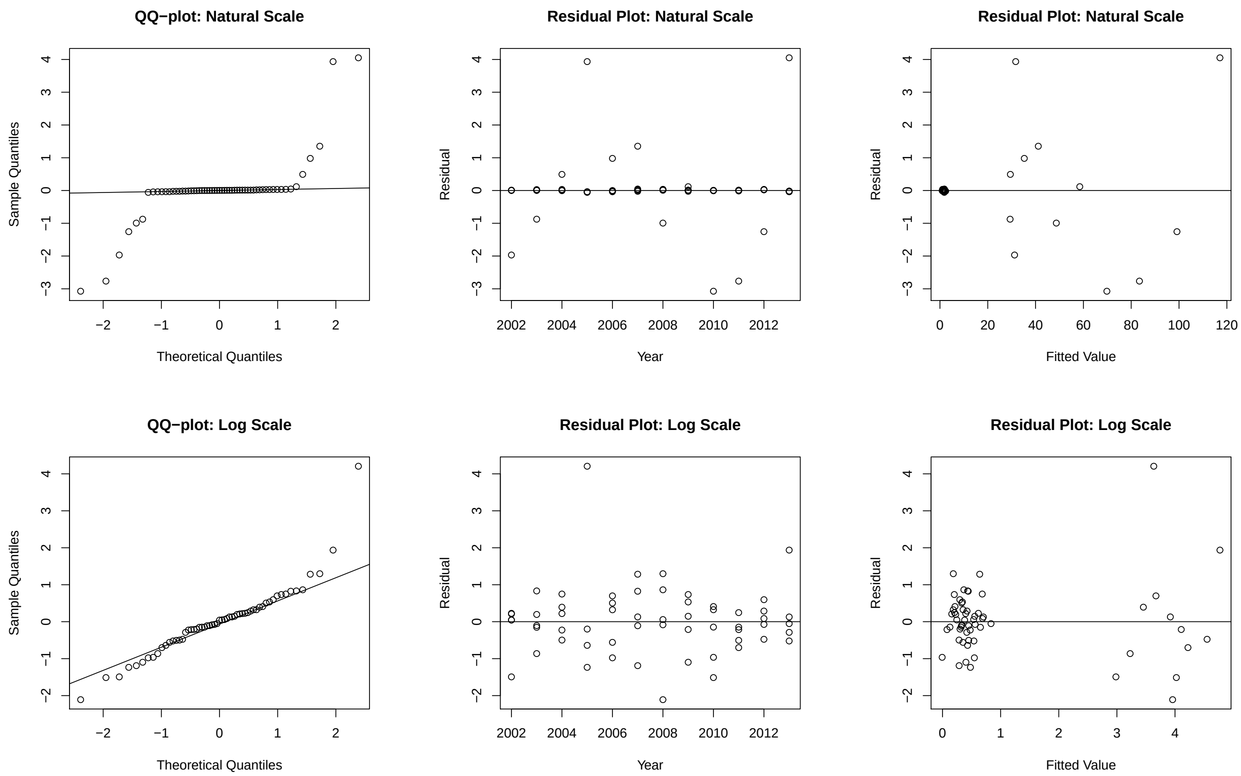






Comment:
None of the lakes exhibited greater than 10% of data was less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
52	Cujo	2005	60.73	31.69	3.94
57	Cujo	2010	47.15	69.82	-3.07
60	Cujo	2013	147.00	117.11	4.05

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
52	Cujo	2005	60.73	3.63	4.21

AIC weights and model comparison:

Natural Model	Log Model	Best Model
2.65E-105	1.00E+00	log model

Conclusion:
AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
294.78	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
2.56	4.00	0.63

- Conclusions:
  The slopes do not differ significantly among reference lakes.

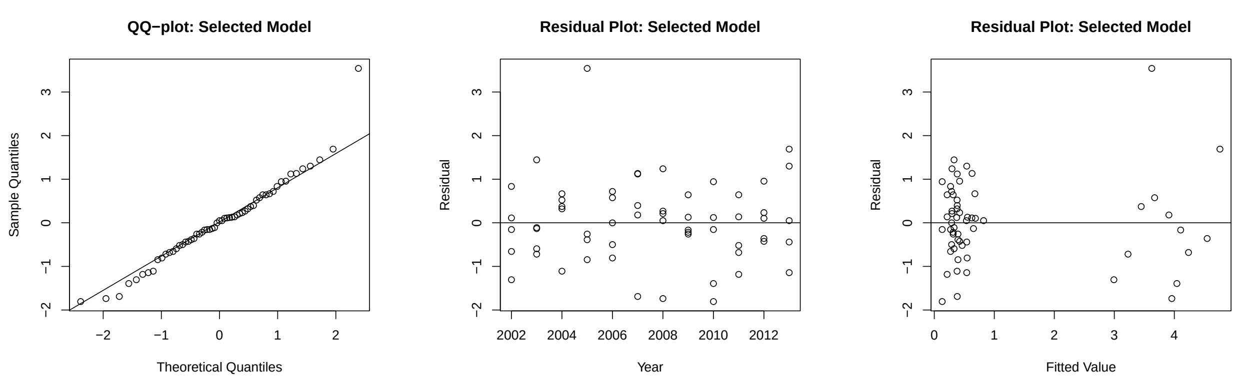
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.888	0.078	0.035	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
52	Cujo	2005	60.73	3.62	3.54

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Cujo	49.07	2.00	0.00
LdS1	0.27	2.00	0.87

- Conclusions:
  Cujo Lake shows significant deviation from the common slope of reference lakes.

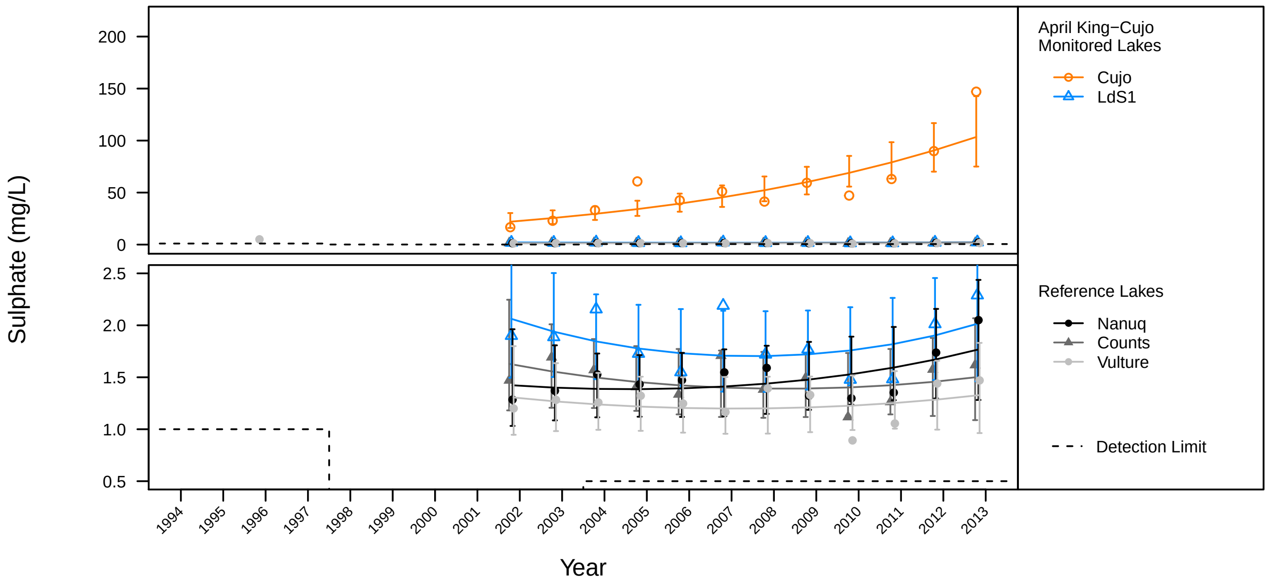
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0700
Monitored Lake	Cujo	0.7740
Monitored Lake	LdS1	0.1940

- Conclusions:
  Model fit for reference lakes and LdS1 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean sulphate for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	1.47E+02	1.03E+02	1.70E+01	7.50E+01	1.43E+02	4.96E+01
LdS1	2.29E+00	2.01E+00	3.30E-01	1.46E+00	2.78E+00	9.66E-01
Nanuq	2.05E+00	1.77E+00	2.90E-01	1.28E+00	2.44E+00	
Counts	1.62E+00	1.50E+00	2.46E-01	1.09E+00	2.07E+00	
Vulture	1.47E+00	1.33E+00	2.18E-01	9.63E-01	1.83E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Sulphate	April	King-Cujo	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	hardness-dependent	Cujo

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

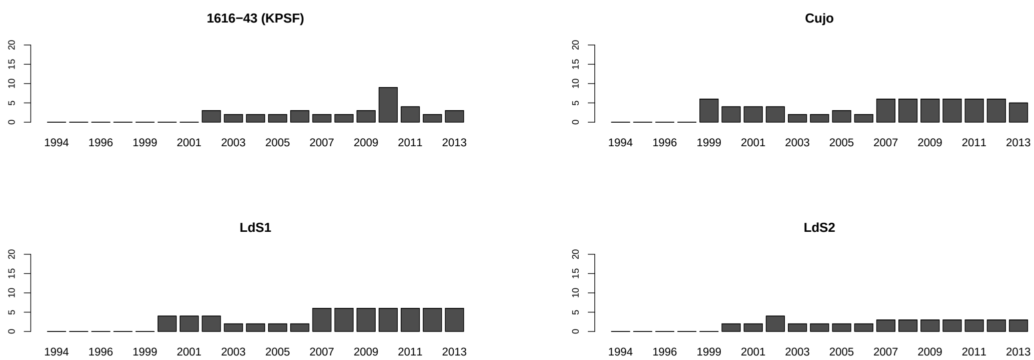
Analysis of August Sulphate in Lakes of the King-Cujo Watershed and Lac du Sauvage

January 18, 2014

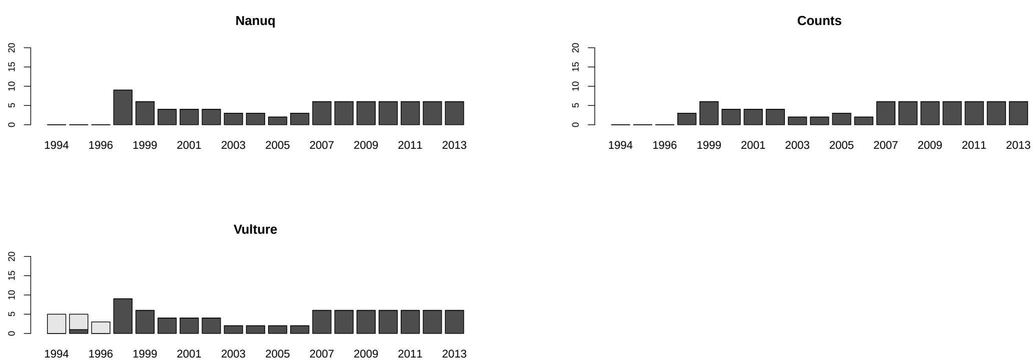
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

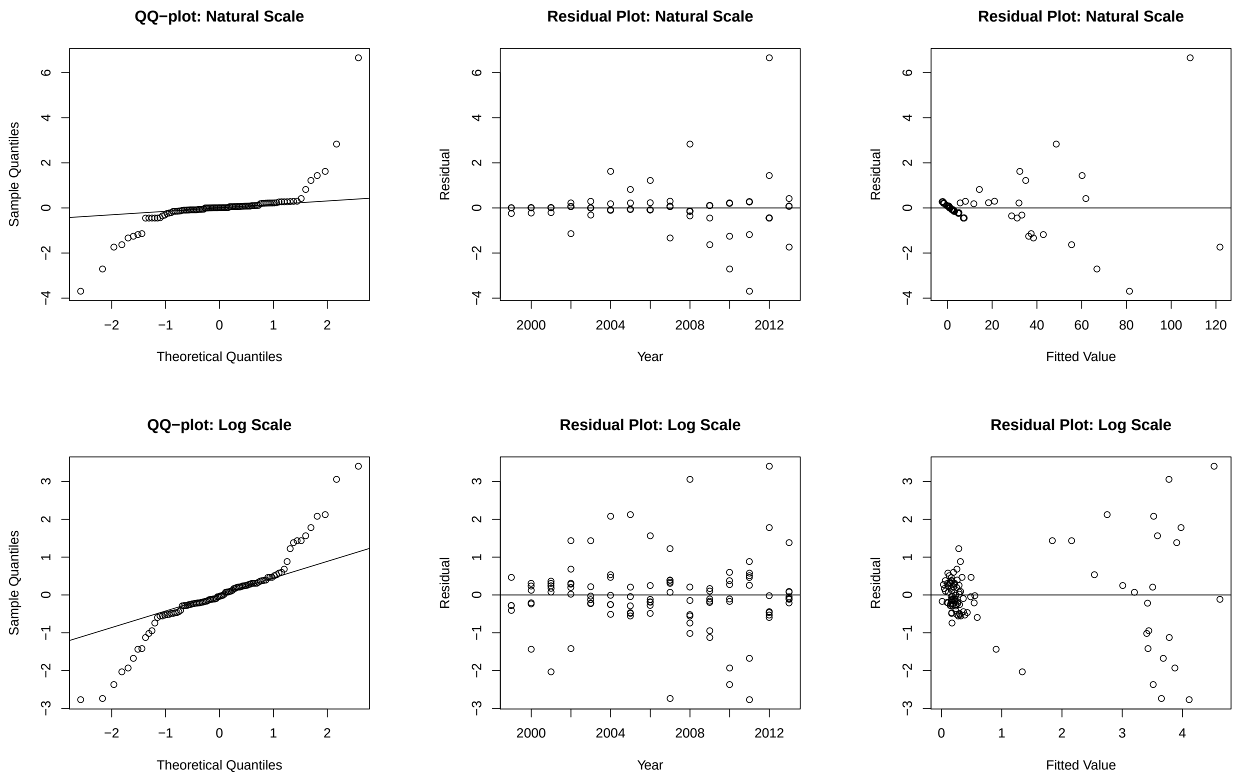


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-43 (KPSF)	2011	33.12	81.37	-3.69
19	1616-43 (KPSF)	2012	195.50	108.49	6.66

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
15	1616-43 (KPSF)	2008	85.65	3.78	3.06
19	1616-43 (KPSF)	2012	195.50	4.52	3.40

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
3.28	6.00	0.77

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

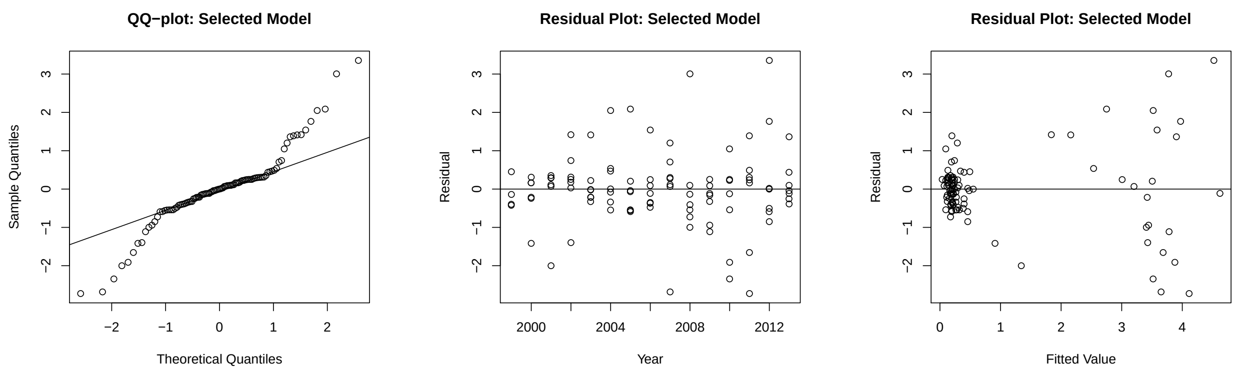
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.012	0.000	0.988	Ref. Model 3

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
15	1616-43 (KPSF)	2008	85.65	3.77	3.01
19	1616-43 (KPSF)	2012	195.50	4.52	3.36

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Lakes

Fitted model of the slope and intercept of each monitored lake compared to a common slope and intercept fitted for all reference lakes together (reference model 3).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	279.8583	3	0.0000
Cujo	1585.1141	3	0.0000
LdS1	0.4724	3	0.9249
LdS2	1.4151	3	0.7020

- Conclusions:
  1616-43 (KPSF) and Cujo Lake show significant deviation from the common slope and intercept of reference lakes.

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	5.7802	2	0.0556
Cujo	236.2840	2	0.0000
LdS1	0.0823	2	0.9597
LdS2	0.1248	2	0.9395

- Conclusions:
  When allowing for differences in intercept, 1616-43 (KPSF) and Cujo Lake show significant deviation from the common slope of reference lakes.

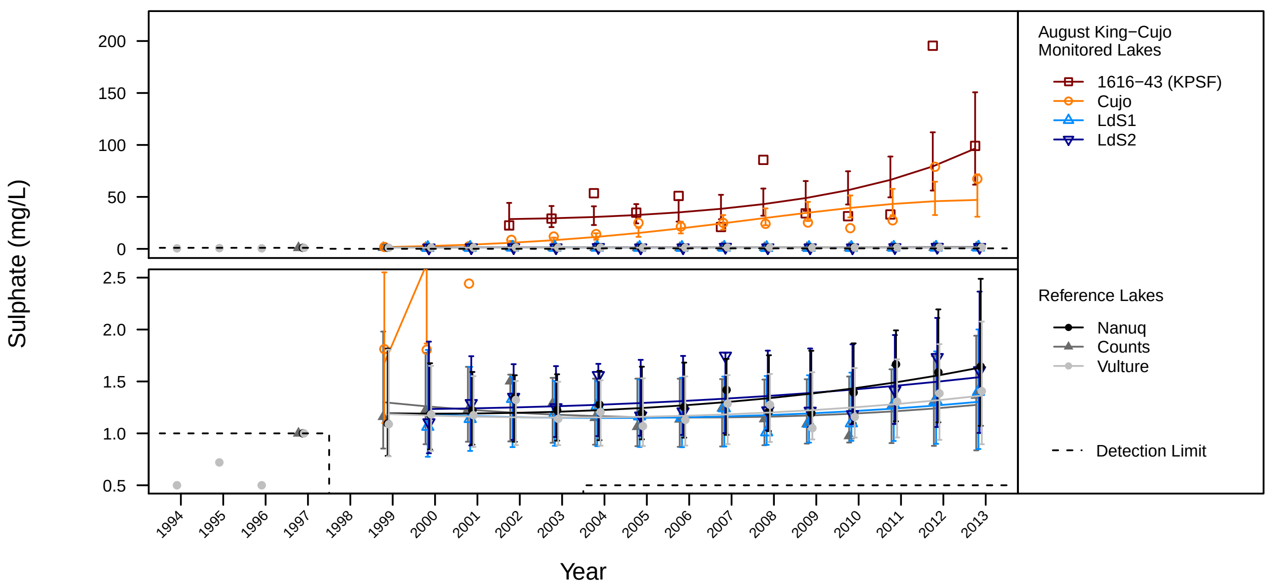
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.2320
Monitored Lake	1616-43 (KPSF)	0.3710
Monitored Lake	Cujo	0.8850
Monitored Lake	LdS1	0.1820
Monitored Lake	LdS2	0.2270

- Conclusions:
  Model fit for reference lakes and 1616-43 (KPSF) is weak. Model fit for LdS1 and LdS2 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean sulphatefor each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	9.91E+01	9.65E+01	2.19E+01	6.18E+01	1.51E+02	6.42E+01
Cujo	6.73E+01	4.71E+01	1.01E+01	3.09E+01	7.17E+01	2.96E+01
LdS2	1.61E+00	1.54E+00	3.37E-01	1.00E+00	2.37E+00	9.86E-01
LdS1	1.40E+00	1.30E+00	2.85E-01	8.49E-01	2.00E+00	8.34E-01
Nanuq	1.64E+00	1.63E+00	3.51E-01	1.07E+00	2.49E+00	
Counts	1.36E+00	1.27E+00	2.73E-01	8.37E-01	1.94E+00	
Vulture	1.41E+00	1.36E+00	2.93E-01	8.95E-01	2.08E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Sulphate	August	King-Cujo	Lake	Water	none	log e	linear mixed effects regression	#3 shared intercept & slope	hardness-dependent	1616-43 (KPSF) Cujo

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

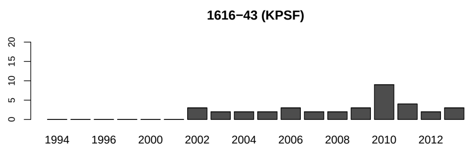
Analysis of August Sulphate in King-Cujo Watershed Streams

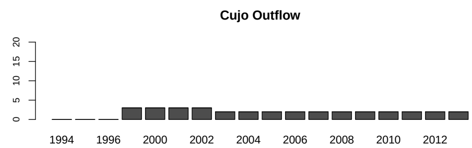
December 30, 2013

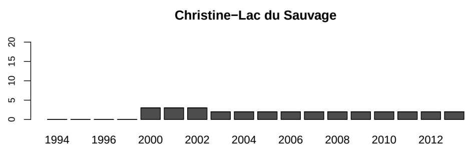
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

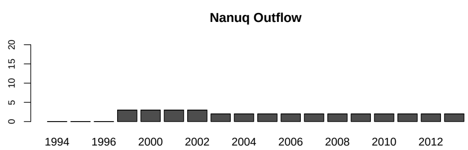
1.1 Monitored

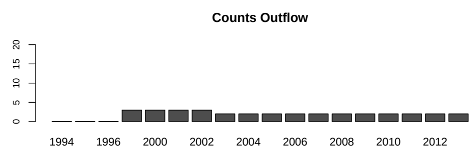


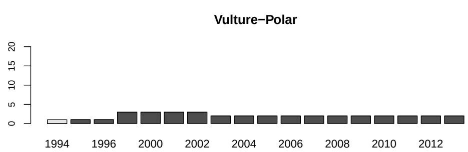




1.2 Reference

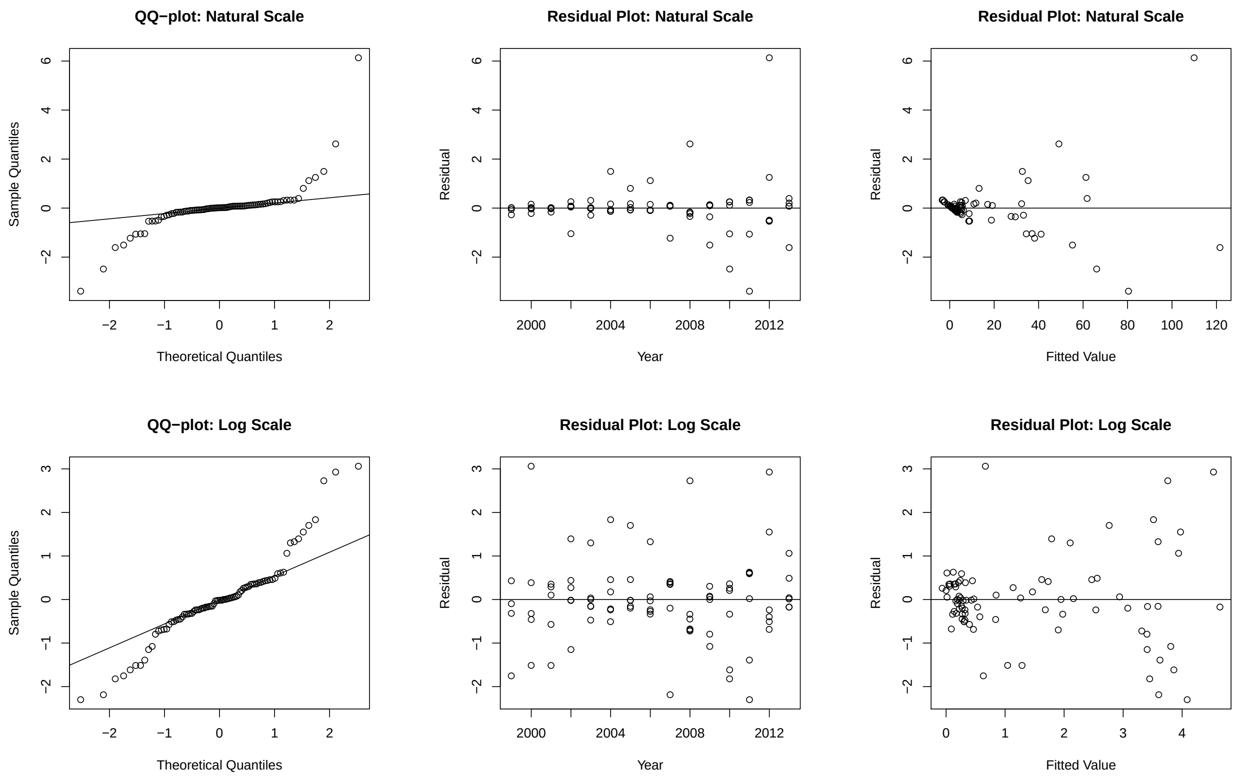






Comment:
None of the streams exhibited greater than 10% of data less than the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-43 (KPSF)	2011	33.12	80.41	-3.39
19	1616-43 (KPSF)	2012	195.50	109.94	6.13

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
107	Vulture-Polar	2000	4.24	0.67	3.06

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
26.41	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
25.30	4.00	0.00

- Conclusions:
  The slopes differ significantly among reference streams. Reference streams do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.089	0.000	0.911	Ref. Model 3

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference streams are best modeled with a common slope and intercept, results of contrasts suggest that slopes and intercepts differ among reference streams. Proceeding with monitored contrasts using reference model 1a (fitting separate slopes and intercepts for reference streams).

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to slope of each reference stream (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)-vs-Nanuq Outflow	103.4999	3	0.0000
1616-43 (KPSF)-vs-Counts Outflow	106.9414	3	0.0000
1616-43 (KPSF)-vs-Vulture-Polar	74.6161	3	0.0000
Cujo Outflow-vs-Nanuq Outflow	756.6296	3	0.0000
Cujo Outflow-vs-Counts Outflow	855.8785	3	0.0000
Cujo Outflow-vs-Vulture-Polar	800.0585	3	0.0000
Christine-Lac du Sauvage-vs-Nanuq Outflow	233.3835	3	0.0000
Christine-Lac du Sauvage-vs-Counts Outflow	290.1384	3	0.0000
Christine-Lac du Sauvage-vs-Vulture-Polar	257.4862	3	0.0000

- Conclusions:
  All monitored streams show significant deviations from the slopes of individual reference streams.

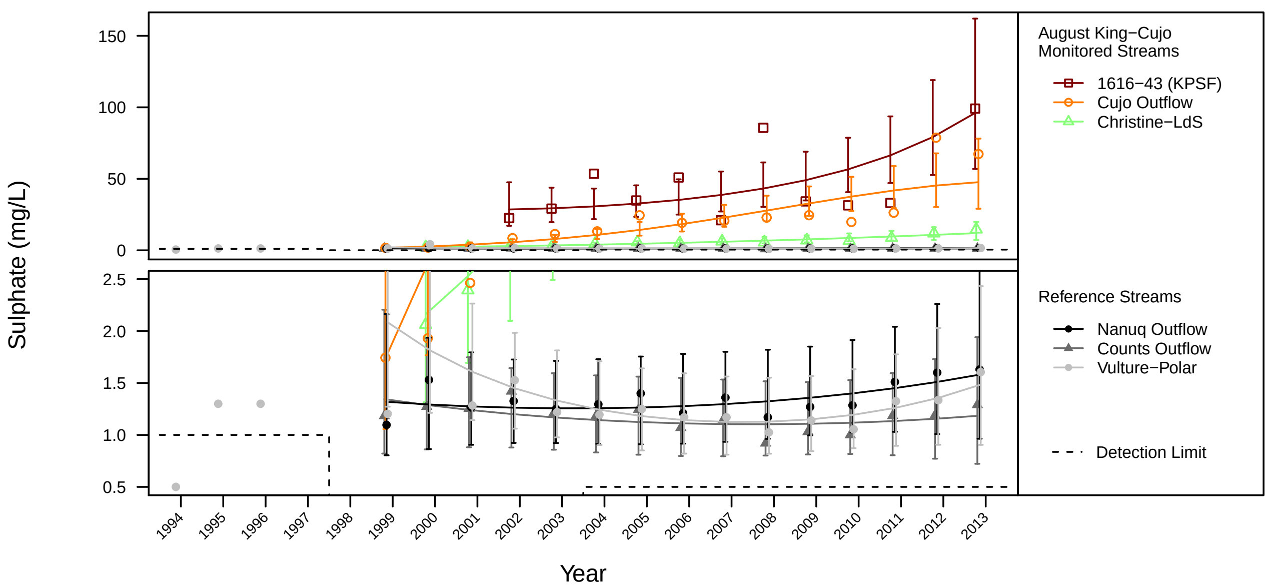
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Reference Stream	Counts Outflow	0.2970
Reference Stream	Nanuq Outflow	0.3880
Reference Stream	Vulture-Polar	0.3020
Monitored Stream	1616-43 (KPSF)	0.3690
Monitored Stream	Christine-Lac du Sauvage	0.9370
Monitored Stream	Cujo Outflow	0.8860

- Conclusions:
  Model fit for Counts Outflow, Nanuq Outflow, Vulture-Polar, and 1616-43 (KPSF) is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total sulphate for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	9.91E+01	9.60E+01	2.56E+01	5.69E+01	1.62E+02	7.50E+01
Cujo Outflow	6.73E+01	4.76E+01	1.20E+01	2.91E+01	7.81E+01	3.52E+01
Christine-Lac du Sauvage	1.46E+01	1.20E+01	3.08E+00	7.25E+00	1.98E+01	9.02E+00
Nanuq Outflow	1.63E+00	1.58E+00	3.98E-01	9.64E-01	2.59E+00	
Counts Outflow	1.29E+00	1.18E+00	2.99E-01	7.22E-01	1.94E+00	
Vulture-Polar	1.60E+00	1.48E+00	3.74E-01	9.05E-01	2.43E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Sulphate	August	King-Cujo	Stream	Water	none	log e	linear mixed effects regression	#1a separate intercepts & slopes	NA	1616-43 (KPSF) Cujo Outflow Christine-Lac du Sauvage

* Monitored streams are contrasted to the slope of each individual reference stream in model 1a, a slope of 0 in reference model 1b, the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

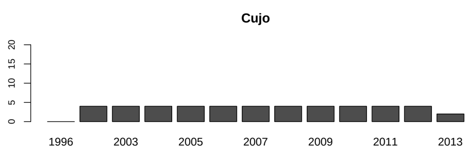
Analysis of April Potassium in Lakes of the King-Cujo Watershed and Lac du Sauvage

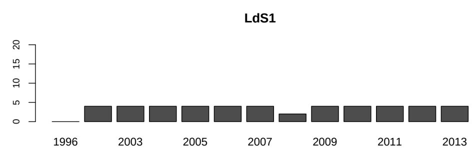
January 21, 2014

1 Censored Values:

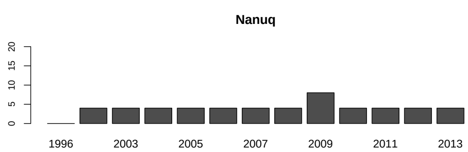
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

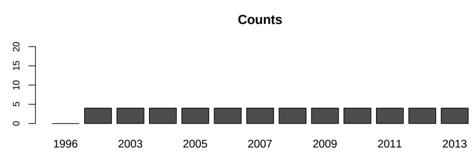
1.1 Monitored

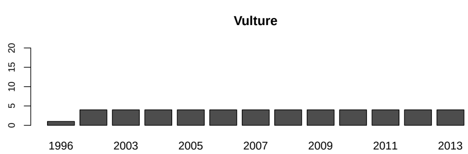




1.2 Reference

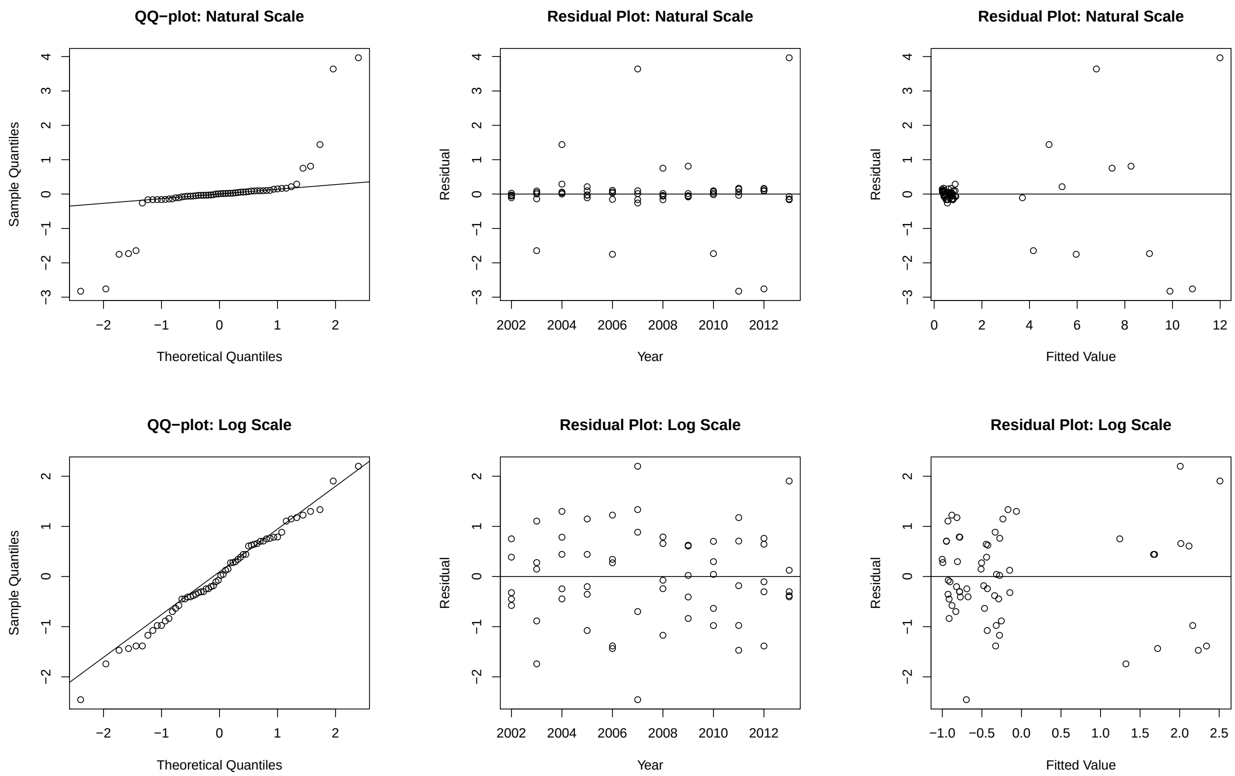






Comment:
None of the lakes exhibited greater than 10% of data was less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
54	Cujo	2007	8.65	6.81	3.64
60	Cujo	2013	14.00	11.99	3.96

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
9.68E-49	1.00E+00	log model

Conclusion:
AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
3.16	6.00	0.79

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

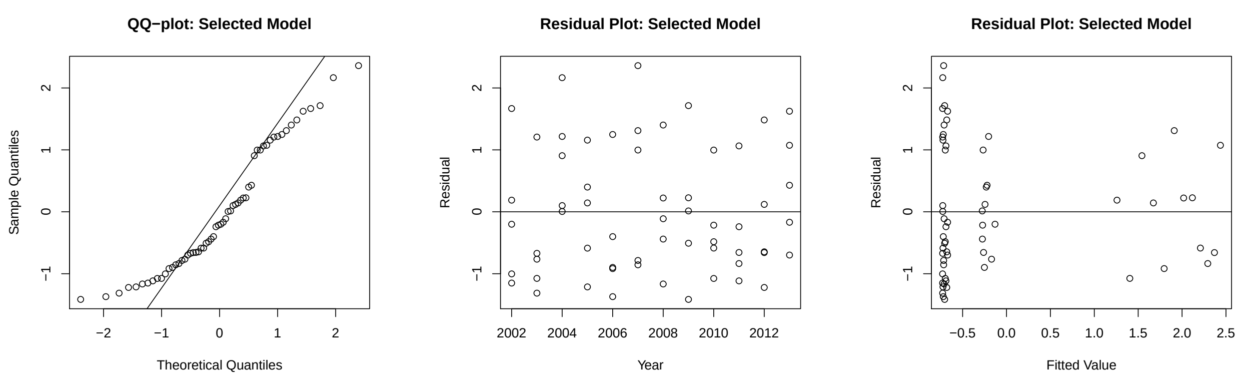
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope and intercept. Proceeding with monitored contrasts using reference model 3 (fitting a common slope and intercept for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero and because AIC suggests that the fit of reference models 2 and 3 are indistinguishable.

3.3 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Lakes

Fitted model of the slope and intercept of each monitored lake compared to a common slope and intercept fitted for all reference lakes together (reference model 3).

	Chi-squared	DF	P-value
Cujo	42.18	3.00	0.00
LdS1	3.33	3.00	0.34

- Results:

- Conclusions:
  Cujo lakes show significant deviation from the common slope of reference lakes.

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Cujo	18.28	2.00	0.00
LdS1	0.43	2.00	0.81

- Conclusions:
  When allowing for differences in intercept, Cujo Lake shows significant deviation from the common slope of reference lakes.

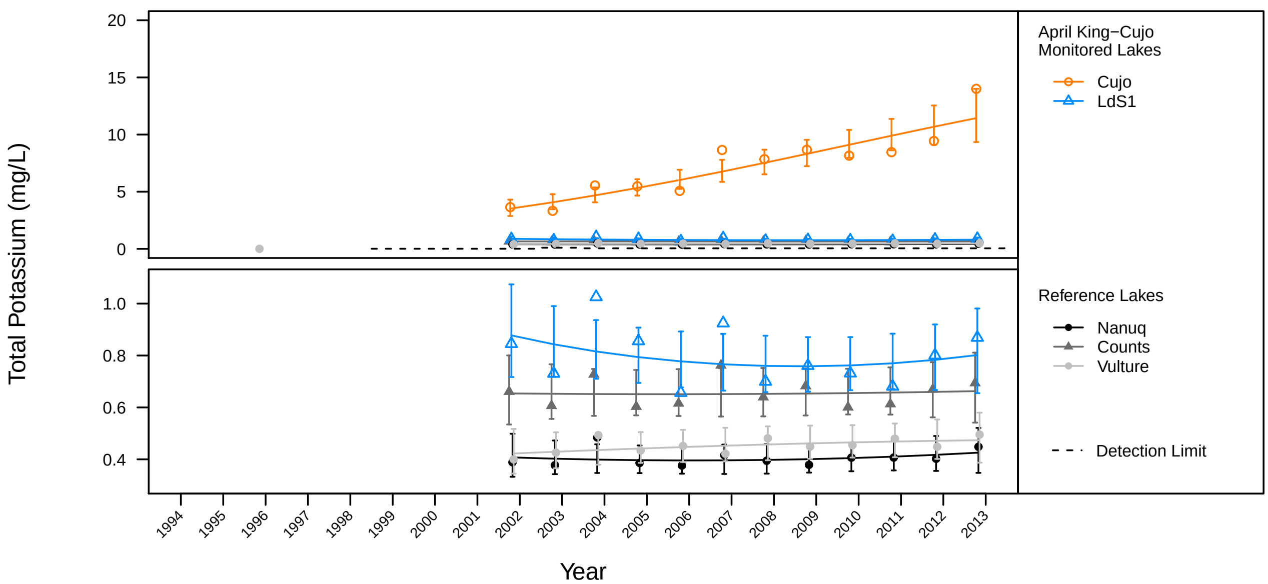
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0070
Monitored Lake	Cujo	0.8650
Monitored Lake	LdS1	0.1160

- Conclusions:
  Model fit for reference lakes and LdS1 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean potassium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	1.40E+01	1.14E+01	1.18E+00	9.34E+00	1.40E+01	3.45E+00
LdS1	8.69E-01	8.02E-01	8.27E-02	6.55E-01	9.81E-01	2.42E-01
Nanuq	4.48E-01	4.26E-01	4.39E-02	3.48E-01	5.21E-01	
Counts	6.94E-01	6.63E-01	6.83E-02	5.41E-01	8.11E-01	
Vulture	4.95E-01	4.74E-01	4.88E-02	3.87E-01	5.80E-01	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Potassium	April	King-Cujo	Lake	Water	none	log e	linear mixed effects regression	#3 shared intercept & slope	41	Cujo

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

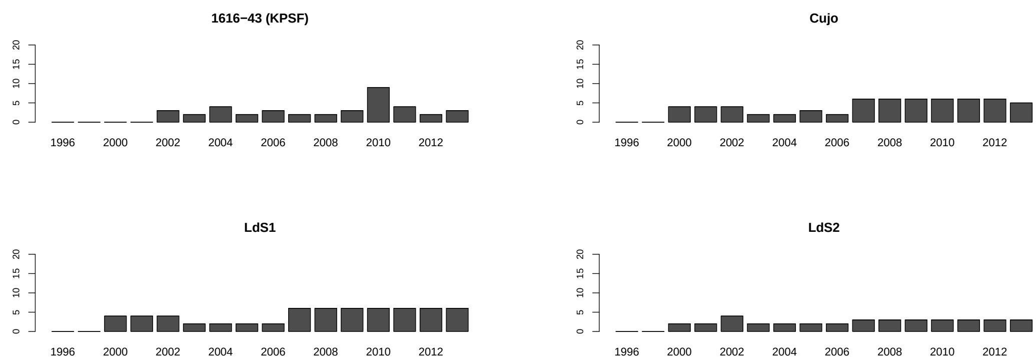
Analysis of August Potassium in Lakes of the King-Cujo Watershed and Lac du Sauvage

January 21, 2014

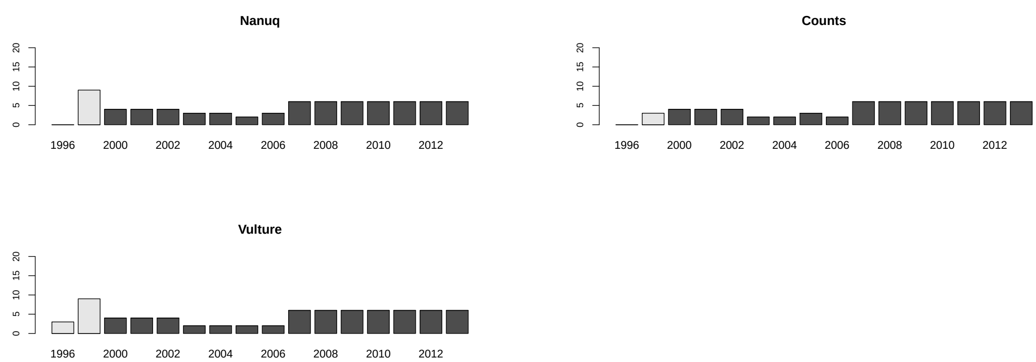
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

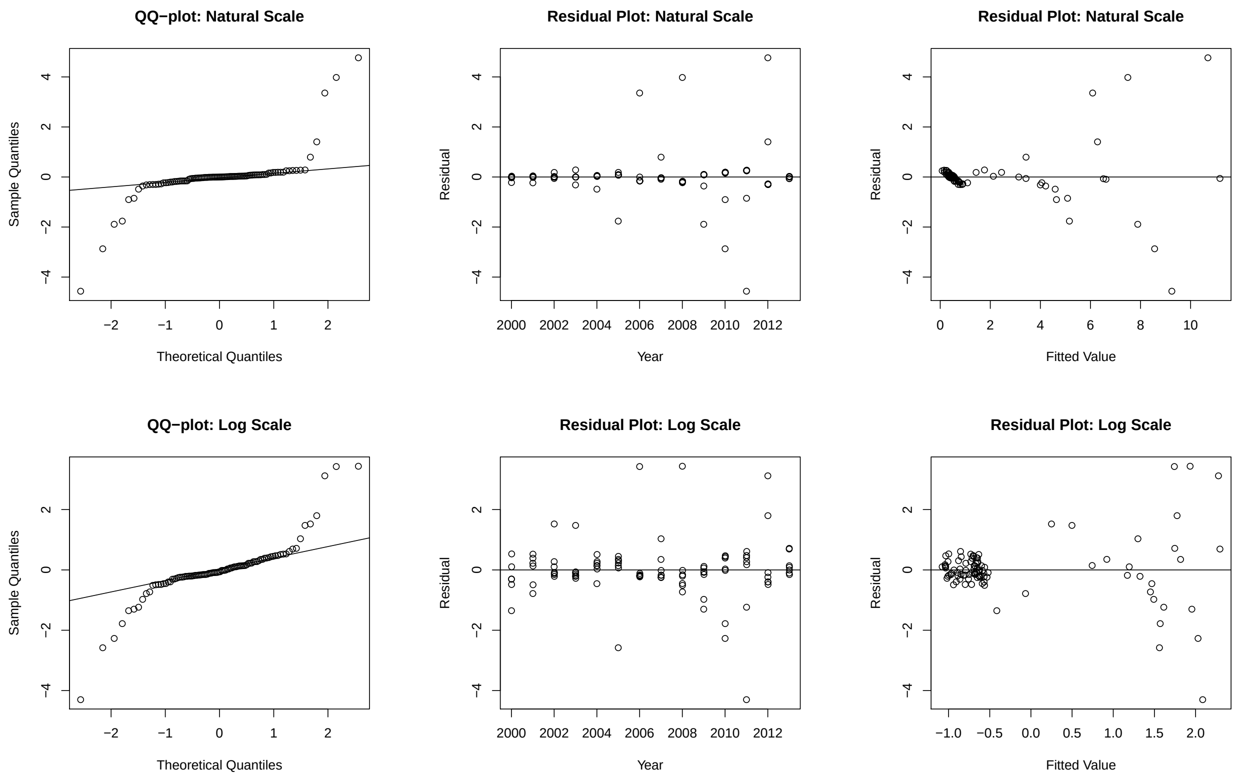


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
13	1616-43 (KPSF)	2006	9.93	6.09	3.36
15	1616-43 (KPSF)	2008	12.05	7.49	3.98
18	1616-43 (KPSF)	2011	4.02	9.25	-4.56
19	1616-43 (KPSF)	2012	16.15	10.69	4.76

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
13	1616-43 (KPSF)	2006	9.93	1.74	3.43
15	1616-43 (KPSF)	2008	12.05	1.93	3.44
18	1616-43 (KPSF)	2011	4.02	2.09	-4.30
19	1616-43 (KPSF)	2012	16.15	2.28	3.12

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. AIC also reveals that the data is modeled best after log transformation. Proceeding with the remaining analyses using the log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
31.47	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
0.79	4.00	0.94

- Conclusions:
  The slopes do not differ significantly among reference lakes.

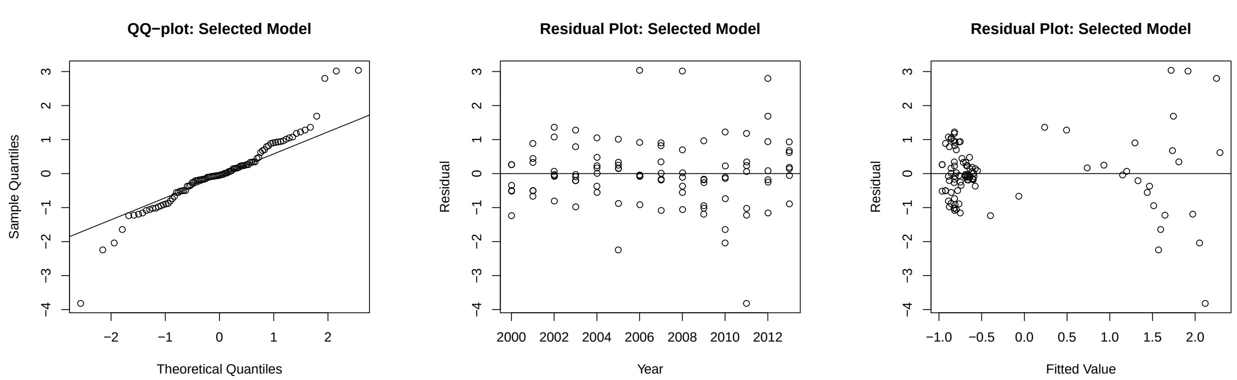
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.999	0.000	0.001	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
13	1616-43 (KPSF)	2006	9.93	1.72	3.04
15	1616-43 (KPSF)	2008	12.05	1.92	3.01
18	1616-43 (KPSF)	2011	4.02	2.12	-3.82

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	7.1809	2	0.0276
Cujo	113.2603	2	0.0000
LdS1	0.1461	2	0.9295
LdS2	0.0472	2	0.9767

- Conclusions:
  1616-43 (KPSF) and Cujo Lake show significant deviation from the common slope of reference lakes.

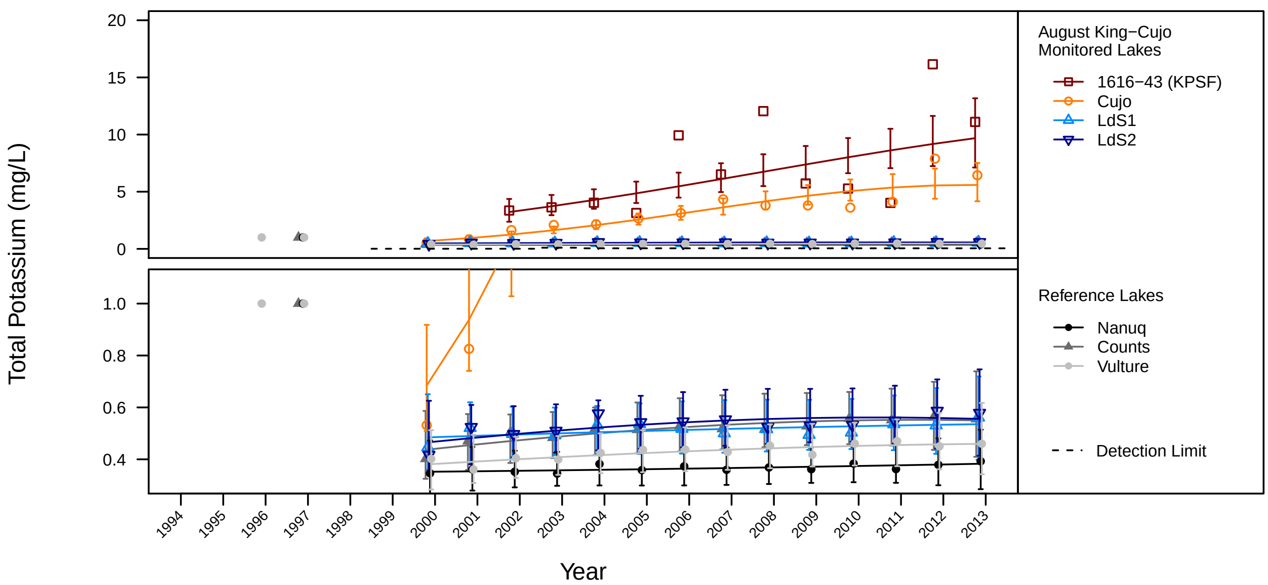
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.1200
Monitored Lake	1616-43 (KPSF)	0.4110
Monitored Lake	Cujo	0.9110
Monitored Lake	LdS1	0.3490
Monitored Lake	LdS2	0.5390

- Conclusions:
  Model fit for 1616-43 (KPSF) and LdS1 is weak. Model fit for reference lakes is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean potassium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	1.11E+01	9.68E+00	1.52E+00	7.12E+00	1.32E+01	4.45E+00
Cujo	6.44E+00	5.59E+00	8.42E-01	4.16E+00	7.51E+00	2.46E+00
LdS2	5.78E-01	5.56E-01	8.36E-02	4.14E-01	7.46E-01	2.45E-01
LdS1	5.61E-01	5.35E-01	8.06E-02	3.99E-01	7.19E-01	2.36E-01
Nanuq	3.93E-01	3.83E-01	5.76E-02	2.85E-01	5.14E-01	
Counts	5.55E-01	5.50E-01	8.28E-02	4.10E-01	7.39E-01	
Vulture	4.60E-01	4.60E-01	6.92E-02	3.42E-01	6.17E-01	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Potassium	August	King-Cujo	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	41	1616-43 (KPSF) Cujo

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

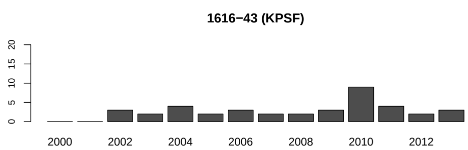
Analysis of August Total Potassium in King-Cujo Watershed Streams

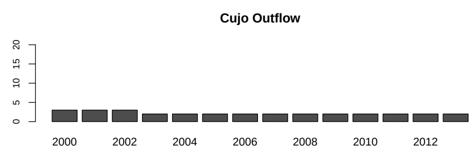
January 18, 2014

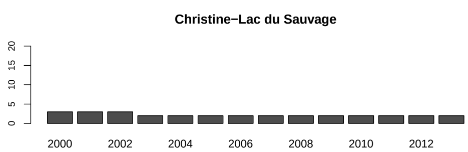
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

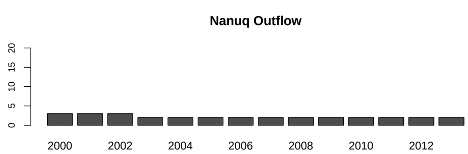
1.1 Monitored

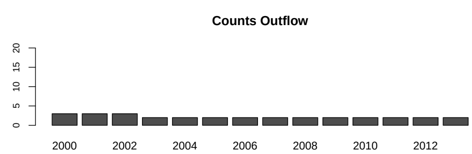


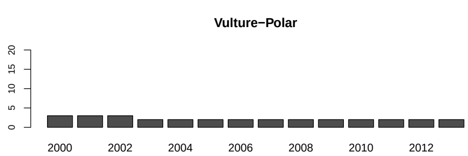




1.2 Reference

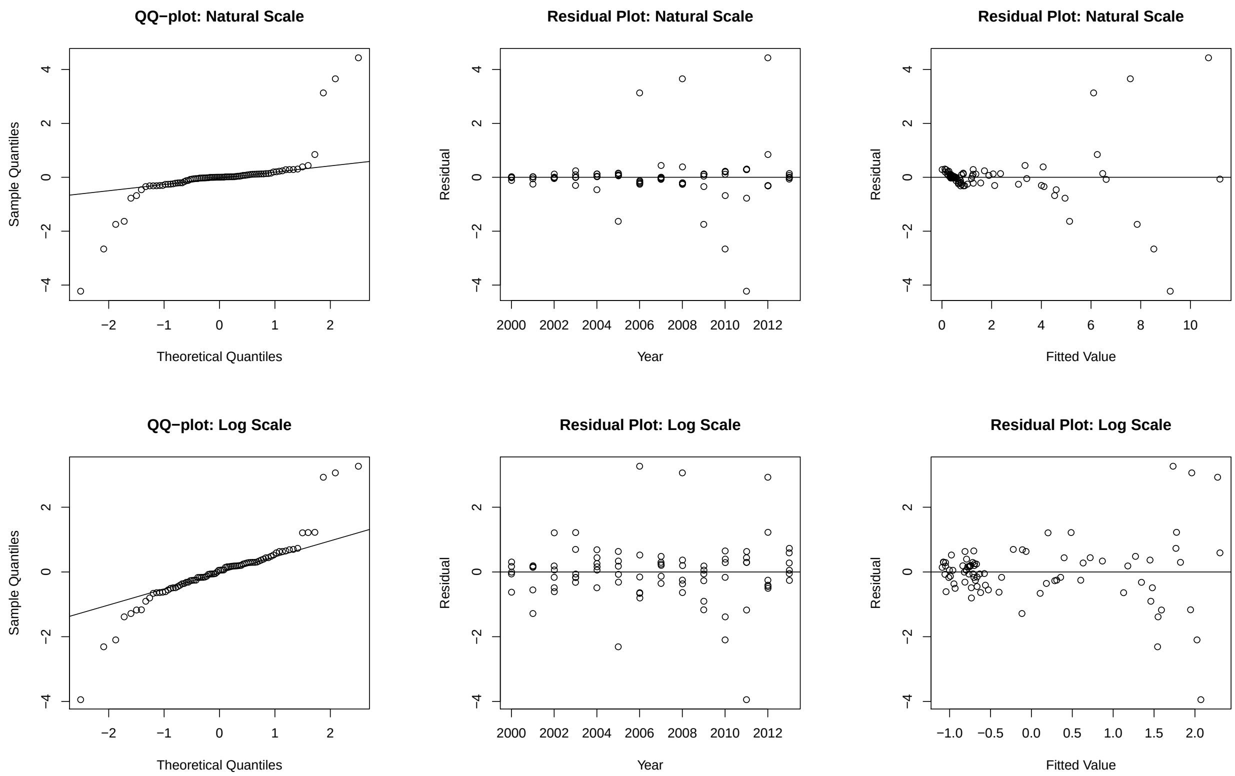






Comment:
None of the streams exhibited greater than 10% of data less than the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
13	1616-43 (KPSF)	2006	9.93	6.10	3.13
15	1616-43 (KPSF)	2008	12.05	7.58	3.65
18	1616-43 (KPSF)	2011	4.02	9.19	-4.23
19	1616-43 (KPSF)	2012	16.15	10.73	4.43

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
13	1616-43 (KPSF)	2006	9.93	1.73	3.27
15	1616-43 (KPSF)	2008	12.05	1.96	3.06
18	1616-43 (KPSF)	2011	4.02	2.07	-3.95

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
24.63	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
9.44	4.00	0.05

- Conclusions:
  The slopes do not differ significantly among reference streams.

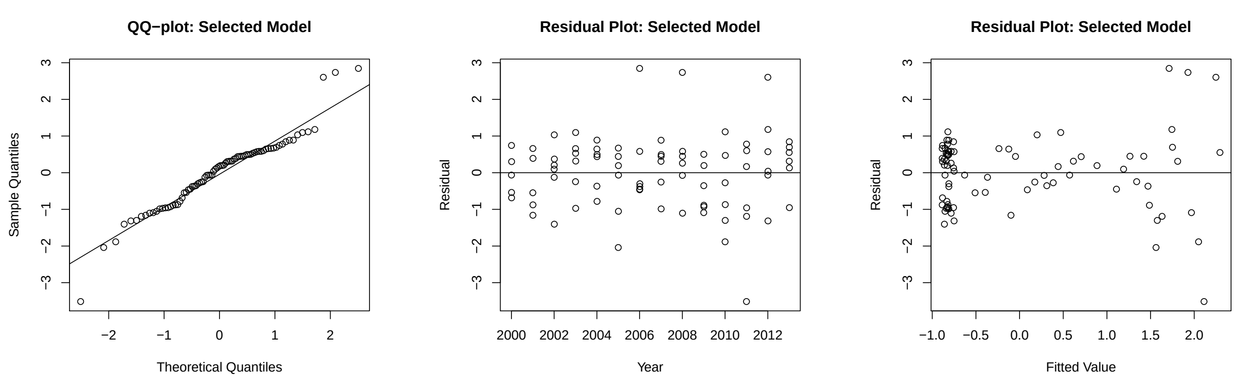
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.997	0.000	0.003	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference streams are best modeled using separate slopes and intercepts, contrasts suggest that reference streams share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference streams) to avoid defaulting to comparing trends in monitored streams against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-43 (KPSF)	2011	4.02	2.11	-3.51

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference stream slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	6.6008	2	0.0369
Cujo Outflow	105.0224	2	0.0000
Christine-Lac du Sauvage	30.5487	2	0.0000

- Conclusions:
  All monitored streams show significant deviation from the common slope of reference streams.

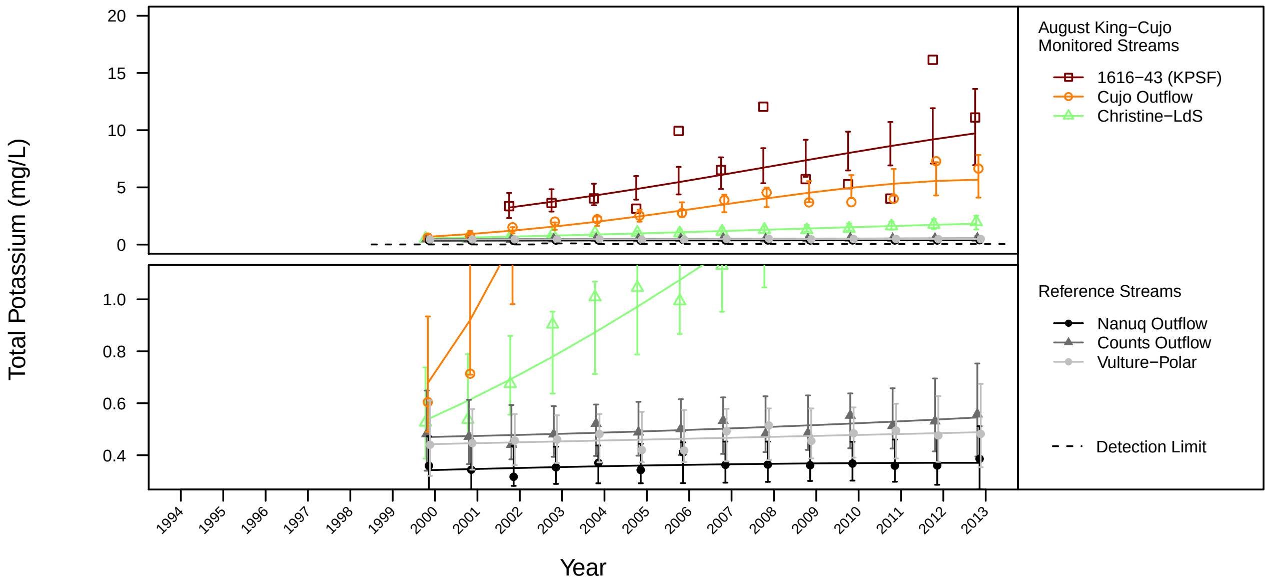
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.0490
Monitored Stream	1616-43 (KPSF)	0.4100
Monitored Stream	Christine-Lac du Sauvage	0.9550
Monitored Stream	Cujo Outflow	0.9250

- Conclusions:
  Model fit for 1616-43 (KPSF) is weak. Model fit for reference streams is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total potassium for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	1.11E+01	9.72E+00	1.67E+00	6.94E+00	1.36E+01	4.88E+00
Cujo Outflow	6.64E+00	5.67E+00	9.34E-01	4.11E+00	7.83E+00	2.73E+00
Christine-Lac du Sauvage	1.98E+00	1.82E+00	3.00E-01	1.32E+00	2.52E+00	8.79E-01
Nanuq Outflow	3.86E-01	3.71E-01	6.10E-02	2.69E-01	5.12E-01	
Counts Outflow	5.58E-01	5.45E-01	8.98E-02	3.95E-01	7.53E-01	
Vulture-Polar	4.82E-01	4.89E-01	8.04E-02	3.54E-01	6.75E-01	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Potassium	August	King-Cujo	Stream	Water	none	log e	linear mixed effects regression	#2 shared slopes	41	1616-43 (KPSF) Cujo Outflow Christine-Lac du Sauvage

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

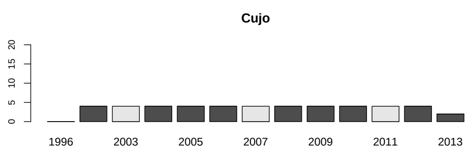
Analysis of April Total Ammonia in Lakes of the King-Cujo Watershed and Lac du Sauvage

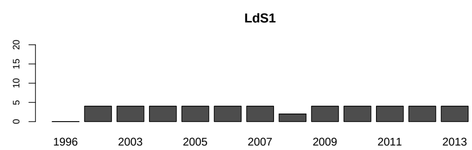
January 12, 2014

1 Censored Values:

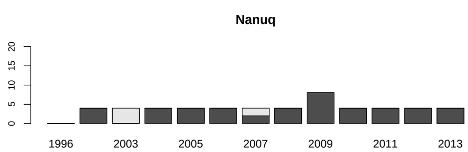
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

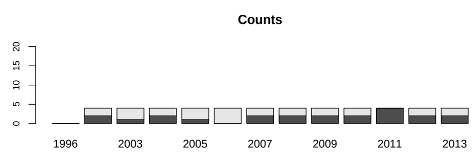
1.1 Monitored

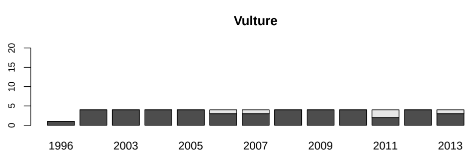




1.2 Reference

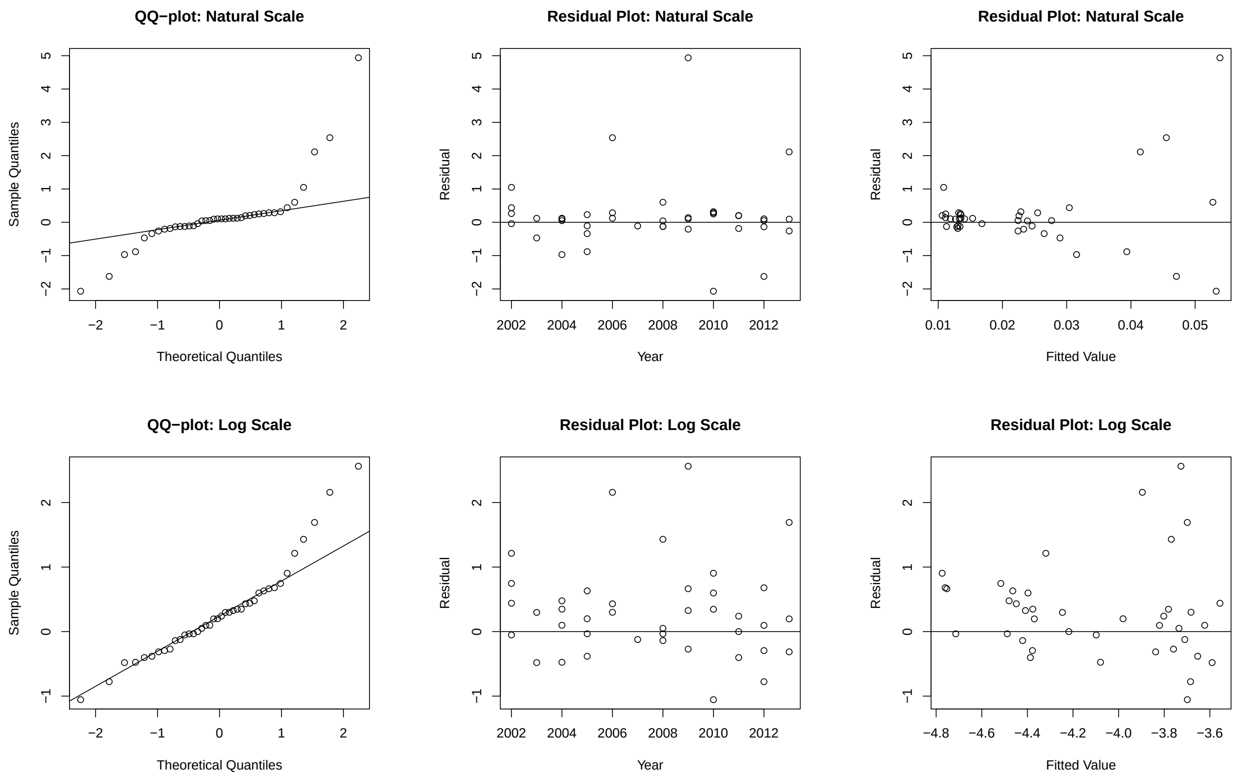






Comment:
10-60% of data in Counts, Nanuq, and Cujo Lake was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
56	Cujo	2009	0.15	0.05	4.94

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	4.32E-37	natural model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
98058.90	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
98745.42	4.00	0.00

- Conclusions:
  The slopes differ significantly among reference lakes. Reference lakes do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.533	0.463	0.004	Indistinguishable support for 1 & 2; choose Model 2.

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled with a common slope, results of contrasts suggest that slopes and intercepts differ among reference lakes. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Cujo	0.9616	2	0.6183
LdS1	0.1815	2	0.9132

- Conclusions:
  No significant deviations were found when comparing monitored lakes to a constant slope of zero.

