

# Applying knowledge of biological legacies to forest management

## H.J. Andrews Experimental Forest



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# Disturbances are a major influence on HJA ecosystem

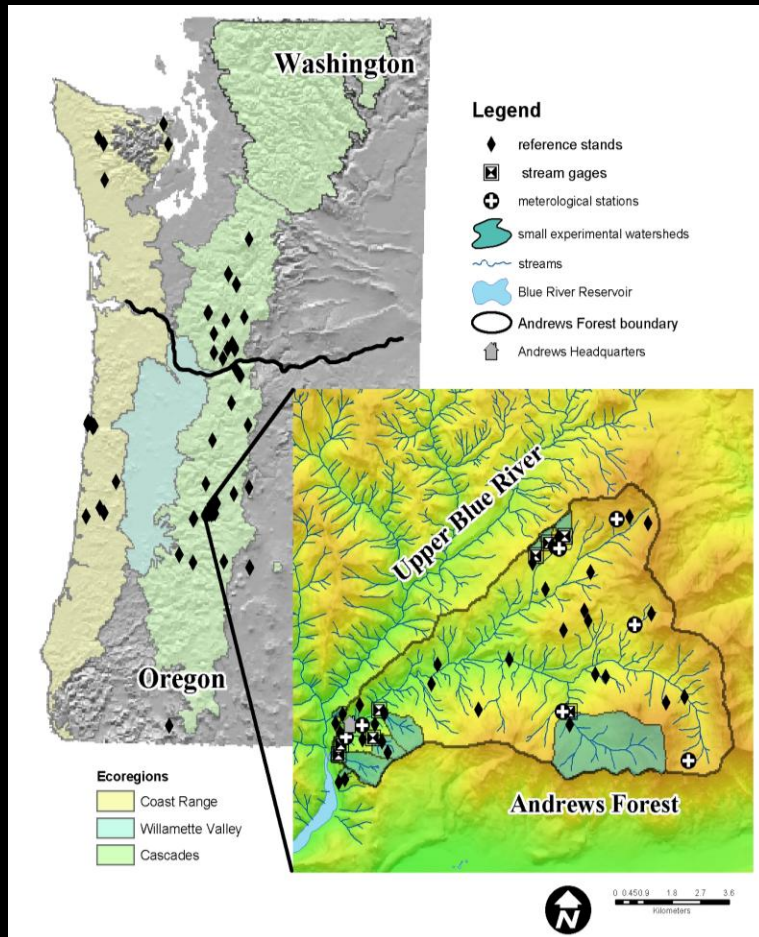


# Ecosystem research and forest management:

Using an understanding of ecological and watershed processes as framework for landscape-scale management objectives

# ILTER Network

## H.J. Andrews Experimental Forest



# Research history at HJA

**1950s** – Effects of forest harvest in small watersheds



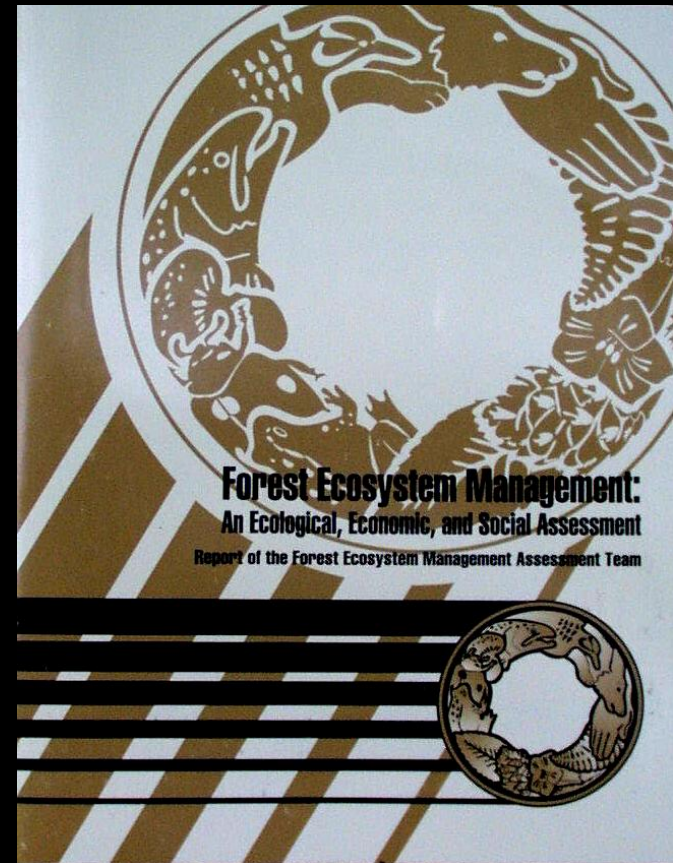
**1960s-70s** – IBP, nutrient cycling, forest stream interactions

**1980s to present** – LTER, causes and consequences of disturbances, legacies

# HJA LTER instrumental in transitions in National Forest management

## Half century of stewardship

- Early research on timber production and forest harvest
- Species viability
- Landscape ecology and ecosystem management



NW Forest Plan / FEMAT

# Partnerships in research and management

Academics

Federal research scientists

Land managers



# Understanding and managing complex ecosystems

Institutional and cultural differences:

- Research focus on complexity of systems
  - Aquatic and terrestrial interactions
  - Social and policy
- Management thrust for simplification
  - Regulatory issues
  - Monoculture plantations
  - Rapid decisions



