

USDA Symposium
Greenhouse Gases in Agriculture and Forestry:
Refining Knowledge and Building Tools

March 23, 2005

Carbon and Fire Risk:
Alternative Treatments and the
Probability of Fire

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*A non-profit corporation formed by 15 research
institutions to conduct cradle to grave
environmental studies of wood products*

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Research Scientist

ONRC

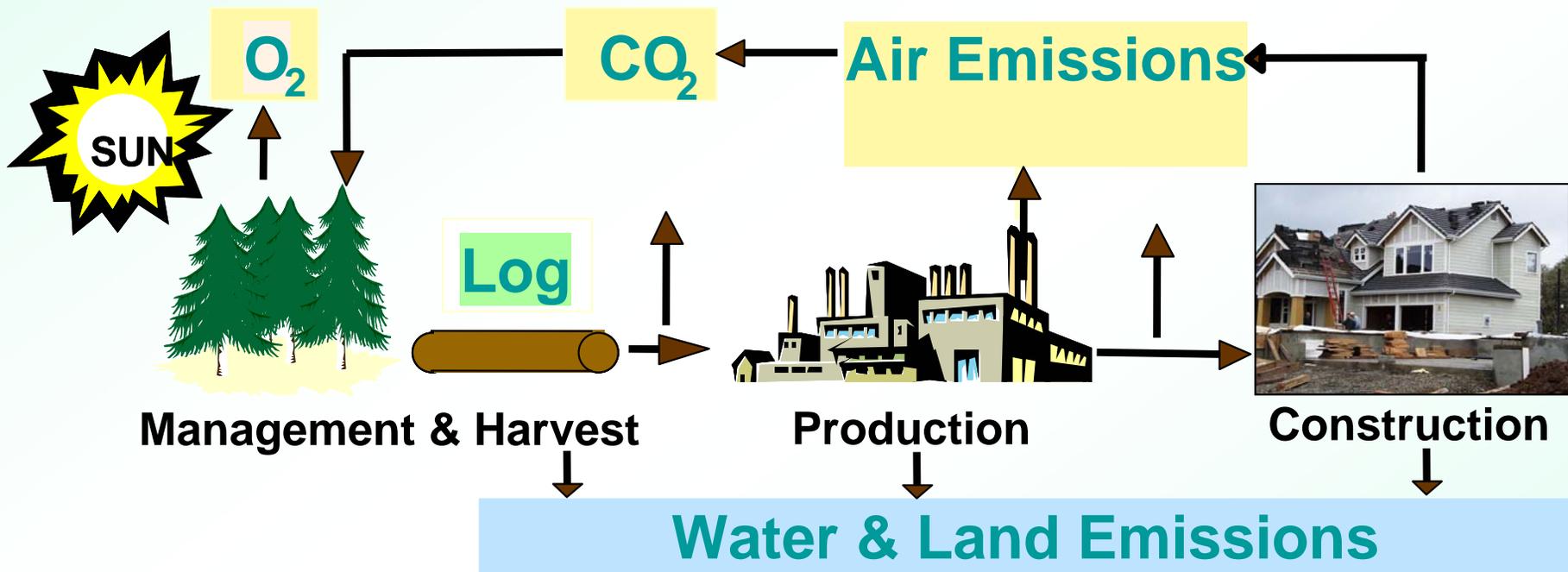
Olympic Natural Resources Center

College of Forest Resources,
University of Washington

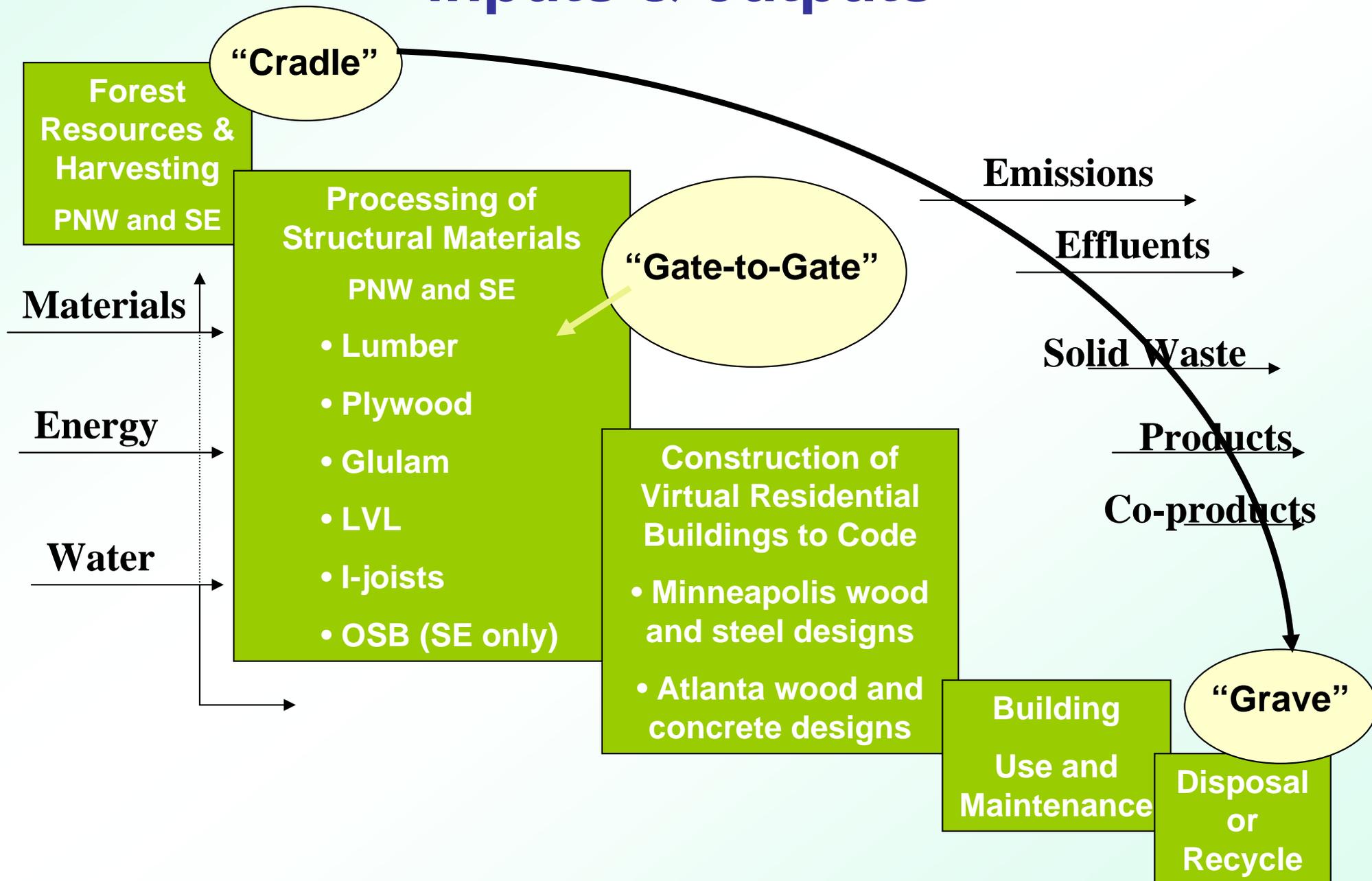
Background

- The CORRIM report estimated the carbon storage contribution from three pools linked to the forest
 1. In the Forest pool
 2. In wood products pool (net of energy used and biofuel produced)
 3. Avoided fossil intensive product pool
- A major conclusion was that the highest leverage use of wood is in long lived products that substitute for fossil intensive products
- A second conclusion was the shortest and most intensive rotations that produce long lived products stores the most carbon