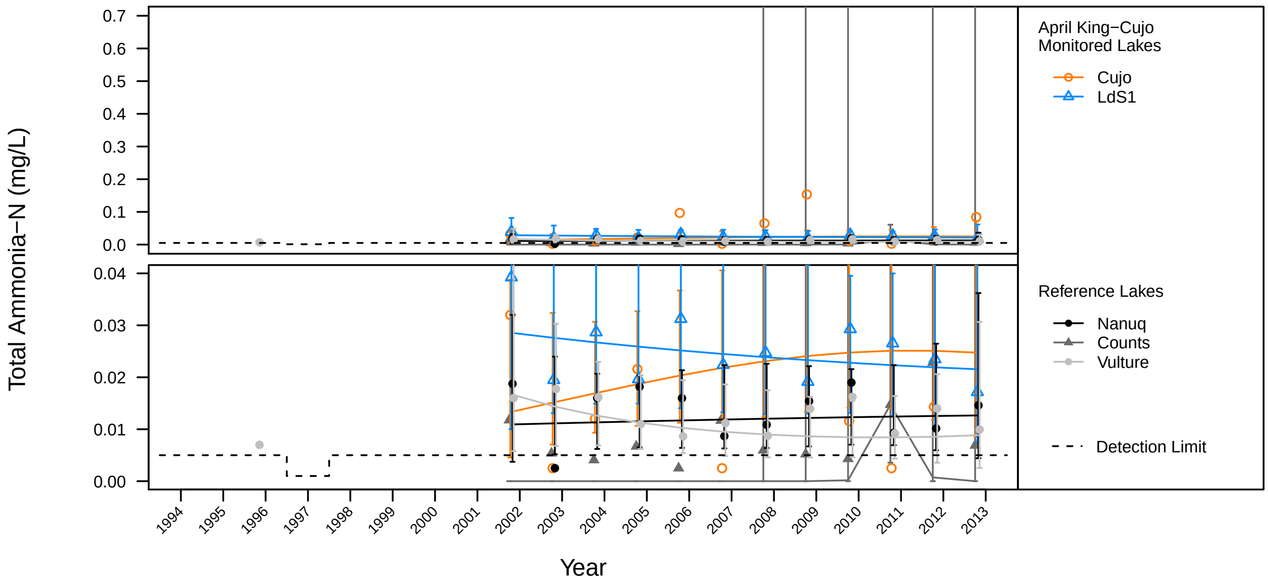
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Reference Lake	Counts	0.5000
Reference Lake	Nanuq	0.0080
Reference Lake	Vulture	0.4740
Monitored Lake	Cujo	0.0270
Monitored Lake	LdS1	0.1480

- Conclusions:
  Model fit for Vulture Lake is weak. Model fit for the Nanuq, Cujo, and LdS1 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total ammonia for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	8.41e-02	2.48e-02	1.33e-02	8.63e-03	7.10e-02	3.89e-02
LdS1	1.72e-02	2.15e-02	1.15e-02	7.56e-03	6.14e-02	3.37e-02
Nanuq	1.46e-02	1.27e-02	6.79e-03	4.43e-03	3.62e-02	NA
Counts	6.88e-03	2.10e-08	5.50e-06	4.74e-231	9.34e+214	NA
Vulture	9.92e-03	8.86e-03	5.61e-03	2.56e-03	3.07e-02	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
AmmoniaN	April	King-Cujo	Lake	Water	None	log e	Tobit regression	#1b separate intercepts & slopes	pH- and temperature-dependent	LdS1

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

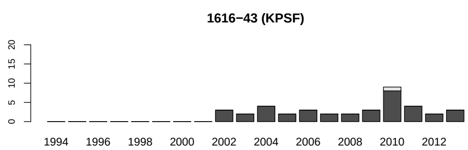
Analysis of August Total Ammonia-N in Lakes of the King-Cujo Watershed and Lac du Sauvage

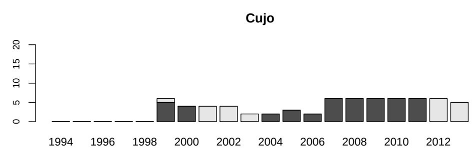
January 12, 2014

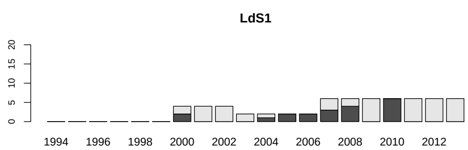
1 Censored Values:

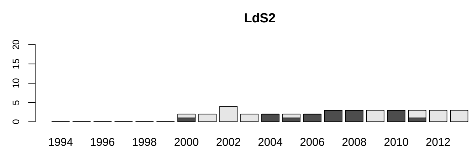
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

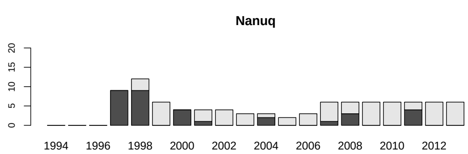


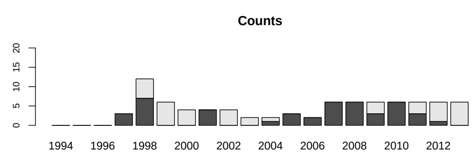


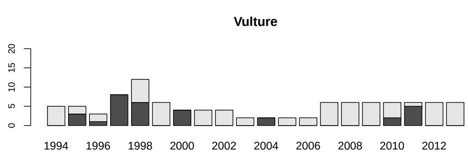




1.2 Reference

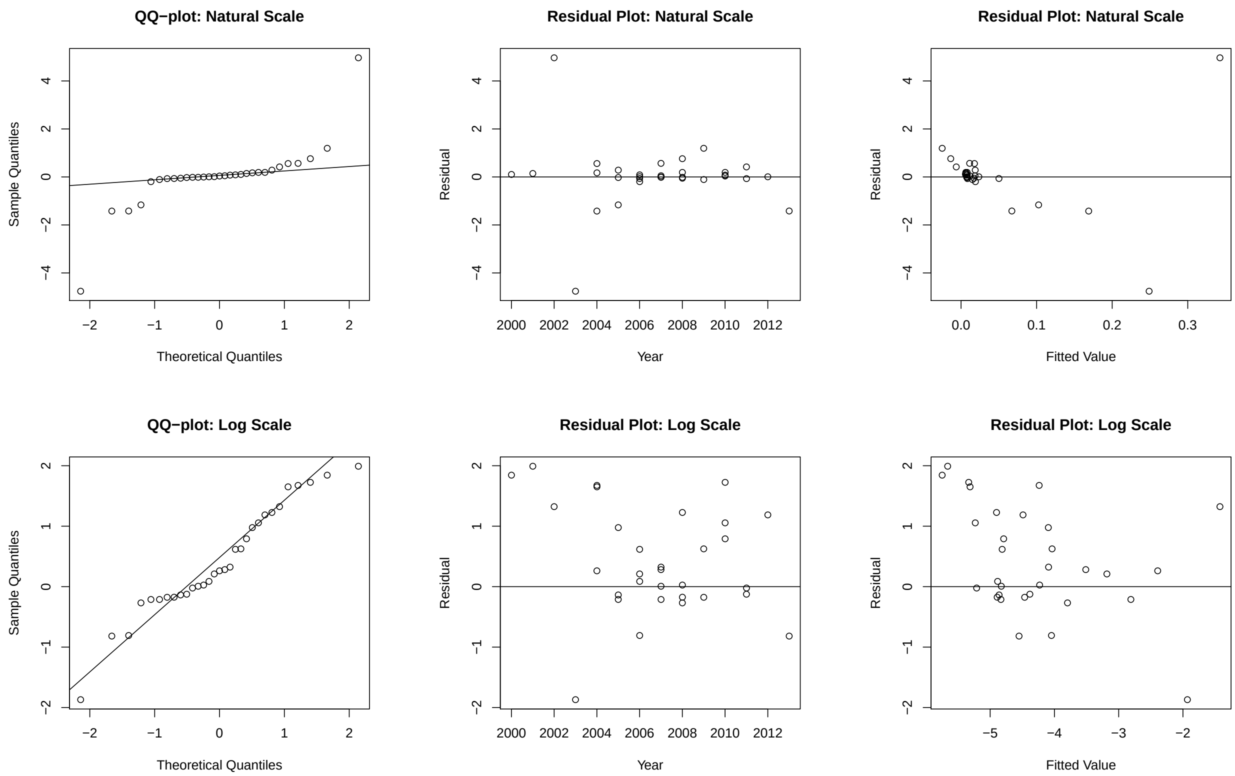






Comment:
Greater than 60% of data in Nanuq, Vulture, and LdS1 was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in Counts, Cujo, and LdS2 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
9	1616-43 (KPSF)	2002	0.56	0.34	4.96
10	1616-43 (KPSF)	2003	0.04	0.25	-4.76

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.002	0.998	Log-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed mode, but shows some dependence on year and fitted valuel. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model. Results of statisical analyses and MDD should be interpreted with caution.

3 Comparisons within Reference Lakes

Two of three reference lakes were removed from the analysis. Tests could not be performed. Proceeding with analysis using reference model 1.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	29.7287	2	0.0000
Cujo	11.6306	2	0.0030
LdS2	3.4029	2	0.1824

- Conclusions:
  1616-43 (KPSF) and Cujo Lake show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored lake compared to slope of each reference lake (reference model 1b).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)-vs-Counts	66.9144	3	0.0000
Cujo-vs-Counts	4.8575	3	0.1825
LdS2-vs-Counts	1.2418	3	0.7430

- Conclusions:
  1616-43 (KPSF) shows significant deviation from the slope of Counts Lake.

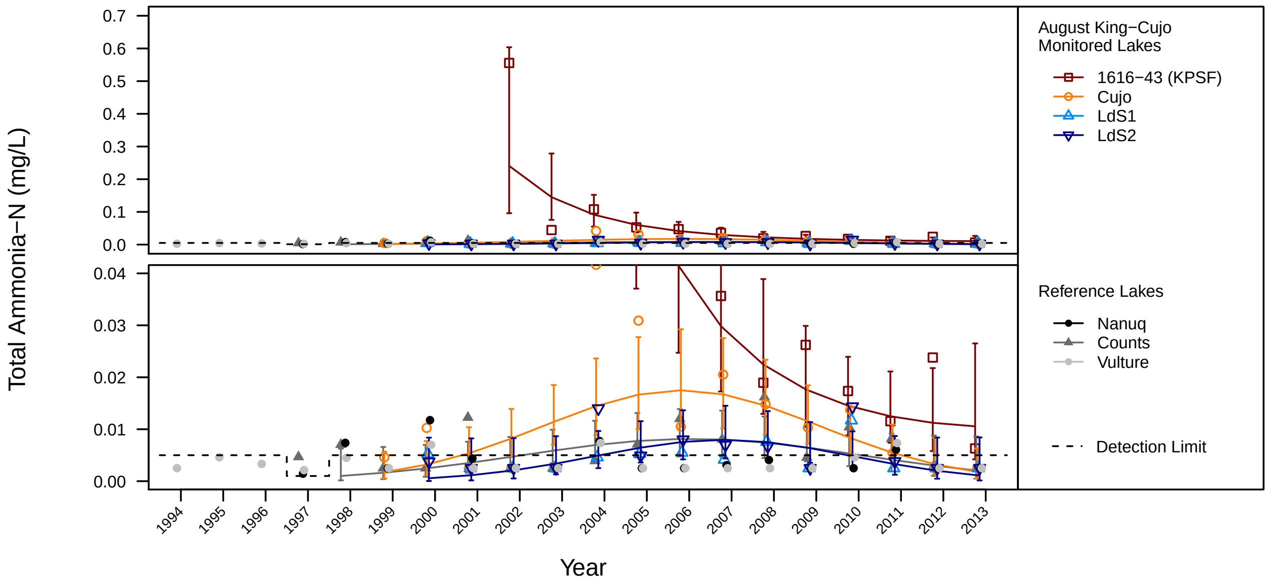
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Reference Lake	Counts	0.4420
Monitored Lake	1616-43 (KPSF)	0.7900
Monitored Lake	Cujo	0.5070
Monitored Lake	LdS2	0.5620

- Conclusions:
  Model fit for Counts Lake weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total ammonia-N for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	6.3e-03	1.06e-02	4.96e-03	4.21e-03	2.65e-02	1.45e-02
Cujo	2.5e-03	1.78e-03	1.15e-03	5.01e-04	6.30e-03	3.36e-03
LdS2	2.5e-03	1.10e-03	1.14e-03	1.43e-04	8.42e-03	3.34e-03
LdS1	2.5e-03	NA	NA	NA	NA	NA
Nanuq	2.5e-03	NA	NA	NA	NA	NA
Counts	2.5e-03	2.06e-03	1.50e-03	4.93e-04	8.61e-03	NA
Vulture	2.5e-03	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
AmmoniaN	August	King-Cujo	Lake	Water	Nanuq Vulture LdS1	log e	Tobit regression	#1b separate intercepts & slopes	pH- and temperature-dependent	1616-43 (KPSF)

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

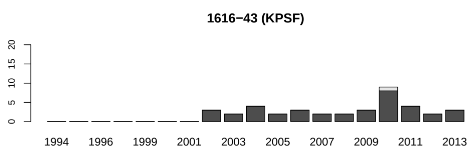
Analysis of August Total Ammonia-N in King-Cujo Watershed Streams

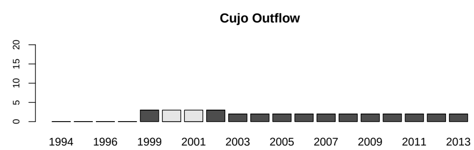
January 12, 2014

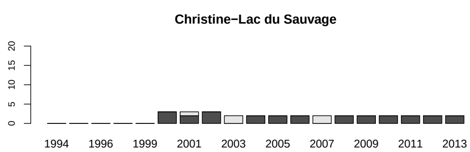
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

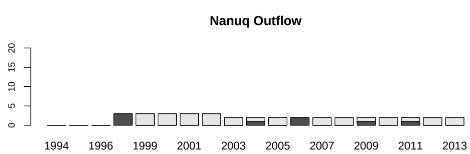
1.1 Monitored

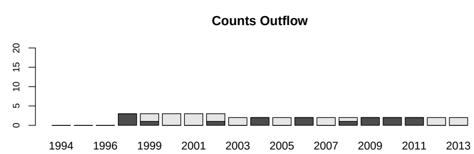


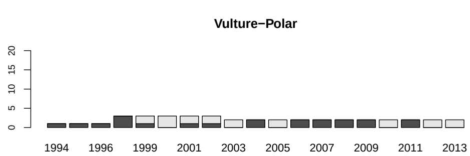




1.2 Reference

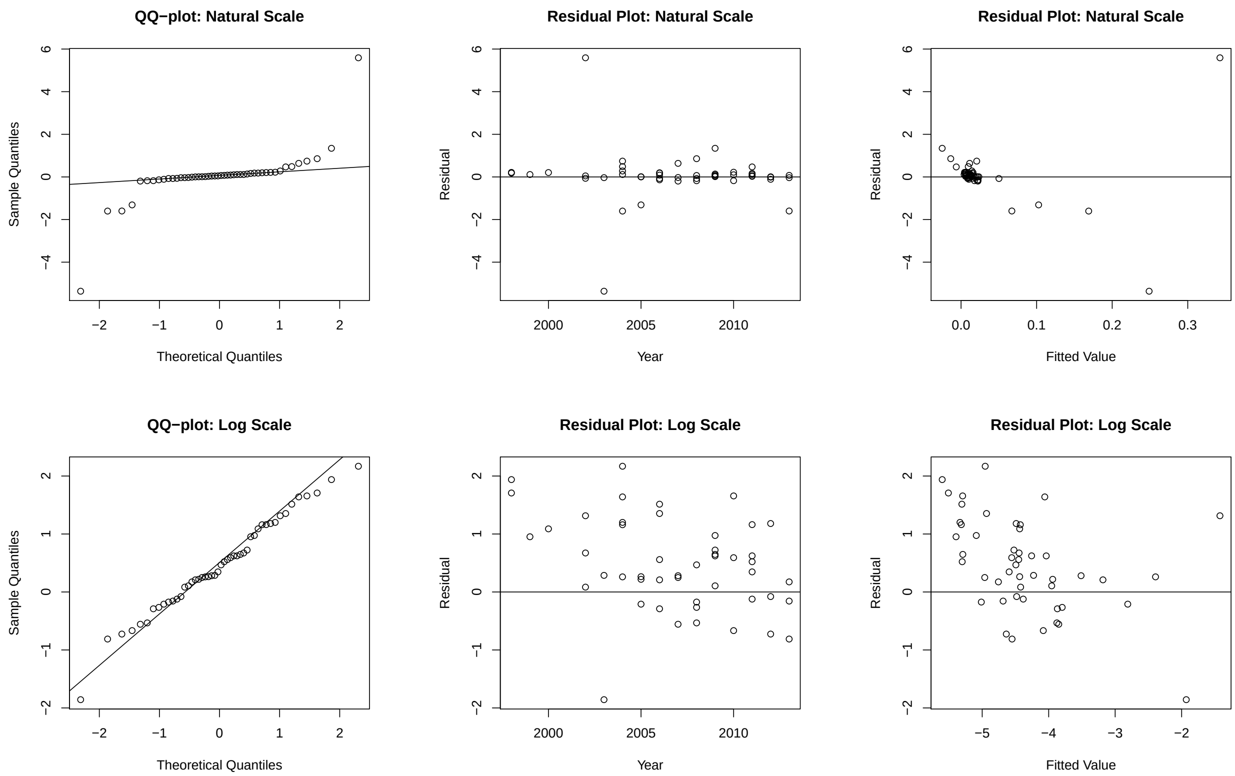






Comment:
Greater than 60% of data in Nanuq Outflow was less than the detection limit. These streams were excluded from further analyses. 10-60% of data in Counts Outflow, Vulture-Polar, Cujo Outflow, and Christine-Lac du Sauvage was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
9	1616-43 (KPSF)	2002	0.56	0.34	5.59
10	1616-43 (KPSF)	2003	0.04	0.25	-5.36

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The natural and log transformed models show dependence on year or fitted value. AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model". Results should be interpreted with caution.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
0.03	3.00	1.00

- Conclusions:
  The slopes and intercepts do not differ significantly among reference streams.

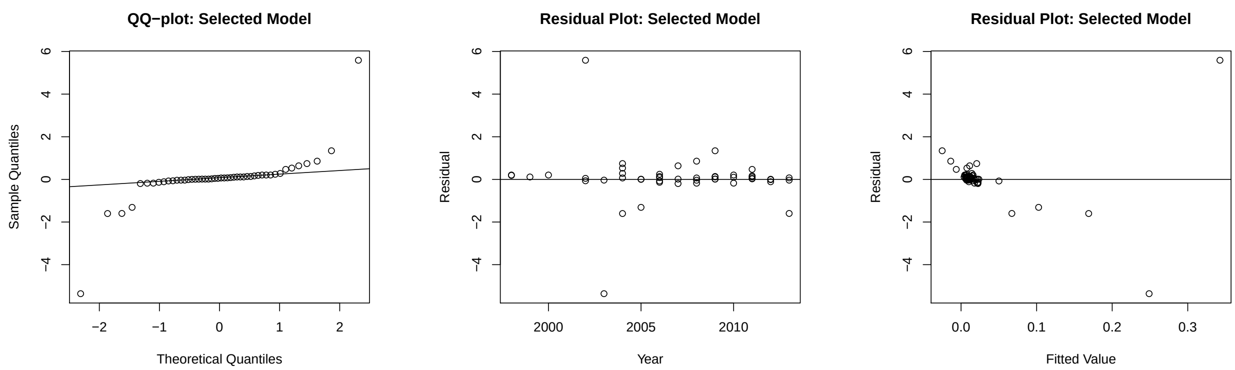
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.043	0.115	0.842	Ref. Model 3

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
9	1616-43 (KPSF)	2002	0.56	0.34	5.59
10	1616-43 (KPSF)	2003	0.04	0.25	-5.36

Conclusion:
Reduced model shows dependence on fitted value. Results should be interpreted with caution.

4 Test Results for Monitored Streams

Fitted model of the slope and intercept of each monitored stream compared to a common slope and intercept fitted for all reference streams together (reference model 3).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	129.2213	3	0.0000
Cujo Outflow	0.7648	3	0.8579
Christine-Lac du Sauvage	0.2775	3	0.9642

- Conclusions:
  1616-43 (KPSF) shows significant deviation from the common slope of reference streams.

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	93.6576	2	0.0000
Cujo Outflow	0.1949	2	0.9072
Christine-Lac du Sauvage	0.0171	2	0.9915

- Conclusions:
When allowing for differences in intercept, 1616-43 (KPSF) shows significant deviation from the common slope of reference streams.

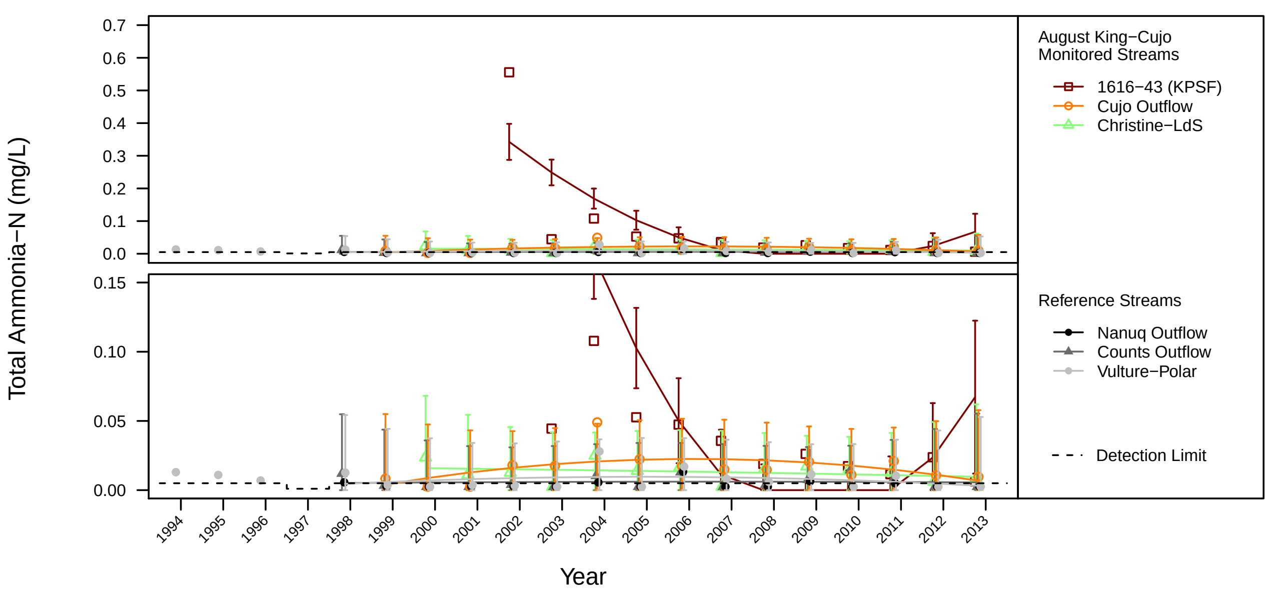
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.0370
Monitored Stream	1616-43 (KPSF)	0.5960
Monitored Stream	Christine-Lac du Sauvage	0.0870
Monitored Stream	Cujo Outflow	0.3020

- Conclusions:
Model fit for Cujo Outflow is weak. Model fit for reference streams and Christine-Lac du Sauvage is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total ammonia-N for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	6.30e-03	6.72e-02	2.82e-02	1.2e-02	1.22e-01	8.25e-02
Cujo Outflow	9.60e-03	6.84e-03	2.60e-02	0.0e+00	5.78e-02	7.60e-02
Christine-Lac du Sauvage	8.35e-03	9.69e-03	2.67e-02	0.0e+00	6.19e-02	7.80e-02
Nanuq Outflow	2.50e-03	NA	NA	NA	NA	NA
Counts Outflow	2.50e-03	5.62e-03	2.54e-02	0.0e+00	5.53e-02	NA
Vulture-Polar	2.50e-03	3.15e-03	2.54e-02	0.0e+00	5.29e-02	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
AmmoniaN	August	King-Cujo	Stream	Water	Nanuq Outflow	none	Tobit regression	#3 shared intercept & slope	pH- and temperature-dependent	1616-43 (KPSF)

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

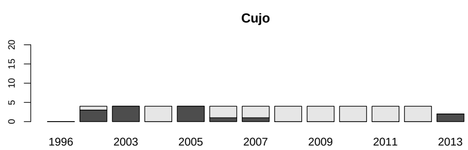
Analysis of April Nitrite in Lakes of the King-Cujo Watershed and Lac du Sauvage

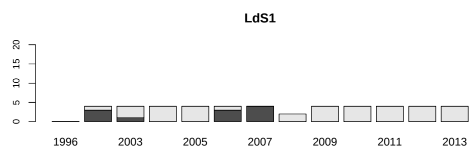
January 12, 2014

1 Censored Values:

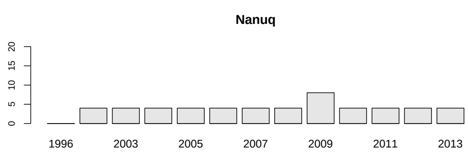
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

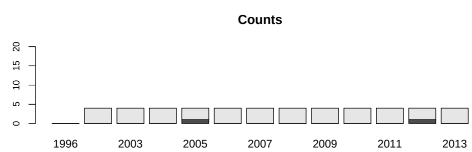
1.1 Monitored

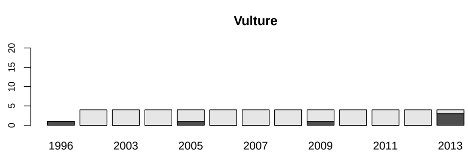




1.2 Reference

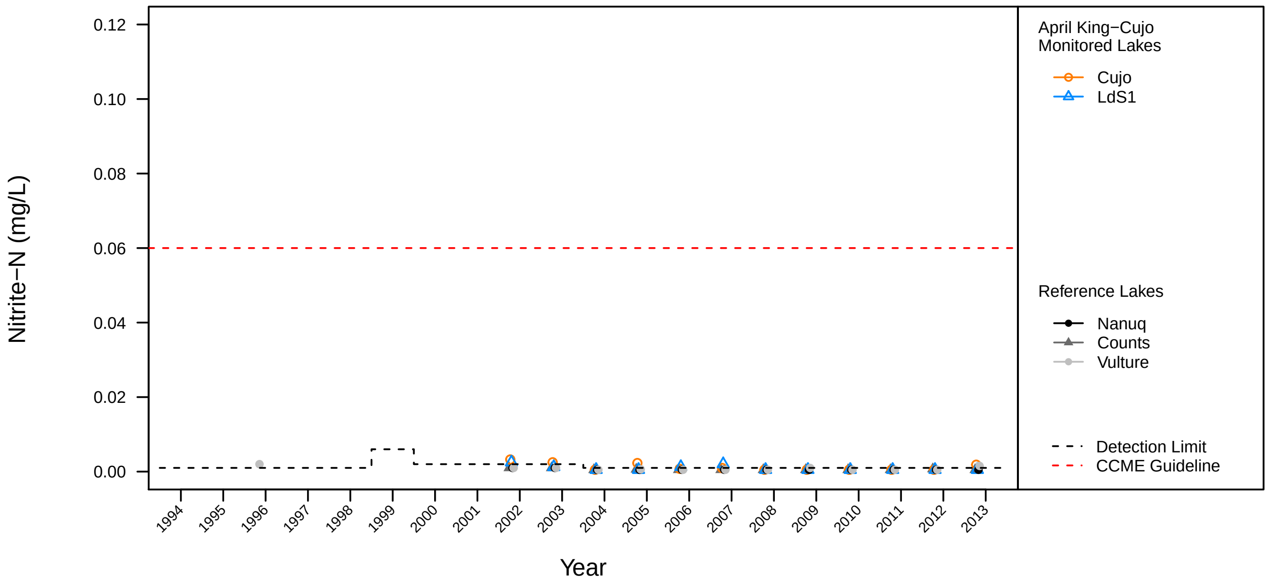






Comment:
Greater than 60% of data in all reference and monitored lakes was less than the detection limit. All lakes were excluded from further analyses. Tests not performed. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

3 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
NitriteN	April	King-Cujo	Lake	Water	all	NA	NA	NA	0.06	NA

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

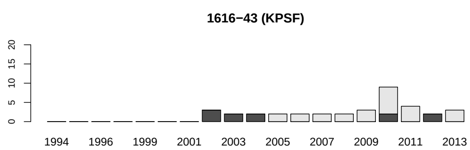
Analysis of August Nitrite-N in Lakes of the King-Cujo Watershed and Lac du Sauvage

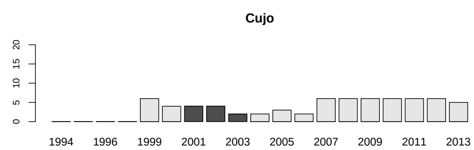
January 12, 2014

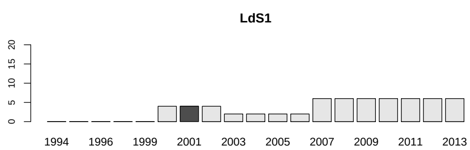
1 Censored Values:

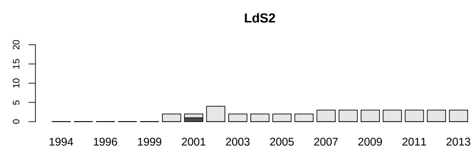
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

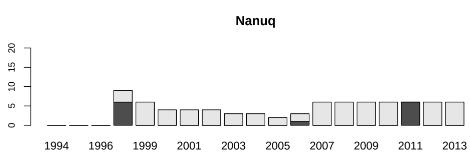


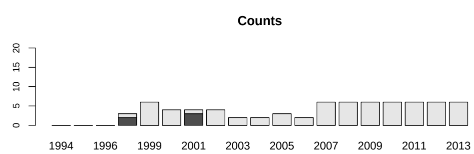


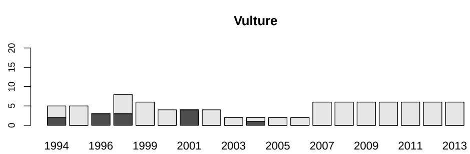




1.2 Reference

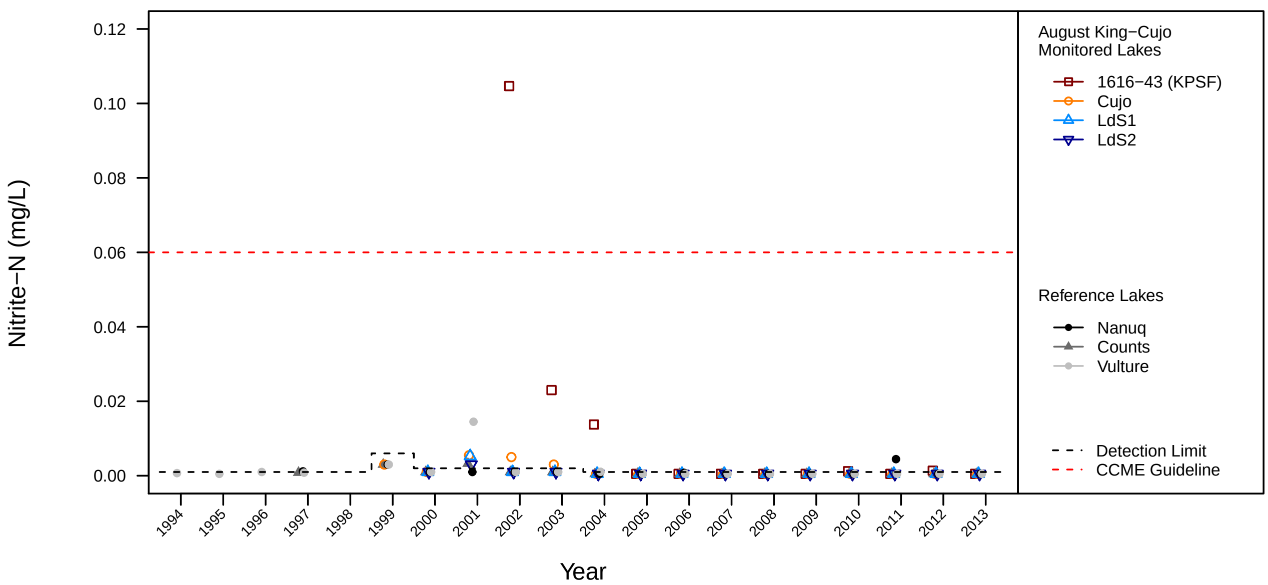






Comment:
Greater than 60% of data in all reference and monitored lakes was less than the detection limit. All lakes were excluded from further analyses. Tests not performed.

2 Observed and Fitted Values



Note: The yearly observed mean for lakes are represented by symbols only.

3 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
NitriteN	August	King-Cujo	Lake	Water	all	NA	NA	NA	0.06	NA

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

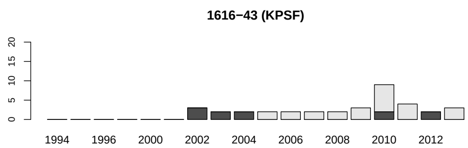
Analysis of August Nitrite in King-Cujo Watershed Streams

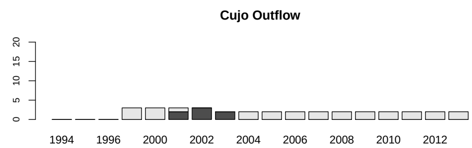
January 12, 2014

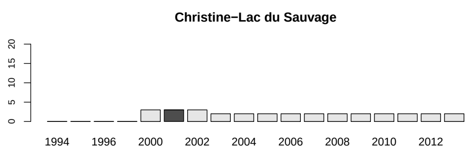
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

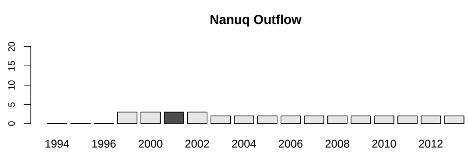
1.1 Monitored

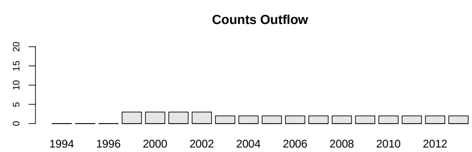


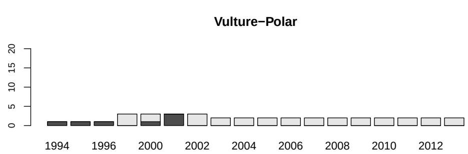




1.2 Reference

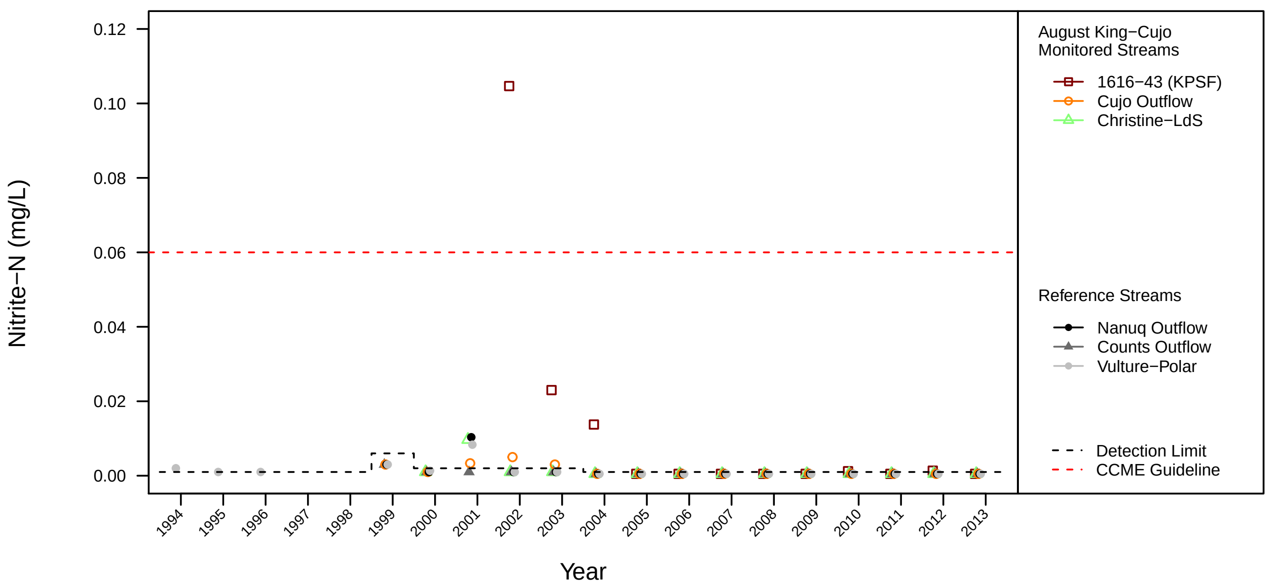






Comment:
Greater than 60% of data in all reference and monitored streams was less than the detection limit. All streams were excluded from further analyses. Tests not performed.

2 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

3 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
NitriteN	August	King-Cujo	Stream	Water	Counts Outflow Nanuq Outflow Vulture-Polar 1616-43 (KPSF) Cujo Outflow Christine-Lac du Sauvage	NA	NA	NA	0.06	NA

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

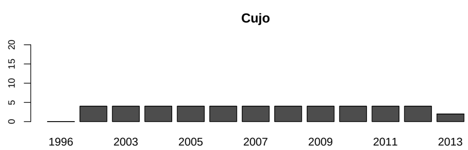
Analysis of April Nitrate in Lakes of the King-Cujo Watershed and Lac du Sauvage

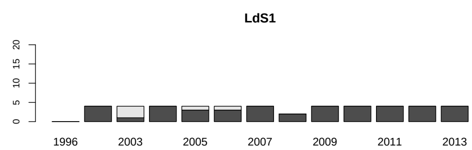
January 12, 2014

1 Censored Values:

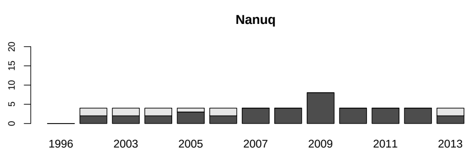
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

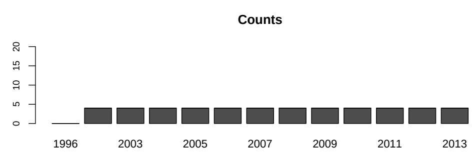
1.1 Monitored

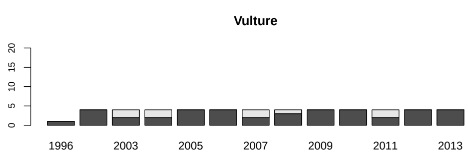




1.2 Reference

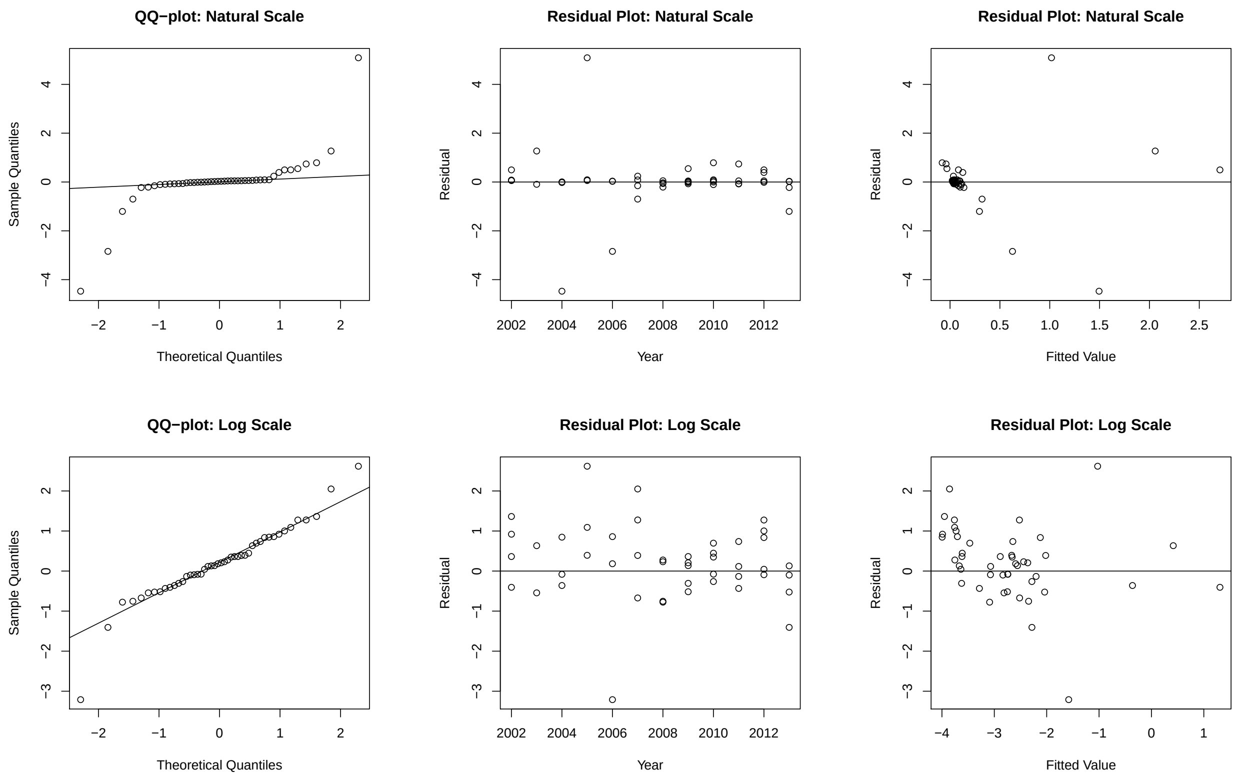






Comment:
10-60% of data in Nanuq, Vulture, and LdS1 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
51	Cujo	2004	0.55	1.49	-4.47
52	Cujo	2005	2.10	1.02	5.09

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
53	Cujo	2006	0.02	-1.58	-3.21

AIC weights and model comparison:

Natural Model	Log Model	Best Model
7.44E-11	1.00E+00	log model

Conclusion:
AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
7.98	6.00	0.24

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
6.95	4.00	0.14

- Conclusions:
  The slopes do not differ significantly among reference lakes.

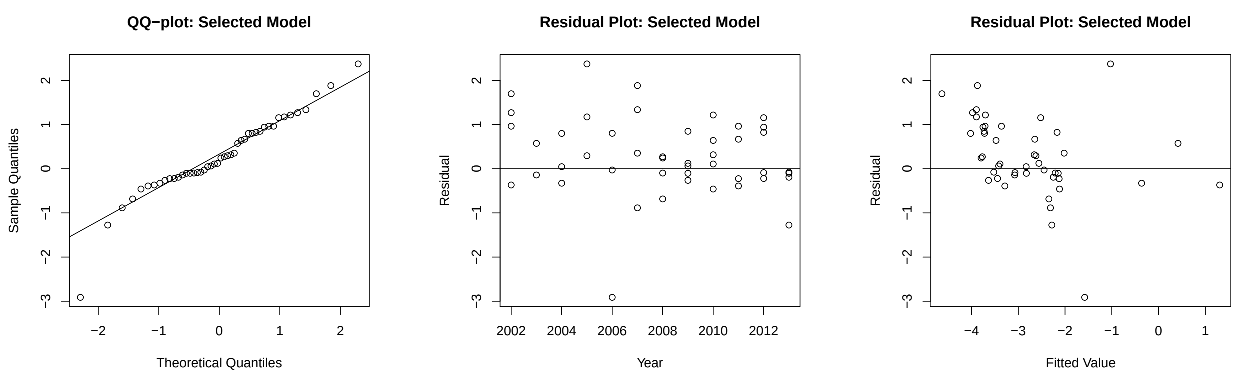
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.978	0.022	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope and intercept. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero and because AIC suggests that reference model 2 provides a better fit to reference lake data than does reference model 3.

3.4 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Cujo	42.8500	2	0.0000
LdS1	1.7461	2	0.4177

- Conclusions:
  Cujo Lake shows significant deviation from the common slope of reference lakes.

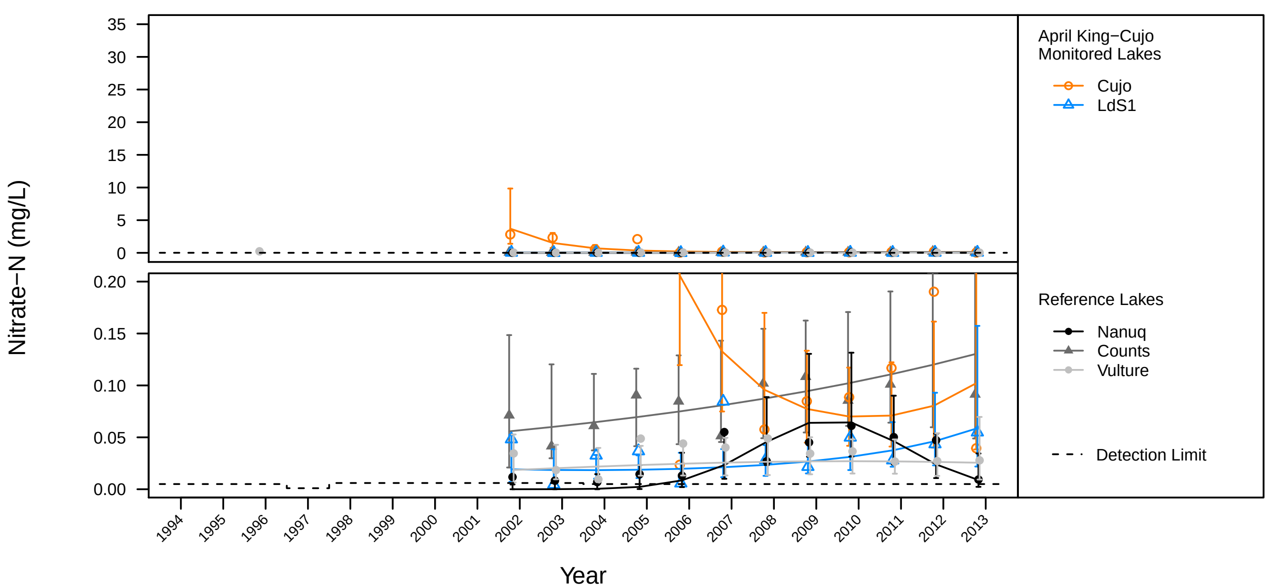
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.7060
Monitored Lake	Cujo	0.6510
Monitored Lake	LdS1	0.2040

- Conclusions:
  Model fit for LdS1 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean nitrate for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	3.95e-02	1.02e-01	5.10e-02	3.84e-02	2.72e-01	1.49e-01
LdS1	5.49e-02	5.87e-02	2.95e-02	2.19e-02	1.57e-01	8.64e-02
Nanuq	9.38e-03	8.89e-03	6.14e-03	2.30e-03	3.44e-02	NA
Counts	9.13e-02	1.30e-01	6.50e-02	4.89e-02	3.46e-01	NA
Vulture	2.78e-02	2.55e-02	1.31e-02	9.35e-03	6.96e-02	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
NitrateN	April	King-Cujo	Lake	Water	none	log e	Tobit regression	#2 shared slopes	hardness-dependent	Cujo

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

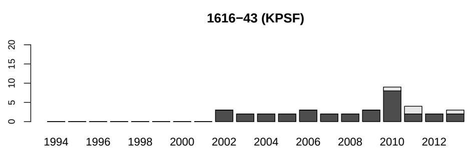
Analysis of August Nitrate-N in Lakes of the King-Cujo Watershed and Lac du Sauvage

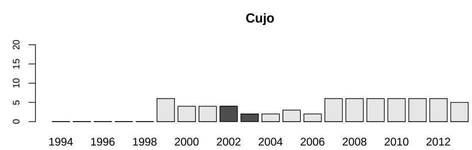
January 21, 2014

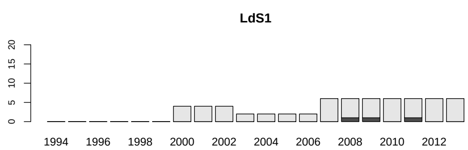
1 Censored Values:

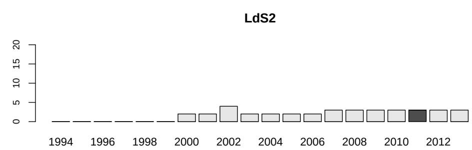
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

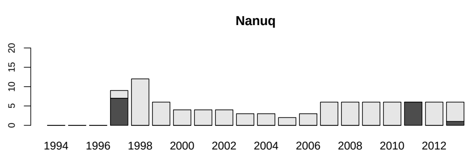


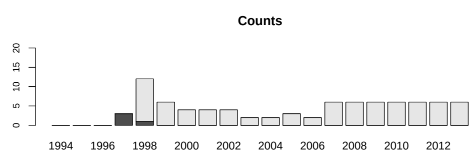


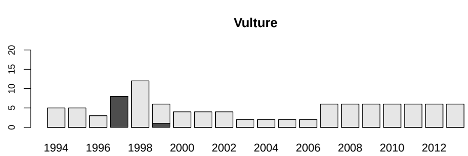




1.2 Reference

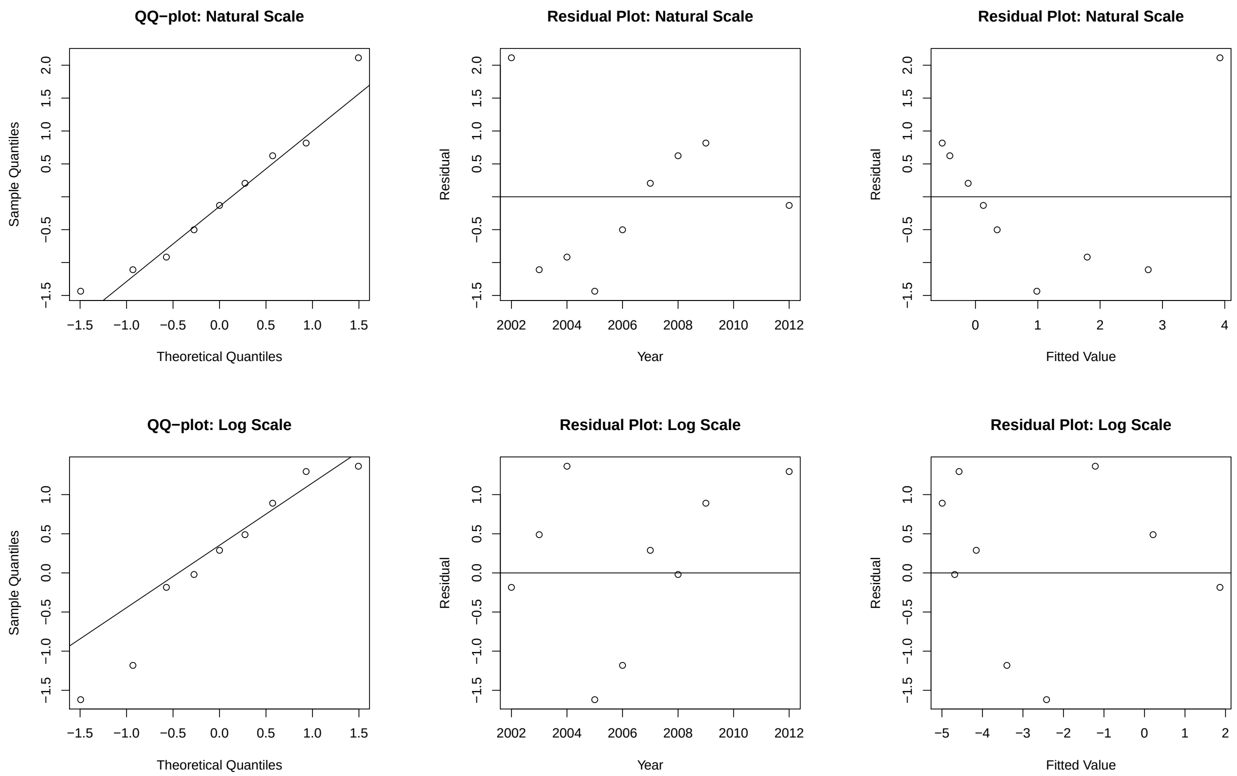






Comment:
Greater than 60% of data in all reference and monitored lakes was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in 1616-30 (KPSF) was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	48.3746	2	0.0000

- Conclusions:
  1616-30 (KPSF) shows significant deviation from a constant slope of zero.

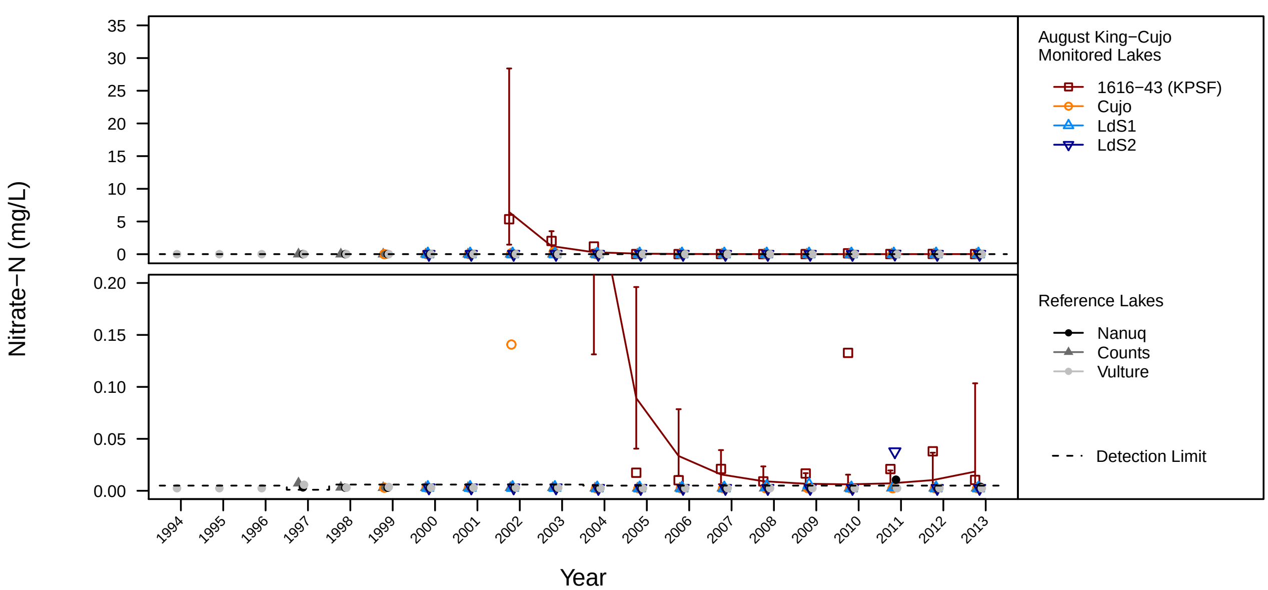
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	1616-43 (KPSF)	0.7500

- Conclusions:
  Models provide a good fit for all monitored lakes.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes are represented by symbols.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean nitrate-N for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	1.05e-02	1.85e-02	1.62e-02	3.3e-03	1.03e-01	4.75e-02
Cujo	2.50e-03	NA	NA	NA	NA	NA
LdS2	2.50e-03	NA	NA	NA	NA	NA
LdS1	2.50e-03	NA	NA	NA	NA	NA
Nanuq	3.75e-03	NA	NA	NA	NA	NA
Counts	2.50e-03	NA	NA	NA	NA	NA
Vulture	2.50e-03	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
NitrateN	August	King-Cujo	Lake	Water	Counts Nanuq Vulture Cujo LdS1 LdS2	log e	Tobit regression	#1a slope of zero	hardness-dependent	1616-43 (KPSF)

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

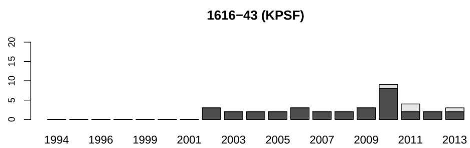
Analysis of August Nitrate-N in King-Cujo Watershed Streams

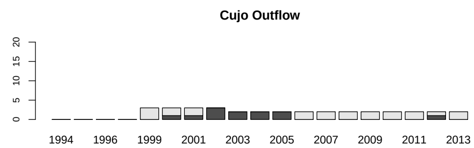
January 21, 2014

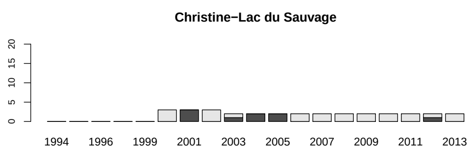
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

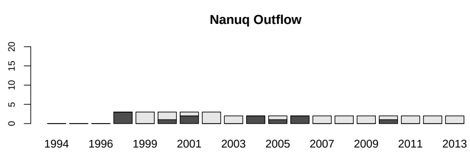
1.1 Monitored

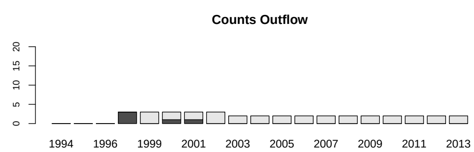


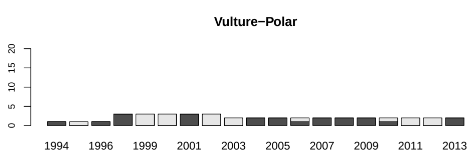




1.2 Reference

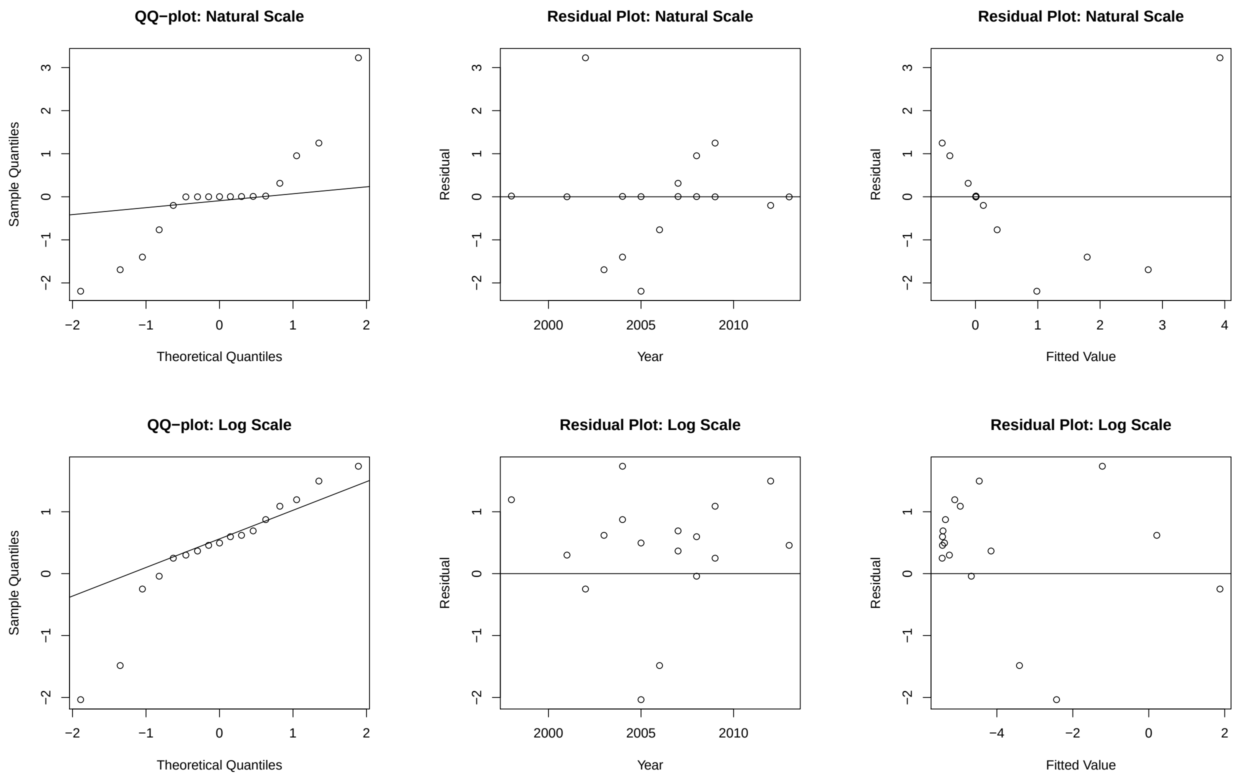






Comment:
Greater than 60% of data in Counts Outflow, Nanuq Outflow, Cujo Outflow, and Christine-Lac du Sauvage was less than the detection limit. These streams were excluded from further analyses. 10-60% of data in 1616-43 (KPSF) and Vulture-Polar was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
9	1616-43 (KPSF)	2002	5.35	3.92	3.23

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Streams

Two of three reference streams were removed from the analysis. Tests could not be performed. Proceeding with analysis using reference model 1.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	75.9168	2	0.0000

- Conclusions:
  1616-43 (KPSF) shows significant deviation from a slope of zero.

Fitted model of the trend (slope) of each stream compared to slope of reference stream (reference model 1b).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)-vs-Vulture-Polar	121.5144	3	0.0000

- Conclusions:
  1616-43 KPSF shows significant deviation from the slope of Vulture-Polar.

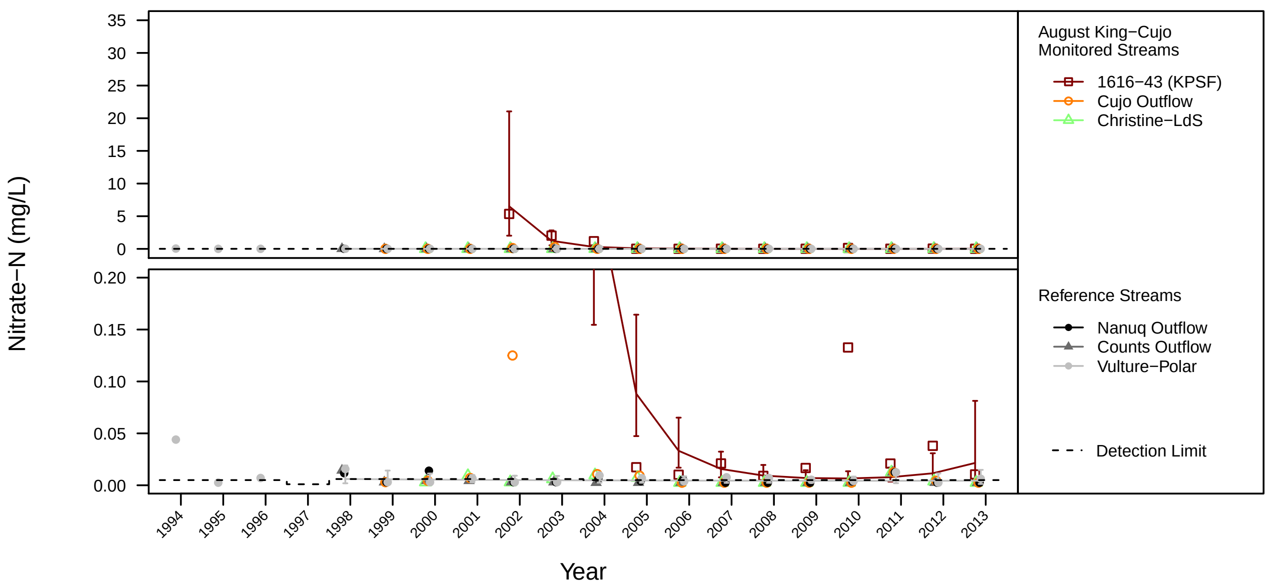
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Reference Stream	Vulture-Polar	0.0750
Monitored Stream	1616-43 (KPSF)	0.7520

- Conclusions:
  Model fit for Vulture-Polar is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean nitrate-N for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	1.05e-02	2.15e-02	1.46e-02	5.69e-03	8.13e-02	4.27e-02
Cujo Outflow	2.50e-03	NA	NA	NA	NA	NA
Christine-Lac du Sauvage	2.50e-03	NA	NA	NA	NA	NA
Nanuq Outflow	2.50e-03	NA	NA	NA	NA	NA
Counts Outflow	2.50e-03	NA	NA	NA	NA	NA
Vulture-Polar	6.30e-03	4.37e-03	2.73e-03	1.29e-03	1.48e-02	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
NitrateN	August	King-Cujo	Stream	Water	Counts Outflow Nanuq Outflow Cujo Outflow Christine-Lac du Sauvage	log e	Tobit regression	#1b separate intercepts & slopes	hardness-dependent	1616-43 (KPSF)

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

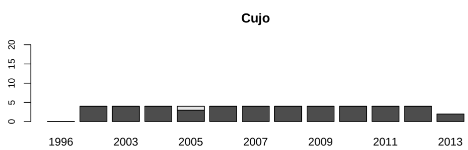
Analysis of April Total Phosphorus in Lakes of the King-Cujo Watershed and Lac du Sauvage

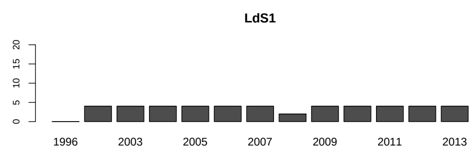
January 12, 2014

1 Censored Values:

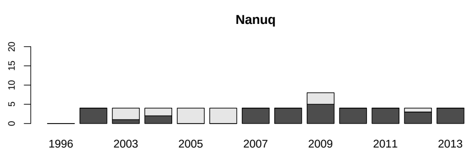
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

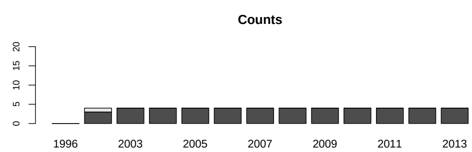
1.1 Monitored

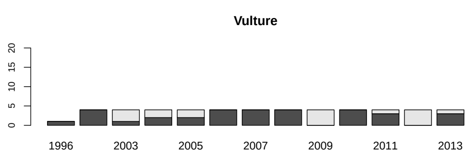




1.2 Reference

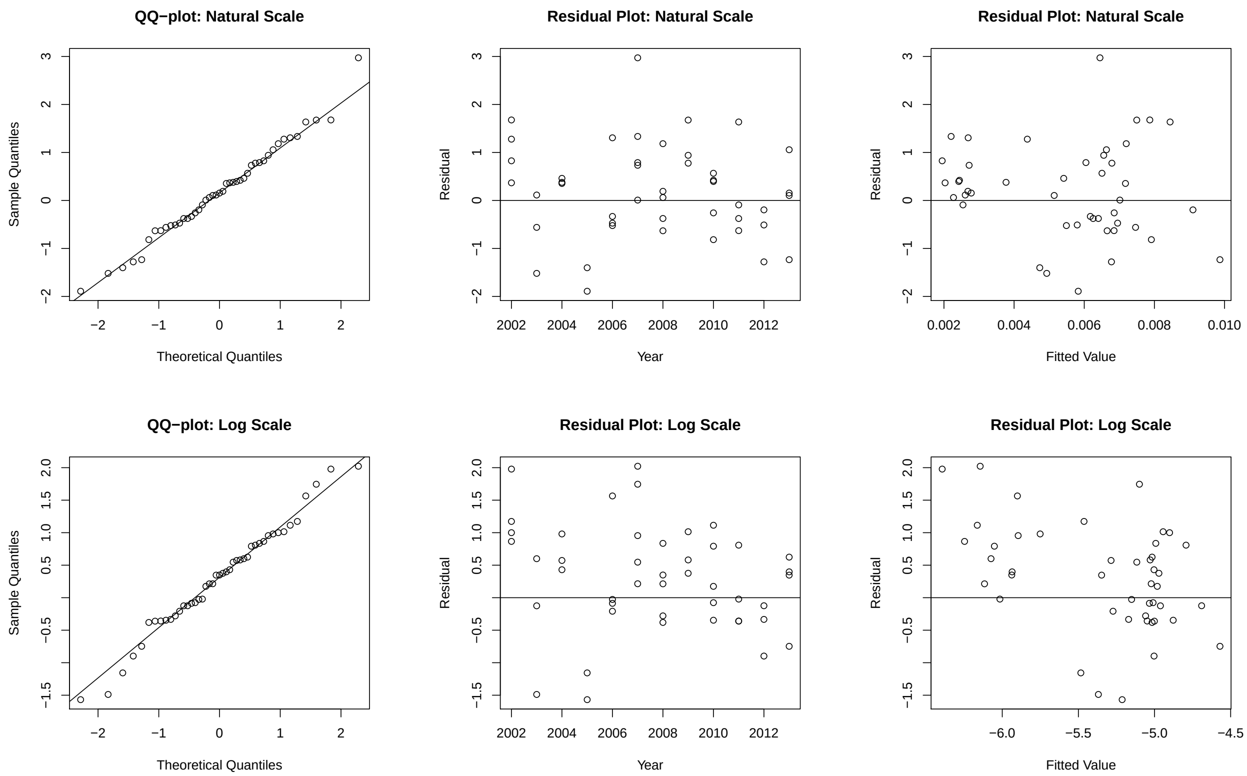






Comment:
10-60% of data in Nanuq and Vulture lakes was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	8.42E-100	natural model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
48.09	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
11.96	4.00	0.02

- Conclusions:
  The slopes differ significantly among reference lakes. Reference lakes do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.813	0.187	0.000	Ref. Model 1

- Conclusions:
  AIC results are in agreement with reference mode testing and reveal that the reference lakes are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Cujo	5.7745	2	0.0557
LdS1	4.7257	2	0.0941

- Conclusions:
  Cujo Lake shows significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored lake compared to slope of each reference lake (reference model 1b).

- Results:

	Chi-squared	DF	P-value
Cujo-vs-Nanuq	111.7527	3	0.0000
Cujo-vs-Counts	39.8771	3	0.0000
Cujo-vs-Vulture	113.3801	3	0.0000

- Conclusions:
  Cujo Lake shows significant deviations from the slopes of individual reference lakes.

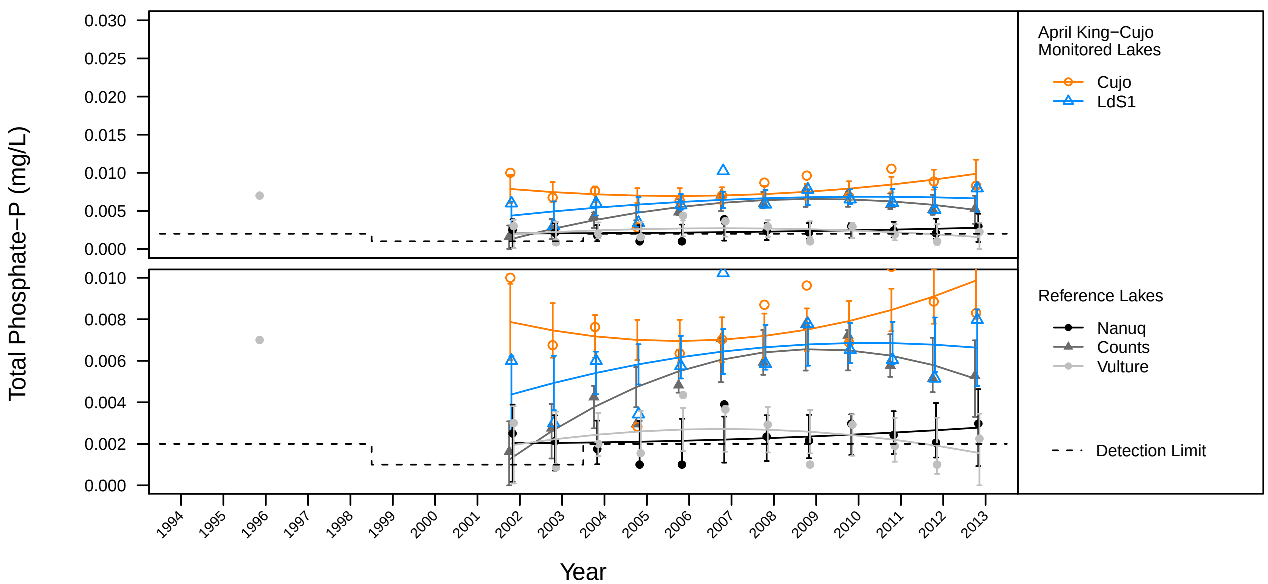
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Reference Lake	Counts	0.8010
Reference Lake	Nanuq	0.0990
Reference Lake	Vulture	0.1130
Monitored Lake	Cujo	0.1980
Monitored Lake	LdS1	0.1840

- Conclusions:
  Model fit for Nanuq, Vulture, Cujo, and LdS1 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total phosphorus for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	8.30e-03	9.87e-03	9.40e-04	8.03e-03	1.17e-02	2.75e-03
LdS1	7.97e-03	6.63e-03	9.40e-04	4.79e-03	8.47e-03	2.75e-03
Nanuq	2.97e-03	2.78e-03	9.44e-04	9.28e-04	4.63e-03	NA
Counts	5.28e-03	5.14e-03	9.40e-04	3.30e-03	6.98e-03	NA
Vulture	2.25e-03	1.56e-03	9.66e-04	0.00e+00	3.45e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Phosphorus	April	King-Cujo	Lake	Water	none	none	Tobit regression	#1b separate intercepts & slopes	NA	Cujo

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

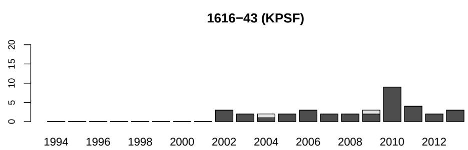
Analysis of August Total Phosphate-P in Lakes of the King-Cujo Watershed and Lac du Sauvage

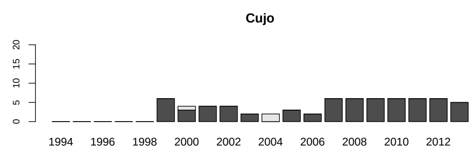
January 12, 2014

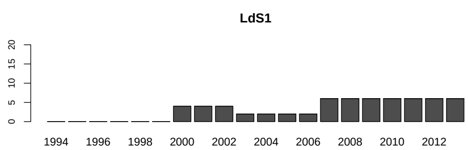
1 Censored Values:

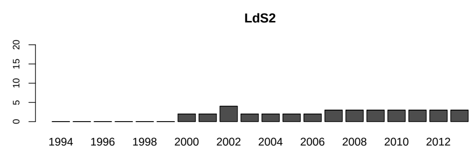
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

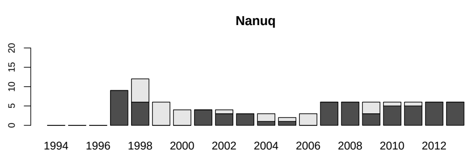


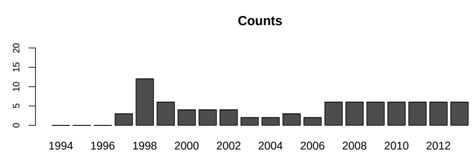


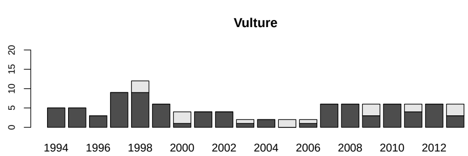




1.2 Reference

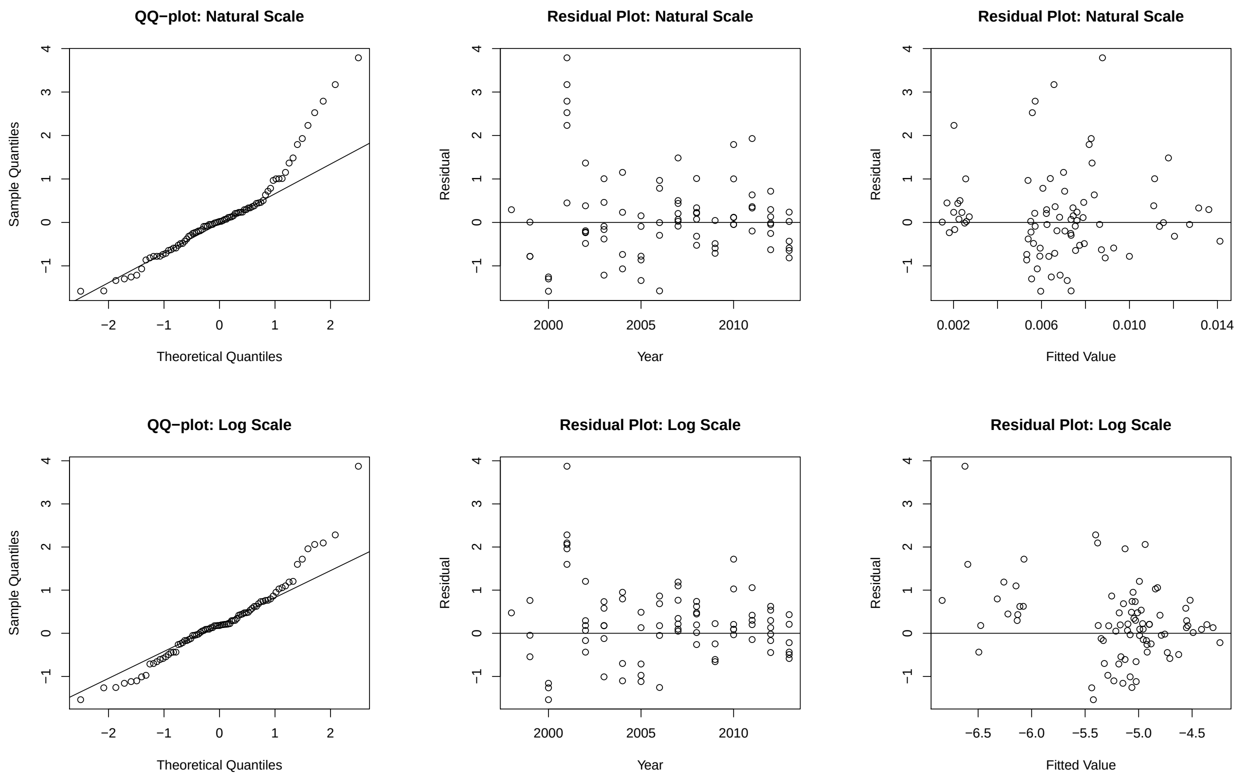






Comment:
10-60% of data in Nanuq and Vulture lakes was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
28	Counts	2001	0.01	0.01	3.17
48	Cujo	2001	0.02	0.01	3.79

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
108	Nanuq	2001	0.01	-6.62	3.87

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The natural model best meets the assumptions of normality and equal variance. AIC also reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
53.28	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
0.63	4.00	0.96

- Conclusions:
  The slopes do not differ significantly among reference lakes.