# Applications of basic research to management

- **Legacies and landscapes**

Standing and down wood

In stream wood

Carbon sequestration

Nutrient biogeochemistry

Species persistence

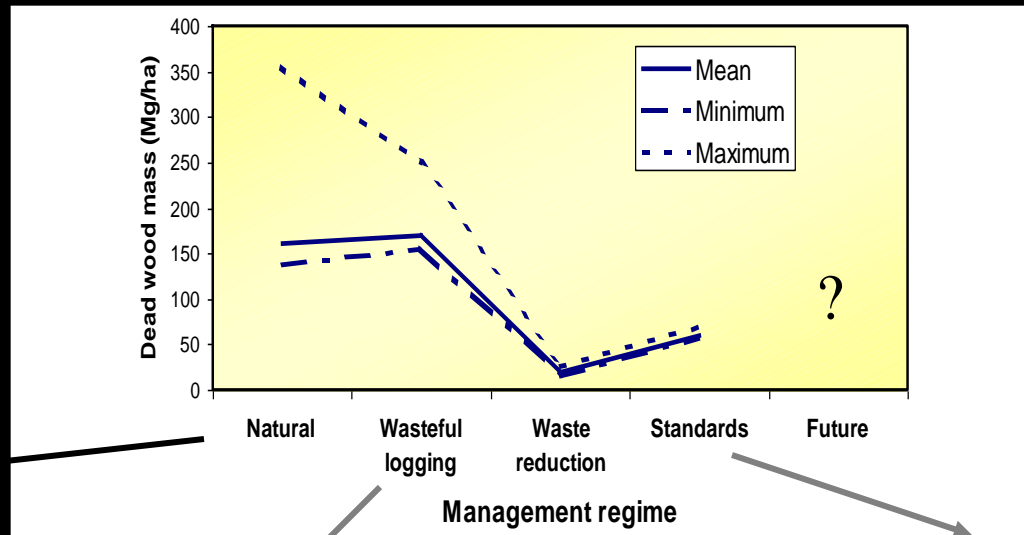
Hydrologic responses

- **Emulating disturbances**

Forest gaps

Fire history

# Disturbance legacies and wood biomass



# Research into the functions of dead wood in forests and streams



insects



fungi & microbes



soil and nutrients



streams

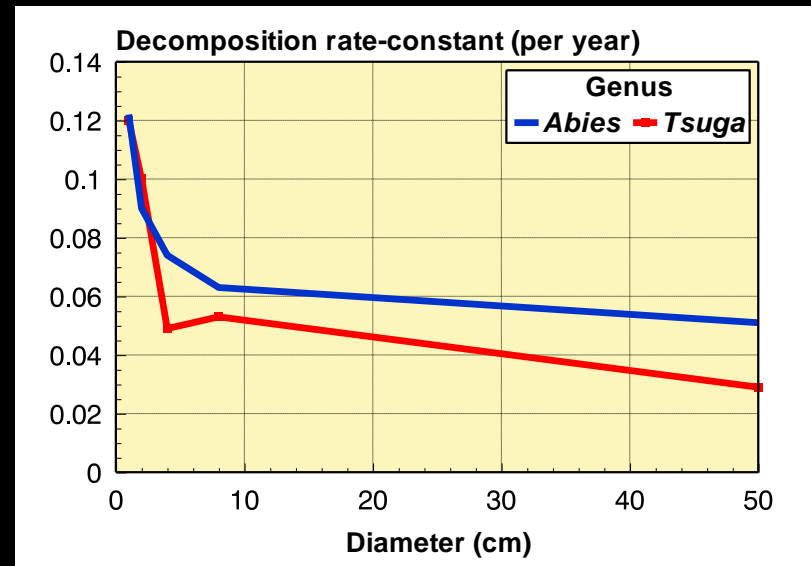


carbon storage



plants

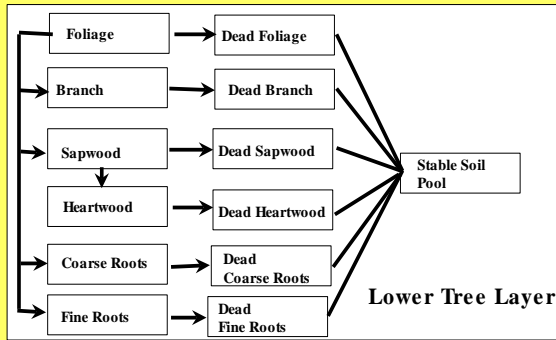
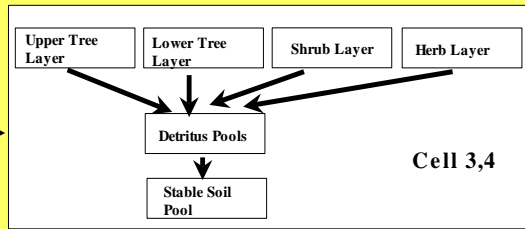
# Wood decomposition research: 200 yr study



