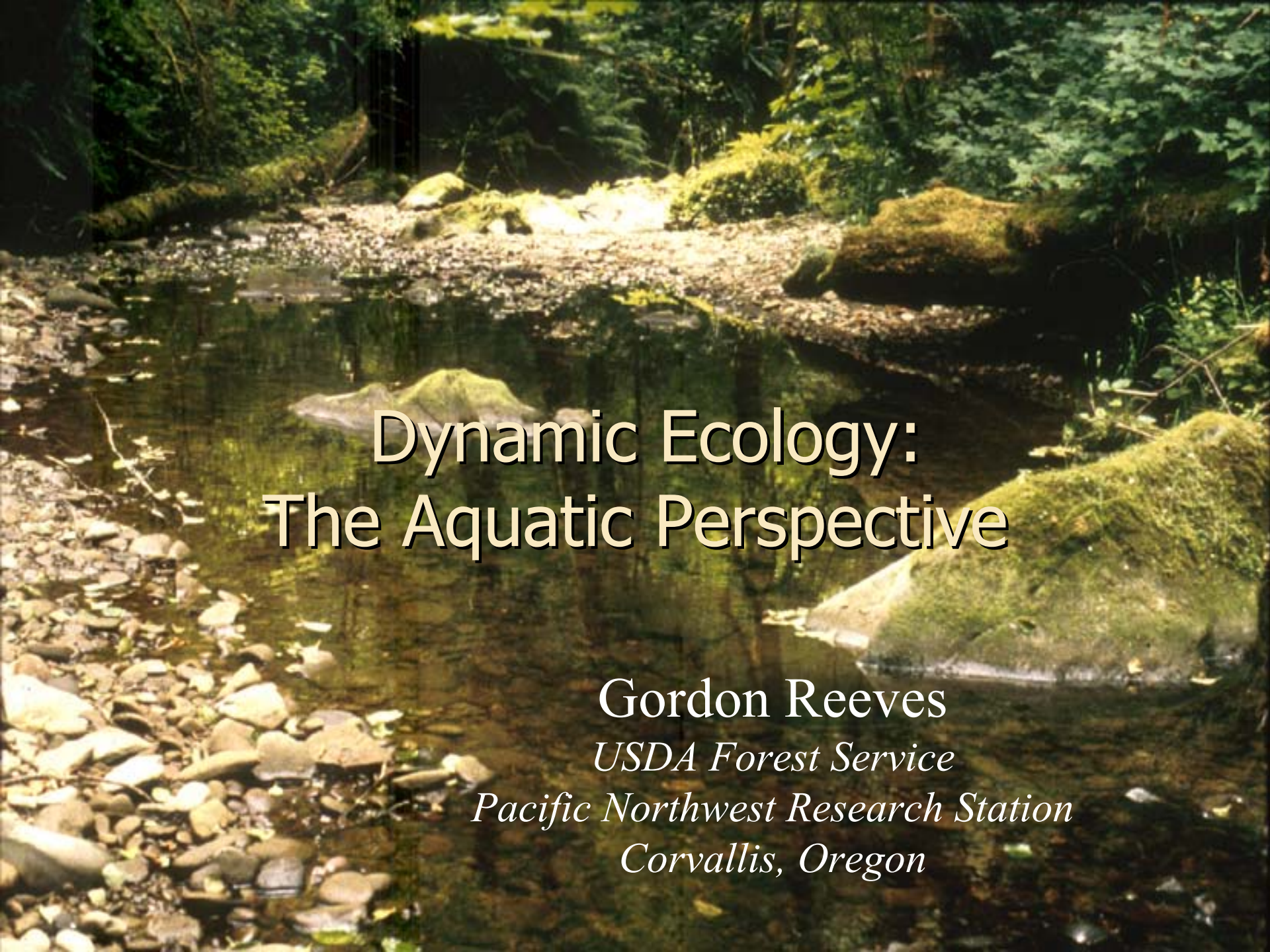


Dynamic Ecology: The Aquatic Perspective

Gordon Reeves
USDA Forest Service
Pacific Northwest Research Station
Corvallis, Oregon

Dynamic Aspects of the ACS

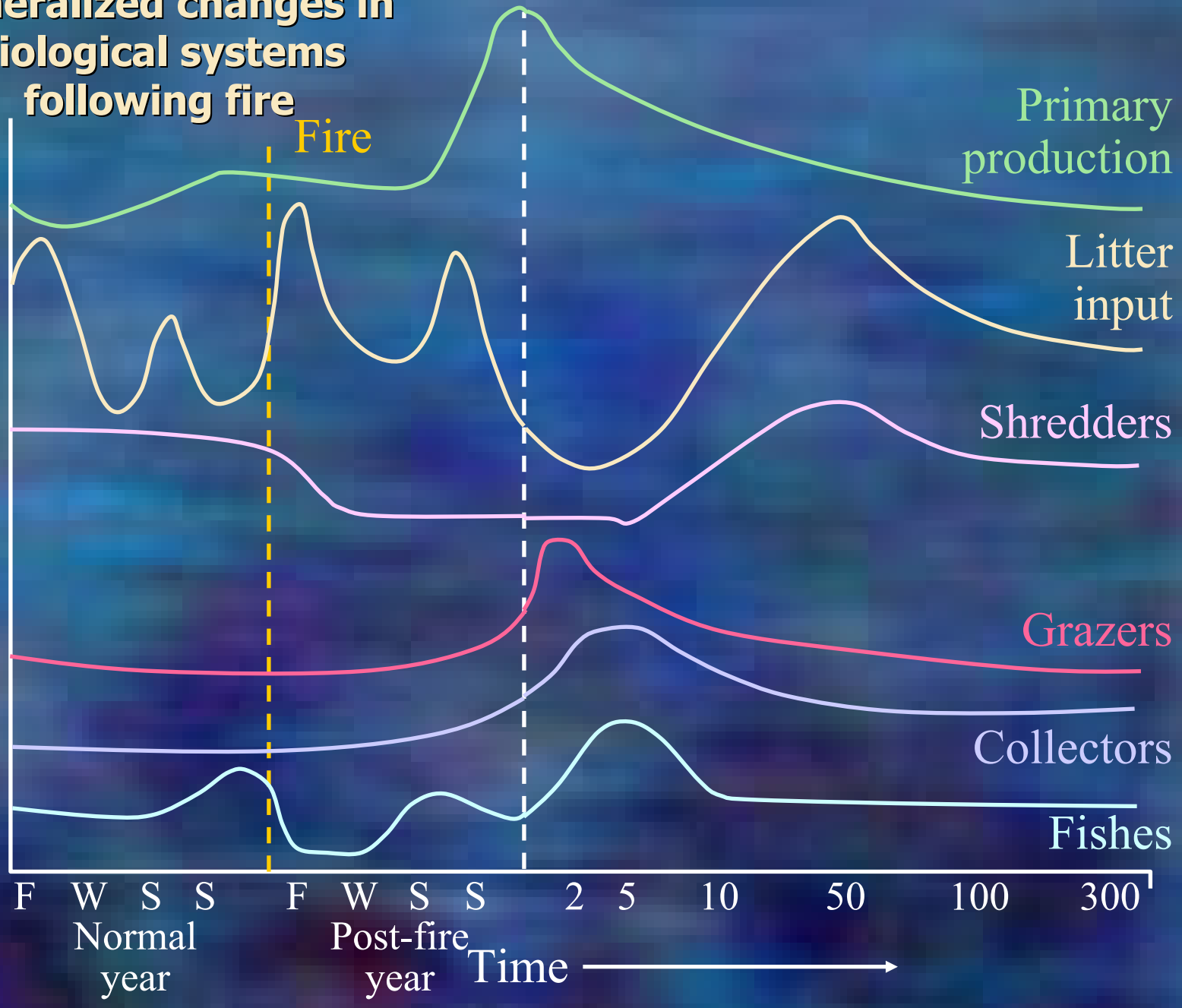
- "At the heart of this approach (the ACS) is the recognition that fish and other organisms evolved within a **dynamic environment** that has been **constantly influenced and changed** by geomorphic and ecologic disturbance." FEMAT p. V-29

