Statewide Assessment & Strategy
Draft Priority Landscape Evaluation
Spatial Data Layers and Analysis Process
Washington State Department of Natural Resources
March 25, 2010

Introduction: This document describes the rationale, data and analysis processes used to produce draft priority landscape maps for the Statewide Assessment & Strategy. The project is organized around a set of five issues designed to bridge the National Goals and Objectives of State & Private Forestry Redesign, as codified in the 2008 Farm Bill, with specific focal issues for forestry in Washington State. These issues include: Working Forestlands & Conversion; Biodiversity & Habitat Conservation; Wildfire Hazard Reduction; Forest Health Restoration; and Upland Water Quality, Quantity & Puget Sound Restoration.

Purpose: The purpose of evaluating priority landscapes is to identify where shared priorities exist in an all-lands context, so that opportunities to leverage multiple landowner efforts and investments are realized with the help of State & Private Forestry funded activities.

Watershed Resource Inventory Areas (WRIAs) were selected as the boundaries to differentiate among landscapes. There are 62 WRIAs in Washington, similar in size to HUC-8 subbasins, but the basin groupings differ in some cases. The watershed boundaries were drawn in accordance with state statute and administrative code, many data resources are readily available and aggregated by WRIA, and the physical size of the watersheds lends itself readily to mid-scale prioritization (as opposed to something as large as a County, or as small as a Watershed Administrative Unit).

Desired Outcome: The deployment of State & Private Forestry funds for forestland treatments will be prioritized in accordance with the identified landscapes. The draft maps, one for each issue area, will undergo a process of consolidation, likely becoming one western Washington map and one eastern Washington map. Each year, DNR must report on the use of funds, and expects to be able to display a gradient of expenditure that corresponds to high, moderate, and low priority landscapes. Some program functions, for example Fire Preparedness or the annual Forest Health Aerial Survey, must remain a statewide priority and will not be specifically associated with priority landscapes for obvious reasons.

Data Selection: All data were geospatially based. To the maximum extent practicable, data for this analysis were selected that included strategic components in addition to resource information components. For instance, Community Wildfire Protection Plan data not only describe the location of wildfire hazard conditions, but also the priorities for where treatments should be strategically implemented based on the density of structures, prevailing winds and fire behavior, and other factors that Communities' considered in consultation with land and fire management agencies.

Basic Analysis Process: For each issue, a set of three to four data layers were selected for the draft analysis. In most cases, a subset of the full data layer was identified in order to display its highest priority strategic value. Most data layers with statewide coverage were clipped to forestland cover using the USGS National Land Cover Dataset (the non-forestland portion of the data was not used). The values for each data layer were then summarized by WRIA in order to be able to compare among landscapes.

The following table displays an example methodology for how the WRIAs were compared based on the data. For each data layer, WRIAs were ranked on the basis of the magnitude of whatever the data layer measured (e.g., acres, miles) relative to the amount in the other WRIAs (i.e., most acres, second-most acres, third-most acres…). A rating was assigned on the basis of where the WRIA ranked compared to others; if it was in the top-third, it got a rating of "3", middle-third = "2", bottom-third = "1". The ratings were summed to create a composite rating, and WRIAs were re-ranked into thirds based on this value; top-20 = high priority, middle-20 = moderate priority, bottom-20 = low priority.

WRIA #	WRIA Name	Data Layer #1		Data Layer #2		Data Layer #3		**Composite Rating**
		Rank	Rating	*Rank*	Rating	*Rank*	Rating	
22	Lower Chehalis	*1*	3	*59*	1	*2*	3	**7**
3	Lower Skagit/Samish	*5*	3	*47*	1	*58*	1	**5**
19	Lyre-Hoko	*27*	2	*29*	2	*4*	3	**7**
39	Upper Yakima	*38*	2	*24*	2	*60*	1	**5**
60	Kettle	*43*	1	*4*	3	*21*	2	**6**
49	Okanogan	*54*	1	*1*	3	*20*	2	**6**

Where feasible and logical, additional factors were applied to refine the composite rating (explained in the individual issue discussions below). These included refinements like comparing the data layer values to the total forested acres in the WRIA, and adjusting for the proportion of private forestland in a WRIA.

1. Working Forestlands & Conversion:

a.) Data Layers:

Forest Legacy Program Assessment of Need (AON) – Priority A and B proposed acquisition areas based on structures per acre. Metric: forested acres by WRIA.

DNR Asset Management Strategy – Asset inventory classes Hold & Consolidate and Hold & Expand for state trust lands (DNR "working forest landscapes"). Metric: forested acres by WRIA.