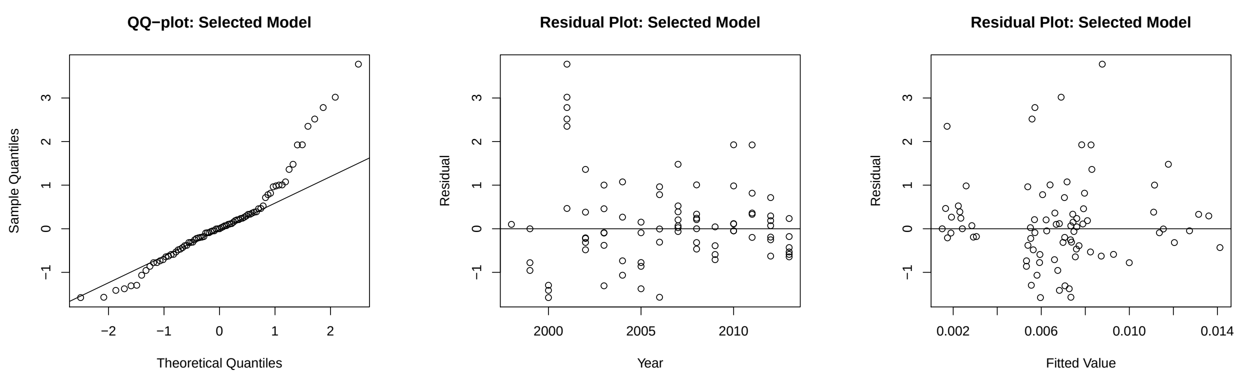
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.024	0.976	0.000	Ref. Model 2

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with a common slope. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
28	Counts	2001	0.01	0.01	3.02
48	Cujo	2001	0.02	0.01	3.78

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	0.5847	2	0.7465
Cujo	2.2639	2	0.3224
LdS1	0.3725	2	0.8301
LdS2	0.1042	2	0.9492

- Conclusions:
  No significant deviations were found when comparing monitored lakes to reference lakes.

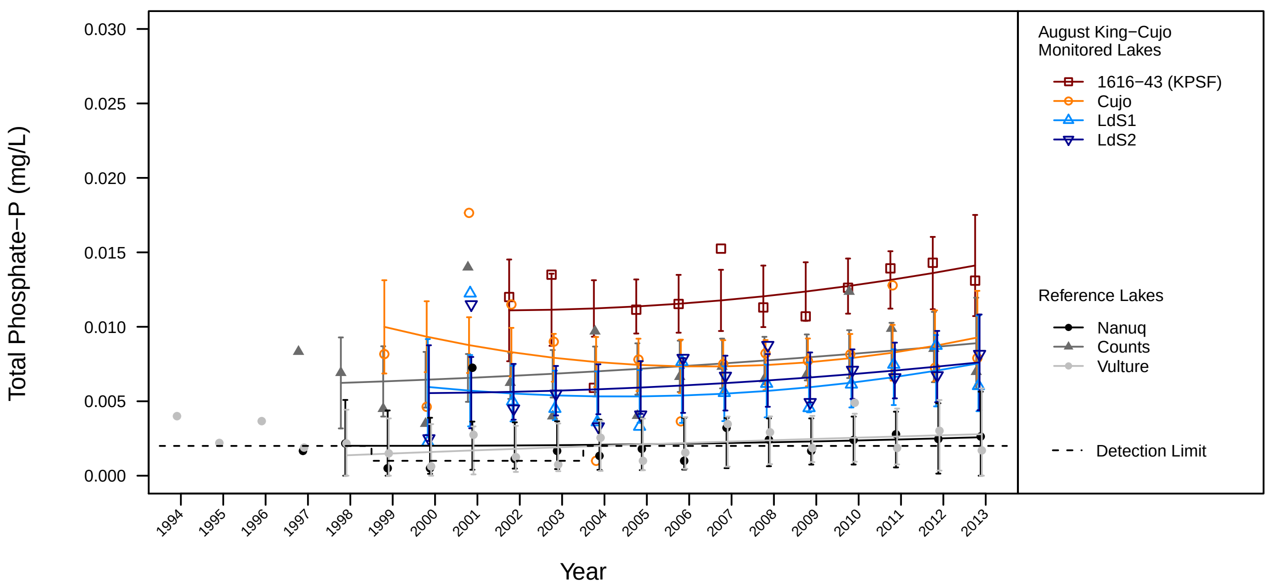
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.6320
Monitored Lake	1616-43 (KPSF)	0.1800
Monitored Lake	Cujo	0.0470
Monitored Lake	LdS1	0.0740
Monitored Lake	LdS2	0.0820

- Conclusions:
  Model fit for 1616-43 (KPSF), Cujo, LdS1, and LdS2 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total phosphate-P for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	1.31e-02	1.41e-02	1.73e-03	1.07e-02	1.75e-02	5.07e-03
Cujo	7.90e-03	9.28e-03	1.60e-03	6.15e-03	1.24e-02	4.68e-03
LdS2	8.17e-03	7.61e-03	1.64e-03	4.40e-03	1.08e-02	4.80e-03
LdS1	6.03e-03	7.55e-03	1.64e-03	4.33e-03	1.08e-02	4.80e-03
Nanuq	2.63e-03	2.58e-03	1.56e-03	0.00e+00	5.64e-03	NA
Counts	6.98e-03	8.90e-03	1.56e-03	5.84e-03	1.20e-02	NA
Vulture	1.70e-03	2.79e-03	1.57e-03	0.00e+00	5.86e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Phosphorus	August	King-Cujo	Lake	Water	none	none	Tobit regression	#2 shared slopes	NA	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

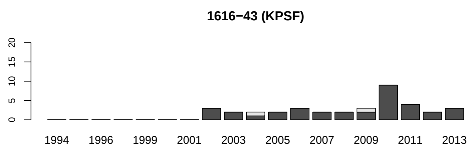
Analysis of August Total Phosphate-P in King-Cujo Watershed Streams

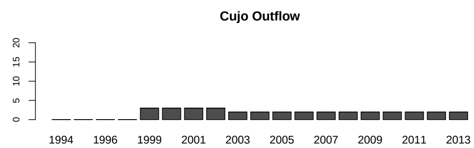
January 12, 2014

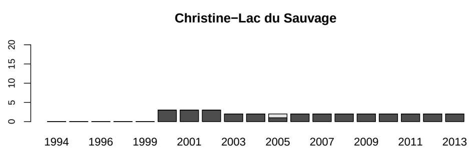
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

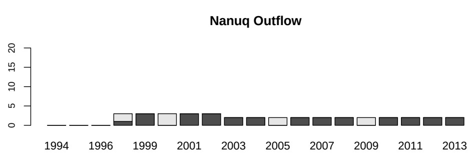
1.1 Monitored

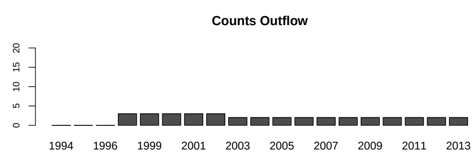


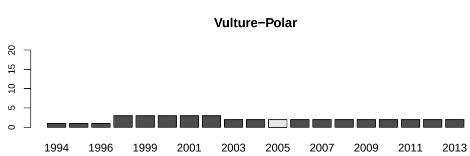




1.2 Reference

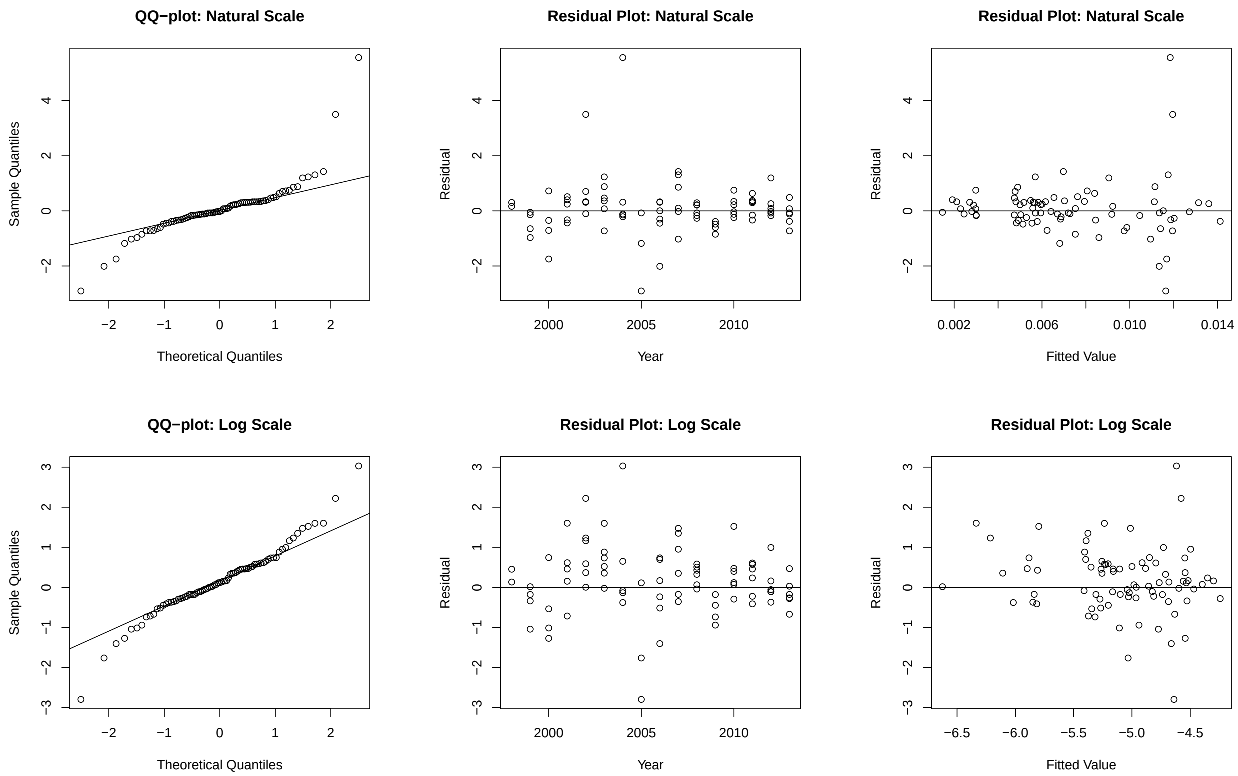






Comment:
10-60% of data in Nanuq Outflow was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
69	Cujo Outflow	2002	0.02	0.01	3.50
71	Cujo Outflow	2004	0.03	0.01	5.57

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
71	Cujo Outflow	2004	0.03	-4.62	3.03

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
102.80	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
8.80	4.00	0.07

- Conclusions:
  The slopes do not differ significantly among reference streams.

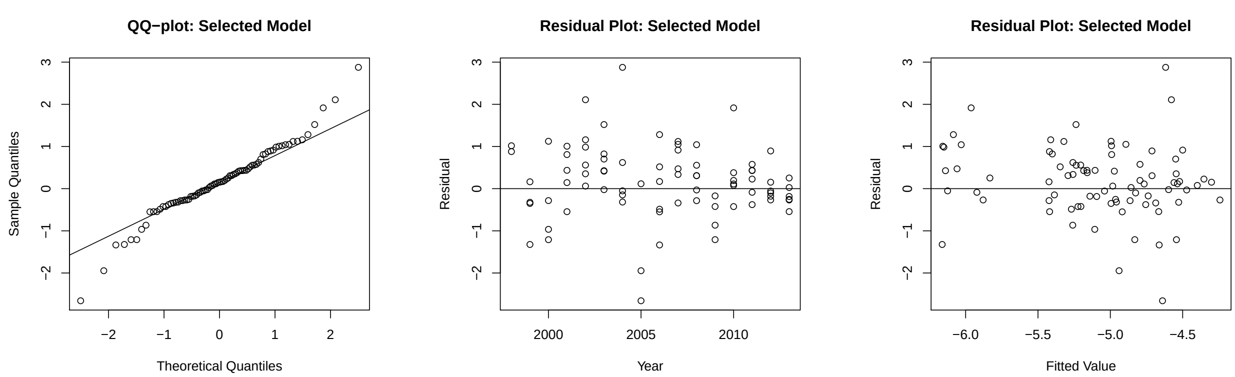
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.636	0.364	0.000	Indistinguishable support for 1 & 2; choose Model 2.

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with a common slope. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference stream slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	0.0195	2	0.9903
Cujo Outflow	4.0822	2	0.1299
Christine-Lac du Sauvage	0.6227	2	0.7325

- Conclusions:
  No significant deviations were found when comparing monitored streams to reference streams.

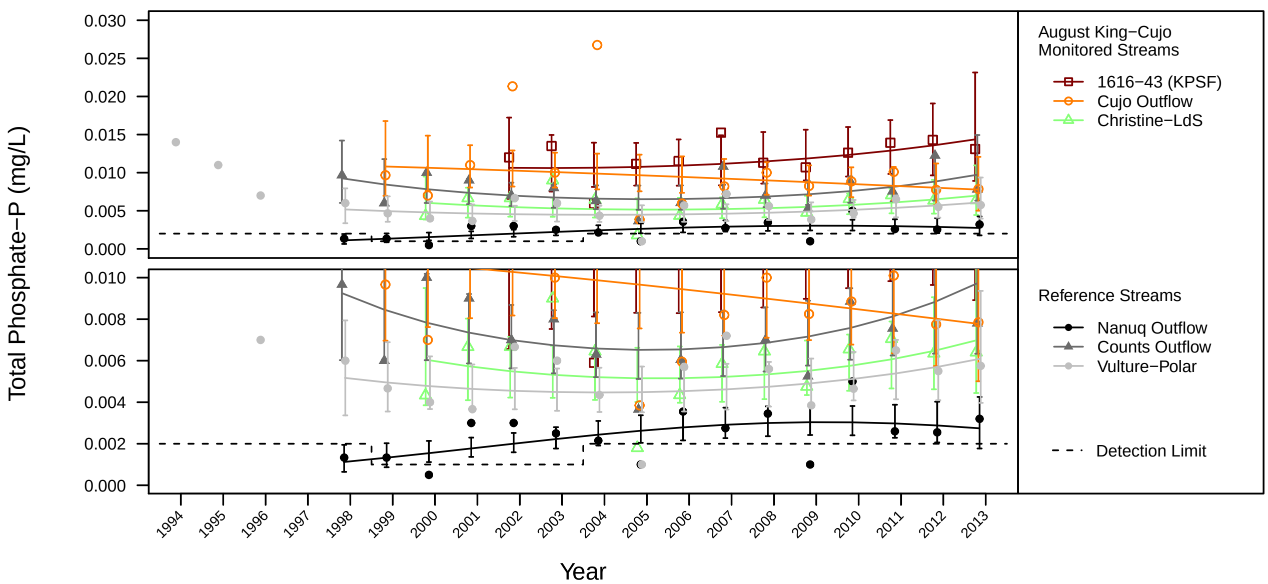
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.5540
Monitored Stream	1616-43 (KPSF)	0.1820
Monitored Stream	Christine-Lac du Sauvage	0.0620
Monitored Stream	Cujo Outflow	0.0520

- Conclusions:
  Model fit for 161643 (KPSF), Cujo Outflow, and Christine-Lac du Sauvage is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total phostphate-P for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	1.31e-02	1.44e-02	3.50e-03	8.92e-03	2.31e-02	1.02e-02
Cujo Outflow	7.85e-03	7.78e-03	1.74e-03	5.01e-03	1.21e-02	5.10e-03
Christine-Lac du Sauvage	6.40e-03	6.98e-03	1.61e-03	4.44e-03	1.10e-02	4.70e-03
Nanuq Outflow	3.20e-03	2.74e-03	6.13e-04	1.77e-03	4.25e-03	NA
Counts Outflow	7.80e-03	9.73e-03	2.13e-03	6.33e-03	1.49e-02	NA
Vulture-Polar	5.75e-03	6.09e-03	1.33e-03	3.97e-03	9.36e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Phosphorus	August	King-Cujo	Stream	Water	none	log e	Tobit regression	#2 shared slopes	NA	none

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

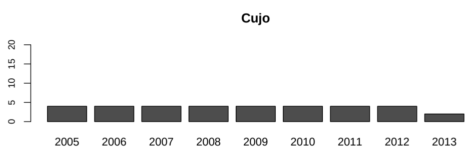
Analysis of April Total Organic Carbon in Lakes of the King-Cujo Watershed and Lac du Sauvage

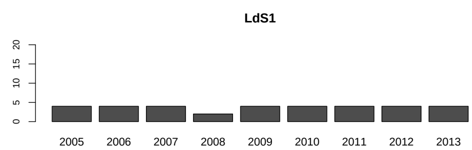
January 18, 2014

1 Censored Values:

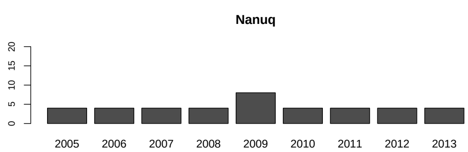
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

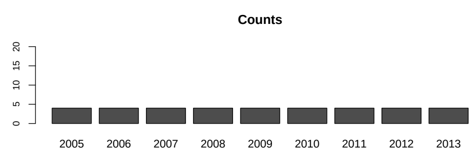
1.1 Monitored

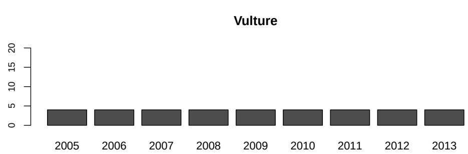




1.2 Reference

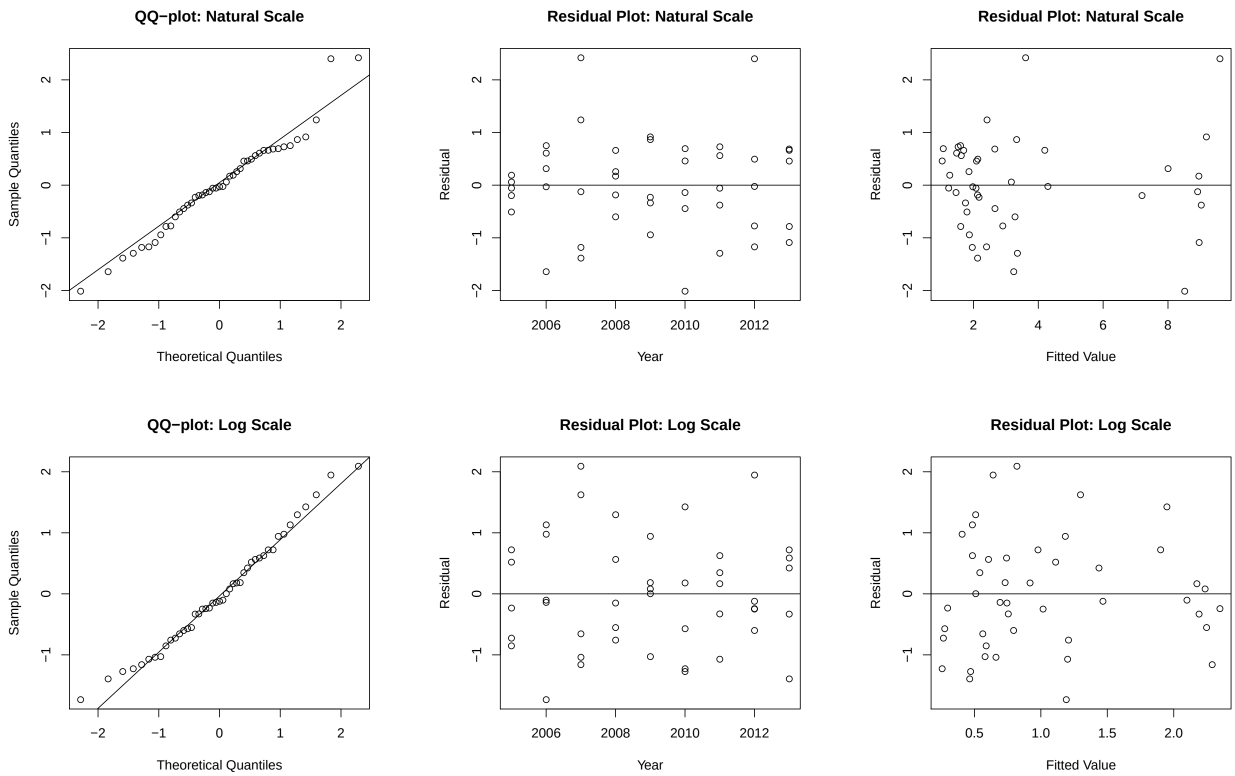






Comment:
None of the lakes exhibited greater than 10% of data was less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
2.89E-21	1.00E+00	log model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
102.11	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
8.77	4.00	0.07

- Conclusions:
  The slopes do not differ significantly among reference lakes.

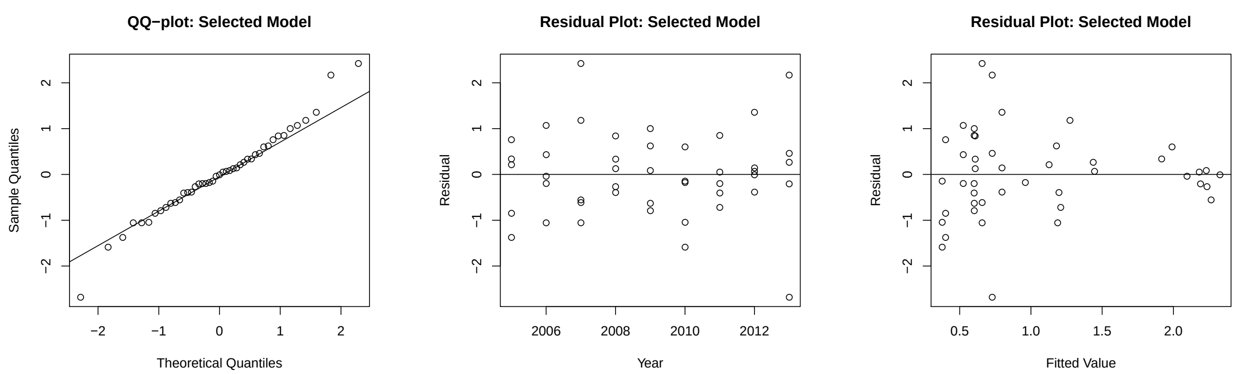
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Cujo	0.41	2.00	0.81
LdS1	0.38	2.00	0.83

- Conclusions:
  No significant deviations were found when comparing monitored lakes to reference lakes.

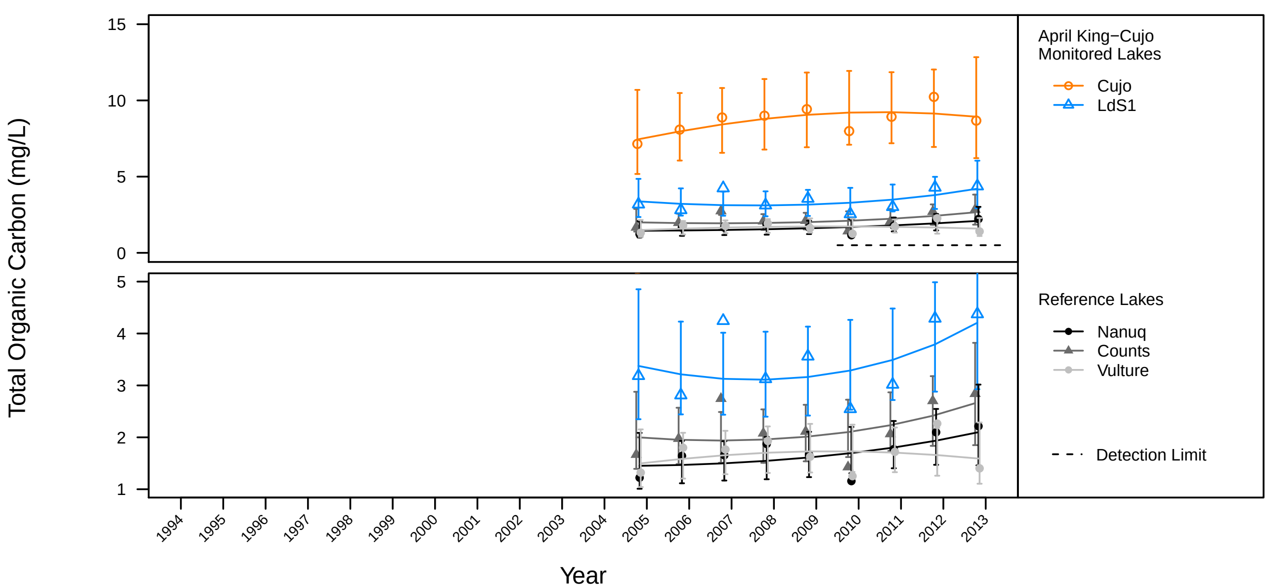
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.1100
Monitored Lake	Cujo	0.5180
Monitored Lake	LdS1	0.2620

- Conclusions:
  Model fit for LdS1 is weak. Model fit for reference lakes is poor.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total organic carbon for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	8.68E+00	8.93E+00	1.65E+00	6.21E+00	1.28E+01	4.84E+00
LdS1	4.38E+00	4.21E+00	7.79E-01	2.93E+00	6.05E+00	2.28E+00
Nanuq	2.21E+00	2.10E+00	3.88E-01	1.46E+00	3.02E+00	
Counts	2.84E+00	2.66E+00	4.92E-01	1.85E+00	3.82E+00	
Vulture	1.40E+00	1.59E+00	2.94E-01	1.11E+00	2.29E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
TOC	April	King-Cujo	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	NA	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

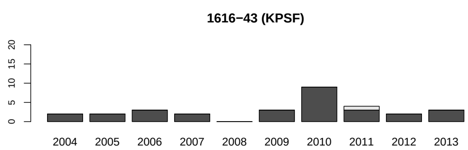
Analysis of August Total Organic Carbon in Lakes of the King-Cujo Watershed and Lac du Sauvage

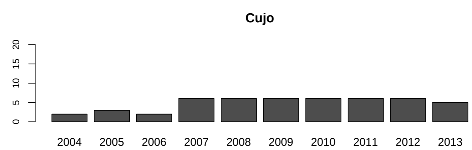
January 21, 2014

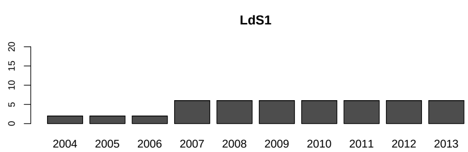
1 Censored Values:

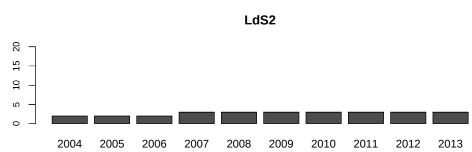
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

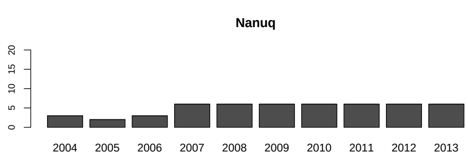


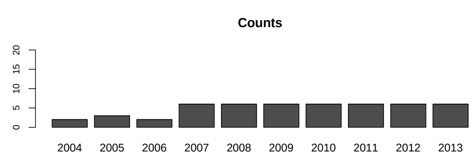


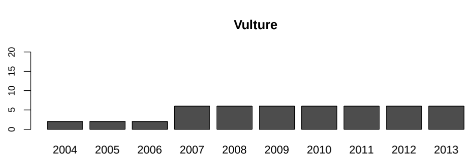




1.2 Reference

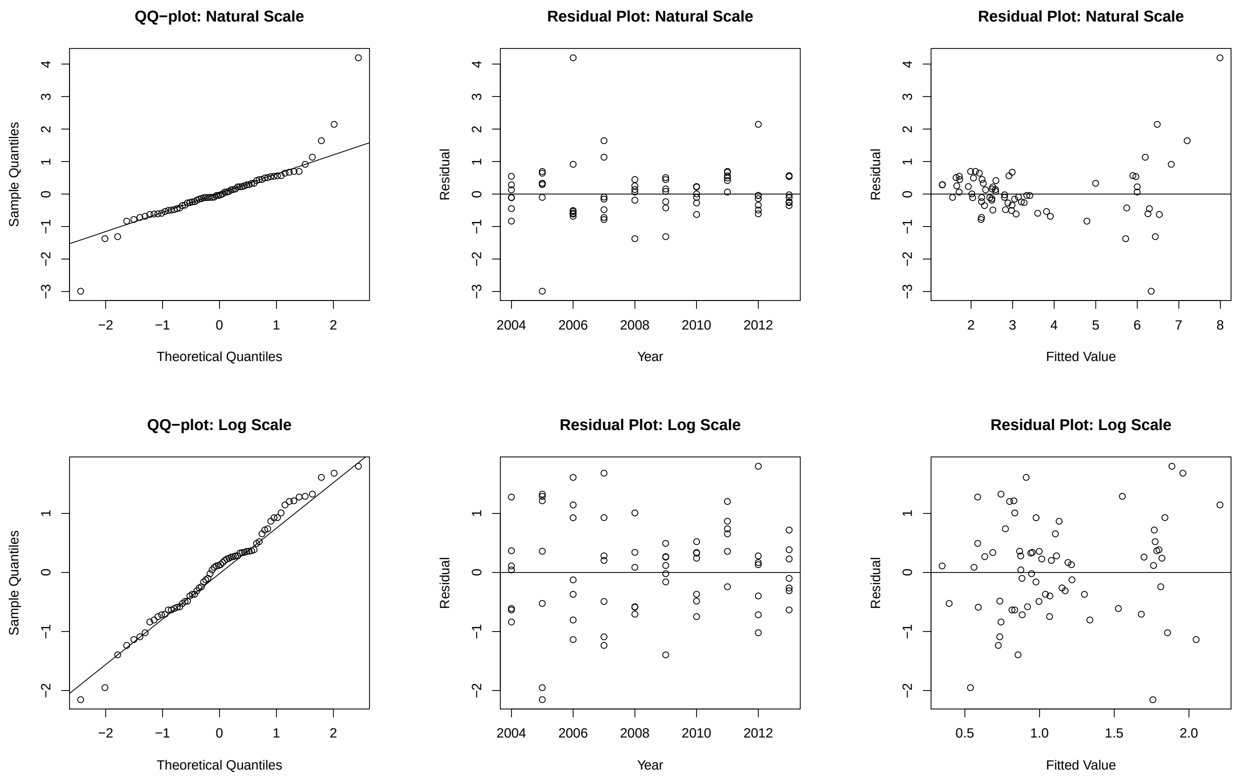






Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
13	1616-43 (KPSF)	2006	9.79	7.99	4.19

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
31.98	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
11.55	4.00	0.02

- Conclusions:
  The slopes differ significantly among reference lakes. Reference lakes do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  AIC results are in agreement with reference mode testing and reveal that the reference lakes are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	0.3967	2	0.8201
Cujo	5.4167	2	0.0666
LdS1	6.9095	2	0.0316
LdS2	5.8036	2	0.0549

- Conclusions:
  LdS1 and LdS2 show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored lake compared to slope of each reference lake (reference model 1b).

- Results:

	Chi-squared	DF	P-value
LdS1-vs-Nanuq	33.8250	3	0.0000
LdS1-vs-Counts	0.5312	3	0.9120
LdS1-vs-Vulture	14.9032	3	0.0019
LdS2-vs-Nanuq	40.6578	3	0.0000
LdS2-vs-Counts	1.6299	3	0.6526
LdS2-vs-Vulture	19.2955	3	0.0002

- Conclusions:
  LdS1 and LdS1 show significant deviation from the slopes of individual reference lakes.

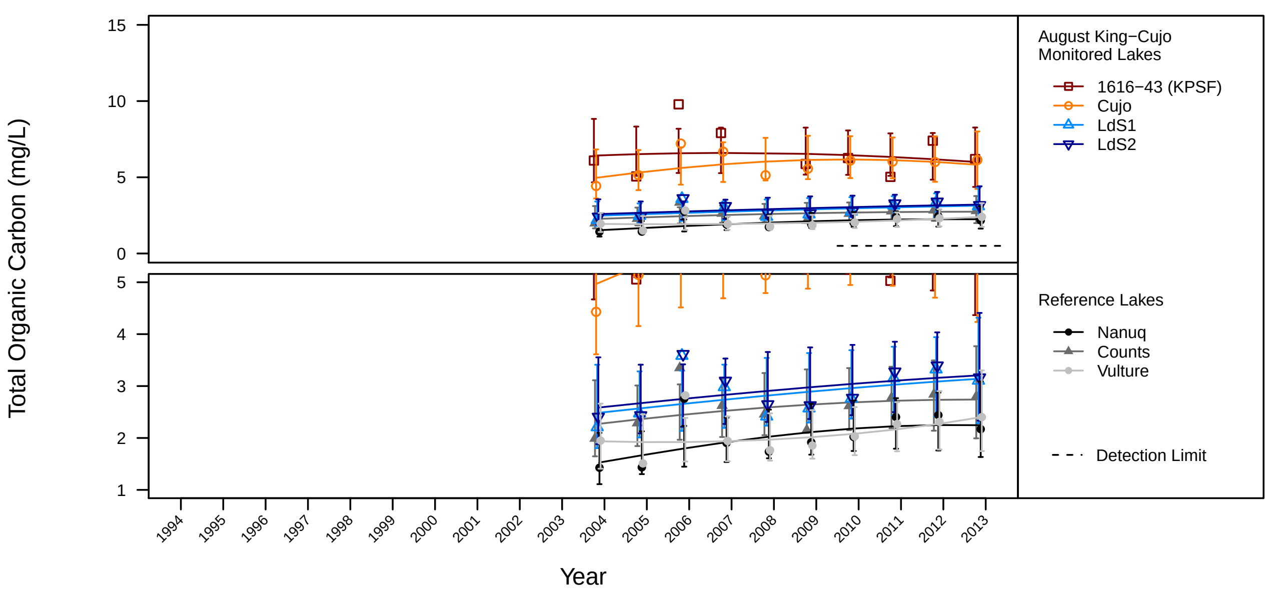
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Reference Lake	Counts	0.1940
Reference Lake	Nanuq	0.3900
Reference Lake	Vulture	0.1970
Monitored Lake	1616-43 (KPSF)	0.0250
Monitored Lake	Cujo	0.2560
Monitored Lake	LdS1	0.2610
Monitored Lake	LdS2	0.2580

- Conclusions:
  Model fit for Nanuq, Cujo, LdS1, and LdS2 is weak. Model fit for 1616-43 (KPSF), Counts, and Vulture lakes is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total organic carbon for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	6.20E+00	6.01E+00	9.77E-01	4.37E+00	8.26E+00	2.86E+00
Cujo	6.14E+00	5.82E+00	9.46E-01	4.24E+00	8.00E+00	2.77E+00
LdS2	3.16E+00	3.21E+00	5.21E-01	2.33E+00	4.41E+00	1.52E+00
LdS1	3.11E+00	3.14E+00	5.10E-01	2.28E+00	4.32E+00	1.49E+00
Nanuq	2.17E+00	2.25E+00	3.65E-01	1.63E+00	3.09E+00	
Counts	2.80E+00	2.74E+00	4.45E-01	1.99E+00	3.77E+00	
Vulture	2.40E+00	2.40E+00	3.90E-01	1.75E+00	3.30E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
TOC	August	King-Cujo	Lake	Water	none	log e	linear mixed effects regression	#1b separate intercepts & slopes	NA	LdS1 LdS2

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

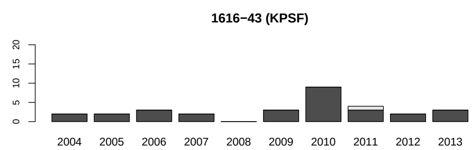
Analysis of August Total Organic Carbon in King-Cujo Watershed Streams

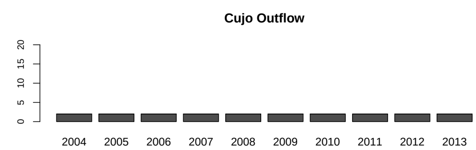
January 21, 2014

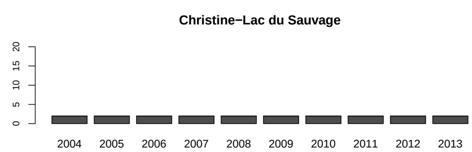
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

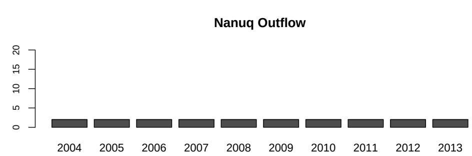
1.1 Monitored

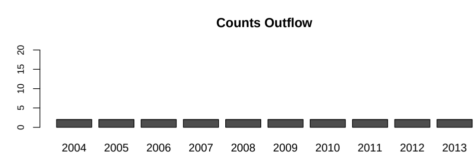


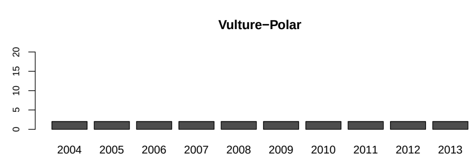




1.2 Reference

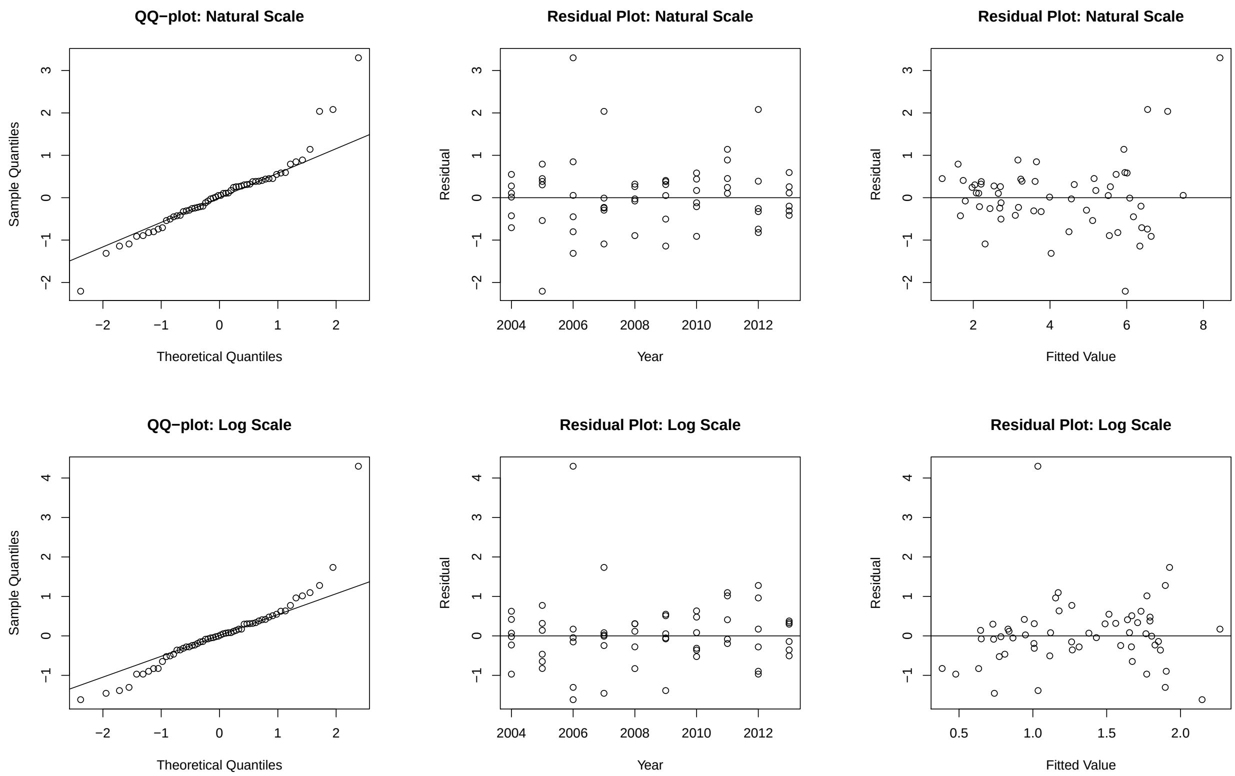






Comment:
None of the streams exhibited greater than 10% of data less than the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
13	1616-43 (KPSF)	2006	9.79	8.43	3.30

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
93	Nanuq Outflow	2006	4.00	1.03	4.30

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
14.62	6.00	0.02

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
3.84	4.00	0.43

- Conclusions:
  The slopes do not differ significantly among reference streams.

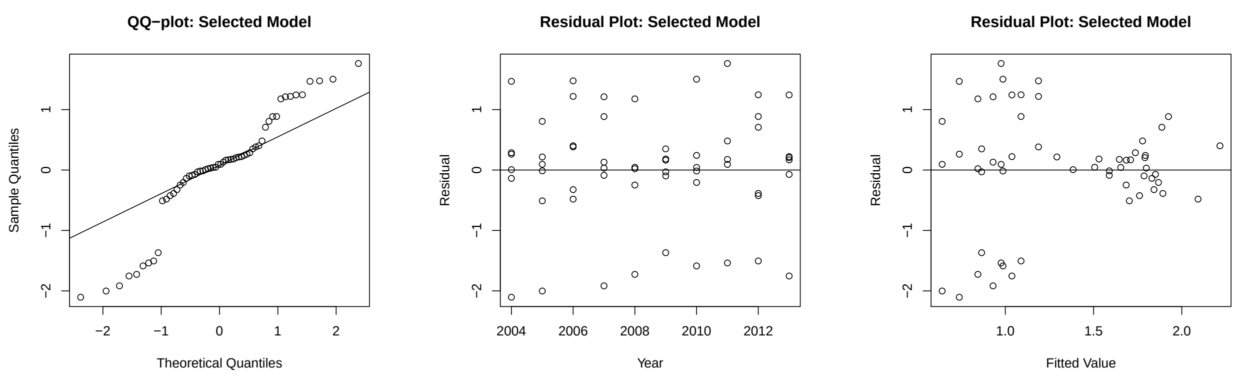
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference streams are best modeled using separate slopes and intercepts, contrasts suggest that reference streams share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference streams) to avoid defaulting to comparing trends in monitored streams against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference stream slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	0.8709	2	0.6470
Cujo Outflow	1.2100	2	0.5461
Christine-Lac du Sauvage	0.0230	2	0.9886

- Conclusions:
  No significant deviations were found when comparing monitored streams to reference streams.

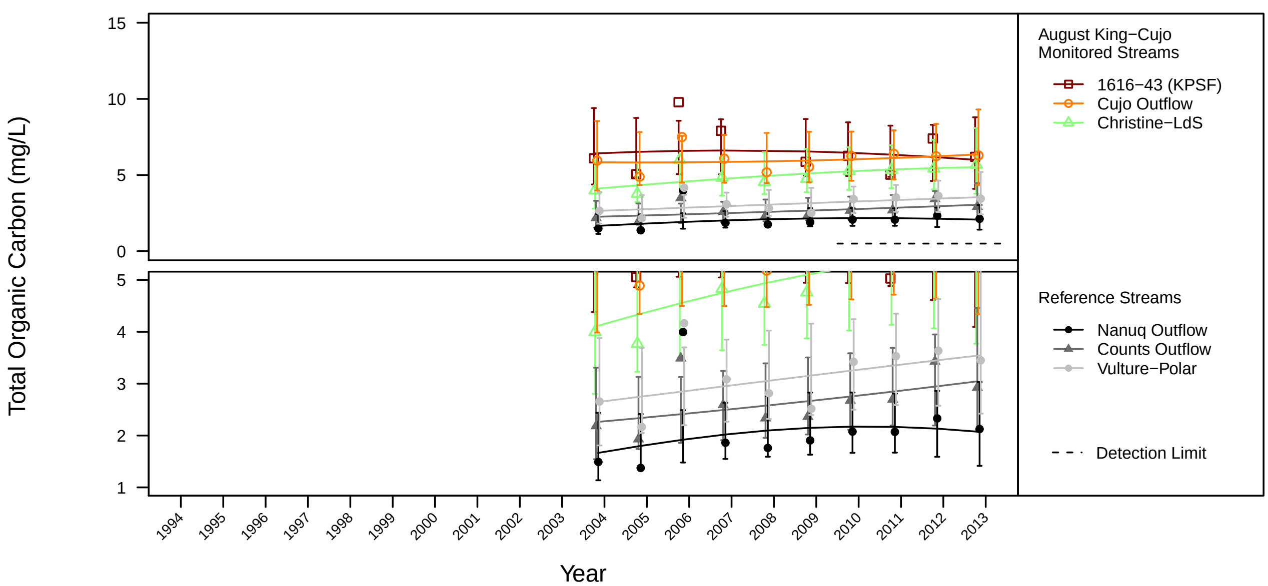
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.0980
Monitored Stream	1616-43 (KPSF)	0.0280
Monitored Stream	Christine-Lac du Sauvage	0.4630
Monitored Stream	Cujo Outflow	0.0650

- Conclusions:
  Model fit for Christine-Lac du Sauvage is weak. Model fit for reference lakes, 1616-43 (KPSF), and Cujo Outflow is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total organic carbon for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	6.20E+00	6.00E+00	1.17E+00	4.10E+00	8.79E+00	3.42E+00
Cujo Outflow	6.29E+00	6.36E+00	1.24E+00	4.34E+00	9.30E+00	3.62E+00
Christine-Lac du Sauvage	5.68E+00	5.52E+00	1.07E+00	3.77E+00	8.08E+00	3.14E+00
Nanuq Outflow	2.12E+00	2.07E+00	4.03E-01	1.41E+00	3.03E+00	
Counts Outflow	2.92E+00	3.04E+00	5.92E-01	2.08E+00	4.46E+00	
Vulture-Polar	3.45E+00	3.55E+00	6.90E-01	2.42E+00	5.19E+00	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
TOC	August	King-Cujo	Stream	Water	none	log e	linear mixed effects regression	#2 shared slopes	NA	none

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

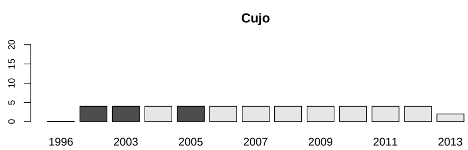
Analysis of April Total Antimony in Lakes of the King-Cujo Watershed and Lac du Sauvage

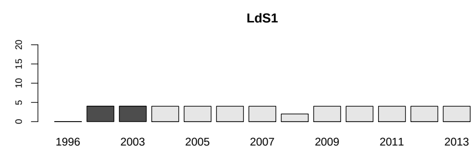
January 12, 2014

1 Censored Values:

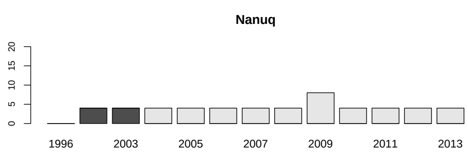
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

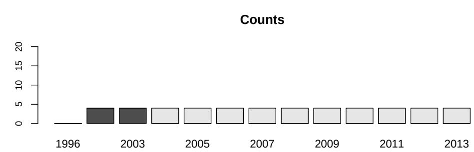
1.1 Monitored

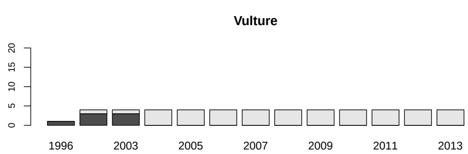




1.2 Reference

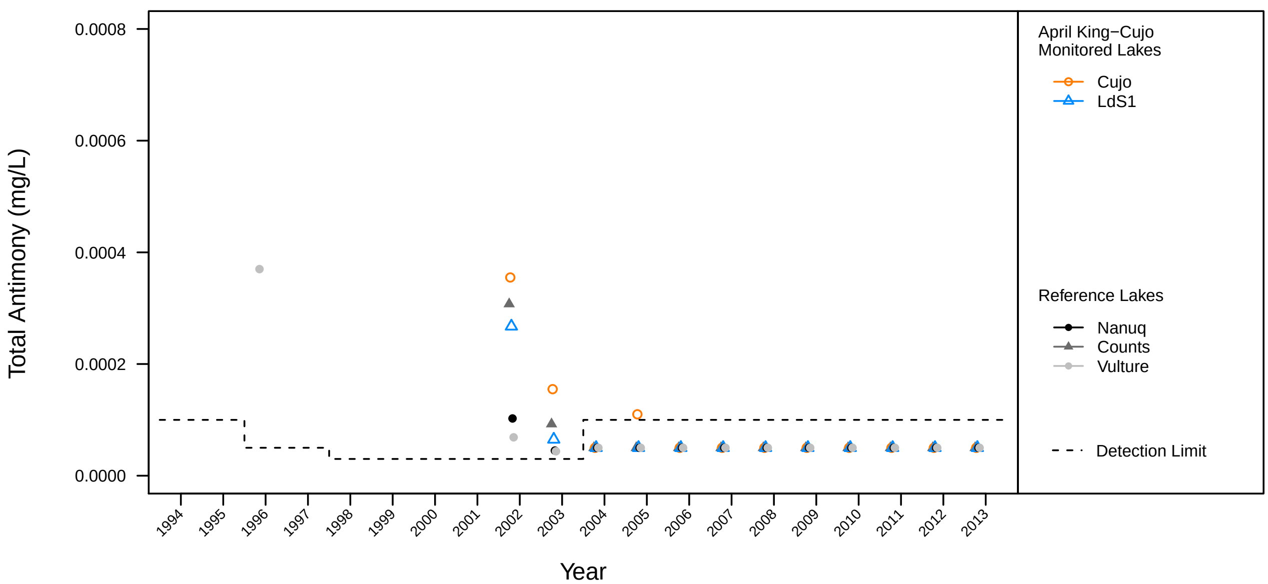






Comment:
Greater than 60% of data in all lakes was less than the detection limit. All lakes were excluded from further analyses. Tests not performed. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

3 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Antimony	April	King-Cujo	Lake	Water	all	NA	NA	NA	0.02	NA

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

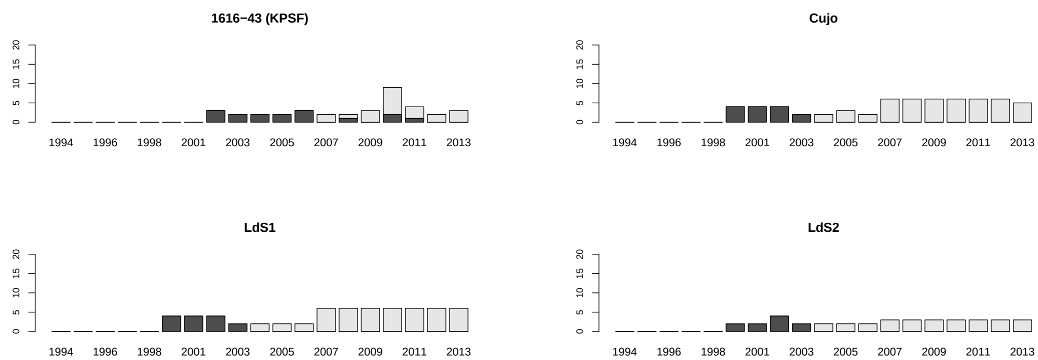
Analysis of August Total Antimony in Lakes of the King-Cujo Watershed and Lac du Sauvage

January 12, 2014

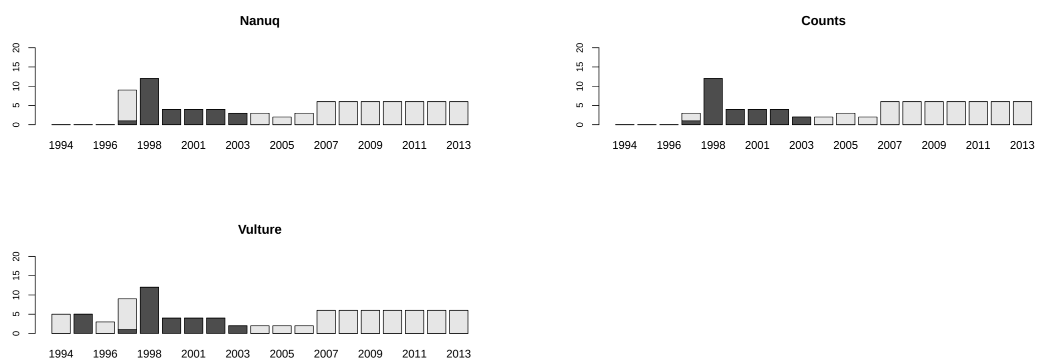
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored



1.2 Reference



Comment:
Greater than 60% of data in all reference and monitored lakes except 1616-43 (KPSF) was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in 1616-43 (KPSF) was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

3 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	10.2916	2	0.0058

- Conclusions:
  1616-43 (KPSF) shows significant deviation from a constant slope of zero.

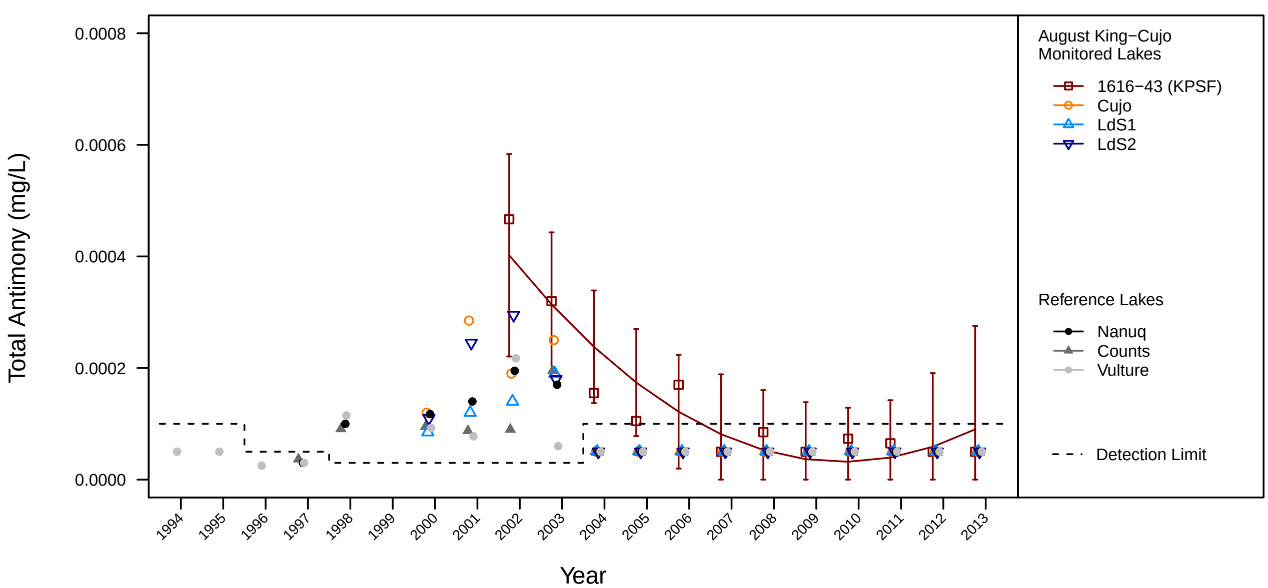
4 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	1616-43 (KPSF)	0.8690

- Conclusions:
  Model provides a good fit for 1616-43 (KPSF).

5 Observed and Fitted Values



Note: The yearly observed mean for lakes are represented by symbols only.

6 Minimum Detectable Differences

The estimated minimum detectable difference in mean total antimony for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	5e-05	9e-05	9.46e-05	0e+00	2.75e-04	2.77e-04
Cujo	5e-05	NA	NA	NA	NA	NA
LdS2	5e-05	NA	NA	NA	NA	NA
LdS1	5e-05	NA	NA	NA	NA	NA
Nanuq	5e-05	NA	NA	NA	NA	NA
Counts	5e-05	NA	NA	NA	NA	NA
Vulture	5e-05	NA	NA	NA	NA	NA

Not performed, all reference lakes removed from analysis.

7 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Antimony	August	King-Cujo	Lake	Water	Counts Nanuq Vulture Cujo LdS1 LdS2	none	Tobit regression	#1a slope of zero	0.02	1616-43 (KPSF)

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

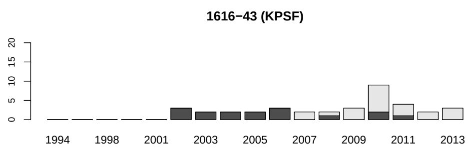
Analysis of August Total Antimony in King-Cujo Watershed Streams

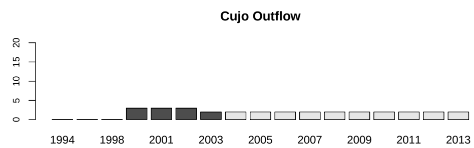
January 12, 2014

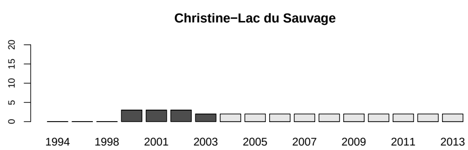
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

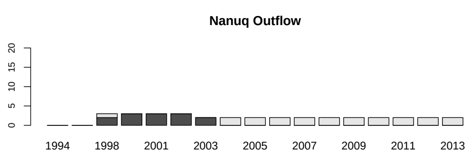
1.1 Monitored

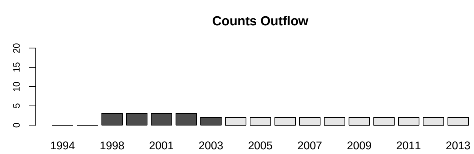


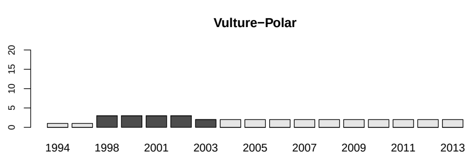




1.2 Reference

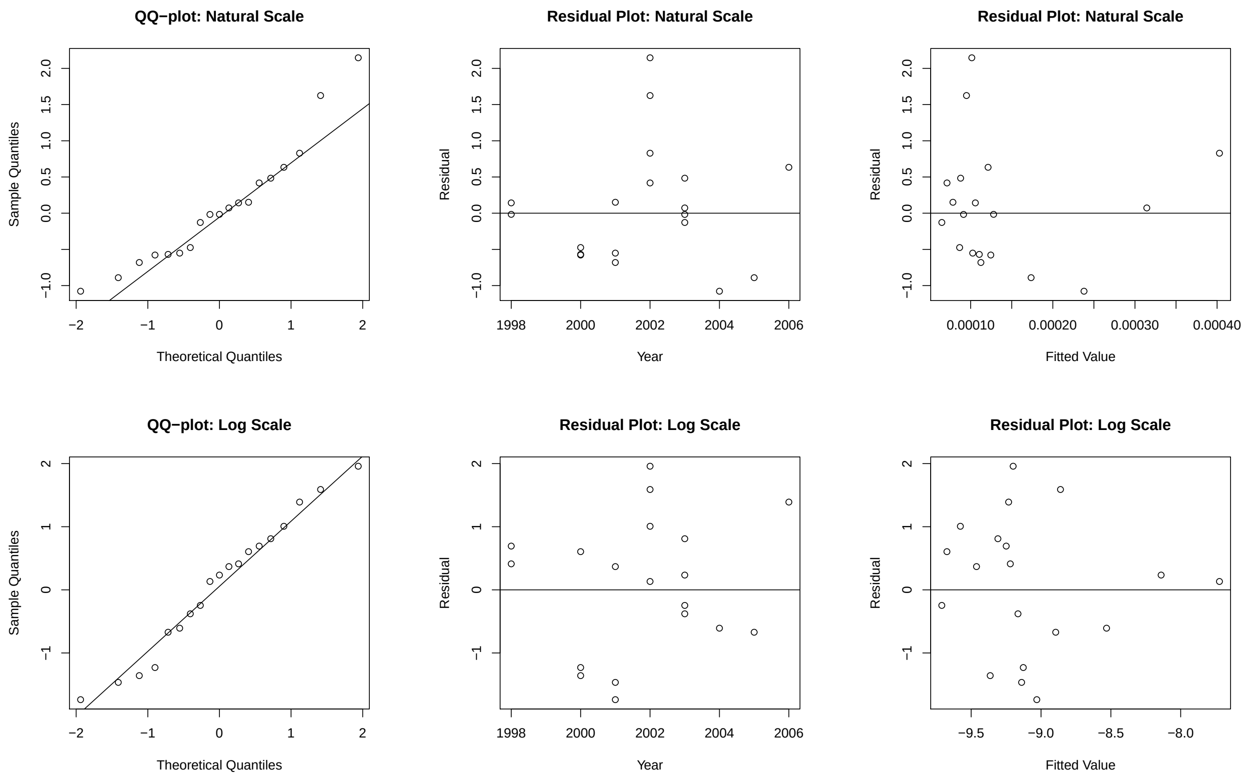






Comment:
Greater than 60% of data in Nanuq Outflow, Cujo Outflow, and Christine-Lac du Sauvage was less than the detection limit. These streams were excluded from further analyses. 10-60% of data in Counts Outflow, Vulture-Polar, and 1616-43 (KPSF) was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
1.71	3.00	0.63

- Conclusions:
  The slopes and intercepts do not differ significantly among reference streams.

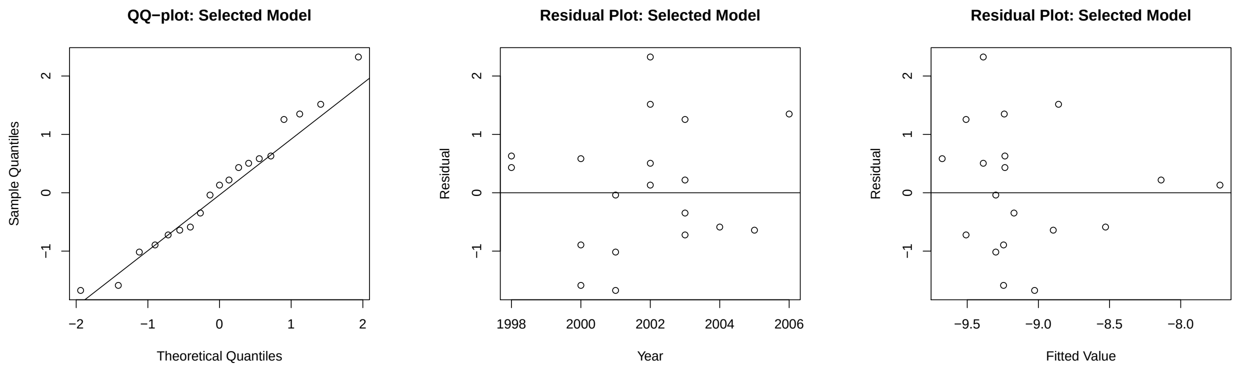
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.083	0.185	0.731	Ref. Model 3

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference stream slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Streams

Fitted model of the slope and intercept of each monitored stream compared to a common slope and intercept fitted for all reference streams together (reference model 3).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	24.9330	3	0.0000
Christine-Lac du Sauvage	3.4448	3	0.3280

- Conclusions:
  1616-43 (KPSF) shows significant deviation from the common slope of reference streams.

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	1.4901	2	0.4747
Christine-Lac du Sauvage	3.1004	2	0.2122

- Conclusions:
  When allowing for differences in intercept, no significant deviations were found when comparing monitored to the common slope of reference streams.

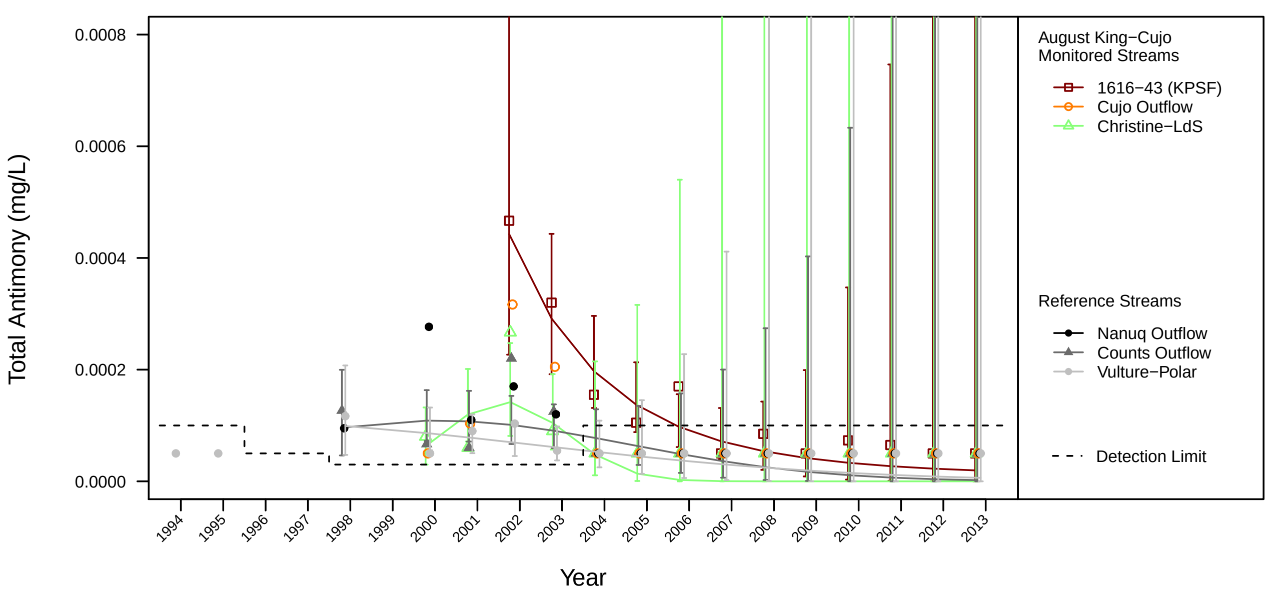
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.5470
Monitored Stream	1616-43 (KPSF)	0.7590
Monitored Stream	Christine-Lac du Sauvage	0.5050

- Conclusions:
  Models provide a good fit for all reference and monitored streams.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total antimony for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	5e-05	1.96e-05	5.78e-05	6.05e-08	6.35e-03	1.69e-04
Cujo Outflow	5e-05	NA	NA	NA	NA	NA
Christine-Lac du Sauvage	5e-05	2.40e-17	4.64e-16	8.16e-34	7.06e-01	1.36e-15
Nanuq Outflow	5e-05	NA	NA	NA	NA	NA
Counts Outflow	5e-05	2.09e-06	7.95e-06	1.19e-09	3.65e-03	NA
Vulture-Polar	5e-05	6.18e-06	3.32e-05	1.65e-10	2.31e-01	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Antimony	August	King-Cujo	Stream	Water	Nanuq Outflow Cujo Outflow Christine-Lac du Sauvage	log e	Tobit regression	#3 shared intercept & slope	0.02	1616-43 (KPSF)

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

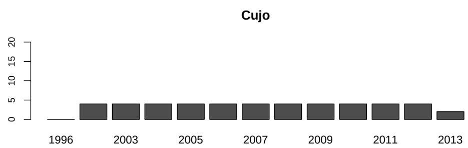
Analysis of April Total Arsenic in Lakes of the King-Cujo Watershed and Lac du Sauvage

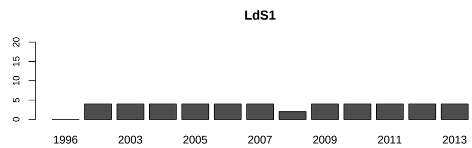
January 21, 2014

1 Censored Values:

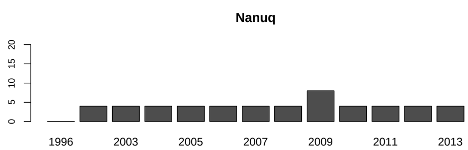
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

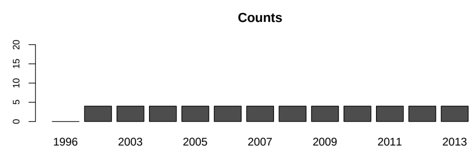
1.1 Monitored

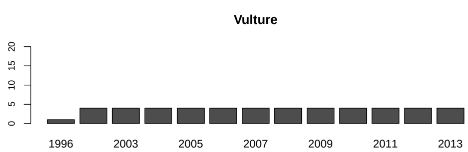




1.2 Reference

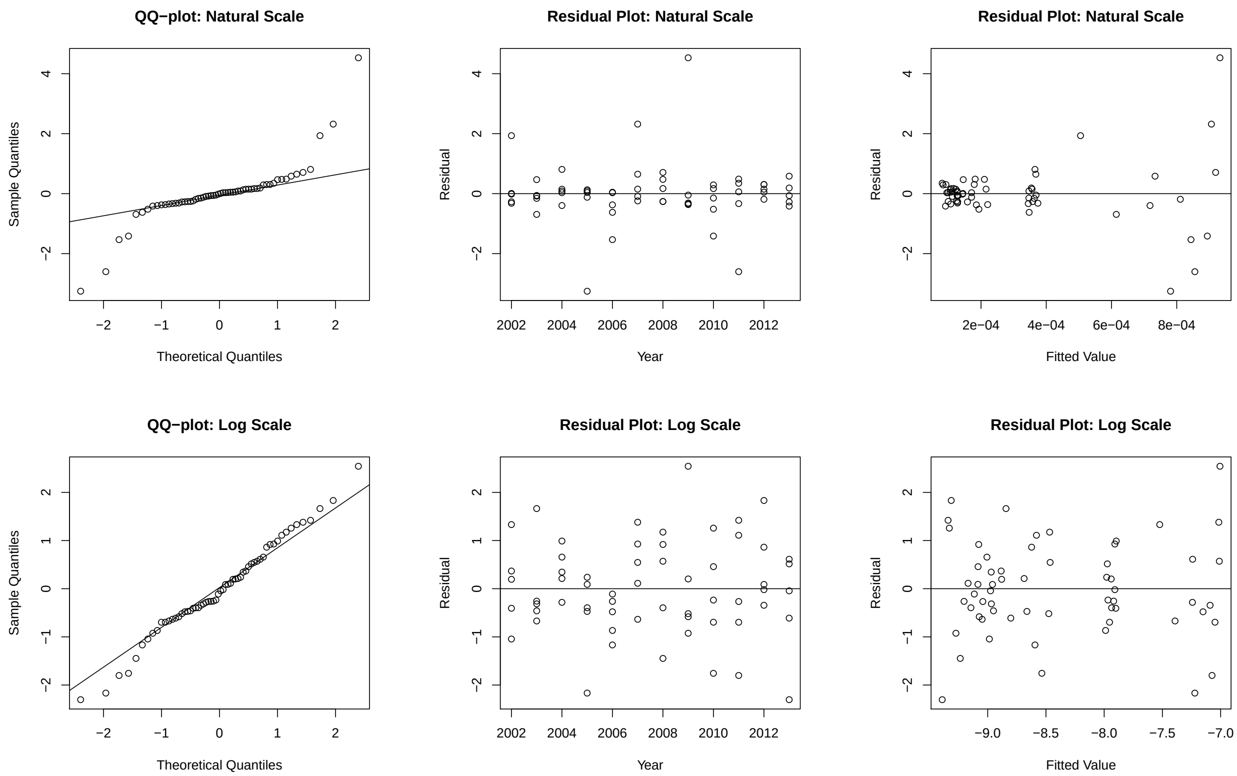






Comment:
None of the lakes exhibited greater than 10% of data was less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
52	Cujo	2005	0.00	0.00	-3.25
56	Cujo	2009	0.00	0.00	4.53

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	8.02E-197	natural model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
20620.61	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
16.41	4.00	0.00

- Conclusions:
  The slopes differ significantly among reference lakes. Reference lakes do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  AIC results are in agreement with reference mode testing and reveal that the reference lakes are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Cujo	16.36	2.00	0.00
LdS1	0.07	2.00	0.96

- Conclusions:
  Cujo Lake shows significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored lake compared to slope of each reference lake (reference model 1b).