Dynamic Aspects of Aquatic Ecosystems in FEMAT

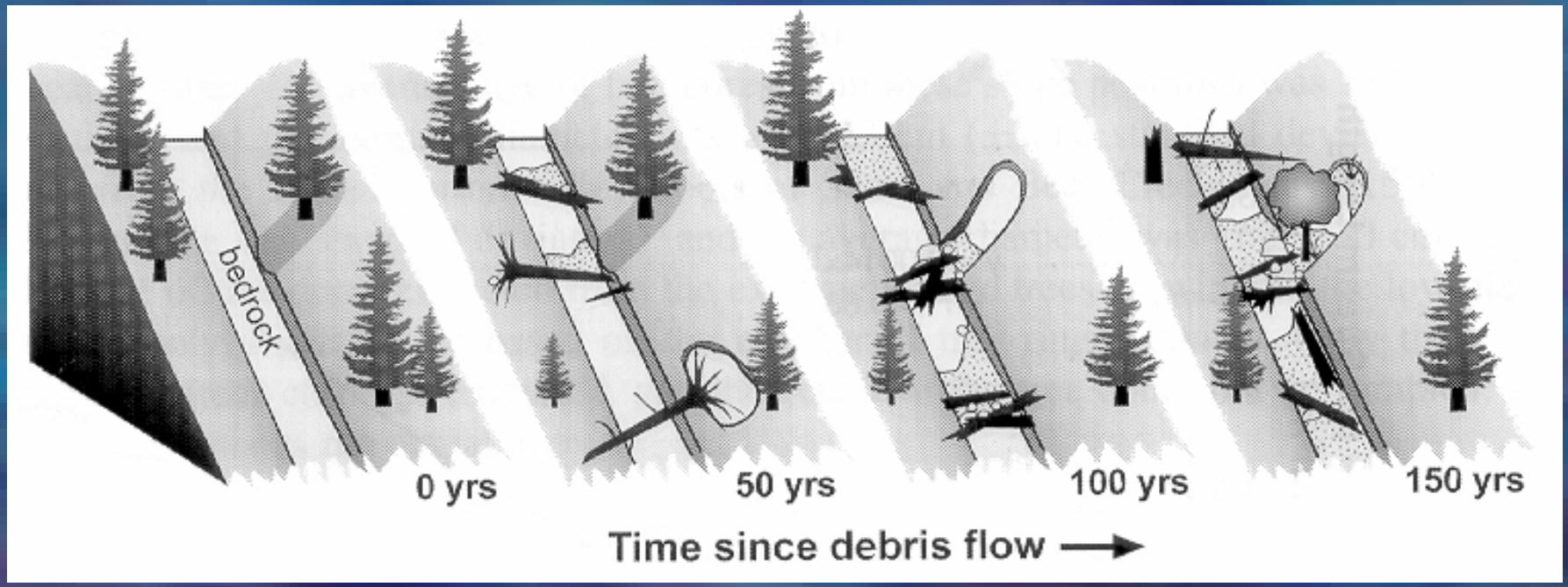
- "To maintain community viability throughout a large drainage basin, it is necessary to **maintain features of the natural disturbance regime** (i.e., frequency, distribution, and magnitude." p. V-13

- "Wood enters streams inhabited by fish either directly from the adjacent riparian zone or **from tributaries that may or may not be inhabited by fish, or hillslopes**." p. V-13

Generalized changes in biological systems following fire

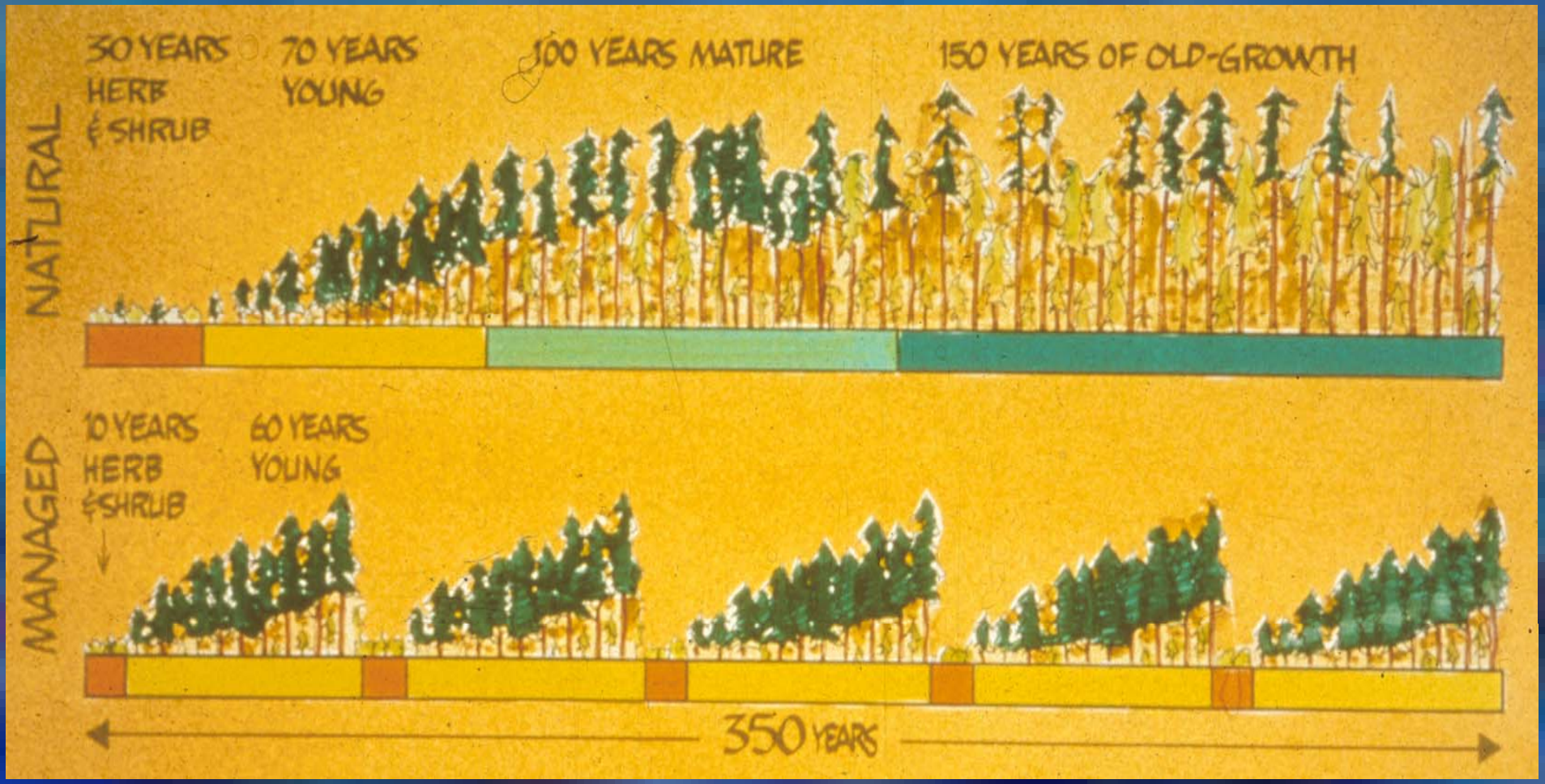


Adapted from: G.W. Minshall et al. 1989



From: May and Gresswell 2003

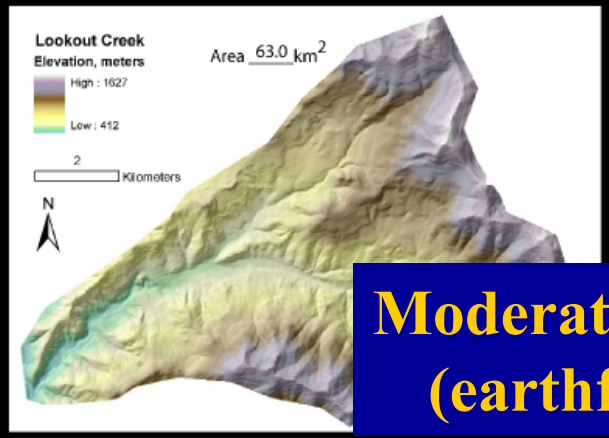

Wide Floodplains
Trapper Creek Basin
Fan


NATURAL
30 YEARS HERB & SHRUB
70 YEARS YOUNG
100 YEARS MATURE
150 YEARS OF OLD-GROWTH
MANAGED
10 YEARS HERB & SHRUB
60 YEARS YOUNG
350 YEARS

