Research Brief for Forest Managers

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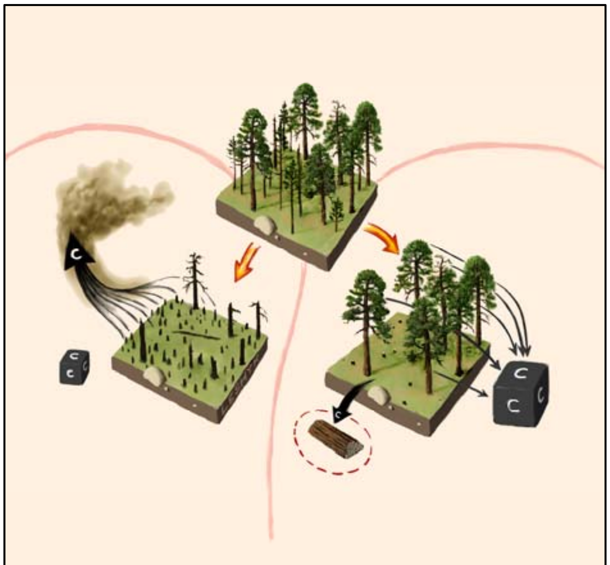
Carbon Sequestration in Fire-Prone Forests

As trees grow, they sequester carbon from the atmosphere, some of which is converted to wood. Carbon removed from the atmosphere and stored in trees provides a climate mitigation benefit. As a result, a number of carbon accounting protocols have been developed to quantify this climate mitigation benefit. Reforestation projects offer a clear climate mitigation benefit. By planting trees on degraded lands, more carbon is sequestered from the atmosphere than by leaving those lands in a disturbed state. However, on lands that are currently forested, increasing the climate mitigation benefit is more complicated than increasing the amount of tree biomass per unit area. The role of disturbance in forested systems must be considered since large-scale events such as wildfire can release carbon back to the atmosphere.



The carbon accounting consequences of two possible options for a given fire-prone forest stand. The cubes represent the carbon present following a wildfire. *Originally published in Frontiers in Ecology and the Environment 2008; 6(9):493-498*

In the western United States, nearly a century of fire suppression has increased tree densities and fuel accumulations. In forests that were historically maintained by frequent, low-severity fire, fire suppression has increased the risk of high-severity wildfire. Fuel treatments are being widely implemented to reduce this risk and restore forests to a more open, fire-resistant structure. These treatments carry a near-term carbon cost because standing tree biomass is reduced to lower the risk of future high-severity fire and its large carbon emission. Through a series of papers, we examined the risks and benefits of fuel treatments on forest carbon stocks and emissions, and the reduction in wildfire severity. Present day carbon stocks in fire-suppressed forests are lower than historic conditions because modern forests have fewer, very large trees. By reducing tree density and fuels, and retaining large, fire-resistant species, carbon loss is substantially reduced when a wildfire occurs. These open conditions also allow for large tree development, making the future forest store more carbon than it currently holds. Forest management based on ecosystem-specific practices will likely yield the greatest benefit in carbon storage and long-term stabilization.

Management Implications:

- Consolidating carbon stocks in fewer, larger, fire-resistant trees reduces the risk of carbon loss from fire.
- The pre-suppression forest structure provides the best target for maintaining sustainable carbon stocks and ecological function.

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