- Results:

	Chi-squared	DF	P-value
Cujo-vs-Nanuq	4.5412	3	0.2086
Cujo-vs-Counts	7398.0994	3	0.0000
Cujo-vs-Vulture	1357.9374	3	0.0000

- Conclusions:
  Cujo Lake shows significant deviations from the slopes of individual reference lakes.

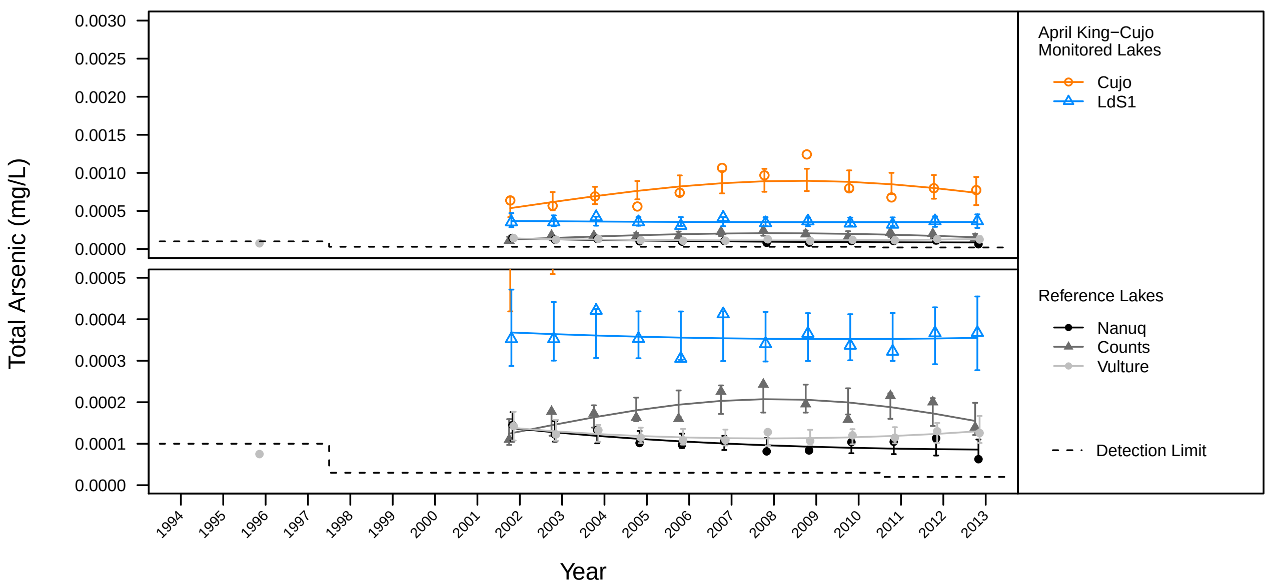
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Reference Lake	Counts	0.5310
Reference Lake	Nanuq	0.4850
Reference Lake	Vulture	0.5260
Monitored Lake	Cujo	0.4360
Monitored Lake	LdS1	0.0250

- Conclusions:
  Model fit for Nanuq and Cujo lakes is weak. Model fit for LdS1 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total arsenic for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	7.73e-04	7.38e-04	9.33e-05	5.76e-04	9.46e-04	2.73e-04
LdS1	3.67e-04	3.55e-04	4.49e-05	2.77e-04	4.55e-04	1.31e-04
Nanuq	6.28e-05	8.60e-05	1.09e-05	6.71e-05	1.10e-04	NA
Counts	1.40e-04	1.55e-04	1.96e-05	1.21e-04	1.99e-04	NA
Vulture	1.26e-04	1.30e-04	1.65e-05	1.02e-04	1.67e-04	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Arsenic	April	King-Cujo	Lake	Water	none	log e	linear mixed effects regression	#1b separate intercepts & slopes	0.005	Cujo

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

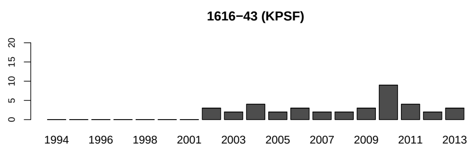
Analysis of August Total Arsenic in Lakes of the King-Cujo Watershed and Lac du Sauvage

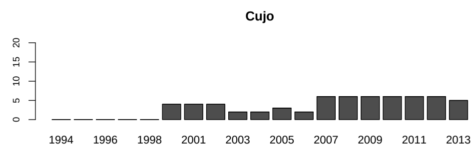
January 18, 2014

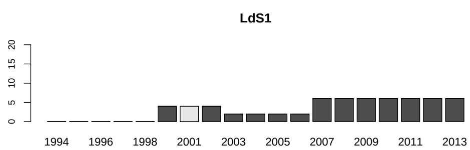
1 Censored Values:

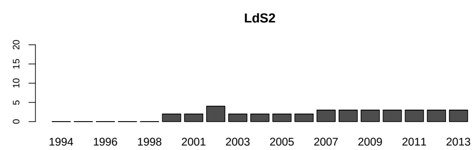
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

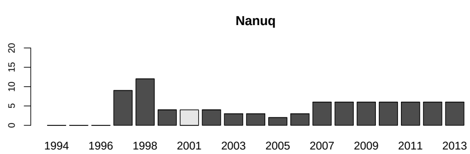


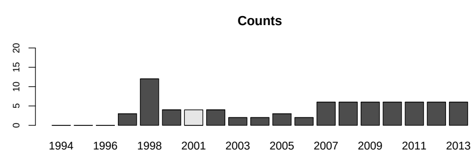


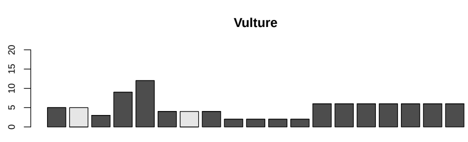




1.2 Reference

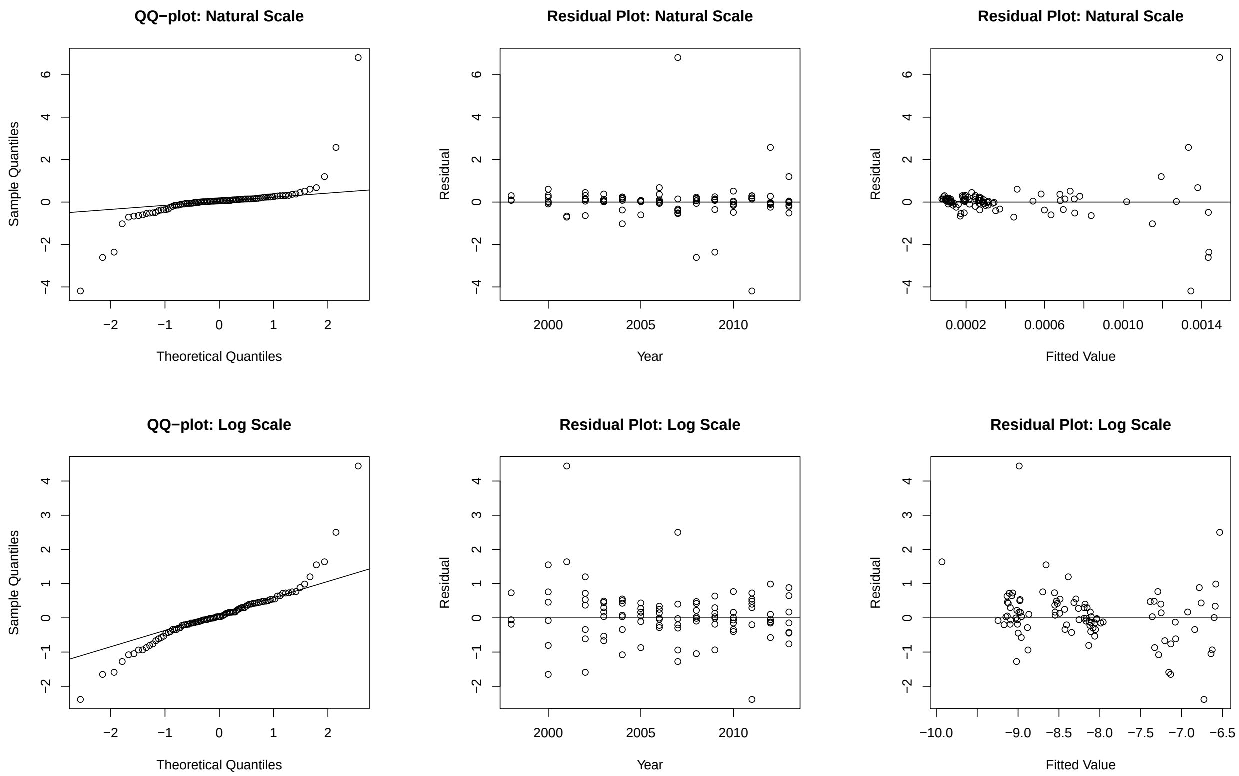






Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
14	1616-43 (KPSF)	2007	0.00	0.00	6.81
18	1616-43 (KPSF)	2011	0.00	0.00	-4.19

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
48	Cujo	2001	0.00	-8.99	4.44

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
64.88	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
0.93	4.00	0.92

- Conclusions:
  The slopes do not differ significantly among reference lakes.

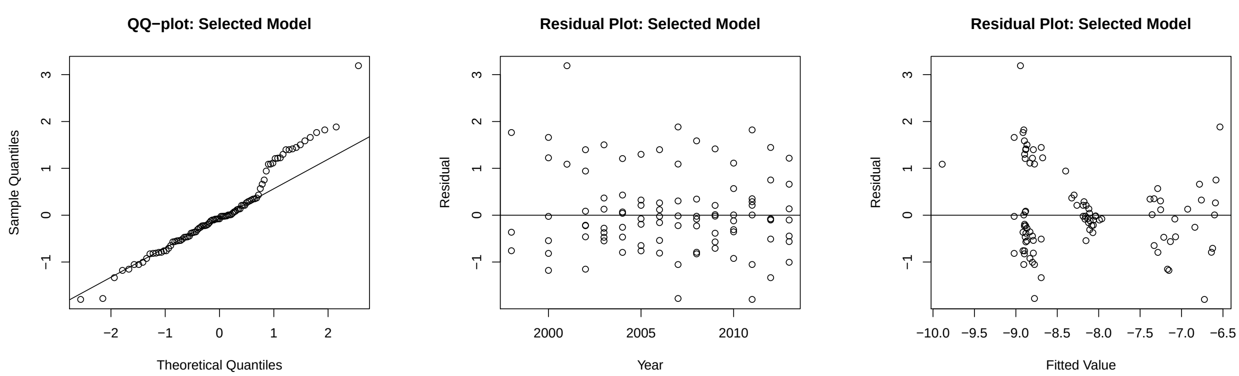
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
48	Cujo	2001	0.00	-8.94	3.19

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	0.4995	2	0.7790
Cujo	1.2974	2	0.5227
LdS1	1.7207	2	0.4230
LdS2	0.2432	2	0.8855

- Conclusions:
  No significant deviations were found when comparing monitored lakes to reference lakes.

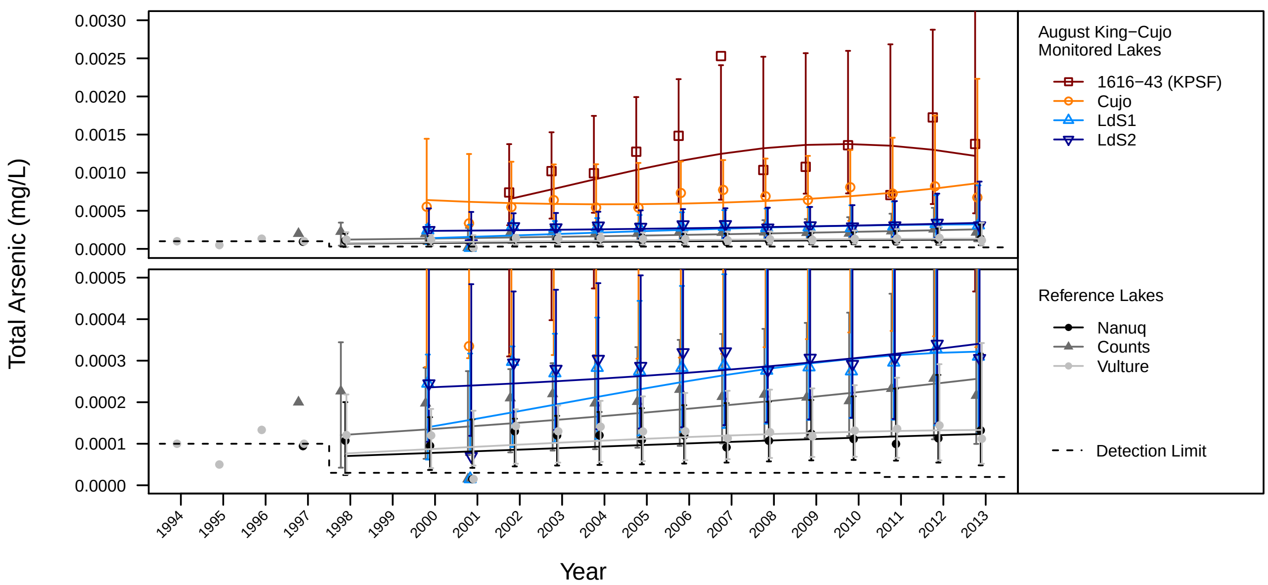
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0830
Monitored Lake	1616-43 (KPSF)	0.3500
Monitored Lake	Cujo	0.2560
Monitored Lake	LdS1	0.1430
Monitored Lake	LdS2	0.1140

- Conclusions:
  Model fit for 1616-43 (KPSF) and Cujo Lake is weak. Model fit for reference lakes, LdS1, and LdS2 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total arsenic for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	1.38e-03	1.22e-03	5.98e-04	4.67e-04	3.19e-03	1.75e-03
Cujo	6.75e-04	8.61e-04	4.18e-04	3.33e-04	2.23e-03	1.22e-03
LdS2	3.06e-04	3.41e-04	1.66e-04	1.32e-04	8.83e-04	4.84e-04
LdS1	3.10e-04	3.22e-04	1.56e-04	1.24e-04	8.34e-04	4.57e-04
Nanuq	1.32e-04	1.23e-04	5.94e-05	4.80e-05	3.17e-04	NA
Counts	2.16e-04	2.56e-04	1.23e-04	9.96e-05	6.58e-04	NA
Vulture	1.12e-04	1.33e-04	6.42e-05	5.19e-05	3.43e-04	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Arsenic	August	King-Cujo	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	0.005	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

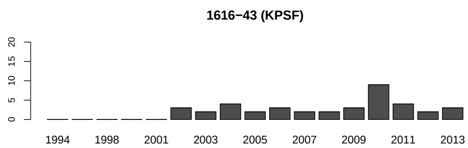
Analysis of August Total Arsenic in King-Cujo Watershed Streams

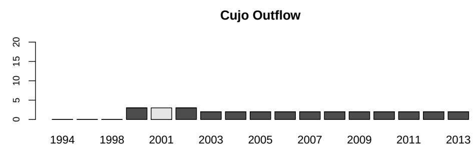
January 12, 2014

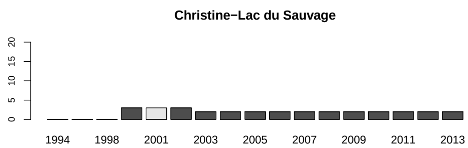
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

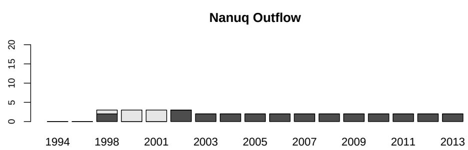
1.1 Monitored

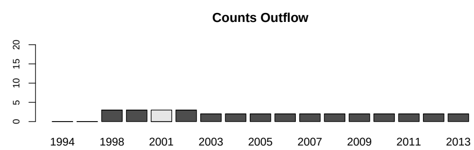


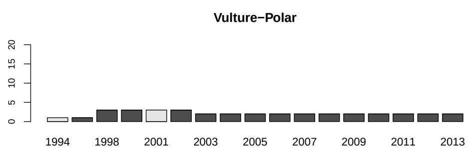




1.2 Reference

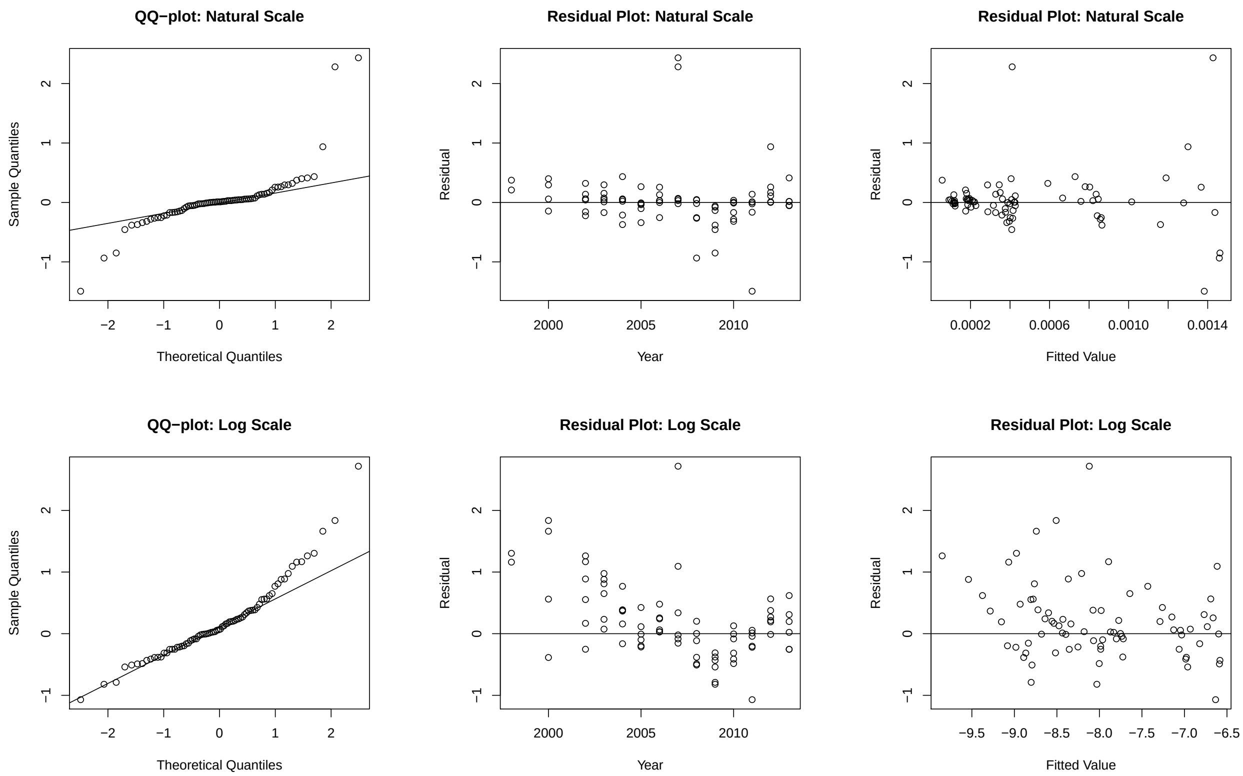






Comment:
10-60% of data in Nanuq Outflow was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The natural model best meets the assumptions of normality and equal variance. AIC also reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
2.19	6.00	0.90

- Conclusions:
  The slopes and intercepts do not differ significantly among reference streams.

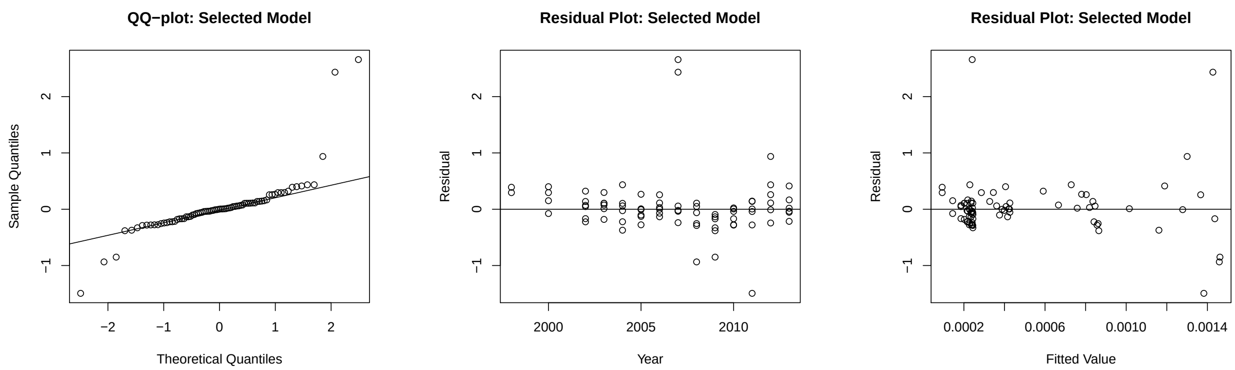
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.006	0.253	0.741	Ref. Model 3

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference stream slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Streams

Fitted model of the slope and intercept of each monitored stream compared to a common slope and intercept fitted for all reference streams together (reference model 3).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	49.8545	3	0.0000
Cujo Outflow	14.4777	3	0.0023
Christine-Lac du Sauvage	1.3890	3	0.7081

- Conclusions:
  All monitored streams except Christine-Lac du Sauvage show significant deviation from the common slope and intercept of reference streams.

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	1.5693	2	0.4563
Cujo Outflow	0.6953	2	0.7063
Christine-Lac du Sauvage	0.0237	2	0.9882

- Conclusions:
When allowing for differences in intercept, no significant deviations were found when comparing monitored to the common slope of reference streams.

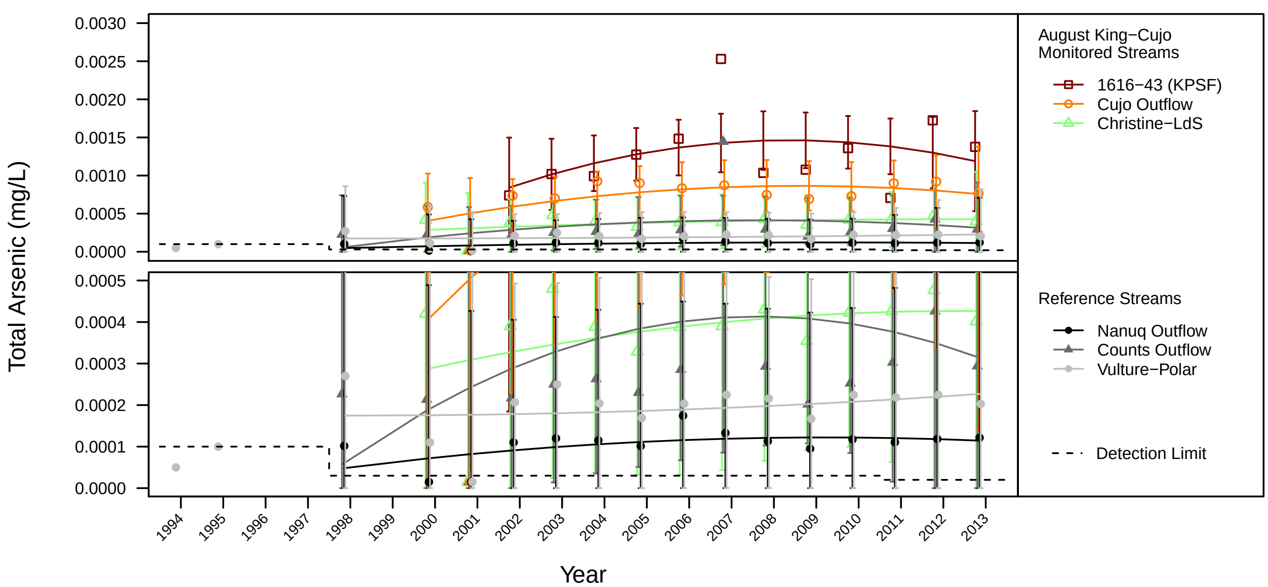
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.0430
Monitored Stream	1616-43 (KPSF)	0.1540
Monitored Stream	Christine-Lac du Sauvage	0.1750
Monitored Stream	Cujo Outflow	0.3900

- Conclusions:
Model fit for Cujo Outflow is weak. Model fit for reference streams, 1616-43 (KPSF), and Christine-Lac du Sauvage is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total arsenic for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	1.38e-03	1.19e-03	3.35e-04	5.33e-04	1.85e-03	9.80e-04
Cujo Outflow	7.67e-04	7.59e-04	3.17e-04	1.38e-04	1.38e-03	9.27e-04
Christine-Lac du Sauvage	4.02e-04	4.27e-04	3.17e-04	0.00e+00	1.05e-03	9.27e-04
Nanuq Outflow	1.21e-04	1.14e-04	3.02e-04	0.00e+00	7.07e-04	NA
Counts Outflow	2.94e-04	3.16e-04	3.02e-04	0.00e+00	9.09e-04	NA
Vulture-Polar	2.03e-04	2.27e-04	3.02e-04	0.00e+00	8.20e-04	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Arsenic	August	King-Cujo	Stream	Water	none	none	Tobit regression	#3 shared intercept & slope	0.005	1616-43 (KPSF) Cujo Outflow

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

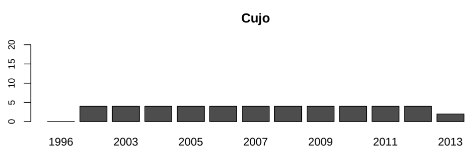
Analysis of April Total Barium in Lakes of the King-Cujo Watershed and Lac du Sauvage

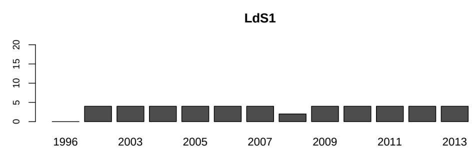
January 18, 2014

1 Censored Values:

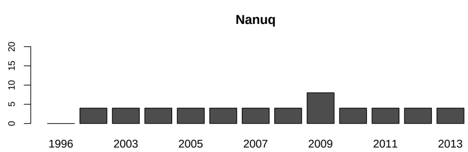
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

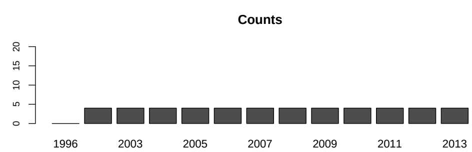
1.1 Monitored

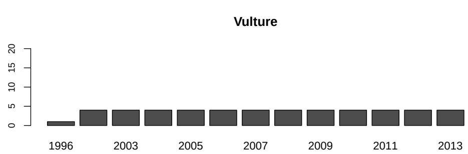




1.2 Reference

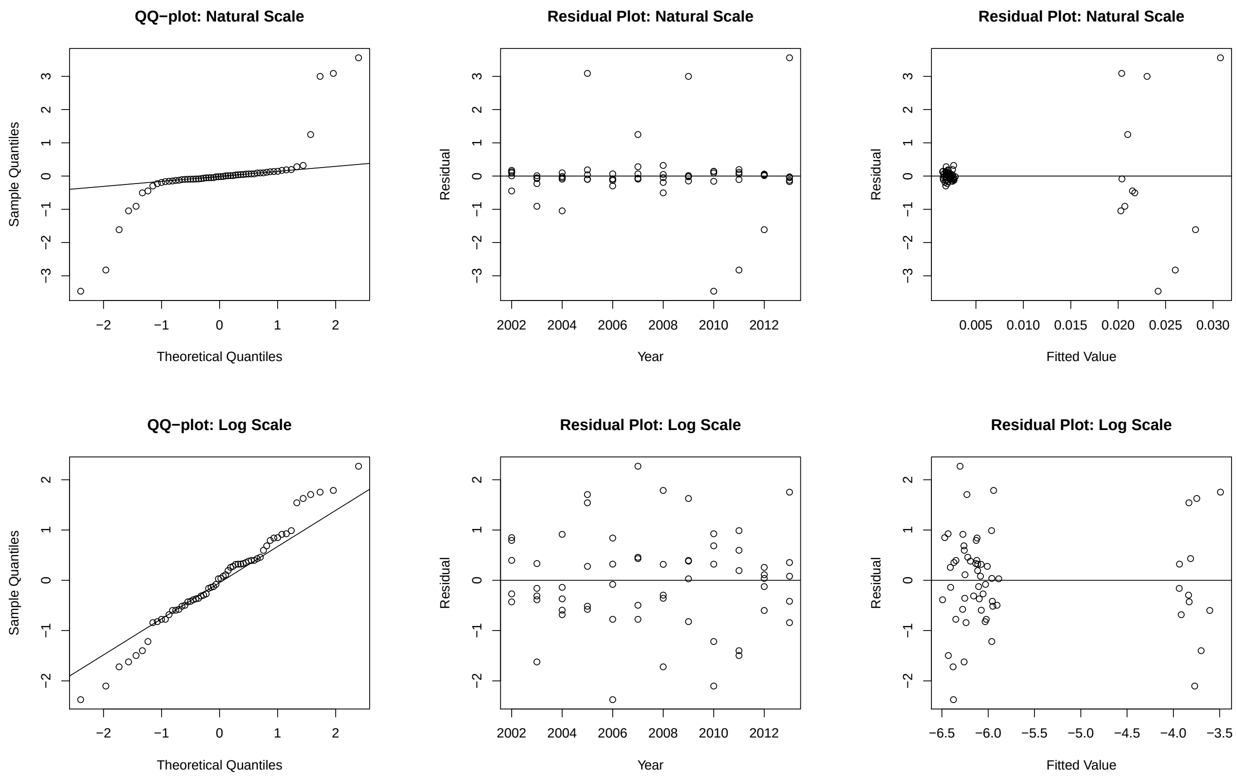






Comment:
None of the lakes exhibited greater than 10% of data was less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
52	Cujo	2005	0.03	0.02	3.09
57	Cujo	2010	0.02	0.02	-3.46
60	Cujo	2013	0.04	0.03	3.56

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	9.70E-111	natural model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
10445.58	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
4.21	4.00	0.38

- Conclusions:
  The slopes do not differ significantly among reference lakes.

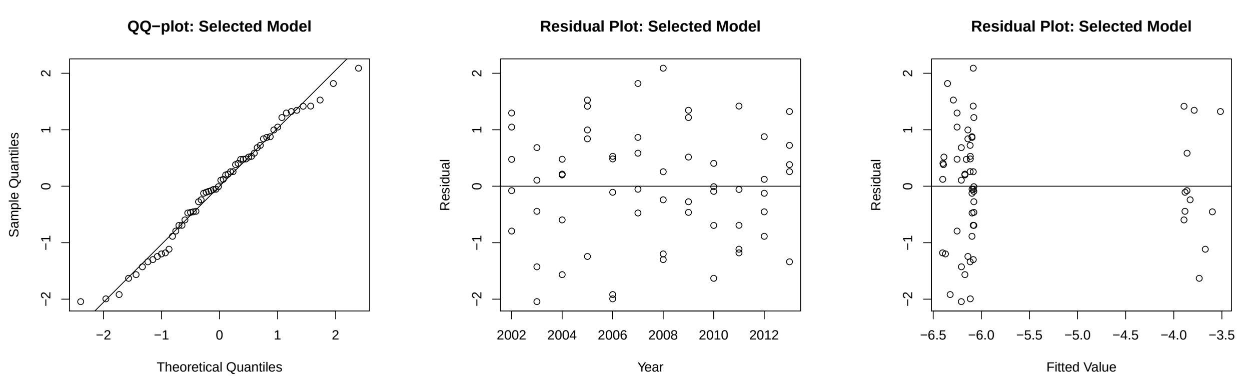
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Cujo	2.46	2.00	0.29
LdS1	3.59	2.00	0.17

- Conclusions:
  No significant deviations were found when comparing monitored lakes to reference lakes.

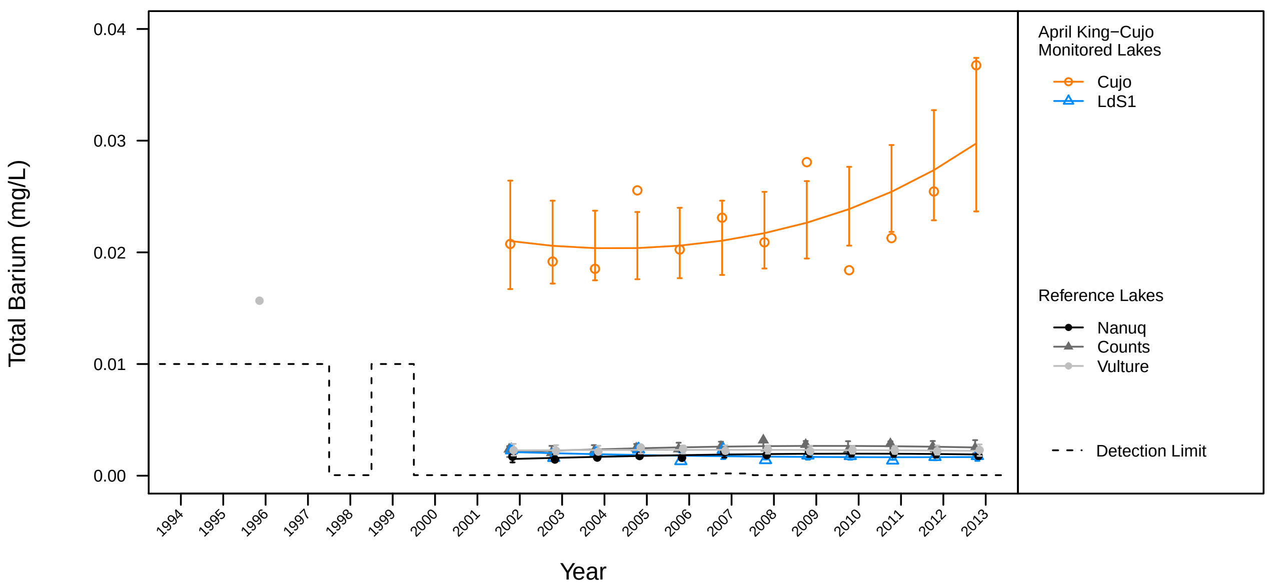
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.1070
Monitored Lake	Cujo	0.3980
Monitored Lake	LdS1	0.1670

- Conclusions:
  Model fit for Cujo Lake is weak. Model fit for reference lakes and LdS1 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total barium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	3.68e-02	2.98e-02	3.48e-03	2.37e-02	3.74e-02	1.02e-02
LdS1	1.78e-03	1.67e-03	1.95e-04	1.33e-03	2.10e-03	5.72e-04
Nanuq	1.78e-03	1.91e-03	2.23e-04	1.52e-03	2.40e-03	NA
Counts	2.48e-03	2.53e-03	2.96e-04	2.01e-03	3.18e-03	NA
Vulture	2.30e-03	2.23e-03	2.60e-04	1.77e-03	2.80e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Barium	April	King-Cujo	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	1	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

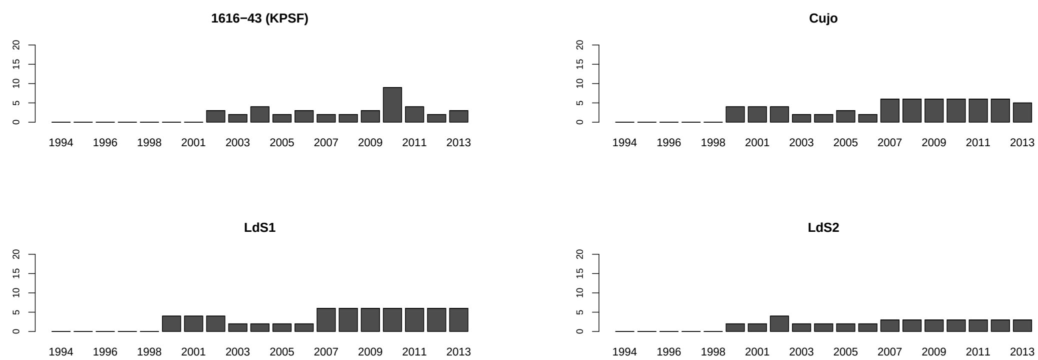
Analysis of August Total Barium in Lakes of the King-Cujo Watershed and Lac du Sauvage

January 18, 2014

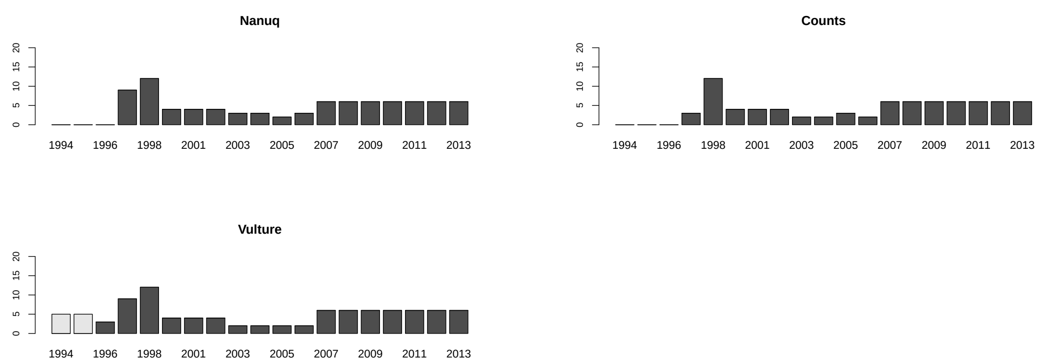
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

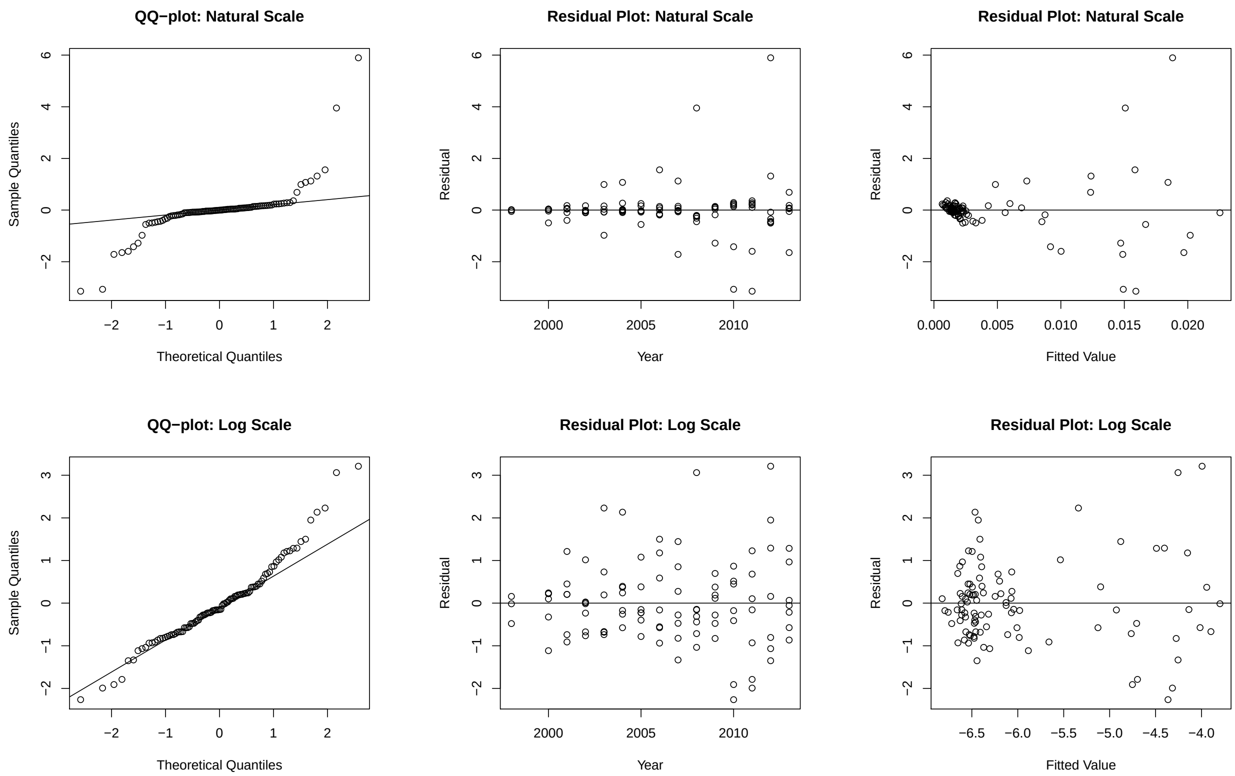


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
15	1616-43 (KPSF)	2008	0.02	0.02	3.95
17	1616-43 (KPSF)	2010	0.01	0.01	-3.07
18	1616-43 (KPSF)	2011	0.01	0.02	-3.14
19	1616-43 (KPSF)	2012	0.03	0.02	5.90

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
15	1616-43 (KPSF)	2008	0.02	-4.26	3.06
19	1616-43 (KPSF)	2012	0.03	-3.99	3.21

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
65.04	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
0.28	4.00	0.99

- Conclusions:
  The slopes do not differ significantly among reference lakes.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	1.9938	2	0.3690
Cujo	44.9410	2	0.0000
LdS1	1.6982	2	0.4278
LdS2	0.1423	2	0.9313

- Conclusions:
  Cujo Lake shows significant deviation from the common slope of reference lakes.

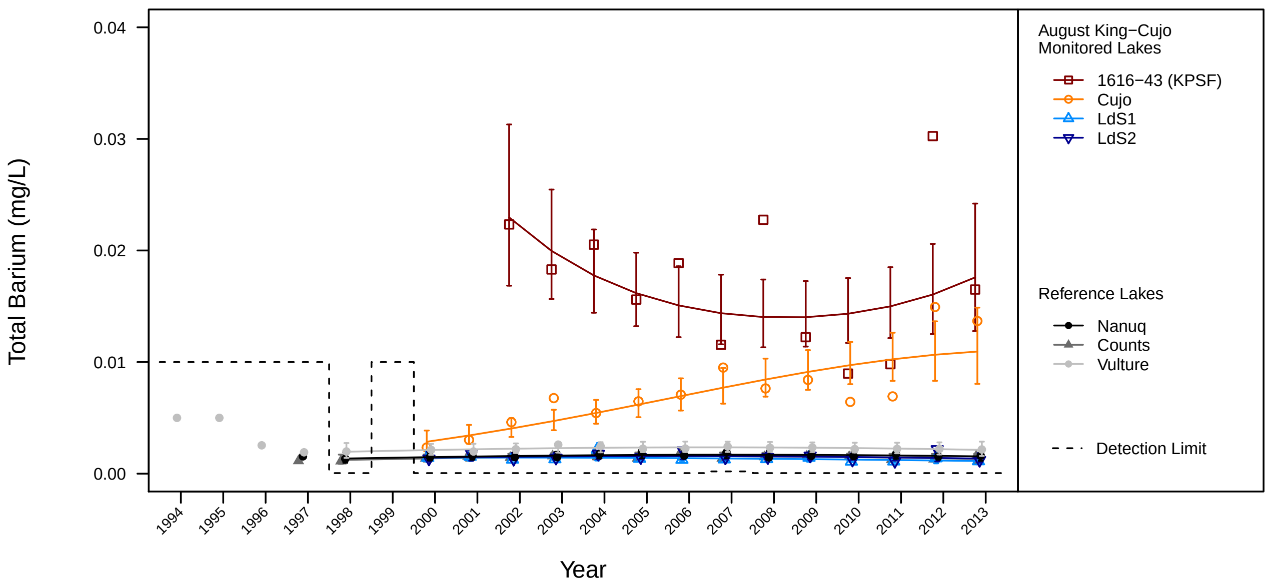
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0780
Monitored Lake	1616-43 (KPSF)	0.1940
Monitored Lake	Cujo	0.7700
Monitored Lake	LdS1	0.2350
Monitored Lake	LdS2	0.0520

- Conclusions:
Model fit for LdS1 is weak. Model fit for reference lakes, 1616-43 (KPSF), and LdS2 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total barium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	1.65e-02	1.76e-02	2.87e-03	1.28e-02	2.42e-02	8.39e-03
Cujo	1.37e-02	1.09e-02	1.72e-03	8.05e-03	1.49e-02	5.02e-03
LdS2	1.21e-03	1.35e-03	2.12e-04	9.95e-04	1.84e-03	6.21e-04
LdS1	1.13e-03	1.13e-03	1.78e-04	8.34e-04	1.54e-03	5.21e-04
Nanuq	1.60e-03	1.55e-03	2.35e-04	1.15e-03	2.08e-03	NA
Counts	1.58e-03	1.32e-03	2.01e-04	9.83e-04	1.78e-03	NA
Vulture	2.17e-03	2.13e-03	3.24e-04	1.58e-03	2.87e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Barium	August	King-Cujo	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	1	Cujo

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

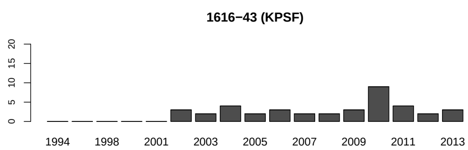
Analysis of August Total Barium in King-Cujo Watershed Streams

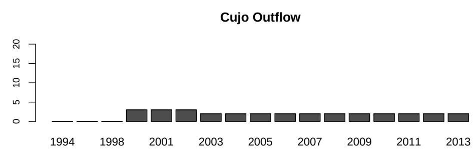
January 18, 2014

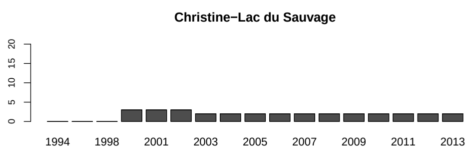
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

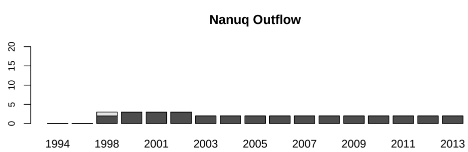
1.1 Monitored

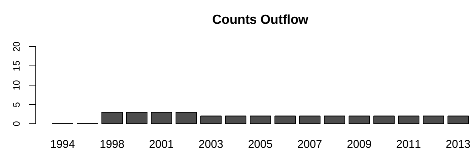


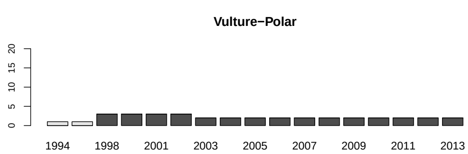




1.2 Reference

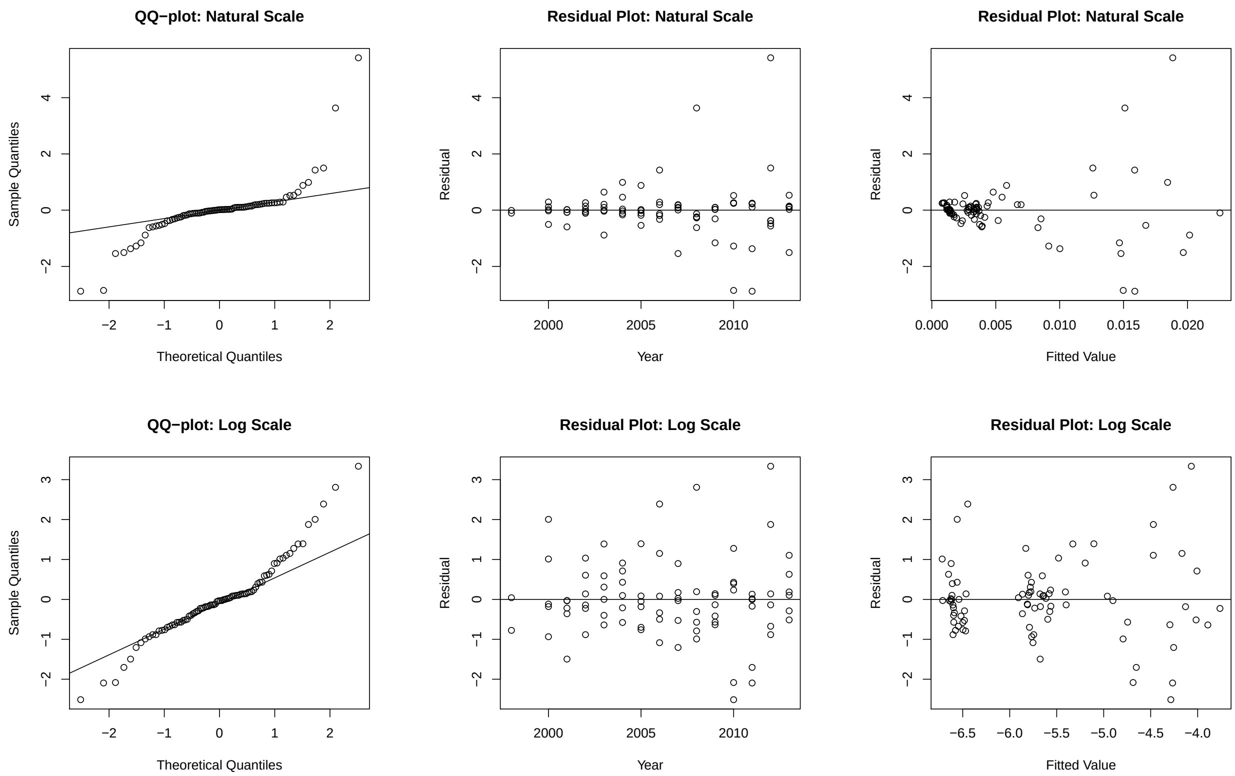






Comment:
None of the streams exhibited greater than 10% of data less than the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
15	1616-43 (KPSF)	2008	0.02	0.02	3.63
19	1616-43 (KPSF)	2012	0.03	0.02	5.42

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
19	1616-43 (KPSF)	2012	0.03	-4.07	3.34

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
163.56	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
5.29	4.00	0.26

- Conclusions:
  The slopes do not differ significantly among reference streams.

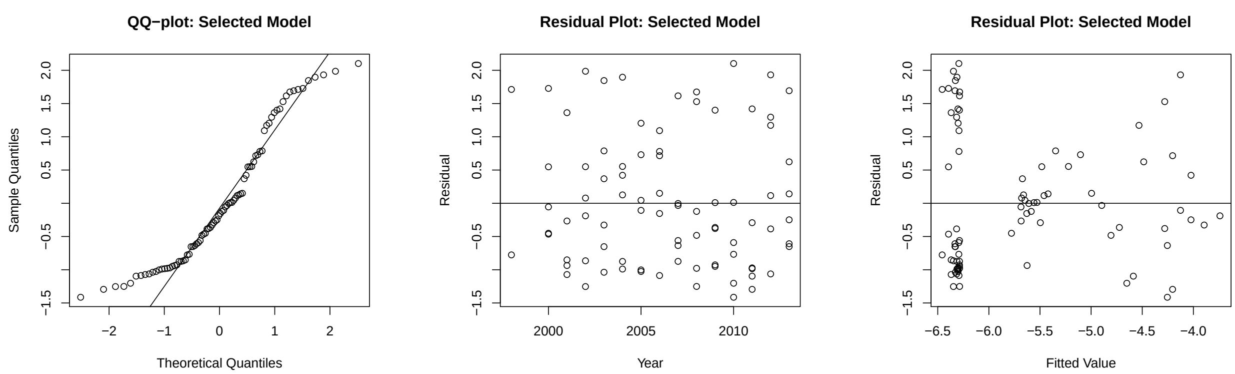
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference streams are best modeled using separate slopes and intercepts, contrasts suggest that reference streams share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference streams) to avoid defaulting to comparing trends in monitored streams against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference stream slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	0.9094	2	0.6346
Cujo Outflow	15.3763	2	0.0005
Christine-Lac du Sauvage	0.6181	2	0.7341

- Conclusions:
  Cujo Ouflow shows significant deviation from the common slope of reference streams.

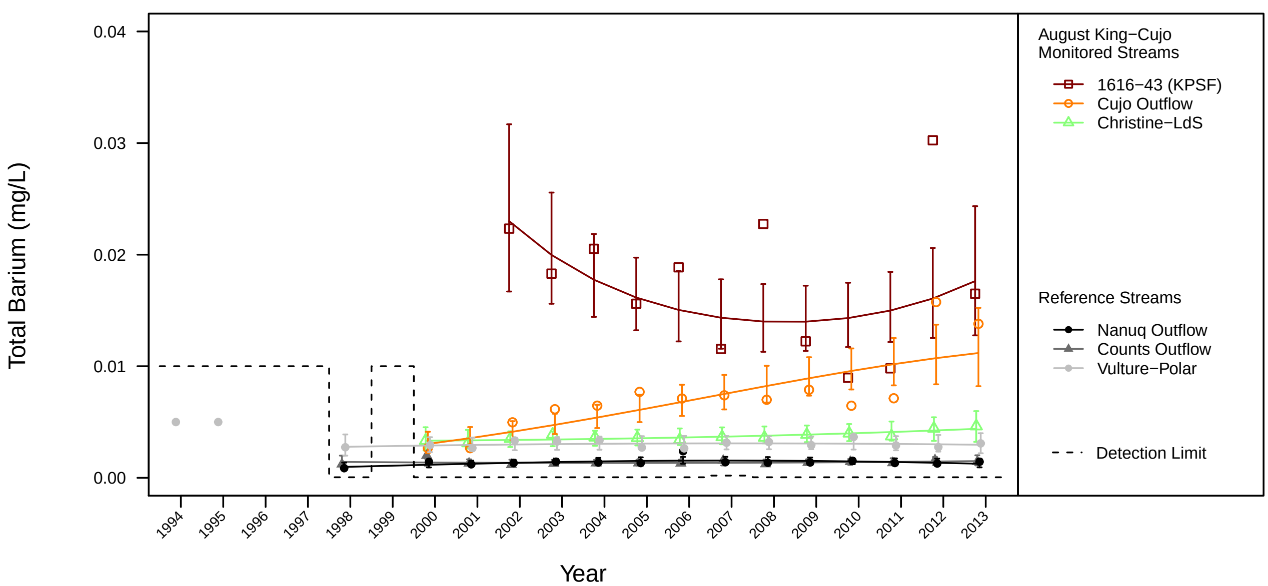
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.0140
Monitored Stream	1616-43 (KPSF)	0.2100
Monitored Stream	Christine-Lac du Sauvage	0.7100
Monitored Stream	Cujo Outflow	0.7410

- Conclusions:
  Model fit for reference lakes and 1616-43 (KPSF) is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total barium for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	1.65e-02	1.76e-02	2.90e-03	1.28e-02	2.43e-02	8.49e-03
Cujo Outflow	1.38e-02	1.12e-02	1.76e-03	8.21e-03	1.52e-02	5.16e-03
Christine-Lac du Sauvage	4.63e-03	4.39e-03	6.92e-04	3.22e-03	5.98e-03	2.03e-03
Nanuq Outflow	1.44e-03	1.27e-03	1.93e-04	9.40e-04	1.71e-03	NA
Counts Outflow	1.46e-03	1.50e-03	2.28e-04	1.11e-03	2.02e-03	NA
Vulture-Polar	3.09e-03	2.97e-03	4.51e-04	2.20e-03	4.00e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Barium	August	King-Cujo	Stream	Water	none	log e	linear mixed effects regression	#2 shared slopes	1	Cujo Outflow

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

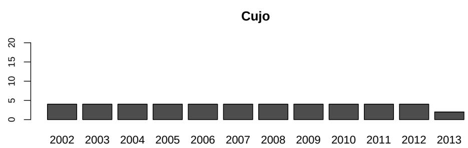
Analysis of April Total Boron in Lakes of the King-Cujo Watershed and Lac du Sauvage

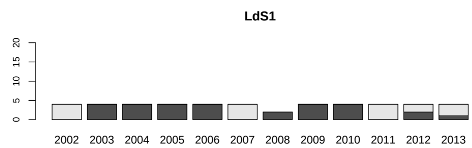
January 12, 2014

1 Censored Values:

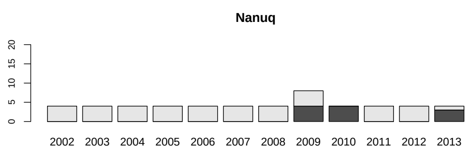
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

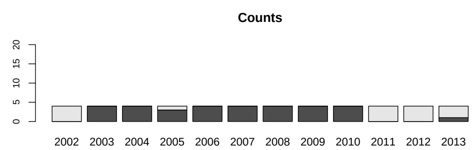
1.1 Monitored

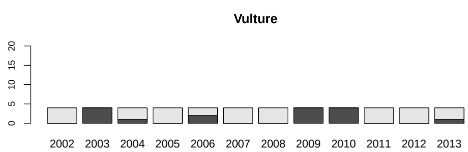




1.2 Reference

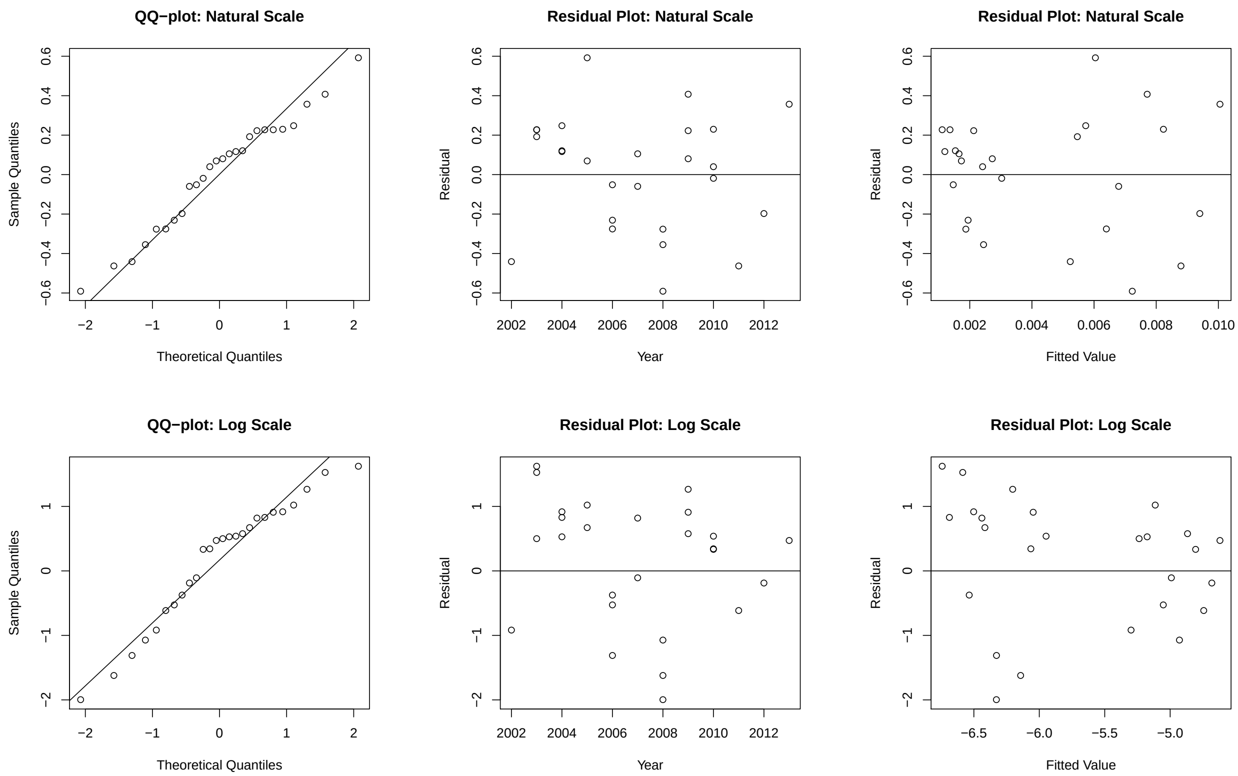






Comment:
Greater than 60% of data in Nanuq and Vulture lakes was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in Counts and LdS1 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	9.90E-53	natural model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Lakes

Two of three reference lakes were removed from the analysis. Tests could not be performed. Proceeding with analysis using reference model 1.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Cujo	3.5740	2	0.1675
LdS1	1.1538	2	0.5616

- Conclusions:
  No significant deviations were found when comparing monitored lakes to a constant slope of zero.

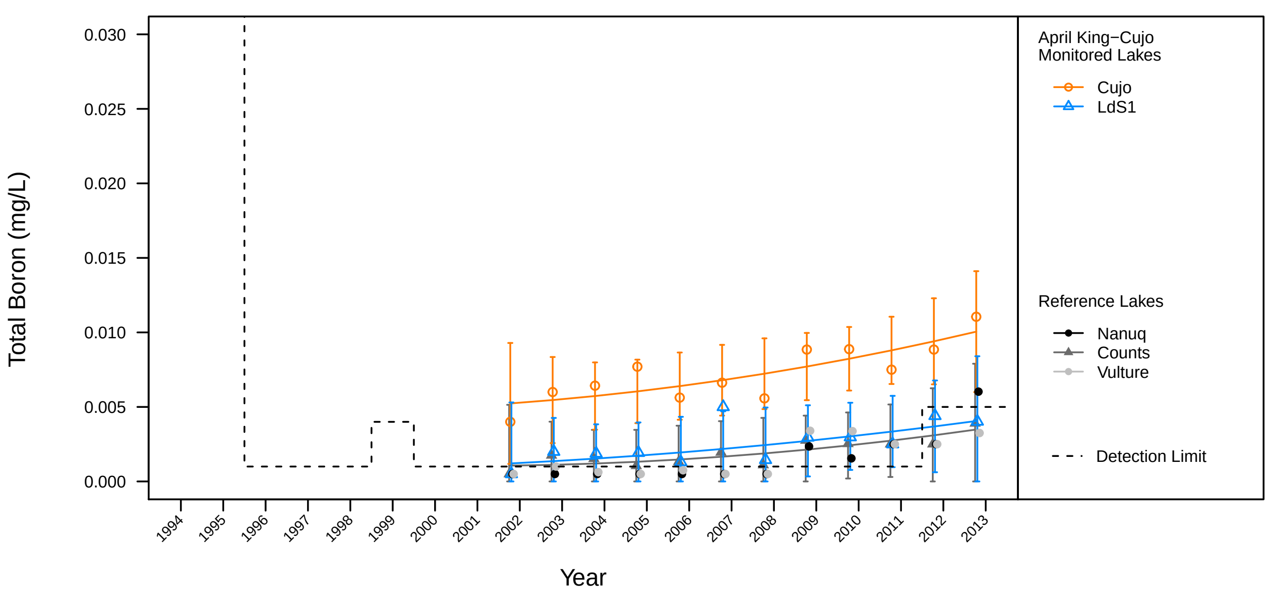
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Reference Lake	Counts	0.7370
Monitored Lake	Cujo	0.6810
Monitored Lake	LdS1	0.4610

- Conclusions:
  Model fit for LdS1 is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total boron for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	1.11e-02	1.01e-02	2.07e-03	5.99e-03	1.41e-02	6.06e-03
LdS1	4.02e-03	4.07e-03	2.21e-03	0.00e+00	8.40e-03	6.47e-03
Nanuq	6.02e-03	NA	NA	NA	NA	NA
Counts	3.90e-03	3.47e-03	2.26e-03	0.00e+00	7.90e-03	NA
Vulture	3.25e-03	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Boron	April	King-Cujo	Lake	Water	Nanuq Vulture	none	Tobit regression	#1a slope of zero	1.5	Cujo

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

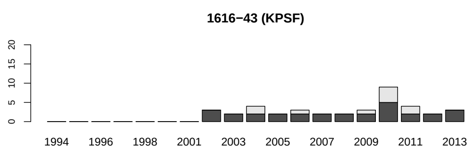
Analysis of August Total Boron in Lakes of the King-Cujo Watershed and Lac du Sauvage

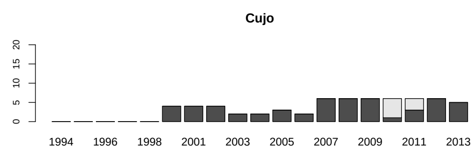
January 12, 2014

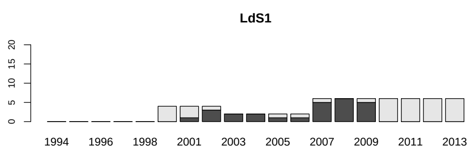
1 Censored Values:

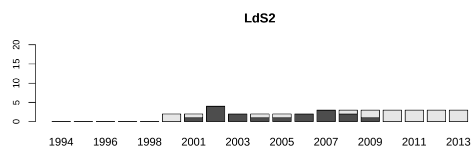
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

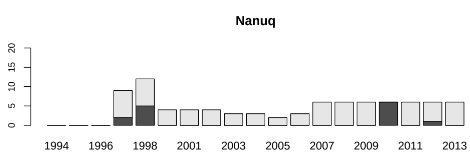


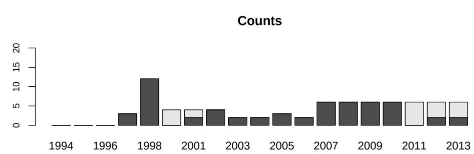


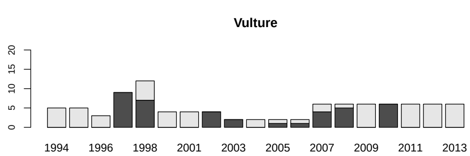




1.2 Reference

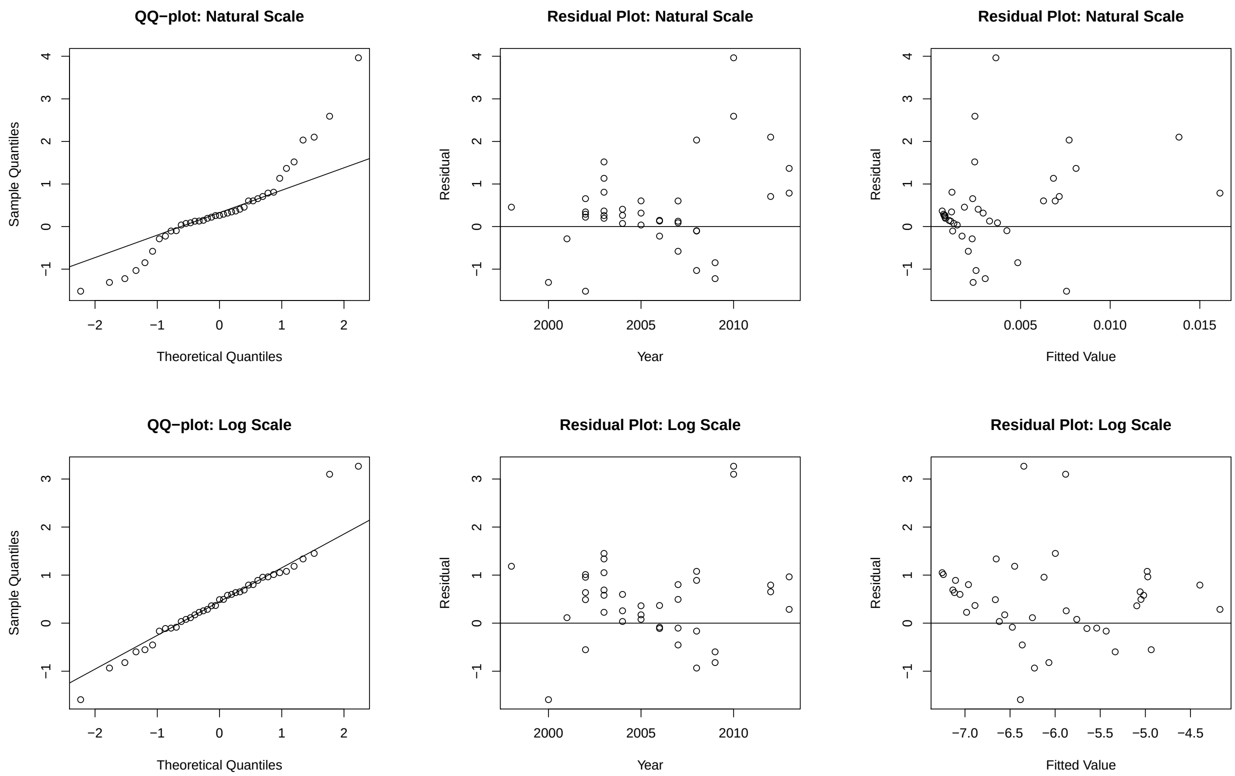






Comment:
Greater than 60% of data in Nanuq Lake was less than the detection limit. This lake was excluded from further analyses. 10-60% of data in Counts, Vulture, 1616-43 (KPSF), Cujo, LdS1, and LdS2 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
37	Counts	2010	0.01	0.00	3.96

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
37	Counts	2010	0.01	-5.88	3.10
137	Vulture	2010	0.01	-6.35	3.27

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
12.50	3.00	0.01

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
0.41	2.00	0.81

- Conclusions:
  The slopes do not differ significantly among reference lakes.

