

Climate Change and the Water Cycle: A New Southwest Regional Climate Hub Unit for 6th-12th Grade Students

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Climate Change and the Water Cycle, is a scientifically rigorous education unit for 6th -12th grade students.

- For formal and informal educators
- Contains nine activities (Table 1), which can be conducted over 10 instruction hours. Each activity can also stand alone.
- Activities include hands-on experiments and games (Figure 1) using widely available and inexpensive materials for educators.
- Reviewed by educators for educational practices and scientists for scientific accuracy

Table 1. Climate Change and the Water Cycle unit activities.

Activity	Description
<i>Insulating You, Insulating Earth</i>	To model the enhanced greenhouse effect, students conduct an experiment using their own body heat, thermometers, towels, and space blankets.
<i>Weather or Climate? You Decide!</i>	Students use their understanding of the definitions of weather and climate to identify which of the two concepts is better represented by several figures that are presented during the activity.
<i>Understanding the Difference</i>	Students read a short article and examine selections from the media to determine whether the American public and media tend to understand the difference between weather and climate.
<i>Evaporation Investigation</i>	Students conduct an experiment to investigate the effects of different factors on the rate of evaporation.
<i>The Water Cycle Game</i>	Students play the roles of reservoirs and hydrologic processes to illustrate the movement of water in the water cycle.
<i>Streams and Steam</i>	Students play a Chutes-and-Ladders-style board game to understand the effects of climate change on the water cycle.
<i>Ready, Set, Grow!</i>	Students play the roles of water-intensive and drought-tolerant plants to understand the impacts of climate change on water, primary producers, and the food web.
<i>Rainout Shelters</i>	Students analyze data from a desert field experiment to examine the effect of water availability on plant growth.
<i>Climate Data Jam</i>	Students analyze and then showcase climate data by developing a creative project to communicate data trends to nonscientists.

