RURAL TECHNOLOGY INITIATIVE

Eastern Washington Timber Supply

Elaine Oneil
University of Washington

Western Forest Economists
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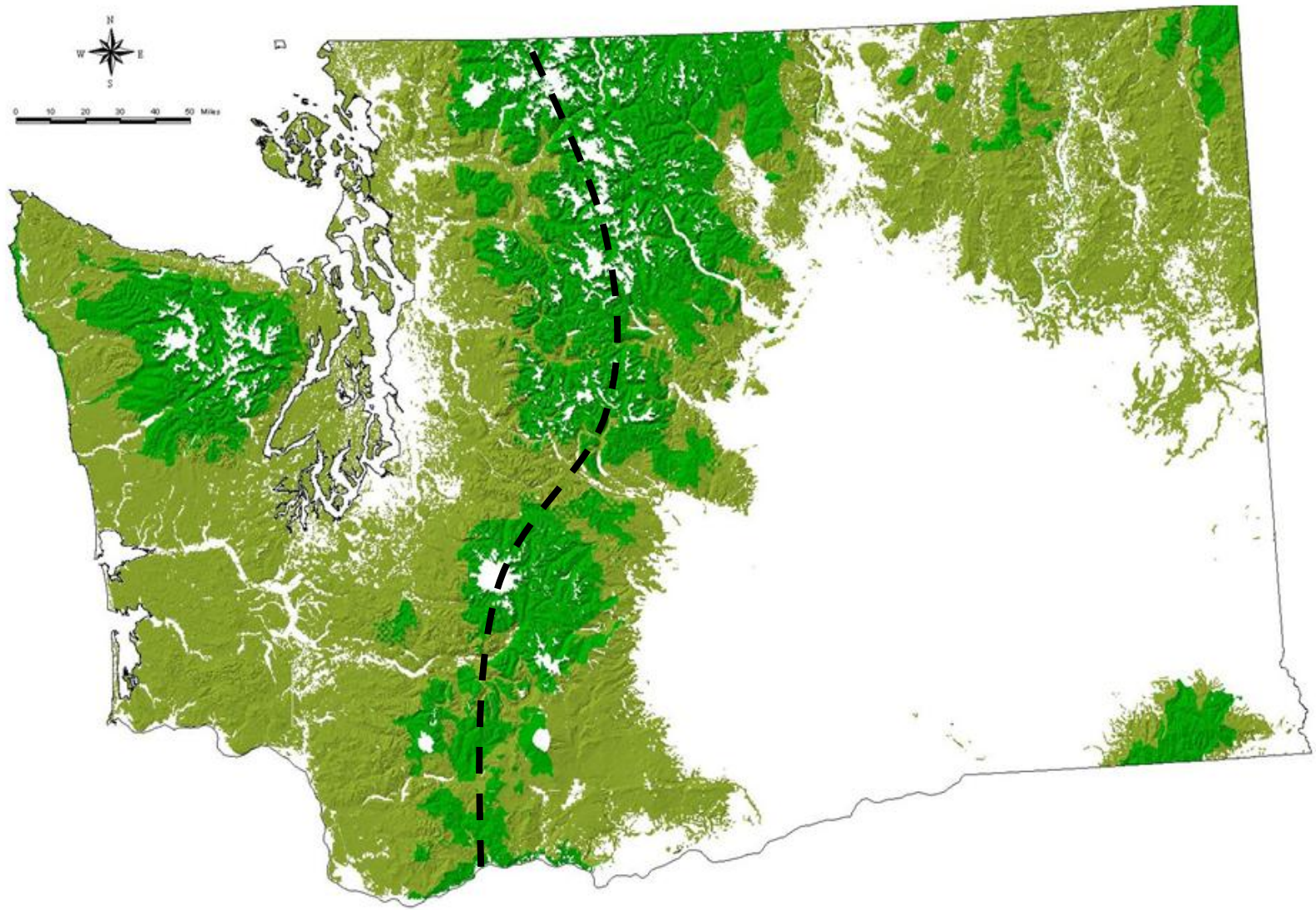
WASHINGTON STATE UNIVERSITY
UNIVERSITY OF WASHINGTON
USDA Forest Service
State & Private Forestry
Cooperative Forestry



Western WA

15.9 million acres total

11.9 million acres forestland

Eastern WA

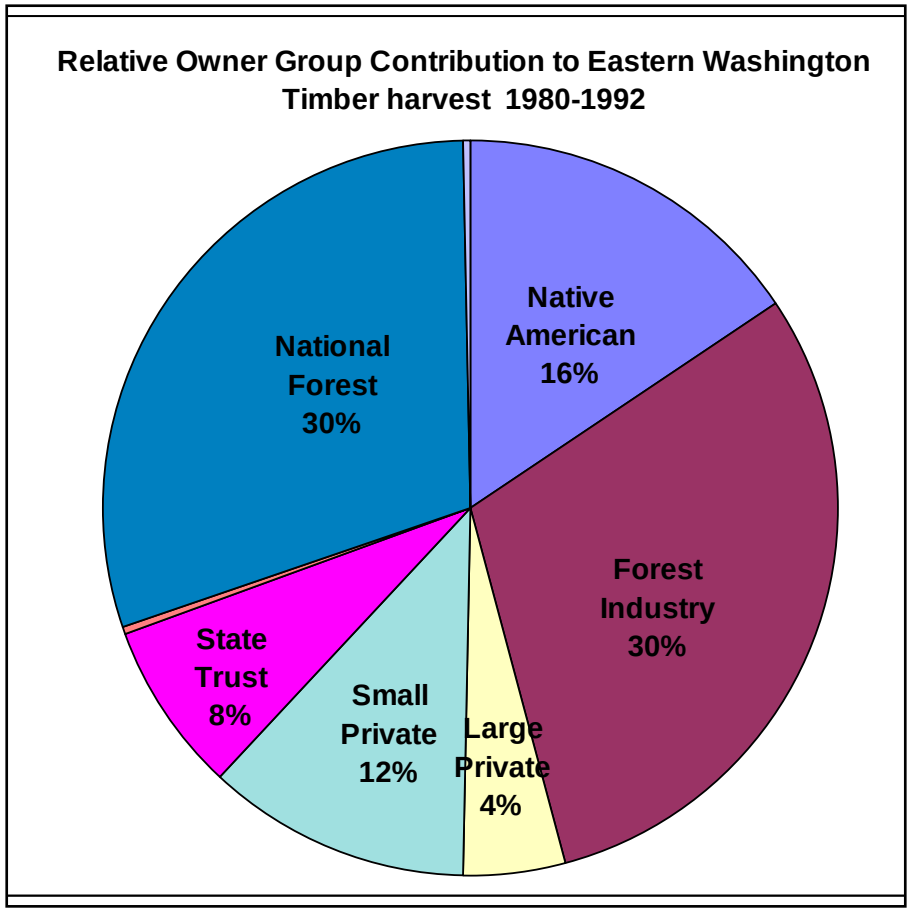
26.6 million acres total

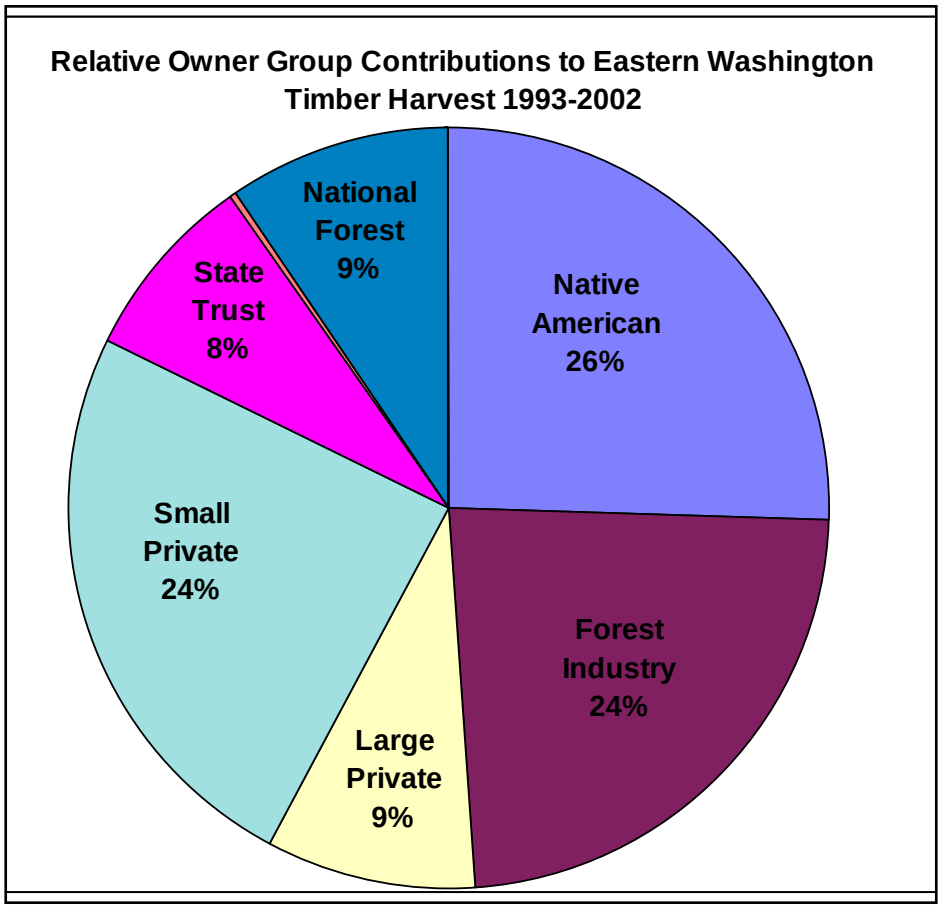
9 million acres forestland

The Issues

- Sustainable wood supply
- Infrastructure
- Forest health & climate change
  - Insects
  - Fire
  - Carbon

Where is the Timber Supply Going to Come From?





While these are the historic trends – ownership patterns are in dynamic flux

Some Land Ownership Trends

- Development and Divestment
  - Plum Creek trades Ahtanum blocks for developable forest land in the I-90 corridor
  - Boise sells timber lands to Forest Capital who sells some lands to West Pacific Timber who trades to DNR for developable land on the Westside
  - American Forest Resources – Teanaway – selling and developing lands on I-90 corridor
  - Forest Capital – Northeast – plans to sell lands as mini estates - ~ 1600 ac for sale now
  - Stimson Lumber in Colville – selling forest land for development
- Trends suggest that there will be a substantial decline in timber lands within the industrial land base

Baseline Harvest Rates for Timber Supply

Baseline treatment regimes represent the kinds of activities that would be needed across the landscape to produce the average volumes we have removed from timber producing lands in the recent past.

