

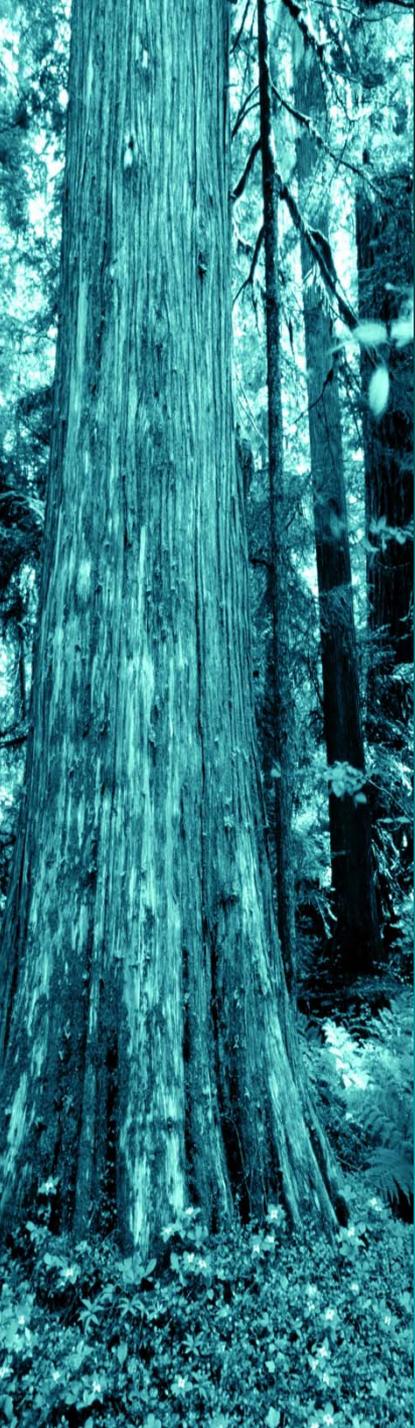
Forest Inventory and Analysis Program

AN OVERVIEW with APPLICATIONS TO CARBON



Pacific Northwest Research Station
USDA Forest Service





FIA conducts a comprehensive forest inventory for each of the 50 States...

and



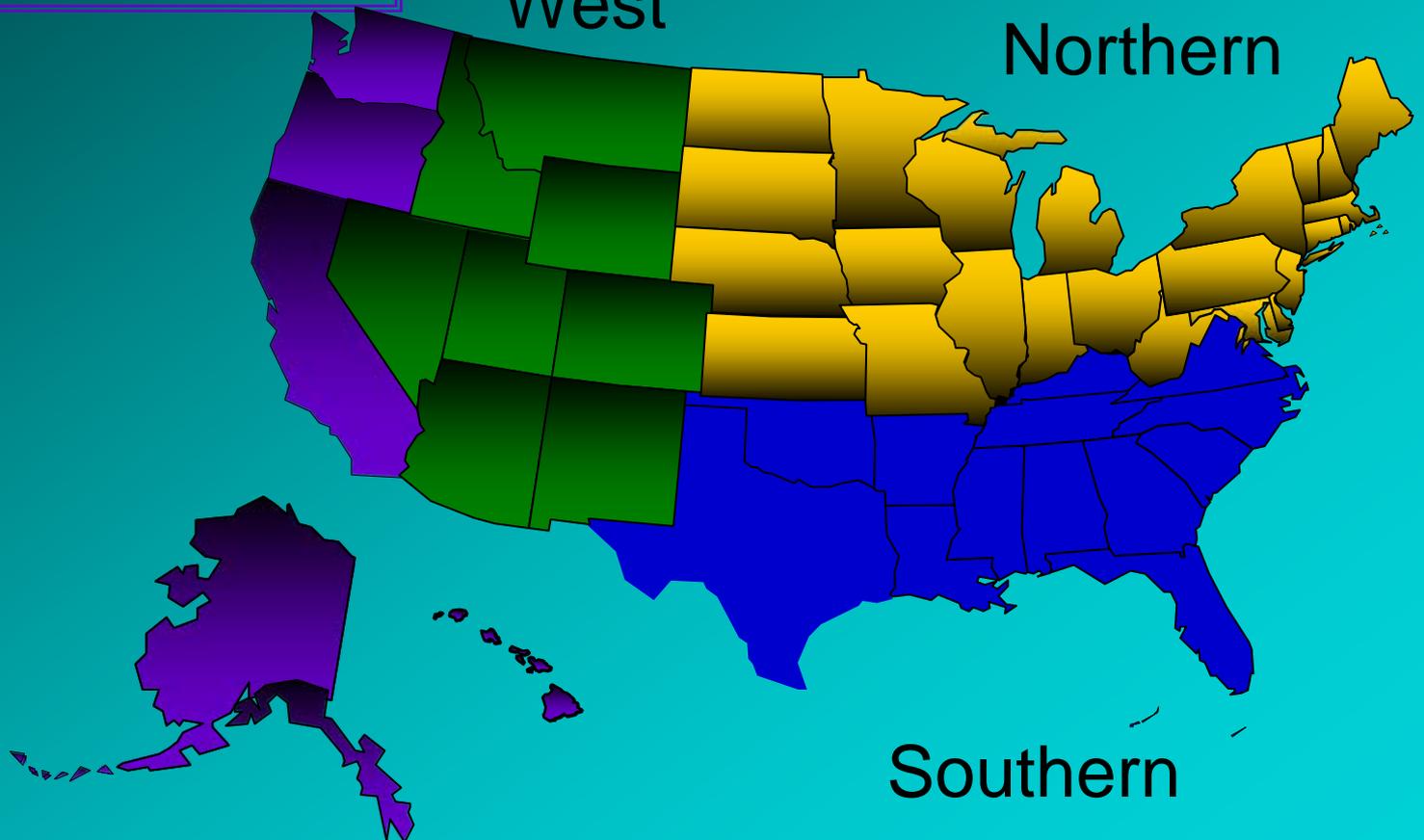
U.S. Associated Pacific and Caribbean Islands

