The role of riparian buffers and thinning in linkage areas to maintain forest biodiversity

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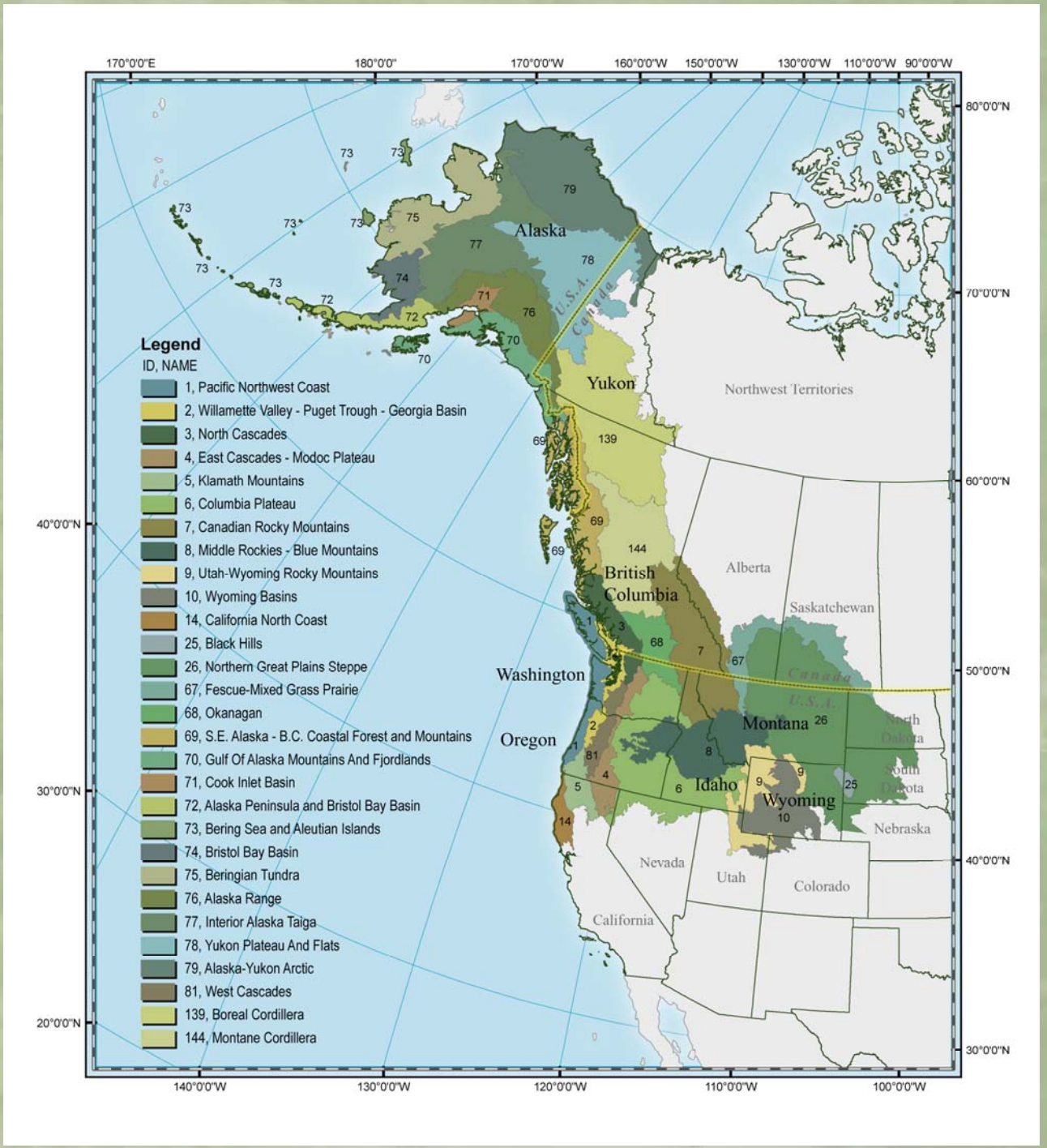
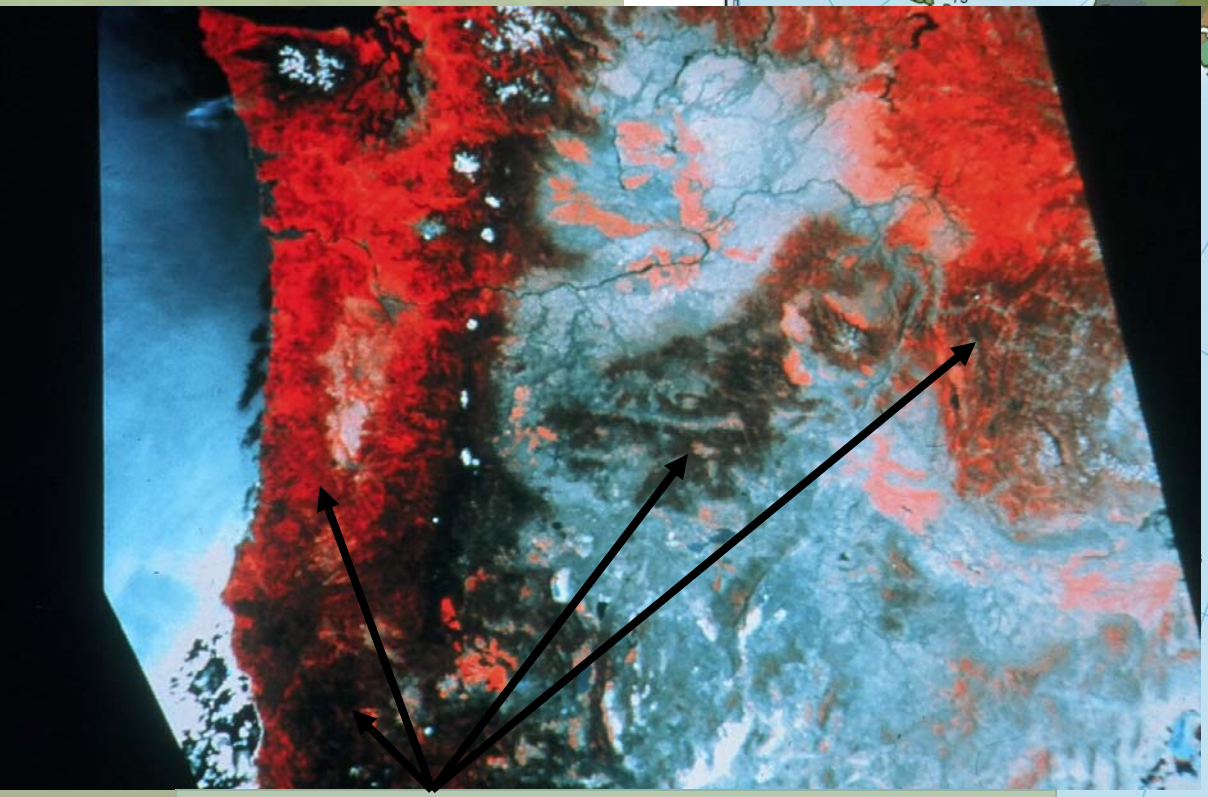
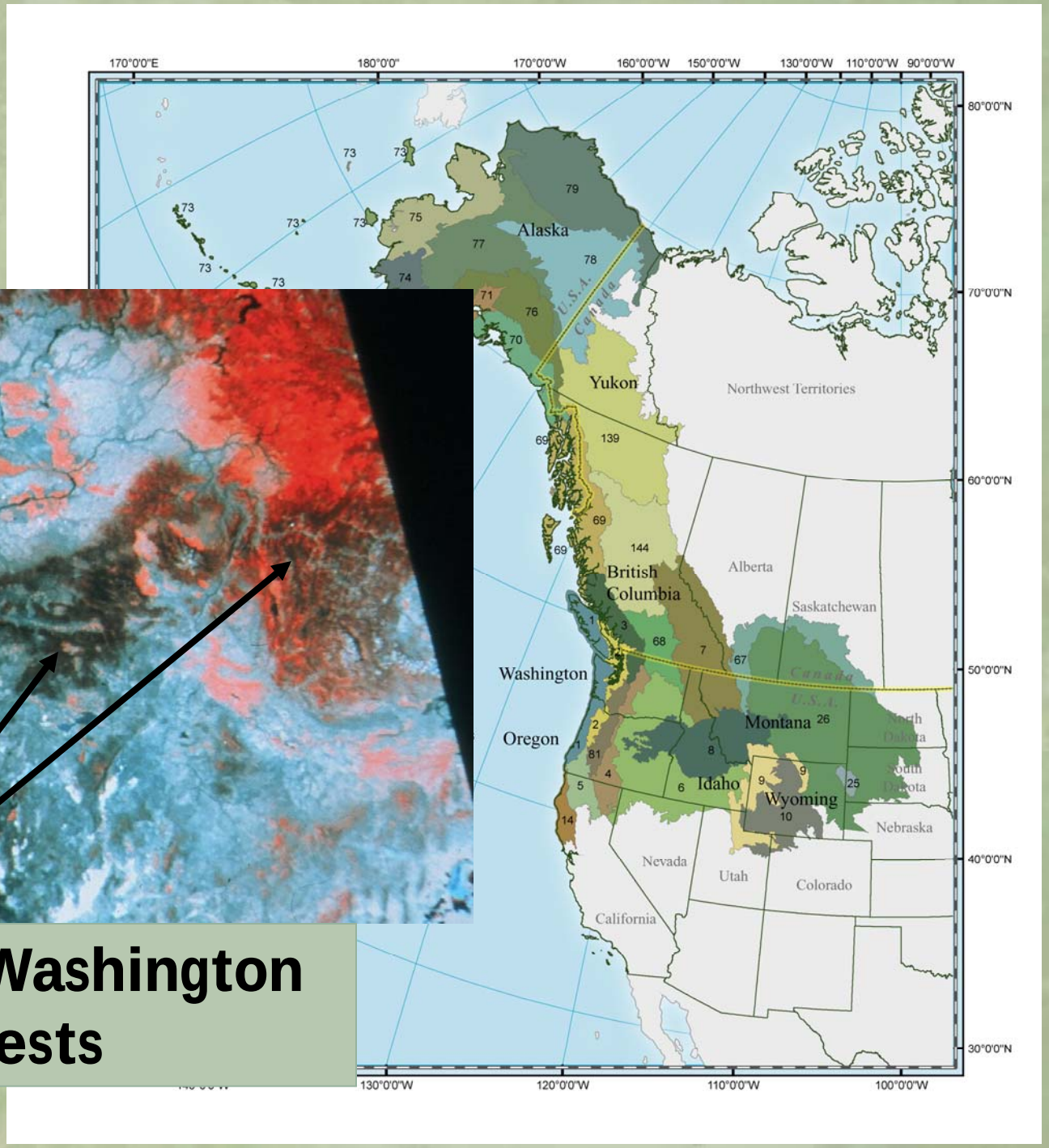
Northwestern North America Ecoregions



