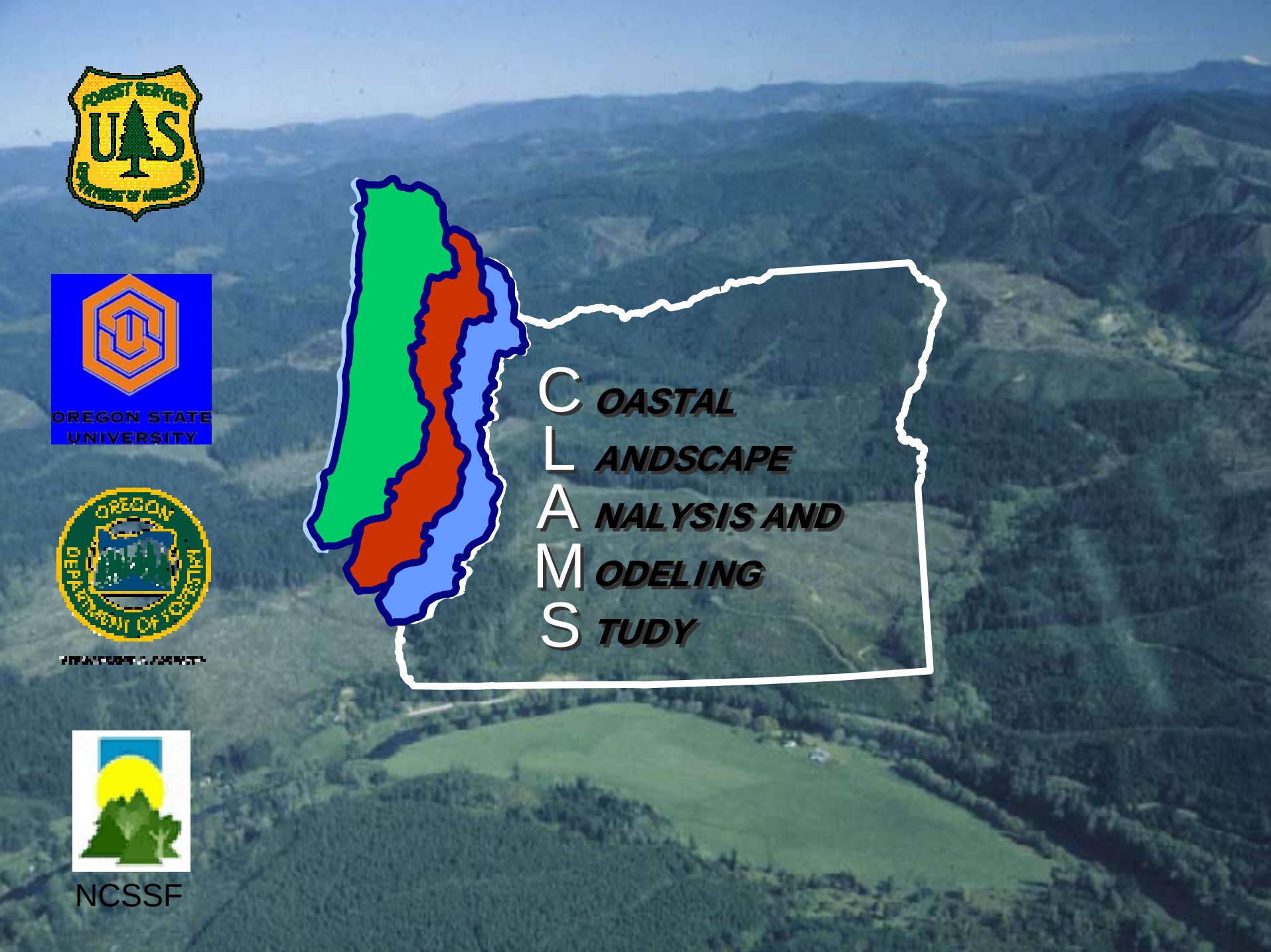

C OASTAL
L ANDSCAPE
A NALYSIS AND
M ODELING
S TUDY
OREGON STATE UNIVERSITY
NCSSF

CLAMS - Principal Investigators

Pacific NW Research Station

Thomas Spies
Kelly Burnett
Gordon Grant
Brian Garber-Yonts
Jeff Kline
Janet Ohmann
Gordon Reeves

Oregon State University

K. Norman Johnson
Steve Garman
Rebecca Johnson
Steven Lancaster

Oregon Dept. of Forestry

Gary Lettman

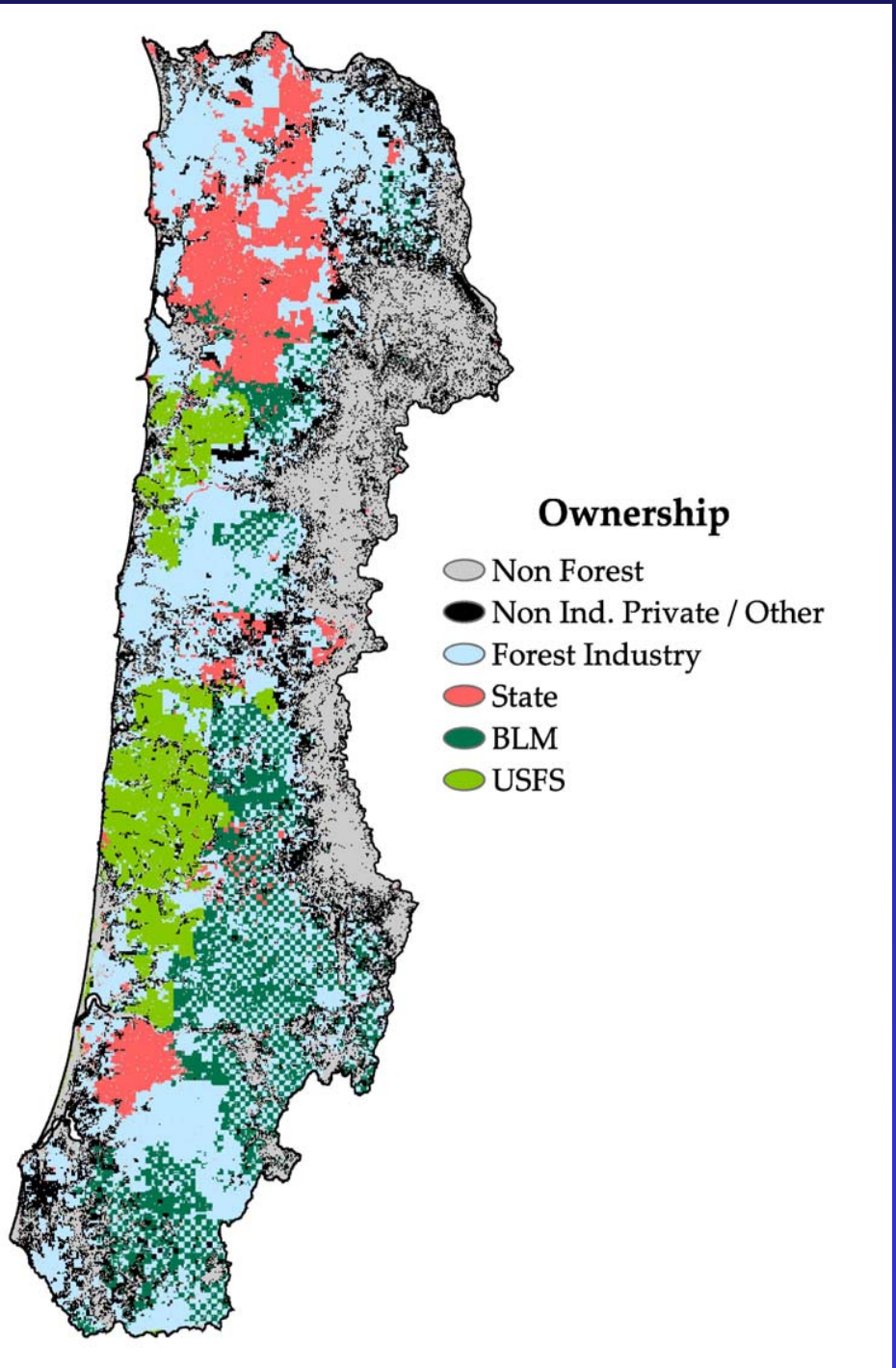
University of Georgia

Pete Bettinger
Michael Wimberly

Environmental Protection Agency

Brenda McComb

The Coast Range



Ownership Types 1996

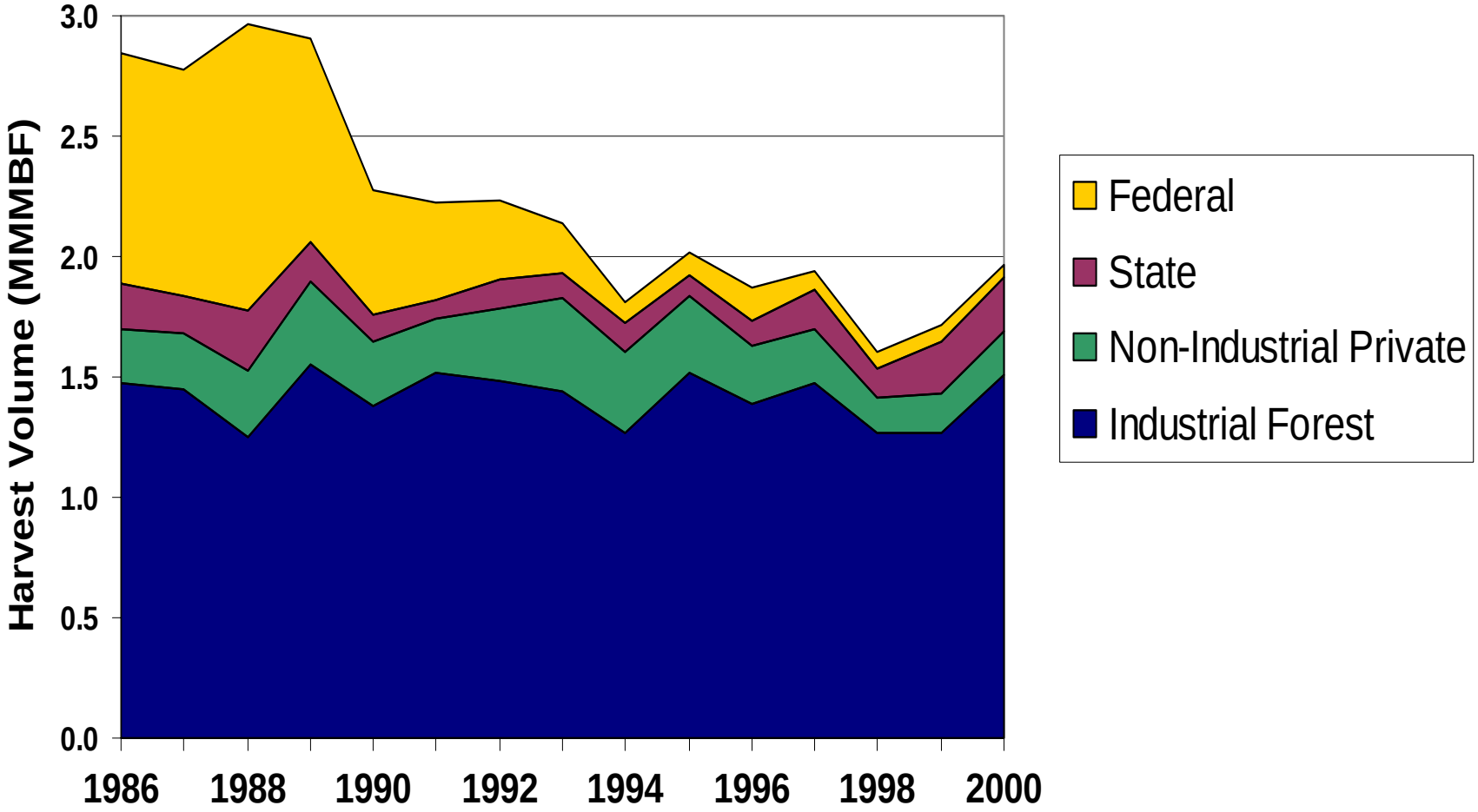
Regeneration generally occurred after harvest.

In the 1950s harvest increased on public land as private lands depleted their supply of old growth.

Harvest of old growth trees became the mainstay of Northwest economy

Lawsuits challenged adequacy of protection of old growth species and fish in federal forest plans. Courts stopped old growth harvest until credible conservation strategies were developed.

Annual Harvest Volume for Oregon Coast Range by Owner, 1986-2000



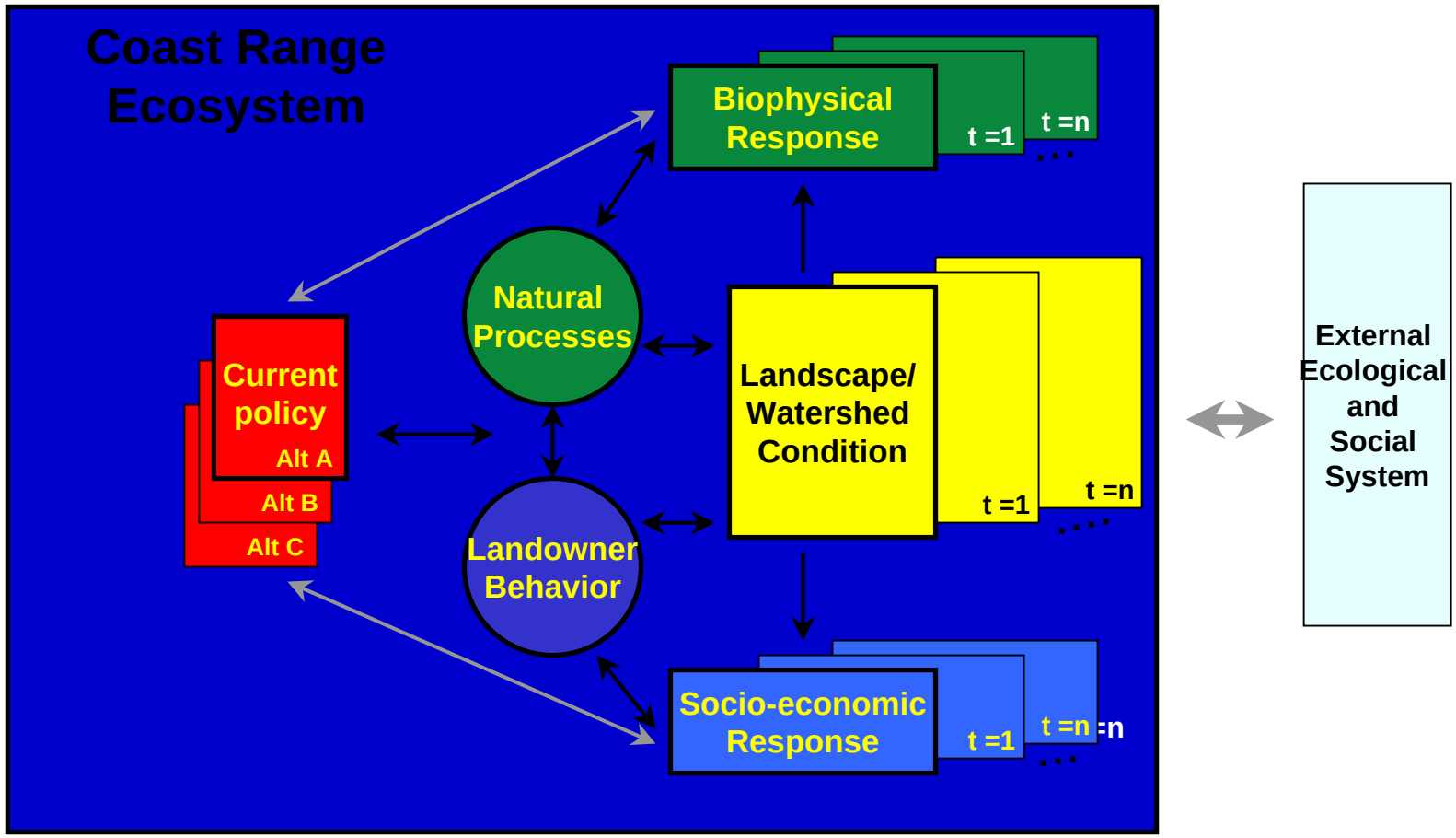
History

- Began following the NW Forest Plan 1994
- Motivated by forest management/biodiversity crises/issues
- Bottom up
- Blend of research and policy analysis
- Multi-scale, multi-ownership
- Funding slow at start—variable throughout