FIA is a National Program

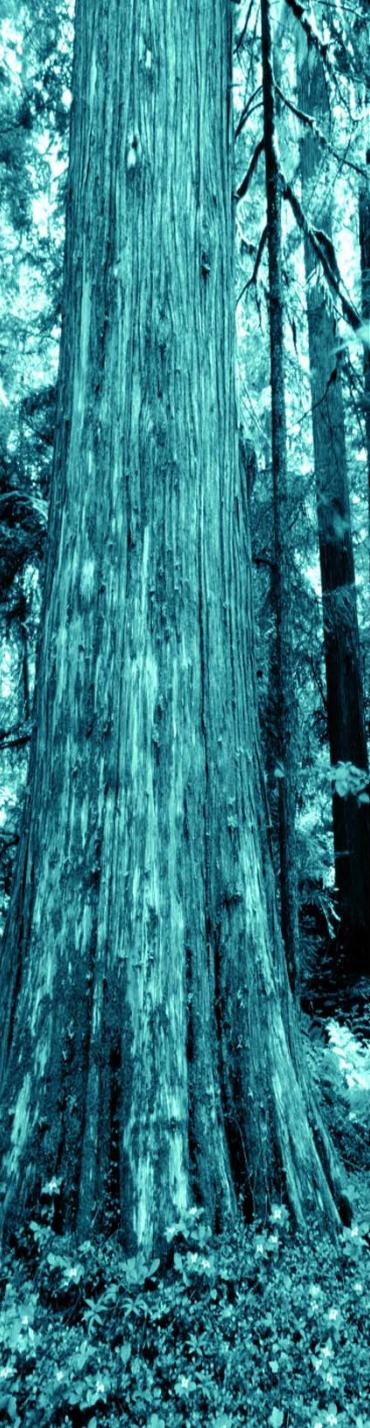
Pacific
Northwest

Interior
West

Northern

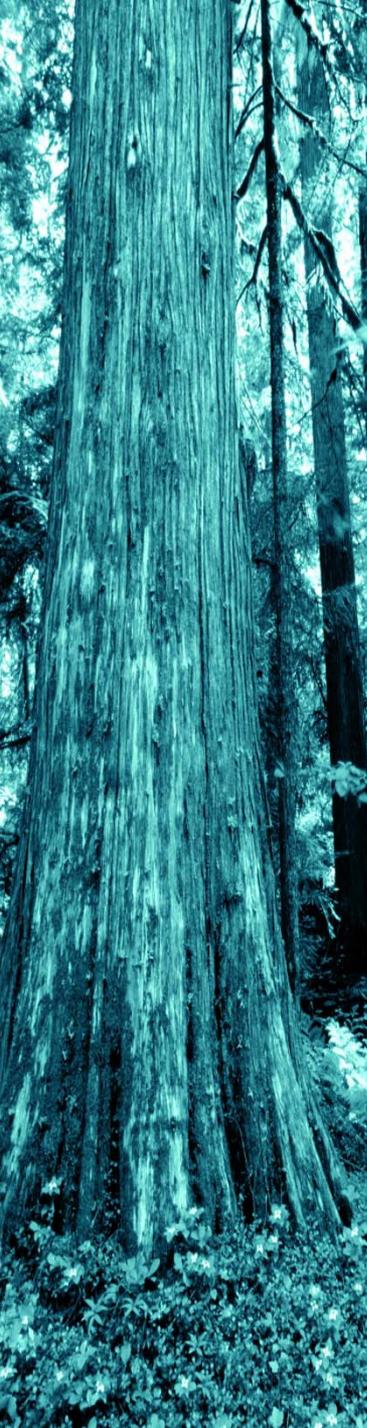


Southern



National Mandates

- Legislation since 1928– required FS to do a comprehensive inventory of the nations forests. (FIA did periodic inventories until 2000)
- 1998 “Farm Bill” – required the FS to implement an annual inv. on a 5-year cycle (given budgets and staff, a cycle of 7-yrs in the East and 10-yrs the West was agreed to)
- 2001 Appropriations bill tied FIA to the 1985 Food Security Act regarding data confidentiality

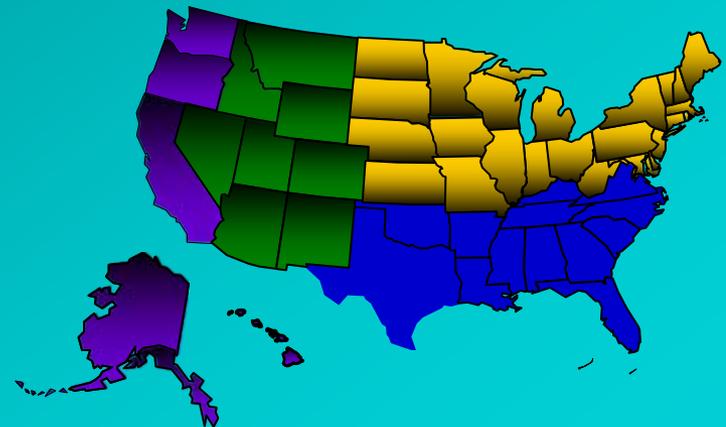


FIA is required by law to keep plot locations and names of individual land owners confidential

- Violations of the law result in stiff penalties
- This information is not subject to FOIA
- Reasons are: To protect landowner privacy, plot integrity, and inventory credibility (statistically representative)

National Consistency

- One field manual with regional additions
- National data recorder & software
- National data compilation system
- National databases



How is PNW-FIA organized?



❖ Teams based in Portland and Anchorage

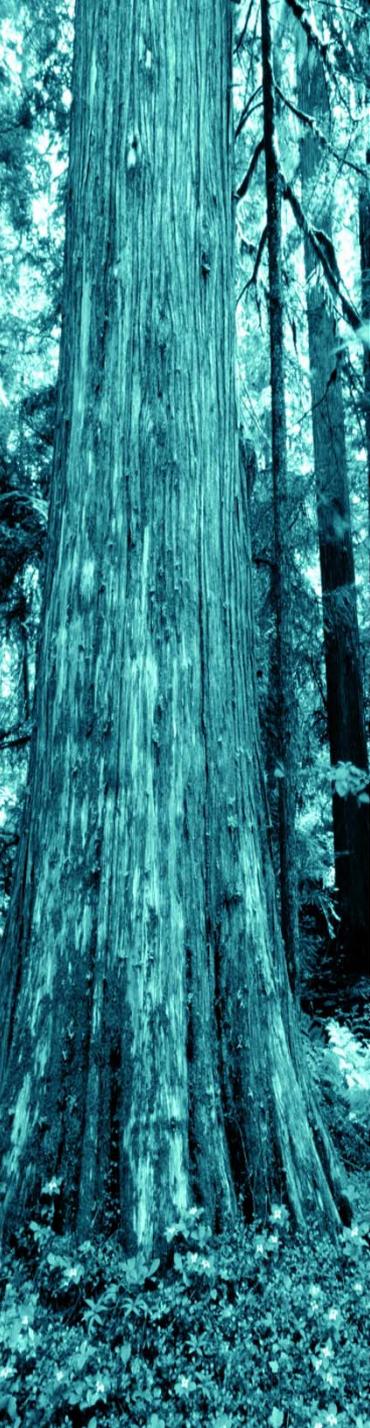
2 Data Collection

Data Compilation

Inventory Reporting & Analysis

Research

Remote Sensing / Techniques



What do we inventory?

