

Unit 1: Climate & Pacific Northwest Agriculture

Unit Summary: This unit is designed to provide students with a general overview of climate change and its impact on agriculture, with specific examples from the Pacific Northwest. This unit could be adapted to fit any region with minimal changes.

Teaching Time: It is anticipated that this unit and its related activities will take five 50-minute class periods to complete. Depending on the number of readings utilized, this could be longer.

Audience: 9-12 Science & Agriculture Students

Unit's placement in the overall course: This unit is designed to be the introductory unit of instruction for a course on agronomy, applied biology, ecology, or plant science. It requires little prior knowledge in any of these subjects by the students. Depending on the instructor's level of familiarity with agriculture and climate change, additional preparation may be required.

Goals: The purpose of this unit is to give students a broad overview of climate change and its impact on agricultural production in the Pacific Northwest. This unit introduces the concept of anthropogenic (human induced) climate change, however discussion related to the validity of this concepts is recommended only after completing this and several other of the units in this curriculum. The unit instead focuses on agricultural production and the changes occurring as the climate has changed and continues to change.

Description of the unit: This unit contains a PowerPoint Presentation, a classroom lab activity meant to model the greenhouse effect, and five readings about agriculture and climate change. Teacher notes are supplied with most slides to help guide class discussion.

Using this unit: Within the PowerPoint for this unit are hidden slides. On these slides are embedded Microsoft Word Documents. These documents provide the additional resources needed to deliver this unit. A standards document is provided which includes the relevant Next Generation Science Standards, Common Core State Standards for Math and ELA, and Agriculture, Food, & Natural Resources Standards. The standards included may be only introduced through this curriculum, and the teacher will need to decide the level at which they want to augment the provided instruction in relation to these standards. Readings associated with the unit are in a separate zipped PDF file. This document includes all the readings in one zipped file so teachers can select those readings most appropriate for their classrooms.

Related Readings for Meeting CCSS in ELA: These readings are not overly technical, however teachers reported some difficulty using them with students on IEP's. To accommodate these students it is recommended teachers choose a portion of the readings and run it through an application like <http://www.rewordify.com> which can adjust the reading levels as needed. Several of the readings are lengthy, and teachers may wish to choose one and break up the reading over the course of the unit, or the entire semester.

Foundational Readings usable for all REACCH curriculum units:

- Ch. 6: Agriculture. Climate Change Impacts in the United States: The Third National Climate Assessment. doi:10.7930/J02Z13FR
- Ch. 21: Northwest. Climate Change Impacts in the United States: The Third National Climate Assessment. doi:10.7930/J04Q7RWX
- Climate Change and Agriculture in the United States: Effects and Adaptation. USDA Technical Bulletin 1935. Washington, DC.
- Lambert, J. (2014). Global Climate Change: The Science Needed to Understand the Problem.
- Climate Literacy Handbook. NOAA.
- Rural Connections (June, 2011). Climate Change Adaptations in the Rural West. Western Rural Development Center. Utah State University, Logan, UT.
- Malcolm, S., Marshall, E., Aillery, M., Heisey, P., Livingston, M., & Day-Rubenstein, K. (2012). Agricultural Adaptation to a Changing Climate: Economic and Environmental Implications Vary by U.S. Region, ERR-136, U.S. Department of Agriculture, Economic Research Service.

Fee to Use, or acquire through your local library:

- Adams, R. M., Rosenzweig, C., Peart, R. M., Ritchie, J. T., McCarl, B. A., Glycer, J. D., Allen, L. H. (1990). Global climate change and US agriculture. *Nature*, 345(6272), 219-224. doi:10.1038/345219a0.

Required Supplies: The activity in this unit requires the use of large containers and thermometers. In addition, a small heating device is required. To utilize the activity as outlined will require each group of students (recommend groups of 4) to have:

- 2- 8-Quart Rubbermaid storage containers
- 1- Go! Thermometer
- 1- KAT heater
- 1/8 of 1 Alka-Seltzer tablet
- 2 small disposable aluminum loaf pans
- Logger Lite Software

This could also be conducted as a class, or used in conjunction with the readings with one group running the experiment and all groups rotating through. This would give multiple runs of the experiment to compare results and discuss replication in scientific studies.