WHITE PAPER

USDA Forest Service Pacific Northwest Region Umatilla National Forest

WHITE PAPER F14-SO-WP-SILV-32

Review of "Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin, and Portions of the Klamath and Great Basins" – Forest Vegetation[1]

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INTRODUCTION

An objective of this review is to summarize key information and findings from an "Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin and Portions of the Klamath and Great Basins" (published as general technical report PNW-GTR-382 in September 1996). A particular emphasis of this review is to highlight any 'new' information (new in a context of previous assessment efforts such as Gast, Caraher, and Everett Reports).

This summary is somewhat general, which is in keeping with the Interior Columbia Basin (ICB) assessment itself – it is basically an integration of other products produced by Interior Columbia Basin Ecosystem Management Project's (ICBEMP) science integration team (SIT).

Many of the 'nuts and bolts' forming a basis for this assessment are provided in other associated documents – particularly a four-volume *Assessment of Ecosystem Components*[2] – along with numerous other general technical reports produced by ICBEMP and published by USDA Forest Service's Pacific Northwest and Intermountain Research Stations.

One example of an associated document is a general technical report, *Simulating coarse-scale vegetation dynamics using the Columbia River Basin succession model–CRBSUM*, which describes the modeling process used by ICBEMP to characterize broad-scale vegetation conditions across the basin.[3]

An ICB scientific assessment is the most recent in a long line of reports characterizing vegetation conditions for eastern Oregon and eastern Washington. A chronology for some of these efforts is described below:

- April 1991 – Publication of “Blue Mountains Forest Health Report: New Perspectives in Forest Health” (typically referred to as Gast Report). This report describes deteriorating forest health conditions for northeastern Oregon and southeastern Washington.[4]
- July 1992 – Release of a report called “Restoring Ecosystems in the Blue Mountains: A Report to the Regional Forester and the Forest Supervisors of the Blue Mountains” (typically referred to as Caraher Report). This document was prepared by a panel of resource scientists who assessed forest ecosystem health for every Blue Mountains river basin.[5]
- October 1992 – Release of a “Forest Health Restoration Project” strategy pertaining to North Fork John Day River basin. Based on the Caraher process, this document analyzed specific restoration opportunities for the NFJD basin.[6]
- January 1993 – Release of a “Blue Mountains Ecosystem Restoration Strategy” identifying a broad range of restoration needs (prescribed fire, thinning, revegetation and reforestation, timber harvest, road obliteration and reconstruction, stream rehabilitation) totaling $247,000,000 for Blue Mountain national forests, of which $191,000,000 was special funding (i.e., funding outside their normal budget).[7]
- April 1993 – Release of an “Eastside Forest Ecosystem Health Assessment” (typically referred to as Everett Report). Pacific Northwest Research Station published assessment findings as a series of general technical reports in 1994.[8]
- June 1993 – A report called “A First Approximation of Ecosystem Health, National Forest Lands, Pacific Northwest Region” was released; it described many forest health problems affecting eastside forests.[9]
- August 1993 – Release of an “Interim Approach for Sale Preparation, Eastside Forests” (typically referred to as Eastside Screens). This interim process established three screens pertaining to riparian habitat, late-old forest structure, and old-growth dependent wildlife habitat.[10] Note that the Eastside Screens were issued as Regional Forester’s Forest Plan Amendment 1 in May 1994 (revised as Plan Amendment 2 in June 1995).
- August 1994 – An Eastside Forests Scientific Society Panel released a report called “Interim Protection for Late-Successional Forests, Fisheries, and Watersheds.” This panel was chartered by Congress (U.S. House Speaker Tom Foley from Washington and U.S. Senator Mark Hatfield from Oregon) to “initiate a review and report on the eastside forests of Oregon and Washington.”[11]

- Late 1994 – Publication of "Assessing Forest Ecosystem Health in the Inland West," describing a scientific workshop sponsored by American Forests and other organizations. It includes an assessment of ecosystem health for much of the interior Pacific Northwest, including the Blue Mountains area.[12]

Although somewhat lengthy, this list is still not inclusive! For example, PACFISH, INFISH, a Taylor Forest Health Report, and many other broad-scale initiatives were not included here.