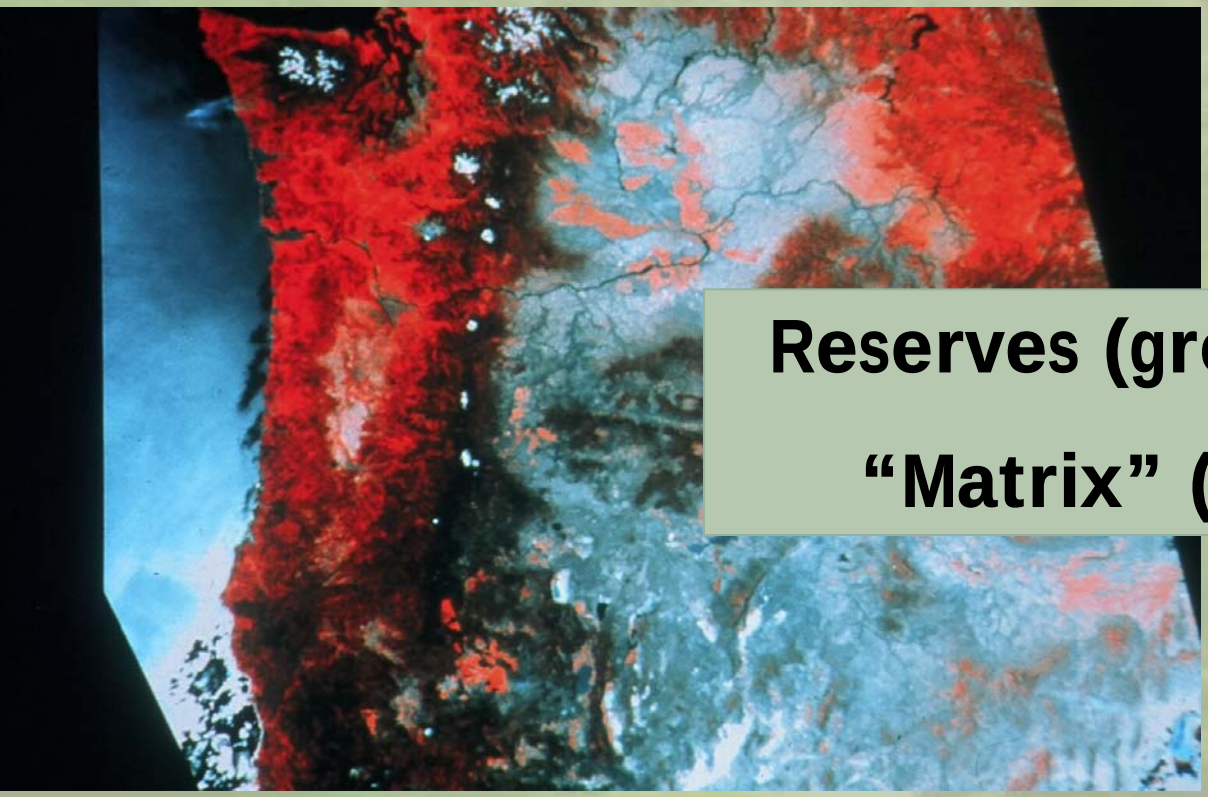
Northwestern North America Ecoregions





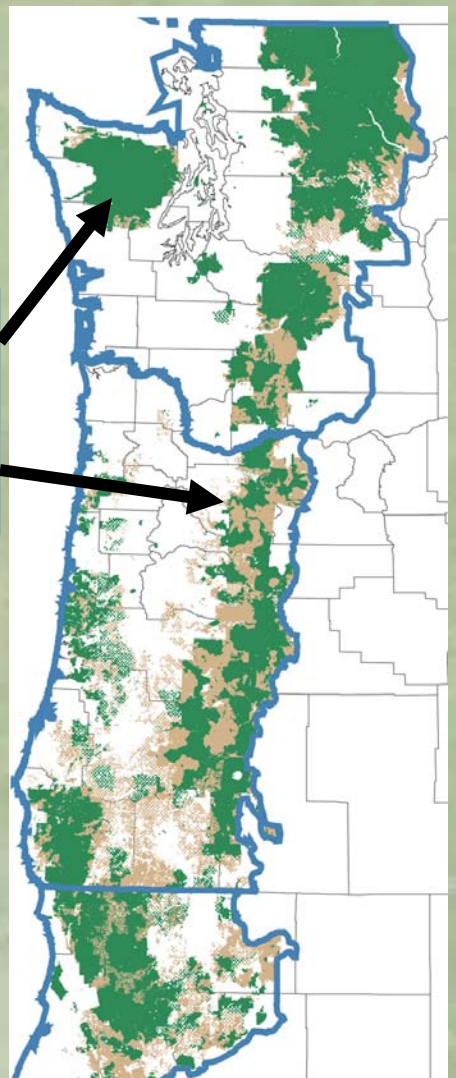
Oregon & Washington Forests

Forest Biodiversity Conservation: US Federal Lands

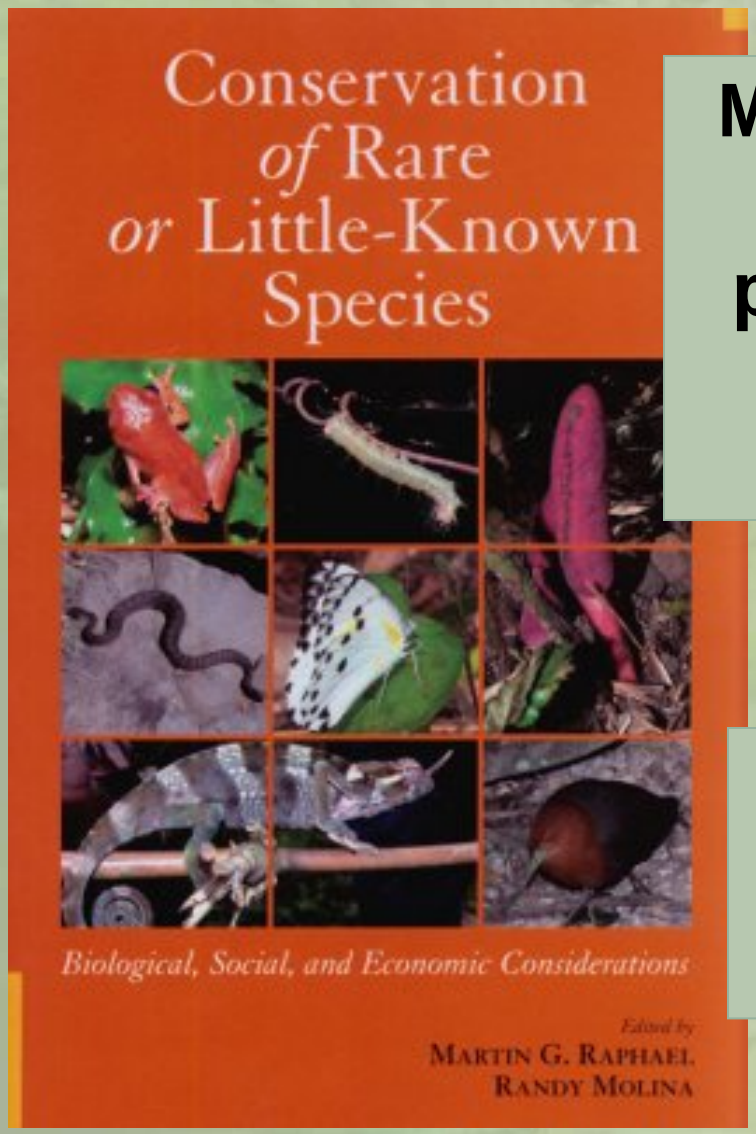


Reserves (green)

“Matrix” (tan)



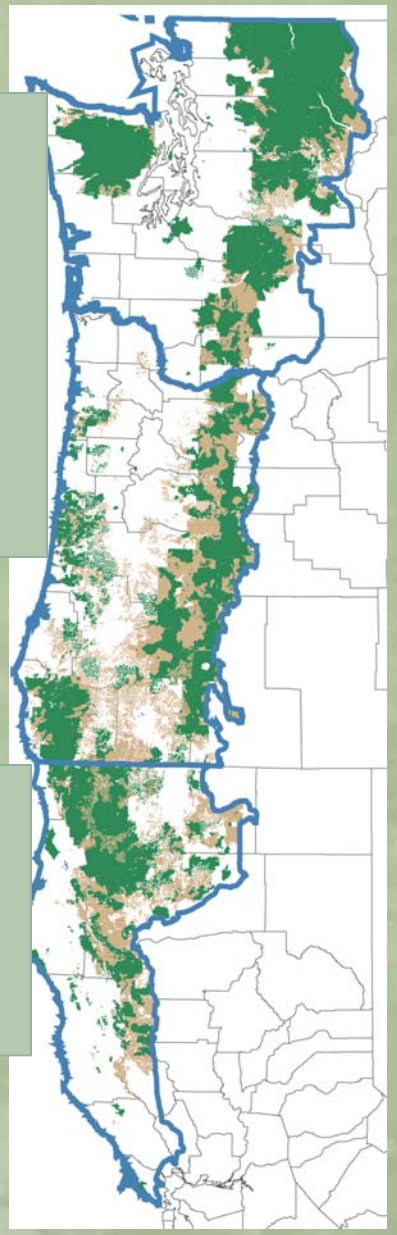
USDA & USDI 1994

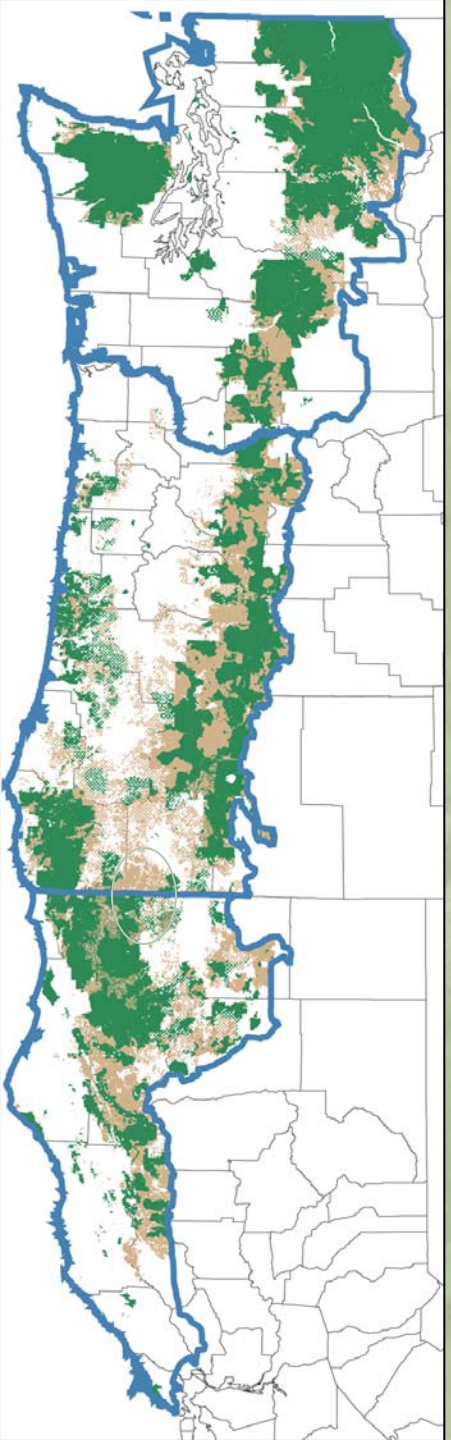


Raphael & Molina (eds) 2007
Island Press

Matrix management needed to ensure persistence of rare and little known species

Within & among basin designs needed





Within & among basin designs:

Terrestrial Species

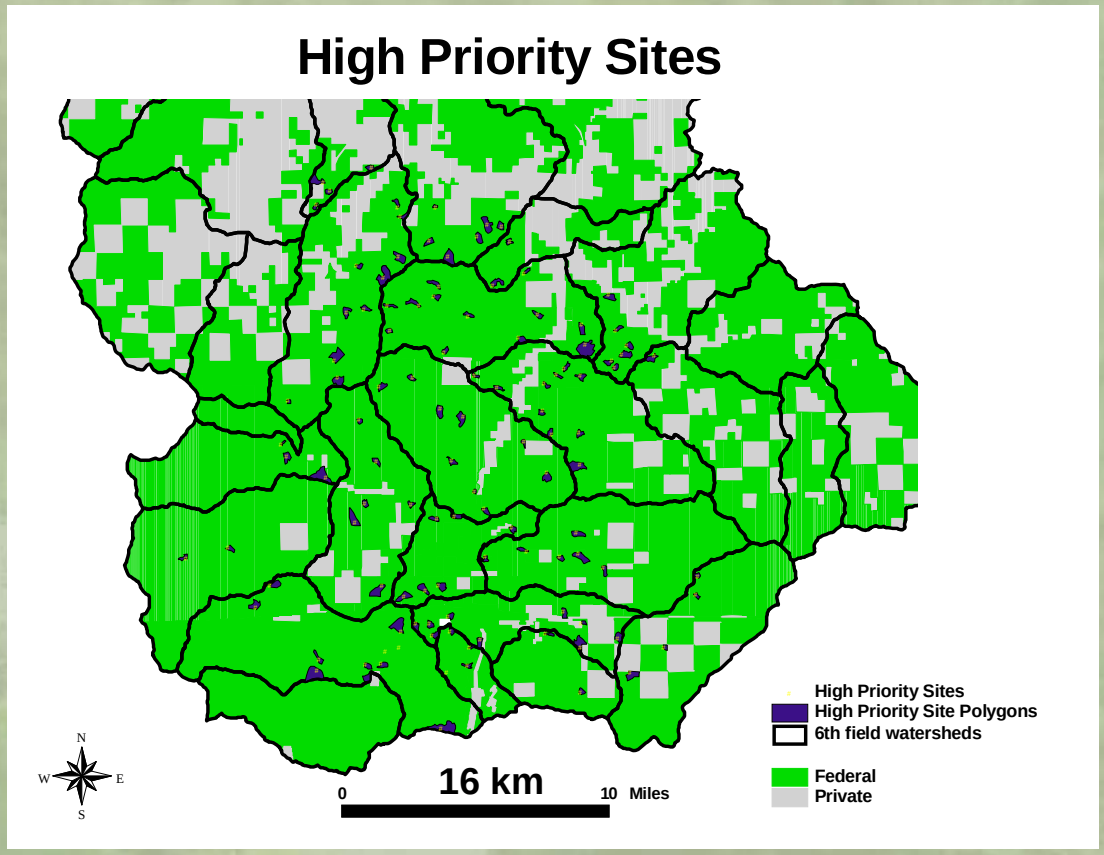
Example

Siskiyou Mountains Salamander (*Plethodon stormi*)

Rock Associate

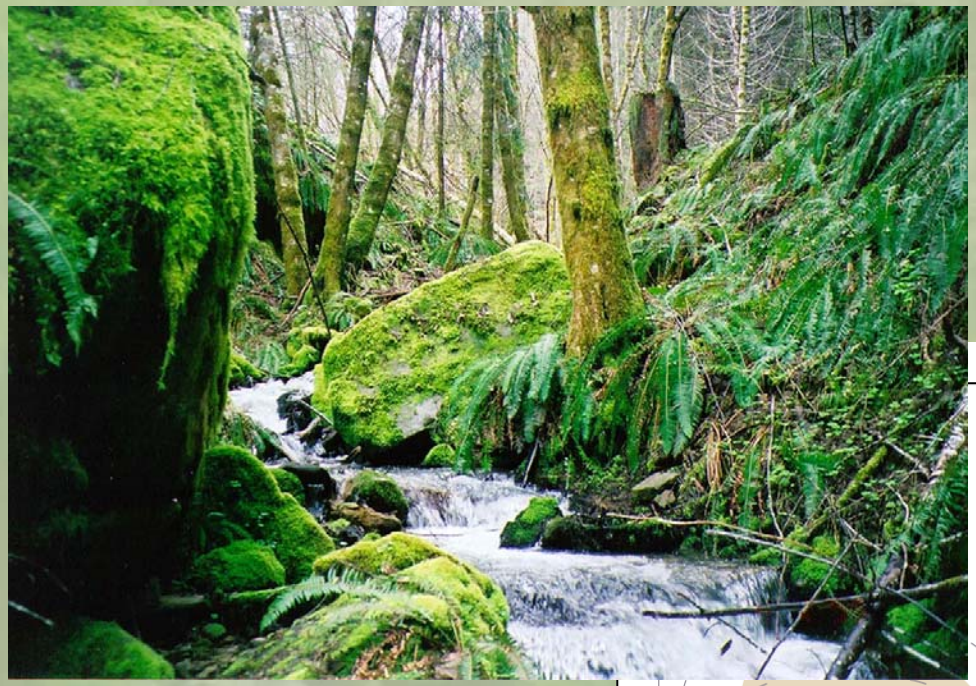
Olson, Clayton et al. 2007

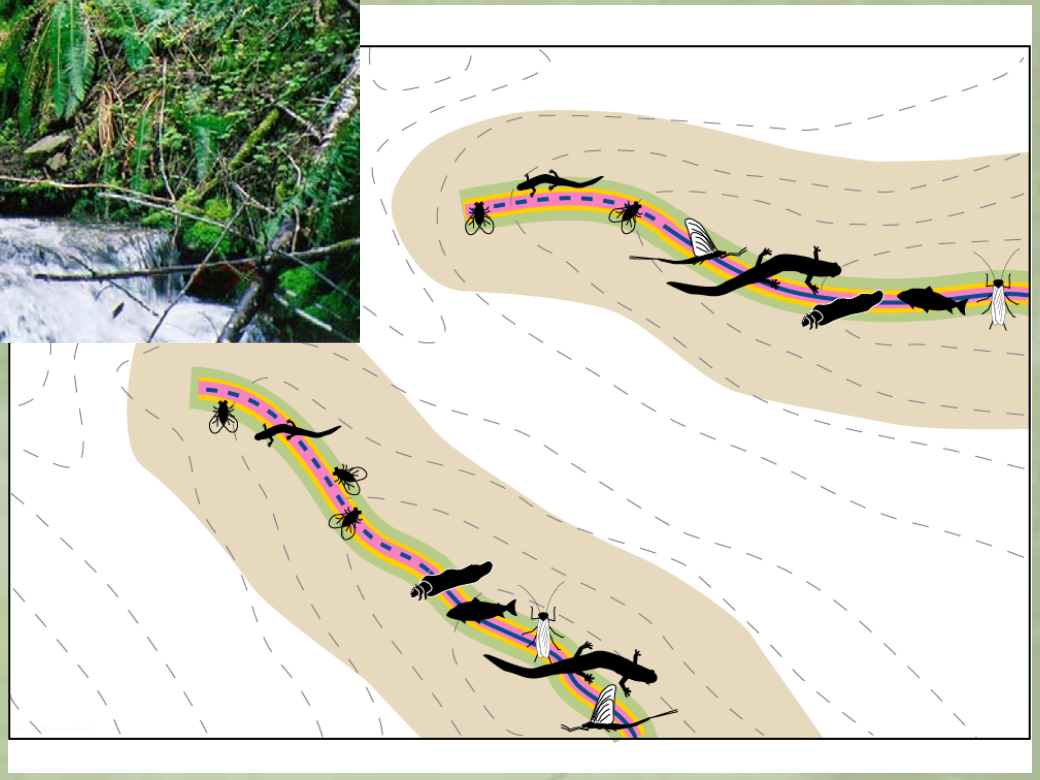
~1/3 of Siskiyou Mountains Salamander Sites protected in Oregon…



…well distributed within/among 6th field watersheds (6 code Hydrologic Units: HUCs)