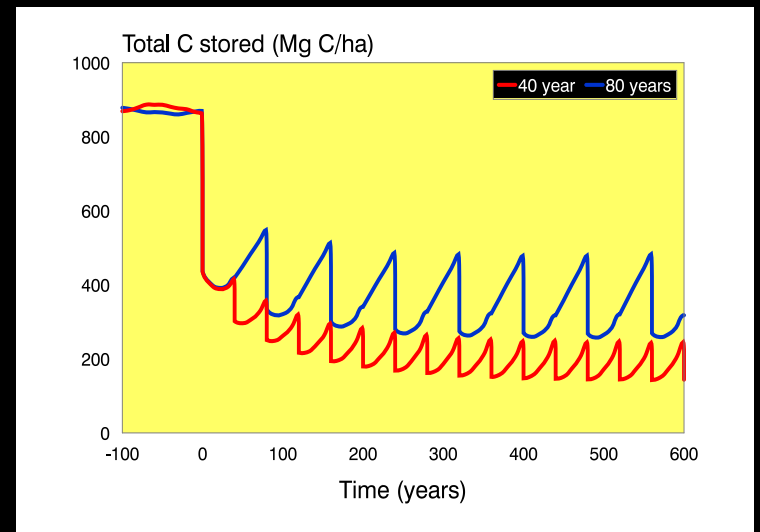
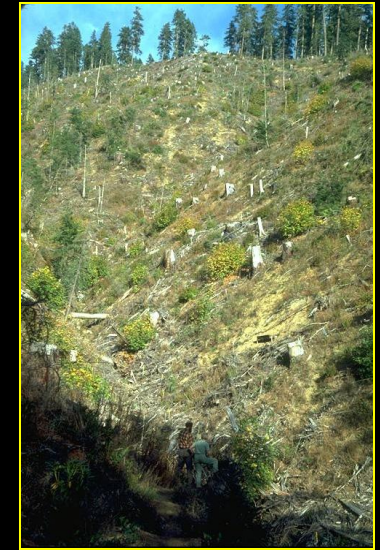
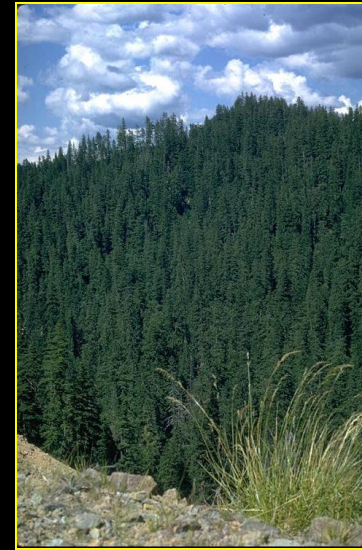
# Dead wood, forest harvest and scaling up to regional carbon sequestration