Goals

- Develop and evaluate concepts and tools to understand pattern and dynamics of province-scale ecosytems
- Analyze the aggregate ecological and socio-economic consequences of different forest policies
- Help policy makers understand the aggregate implications of their policies so they can make incremental adjusts to avoid the next crisis

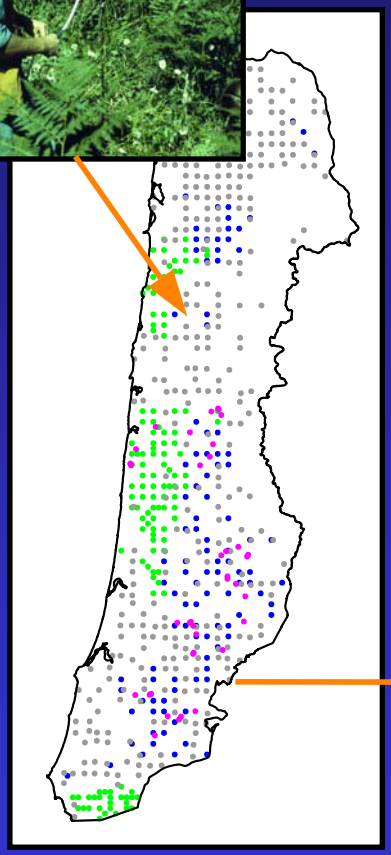
A Simulation Approach

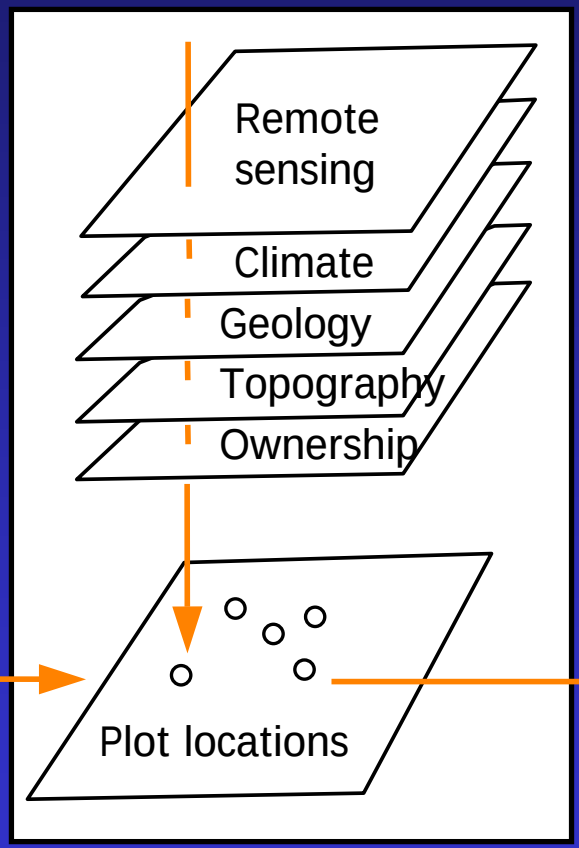


A Novel Way to Map Vegetation

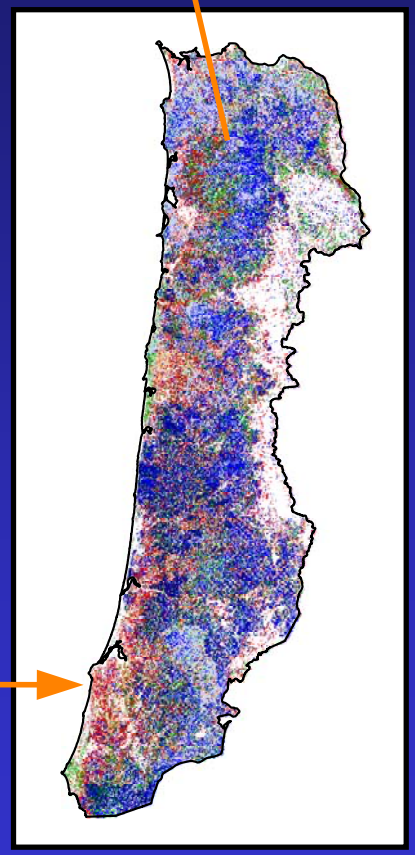
A 'tree list' for each pixel

IDNO	TREE #	SPECIES	DBHCM	HTM	CC	BHAGE	TPHPLT
41034020	101	TSHE	39.116	24.384	4	83	2.617
41034020	116	CHLA	109.728	32.309	3	136	2.617
41034020	123	TSHE	55.880	39.319	3	103	2.617
41034020	129	PSME	200.152	58.826	3	913	1.000
41034020	133	PSME	66.802	40.843	3	99	2.617
41034020	316	TSHE	57.404	40.234	3	80	2.617
41034020	319	CHLA	105.664	45.110	3	244	2.617
41034020	320	CHLA	80.518	42.062	4	349	2.617





Statistical model

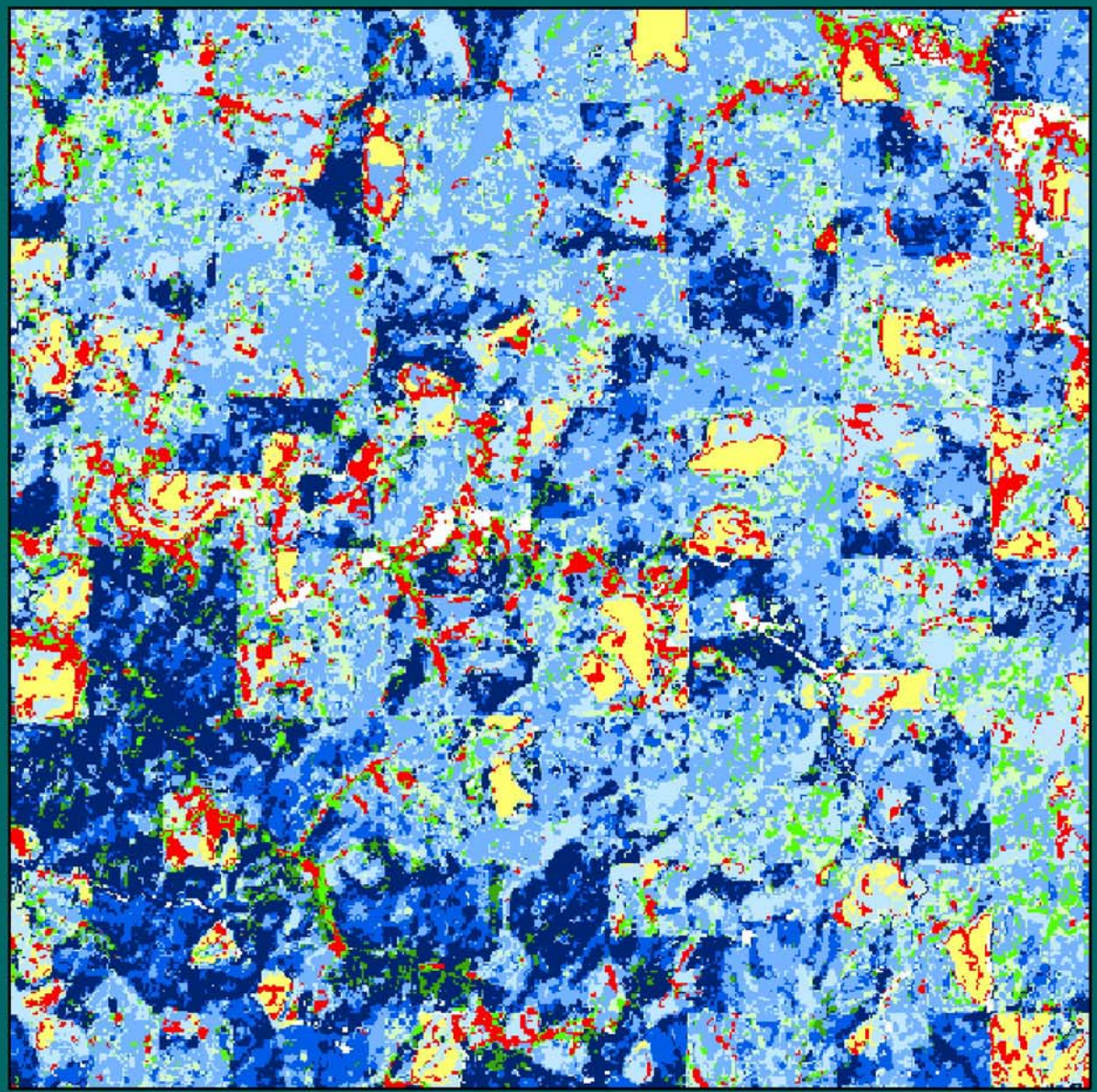


Data from plots (FIA, CVS, BLM, OG)

Spatial data in GIS

Vegetation maps (1996)

CLAMS vegetation map ...somewhere SW of Eugene, 1996

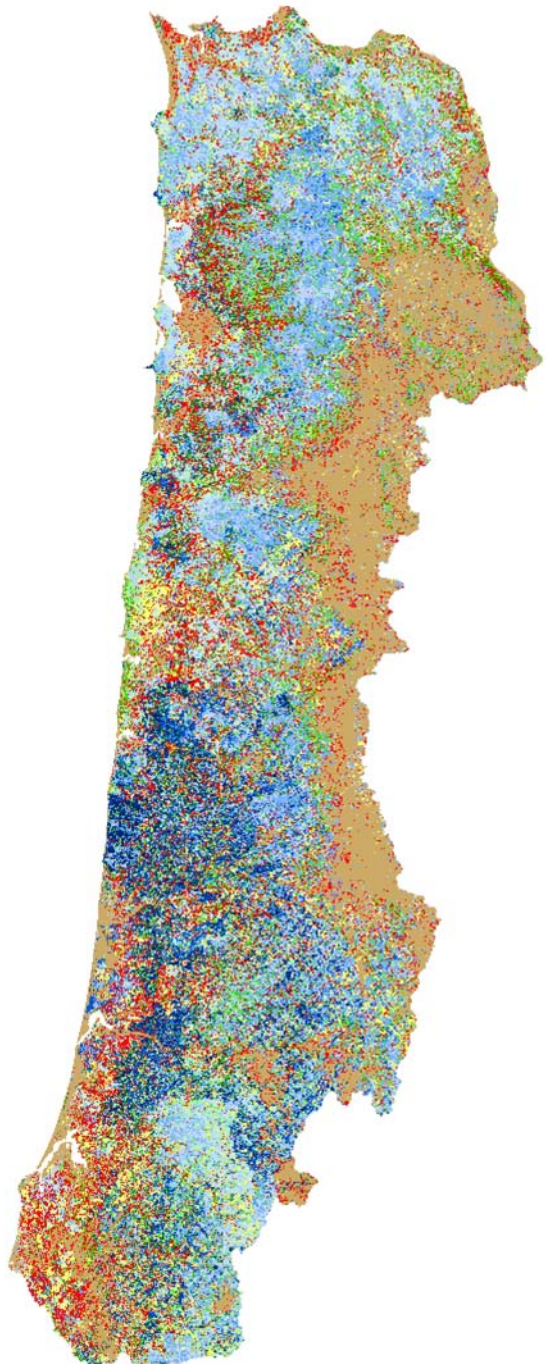


nonforest
open
broadleaf
mixed, small
mixed, medium
mixed, large
mixed, very large
conifer, small
conifer, medium
conifer, large
conifer, very large
mixed, very small
conifer, very small

2 1 0 2 KM

Vegetation Classes
1996 – Initial Period
Base Policy

- Not Simulated
- Open Forest
- Broadleaf
- Mixed Small
- Mixed Medium
- Mixed Large
- Mixed Very Large
- Conifer Small
- Conifer Medium
- Conifer Large
- Conifer Very Large
- Mixed Very Small
- Conifer Very Small
- Remnants