30 year average harvest rate *	State	Private	National Forest
MBF/yr	80,541	681,562	77,937

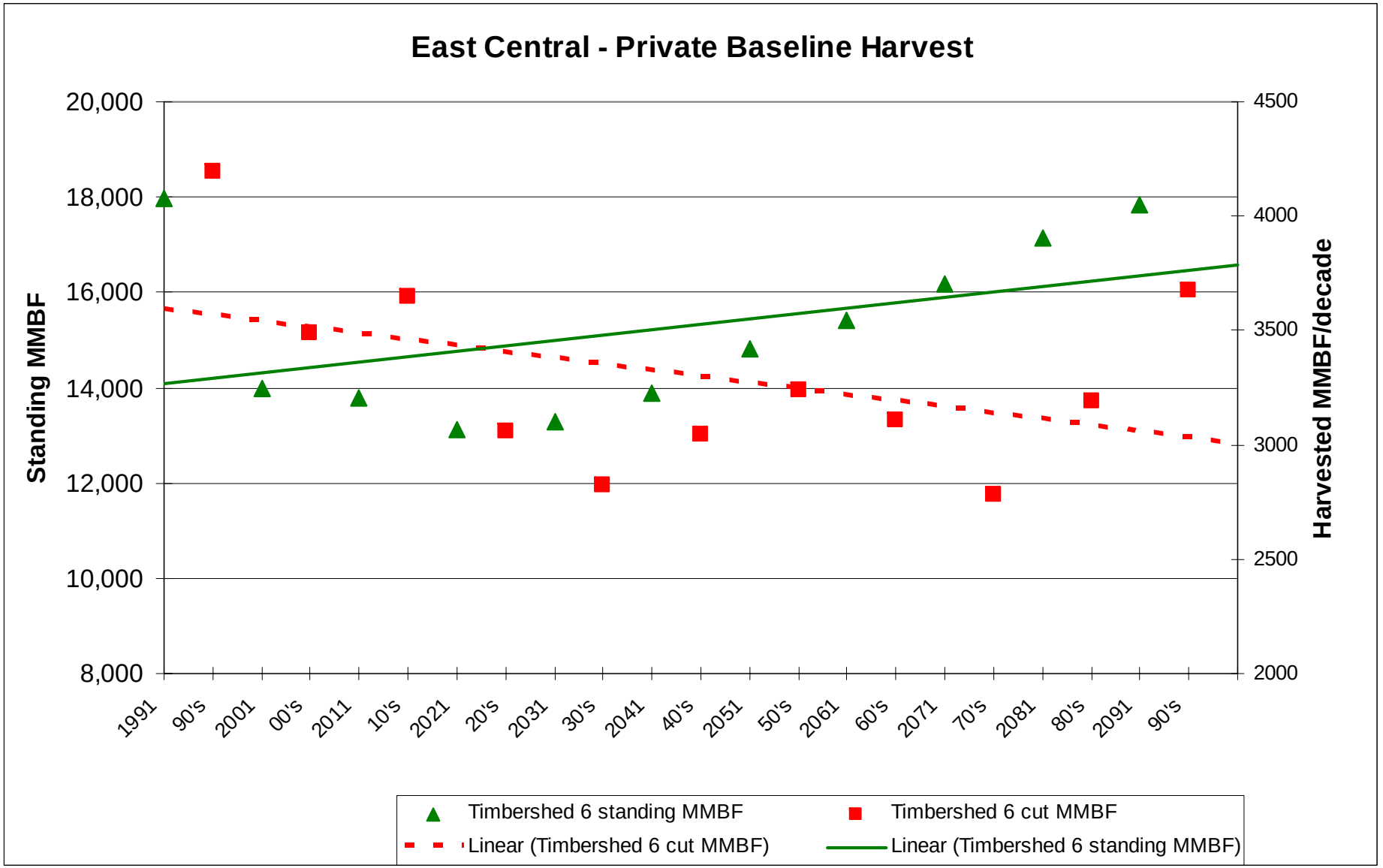
*** National Forests based on 1994-03 harvest rate**

These volumes assume no net loss of timber producing lands and control of mortality via salvage harvest. These volumes should be considered the minimum needed to maintain milling infrastructure at its current capacity

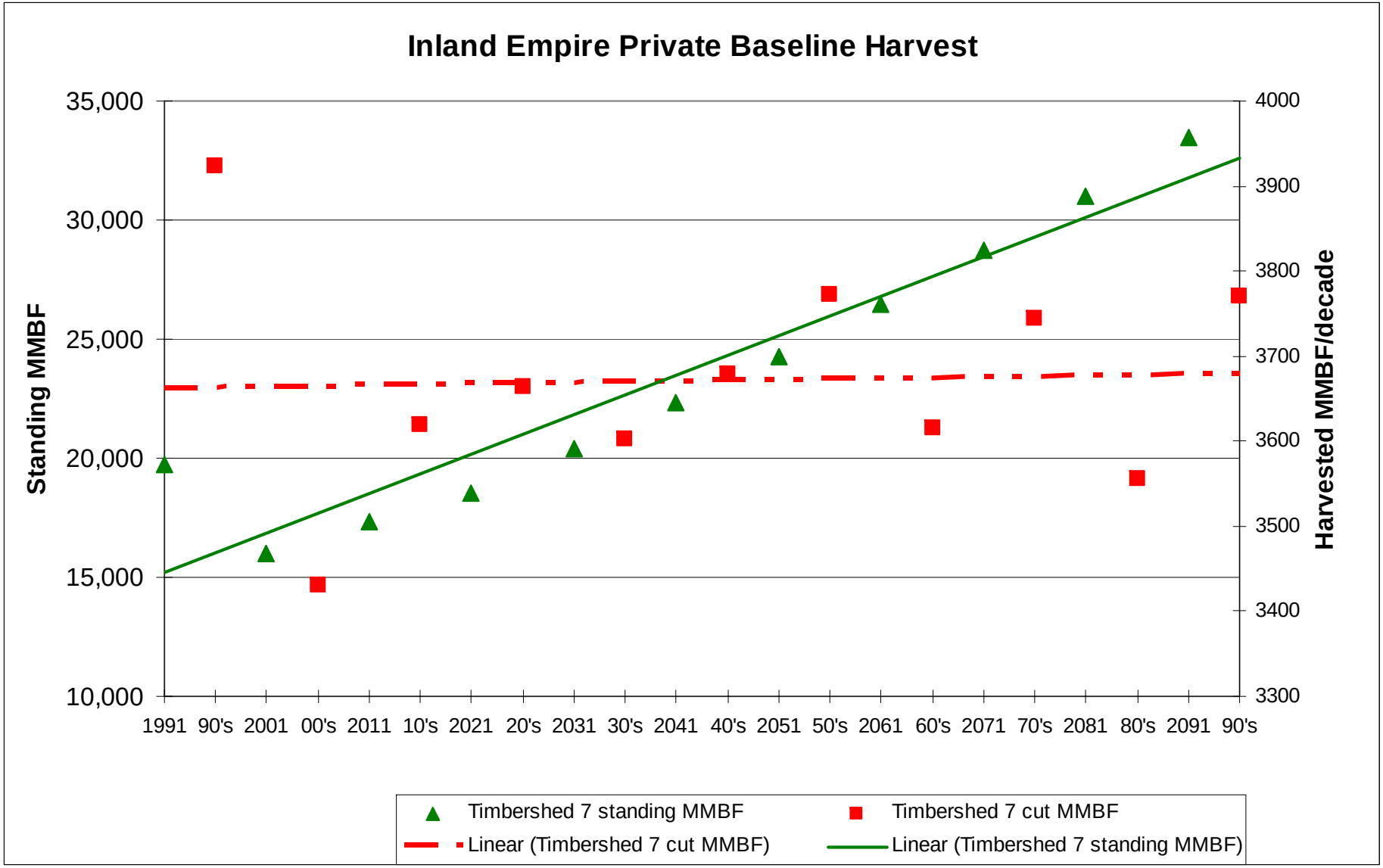
Can we meet the baseline volume target?

- State
  - 60 MMBF per year for the next decade available from overstocked stands in the Southeast (Shelton, 2004)
  - 20 MMBF in the Northeast (historic rate)
- National Forests
  - Inventory Estimate: 7x the current harvest rate available in thin from below strategies to a 12” diameter on select habitat types
  - OKA-WEN Spatial estimate: 8-10 MMBF/ year available for 20 years on OKA-WEN (2004 Forest Health Assessment)
  - Colville estimate: to be determined

		% of target attainable with State and Private Wood for the period ending 'X' years forward										
		State and Private Target	10*	20	30	40	50	60	70	80	90	100
Northeast	sawlog and hewsaw	317,928	81%	67%	87%	103%	130%	117%	133%	108%	129%	99%
	with pulp		101%	93%	94%	115%	152%	132%	149%	119%	158%	105%
East Cascades	sawlog and hewsaw	424,192	73%	103%	68%	14%	32%	99%	78%	56%	81%	11%
	with pulp		101%	140%	78%	23%	34%	153%	108%	82%	97%	63%
Southeast	sawlog and hewsaw	19,981	104%	123%	151%	117%	152%	110%	149%	257%	165%	277%
	with pulp		112%	123%	159%	123%	212%	128%	163%	266%	177%	297%