## Stand Example

1,1	1,2	1,3	1,4
2,1	2,2	2,3	2,4
3,3	3,2	3,3	3,4
4,1	4,2	4,3	4,4



## STANDCARB MODEL



# Changes in forest harvest practices: providing for future live and dead wood



**15% retention**

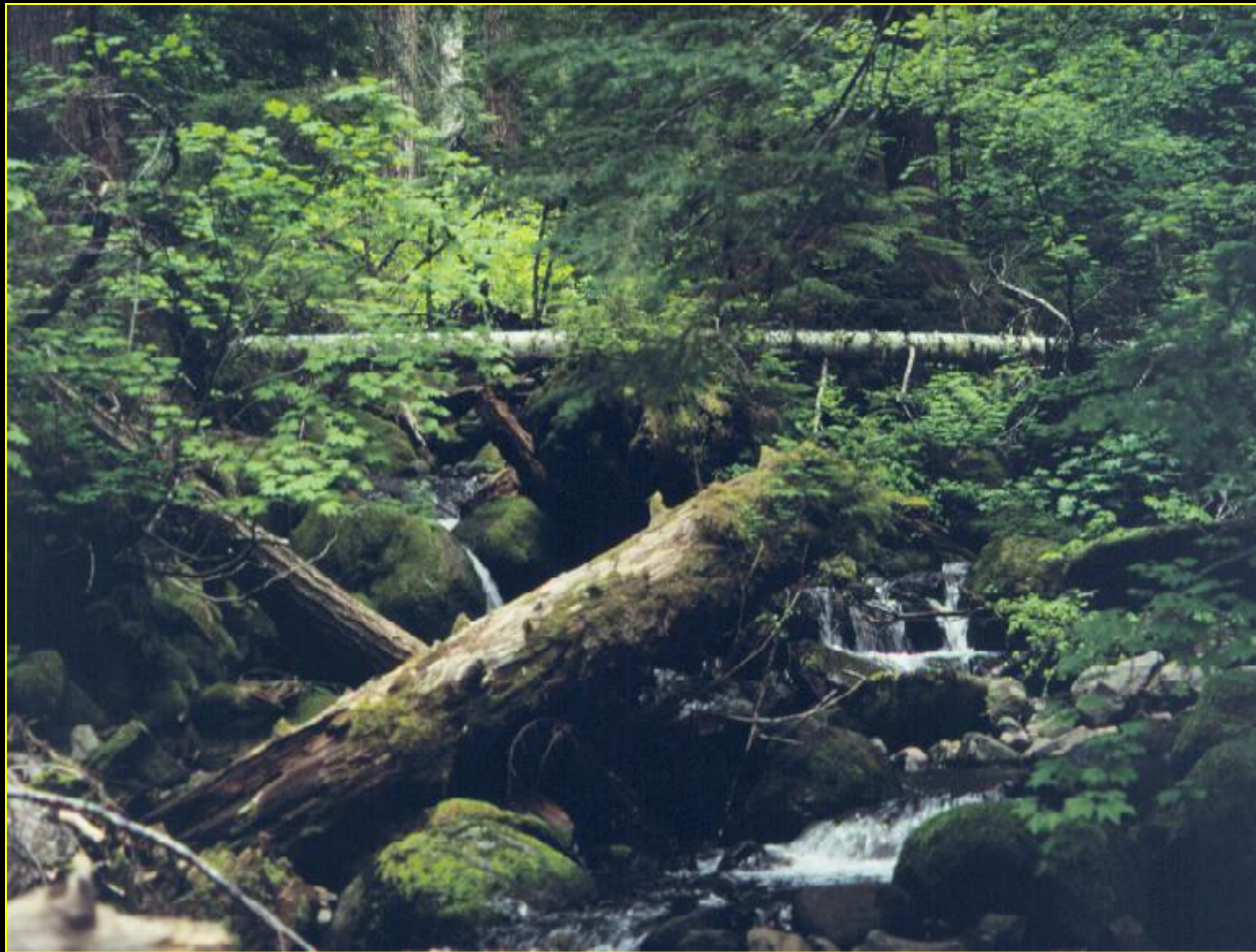


**30% retention**



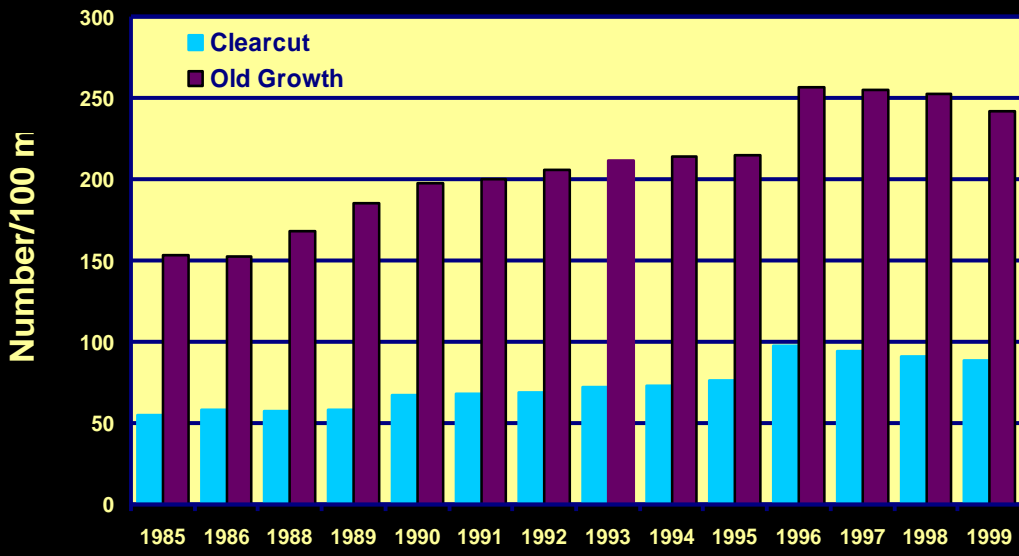
**50% retention  
and snag creation**

# Biological legacies: Wood in streams and sources of new wood



- **Sources within channel or floodplain**
  - riparian vegetation
  - remobilization of instream material
- **Sources external to system**
  - debris flows
  - wood from hillslopes
- **Stream cleaning after harvest**
  - wood removed from streams

# Long-term research on role of wood and forest stream interactions

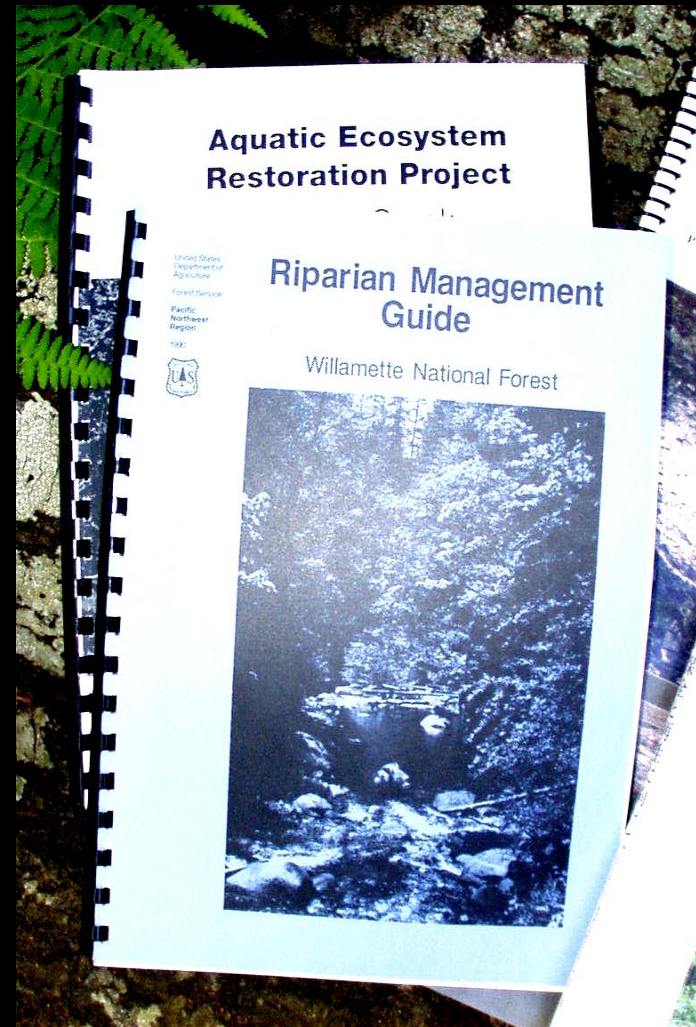


Wood in Mack Creek





# Research rapidly translated into riparian management guidelines



# Stream restoration:

Initial key pieces of wood added

Then reliance on natural processes for accumulations to emulate natural wood densities