Life Cycle Assessment of Wood Products & Buildings

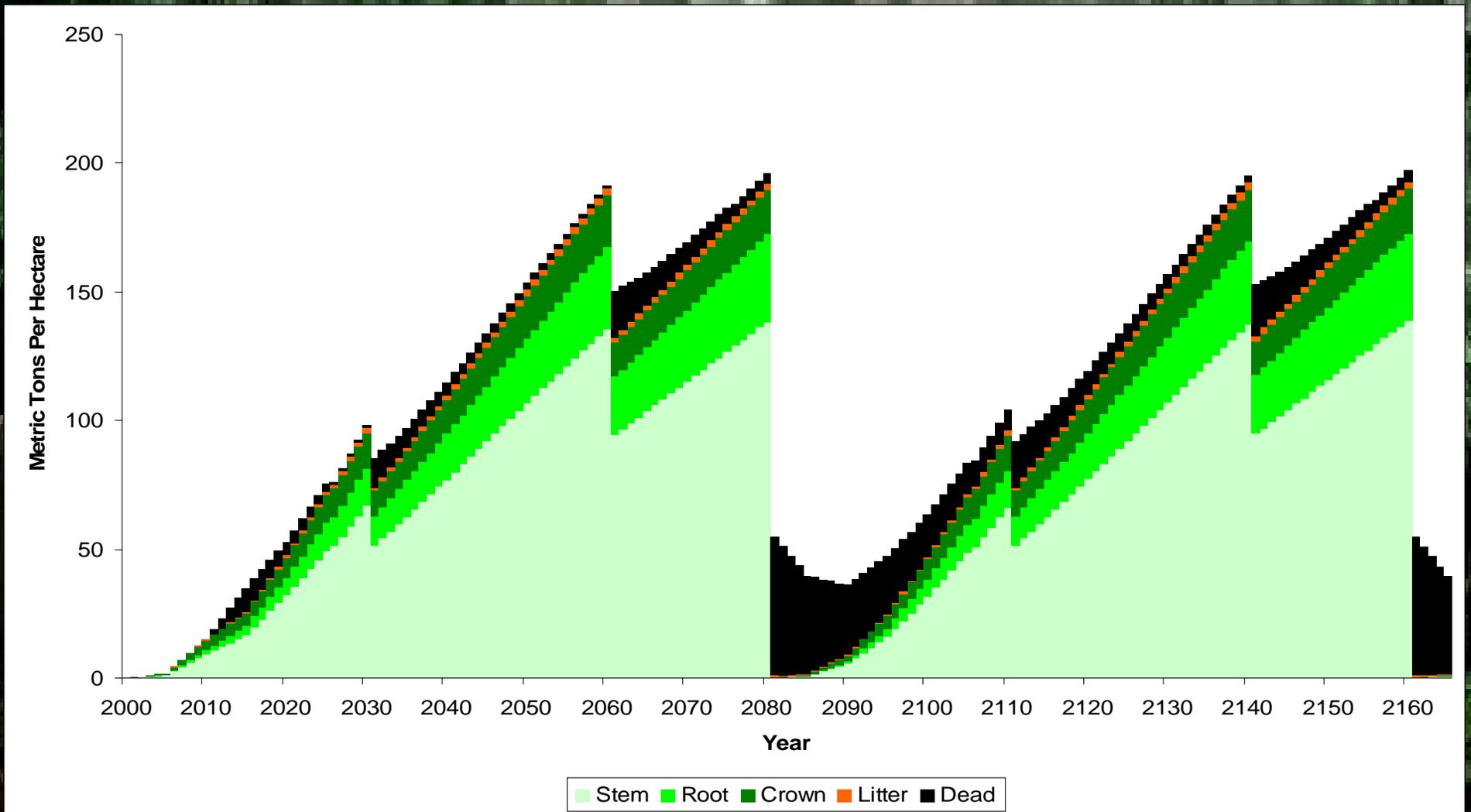


Life Cycle Inventories: measure all inputs & outputs



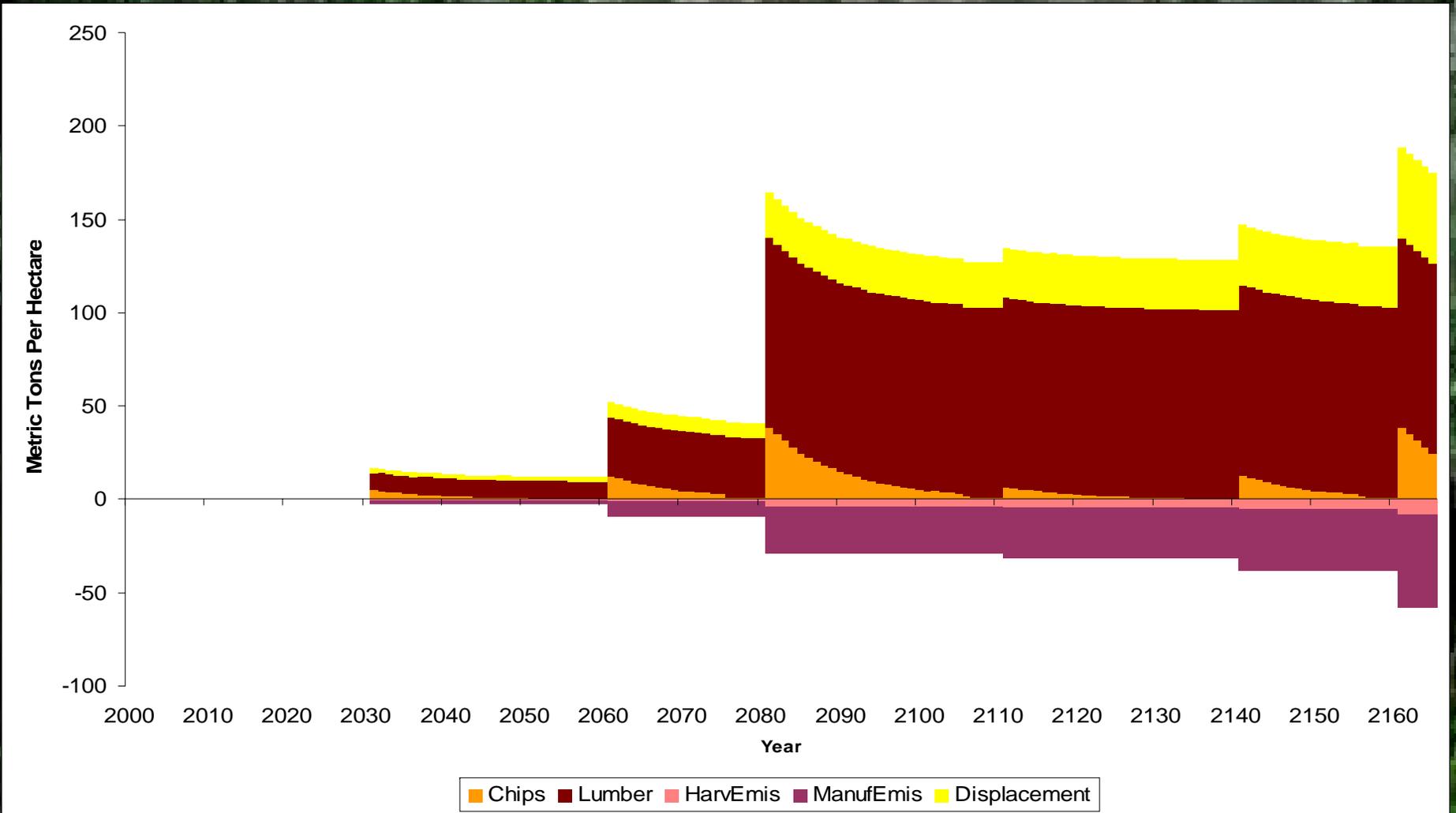
Carbon in PNW Forest Pools

80-Year Rotation with Two Thinnings



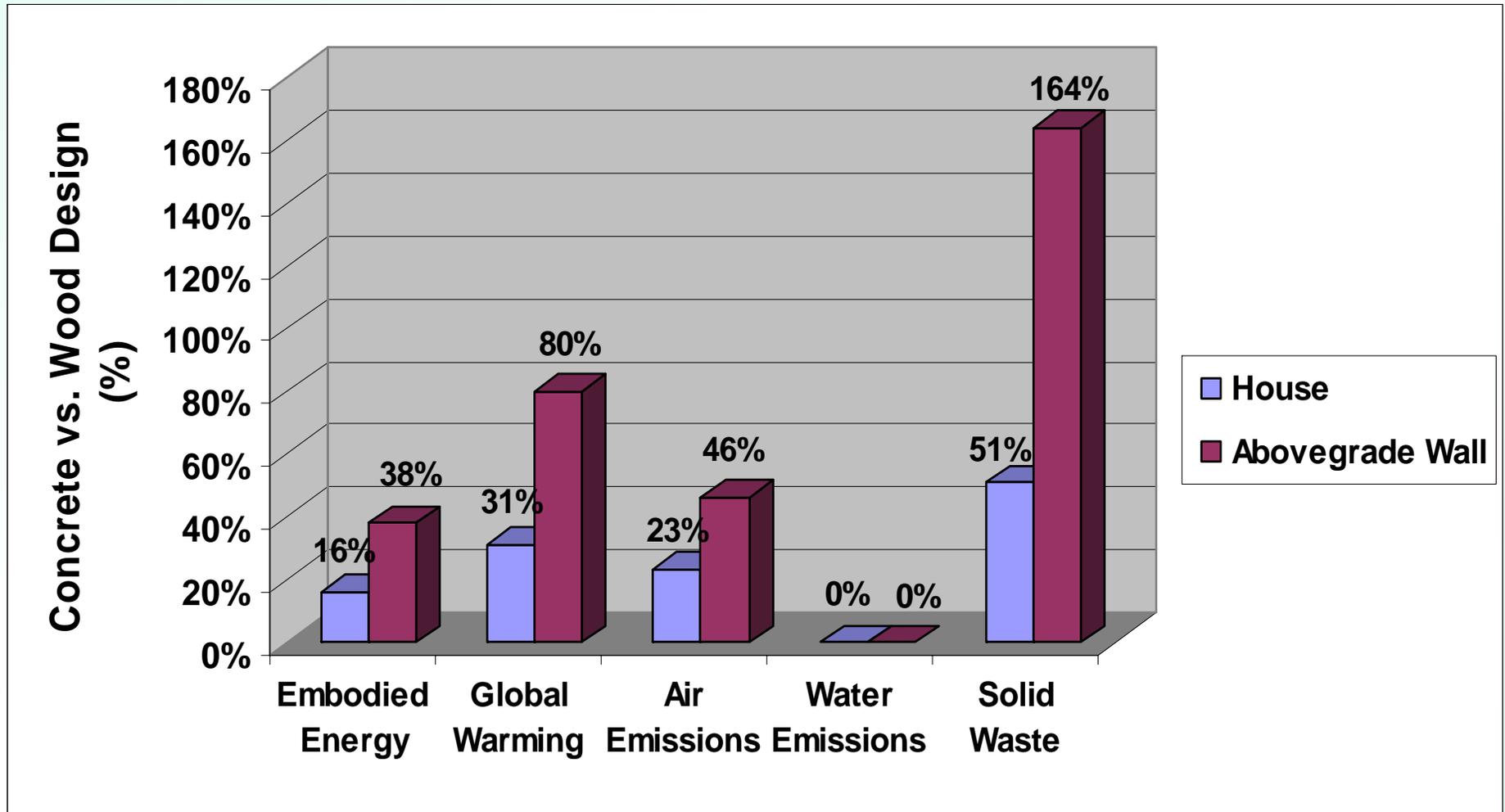
Carbon in Product Pools

Processing Energy and Displacement

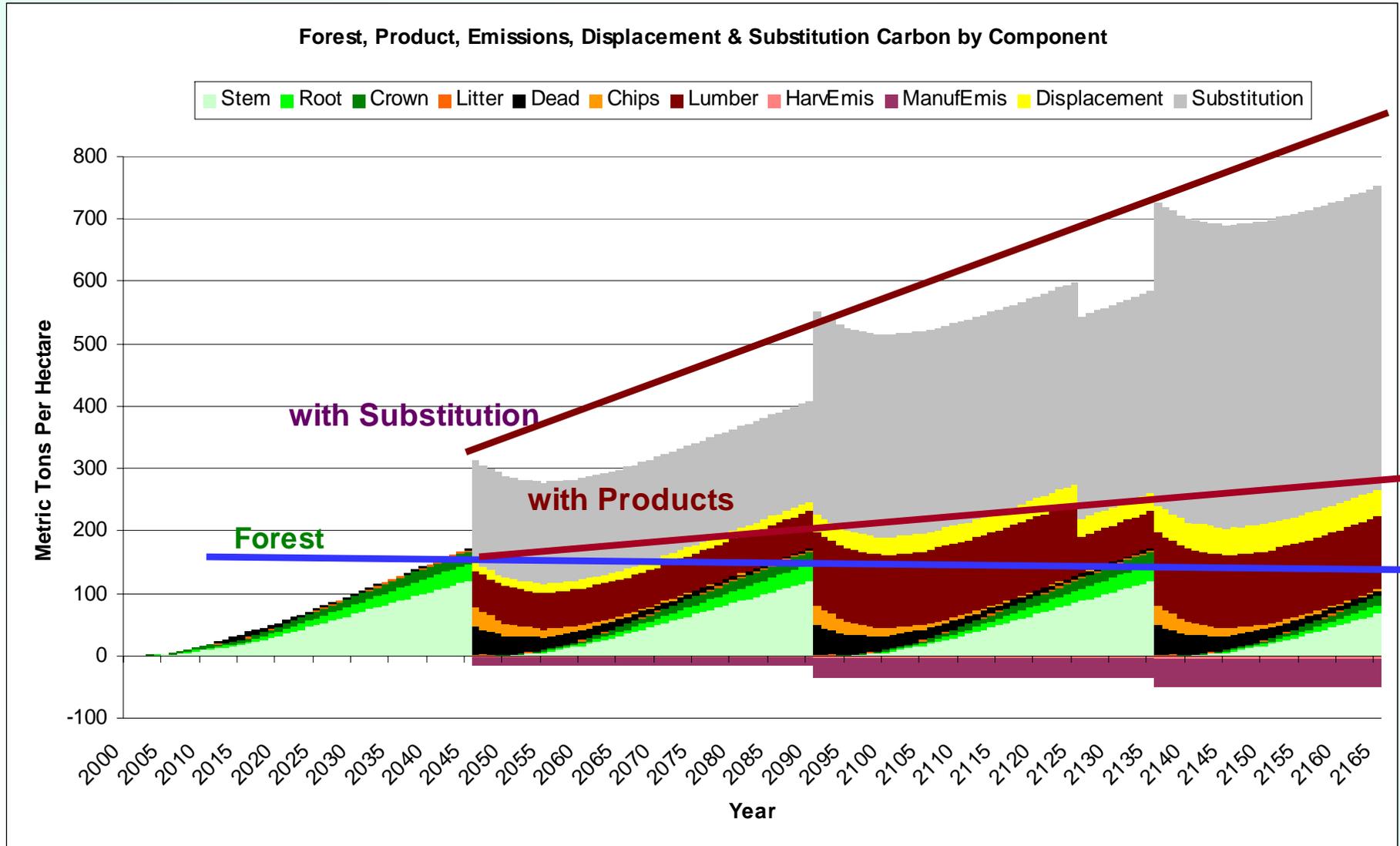


Summary Performance Indices

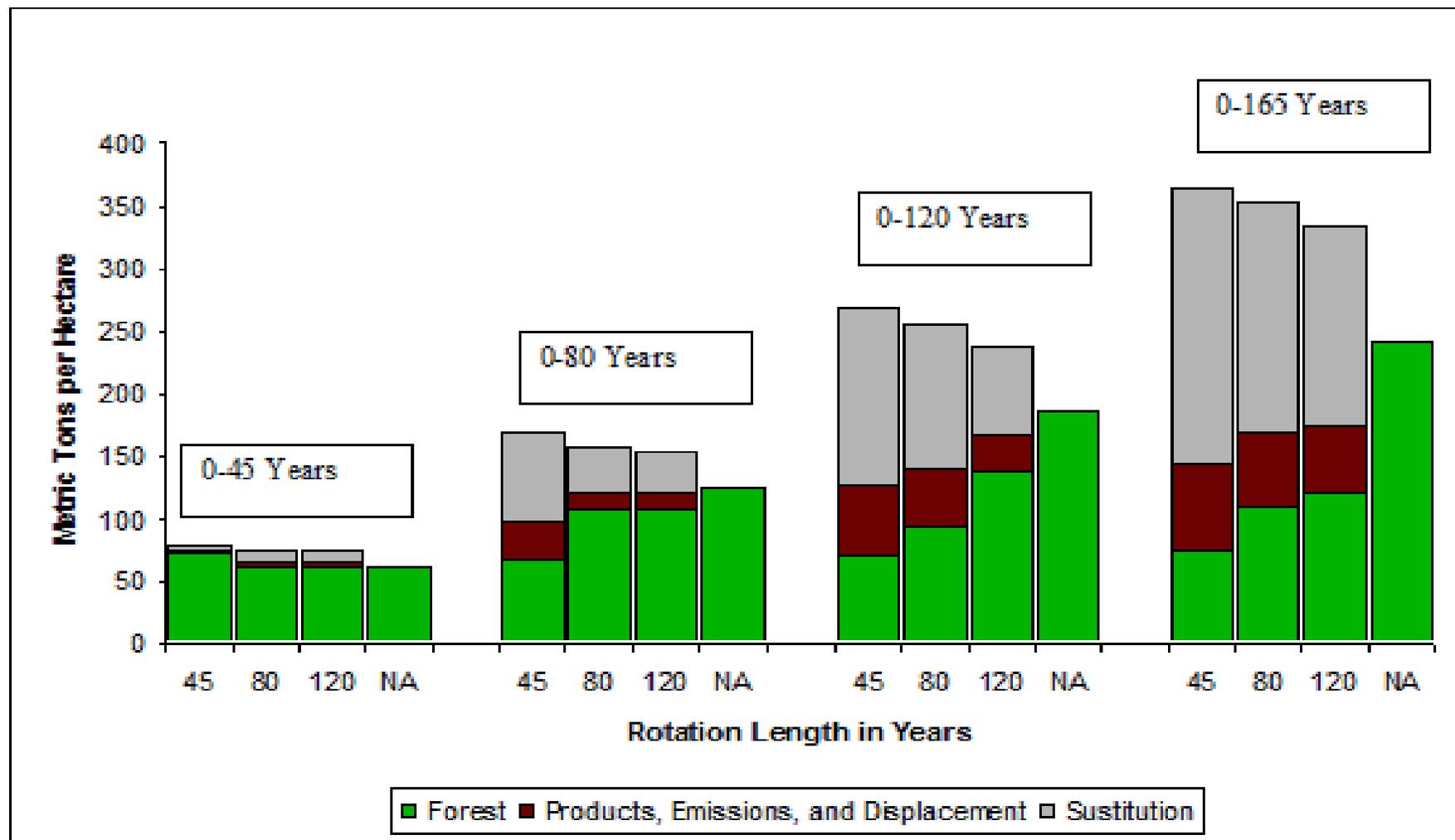
Atlanta House vs. Above-grade Wall



Forest, Product and Substitution Pools



Carbon in Forests, Products and Concrete Frame Substitutes



Problem

- This raises several interesting questions for carbon strategy in the Inland West.
 - What is the impact of fire which eliminates the opportunity to produce products and also impedes regeneration and productivity.
 - Should the Inland West produce long lived product or biofuels
- Knowing the carbon impact after a range of fire risk reduction treatments (NA, BA45, 9&Under, 12&Up, & Wildfire) is not sufficient.
- We need to know the expected value of carbon which depends upon the probability of fire as a function of the treatment.
- We also need to know the likelihood of producing long lived engineered products vs. biofuel

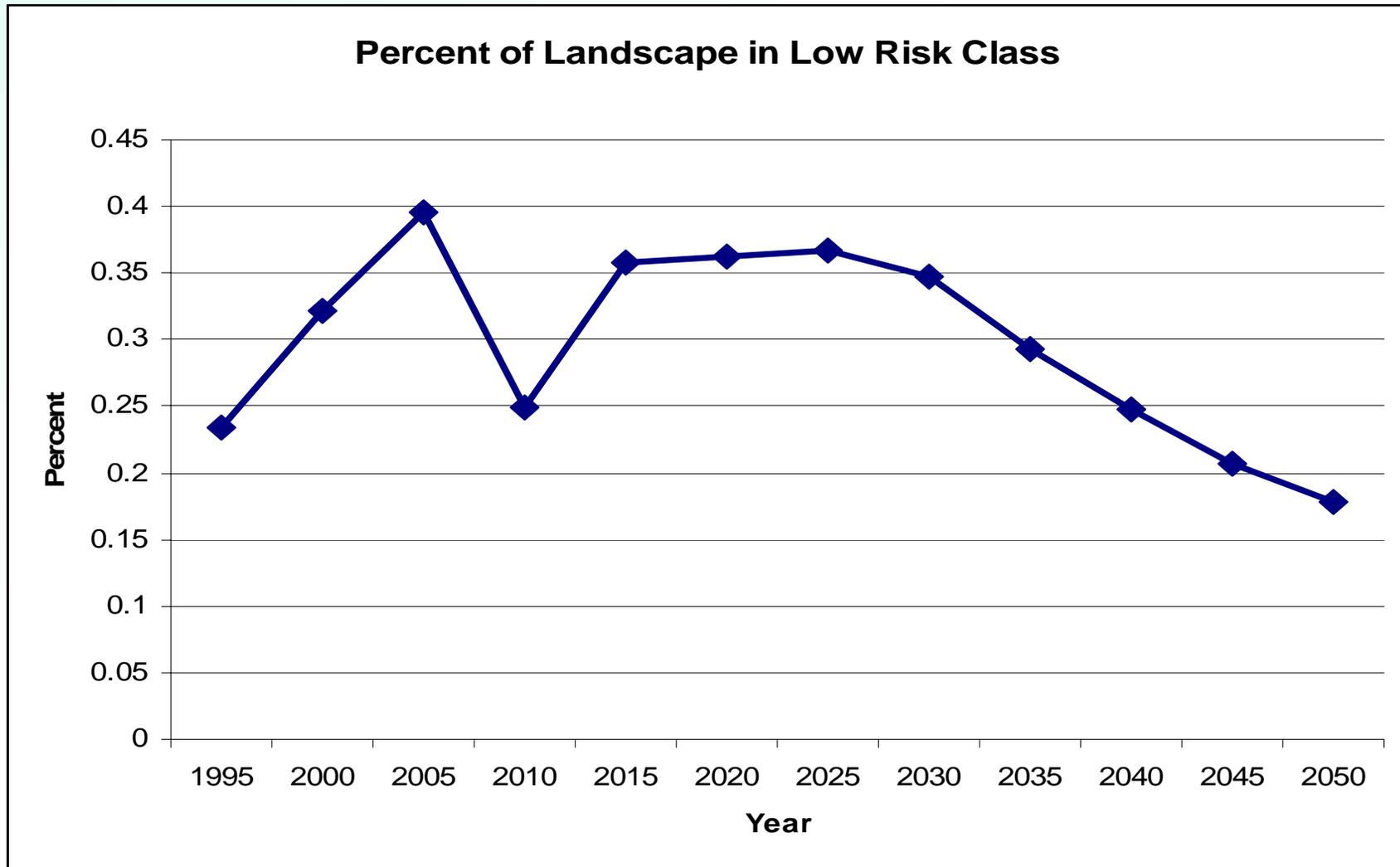