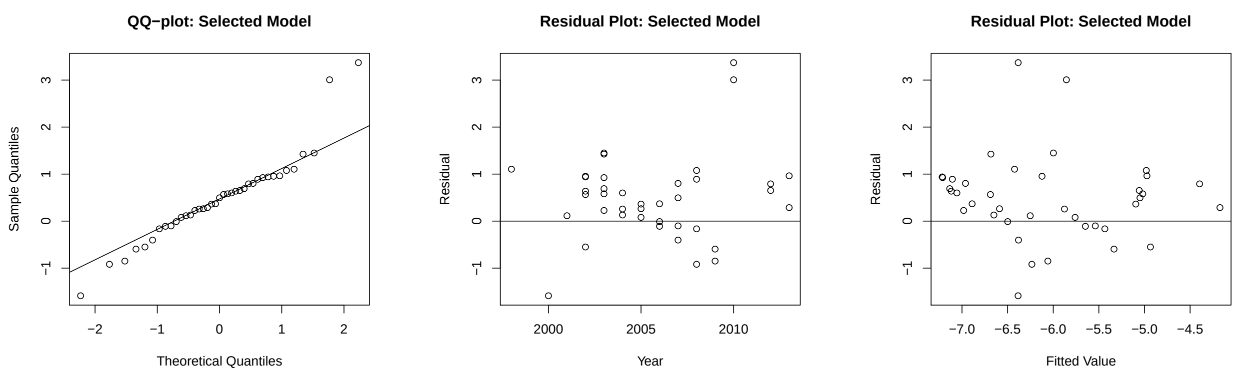
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.307	0.683	0.010	Indistinguishable support for 2 & 1; choose Model 2.

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with a common slope. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
37	Counts	2010	0.01	-5.86	3.01
137	Vulture	2010	0.01	-6.38	3.37

Conclusion:
Reduced model shows dependence on year and fitted value. Results should be interpreted with caution.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	4.3537	2	0.1134
Cujo	4.6621	2	0.0972
LdS1	2.3041	2	0.3160
LdS2	2.7232	2	0.2562

- Conclusions:
  No significant deviations were found when comparing monitored lakes to reference lakes.

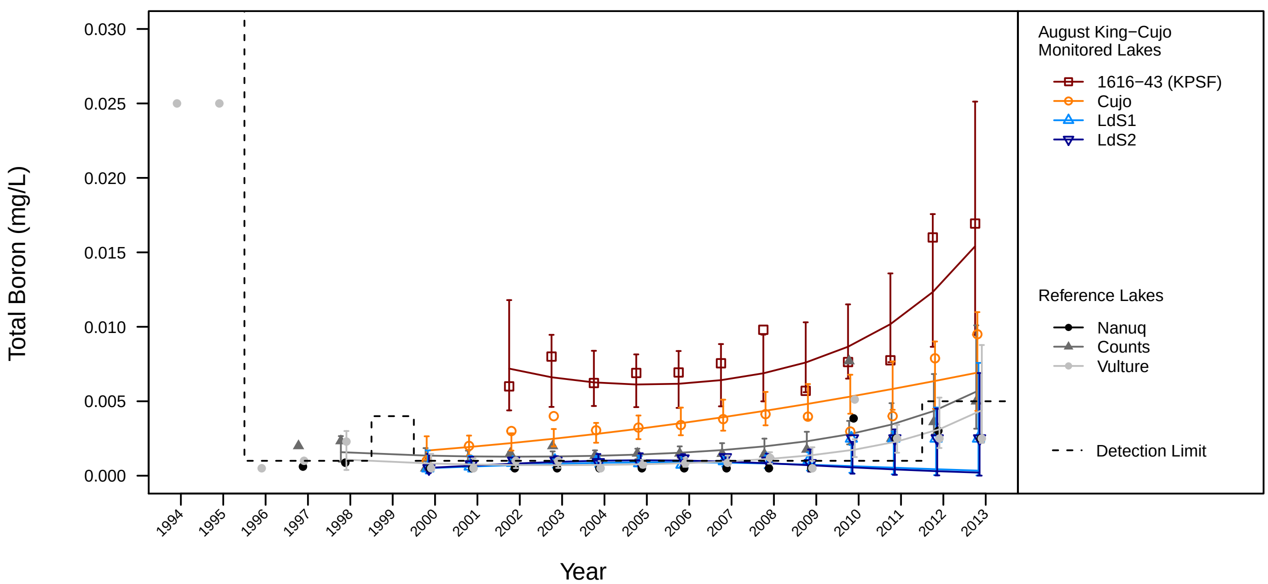
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.5810
Monitored Lake	1616-43 (KPSF)	0.6710
Monitored Lake	Cujo	0.6790
Monitored Lake	LdS1	0.3220
Monitored Lake	LdS2	0.3400

- Conclusions:
  Model fit for LdS1 and LdS2 is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total boron for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	1.69e-02	1.54e-02	3.84e-03	9.45e-03	2.51e-02	1.12e-02
Cujo	9.50e-03	6.92e-03	1.63e-03	4.36e-03	1.10e-02	4.77e-03
LdS2	2.50e-03	2.06e-04	3.69e-04	6.17e-06	6.89e-03	1.08e-03
LdS1	2.50e-03	3.41e-04	5.39e-04	1.53e-05	7.58e-03	1.58e-03
Nanuq	2.50e-03	NA	NA	NA	NA	NA
Counts	5.00e-03	5.64e-03	1.67e-03	3.16e-03	1.01e-02	NA
Vulture	2.50e-03	4.40e-03	1.55e-03	2.20e-03	8.78e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Boron	August	King-Cujo	Lake	Water	Nanuq	log e	Tobit regression	#2 shared slopes	1.5	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

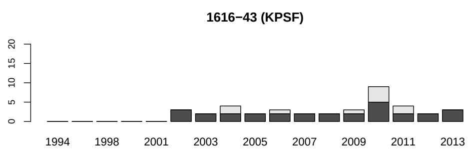
Analysis of August Total Boron in King-Cujo Watershed Streams

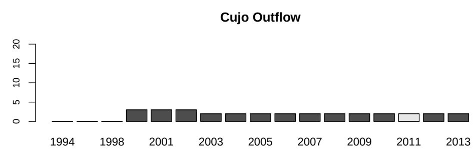
January 12, 2014

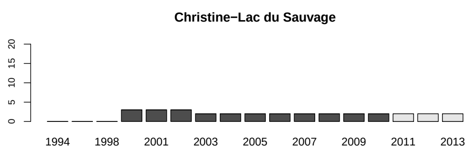
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

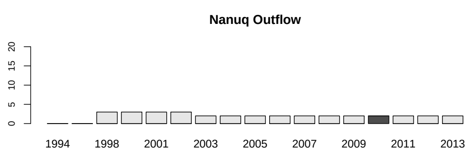
1.1 Monitored

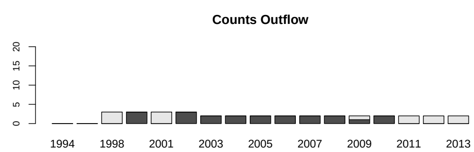


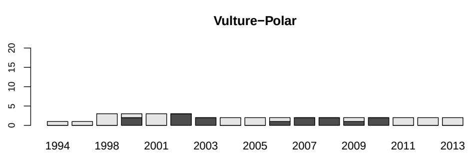




1.2 Reference

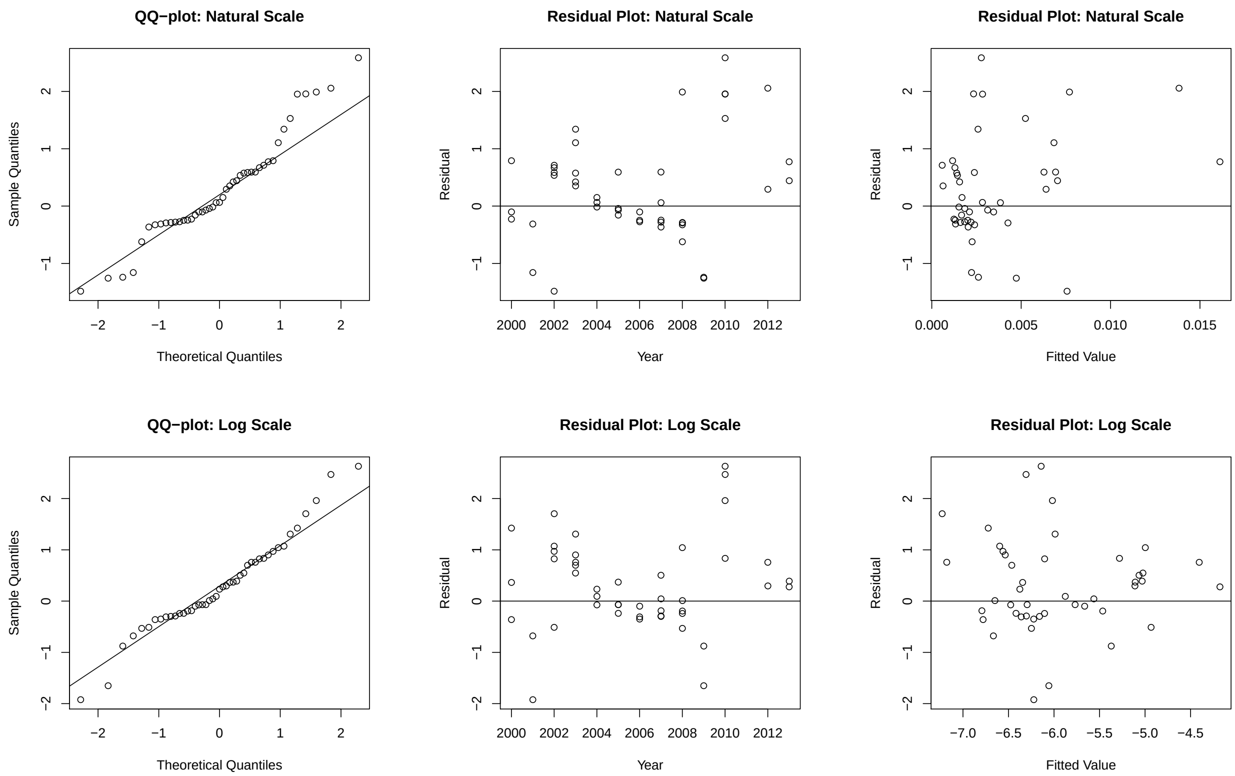






Comment:
Greater than 60% of data in Nanuq Outflow was less than the detection limit. This stream was excluded from further analyses. 10-60% of data in Counts Outflow, Vulture-Polar, 1616-43 (KPSF), and Christine-Lac du Sauvage was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
10.04	3.00	0.02

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
1.76	2.00	0.41

- Conclusions:
  The slopes do not differ significantly among reference streams.

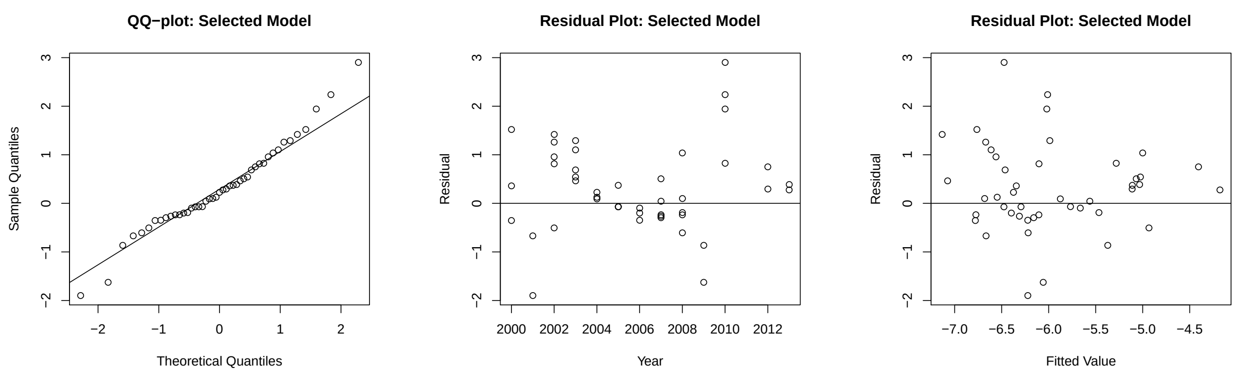
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.443	0.496	0.061	Indistinguishable support for 2 & 1; choose Model 2.

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with a common slope. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference stream slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	1.7846	2	0.4097
Cujo Outflow	0.7546	2	0.6857
Christine-Lac du Sauvage	0.5306	2	0.7670

- Conclusions:
  No significant deviations were found when comparing monitored streams to reference streams.

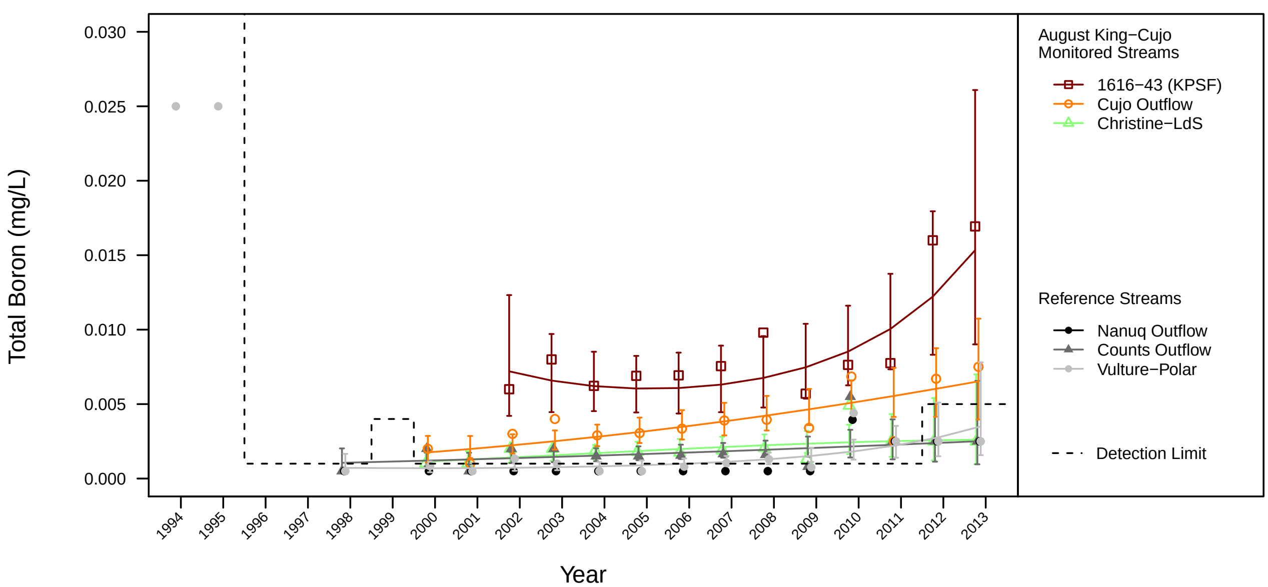
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.4440
Monitored Stream	1616-43 (KPSF)	0.6690
Monitored Stream	Christine-Lac du Sauvage	0.4590
Monitored Stream	Cujo Outflow	0.5860

- Conclusions:
  Model fit for reference lakes and Christine-Lac du Sauvage is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total boron for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	1.69e-02	1.53e-02	4.16e-03	9.01e-03	2.61e-02	1.22e-02
Cujo Outflow	7.50e-03	6.53e-03	1.66e-03	3.97e-03	1.07e-02	4.85e-03
Christine-Lac du Sauvage	2.50e-03	2.60e-03	1.31e-03	9.69e-04	7.00e-03	3.84e-03
Nanuq Outflow	2.50e-03	NA	NA	NA	NA	NA
Counts Outflow	2.50e-03	2.51e-03	1.23e-03	9.57e-04	6.56e-03	NA
Vulture-Polar	2.50e-03	3.50e-03	1.43e-03	1.57e-03	7.80e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Boron	August	King-Cujo	Stream	Water	Nanuq Outflow	log e	Tobit regression	#2 shared slopes	1.5	none

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

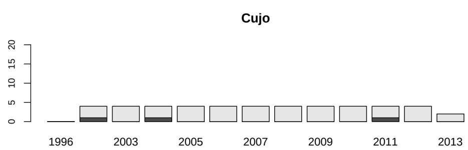
Analysis of April Total Cadmium in Lakes of the King-Cujo Watershed and Lac du Sauvage

January 12, 2014

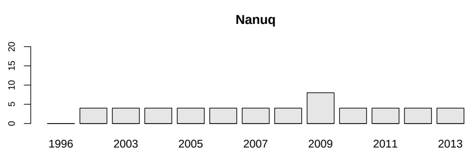
1 Censored Values:

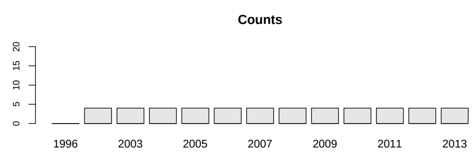
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

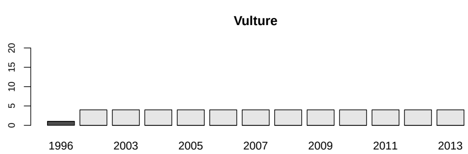
1.1 Monitored



1.2 Reference

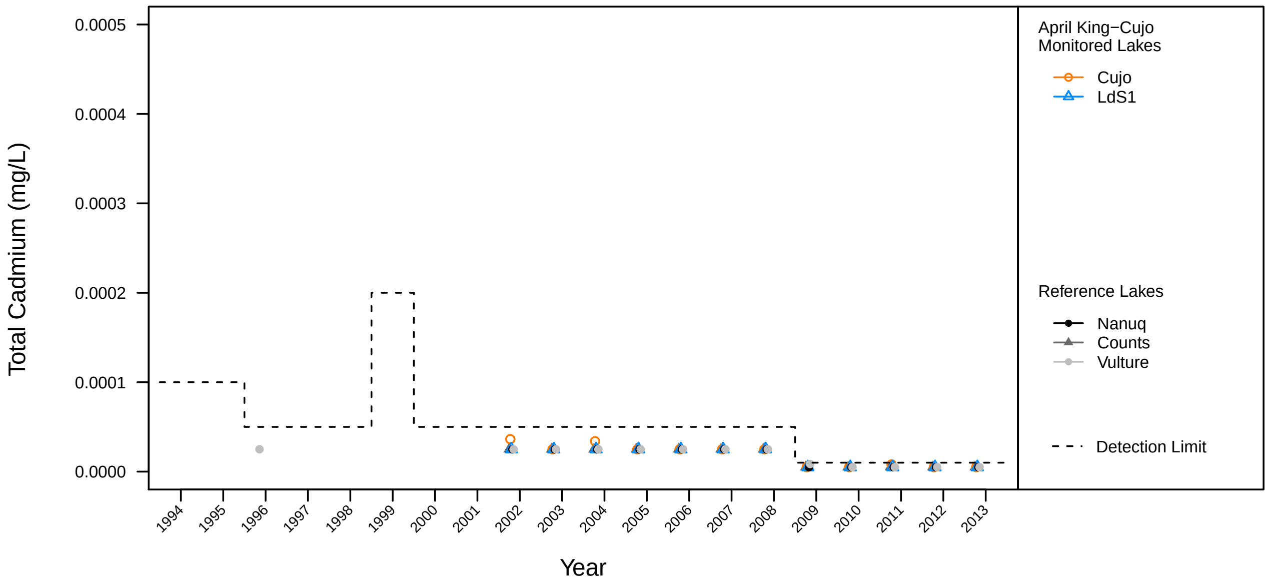






Comment:
Greater than 60% of data in all lakes was less than the detection limit. All lakes were excluded from further analyses. Tests not performed. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

3 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Cadmium	April	King-Cujo	Lake	Water	all	NA	NA	NA	hardness-dependent	NA

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

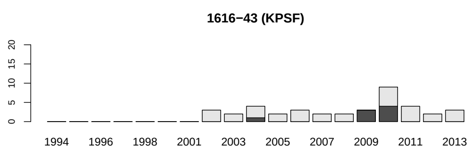
Analysis of August Total Cadmium in Lakes of the King-Cujo Watershed and Lac du Sauvage

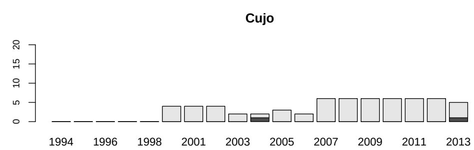
January 12, 2014

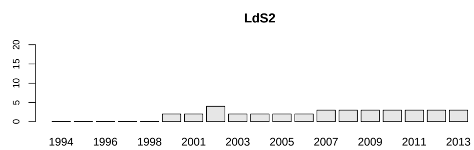
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

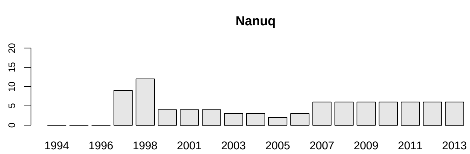
1.1 Monitored

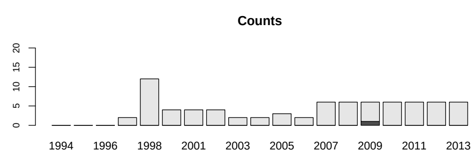


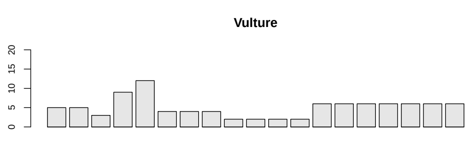




1.2 Reference

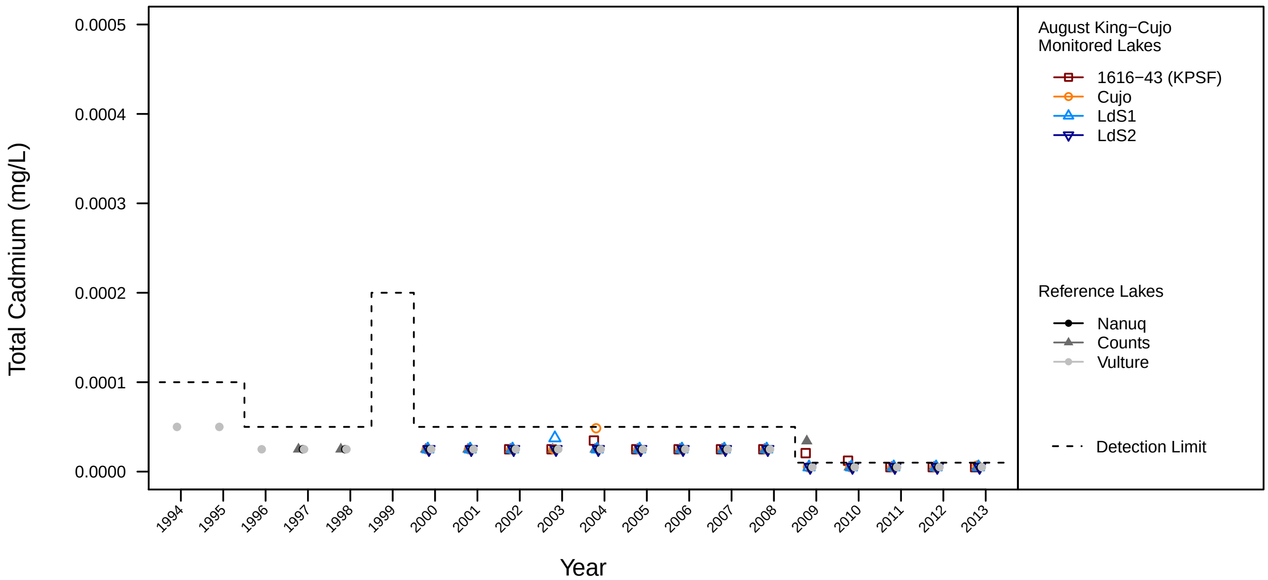






Comment:
Greater than 60% of data in all reference and monitored lakes was less than the detection limit. All lakes were excluded from further analyses. Tests not performed.

2 Observed and Fitted Values



Note: The yearly observed mean for lakes are represented by symbols only.

3 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Cadmium	August	King-Cujo	Lake	Water	all	NA	NA	NA	hardness-dependent	NA

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

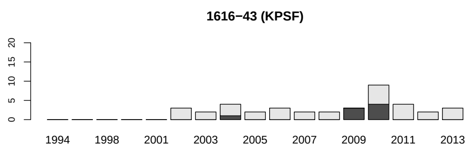
Analysis of August Total Cadmium in King-Cujo Watershed Streams

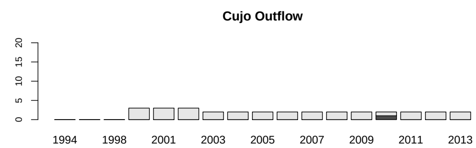
January 12, 2014

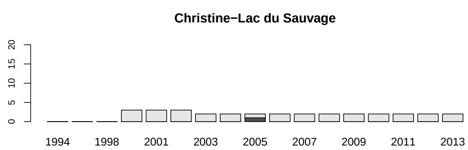
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

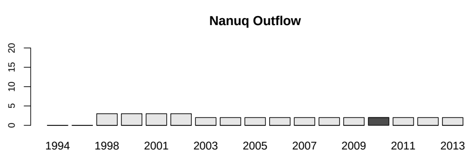
1.1 Monitored

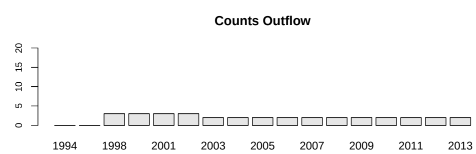


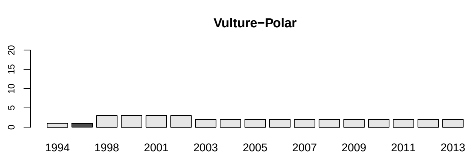




1.2 Reference

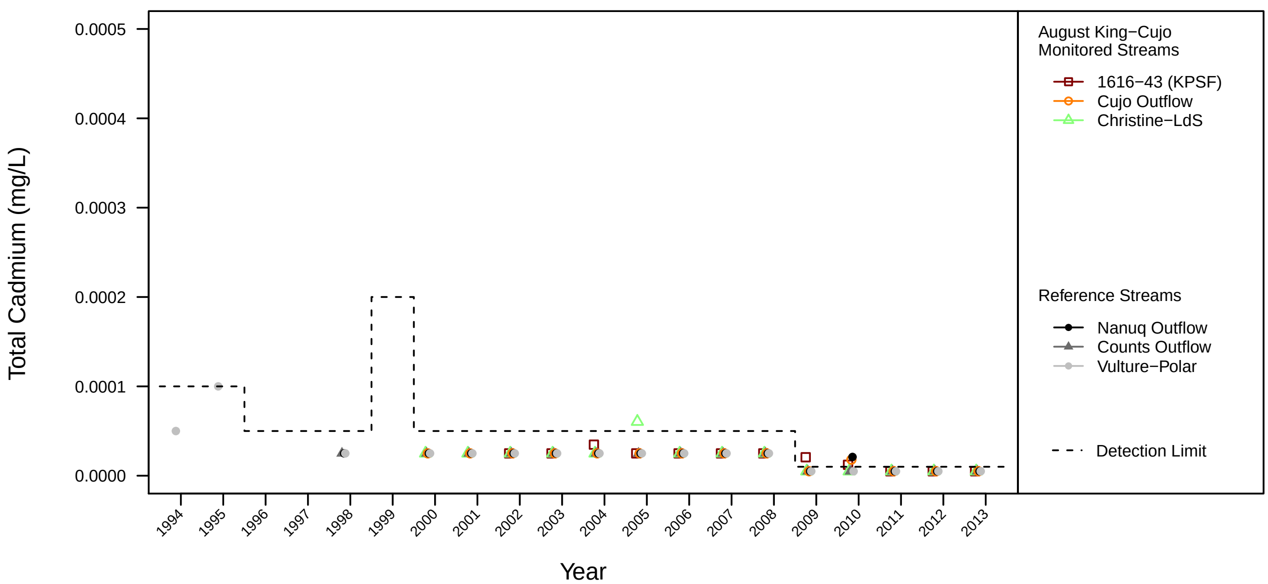






Comment:
Greater than 60% of data in all reference and monitored streams was less than the detection limit. All streams were excluded from further analyses. Tests not performed.

2 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

3 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Cadmium	August	King-Cujo	Stream	Water	all	NA	NA	NA	hardness-dependent	NA

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

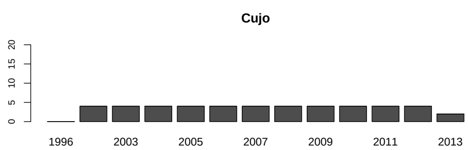
Analysis of April Total Copper in Lakes of the King-Cujo Watershed and Lac du Sauvage

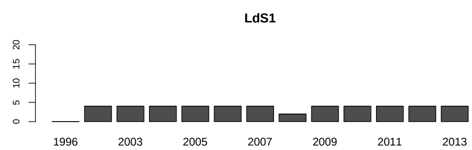
January 12, 2014

1 Censored Values:

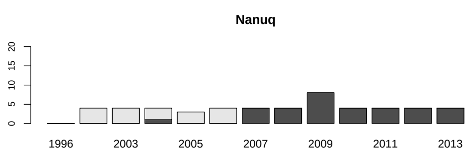
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

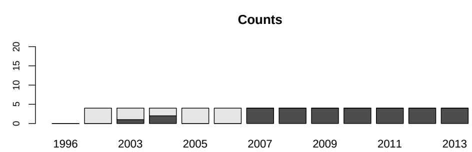
1.1 Monitored

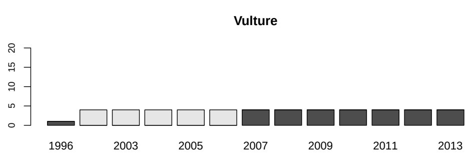




1.2 Reference

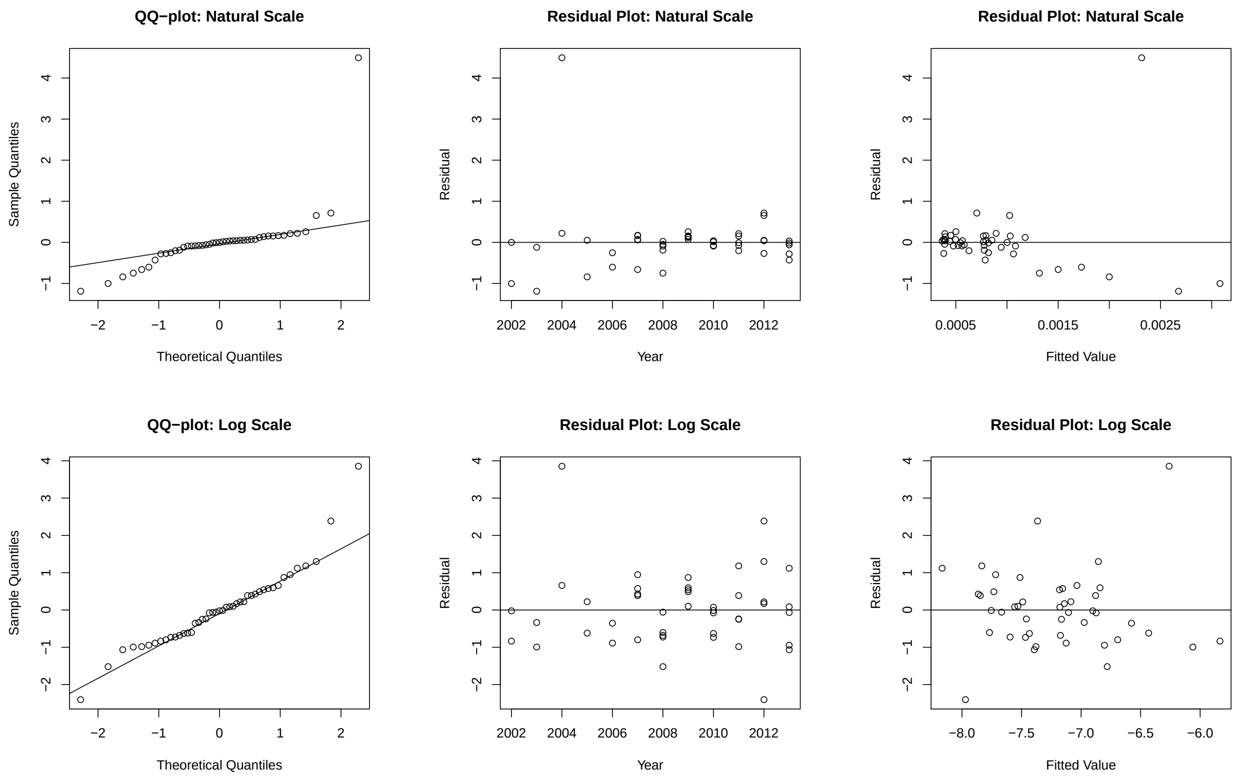






Comment:
10-60% of data in Counts, Nanuq, and Vulture lakes was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
51	Cujo	2004	0.01	0.00	4.49

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
51	Cujo	2004	0.01	-6.26	3.85

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	1.12E-111	natural model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
1.35	6.00	0.97

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

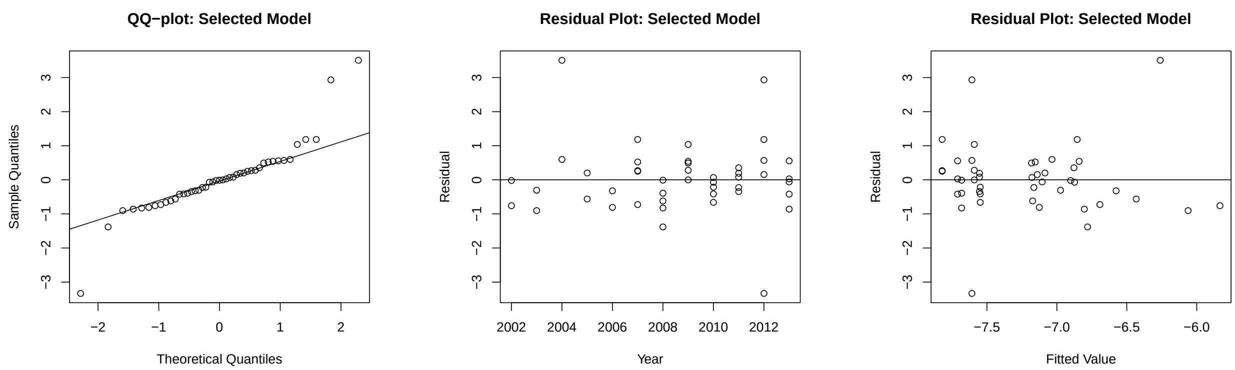
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.053	0.649	0.298	Indistinguishable support for 2 & 3; choose Model 3.

- Conclusions:
AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
51	Cujo	2004	0.01	-6.26	3.51
119	Nanuq	2012	0.00	-7.61	-3.33

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Lakes

Fitted model of the slope and intercept of each monitored lake compared to a common slope and intercept fitted for all reference lakes together (reference model 3).

- Results:

	Chi-squared	DF	P-value
Cujo	20.3313	3	0.0001
LdS1	8.4473	3	0.0376

- Conclusions:
All monitored lakes show significant deviations from the common slope and intercept of reference lakes.

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Cujo	9.2929	2	0.0096
LdS1	4.5682	2	0.1019

- Conclusions:
  When allowing for differences in intercept, Cujo Lake shows significant deviation from the common slope of reference lakes.

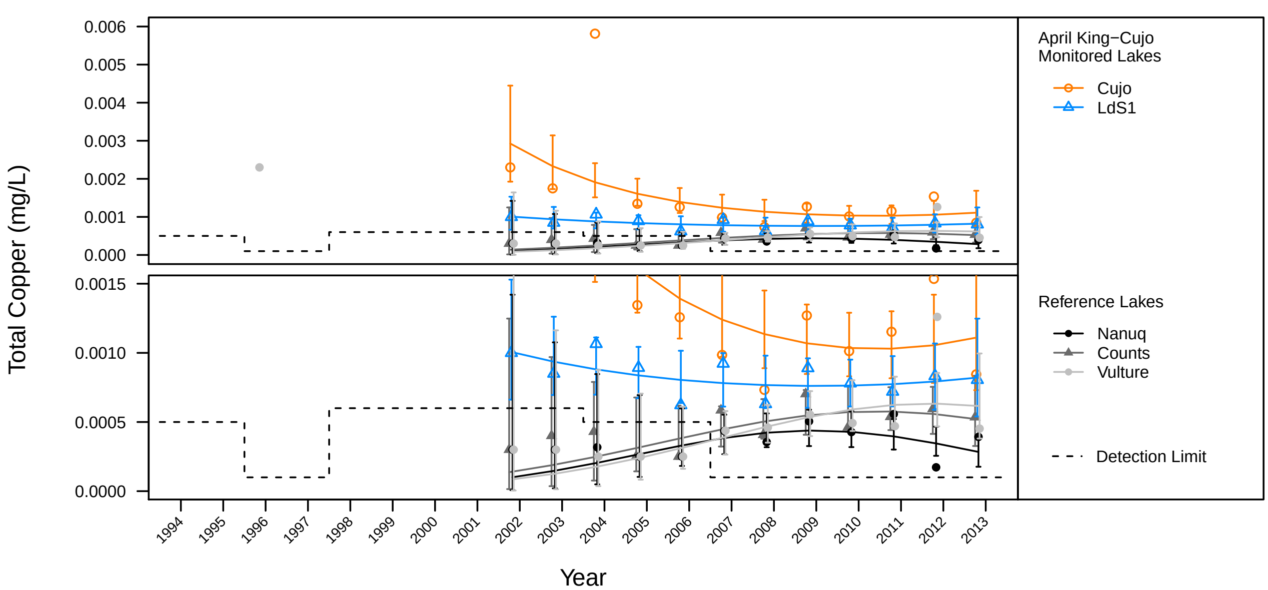
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.5510
Monitored Lake	Cujo	0.4160
Monitored Lake	LdS1	0.2890

- Conclusions:
  Model fit for Cujo and LdS1 is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total copper for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	8.45e-04	1.11e-03	2.37e-04	7.30e-04	1.69e-03	6.94e-04
LdS1	8.05e-04	8.21e-04	1.75e-04	5.40e-04	1.25e-03	5.13e-04
Nanuq	3.92e-04	2.84e-04	6.89e-05	1.77e-04	4.57e-04	NA
Counts	5.35e-04	5.22e-04	1.25e-04	3.27e-04	8.34e-04	NA
Vulture	4.52e-04	6.16e-04	1.51e-04	3.81e-04	9.95e-04	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Copper	April	King-Cujo	Lake	Water	1616-43 (KPSF) LdS2	log e	Tobit regression	#3 shared intercept & slope	NA	Cujo LdS1

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

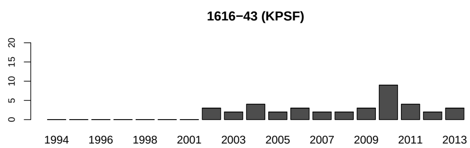
Analysis of August Total Copper in Lakes of the King-Cujo Watershed and Lac du Sauvage

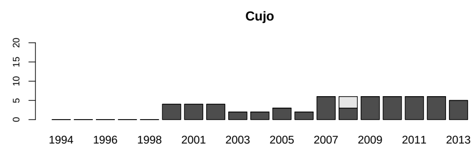
January 12, 2014

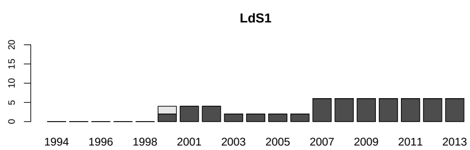
1 Censored Values:

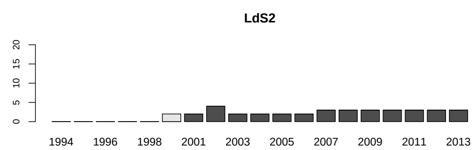
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

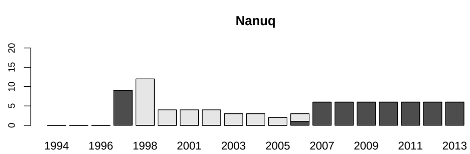


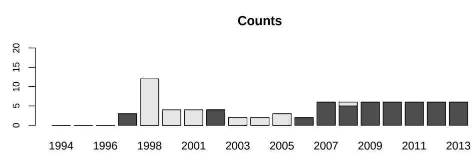


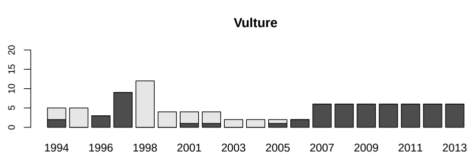




1.2 Reference

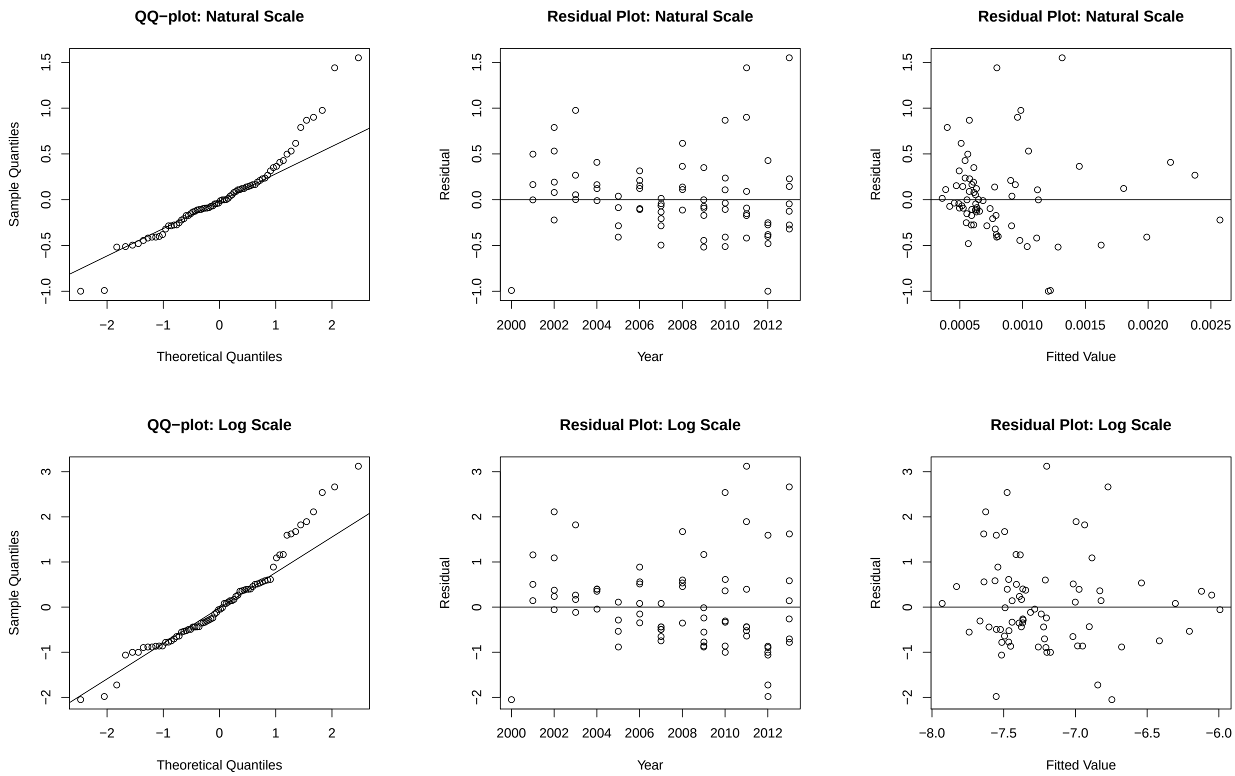






Comment:
10-60% of data in Counts, Nanuq, and Vulture lakes was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
98	LdS2	2011	0.00	-7.20	3.12

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
4.79	6.00	0.57

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
3.29	4.00	0.51

- Conclusions:
  The slopes do not differ significantly among reference lakes.

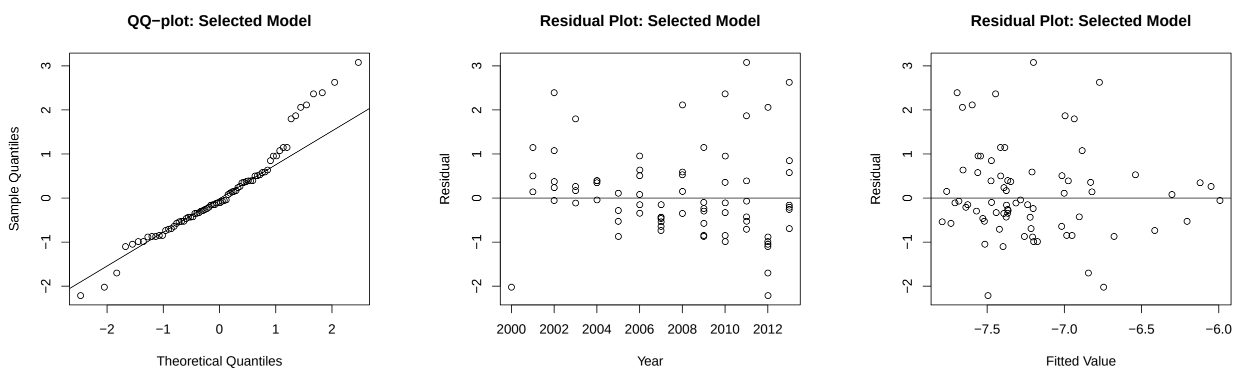
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.103	0.680	0.217	Ref. Model 2

- Conclusions:
  Results of AIC do not agree with reference model testing. Although contrasts suggest that reference lakes share a common slope and intercept, AIC suggests that reference lakes are best modeled with separate intercepts. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
98	LdS2	2011	0.00	-7.20	3.08

Conclusion:
Reduced model shows dependence on year and fitted value. Results should be interpreted with caution.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	47.2922	2	0.0000
Cujo	3.5865	2	0.1664
LdS1	4.4237	2	0.1095
LdS2	0.6499	2	0.7226

- Conclusions:
  1616-43 (KPSF) shows significant deviation from the common slope of reference lakes.

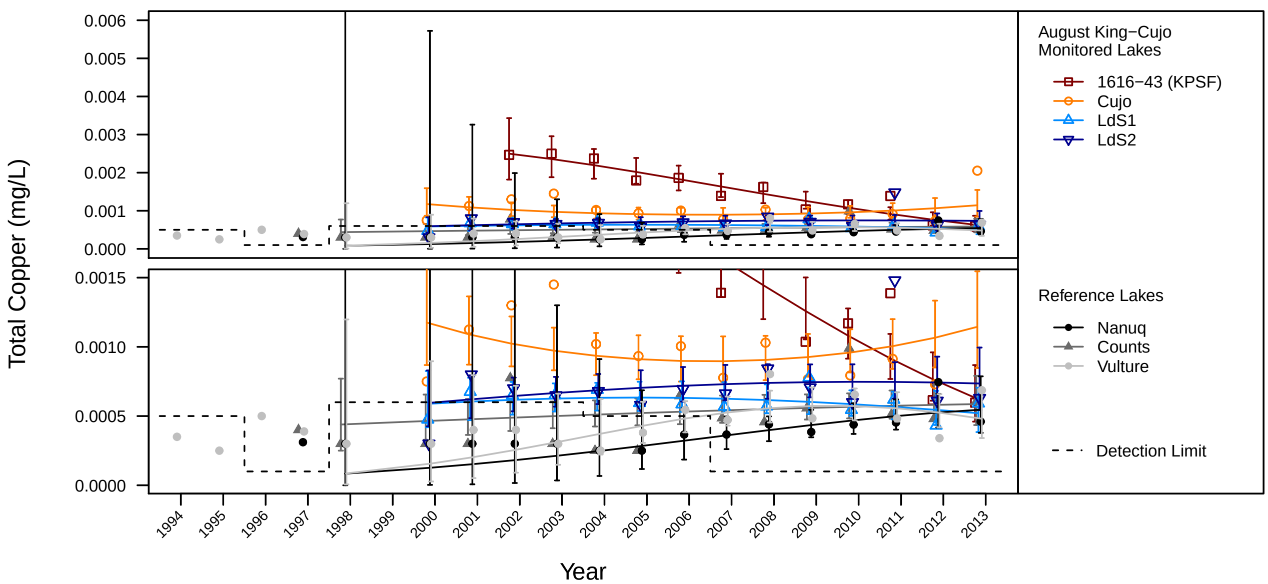
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.3230
Monitored Lake	1616-43 (KPSF)	0.8740
Monitored Lake	Cujo	0.0970
Monitored Lake	LdS1	0.1630
Monitored Lake	LdS2	0.0730

- Conclusions:
  Model fit for reference lakes weak. Model fit for Cujo, LdS1, and LdS2 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total copper for each monitored lake in 2012. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	5.97e-04	6.32e-04	1.02e-04	4.60e-04	8.68e-04	3.00e-04
Cujo	2.05e-03	1.14e-03	1.75e-04	8.47e-04	1.55e-03	5.14e-04
LdS2	6.30e-04	7.35e-04	1.13e-04	5.43e-04	9.95e-04	3.32e-04
LdS1	5.92e-04	5.21e-04	8.04e-05	3.85e-04	7.05e-04	2.35e-04
Nanuq	4.60e-04	5.46e-04	1.02e-04	3.79e-04	7.87e-04	NA
Counts	6.05e-04	5.87e-04	8.93e-05	4.35e-04	7.91e-04	NA
Vulture	6.87e-04	4.81e-04	8.44e-05	3.41e-04	6.79e-04	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Copper	August	King-Cujo	Lake	Water	none	log e	Tobit regression	#2 shared slopes	NA	1616-43 (KPSF)

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

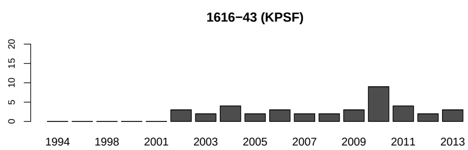
Analysis of August Total Copper in King-Cujo Watershed Streams

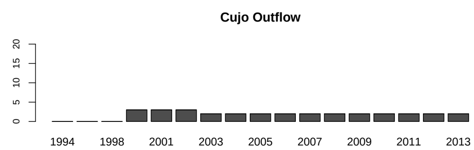
January 12, 2014

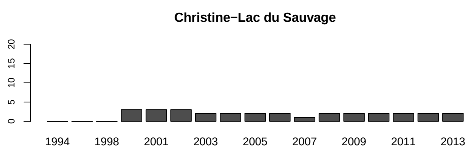
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

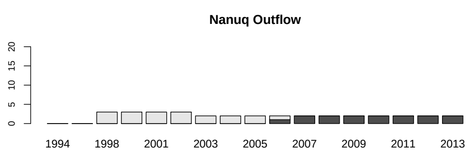
1.1 Monitored

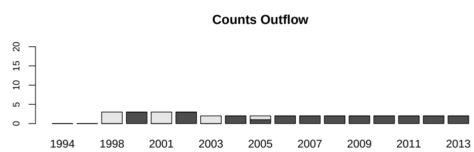


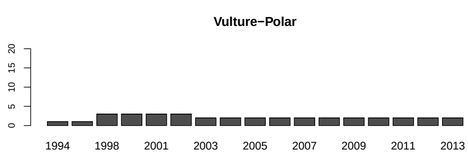




1.2 Reference

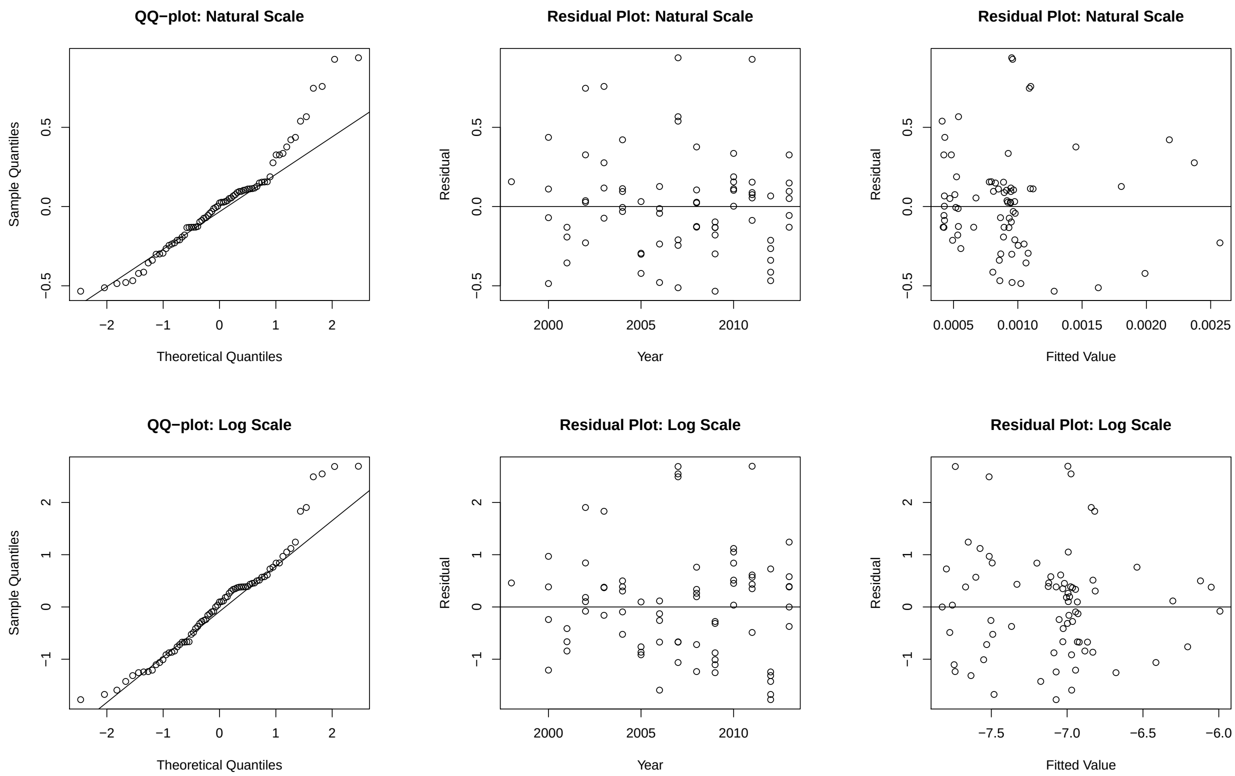






Comment:
10-60% of data in Counts and Nanuq Outflow was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
10.66	6.00	0.10

- Conclusions:
  The slopes and intercepts do not differ significantly among reference streams.

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
0.11	4.00	1.00

- Conclusions:
  The slopes do not differ significantly among reference streams.

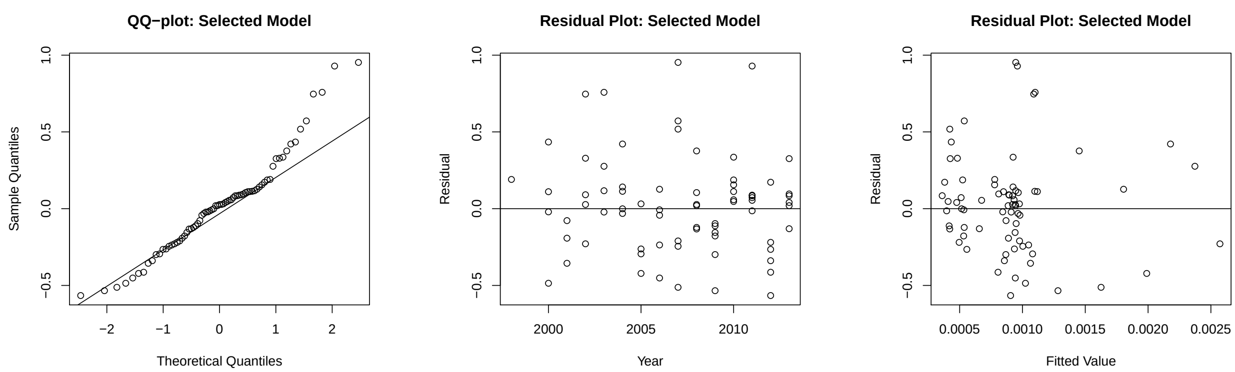
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.018	0.946	0.036	Ref. Model 2

- Conclusions:
  Results of AIC do not agree with reference model testing. Although contrasts suggest that reference lakes share a common slope and intercept, AIC suggests that reference lakes are best modeled with separate intercepts. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference stream slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	16.3468	2	0.0003
Cujo Outflow	2.2448	2	0.3255
Christine-Lac du Sauvage	0.0589	2	0.9710

- Conclusions:
  1616-43 (KPSF) shows significant deviation from the common slope of reference streams.

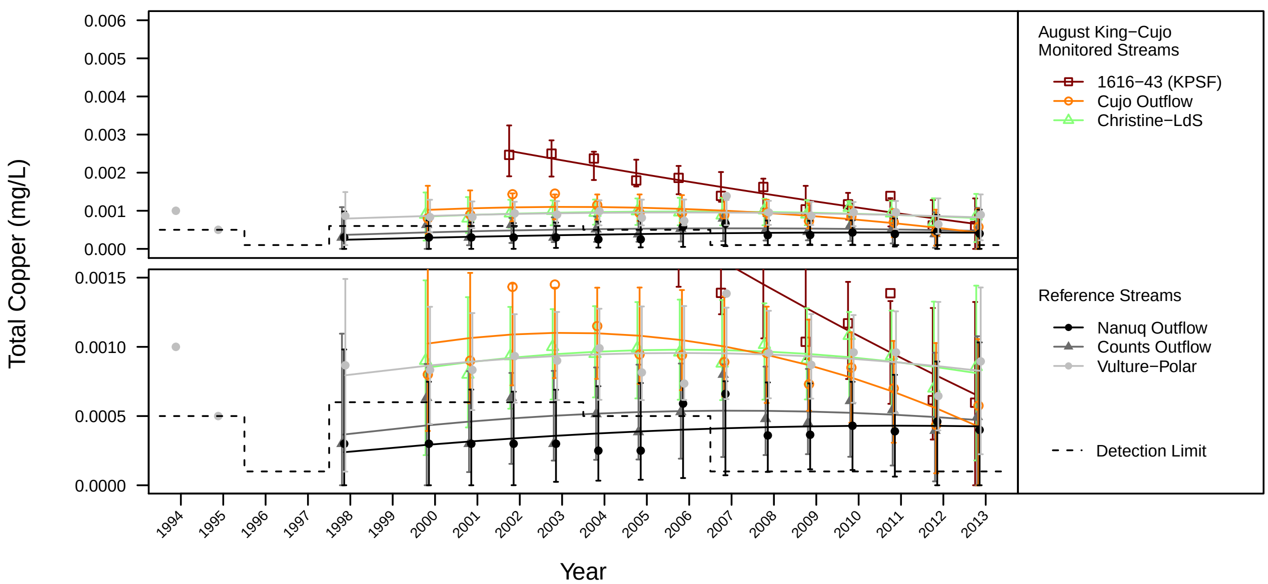
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.7580
Monitored Stream	1616-43 (KPSF)	0.9010
Monitored Stream	Christine-Lac du Sauvage	0.3240
Monitored Stream	Cujo Outflow	0.5980

- Conclusions:
  Model fit for Christine-Lac du Sauvage is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total copper for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	5.97e-04	6.57e-04	3.40e-04	0.00e+00	1.32e-03	9.96e-04
Cujo Outflow	5.75e-04	4.25e-04	3.22e-04	0.00e+00	1.06e-03	9.43e-04
Christine-Lac du Sauvage	8.55e-04	8.11e-04	3.22e-04	1.79e-04	1.44e-03	9.43e-04
Nanuq Outflow	4.00e-04	4.26e-04	3.09e-04	0.00e+00	1.03e-03	NA
Counts Outflow	4.95e-04	4.72e-04	3.09e-04	0.00e+00	1.08e-03	NA
Vulture-Polar	8.95e-04	8.27e-04	3.07e-04	2.24e-04	1.43e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Copper	August	King-Cujo	Stream	Water	none	none	Tobit regression	#2 shared slopes	NA	1616-43 (KPSF)

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

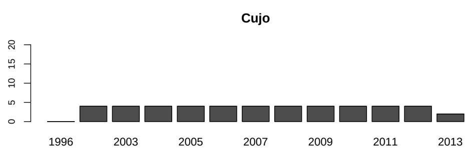
Analysis of April Total Molybdenum in Lakes of the King-Cujo Watershed and Lac du Sauvage

January 18, 2014

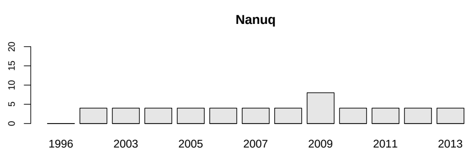
1 Censored Values:

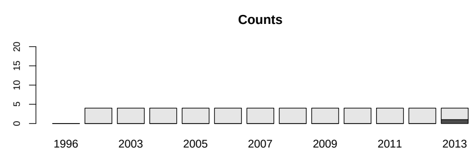
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

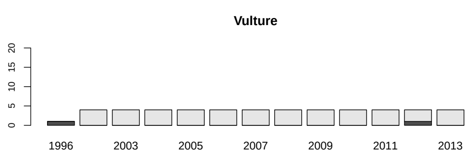
1.1 Monitored



1.2 Reference

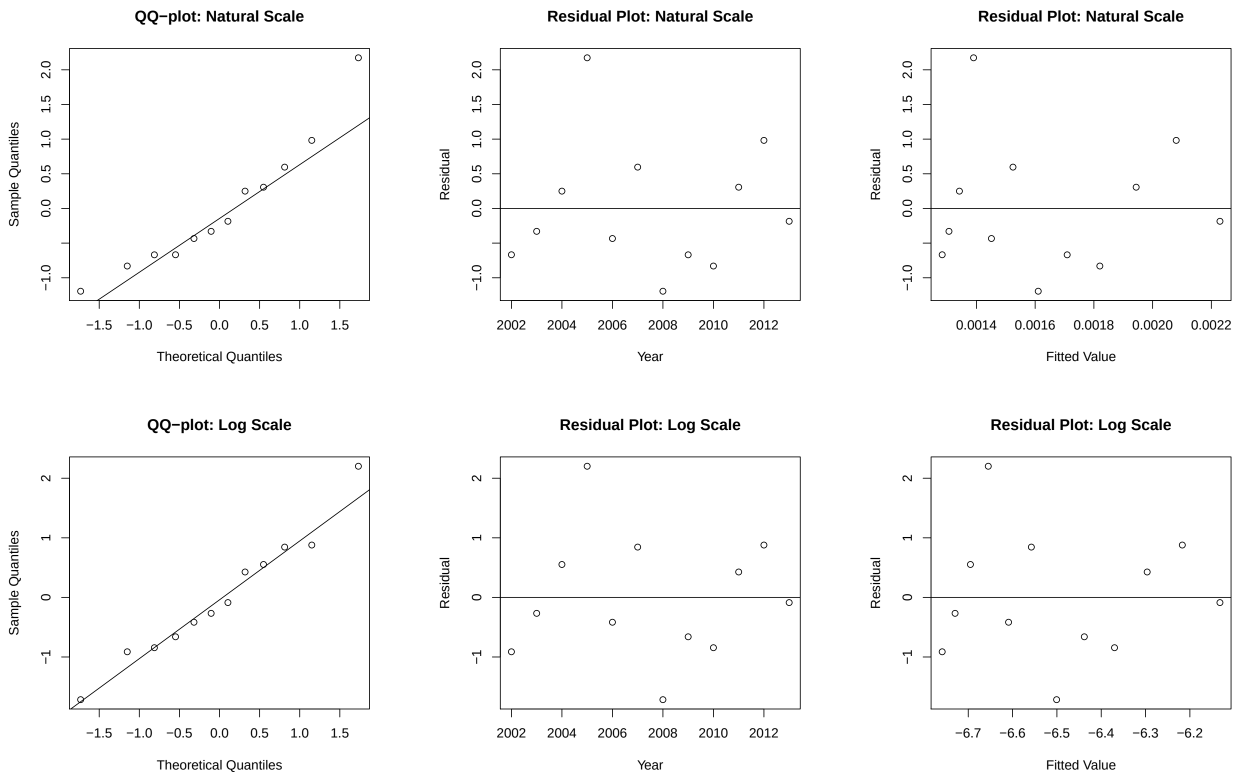






Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, and LdS1 was less than the detection limit. These lakes were excluded from further analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	5.05E-34	natural model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Cujo	2.4611	2	0.2921

- Conclusions:
  No significant deviations were found when comparing monitored lakes to a constant slope of zero.

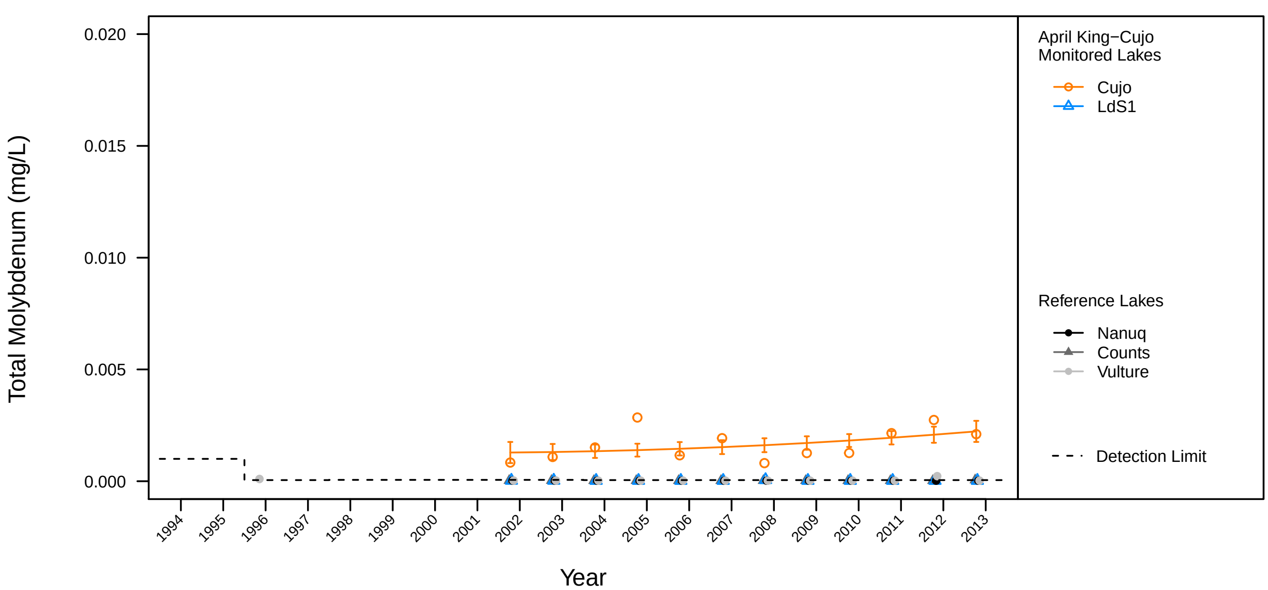
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	Cujo	0.2050

- Conclusions:
  Model fit for Cujo Lake is weak.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total molybdenum for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	2.11e-03	2.23e-03	2.41e-04	1.76e-03	2.7e-03	7.05e-04
LdS1	2.50e-05	NA	NA	NA	NA	NA
Nanuq	2.50e-05	NA	NA	NA	NA	NA
Counts	5.30e-05	NA	NA	NA	NA	NA
Vulture	2.50e-05	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Molybdenum	April	King-Cujo	Lake	Water	Counts Nanuq Vulture LdS1	none	Tobit regression	#1a slope of zero	19.38	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

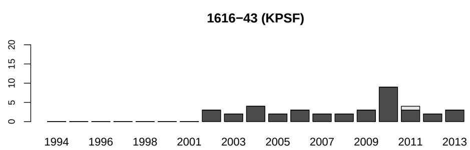
Analysis of August Total Molybdenum in Lakes of the King-Cujo Watershed and Lac du Sauvage

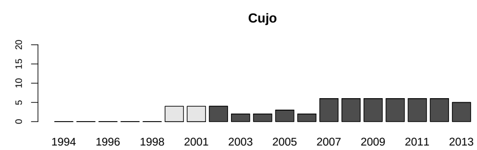
January 21, 2014

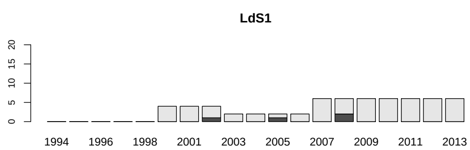
1 Censored Values:

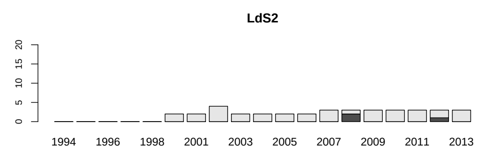
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

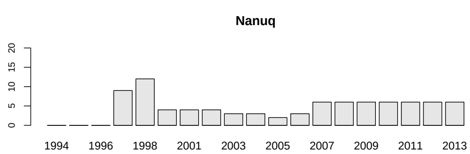


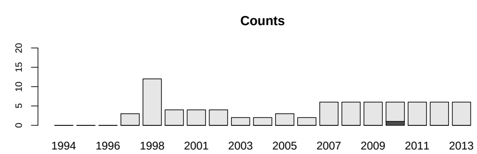


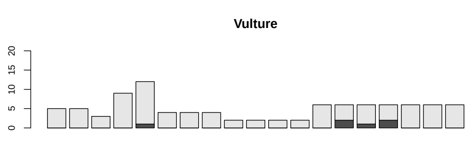




1.2 Reference

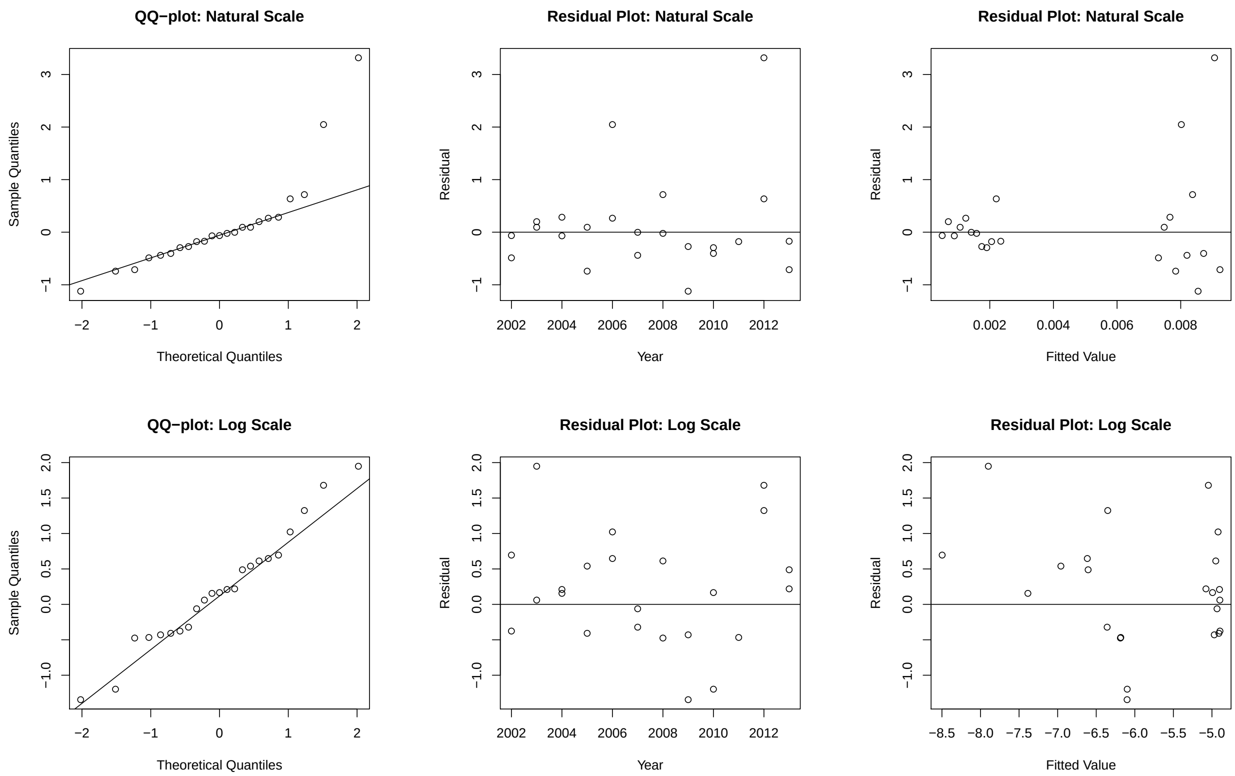






Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, LdS1, and LdS2 was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in Cujo Lake was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
19	1616-43 (KPSF)	2012	0.02	0.01	3.32

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	0.5235	2	0.7697
Cujo	0.8040	2	0.6690

- Conclusions:
  No significant deviations were found when comparing monitored lakes to a constant slope of zero.

