

# IMPACT

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## The carbon cycle: Teaching youth about natural resource sustainability

### The Situation

The Sixth Grade Forestry Tour is a Clearwater County tradition. Since 1961 Clearwater County sixth graders spend three days each July camping in the forest and learning about natural resources. Presenters from many partnering agencies provide learning experiences regarding soils, forestry, logging, grazing, fisheries, water quality, wildland fire, natural resource careers, and many other topics.

While youth are exposed to many different facets of natural resource management, there has not been an organized curriculum for the tour that focuses learning on the achievement of predefined learning objectives that the presentations are aligned with. In addition, there has not been an overriding conceptual framework expressed that ties together what the many different natural resources share in common and how they relate to one another and learning objectives.

Research has demonstrated that to maximize learning, teaching needs to be directed toward definite learning objectives and conceptual schemes must be presented that allow learners to organize what otherwise are unrelated factual information (National Research Council 2000). While maintaining and even increasing the particular “hands on” learning experiences of the Tour, we wanted to better organize these presentations toward reinforcing the primary learning objective categories of – sustainability, economics, and basic science – as well as tie them together with an overarching conceptual framework to increase learning. In summary, we wanted to achieve greater learning of basic principles to accentuate rather than replace the “that’s cool” experiences the students have such as observing fire-fighting equipment operation or touring a lumber mill.



A group photo of the 2013 Sixth Grade Forestry Tour attendees taken from atop the Bertha Hill Fire Lookout.

### Our Response

In 2013, presenters and local educators were consulted, along with examples of learning-objective-driven programs used elsewhere in Extension, to develop learning objectives for the Tour organized within a comprehensive conceptual framework. The carbon cycle was chosen as a conceptual scheme that would not only unify the various natural resources and what they have in common, but also serve as a way of understanding the rationale behind sustainability, as well as increase the basic STEM (science, technology, and math) education value of the Tour.

The carbon cycle has become popularized in recent years due to the issue of global warming. However, there is nothing new about the carbon cycle, it is perhaps the most fundamental of the bio-geo-chemical processes maintaining the biosphere, and is a result of the two most fundamental biochemical processes

that govern ecosystems, natural resource utilization, and agriculture – photosynthesis and respiration.

The carbon cycle provided a means of linking the various natural resources – forest products, fish and wildlife, range lands, energy – and providing a scientific grounding for the core concept of sustainability. As carbon can only be assimilated by living systems at a given rate, our use of carbon resources (and all bio-based resources are made of carbon) could not exceed this rate without threatening the future availability of the resource (whether trees, grass, fish, wildlife, etc.).

Presenters were given a common set of learning objectives, including using the carbon cycle framework, and asked to demonstrate how their particular presentation related to one or more of the overall learning objectives. In addition, presentations on the learning objectives and the carbon cycle were given at the beginning of the Tour, in the morning before the day's events, and at the introduction of each sequence of presentations to set the context for what the students would be learning. Learning objectives were further reinforced at the end of the day by educational games, such as "jeopardy." Students were also provided with a camp booklet that not only included the camp schedule, but also contained figures and statements reinforcing the learning objectives and illustrating the carbon cycle.

Finally, a carbon cycling game ("The Carbon Cycle Game," National Center for Atmospheric Research) demonstration was conducted to further reinforce the carbon cycle as a way of understanding the unifying themes of natural resource management and its scientific basis. The game was presented by Steven Tallas a college intern with the Nez Perce Tribe working for their Environmental Outreach Department. (The Tribe routinely cooperates with us on the Tour by providing presenters and interns.)

In conformity with learning theory, the overall approach was one of continual repetition of the major themes over the three-day tour, illustrating how the major learning objectives were illustrated by the various presentations on different aspects of natural resource management and relating them to the carbon cycle.

### **Program Outcomes**

To test the efficacy of this approach and achievement of the learning objectives a pre and post evaluation was conducted with questions directly related to the learning objectives. Students were given the pretest at the beginning of the Tour prior to the introduction, and the post test was given at the end just prior to students being transported home. The pre and post tests were identical.

Overall student performance on the test increased by 33%. The average score on the pretest was 60.9%, which increased to 80.9% on the post test. Forty-one sixth graders took the pre and post tests. In addition, eight teen leaders, three college interns, one high-school exchange student, four teachers, eight volunteers, and thirty-four presenters participated in the Tour in 2013.

### **The Future**

Given the success of the 2013 pilot, the 2014 Tour will further develop this theme through greater involvement of presenters in teaching to the learning objectives, as well as a change in presentations that will not only reinforce the learning objectives, but will give the students more active learning experiences.

### **References**

- National Center for Atmospheric Research. The Carbon Cycle Game. ([www.eo.ucar.edu](http://www.eo.ucar.edu))
- National Research Council. 2000. How People Learn: Brain, Mind, Experience, and School. National Academy Press. Washington D.C., 374pp.

### **FOR MORE INFORMATION**

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