Methods applied to Okanogan FIA data

- Average per acre metric tons of carbon were calculated for each 5-year time period from 1995 to 2030 for NoAction(NA), BA45, 9&Under, 12&Up, and Wildfire treatments.
- Fire risks were estimated using the FVS Fire and Fuel Extension (FFE model) and categorized as Hi, Moderate or Low risk.
- Probability of fire was computed/calibrated at 17% per 5 year period to result in 15% unburned refugia after 50 years based on prior studies.
- 17% of the acres at high risk were burned each period, 8% at moderate risk and 0 % for low risk.
- Composite carbon totals through time were calculated as a percentage of acres treated and whether unburned or burned.
- All treatments occurred in 2000 or were phased in; Fire occurred each time period.

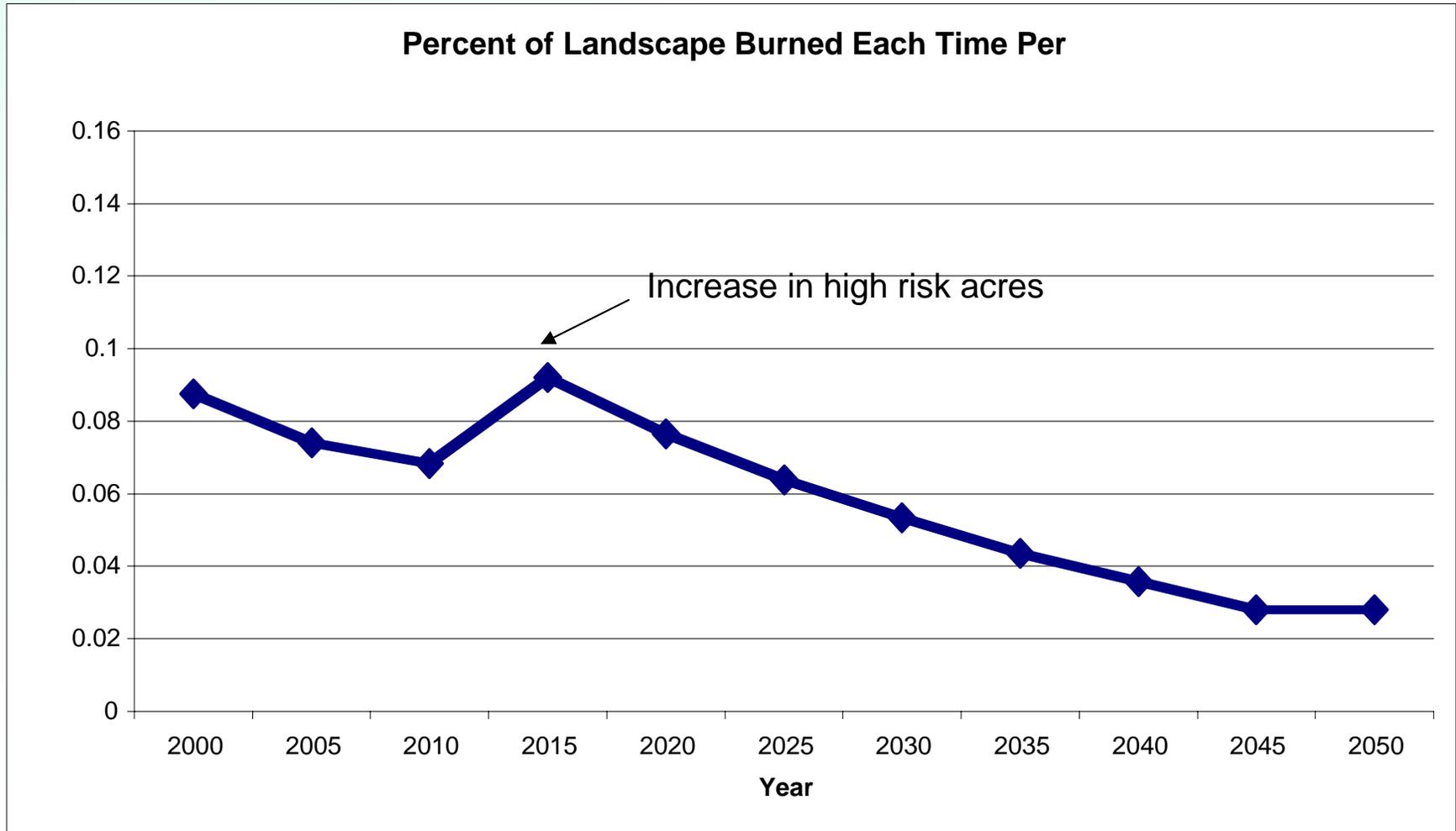
Assumptions

- Low risk acres don't burn (or low intensity fire)
- High and Moderate risk acres can only burn once in the period
- After a fire on High and Moderate risk acres the carbon remaining is estimated from post-fire residual stands:
 - higher in the north (Okanogan)
 - lower in the south (Fremont)
- Regeneration is assumed and may be excessive (many burned stands may actually be ready for a second burn)
- Snags are decayed (no salvage)

