Linking Science and Indigenous Knowledge: Water Quality Trends in Calling Lakes (SK)

The project was supported by Health Canada within the National First Nations Environmental Contaminants Program and received the Recognition Award of the Regional Centre of Expertise (Saskatchewan, Canada)

Experts:

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Elder Lionel Louison – *Kahkewistahaw First Nation*
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FIRST NATIONS UNIVERSITY OF CANADA

Modeling of Water Quality Dynamics with Indigenous Perspectives

The Calling Lakes (Pasqua, Echo, Mission, and Katepwa Lakes)

Linking Science and Indigenous Knowledge: Water Quality Trends in Calling Lakes (SK)

From right to left:
Headman Lambert, Elders Elwood and Evelyn

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Evaluation Parameters

1. How would you evaluate the taste of fish caught in your community water in comparison with our days?
2. How would you evaluate overall quality of water in your community in comparison with our days?
3. How would you evaluate the quality of birds hunted in your community in comparison with our days?
4. How would you evaluate the number of bird nests in the shore in comparison with our days?
5. How would you evaluate the level of chemicals of the water in your community in comparison with our days?
6. How often have your family members swim in the water in your community in comparison with our days?
7. How would you evaluate the transparency of the water in your community in comparison with our days?
8. How would the water quality in your community change in 5/10/15/20 years?

Evaluation Period

- Past
  - 30 years ago
  - 20 years ago
  - 10 years ago
  - 5 years ago
- Future
  - In 5 years
  - In 10 years
  - In 15 years
  - In 20 years

Evaluation Scale

- much better: +2
- better: +1
- about the same: 0
- worse: -1
- much worse: -2

- much more: +2
- more: +1
- about the same: 0
- less: -1
- much less: -2

- much more often: +2
- more often: +1
- about the same: 0
- less often: -1
- much less often: -2

- much more transparent: +2
- more transparent: +1
- about the same: 0
- less transparent: -1
- not transparent at all: -2

Digitizing the Answers (*Example)*

Example

- ***How would you evaluate the change of taste of fish caught in your community water in the past in comparison with modern day?***

$$Averaged\,Mark = \frac{\sum Individual\,Mark \times Number\,of\ the\,Marks}{Number\,of\ Respondents}$$

30 years ago	20 years ago	10 years ago	5 years ago
much better	much better	much better	much better
better	better	better	better
about the same	about the same	about the same	about the same
worse	worse	worse	worse
much worse	much worse	much worse	much worse

Digitizing the Answers (*Example)*

cont.

	# of respondents		
30 years	**26**		
much better	**16**	**2**	**32**
better	**5**	**1**	**5**
about the same	**2**	**0**	**0**
worse	**2**	**-1**	**-2**
much worse	**1**	**-2**	**-2**
			1.27

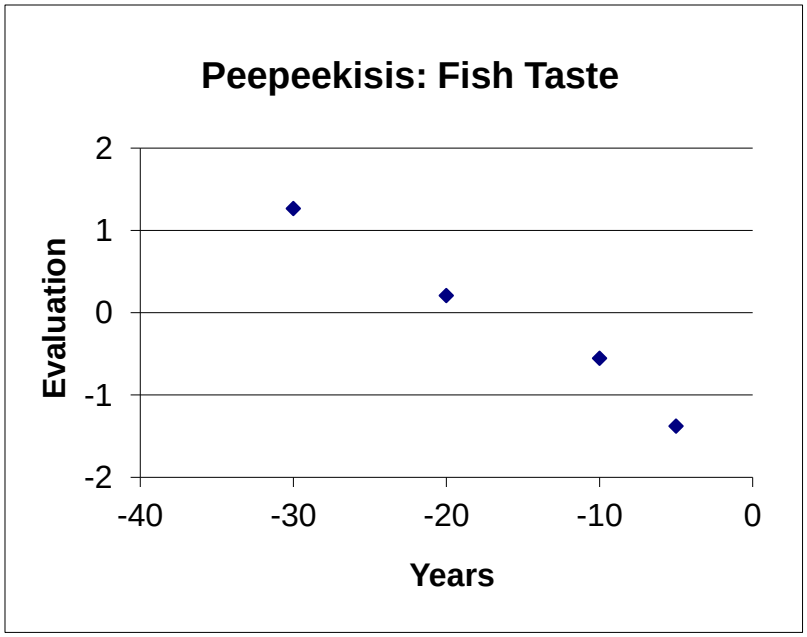
$$\textit{Average Mark} = \frac{2\times16+5\times1+2\times0+2\times(-1)+1\times(-2)}{30} = +1.27$$