Habitat-based approach for forest-associated species in headwaters





Several unique assemblages in headwaters

Olson & Weaver 2007

Progar & Moldenke 2002

Rykken, Moldenke & Olson 2007

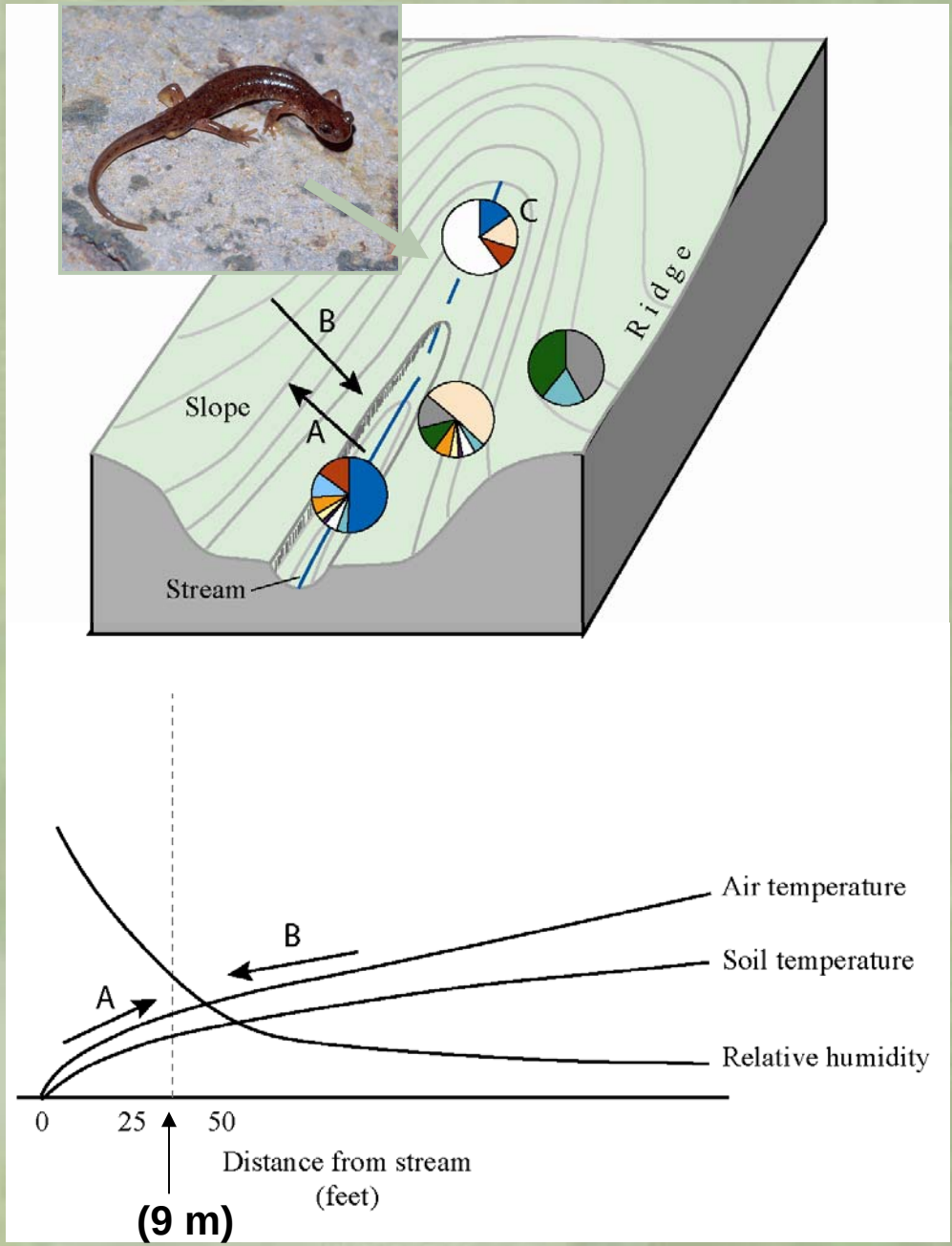
Main Assemblages

- Perennial stream
- Intermittent stream
- Bank
- Upland

Habitat Associations

- Gradient
- Hydrology
- Microclimate
- Down wood

A & B: Microclimate stream effect



Anderson et al. 2007; Olson, Anderson et al. 2007; Sheridan & Olson 2003; Sheridan & Spies 2005

For management, consider

- Rare species locations
- Dispersal capability

Ascaphus

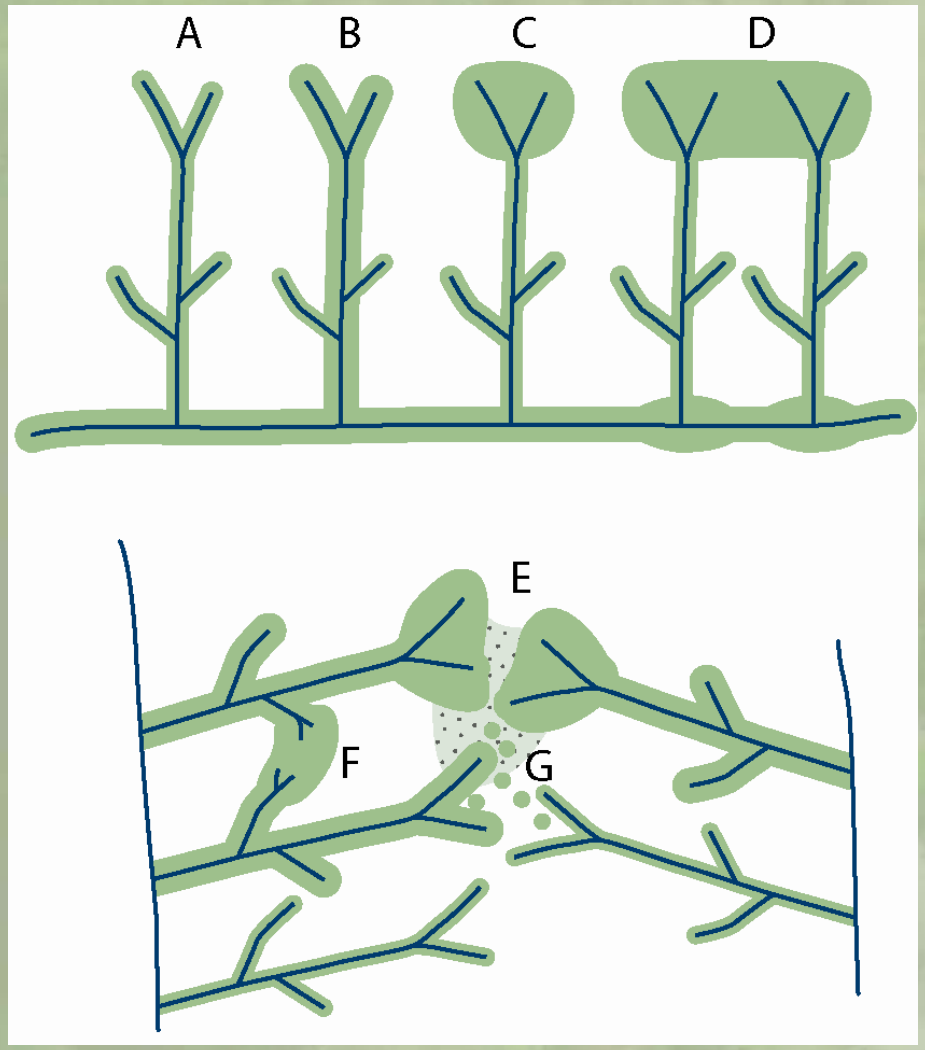
Rhyacotriton

Dicamptodon

Distance from stream	Species	Reference
200 m	*Dicamptodon* *Ascaphus* *Rhyacotriton*	Gomez and Anthony 1996
400 m	*Dicamptodon* *Ascaphus*	McComb et al. 1993

Olson, Anderson et al. 2007

Providing for habitat and dispersal by linking watersheds



A-B: Riparian Buffer

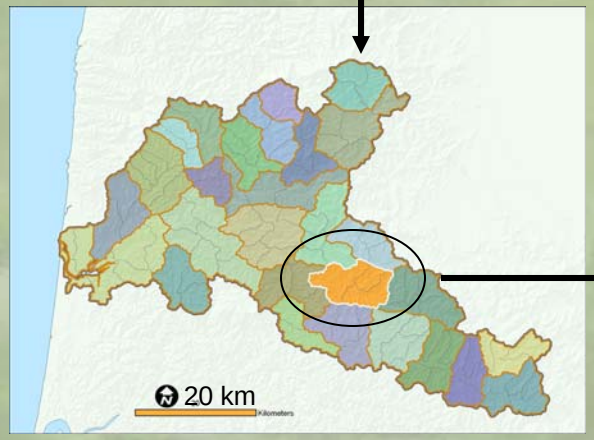
C: Headwater Reserve

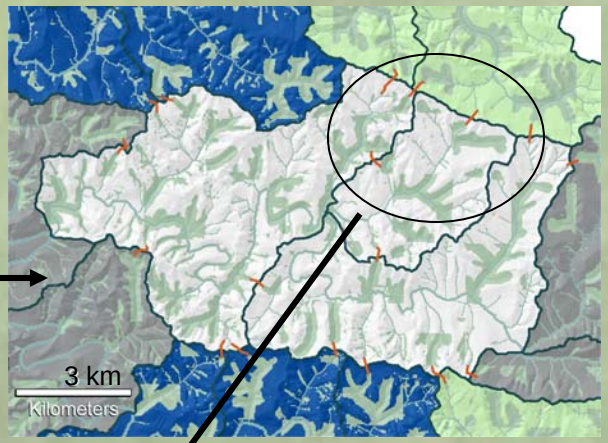
D-G: Linking Basins

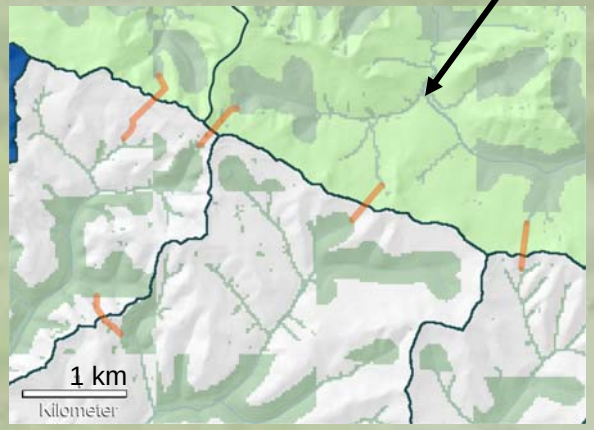
Olson, Anderson et al. 2007
Olson 2008a; Olson 2008b

