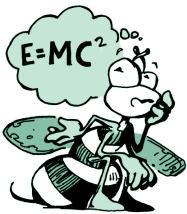


Quaking in Their Roots:

# The Decline of Quaking Aspen

## Meet Dr. Dale Bartos:

“I like being a scientist because I enjoy working with natural systems and attempting to understand how they function. I am able to communicate this information to the land managers who (it is hoped) will do a better job of caring for the land.”



## Thinking About Science...

Sometimes, a scientific question cannot be answered by direct observation, such as by an experiment or by simply observing what is going on. In these cases, scientists collect



Dr. Bartos counts tree rings with the help of a technician.

information from a variety of sources, then put the pieces together as if they were gathering and evaluating clues to a mystery. *In this study, the scientists wanted to know why populations of quaking aspens are declining in the Western United States.*

Because it would take years to watch the growth and development of an aspen stand, the scientists tried to find clues from other sources to help them understand the aspen's decline.



## Thinking About the Environment...

Pando—which means “I spread” in Latin—is the perfect name for a stand of quaking aspen, nominated a few years ago as Earth's most massive living individual. The title still stands, as far as scientists have determined. In the Wasatch Mountains of Utah (on the Fishlake National Forest — see *Figure 1*), Pando

## Glossary:

### **biodiversity:**

(bî'ô di vûr'si tê)  
various kinds of life

### **conifer:** (kô'ne fer)

cone-bearing evergreen tree or shrub

### **distribution:**

(dis' tre byôô'shen) the frequency of occurrence or places where a natural resource can be found

### **ecosystem:** (ek'ô sis tem)

a system formed by the interaction of organisms with their environment

### **forage:** (fôr'ij)

plant food eaten by wildlife, horses, or cattle

### **forest manager:** (fôr'ist

man'i jer) a person who takes specific actions to protect and to use natural resources in a forest

### **forest stand:** (fôr'ist stand)

a particular species of tree growing in a given area

### **natural history:** (nach'er el

his' te rê) history of changes in the natural environment over time

### **stability:** (ste bil'i tê) being

likely to continue

### **succession:** (sek sesh'en)

the natural replacement, over time, of one type of plant life after another

### **suppress:** (se pres')

to put an end to;  
to subdue or conquer



Figure 1. Aspen stand in the Fishlake National Forest, Utah.

weighs about 13 million pounds. He has upwards of 47,000 stems. That's 47,000 of what you and I might mistakenly perceive as separate aspen trees.

Pando is a male aspen. Unlike several other tree species, individual aspen are either male or female. Quaking aspens like Pando are able to cover so much ground by an asexual reproductive process—known as suckering—involving tree roots. New stems rise out of the ground from the aspen's network of horizontally spreading roots. On the surface, these appear to be separate trees, but they are really part of one individual! (This

information is from *Earth and Sky*, Monday, December 9, 1996. Visit their web site at [www.earthsky.com](http://www.earthsky.com).)

### Introduction

The quaking aspen is a tree that helps us a lot! Aspen use less water than *conifers*, provide *forage* for wildlife, and support a wide variety of other kinds of life. The quaking aspen thus helps to maintain the *biodiversity* of an area. Aspen are unique, because they reproduce by sending small shoots up from their root systems. This kind of reproduction is called suckering. In some ways, this is a disadvantage to them. If they are lost to an area, they will

not reproduce from seeds like other trees.

In recent years, populations of quaking aspen have been in decline in the Western United States. Stands of aspen are now mixed with conifer trees. Each year, fewer aspen-dominated stands exist in Utah and other parts of the Western United States. To be classified as an aspen stand, the stand must be more than 50 percent aspen.

The scientists in this study wanted to know more about the decline of quaking aspen. They also wanted to know what should be done about reversing aspen decline, so that large aspen stands

are not lost in the Western United States.



### Reflection

- If aspen declines, what environmental benefits will decline also?