# International applications of HJA LTER research



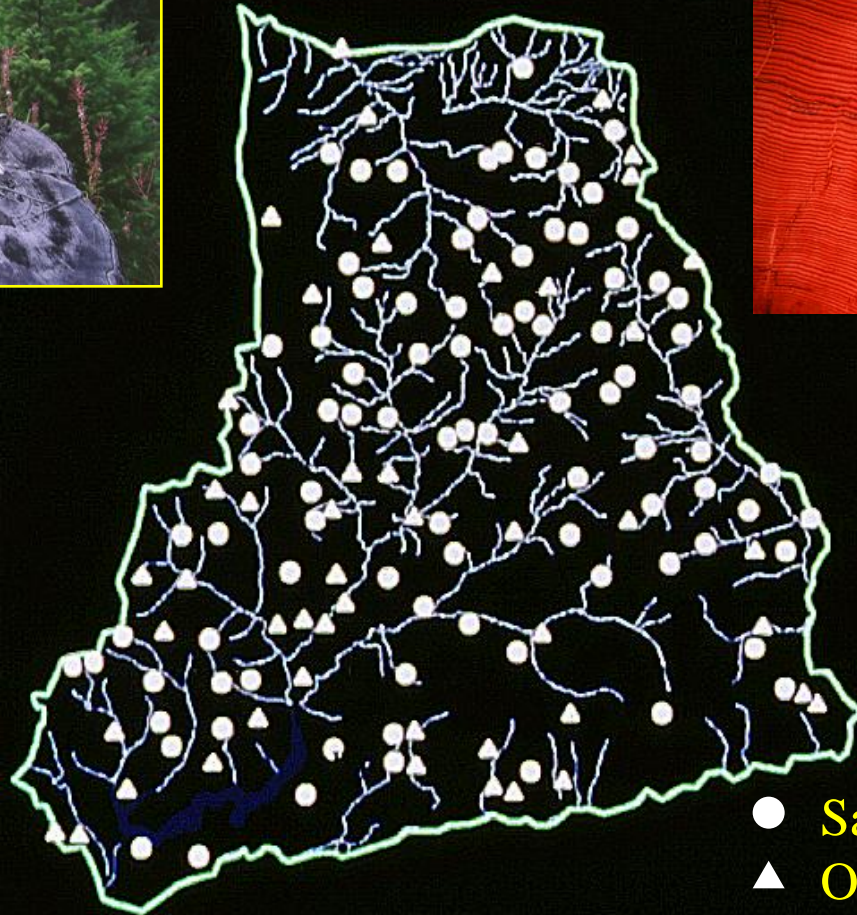
Riparian management guide  
translated into Japanese



