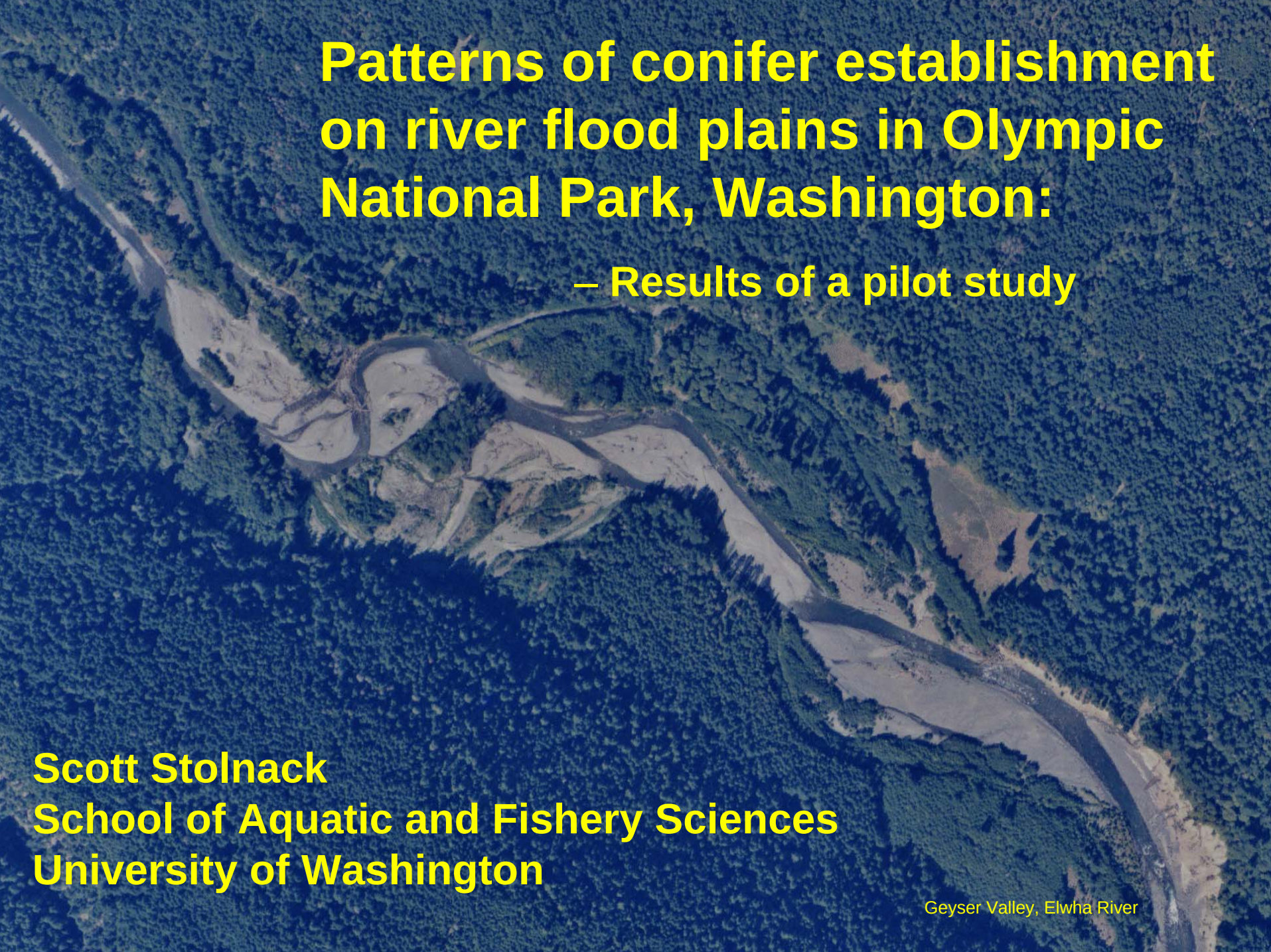
Patterns of conifer establishment on river flood plains in Olympic National Park, Washington:

– Results of a pilot study

Scott Stolnack
School of Aquatic and Fishery Sciences
University of Washington



Geyser Valley, Elwha River


• Background and context
• Project overview
• Results of pilot project
• Implications


Why are flood plains important?

- Filter sediment, nutrients, toxins
- Replenish aquifers, control downstream flooding
- Important wildlife habitat
- Centers of biodiversity and complexity
- Contribute large woody debris to rivers