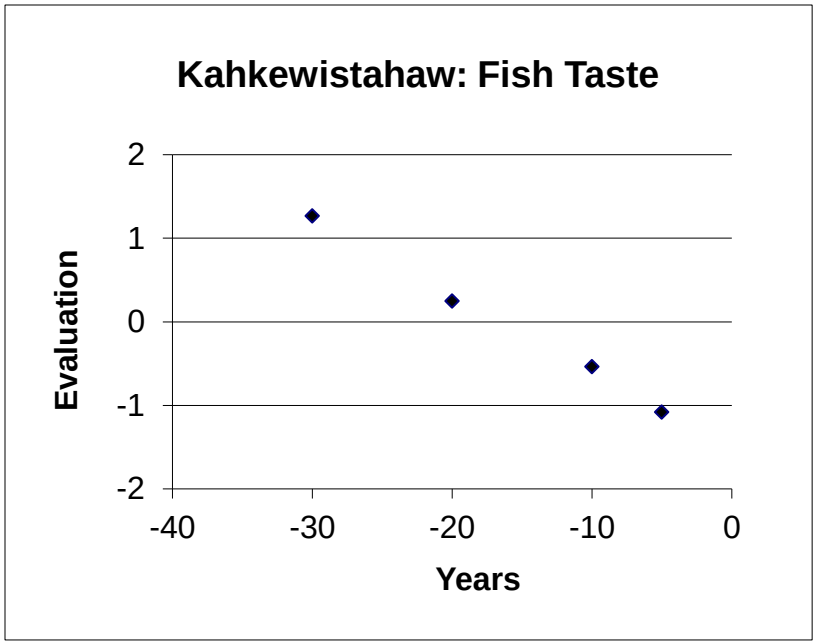
Modeling of Water Quality Dynamics with Indigenous Perspectives

Indigenous Knowledge: Elders told us that the number of eggs in shorebird nests depends on the water quality.

Biological research: egg-laying females need Calcium to help form strong eggshells. Therefore, there is a correlation between the number of eggs and the amount of Calcium in water.

Temporal Dynamics





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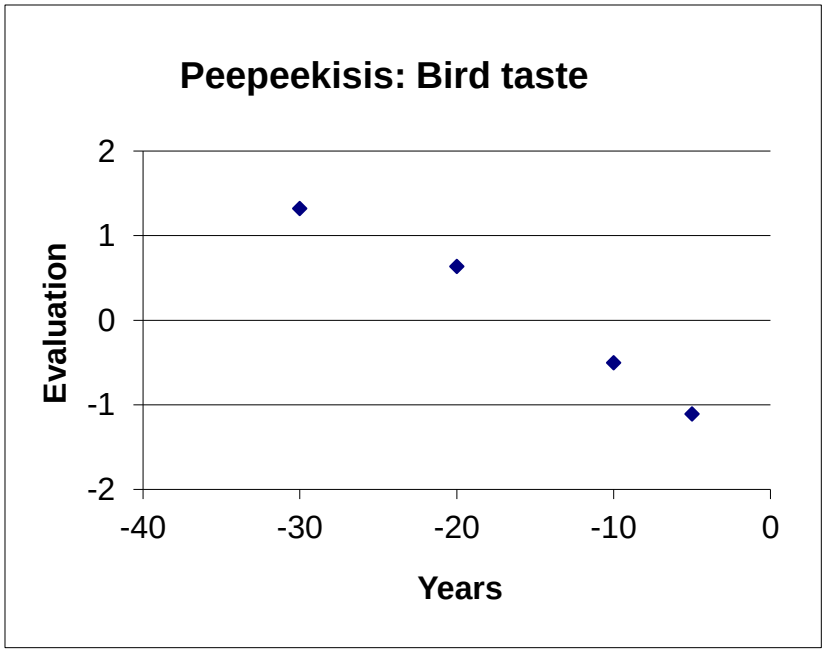