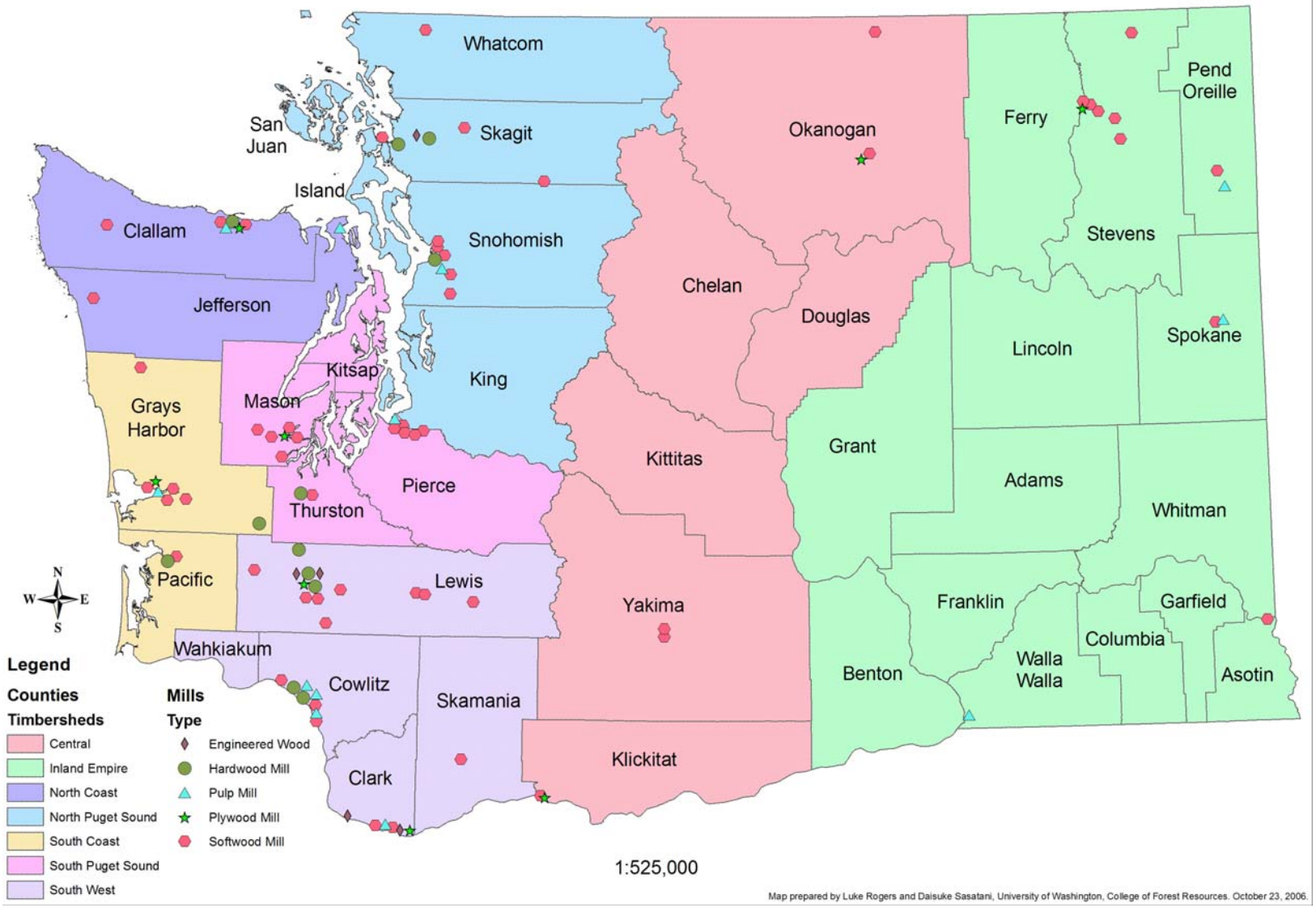


80% of 1980-2002 average private harvest



110% of 1980-2002 average private harvest

Washington State Wood Processing Facilities by Timbershed in 2006



Map prepared by Luke Rogers and Daisuke Sasatani, University of Washington, College of Forest Resources. October 23, 2006.

Tree Mortality caused by Mountain Pine Beetle

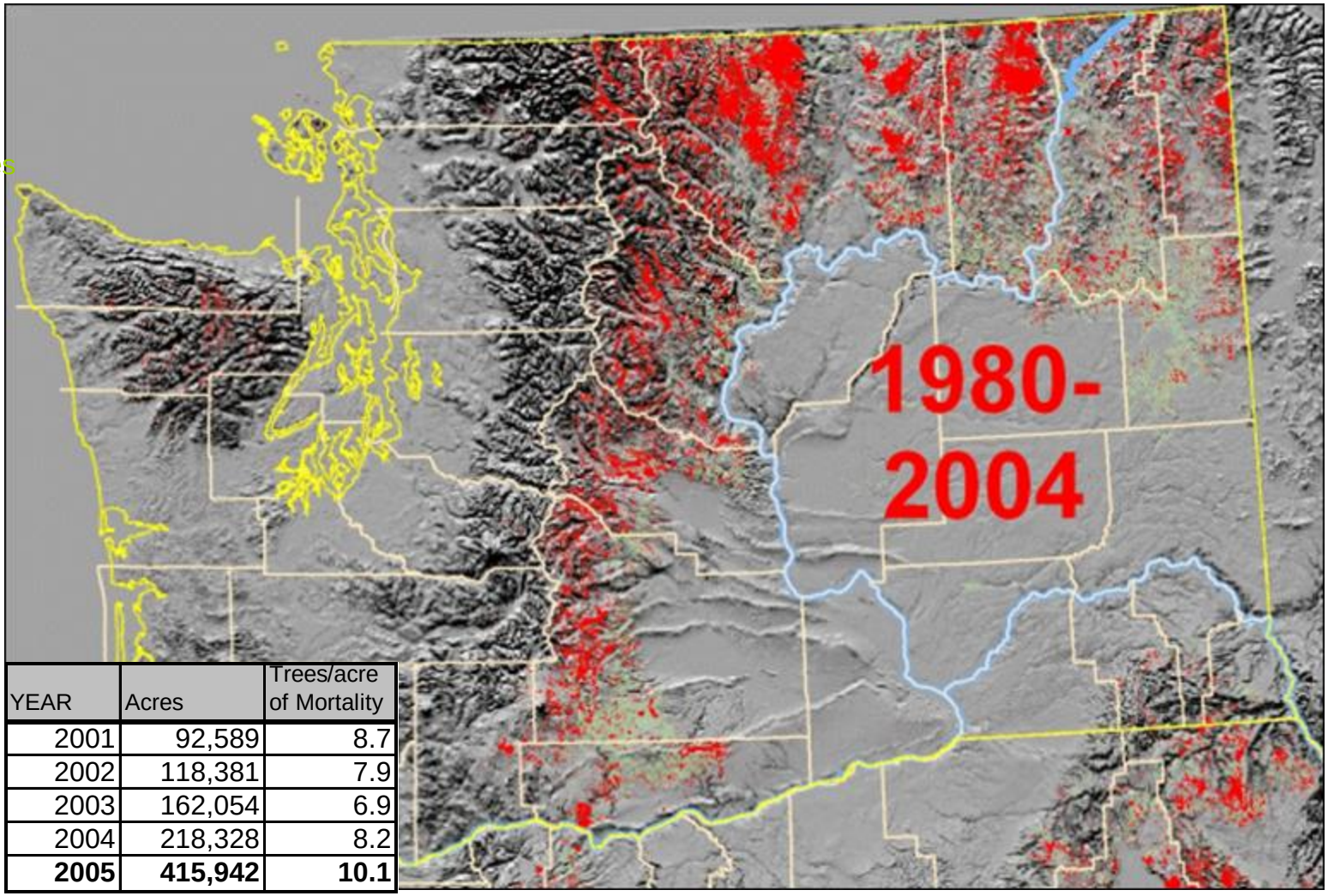
Washington Department of Natural Resources

Forest Health Program

USDA Forest Service

PNW Region

Forest Health Protection



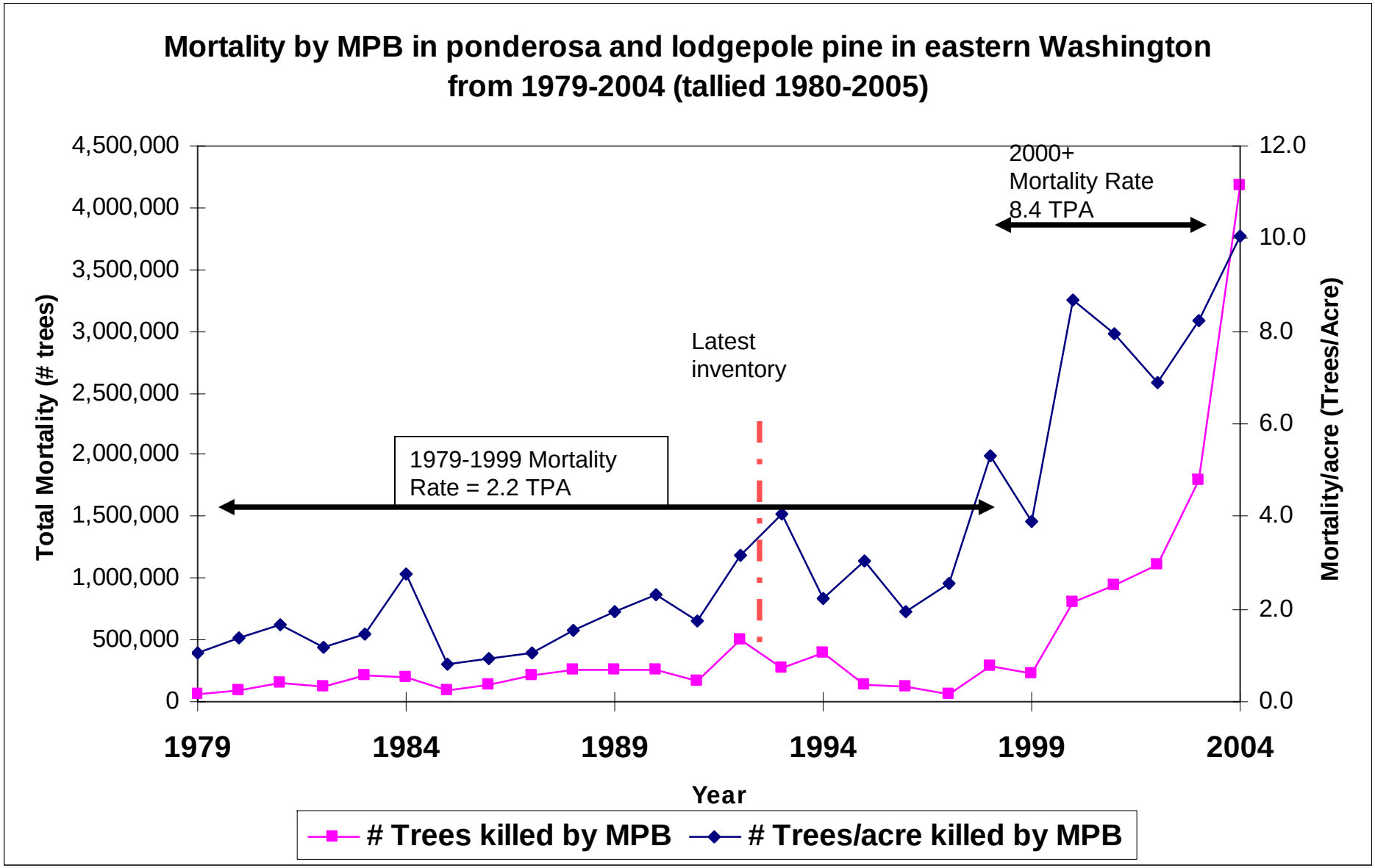
YEAR	Acres	Trees/acre of Mortality
2001	92,589	8.7
2002	118,381	7.9
2003	162,054	6.9
2004	218,328	8.2
2005	**415,942**	**10.1**

