Soil Carbon – More than Just the O-Horizon

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Why does the MNF care about soil carbon?

- 2012 Forest Service Planning Rule
- Fundamental nutrient
- Tie to climate change
- Microbial health
- Water storage capacity
- Below-ground C >> above-ground C

Carbon is present throughout the soil profile

Most is in the organic horizons at the surface

But substantial amounts also exist in mineral horizons (sequestered)

Does your National Forest have carbon management specifically mentioned in its Forest Plan?

Does your National Forest consider carbon in management plans and management decisions?

NFs influence/manage carbon through:

- Harvesting
- Site preparation
- Prescribed fires
- Road/trail construction
- Topsoil segregation/management

Traditionally, land management has focused on *not negatively affecting* existing carbon stores during project activities

Avoiding:

- Organic horizon and mineral soil disturbances
- Hydrologic alterations

Reactive carbon management

Use land management actions to *increase* carbon storage (proactive management)

Challenge

Carbon management will probably rarely be a land management objective for most land owners/managers (unless carbon credits are available and lucrative)

Solution

Implement carbon management by focusing on other ecosystem services that have recognized value or valuation and are at least partially dependent on carbon storage/levels

Increase soil carbon → Improvement or increase of one or more ecosystem services

Result

Carbon management becomes more viable and attainable because it is employed as a tool to achieve other ecosystem service outcomes

Carbon augmentation is an incidental (but intended) result

MNF examples of using land management actions to *increase* carbon storage

- Road obliteration
- Ecological site restoration
- Afforestation (replanting)
- Growth media on severely disturbed soils

Expand approach to achieve more significant outcomes

Focus on ecosystem services that have more appeal (greater value or greater valuation) to a wider audience

Such as:

- Soil moisture availability
- Forest growth rates
- Tree or stand values
- Wood strength and desirability
- Disturbance adaptation, such as changing climate or resistance to insect infestation and diseases
- Habitat conditions, food availability, and health of wildlife species of interest (including T&E species)

Expand approach for more significant outcomes

Knowledge gaps

- How much carbon is currently stored above and below ground?
- Which ecosystem services depend upon carbon and to what degree do they depend on carbon?
- What is the potential and what are the methods for increasing carbon storage in different ecosystems, soils, physical conditions, etc.?
- Economic feasibility relative to specific ecosystem services?

These answers are central for employing ecosystem service outcomes as "hooks" to augment carbon through management

MNF and NRS Cooperative Work:

- Literature review and literature synthesis to provide an understanding of the state-of-the-science of possible techniques to increase below-ground and above-ground carbon stores in forested ecosystems (esp. Eastern forests)
- Literature review of how/which ecosystem services are affected by carbon availability and manipulation

MNF and NRS Cooperative Work:

- Mapping below-ground and above-ground carbon stores on the MNF
- Using state-of-science information and carbon storage information to identify areas where carbon management/augmentation techniques can be tested

Questions?