Vegetation Biodiversity in Coastal Oregon Forests

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- A new kind of vegetation map
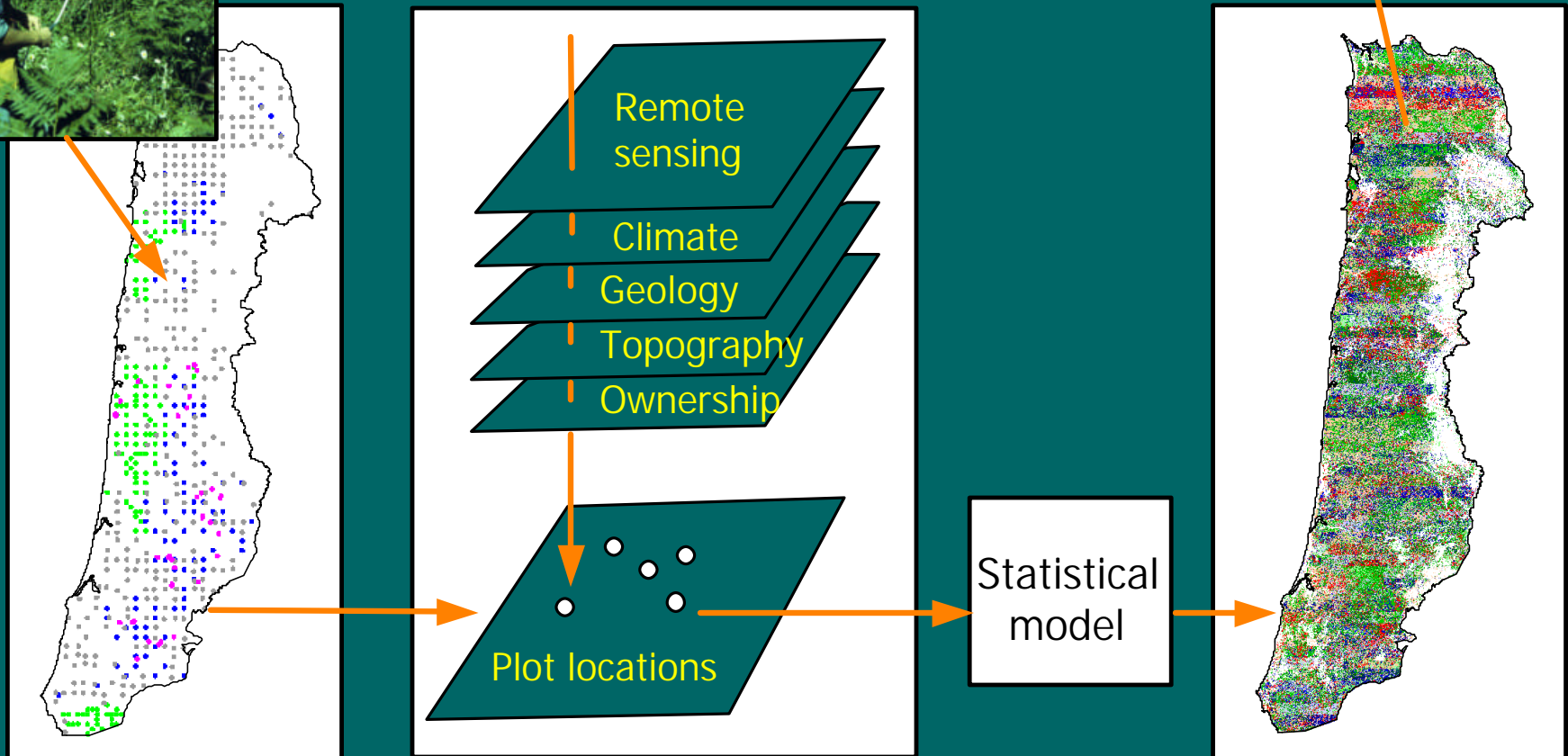
- Uses in CLAMS

- Current vegetation biodiversity

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

Remote sensing

Climate

Geology
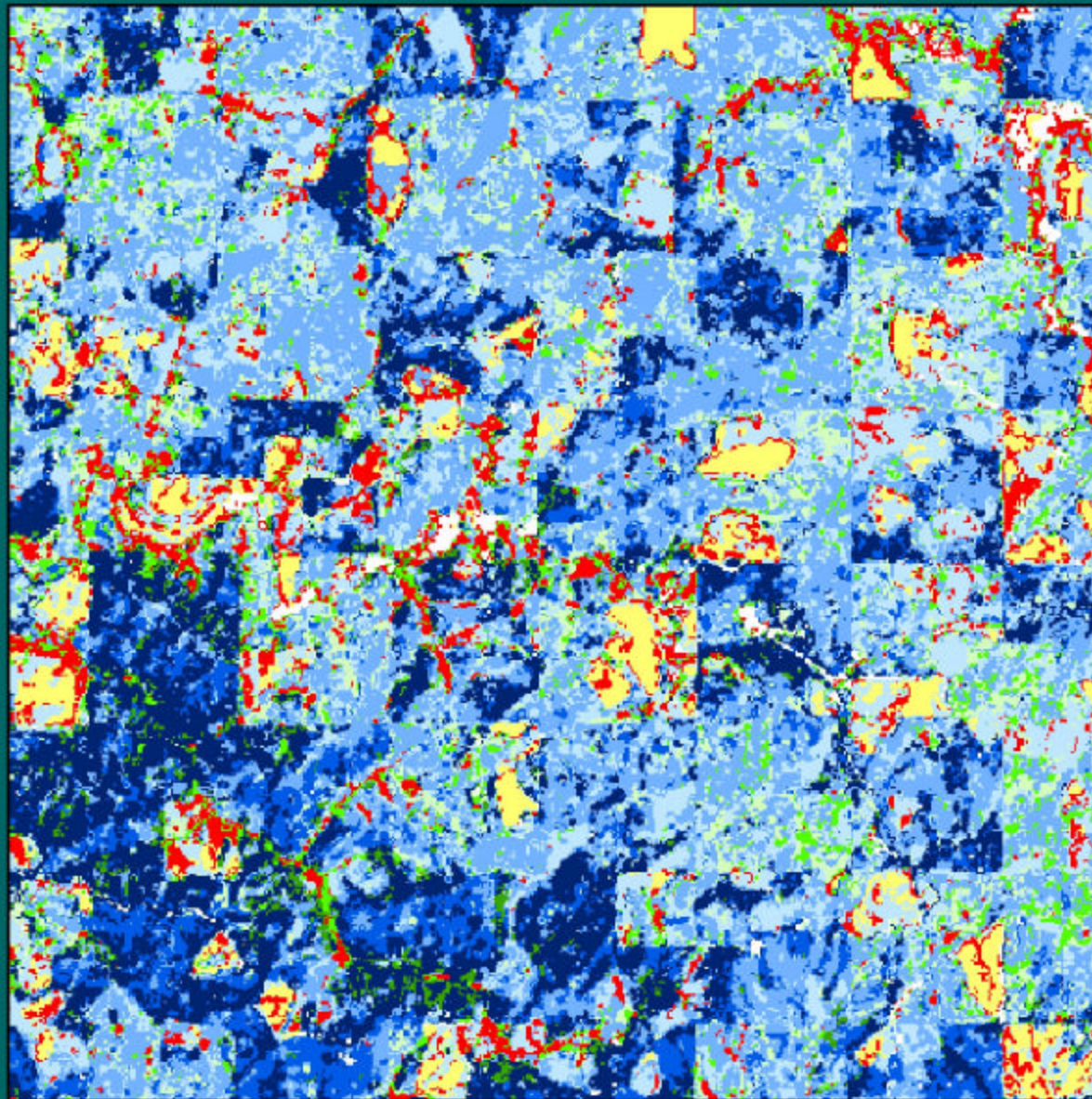
Topography

Ownership

Plot locations

Statistical model

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

Spatial data in GIS

Vegetation maps (1996)