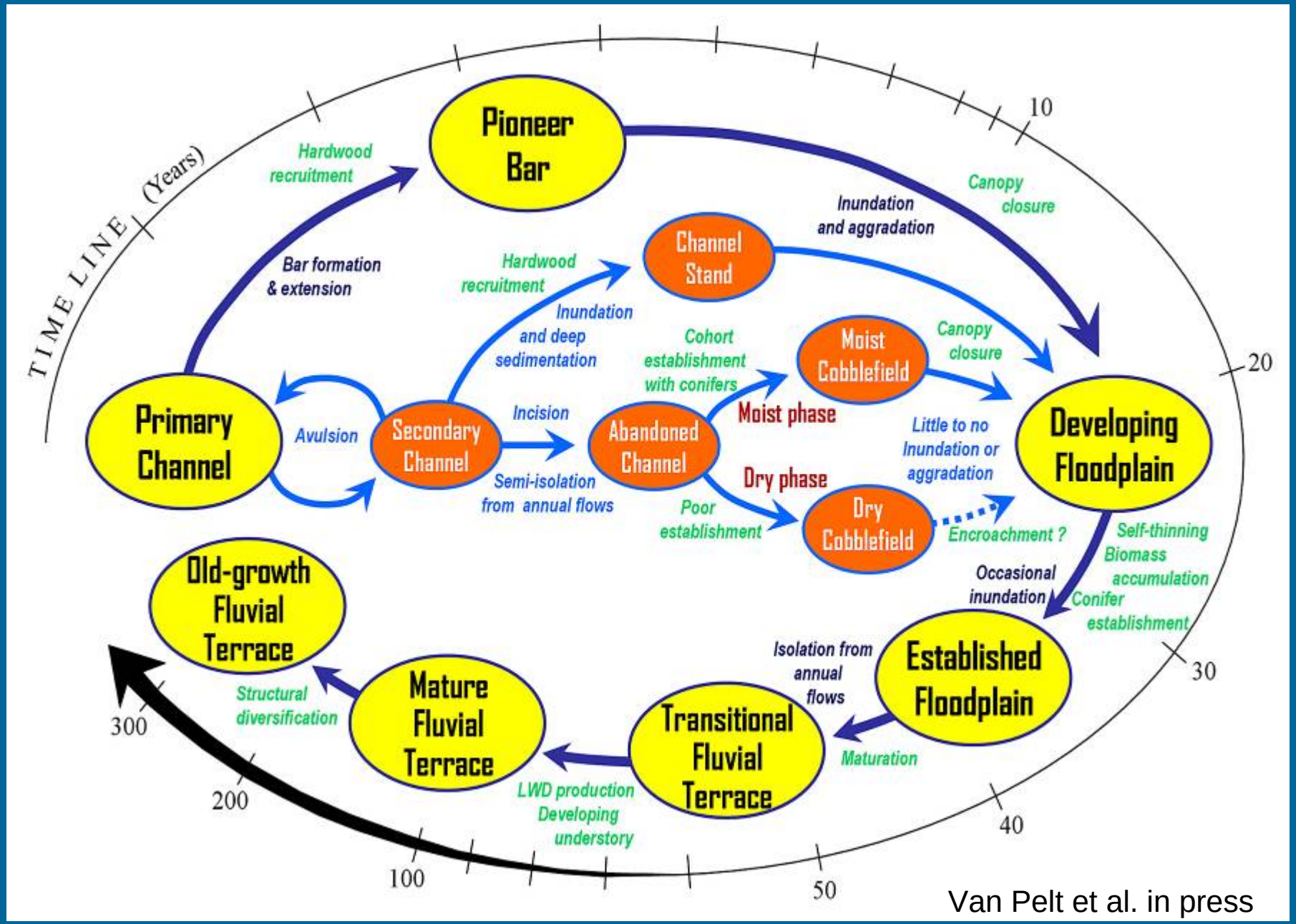

Conifers are especially important contributors of LWD
• Size
• Decay resistance
• “Key” pieces

In natural systems in our region, large conifers shape rivers

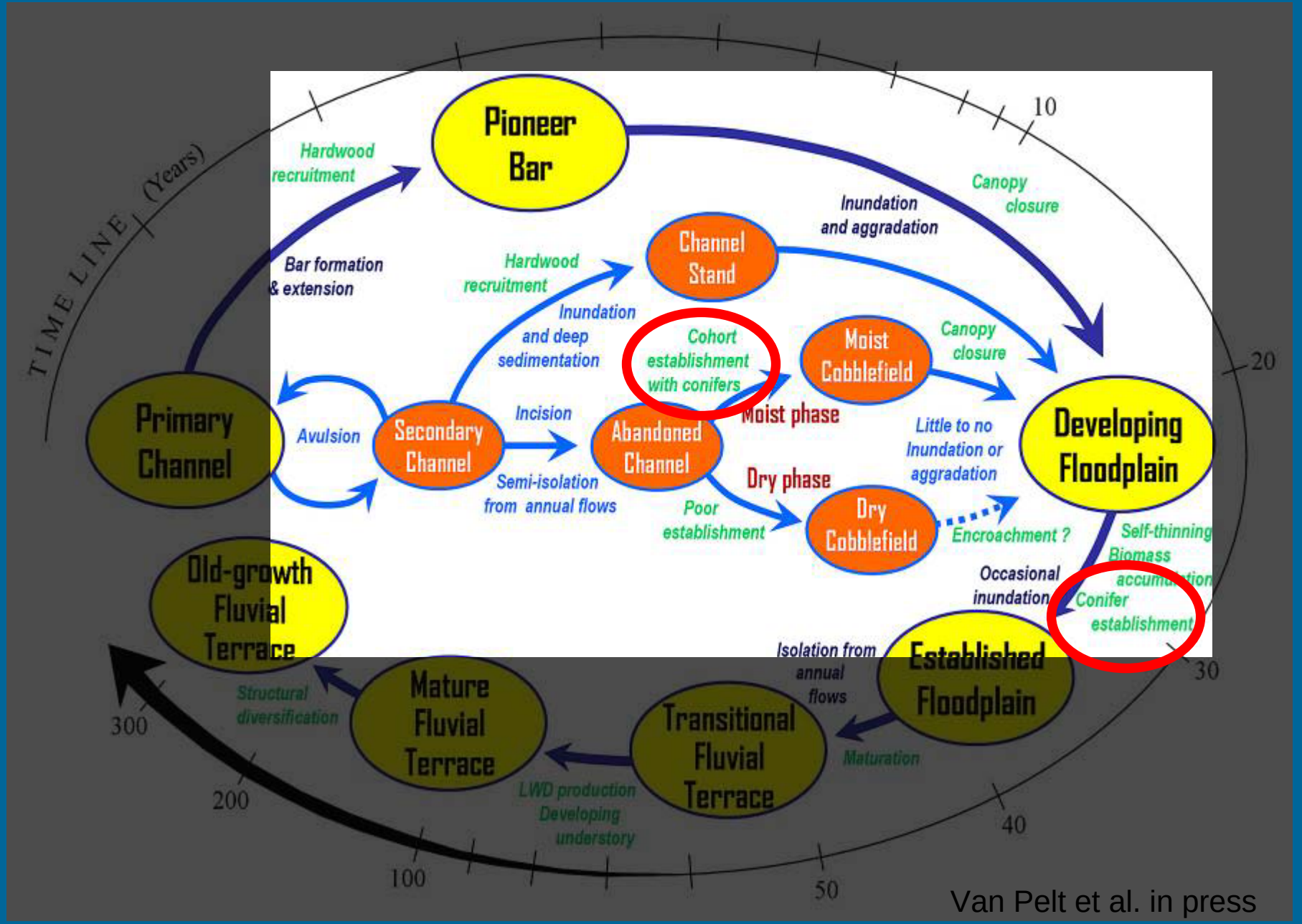
Conifer establishment and early succession on river flood plains