Aggregating linkage areas across basins to establish landscape connectivity

Oregon Coast Range







Coast Range Models

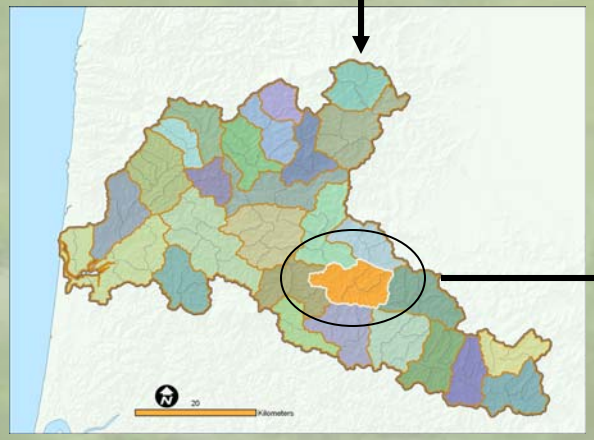
K. Burnett & K. Christiansen

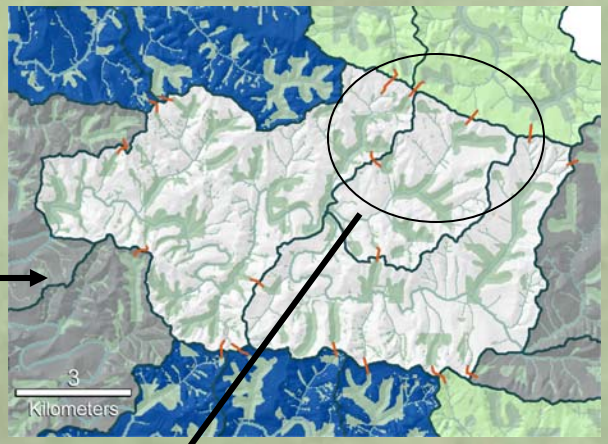
Unknowns

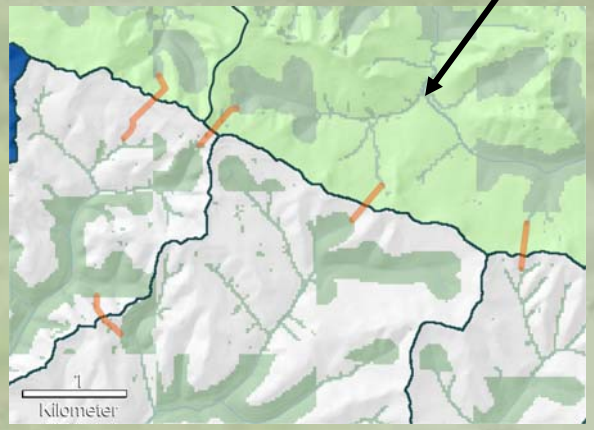
How many links?

Where?

How?



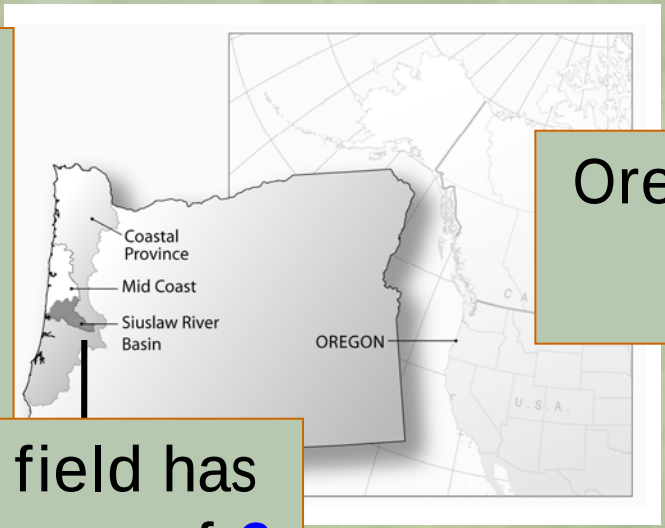




...but can proceed conceptually.

How many links?

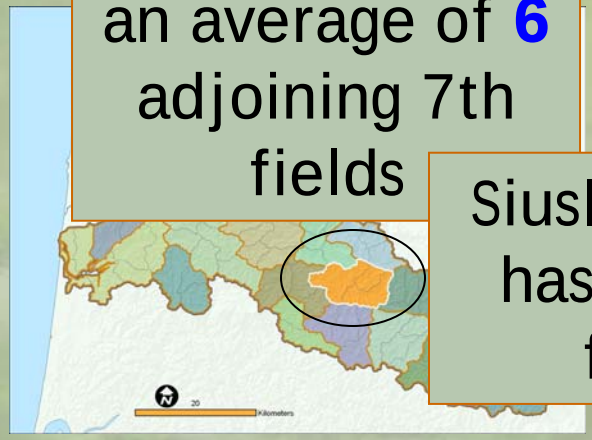
If there were one connection between adjoining **7th** fields…



Oregon Coast Range:

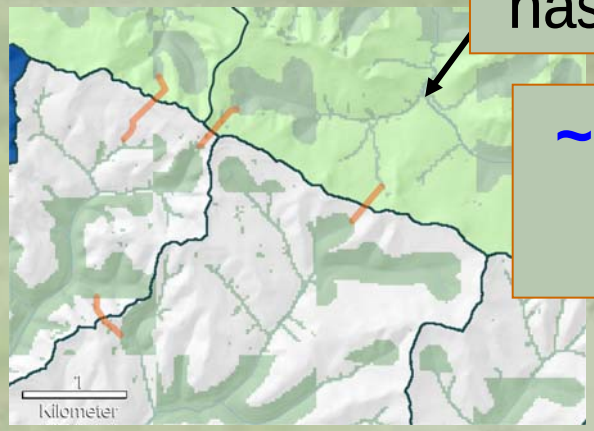
23,000 km^2

A 7th field has an average of **6** adjoining 7th fields



Siuslaw Basin has **109** 7th fields

Oregon Coast Range has **~1,850** 7th fields



~10,000 linkage areas

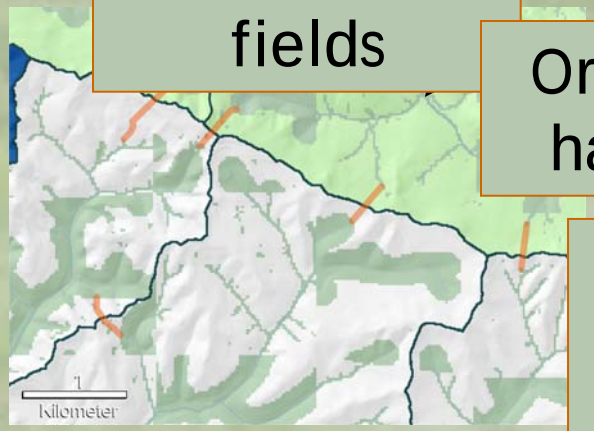
~1 link per 2.3 km^2

If there were one connection between adjoining **6th** fields…

Oregon Coast Range: 23,000 km^2

A 6th field has an average of **6** adjoining 6th fields

Siuslaw Basin has **48** 6th fields



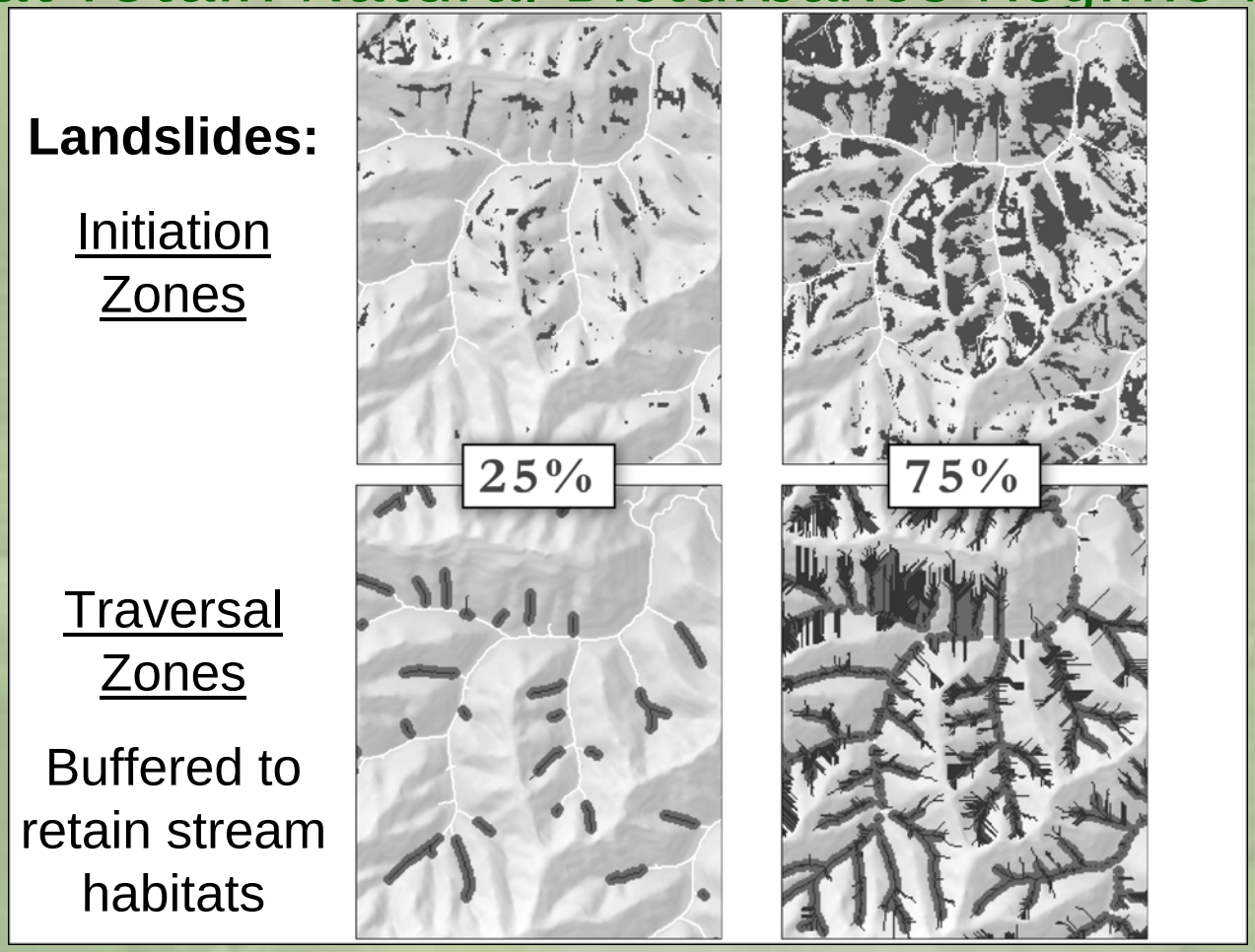
Oregon Coast Range has **~800** 6th fields

~4,000 linkage areas

~1 link per 5.75 km^2

Where?