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

Legend:
- 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

How good is the CLAMS vegetation map?

- Assessed accuracy using a variety of methods

- Excellent representation of regional patterns and variability,
  landscape proportions

- Reasonable representation of fine-scale pattern,
  inexact for specific sites, similar to other satellite-based maps

- Rare species and habitats not well represented

- For more information:

    - Posters

    - Ohmann, J.L.; Gregory, M.J. 2002. Predictive mapping of forest composition
      and structure with direct gradient analysis and nearest neighbor imputation
      in coastal Oregon, USA. Canadian Journal of Forest Research 32:725-741.

Uses of Vegetation Map in CLAMS

Coast Range Ecosystem

- Biophysical Response — t =1 ... t =n
- Natural Processes
- Current policy / Alt A / Alt B / Alt C
- Landscape/ Watershed Condition — t =1 ... t =n
- Landowner Behavior
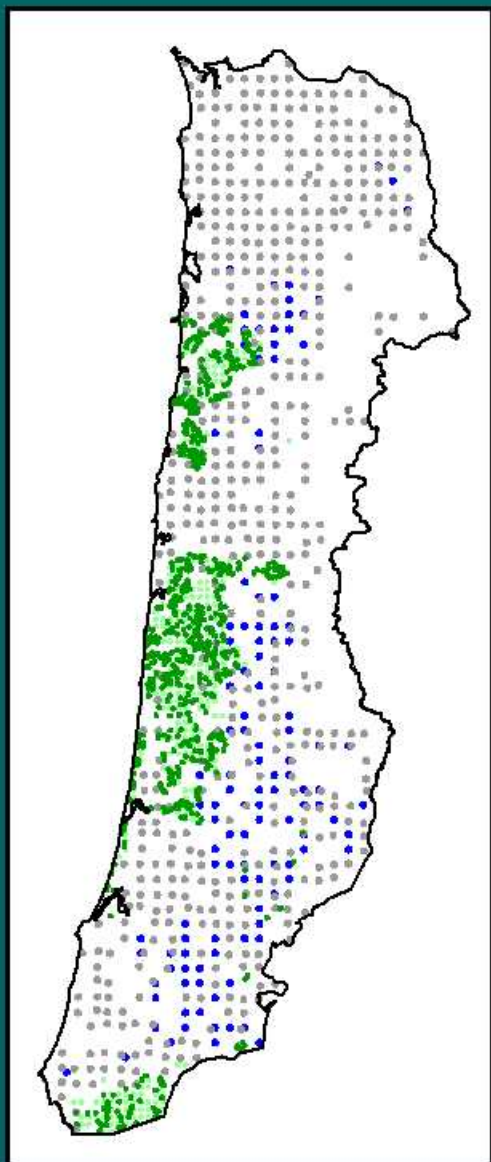- Socio-economic Response — t =1 ... t =n
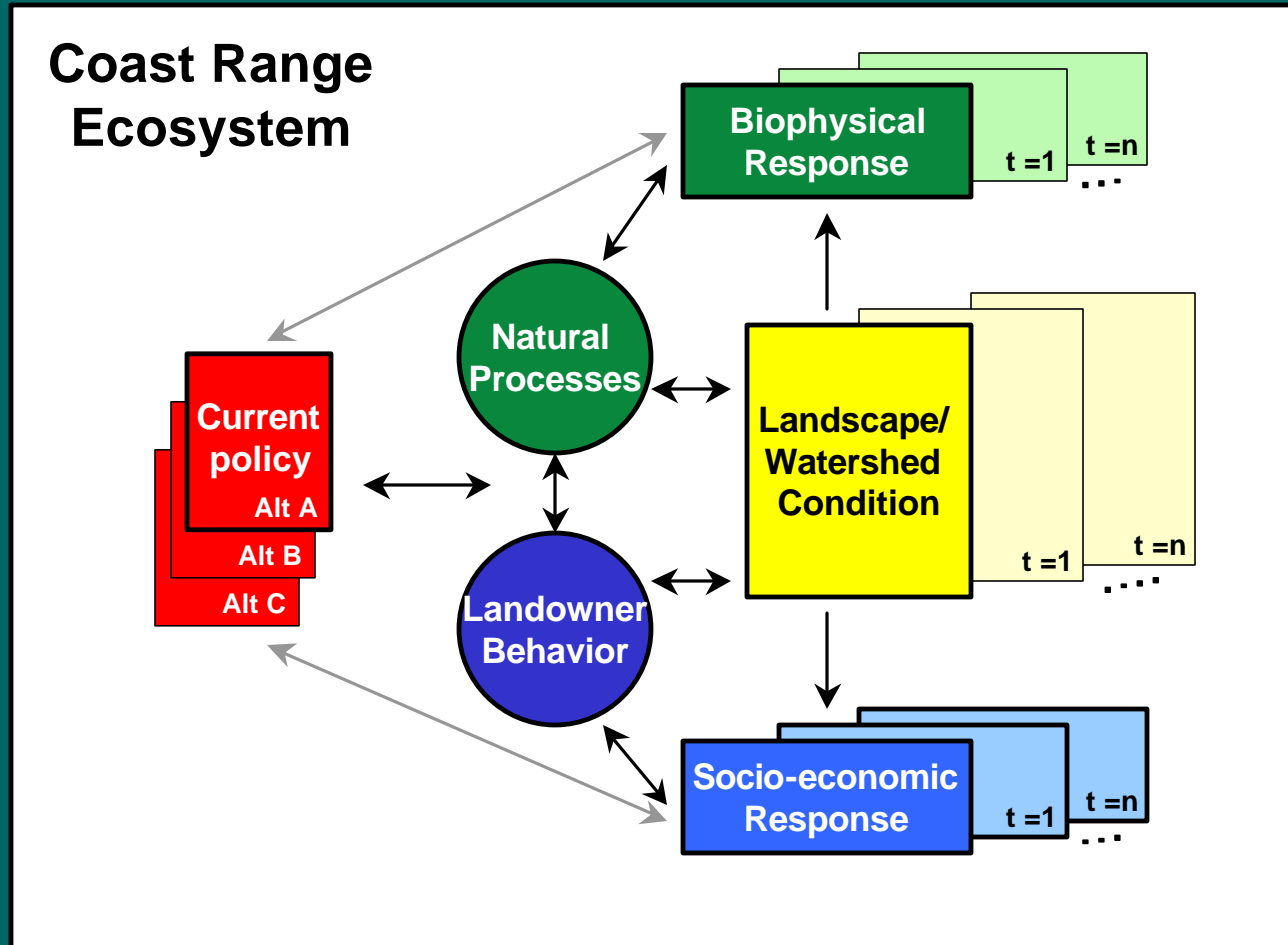
CLAMS conceptual model