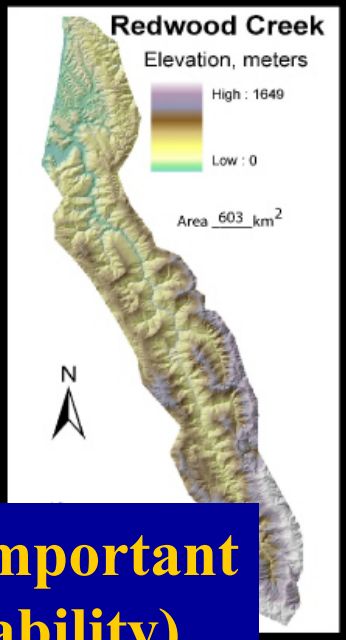
	Natural Disturbance	Human Disturbance
Magnitude	Low/High	Low
Frequency	Low/High	High
Coupling of System		
Legacy		

Relevance of Dynamic Events

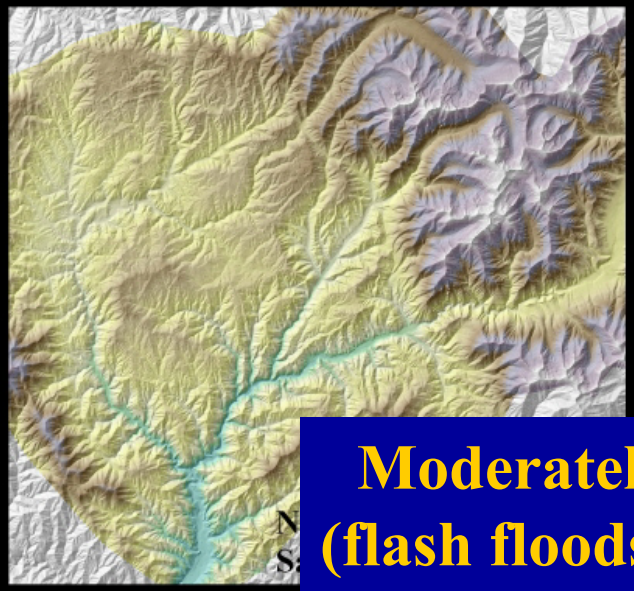
Very important
(confluences & offsite)



Moderately important
(earthflows/slides)

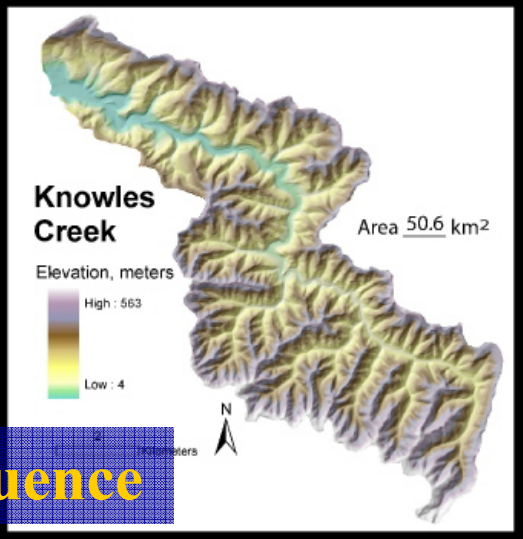


Little to Very important
(channel instability)

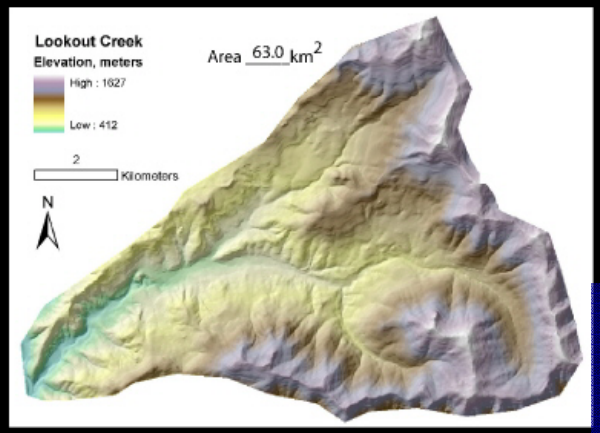


Moderately important
(flash floods/confluences,
rare)

