Northwest Forest Plan Interagency Regional Monitoring
25-Year Report
Status and Trend of Watershed Condition
Aquatic and Riparian Effectiveness Monitoring Program (AREMP)

Objective -The Aquatic and Riparian Effectiveness Monitoring Program (AREMP) evaluates whether the Northwest Forest Plan (NWFP) aquatic conservation strategy (ACS) is achieving the goal of maintaining and restoring the condition of watersheds.

Methods and New Science—AREMP determines the status and trend of in-channel and upslope-riparian watershed condition for sixth-field watersheds within the NWFP area. Upslope and riparian conditions were based on mapped data (e.g., road density, vegetation) representing years 1993-2017 for all watersheds with >5% federal ownership. Stream condition used in-channel data (e.g., substrate, wetted width, macroinvertebrates) collected yearly under a sampling program that visits watersheds with 25% or more federal ownership in repeating eight-year rotations. The first rotation, second rotation, and first year of the third rotation (2002-2009, 2010-2017, 2018-) are included in the 25-year report. This report uses an updated approach which incorporates multiple lines of evidence to evaluate status and trend and understand the influences of environmental variability (e.g., drought). Outputs from new modeling tools and updated inventories of roads and culverts have been included in this report. Upslope-riparian vegetation assessments were improved by the mapping of and use of the riparian management area (RMA) extents. Estimates of fish passage were improved by compilation of existing culvert databases with a newly created database of previously unidentified potential culverts. Amphibian and fish species presence sampling was reintroduced with eDNA methods developed by the Pacific Northwest Research Station, although the current incorporation of this metric is limited to a case study demonstrating future utility.

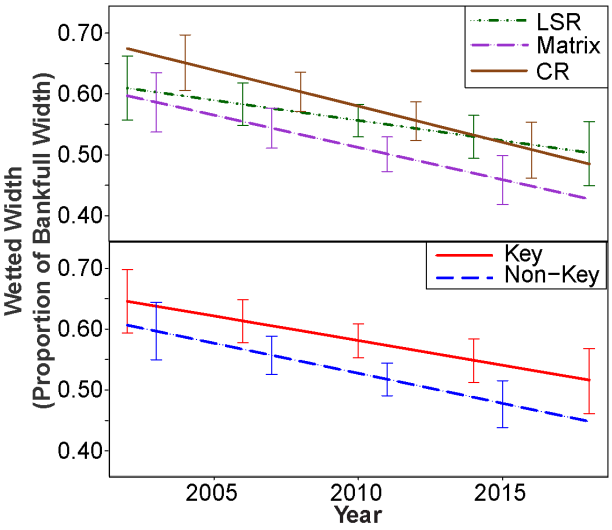

Figure 1.Watershed-year estimates of average wetted width as a proportion of bankfull width by year at sampled sites in late successional reserves (LSR), Congressionally reserved lands (CR), and matrix designations and key and non-key watersheds. Vertical lines are 95% credibility intervals.

Key Results:

Climate and surface water availability in the NWFP area—Climate has been changing dramatically enough that we are observing effects of changed precipitation and air temperature regimes in declining summer wetted width measurements. Lower water availability evidenced by observed decreases in wetted width was corroborated with modeled flows (decreasing) and drought index (higher number of drought years).

Canopy cover and stream temperature—Between 1993 and 2017, slight increases (70-72%) were measured in mean canopy cover in RMAs over the NWFP area. The variation in canopy cover in specific subwatersheds ranged from 0 to 94% where large losses in canopy cover were mostly associated with wildfire. Given that we did not observe larger, widespread changes in canopy cover within RMAs it is not surprising that major temporal changes in temperatures did not seem to be evident, although longer time series would be needed to more rigorously evaluate annual trends.

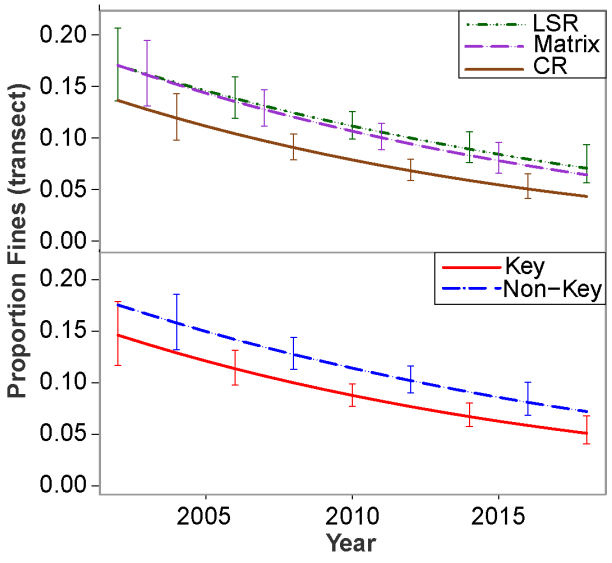

Figure 2. Watershed-year estimates of proportion fines measured on instream transects in LSR, CR, and matrix designations and key and non-key watersheds. Vertical lines are 95% credibility intervals.

