The Science Behind Carbon & Climate Change in the Great Basin

Global climate change is caused by rising levels of greenhouse gases ... carbon in the atmosphere that traps heat from the sun.

Levels of carbon in our atmosphere are 40% higher today than they were in 1750.

Some of this carbon comes from the way we humans live.

Some of it also comes from ecosystems that are out of balance.

**Carbon & Climate Change Quick Facts**

- Increased carbon in the atmosphere traps energy from the sun and is the major factor in global climate change.
- Atmospheric carbon can come from human-caused pollution and fire.
- Natural environments in the Great Basin act like a giant sink for carbon, pulling it from the atmosphere. Native plants hold carbon in their leaves, stems, and roots. When fires occur, carbon stored above the ground is released to the atmosphere, but the carbon underground typically remains where it is.
- Cheatgrass and expanding pinyon-juniper woodlands are changing this cycle. Cheatgrass is a non-native invasive plant that doesn’t efficiently store carbon underground. Most carbon the plant holds returns to the atmosphere when it burns.
- Pinyon-juniper woodlands are native, but have expanded beyond their historic boundaries, creating further stress on native grasses. Dense woodlands are especially prone to burning during wildfire, and the disturbed land allows cheatgrass to invade.
- Scientists are using herbicides, mowing, and cutting to help native grasses reestablish and compete against cheatgrass. They are closely monitoring these techniques to understand the best way to restore native Great Basin environments.

**Before we started burning fossil fuels,** the carbon content of the air generally remained steady, but that carbon was still mobile. It was introduced into the atmosphere by natural processes, and absorbed into the land by others.

**But now, these natural systems are changing ...**

Smoke from fires put carbon into the atmosphere ...

... and plants reabsorbed and stored it in their leaves, stems, and deep underground.

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In the western U.S., invasive plants and expanding pinyon and juniper woodlands are altering the way landscapes store and release carbon. Non-native plants like cheatgrass have invaded and taken over sagebrush land. Now, when a fire occurs, more of the landscape burns. Smoke from these wildfires contributes enormous amounts of carbon to the atmosphere. Scientists and land managers are working to restore sagebrush ecosystems to a healthy state ... one that will slow the spread of invasive species, reduce the impacts of wildfire, and help control the amount of carbon in the atmosphere. The key to this recovery is native perennial grasses ... species that compete with invasive plants and efficiently absorb carbon and store it deep underground. Managers are helping recovery by using mowing, herbicides, and tree cutting or shredding. These methods take out cheatgrass, shrubs, and trees that crowd out native plants and give native grasses room to grow and a chance to reestablish.

To make matters worse, cheatgrass doesn’t store much carbon underground. Any carbon it holds will only remain there until the next wildfire. Scientists are carefully watching the long-term results to carefully evaluate whether these actually are effective ways to help native grasses recover. Sagebrush Steppe ecosystems are at a tipping point. A great deal rests on the success of native plants for the health of the West, and for the planet as a whole.