# Use of fire history and prescribed fire in forest management



# Fire History Studies



- Sampled sites
- ▲ Opportunistic sites

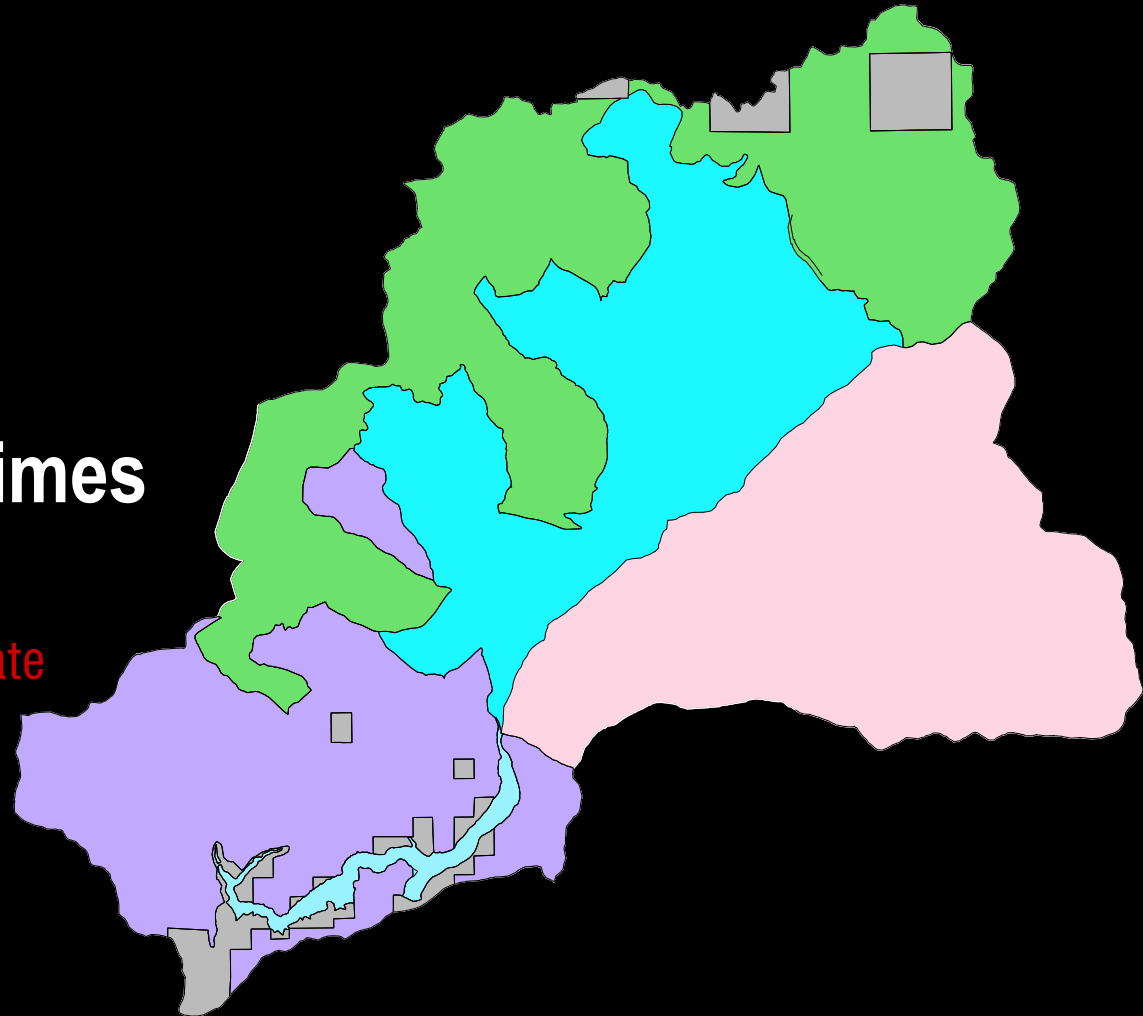


# Biological legacies: Using fire history