- Dominant paradigm: conifers establish after hardwoods (willow, alder, cottonwood) on flood plains
- Conifers not considered significant early components of flood plain ecology

Someone forgot to tell these Douglas-firs to wait for the hardwoods….



Van Pelt et al. in press



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Sitka spruce growing in cobble on Queets River floodplain

- More than one pathway leads to conifer establishment.
- Alternate pathways, and the conditions leading to them, have not been described in detail.
- Knowledge of alternate pathways could aid riparian management, conservation and restoration

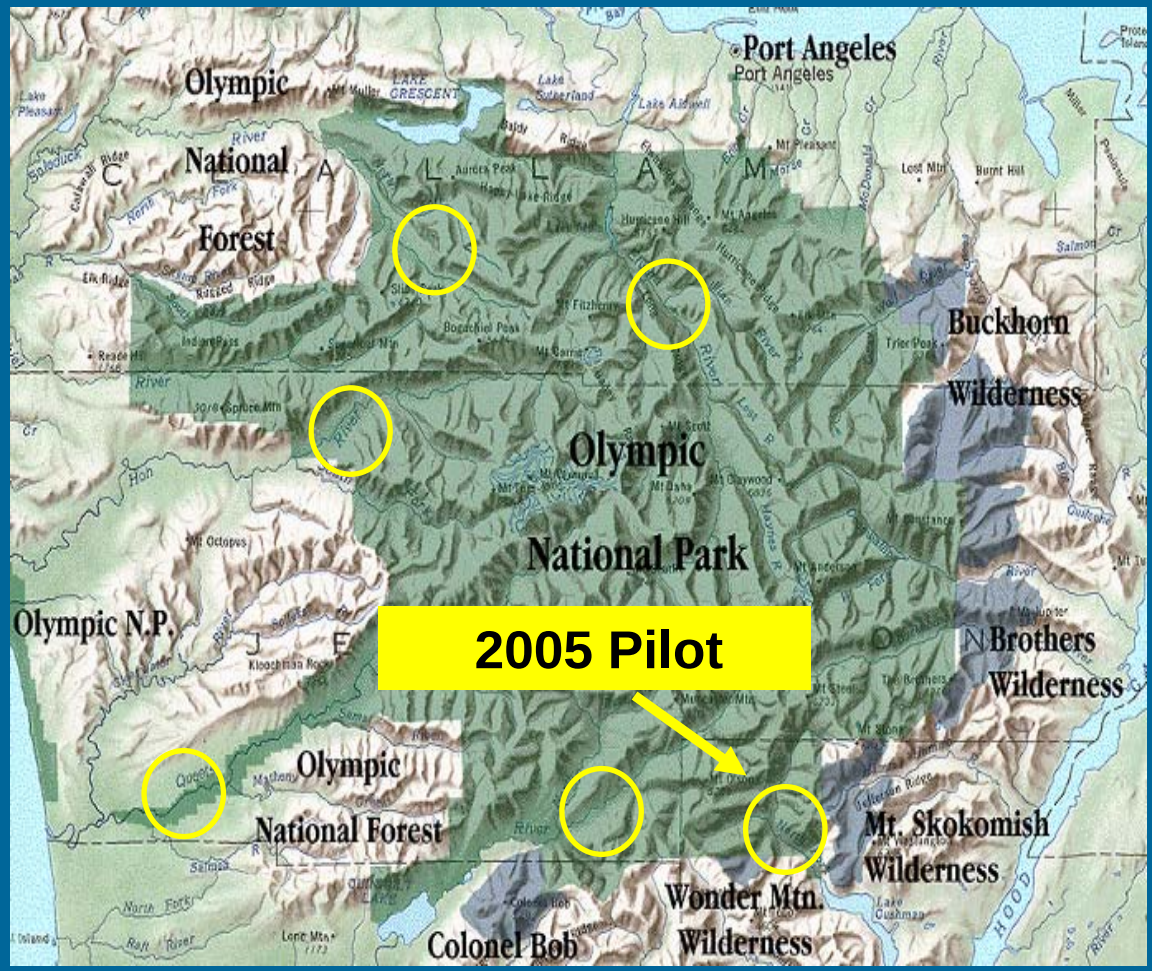
Project Overview:

Main questions

- Where do conifer trees establish on flood plains of selected rivers inside Olympic National Park?
- What are the biophysical conditions at patch and reach scales?
- Do growth rates in young (to approximately 40 year-old) conifer stands with and without hardwood competitors differ?