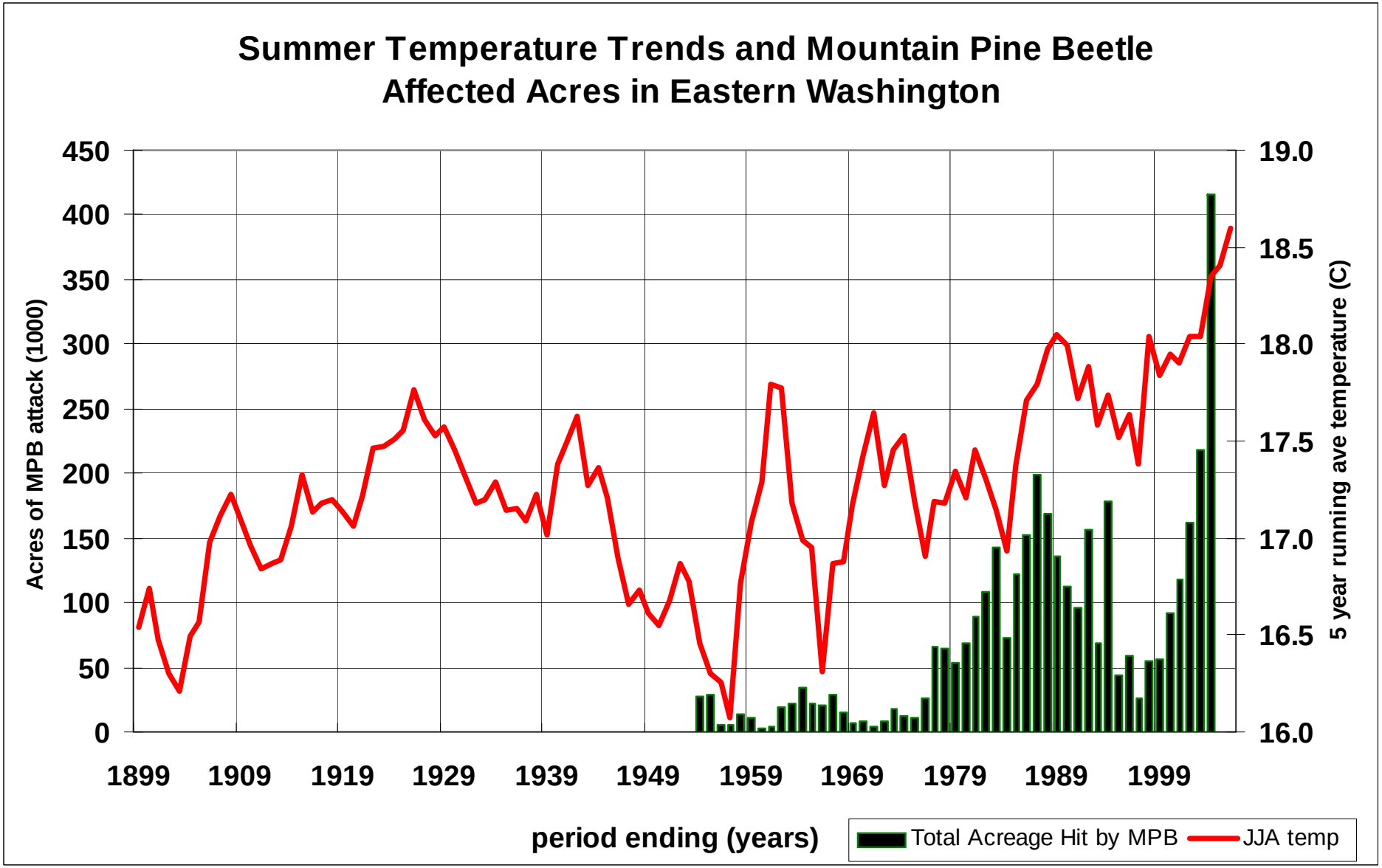
= Host Type

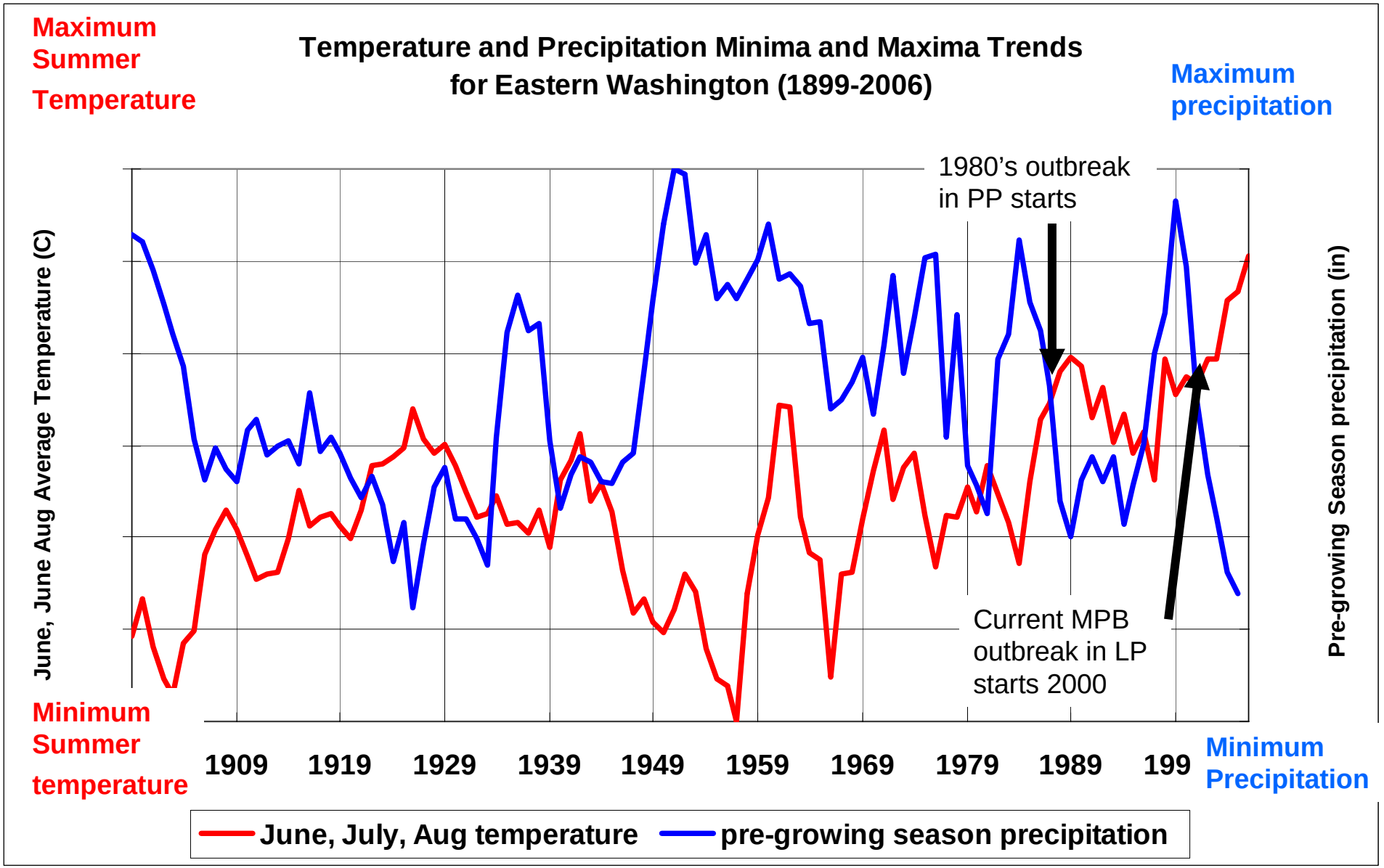
Pinus spp.

Note: Shaded areas show locations where trees were killed. Intensity of damage is variable and **not all trees in shaded areas are dead**.

Sources: Annual aerial insect and disease surveys flown by USDA Forest Service, Oregon Department of Forestry, and Washington Department of Natural Resources; 250m forest type map developed by USDA Forest Service - Remote Sensing Application Center.

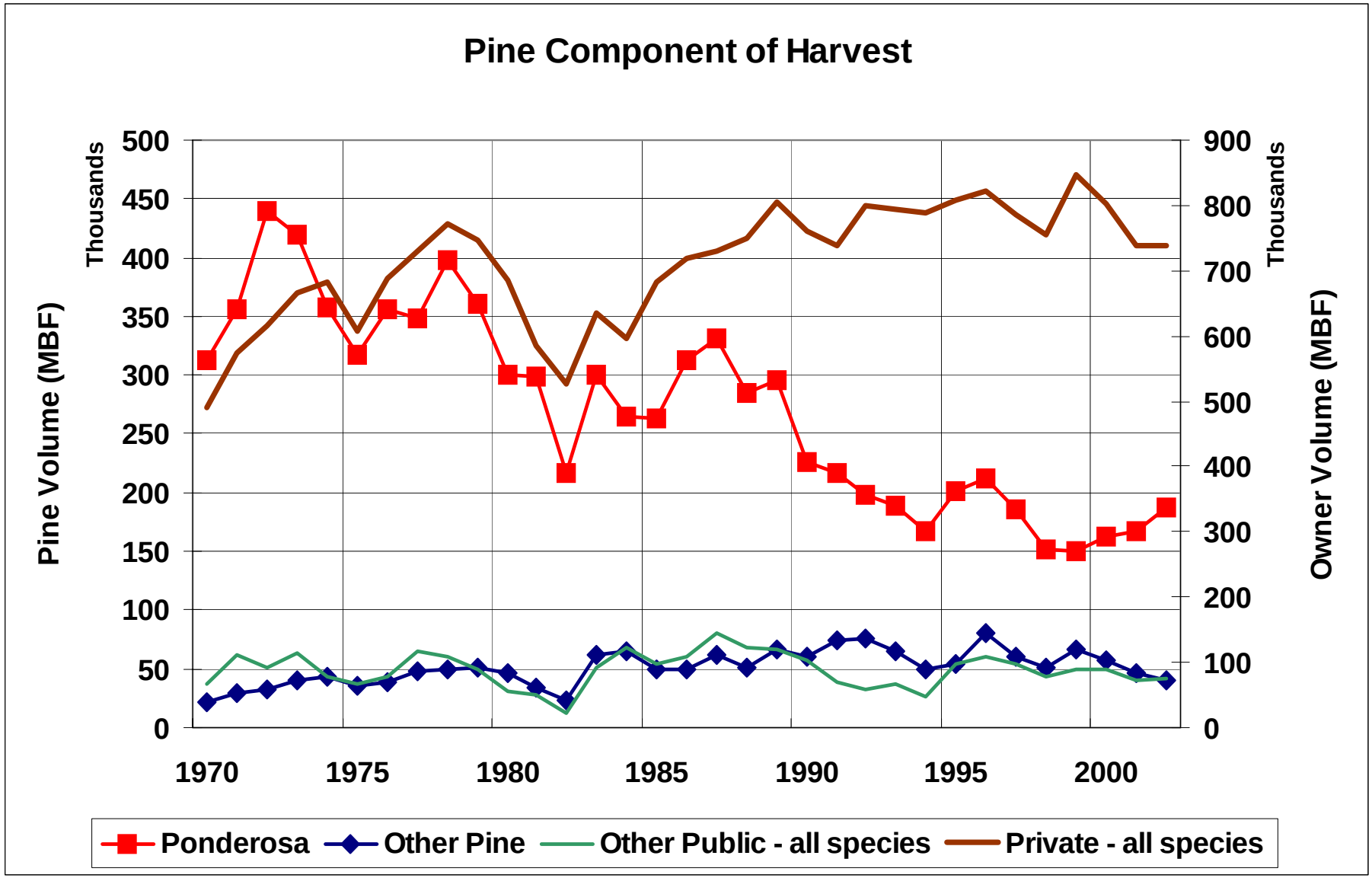

Mortality by MPB in ponderosa and lodgepole pine in eastern Washington from 1979-2004 (tallied 1980-2005)
Total Mortality (# trees)
Mortality/acre (Trees/Acre)
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
2000+
Mortality Rate
8.4 TPA
Latest
inventory
1979-1999 Mortality
Rate = 2.2 TPA
1979
1984
1989
1994
1999
2004
Year
Trees killed by MPB
Trees/acre killed by MPB