- ▣ All forest lands
- ▣ All ownerships – public and private
- ▣ Both unreserved and reserved areas (i.e. wilderness, Nat. Parks, other)
- ▣ PNW—land within our state boundaries (CA, OR, WA, AK, HI, Islands)

FIA Inventory Design

Annual Inventory (10% of plots sampled/year)
CA, OR, WA, Coastal AK

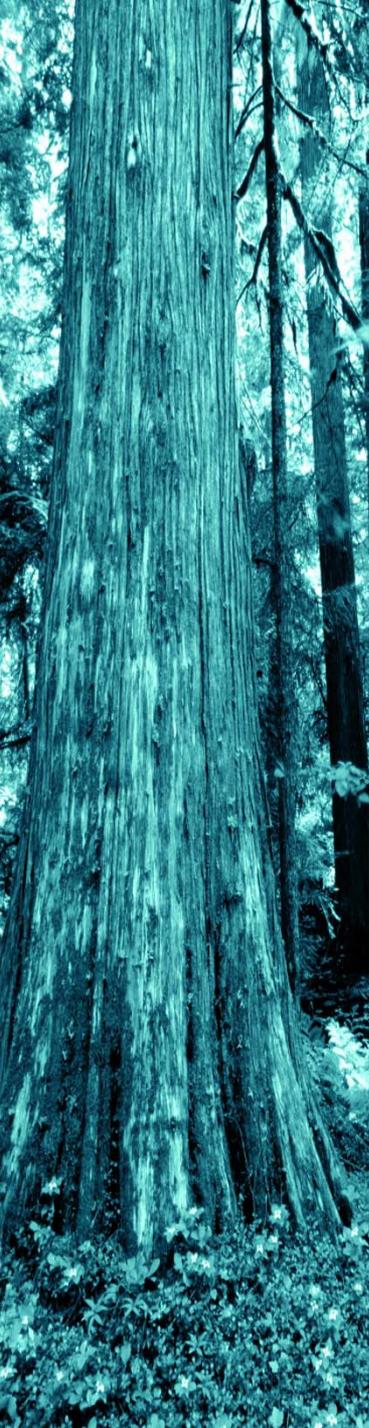
Periodic Inventory (All plots every 10 yrs)
Interior Alaska, Pacific Islands

3 - phase inventory

Phase 1: Remote sensing

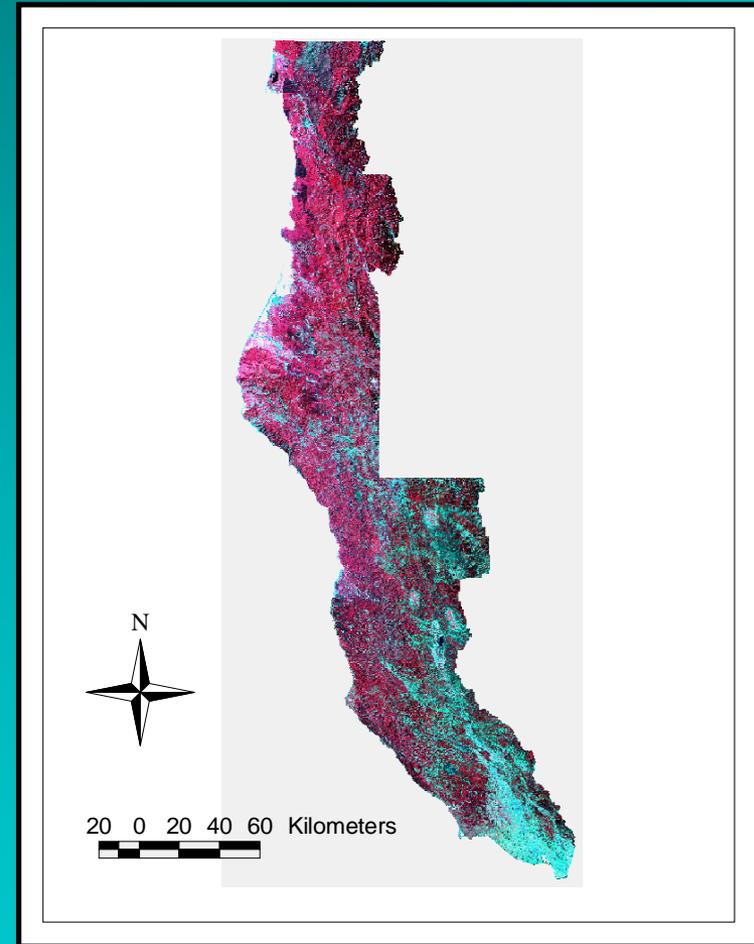
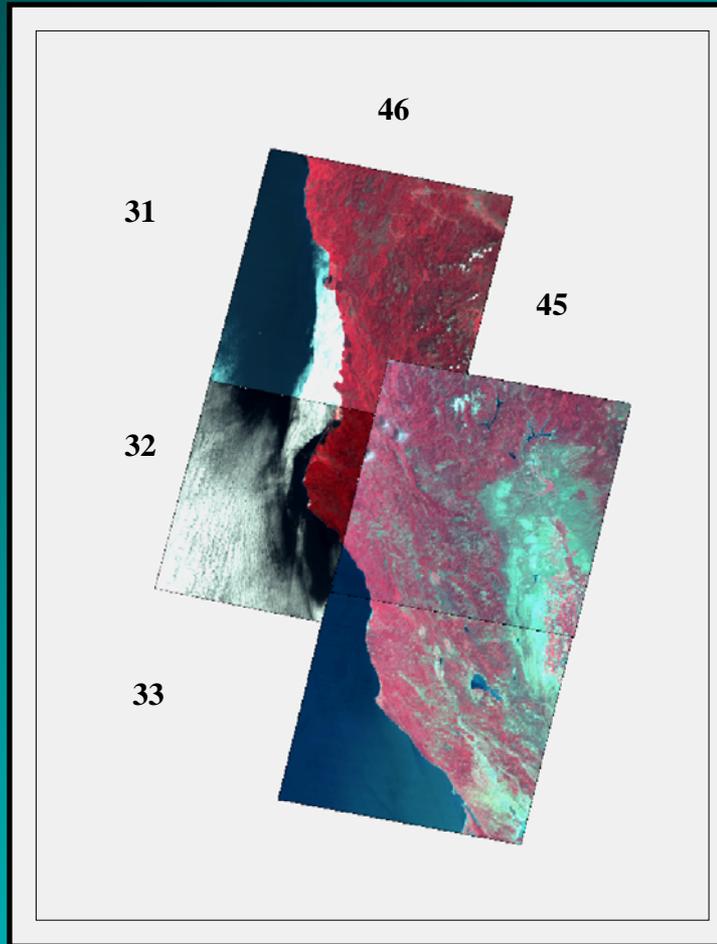
Phase 2: Field plots (1 per 6000 ac)
[National Core variables]
[Regional Add-ons]

Phase 3: Field plots (1 per 96000 ac)
[Forest Health variables]



