ECOLOGICAL IMPORTANCE OF BUREAU OF LAND MANAGEMENT O&C AND COOS BAY WAGON ROAD HOLDINGS IN WESTERN OREGON WITH SPECIAL ATTENTION TO SURFACE WATER SOURCE AREAS



Photos: D. DellaSala Corbis K. Crocker

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EXECUTIVE SUMMARY

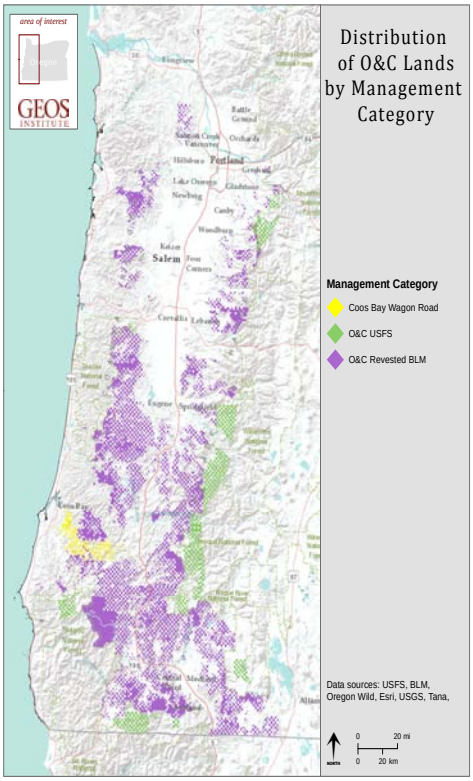
Bureau of Land Management (BLM) O&C and Coos Bay Wagon Road (CBWR) holdings in western Oregon provide irreplaceable ecosystem benefits to people and wildlife, particularly those lands with Surface Water Source Areas (SWSAs) that supply downstream users with drinking water. This subset of BLM lands, totaling 1.2 million acres of the 2.1 million acres of BLM O&C and CBWR lands, includes 79 Surface Water Source Areas (SWSA) that provide clean drinking water for 1.5 million people from Medford to Portland, high-quality water for salmon, old forest habitat for threatened wildlife, and are important for preparing communities and wildlife for the inevitable consequences of climate change. Co-benefits present in BLM areas with SWSAs that are at risk to logging include: (1) watersheds with up to five species of salmon, including federally listed coho (*Oncorhynchus kisutch)*; (2) watersheds with high water quality and

low Total Maximum Daily Loads essential to salmon and people; (3) over 260,000 acres of old forest (80-150 years), much of which serves as critical habitat for threatened species; (4) 434,635 acres of older forests (less than 150 years) that store the carbon dioxide equivalent of 38 times the state's annual greenhouse gas pollution; and (5) important areas projected to have relatively stable climatic conditions by the end of the century needed to support the current vegetation. Increased logging in these watersheds would pollute drinking water supplies with sediment, degrade salmon habitat by clearcutting older forests and releasing stored carbon as carbon dioxide pollution, possibly jeopardize federally listed species, and would move BLM even further away from a comprehensive climate change approach needed on federal lands. In terms of watershed benefits, these BLM lands are worth more than the timber sought by O&C counties as they contain irreplaceable ecosystem benefits most often degraded by industrial-scale logging on nonfederal lands and increasingly important in a climate changing world.

Key Words: Bureau of Land Management, carbon storage, O&C and Coos Bay Wagon Road lands, older forests, salmon, water quality

BLM MANAGEMENT AUTHORITIES

In western Oregon, BLM (photo: K. Crocker) administers the use of a variety of natural resources on ~ 2.6 million acres; ~2.1 million acres of which encompass the O&C and CBWR lands while the remainder are BLM public domain lands. Resource management plans (RMPs) define the management direction for specified areas of BLM-administered lands (typically for individual BLM districts or BLM resource areas) and are designed to continue a defined management direction for a specified period of time. Periodically, RMPs are formally evaluated to determine whether there is significant cause for amending or revising them. All BLM lands in western Oregon (Public Domain, O&C, CBWR and other special lands) are managed under the standards and guidelines of the Northwest Forest Plan (NWFP). In 1995, the BLM districts in Western Oregon completed RMPs that incorporated NWFP land allocations and standards and guidelines as part of a coordinated ecosystem management approach on federal lands that was necessary to



