Use of Photo Interpretation in Landscape Evaluations: The Okanogan-Wenatchee Forest Restoration Strategy

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Theory to Practice Workshop
Lubrecht Experimental Forest
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Objectives

• Background

• Forest Restoration Strategy
  – Landscape Evaluation
    • Terrestrial Evaluation
    • Aquatic Evaluation
  – Landscape Diagnosis and Prescription

• Quality Assurance/Quality Control

• Adaptive Management and Monitoring
Some Background

- Forest Restoration Strategy
  - Science/Management Collaboration
  - District Review and Input
  - Science Review
  - Provincial Advisory Committee Review
Key Forest Restoration Issues

• Landscape Evaluation
  – Integration across resources
  – Treatment priorities

• Road/Aquatic Interactions
  – Integration
  – Aquatic restoration priorities

• Key Ecological Features
  – Large and old trees
  – Within-stand Spatial Patterning

• Efficient Planning
  – Double restoration footprint over the next 10 years.
Landscape Evaluation

“landscape evaluations concerned with the restoration of ecosystems might be based on a set of ecological indicator measures against reference conditions for those same indicators” from Reynolds and Hessburg 2005
Why Photo Interpretation?

- Detail to use in project level planning
- Comparable to reference conditions
- Assess spatial patterns
- New imagery and technology
- Lack of an alternative

- 20-25 cm resolution
- On-screen 3-d image
- On-screen digitizing
- 2 m spatial accuracy
*Canopy Closure
*Canopy Layers
*Overstory Species
*Understory Species
*Tree Size
*Snags
*Clumpiness
North Fork Taneum Creek Watershed (HUC 12)
Preliminary Aquatic Resource Assessment

Rectified Stream Layer
NetMap Stream Layer
Reference Conditions

• Objective Measure of Current Conditions
  – More resilient landscapes and watersheds

• Changes Over Time
  – Historical Range of Variation
  – Future Range of Variation

• Amount and Configuration
  – Percent landscape
  – Aggregation Index
  – Patch Density
  – Largest Patch Index
Terrestrial Landscape Evaluation
<table>
<thead>
<tr>
<th>Key Indicator</th>
<th>Key Questions</th>
<th>Datalayers</th>
<th>Potential Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetation Pattern</td>
<td>What is the amount and spatial arrangement of cover types, structure classes and cover x structure?</td>
<td>PVT, Cover Type, Structure Classes</td>
<td>Photo-interpretation, Departure Analysis, CC-HRV-FRV, Spatial Metrics</td>
</tr>
<tr>
<td>Insect and Disease Vulnerability</td>
<td>What is the current amount and spatial arrangement of forest structure that is susceptible to forest insects and diseases?</td>
<td>PVT, Cover Type, Structure Classes</td>
<td>Insect and Disease Risk Models, CC-HRV-FRV, Spatial Metrics</td>
</tr>
<tr>
<td>Landscape Fire</td>
<td>How can treatments be strategically located to interrupt landscape fire flow?</td>
<td>Fire “sending areas”</td>
<td>Fire Modeling done at subbasin scale or larger</td>
</tr>
<tr>
<td>Stand Level Fire</td>
<td>What is the current condition of fuel conditions and fire behavior compared to reference conditions?</td>
<td>Vegetation data used to map fuels</td>
<td>Fire modeling, Departure Analysis CC-HRV-FRV, Spatial Metrics</td>
</tr>
<tr>
<td>Focal Wildlife Species Habitats (2-5 species)</td>
<td>What is the current amount and spatial arrangement of focal species habitat?</td>
<td>Vegetation data used to map focal species habitats</td>
<td>Departure Analysis, CC-HRV-FRV, Spatial Metrics</td>
</tr>
</tbody>
</table>
Vegetation Pattern

- Cover-type, Potential Vegetation, Structural Classes
- Insect and Disease Risk
- Departure from Reference Conditions
  - Natural Range of Variability
  - Future Range of Variability
Fire Movement