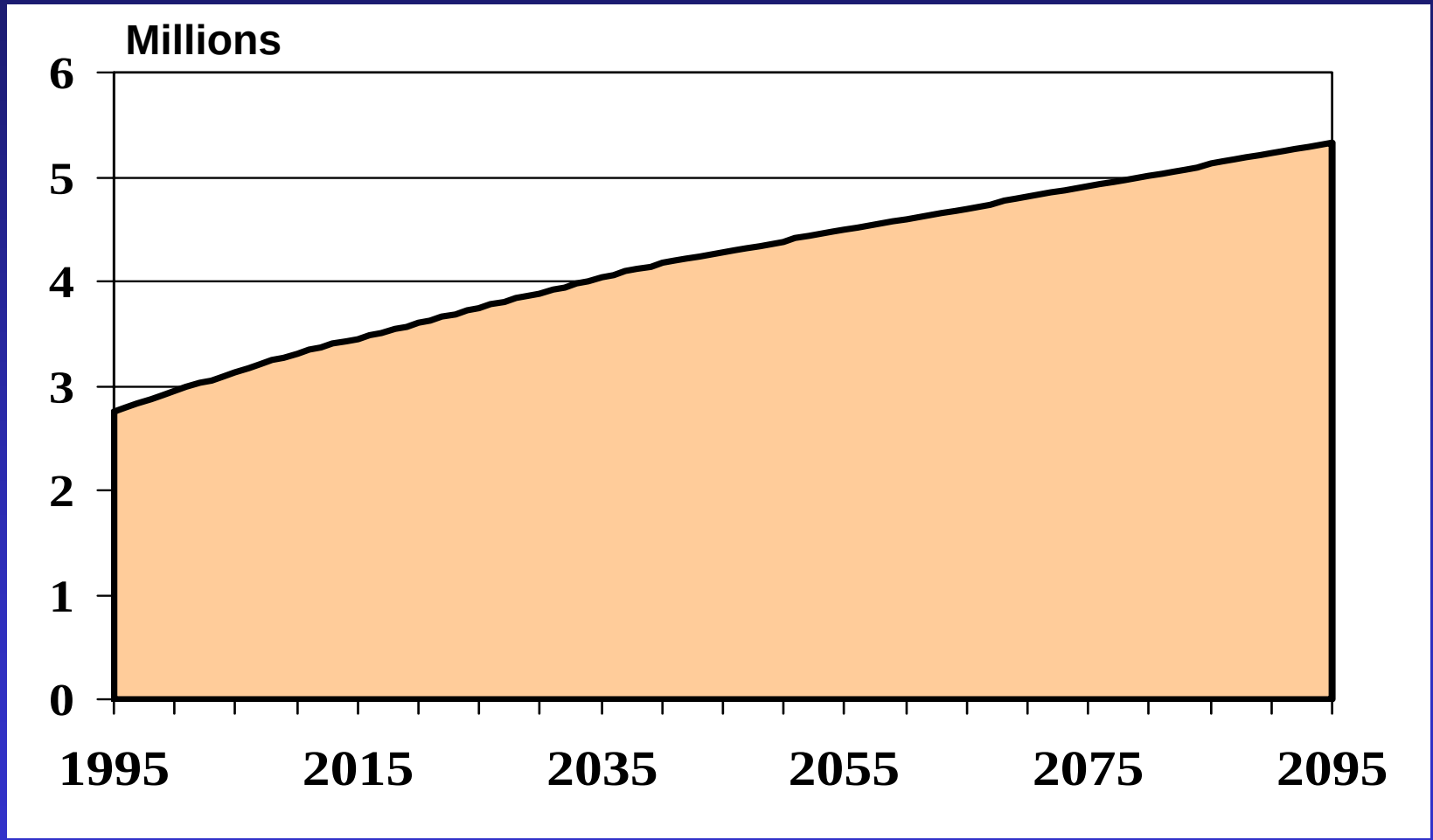


Dynamics in Model

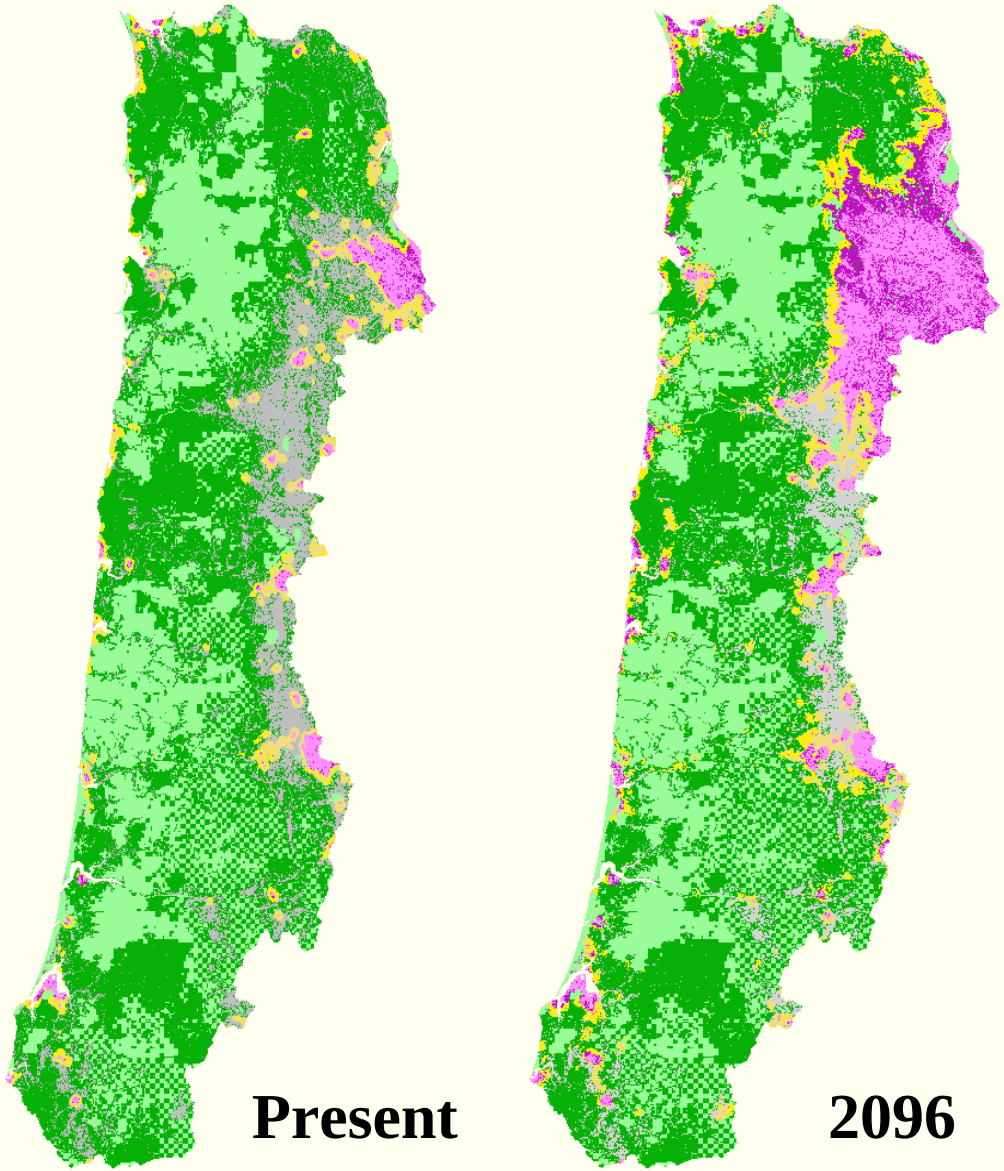
- Land-use change
- Logging—regeneration cuts and thinning
- Small natural gap disturbances (<2ha)
- Landslides and debris flow potential (response only)
- Succession and stand development

Land Development

Projected Population in Western Oregon



Land Development

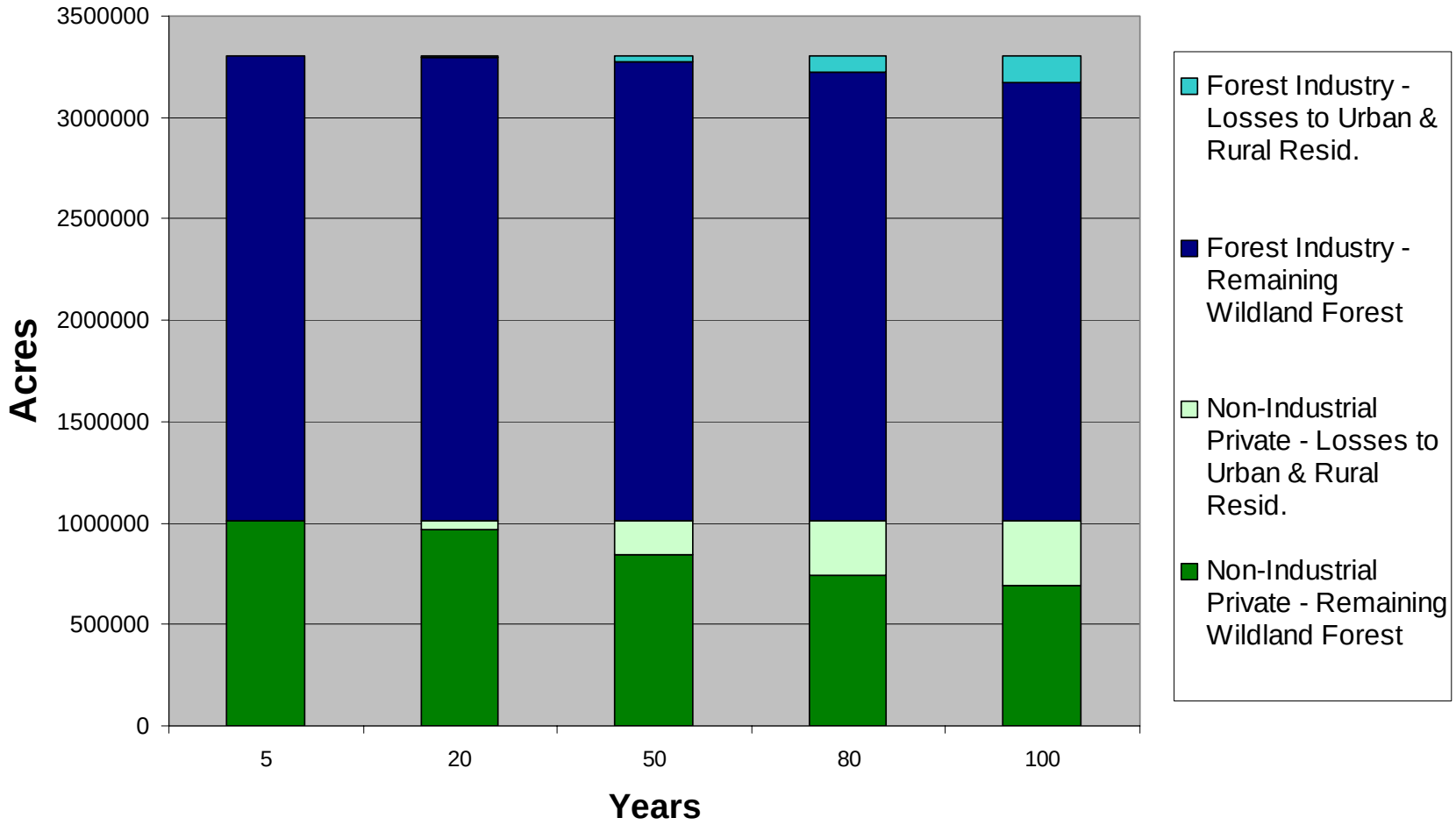


PUBLIC & TRIBAL LANDS

PRIVATE LANDS

- Urban Forest
- Urban Non-Forest
- Low-Density Residential Forest
- Low-Density Residential Non-Forest
- Wildland forest
- Non-Forest

Simulated Land Use on Private Wildland Forest Over the Next 100 Years



Land Development

Development of Oregon's Coast Range over the next 100 years should leave intact a large majority of coastal forests. Still, significant losses are projected for private forests around Portland and in Coastal valleys.

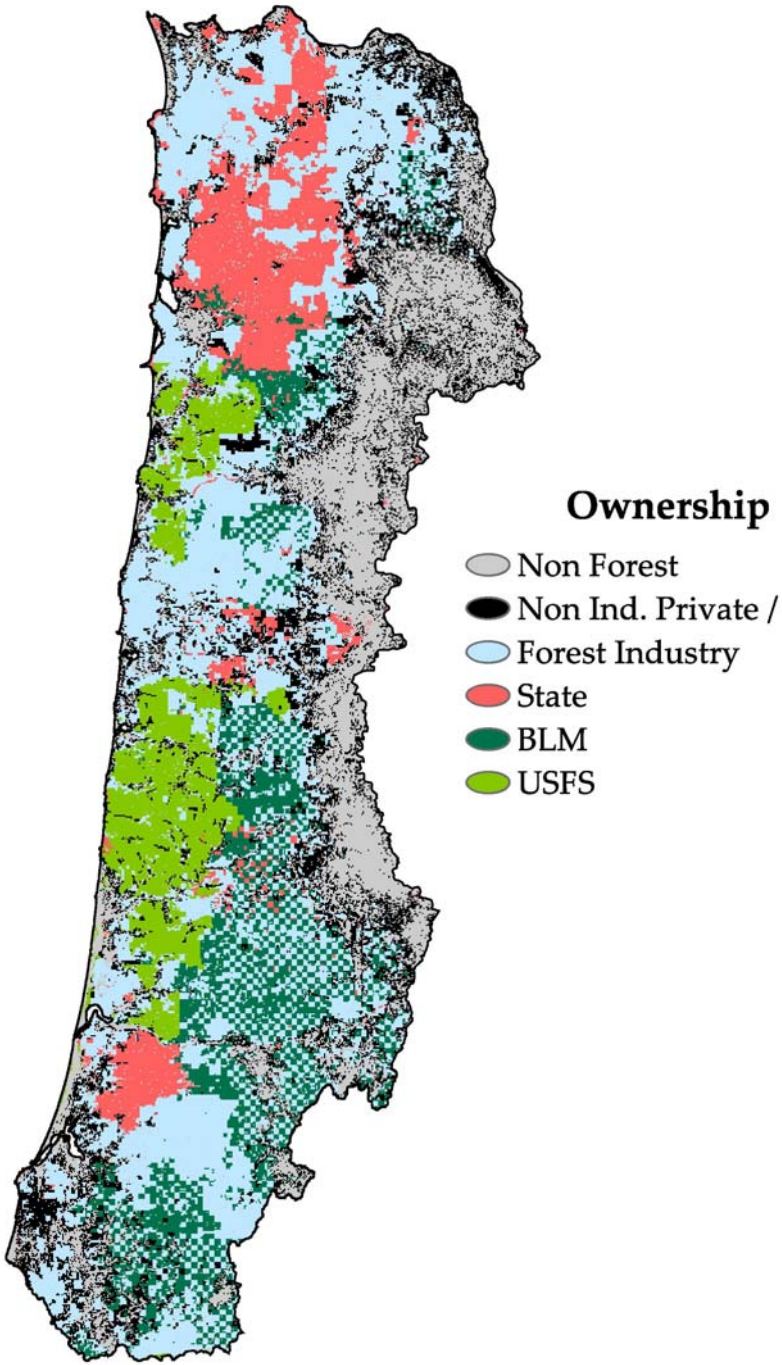
Land Development

Greatest unknown: potential “speckling” of homes through remaining wildland forest and how that speckling will affect commercial forestry

Public Policy Framework for Forest Management

- Northwest Forest Plan (federal)
- State plan
- Tribal and county plans
- Forest Practice Rules for private lands- riparian areas, “free to grow” plantations, wildlife leave trees, clearcut size (48 ha/5yrs)

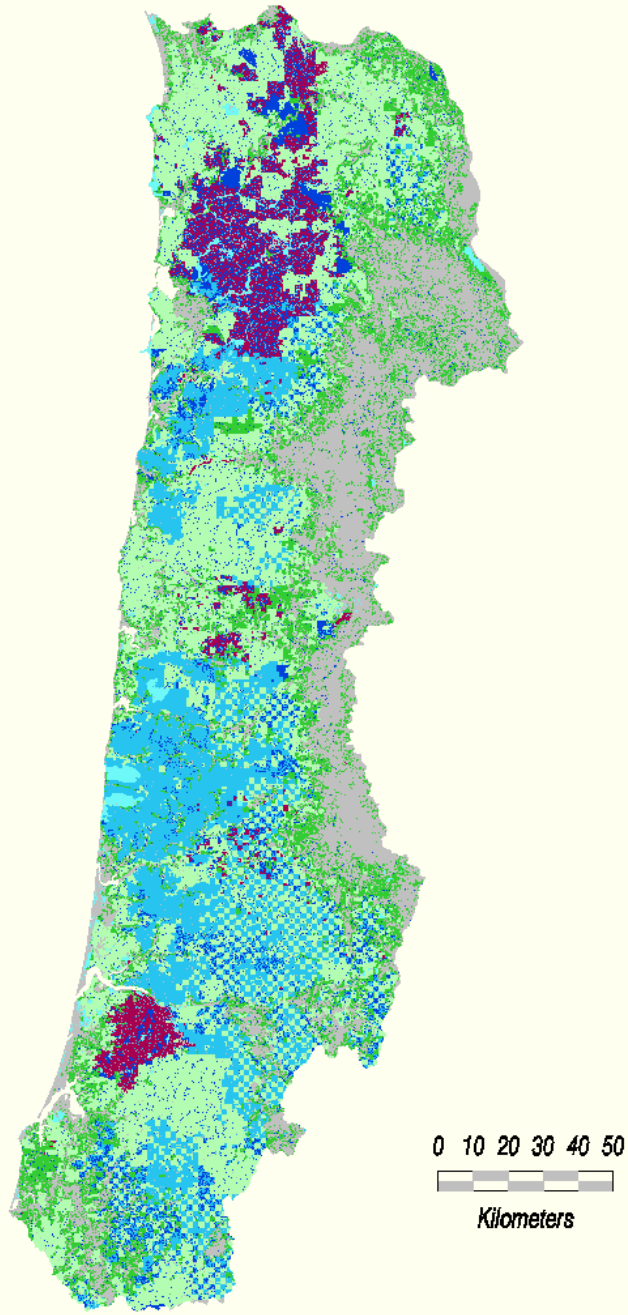
A multi-ownership view



Owner	Policy	Goals	Strategy
USFS and BLM	NW Forest Plan Forest Plans	LS/OG T&E species Aquatic Commodities	Reserves Matrix Gr-Tree retention AMA
State of Oregon	New Forest plans	Healthy forests Indigenous species Abundant timber T&E species	Structure-based management Hab. Cons. Plan
Private. Industrial and Non-Industrial	Forest Practices Act	Priority to growth and harvest of trees Protect environment and fish/wildlife	Retain trees in clearcuts, Streamside protection rules

Management Emphasis 2001

- *Non-forest*
- *No harvest*
- *Ecological objectives*
- *Ecol. obj. (primary)*
  Timber prod. obj. (secondary)
- *Timber prod. under envir. consts.*
- *Timber prod. & other obj. under envir. consts.*
- *Complex mixture of timber & ecol. obj.*



Likely Management Behavior

Estimating Likely Forest Management Practices Under Current Policy

	Historical Data	Group Survey	Tailored to Landowner
FS			X
BLM			X
State			X
FI	X	X	X
NIP	X	X	

Forest Industry Rotation Ages for Even-Aged Management in CLAMS Area (1999)