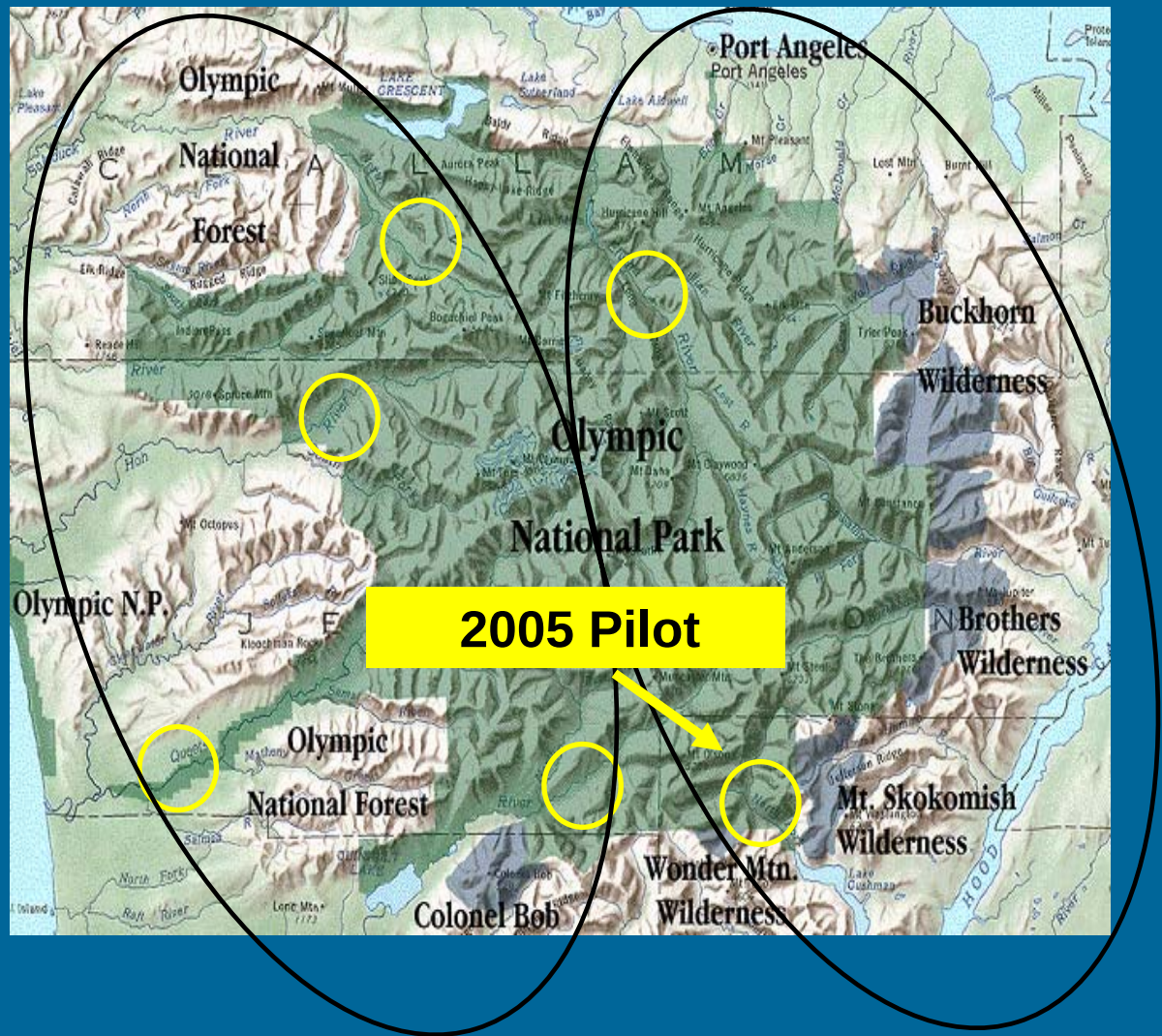
Study sites

- Flood plains of up to six rivers in Olympic National Park:
  - Quinault
  - Queets
  - Hoh
  - Sol Duc
  - Elwha
  - Skokomish



West: Sitka Spruce

East: Douglas-fir



Pilot Project

Objectives:

- Locate study reaches with young conifers
- Test field survey and sampling protocols
- Quantify conditions on one river
- Test analytical approaches
- Get in as much “dirt time” as possible