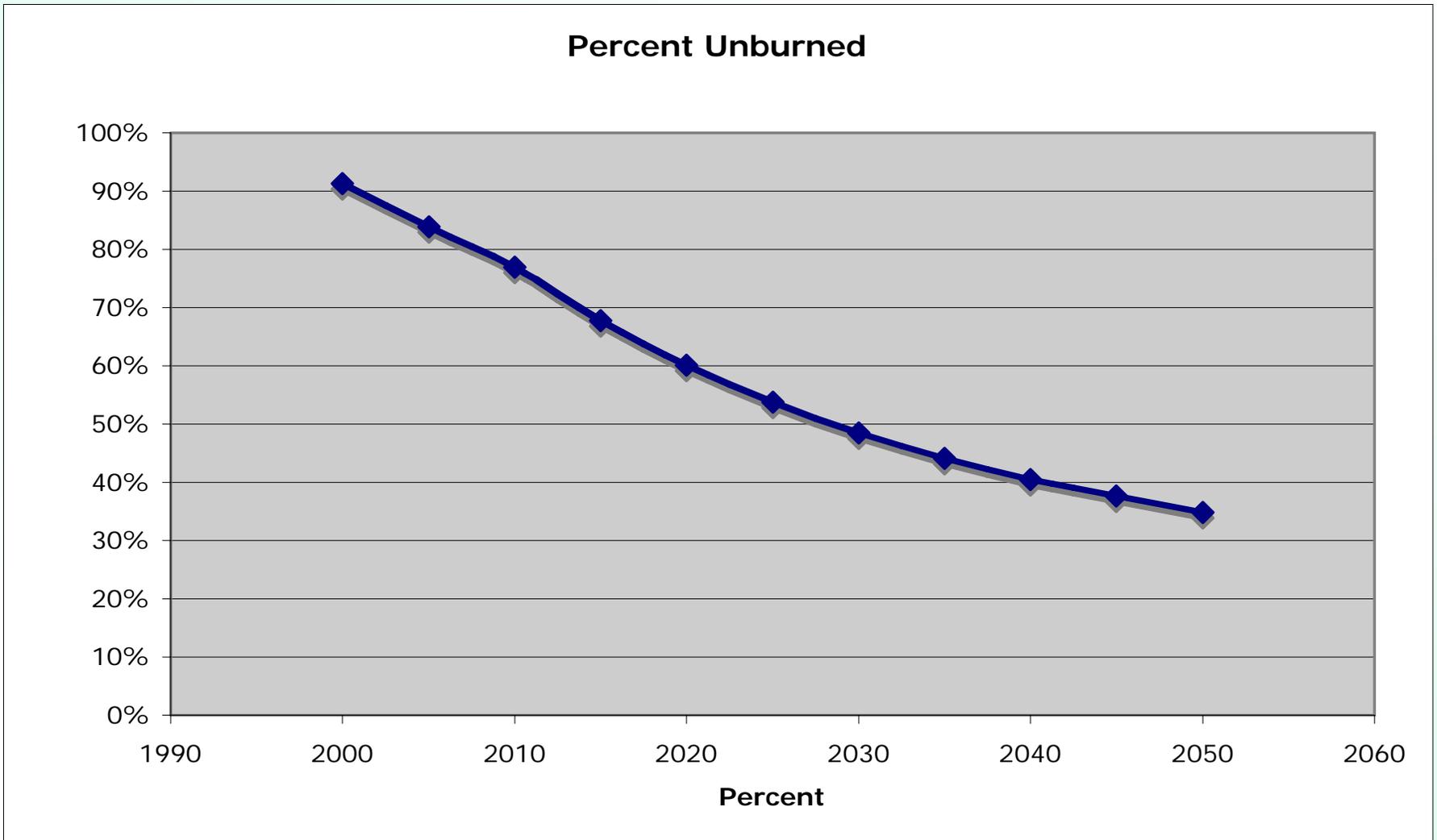
Acres in Low Risk Class - no fire



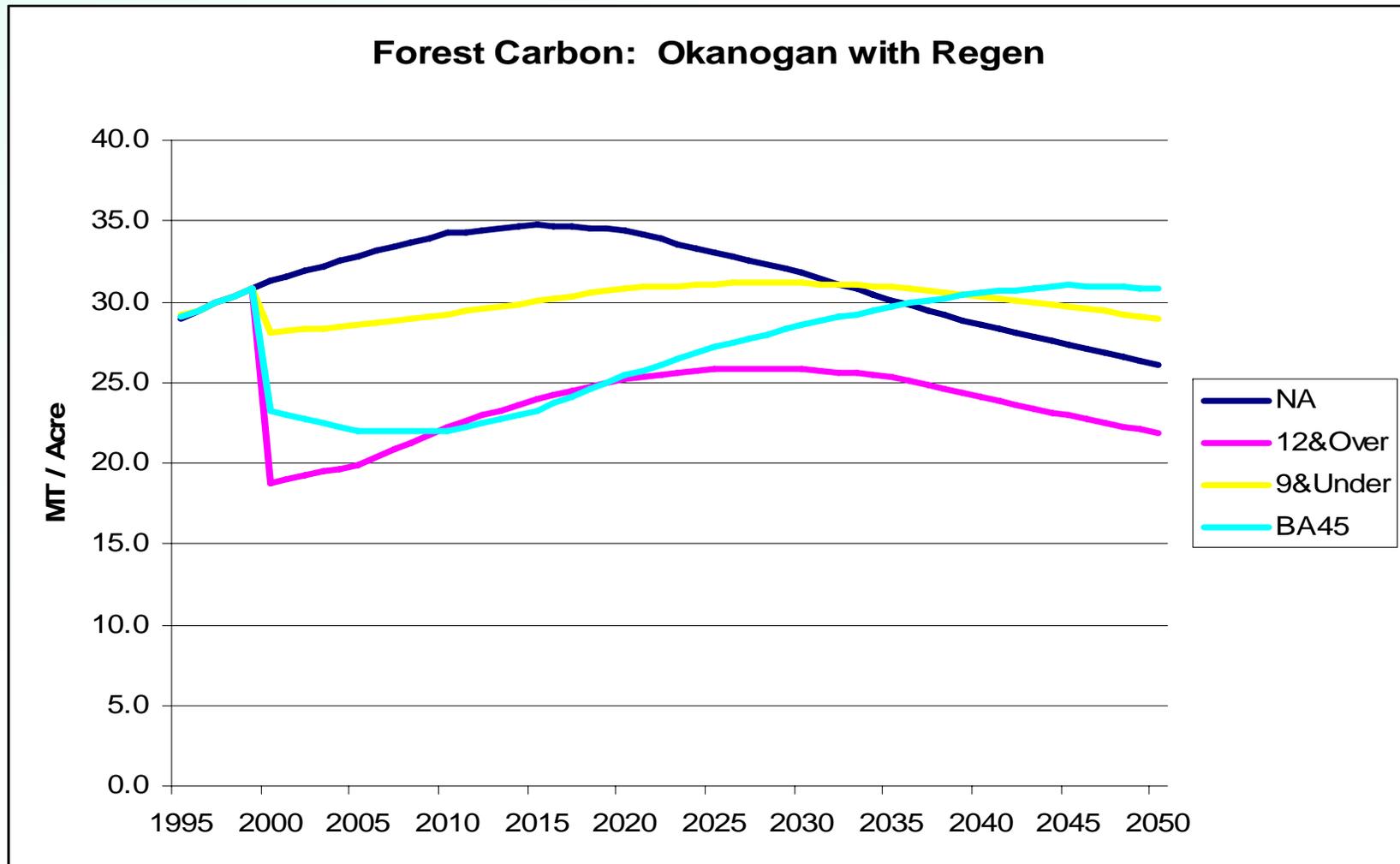
Acres burned each period: **Okanogan with Regeneration**



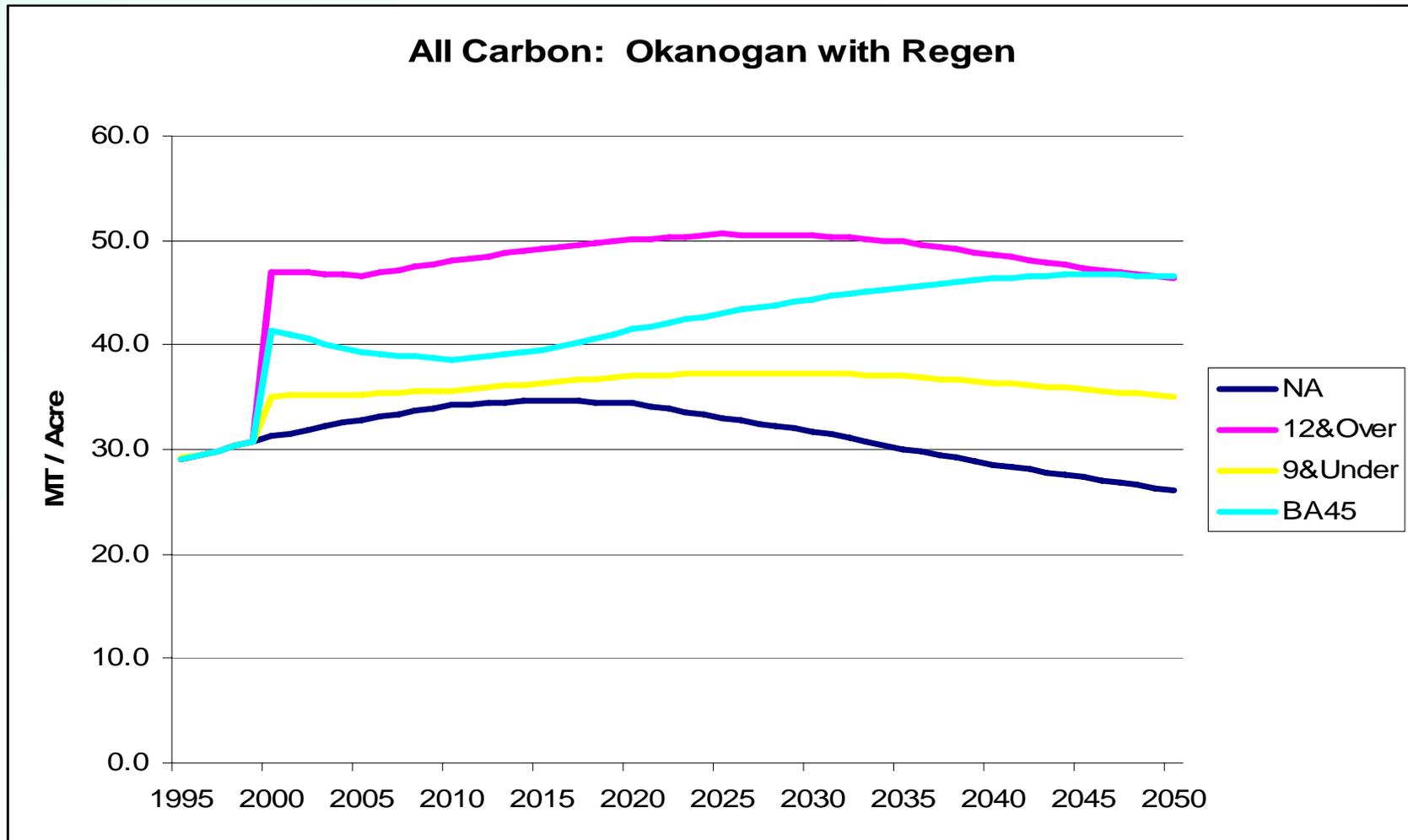
Acres unburned : **Okanogan with Regeneration**