The main reason for providing this chronology of assessment efforts is to establish a context for an integrated ICB assessment – it did not materialize out of thin air, and it was not prepared in a vacuum. Much information utilized by the SIT to develop an ICB assessment was initially compiled during one or more of these previous efforts.

In some respects, an integrated ICB assessment could be viewed as not producing much in the way of 'new' information. If this is an accurate characterization (it certainly qualifies as my subjective opinion), an important reason for lack of new information is that the ICB assessment built upon previous efforts to such an extent that new findings would not have been expected.

Although I found little in the assessment that qualifies as dramatic 'gee whiz' findings, the ICB assessment does a good job of analyzing important ecological issues at a scale never used before in North America. In other words, an ICB assessment may not have identified findings that differed strongly from previous assessments, but it extrapolated them to a much larger geographical area.

This conclusion means that any new information results not necessarily from previously unknown findings, but from the unprecedented scope and context associated with an ICB scientific assessment.

RESULTS OF THE REVIEW

For most intents and purposes, Umatilla National Forest occurs in one ecological reporting unit (ERU) – the Blue Mountains (ERU #6). However, a small portion of Umatilla NF does occur in Columbia Plateau (ERU #5).

[Note: an ecological reporting unit is the largest geographical subdivision of the Interior Columbia Basin. There are 13 ERUs in an ICB assessment area. ERUs were intended to encompass both biophysical and social systems. They were delineated by using a mix of aquatic and terrestrial factors. An ERU is a conglomeration of 6^{th} code hydrologic units (HUCs; HUC6s are also called subwatersheds). Subwatersheds were not split during delineation of ERUs; each 6^{th} code HUC is entirely in, or out of, an ERU.]

Other results of an integrated assessment are reported for 4th code subbasins, and by forest or range clusters that are aggregates of subbasins with similar conditions.

Umatilla National Forest occurs in portions of 10 subbasins, as summarized below:

Subbasin (HUC4)	Forest Cluster	Range Cluster	Forest Integrity	Composite Integrity
Lower Grande Ronde #61	5	6	L	M
Lower John Day #63	None	1	None	L
Lower Snake – Asotin #72	3	4	L	M
Lower Snake – Tucannon #73	None	4	None	L
Middle Fork John Day #83	5	6	L	L
North Fork John Day #95	5	3	L	L
Umatilla #131	5	4	L	L
Upper Grande Ronde #139	5	3	L	L
Walla Walla #155	None	4	None	L
Willow #163	None	4	None	L

Forest cluster 3 findings (this cluster has limited occurrence for Umatilla NF):

- Moderate- and low-integrity forests have high departures from native fire frequency and intensity.
- Areas with late- or early-seral structural classes have declined significantly.
- Mid-seral structures have increased with a net result being a more homogenous forest condition.
- Some subwatersheds in this cluster have significant vulnerability to future degradation from large-scale wildfire of uncharacteristic intensity.

Forest cluster 5 findings (much of Umatilla NF occurs in this cluster):

- Dry forests have low integrity and many of them exhibit significant changes in fire frequency and intensity. A very high percentage of cluster 5 (80%) was classified as having low forest integrity.
- Late-seral structural classes increased significantly in montane forests, primarily as a result of plant succession in an absence of recurrent underburning – following alteration of a short-interval fire regime, shade-tolerant species such as grand fir and Douglas-fir invaded forests whose overstories were historically dominated by shade-intolerant species such as ponderosa pine and western larch.
- Mid-seral structures increased in lower montane and montane settings.
- Forests tend to be less productive than those associated with other clusters.

- Historical disturbance regimes imply a need for frequent silvicultural and prescribed fire treatments to maintain a healthy condition.
- Subbasins in this cluster show moderate opportunities for restoration of ecological integrity.