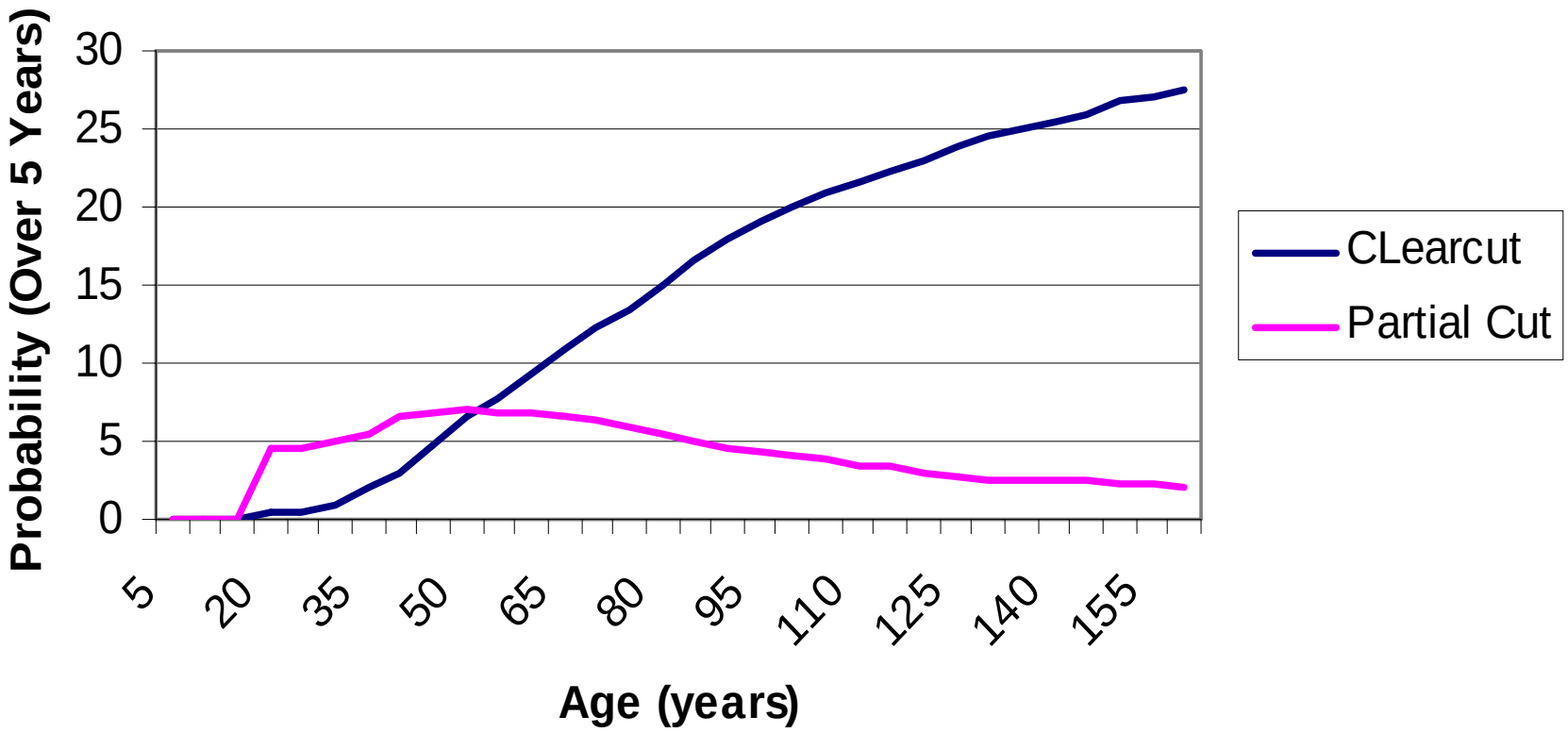
- Range: 30-70
- Douglas-fir: 50
- Red Alder: 43

Forest Industry Management

Goal of simulation:

- Find a sustainable harvest level while moving to a 45-50 year rotation and harvesting the most valuable stands first in patch sizes similar to recent history

Harvest Probabilities for NIPF Lands

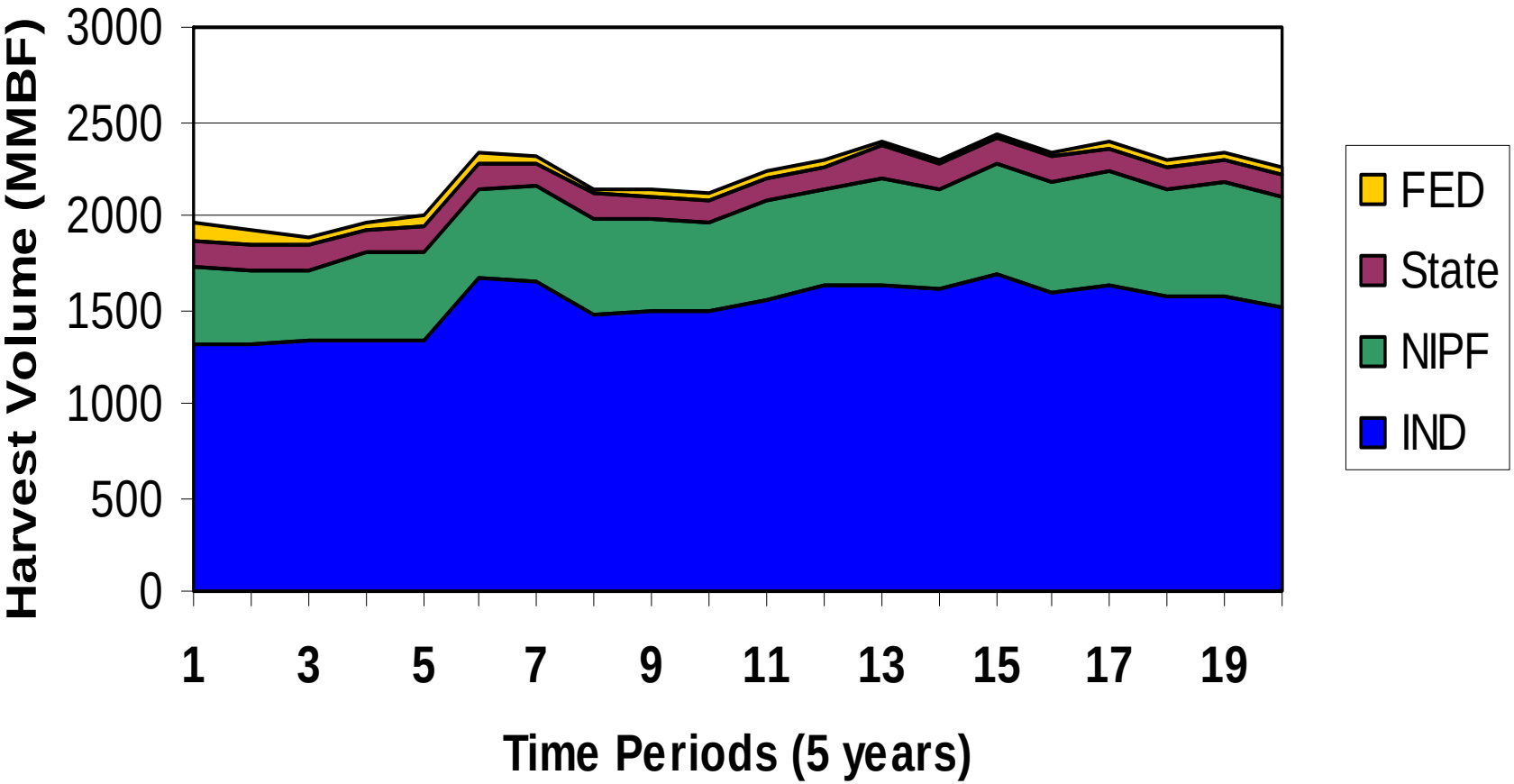


Source: Lettman and Cambell (1997)

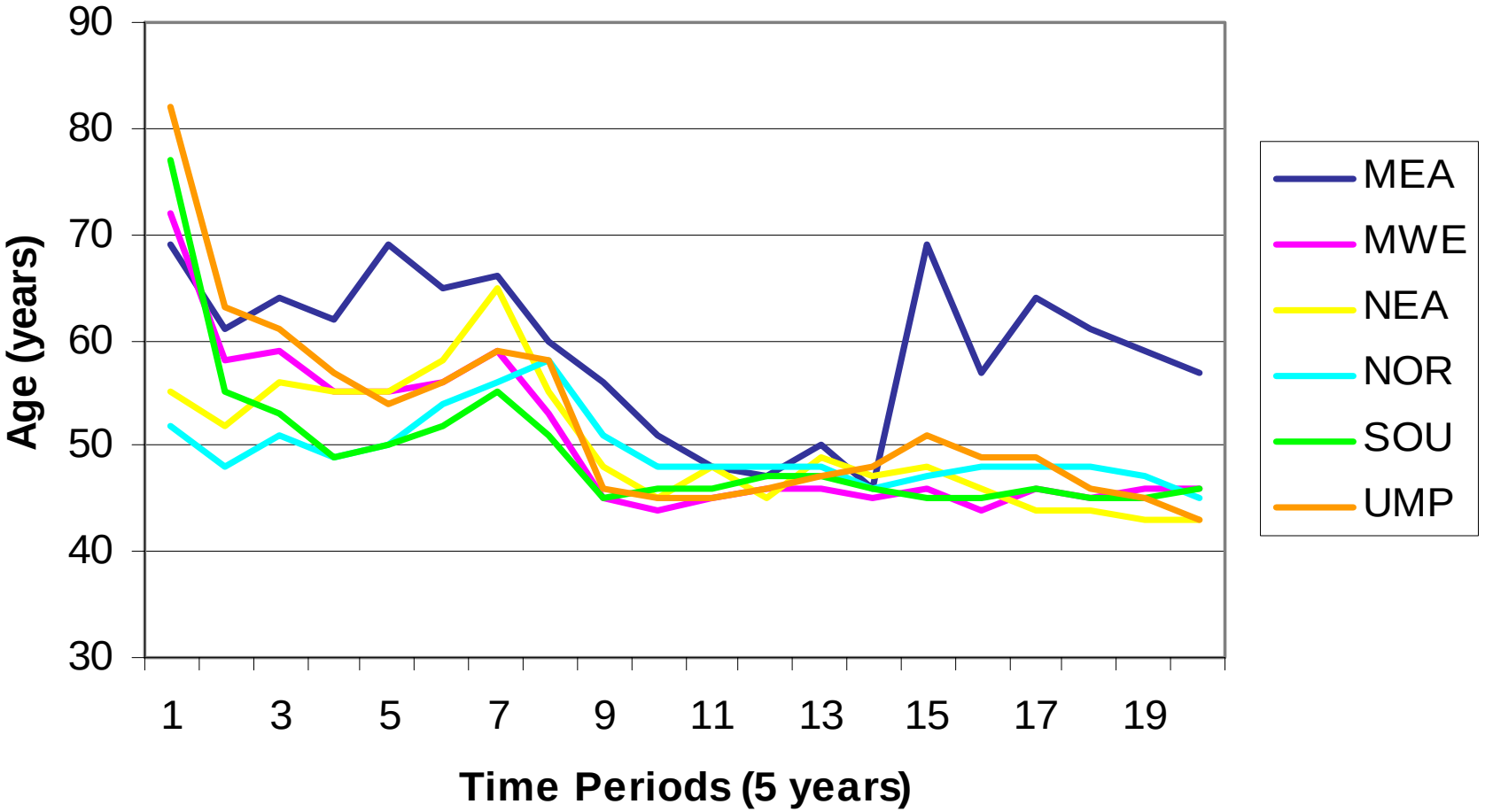
Federal Management

- Matrix volume targets
- LSR thinning to reduce density in conifer plantations

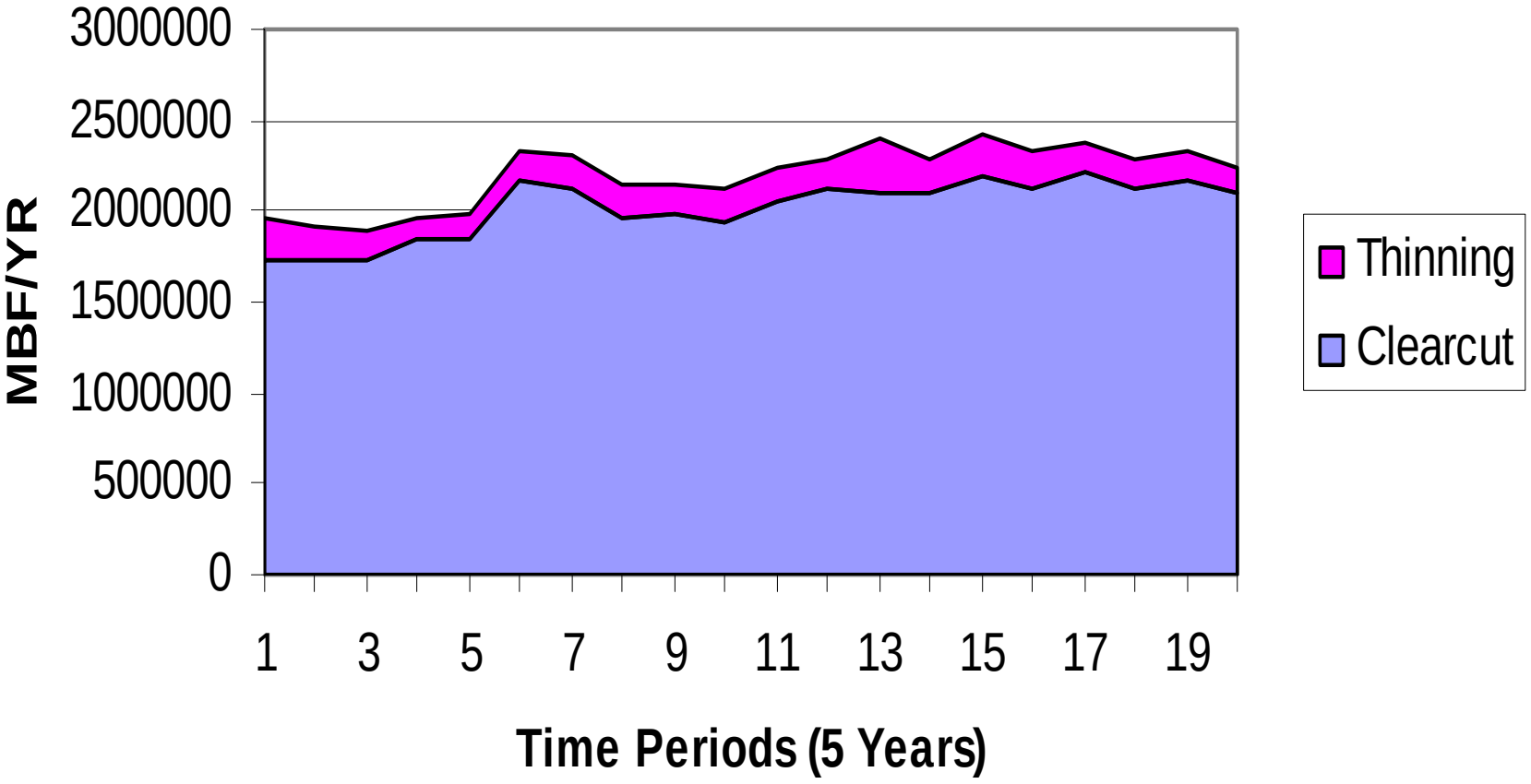
Annual Harvest Volume by Owner
Base Policy



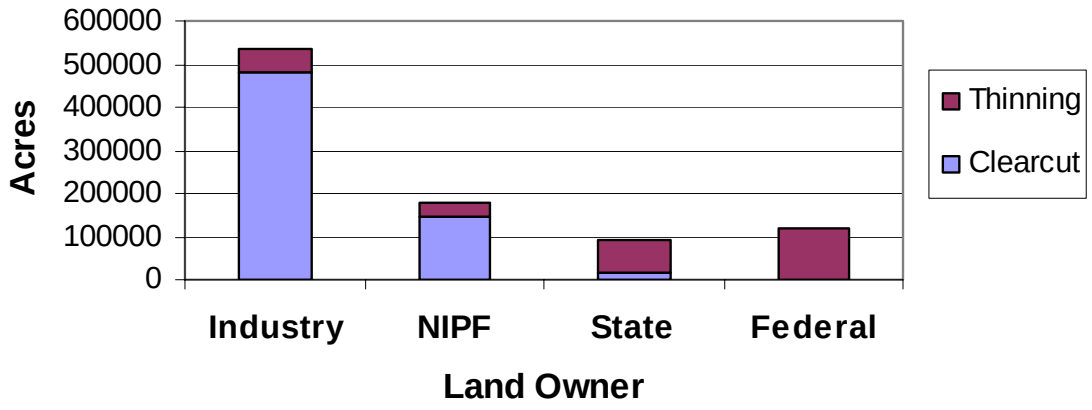
Industry Average Harvest Ages
Base Policy



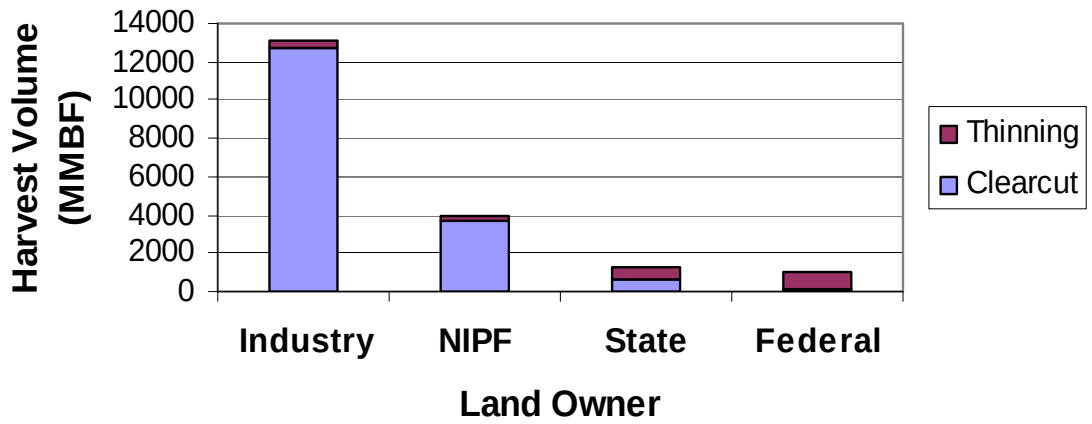
Annual Harvest Volume (All Owners)
Base Policy