- Initial conditions (1996) for landscape simulations

- Response models for wildlife, aquatic, timber

- 'Big picture' vegetation conditions

- Current vegetation biodiversity

445 Plant Species
on 1,500 forest plots

Trees:
46 species
(10%)

Shrubs:
81 species
(18%)

Herbs:
318 species
(72%)

Tree Species and Forest Types: Linked to Environment
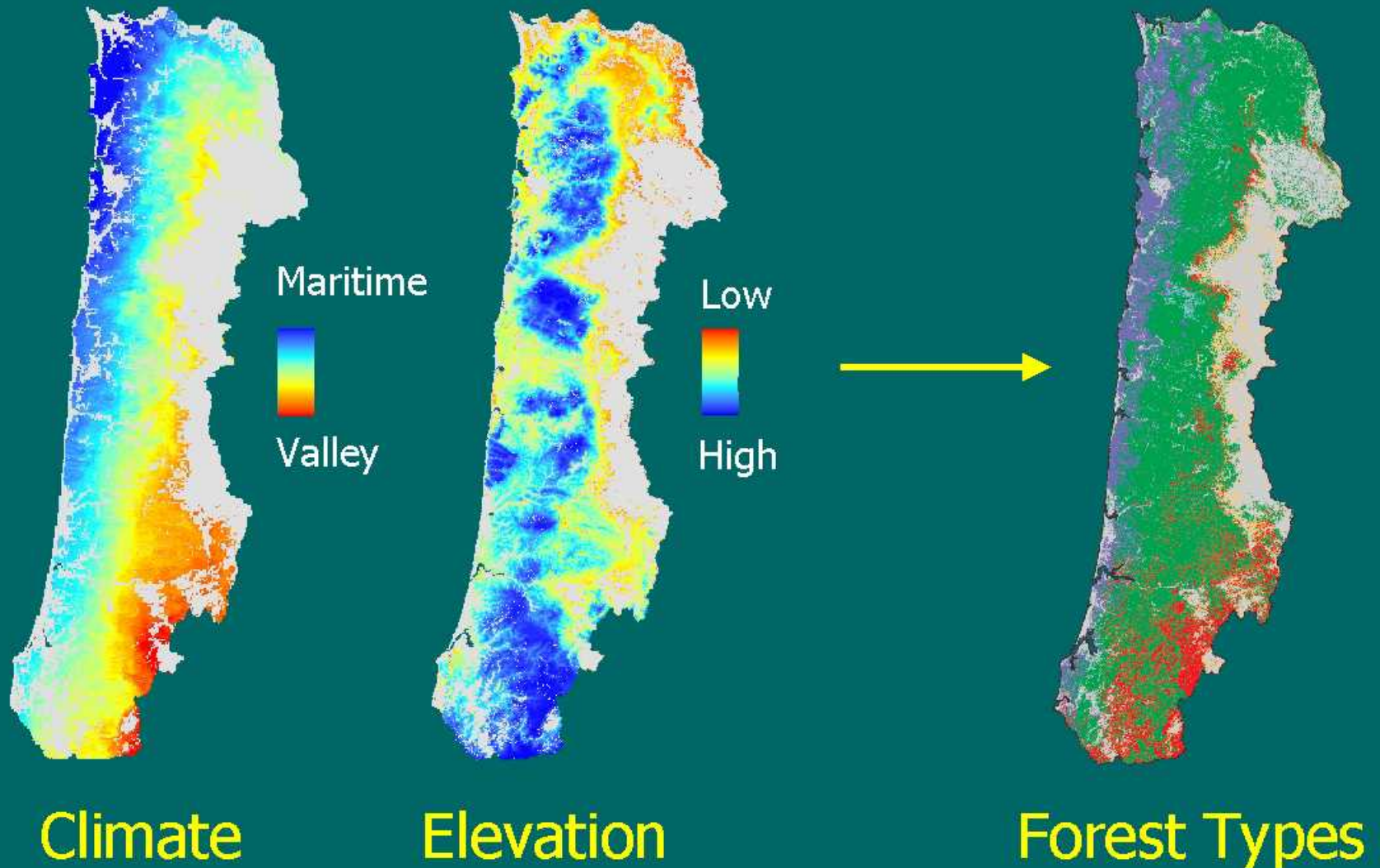
Sitka Spruce Forest

- 331,357 ha (818,783 ac)

- 15% of forest area

Western Hemlock Forest
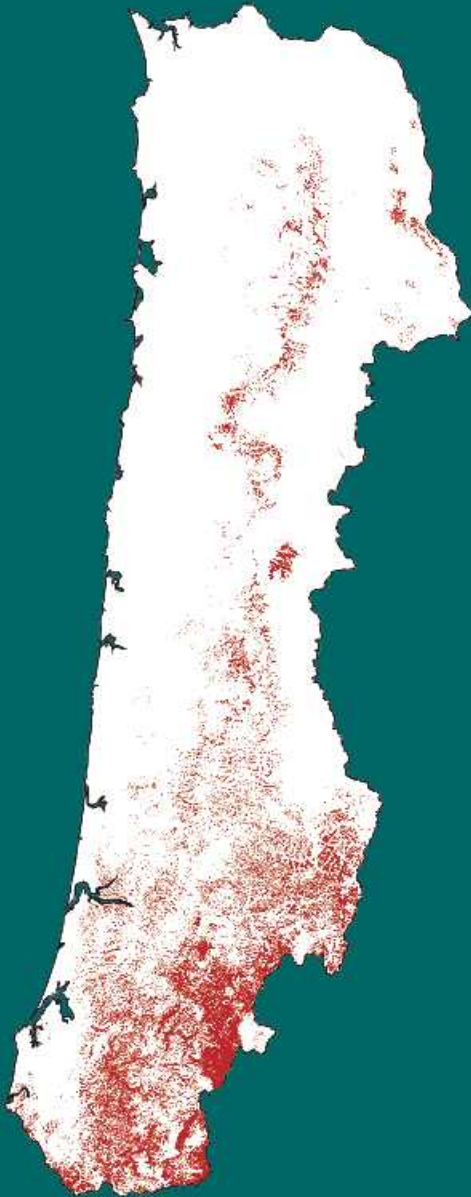
- 1.5 mill. ha (1.6 mill. ac)