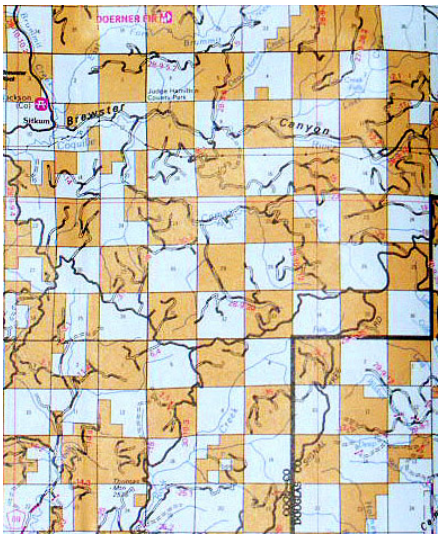
maintain the viability of hundreds of old-forest dependent species. The NWFP has since been hailed by scientists as a global model of ecosystem management and biodiversity conservation (DellaSala and Williams 2006); recent scientific reviews have reaffirmed that it continues to be based on the best available science (Special Feature in Conservation Biology 2006, Courtney et al. 2006, Lint et al. 2006, Krankina et al. 2012).

For the ~ 2.1 million acres of the O&C and CBWR lands (photo: K. Schaffer), the primary administration direction is derived from the statutory authority of the Oregon and California Railroad and Coos Bay Wagon Road Grant Lands Act (O&C Act 1937) [1]. These lands are also managed under the Clean Water Act (1972), Endangered Species Act (1973), National Environmental Policy Act (1970), Federal Lands Policy and Management Act (1976), and other federal statues (all as amended). The remaining BLM-administered lands within the western Oregon planning area are public domain lands; other statutory authorities direct administration of those lands.

[1] "for permanent forest production, and the timber thereon shall be sold, cut, and removed in conformity with the principal of sustained yield for the purpose of providing a permanent source of timber supply, **protecting watersheds, regulating stream flow**, and contributing to the economic stability of local communities and industries, and providing recreational facilities" (emphasis added).

BLM O&C AND CBWR LANDS ARE VITAL COGS IN THE NORTHWEST FOREST PLAN (REGIONAL CONTEXT)

All 2.1 million acres of BLM O&C and CBWR holdings (photo: KS Wild) in western Oregon provide important ecosystem benefits that are in short supply on state and private lands, including outdoor recreation and quality of life amenities for local residents[2]; clean water; air purification; critical habitat for federally threatened coho, marbled murrelet (*Brachyramphus marmoratus)*, and northern spotted owl (*Strix occidentalis caurina*); and old forests for hundreds of plants and wildlife (DellaSala et al. 2005, Staus et al. 2010, TNC and Wild Salmon Center 2012).



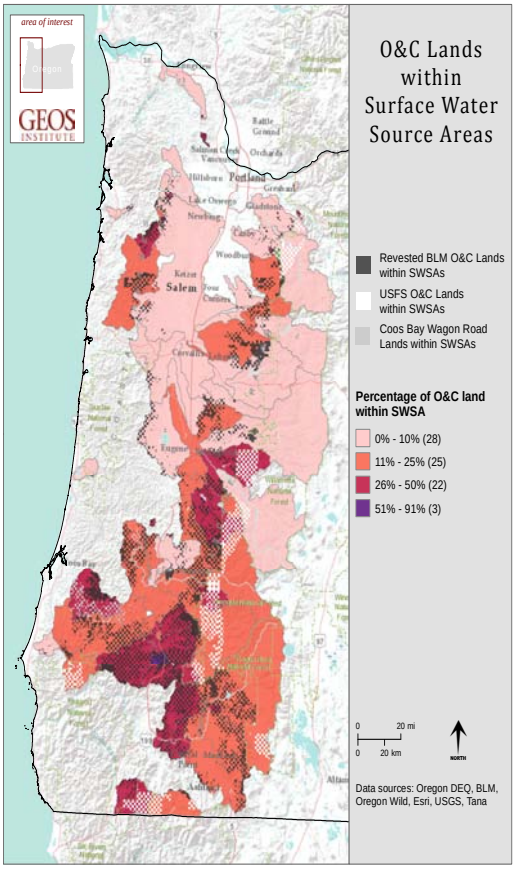
In particular, the "checkerboard" (figure courtesy of Cascadia Wildlands) ownerships in southwest Oregon make BLM lands even more of vital cog in the NWFP, given industrial-scale logging takes place on private lands in the checkerboard and National Forests are lacking in this region. Further, Habitat Conservation Plans (HCPs) on nonfederal lands allow landowners to "take" (remove) habitat or individuals of a threatened species under the assumption that federal lands will provide the majority of recovery needs for a listed species. Thus, all BLM lands in western Oregon are vital to

[2] http://kswild.org/blmheritageforests

the legal and scientific credibility of HCP on nonfederal lands.