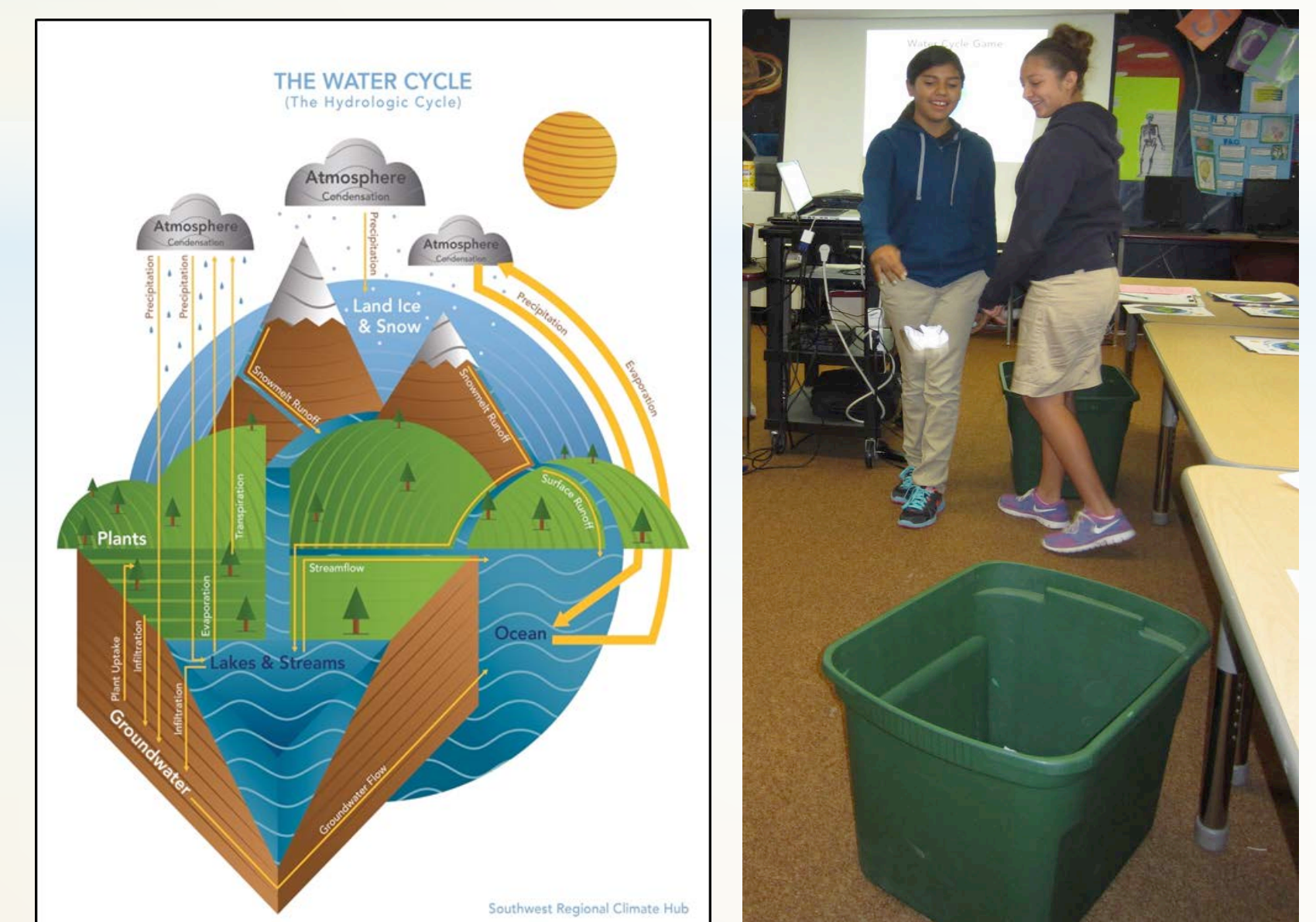
Figure 1. Hands on activities and games



Example activity: Students first look at the effects of insulating their lap with a towel, which models the greenhouse effect, and then they examine the effects of adding a space blanket to model the enhanced greenhouse effect



Example activity: Using our water cycle diagram, students model the movement of water from one reservoir to another by tossing paper wads, representing water, into labeled bins, representing reservoirs.



Example activity: Streams and Steam, is a Chutes-and-Ladders-style board game which is based on the effects of climate change on the water cycle. It is a favorite of students



Example activity: The objective of the data jam is to communicate science to non-scientists. Using projected county-level temperature and precipitation data, students analyze and then devise creative ways to present the data. The students on the left, wrote and performed a piece of music that represented trends in the data. The students on the right created and performed a puppet show to highlight data trends.



Curriculum Development and Testing

Activities were pilot tested with 524 middle and high school students in New Mexico, and outcomes were assessed with pre- and post-tests (Table 2). A student commented: “*I loved all of the activities! They are fun and help us understand about what goes on in the world.*” Educators who participated in pilot testing said: “*the entire curriculum is great, but I was particularly impressed with the progression of ideas and the variety of lessons,*” and “*students could see the relevance and importance of these real life issues.*”

Table 2. Example of pre- and post- test assessment

Ability	On Pretest*	On Post Test*
Name a greenhouse gas	48%	91%
Identify relationship between global temperature and carbon dioxide levels	52%	86%