- 65% of forest area

Pacific Silver Fir / Noble Fir Forest

- 28,594 ha (70,656 ac)

- 1% of forest area

Dry Western Hemlock / Mixed Evergreen Forest

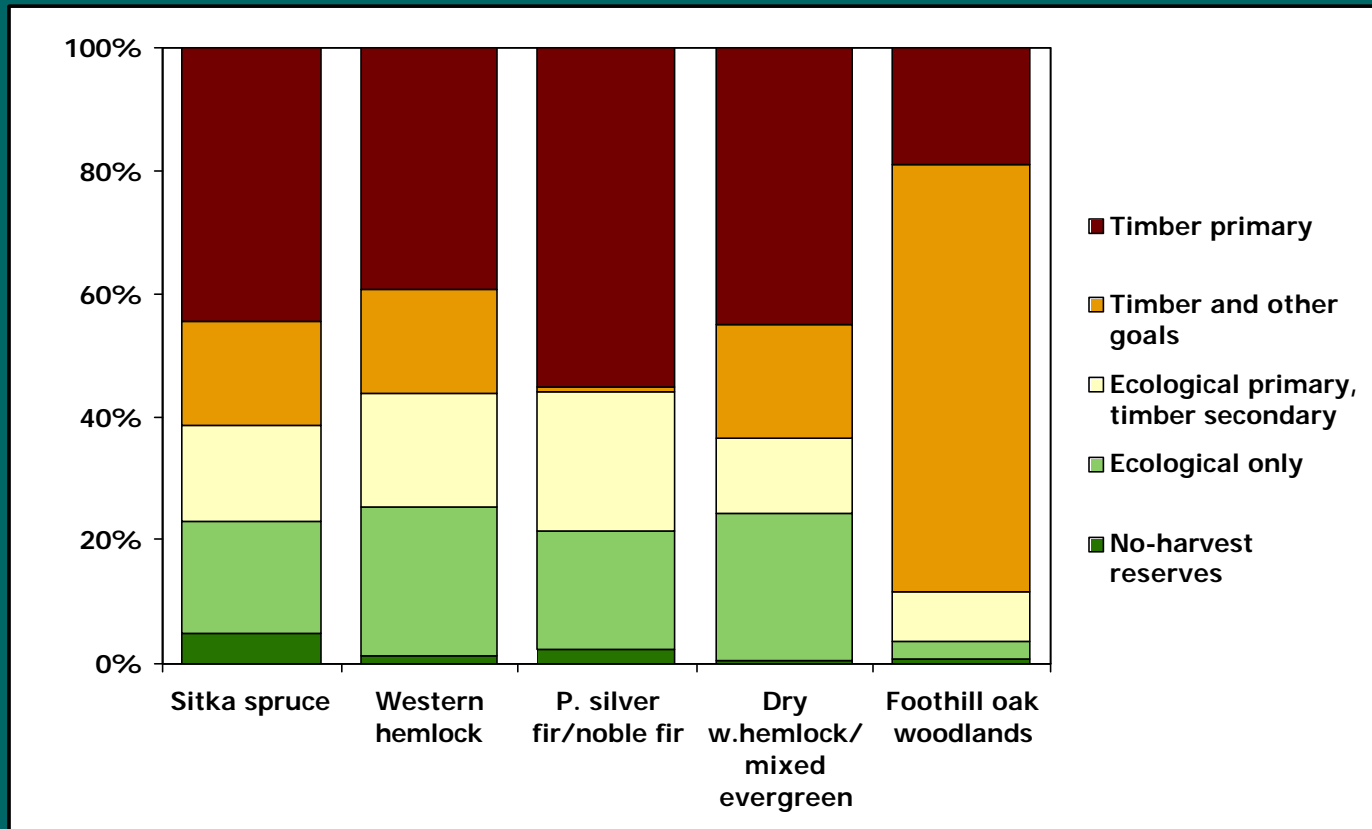- 308,482 ha (762,210 ac)

- 14% of forest area

Foothill Oak Woodlands

- 125,379 ha (309,812 ac)

- 6% of forest area

Forest Types and Management Objectives

- About 1/3 of each forest type managed for ecological goals *EXCEPT*...

- Foothill oak woodlands: 94% on private lands, few reserves, threatened by nonforest development.
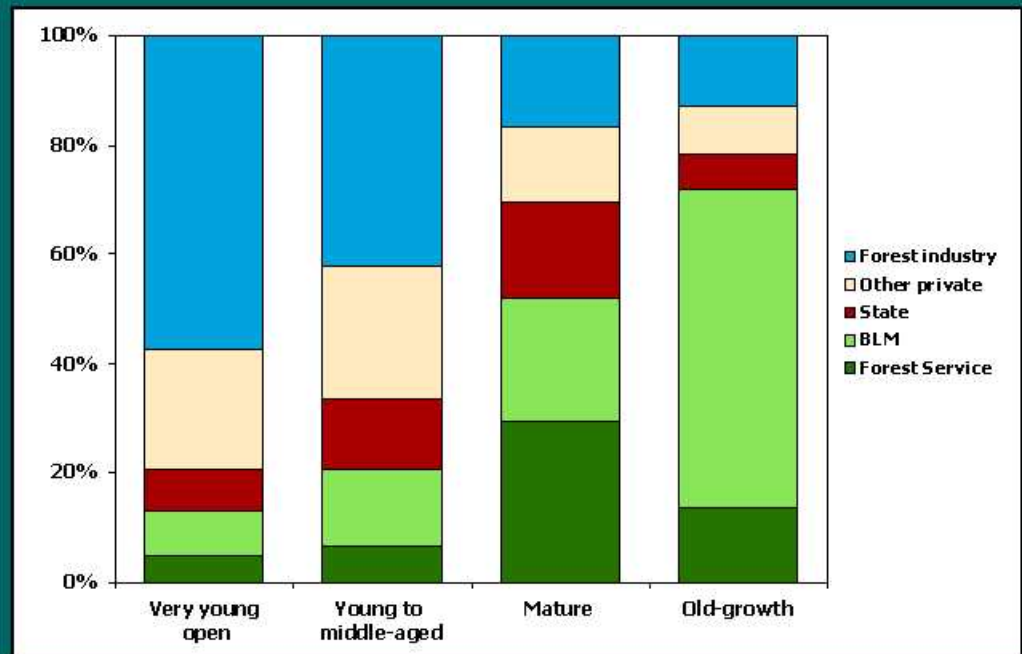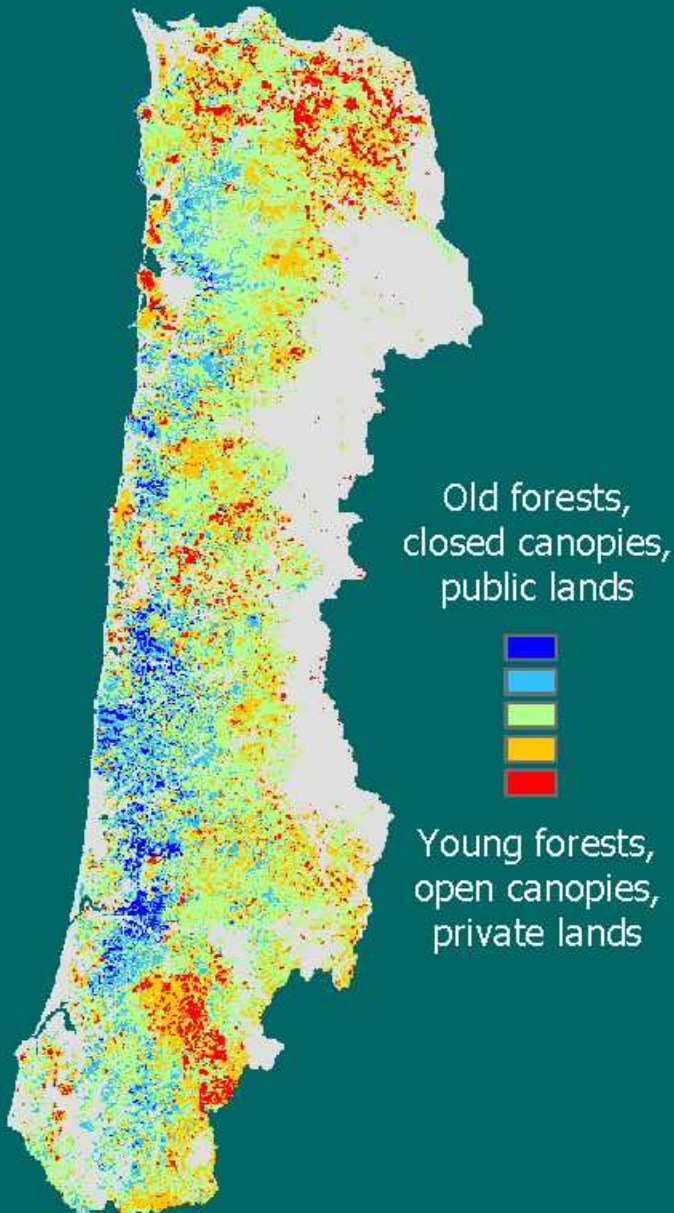