This report builds on prior assessments of BLM lands in western Oregon (DellaSala et al. 2005, Staus et al. 2010, TNC and Wild Salmon Center 2012) by emphasizing ecosystem benefits accruing from clean drinking water, wild salmon, old forests, and climate change assurances on a subset of BLM O&C and CBWR holdings that overlap with SWSAs – watersheds that supply downstream users with clean drinking water. We focused on this subset of BLM lands at risk to logging given prior assessments already identified ecological values on the full suite of BLM lands in western Oregon and that by protecting clean water supplies there are co-benefits to communities that we wanted to emphasize for decision makers. In sum, these particular BLM lands are worth more to communities than the timber sought in logging proposals as they contain irreplaceable ecosystem benefits most often degraded by industrial-scale logging on nonfederal lands and increasingly important in a climate changing world.

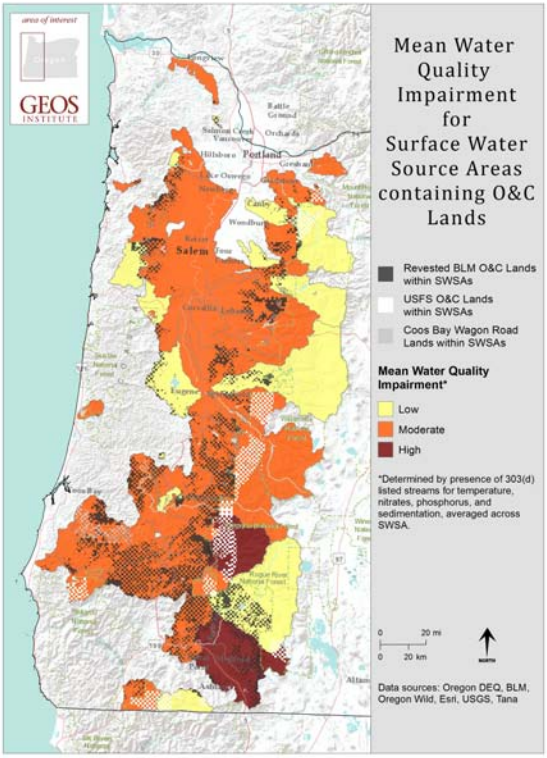
ECOLOGICAL VALUES OF BLM O&C AND CBWR LANDS HAVING SURFACE WATER SOURCE AREAS



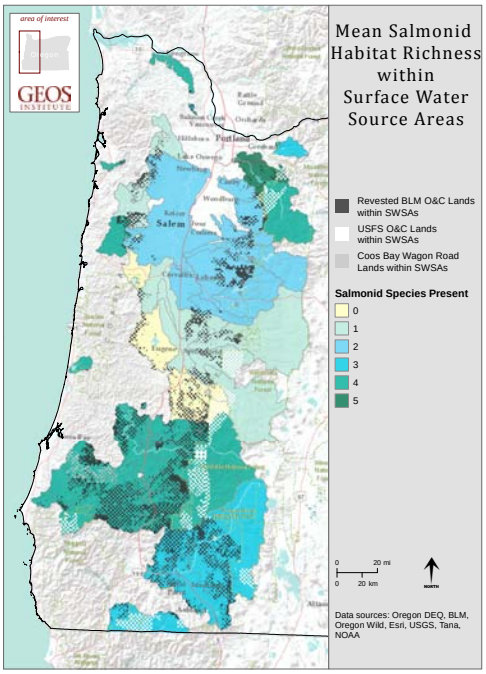
Clean Drinking Water (photo: K. Crocker) – Oregon's SWSAs were mapped using Oregon Department of Water Quality datasets (Appendix) and overlayed onto BLM O&C and CBWR holdings. This subset of BLM lands included 79 SWSAs that supply clean drinking water to over 1.5 million people from Medford to Portland (Appendix). Some notable rural examples of Public Water Systems having significant O&C lands include the City of Cave Junction servicing 1,380 people (8% overlap of SWSAs with O&C lands); City of Riddle servicing 1,225 people (41%); City of Canyonville servicing 1,265 people (54%); City of Grants Pass servicing 24,000 people (37%); as well as larger metropolitan areas like the Medford Water Commission servicing 131,000 people (19%). Increased logging in these watersheds could add to higher water treatment costs for municipalities to remove sediments. Notably, in 1996, the City of Salem spent ~$100

million on new treatment facilities after logging in upper watersheds created conditions leading to mass sedimentation following storms (DellaSala et al. 2011).