Phase 1

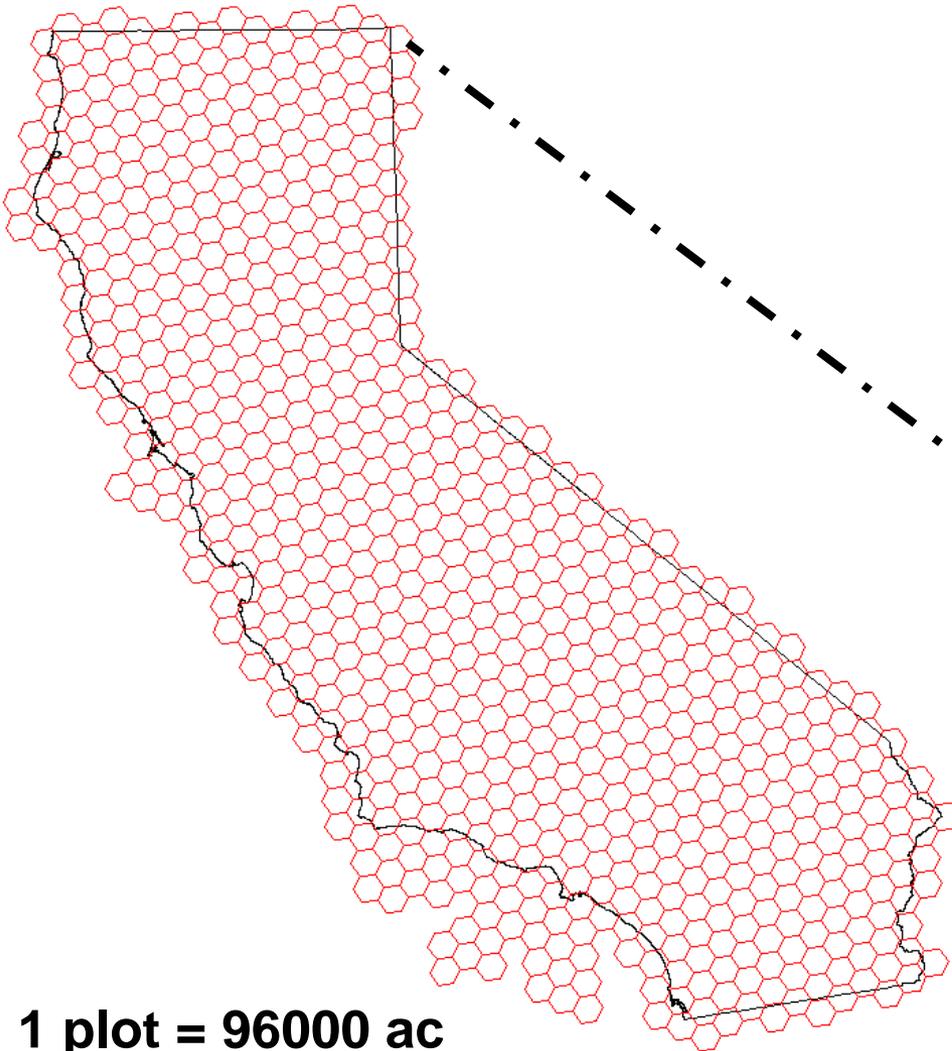
Satellite imagery and other ancillary data are used for land classification



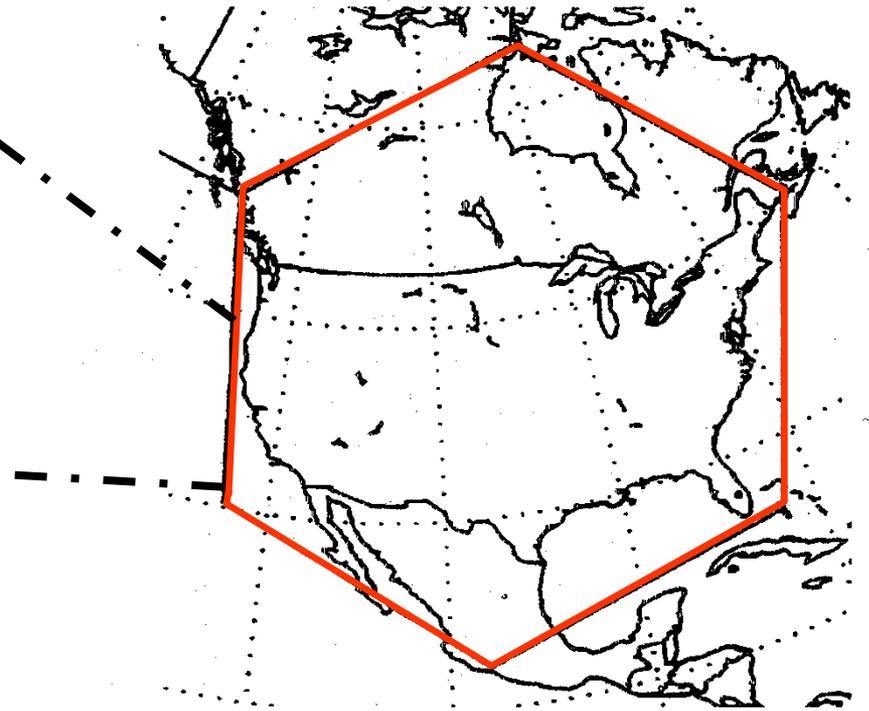
Hexagonal Grid across the U.S.

Phase 2 and Phase 3 plots

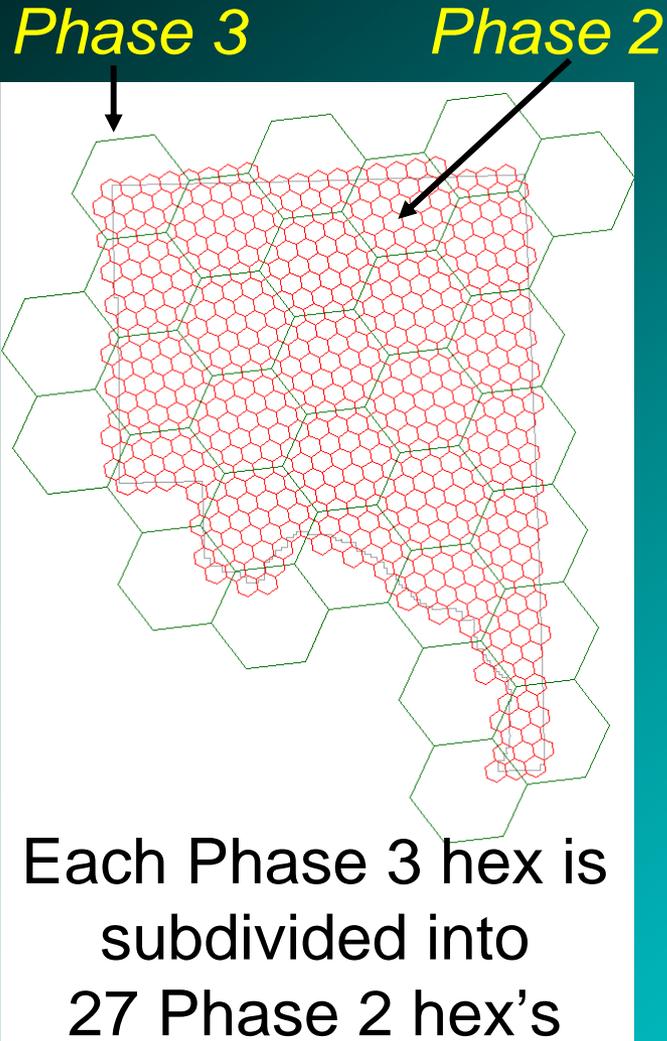
Phase 3 grid



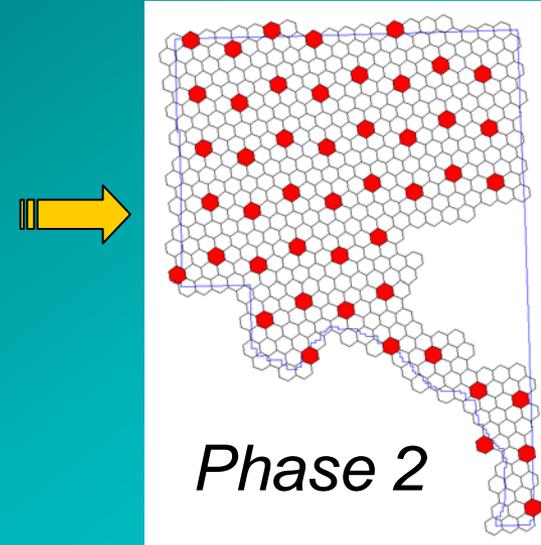
There are about 28,000 Phase 3 and 360,000 Phase 2 hexagons across the conterminous US.