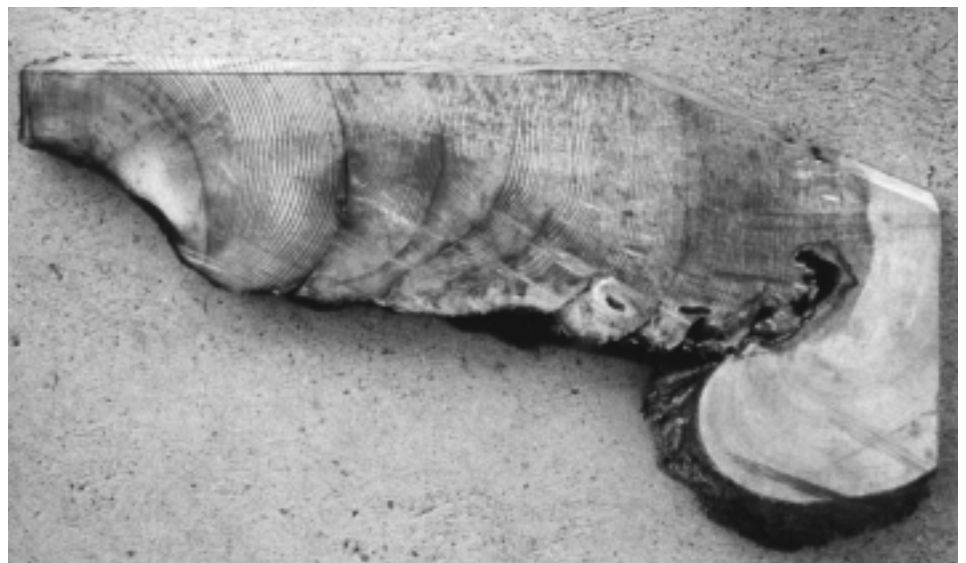
### Methods

The scientists collected information from a wide variety of sources. First, they researched the *natural history* of the area. They specifically looked at the history of fire and of the *distribution* of aspen. In part, they learned about the fire history from two ponderosa pine trees (*Figure 2*). Even though ponderosa pine trees can't talk, they can still tell scientists about past fires. The scientists took a small slice from the trunk of each of the pine trees and examined the slice for fire scars near the trees' growth rings (*Figure 3*).

The scientists also dug trenches in *forest stands* of pure aspen, and in stands with a mixture of aspen and conifer trees (*Figure 4*). They pulled the aspen roots from these trenches and counted them. In this way, they could determine whether aspen reproduction was declining in stands being shared with conifers.



*Figure 2. Ponderosa pine damaged by fire.*



*Figure 3. Fire-scarred growth rings from ponderosa pine.*



Figure 4. Digging up the aspen roots and counting them.



### Reflection

- If fires are not allowed to burn, the aspen in an ecosystem are gradually

replaced by other trees. How does fire maintain the stability of the aspen ecosystem?

### Implications

Unless *forest managers* make some changes, the population of aspen trees in the Western United States will continue to decline. Recommended changes include reducing livestock grazing among aspen trees and beginning a program to allow fires to burn about every 20 years within aspen stands.

The scientists know a great deal about how to save the quaking aspen, but more research is needed. What they do know is that if the aspen population continues to decline, many of the environmental benefits of aspen ecosystems will also decline.



### Reflection

- If you were the scientist, what would you suggest should be done about the decline of quaking aspen?

From: Bartos, Dale L. and Campbell, Jr., Robert B. (1998). Decline of Quaking Aspen in the Interior West— Examples from Utah, *Rangelands*, 20(1): 17–24.



### Reflection

- What is it about the number of aspen roots that would tell the

scientists that aspen reproduction is declining in mixed stands, as compared with stands with mostly aspen trees?

- What is the relationship between fire and the growth of conifer trees in aspen stands?

### Results

By looking at the trunk slices, the scientists discovered that nine fires had occurred during the early lifetime of the Ponderosa pines, but that no fires had occurred since 1836. Prior to 1836, fires burned in this area about every 19

years. These fires were helpful to aspens because they reduced the competition of other species. Aspens regrew after the fires had burned, and, therefore, these small fires actually helped the aspen stands to remain healthy. Fire acted like a feedback mechanism that helped to keep the aspen *ecosystem* balanced within certain limits.

Over the past 150 years, humans have *suppressed* fires, and have allowed livestock to graze among the aspen. These activities have allowed forest *succession* to proceed. When this happens in aspen stands, the aspens begin to die and the areas become dominated by conifers and/or sagebrush. This is what is happening now to the aspen stands studied by Dr. Bartos and Mr. Campbell.



## Discovery FACTivity

When a tree is cut down or a branch is cut off of a tree, the trunk or branch shows a pattern of rings. Each ring is a layer of wood produced during 1 year's growing season. Have your teacher bring thin slices from a cut tree or branch, enough for each student or for small teams of students. Carefully examine the rings. In years with good growing conditions, the area between rings is large, indicating a lot of growth. In years of drought, insect damage, fire, root damage, or

other stress, the area between rings is small and may actually show the damage, indicating poor growth in that year. *See the example.*

What can you determine about the tree's (or branch's) life and the yearly environmental conditions by reading tree rings? See if you can even count the rings to determine the tree's (or branch's) age.

Just like trees, people grow each year. We are going to borrow the idea of reading tree rings, except that you are going to draw your own life story, just as if you were a tree. Get a plain piece of paper. Put a dot in the center. The dot represents the year

you were born. Now, draw circles around the dot. Each circle represents a year of your life. If you grew a lot 1 year, leave a lot of area in between that circle and the next larger one. You can show memorable events in your life on the rings. Share your life stories with other students in the class. *See the example below.*

For more information, see: [www.xmission.com/~rmrs/staffs/labs/logan/logan\\_int4301.html](http://www.xmission.com/~rmrs/staffs/labs/logan/logan_int4301.html)