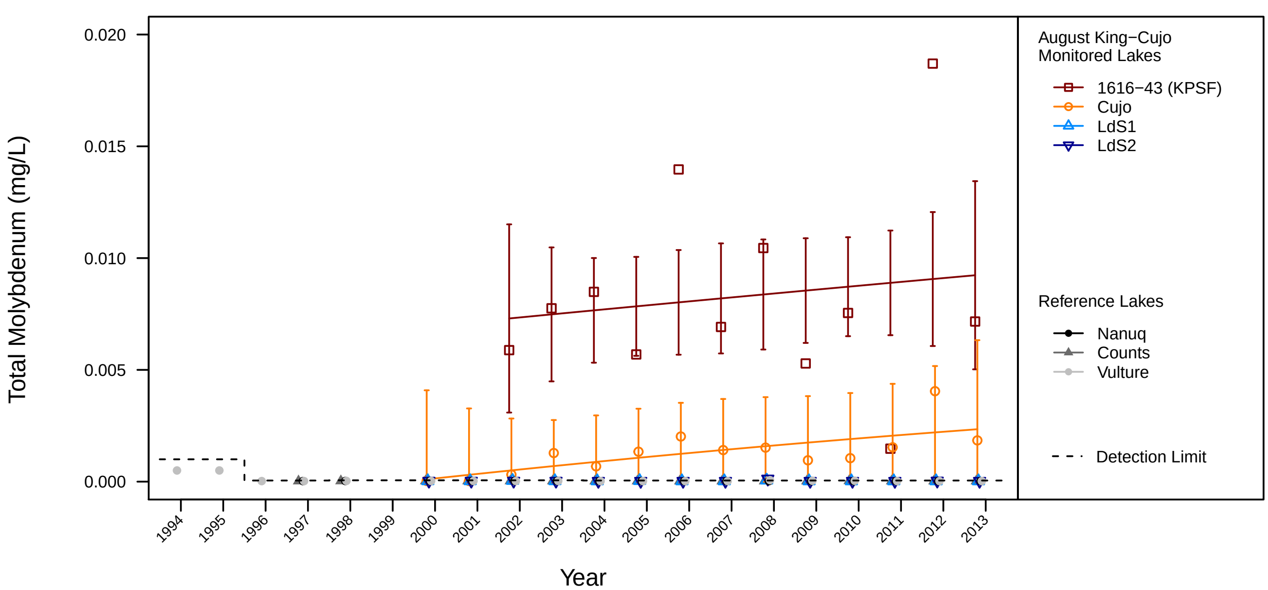
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	1616-43 (KPSF)	0.0200
Monitored Lake	Cujo	0.5130

- Conclusions:
  Model fit for 1616-43 (KPSF) is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total molybdenum for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	7.16e-03	9.23e-03	2.15e-03	5.02e-03	1.34e-02	6.28e-03
Cujo	1.85e-03	2.35e-03	2.03e-03	0.00e+00	6.33e-03	5.95e-03
LdS2	2.50e-05	NA	NA	NA	NA	NA
LdS1	2.50e-05	NA	NA	NA	NA	NA
Nanuq	2.50e-05	NA	NA	NA	NA	NA
Counts	2.50e-05	NA	NA	NA	NA	NA
Vulture	2.50e-05	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Molybdenum	August	King-Cujo	Lake	Water	Nanuq Counts Vulture LdS1 LdS2	none	Tobit regression	#1a slope of zero	19.38	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

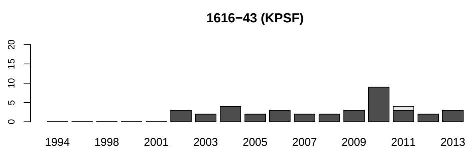
Analysis of August Total Molybdenum in King-Cujo Watershed Streams

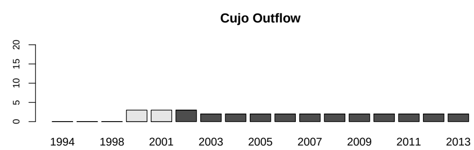
January 12, 2014

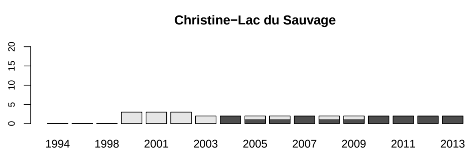
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

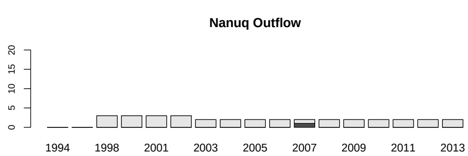
1.1 Monitored

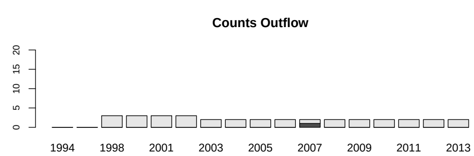


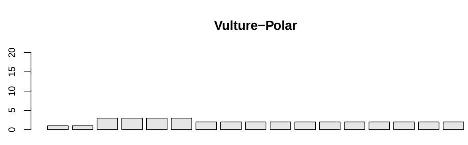




1.2 Reference

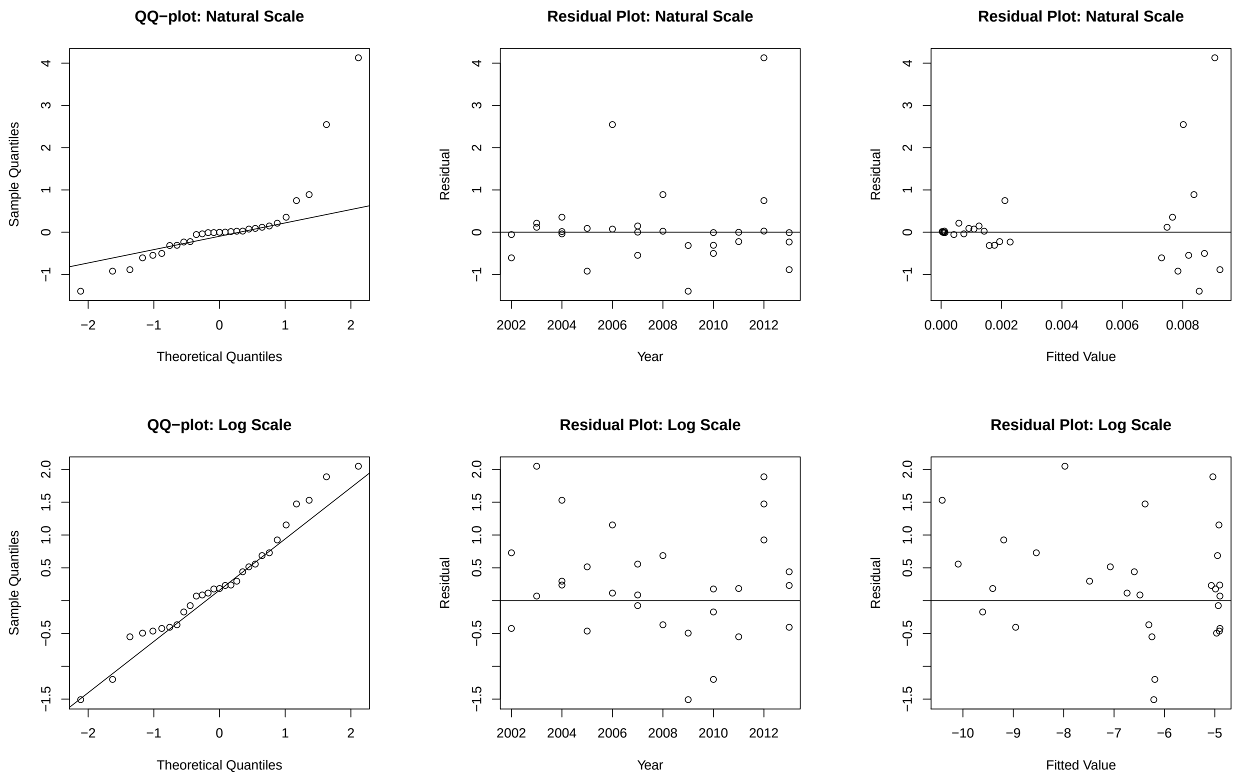






Comment:
Greater than 60% of data in Counts Outflow, Nanuq Outflow, and Vulture-Polar was less than the detection limit. These streams were excluded from further analyses. 10-60% of data in Cujo Outflow and Christine-Lac du Sauvage was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
19	1616-43 (KPSF)	2012	0.02	0.01	4.13

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Streams

All reference streams removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored stream against a slope of 0.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	0.1176	2	0.9429
Cujo Outflow	47.1417	2	0.0000
Christine-Lac du Sauvage	7.5219	2	0.0233

- Conclusions:
  Cujo Outflow and Christine-Lac du Sauvage show significant deviation from the common slope of reference streams.

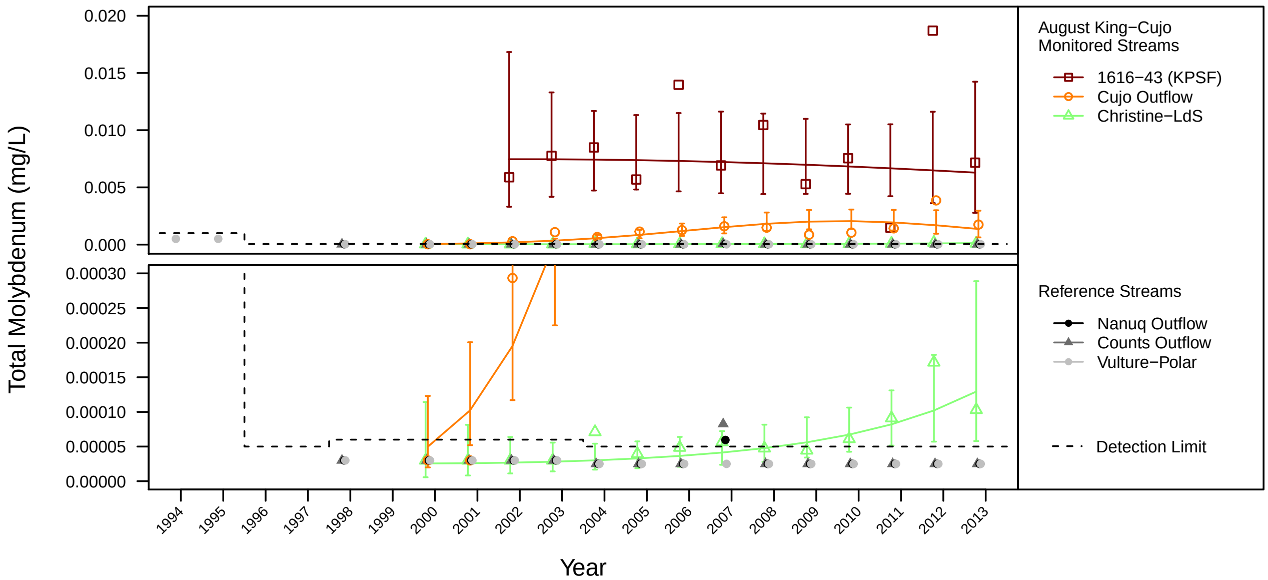
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Monitored Stream	1616-43 (KPSF)	0.0090
Monitored Stream	Christine-Lac du Sauvage	0.7450
Monitored Stream	Cujo Outflow	0.7810

- Conclusions:
  Model fit for 1616-43 (KPSF) is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total molybdenum for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	7.16e-03	6.29e-03	2.62e-03	2.78e-03	1.42e-02	7.67e-03
Cujo Outflow	1.74e-03	1.36e-03	5.40e-04	6.27e-04	2.96e-03	1.58e-03
Christine-Lac du Sauvage	1.03e-04	1.29e-04	5.30e-05	5.79e-05	2.89e-04	1.55e-04
Nanuq Outflow	2.50e-05	NA	NA	NA	NA	NA
Counts Outflow	2.50e-05	NA	NA	NA	NA	NA
Vulture-Polar	2.50e-05	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Molybdenum	August	King-Cujo	Stream	Water	Counts Outflow Nanuq Outflow Vulture-Polar	log e	Tobit regression	#1a slope of zero	19.38	Cujo Outflow Christine-Lac du Sauvage

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

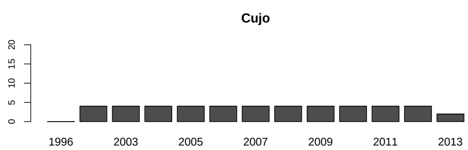
Analysis of April Total Nickel in Lakes of the King-Cujo Watershed and Lac du Sauvage

January 21, 2014

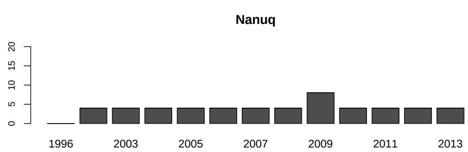
1 Censored Values:

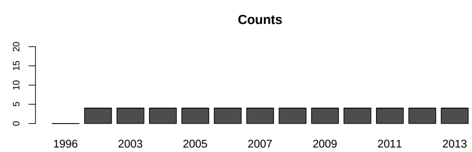
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

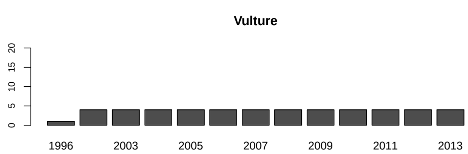
1.1 Monitored



1.2 Reference

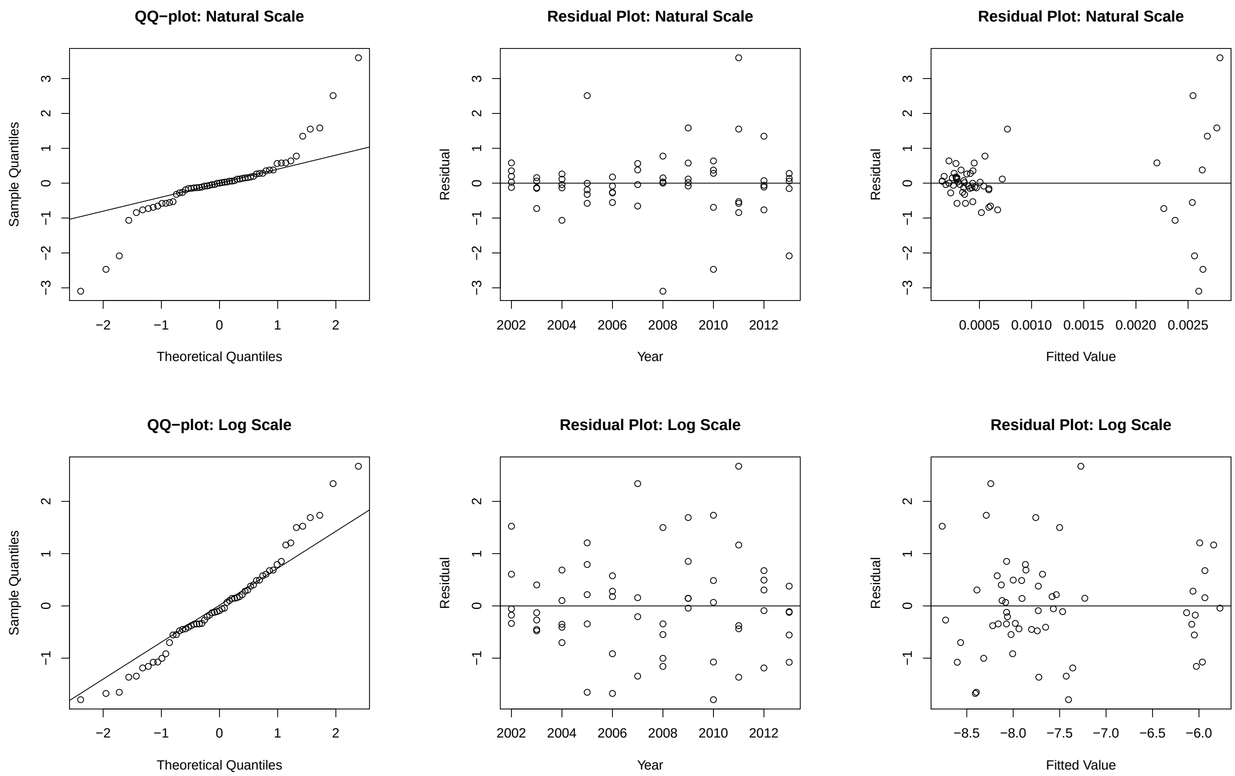






Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
55	Cujo	2008	0.00	0.00	-3.10
58	Cujo	2011	0.00	0.00	3.60

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	7.22E-177	natural model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
6394.94	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
8.60	4.00	0.07

- Conclusions:
  The slopes do not differ significantly among reference lakes.

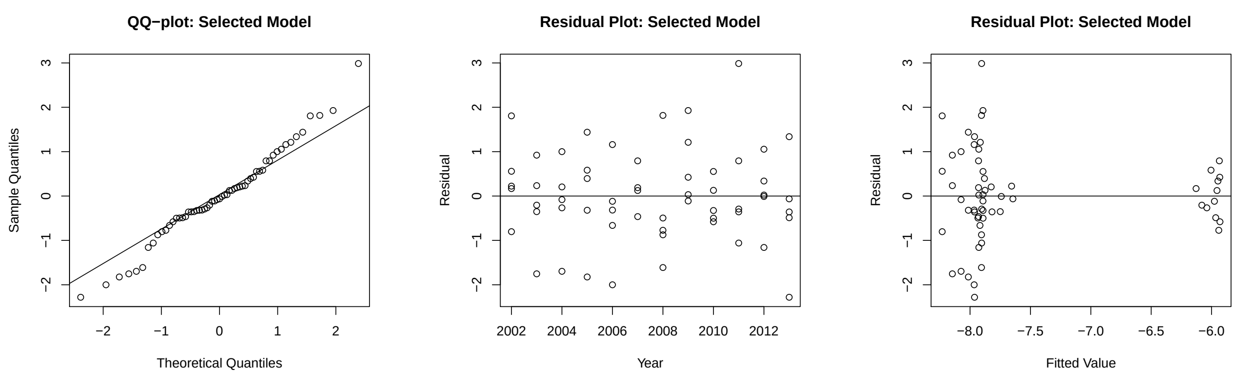
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Cujo	0.08	2.00	0.96
LdS1	1.34	2.00	0.51

- Conclusions:
  No significant deviations were found when comparing monitored lakes to reference lakes.

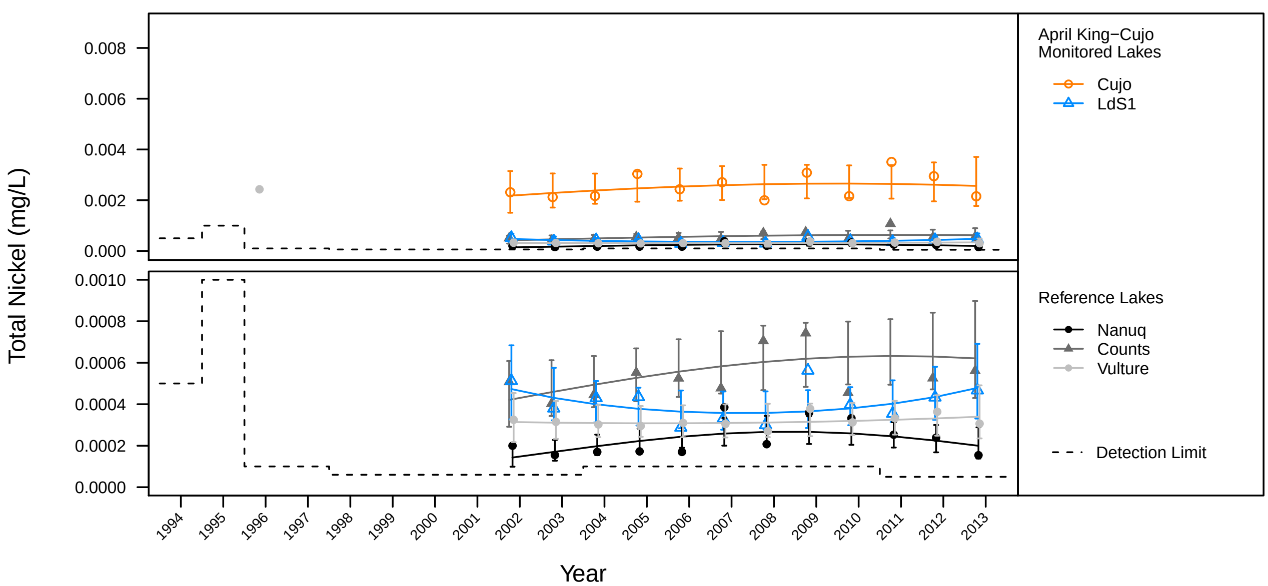
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0540
Monitored Lake	Cujo	0.1220
Monitored Lake	LdS1	0.2580

- Conclusions:
  Model fit for LdS1 is weak. Model fit for reference lakes and Cujo Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total nickel for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	2.15e-03	2.57e-03	4.82e-04	1.78e-03	3.71e-03	1.41e-03
LdS1	4.68e-04	4.78e-04	8.98e-05	3.31e-04	6.91e-04	2.63e-04
Nanuq	1.54e-04	2.00e-04	3.75e-05	1.38e-04	2.89e-04	NA
Counts	5.61e-04	6.21e-04	1.17e-04	4.30e-04	8.98e-04	NA
Vulture	3.06e-04	3.40e-04	6.38e-05	2.35e-04	4.91e-04	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Nickel	April	King-Cujo	Lake	Water	None	log e	linear mixed effects regression	#2 shared slopes	hardness-dependent	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

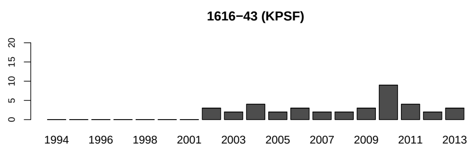
Analysis of August Total Nickel in Lakes of the King-Cujo Watershed and Lac du Sauvage

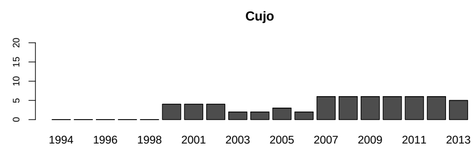
January 21, 2014

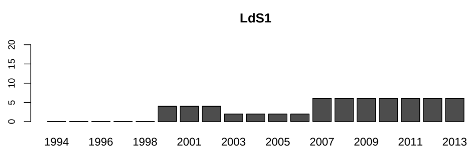
1 Censored Values:

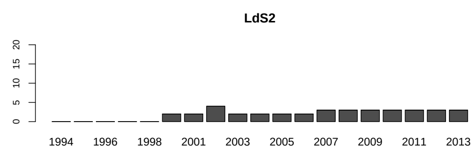
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

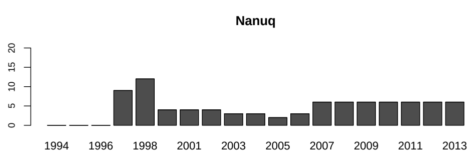


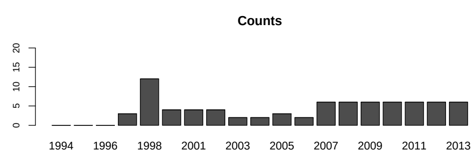


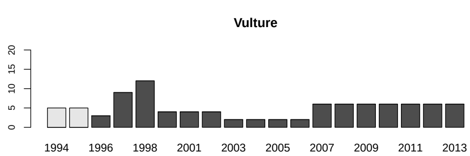




1.2 Reference

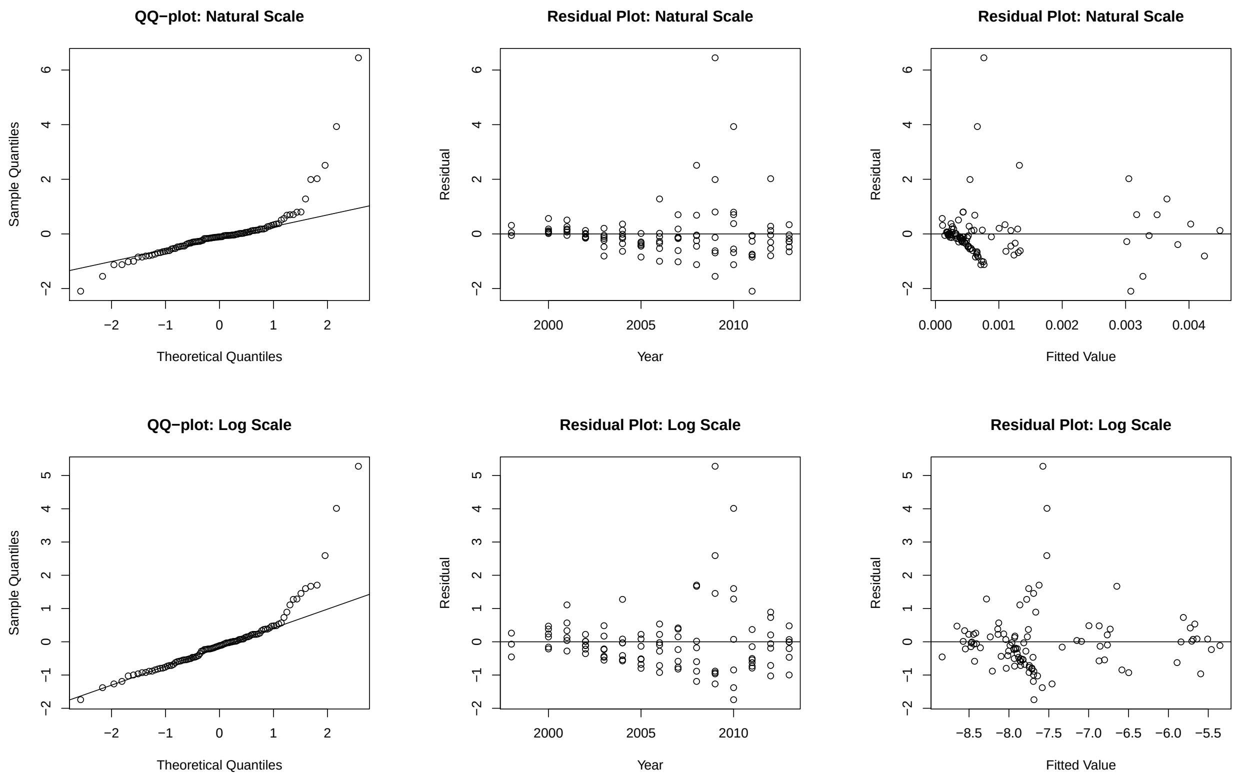






Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
76	LdS1	2009	0.00	0.00	6.45
137	Vulture	2010	0.00	0.00	3.93

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
76	LdS1	2009	0.00	-7.57	5.28
137	Vulture	2010	0.00	-7.52	4.01

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
27.83	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
0.64	4.00	0.96

- Conclusions:
  The slopes do not differ significantly among reference lakes.

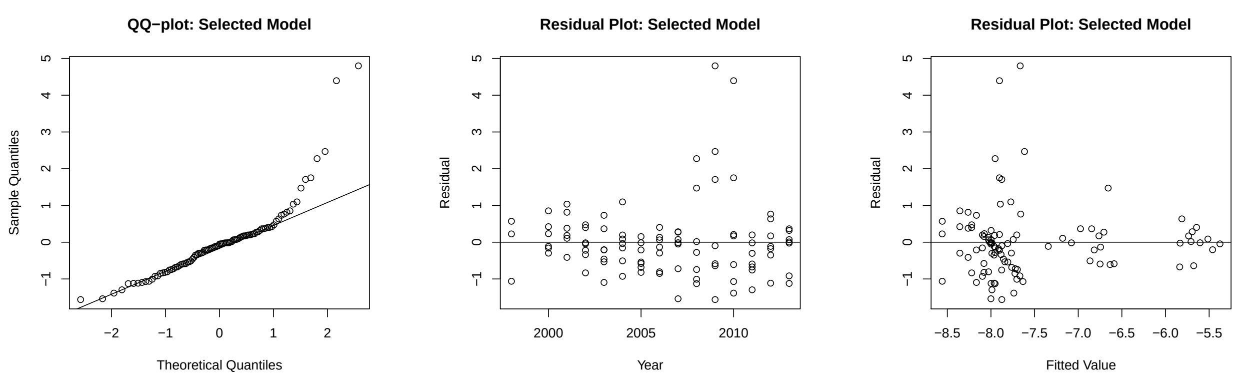
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.998	0.000	0.002	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
76	LdS1	2009	0.00	-7.67	4.80
137	Vulture	2010	0.00	-7.90	4.40

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	0.8466	2	0.6549
Cujo	0.4800	2	0.7866
LdS1	0.7010	2	0.7043
LdS2	0.1364	2	0.9341

- Conclusions:
  No significant deviations were found when comparing monitored lakes to reference lakes.

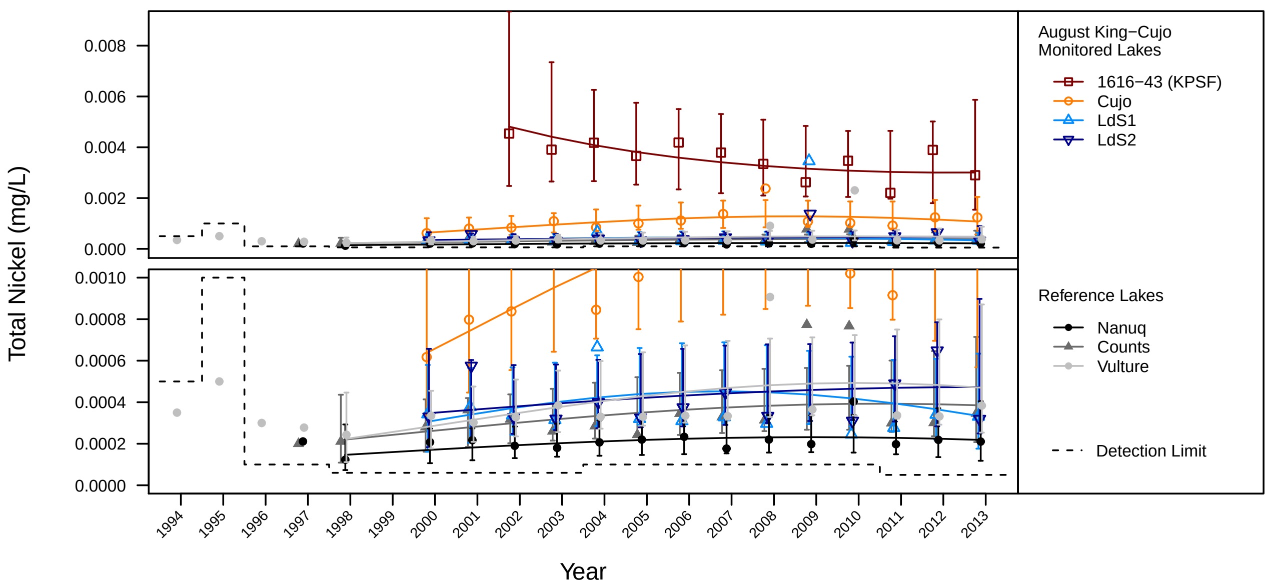
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.1360
Monitored Lake	1616-43 (KPSF)	0.4840
Monitored Lake	Cujo	0.4810
Monitored Lake	LdS1	0.0350
Monitored Lake	LdS2	0.0610

- Conclusions:
  Model fit for 1616-43 (KPSF) and Cujo Lake is weak. Model fit for reference lakes, LdS1, and LdS2 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total nickel for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	2.90e-03	3.01e-03	1.03e-03	1.54e-03	5.87e-03	3.00e-03
Cujo	1.24e-03	1.08e-03	3.52e-04	5.68e-04	2.04e-03	1.03e-03
LdS2	3.19e-04	4.73e-04	1.55e-04	2.50e-04	8.97e-04	4.52e-04
LdS1	3.31e-04	3.34e-04	1.09e-04	1.76e-04	6.34e-04	3.19e-04
Nanuq	2.10e-04	2.18e-04	6.87e-05	1.18e-04	4.05e-04	NA
Counts	3.46e-04	3.86e-04	1.21e-04	2.08e-04	7.14e-04	NA
Vulture	3.84e-04	4.70e-04	1.48e-04	2.54e-04	8.71e-04	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Nickel	August	King-Cujo	Lake	Water	none	log e	linear mixed effects regression	#2 shared slopes	hardness-dependent	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

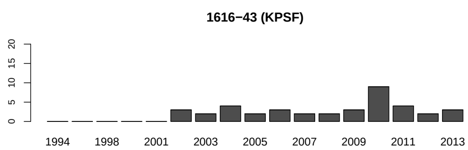
Analysis of August Total Nickel in King-Cujo Watershed Streams

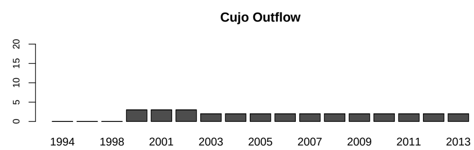
January 21, 2014

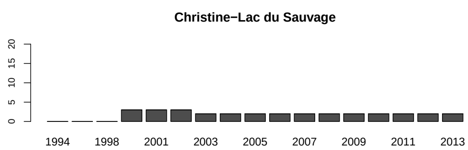
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

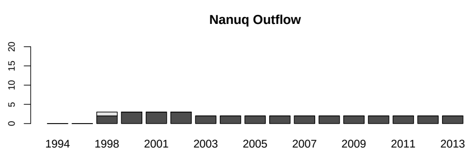
1.1 Monitored

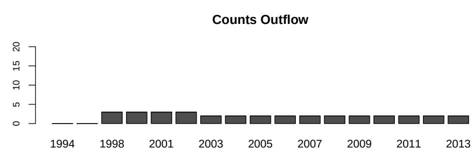


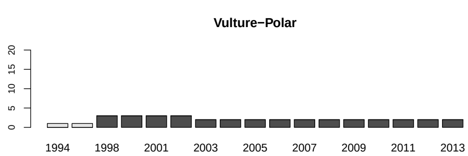




1.2 Reference

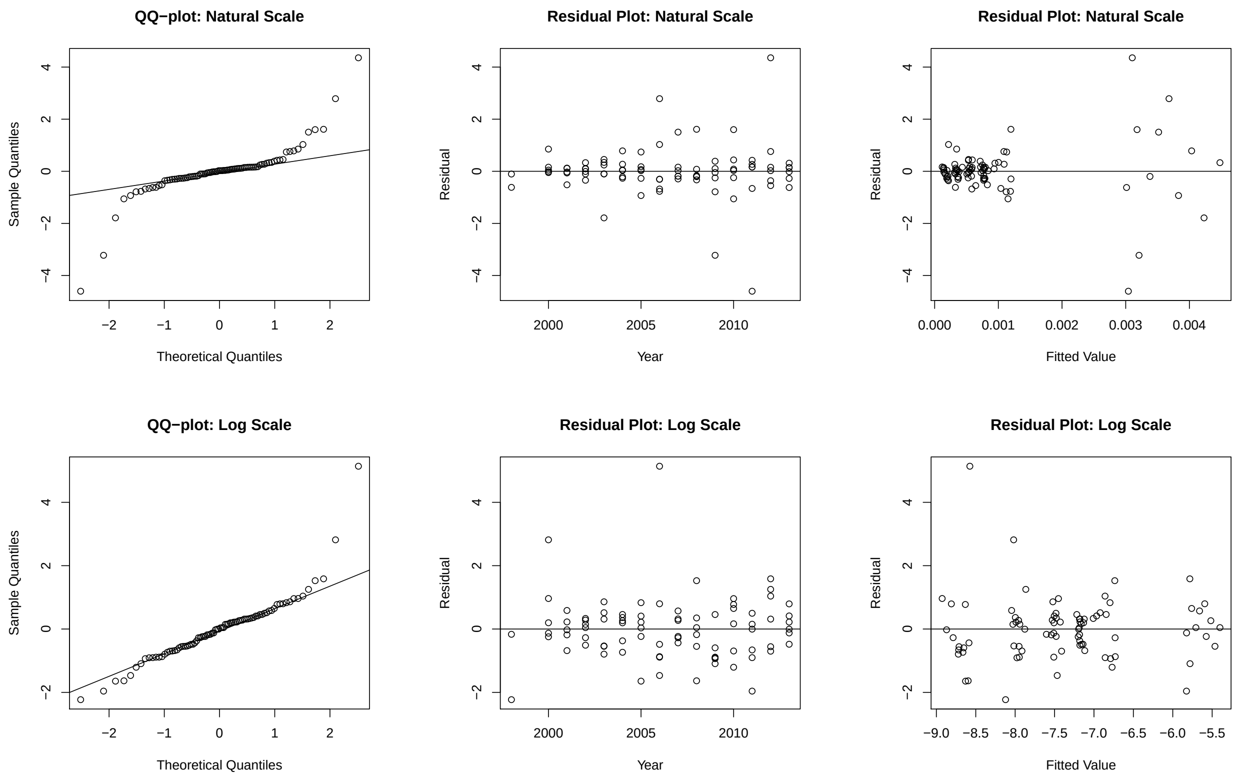






Comment:
None of the streams exhibited greater than 10% of data less than the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
16	1616-43 (KPSF)	2009	0.00	0.00	-3.22
18	1616-43 (KPSF)	2011	0.00	0.00	-4.60
19	1616-43 (KPSF)	2012	0.00	0.00	4.36

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
93	Nanuq Outflow	2006	0.00	-8.57	5.14

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:

The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
540.33	6.00	0.00

- Conclusions:
The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
9.85	4.00	0.04

- Conclusions:
The slopes differ significantly among reference streams. Reference streams do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	9.6241	2	0.0081
Cujo Outflow	3.2870	2	0.1933
Christine-Lac du Sauvage	0.0345	2	0.9829

- Conclusions:
1616-43 (KPSF) shows significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored stream compared to slope of each reference stream (reference model 1b).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)-vs-Nanuq Outflow	659.2261	3	0.0000
1616-43 (KPSF)-vs-Counts Outflow	325.6641	3	0.0000
1616-43 (KPSF)-vs-Vulture-Polar	222.5868	3	0.0000

- Conclusions:
  1616-43 (KPSF) shows significant deviation from the slopes of individual reference streams.

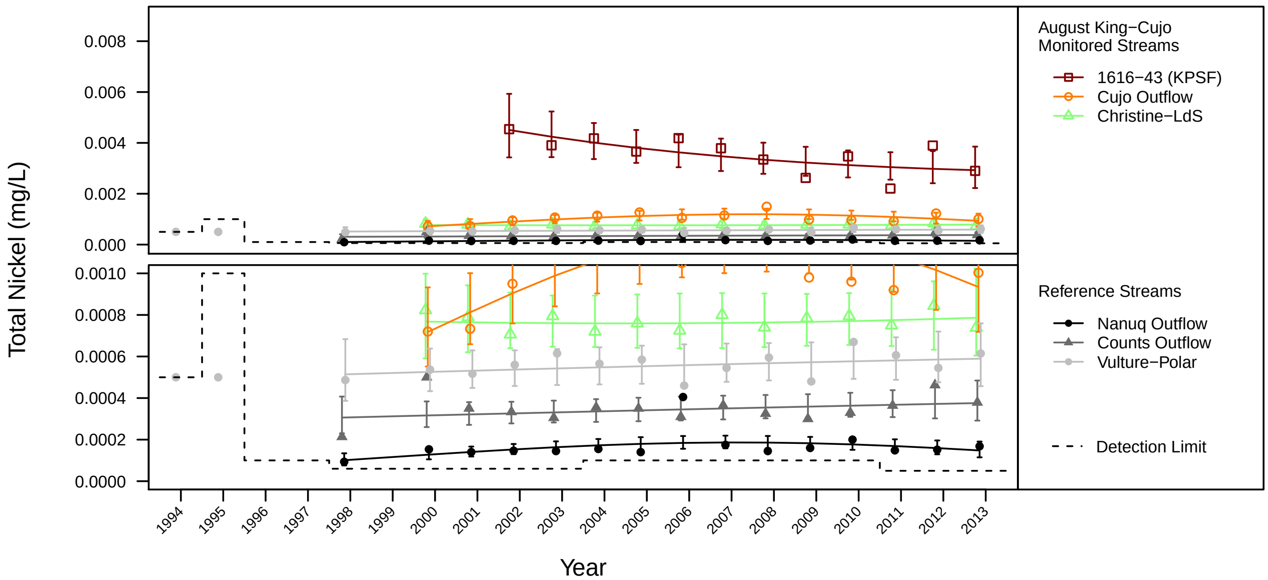
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Reference Stream	Counts Outflow	0.1040
Reference Stream	Nanuq Outflow	0.3140
Reference Stream	Vulture-Polar	0.1580
Monitored Stream	1616-43 (KPSF)	0.4590
Monitored Stream	Christine-Lac du Sauvage	0.0440
Monitored Stream	Cujo Outflow	0.5760

- Conclusions:
  Model fit for Nanuq Outflow and 1616-43 (KPSF) is weak. Model fit for Counts Outflow, Vulture-Polar, and Christine-Lac du Sauvage is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total nickel for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	2.90e-03	2.93e-03	4.11e-04	2.22e-03	3.85e-03	1.20e-03
Cujo Outflow	1.00e-03	9.35e-04	1.25e-04	7.18e-04	1.22e-03	3.67e-04
Christine-Lac du Sauvage	7.39e-04	7.86e-04	1.06e-04	6.05e-04	1.02e-03	3.09e-04
Nanuq Outflow	1.68e-04	1.48e-04	1.91e-05	1.15e-04	1.91e-04	NA
Counts Outflow	3.79e-04	3.76e-04	4.86e-05	2.92e-04	4.84e-04	NA
Vulture-Polar	6.15e-04	5.89e-04	7.62e-05	4.57e-04	7.59e-04	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Nickel	August	King-Cujo	Stream	Water	none	log e	linear mixed effects regression	#1b separate intercepts & slopes	hardness-dependent	1616-43 (KPSF)

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

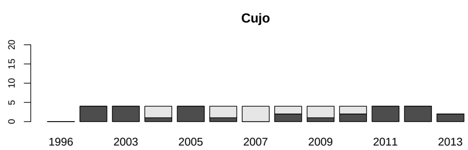
Analysis of April Total Selenium in Lakes of the King-Cujo Watershed and Lac du Sauvage

January 12, 2014

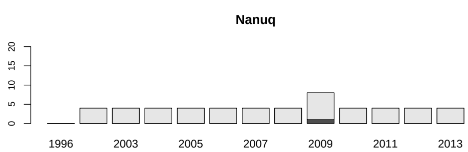
1 Censored Values:

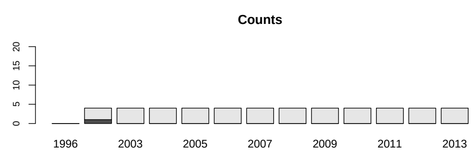
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

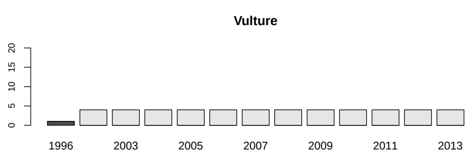
1.1 Monitored



1.2 Reference

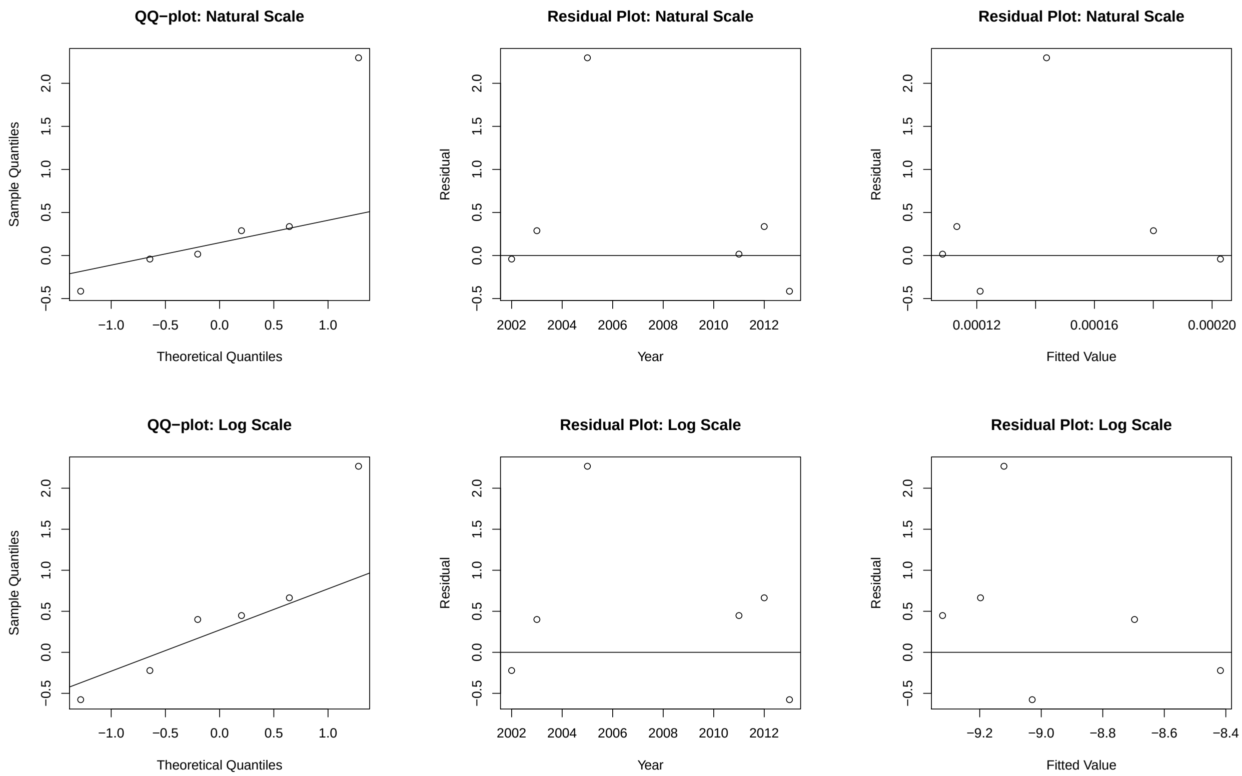






Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, and LdS1 was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in Cujo Lake was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	9.48E-22	natural model

Conclusion:
AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
Cujo	2.2451	2	0.3255

- Conclusions:
  No significant deviations were found when comparing monitored lakes to a constant slope of zero.

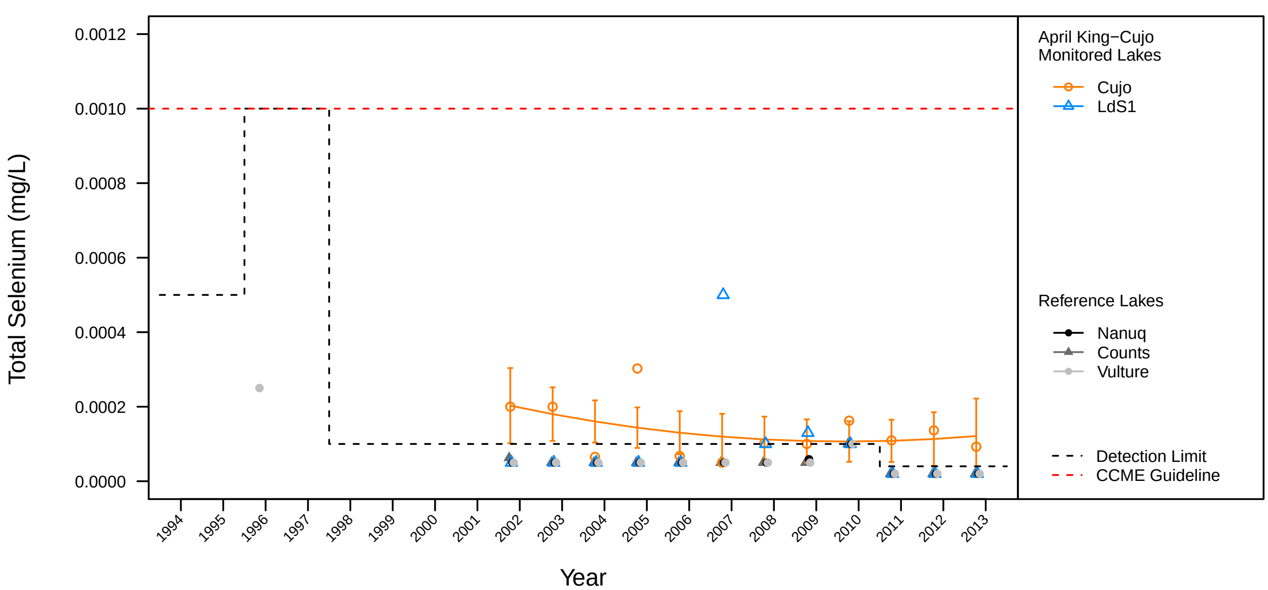
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	Cujo	0.1870

- Conclusions:
  Model fit for Cujo Lake is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total selenium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	9.25e-05	1.21e-04	5.13e-05	2.05e-05	2.22e-04	1.5e-04
LdS1	2.00e-05	NA	NA	NA	NA	NA
Nanuq	2.00e-05	NA	NA	NA	NA	NA
Counts	2.00e-05	NA	NA	NA	NA	NA
Vulture	2.00e-05	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Selenium	April	King-Cujo	Lake	Water	Counts Nanuq Vulture LdS1	none	Tobit regression	#1a slope of zero	0.001	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

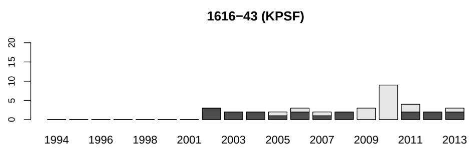
Analysis of August Total Selenium in Lakes of the King-Cujo Watershed and Lac du Sauvage

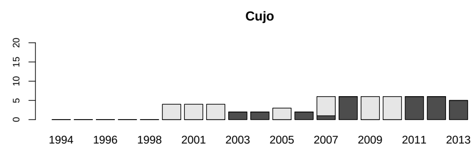
January 18, 2014

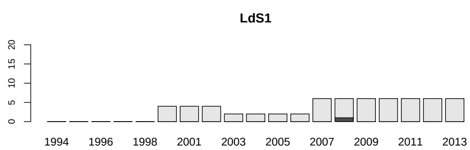
1 Censored Values:

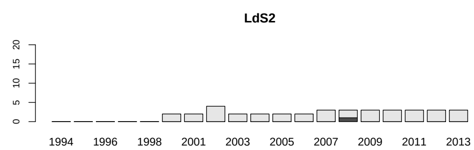
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

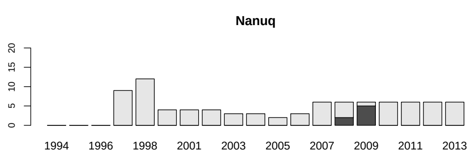


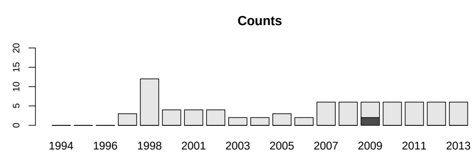


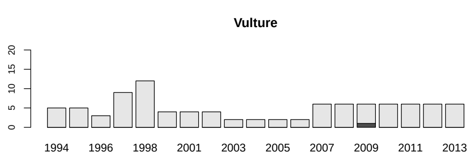




1.2 Reference

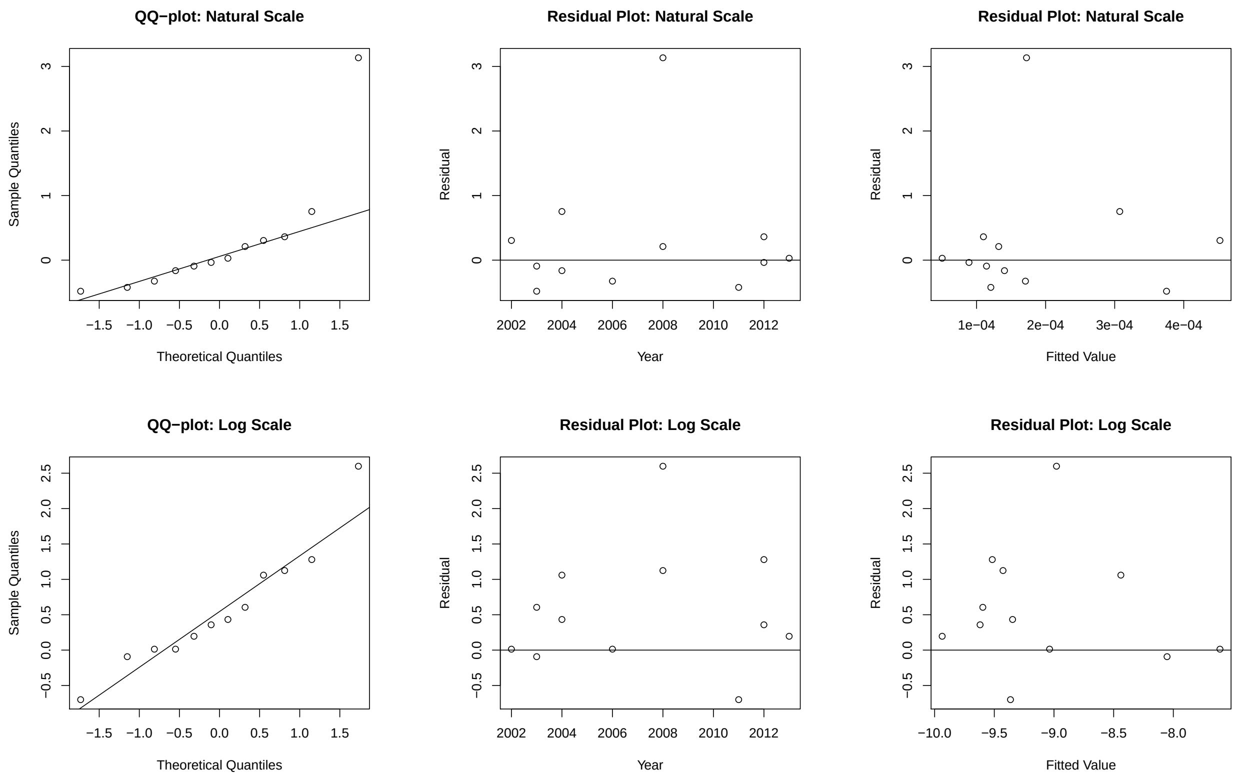






Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, LdS1, and LdS2 was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in 1616-43 (KPSF) and Cujo Lake was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
55	Cujo	2008	0.00	0.00	3.13

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	6.0972	2	0.0474
Cujo	1.6838	2	0.4309

- Conclusions:
  1616-43 (KPSF) shows significant deviation from a constant slope of zero.

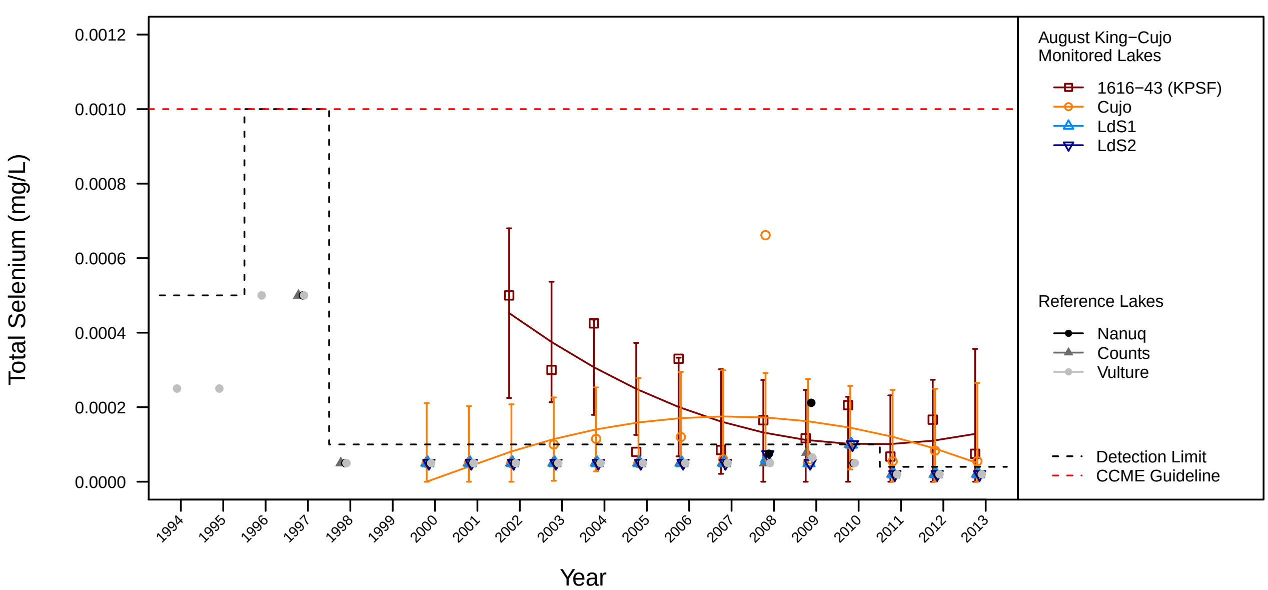
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	1616-43 (KPSF)	0.6280
Monitored Lake	Cujo	0.1260

- Conclusions:
  Model fit for Cujo Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total selenium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	7.50e-05	1.28e-04	1.16e-04	0e+00	3.57e-04	3.41e-04
Cujo	5.48e-05	5.02e-05	1.10e-04	0e+00	2.65e-04	3.21e-04
LdS2	2.00e-05	NA	NA	NA	NA	NA
LdS1	2.00e-05	NA	NA	NA	NA	NA
Nanuq	2.00e-05	NA	NA	NA	NA	NA
Counts	2.00e-05	NA	NA	NA	NA	NA
Vulture	2.00e-05	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Selenium	August	King-Cujo	Lake	Water	Counts Nanuq Vulture LdS1 LdS2	none	Tobit regression	#1a slope of zero	0.001	1616-43 (KPSF)

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

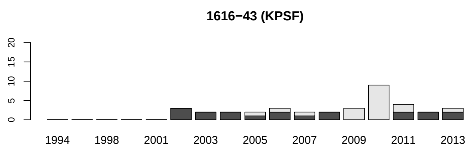
Analysis of August Total Selenium in King-Cujo Watershed Streams

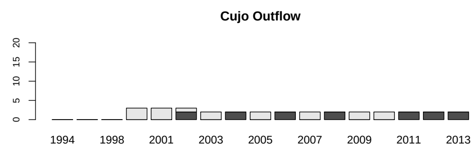
January 21, 2014

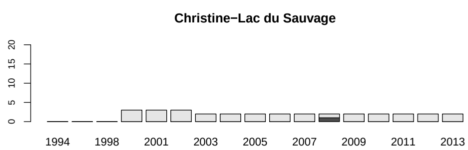
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

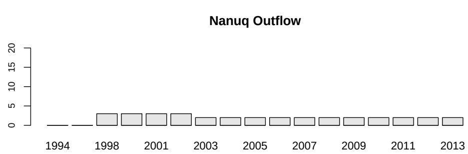
1.1 Monitored

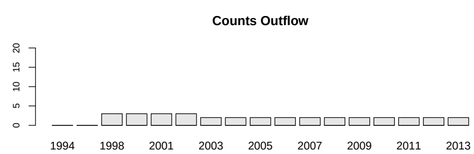


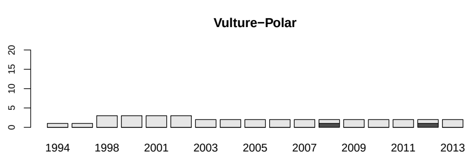




1.2 Reference

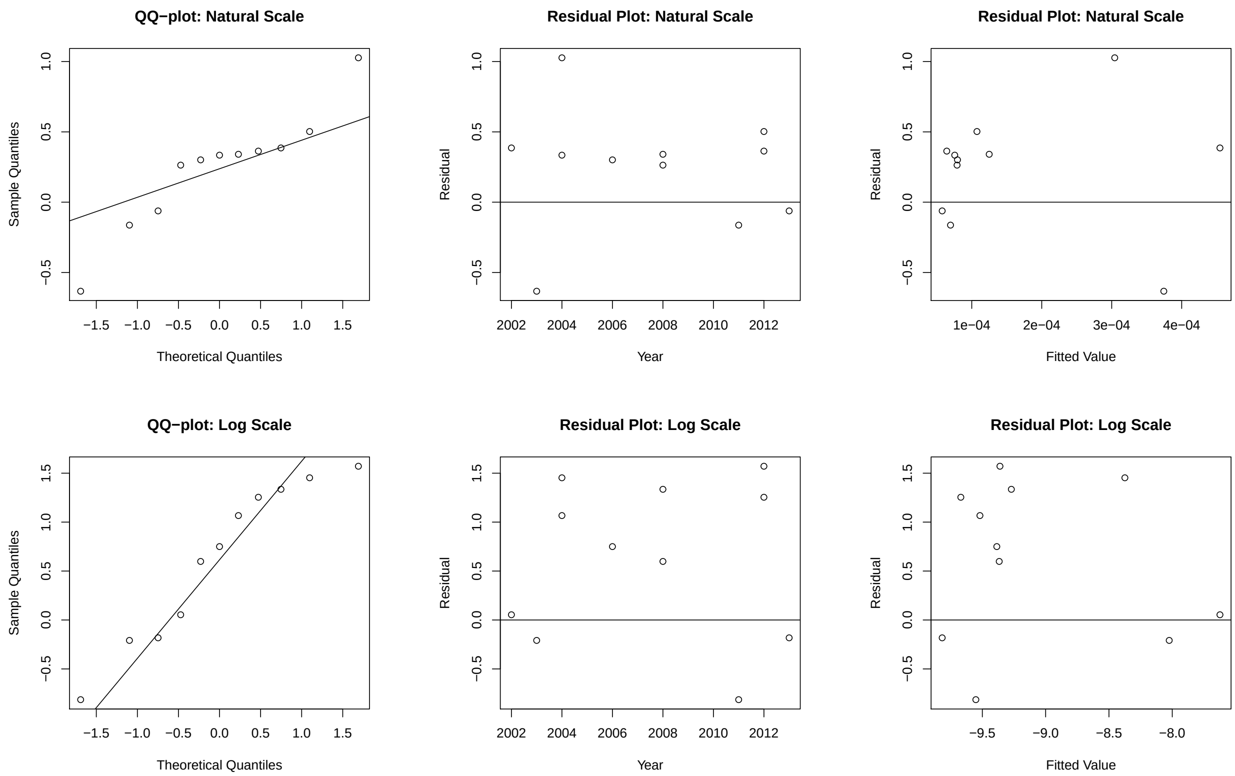






Comment:
Greater than 60% of data in Counts Outflow, Nanuq Outflow, Vulture-Polar, and Christine-Lac du Sauvage was less than the detection limit. These streams were excluded from further analyses. 10-60% of data in 1616-43 (KPSF) and Cujo Outflow was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Streams

All reference streams removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored stream against a slope of 0.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	17.3650	2	0.0002
Cujo Outflow	1.4503	2	0.4843

- Conclusions:
  1616-43 (KPSF) shows significant deviation from a constant slope of zero.

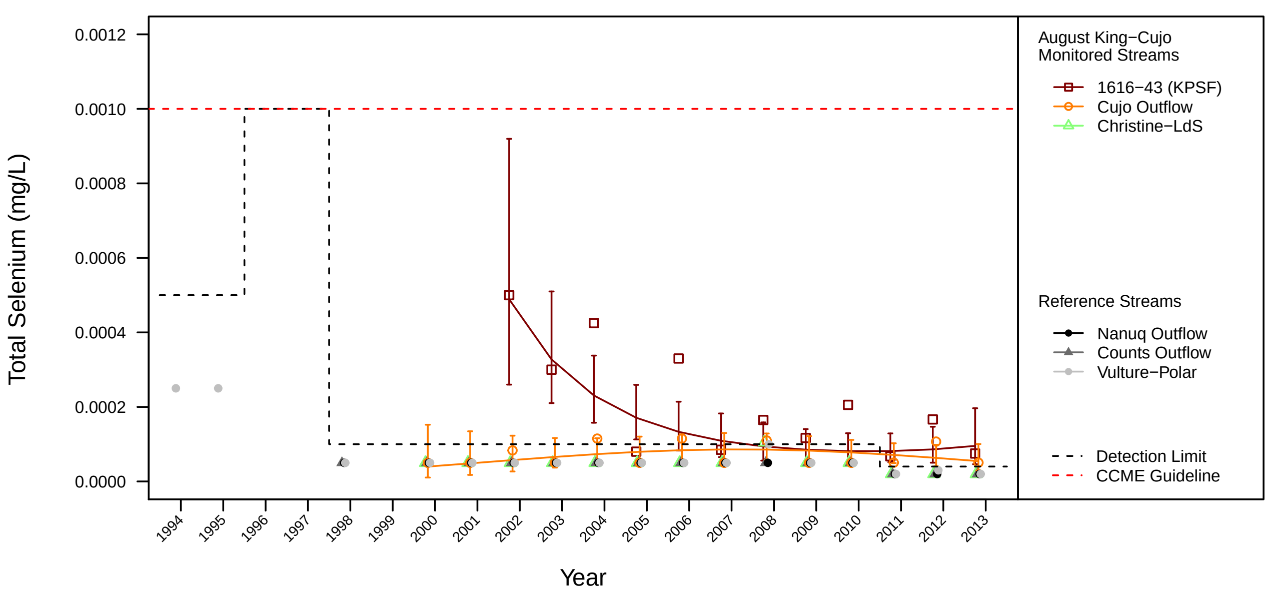
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Monitored Stream	1616-43 (KPSF)	0.5530
Monitored Stream	Cujo Outflow	0.2700

- Conclusions:
  Model fit for Cujo Outflow is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total selenium for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	7.50e-05	9.54e-05	3.52e-05	4.63e-05	1.96e-04	1.03e-04
Cujo Outflow	5.05e-05	5.45e-05	1.70e-05	2.96e-05	1.00e-04	4.97e-05
Christine-Lac du Sauvage	2.00e-05	NA	NA	NA	NA	NA
Nanuq Outflow	2.00e-05	NA	NA	NA	NA	NA
Counts Outflow	2.00e-05	NA	NA	NA	NA	NA
Vulture-Polar	2.00e-05	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Selenium	August	King-Cujo	Stream	Water	Counts Outflow Nanuq Outflow Vulture-Polar Christine-Lac du Sauvage	log e	Tobit regression	#1a slope of zero	0.001	1616-43 (KPSF)

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

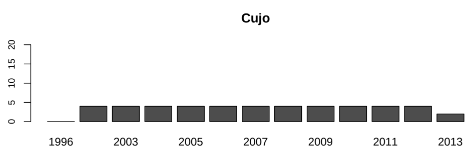
Analysis of April Total Strontium in Lakes of the King-Cujo Watershed and Lac du Sauvage

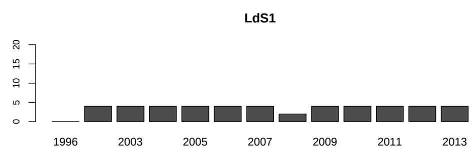
January 21, 2014

1 Censored Values:

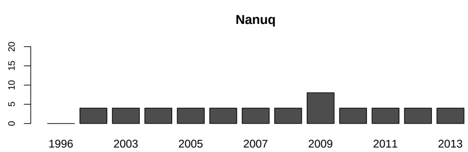
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

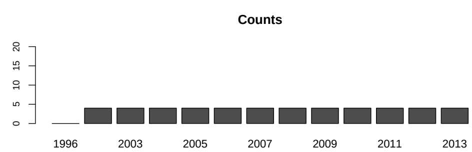
1.1 Monitored

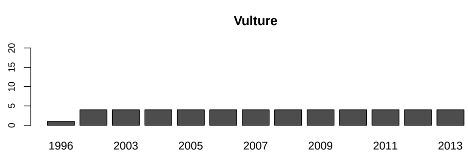




1.2 Reference

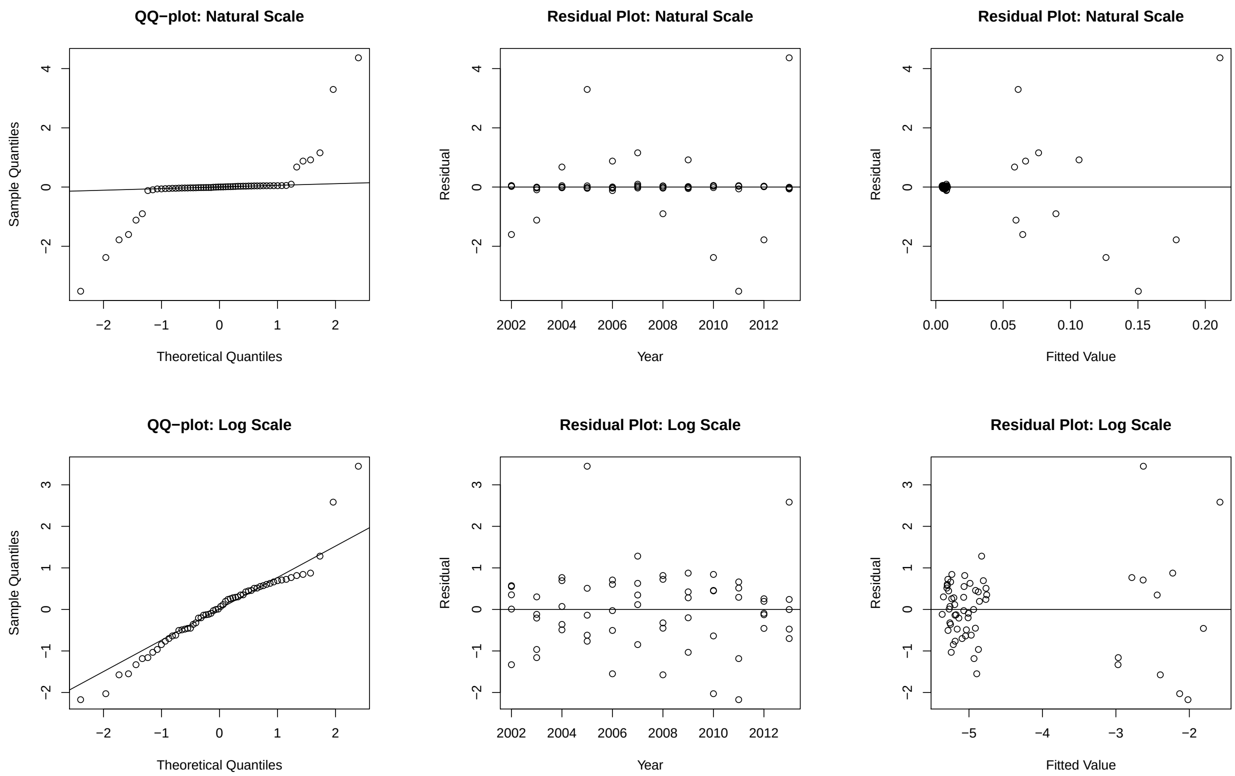






Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
52	Cujo	2005	0.10	0.06	3.30
58	Cujo	2011	0.11	0.15	-3.52
60	Cujo	2013	0.26	0.21	4.37

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
52	Cujo	2005	0.10	-2.63	3.45

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	2.27E-57	natural model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
6306.47	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
0.56	4.00	0.97

- Conclusions:
  The slopes do not differ significantly among reference lakes.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Cujo	44.09	2.00	0.00
LdS1	0.92	2.00	0.63

- Conclusions:
  Cujo Lake shows significant deviation from the common slope of reference lakes.