• Landscape Fire
  • Areas fires are likely to start and move from
  • Known fire starts
  • Fire modeling

• Stand Level Fire
  • Stand level fuel conditions
  • Rate of spread, fireline intensity, etc.
  • Compared to reference conditions
Wildlife Habitat

• Focal Wildlife Species
  – Northern spotted owl-NWFP
  – Northern goshawk-EastScreen
  – White-headed woodpecker
  – Other focal species: American marten, pileated woodpecker

• Reference Conditions
  – Current amount and arrangement of habitats
  – HRV, FRV
Aquatic Landscape Evaluation
<table>
<thead>
<tr>
<th>Watershed/Stream Process</th>
<th>Key Questions</th>
<th>Datalayers</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runoff and Stream Flow</td>
<td>How are forest roads influencing the drainage network? How will vegetation management influence snow accumulation, retention, and runoff?</td>
<td>Roads, streams, DEM, vegetation cover, snow</td>
<td>UCSRB Snow DST, CC-HRV-FRV</td>
</tr>
<tr>
<td>Erosion and Sediment Supply</td>
<td>Which roads are contributing fine sediment to streams? Which roads interrupt wood and coarse sediment delivery to streams?</td>
<td>Roads, streams, DEM, LTAs, vegetation cover</td>
<td>OWNF Proced., Graip-Lite, Erosion-Potential Delivered</td>
</tr>
<tr>
<td>Riparian Conditions</td>
<td>What is the current condition of riparian habitats to provide shade, wood, filter sediment, etc.?</td>
<td>Stream-type, Vegetation, grazing, large trees</td>
<td>Riparian Reserves, CC-HRV-FRV</td>
</tr>
<tr>
<td>Channel, Floodplain, and Habitat Dynamics</td>
<td>How have human activities impacted the amount and function of floodplains?</td>
<td>Floodplains, DEM, roads, other human developments</td>
<td>Floodplain Mapping Tool, LiDAR, in-channel surveys</td>
</tr>
<tr>
<td>Habitat Connectivity</td>
<td>How have human developments affected aquatic organism passage? Do barriers prevent access to current and future cold water?</td>
<td>Road-stream crossings, barrier inventory, current and potential fish habitat, cold water</td>
<td>Barrier data, Field evaluations, intrinsic habitat potential</td>
</tr>
<tr>
<td>Listed Fish Species</td>
<td>What is the current distribution of listed fish? Where is potential habitat? Are there key spawning and rearing habitats?</td>
<td>Current fish distribution, potential habitat, stream surveys</td>
<td>Fish distribution surveys, intrinsic habitat potential</td>
</tr>
</tbody>
</table>
Landscape Diagnosis and Prescription
Landscape Prescription

- Restoration of Landscape and Watershed Resilience
- Ideal is to target the zone of overlap between HRV and FRV
- Identifies amount and location of potential terrestrial and aquatic restoration treatments
- An integrated package of restoration opportunities and priorities vetted by scenario evaluation
- Used to develop Purpose and Need
Quality Assurance/Quality Control
Quality Assurance
versus
Quality Control

• QA is done during the executing process
  o Focus on work being done now
  o Ensures team is following planned process

• QC is a monitoring process
  o Examines deliverables
  o Ensures deliverables are correct and meet “planned level of quality”
Quality Assurance

• Photo-Interpretation
  – Field time to get familiar with the area
  – Cross check of polygon delineation
  – Cross check of vegetation attributes

• Field Evaluation of Vegetation/Habitat Mapping
  – Independent from photo-interpreter
  – Stratified random sample of vegetation polygons to collect field data

• Revise Vegetation/Habitat Mapping as Needed
Adaptive Management and Monitoring

- Photo interpreted landscapes provide a baseline for monitoring
- Allows a comparison of current condition, reference conditions, and landscape prescription
- Can be updated as projects are implemented or as conditions change (e.g., fires)
- Are we moving landscapes and habitats to more resilient conditions?