FOREST INTEGRITY RATINGS

Forest integrity ratings were based on factors such as these:

- Consistency of existing forest (tree) density levels with those produced by native disturbance regimes;
- Abundance and distribution of exotic species;
- Abundance of snags and coarse woody material;
- Disruptions of a native hydrologic regime;
- Absence or presence of wildfire and its effect on forest composition and structure;
- Changes in fire severity and frequency from historical times to the present.

Since many of these factors cannot be assessed directly, ratings for a factor were often based on proxies or surrogates. For example, road density was used as an indicator (proxy) for disruption of hydrologic systems.

An integrated ICB assessment states that ecosystems have high integrity "when their components have no substantive impairment in structure, composition, or function. In this sense, a living system exhibits integrity if, when subjected to disturbance, it maintains its capacity for self-organization" (see page 29 of ICB scientific assessment).

Both forest clusters encompassing the Umatilla NF were rated as having low integrity. This means that one or more ecosystem components (composition, structure, function) were considered to be impaired, or that ecosystems would not be resilient when exposed to significant disturbance processes.

Composite integrity is designed to integrate five individual integrity ratings (forestland, rangeland, forestland hydrologic, rangeland hydrologic, and aquatic systems), although a composite rating also reflects knowledge about actual ground conditions for a subbasin.

BASIN-WIDE TRENDS

Some basin-wide vegetation trends identified in an integrated ICB assessment include the following items:

- Native herblands, shrublands, and old forest (both multi-layered and single-layered) declined significantly in area and connectivity after the interior Columbia River basin was settled by Euro-American emigrants.
- Exotic plants expanded throughout native forests and rangelands since Euro-American settlement, but most especially in areas that were once dry native herblands and shrublands.
- Area and connectivity of early-seral forest structures declined substantially, particularly in areas where historical fire regimes were of mixed or lethal severity.
- Intermediate-aged forest (commonly referred to as mid-seral structures or the ‘mid-age blob’) increased dramatically both in area and connectivity.
- In areas experiencing significant influence from fire suppression, selective cutting, or grazing, forests often expanded (invaded) onto sites previously supporting native woodlands, shrublands, or herblands.
- Forest canopies generally became more complex and layered, especially as a result of plant succession in the absence of native fire regimes.
- Forests became more densely stocked, with much of the increased stocking contributed by shade-tolerant species such as true firs (grand fir, white fir) and Douglas-fir.
- Forests became more susceptible to high-intensity fire and severe insect and disease outbreaks.
- Forest composition and structure became more homogeneous. This trend was discussed in several portions of the ICB assessment. Both late-seral and early-seral structures declined due to a variety of reasons, with one result being an increase of mid-seral structure (i.e., structures at both ends of a structural spectrum declined; mid-spectrum structure increased).
- Early-seral forests dominated by shade-intolerant species became more fragmented, although late-seral forests of shade-tolerant species became more continuous (less fragmented). An end result in many montane areas was a more homogeneous landscape than would have existed historically; this finding showed that one effect of fire suppression was to ‘de-fragment’ the landscape.
- Stand-initiating (lethal) fires increased substantially, with corresponding declines in stand-maintaining (non-lethal) fires. Altered fire regimes were a major reason for a landscape homogenization trend described above.
- People support a goal of healthy forests and rangelands but are skeptical about the effectiveness and sincerity of ecosystem management as a way to reach this goal.
- There is an apparent relationship between economic and social activity, and ecological integrity. Areas with high ecological integrity tend to support high levels of economic activity.

- There are several portions of an ICB assessment area where human pressures may threaten continued existence of high ecological integrity.
- Wildland-urban interface issues will be most acute where high economic activity and resiliency coincide with moderate to high ecological integrity.
- Areas with high ecological integrity often occur in large continuous aggregations where human population density is low, and it is projected to stay that way.

TERRESTRIAL TRENDS

Some basin-wide terrestrial trends identified in the integrated assessment include:

- Large residual trees and snags declined by 20%.
- Old forest structures decreased by 27% to 60%.
- Landscape patterns changed on 97% of landscapes, basin-wide.
- Fewer species extirpations are likely under a restoration approach to management than a reserve approach.
- Species likely to decline are associated with landscape and habitat components that are declining, especially old-forest structure and native shrublands and grasslands.
- Core pieces remain for rebuilding and maintaining high-quality terrestrial species habitat.