Conservation Opportunity Framework (COF) – Uses combined biodiversity "significance" and "risk" from the Western Futures population growth model to establish "priority". The combined ratings were used for this part of the analysis. Metric: Forested acres in the top three priority categories by WRIA.

b.) Narrative: The purpose of this analysis was to identify a subset of WRIA scale landscapes where working forestlands are not only providing significant economic and environmental benefits, but also where investments in permanent conservation are both justified and affordable. This differs from other analyses that have identified landscapes where the greatest *amount* of conversion is projected to take place, or where conversion *pressures* are highest. In many such analyses, conversion pressure is greatest where the HBU property values greatly exceed the forestland asset value, typically in direct proximity to urban growth areas. This analysis sought to identify landscapes where a substantial component of forestland ownership is relatively stable (DNR "working forest landscapes"), where population growth pressures exist but do not drive property values to the point of being too expensive (AON), and where at least one ecosystem service co-benefit of maintaining working forestland has been quantified in concert with conversion risk (COF).

c.) Technical Analysis Process: Establish a rating for each WRIA for each of the three data layers (i.e., greatest to least acres of Forest Legacy priority by WRIA). Break the WRIAs

into three groups: Top-20, Middle-20, and Bottom-22 for each data layer. Top-third earns a rating value of "3", middle a "2", bottom a "1". Sum the rating values across all three data layers to create a composite rating (highest possible score = 9, lowest = 3). To account for WRIAs of varying geographic size with varying proportions of forestland, divide the WRIA acreage of each data layer by the total WRIA forestland acreage (e.g., "X" DNR working forest Acres/"Y" total WRIA forestland); sum the coefficients to create a single value. Multiply the value by the rating to produce a final value. Re-rank and assign a natural break in the scores: value > 8 (top 18) is "high" priority, value > 4 (middle 20) is "medium", value < 4 (bottom 24) is "low".

2. Biodiversity & Habitat Conservation:

a.) Data Layers:

Conservation Opportunity Framework (COF) – Uses combined biodiversity "significance" and "risk" from the Western Futures population growth model to establish "priority". Only the "significance" data were used for this portion of the analysis. Metric: Forested acres in the top three significance categories by WRIA.

Priority Habitats & Species (PHS) – Occurrence and habitat for state- and federally-listed species in endangered, threatened, and candidate categories. Metric: Forested acres by WRIA.

Salmonid Stock Inventory (SaSI) – Stream reaches with Candidate, Threatened and Endangered runs, excluding those classed as "healthy." Metric: Miles of stream in forested reaches by WRIA.

b.) Narrative: The purpose of this analysis was to identify a subset of WRIA scale landscapes where forestlands of all ownerships can contribute to maintaining multiple, intersecting terrestrial and aquatic biodiversity priorities. The COF provides a baseline of spatially explicit ecoregional assessments of biodiversity using quantitative data on rare or declining species, natural communities, and ecological systems. The PHS and SaSI augment and overlay the biodiversity information using species-specific spatial data associated with the occurrence and status of state and federally listed species and their habitats.

c.) Analysis Process: Establish a rating for each WRIA as in 1c. SaSI data are in miles, whereas COF and PHS data are in acres, so the units are not comparable. Apply the acreage percentage coefficient for PHS and COF-High, and COF-Medium, except reduce the weight of the COF-Medium coefficient by half. Multiply by the rating to produce a final value. Applying a similar coefficient by the forested acres' reach of stream within a WRIA for SaSI was not feasible because of water typing data discrepancies, and overlapping SaSI segments that reflect multiple species and multiple runs. Re-rank and assign a natural break in the scores: value >8 (top 20) is "high" priority, value > 3 (middle 19) is "medium", value < 3 (bottom 23) is "low".

3. Water Quality, Quantity & Puget Sound Restoration:

a.) Data Layers:

305b Water Quality Data – Impaired water segments (excludes lakes, impoundments) that have an approved TMDL or that require the development of a TMDL (303d listed waters), and have as their categories of impairment one of the following: fine sediment, coarse sediment, temperature, dissolved oxygen, fish habitat, large woody debris, instream flow and turbidity. Metric: Forested "acres" (although these are linear features, an artifact of the data is that the value is acres) by WRIA.

Salmonind Stock Inventory (SaSI) – Stream reaches with Candidate, Threatened and Endangered runs, excluding those classed as "healthy." Metric: Miles of stream in forested reaches by WRIA.

US Forest Service Priority Watersheds – Watersheds that have been identified by individual National Forests in Washington State as focal areas for restoration investment using the Regional Aquatic Restoration Strategy. Metric: Acres by WRIA.

b.) Narrative: The purpose of this analysis was to identify a subset of WRIA scale landscapes where upland forest conditions of all ownerships are linked with and can contribute to remedying water quality issues. In particular, there was a desire to recognize and leverage the investments that many land managers, governments and citizens are making in restoring Puget Sound. The core of the analysis is formed by water quality concerns that are both potentially related to forest management activities, and have identified impaired status that is proximate to forest land. SaSI data are used to weight water quality issues that can affect salmonids, which is a key Puget Sound restoration priority. USFS priority watersheds are used to identify opportunities where multiple forest landowners can be working on shared priorities. *Although the quantity, timing and duration of surface water runoff can be affected by the condition of upland forests, no quantitative spatial data were identified that could contribute to the analysis at a statewide scale. The aggregation of locations where water quality, salmonid habitat and restoration priorities exist will serve as a surrogate for water quantity until more specific data can be aggregated.*