Timber goals predominate

Ecological goals predominate

Forest Age and Structure
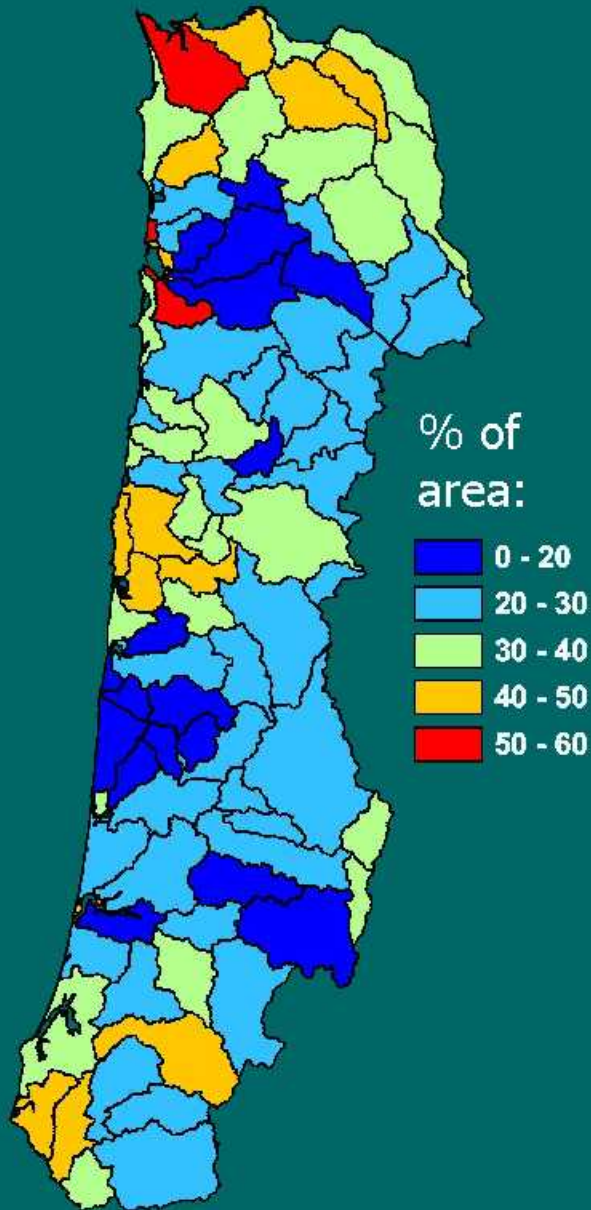
- Associated with management history, land ownership

Very Young, Open Forest
(0-25 cm, <70% cover)
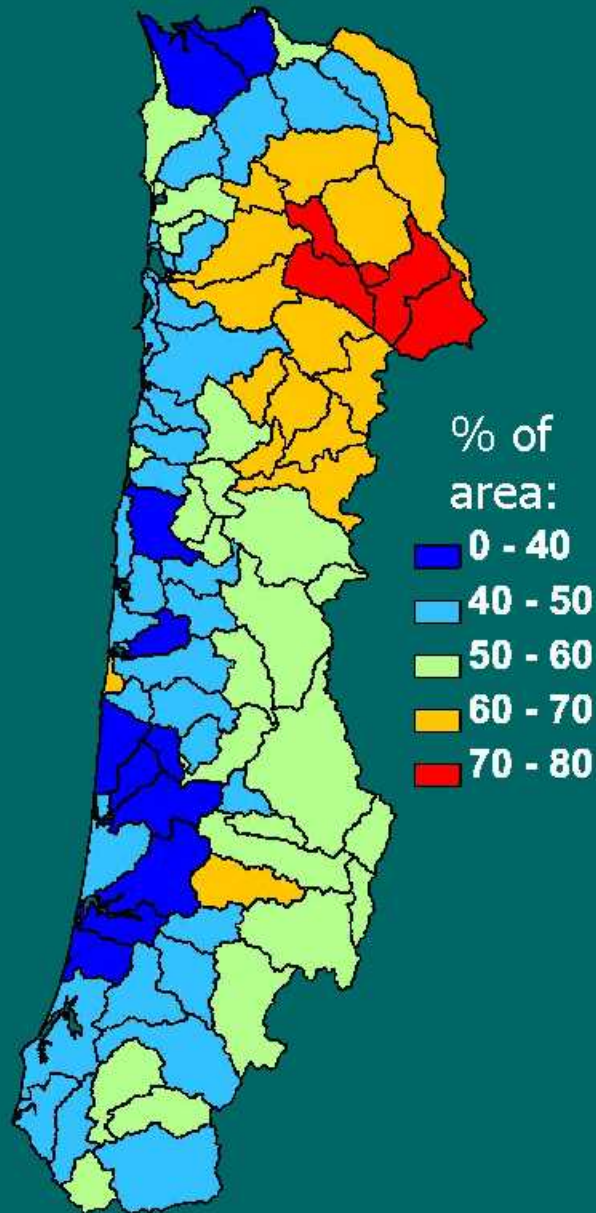
- 29% of landscape