Summer Temperature Trends and Mountain Pine Beetle
Affected Acres in Eastern Washington
Acres of MPB attack (1000)
450
400
350
300
250
200
150
100
50
0
19.0
18.5
18.0
17.5
17.0
16.5
16.0
5 year running ave temperature (C)
1899
1909
1919
1929
1939
1949
1959
1969
1979
1989
1999
period ending (years)
Total Acreage Hit by MPB
JJA temp


Maximum Summer Temperature
Temperature and Precipitation Minima and Maxima Trends for Eastern Washington (1899-2006)
Maximum precipitation
1980's outbreak in PP starts
June, June Aug Average Temperature (C)
Pre-growing Season precipitation (in)
Current MPB outbreak in LP starts 2000
Minimum Summer temperature
1909
1919
1929
1939
1949
1959
1969
1979
1989
199
Minimum Precipitation
June, July, Aug temperature
pre-growing season precipitation

For trees over 10” this stand has: SDI =83; DBHq =13.7 ; 72 =TPA; BA =60

Trends in PP and LPP harvest volume

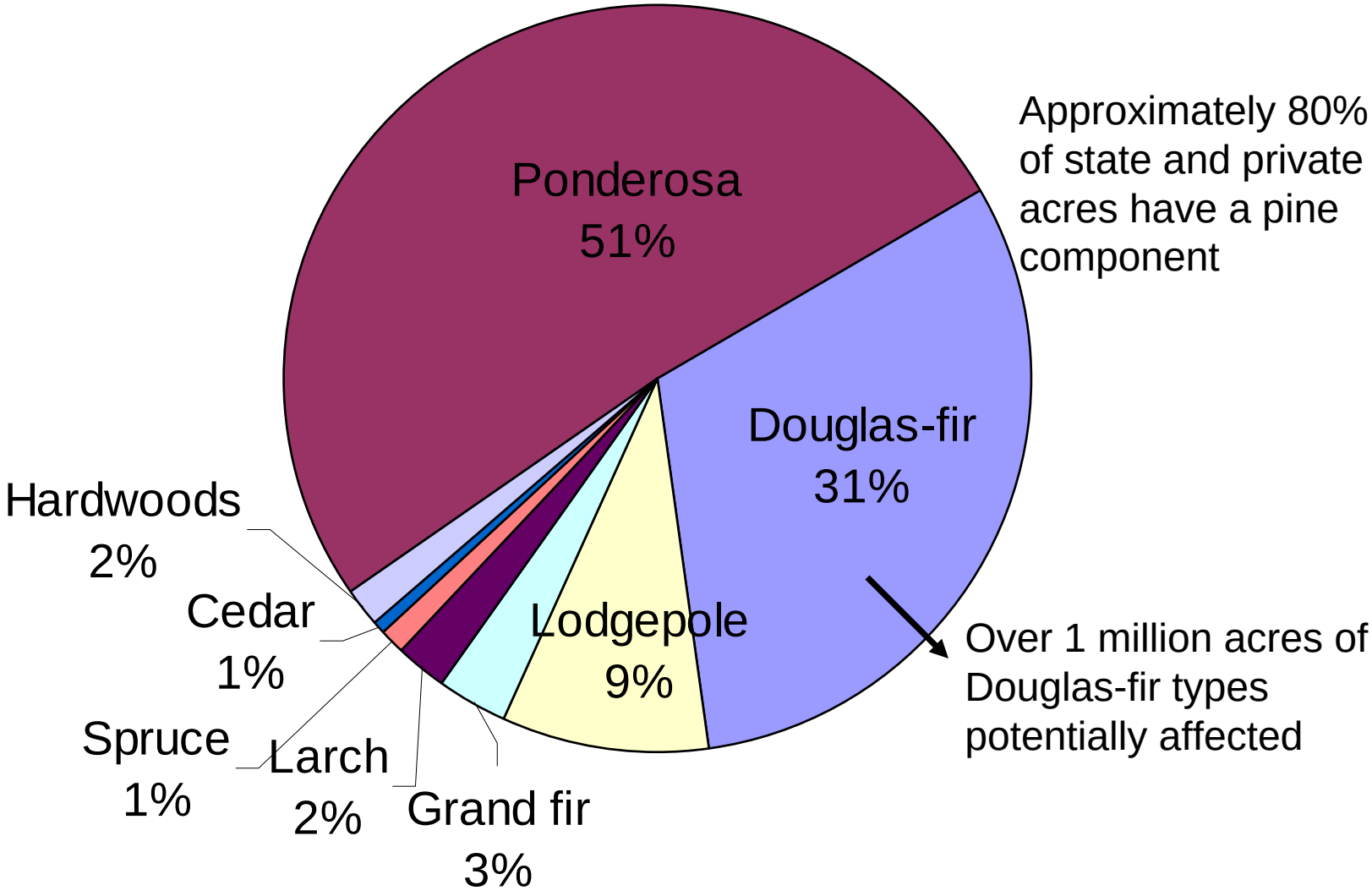


Pine Inventory Changes on State Tribal and Private Forests

1991-2004 period

- LPP – without salvage we lost 230 MMBF
  - 24% of total lodgepole removals were mortality
- PP – without salvage we lost 61 MMBF
  - 2.5% of ponderosa removals were mortality

Percent Acres of Susceptible Pine allocated by Forest Type - State and Private Ownerships Only