Water Quality (photo: K. Crocker) - The Clean Water Act requires individual states to compile lists of water bodies that do not fully support fisheries, drinking water, recreation, industry, and agriculture, and to restore these waters to be "fishable and swimmable." These inventories are known as 303(d) lists and characterize waters as fully supporting, impaired, or in some cases threatened for such beneficial uses. Total Maximum Daily Load (TMDL) of individual waterways is used to describe the maximum amount of a pollutant (like sediment) that a body of water can receive while still meeting State water quality standards. Water quality limited streams (dark red areas) in this inventory therefore represent a specific stream reach (or segment) that does not meet water-quality standards for temperature, sediment, nitrates and/or phosphorus. Every two years, the Department of Environmental Quality

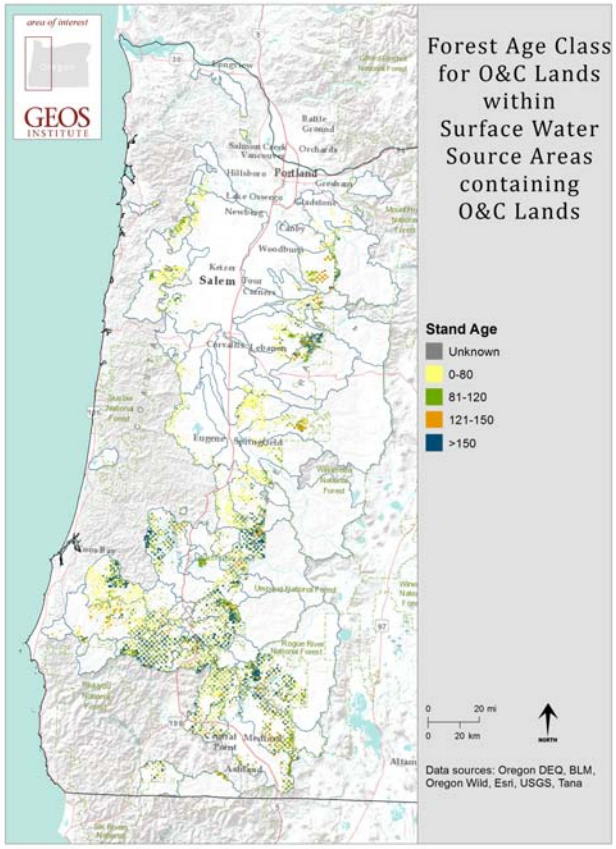


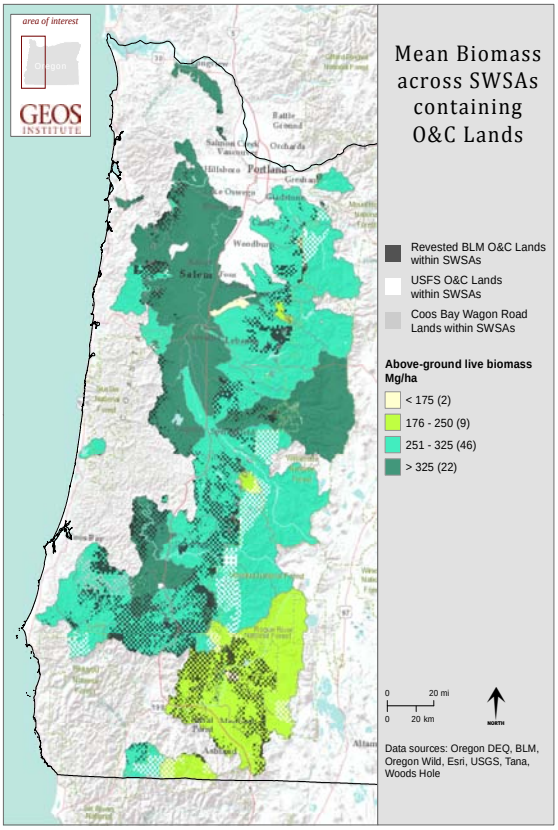
(DEQ) produces a report on the condition of Oregon's waters. Using DEQ datasets, water quality on BLM O&C and CBWR holdings with SWSAs varied from low to high. Low quality (dark red) areas require specific measures to reduce TMDLs, such as closing roads and restoring streams-side vegetation. High quality (yellow) SWSAs would benefit from protecting the surrounding watershed from logging and road building. More logging would increase TMDLs in these watersheds.