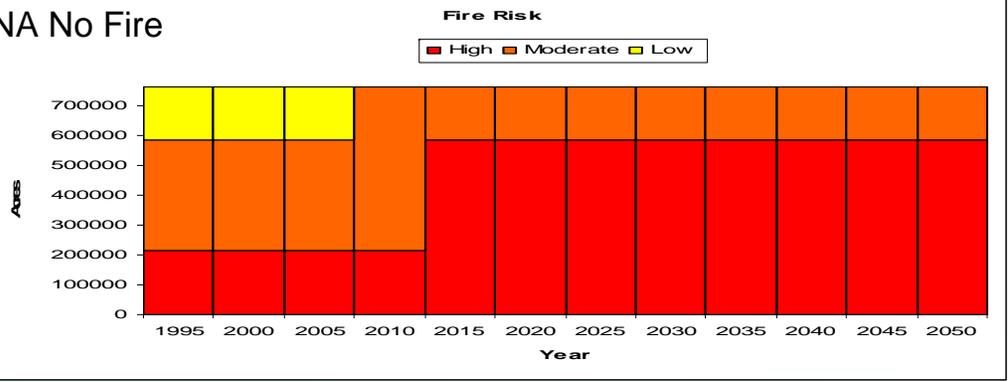
Forest Carbon: Okanogon with Regeneration