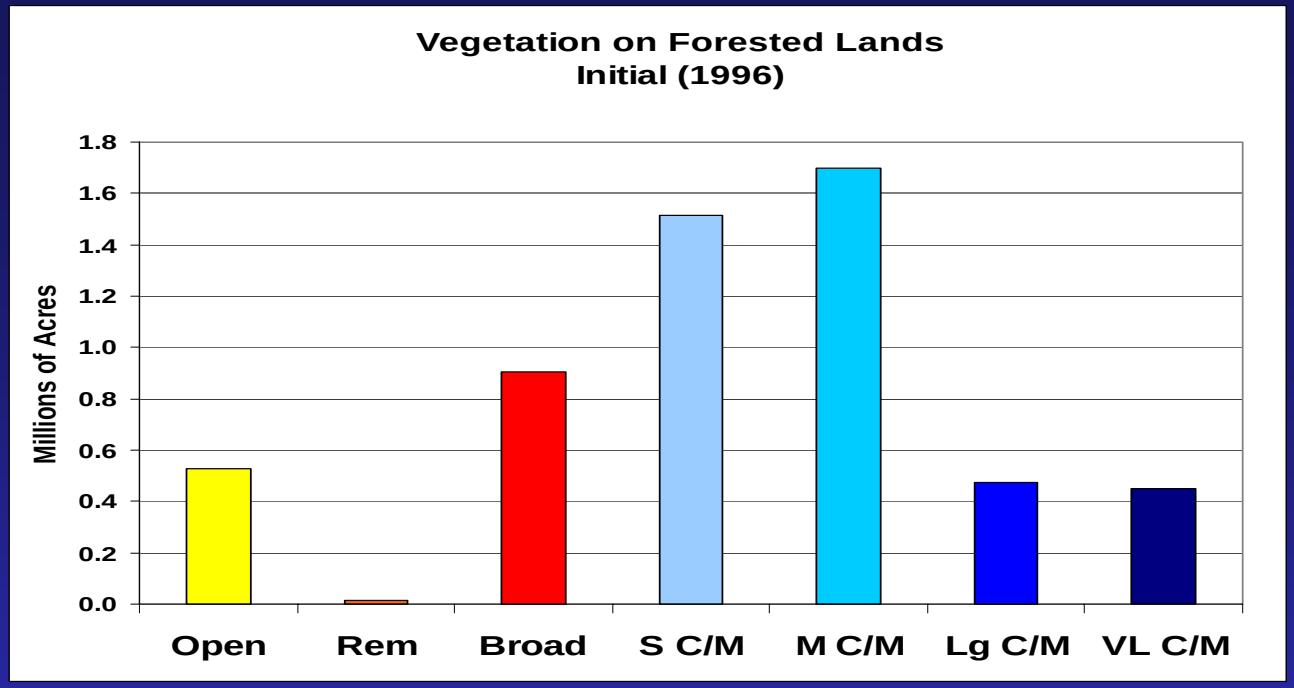


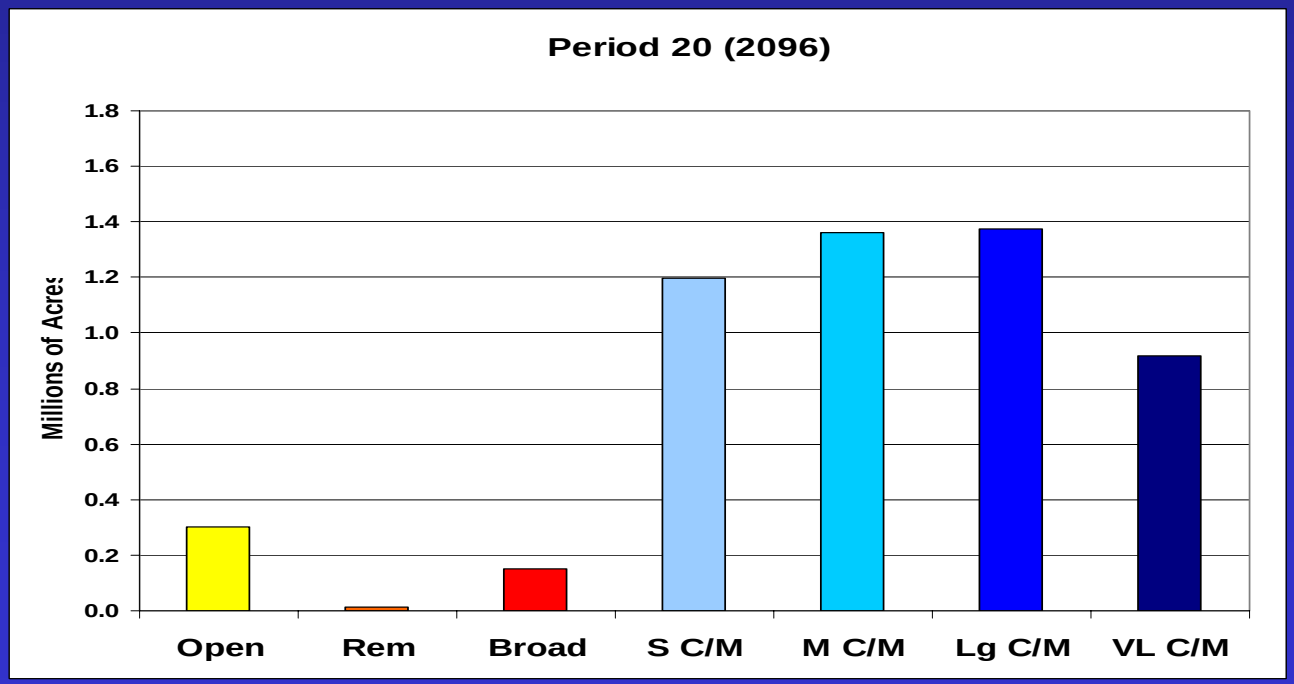
First Decade Harvest Acres
Base Policy

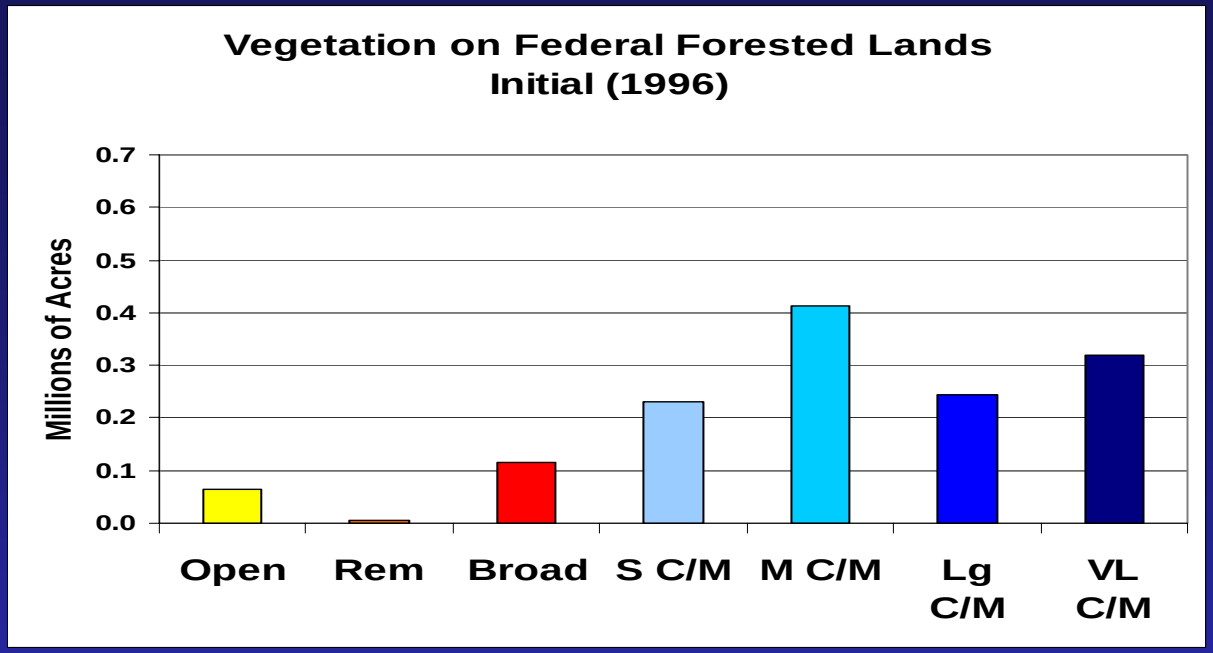


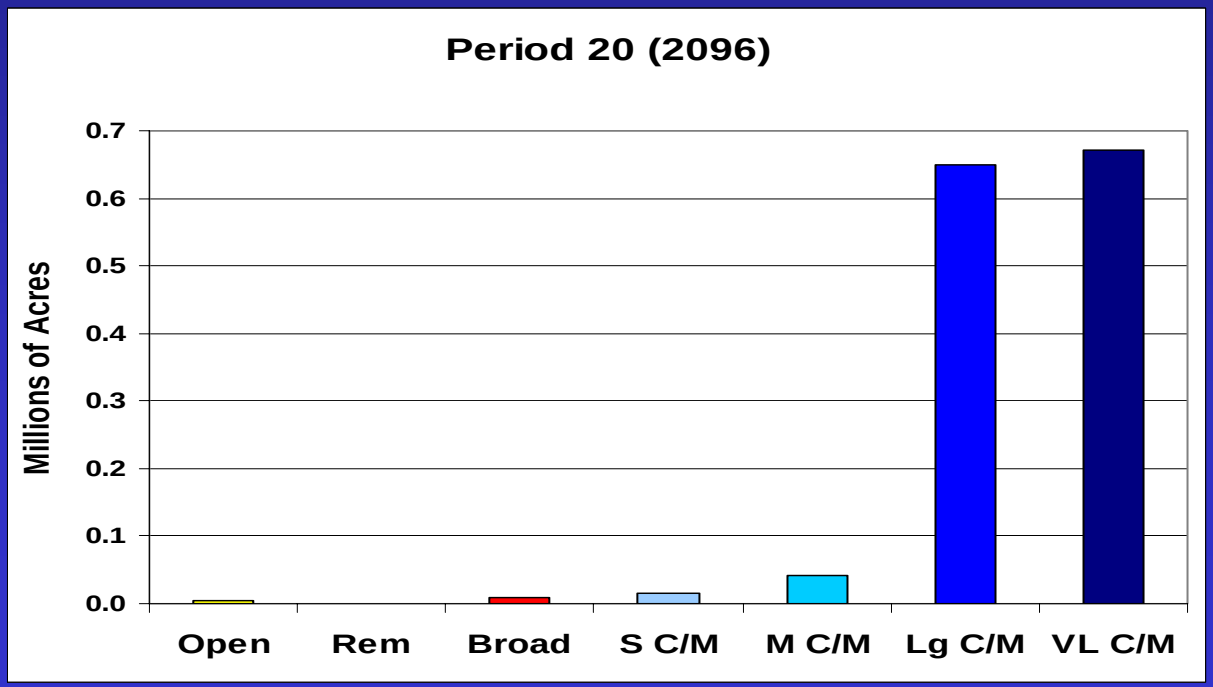
First Decade Harvest Volume
Base Policy

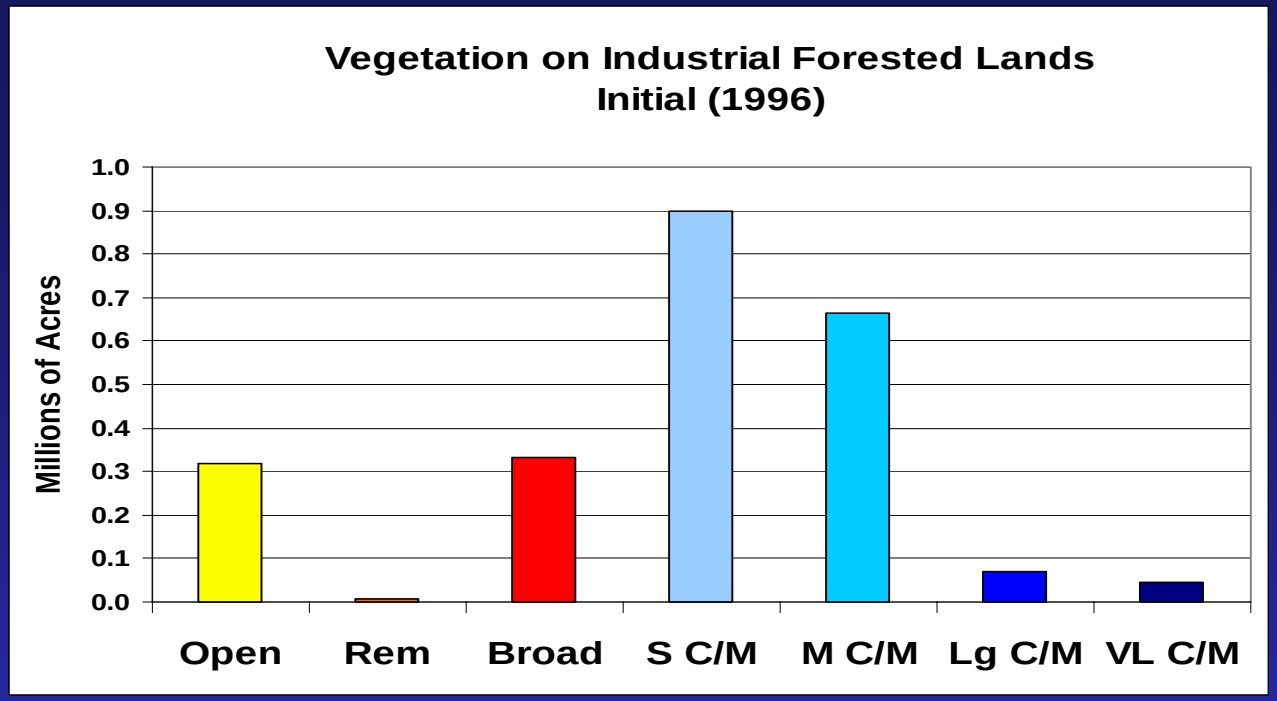


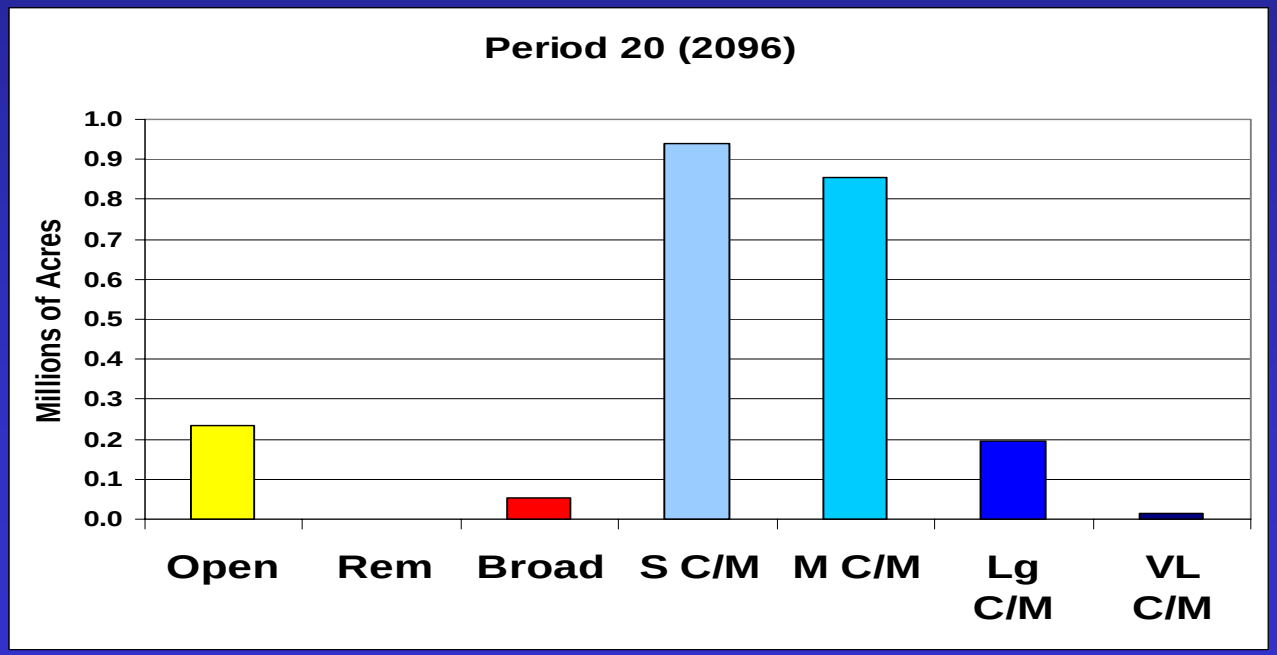

Vegetation on Forested Lands
Initial (1996)
Millions of Acres
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Open
Rem
Broad
S C/M
M C/M
Lg C/M
VL C/M