Phase 2



- 1 plot per 6000 ac hexagon, across the landscape
- 1,062 P3 plots in CA
- 17,170 P2 field plots in CA
- Each plot assigned to one of 10 panels
- One panel is sampled per year (10% / year)



Plot Design

(total area = 2.5 acres)

Lichen Plot:
(120 ft radius)
Diversity and abundance

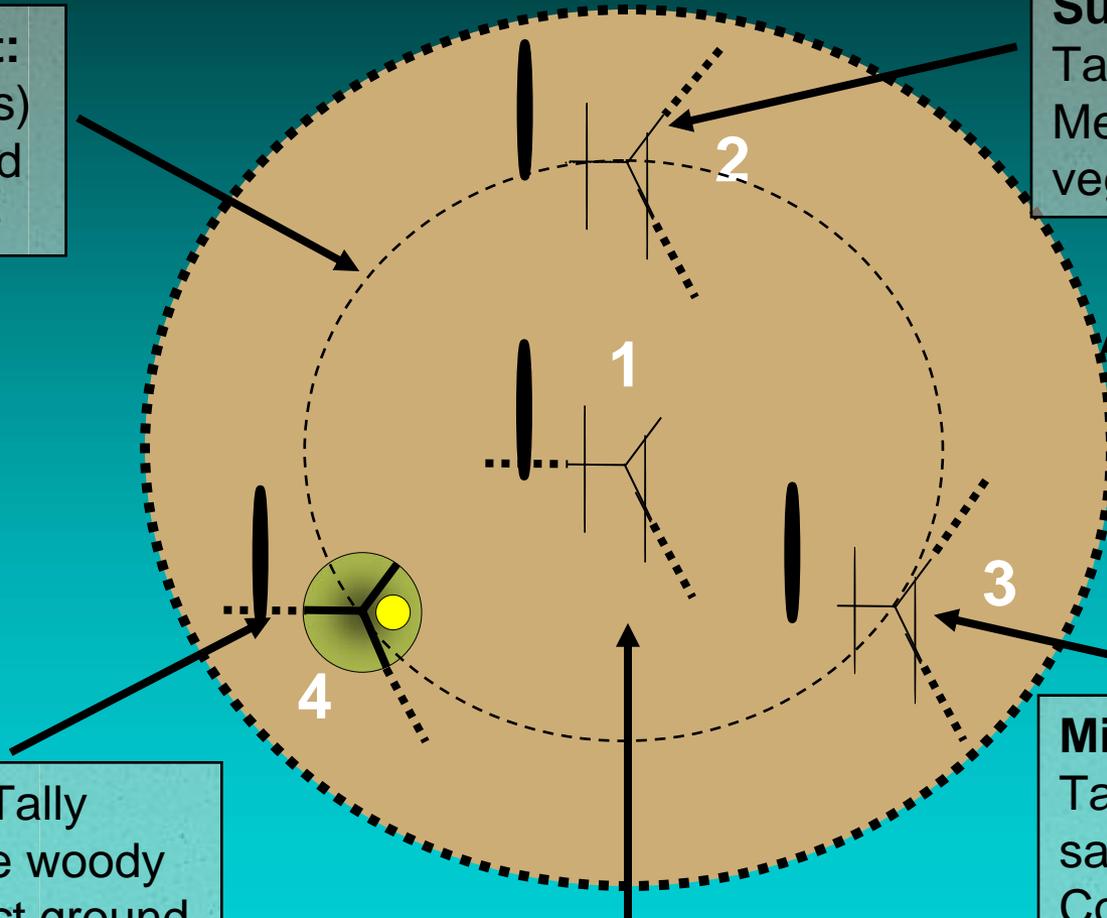
Subplot (24 ft radius):
Tally all trees ≥ 5 " dbh
Measure understory veg.