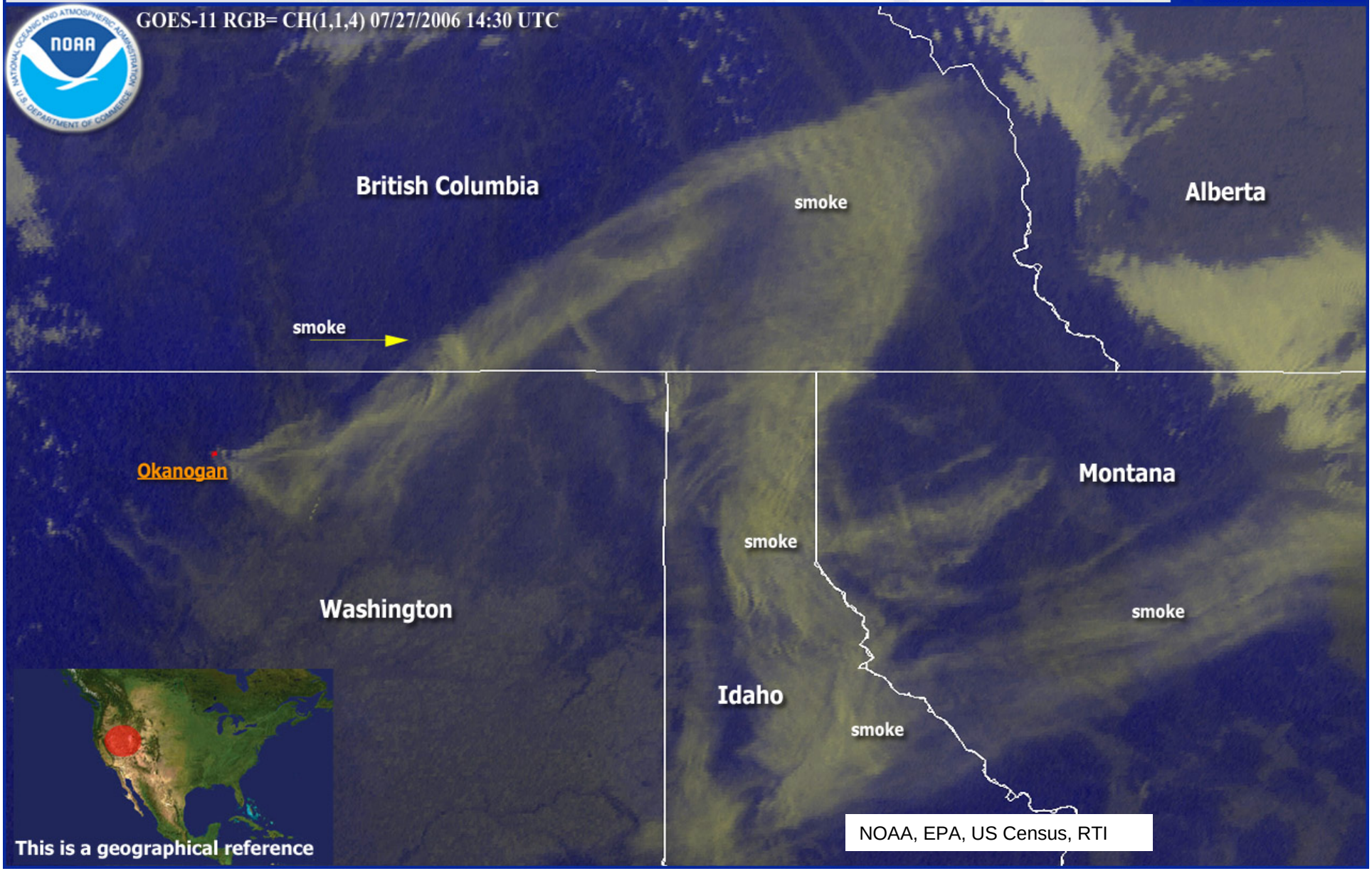


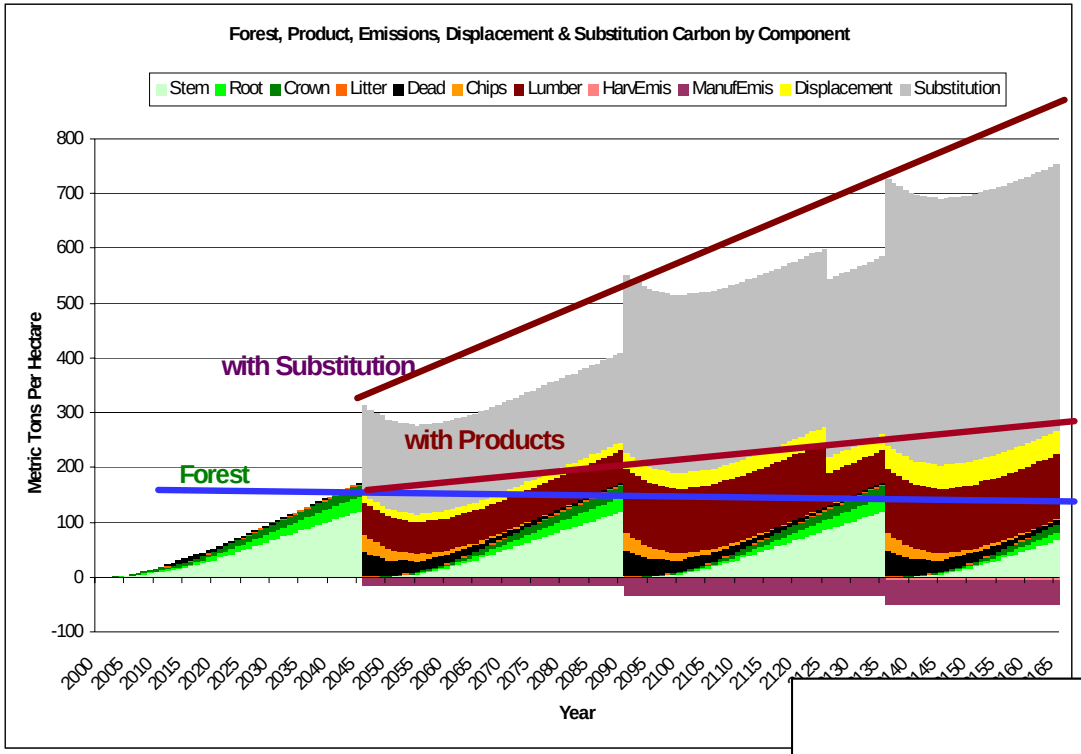
What are the outcomes from the climate trends?

- Multi year droughts that produce analogous outcomes to current levels of MPB activity in pine
- Intensification of insect outbreaks (Logan et al 2006)
- Range expansion of MPB (Logan and Powell, 2006, Carroll et al 2003)
- Earlier snowmelt and higher summer temperatures creating greater cumulative summer moisture deficits, a longer fire season, expansion of high fire risk areas into high elevation sites earlier in the year and in more years (Running 2006, Westerling et al 2006)
- 2-3x increase in fire extent in Eastern Washington (McKenzie et al 2003)
  - This is without a precipitation effect as temperature was the dominant driver

A large wildfire in Okanogan, Washington State, was producing a dense plume of smoke that snaked northeastward into British Columbia and Alberta, then south into Idaho and Montana.

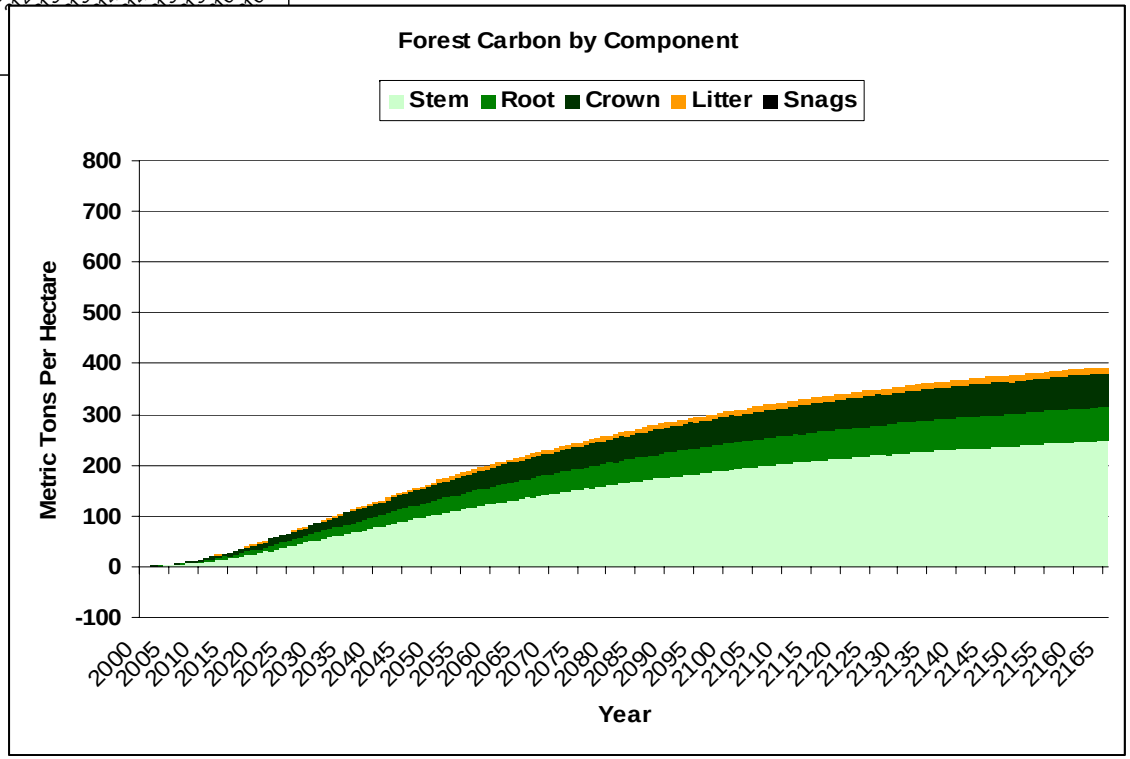
Credit: NOAA





Carbon Pools in: Forest, products & energy displacement, & fossil intensive substitutes

Carbon pools in unharvested forest, for stem, roots, crown, litter, and dead wood