- Mostly (80%) on private lands

- 24% is managed for ecological goals

- Virtually all is managed forest, lacking legacy trees

% of area:

■ (blue)	0 - 20
■ (light blue)	20 - 30
■ (green)	30 - 40
■ (orange)	40 - 50
■ (red)	50 - 60

Young to Middle-Aged Forest
(25-50 cm, >70% cover)
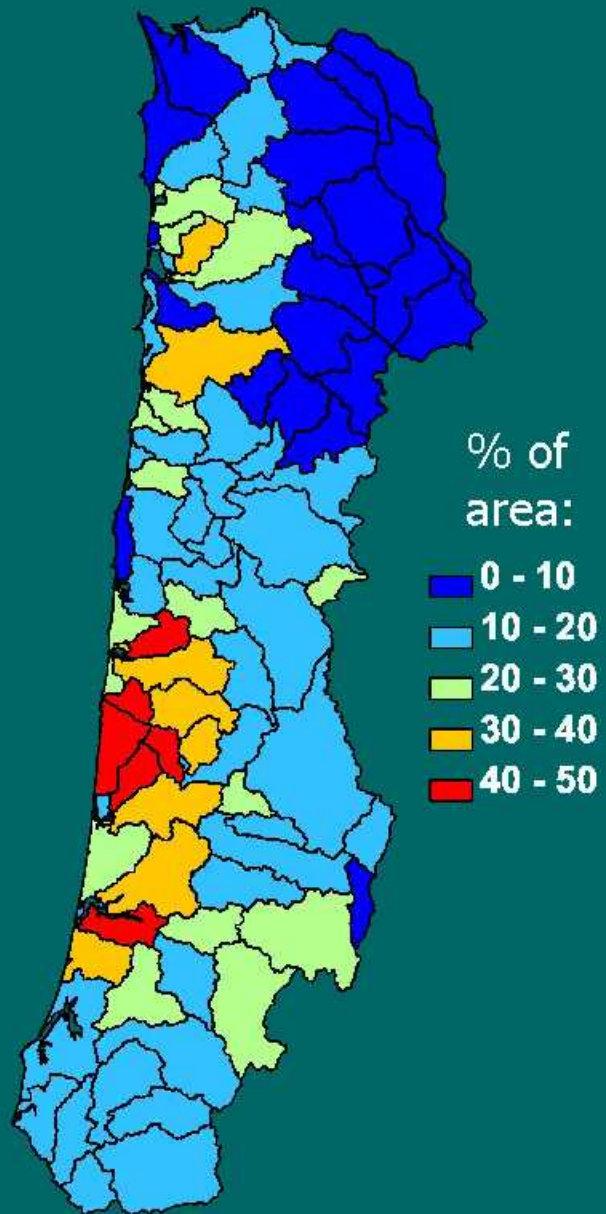
- Predominant condition (52% of landscape)

- Mostly (66%) on private lands

- 37% is managed for ecological goals

% of area:
- 0 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80

Mature Forests
(>50 cm, but lacking old growth characteristics)

- Small part (17%) of landscape

- Mostly (70%) on public lands

- 72% is managed for ecological goals

% of
area:

- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50

Old-Growth Forests *

- 2% of all forest, below historic range of variability

- Mostly (78%) on public lands, especially BLM

- 79% managed for ecological goals

% of area:

- **0 - 1** (dark blue)
- **1 - 2** (light blue)
- **2 - 3** (light green)
- **3 - 5** (orange)
- **5 - 8** (red)
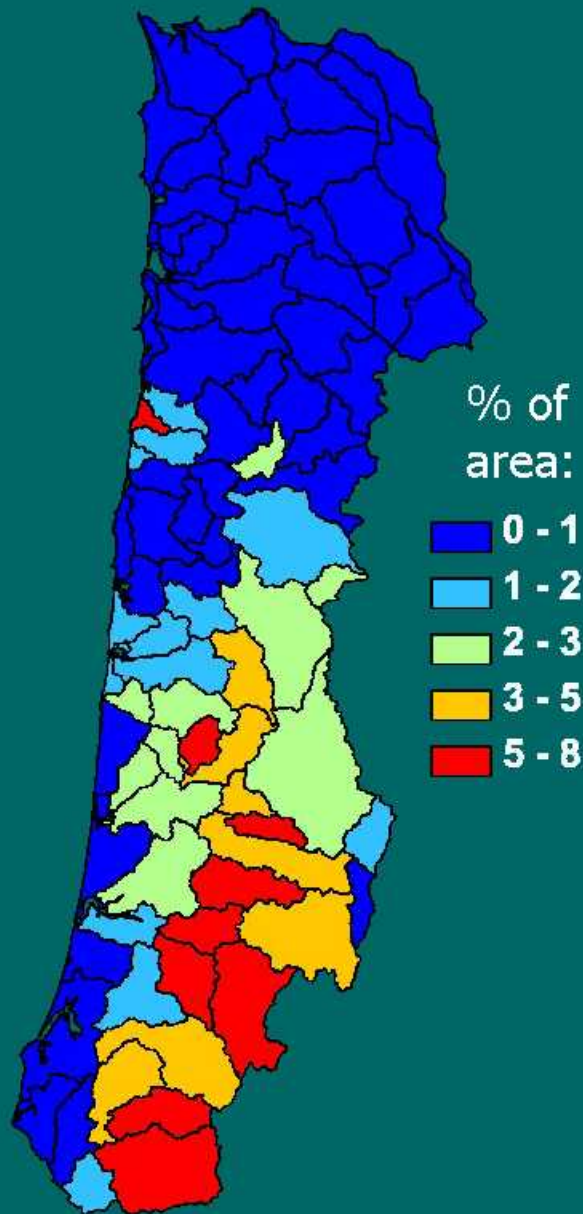
* Old-Growth Habitat Index ≥75. Based on stand age, tree size diversity, large tree density, snag density, down wood volume.