ALTERNATIVE MANAGEMENT SCENARIOS

An integrated ICB assessment includes a lengthy section analyzing effects of alternative management scenarios on future ecological integrity for the interior Columbia River basin. Some findings from this section include:

- A restoration option should emphasize ecosystem analysis and public involvement specifically reflecting native disturbance regimes (ecosystem functions), along with a range of ecosystem components (structure, pattern, composition) relying upon disturbance processes.
- Future management strategies adopting a landscape approach, while also emphasizing ecosystem process and function, will be more effective at improving ecological integrity than strategies emphasizing stand-level treatments and commodity production.
- Management actions designed to restore and maintain forest health would need to consider how proposed practices and treatments are matched to the land's capability, as assessed by using a biophysical template such as potential vegetation.

APPENDIX: SILVICULTURE WHITE PAPERS

White papers are internal reports, and they are produced with a consistent formatting and numbering scheme – all papers dealing with Silviculture, for example, are placed in a silviculture series (Silv) and numbered sequentially. Generally, white papers receive only limited review and, in some instances pertaining to highly technical or narrowly focused topics, the papers may receive no technical peer review at all. For papers that receive no review, the viewpoints and perspectives expressed in the paper are those of the author only, and do not necessarily represent agency positions of the Umatilla National Forest or the USDA Forest Service.

Large or important papers, such as two papers discussing active management considerations for dry and moist forests (white papers Silv-4 and Silv-7, respectively), receive extensive review comparable to what would occur for a research station general technical report (but they don't receive blind peer review, a process often used for journal articles).

White papers are designed to address a variety of objectives:

(1) They guide how a methodology, model, or procedure is used by practitioners on the Umatilla National Forest (to ensure consistency from one unit, or project, to another).
(2) Papers are often prepared to address ongoing and recurring needs; some papers have existed for more than 20 years and still receive high use, indicating that the need (or issue) has long standing – an example is white paper #1 describing the Forest's big-tree program, which has operated continuously for 25 years.
(3) Papers are sometimes prepared to address emerging or controversial issues, such as management of moist forests, elk thermal cover, or aspen forest in the Blue Mountains. These papers help establish a foundation of relevant literature, concepts, and principles that continuously evolve as an issue matures, and hence they may experience many iterations through time. [But also note that some papers have not changed since their initial development, in which case they reflect historical concepts or procedures.]
(4) Papers synthesize science viewed as particularly relevant to geographical and management contexts for the Umatilla National Forest. This is considered to be the Forest's self-selected 'best available science' (BAS), realizing that non-agency commenters would generally have a different conception of what constitutes BAS – like beauty, BAS is in the eye of the beholder.
(5) The objective of some papers is to locate and summarize the science germane to a particular topic or issue, including obscure sources such as master's theses or Ph.D. dissertations. In other instances, a paper may be designed to wade through an overwhelming amount of published science (dry-forest management), and then synthesize sources viewed as being most relevant to a local context.
(6) White papers function as a citable literature source for methodologies, models, and procedures used during environmental analysis – by citing a white paper, specialist reports can include less verbiage describing analytical databases, techniques, and so forth, some of which change little (if at all) from one planning effort to another.
(7) White papers are often used to describe how a map, database, or other product was developed. In this situation, the white paper functions as a 'user's guide' for the new product. Examples include papers dealing with historical products: (a) historical fire extents for the Tucannon watershed (WP Silv-21); (b) an 1880s map developed from General Land Office

survey notes (WP Silv-41); and (c) a description of historical mapping sources (24 separate items) available from the Forest's history website (WP Silv-23).