Salmon - all BLM lands in western Oregon play a vital role in efforts to conserve imperiled salmon. For instance, there are 6,297 miles of spawning and rearing salmon habitat on BLM lands in western Oregon (all lands). About 12% of these salmon-bearing streams are located on BLM O&C and CBWR lands with SWSAs that support up to five species of salmon. This subset of lands nearest the coast and in southwest Oregon generally supported greater numbers of salmon species (dark green areas). Thus, protecting these watersheds for water quality would provide co-benefits to people and salmon.

Old Forests (*photo: D. DellaSala* – these forests are in short supply throughout the Pacific Northwest due to historic logging on public lands and ongoing logging on nonfederal lands (Strittholt et al. 2006). Based on the BLM Oregon Forest Cover Operations Inventory, BLM O&C and CBWR lands with SWSAs include 158,732 acres of 80-120 year forests (green areas), 103,273 acres of 120-150 year forests (orange areas), and 261,647 acres of old growth (older than150 years and not currently at risk, blue areas). In particular, mature forests (80-150 years totaling some 262,007 acres) are at risk from logging proposals and thus the deficit of old growth on public lands would grow overtime by not allowing mature forest to become future old growth. Many of these forests are critical habitat for the federally threatened marbled murrelet and northern spotted owl (DellaSala et al. 2005, Staus et al. 2010).





Climate Change Mitigation (photo F. Eatherington)– old forests of the Pacific Northwest, especially coastal areas in Oregon, are among the most carbon dense ecosystems on the planet (Smithwick et al. 2002). Notably, BLM O&C and CBWR with SWSAs contain 434,640 acres of old forests (less than 150 years) with high biomass values. High-biomass forests average 500 tons of live above ground carbon per acre stored (Krankina et al. in review) mostly in large trees, dense foliage, and productive soils. These forests are storing the carbon dioxide equivalent of ~ 38 times the state's annual greenhouse gas emissions[3]. Logging them would release most of this stored carbon as a greenhouse gas pollutant through rapid decomposition of logging slash left behind after logging operations and soil oxidation. Planting trees or storing carbon in wood products will not make up for the carbon released to the atmosphere when logging in high-biomass forests (Harmon et al. 1990,

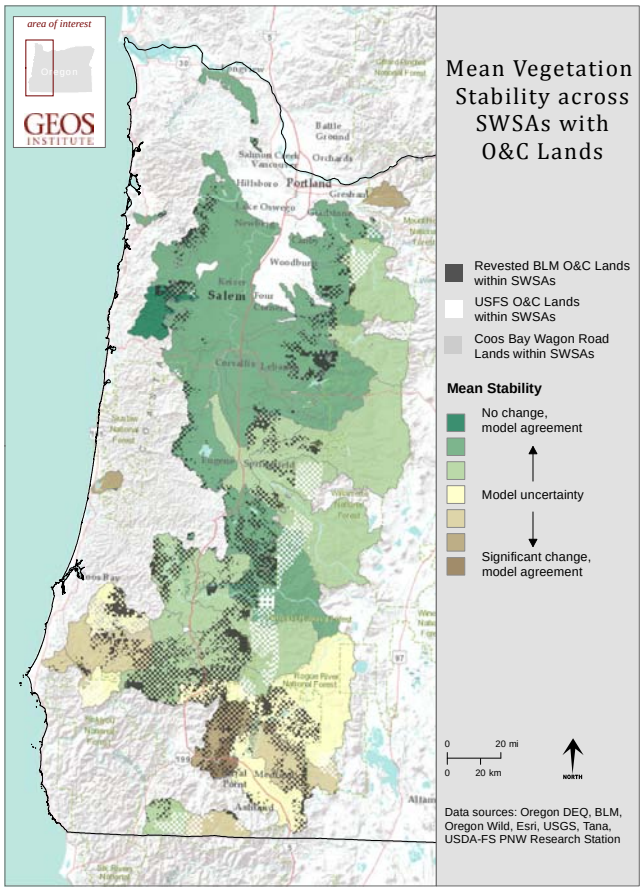
[3] 434,640 acres high-biomass forests x 500 tons per acre (on average) x 3.67 conversion to CO2 equivalents x 0.9 conversion to metric tons. This was then compared to the state's annual emissions as reported by the Department of Environmental Quality in 2010 (1.9 x 10 7 metric tons of CO2 e).