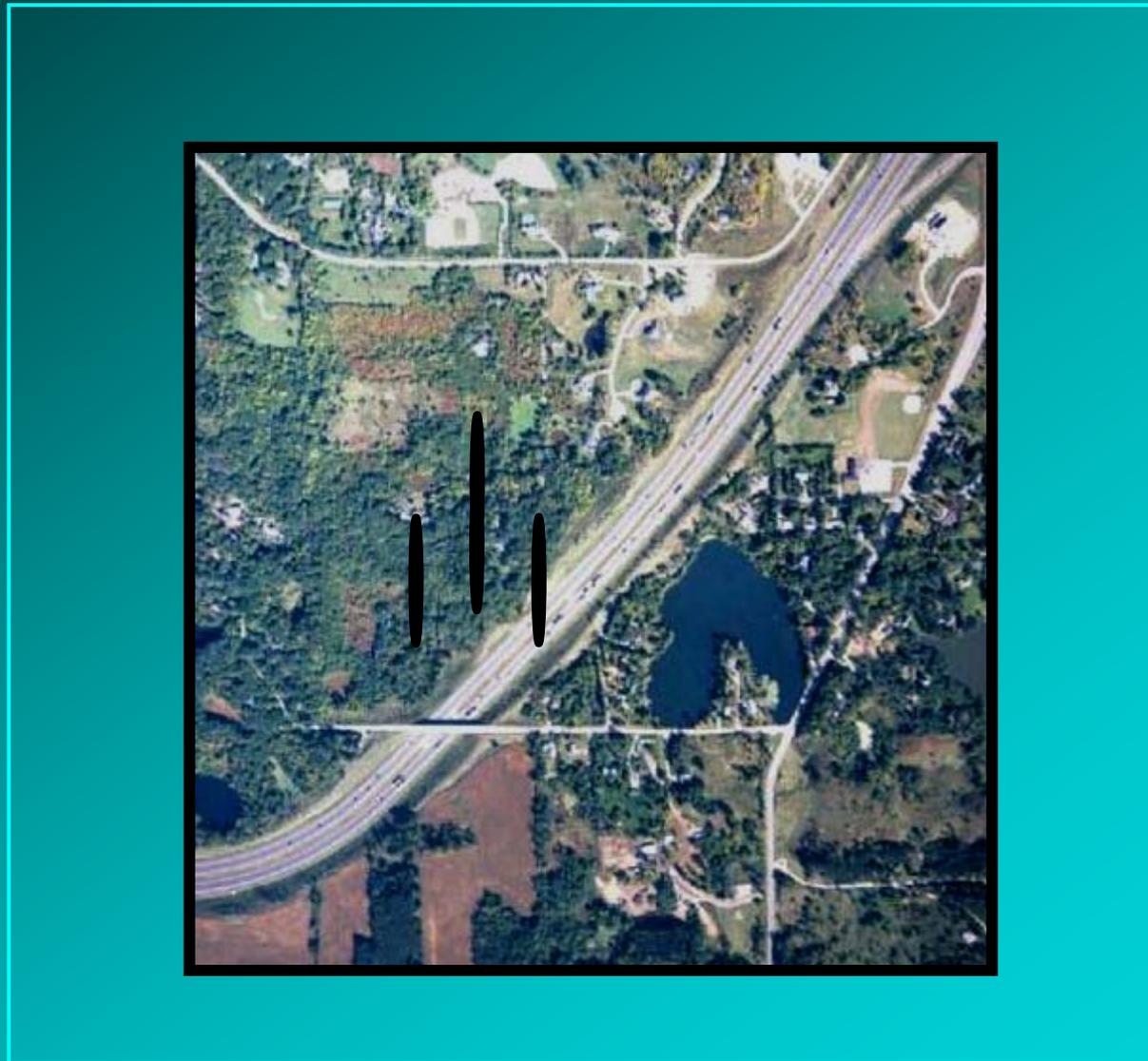
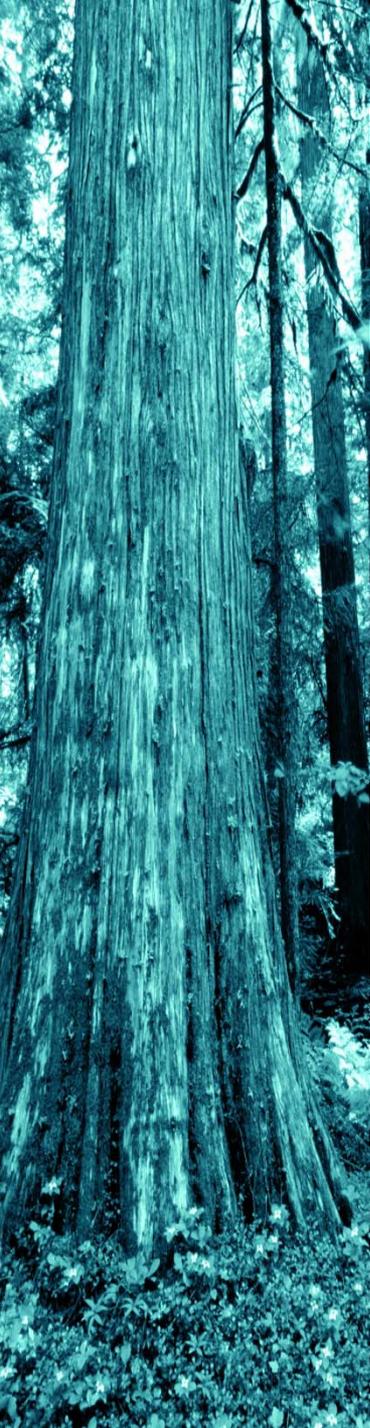
1-hectare plot
(~180 ft radius):
Tally very large trees

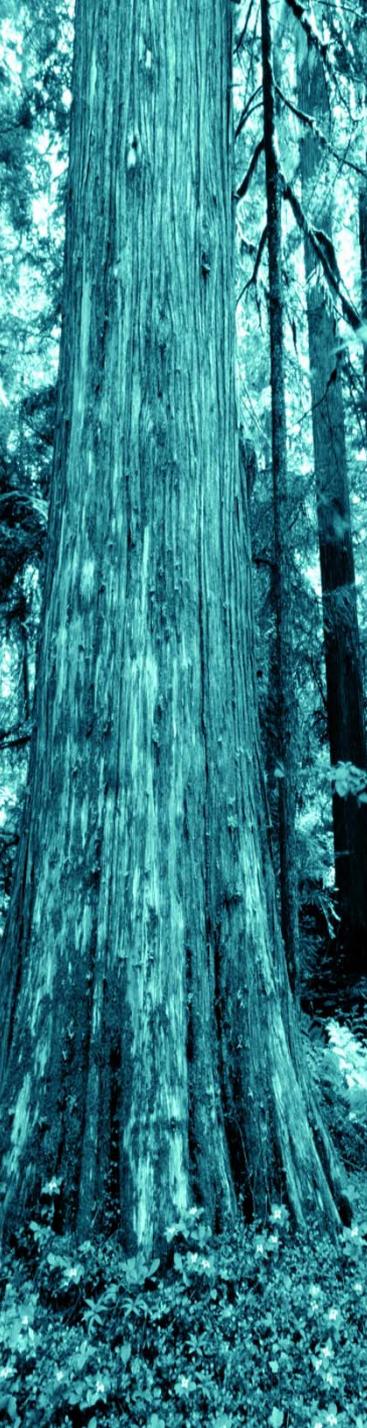
Microplot (6.8 ft radius)
Tally seedlings & saplings
Collect fuels data

Transects: Tally coarse & fine woody debris; collect ground cover data

Annular Plot (58.9 ft radius):
For sample intensification or sampling rare events







Scope of PNW-FIA Phase 2 Data

National core data

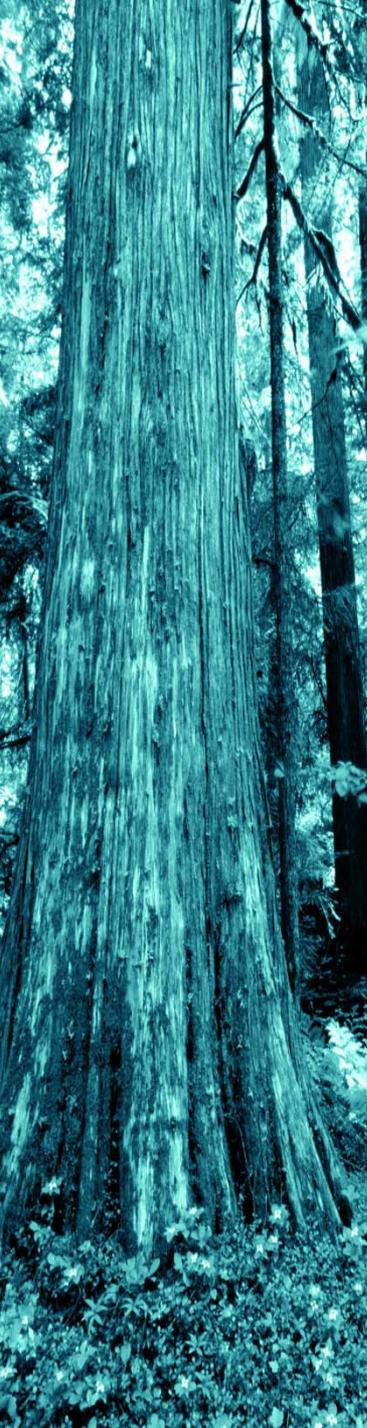
Plot/condition attributes, site class

Live trees, mortality, standing dead (snags)

Regional “add-ons”

Each FIA unit may collect data that is regionally important but not required at the national level

- Understory vegetation
- Insect and disease occurrence/severity
- Down woody debris and fuels
- Ground surveys



National Core Data

Data that all FIA regions collect

On Phase 2 plots

- Plot variables
- Owner class, Land class
- Tree measurements
(species, diameter, height, crown...)
- Disturbance
- Decay
- Cause of death
- Productivity potential (site index)
- and more....

