Climate Fast Forward Conference

Track 4: Natural Carbon Sinks

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The Challenge and the Question

Healthy soils and forests are natural carbon sinks. The forests of the northern Great Lakes region are a nationally important carbon sink, and there is also notable carbon sequestration potential in Wisconsin's agricultural lands, prairies, and wetlands. However, forest management is fragmented across various types of ownership, and various soil types and cultivation practices can limit the carbon storage potential of soils or even result in net carbon emissions.

What steps can Wisconsin take to identify, safeguard, and incentivize these natural carbon-storing assets in the Wisconsin landscape? **Likely topics for small group discussion within this track include: forestry strategies for carbon storage, monetizing/incentivizing agricultural carbon storage to support rural economies, managing prairies and wetlands for optimal carbon sequestration, promoting urban forests, and identifying best practices for co-benefits (e.g., water quality and carbon storage) in agricultural land management.**

Additional background/discussion

Worldwide, photosynthesis results in an estimated net storage of approximately 3 gigatons per year of carbon in soils and woody vegetation.[1] In the US, more than 90 percent of land-based carbon sequestration is attributed to forests[2].

Although the United States remains the world's largest emitter of greenhouse gases from fossil fuels, net carbon sequestration from forests and grasslands is conservatively estimated[1] to offset at least 11% of those emissions. Recent research[3] shows that the variety of strategies for managing forests, agricultural, and conservation lands, collectively known as Natural Climate Solutions, has the potential to double current rates of offset by generating greenhouse gas mitigation services equivalent to 21% of net annual emissions. In Wisconsin, with our large base of productive forest and agriculture lands, that potential may be even higher. If fully implemented, strategies for maximizing greenhouse mitigation from natural carbon storage *could comprise as much as 37% of the mitigation actions needed in the United States to hold global temperature increases below 2° C*[4].

Land conversion and land use change (e.g., reforestation, or conversely, converting forests to housing developments, or forests to cropland) are the biggest drivers of landscape carbon storage or loss. Since the depth of forest loss during the cutover period in the early 20th Century, Wisconsin has experienced a significant overall increase in forest cover that has resulted in natural carbon storage in both standing trees and forest soils. Today's challenge is to protect these gains in the face of a growing population and resource demands. Another factor to contend with is that a warming climate increases nighttime carbon emissions from soils and plants, and also increases the risk of fire, insects, diseases, and storm damage that, if not managed, can lead to ecosystem degradation and associated carbon emissions. Land management practices also have a significant collective impact. While most natural carbon storage in the US is attributed to forests, how our agricultural lands are managed can also have a significant impact on net carbon storage.

Overall Goal

Optimizing carbon storage on farms, forests, and conservation lands is an important part of our strategy to reduce net current greenhouse gas emissions in Wisconsin. To move toward that goal we will need to increase our net landscape carbon storage by as much as 25% in the near term. Reducing the emissions associated with land-related activities will be an important focus of complementary strategies which will create greater benefits. Successful strategies must be designed to maintain our food, fuel, fiber, and wood production, protect outdoor recreation opportunities, improve farm and forest economic viability, and maintain the range of ecosystem services that our working landscape provides.

What actions could advance progress toward that goal in the next decade?

Core Strategy	**Benefits**	**Decision-makers**	**Implementers**
Keep forests as forests Reforestation / Restoration Improved Forest Management Use sustainably produced forest products instead of more carbon-intensive materials in construction.	Avoid large carbon losses from forest loss Restoring trees has the biggest potential carbon gains Longer rotations and improved management store additional carbon and increase resilience Wood stores carbon and the lifecycle carbon footprint of wood in construction is lower than concrete, steel, or aluminum	State government DNR private landowners public landowners farmers industry investors Policy makers, commercial building code authorities, architects, designers, contractors, consumers	DNR; federal, local, and tribal landowners; private landowners; farmers; industry/investors Public, academic, and private entities in building construction and related wood using sectors
Manage soil health: • reduce disturbance (reduce tillage) • increase diversity (crop rotation, cover crops, etc.) • living roots and covered soil year-round (cover crops, perennial crops) Integrate woody species (agroforestry)	More carbon stored in the soil More carbon stored in soils and trees	Federal, state, and local government private landowners farmers processors investors	Farmers
Increase / maintain conservation land	Grassland and wetlands are major carbon sinks. They also provide co-benefits like water filtration and flood water storage.	Federal, state, and local gov't., private landowners, NGOs	Federal, state, and local gov't., private landowners, NGOs
Increase / maintain urban forest and parks; utilize tree waste		Cities, business, homeowners	Cities, business, homeowners, NGOs

What are the barriers/challenges to pursuing solutions?

And how do we overcome them?

- New policies and approaches will almost always generate support and opposition in proportion to their potential impact. Leadership will be needed to overcome inertia and fear of change.
- The costs of transitioning to new land uses or of establishing new practices need to be acknowledged and borne in an equitable manner. For example, the cost of establishing and maintaining urban trees through to maturity can be significant, even though their eventual benefits greatly outweigh those costs.
- Understanding the direction and magnitude of carbon fluxes for given activities is essential to determine how to structure goals and incentives. Technical expertise and additional research will be needed in the public, business, and NGO sectors.
- Skepticism about climate science in politics may translate into reluctance to adopt carbon storage policies unless those policies have clearly associated co-benefits.