Period 20 (2096)
Millions of Acres
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Open
Rem
Broad
S C/M
M C/M
Lg C/M
VL C/M


Vegetation on Federal Forested Lands
Initial (1996)
Millions of Acres
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Open
Rem
Broad
S C/M
M C/M
Lg C/M
VL C/M


Period 20 (2096)
Millions of Acres
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Open
Rem
Broad
S C/M
M C/M
Lg C/M
VL C/M


Vegetation on Industrial Forested Lands
Initial (1996)
Millions of Acres
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Open
Rem
Broad
S C/M
M C/M
Lg C/M
VL C/M


Period 20 (2096)
Millions of Acres
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Open
Rem
Broad
S C/M
M C/M
Lg C/M
VL C/M

Vegetation Classes
1996 – Initial Period
Base Policy

- Not Simulated
- Open Forest
- Broadleaf
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- Mixed Very Large
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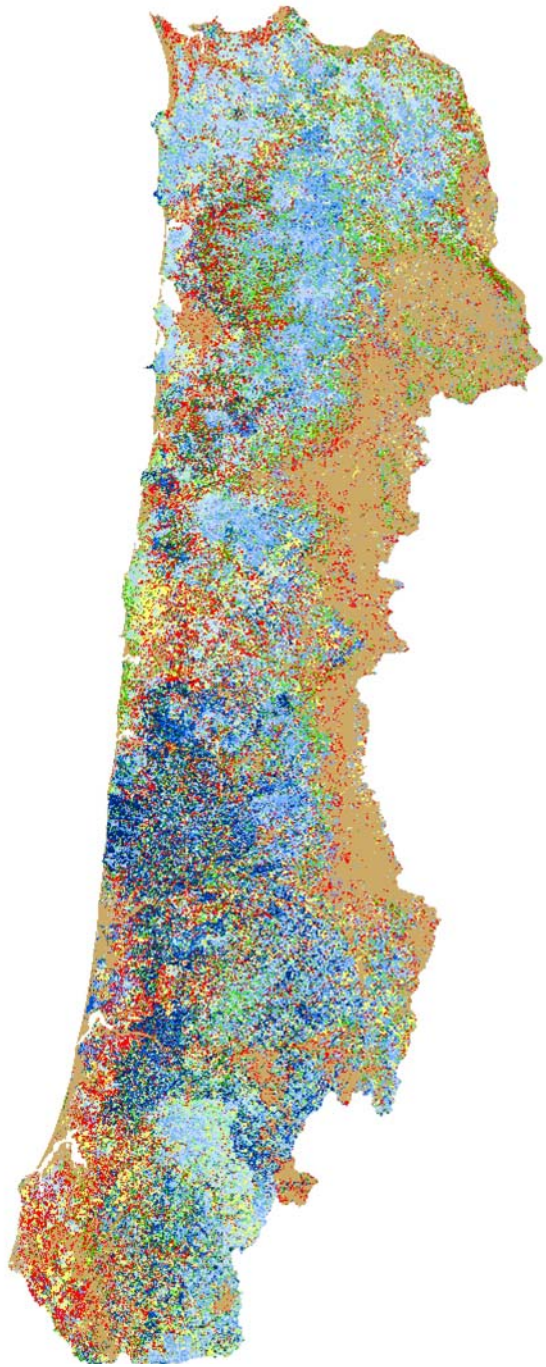
- Conifer Very Small
- Remnants



Vegetation Classes 2046 – Projected Base Policy

- Not Simulated
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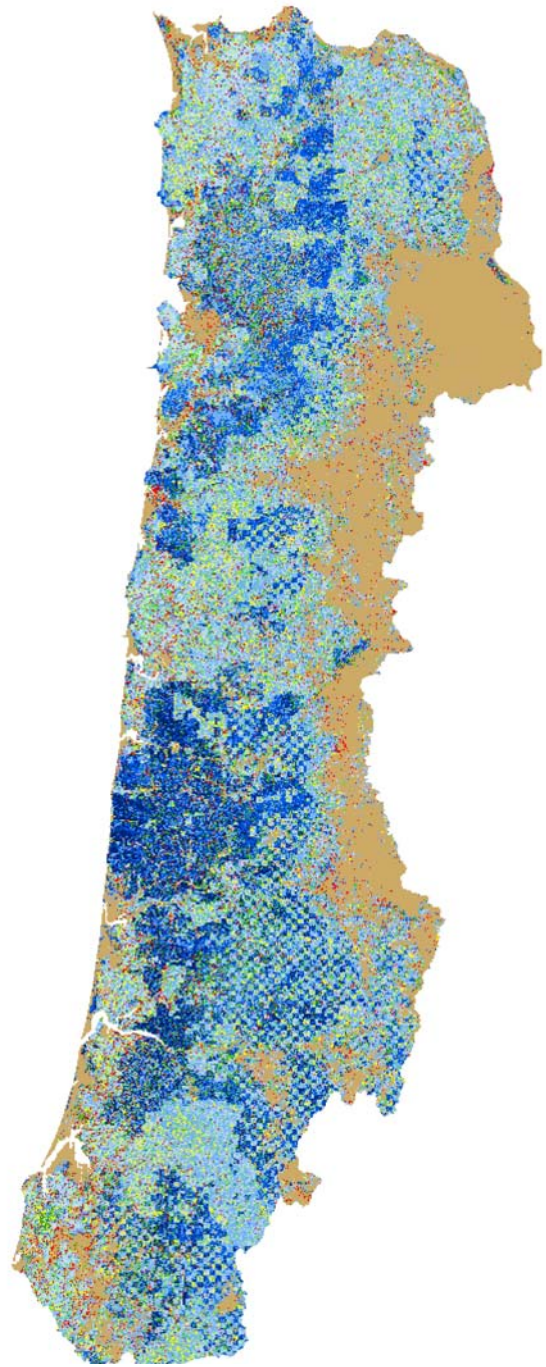

Vegetation Classes 2096 – Projected Base Policy

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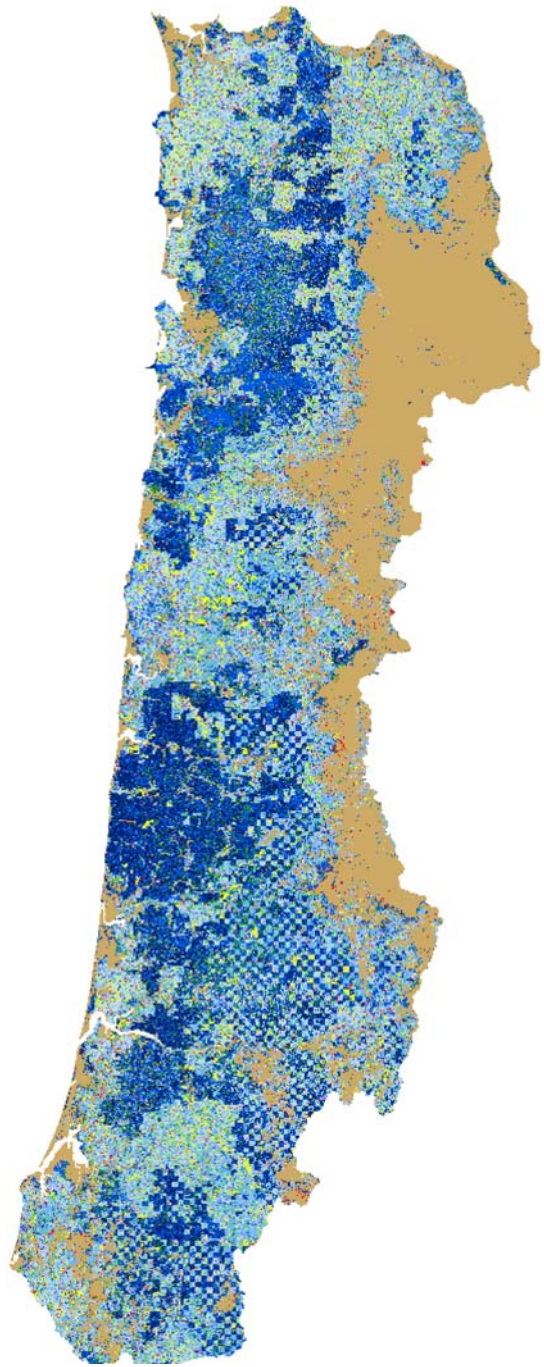

Vegetation Classes 1996 – Initial Period Base Policy

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- Broadleaf
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- Conifer Large
- Conifer Very Large
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- Conifer Very Small
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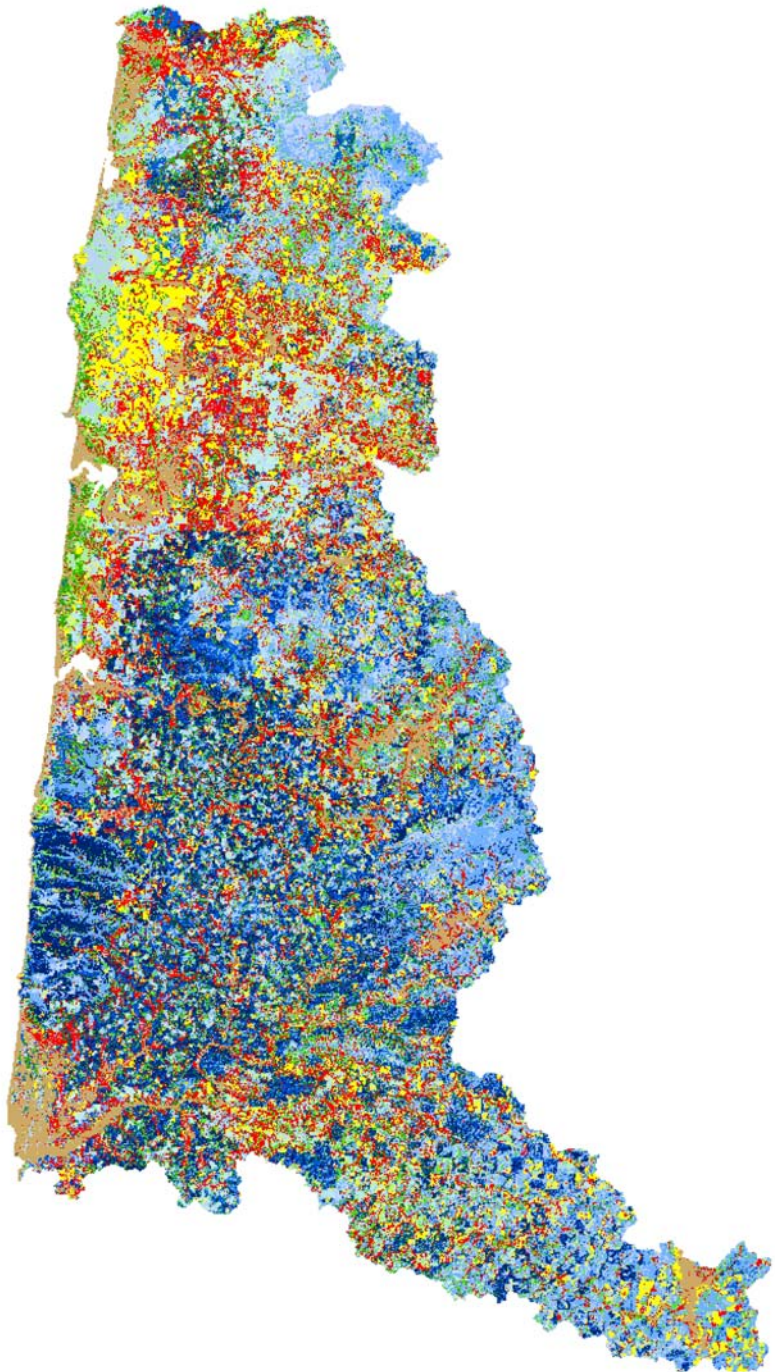

Vegetation Classes 2046 – Projected Base Policy

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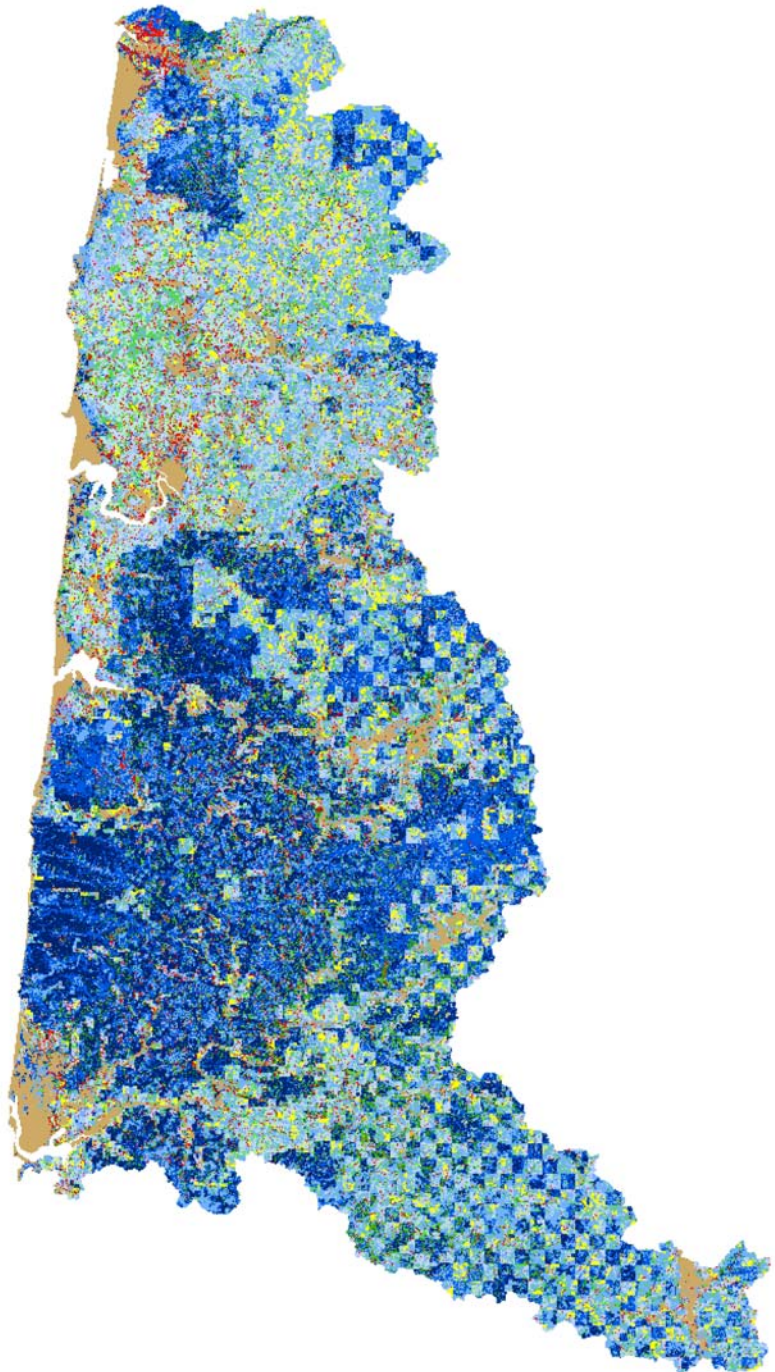