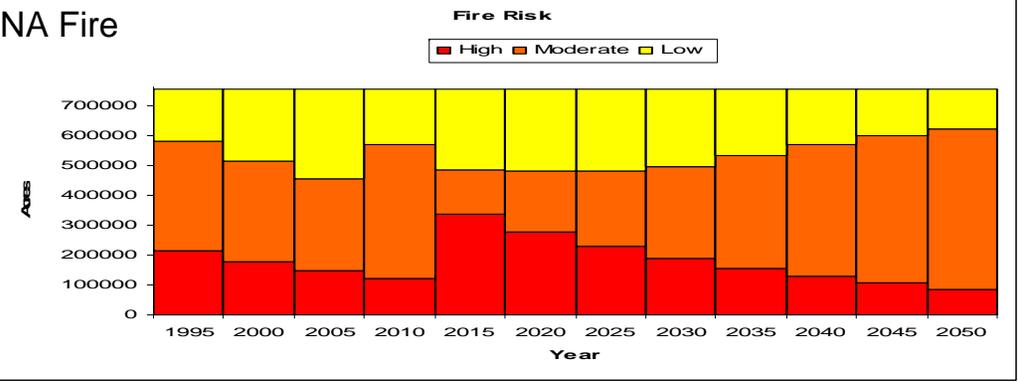
ALL Carbon: Okanogan with Regeneration



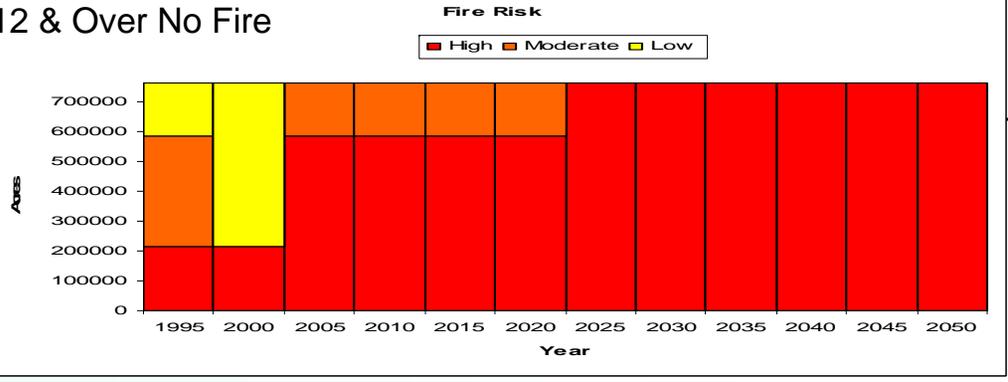
NA No Fire



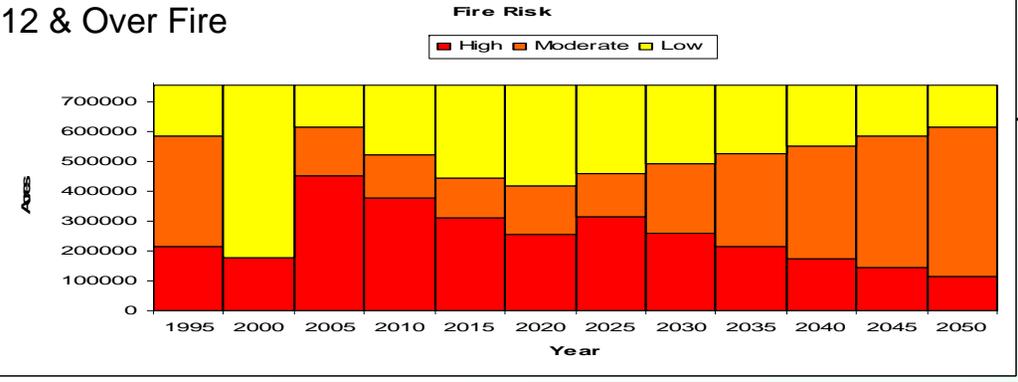
NA Fire



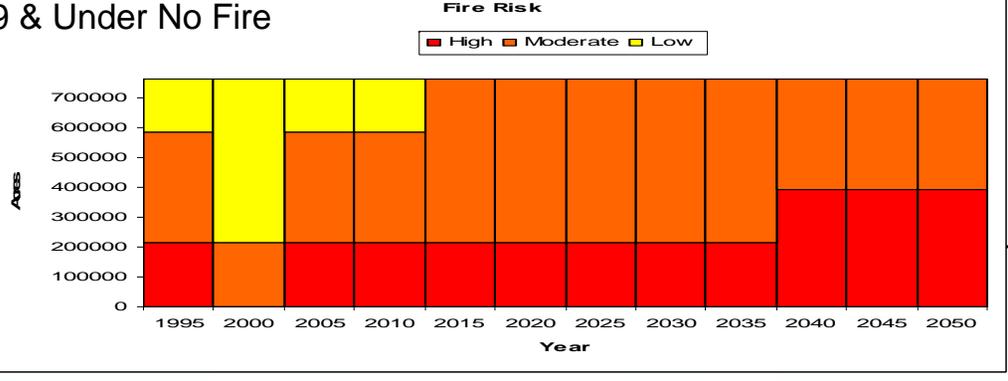
12 & Over No Fire



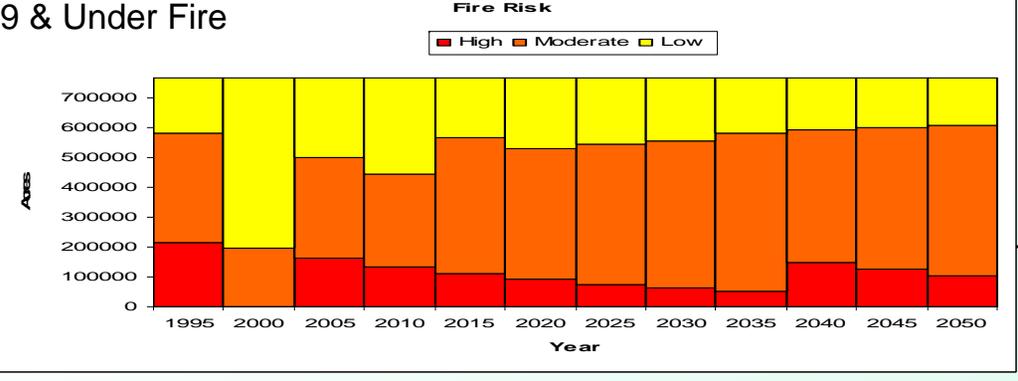
12 & Over Fire



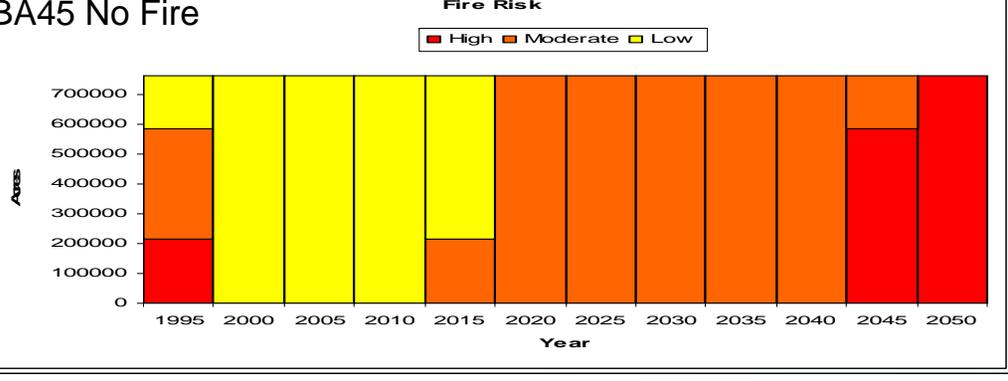
9 & Under No Fire



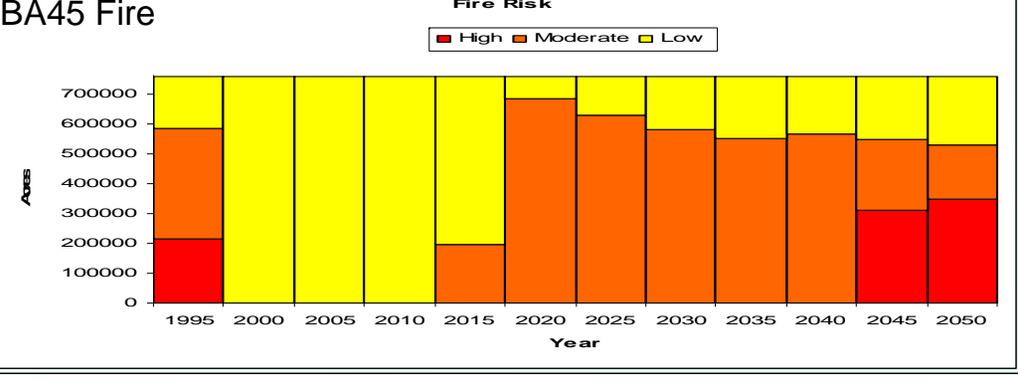
9 & Under Fire



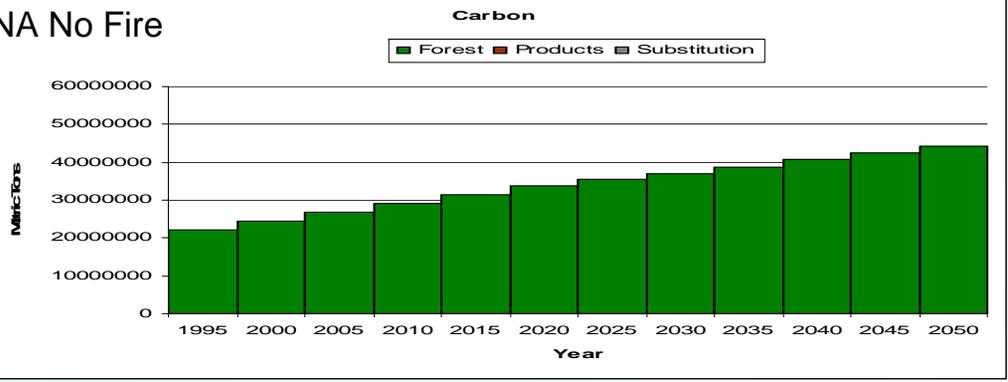
BA45 No Fire



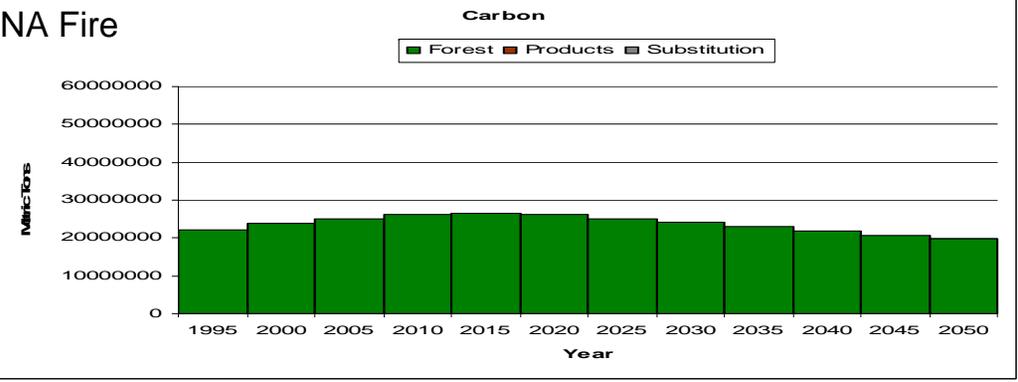
BA45 Fire



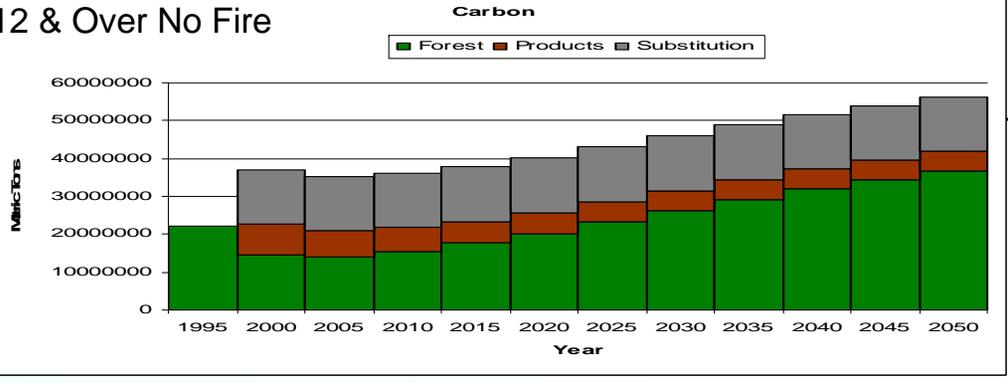
NA No Fire



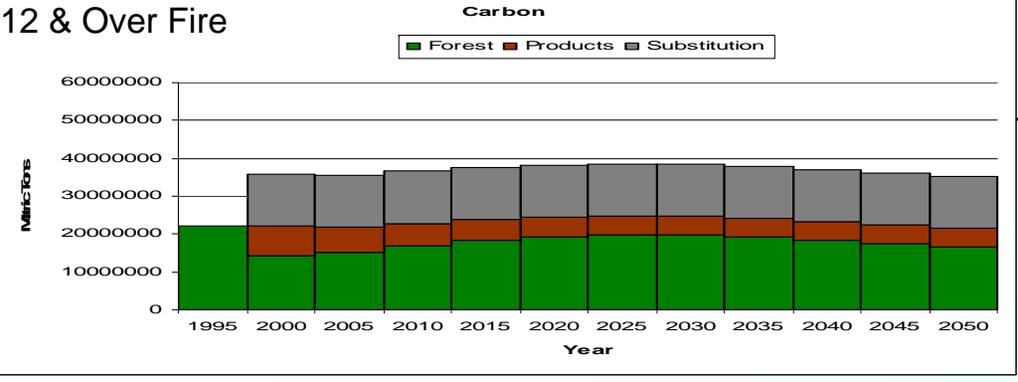
NA Fire



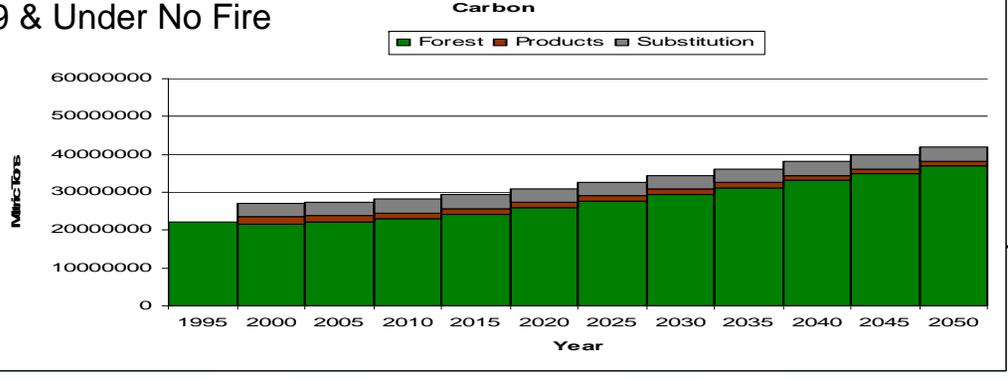
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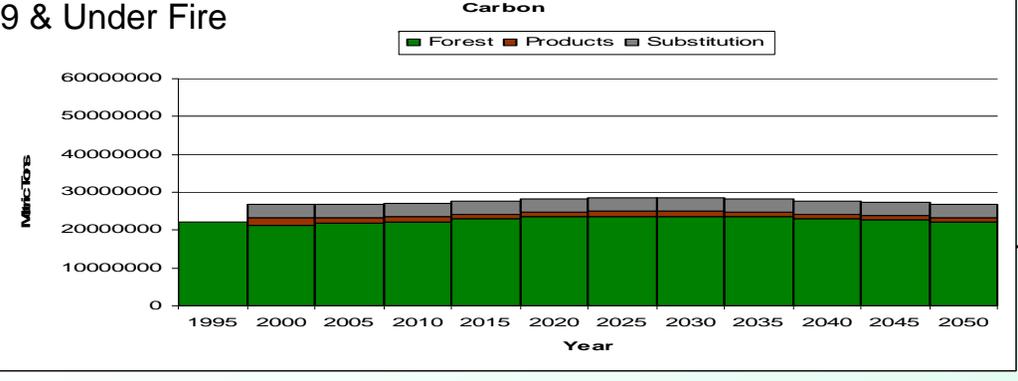
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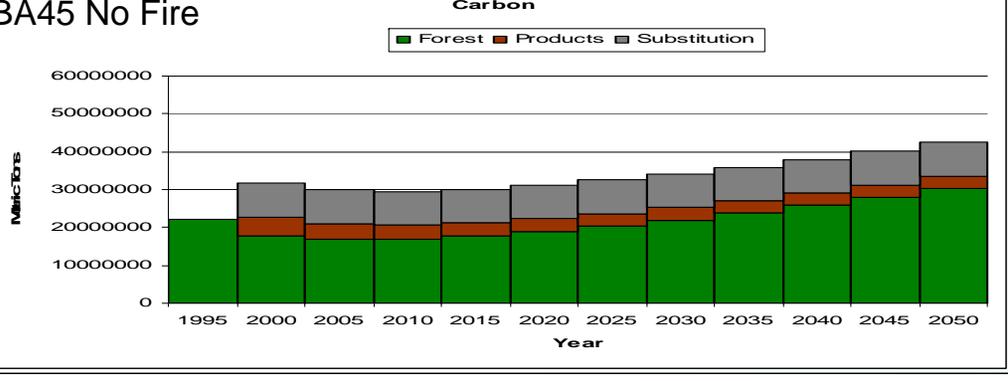
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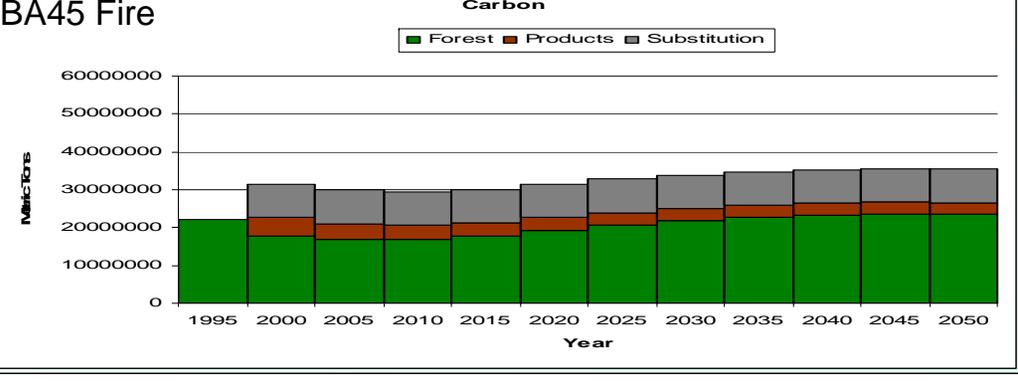
9 & Under Fire