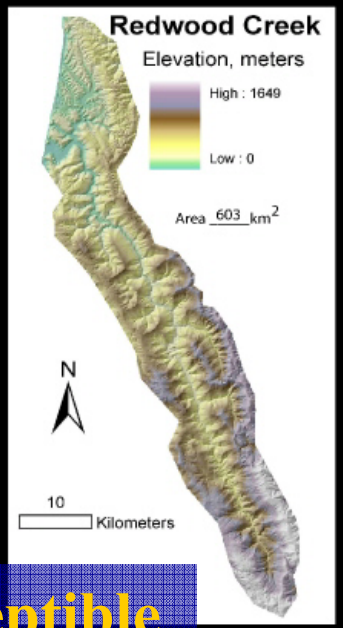
Forest Management Implications



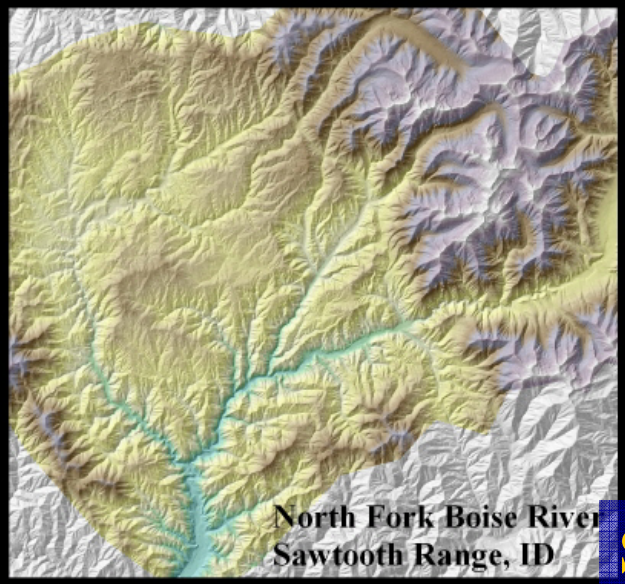
Strong influence



Not highly susceptible

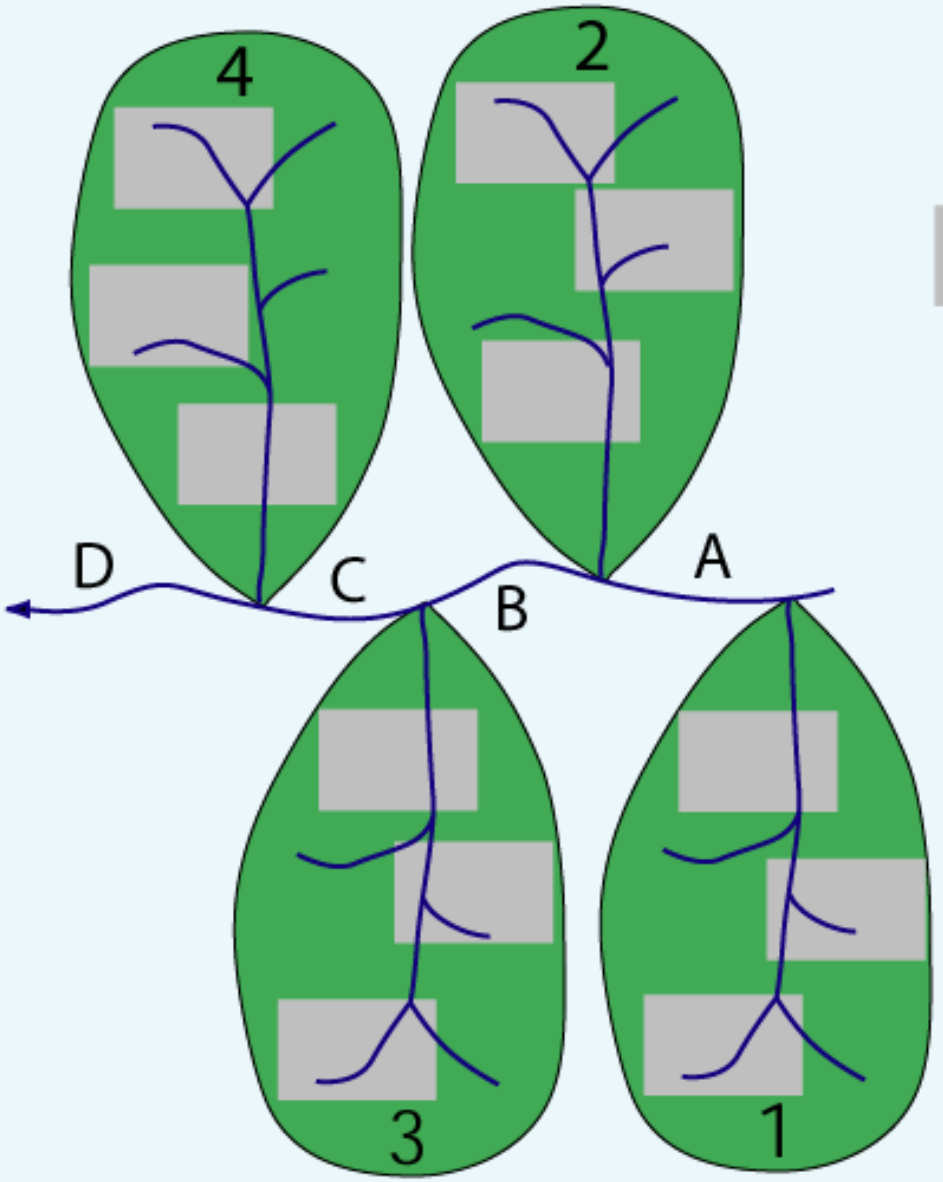


Highly susceptible



Susceptibility varies

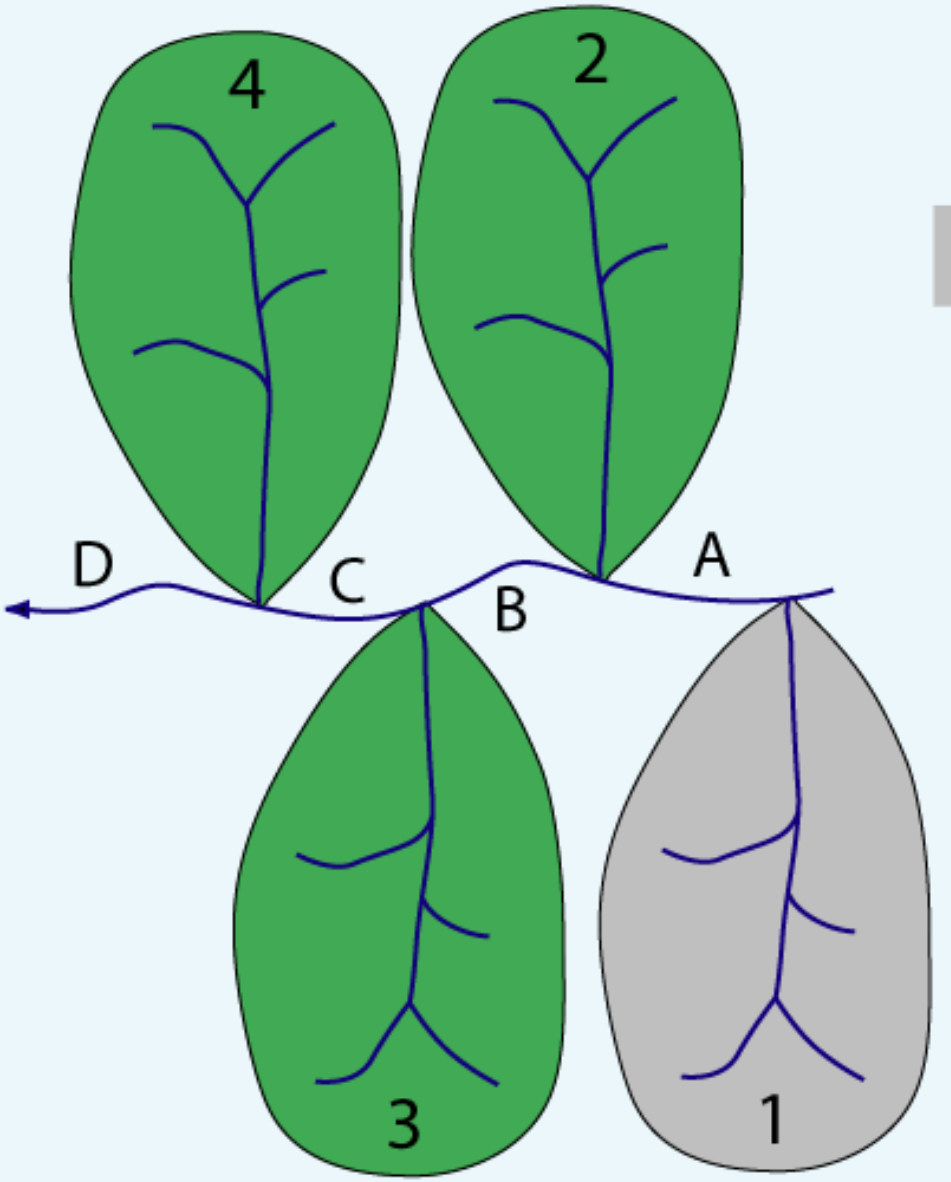
Staggered Setting Scenario



Active Management

25 % of total basin area

Minimum Fragmentation Scenario



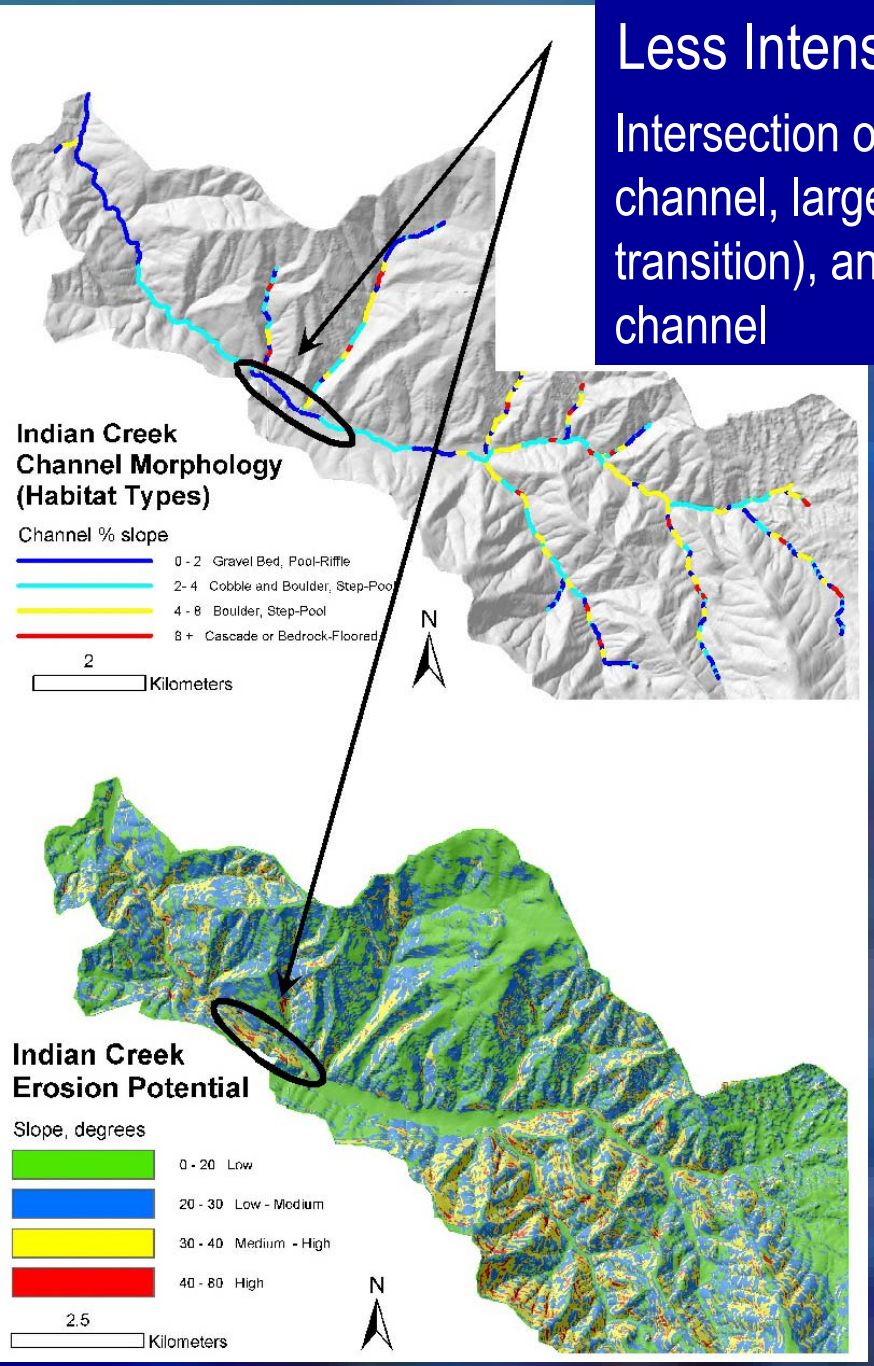