Regional Add-On Data

Down Wood & Fuels

On Phase 2 plots

Down Woody Material
- CWD, FWD

Residue piles

Duff, litter, fuelbed depth

% Cover of live & dead
shrubs/herbs



To assess fuel loads, carbon stores, wildlife habitat

Regional Add-On Data

Tree Damage

On Phase 2 plots

- Insects
- Diseases
- Animals
- Weather

Severity of damage



For assessing impact and distribution of damage, role in forest composition & structure changes, fuels & fire risk, invasive insects & diseases

Regional Add-On Data

Understory vegetation

On Phase 2 plots

Vegetation profile

- Growth habit, height
- Cover by species & total
- Developmental stage
- Life form
- Select weed and indicators



For assessment of relative species abundance, wildlife habitat & forage, grazing potential, site productivity, fire hazard, non-timber forest products

Regional Add-On Data

Specific additions for
R5 National Forests

On Phase 2 plots

Sampling chaparral

Sampling non-forest land

1-hectare plot to sample large trees

Ground cover (rock, moss, litter, bare)



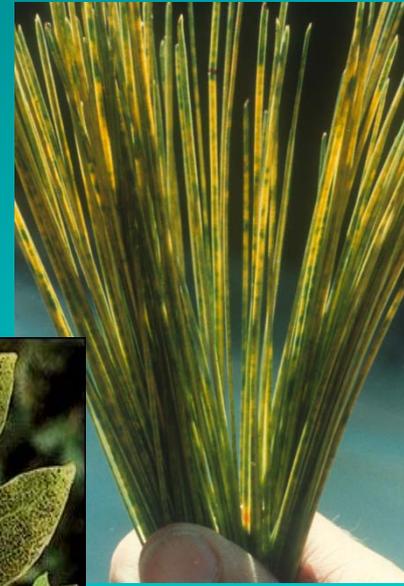
To help assess local issues in the State

Forest Health Data

On Phase 3 plots

Ozone and Lichens

- Extent of injury & severity
- Ozone Risk maps
- Air quality trends
- Lichen species ID
- Relative abundance
- Lichen diversity index