for planning forest harvest rotations

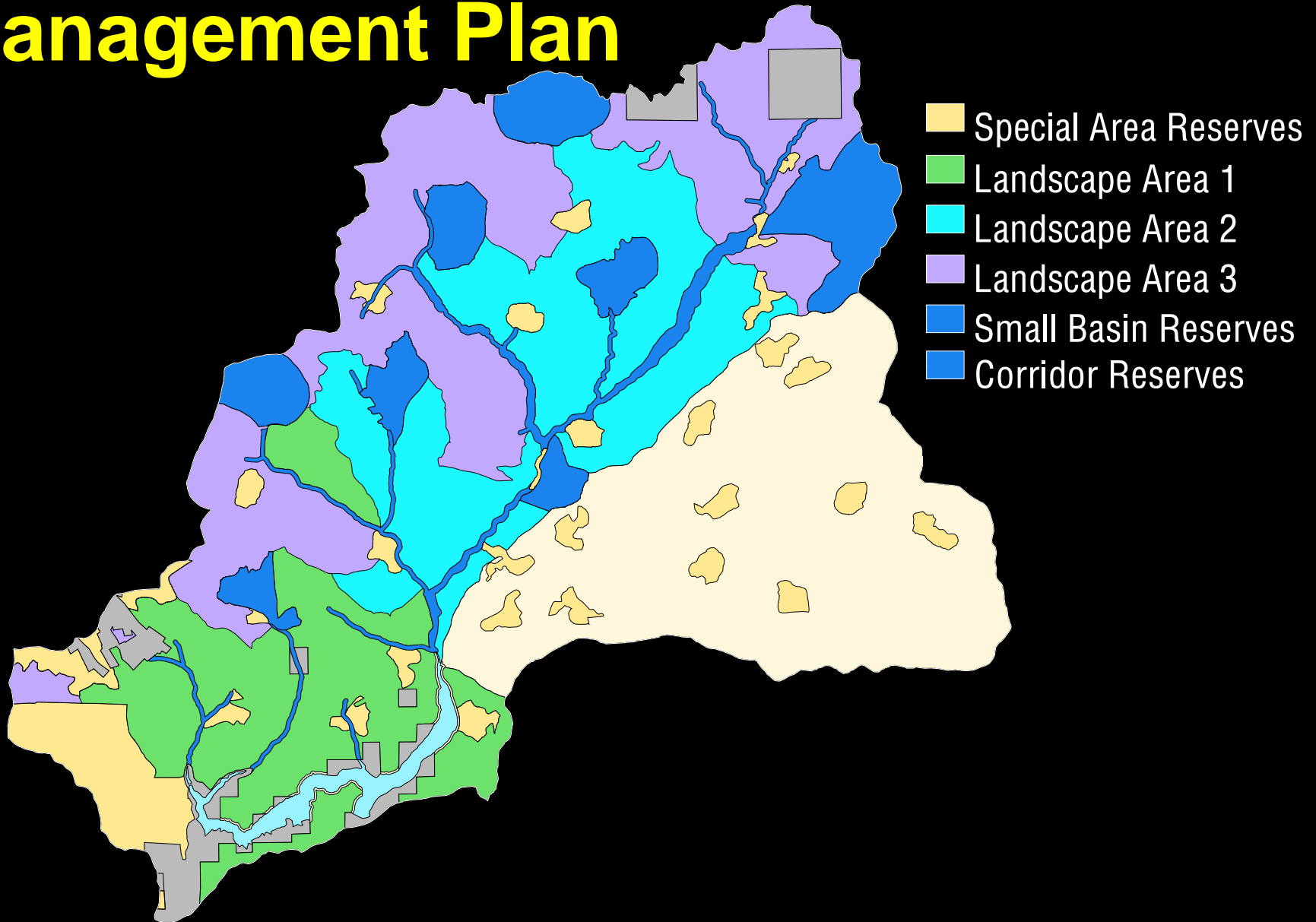


## Fire Regimes

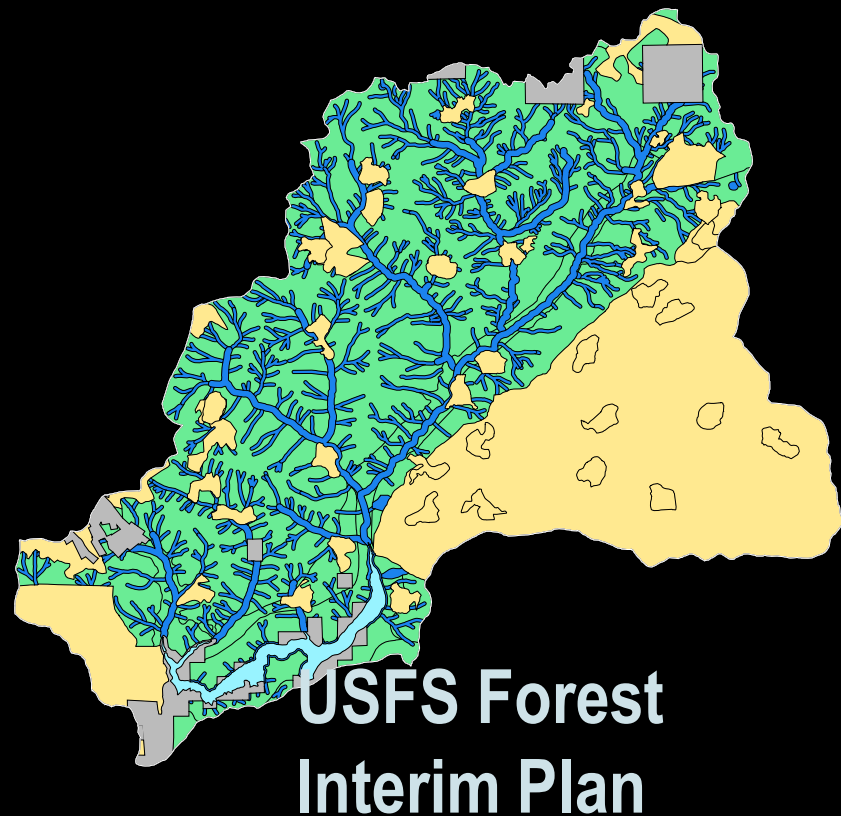
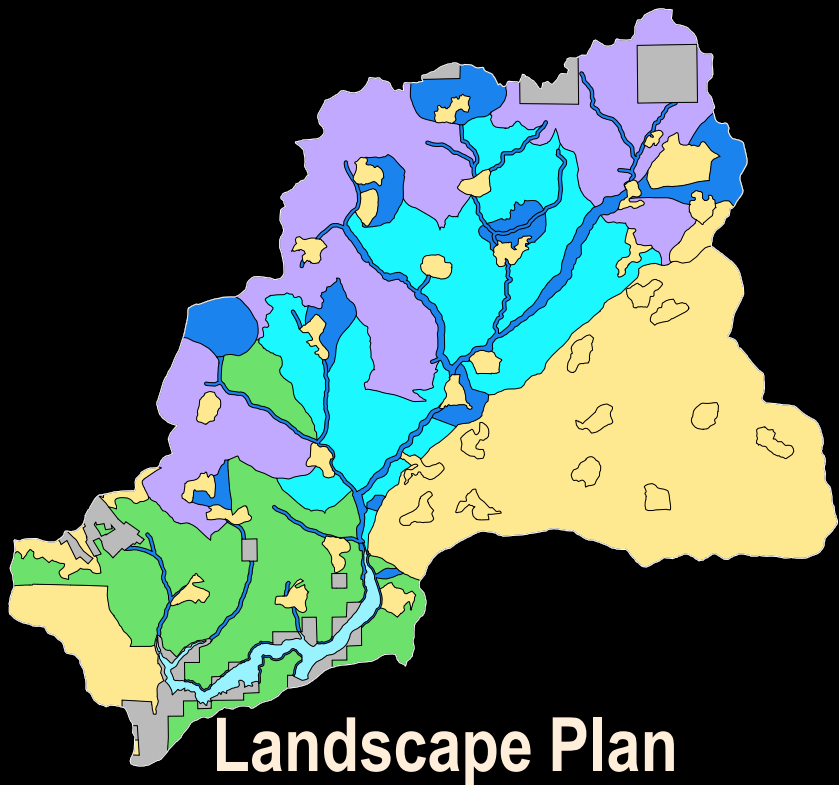
- Low
- Intermediate
- High



