Aquatic and Riparian Effectiveness Monitoring Program
Interagency Monitoring Program – Northwest Forest Plan

2006 Annual Technical Report

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A copy of this report is also available on our Watershed Monitoring Website:
http://www.reo.gov/monitoring/watershed/

Summary

Highlights of Aquatic and Riparian Effectiveness Monitoring Program (AREMP) personnel accomplishments during the 2006 fiscal year:

- AREMP staff responded to the Regional Interagency Executive Committee request to modify the current business practices of the monitoring program. This includes:
    1. Develop a "GIS/remote sensing-based monitoring program option" that will assess watershed (technically a US Geologic Survey 6th-field hydrologic unit code [HUC]; however referred to as watershed in this report) condition for every watershed using GIS, remote sensing, and field data;
    2. Continue to align AREMP with the PacFish/InFish Biological Opinion monitoring program (PIBO); *and*
    3. Preparing a comprehensive review of the attributes we collect and their associated protocols to determine which attributes to continue to collect that will help AREMP accomplish its' objectives, be meaningful information in a time of declining budgets, and how to meet Executives' direction for the program.
- Summer field crews sampled 20 watersheds to measure physical, biological, and chemical attributes used to assess watershed condition as part of our normal field sampling program.
- We engaged in a project with the Roseburg Bureau of Land Management (BLM; which provided separate funding) to provide monitoring for an extensive stream channel restoration project in the Wolf Creek watershed. Field crews sampled 41 reaches within Wolf Creek.
- Provided support to local units on the use of decision support models.
- Refined the standardized core set of field protocols used by AREMP and PIBO.
- Extended the utility of our quality control (QC) program by resurveying 20 QC sites first surveyed in 2005 to enable us to use this data for detecting watershed condition trends.
- Continued development of a landslide model to determine the topographic features associated with landslides and the effects of land management on landslide frequency. A key component of this project is assessing how to extend the landslide models used by the Coastal Landscape Analysis and Modeling Study to the extent of the Forest Plan.
- The AREMP team leader continued to lead the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) watershed workgroup. The workgroup is continuing the analysis of data from a side-by-side protocol comparison test for in-channel physical attributes in the John Day Basin, OR conducted during summer 2005. Eleven different tribal, state, and federal agencies - including AREMP – participated in the test. The goal of the side-by-side protocol comparison test is to determine the best field protocols for assessing a common set of in-channel stream attributes. PNAMP also initiated discussions of developing a multi-agency integrated monitoring program for watershed/stream status and trend monitoring.
- The cost of sampling 20 watersheds (and associated trend sites and quality control sites) was $49,915 per watershed, or $8,319 per sample site. This cost is based on sampling an average of 6 sites in each watershed.
- Student Conservation Association (SCA) interns were utilized as a successful component of the summer field staff. Compared to hiring GS-0404-05 Biological Science Technicians, AREMP realized an $80,000 cost savings.
- AREMP continued to respond to data requests in order to support local unit needs.

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Introduction

Background

The Northwest Forest Plan (hereafter referred to as the Plan), a management strategy applied to 24 million acres of federal land in the Pacific Northwest, was approved in 1994. The Plan includes an Aquatic Conservation Strategy that requires the protection, rehabilitation, and monitoring of aquatic ecosystems under the Plan's jurisdiction (USDA-USDI 1994). The Aquatic and Riparian Effectiveness Monitoring Program (AREMP or the monitoring program hereafter) was developed to fulfill the monitoring component of the strategy. The objectives of the monitoring plan include assessment of the condition of aquatic, riparian, and upslope ecosystems at the watershed scale; development of ecosystem management decision support models to refine indicator interpretation; development of predictive models to improve the use of monitoring data; providing information for adaptive management by analyzing trends in watershed condition and identifying elements that result in poor watershed condition; and providing a framework for adaptive monitoring at the regional scale (Reeves et al. 2004). Monitoring is conducted at the subwatershed scale (US Geologic Survey 6th-field hydrologic unit code [HUC]). These subwatersheds (hereafter referred to as "watersheds") are approximately 10,000-40,000 acres in size.

The purpose of this report is two-fold. First, this report provides an overview of monitoring efforts in 2006. Second, this report serves as a track record for the program as well as indicating future direction of the program at the time of the report.