The following papers are available from the Forest's website: Silviculture White Papers

Paper #	**Title**
1	Big tree program
2	Description of composite vegetation database
3	Range of variation recommendations for dry, moist, and cold forests
4	Active management of Blue Mountains dry forests: Silvicultural considerations
5	Site productivity estimates for upland forest plant associations of Blue and Ochoco Mountains
6	Blue Mountains fire regimes
7	Active management of Blue Mountains moist forests: Silvicultural considerations
8	Keys for identifying forest series and plant associations of Blue and Ochoco Mountains
9	Is elk thermal cover ecologically sustainable?
10	A stage is a stage is a stage…or is it? Successional stages, structural stages, seral stages
11	Blue Mountains vegetation chronology
12	Calculated values of basal area and board-foot timber volume for existing (known) values of canopy cover
13	Created opening, minimum stocking level, and reforestation standards from Umatilla National Forest land and resource management plan
14	Description of EVG-PI database
15	Determining green-tree replacements for snags: A process paper
16	Douglas-fir tussock moth: A briefing paper
17	Fact sheet: Forest Service trust funds
18	Fire regime condition class queries
19	Forest health notes for an Interior Columbia Basin Ecosystem Management Project field trip on July 30, 1998 (handout)
20	Height-diameter equations for tree species of Blue and Wallowa Mountains
21	Historical fires in headwaters portion of Tucannon River watershed
22	Range of variation recommendations for insect and disease susceptibility
23	Historical vegetation mapping
24	How to measure a big tree
25	Important Blue Mountains insects and diseases
26	Is this stand overstocked? An environmental education activity
27	Mechanized timber harvest: Some ecosystem management considerations
28	Common plants of south-central Blue Mountains (Malheur National Forest)
29	Potential natural vegetation of Umatilla National Forest
30	Potential vegetation mapping chronology
31	Probability of tree mortality as related to fire-caused crown scorch

Paper #	Title
32	Review of "Integrated scientific assessment for ecosystem management in the interior Columbia basin, and portions of the Klamath and Great basins" – Forest vegetation
33	Silviculture facts
34	Silvicultural activities: Description and terminology
35	Site potential tree height estimates for Pomeroy and Walla Walla Ranger Districts
36	Stand density protocol for mid-scale assessments
37	Stand density thresholds as related to crown-fire susceptibility
38	Umatilla National Forest Land and Resource Management Plan: Forestry direction
39	Updates of maximum stand density index and site index for Blue Mountains variant of Forest Vegetation Simulator
40	Competing vegetation analysis for southern portion of Tower Fire area
41	Using General Land Office survey notes to characterize historical vegetation conditions for Umatilla National Forest
42	Life history traits for common Blue Mountains conifer trees
43	Timber volume reductions associated with green-tree snag replacements
44	Density management field exercise
45	Climate change and carbon sequestration: Vegetation management considerations
46	Knutson-Vandenberg (K-V) program
47	Active management of quaking aspen plant communities in northern Blue Mountains: Regeneration ecology and silvicultural considerations
48	Tower Fire…then and now. Using camera points to monitor postfire recovery
49	How to prepare a silvicultural prescription for uneven-aged management
50	Stand density conditions for Umatilla National Forest: A range of variation analysis
51	Restoration opportunities for upland forest environments of Umatilla National Forest
52	New perspectives in riparian management: Why might we want to consider active management for certain portions of riparian habitat conservation areas?
53	Eastside Screens chronology
54	Using mathematics in forestry: An environmental education activity
55	Silviculture certification: Tips, tools, and trip-ups
56	Vegetation polygon mapping and classification standards: Malheur, Umatilla, and Wallowa-Whitman National Forests
57	State of vegetation databases for Malheur, Umatilla, and Wallowa-Whitman National Forests
58	Seral status for tree species of Blue and Ochoco Mountains

REVISION HISTORY

February 2012: First version of this white paper was prepared as science documents began to be released by an Interior Columbia Basin Ecosystem Management Project, headquartered in Walla Walla, WA.

February 2012 revision was to make formatting and editing changes, and to implement a new silviculture white-paper format, including adding a list of available white papers.