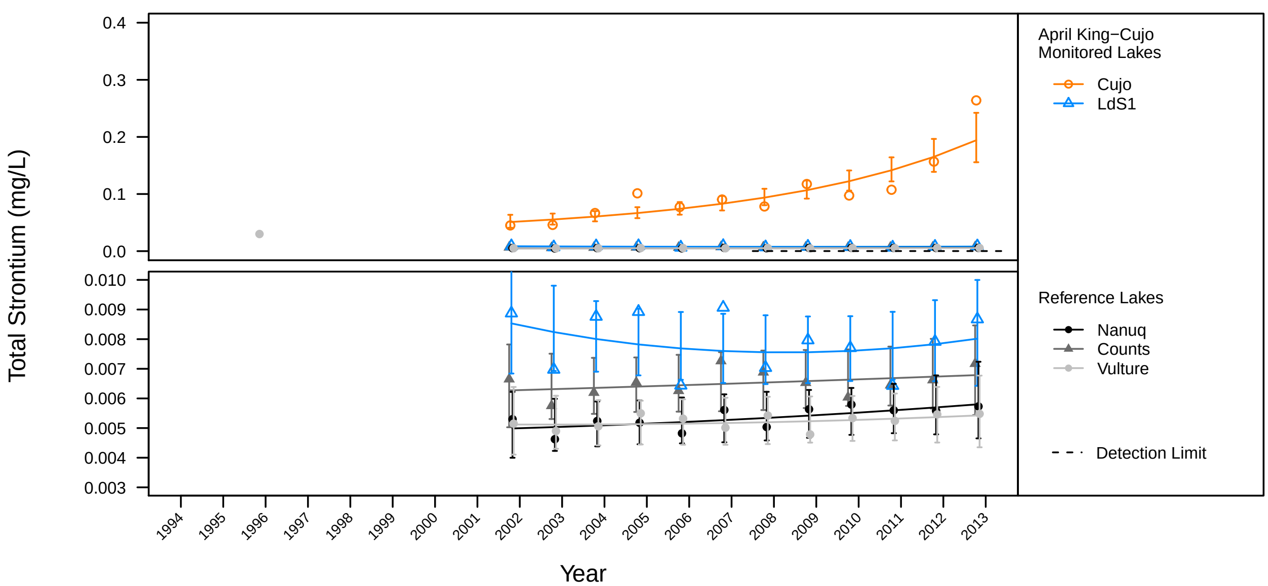
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0680
Monitored Lake	Cujo	0.8070
Monitored Lake	LdS1	0.0880

- Conclusions:
  Model fit for reference lakes and LdS1 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total strontium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	2.64e-01	1.94e-01	2.19e-02	1.56e-01	2.42e-01	6.41e-02
LdS1	8.67e-03	8.01e-03	9.04e-04	6.43e-03	1.00e-02	2.64e-03
Nanuq	5.73e-03	5.80e-03	6.54e-04	4.65e-03	7.24e-03	NA
Counts	7.17e-03	6.79e-03	7.65e-04	5.44e-03	8.46e-03	NA
Vulture	5.48e-03	5.43e-03	6.12e-04	4.35e-03	6.77e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Strontium	April	King-Cujo	Lake	Water	None	log e	linear mixed effects regression	#2 shared slopes	6.242	Cujo

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

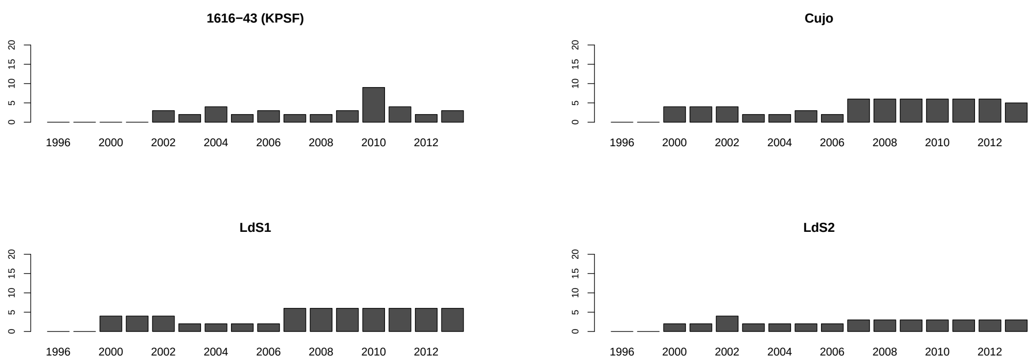
Analysis of August Total Strontium in Lakes of the King-Cujo Watershed and Lac du Sauvage

January 18, 2014

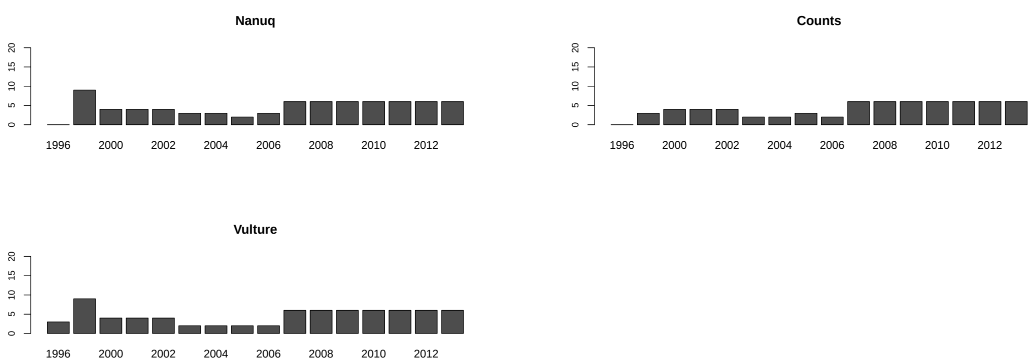
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

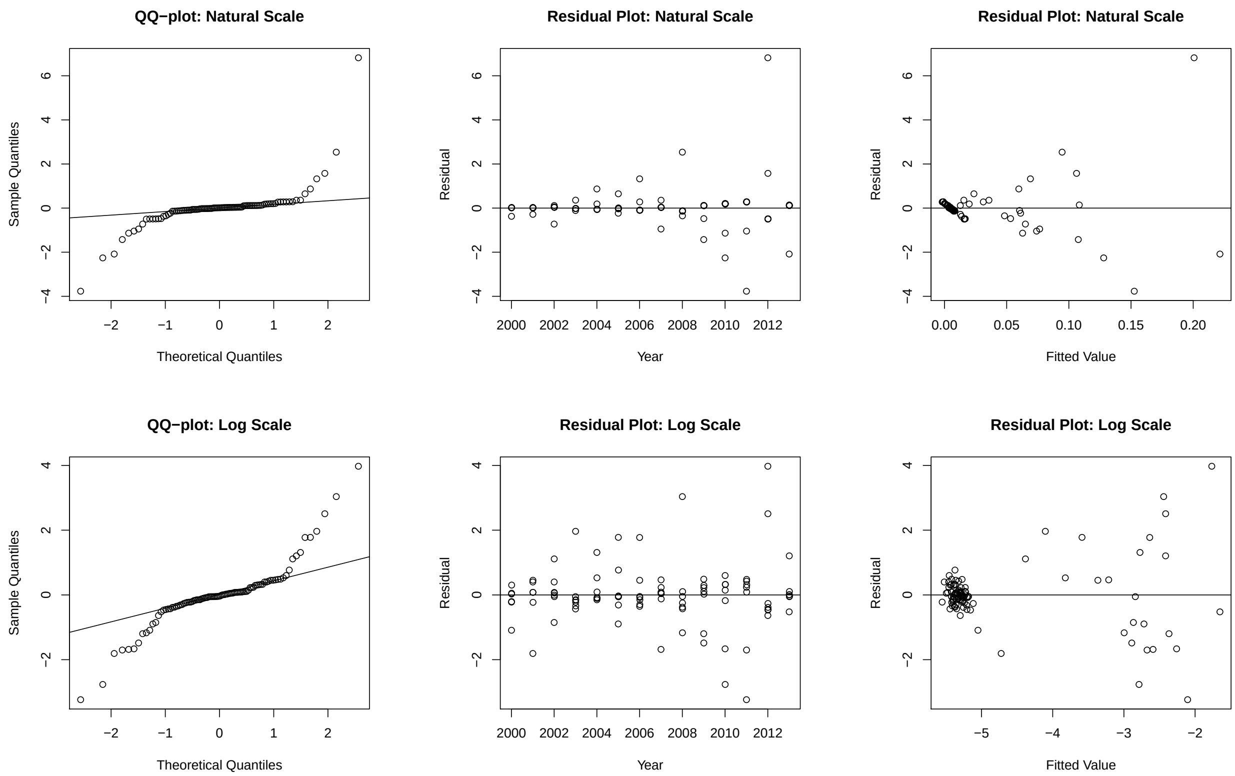


1.2 Reference



Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-43 (KPSF)	2011	0.07	0.15	-3.77
19	1616-43 (KPSF)	2012	0.35	0.20	6.82

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
15	1616-43 (KPSF)	2008	0.15	-2.44	3.04
18	1616-43 (KPSF)	2011	0.07	-2.10	-3.23
19	1616-43 (KPSF)	2012	0.35	-1.77	3.97

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
1.66	6.00	0.95

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

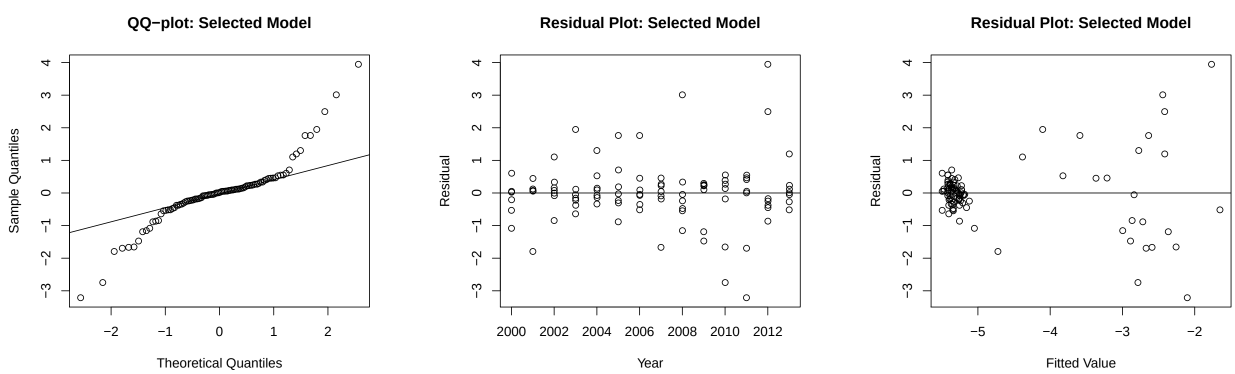
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.006	0.000	0.994	Ref. Model 3

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
15	1616-43 (KPSF)	2008	0.15	-2.44	3.01
18	1616-43 (KPSF)	2011	0.07	-2.10	-3.21
19	1616-43 (KPSF)	2012	0.35	-1.77	3.95

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Lakes

Fitted model of the slope and intercept of each monitored lake compared to a common slope and intercept fitted for all reference lakes together (reference model 3).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	235.2580	3	0.0000
Cujo	1317.8634	3	0.0000
LdS1	3.5133	3	0.3190
LdS2	6.0128	3	0.1110

- Conclusions:
  1616-43 (KPSF) and Cujo Lake show significant deviation from the common slope and intercept of reference lakes.

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	10.5610	2	0.0051
Cujo	184.7751	2	0.0000
LdS1	0.0331	2	0.9836
LdS2	0.1062	2	0.9483

- Conclusions:
  When allowing for differences in intercept, 1616-43 (KPSF) and Cujo Lake show significant deviation from the common slope of reference lakes.

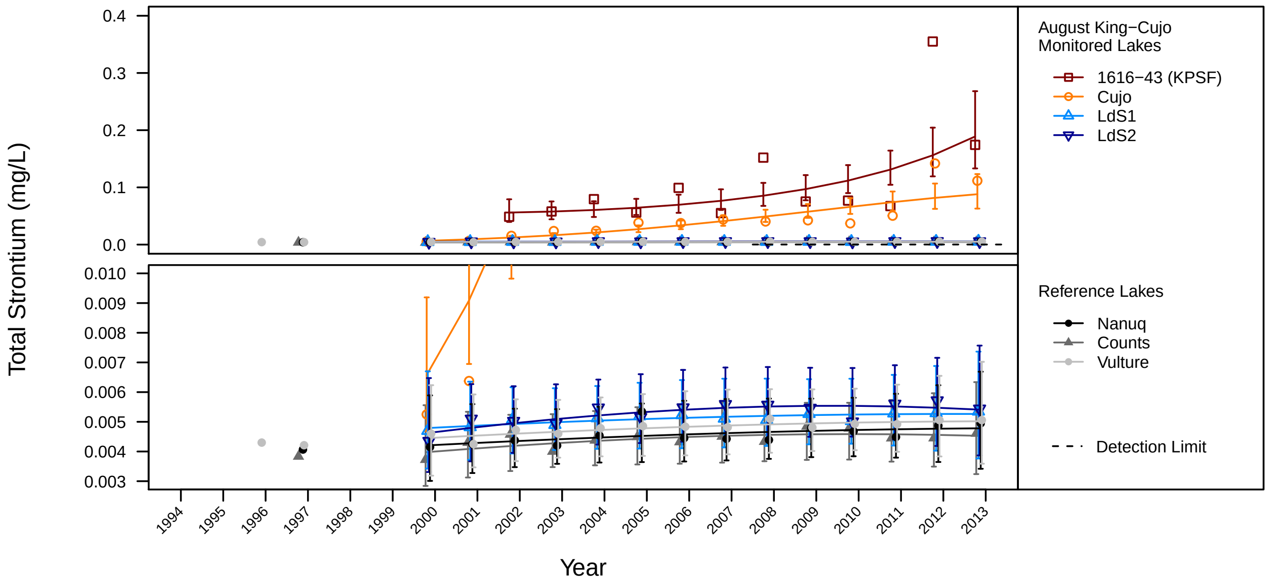
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.3380
Monitored Lake	1616-43 (KPSF)	0.4770
Monitored Lake	Cujo	0.8630
Monitored Lake	LdS1	0.6980
Monitored Lake	LdS2	0.6370

- Conclusions:
  Model fit for reference lakes and 1616-43 (KPSF) is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total strontium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	1.74e-01	1.89e-01	3.38e-02	1.33e-01	2.68e-01	9.88e-02
Cujo	1.12e-01	8.81e-02	1.51e-02	6.30e-02	1.23e-01	4.41e-02
LdS2	5.44e-03	5.41e-03	9.26e-04	3.87e-03	7.57e-03	2.71e-03
LdS1	5.35e-03	5.26e-03	9.01e-04	3.76e-03	7.36e-03	2.64e-03
Nanuq	4.95e-03	4.78e-03	8.19e-04	3.42e-03	6.69e-03	NA
Counts	4.61e-03	4.53e-03	7.76e-04	3.24e-03	6.34e-03	NA
Vulture	5.06e-03	5.02e-03	8.59e-04	3.59e-03	7.02e-03	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Strontium	August	King-Cujo	Lake	Water	none	log e	linear mixed effects regression	#3 shared intercept & slope	6.242	1616-43 (KPSF) Cujo

* Monitored lakes are contrasted to the slope of each individual reference lake in model 1a, a slope of 0 in reference model 1b, the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

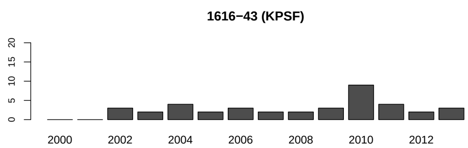
Analysis of August Total Strontium in King-Cujo Watershed Streams

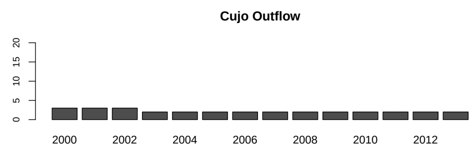
January 21, 2014

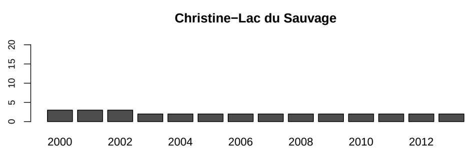
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

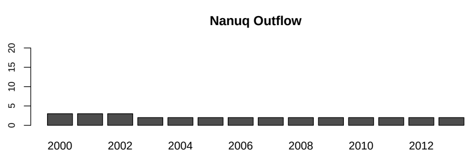
1.1 Monitored

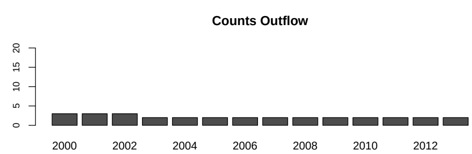


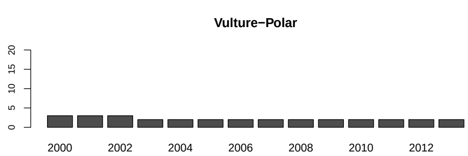




1.2 Reference

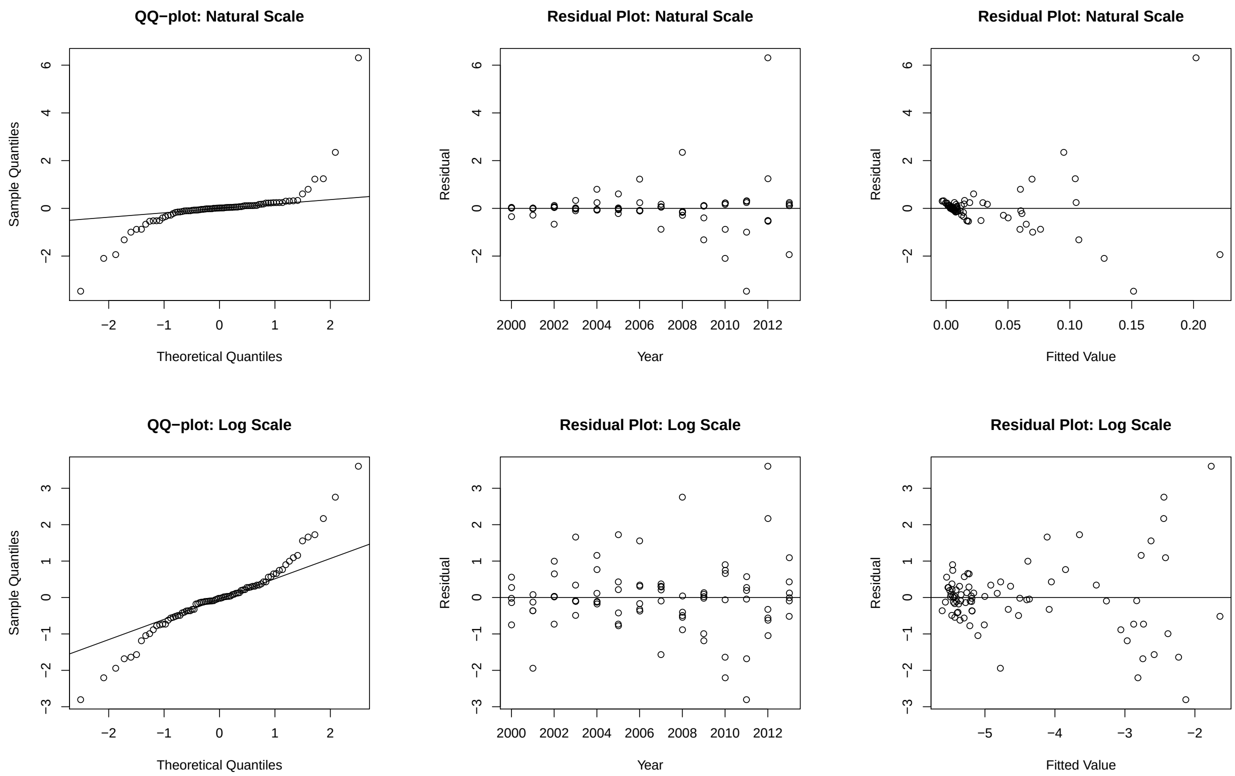






Comment:
None of the streams exhibited greater than 10% of data less than the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-43 (KPSF)	2011	0.07	0.15	-3.47
19	1616-43 (KPSF)	2012	0.35	0.20	6.31

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
19	1616-43 (KPSF)	2012	0.35	-1.77	3.61

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
13.07	6.00	0.04

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-squared	DF	P-value
12.97	4.00	0.01

- Conclusions:
  The slopes differ significantly among reference streams. Reference streams do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.000	0.826	0.174	Ref. Model 2

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference streams are best modeled with a common slope, results of contrasts suggest that slopes and intercepts differ among reference streams. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	54.4491	2	0.0000
Cujo Outflow	9.9346	2	0.0070
Christine-Lac du Sauvage	0.1253	2	0.9393

- Conclusions:
  1616-43 (KPSF) and Cujo Outflow show significant deviation from a slope of zero.

Fitted model of the trend (slope) of each monitored stream compared to slope of each reference stream (reference model 1b).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)-vs-Nanuq Outflow	31.5204	3	0.0000
1616-43 (KPSF)-vs-Counts Outflow	31.3252	3	0.0000
1616-43 (KPSF)-vs-Vulture-Polar	31.1143	3	0.0000
Cujo Outflow-vs-Nanuq Outflow	28.4094	3	0.0000
Cujo Outflow-vs-Counts Outflow	28.3581	3	0.0000
Cujo Outflow-vs-Vulture-Polar	27.3983	3	0.0000

- Conclusions:
  All remaining streams show significant deviation from slopes of individual reference streams.

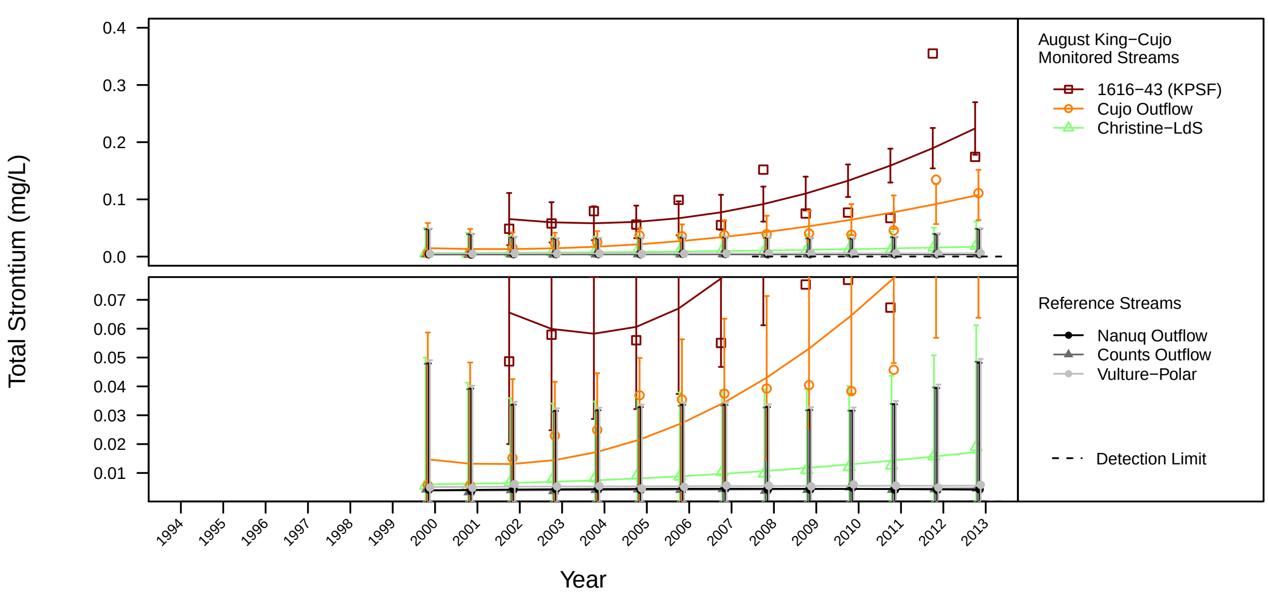
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Reference Stream	Counts Outflow	0.3220
Reference Stream	Nanuq Outflow	0.2470
Reference Stream	Vulture-Polar	0.1040
Monitored Stream	1616-43 (KPSF)	0.4190
Monitored Stream	Christine-Lac du Sauvage	0.9350
Monitored Stream	Cujo Outflow	0.7550

- Conclusions:
  Model fit for Counts Outflow, Nanuq Outflow, and 1616-43 (KPSF) is weak. Model fit for Vulture-Polar is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total strontium for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	1.74e-01	2.24e-01	2.34e-02	1.78e-01	2.70e-01	6.85e-02
Cujo Outflow	1.11e-01	1.08e-01	2.24e-02	6.38e-02	1.52e-01	6.56e-02
Christine-Lac du Sauvage	1.90e-02	1.72e-02	2.24e-02	0.00e+00	6.12e-02	6.56e-02
Nanuq Outflow	4.32e-03	4.21e-03	2.24e-02	0.00e+00	4.81e-02	NA
Counts Outflow	4.68e-03	4.64e-03	2.24e-02	0.00e+00	4.86e-02	NA
Vulture-Polar	5.88e-03	5.59e-03	2.24e-02	0.00e+00	4.95e-02	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Strontium	August	King-Cujo	Stream	Water	none	none	linear mixed effects regression	#1b separate intercepts & slopes	NA	1616-43 (KPSF) Cujo Outflow

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

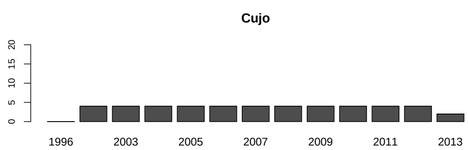
Analysis of April Total Uranium in Lakes of the King-Cujo Watershed and Lac du Sauvage

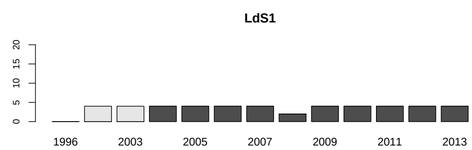
January 2, 2014

1 Censored Values:

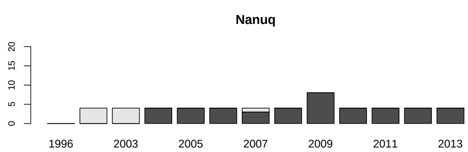
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

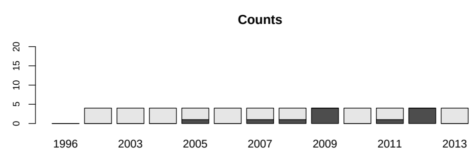
1.1 Monitored

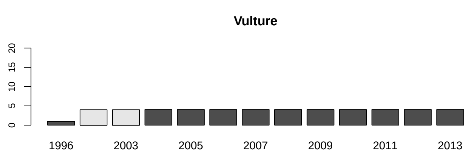




1.2 Reference

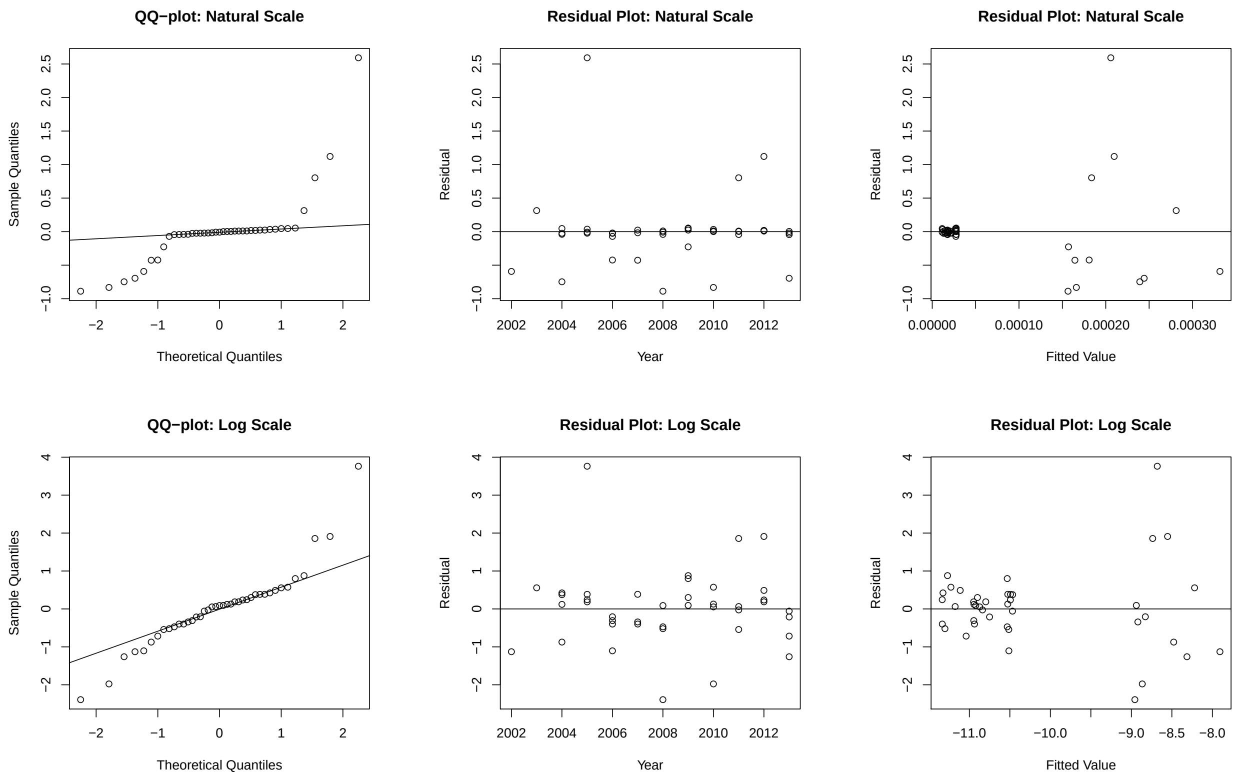






Comment:
Greater than 60% of data in Counts Lake was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in Nanuq, Vulture, and LdS1 was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
52	Cujo	2005	0.00	-8.68	3.76

AIC weights and model comparison:

Natural Model	Log Model	Best Model
1.00E+00	8.56E-142	natural model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
1.57	3.00	0.67

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
0.07	2.00	0.96

- Conclusions:
  The slopes do not differ significantly among reference lakes.

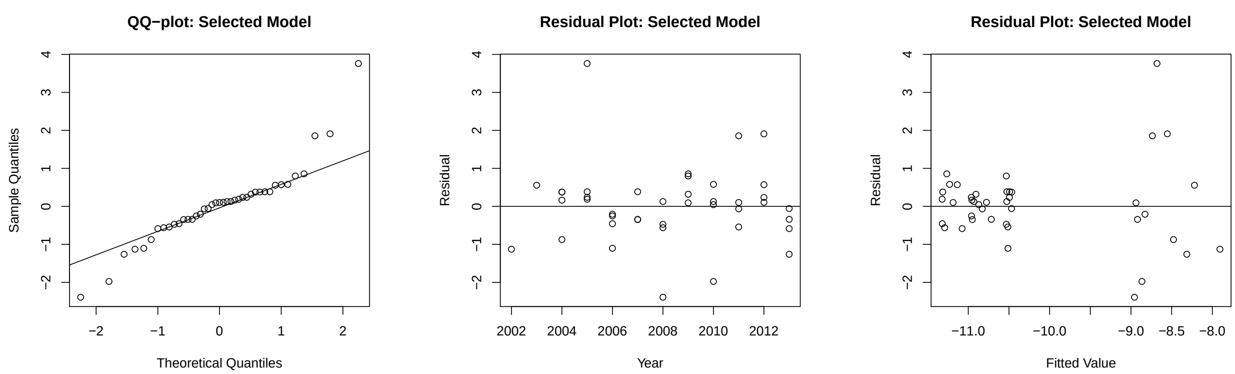
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.253	0.663	0.084	Indistinguishable support for 2 & 1; choose Model 2.

- Conclusions:
  Results of AIC do not agree with reference model testing. However, AIC weights differ little between the best model as selected by AIC and the best model as selected by reference model testing. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
52	Cujo	2005	0.00	-8.68	3.76

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
Cujo	5.3365	2	0.0694
LdS1	0.5806	2	0.7480

- Conclusions:
  No significant deviations were found when comparing monitored lakes to reference lakes.

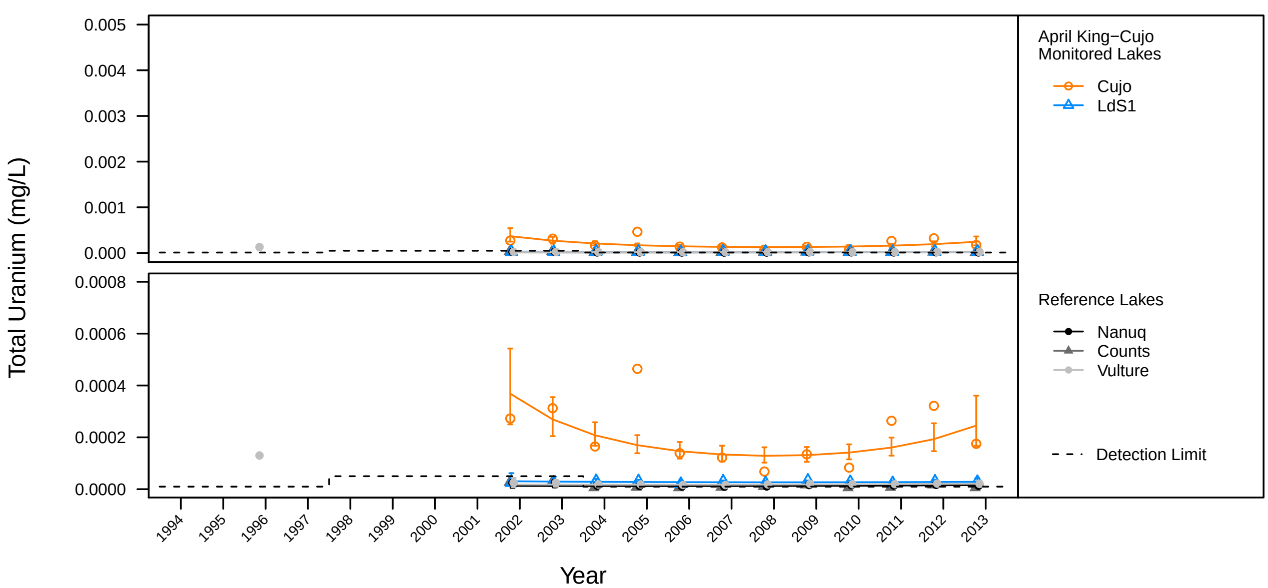
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.4320
Monitored Lake	Cujo	0.3270
Monitored Lake	LdS1	0.0990

- Conclusions:
  Model fit for reference lakes and Cujo Lake is weak. Model fit for LdS1 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total uranium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	1.75e-04	2.45e-04	4.84e-05	1.66e-04	3.61e-04	1.42e-04
LdS1	2.80e-05	2.84e-05	5.82e-06	1.90e-05	4.25e-05	1.70e-05
Nanuq	1.32e-05	1.60e-05	3.38e-06	1.06e-05	2.43e-05	NA
Counts	5.00e-06	NA	NA	NA	NA	NA
Vulture	2.03e-05	2.14e-05	4.50e-06	1.42e-05	3.23e-05	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Uranium	April	King-Cujo	Lake	Water	1616-43 (KPSF) LdS2 Counts	log e	Tobit regression	#2 shared slopes	0.015	none

* Monitored lakes are contrasted to the slope of each individual reference lake in model 1a, a slope of 0 in reference model 1b, the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

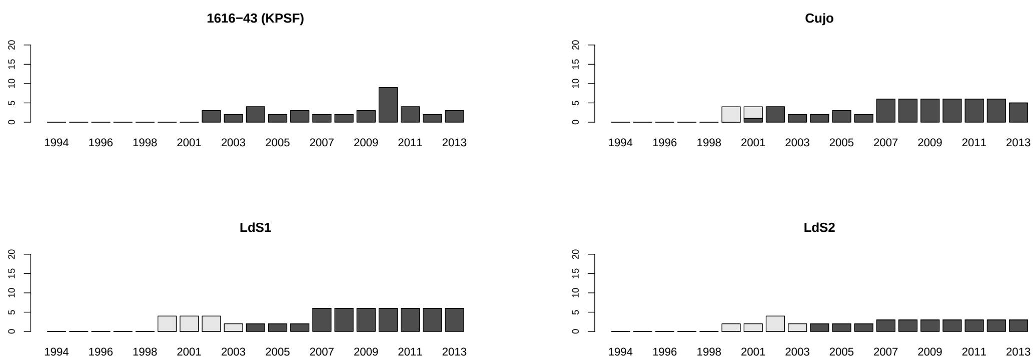
Analysis of August Total Uranium in Lakes of the King-Cujo Watershed and Lac du Sauvage

January 21, 2014

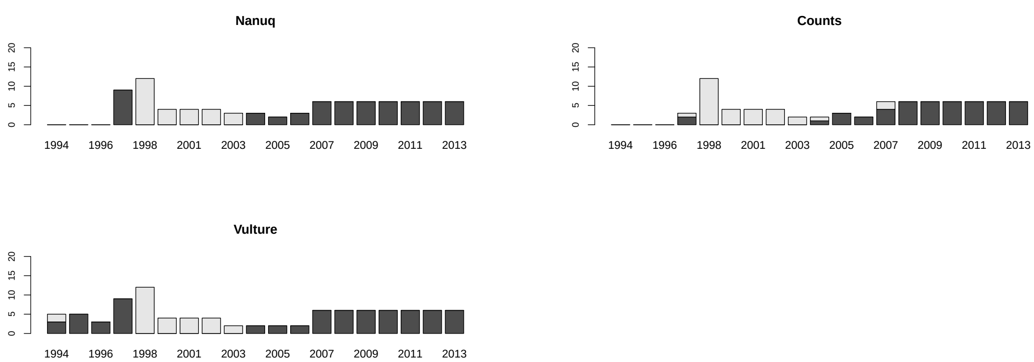
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

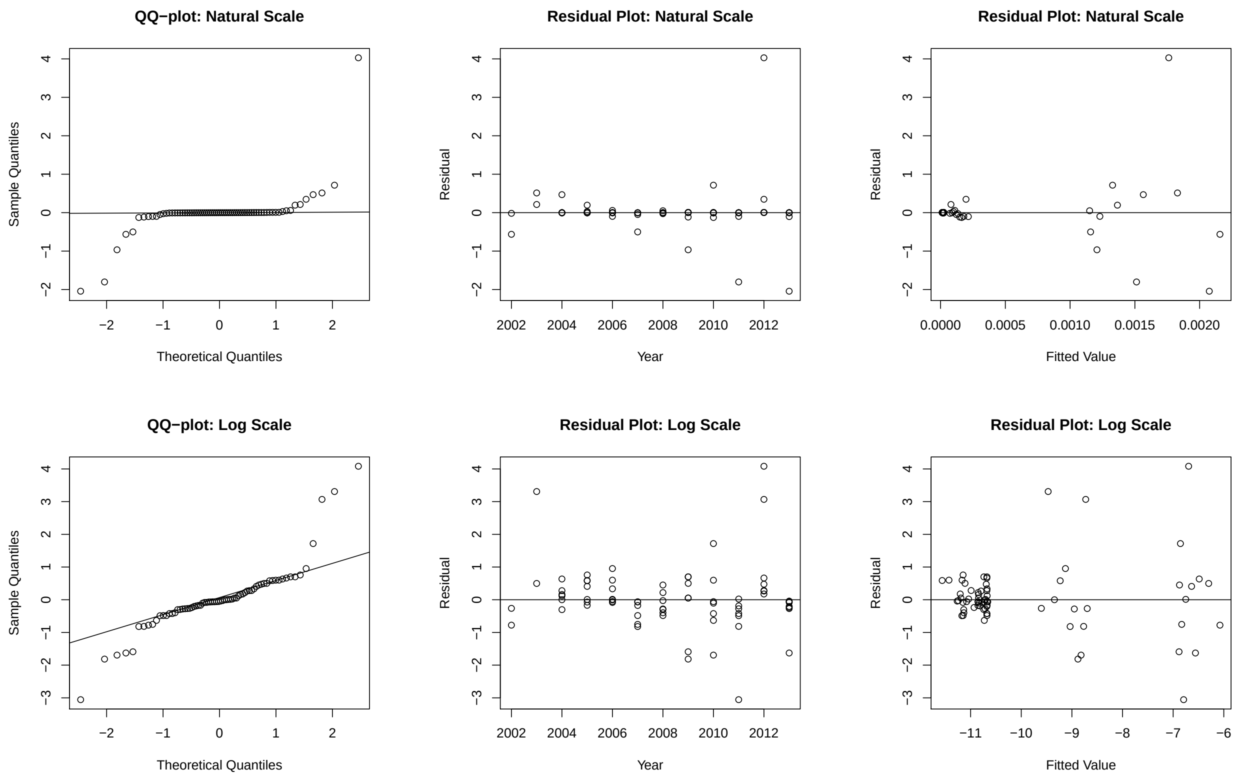


1.2 Reference



Comment:
10-60% of data in all reference and monitored lakes was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
19	1616-43 (KPSF)	2012	0.00	0.00	4.03

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-43 (KPSF)	2011	0.00	-6.79	-3.06
19	1616-43 (KPSF)	2012	0.00	-6.69	4.08
50	Cujo	2003	0.00	-9.47	3.31
59	Cujo	2012	0.00	-8.73	3.07

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-squared	DF	P-value
4.76	6.00	0.57

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-squared	DF	P-value
1.77	4.00	0.78

- Conclusions:
  The slopes do not differ significantly among reference lakes.

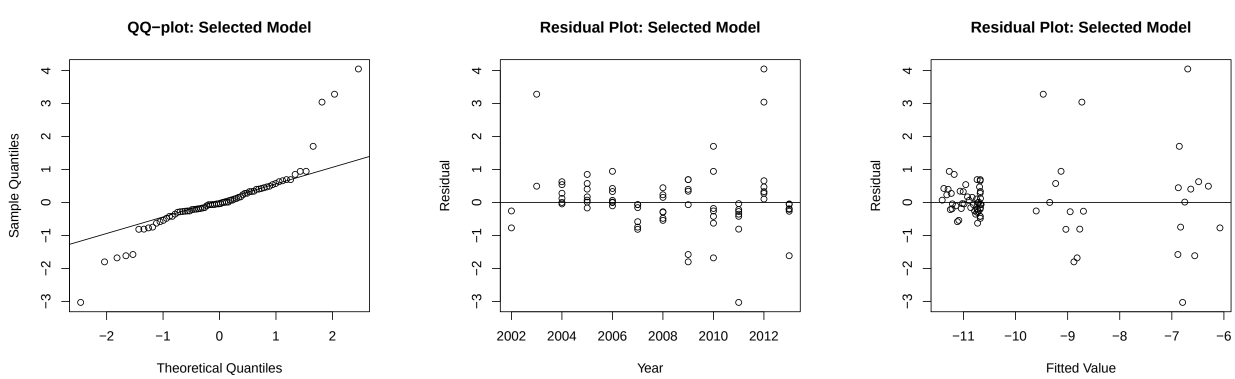
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.042	0.942	0.016	Ref. Model 2

- Conclusions:
  Results of AIC do not agree with reference model testing. Although contrasts suggest that reference lakes share a common slope and intercept, AIC suggests that reference lakes are best modeled with separate intercepts. Proceeding with monitored contrasts using reference model 2.

3.4 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
18	1616-43 (KPSF)	2011	0.00	-6.79	-3.03
19	1616-43 (KPSF)	2012	0.00	-6.69	4.05
50	Cujo	2003	0.00	-9.47	3.28
59	Cujo	2012	0.00	-8.73	3.04

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	5.4322	2	0.0661
Cujo	2.7027	2	0.2589
LdS1	0.6482	2	0.7232
LdS2	0.4977	2	0.7797

- Conclusions:
  No significant deviations were found when comparing monitored lakes to reference lakes.

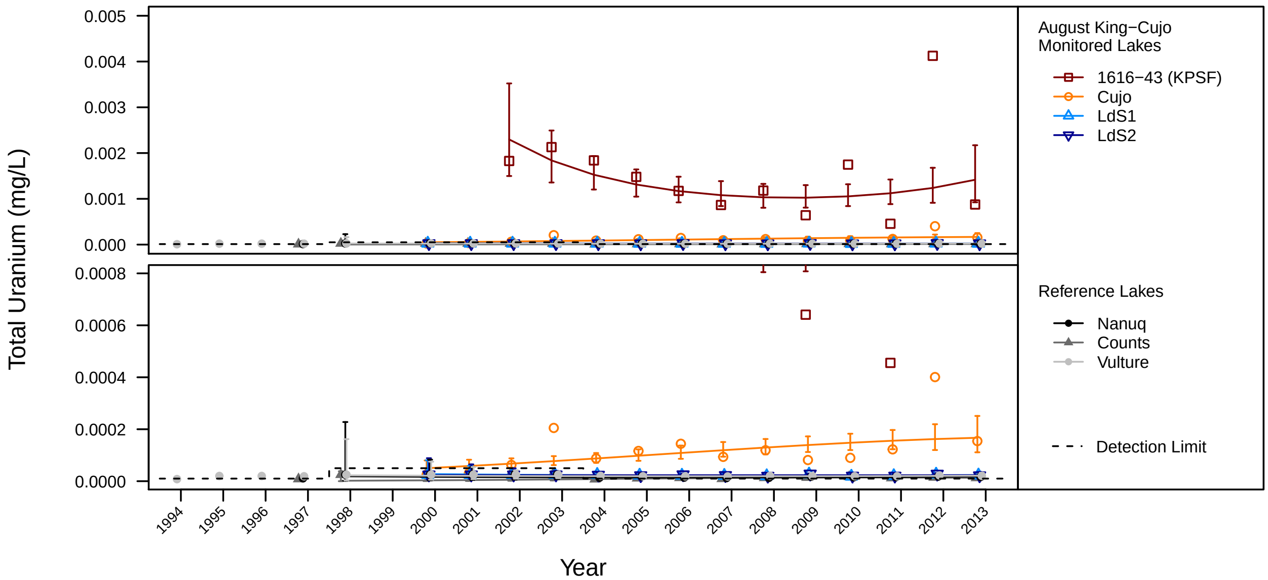
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.3650
Monitored Lake	1616-43 (KPSF)	0.1820
Monitored Lake	Cujo	0.3790
Monitored Lake	LdS1	0.3320
Monitored Lake	LdS2	0.0410

- Conclusions:
  Model fit for reference lakes, Cujo, and LdS1 is weak. Model fit for 1616-43 (KPSF) and LdS2 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total uranium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	8.76e-04	1.42e-03	3.09e-04	9.24e-04	2.17e-03	9.03e-04
Cujo	1.54e-04	1.67e-04	3.47e-05	1.11e-04	2.51e-04	1.02e-04
LdS2	2.17e-05	2.30e-05	5.13e-06	1.49e-05	3.56e-05	1.50e-05
LdS1	2.30e-05	2.34e-05	5.09e-06	1.53e-05	3.59e-05	1.49e-05
Nanuq	1.67e-05	1.79e-05	4.08e-06	1.14e-05	2.80e-05	NA
Counts	1.27e-05	1.28e-05	3.01e-06	8.09e-06	2.03e-05	NA
Vulture	2.05e-05	2.10e-05	4.59e-06	1.37e-05	3.22e-05	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Uranium	August	King-Cujo	Lake	Water	none	log e	Tobit regression	#2 shared slopes	0.015	none

* Monitored lakes are contrasted to the slope of each individual reference lake in model 1a, a slope of 0 in reference model 1b, the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

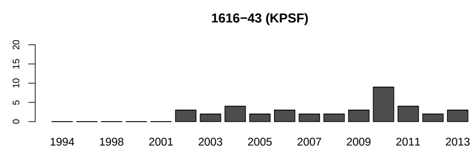
Analysis of August Total Uranium in King-Cujo Watershed Streams

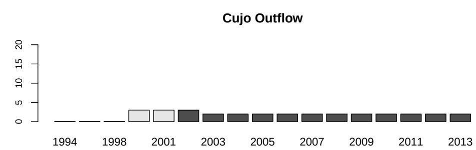
December 30, 2013

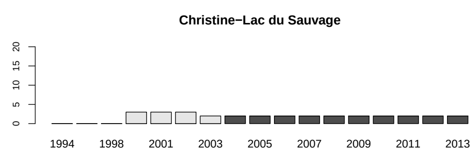
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

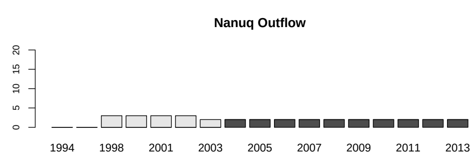
1.1 Monitored

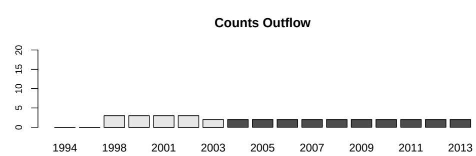


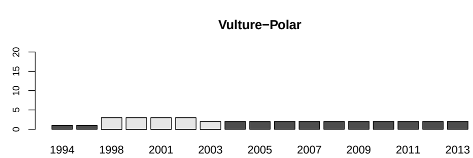




1.2 Reference

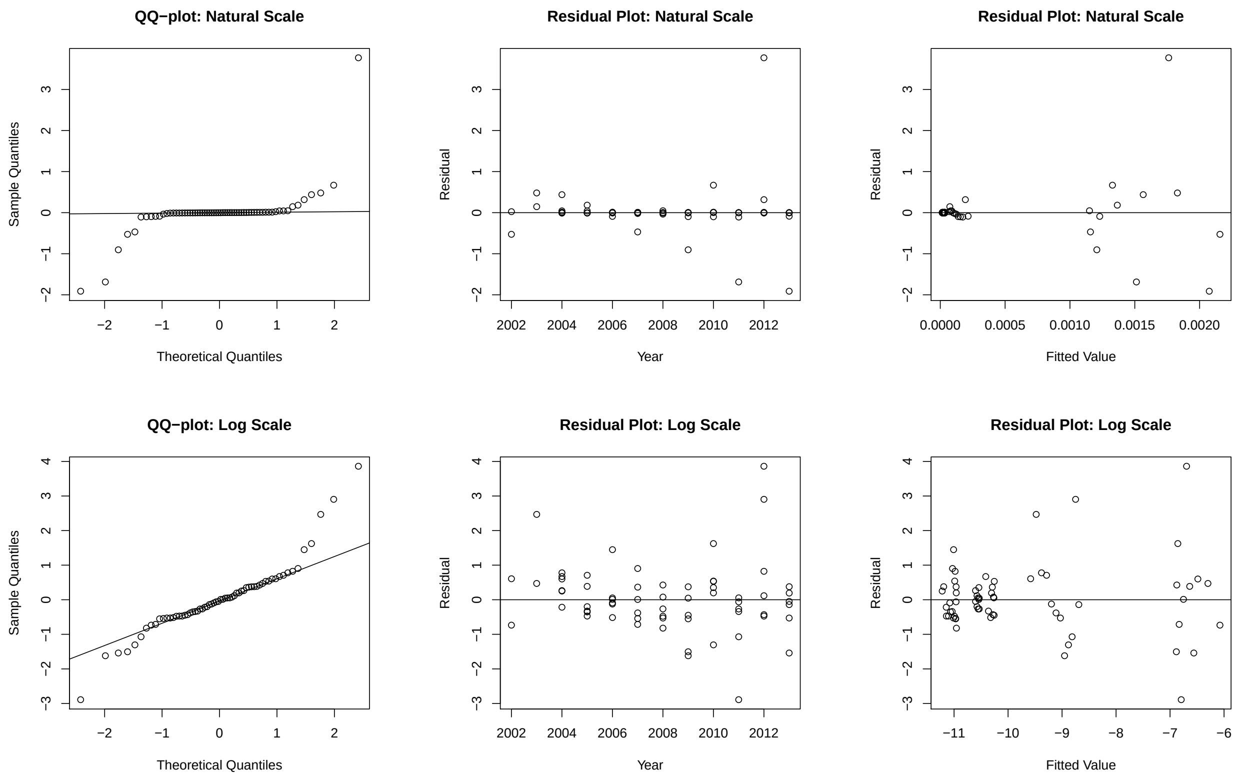






Comment:
10-60% of data in Counts Outflow, Nanuq Outflow, Vulture-Polar, Cujo Outflow, and Christine-Lac du Sauvage was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
19	1616-43 (KPSF)	2012	0.00	0.00	3.77

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
19	1616-43 (KPSF)	2012	0.00	-6.69	3.86

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-squared	DF	P-value
0.00	6.00	1.00

- Conclusions:
  The slopes and intercepts do not differ significantly among reference streams.

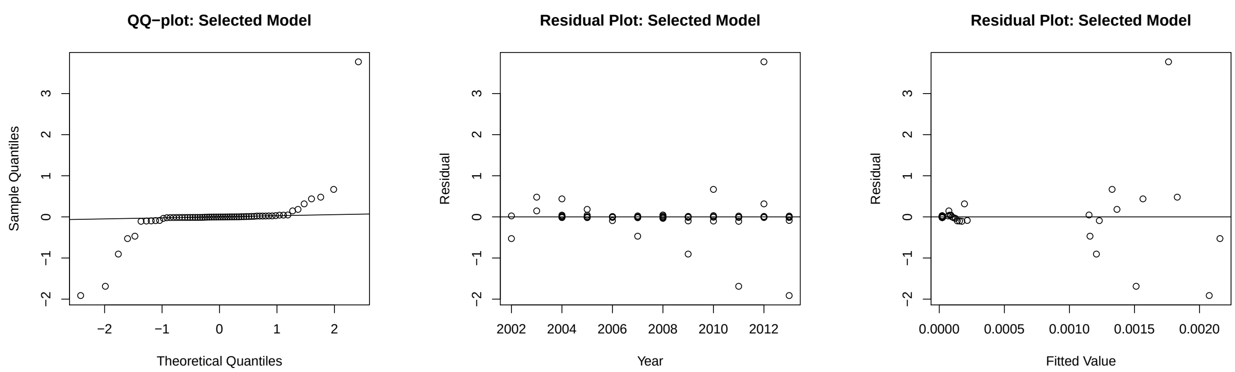
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.002	0.119	0.879	Ref. Model 3

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference streams are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

	Lake	Year	Impute	Fitted	Std. Resid.
19	1616-43 (KPSF)	2012	0.00	0.00	3.77

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference stream slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Streams

Fitted model of the slope and intercept of each monitored stream compared to a common slope and intercept fitted for all reference streams together (reference model 3).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	56.9109	3	0.0000
Cujo Outflow	0.3049	3	0.9591
Christine-Lac du Sauvage	0.0002	3	1.0000

- Conclusions:
  1616-43 (KPSF) shows significant deviation from the common slope of reference streams.

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	3.2842	2	0.1936
Cujo Outflow	0.0652	2	0.9679
Christine-Lac du Sauvage	0.0000	2	1.0000

- Conclusions:
When allowing for differences in intercept, no significant deviations were found when comparing monitored to the common slope of reference streams.

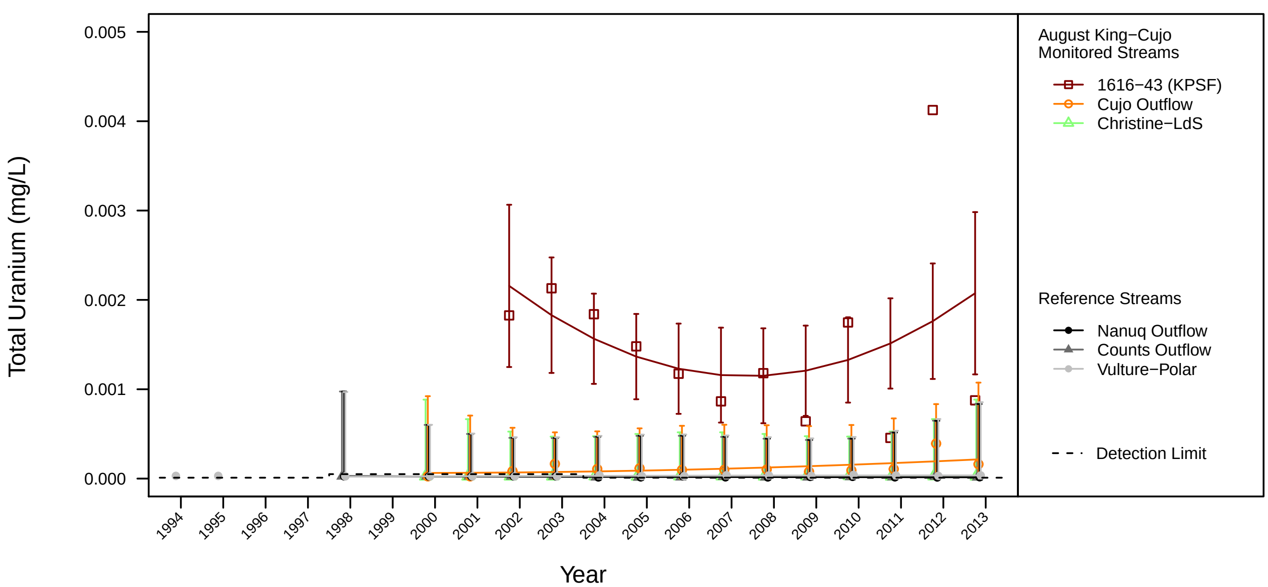
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.0160
Monitored Stream	1616-43 (KPSF)	0.1330
Monitored Stream	Christine-Lac du Sauvage	0.1160
Monitored Stream	Cujo Outflow	0.3260

- Conclusions:
Model fit for Cujo Outflow is weak. Model fit for reference streams, 1616-43 (KPSF), and Christine-Lac du Sauvage is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total uranium for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	8.76e-04	2.07e-03	4.63e-04	1.17e-03	2.98e-03	1.36e-03
Cujo Outflow	1.61e-04	2.15e-04	4.38e-04	0.00e+00	1.07e-03	1.28e-03
Christine-Lac du Sauvage	2.45e-05	2.55e-05	4.38e-04	0.00e+00	8.85e-04	1.28e-03
Nanuq Outflow	1.55e-05	1.48e-05	4.18e-04	0.00e+00	8.35e-04	NA
Counts Outflow	1.40e-05	1.76e-05	4.18e-04	0.00e+00	8.37e-04	NA
Vulture-Polar	3.55e-05	3.53e-05	4.18e-04	0.00e+00	8.55e-04	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Uranium	August	King-Cujo	Stream	Water	none	none	Tobit regression	#3 shared intercept & slope	0.015	1616-43 (KPSF)

* Monitored streams are contrasted to the slope of each individual reference stream in model 1a, a slope of 0 in reference model 1b, the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

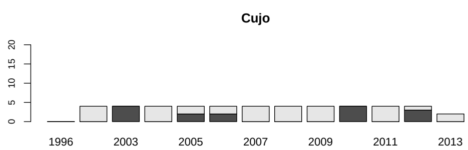
Analysis of April Total Vanadium in Lakes of the King-Cujo Watershed and Lac du Sauvage

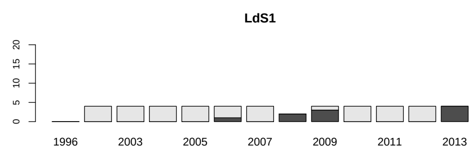
January 12, 2014

1 Censored Values:

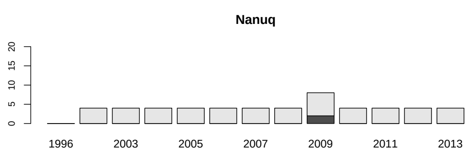
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

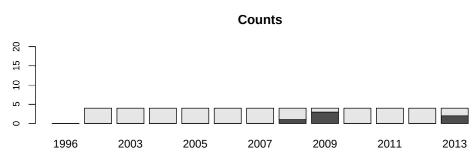
1.1 Monitored

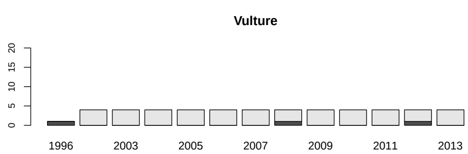




1.2 Reference

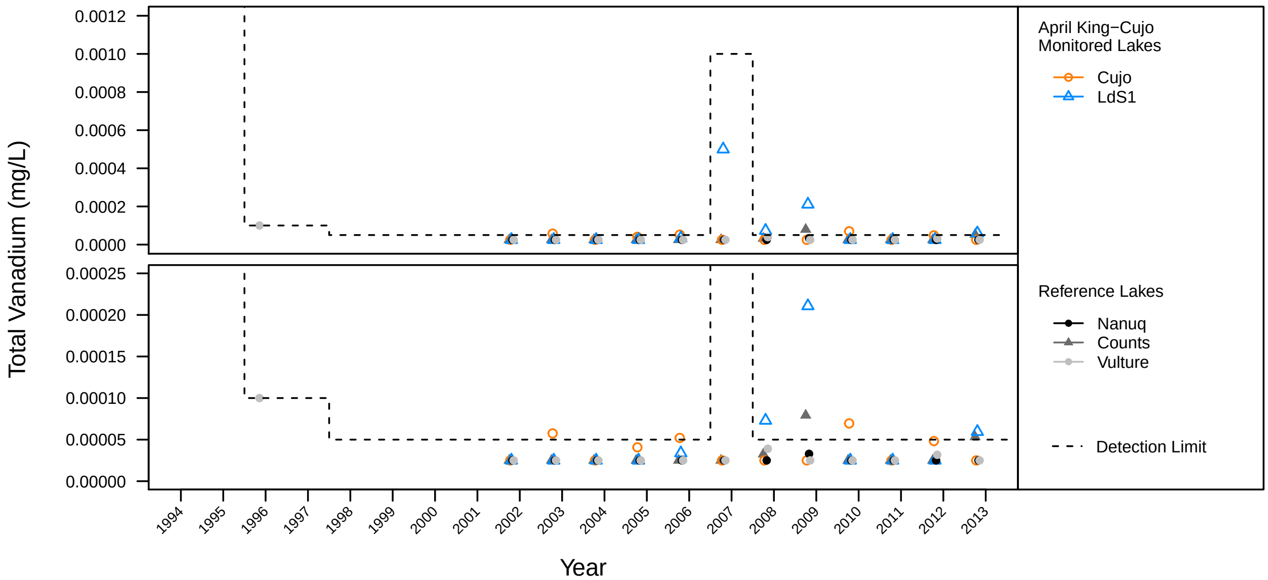






Comment:
Greater than 60% of data in all reference and monitored lakes was less than the detection limit. All lakes were excluded from further analyses. Tests not performed. Note: 1616-43 (KPSF) and LdS2 were not monitored in April.

2 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

3 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Vanadium	April	King-Cujo	Lake	Water	all	NA	NA	NA	0.03	NA

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

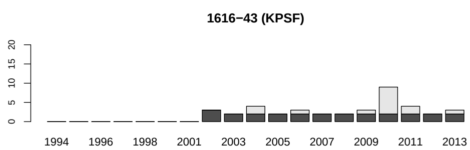
Analysis of August Total Vanadium in Lakes of the King-Cujo Watershed and Lac du Sauvage

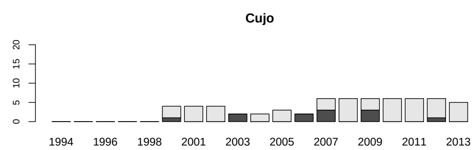
January 21, 2014

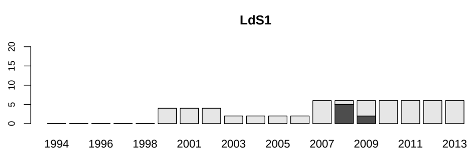
1 Censored Values:

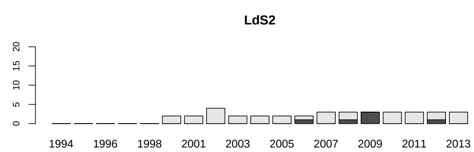
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

1.1 Monitored

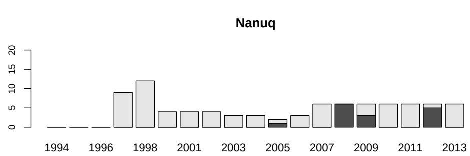


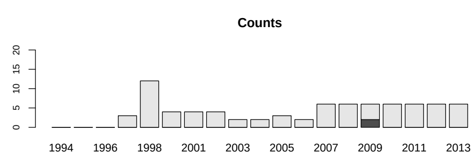


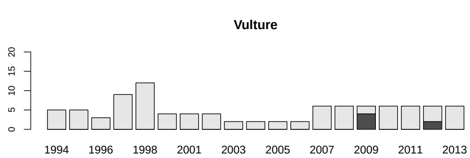




1.2 Reference

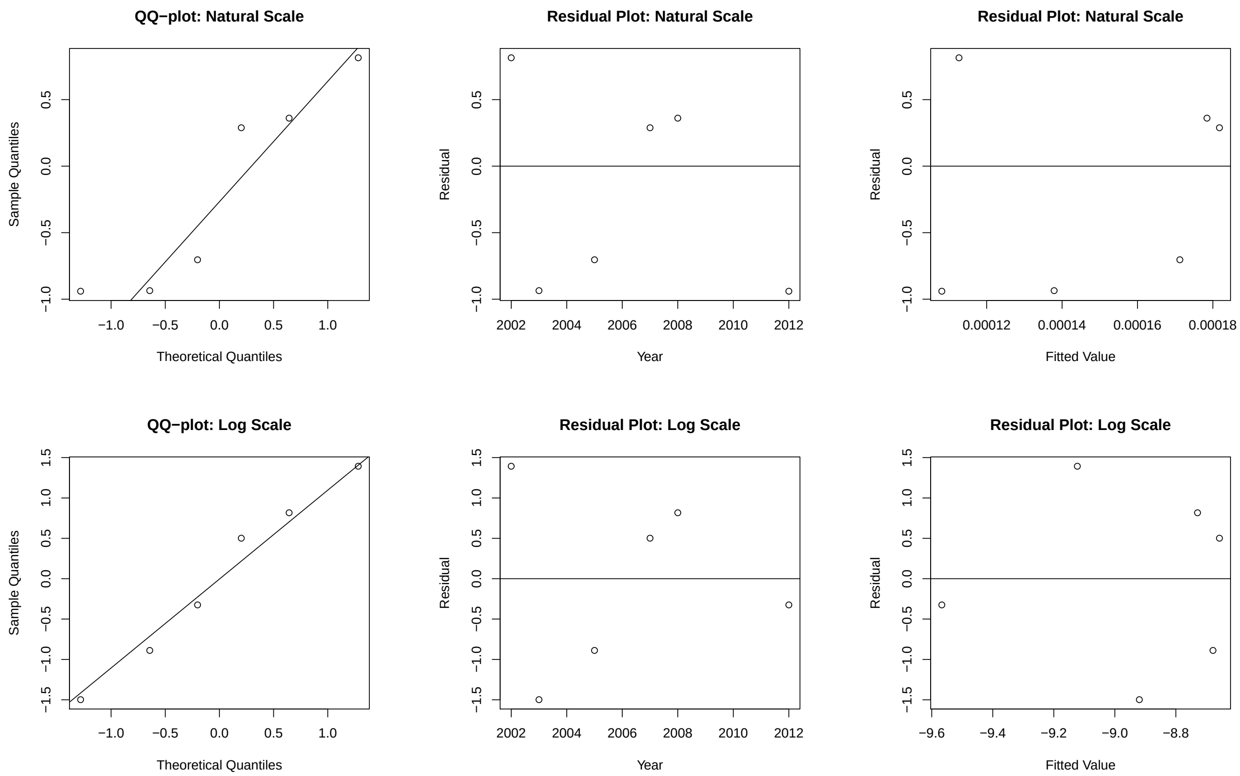






Comment:
Greater than 60% of data in Counts, Nanuq, Vulture, Cujo, LdS1, and LdS2 was less than the detection limit. These lakes were excluded from further analyses. 10-60% of data in 1616-43 (KPSF) was less than the detection limit. Proceeding with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Lakes

All reference lakes removed from analysis. Tests not performed. Proceeding with analysis using reference model 1a, comparing slopes of each monitored lake against a slope of 0.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a constant slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	4.0237	2	0.1337

- Conclusions:
  No significant deviations were found when comparing monitored lakes to a slope of zero.

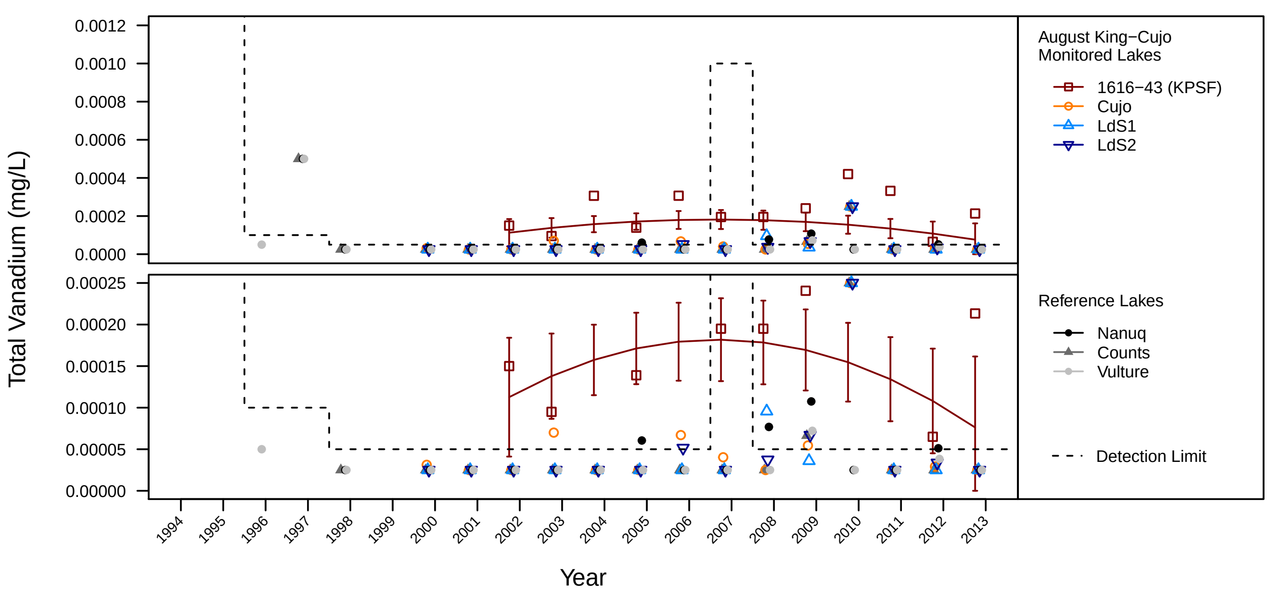
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Monitored Lake	1616-43 (KPSF)	0.3080

- Conclusions:
  Model fit for 1616-43 (KPSF) is weak. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total vanadium for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	2.13e-04	7.62e-05	4.35e-05	0e+00	1.62e-04	1.27e-04
Cujo	2.50e-05	NA	NA	NA	NA	NA
LdS2	2.50e-05	NA	NA	NA	NA	NA
LdS1	2.50e-05	NA	NA	NA	NA	NA
Nanuq	2.50e-05	NA	NA	NA	NA	NA
Counts	2.50e-05	NA	NA	NA	NA	NA
Vulture	2.50e-05	NA	NA	NA	NA	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Vanadium	August	King-Cujo	Lake	Water	Counts Nanuq Vulture Cujo LdS1 LdS2	none	Tobit regression	#1a slope of zero	0.03	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

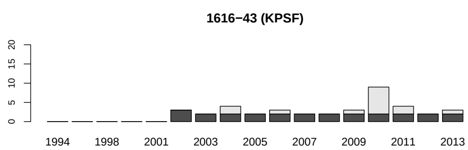
Analysis of August Total Vanadium in King-Cujo Watershed Streams

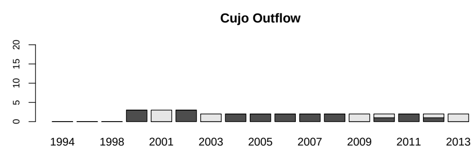
January 21, 2014

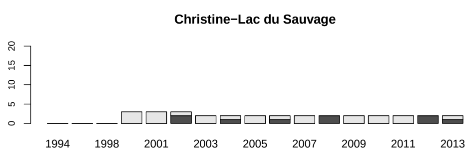
1 Censored Values:

The following charts indicate the number of measurements taken in each year from each stream that were less than the detection limit (grey) or greater than the detection limit (black).