Active Management

25 % of total basin area

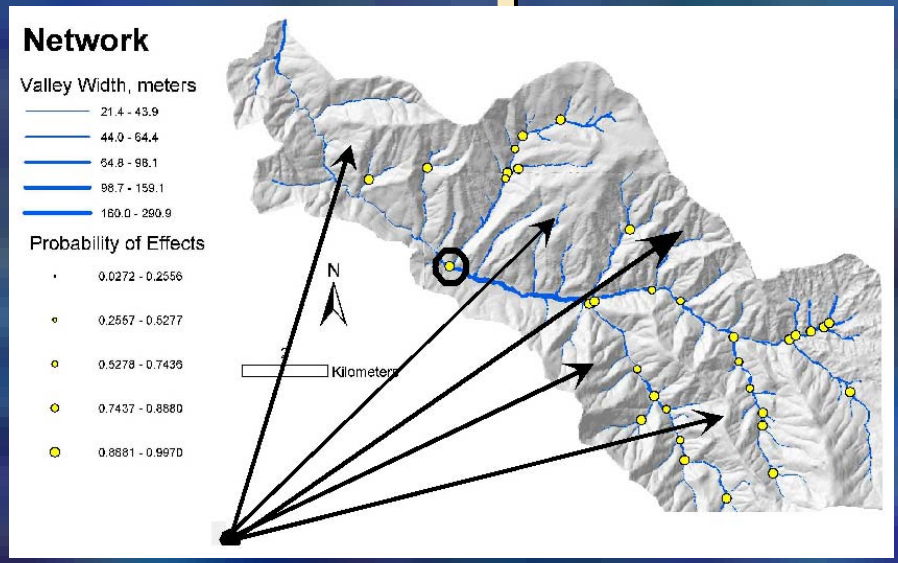
	Natural Disturbance	Human Disturbance
Magnitude	High	Low
Frequency	Low	High
Coupling of System	Maintained	Decoupled
Legacy	Sediment Wood	Sediment

Less Intensive Forestry

Intersection of high-quality fish habitat (low-gradient channel, larger floodplains, junction effect and canyon transition), and steep, erosion-prone slopes adjacent to channel