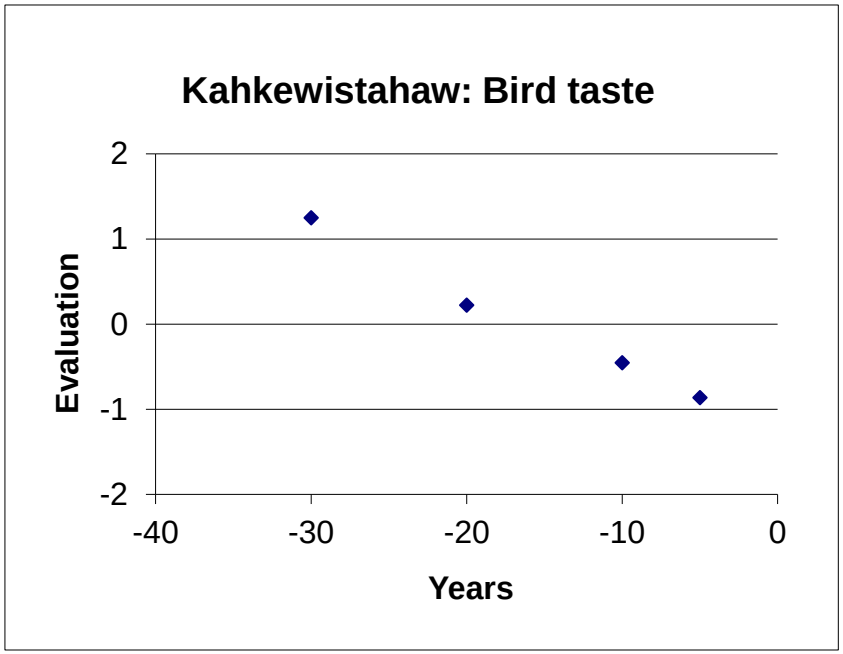

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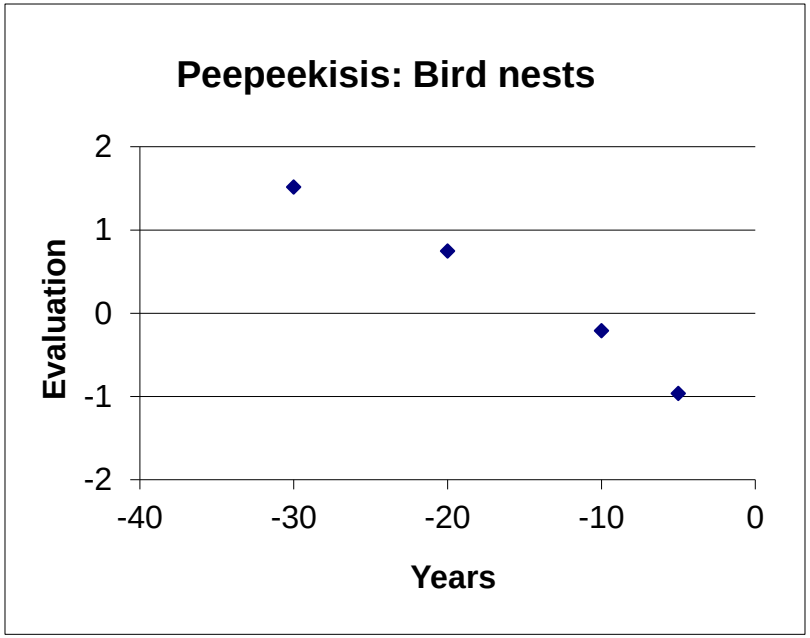