First, consider other protections, such as those that retain Natural Disturbance Regime …



Burnett & Miller 2007

Second, consider biodiversity knowledge

- Rare species locations
- Dispersal capability

Ascaphus

Rhyacotriton

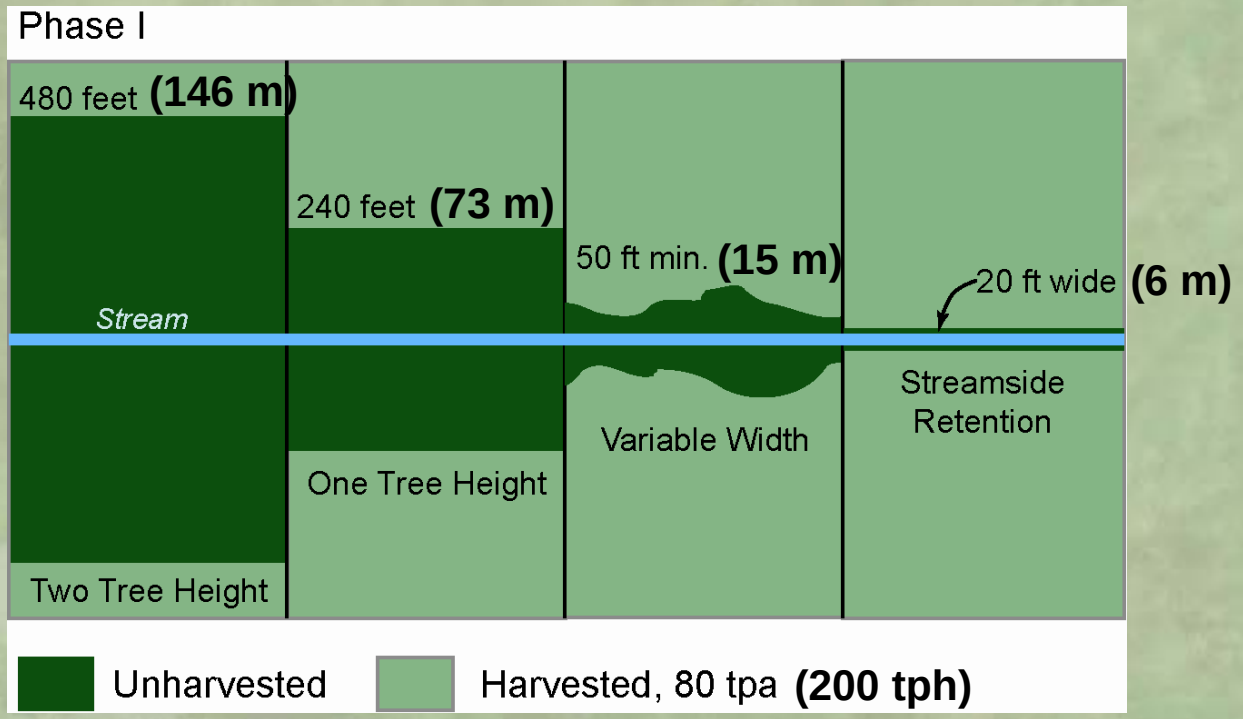
Dicamptodon

Distance from stream	Species	Reference
200 m	*Dicamptodon* *Ascaphus* *Rhyacotriton*	Gomez and Anthony 1996
400 m	*Dicamptodon* *Ascaphus*	McComb et al. 1993

Olson, Anderson et al. 2007

How to link?

Density Management and Riparian Buffer Study



∑: Riparian buffers with thinning have few effects on instream and bank animals, so far…

Olson & Rugger 2007; Rundio & Olson 2007; Kluber, Olson & Puettmann 2008

…but thinning (to 200 tph) has mixed effects

Plants	**Negative** – Native spp, Late-successional (LSOG) spp **Positive** – Ground cover of 2 species and 1 spp group, Richness, Diversity, Early-successional spp, Herbs, Exotics
Arthropods	**Negative** – low mobility spp, 1 spp and 1 spp group **Positive** – 2 spp and 1 spp group
Mollusks	**Negative** – 1 species
Amphibians	**Negative** - Richness

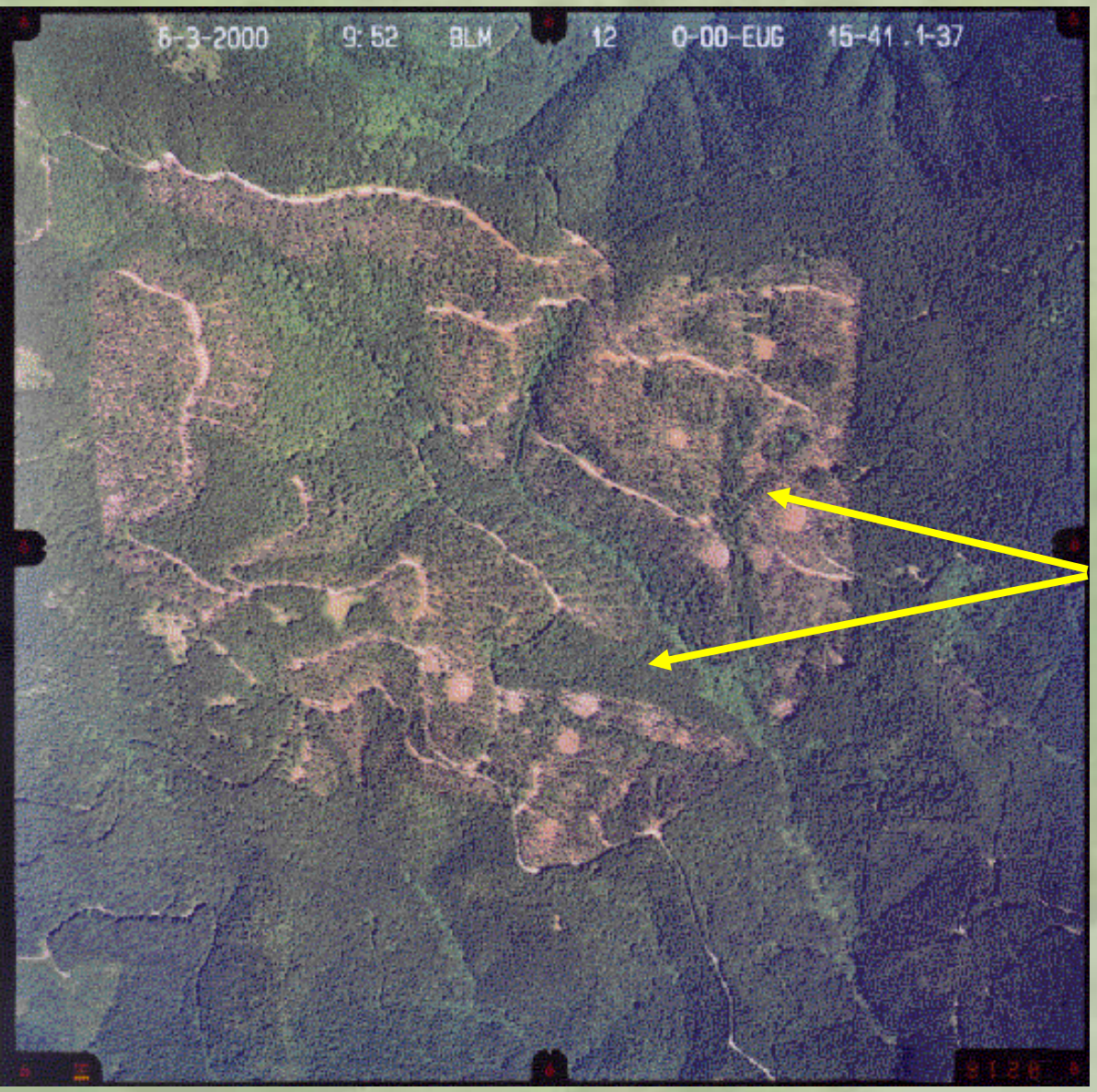
Wessell, Olson & Schmitz submitted a

…and leave Islands have mixed effects

Plants	**Negative** – Richness, Diversity, Herb spp, Early successional spp, Exotic spp, **Positive** – 1 species, native spp, LSOG spp
Arthropods	**Positive** – 6 spp groups, Richness, Density, No. functional groups, Low mobility spp, High mobility spp, LSOG spp
Mollusks	**Positive** – 2 spp and 1 spp group, Density
Amphibians	**Negative** – one spp **Positive** – one spp