Harmon 2004). Notably, the Government Accounting Office recently concluded "The Bureau of Land Management has not established a strategic direction for addressing climate change impacts but is planning to develop a high-level climate change adaptation strategy by the end of the summer 2013[4]." In sum, protecting high-biomass forests on O&C and CBWR lands with SWSAs would go a long way in producing a scientifically credible climate mitigation strategy with co-benefits to people (clean air), fish (water quality), and climate change mitigation (carbon storage). President Obama also recently called on the nation to do more to get ready now for climate change, including "manage our public lands and natural systems to store more carbon."

Climate Change Adaptation (photo: B. Barr) – BLM O&C and CBWR lands with SWSAs contain areas where vegetation is likely to remain stable under a changing climate through the end of the century. Summertime temperatures in the Rogue Valley of Oregon, for example, are projected to increase 8-15° F by the end of the century (Doppelt et al. 2008) and this will impact people (especially the elderly and poor) and natural ecosystems that rely on these lands for salmon, clean water, and quality of life. Regional changes in precipitation will likely include more winter rainfall but less snow in the mountains. Such changes will affect the distribution of plants and wildlife (especially salmon) as they move to more suitable climates, or, in many cases they may not be able to and likely will be extirpated. For instance, based on

[4] http://www.gao.gov/products/GAO-13-253

regional climate projections, scientists predict that up to 10% of all wildlife species in the greater Klamath-Siskiyou ecoregion are at risk of extirpation by the end of the century due to the combination of logging and climate change (Olson et al. 2012). Researchers have identified old forests, particularly those on north-facing slopes, as key to offsetting at least some of these projected extinctions.



Many BLM O&C and CBWR lands with SWSAs provide stable microclimatic conditions (dark green areas) for existing vegetation to persist in a changing climate. Climatically unstable areas (brown areas) are likely to favor the establishment of subtropical vegetation and more hardwoods over conifers with significant ecological and economic costs to future generations. More logging will only fragment areas making it difficult for climate-forced wildlife and plants to migrate to areas of relatively stable climate.

CONCLUSIONS

All BLM lands in western Oregon provide irreplaceable ecosystem benefits in short supply on nonfederal lands where logging is the dominant use. However, at risk O&C and CBWR lands with SWSAs were called out in this report to highlight their unique values. As decision makers consider proposals to log in these watersheds, it is important to evaluate co-benefits of these at-risk BLM lands because they provide clean water to 1.5 million Oregonians, recreation, fisheries, wildlife habitat, old forests, and opportunities to prepare for climate change that are otherwise greatly diminished in logged-over landscapes.

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Appendix
(prepared by Jessica Leonard, Spatial Analysis Program, Geos Institute)