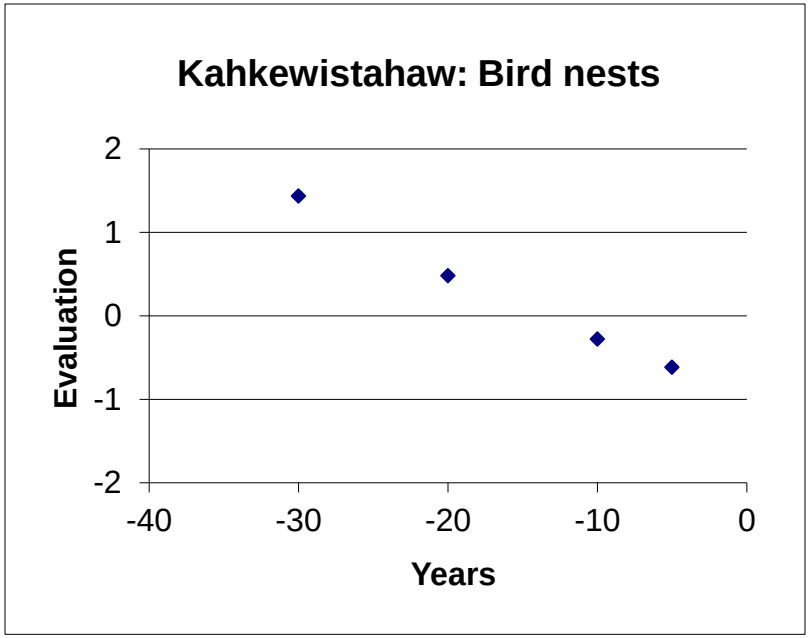

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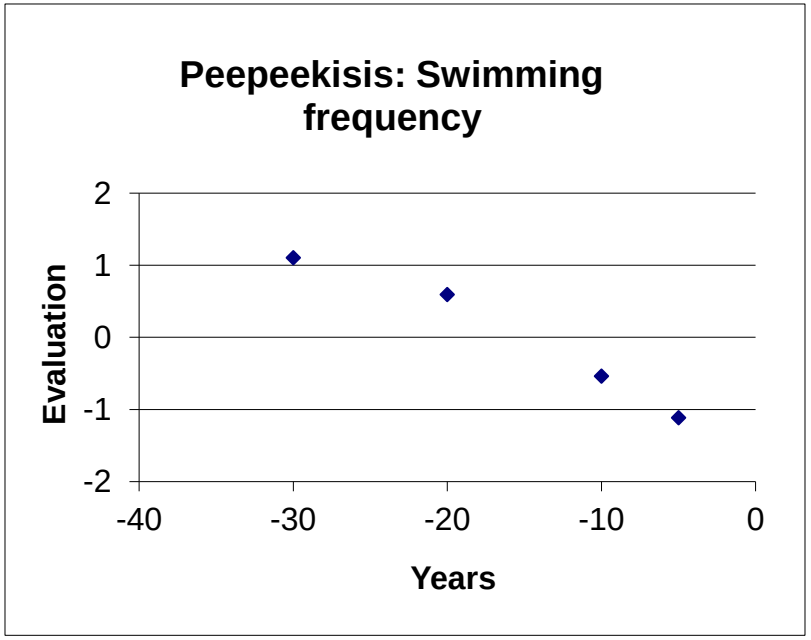

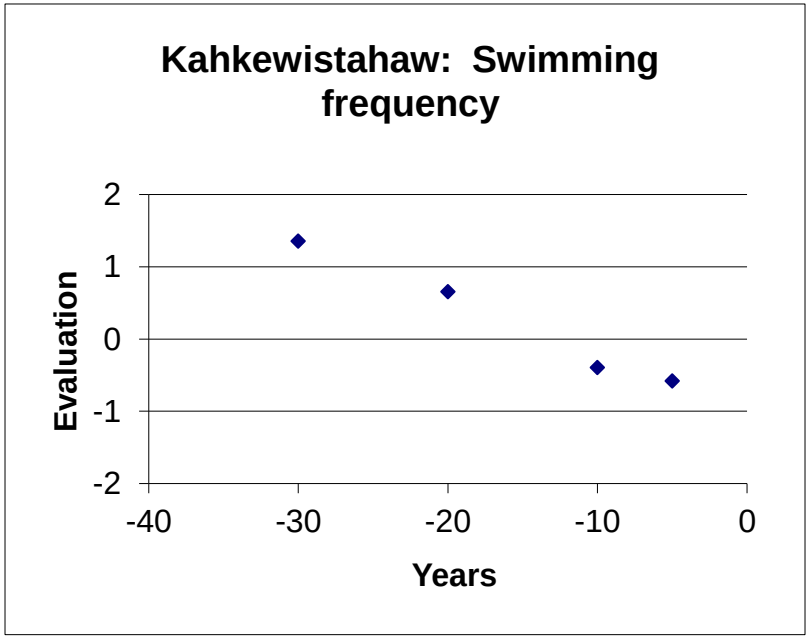

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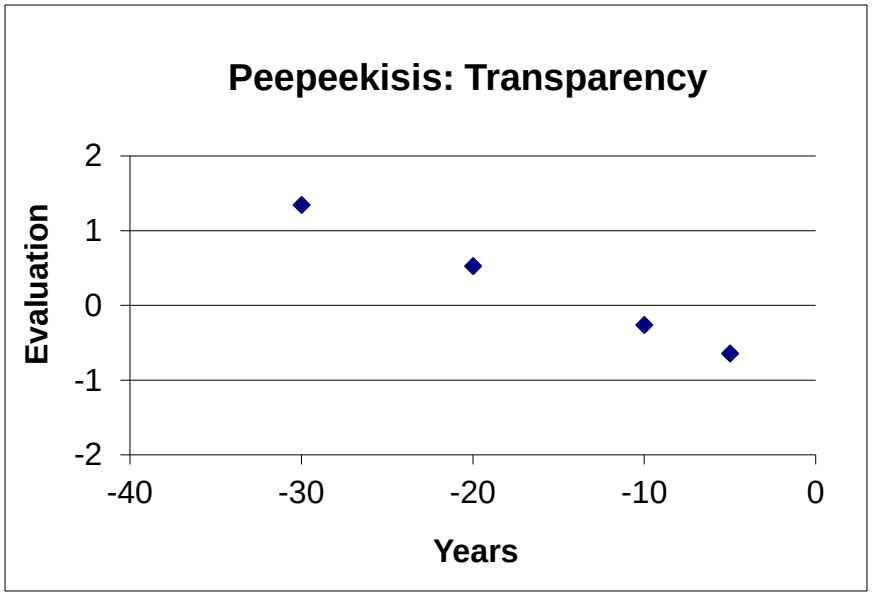