Legacy Trees
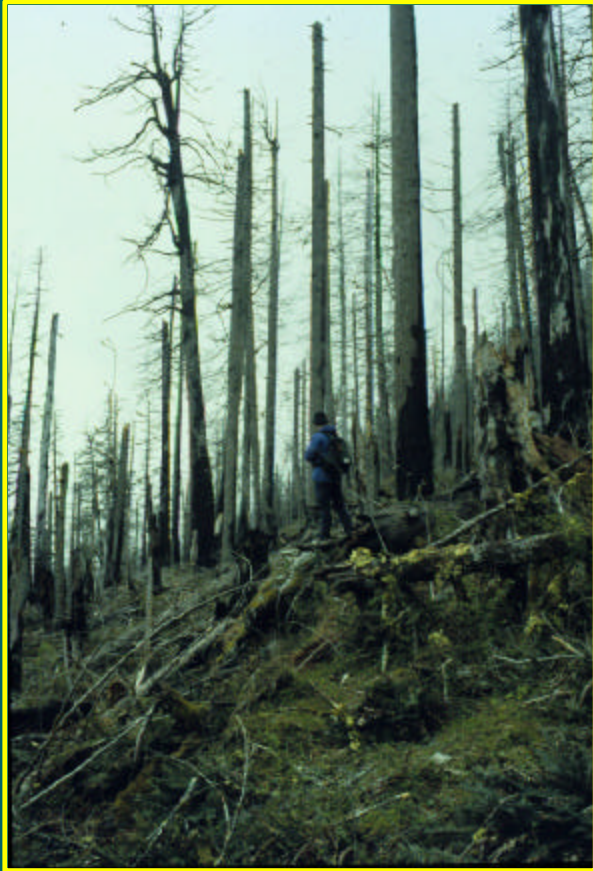
Natural legacies after wildfire

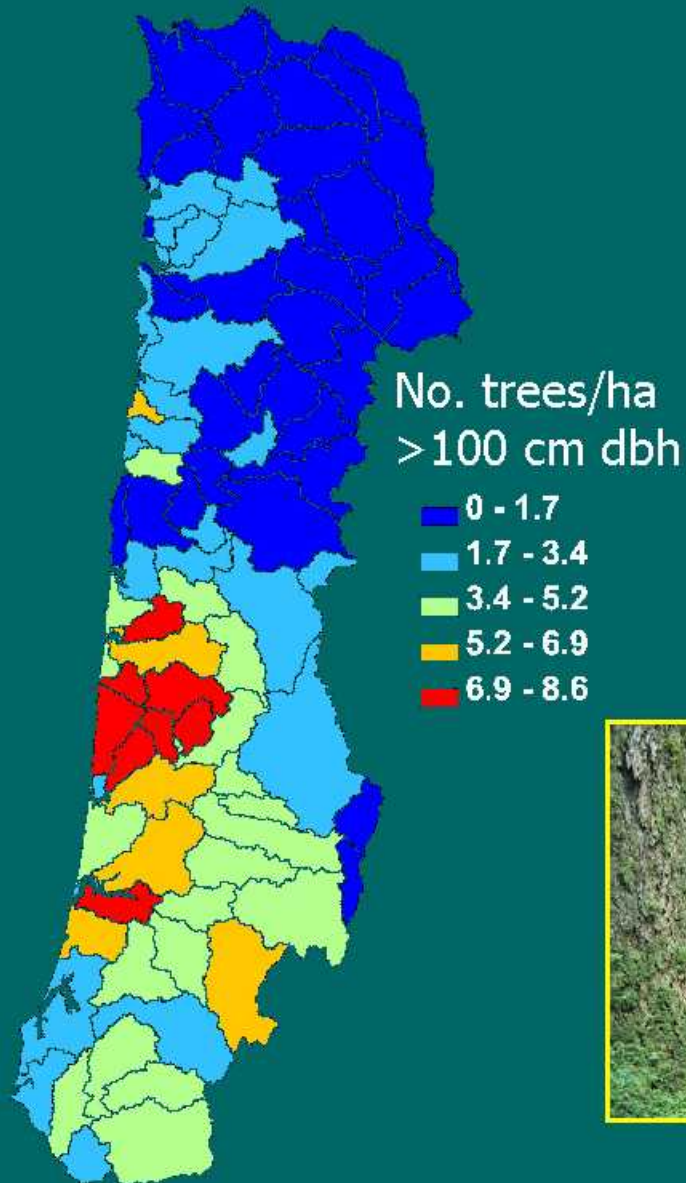

Lack of legacies under intensive management
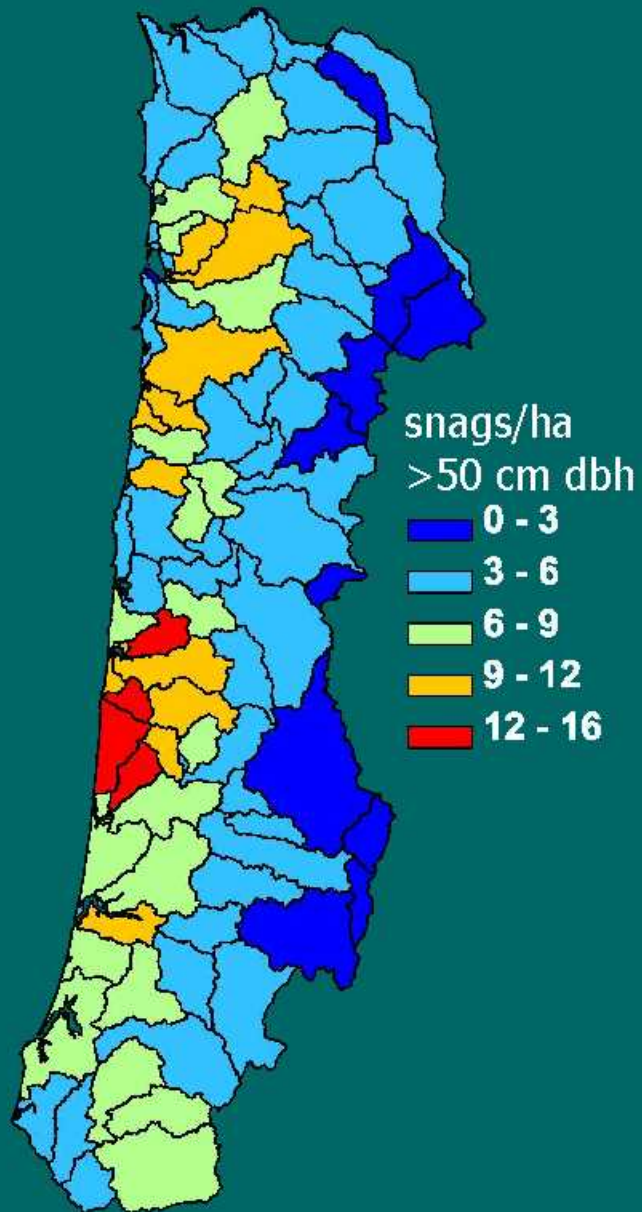