O&C LANDS GIS

LAYERS

- O&C Lands extracted 'OC' land category from WOPR BLM Ownership Polygon, layer last updated June 14, 2011, downloaded via http://www.blm.gov/or/plans/wopr/data/final/data-details.php?data=ds000133 on May 2, 2013
- Surface Water Source Areas: Surface Water Drinking Water Source Areas, layer last updated November 28, 2012, downloaded via http://www.deq.state.or.us/wq/dwp/results.htm on March 13, 2013, for more information and summary PWS sheets: http://www.deq.state.or.us/wq/dwp/swrpts.asp
- Salmon Richness: ESU- NOAA Fisheries Northwest Regional Office, updated January 2013, downloaded via http://www.nwr.noaa.gov/maps_data/species_population_boundaries.html on March 18, 2013
- Above-ground Live Biomass: Woods Hole Research Center. 2011. National Biomass and Carbon Dataset for the Year 2000. Disturbance removed using LANDFIRE to update layer to 2009.
- Stand Age: BLM OR Forest Cover Operations Inventory. IR field to group by age class. Downloaded via http://www.blm.gov/or/gis/data-details.php?data=ds000045 on June 10, 2013.
- Oregon 303(d) listed streams from Oregon's 2010 Integrated Report and 303(d) list as approved and effective March 2012, downloaded via http://www.deq.state.or.us/wq/assessment/AssessGIS.htm#gis10 on December 19, 2012
- Trout Unlimited Conservation Success Index priority basins, obtained from Kurt Kesenmyer (KFesenmyer@tu.org) on March 20, 2013 via TU ftp server
- National Land Cover Dataset 2001, downloaded via www.databasin.org on June 27, 2011. Preferred NLCD2001 citation: Homer, C., Dewitz, J., Fry, J., Coan, M., Hossain, N., Larson, C., Herold, N., McKerrow, A., VanDriel, J.N., and Wickham, J. 2007. Completion of the 2001 National Land Cover Database for the Conterminous United States.*Photogrammetric Engineering and Remote Sensing*, Vol. 73, No. 4, pp 337-341.

METHODOLOGY AND RESULTS

In Oregon, 79 of 156 Surface Water Source Areas (SWSAs) contain >1 acre of O&C Revested Lands. These 79 SWSAs serve drinking water to a population of approximately 1.5 million users. There are 20 SWSAs that contain more than 25% of O&C lands.

Public Water System Name	Population Served	Percent of SWSA containing O&C Land (BLM & CBWR)
BUELL-RED PRAIRIE WATER ASSN	980	90.62%
CANYONVILLE, CITY OF	1,265	54.00%
CARLTON, CITY OF	1,570	51.52%
MILO ACADEMY	195	43.61%
RIDDLE, CITY OF	1,225	40.70%
SCAPPOOSE, CITY OF	3,500	39.91%
MYRTLE POINT, CITY OF	2,715	39.19%

ANGLERS COVE/SCHWC	-	39.05%
GRANTS PASS, CITY OF	24,000	36.49%
CLARKS BRANCH WTR. ASSOCIATION	140	36.02%
DRAIN, CITY OF	1,145	34.05%
LAWSON ACRES WATER ASSOCIATION	75	33.64%
TRI-CITY WATRI-CITY JW & SA	3,500	32.72%
YAMHILL, CITY OF	1,500	31.74%
GLENDALE, CITY OF	860	30.62%
YONCALLA, CITY OF	1,095	29.45%
LONDON WATER CO-OP	50	29.12%
WILLAMINA, CITY OF	1,760	28.52%
COLTON WATER DISTRICT	1,200	28.03%
ROGUE RIVER, CITY OF	2,000	26.73%
CRESWELL, CITY OF	3,380	20.64%
COQUILLE, CITY OF	4,300	19.48%
WINSTON-DILLARD WATER DISTRICT	5,500	19.35%
MOLALLA, CITY OF	3,100	19.17%
ELKTON, CITY OF	170	19.17%
MEDFORD WATER COMMISSION	131,000	19.10%
ROSEBURG, CITY OF - WINCHESTER	30,000	18.52%
COTTAGE GROVE, CITY OF	8,500	18.45%
LYONS MEHAMA WATER DISTRICT	1,670	17.12%
FALLS CITY WATER DEPARTMENT	1,045	16.95%
DALLAS, CITY OF	12,900	16.03%
GLIDE WATER ASSOCIATION	900	13.72%
SANDY, CITY OF	5,030	13.09%
ALBANY, CITY OF	39,000	12.93%
ROSEBURG FOREST PROD-DILLARD	2,000	12.62%
COUNTRY VIEW MH ESTATES	120	11.93%
MCMINNVILLE WATER AND LIGHT	21,000	11.49%
MYRTLE CREEK, CITY OF	3,420	11.49%
POPE & TALBOT, INC.,	800	11.15%
SHERIDAN, CITY OF	5,200	10.94%
SILETZ, CITY OF	1,100	10.25%
SPRINGFIELD UTILITY BOARD	-	10.15%
GOLD HILL, CITY OF	1,110	9.84%
SUTHERLIN, CITY OF	6,360	9.53%
CORBETT WATER DISTRICT	2,910	9.48%
BEAVER WATER DISTRICT	500	8.45%
SWEET HOME, CITY OF	7,235	8.20%
MONROE, CITY OF	-	8.02%
CITY OF CAVE JUNCTION	1,380	7.81%
OAKLAND, CITY OF	954	7.68%
MILL CITY WATER DEPARTMENT	1,800	7.18%

