

## **Wild Rice (*Manoomin*) and Climate Teaching Box**

*Question: What is the effect of climate change on wild rice harvest in northern Wisconsin?*

### Objectives

Provide students with an introduction to climate projection data and the application of these data to a problem of interest to the Anishinaabeg people (wild rice or *Manoomin*)

1. Encourage students to explore options as to how to apply climate projection data to the problem
2. Teach students how to use basic Excel spreadsheet and statistical tools to evaluate recent climate effects on wild rice harvest and potential future effects from climate change
3. Give students experience with the spatial aggregation of data for analysis
4. Provide students with greater understanding of the importance of temporal variability to produce the most beneficial research results
5. Challenge students to interpret results and present conclusions that would benefit management of the wild rice crop in an environment of changing climate conditions

Resources: County level daily precipitation data, county level rice harvest data, study area graphic, wild rice ecological information and climate change projection data (county level temperature data is available too)

Teacher Guidance: Provide students with a basic understanding of statistics and spreadsheet analysis. Discuss climate change projections and assumptions inherent in the various emissions scenarios (A1b, A2, etc.). Consider discussing statistical significance and whether or not results can be important if not statistically significant. Provide suggestions for effective presentations and how to present results to agricultural decision-makers and tribal elders.

### ***Task 1***

1. Develop a time series graph of average annual rice harvest and average annual precipitation. Show a regression equation that describes the effect of precipitation changes on wild rice harvest.
2. Use climate projection data from the website below to extend the time series trend line for precipitation to 2030, 2050, and 2090. Assume the A2 emissions scenario and the 50<sup>th</sup> percentile.
3. Discuss your results.
4. What are your conclusions?

### ***Task 2***

1. Determine the effect of precipitation changes on wild rice over the growing season, germination stage, and floating leaf stage by repeating the steps 1-4 in task 1.

2. Students present project results and recommendations to agricultural decision makers and tribal elders.

*Prepare all materials and submit electronically. Show all your work. (2 pages max for discussion and conclusions, not including graphs and equations) Email to: (teacher's email)*

### Assessment

Professional writing of report and recommends  
Professional presentation of results  
Ability of student to interact with decision-makers and peers

### Teacher Notes

Students could consider the advantages and disadvantages of spatially aggregating the data. Also, would finer or different temporal scales likely be beneficial to evaluate. What recommendations can be made to potentially mitigate adverse climate effects? Climate changes occurring are beyond our control (assume we all agree, but maybe not). Focus on climate data from observations and models and not the portion of climate change that may or may not be caused by humans.

Website Climate Change Projections: <http://rcpm.ucar.edu>

1. Open website and click on US data
2. Click on the ENC region on the map (East North Central)
3. Click on quantiles.txt
4. Select % dP for the percent change in temperature for the time period of interest (change in dT (temperature) or dP (precipitation) are absolute projected changes you can use for other applications too).

### **Teacher Box Application**

#### *1. Undergraduate Level*

- a. Teacher provides student with climate and rice data
- b. Students graph climate variables and rice acreage:

Temperature, precipitation, rice acreage

Student: What are the trends for each variable?

- c. Teacher provides background information on climate trends using G-WOW.
- d. Teacher introduces students to the Excel Data Analysis Tool
- e. Student uses the Excel tool to produce descriptive statistics for each variable and linear regression analysis among the three variables.

Student: What is the relationship between climate and rice acreage?

Are these relationships statistically significant?

What conclusions can you make from your results? Consider climate effects on rice acreage and potential cultural effects.

2. High School

- a. Teacher provides student with climate and rice data
- b. Students graph climate variables and rice acreage: Temperature, precipitation, rice acreage

Student: What are the trends for each variable?

- c. Teacher provides background information on climate trends using G-WOW
- d. Students discuss and list potential climate effects on rice acreage. Teacher may ask students to prioritize list and justify rankings

3. K-8

- a. Repeat the “game” exercise.
- b. Share introductory information on climate change and relevance to culture including rice as food source (e.g. Doug’s introductory information)
- c. Students are tasked to make a poster about climate change and their culture