# Blue River Adaptive Management Plan



# Comparison of Adaptive Management landscape plan: Disturbance regimes vs NW Forest Plan

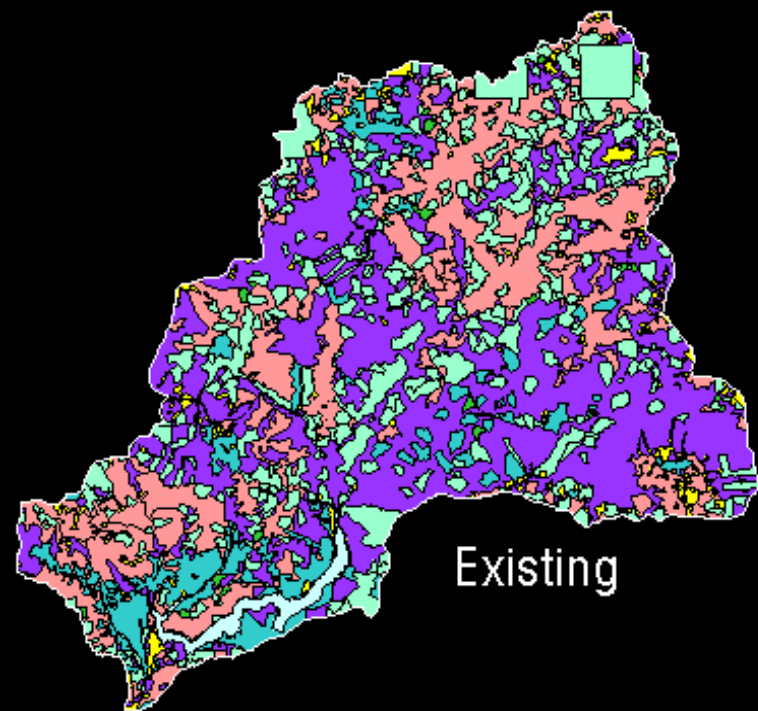


- Special Area Reserves
- Aquatic Reserves
- Landscape Area 1
- Landscape Area 2
- Landscape Area 3

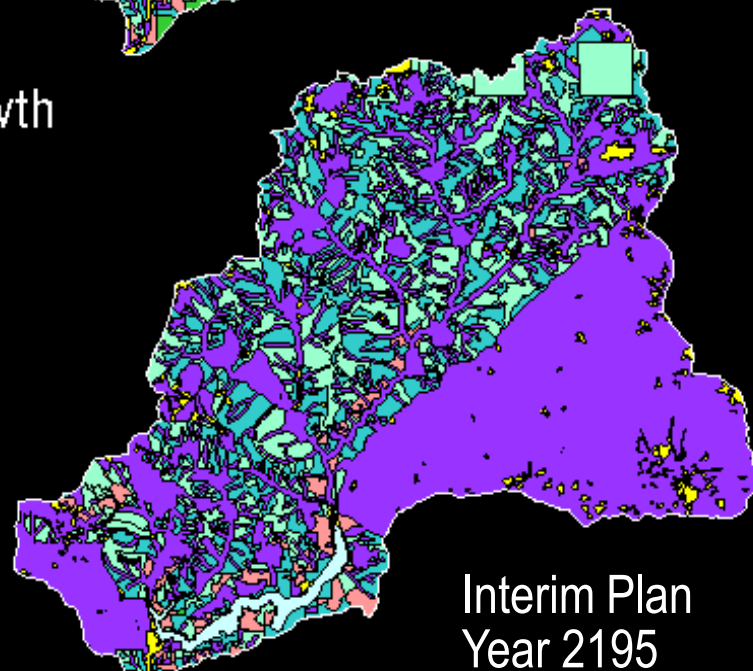
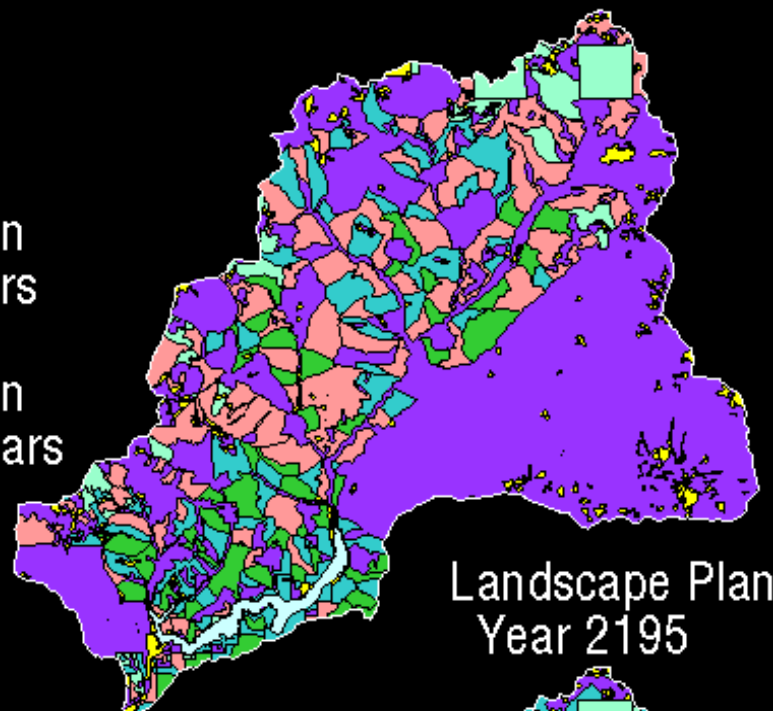
- Special Area Reserves
- Riparian Reserves
- Matrix



# Existing Vegetation and Future Alternatives Comparison



- Plantation 1-20 years
- Plantation 20-40 years
- Young
- Mature
- Old Growth



# Summary

**Pacific Northwest landscapes are very dynamic with long-lasting biological legacies**

**Future landscapes will reflect interactions of natural disturbances and management patterns**

**Use of historic landscape dynamics to guide future management may help us balance species protection, wood production, fire risk management, and other objectives**

# **Biological legacies and Forest management**

**Basic research explores fundamental  
assumptions of how ecosystems operate**

**But waiting to apply research findings isn't  
necessary**

**Adaptive techniques and good partnerships  
allow for rapid incorporation of research  
findings to stream and forest management.**

# Experimental Watersheds

## H.J. Andrews Experimental Forest