BA45 No Fire

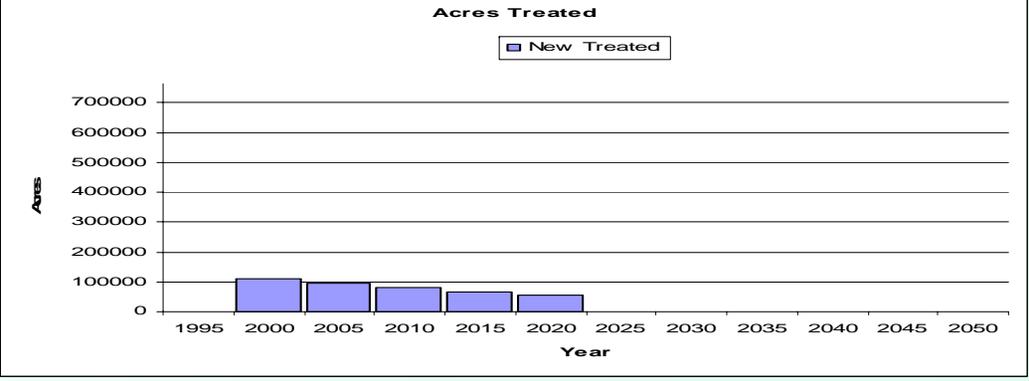
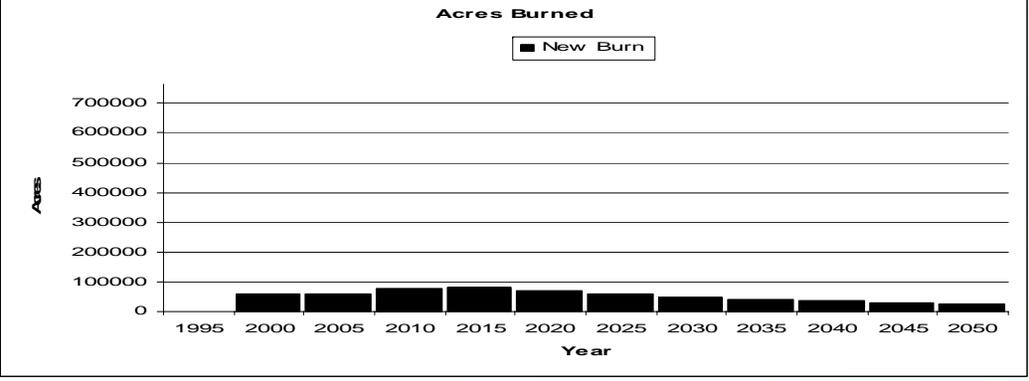
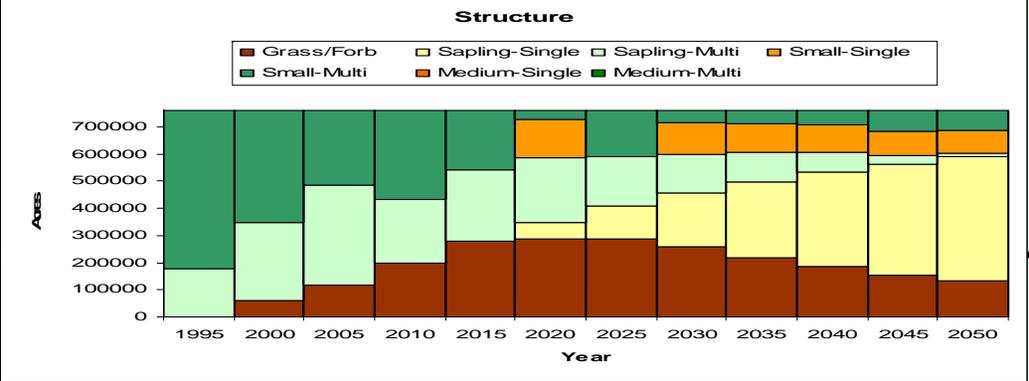
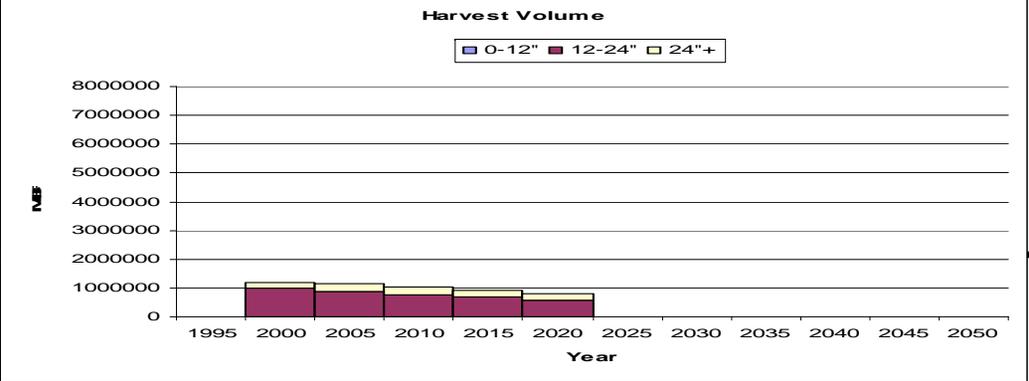
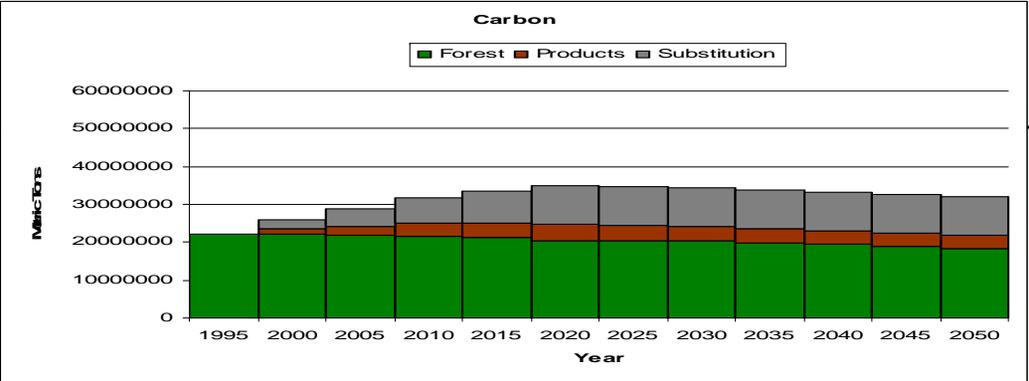
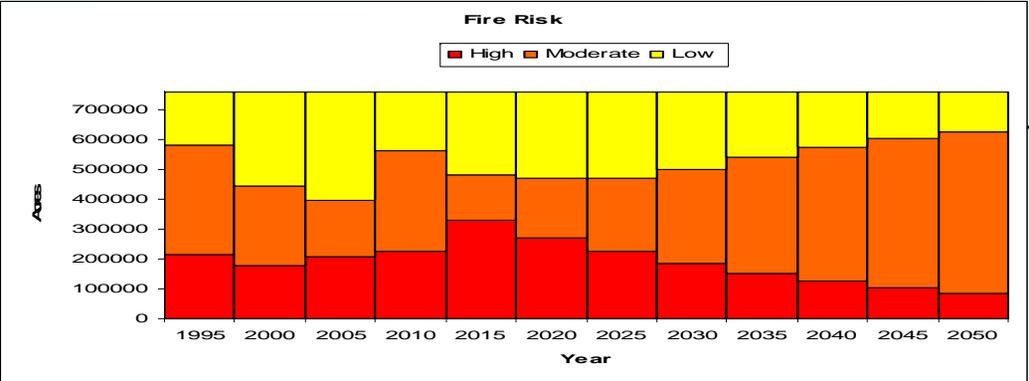


BA45 Fire



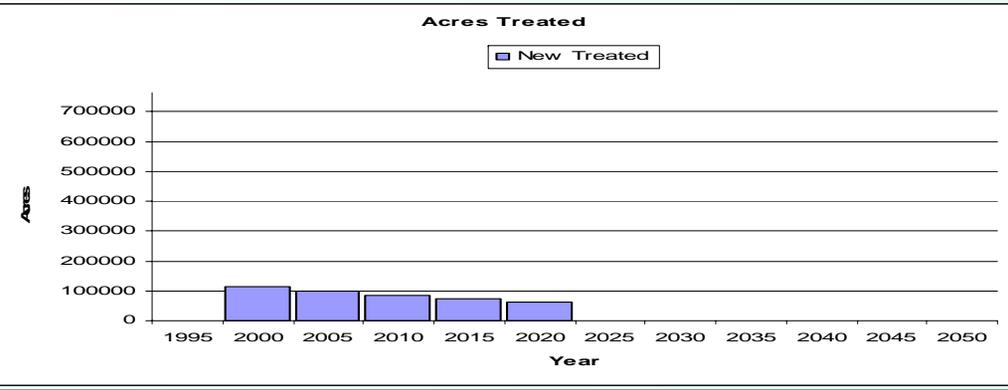
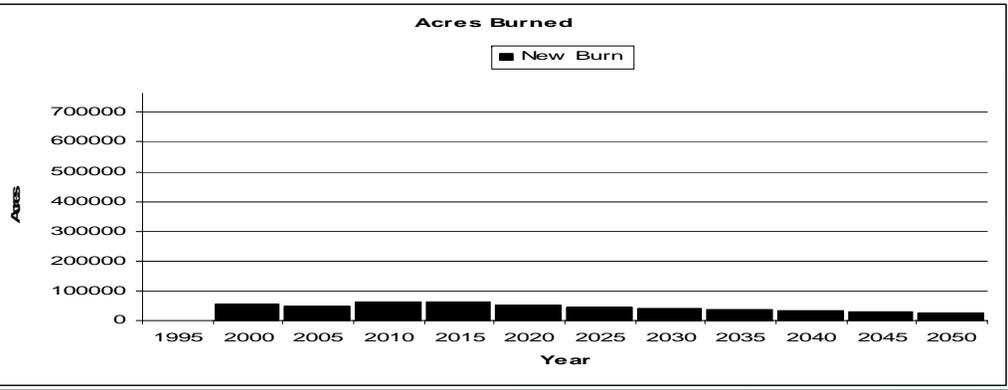
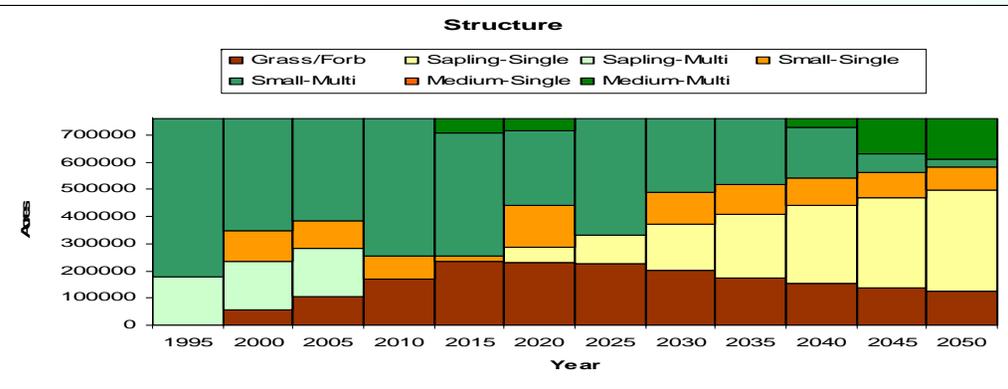
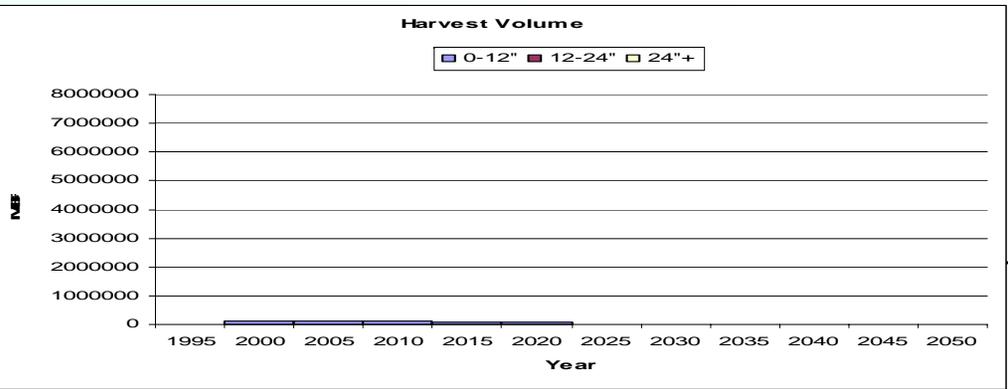
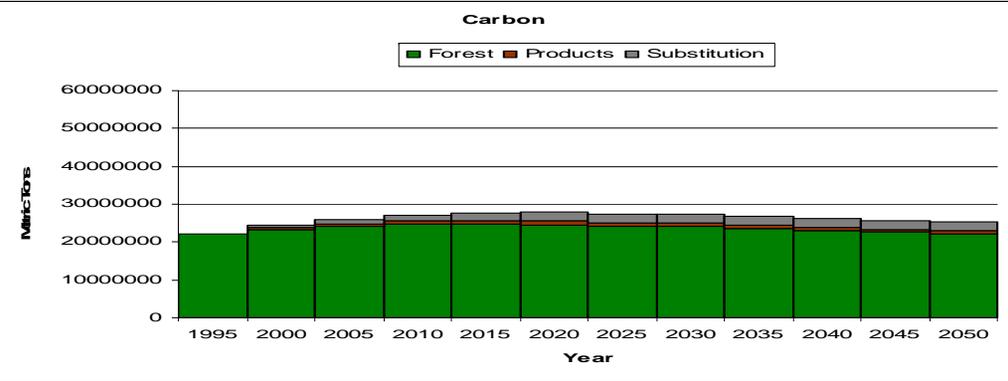
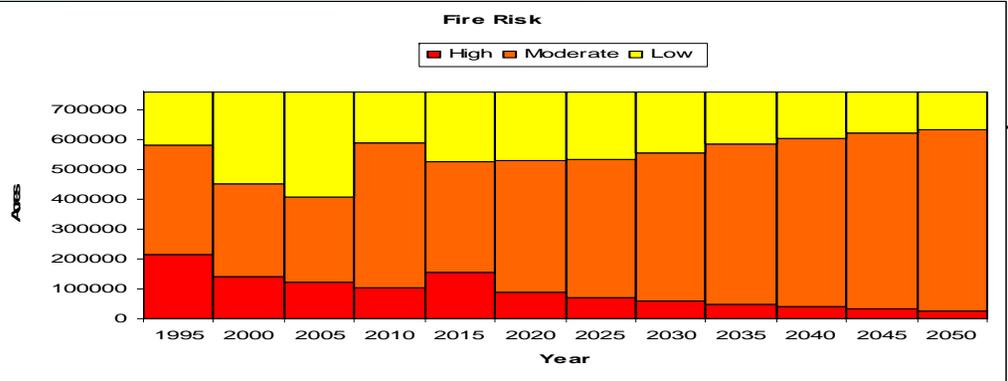
12 & Over:

20% of Initially High and Moderate groups treated during each of first 5 periods (2000 – 2020)



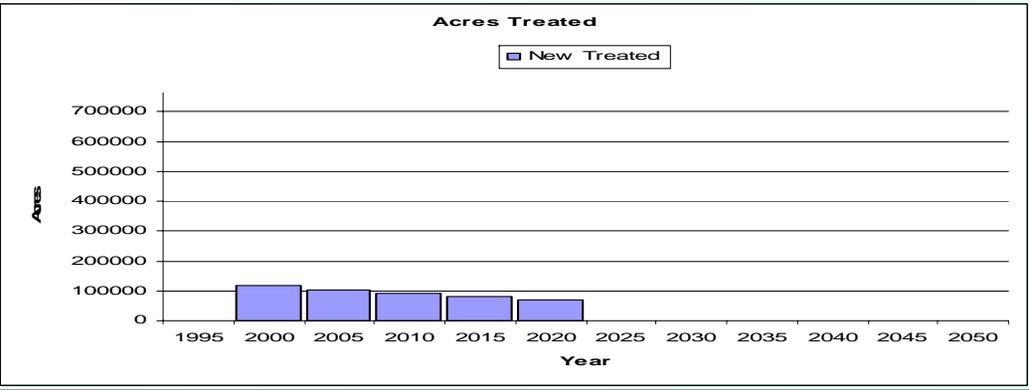
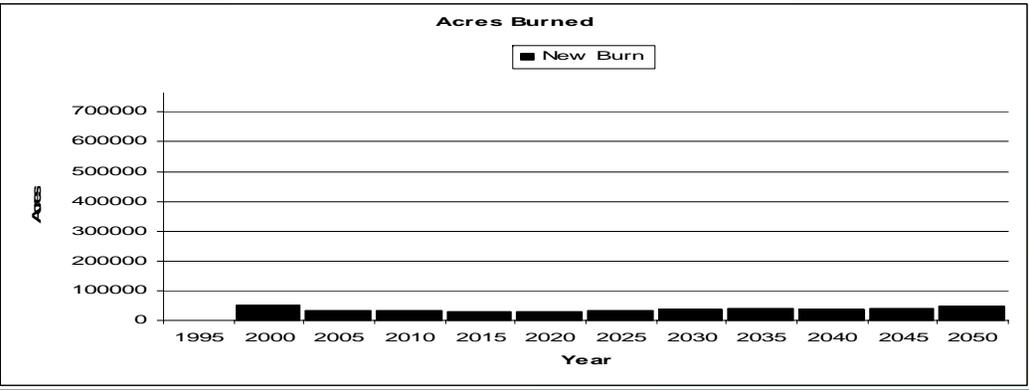
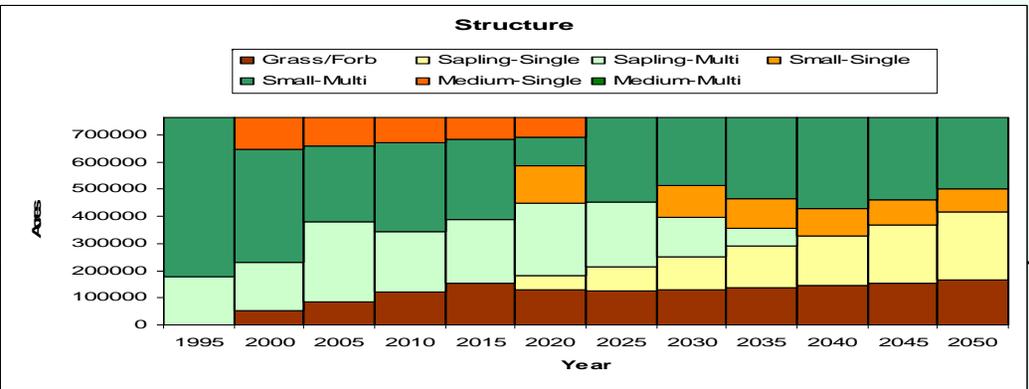
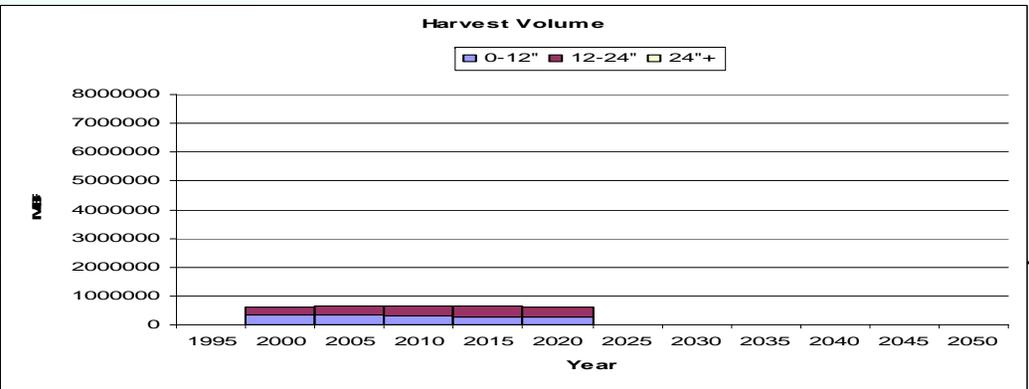
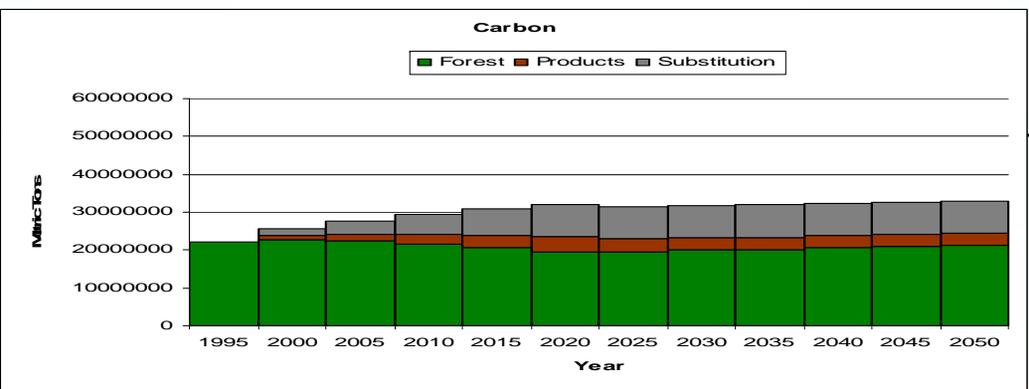
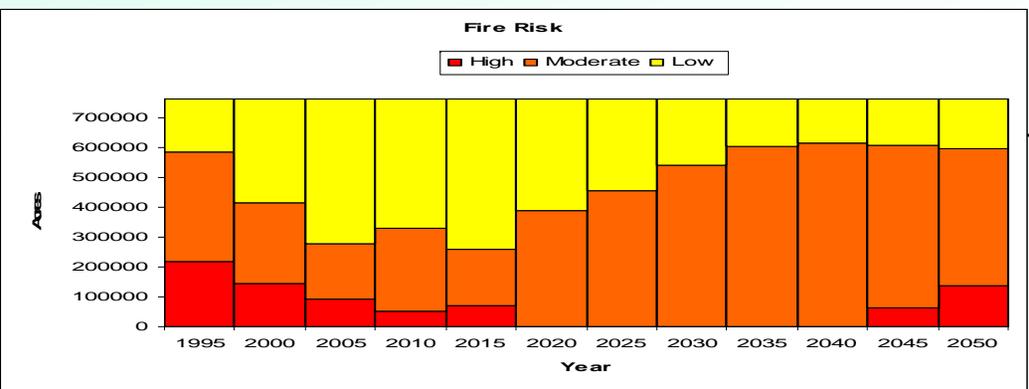
9 & Under:

20% of Initially High and Moderate groups treated during each of first 5 periods (2000 – 2020)



BA45:

20% of Initially High and Moderate groups treated during each of first 5 periods (2000 – 2020)



Treatments phased in over 25 years

	Treatments:	Fire	9"-	12"+	45sfBA
Carbon	mil. Tonnes	23.9	26.8	33.1	31.4
Burn	000's acres	557	471	562	377
Harvest	mil bft	0	495	5084	3213

Treatment Costs and Revenues

\$mils	Treatments:	Fire	9"-	12"+	45sfBA
	Carbon Value @\$2/T	\$48	\$54	\$66	\$63
	Rel Carbon Rev	\$0	\$6	\$18	\$15
	Fire Dept Cost@\$2000/acre	\$1,114	\$942	\$1,124	\$754
	Harvest Value @\$200/m bf	\$0	-\$30	\$1,017	\$573
	removal of non-mkt mat'l		\$300/acre		\$150/acre
	Net Rev-Cost	-\$1,114	-\$978	-\$126	-\$196

Conclusions

- **Fire risk reduction treatments do increase carbon stored**
 - **12 tonnes/acre but the accounting is complex**
- **Treatment response time reduces benefits (limits reduction in acres burned & delays product carbon)**
- **9”&under barely reduces fire risk or cost**
- **12+&over produces highest net revenue but maintains high fire risk**
 - **Other non-mkt values (avoided costs) would reduce benefit**
- **45sfBA almost as good with fire fighting cost included**
 - **Better with other non-mkt benefits included**

Support Acknowledgements

- CORRIM- Consortium for Research on Renewable Industrial Materials
 - 15 research institutions and 23 authors
 - DOE & 5 companies funded the Research Plan
 - USFS/FPL, 10 companies & 8 institutions funded Phase I
- PNW & SE product manufactures surveyed
- USDA/CSREES National Research Initiative competitive grants program
- EPA & Special grants for carbon links

The Details

CORRIM: www.CORRIM.ORG

Athena: www.athenaSMI.ca

LMS: <http://LMS.cfr.washington.edu>

USLCI database: www.nrel.gov/lci