END NOTES

[1] This review focuses on forest vegetation sections in the following report: **Quigley, T.M.; Haynes, R.W.; Graham, R.T., tech. eds. 1996.** Integrated scientific assessment for ecosystem management in the interior Columbia basin and portions of the Klamath and Great basins. Gen. Tech. Rep. PNW-GTR-382. Portland, OR: USDA Forest Service, Pacific Northwest Research Station. 303 p. http://www.treesearch.fs.fed.us/pubs/25384

[2] See: **Quigley, T.M.; Arbelbide, S.J., tech. eds. 1997.** An assessment of ecosystem components in the interior Columbia basin and portions of the Klamath and Great Basins. Gen. Tech. Rep. PNW-GTR-405. Portland, OR: USDA Forest Service, Pacific Northwest Research Station. 4 volumes. 2,066 p. http://www.treesearch.fs.fed.us/pubs/24921

[3] See: **Keane, R.E.; Long, D.G.; Menakis, J.P.; Hann, W.J.; Bevins, C.D. 1996.** Simulating coarse-scale vegetation dynamics using the Columbia River basin succession model – CRBSUM. Gen. Tech. Rep. INT-GTR-340. Ogden, UT: USDA Forest Service, Intermountain Research Station. 50 p. https://archive.org/download/CAT10818722/CAT10818722.pdf

[4] See: **Gast, W.R., Jr.; Scott, D.W.; Schmitt, C.; Clemens, D.; Howes, S.; Johnson, C.G., Jr.; Mason, R.; Mohr, F.; Clapp, R.A. 1991.** Blue Mountains forest health report: "new perspectives in forest health." Portland, OR: USDA Forest Service, Pacific Northwest Region, Malheur, Umatilla, and Wallowa-Whitman National Forests. 300 p. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev7_015666.pdf

[5] See: **Caraher, D.L.; Henshaw, J.; Hall, F.; Knapp, W.H.; McCammon, B.P.; Nesbitt, J.; Pedersen, R.J.; Regenovitch, I.; Tietz, C. 1992.** Restoring ecosystems in the Blue Mountains: a report to the Regional Forester and the Forest Supervisors of the Blue Mountain forests. Portland, OR: USDA Forest Service, Pacific Northwest Region. 14 p (and 5 appendices). http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev7_015660.pdf

[6] See: **USDA Forest Service. 1992.** Summary report: forest health restoration project. Pendleton, OR: USDA Forest Service, Umatilla National Forest, Restoration Team 92. 26 p (and 6 appendices).

[7] See: **Schmidt, T.; Boche, M.; Blackwood, J.; Richmond, B. 1993.** Blue Mountains ecosystem restoration strategy: a report to the Regional Forester. Unnumbered Report. Portland, OR: USDA Forest Service, Pacific Northwest Region. 12 p (plus appendices).

[8] See: 'Everett Report' general technical reports published by Pacific Northwest Research Station (PNW-GTR-317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, and 331 (1994) and PNW-GTR-355 (1995).

Note: Complete citations, including weblinks utilizing the Forest Service's Treesearch system, are provided for all Everett Report documents in white paper F14-SO-WP-Silv-11: "Blue Mountains vegetation chronology."

[9] See: **USDA Forest Service. 1993.** A first approximation of ecosystem health: national forest system lands. Portland, OR: USDA Forest Service, Pacific Northwest Region. 109 p.

[10] See: **USDA Forest Service. 1995.** Interim management direction establishing riparian, ecosystem and wildlife standards for timber sales (revised); Regional Forester's Forest Plan amendment #2. Portland, OR: USDA Forest Service, Pacific Northwest Region. 14 p. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5211858.pdf

[11] See: **Henjum, M.G.; Karr, J.R.; L., B.D.; Perry, D.A.; Bednarz, J.C.; Wright, S.G.; Beckwitt, S.A.; Beckwitt, E. 1994.** Interim protection for late-successional forests, fisheries, and watersheds; national forests east of the Cascade crest, Oregon, and Washington. Wildlife Society Technical Review 94-2. Bethesda, MD: Wildlife Society. 245 p.

[12] See: Sampson, R.N.; Adams, D.L., eds. 1994. Assessing forest ecosystem health in the inland west. New York: Food Products Press. 461 p. isbn:1-56022-052-X