A general protocol for identifying and prioritizing restoration actions

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The basic steps

- Establish a restoration goal
- Choose prioritization approach
- Identify necessary restoration actions
- Set priorities
Establish a restoration goal

- What are we restoring?
  - A listed species?
  - An ecosystem?
- What are the constraints?
  - Local economy?
- Specifies value system for setting priorities

An example

- A goal for sustained ecosystem function:
  
  Support *salmon recovery* by *restoring landscape processes* that sustain aquatic habitats, while *minimizing impacts on local economies*
Six prioritization approaches

- Project type
- Refugia
- Decision support systems
- Single species
- Multi-species
- Cost effectiveness

Logic frameworks
Six prioritization approaches

- Project type
- Refugia
- Decision support systems
- Single species
- Multi-species
- Cost effectiveness

Analytical frameworks

<table>
<thead>
<tr>
<th>Prioritization approach</th>
<th>Information needs</th>
<th>Causes of impairment</th>
<th>List of actions</th>
<th>Biological benefit</th>
<th>Cost</th>
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<tr>
<td>Project type</td>
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<td>O</td>
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</table>
Conduct watershed assessments

- Which habitat changes are most important?

Conduct watershed assessments

- What are the causes of habitat change?
- Which habitat changes are most important?
Scales and types of processes

- Basin scale
  - Non-point processes
- Reach scale
  - Localized effects
- Connectivity
  - Migration pathways

- Sediment supply
- Hydrologic processes
  - Urban
  - Rain-on-snow
- Water quality

- Riparian functions
  - Leved floodplains and deltas
- Inaccessible habitat
  - Stream blockages
Scales and types of processes

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- Inaccessible habitat
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List process restoration needs

- Summarize process impairment by location

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<th>Sub-Process</th>
<th>Reach</th>
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<tr>
<td>Hydrology</td>
<td></td>
<td>1 2</td>
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<tr>
<td>Sediment</td>
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<td>3 4</td>
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<td>Tidal exchange</td>
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<td>Sediment delivery</td>
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<td>Riparian</td>
<td>LWD Delivery</td>
<td>M</td>
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<td>Stream shading</td>
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<td>M</td>
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<td>Channel</td>
<td>Channel migration</td>
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<td>Hydraulics</td>
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<td>Fish migration</td>
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<td>Floodplain</td>
<td>Sediment routing</td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>Channel migration</td>
<td>M</td>
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</table>

1: Low
2: Medium
3: High
4: Very High
List necessary restoration actions

- Create the project list
- List all action types
  - Specify project type
  - Specify location

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<th>Action</th>
<th>Reach</th>
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<tr>
<td>Hydrology</td>
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<tr>
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<td>Replace tide-gate</td>
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<td>Sediment</td>
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<td>Riparian</td>
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<td>Replant riparian</td>
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<td>Connectiv</td>
<td>Fish passage</td>
<td>M L M M</td>
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<td>Floodplai</td>
<td>Levee setback</td>
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<td>Levee removal</td>
<td>H H L L</td>
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Prioritize actions

- Scoring system can consider
  - Species benefit
  - Cost
  - Certainty
  - Economic constraints
  - Education value

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<th>Evaluation Criteria</th>
<th>Weight</th>
<th>Score</th>
<th>Total</th>
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<tr>
<td>How many local species does the project benefit?</td>
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<td>Do not directly address process</td>
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<td>What is the project cost?</td>
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<tr>
<td>High cost</td>
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<tr>
<td>What is the difficulty of project design and permitting?</td>
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<td>Technical challenging and difficult to permit</td>
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<td>What is the education value of the project?</td>
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<td>What is the likelihood of obtaining funding?</td>
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<th>Priority score</th>
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<tr>
<td>Replace impassible culvert, Jones Road, MP 3.6</td>
<td>3</td>
<td>79</td>
</tr>
<tr>
<td>Replace impassible culvert, Road 1341, MP 1.2</td>
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<tr>
<td>Riparian planting, Mainstem, Rkm 1.2-1.6</td>
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<tr>
<td>Levee setback, Mainstem Rkm 0.0-1.1</td>
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<td>65</td>
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<tr>
<td>Riparian planting/fencing, Trib A, Rkm 0.2-1.1</td>
<td>2</td>
<td>58</td>
</tr>
<tr>
<td>Replace impassible culvert, Smith Road, MP 1.3</td>
<td>2</td>
<td>53</td>
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<tr>
<td>Road erosion reduction, Jones Road, MP 1.1-2.5</td>
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<td>Wood placement, Mainstem, Rkm 6.4-7.2</td>
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<th>Site</th>
<th>Project Type</th>
<th>Cost</th>
<th>Estimated smolts</th>
<th>Cost/smolt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little Park Creek</td>
<td>Culvert (fish passage)</td>
<td>$130,000</td>
<td>271,050</td>
<td>$0.48</td>
</tr>
<tr>
<td>Boundary Creek</td>
<td>Culvert (fish passage)</td>
<td>$81,000</td>
<td>129,375</td>
<td>$0.61</td>
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<tr>
<td>Deepwater Slough</td>
<td>Reconnect side channel</td>
<td>$242,000</td>
<td>205,875</td>
<td>$1.18</td>
</tr>
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<td>Barnaby Slough</td>
<td>Reconnect side channel</td>
<td>$80,000</td>
<td>363,600</td>
<td>$0.22</td>
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<tr>
<td>Skinny Sauk Pond</td>
<td>Off-channel pond</td>
<td>$37,700</td>
<td>45,300</td>
<td>$0.83</td>
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<td>Zander Pond</td>
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<td>$23,750</td>
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## Summary

1. Specify values in goals and prioritization scheme
2. Use values to develop prioritization scheme
3. Use watershed assessment to identify necessary actions and get information for priority setting
4. Set priorities