Timber Harvest Planning: An Example

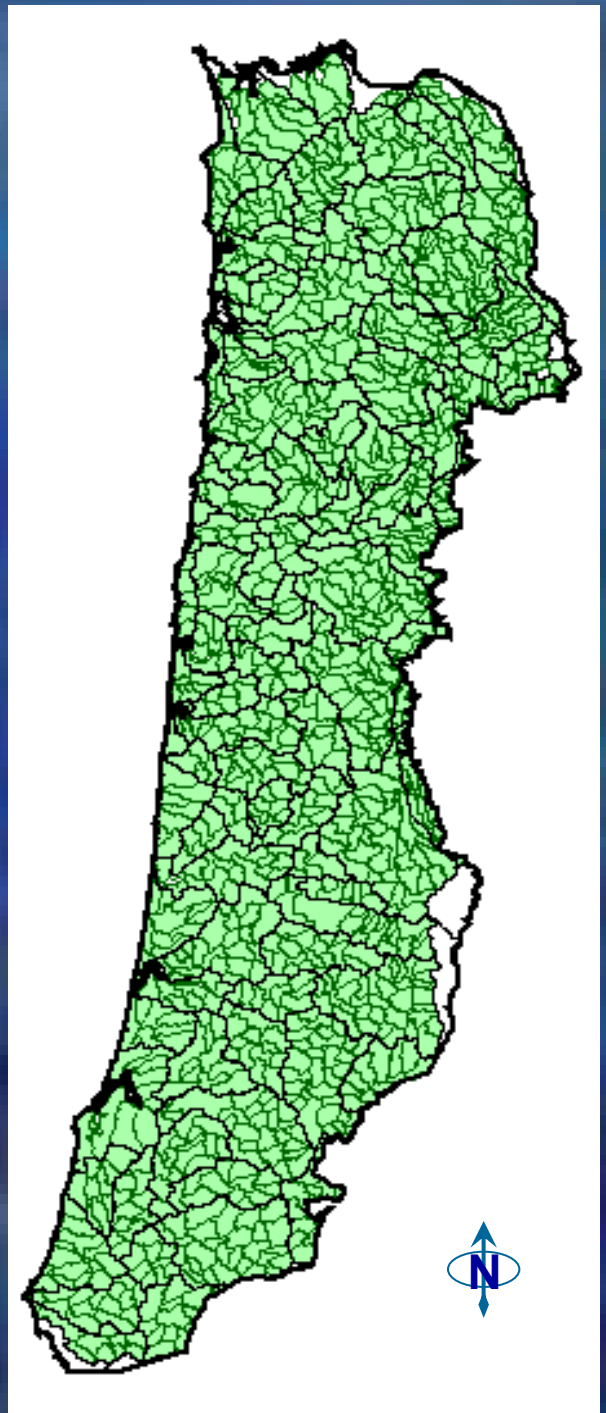


More Intensive Forestry

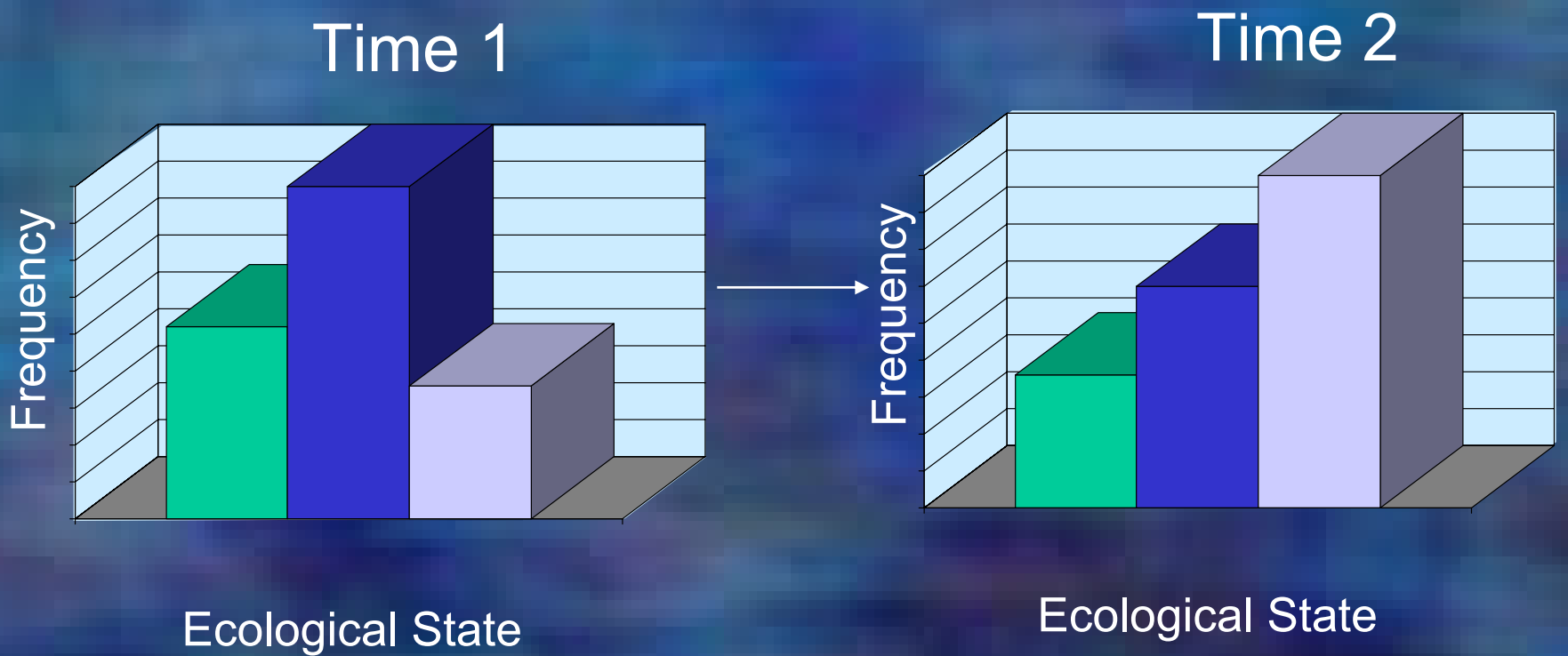
“The significant problems we face today cannot be solved with the same level of thinking that were at when we created them.”

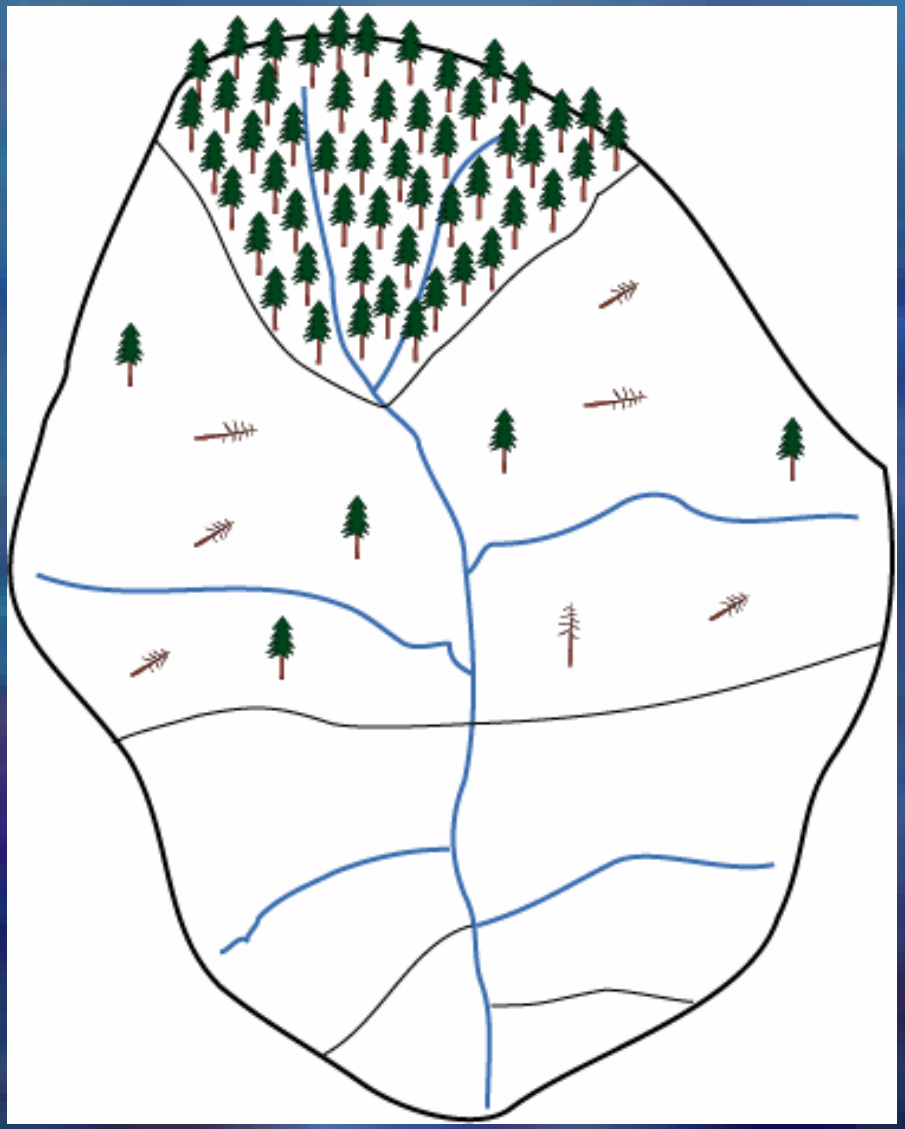
Albert Einstein

The Aquatic View?