c.) Analysis Process: Establish a rating for each WRIA as in 1c. There was not enough differentiation among the data when broken into thirds, so ratings were broken into sixths; top-10 earns a value of "5", 11-20 earns "4", 21-30 earns "3", 31-40 earns "2", 41-50 earns "1", 50+ earns "0". WRIAs that drain Puget Sound earn a supplemental rating of "3". Sum the ratings across data layers to create a composite rating (highest possible score = 18, lowest = 0). Complete disagreement in units among SaSI (miles), 303d (linear "acres"), and USFS Watersheds (acres) prevents weighted forestland acreage adjustment. Assign a natural break in the composite ratings: value > 11 (top 20) is "high" priority, value > 6 (middle 21) is "medium", value < 6 (bottom 21) is "low".

4. Forest Health Restoration:

a.) Data Layers:

Cumulative Mortality Mapper – Tree mortality caused by biotic and abiotic agents (primarily bark beetles, excludes defoliators and wildfires) aggregated over 20 years' aerial survey data, expressed as trees-per-acre killed. Metric: Acres with > 10 TPA by WRIA.

FIA Bark Beetle Mortality Risk Projections – Predicted tree mortality and damage within 15 years based on FIA stand condition data, expressed as a percentage of total basal area estimated to be affected. Metric: Acres with > 20% predicted mortality by WRIA.

Coincidence of predicted and actual mortality – Intersect of first two layers. Metric: Acres by WRIA.

US Forest Service Planning Areas – Best available representation of where the USFS intends to perform management activities within a five-year time horizon. Metric: Acres by WRIA.

b.) Narrative: The purpose of this analysis was to identify a subset of WRIA scale landscapes where forest insect and disease mortality is predicted, has actually occurred, and where the USFS – as the largest landowner in eastern Washington and the location of a disproportionate amount of at-risk conditions – plans to conduct forest management actions that can be leveraged toward broader outcomes. Because many eastern Washington WRIAs are dominated by federal land, a minimum amount of non-federal land must be present in order for cross-ownership opportunities to exist. For the purposes of identifying focal landscapes,

western Washington WRIAs were omitted although it is recognized that certain statewide Forest Health functions will remain a priority.

c.) Analysis Process: For the 34 eastern Washington WRIAs only, establish a rating for each WRIA as in 1c. WRIAs that have greater than 10% private forestland earn a supplemental rating of "1", those with less than 10% earn "0". Sum the ranks across data layers to create a composite rating (highest possible score = 13, lowest = 4). Assign a natural break in the composite ratings: value > 9 (top 11) is "high" priority, value > 5 (middle 11) is "medium", value < 5 and western Washington WRIAs (bottom 40) is "low". Correction for percent of forestland does not yield significant adjustments in the ranking.

5. Wildfire Hazard Reduction:

a.) Data Layers:

Fire Regime Condition Class – FRCC combines data about the historical fire regime with the degree of departure from historical forest reference conditions. Metric: Forested acres of FRCC 2 and 3 (moderate and high departure).

Completed CWPP Fuels Treatments – Acres of DNR completed and near-completed fuels treatments on private land identified in a Community Wildfire Protection Plan. A measure of past investment and priority, as well as leverage points. Metric: Acres by WRIA.

Planned CWPP Fuels Treatments – Areas identified in CWPPs as priority fuels projects on mostly private, but also state and federal land that the community has categorized as important to protecting the wildland urban interface. Metric: Acres by WRIA.

US Forest Service Planning Areas – Best available representation of where the USFS intends to perform management activities within a five-year time horizon. Metric: Acres by WRIA.

b.) Narrative: The purpose of this analysis was to identify a subset of WRIA scale landscapes where wildfire hazard is predicted to exist on forestland (FRCC), has been identified by local knowledge and quantitative data as posing a risk to communities (CWPP), and where the USFS – as the largest landowner in eastern Washington and the location of a disproportionate amount of at-risk conditions – plans to conduct forest management actions that can be leveraged toward broader outcomes. CWPP completed treatments offer both a proxy for past assignment of priority, and an indication of where previous work can be built-upon. CWPP planned treatments provide both an estimation of the amount of work necessary, and serve as a proxy for the location of wildland-urban interface lands. For the purposes of identifying focal landscapes, western Washington WRIAs were omitted although it is recognized that certain statewide wildfire preparedness and prevention functions will remain a priority.

c.) Analysis Process: For the 34 eastern Washington WRIAs only, establish a rating for each WRIA as in 1c. Sum the ratings across data layers to create a composite rating (highest possible score = 12, lowest = 4). Assign a natural break in the composite ratings: value > 8 (top 12) is "high" priority, value > 4 (middle 12) is "medium", value < 4 and western Washington WRIAs (bottom 38) is "low". Correction for percent of forestland creates ranking anomalies because some planned CWPP treatments are not on forestland, but still need to be accounted for. Also, in some WRIAs that contain an extraordinarily small amount of forestland, 100 percent of the area was at-risk and had planned treatments, artificially creating a high priority ranting. This operation was therefore not completed.