Forest management w/ legacies

Large Live Trees

No. trees/ha
>100 cm dbh

- 0 - 1.7
- 1.7 - 3.4
- 3.4 - 5.2
- 5.2 - 6.9
- 6.9 - 8.6

- Most abundant in older forest, federal lands

- Important habitat in young forests, legacy from previous forest

Snags

snags/ha
>50 cm dbh
- ■ 0 - 3
- ■ 3 - 6
- ■ 6 - 9
- ■ 9 - 12
- ■ 12 - 16
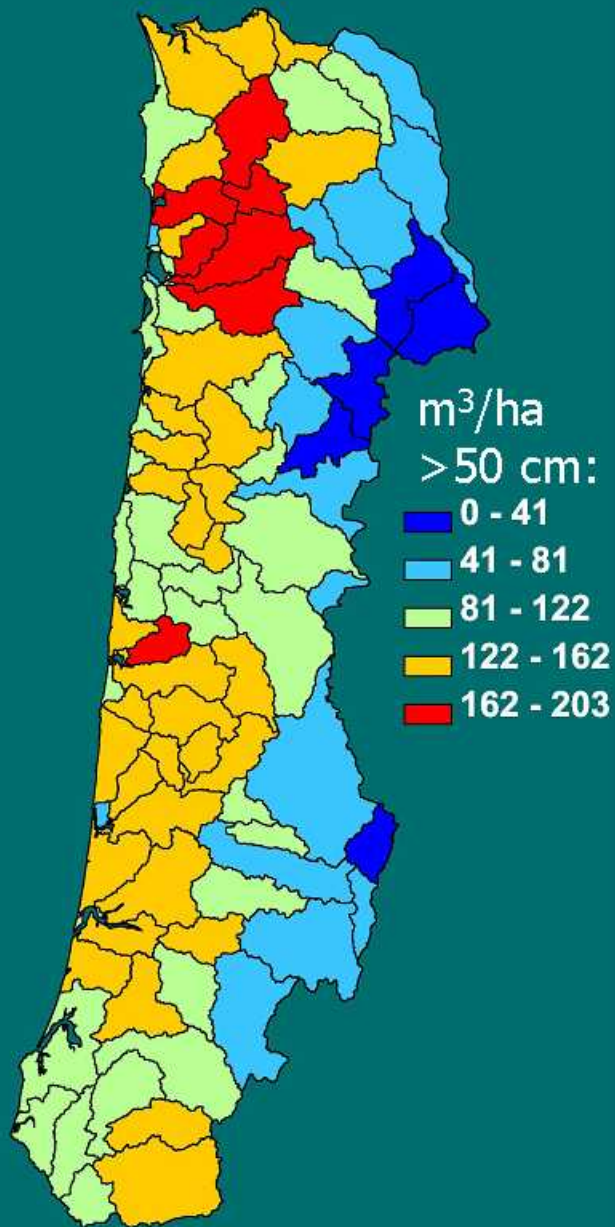
- Strongly affected by forest management

- Most abundant in older forests, public lands

- Diminished in young managed forest

m³/ha
>50 cm:
- 0 - 41
- 41 - 81
- 81 - 122
- 122 - 162
- 162 - 203

Down Wood

- Associated with site productivity, long-term history

- More evenly distributed across ages and ownerships (greater longevity)

- Tillamook Burn legacy

Broadleaf Trees

- Coastal, riparian, foothill, disturbed habitats

- Reduced by intensive forest management favoring conifers

- Most abundant on nonindustrial private lands

% broadleaf
basal area
- 0 - 20
- 20 - 27
- 27 - 34
- 34 - 41
- 41 - 62
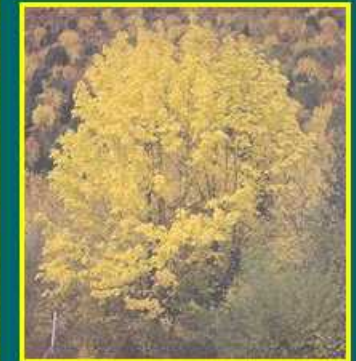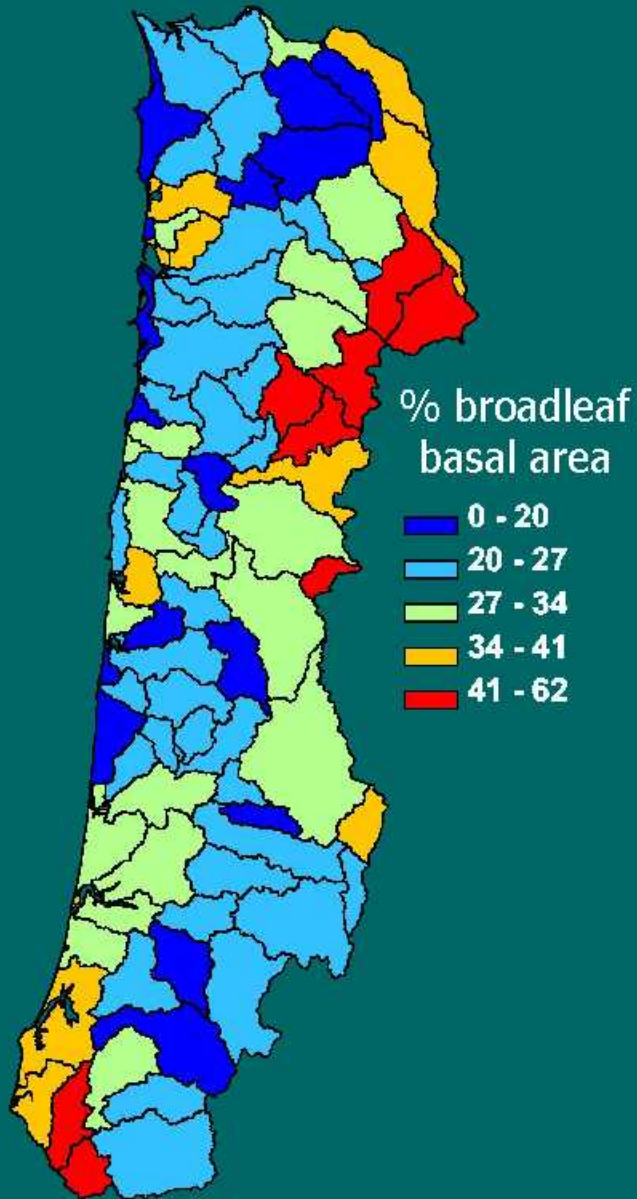
Key Findings:
Vegetation Biodiversity in Coastal Oregon

- In semi-natural forested landscapes, all ownerships contribute to biodiversity.

- Some biodiversity elements (tree species, forest types) are relatively insensitive to forest management practices: conservation must consider regional environmental gradients.

- Forest types represented in reserves EXCEPT foothill oak woodlands.

- Older forests: small part of current landscape and below HRV, but being addressed by current policies.
  Diverse young forests: also rare but receiving less attention.
  Legacy tree habitat: uncertain future.

What's so novel about the CLAMS vegetation map?
(i.e., advantages for ecological analysis, simulation modeling, integrated assessment)

- Spatially complete, regional in scope, AND rich in detail (tree species and structures)

- Each pixel contains a tree list, from which many continuous vegetation variables can be derived. User-defined classification systems can be applied to meet a variety of objectives.

- At regional level, full range of variability is represented. At site level, covariance of species and structures is maintained.

- Use of mapped environmental data results in models that better capture ecological relationships.