Scientists Coax Carbon into Reclaimed Mine Lands, Forests

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Three University of Wyoming researchers are attempting to determine best-management practices to harness the Earth's primal forces and turn landscapes into sponges for carbon. Or, at least through the efforts of Pete Stahl, Daniel Tinker, and George Vance, find more efficient ways to coax carbon out of the atmosphere and stick it in the ground.

Stahl, associate professor in the College of Agriculture's Department of Renewable Resources, is peering into ways reclaimed mining land can be best managed to absorb carbon in the atmosphere.

"More and more scientists believe global warming is a real phenomenon," he says. "If we can come up with ways to keep carbon out of the atmosphere, that can be really important."

Wyoming's surface mining legacy offers a unique test tube to examine best-management practices of grazing, topsoil replacement methods, mulch use, and grass and forb seed.

Stahl compares sites on a half-dozen Wyoming coal mines. Since mining companies are required to keep records of their land reclamation efforts, there is a long-term canvas for comparisons.

One area, near Hanna, has been so successfully reclaimed that "if you go up there, you wouldn't know a mine was ever there," Stahl notes.

Stahl samples soil at three depths - from 0-5 centimeters, 5 to 15

centimeters, and 15 to 30 centimeters - to determine the amount of soil organic matter.

He's had at least one instance that raised his eyebrows. Rangeland reclaimed from surface mines and grazed by domestic livestock and wildlife seems energized.

"The mining companies are doing such a good job reclaiming that there is a period those sites are more productive than undisturbed sites," he says.

Re-establishing the plant community takes a few years, and then the site enters an extremely productive span for several more years.

Another, not quite "Aha!" moment but still an illuminating one, was his revisit of the Hanna site.

"We saw that the amount of organic carbon in the soil had increased so much. Sagebrush had re-established on the reclaimed mine land, which is significant because it captures much of the snow," he says.

Stahl also is examining best forest management practices in the Medicine Bow National Forest and another area in the Black Hills in northeastern Wyoming with Vance, an environmental soil science professor in the Department of Renewable Resources, and Tinker, an assistant professor in the Department of Biology.

"We are looking at how different forest management practices influence carbon levels in the soil," Stahl notes.

Researchers had to first estimate how much carbon exists in above- and below-ground plant material before they could determine any rates of replacement.

That's where Tinker, who also has ongoing research projects in the Yellowstone area, put his forestry expertise to use.

Tinker looked at three timber stands that were being managed differently and one stand where there has been no forest management. Tinker's team had to determine the amount of carbon in each of the above- and below-ground pools, and then somehow determine how much carbon was being sequestered each year.

To solve the first problem required lots of manual labor coupled with the development of mathematical equations. To solve the second problem required a skill almost anyone who has ever felled a tree knows; however, gathering the data was not easy.

Tinker had to develop allometric equations, which relate easily-measured tree characteristics, such as diameter, to the entire tree to determine the biomass.

"We had to cut down lots of trees and weigh individual parts," he explains. "The only way is to cut a tree into little pieces and weigh the pieces in the field."

They felled 80 trees. The chunks then had to be dried and weighed again to discount moisture. The researchers established total mass of the individual components, including roots, stems, branches and needles.

Scientists then looked at tree rings to determine the amount of carbon stored each year. Tinker observed the biomass in the three sites - even-age management where trees of the same age were left standing, uneven-age management where there has been more selection in the trees removed, and uneven-age management areas that were more intensely harvested.

Tinker says that while the unmanaged stand contains more biomass in the current pools, all three managed areas probably are storing carbon at higher rates than the unmanaged area. He cautions the data provide only a snapshot of conditions over the last five years.

Source: University of Wyoming