Forest condition and instream large wood—Measures in old growth structure index at 80 years (OGSI80) in RMAs increased from 57% in 1993 to 61% in 2017, although fires since that time period may have reduced the current amount of OGSI80 in RMAs. Trends in the density of instream wood indicate spatially variable patterns for smaller size classes of large wood and consistent loss of larger wood in streams across the NWFP. This may be expected as historical (pre-NWFP) forest harvest practices (loss of available trees and active removals from stream channels) across much of the NWFP area likely reduced availability of large wood that can be recruited and retained in streams.

Roads, landslide risk, and instream fines—Road decommissioning across the NWFP footprint has reduced the connected road length on Federal lands by 1,608 km (6.6% reduction), estimated sediment delivery by 4.0%, and landslide risk associated with roads by 11%. Trends in instream fine sediment measurements showed improvements and were generally negative across years. Overall, these data indicate that improvements in roads and vegetation management appear to be having the desired effects of decreasing instream fine sediment concentrations.

Biota, fish passage, and macroinvertebrates—Measures of aquatic connectivity related to assessed fish passage and the measured index of macroinvertebrate health demonstrated improvements. Based on our assembly of multiple and overlapping sources of information on stream culverts, we were able to develop the most comprehensive assessment to date across the NWFP. Of the 3,193 stream culverts that have been surveyed for their potential for fish passage across the NWFP, 773 (24%) are passable. In addition, we found 539 culverts in the databases without passage status, and 1,843 road-stream crossings not in existing databases. Observed to expected ratios of macroinvertebrates were increasing for the majority of AREMP watersheds demonstrating a positive trend over time.

Management implications and next steps

Key vs. Non-Key—Key watersheds were selected for their potential value as high quality salmonid habitat. Key watersheds were found to be in better condition than non-key watersheds overall (less fine sediment, more in-channel wood, more intact macroinvertebrate communities, more canopy cover) at the start and end of the monitoring period. Road decommissioning was focused in key watersheds which displayed a 12% reduction in total road length compared to a 5% reduction in non-key watersheds. Key watersheds displayed more than double the reduction in landslide risk and modeled road derived sediment inputs from 1993 to 2018.

Land Use Allocations (LUA): Matrix, Late Successional Reserves (LSR), and Congressionally Reserved (CR)—Riparian reserve prescriptions were applied across all LUAs which could mediate LUA management differences in streams. Matrix lands showed more vegetation related improvements with increases in OGSI80, large tree densities, and mean percent canopy cover. LSR had the highest in-stream large wood densities although large wood densities decreased over time across all LUAs. Congressional Reserves had less fine sediment in the channel, while all LUAs showed decreases in fine sediments. Trends in wetted width over time showed LSR with slower loss of available water compared to Matrix and CRs. Macroinvertebrate communities showed the most improvement in Matrix lands.

Next steps include research and publications examining relationships between instream condition associated with recovery and disturbance of upslope-riparian areas.

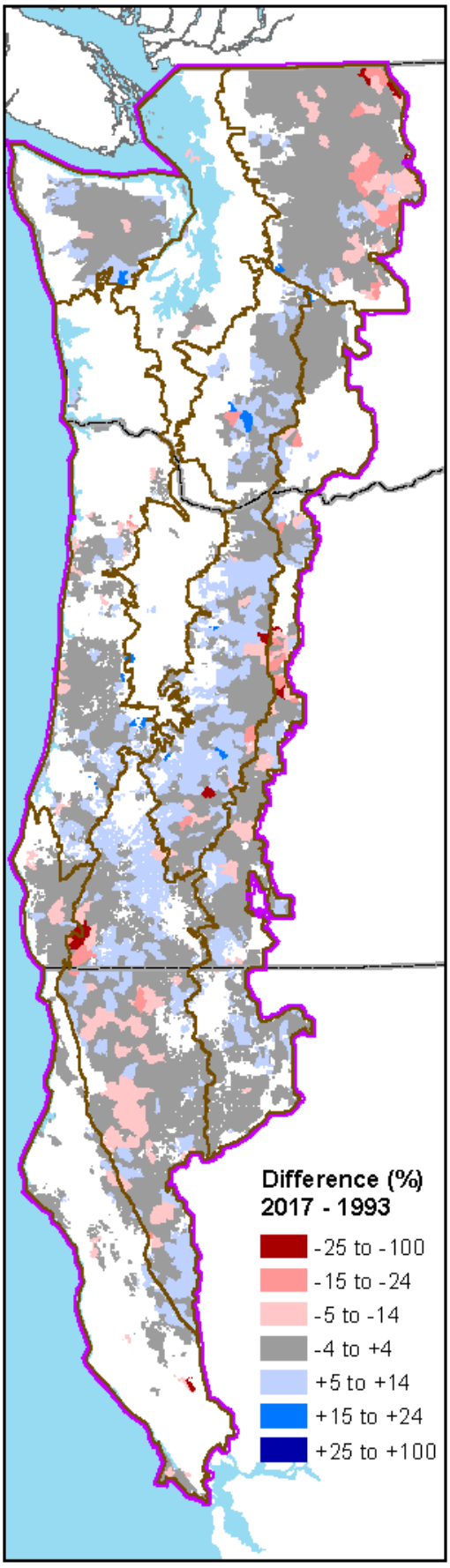

Figure 3. Difference in the mean percent canopy cover within riparian management areas per watershed from 1993 to 2017.