What tradeoffs are involved in moving the solutions forward? Who gains, who stands to lose?

Strategies to increase climate mitigation will need to balance the economic and social benefits, and the needs of stakeholders on all of our working land base. At a state level, effective strategies that increase carbon storage on Wisconsin forests and soils need to sustain forest and agricultural productivity. If Wisconsin forest harvest levels were severely curtailed for example, the substitution effect of increased harvesting in other areas could create a net negative effect on natural carbon storage. Similarly, converting Wisconsin cornfields to pasture or forest while increasing grain imports that result in soil carbon loss elsewhere provides no net gain in natural carbon storage.

Jobs and local economics will be an important consideration for any climate mitigation policies. In many cases, practices that sequester more carbon will result in forest or farm systems that are more resilient and better prepared to withstand the stresses associated with a changing climate. In some cases, such changes will involve different business models with different economic thresholds for profitability. Pathways that result in increased carbon storage without significant reductions in productivity and value added from farm and forest products will have a natural advantage in adoption.

We also need to increase carbon storage without relying on inputs or activities that generate greater net emissions, such as synthetic fertilizer applications.

A focus on natural carbon storage and reforestation has potential to alter prices for commodities such as solid wood, fiber, and crops. Farmers and landowners naturally fear that increased regulation or conservation requirements could have major costs for them. However, if national or global climate policies result in less overproduction, these requirements could actually result in a better farm and forest economy. Designing carbon policies that are both equitable and effective is the challenge.

How will these actions address equity, inclusivity, transparency, accountability and justice?

Family forests and small farms generally face the toughest economic hurdles to profitability. Conservation incentives or requirements for farms and forestland need to be designed so their benefits and costs are fairly distributed across farm and forest sizes. Including good representation from small and mid-size farms in the development of conservation requirements and incentives is critical.

Wisconsin has examples of management on private, public, and tribal forest lands that provide climate benefits and that can serve as models in long-term sustainable land management that can mitigate and adapt to climate change.

Increasing urban forest cover can benefit low income and minority neighborhoods and can help address health inequities in urban communities, as well as providing climate mitigation.

What economic factors, costs, and distribution of costs and benefits will influence the viability of these actions?

Carbon markets have the potential to incentivize natural carbon storage. They need to be designed and implemented so their benefits are accessible to small and mid-sized farms and forest owners and so they result in real and lasting net storage of carbon. Another possible market incentive may be climate-friendly certification, which could either be added to existing certification programs such as the organic label or the Forest Stewardship Council, or could be developed as a separate certification.

Tax policy has a powerful influence on land management decisions. Lowering the minimum acreage for participating in the Managed Forest Land tax program and lowering the property tax rate on agricultural land under carbon-friendly management such as agroforestry or permanent pasture are examples of tax changes that could increase natural carbon storage in Wisconsin.

A few federal policies encourage carbon storage, including some Environmental Quality Incentive Program (EQIP) practices and conservation easement programs. However, most federal farm policy currently emphasizes abundant production of commodity crops, with no regard for climate implications. The effect of commodity prices is complex – both high and low prices can result in undesirable land use conversion. Farm policies and subsidies need to go beyond simple price supports to address environmental impacts, including climate.

Developing viable markets for urban and rural forest waste (such as pellets for wood heat) has the potential to help fund forest management and displace some fossil fuel use.
Public land ownership in Wisconsin is significant. Local, tribal, state, and federal governments can lead the way if they include carbon storage in their land management decisions.

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[1] Kayler, Z.; Janowiak, M.; Swanston, C. 2017. Global Carbon. (June, 2017). U.S. Department of Agriculture, Forest Service, Climate Change Resource Center. https://www.fs.usda.gov/ccrc/topics/global-carbon

[2] U.S. Agriculture and Forestry Greenhouse Gas Inventory: 1990–2013. 2016. United States Department of Agriculture, Office of the Chief Economist, Climate Change Program Office. Technical Bulletin No. 1943. 137 pp. https://www.usda.gov/oce/climate_change/AFGG_Inventory/USDA_GHG_Inventory_1990-2013_9_19_16_reduced.pdf

[3] The Nature Conservancy. Lands of Opportunity: Unleashing the full potential of natural climate solutions. From Griscom, B.W., Adams, J., Ellis, P.W., Houghton, R.A., Lomax, G., Miteva, D.A., Schlesinger, W.H., Shoch, D., Siikamäki, J.V., Smith, P. and Woodbury, P., 2017. Natural climate solutions. *Proceedings of the National Academy of Sciences, 114*(44), pp.11645-11650.

[4] Fargionne, J., et al. Natural climate solutions for the United States
Science Advances 14 November, 2018 Vol. **4, No.** 11, eaat1869. https://advances.sciencemag.org/content/4/11/eaat1869