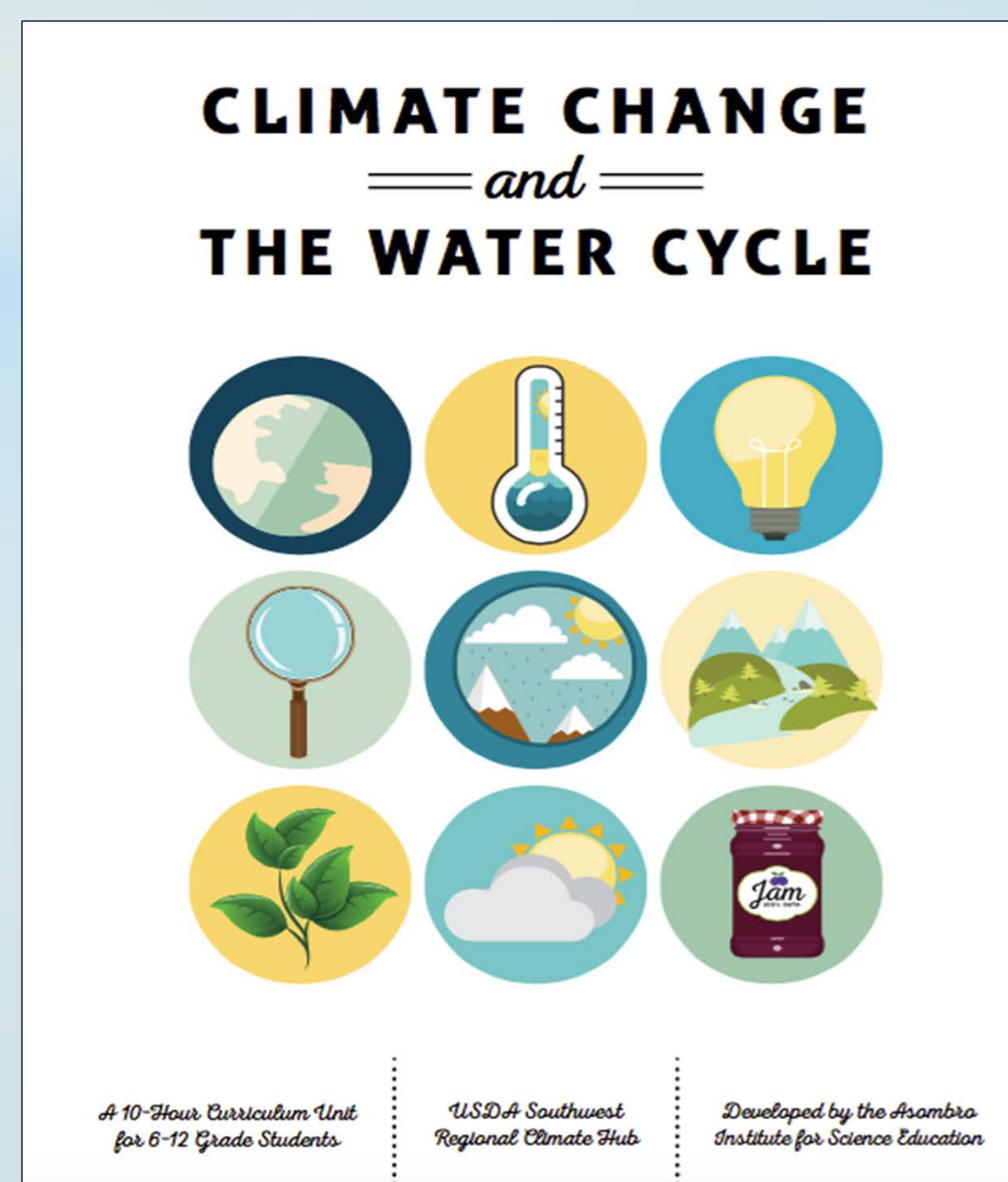
*Percent of students who answered correctly

Highlights:

- Hands-on activities
- Aligned with Common Core State Standards and Next Generation Science Standards
- Tested and Refined by students and teachers.
- Reviewed by educators for educational practices.
- Reviewed by scientists for accuracy
- Downloadable instruction manual with links to PowerPoint presentations and videos, printable student worksheets, inexpensive teacher materials for each activity.
- Extensions to expand upon each lesson.
- Freely available and ready to use!

Next Steps

In 2016, we aim to work with educators in each Southwest Climate Hub State (Arizona, California, Nevada, New Mexico, Utah and Hawaii) to implement *Climate Change and the Water Cycle* in at least one community per state. Asombro Institute staff is actively developing the second unit of the series: *Climate Change and Threats to Agriculture*, to be completed near the end of 2016.



Full curriculum and individual activities freely available online:
<http://swclimatehub.info/education/climate-change-and-water-cycle>