HILLSBORO-CHERRY GROVE	250	5.86%
LEBANON, CITY OF	11,000	5.70%
SALEM PUBLIC WORKS	170,000	5.36%
BROWNSVILLE, CITY OF	-	4.83%
CLACKAMAS RIVER WATER-CLACKAMAS	30,000	4.79%
USFS WOLF CREEK JOB CORPS	250	3.73%
UMPQUA BASIN WATER ASSOCIATION	8,500	3.62%
USFS TILLER RANGER STATION	100	3.59%
USFS STAR RANGER STATION	40	3.46%
ADAIR VILLAGE WATER SYSTEM	650	3.45%
LANGLOIS WATER DISTRICT	250	3.34%
EUGENE WATER & ELECTRIC BOARD	-	3.32%
SILVERTON, CITY OF	5,480	3.26%
CANBY UTILITY	12,000	3.18%
HILLSBORO-FOREST GROVE-BEAVERTON	65,100	2.81%
WILSONVILLE, CITY OF	-	2.27%
ESTACADA, CITY OF	1,910	1.63%
SOUTH COAST WATER DIST INC	125	1.22%
GATES, CITY OF	535	1.07%
GEORGIA-PACIFIC CPLP WAUNA	-	0.94%
PHILOMATH PUBLIC WORKS	4,000	0.90%
TILLER ELEMENTARY, SD #15	60	0.48%
JEFFERSON, CITY OF	2,245	0.36%
POWERS, CITY OF	700	0.27%
ROW RIVER VALLEY WATER DIST	-	0.22%
LOWELL, CITY OF	-	0.11%
PORTLAND BUREAU OF WATER WORKS	831,000	0.09%
CORVALLIS, CITY OF	50,101	0.03%

We applied the zonal statistics tool using the Public Water System ID (PWS_ID) to calculate means across SWSAs for our layers of interest. Vector data (shapefiles) were converted to raster grids when necessary. The zonal statistics table was then joined to the SWSA layer and the mean field added. Area calculations were performed by intersecting data and calculating geometry using the NAD83 State Plane Oregon South projection.

Mean water quality was determined by a subset of the 303(d) listed streams (temperature, nitrates, phosphorus, and sedimentation) applied to sub-watersheds. The sub-watersheds were then averaged across SWSAs to determine pollution class. We selected each pollutant from the 303(d) shapefile and exported to new feature class. We chose to represent the polluted streams by sub-watershed by selecting intersecting HUC12's from the Watershed Boundary Dataset. Once the shapefiles were converted to raster, we were able to add the rasters together to show sub-watersheds with a high concentration of our chosen pollutants. Pollutants extracted from 303(d) shapefile include nitrates, phosphorus, sedimentation, and water temperature.

Critical habitat richness was calculated using the NOAA Endangered Species Unit shapefile. After conversion to raster, we used the weighted sum tool to add rasters together and create a richness calculation.

Type	River Basin
Chum	Columbia
Chum	Pacific Coast
Coho	Lower Columbia
Coho	Oregon Coast
Coho	Southern Oregon
Chinook	Deschutes
Chinook	Mid Columbia
Chinook	Oregon Coast
Chinook (Fall)	Snake
Chinook (Spring & Summer)	Snake
Chinook	Southern Oregon
Chinook	Klamath
Chinook	Upper Willamette
Chinook	Lower Columbia
Sockeye	Snake
Steelhead	Lower Columbia
Steelhead	Mid Columbia
Steelhead	Oregon Coast
Steelhead	Snake
Steelhead	Southwest Washington
Steelhead	Klamath
Steelhead	Upper Willamette

Stand age was reclassified from the BLM FOI layer into age classes of 0-80, 81-120, 121-150, and >150 years. The layer was intersected with the O&C lands in order to calculate areas.

Aboveground live biomass was calculated for SWSAs from the NBCD2000 with LANDFIRE disturbance removed from 2000-2009. Pixels with values >200Mg/ha were extracted from the source layer and grouped as "high biomass" in order to intersect with the stand age class <150 years.

Mean stability was calculated from the vegetation type variable in the MC1 climate model. Vegetation types were compared over three global climate models and two future time steps in the A2 emissions scenario.