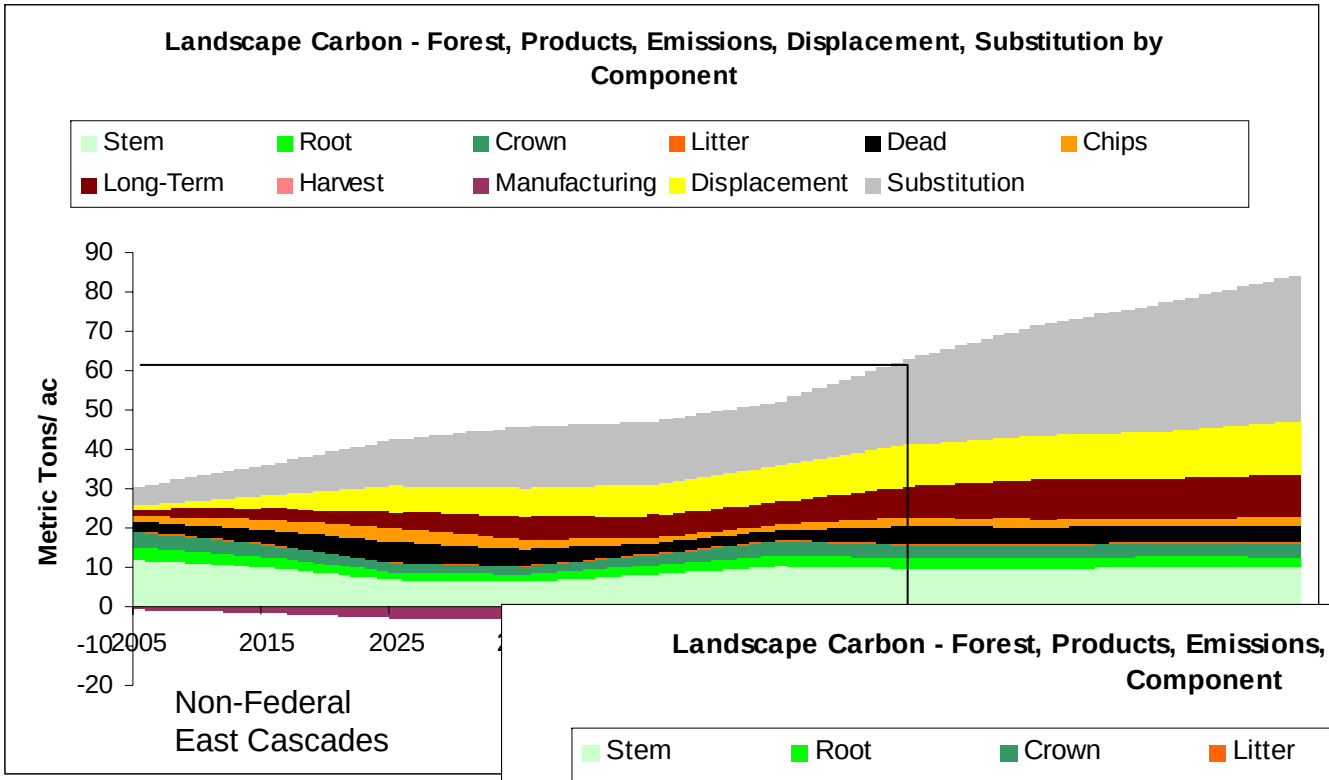
CORRIM

Carbon sequestration under Different Treatment Options

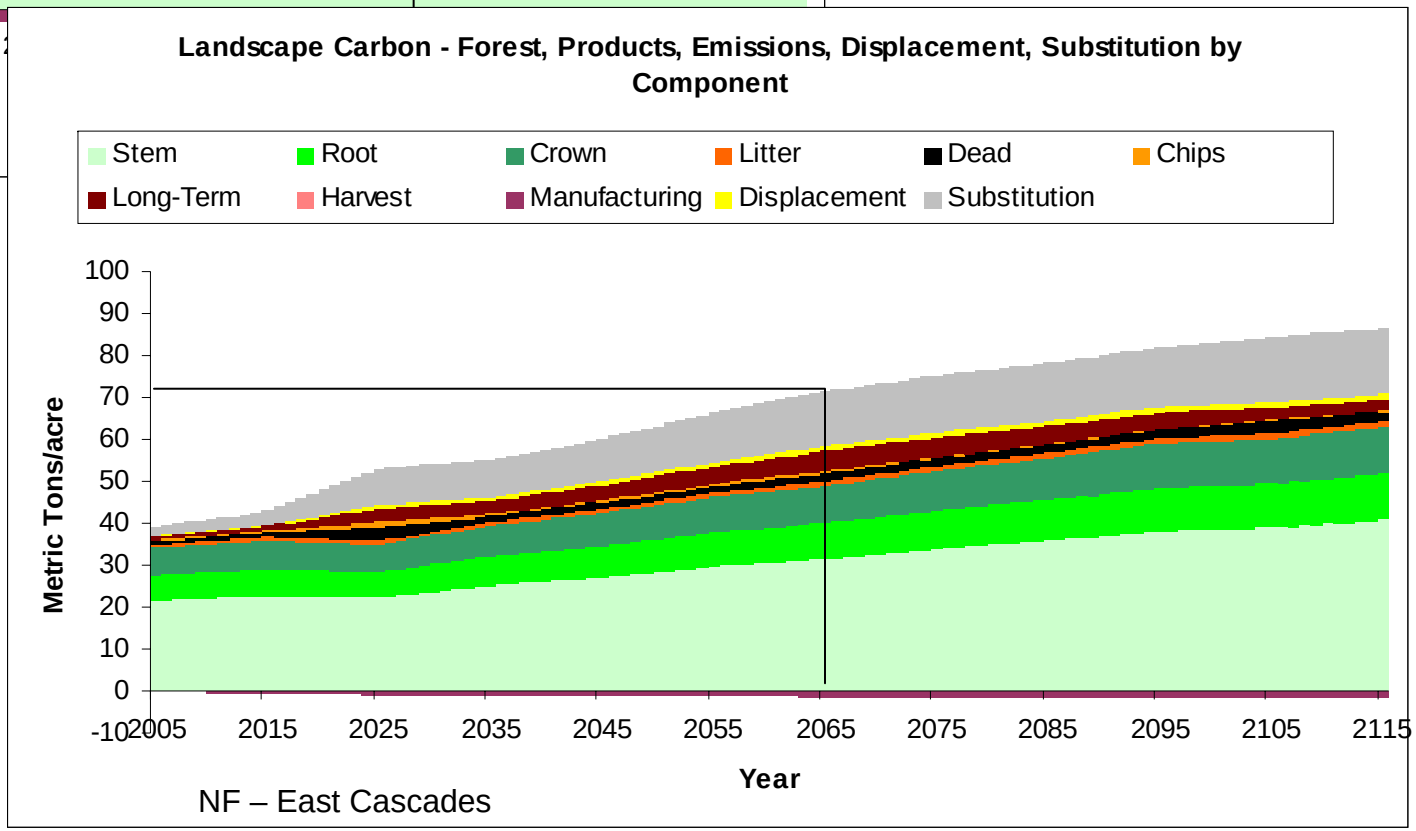
Two management scenarios using the East Cascades region as an example

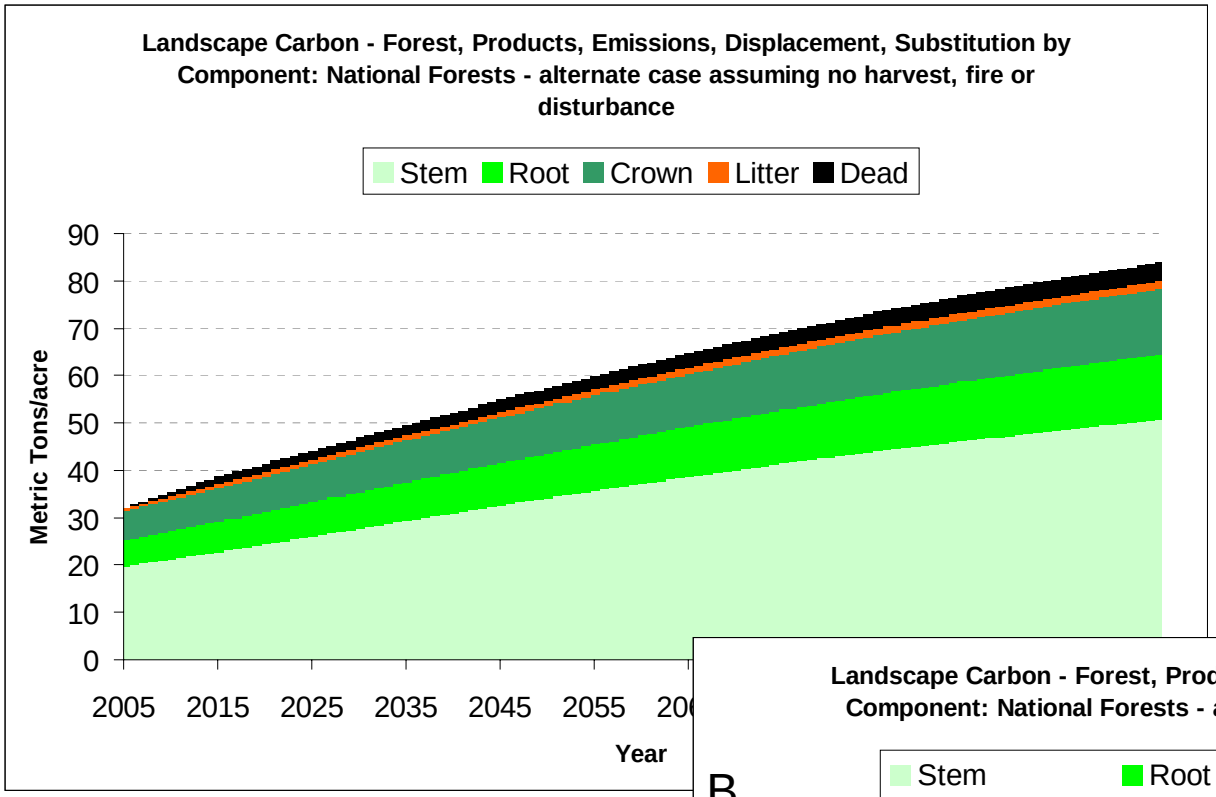
- Non-federal managed to maintain harvest volumes

- Federal thinned to a basal area of 60 sqft/acre on Douglas-fir, Grand-fir and Ponderosa Pine habitat types (61% of the forest types) (accelerated harvest rate)

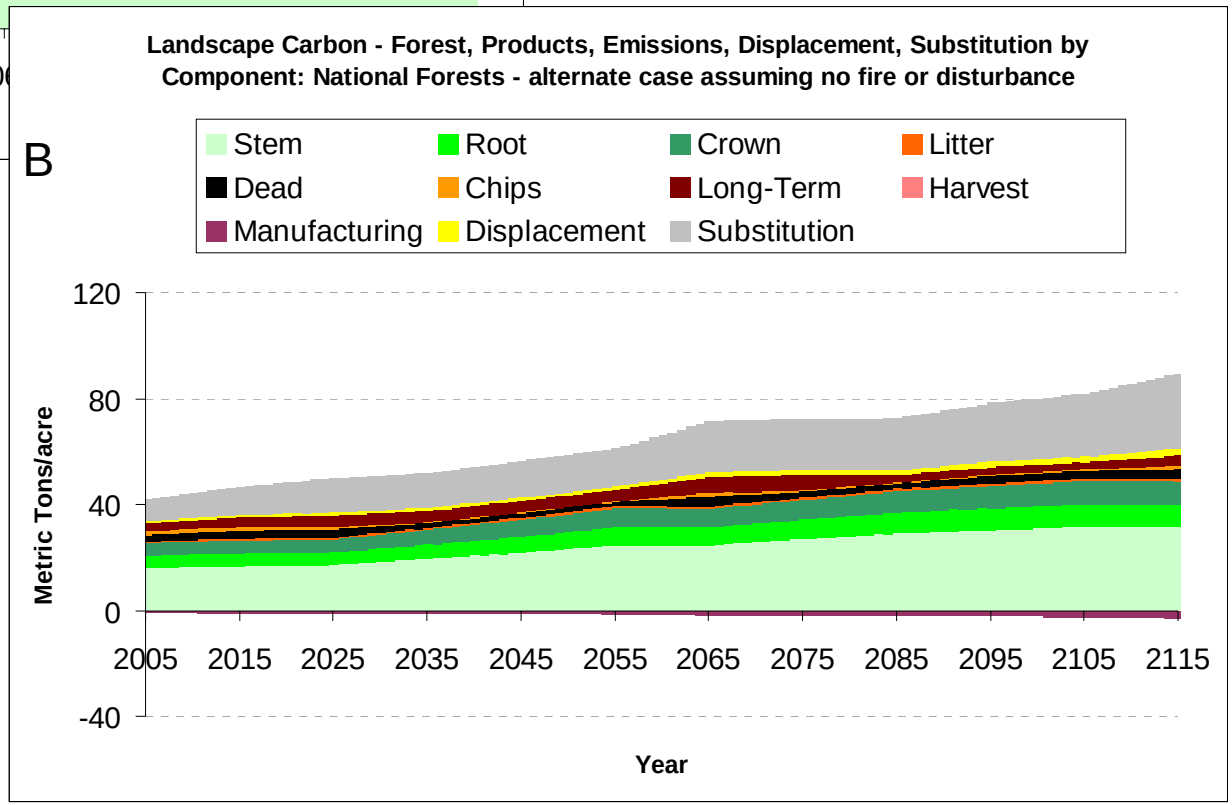


LCI Carbon Accounting (with no fire)