Wessell, Olson & Schmitz submitted a

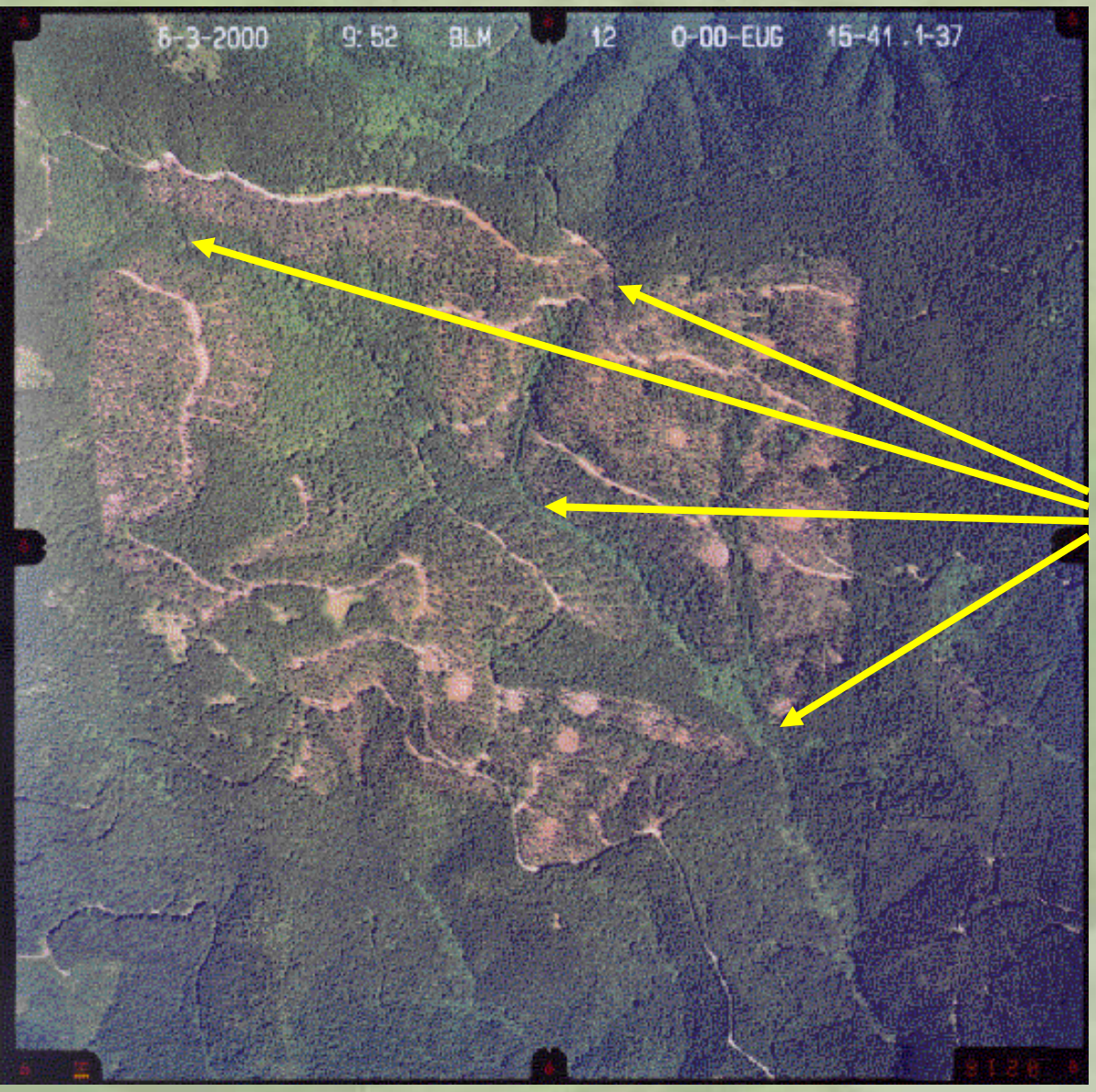
Hedge effects with multiple provisions



1. Riparian Buffers

Varying widths

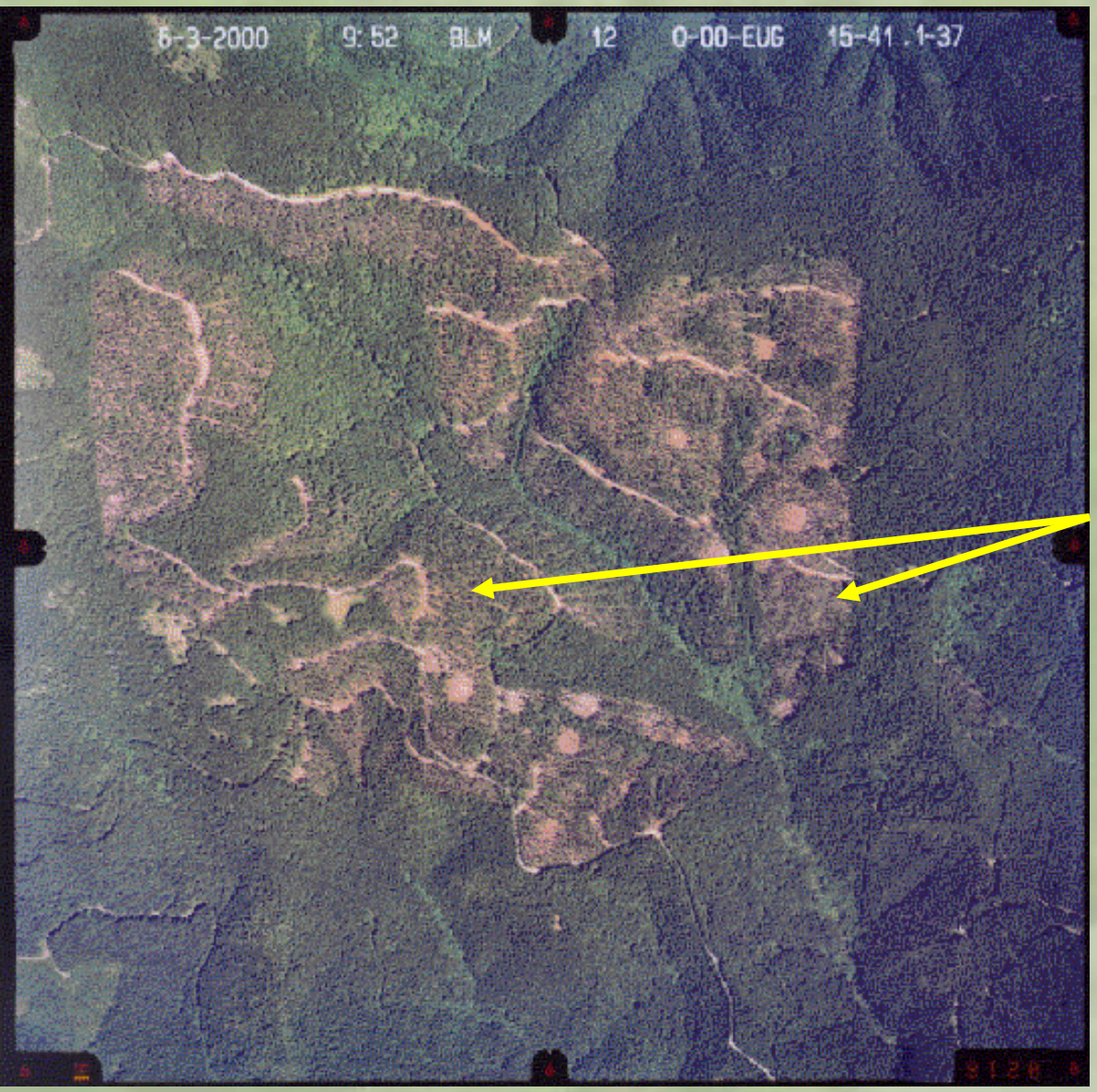
Multiple provisions



1. Riparian Buffers

Extend them to uncut blocks

Multiple provisions



2. Thinning

Variable density

Multiple provisions

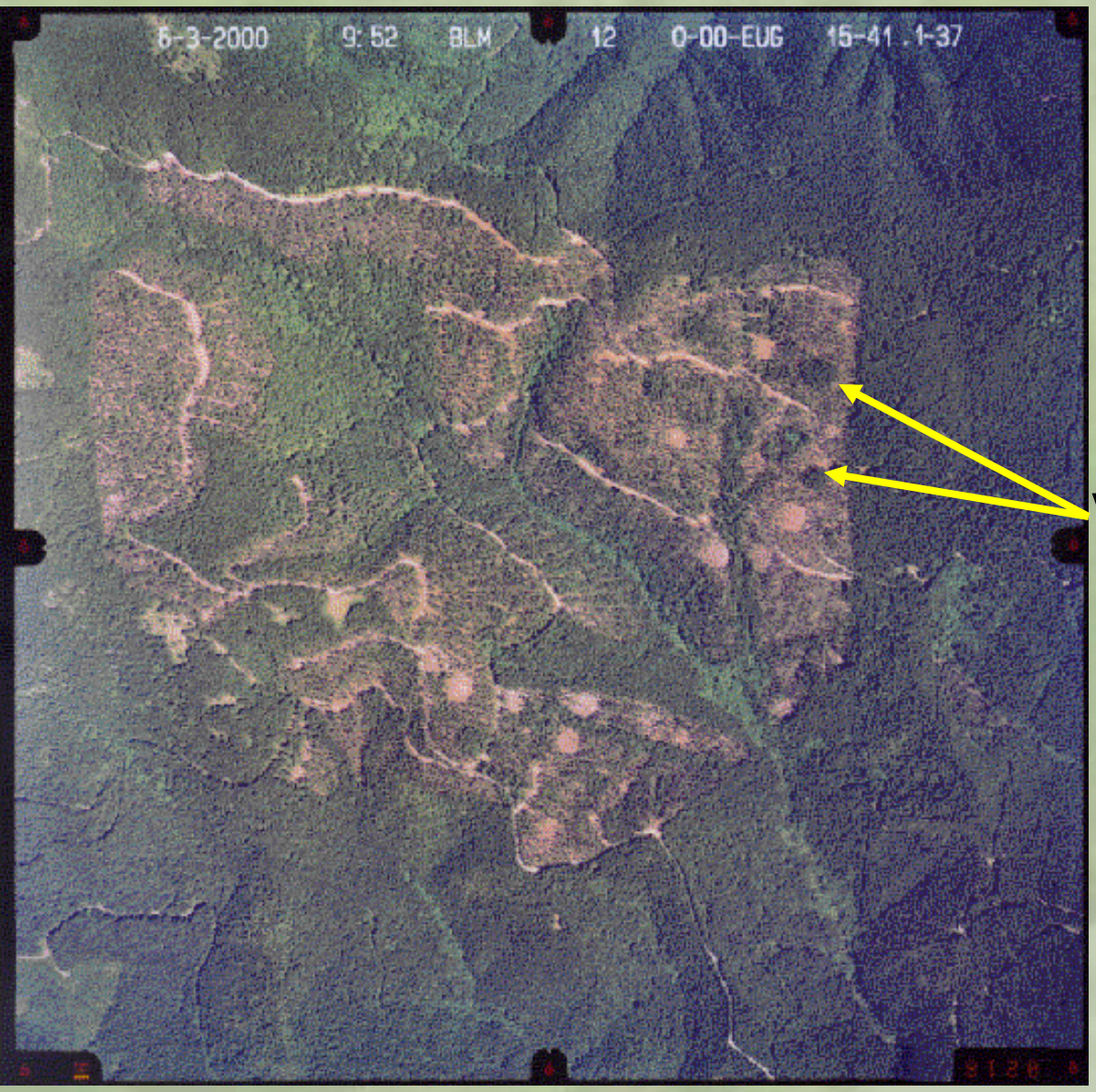
3. Down Wood

Retain and Recruit

Olson et al. 2006

Kluber, Olson & Puettmann submitted

Multiple provisions



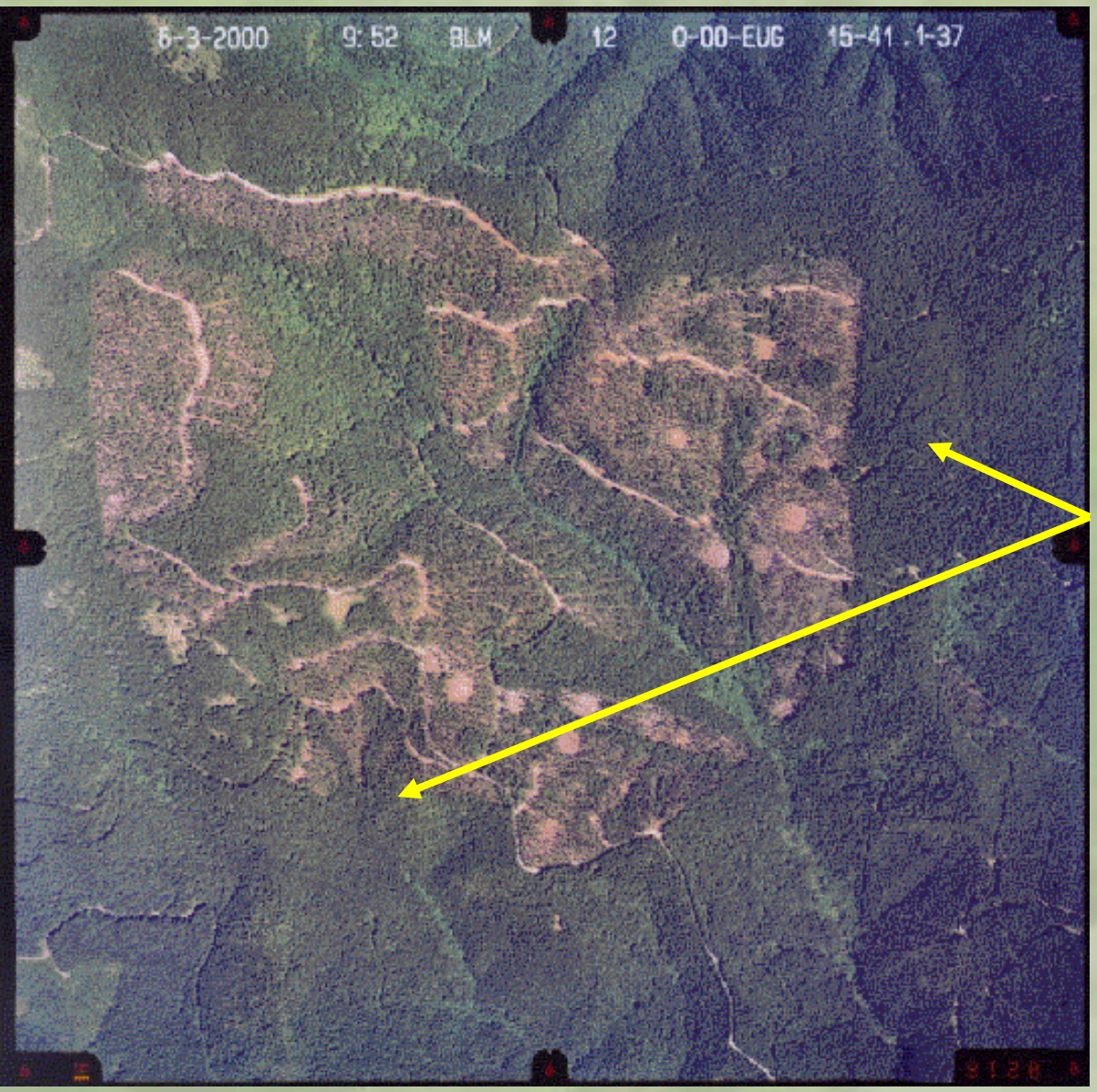
4. Leave Islands

Variable diameters

(0.4 ha circle retains interior microclimate)

Wessell, Olson & Schmitz submitted b

Multiple provisions



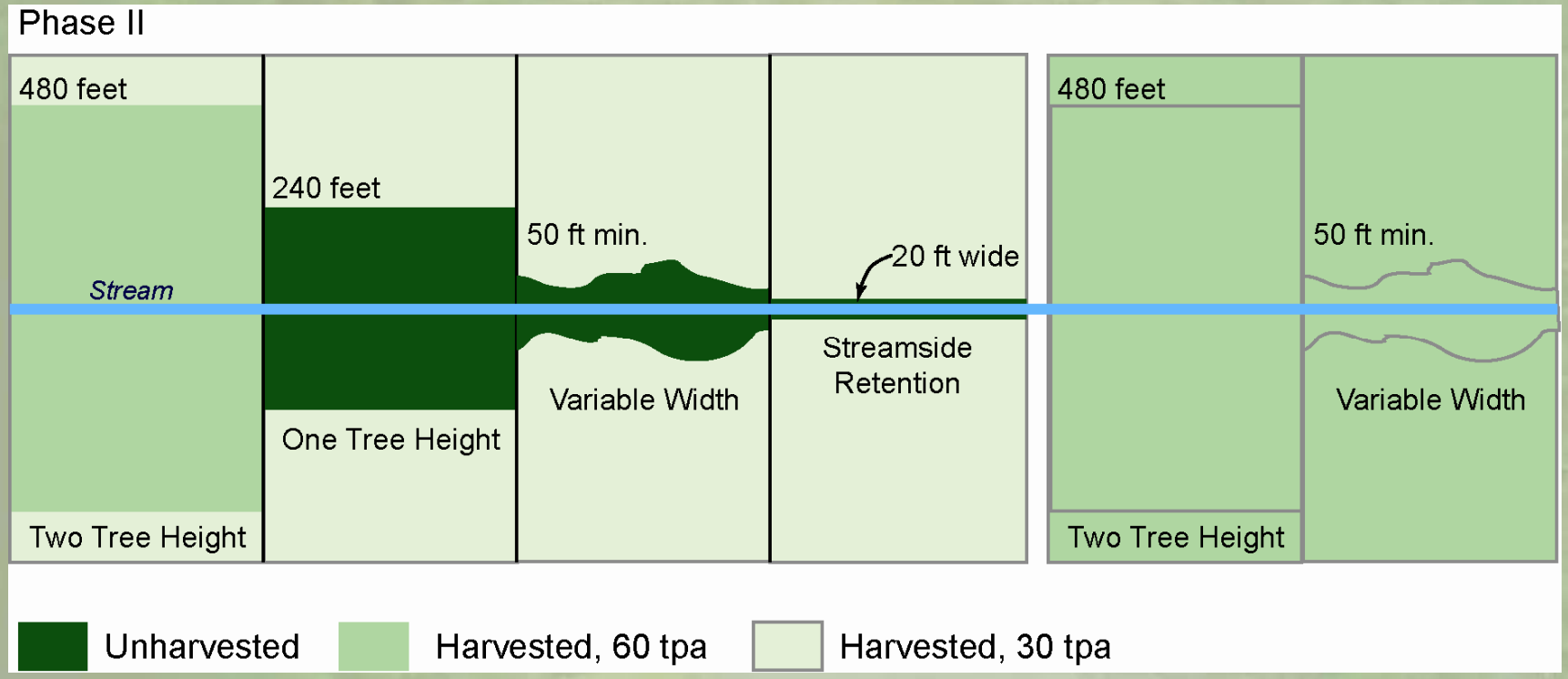
5. Uncut Blocks

To serve as anchors

Phase II: We are now testing

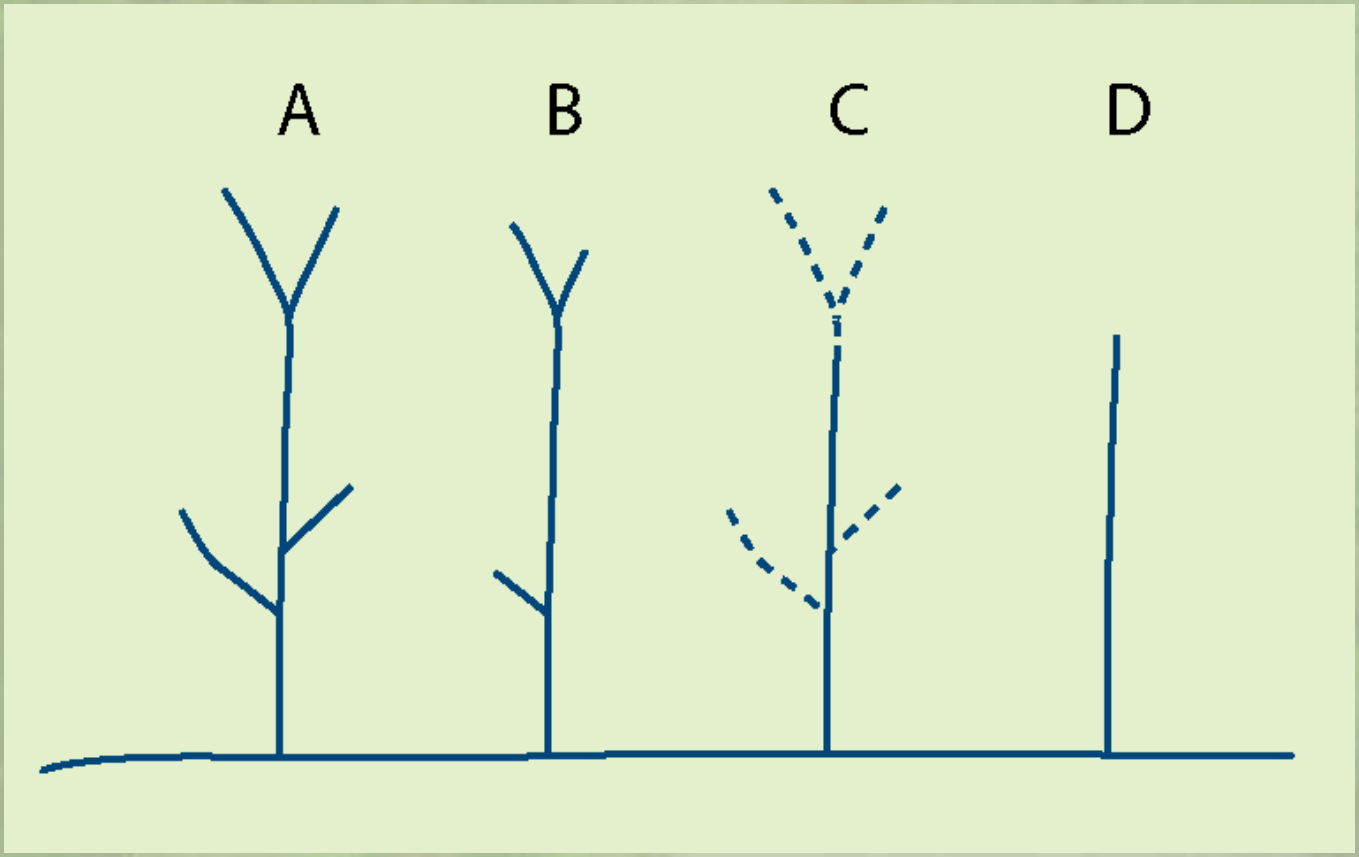
-- 2nd Entry Thinning

--Thin-through stream buffers



We are now considering
climate change scenarios in headwaters:

Shrunken Heads?



In summary...

- Within and among basin designs needed to retain aquatic-dependent forest biodiversity

- Consider linking 7th field watersheds by headwater management scenarios, with:
  - Variable width stream buffers (6-75 m)
  - Variable thinning densities (200 tph)
  - Variable-diameter leave islands (0.4 ha)
  - Uncut anchors

- Designs needed for changing hydrology patterns

Thank You

- Kathryn Ronnenberg – graphics
- Kelly Christiansen – GIS
- Loretta Ellenburg – field sampling
- Paul Anderson – microclimate study information
- Kelly Burnett – landslide & landscape models
- Students
  - Chris Sheridan
  - Dave Rundio
  - Stephanie Wessell
  - Matt Kluber
- US BLM and FS –funding!