Dynamic Ecology: The Aquatic Perspective

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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
Trapper Creek Basin

Wide Floodplains

Trapper Creek Basin

Fan
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<thead>
<tr>
<th></th>
<th>Natural Disturbance</th>
<th>Human Disturbance</th>
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<tbody>
<tr>
<td><strong>Magnitude</strong></td>
<td>Low/High</td>
<td>Low</td>
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<tr>
<td><strong>Frequency</strong></td>
<td>Low/High</td>
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<td><strong>Coupling of System</strong></td>
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<td><strong>Legacy</strong></td>
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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
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<td><strong>Legacy</strong></td>
<td>Sediment Wood</td>
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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

Time 1

Frequency

Ecological State

Time 2

Frequency

Ecological State
Present
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 ratio.
Recruitment Flux of Large Woody Debris

From: Benda and Sias 2003