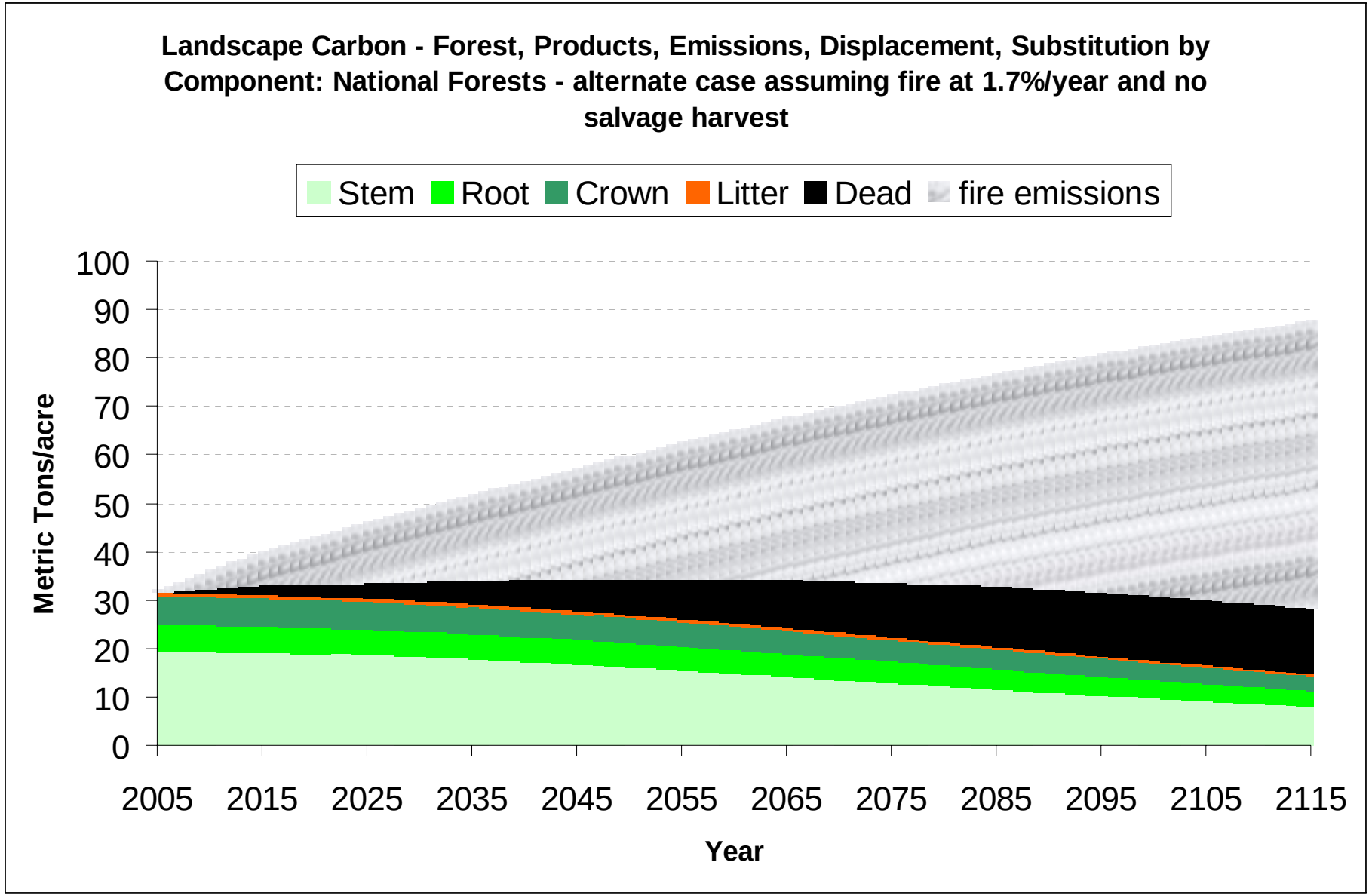


A



B

Carbon pools in a Inland West National Forests, assuming a) no harvest and b) harvest in keeping with healthy forest restoration activities on DF, GF, PP and LP forest types

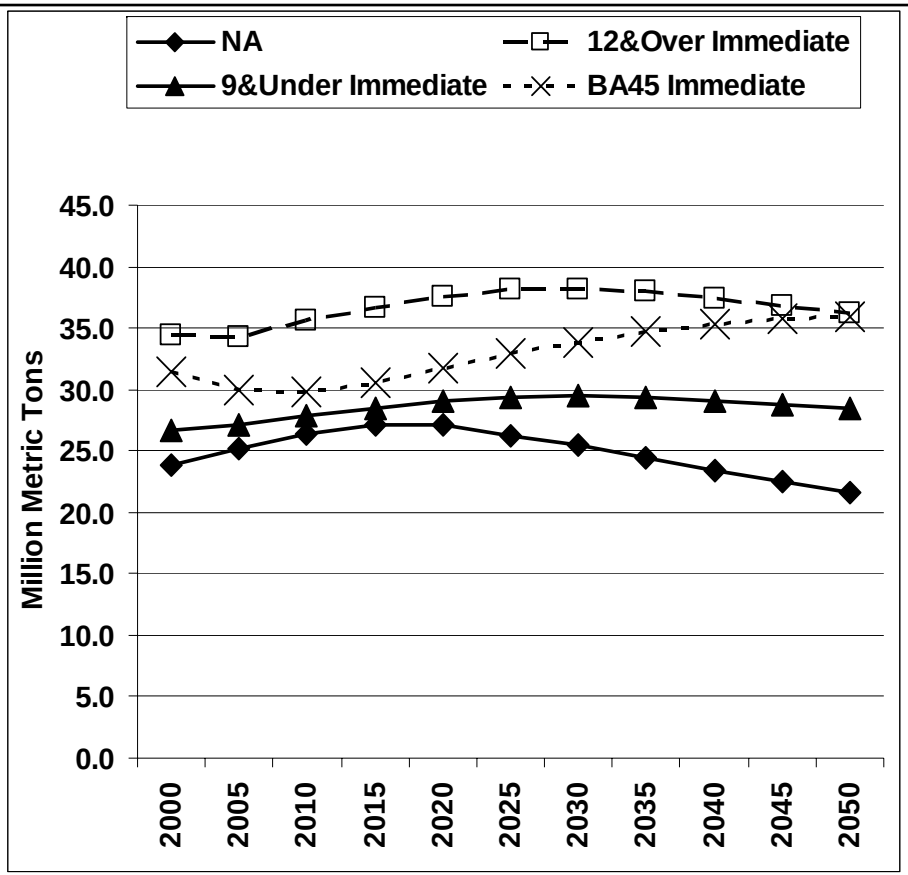

Landscape Carbon - Forest, Products, Emissions, Displacement, Substitution by Component: National Forests - alternate case assuming fire at 1.7%/year and no salvage harvest
Stem
Root
Crown
Litter
Dead
fire emissions
Metric Tons/acre
100
90
80
70
60
50
40
30
20
10
0
2005
2015
2025
2035
2045
2055
2065
2075
2085
2095
2105
2115
Year

Protocols for Assessing a carbon Strategy for Eastern Washington

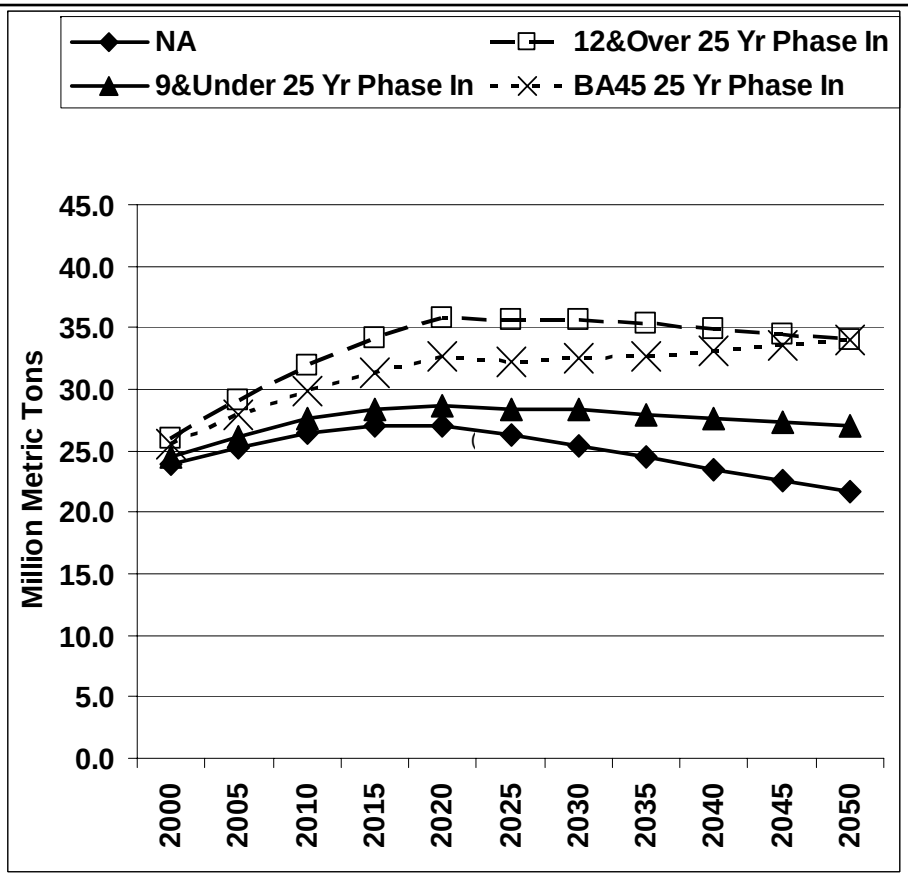
- How should we refine the fire estimate to more accurately reflect risk?
  - Knowing the carbon impact after a range of fire risk reduction treatments (NA, BA45, 9&Under, 12&Up, & Wildfire) is not sufficient.
  - We need to know the expected value of carbon which depends upon the probability of fire as a function of the treatment.

Total Carbon (Forest, Products, Substitution)

Immediate Treatment Schedule



25 Yr Phase In Treatment Schedule



Carbon Summary

- NA: 6 tonnes per acre of carbon released from burning
- BA45: 16 tonnes per acre more total carbon than NA; 20 more tonnes per acre end of period
  - 26% more carbon than NA on average
  - 38% more from 2025 to 2050
  - 50% more by 2050

Treatments Phased In Over 25 Years

	NA	9&Under	12&Over	BA45
Carbon million Tonnes	24.9	27.4	33.4	31.4
Burn 000's acres Average	544	460	546	374
Fire Cost $ mil. NPV Total	237	202	237	147
Harvest $ mil. NPV $1000/acre	0	-100	457	20
Total Value $ mil. NPV	-237	-302	220	-127

Conclusions

- **Treatment delay reduces benefits (limits reduction in acres burned & delays product carbon)**
- **Fire risk reduction treatments do increase carbon stored**
  - **16 tonnes/acre but the accounting is complex**
- **9&Under barely reduces fire hazard and increases cost**
- **12&Over produces highest net revenue but maintains high fire hazard**
  - **Other fire sensitive non-mkt values (avoided costs) would reduce the benefit**
- **BA45 reduces fire fighting cost**
  - **Better with other non-mkt benefits included**

Eastern Washington Timber Supply Issues Summary

1. MPB mortality is high & growing
2. Climate change is outside of historic range - more than temporary?
3. Treatments to reduce density can help but may need to be lower than before.
4. Need more research on impact of climate on carrying capacity and site specific density management
5. Fire hazard is high and can be reduced, not eliminate by treatments
6. Treatments to reduce fire hazard store more carbon
7. Private harvest will decline. Can it be offset by climate & fire mitigation treatments
8. Adapt growth models to changes in tree growth & carry capacity
9. Need better inventory data to plan & implement