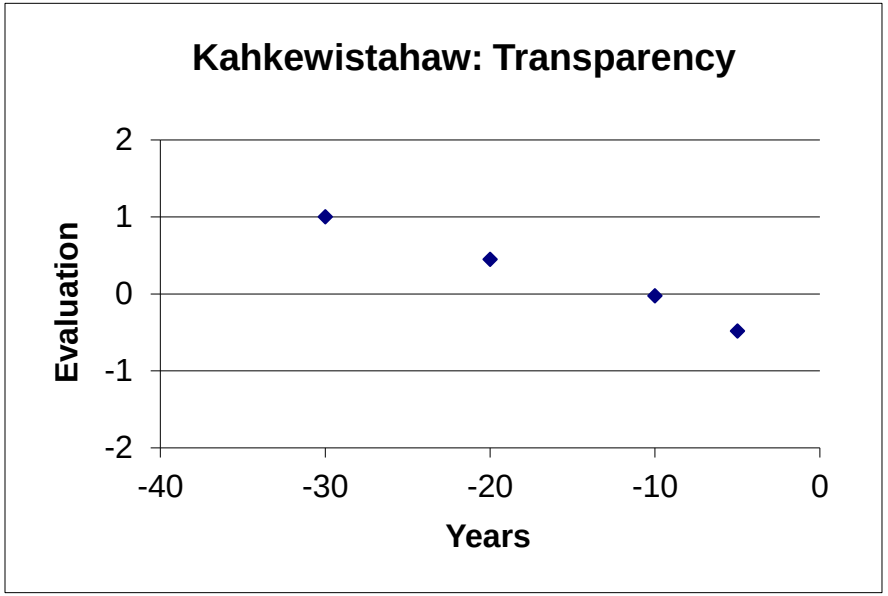

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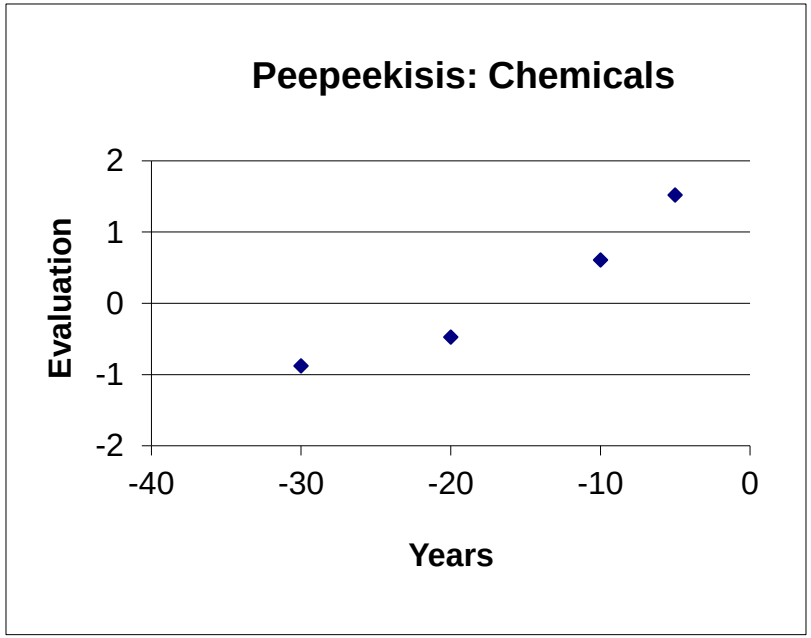
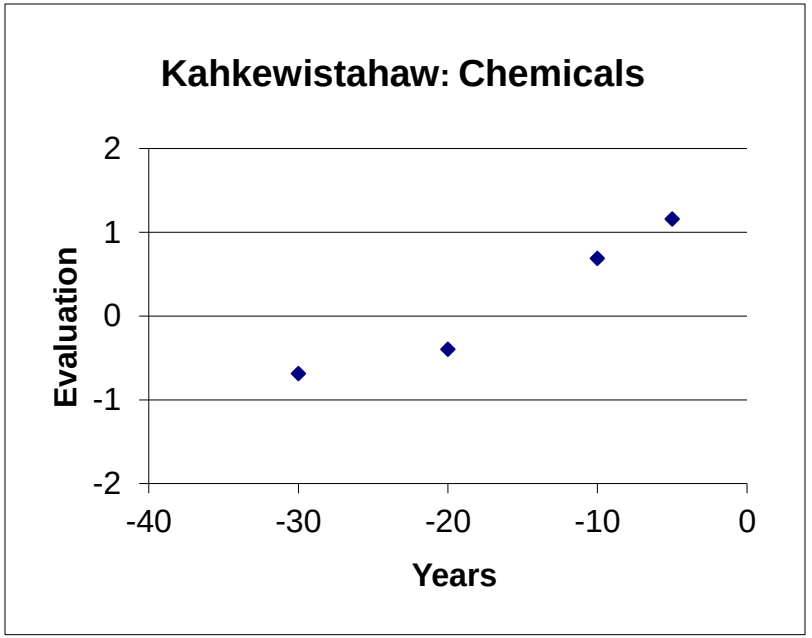
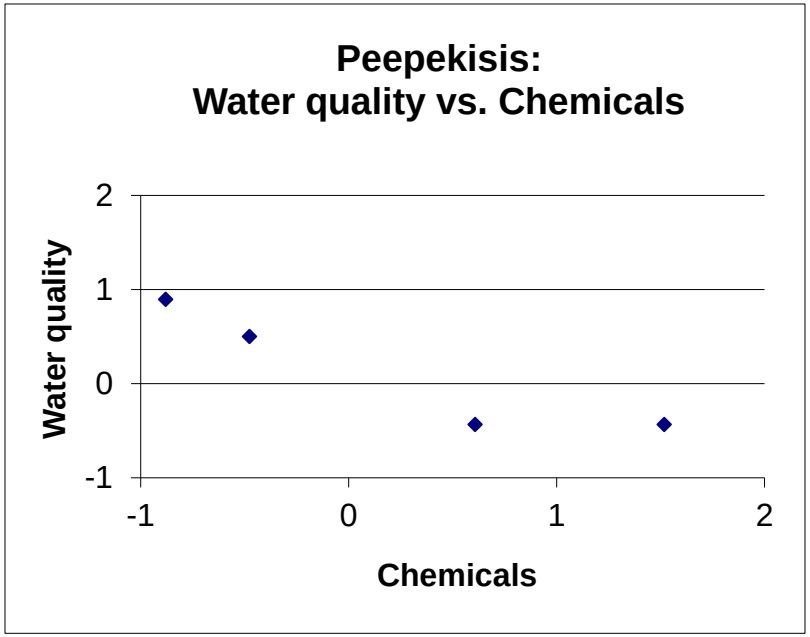
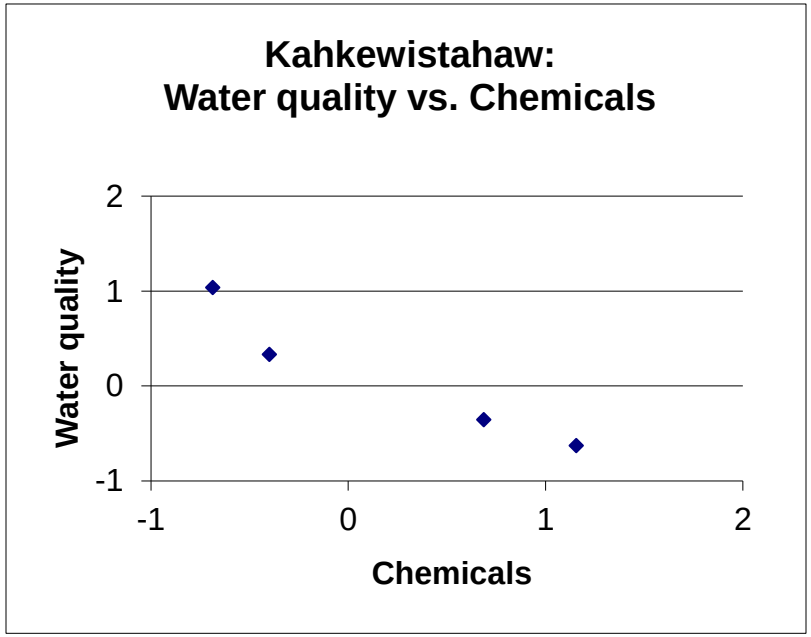




Phase Diagram





Statistical Analysis

Peepeekisis Water Survey Analysis

Q2. & Q8. combined

95.6% of the variation in the evaluation of water quality in the past and future combined is explained by the variation in the year.