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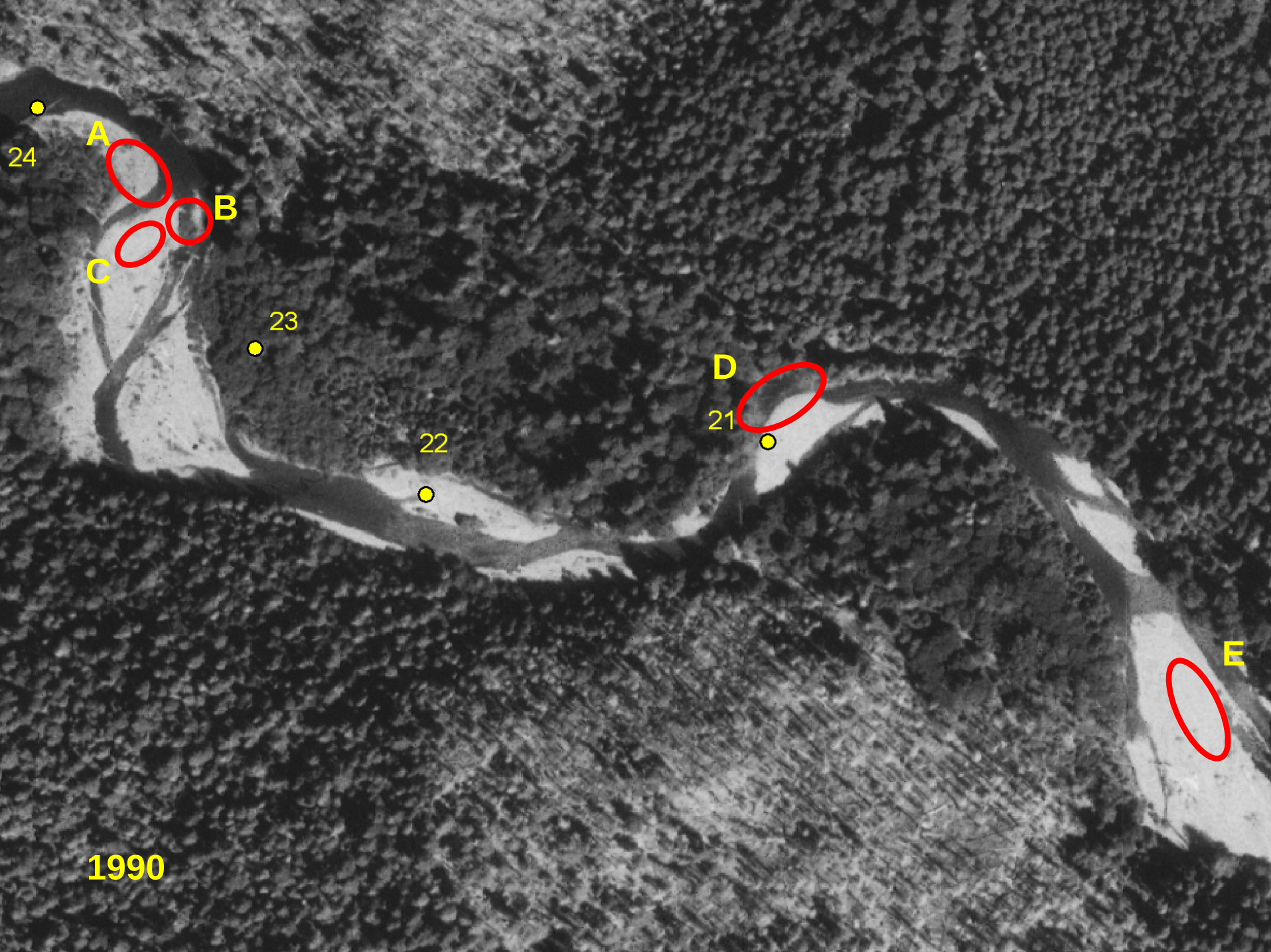
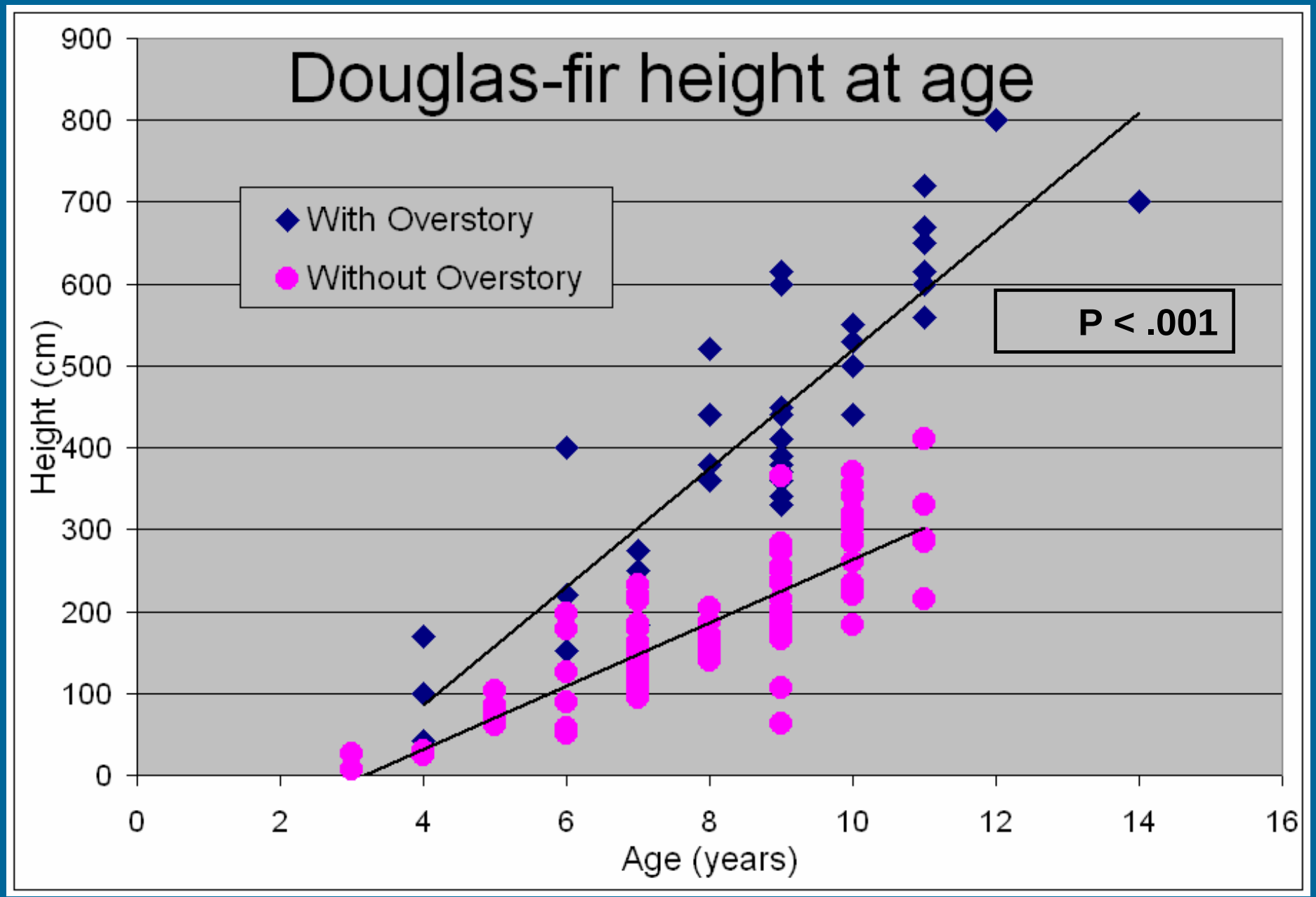
A
B
C
D
E
2003
North
Fork
Stream
Slate
Skokomish
Staircase
Rapids
Staircase
Ranger Station
Staircase
Campground
2202T
2194T