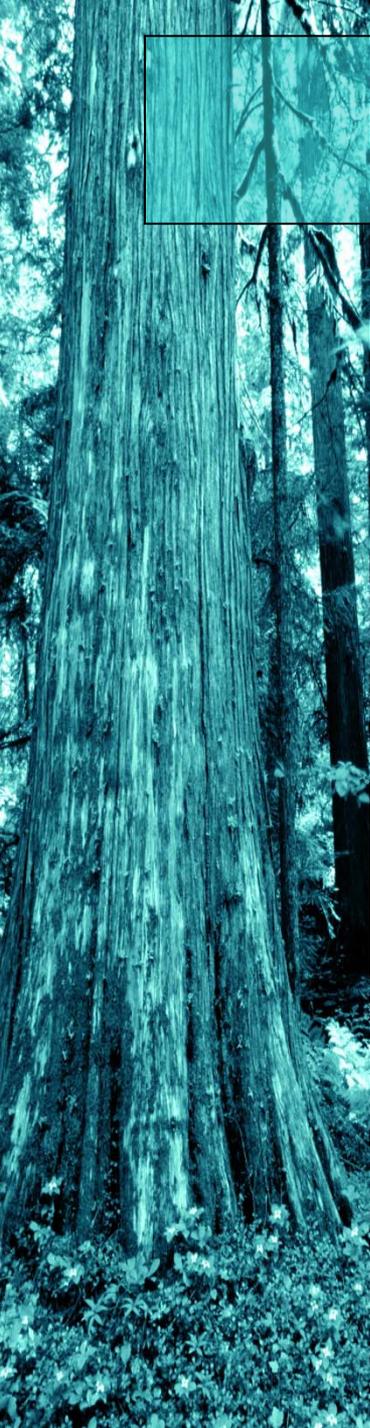


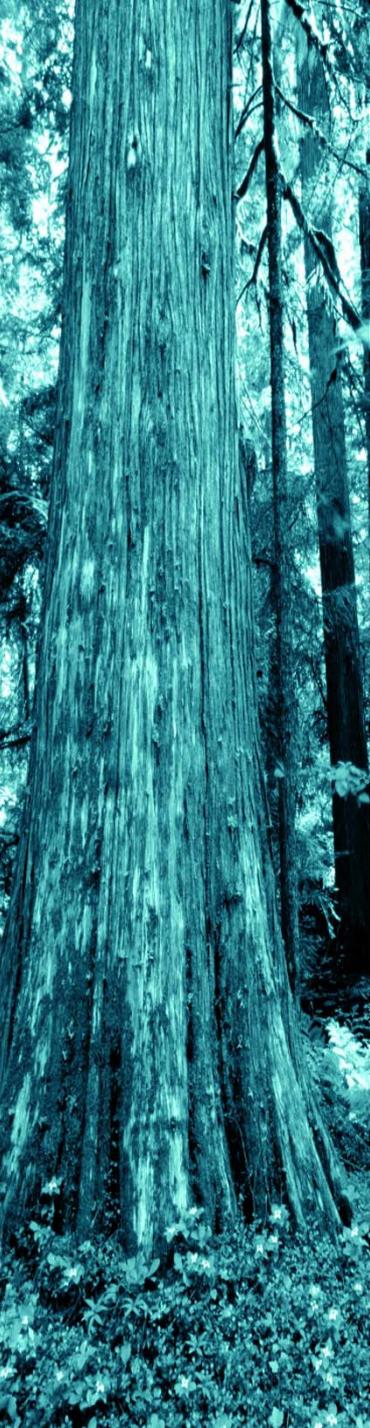
Forest Health Data

On Phase 3 plots

Tree crown density,
dieback, transparency

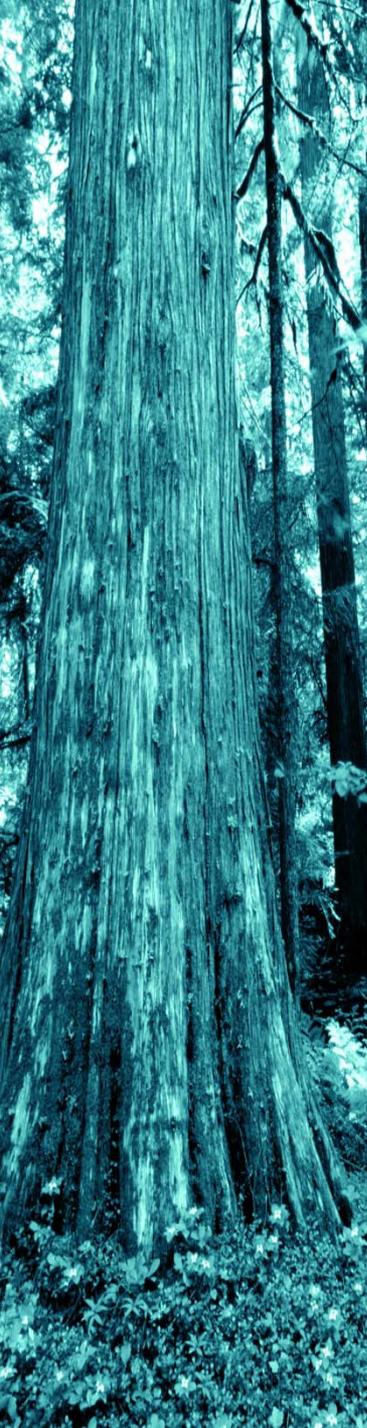
Soil physical and
chemical properties





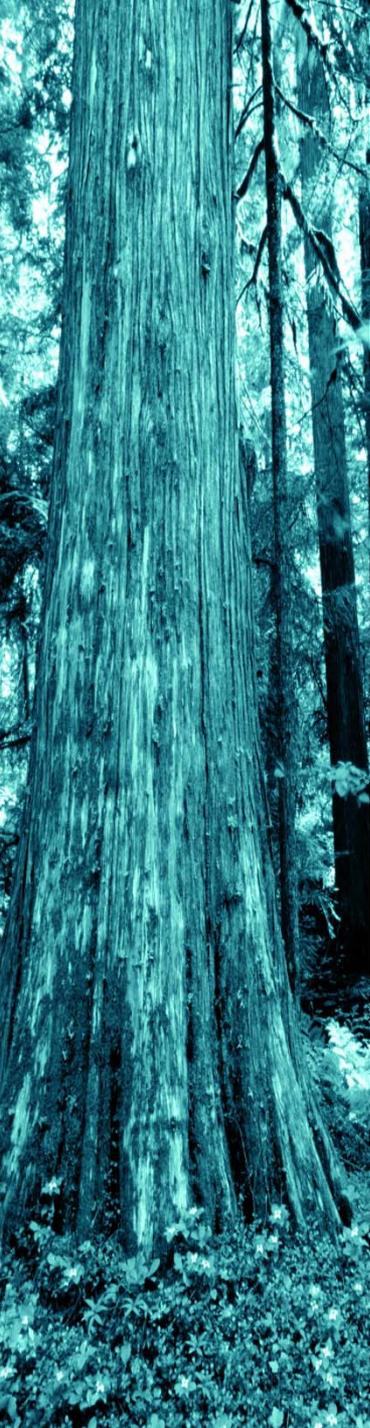
What do we do with all that data?

- Stored in National Databases
- Summarized
- Analyzed
- Published
 - 5-year reports
 - Issue reports
 - Resource reports
 - Journal articles

A vertical photograph of a large tree trunk, likely a redwood or sequoia, showing its characteristic deeply furrowed bark. The tree is set against a background of other trees and foliage in a forest. The image is positioned on the left side of the slide, partially overlapping the blue background.

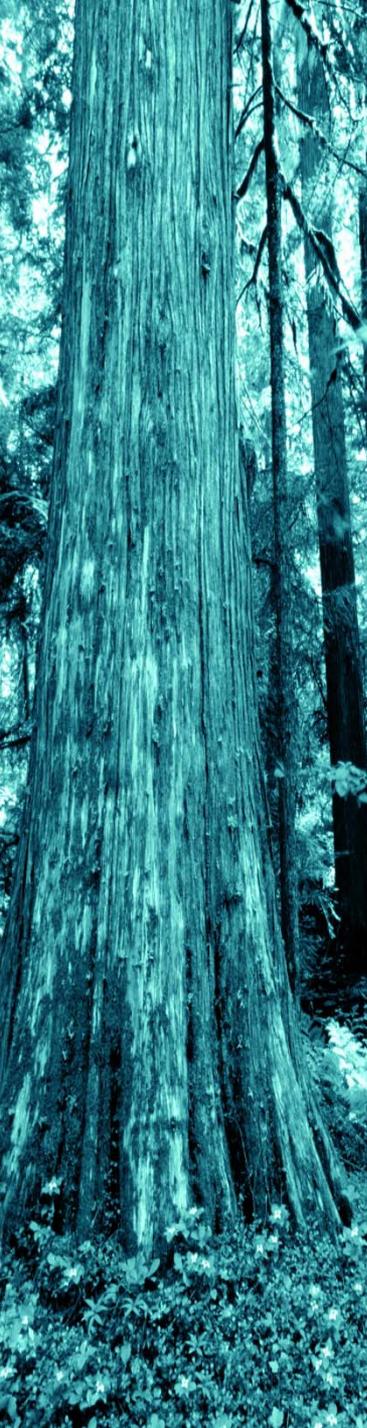
How Does FIA Estimate Carbon?

- Based on species, diameter, height
- Species-specific wood density
- Volume to Biomass
- Biomass to Carbon
- Expand across post-stratified areas

A vertical photograph of a large tree trunk with rough, textured bark, set against a background of a forest with other trees and green foliage.

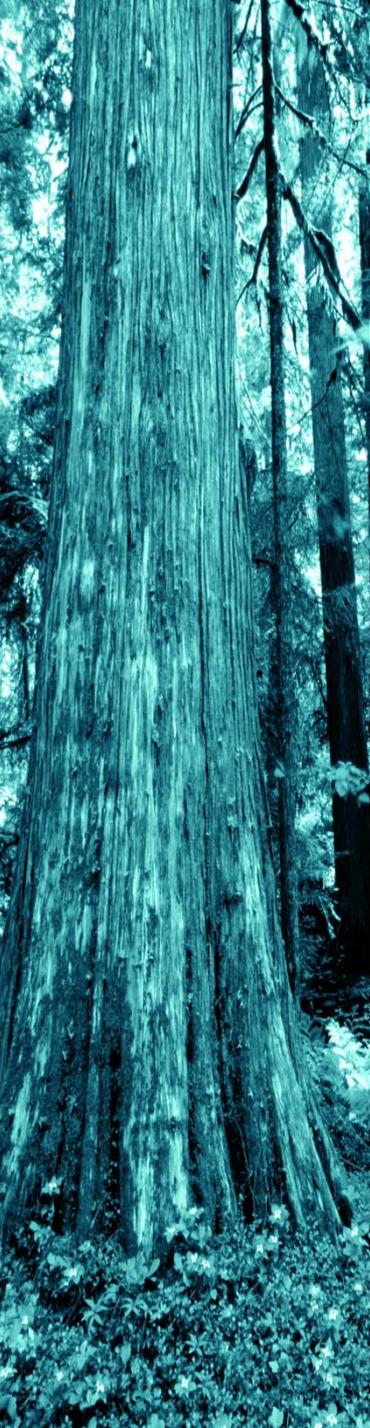
How Does FIA Estimate Carbon?

- FIA uses Component Ratio Method – (CRM)
- Estimate biomass/carbon by components according to Jenkins



How Does FIA Estimate Change?

- For CA 5-year Report, modeled
 - Small sample of remeasured trees
 - X trees
 - High standard errors
- For CA 10-year Report (2001-2010)
 - Larger sample of remeasured trees
 - X trees
 - Lower standard errors
 - Complete remeasurement in 2020



Questions?