Vegetation Classes 2096 – Projected Base Policy

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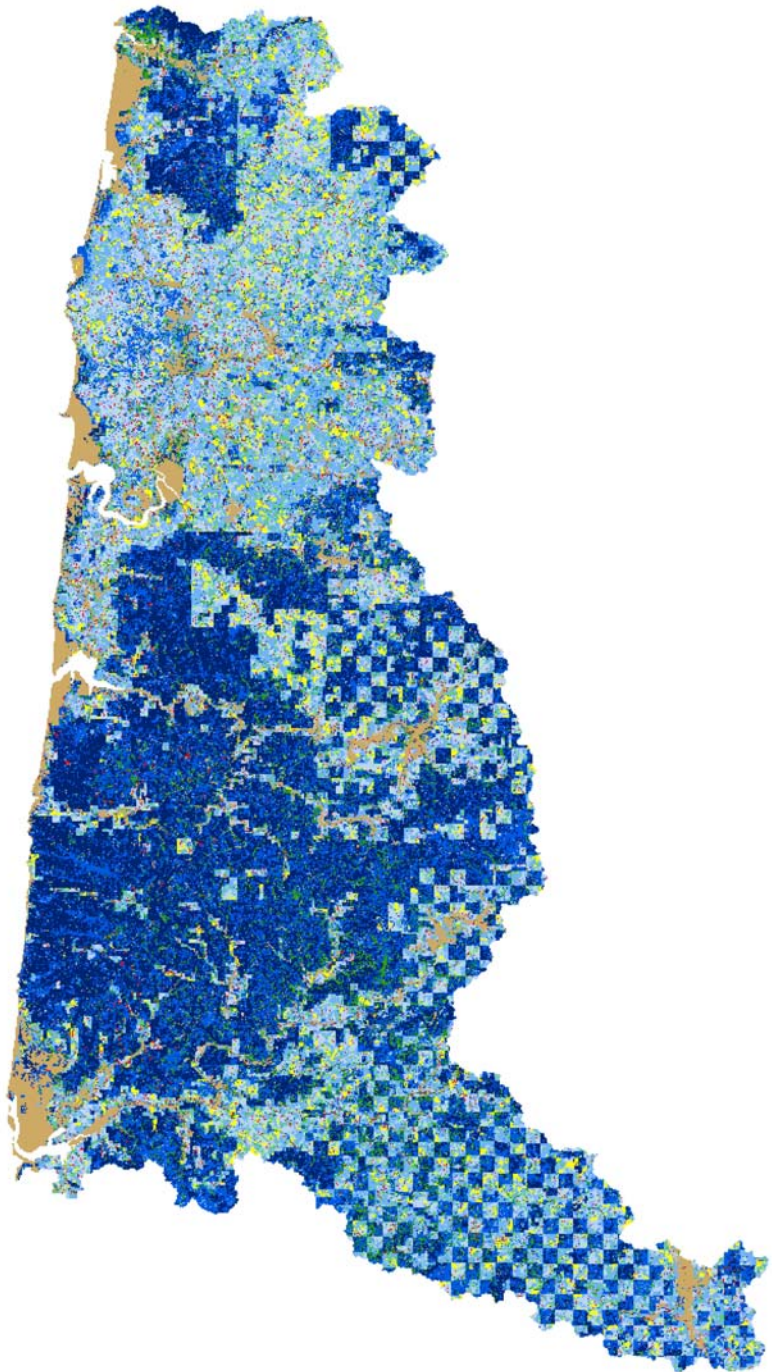
- Conifer Very Small
- Remnants



Biological diversity measures

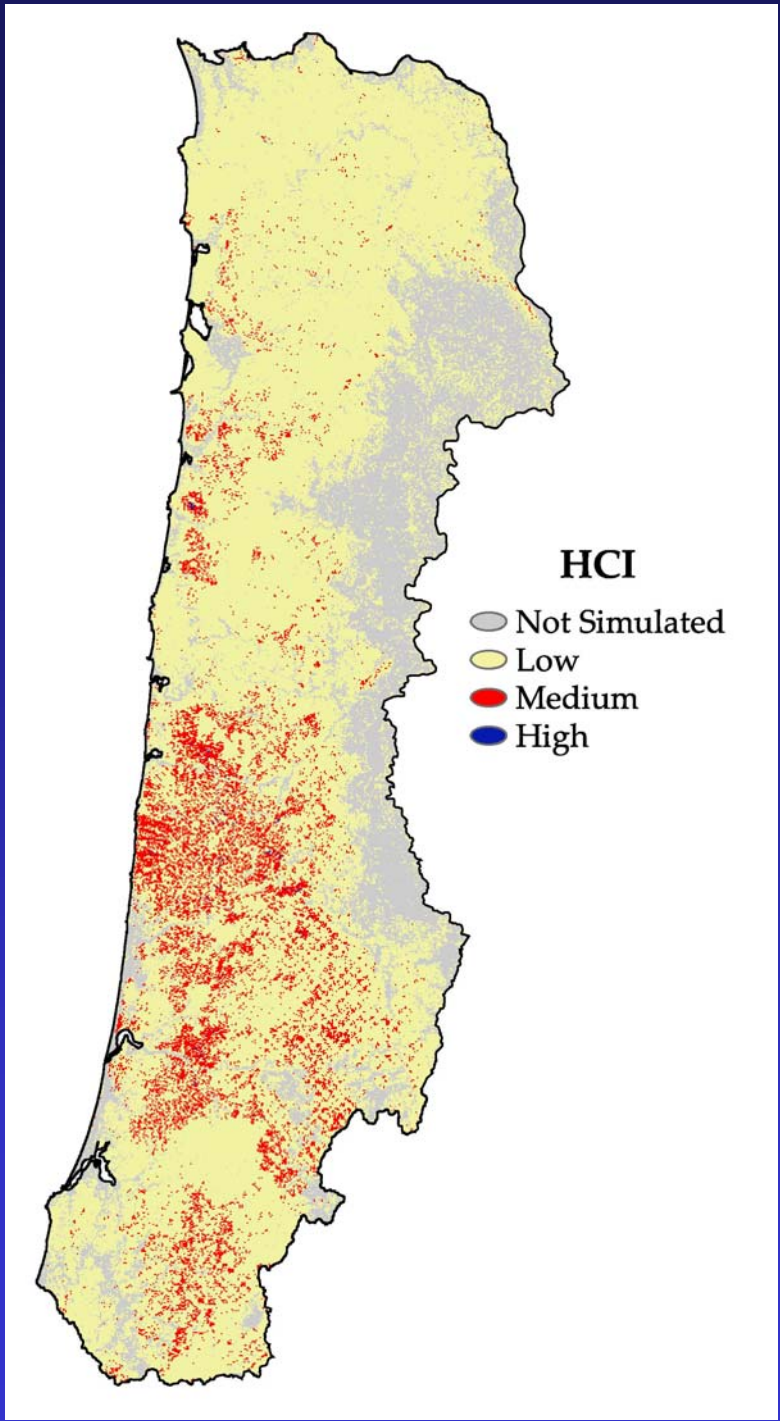
- **Focal Species**
  - **habitat quality and abundance**
    - Northern Spotted Owl
    - Marbled Murrelet
    - Olive-sided Flycatcher
    - Canopy Lichens
    - Red Tree Vole
    - Western Blue Bird
    - Salmonid Habitat

- **Community level**
  - –Vegetation types
  - –Landscape pattern

- **Ecosystem Dynamics**
  - -Landslides and debris flows
  - -Historical Range of Variability

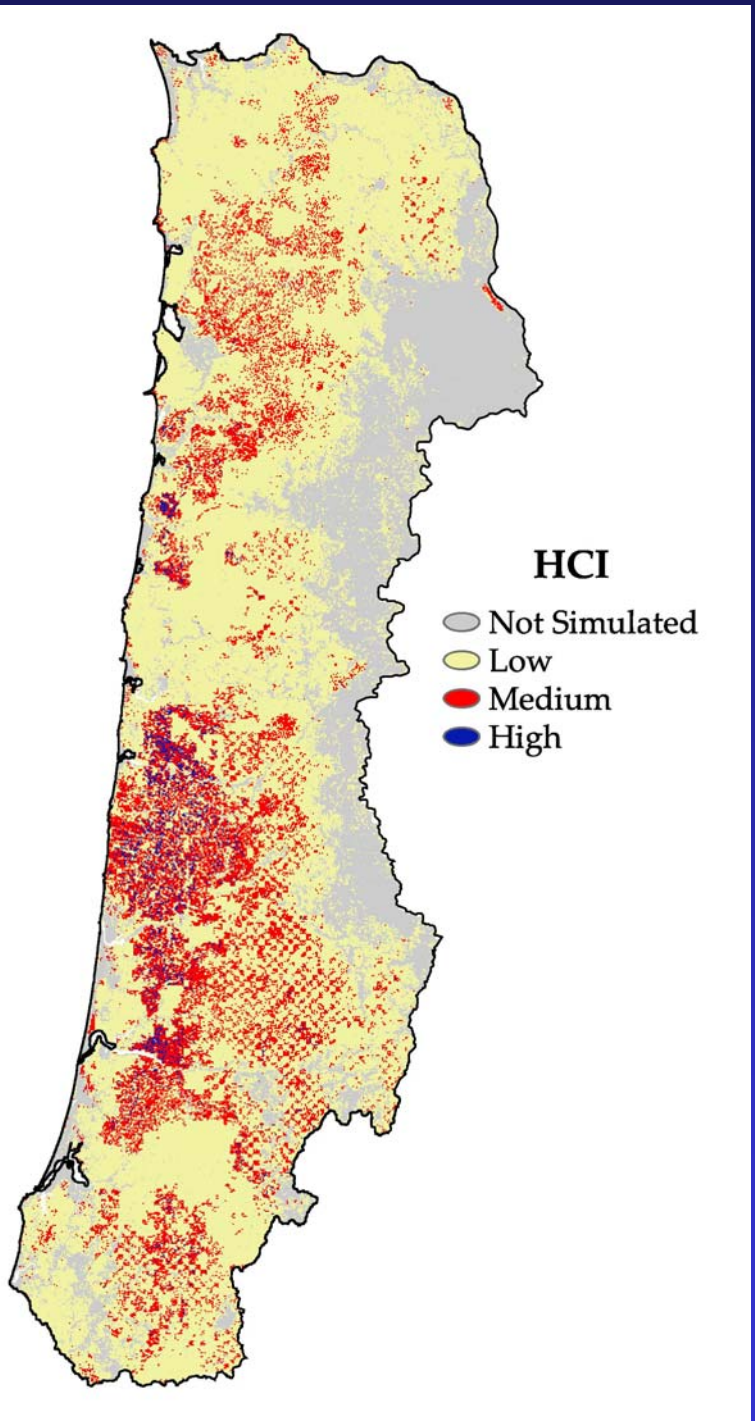
Northern Spotted Owl Habitat Suitability Index

- **Nesting Suitability Index (patch)**
  - Density of trees > 100cm dbh/ha
  - Diameter Diversity Index
- **Foraging Suitability Index (patch/landscape level)**
  - Canopy height
  - Diameter Diversity Index
  - Habitat availability within 2.2 km of patch
- HSI = SQRT (NSI * FSI)