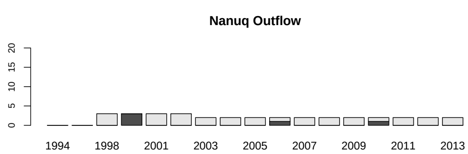
1.1 Monitored

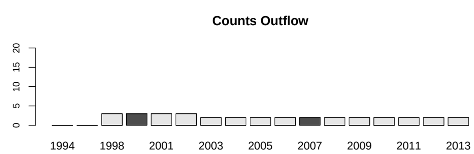


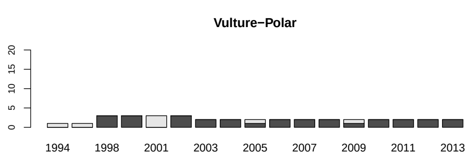




1.2 Reference

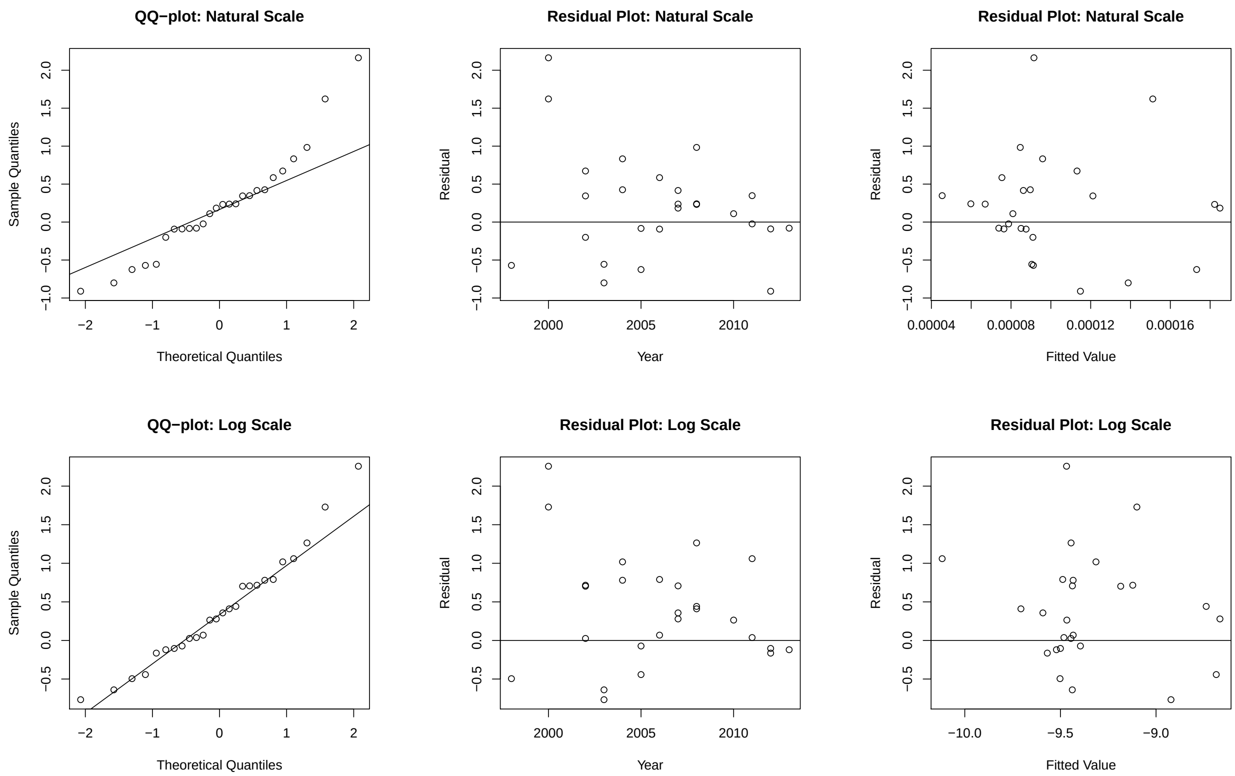






Comment:
Greater than 60% of data in Counts Outflow, Nanuq Outflow, and Christine-Lac du Sauvage was less than the detection limit. These streams were excluded from further analyses. 10-60% of data in Vulture-Polar, Cujo Outflow, and Christine-Lac du Sauvage was less than the detection limit. We proceeded with Tobit regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

None

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	1.000	0.000	Un-transformed Model

Conclusion:
AIC reveals that the data is modeled best with no transformation. Proceeding with analysis using the untransformed "natural model".

3 Comparisons within Reference Streams

Two of three reference streams were removed from the analysis. Tests could not be performed. Proceeding with analysis using reference model 1.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a slope of zero (reference model 1a).

- Results:

	Chi-squared	DF	P-value
1616-43 (KPSF)	2.7098	2	0.2580
Cujo Outflow	5.5814	2	0.0614

- Conclusions:
  No significant deviations were found when comparing monitored streams to a constant slope of zero.

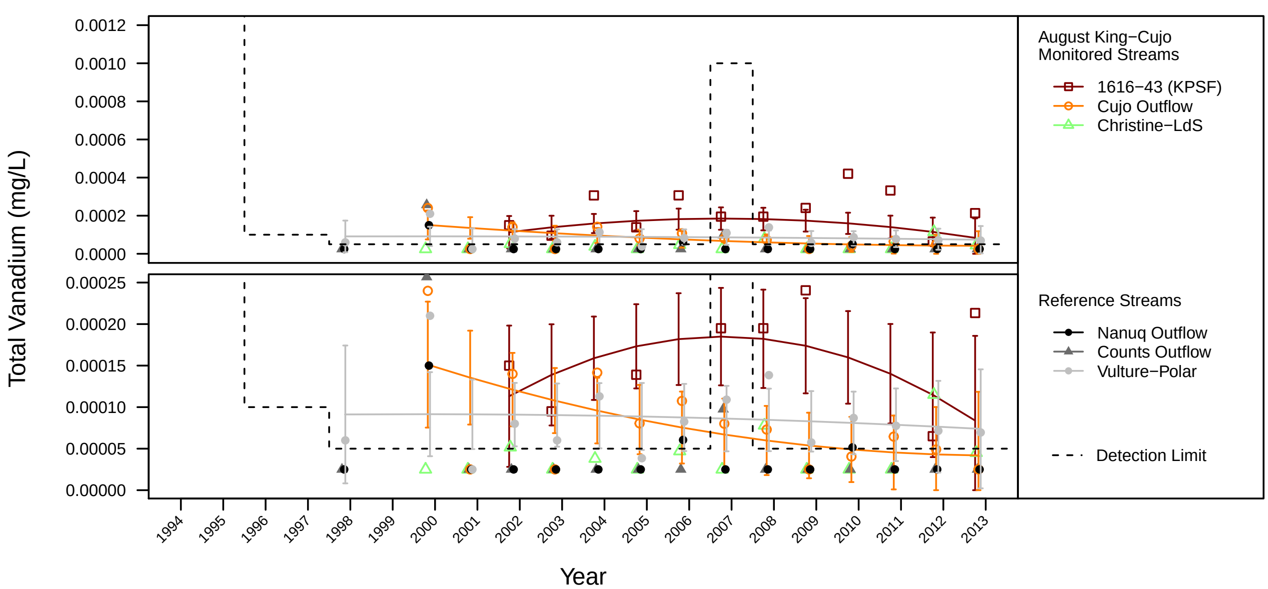
5 Overall Assessment of Model Fit for Each Stream

- R-squared values for model fit for each stream:

Stream Type	Stream Name	R-squared
Reference Stream	Vulture-Polar	0.0170
Monitored Stream	1616-43 (KPSF)	0.2980
Monitored Stream	Cujo Outflow	0.3460

- Conclusions:
  Model fit for 1616-43 (KPSF) and Cujo Outflow is weak. Model fit for Vulture-Polar is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean total vanadium for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
1616-43 (KPSF)	2.13e-04	8.38e-05	5.20e-05	0.00e+00	1.86e-04	1.52e-04
Cujo Outflow	2.50e-05	4.19e-05	3.91e-05	0.00e+00	1.18e-04	1.14e-04
Christine-Lac du Sauvage	4.50e-05	NA	NA	NA	NA	NA
Nanuq Outflow	2.50e-05	NA	NA	NA	NA	NA
Counts Outflow	2.50e-05	NA	NA	NA	NA	NA
Vulture-Polar	6.95e-05	7.39e-05	3.66e-05	2.22e-06	1.46e-04	NA

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Vanadium	August	King-Cujo	Stream	Water	Counts Outflow Nanuq Outflow Christine-Lac du Sauvage	none	Tobit regression	#1a slope of zero	0.03	none

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.

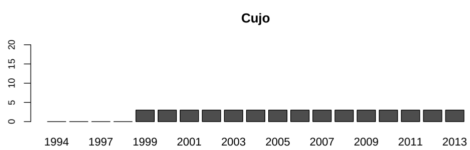
Analysis of Phytoplankton Biomass in Lakes of the King-Cujo Watershed and Lac du Sauvage

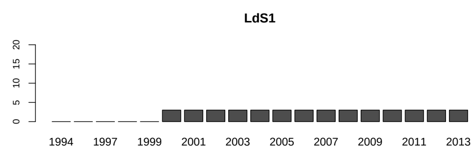
January 30, 2014

1 Censored Values:

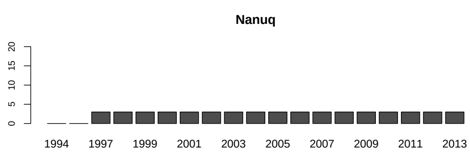
The following charts indicate the number of measurements taken in each year from each lake that were below the detection limit (grey) or above the detection limit (black).

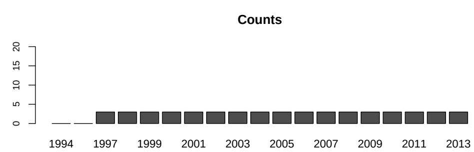
1.1 Monitored

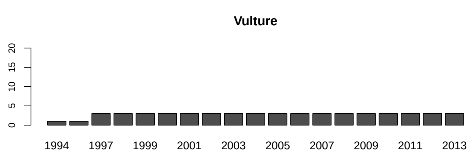




1.2 Reference

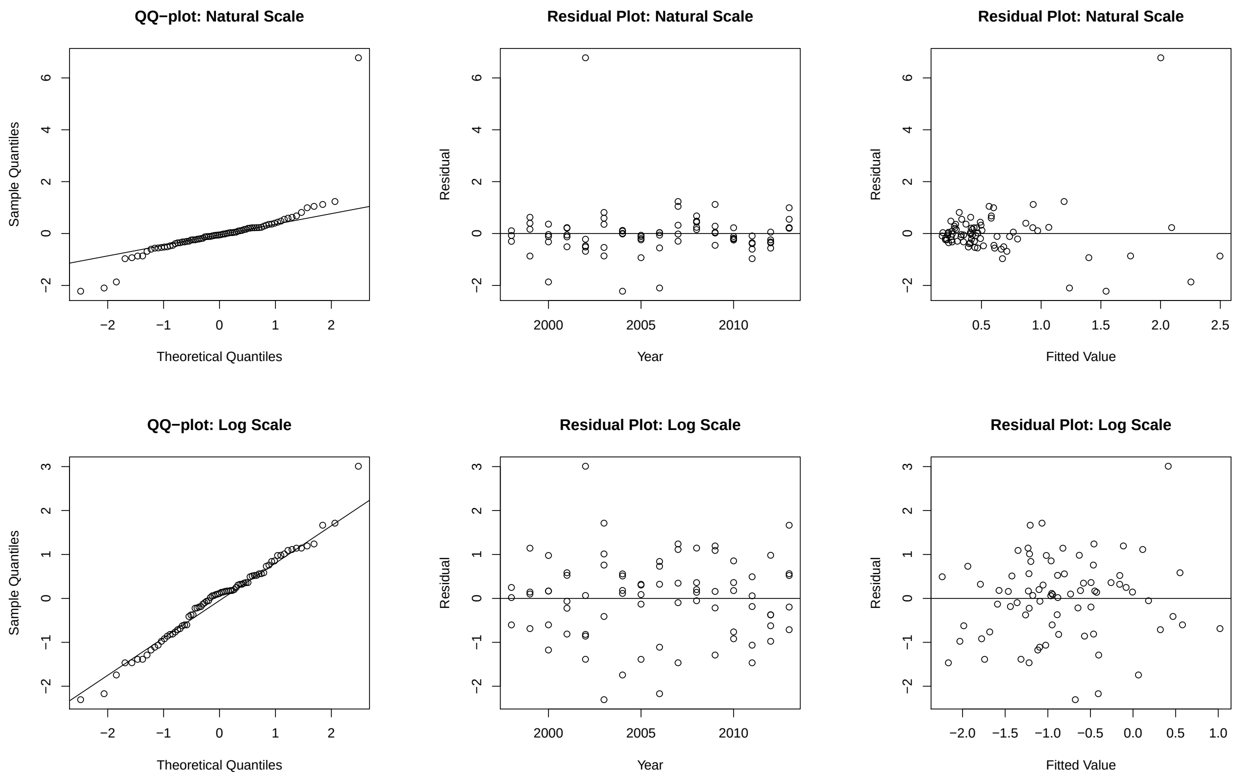






Comment:
None of the lakes exhibited greater than 60% of data below the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
29	Cujo	2002	5.10	2.00	6.78

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
29	Cujo	2002	5.10	0.41	3.01

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.510	0.490	Un-transformed Model

Conclusion:
The log transformed model meets the regression assumptions of normality and equal variance better than the untransformed model. We are proceeding with the remaining analyses using the log transformed model despite the contradictory AIC results, because AIC is less reliable when data do not meet the assumption of normally distributed errors.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
9.34	6.00	0.16

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
1.39	4.00	0.85

- Conclusions:
  The slopes do not differ significantly among reference lakes.

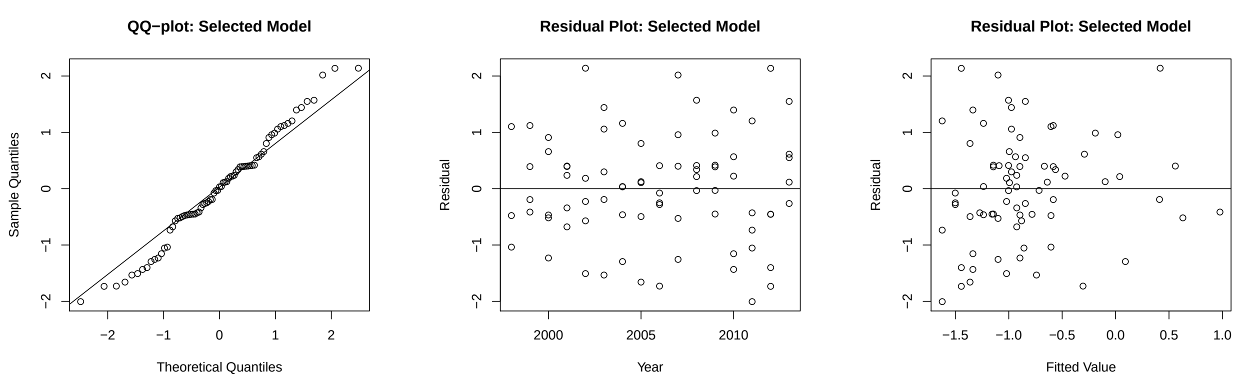
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope and intercept. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero and because AIC indicated that reference model 2 was a better fit to the data than reference model 3.

3.4 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-square	DF	P-value
Cujo	1.9108	2	0.3847
LdS1	0.6747	2	0.7137

- Conclusions:
  No significant deviations were found when comparing monitored lakes to reference lakes.

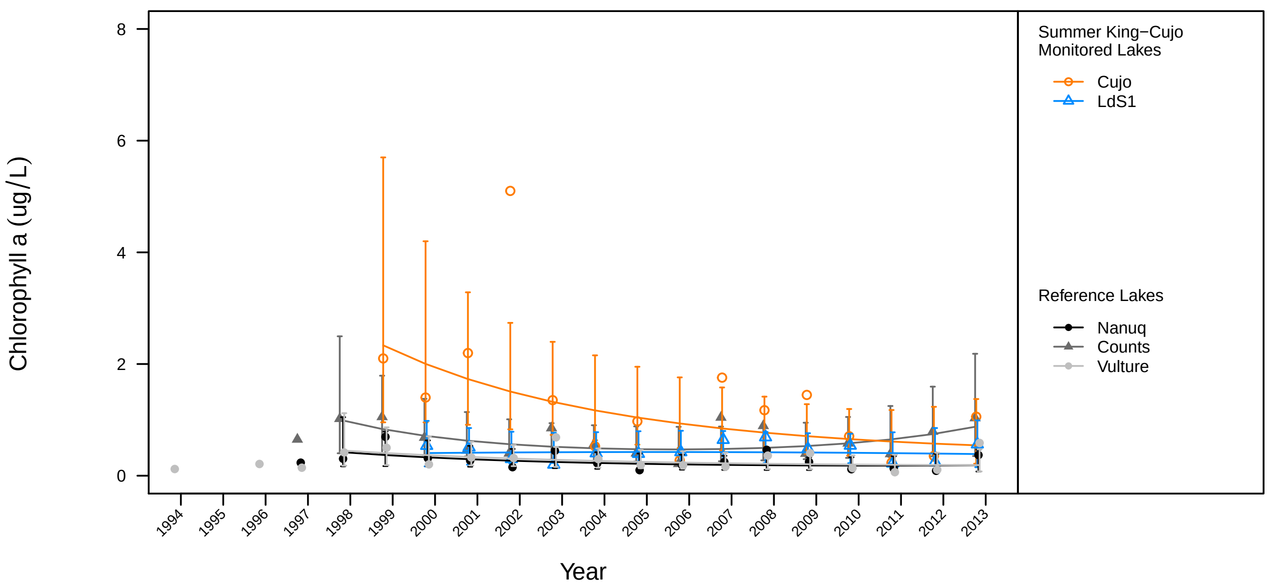
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.1040
Monitored Lake	Cujo	0.3220
Monitored Lake	LdS1	0.0050

- Conclusions:
  Model fit for Cujo Lake is weak. Model fit for reference lakes, LdS1 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean biomass for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	1.06E+00	5.44E-01	2.57E-01	2.16E-01	1.37E+00	7.52E-01
LdS1	5.63E-01	3.88E-01	1.86E-01	1.52E-01	9.92E-01	5.44E-01
Nanuq	3.70E-01	1.87E-01	8.73E-02	7.52E-02	4.67E-01	
Counts	1.03E+00	8.76E-01	4.08E-01	3.52E-01	2.18E+00	
Vulture	5.87E-01	1.90E-01	8.86E-02	7.63E-02	4.74E-01	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Biomass	Summer	King-Cujo	Lake	Biology	none	log e	linear mixed effects regression	#2 shared slopes	NA	none

* Monitored lakes are contrasted to a constant in reference model 1, to the slope of reference lakes in model 2, and to the slope and intercept of reference lakes in model 3.

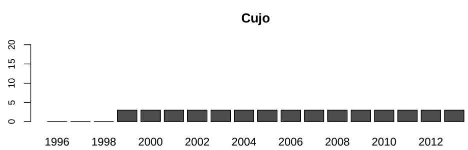
Analysis of Phytoplankton Density in Lakes of the King-Cujo Watershed and Lac du Sauvage

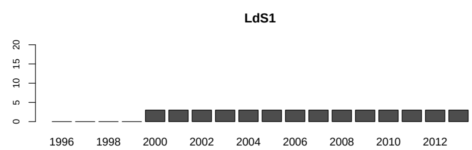
January 22, 2014

1 Censored Values:

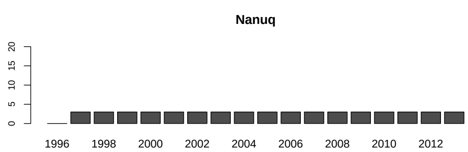
The following charts indicate the number of measurements taken in each year from each lake that were below the detection limit (grey) or above the detection limit (black).

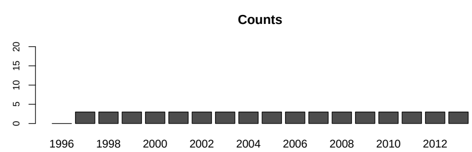
1.1 Monitored

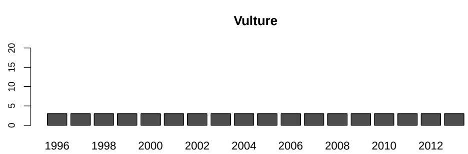




1.2 Reference

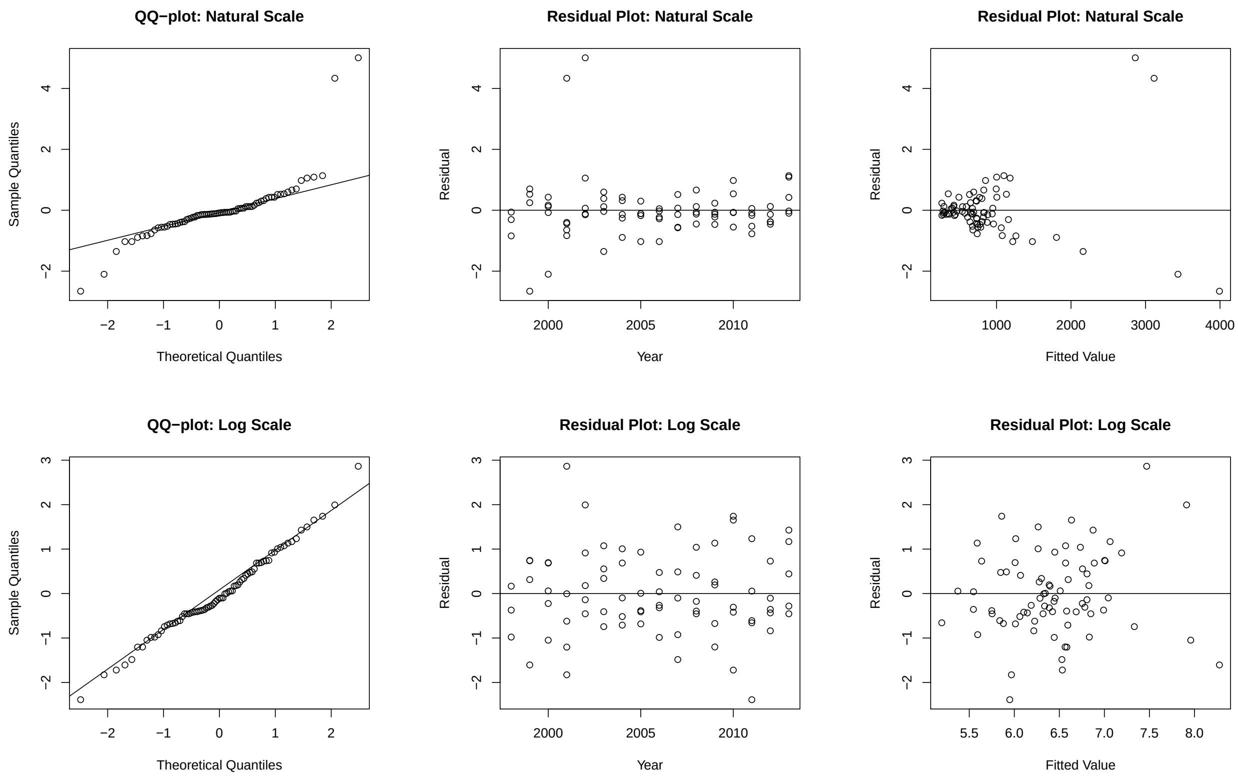






Comment:
None of the lakes exhibited greater than 60% of data below the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
28	Cujo	2001	6564.60	3115.16	4.33
29	Cujo	2002	6847.07	2862.63	5.01

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the log transformed model. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
3.13	6.00	0.79

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

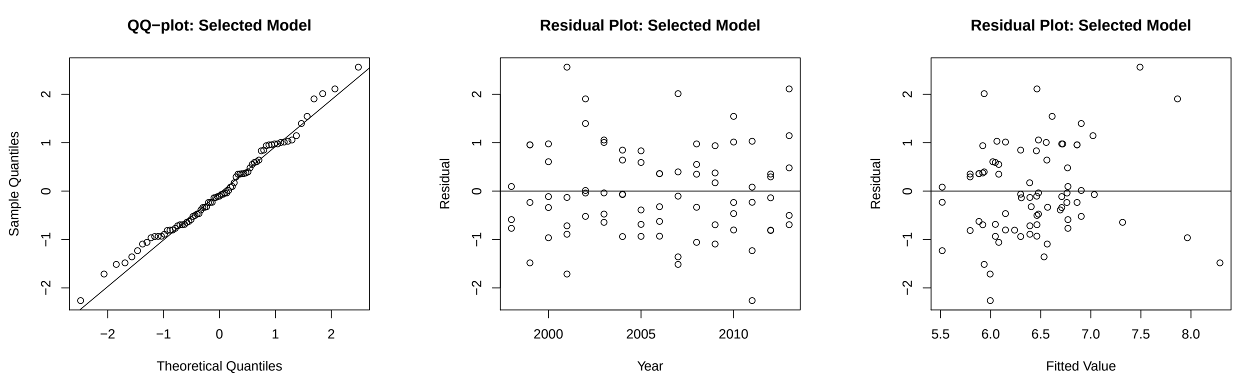
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.455	0.000	0.545	Indistinguishable support for 3 & 1; choose Model 3.

- Conclusions:
  AIC results are in agreement with reference model testing and reveal that the reference lakes are best modeled with a common slope and intercept. Proceeding with monitored contrasts using reference model 3.

3.3 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Lakes

Fitted model of the slope and intercept of each monitored lake compared to a common slope and intercept fitted for all reference lakes together (reference model 3).

- Results:

	Chi-square	DF	P-value
Cujo	6.8494	3	0.0769
LdS1	5.5507	3	0.1356

- Conclusions:
  No significant deviations were found when comparing monitored lakes to reference lakes.

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-square	DF	P-value
Cujo	2.4484	2	0.2940
LdS1	5.0267	2	0.0810

- Conclusions:
  When allowing for differences in intercept, no significant deviations were found when comparing the slopes of monitored lakes to the common slope of reference lakes.

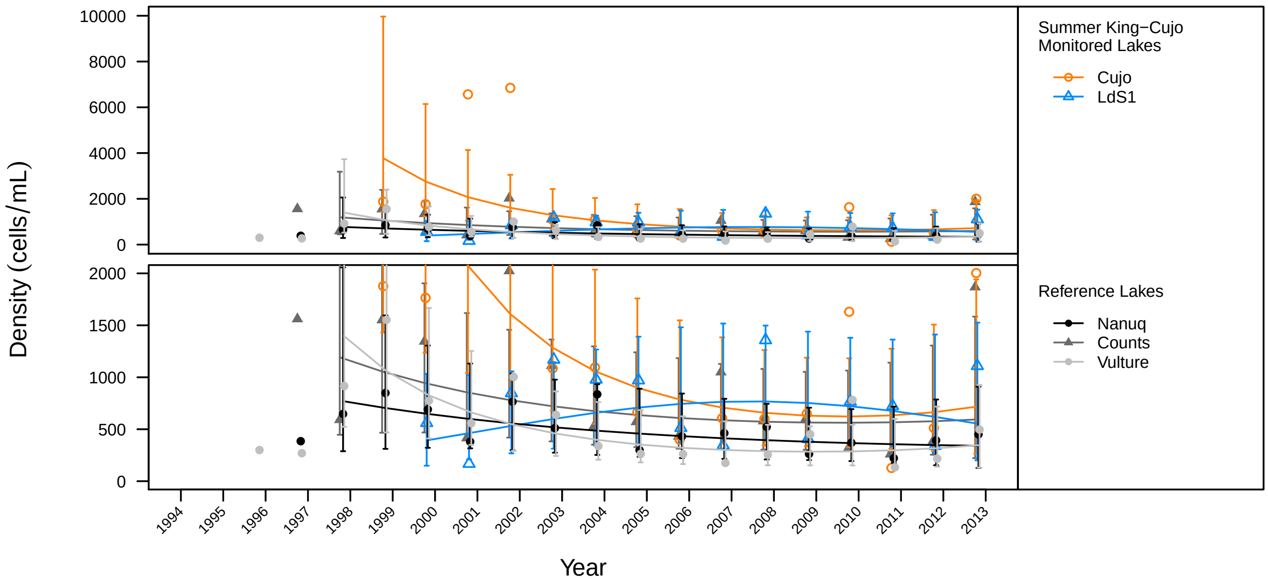
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.2830
Monitored Lake	Cujo	0.3480
Monitored Lake	LdS1	0.1030

- Conclusions:
  Model fit for reference lakes and Cujo Lake is weak. Model fit for LdS1 is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean density for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	2.00E+03	7.17E+02	3.65E+02	2.64E+02	1.94E+03	1.07E+03
LdS1	1.11E+03	5.55E+02	2.86E+02	2.01E+02	1.53E+03	8.38E+02
Nanuq	4.50E+02	3.40E+02	1.71E+02	1.28E+02	9.09E+02	
Counts	1.87E+03	5.93E+02	2.97E+02	2.22E+02	1.58E+03	
Vulture	4.96E+02	3.46E+02	1.74E+02	1.30E+02	9.25E+02	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Density	Summer	King-Cujo	Lake	Biology	none	log e	linear mixed effects regression	#3 shared intercept & slope	NA	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

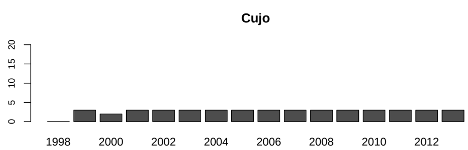
Analysis of August Zooplankton Biomass in Lakes of the King-Cujo Watershed and Lac du Sauvage

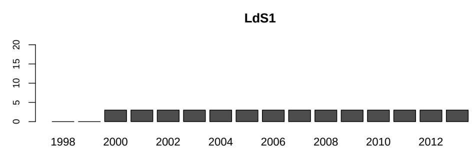
January 22, 2014

1 Censored Values:

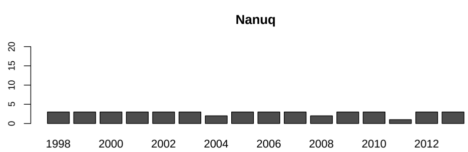
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

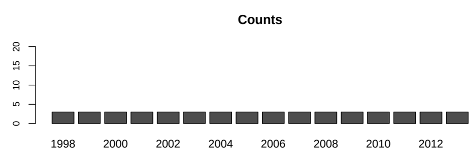
1.1 Monitored

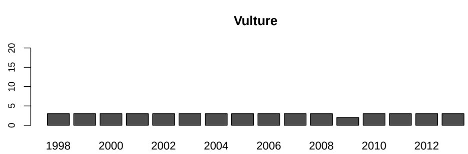




1.2 Reference

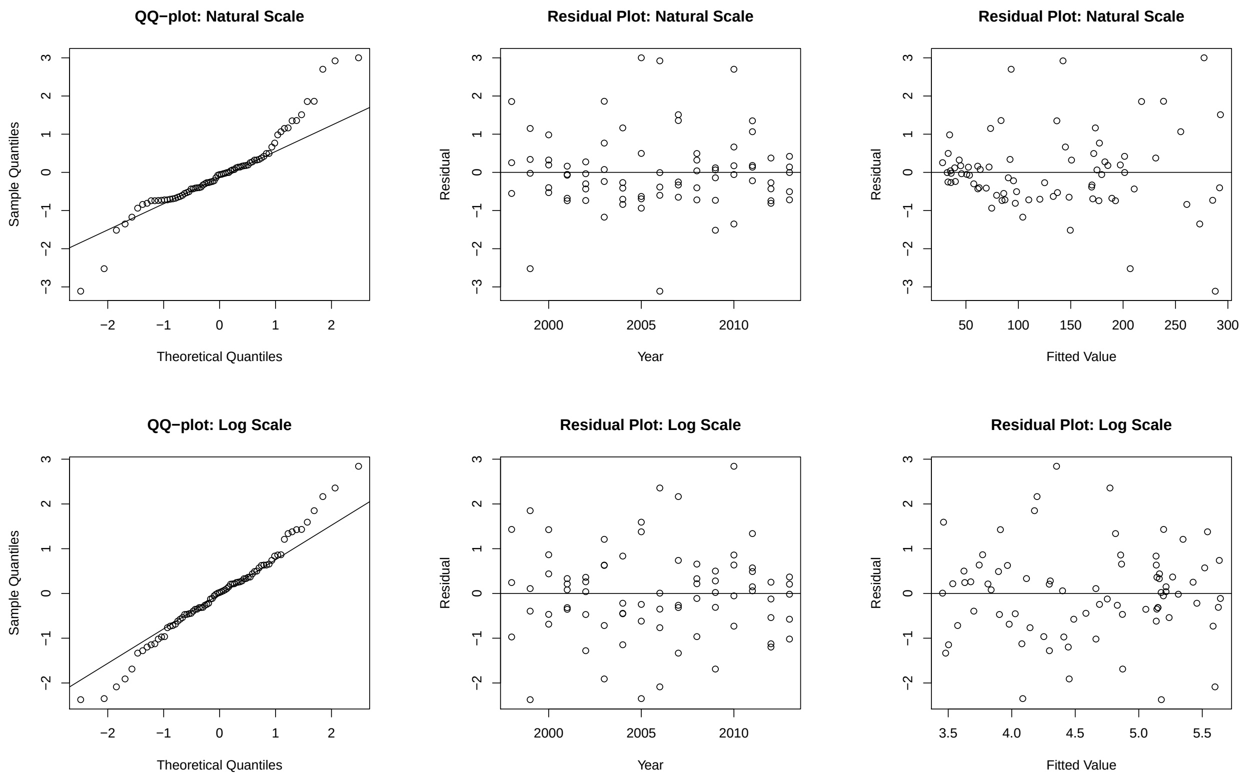






Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
52	Cujo	2005	441.21	277.27	3.00
53	Cujo	2006	117.92	287.97	-3.11

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
27.13	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
10.17	4.00	0.04

- Conclusions:
  The slopes differ significantly among reference lakes. Reference lakes do not fit reference model 2.

3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  AIC results are in agreement with reference mode testing and reveal that the reference lakes are best modeled with separate slopes and intercepts. Proceeding with monitored contrasts using reference model 1.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a slope of zero (reference model 1a).

- Results:

	Chi-square	DF	P-value
Cujo	0.1438	2	0.9306
LdS1	5.3764	2	0.0680

- Conclusions:
  No significant deviations were found when comparing monitored lakes to a constant slope of zero.

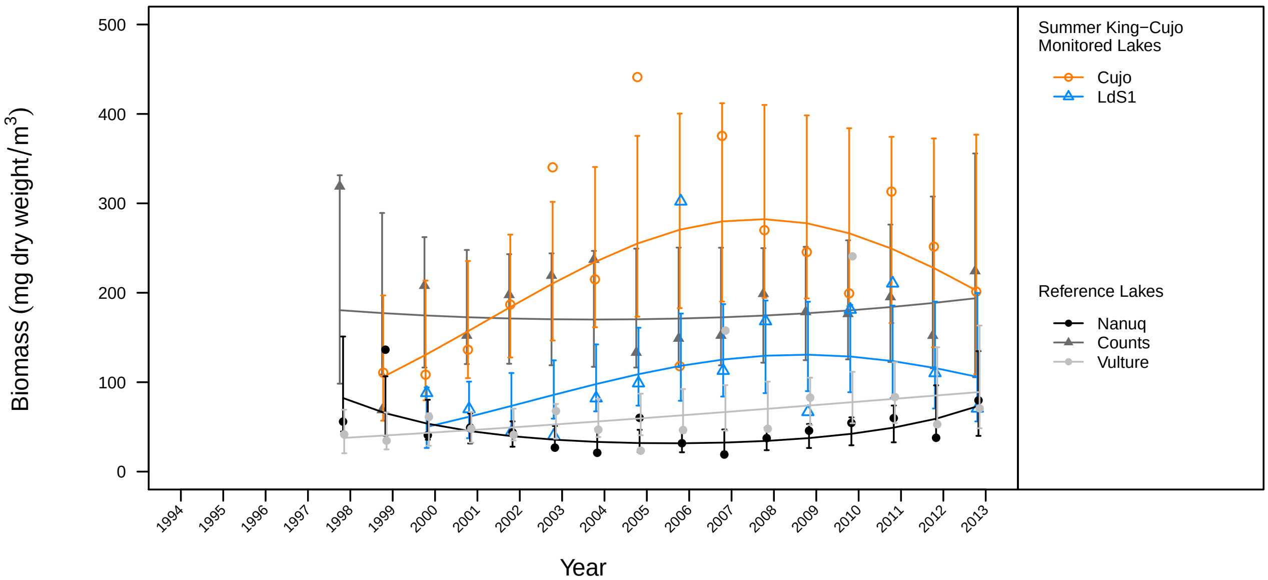
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Reference Lake	Counts	0.0140
Reference Lake	Nanuq	0.4110
Reference Lake	Vulture	0.2320
Monitored Lake	Cujo	0.4480
Monitored Lake	LdS1	0.2730

- Conclusions:
  Model fit for Nanuq, Vulture, Cujo, and LdS1 is weak. Model fit for Counts Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean zooplankton biomass for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	2.01E+02	2.03E+02	6.41E+01	1.09E+02	3.77E+02	1.88E+02
LdS1	7.07E+01	1.06E+02	3.43E+01	5.62E+01	2.00E+02	1.00E+02
Nanuq	7.97E+01	7.34E+01	2.27E+01	4.00E+01	1.35E+02	
Counts	2.24E+02	1.94E+02	6.01E+01	1.06E+02	3.56E+02	
Vulture	7.08E+01	8.90E+01	2.76E+01	4.85E+01	1.63E+02	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Biomass	Summer	King-Cujo	Lake	Biology	none	log e	linear mixed effects regression	#1a slope of zero	NA	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

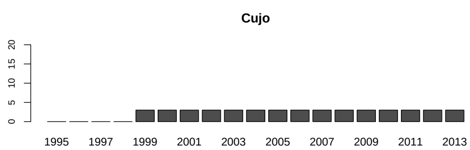
Analysis of August Zooplankton Density in Lakes of the King-Cujo Watershed and Lac du Sauvage

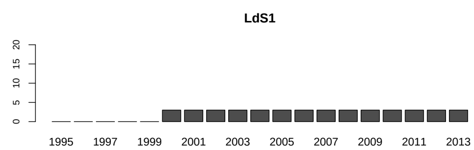
January 22, 2014

1 Censored Values:

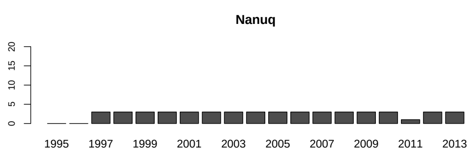
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

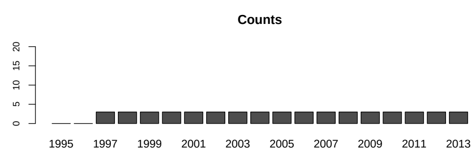
1.1 Monitored

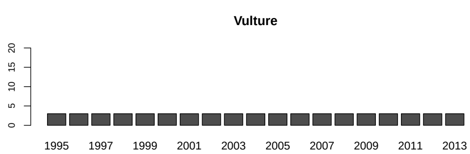




1.2 Reference

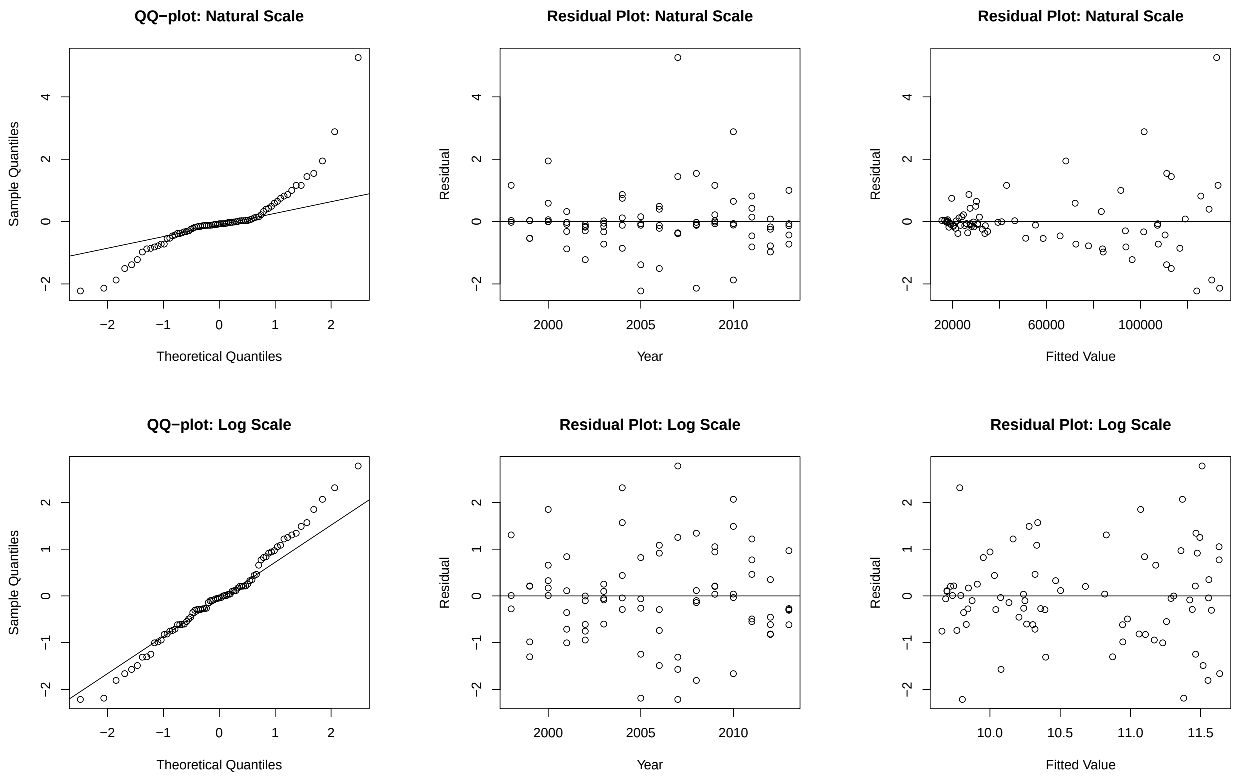






Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
54	Cujo	2007	348239.66	132418.33	5.26

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
6.47	6.00	0.37

- Conclusions:
  The slopes and intercepts do not differ significantly among reference lakes.

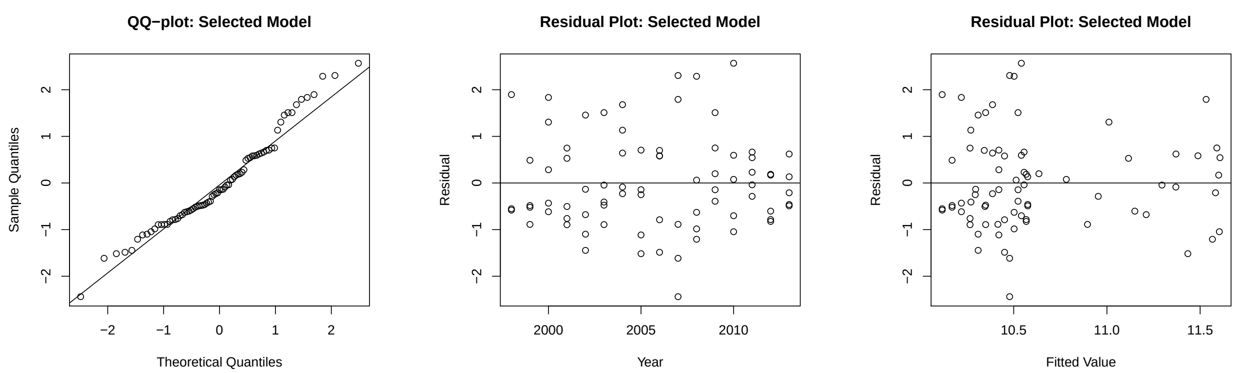
3.2 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope and intercept. Proceeding with monitored contrasts using reference model 3 (fitting a common slope and intercept for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero, given that reference model 3 was the second best model according to AIC.

3.3 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope and intercept (reference model 3). Proceeding with remaining analyses using reference model 3.

4 Test Results for Monitored Lakes

Fitted model of the slope and intercept of each monitored lake compared to a common slope and intercept fitted for all reference lakes together (reference model 3). Fitted model of the trend (slope) of each monitored lake compared to slope of each reference lake (reference model 1a).

- Results:

	Chi-square	DF	P-value
Cujo	1.8894	3	0.5957
LdS1	1.5425	3	0.6725

- Conclusions:
No significant deviations were found when comparing monitored lakes to reference lakes.

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-square	DF	P-value
Cujo	0.1870	2	0.9107
LdS1	0.9984	2	0.6070

- Conclusions:
  When allowing for differences in intercept, no significant deviations were found when comparing monitored to the common slope of reference lakes.

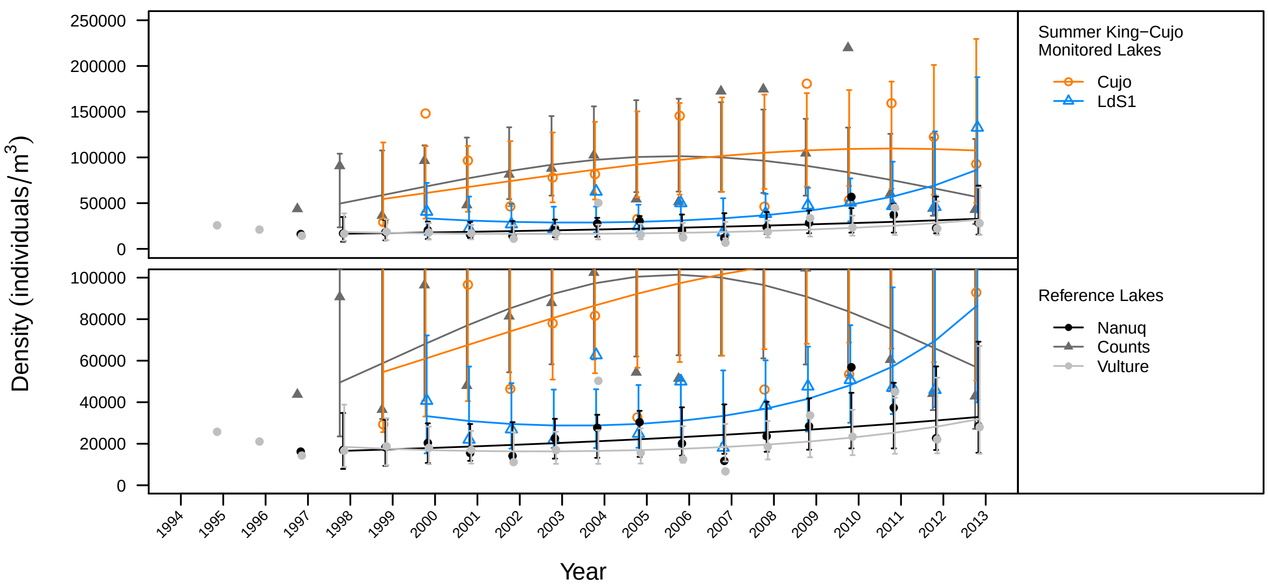
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0340
Monitored Lake	Cujo	0.1170
Monitored Lake	LdS1	0.4670

- Conclusions:
  Model fit for LdS1 is weak. Model fit for reference lakes and Cujo Lake is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean zooplankton density for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	9.29E+04	1.08E+05	4.16E+04	5.04E+04	2.30E+05	1.22E+05
LdS1	1.33E+05	8.66E+04	3.42E+04	4.00E+04	1.88E+05	1.00E+05
Nanuq	2.85E+04	3.29E+04	1.25E+04	1.56E+04	6.91E+04	
Counts	4.29E+04	5.71E+04	2.17E+04	2.72E+04	1.20E+05	
Vulture	2.80E+04	3.19E+04	1.21E+04	1.52E+04	6.71E+04	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transfor-mation	Model Type	Reference Model	CCME Guidline	Significant Monitored Con-trasts*
Density	Summer	King-Cujo	Lake	Biology	1616-43 (KPSF) LdS2	log e	linear mixed effects regression	#3 shared intercept & slope	NA	none

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

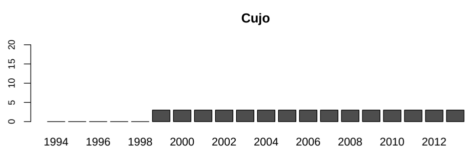
Analysis of August Benthos Density in Lakes of the King-Cujo Watershed and Lac du Sauvage

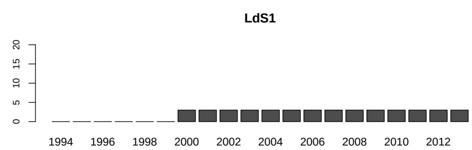
January 22, 2014

1 Censored Values:

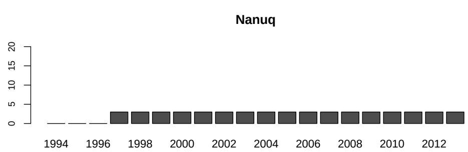
The following charts indicate the number of measurements taken in each year from each lake that were less than the detection limit (grey) or greater than the detection limit (black).

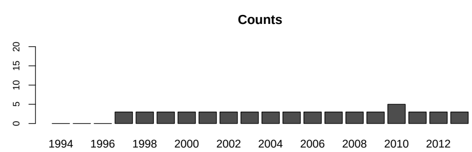
1.1 Monitored

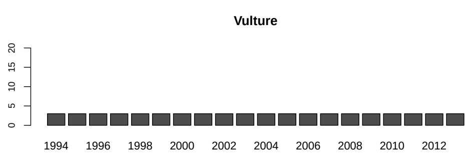




1.2 Reference

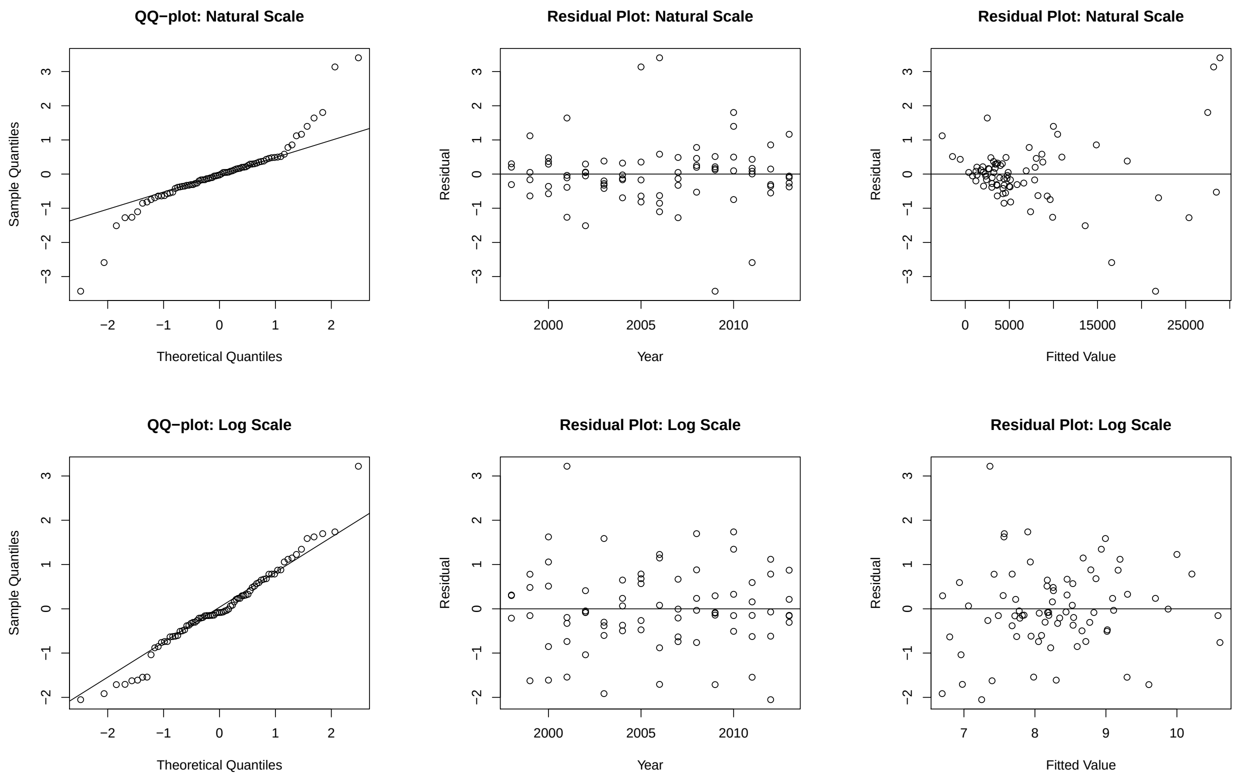






Comment:
None of the lakes exhibited greater than 10% of data less than the detection limit. Proceeding with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
52	Cujo	2005	42874.07	28170.57	3.14
53	Cujo	2006	44844.44	28886.55	3.40
56	Cujo	2009	5511.11	21582.98	-3.43

Outliers on log scale:

	Lake	Year	Impute	Fitted	Std. Resid.
108	Nanuq	2001	10192.59	7.37	3.22

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting the untransformed and log transformed models. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Lakes

3.1 Compare Fitted Curves for All Reference Lakes: reference model 3

- Results:

Chi-square	DF	p-value
21.60	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference lakes. Reference lakes do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Lakes: reference model 2

- Results:

Chi-square	DF	p-value
4.45	4.00	0.35

- Conclusions:
  The slopes do not differ significantly among reference lakes.

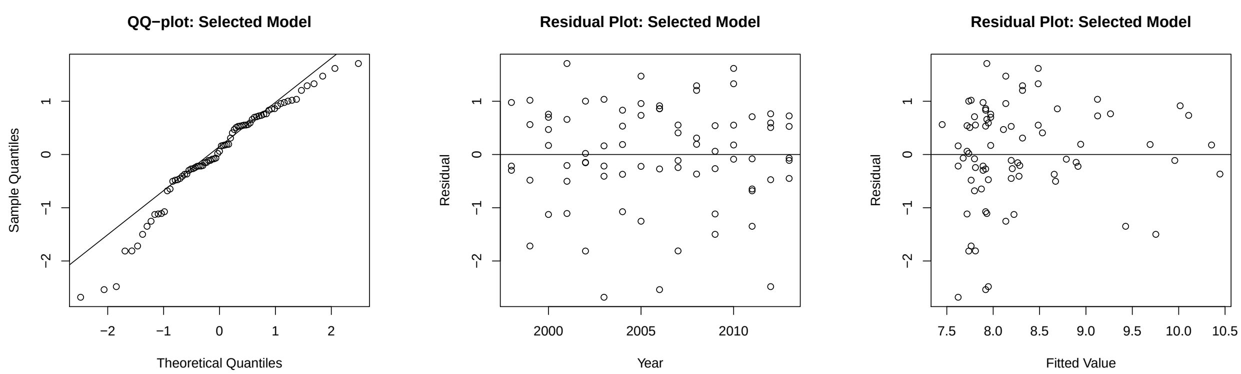
3.3 Compare Reference Models using AIC Weights

- Results:

	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	1.000	0.000	0.000	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference lakes are best modeled using separate slopes and intercepts, contrasts suggest that reference lakes share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference lakes) to avoid defaulting to comparing trends in monitored lakes against a slope of zero.

3.4 Assess Fit of Reduced Model



Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference lake slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Lakes

Fitted model of the trend (slope) of each monitored lake compared to a common slope fitted to all reference lakes (reference model 2). This contrast does not test for differences in intercepts between reference and monitored lakes.

- Results:

	Chi-square	DF	P-value
Cujo	6.8854	2	0.0320
LdS1	1.5817	2	0.4535

- Conclusions:
  Cujo Lake shows significant deviation from the slopes of individual reference lakes.

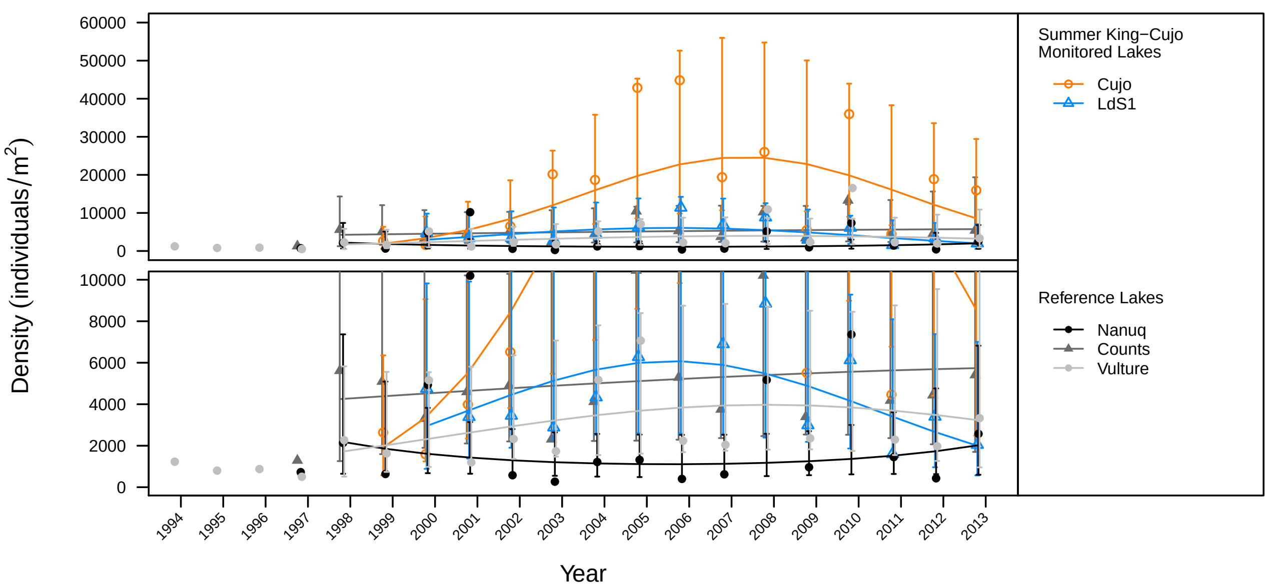
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Lake Type	Lake Name	R-squared
Pooled Ref. Lakes	(more than one)	0.0090
Monitored Lake	Cujo	0.5550
Monitored Lake	LdS1	0.3970

- Conclusions:
  Model fit for LdS1 is weak. Model fit for reference lakes is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean benthos density for each monitored lake in 2013. Reference lakes are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo	1.59E+04	8.56E+03	5.39E+03	2.49E+03	2.94E+04	1.58E+04
LdS1	2.05E+03	2.00E+03	1.28E+03	5.70E+02	7.00E+03	3.74E+03
Nanuq	2.57E+03	2.02E+03	1.25E+03	5.99E+02	6.82E+03	
Counts	5.41E+03	5.74E+03	3.56E+03	1.70E+03	1.94E+04	
Vulture	3.33E+03	3.22E+03	2.00E+03	9.56E+02	1.09E+04	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Density	Summer	King-Cujo	Lake	Biology	none	log e	linear mixed effects regression	#2 shared slopes	NA	Cujo

* Monitored lakes are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference lake in model 1b, to the common slope of reference lakes in model 2, and to the common slope and intercept of reference lakes in model 3.

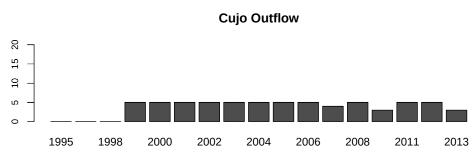
Analysis of Benthos Density in Streams of the King-Cujo Watershed and Lac du Sauvage

January 16, 2014

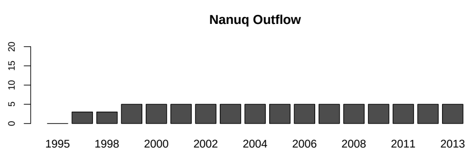
1 Censored Values:

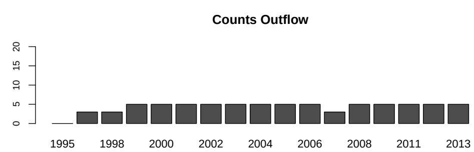
The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (grey) or above the detection limit (black).

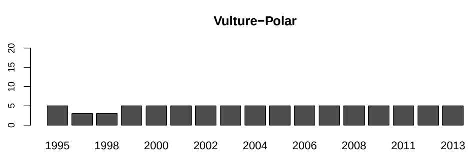
1.1 Monitored



1.2 Reference

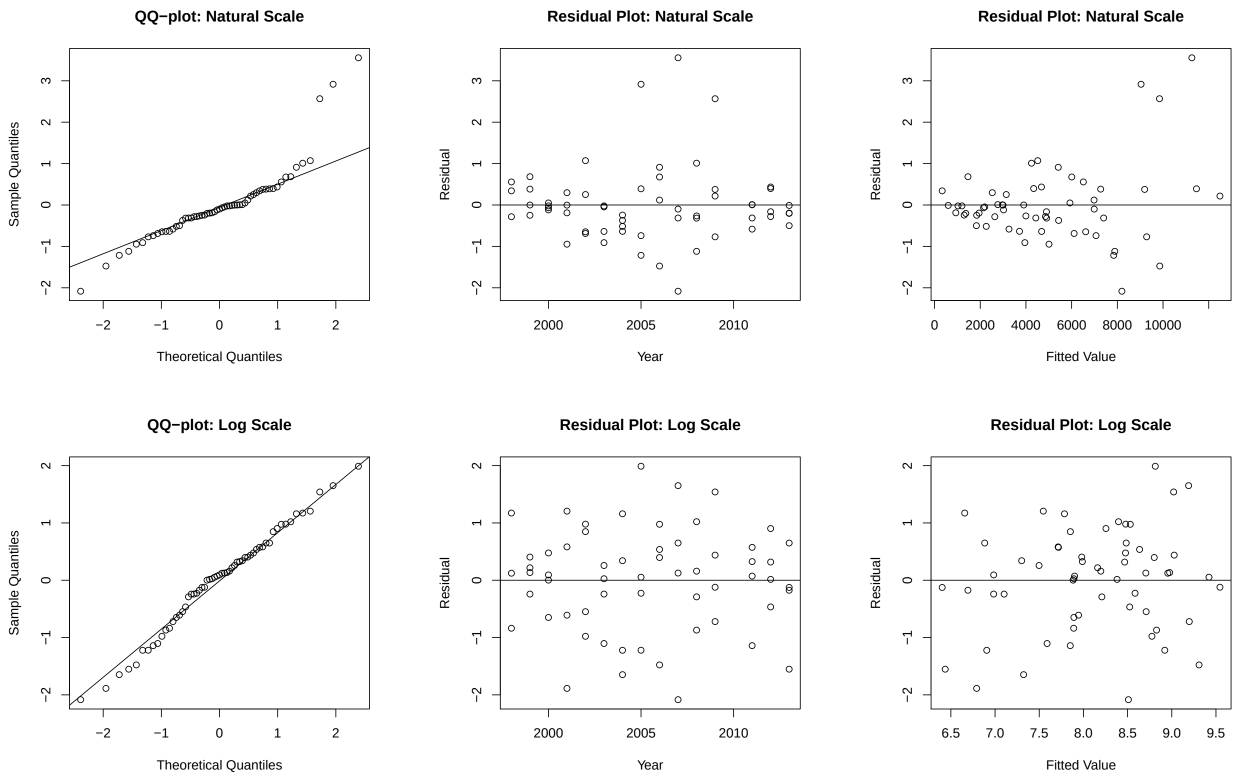






Comment:
None of the streams exhibited greater than 60% of data below the detection limit. We proceeded with linear mixed model regression for the remainder of the analyses.

2 Initial Model Fit



Outliers on natural scale:

	Lake	Year	Impute	Fitted	Std. Resid.
74	Cujo Outflow	2007	22252.75	11261.42	3.56

Outliers on log scale:

None

AIC weights and model comparison:

	Un-transformed Model	Log-transformed Model	Best Model
Akaike Weight	0.000	1.000	Log-transformed Model

Conclusion:
No extreme deviations from normality and equal variance found after fitting both the untransformed natural and the log transformed models. AIC reveals that the data is modeled best after log transformation. Proceeding with analysis using log transformed model.

3 Comparisons within Reference Streams

3.1 Compare Fitted Curves for All Reference Streams: reference model 3

- Results:

Chi-square	DF	p-value
27.06	6.00	0.00

- Conclusions:
  The slopes and intercepts differ significantly among reference streams. Reference streams do not fit reference model 3. Continuing with test of reference model 2 (fitting a common reference slope).

3.2 Compare Trend for All Reference Streams: reference model 2

- Results:

Chi-square	DF	p-value
6.36	4.00	0.17

- Conclusions:
  The slopes do not differ significantly among reference streams.

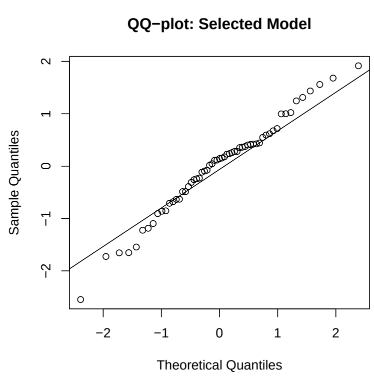
3.3 Compare Reference Models using AIC Weights

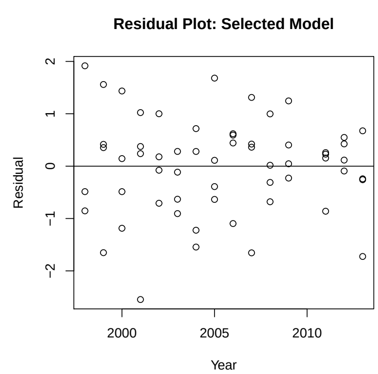
- Results:

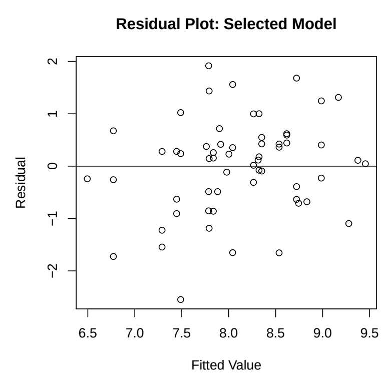
	Ref. Model 1	Ref. Model 2	Ref. Model 3	Best Model
Akaike Weight	0.995	0.000	0.005	Ref. Model 1

- Conclusions:
  Results of AIC do not agree with reference model testing. Although AIC suggests that reference streams are best modeled using separate slopes and intercepts, contrasts suggest that reference streams share a common slope. Proceeding with monitored contrasts using reference model 2 (fitting a common slope for reference streams) to avoid defaulting to comparing trends in monitored streams against a slope of zero.

3.4 Assess Fit of Reduced Model







Outliers:

None

Conclusion:
No extreme deviations from normality and equal variance found after fitting the reduced model using a common reference stream slope while ignoring intercepts (reference model 2). Proceeding with remaining analyses using reference model 2.

4 Test Results for Monitored Streams

Fitted model of the trend (slope) of each monitored stream compared to a common slope fitted to all reference streams (reference model 2). This contrast does not test for differences in intercepts between reference and monitored streams.

- Results:

	Chi-square	DF	P-value
Cujo Outflow	1.1721	2	0.5565

- Conclusions:
  No significant deviations were found when comparing monitored streams to reference streams.

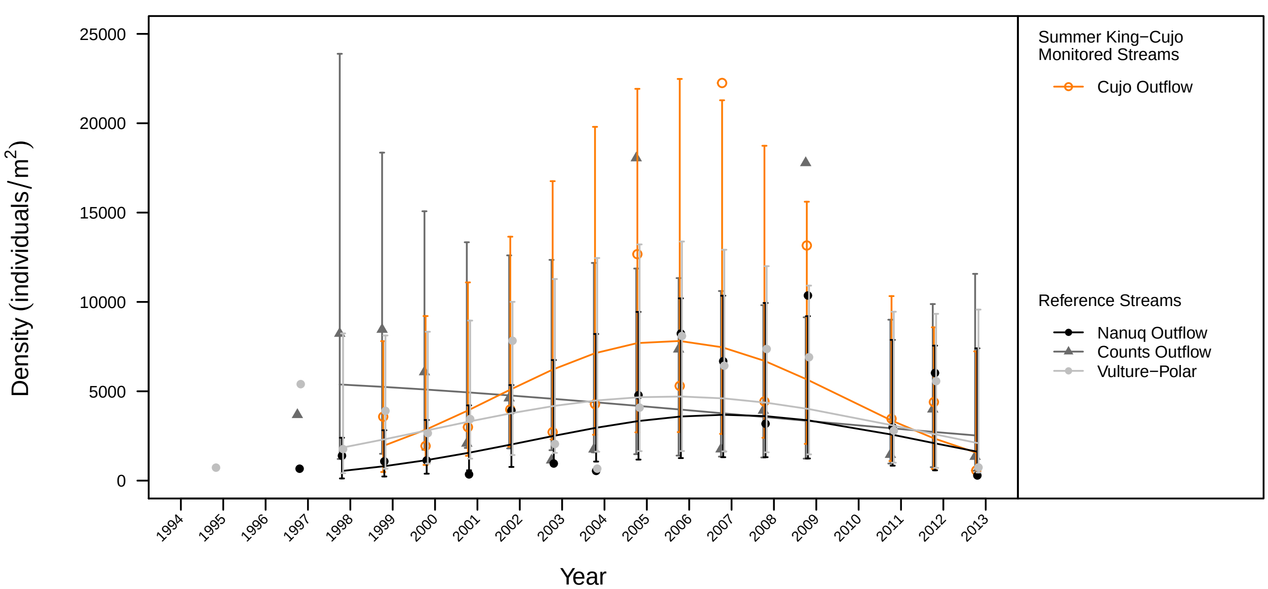
5 Overall Assessment of Model Fit for Each Lake

- R-squared values for model fit for each lake:

Stream Type	Stream Name	R-squared
Pooled Ref. Streams	(more than one)	0.0750
Monitored Stream	Cujo Outflow	0.4260

- Conclusions:
  Model fit for Cujo Outflow is weak. Model fit for reference lakes is poor. Results of statistical tests and MDD should be interpreted with caution.

6 Observed and Fitted Values



Note: The yearly observed mean for streams during baseline years are represented by symbols only. For streams during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

7 Minimum Detectable Differences

The estimated minimum detectable difference in mean benthos density for each monitored stream in 2013. Reference streams are shown for comparison.

	Observed	Fitted	SE Fit	Lower	Upper	Min. Det. Diff
Cujo Outflow	5.67E+02	1.56E+03	1.22E+03	3.39E+02	7.23E+03	3.58E+03
Nanuq Outflow	2.89E+02	1.62E+03	1.26E+03	3.54E+02	7.40E+03	
Counts Outflow	1.35E+03	2.53E+03	1.96E+03	5.54E+02	1.16E+04	
Vulture-Polar	7.40E+02	2.09E+03	1.62E+03	4.58E+02	9.57E+03	

8 Final Summary Table

Parameter	Month	Watershed	Water Body	Analysis	Lakes & Streams Removed	Data Transformation	Model Type	Reference Model	CCME Guidline	Significant Monitored Contrasts*
Density	Summer	King-Cujo	Stream	Biology	none	log e	linear mixed effects regression	#2 shared slopes	NA	none

* Monitored streams are contrasted to a slope of 0 in reference model 1a, to the slope of each individual reference stream in model 1b, to the common slope of reference streams in model 2, and to the common slope and intercept of reference streams in model 3.