24
A
B
C
23
22
D
21
E
1990

Patch	n	n (Doug.-fir only)	Avg age (Doug.-fir only)	Avg height (cm) (Doug.-fir only)
A	137	116	8.0	165
B	25	11	1.9	12.4
C	193	43	0.3	7.9
D	26	23	2.5	36
E	61	55	8.8	426


Douglas-fir height at age
With Overstory
Without Overstory
P < .001
Height (cm)
Age (years)
0
100
200
300
400
500
600
700
800
900
0
2
4
6
8
10
12
14
16

- Average height of 9 year-old Douglas-fir was almost twice as tall under canopy:

(no hardwood overstory)	(with overstory)
225 cm (n = 22)	420 cm (n = 13)

- Conifer stem density was almost 3X greater under canopy:

(no hardwood overstory)	(with overstory)
923 stems/hectare	2,700 stems/hectare

- Average depth to cobble was more than 3X greater under canopy:

(no hardwood overstory)	(with overstory)
5.8 cm	21.2 cm

- Height of patch above water was not substantially different:

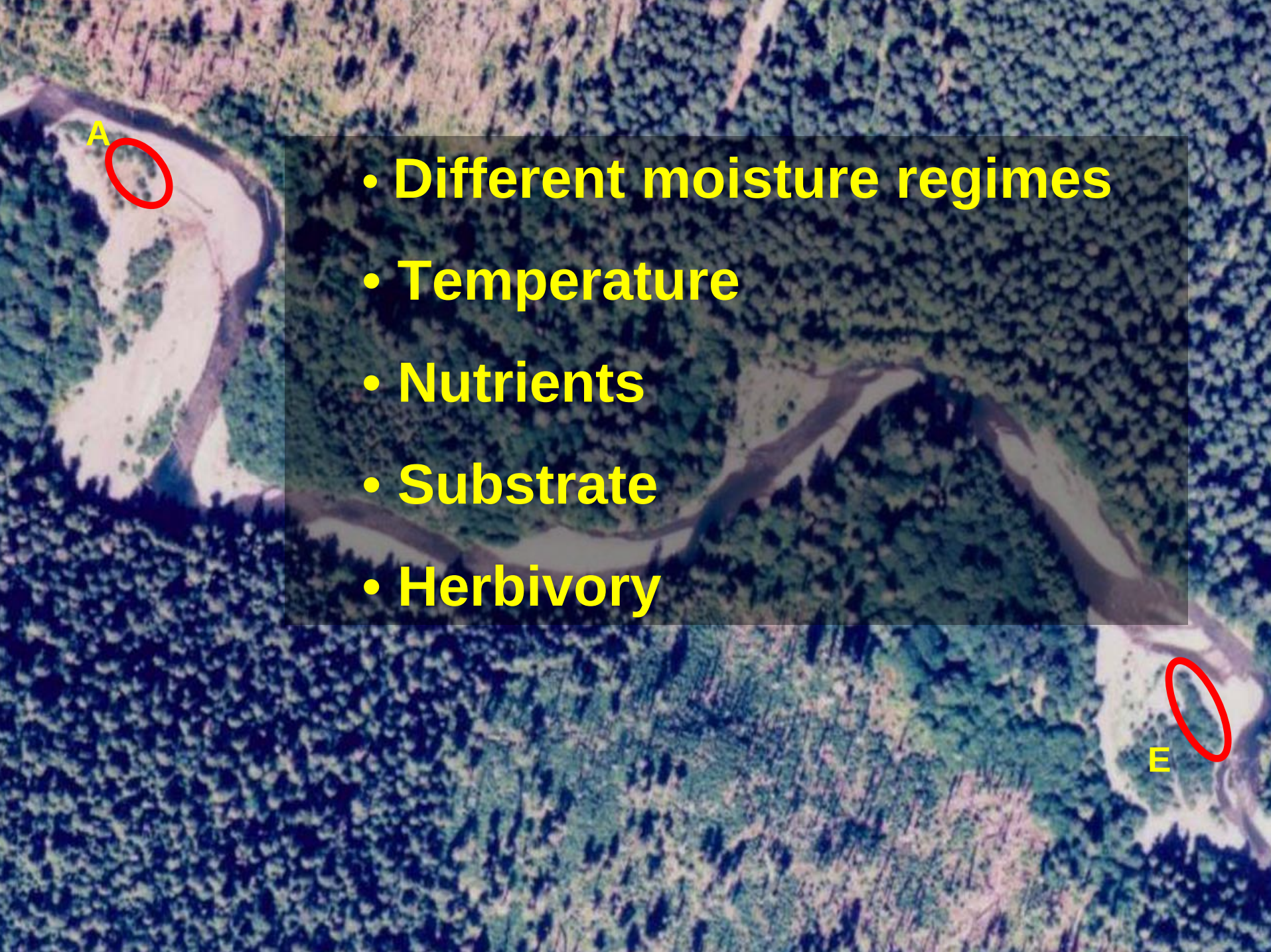
(no hardwood overstory)	(with overstory)
225 cm	217 cm