Q2. & Q8. separate

Q2.- 94.6% of the variation in the evaluation of water quality of the past is explained by the year that you are evaluating.

Q8.- 99.5% of the variation in the evaluation of water quality in the future is explained by the year that you are evaluating.

Q5.

99.9% of the variation in the evaluation of chemicals in the water is explained by the year that you are evaluating.

Kahkewistahaw Water Survey Analysis

Q2. & Q8. combined

98.7% of the variation in the evaluation of water quality in the past and future combined is explained by the variation in the year.

Q2. & Q8. separate

Q2.- 99.96% of the variation in the evaluation of water quality of the past is explained by the year that you are evaluating.

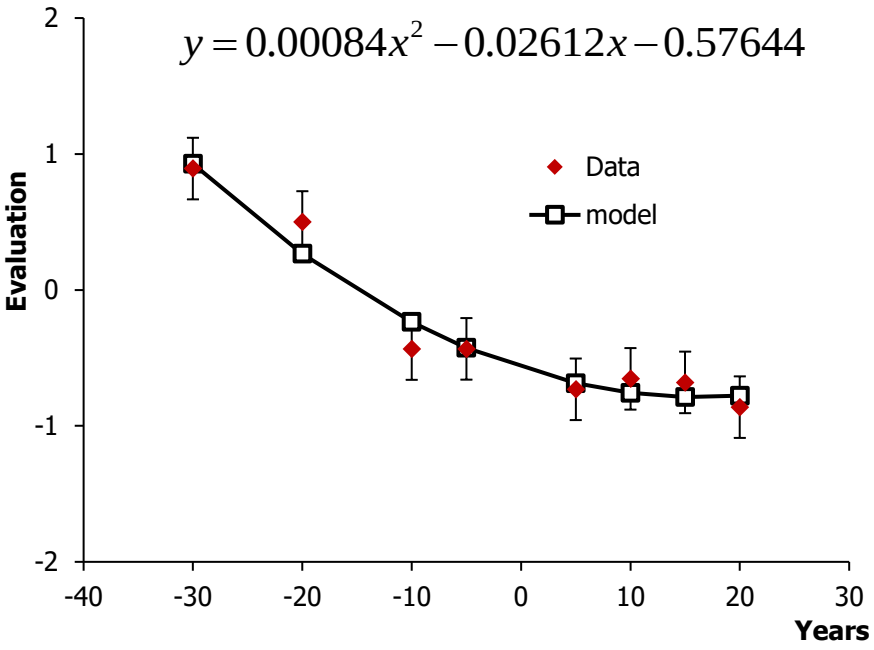
Q8.- 95.8% of the variation in the evaluation of water quality in the future is explained by the year that you are evaluating.

Q5.

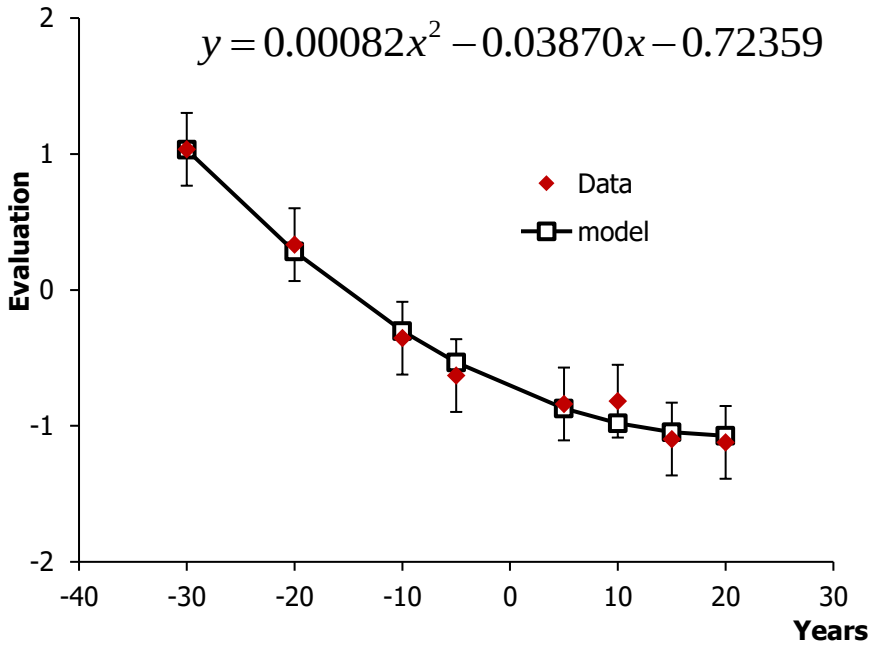
99.0% of the variation in the evaluation of chemicals in the water is explained by the year that you are evaluating.