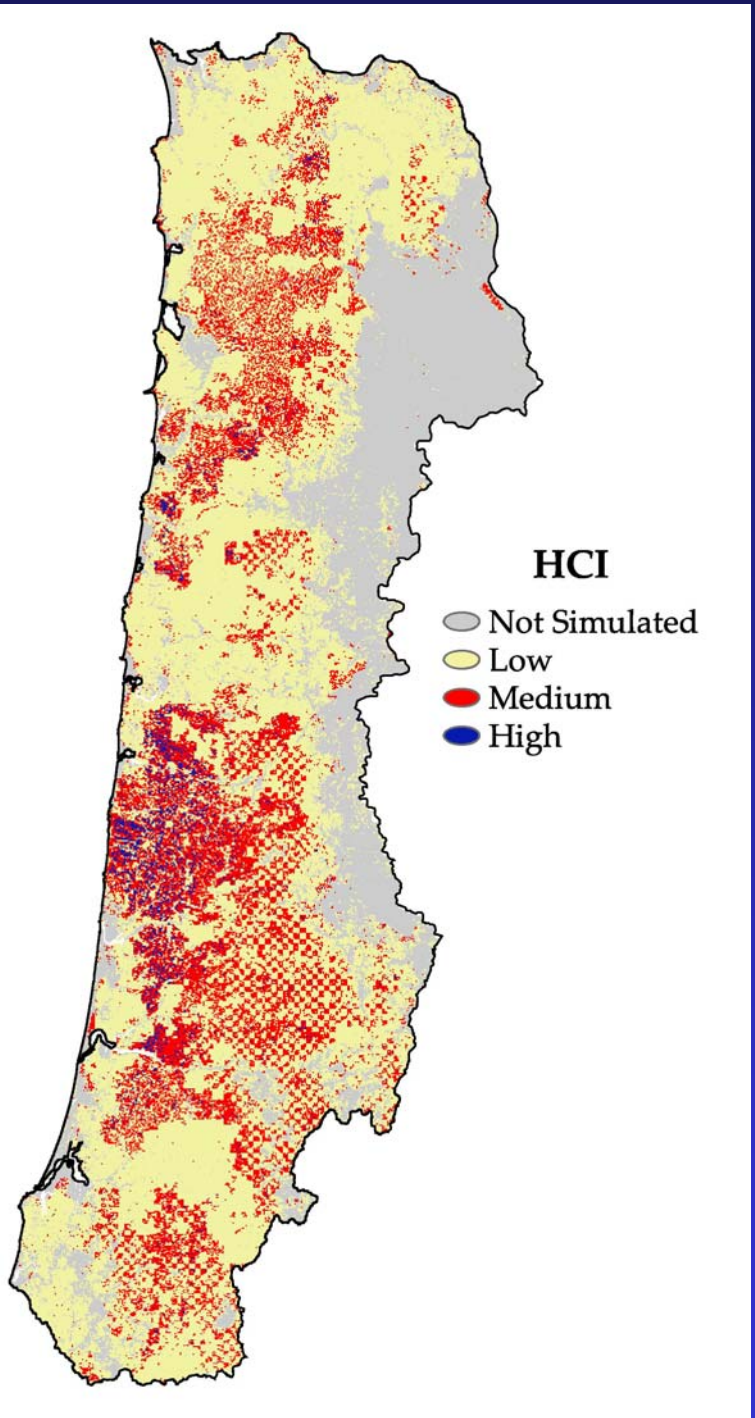
Northern Spotted Owl

1996



Northern Spotted Owl

Base Policy - 2046



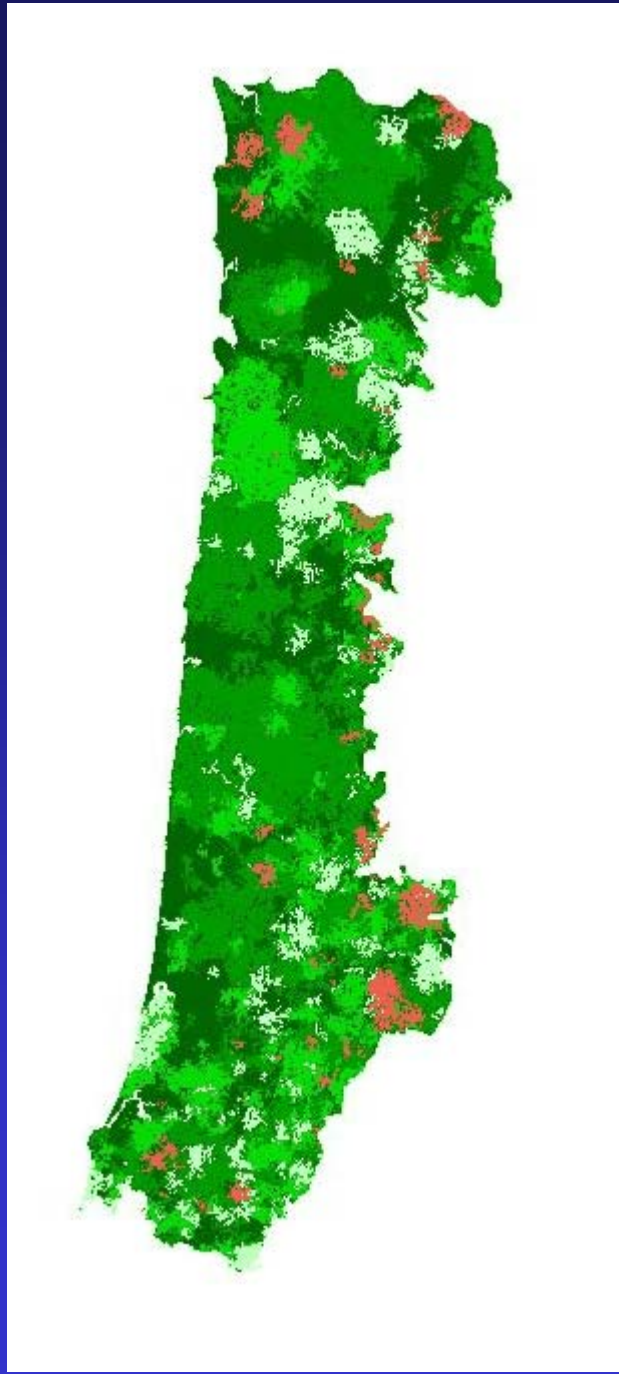
Northern Spotted Owl

Base Policy - 2096

Forest Dynamics

Stand Age

- < 10
- 11 - 40
- 41 - 80
- 81 - 200
- > 200

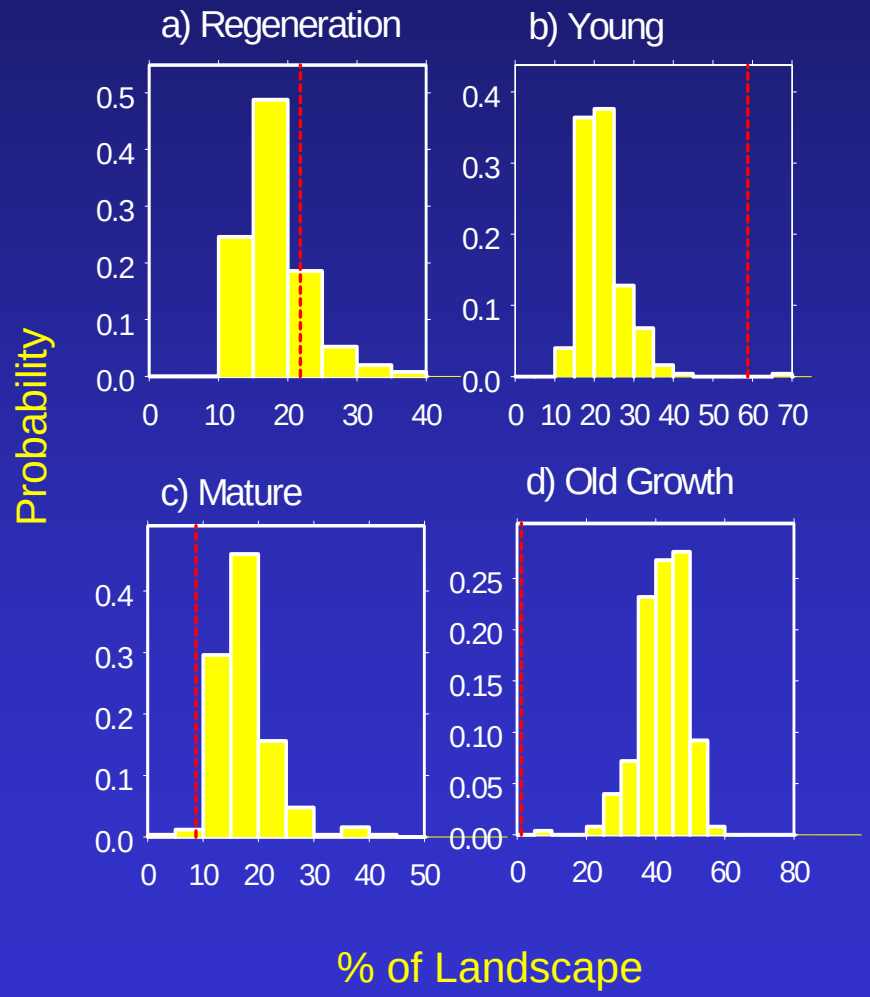


Three Centuries Of Simulated Pre-Columbian Fire History in Oregon Coast Range

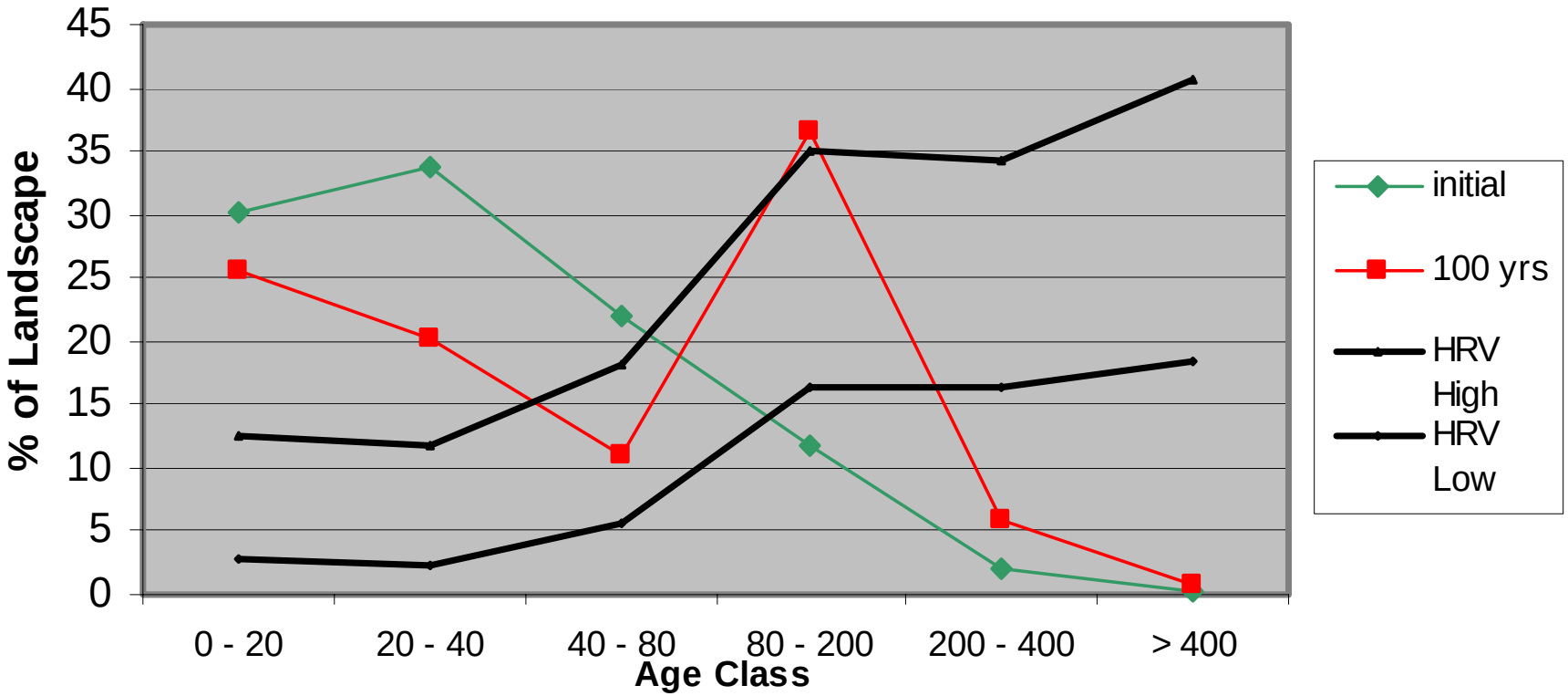
By Nonaka
Wimberly and Spies

Historical Range of Variability – % of Landscape

- Old growth was the dominant patch type in historical landscapes
- Area of young patches has increased
- Area of mature and old-growth patches has decreased



Current and Future Age Class Distributions in Relation to Historical Range of Variation



Major drivers of landscape change in the Coast Range (Continued challenges)

- Globalization
- Climate change
- Wildfire
- Disease (Swiss Needle Cast)

Base Policy Simulation

Major Objectives

- Document historical spatial pattern
- Develop ecological and socio-economic models, measures and relationships
- Develop spatial policy analysis tools
- Project aggregate effects of current policies for 100 years
- Evaluate alternative policies
- Encourage joint learning

Family Forest (NIPF) Management

Regenerated Stand Management Intensities

Intensity		Actions	%
High	1	Plant, PCT, fert	
	2	Plant, PCT	
	3	Plant	100
	4	Natural regen, thin	
Low	5	Natural regen	

Probability functions

Gap disturbances

Succession after regeneration harvest

Selection of stands for regeneration harvest on public land (within limits)

Application of management intensity

Forest Industry Management

Regenerated Stand Management Intensities

Intensity		Actions	%
High	1	Plant, PCT, fert	15
	2	Plant, PCT	55
	3	Plant	28
	4	Natural regen, thin	1
Low	5	Natural regen	1

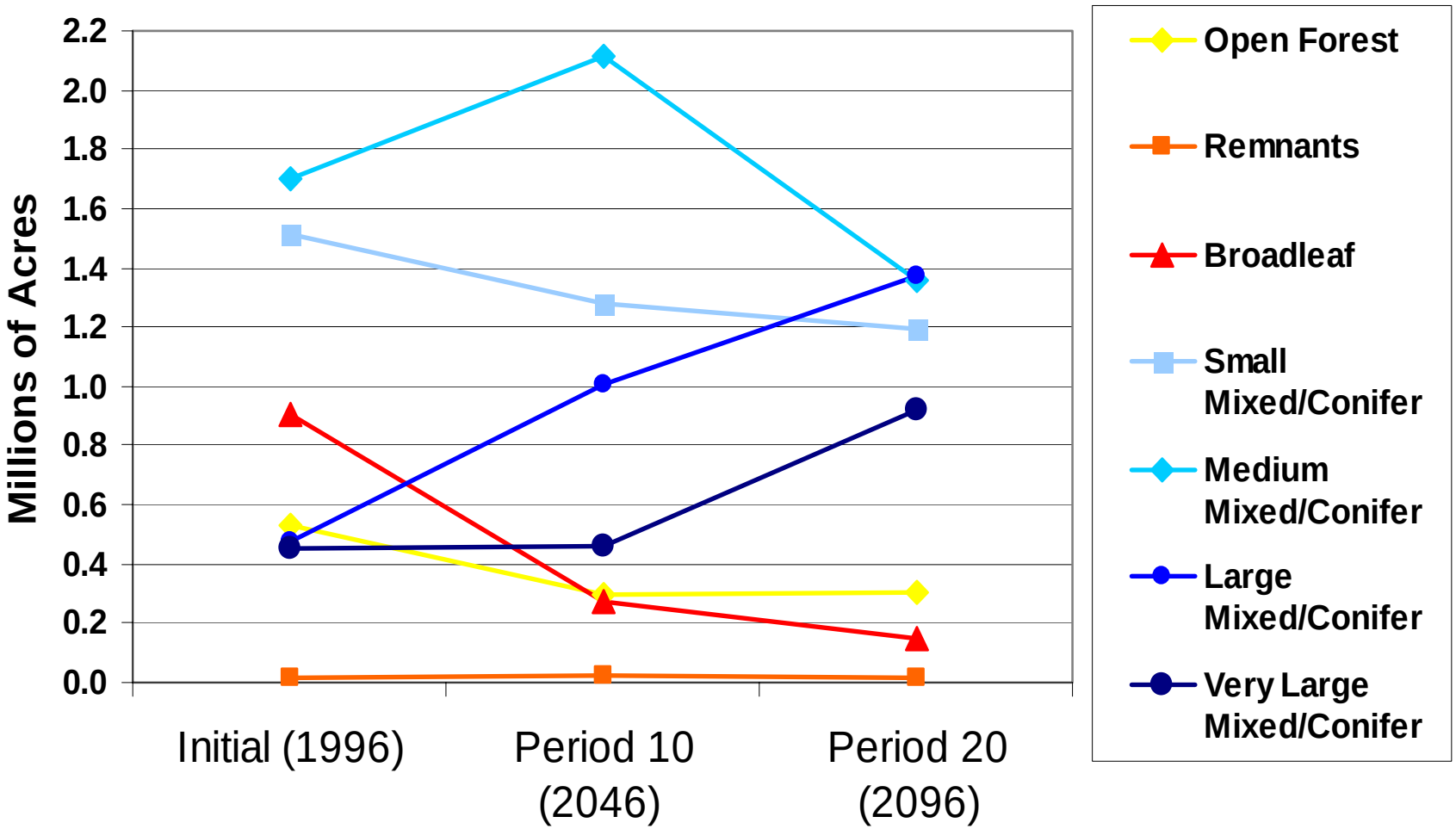
Major drivers of landscape change in the Coast Range

- Development (houses, cities)
- Timber harvest (clearcutting)
- Road building
- Landslides
- Wind
- Disease

Components (human drivers of landscape change)

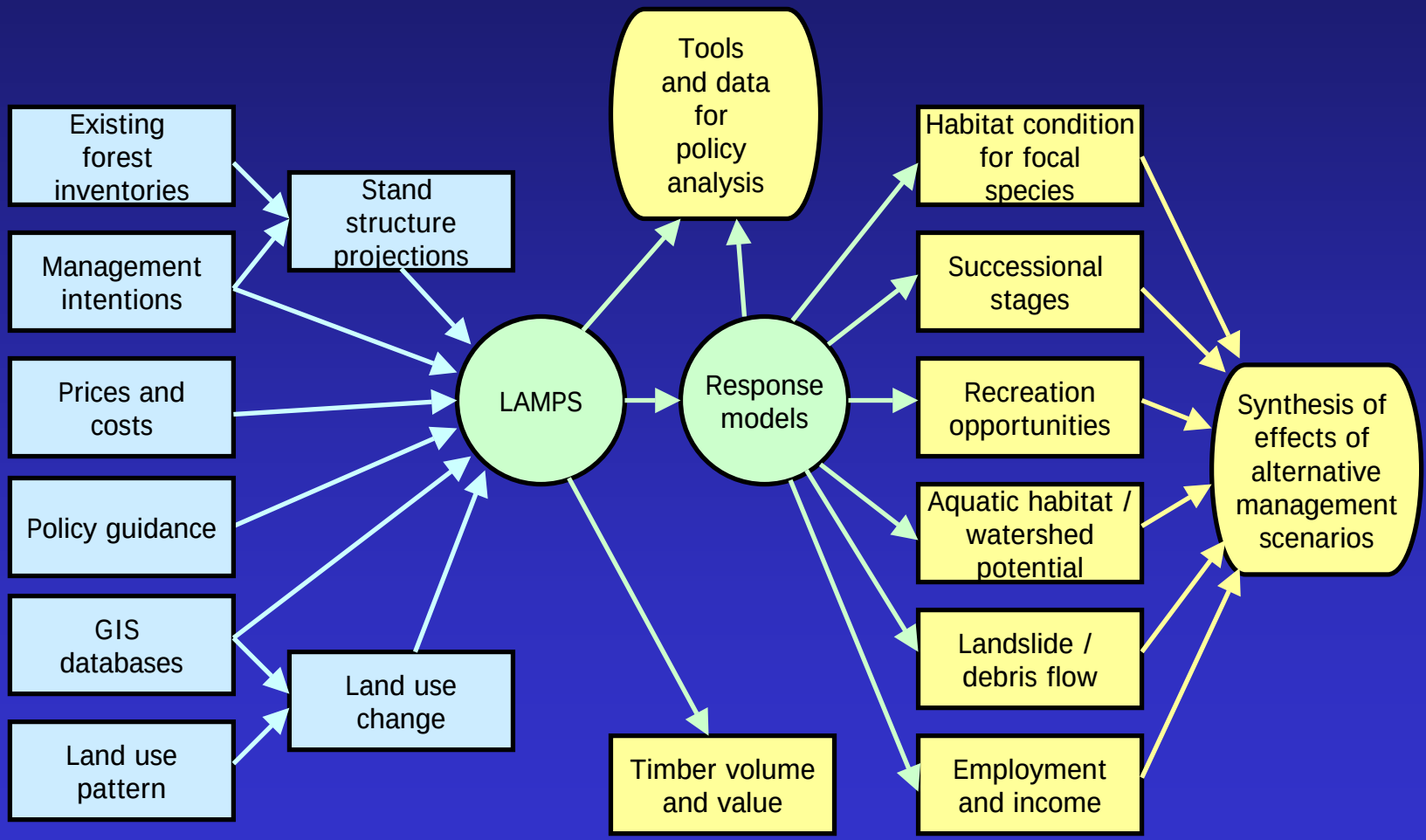
- Effects of development on forest available for management
- Public policy framework (legal requirements and policies that direct/constrain mgt.)
- Likely behavior of managers within public policy framework

Projected Change in Vegetation on Forested Lands Under Current (Base) Policy, Oregon Coast Range



LAndscape Management Policy Simulator (LAMPS) (Bettinger)

Landscape Planning and Analysis Process



State Management

- Maximize non-declining yield subject to:
  - Structural stand constraints
    - Regeneration type: 10%
    - Closed canopy type: 15%
    - Understory type: 25%
    - Layered type: 25%
    - Older forest type: 25%
  - Interior habitat patches

Testing the Northern Spotted Owl Habitat Capability Index against Independent Data