Valuation and production possibilities on a working Forest using multi-objective programming, Woodstock, Timber NPV, and Carbon Storage and Sequestration

K.Harnish\textsuperscript{b}, J.P.Roise\textsuperscript{a,b}, M.Mohan\textsuperscript{a,b,*}, H.Scolforo\textsuperscript{b}, J.Chung\textsuperscript{b}, B.Kanieski\textsuperscript{b}, G.P.Catts\textsuperscript{b}, J.B.McCarter\textsuperscript{b}, J.Posse\textsuperscript{b}, T.Shen\textsuperscript{b}

\textsuperscript{a} Department of Operations Research, North Carolina State University, NC, USA
\textsuperscript{b} Department of Forestry and Environmental Resources, North Carolina State University, NC, USA
Prof Roise, I think it would be better if the map was shown only in the third slide.
Bruno; 2015-08-17
Hofmann Forest
Hofmann Forest

Ownership: A major land holding of the Forestry School at North Carolina State University, USA.

Area: 32,400 contiguous hectares in the coastal plain of North Carolina

- 23,310 ha of Pine (mostly *Pinus Taeda*, but components of *Pinus Palustris*, *Pinus Elliottii*, *Pinus Serotina*),
- 329 ha of hardwood plantation (*Liquidambar, Platanus occidentalis, Eucalyptus*),
- 75 ha of *Chamaecyparis thyoides*, (*atlantic white cedar*),
- 874 ha Natural Hardwood (bottom land,
- 87 ha Natural *Taxodium ascendens* (*pond cypress*)
- 7100 ha of *Pocosin Swamp Ecosystem*
- 625 ha of Agriculture Land (*fire break*)
- 775 KM of forest roads

Elevation: 12 to 20 meters above sea level with an average slope of \(\leq 1\%\).
Hofmann Forest

Revenue: $4 to $5 million
Operating cost: $1.2 to $1.5 million
Net Revenue: $2.5 to 3.8 million

Management Objectives:
Maximize cash flow, Research, Education and Demonstration

Constraints:
Follow best management practices, follow optimal silviculture for the non-research areas, provide areas for research, provide wetland mitigation bank for market Non declining cash flow.
It would be good to have a graph with the current timber stock per age classes.
Bruno; 2015-08-17
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Controversy
Purchase price in 1934: $340,000
Current Market valuation: $150,000,000
ROR on assets: ~ 2.5% /year
ROR on investment: ~ 112%/year

University Endowment fund wants to sell it. Alumni and Faculty want to keep it.

Age old conflict between Conservation and Exploitation.
Add some picture of news about this conflict
Bruno; 2015-08-17
We have temporarily won the conflict, but now we need to come up with a clear vision for the forest, beyond trees, water and wildlife.

**What would a potential carbon market add to the Forest’s value?**

- August 13 - $12.74/tonne CO$_2$e
- August 18 – CARB auction

Max $W_1$NPV + $W_2$C

S.T.

Area Constraints
Harvest Flow Constraints

Remsoft’s Woodstock modeling software was used as the Matrix Generator and Report Writer

- 1.6 million variables
- 100 year planning horizon with 20
- 38,000 constraints
- 5 year periods
If I was in the audience, I would ask you about the carbon market. We assume constant prices, but is it going to hold in the future? We should definitely think about something.
Hofmann Forest

Growth and yield:
Combination of LobDSS for intensive plantation management and FVS for Natural Stand Management, Carbon pool estimation, and stands over 49 years old.

The growth of pine was modeled by combining the effects of site condition, site preparation, and silviculture treatment. LobDSS yields at age 49 were extended to at least 100 years using the periodic increment from FVS.

Carbon stocks included those in standing timber, roots, down woody debris and wood products. The considerable amount of carbon in soil and undergrowth was not included.

Product Carbon estimates used the method specified by the CARB: 100 year averages for pulp, Chip-n-saw and Sawtimber (.0326, .0740, .1209 respectively).
Results

NPV vs Carbon: three levels of harvest flow constraints
Results

Additional Production Opportunity Cost

- 20%
- No Constraint
- Even Flow

1 centimeter = 1.2 kilometers

Hofmann Forest, North Carolina
Results

Total Carbon and Timber NPV Assuming that we could actually get the current CARB market price
Results

NPV vs Carbon: three levels of harvest flow constraints

20%
no constraint
Even Flow

Hofmann Forest, North Carolina

1 centimeter = 1.2 kilometers

Legend

- hofmann_forest
- rail other

CODE

- ag
- young_mature
- processed
- ag
- nonag
- even
- young

SYR 20_30 NT = Southern yellow pine 20 to 30 years old that was thinned at age 15 and age 25

Net Present Value

Carbon (tons)
Conclusion

Carbon market can add value to a forest;

To avoid land use change, we should adapt carbon market rules to the forest production.

Questions?