Polynomial Model

Peepeekisis Water Quality

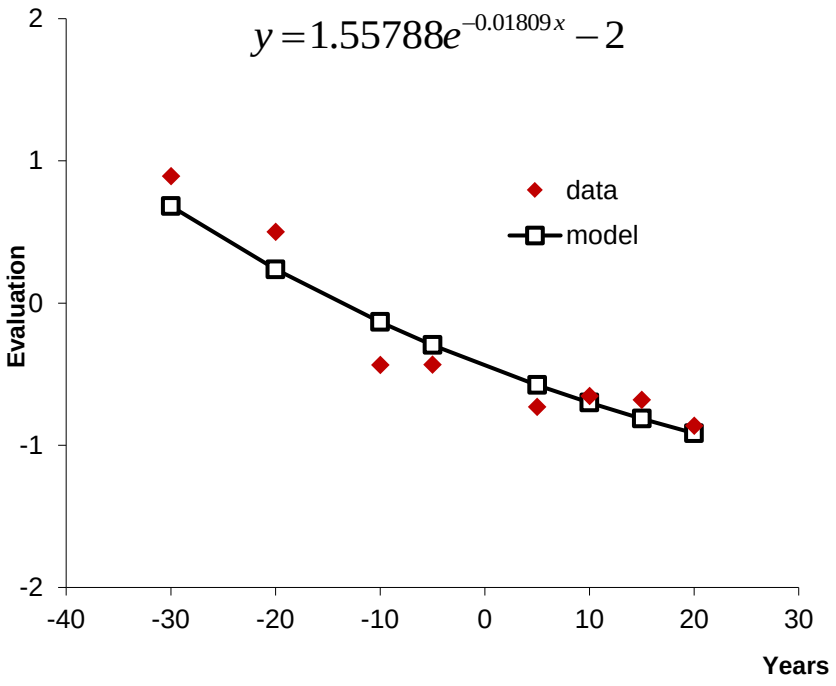


Kahkewistahaw Water Quality

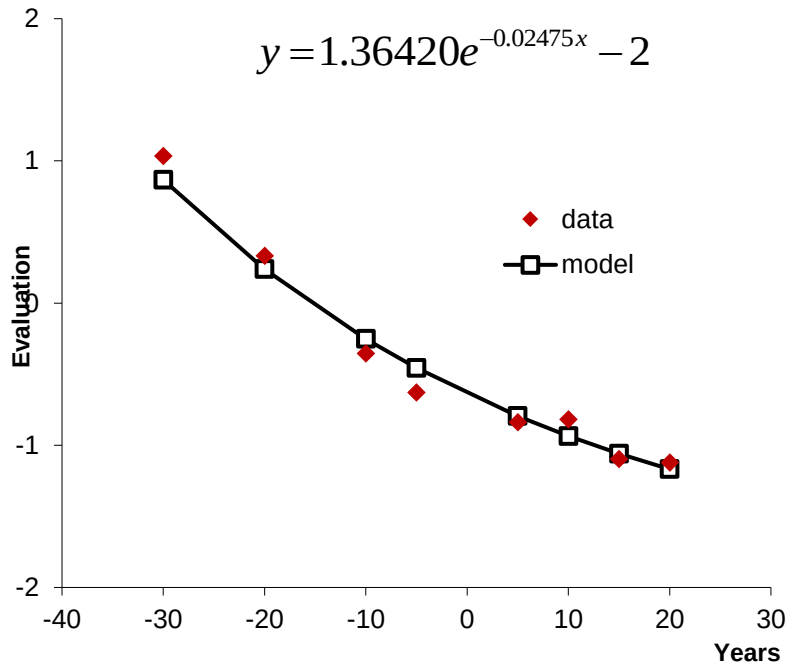


Exponential Model

Peepeekisis Water Quality



Kahkewistahaw Water Quality



THANKS!