



Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Advancing Silviculture in the Entity Guidelines

USDA GHG Guidelines in Managed Forest Systems

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What is Silviculture in Context of Entity Guidelines?

- Applied forest ecology to meet management objectives
 - Site, stand, industry, and landowner specific
- Menu of opportunities for any given acre with divergent futures
- Uncertainties compounded by carbon complexities
 - Changing climate and markets
 - Soils and dead wood
 - Insects/disease
 - Growing data streams and AI
 - Carbon market paradigms: avoided future emissions

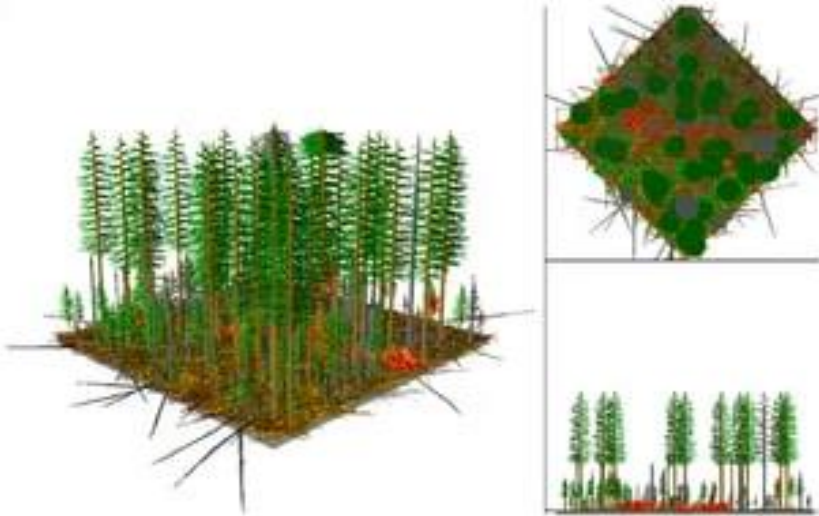


What future condition do I want this forest in?
What are the carbon outcomes?

Entity Version 2.0: Level 3 Silvicultural Approach

What's FVS?

Models forest growth, mortality and fire

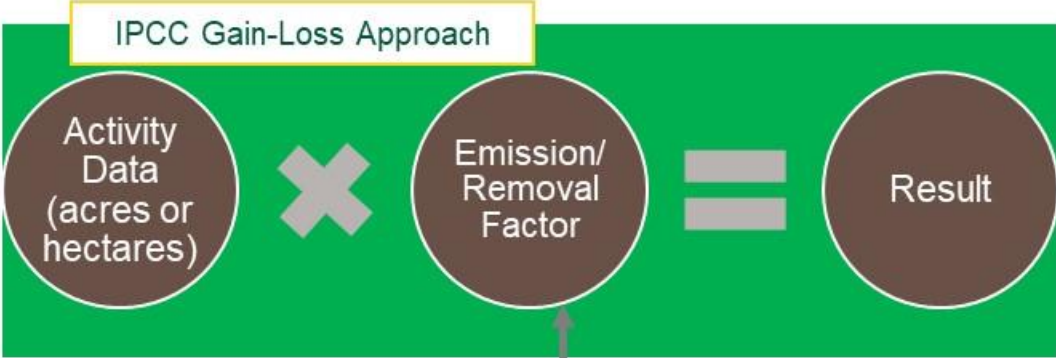


- Professional survey of forest parcel
- Modeling of potential carbon futures across management opportunities: Forest Vegetation Simulator
- Advances in remote sensing and modeling should narrow gap between Level 1 and Level 3 approaches

Entity Version 2.0: Level 1 Silvicultural Approach

ACTIVITIES COVERED

- Basic projection (general forest maintenance)
- Basic projection with harvest*
- Harvest*
- Reforestation
- Avoided deforestation
- Extended rotation*



*Excel workbook connects to HWP carbon flux calculators to provide total result of forest management impact.

E.g., Pacific Southwest Alder / maple group 0-20 year age class Natural origin

2023 FIA National Scale Volume Biomass estimators

Large Knowledge Gaps Intersect with Spatial Domain + Digital Silviculture

Major Needs and Gaps



Lateral transfers between forest carbon pools and flux in response to management, disturbances, and climate change



C flux in harvested wood products along supply chains and LCA analyses



Fire emissions modeling to predict GHG impacts of fuel treatments across changing disturbance regimes



Modeling GHG outcomes of complex forest management practices including adaptive silviculture



Geospatially downscaled forest carbon estimates with reduced latency, increased spatial granularity, and estimation of associated error

- Refining Silviculture towards adaptive practices
- Most impactful questions from society connect to silviculture
- Silviculture connects harvested wood products, fire, geospatial information, and projection systems
- Connections needed between stand management and national, policy relevant scales

Additional Needs Highlighted in Recent Engagements

- Incorporation of uncertainty estimates
- Application of more site-specific C stock estimates related to geospatial estimation advances (i.e., Small Area Estimation)
- Integration of future climate and species range modeling
- Soil and dead wood (stump and belowground) carbon pools
- Improved estimation of post-harvest flux and regrowth
- Refinement of FVS (Level 3 Reforestation)
- New paradigm: Designing future forests



Turning Landowner Questions into Technical Analyses

Improved Forest Management

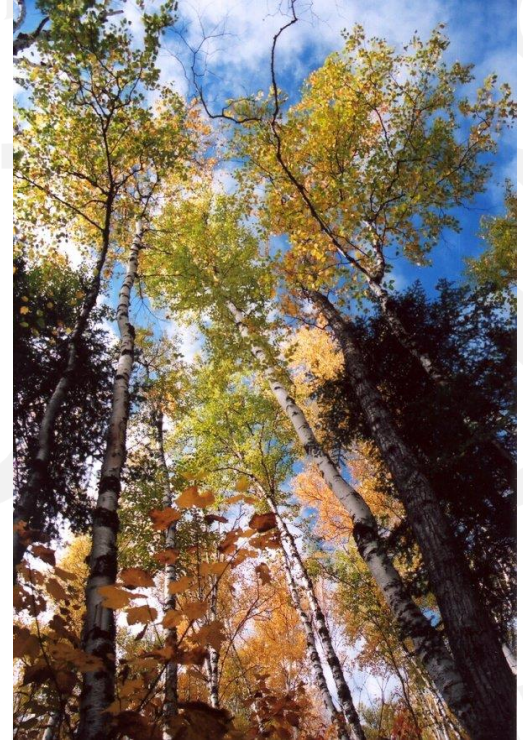


Adaptive Silviculture

Thinning

Questions for You: Tensions of Silviculture in GHG Context

- One tool or many tools?
- Biggest challenges facing forest management now or 10 to 50 years from now?
- Classic Silviculture or Quantitative Metrics?
- Scales: Stand or Parcel or Landscape?
- Quantification: Pixels or Stand-Level Inventories?
- Designing future forests: Connect HWP with Ecology?
- Integration of Expert Knowledge to Adjust Decision Support Defaults (Utilization & Product Ratios)?
- Users: Consulting Foresters, Landowner, or Quant Modelers?





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