Deer herbivory was substantial on the site without an overstory –

- 85% of the Douglas-fir showed signs of browsing by deer
- 54% of grand fir was browsed, most severely so

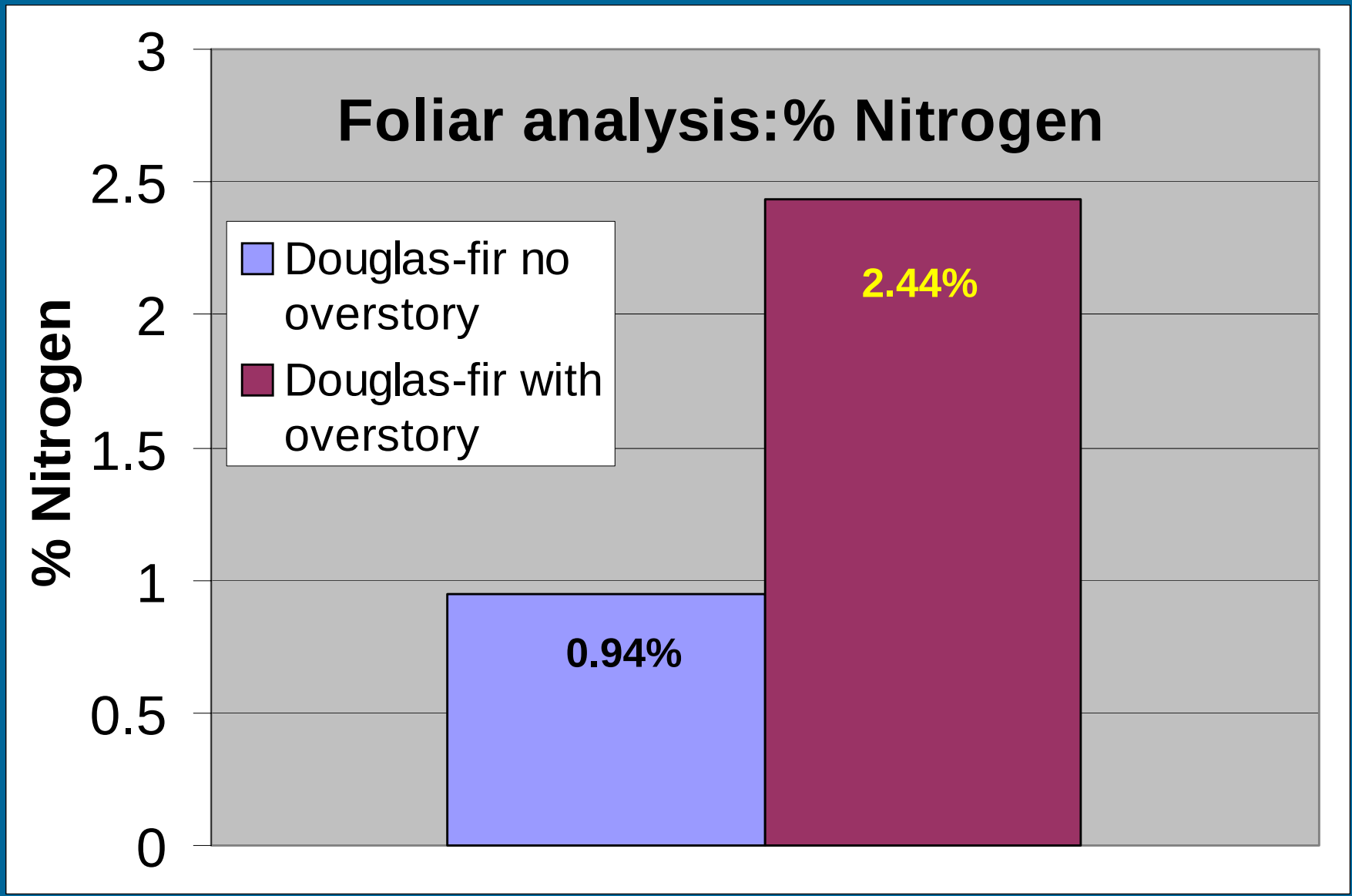

Grand
fir

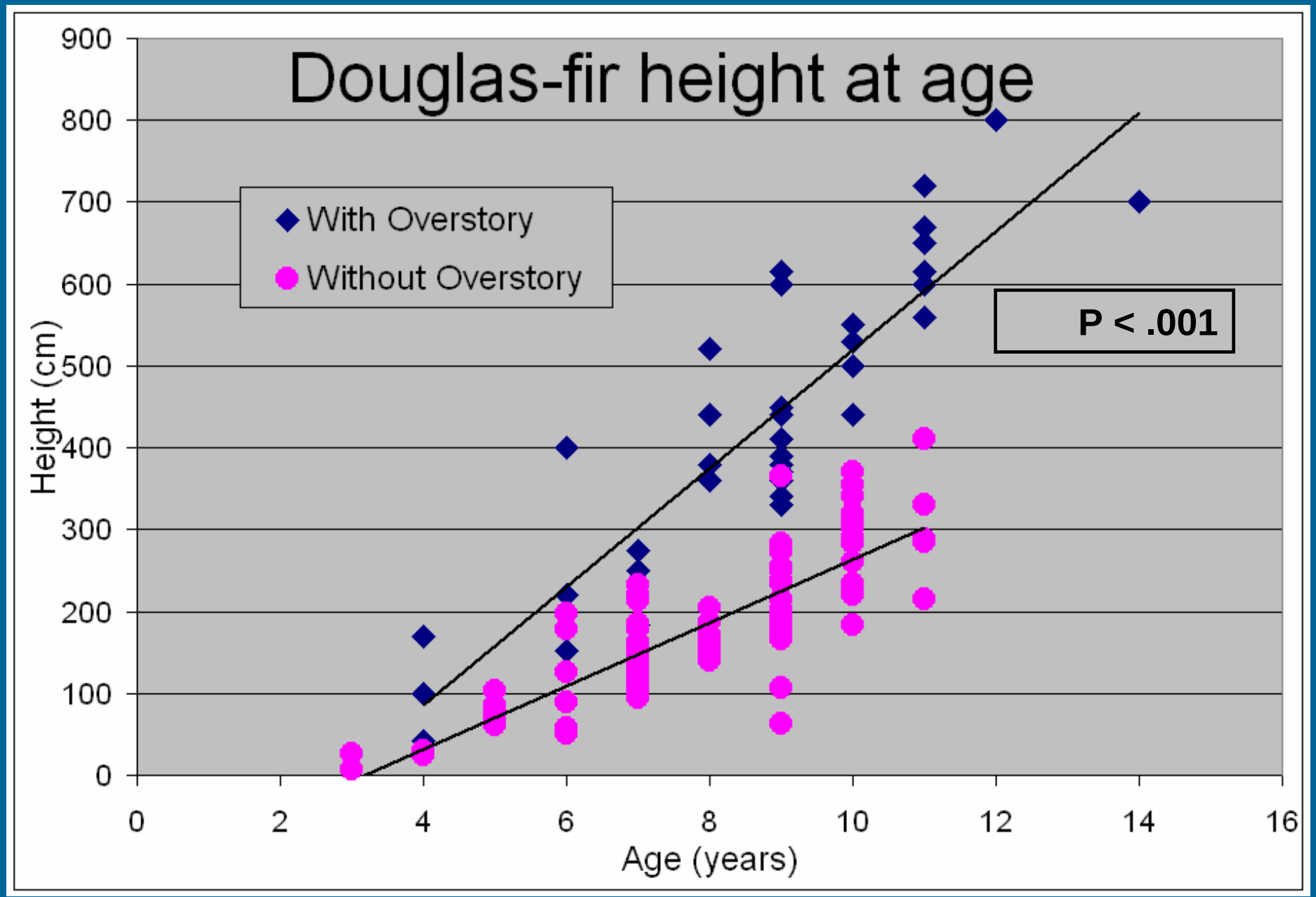

A
E



- Different moisture regimes
- Temperature
- Nutrients
- Substrate
- Herbivory

Elwha River foliar analysis

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Conclusions….

- Evidence supports hypothesis of more than one pathway of early conifer establishment on river flood plains (Douglas-fir)
- Site conditions dictate successional pathways (open vs. closed canopy)
- Relative importance of factors determining the different trajectories remains to be quantified

Implications for management

- Conifers are essential to the long-term integrity of our rivers
- There are multiple pathways of early conifer establishment and succession on river flood plains
- Sustaining these different pathways is crucial to sustain the vitality and resilience of our rivers

Thank you….

Advisory committee:

Robert Naiman

Charles Halpern

Thomas Leschine

Field assistants:

Cameron Chapman

Tobin Youngs

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A
E