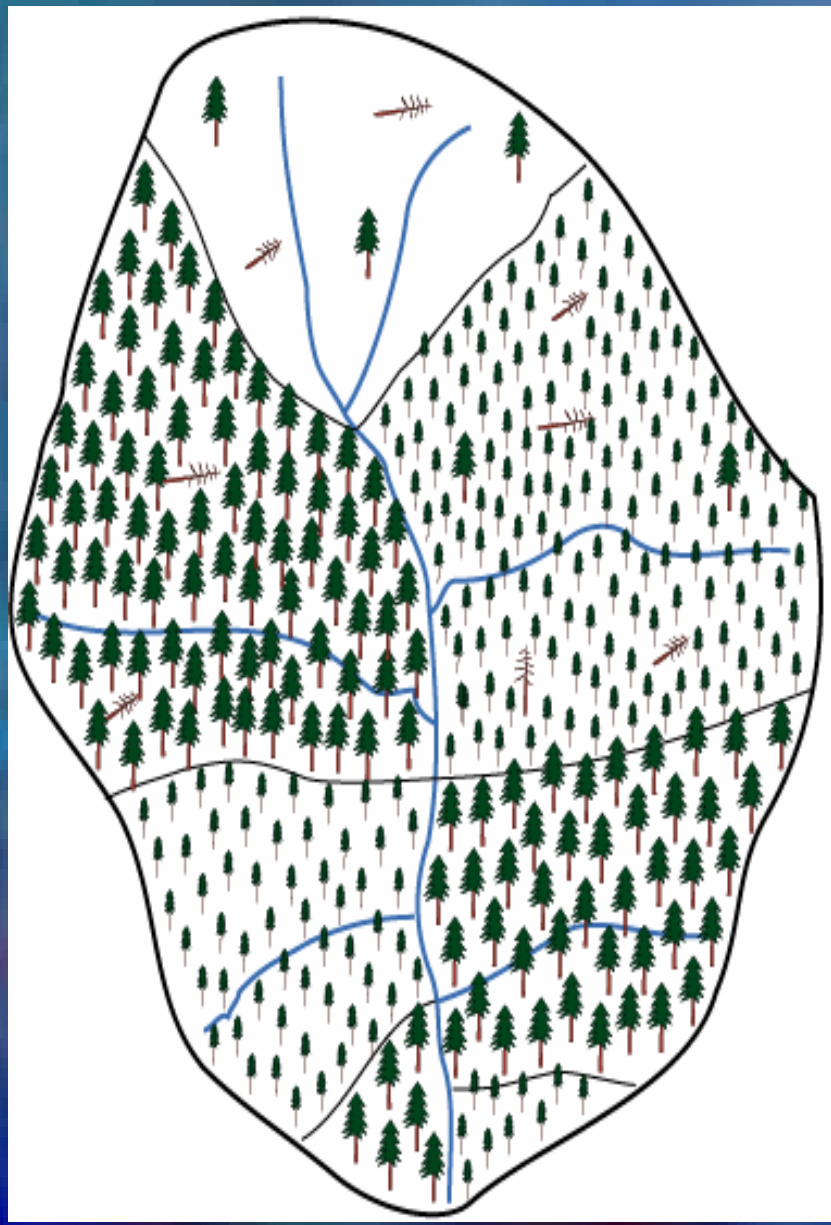


Landscape Condition

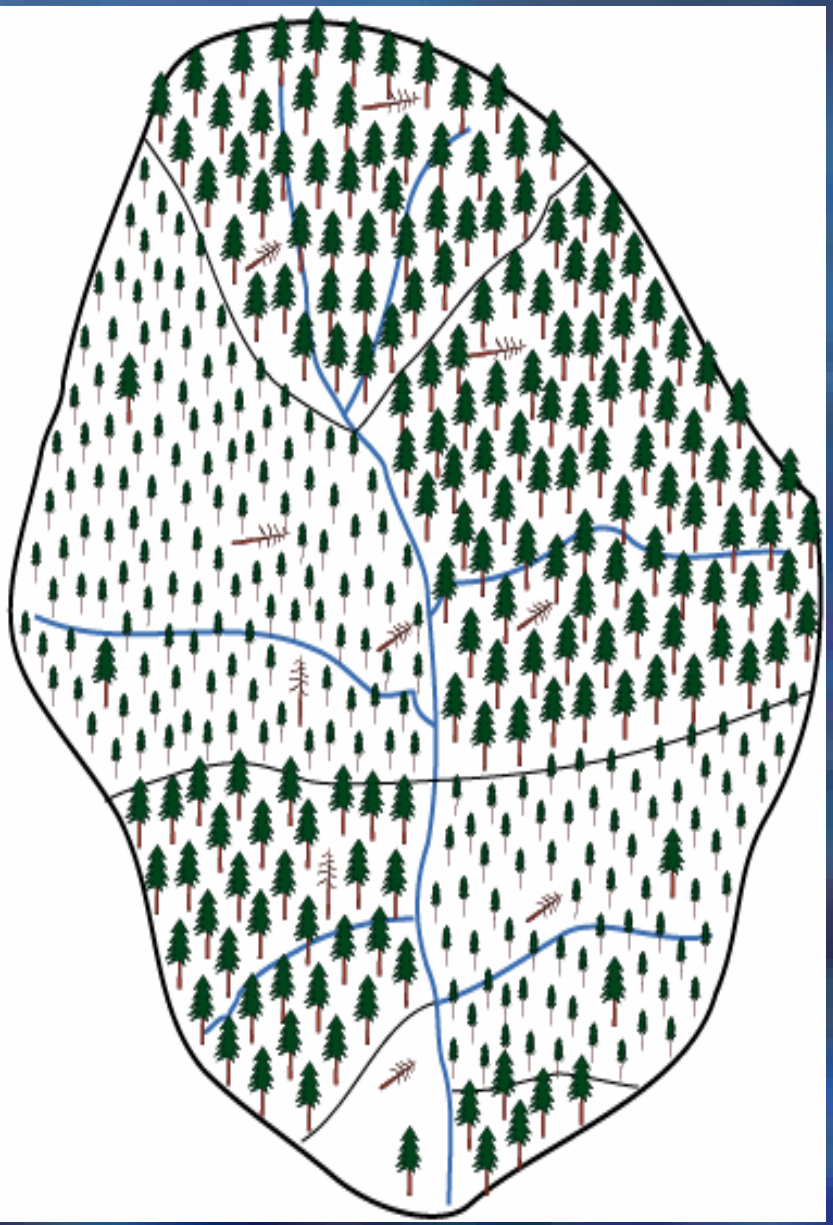




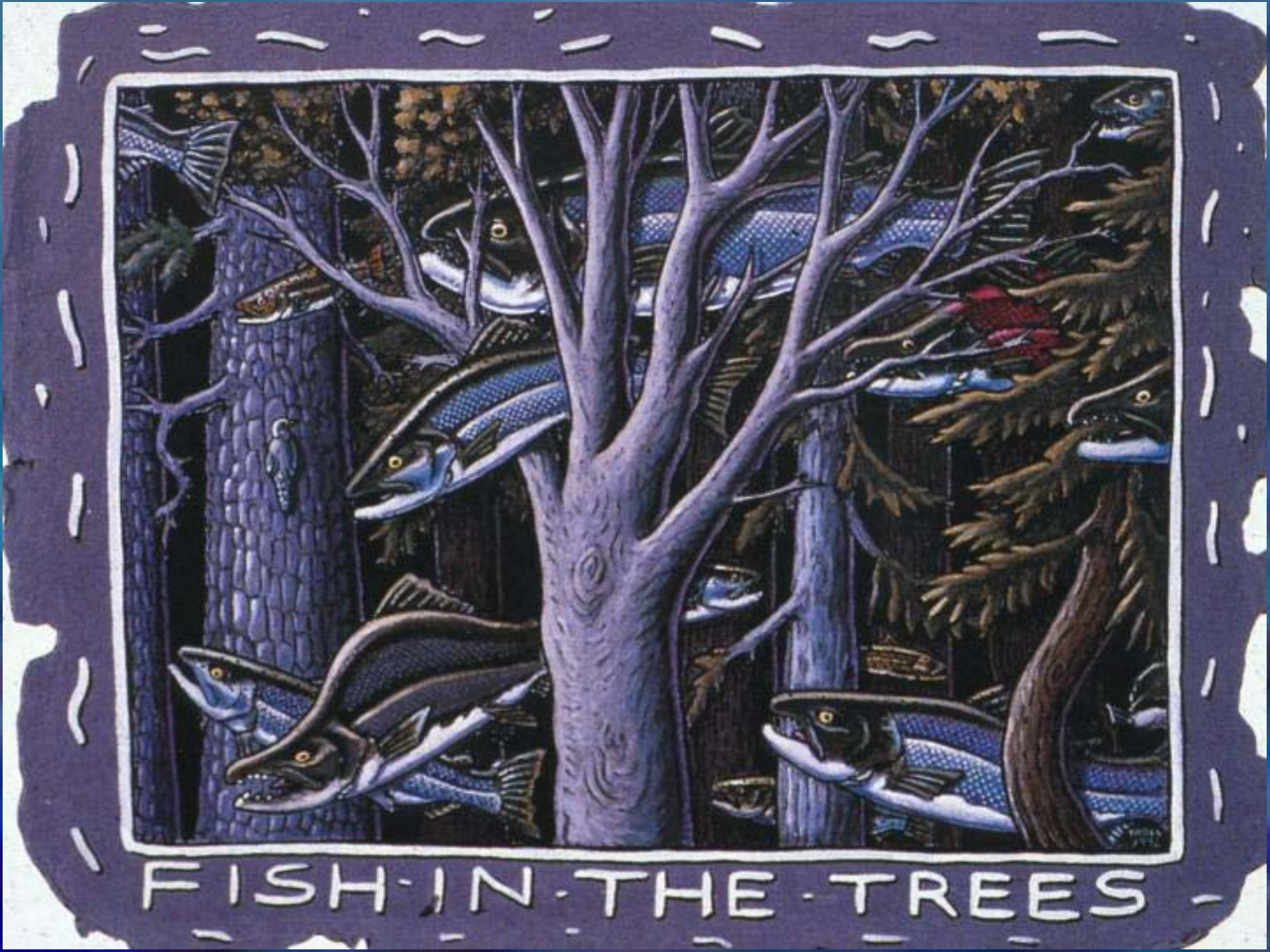
Present



Time 1



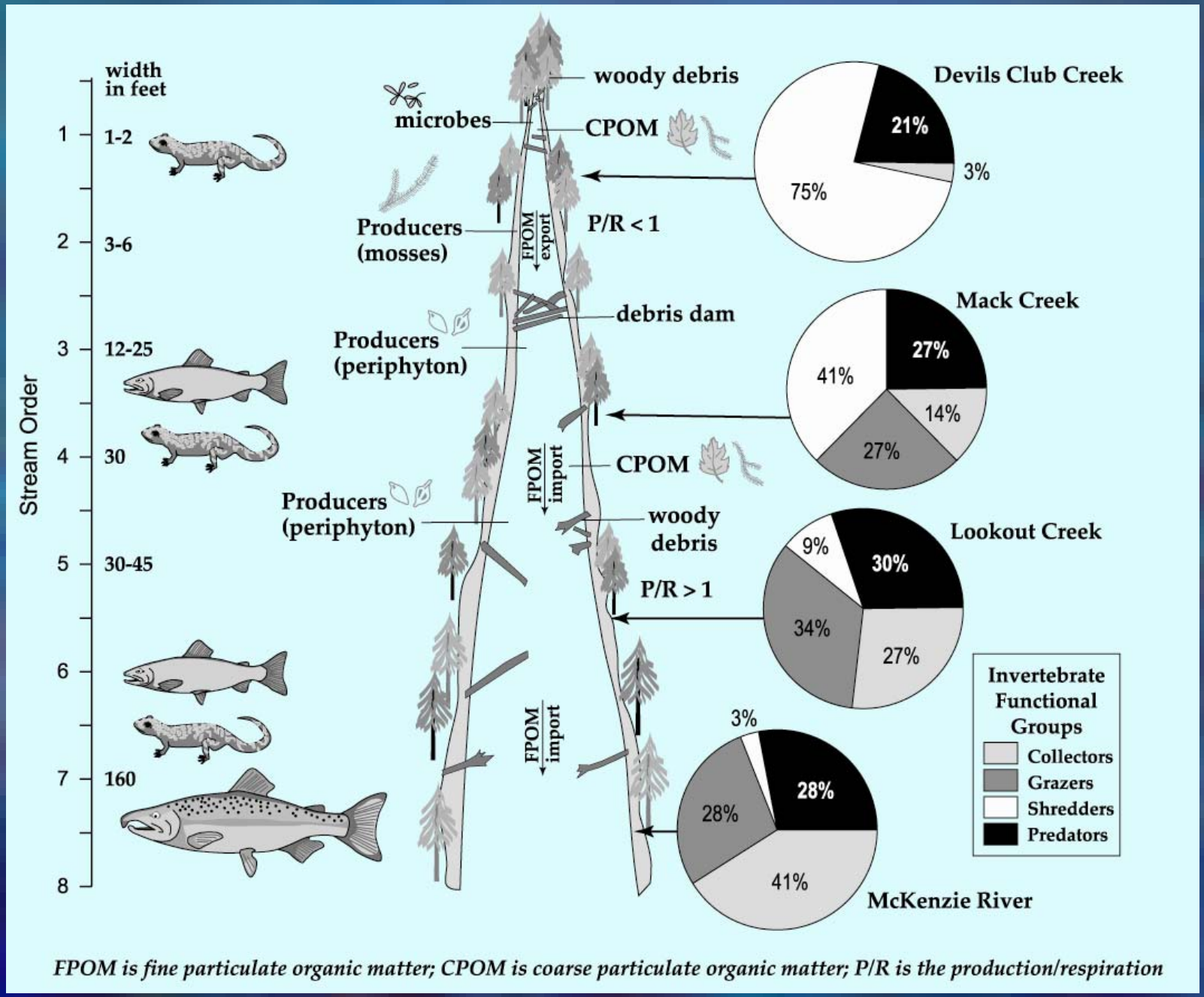
Time 2


FISH·IN·THE·TREES

Sometimes High Intensity Trauma

Happens

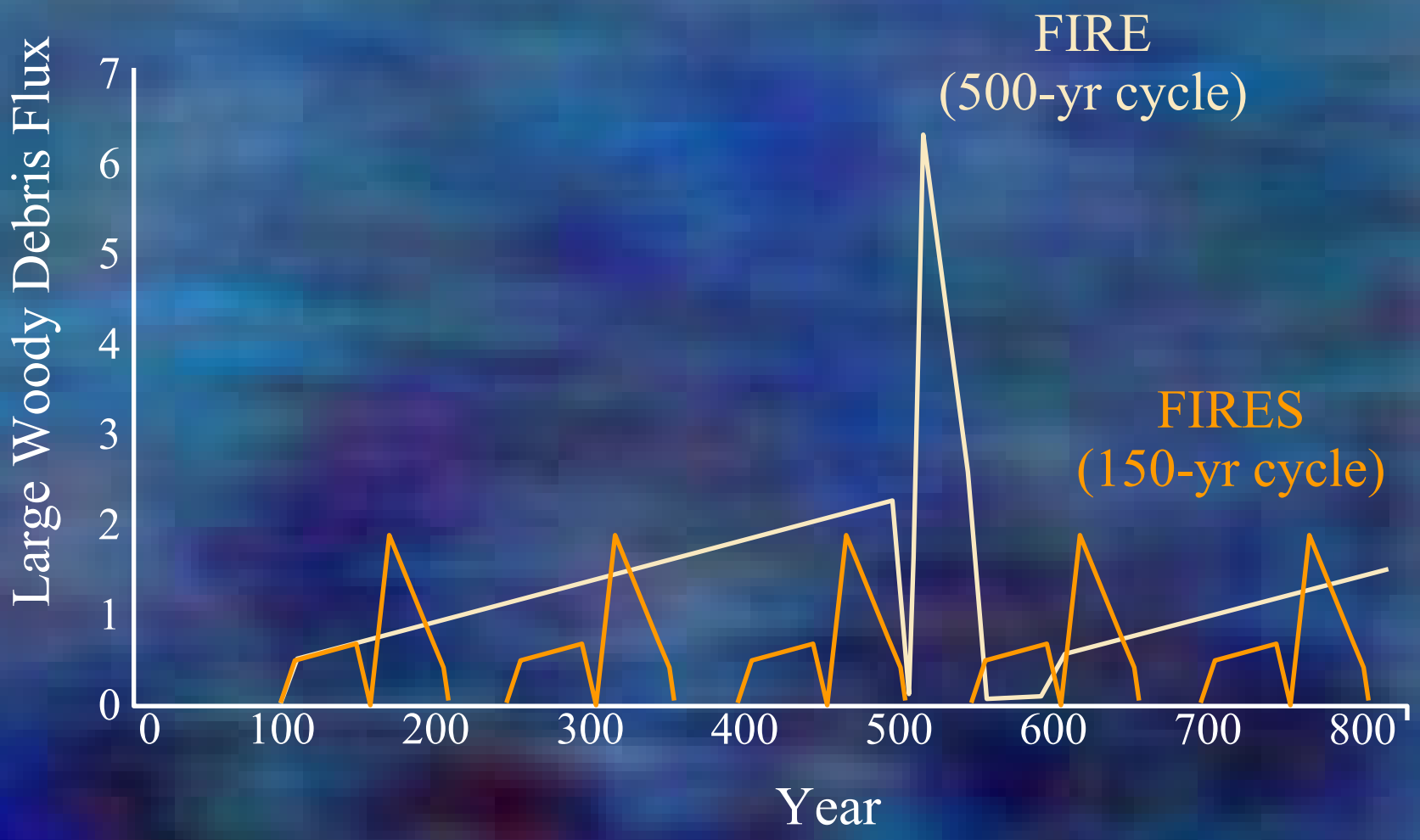
L.M. Reid



FPOM is fine particulate organic matter; CPOM is coarse particulate organic matter; P/R is the production/respiration


NATURAL
30 YEARS
HERB
& SHRUB
70 YEARS
YOUNG
100 YEARS MATURE
150 YEARS OF OLD-GROWTH

Recruitment Flux of Large Woody Debris



From: Benda and Sias 2003