Monitoring program objectives - 2006

During 2006, the monitoring program worked toward or accomplished several objectives:

- Responded to new direction from the Regional Interagency Executive Committee (RIEC) about how to better meet future monitoring needs of management.
    - Initiated a study to develop relationships between in-channel and upslope indicators to support a Geographic Information Systems (GIS)/remote sensing-based monitoring program.
    - Refined the standardized core set of field protocols between this program and the PacFish/InFish Biological Opinion monitoring program (also known as PIBO; more information can be found at http://www.fs.fed.us/biology/fishecology/emp/index.html).
- Completed in-channel surveys to measure physical, biological, and chemical attributes used to assess watershed condition in 20 watersheds.
- Continued the Quality Assessment Program.
- Field-tested different types of sampling equipment in search of improvements for the efficiency of field efforts.
- Implemented the universal sample design developed by the US Environmental Protection Agency (EPA) so our sample site selection methodology is comparable with other monitoring programs with probabilistic sampling designs.
- Continued an assessment of landslides with data collection and a model development effort.
- Continued participation in the Pacific Northwest Aquatic Monitoring Partnership (PNAMP).
- Used Student Conservation Association (SCA) interns on field crews.

A complete discussion of each of these objectives is provided in subsequent sections. Included for each topic is a brief overview and any pertinent progress or results. Updates are also provided for budget and personnel required to accomplish the tasks assigned to the module.

Monitoring Program Accomplishments - 2006

Future direction for the monitoring program

Following the 10-year evaluation of the Northwest Forest Plan, the RIEC directed AREMP staff to develop options for modifying the monitoring program to meet the following objectives: provide information on the status and trend of watershed condition at different spatial scales, ranging from the Forest/BLM administrative unit to the entire Plan area, while operating under a constrained budget; work with PIBO monitoring program personnel to evaluate watershed condition consistently across Oregon and Washington by using common field protocols, a similar selection mechanism for sample sites, and decision support models to assess watershed condition; and standardize protocols and sample designs in order to share data with other state and federal agencies.

Provide information on the status and trend of watershed condition at different spatial scales – To address providing information at multiple scales, AREMP personnel developed a Geographic Information Systems (GIS)/remote sensing-based monitoring program option that relies on continued field sampling to inform GIS analyses. This option would allow the program to evaluate every watershed with more than 25 percent federal ownership in the Plan area as frequently as data are collected or updated.

The GIS/remote sensing-based monitoring program option, tentatively approved by the RIEC (3/17/06), is based on using decision-support models to aggregate in-channel, upslope, and riparian attributes and calculate a watershed condition score. In-channel physical, chemical, and biological attributes are measured in the field at randomly chosen sites within randomly chosen watersheds throughout the Plan area; upslope and riparian attributes are measured for every watershed using GIS and remote sensing data.

Align AREMP with PIBO – The RIEC directed the monitoring program to work with PIBO (a large-scale federal monitoring program that focuses on managed and unmanaged lands in the upper Columbia basin) and align the two programs so there is common way of reporting watershed condition at multiple scales across Oregon and Washington. Our progress to date includes the following:

The monitoring program and PIBO agreed upon a common set of field protocols for a core set of attributes in 2003 (Moyer et al., 2004). Discussions were reopened in 2005 and 2006 to further refine these protocols. The majority of the revisions were made to clarify specific details to ensure both programs were interpreting the protocols in the same way..

A detailed document outlining the 2004 agreed-to protocols and the latest field version of the protocol is available at http://www.reo.gov/monitoring/watershed/docs/2004-Final-AREMP-PIBO-Core-Attributes-Stream-Sampling-Protocol.pdf. An updated version of this document, reflecting changes discussed and agreed to in 2006 is available by contacting Kristina Fausti (541.750.7081; kfausti@fs.fed.us). Each program worked from the above document to develop their final field sampling protocol.

Both the monitoring program and PIBO currently select watersheds for in-channel sampling using the same probabilistic selection mechanism that ensures a uniform random selection of watersheds (Stevens and Olsen 2003, 2004). However, a difference remains in which stream reaches are surveyed. The monitoring program uses the same selection mechanism to select multiple sites for sampling within each chosen watershed. On the other hand, PIBO selects the lowest response reach in a chosen watershed. For a subset of the sampled watersheds, a randomly chosen site is also surveyed. The monitoring program is now working with researchers at the Pacific Northwest Research Station in Corvallis, Oregon and Oregon State University to recommend how to allocate field samples, i.e., how to best balance the number of sites sampled within watersheds with the number of sampled watersheds.

The use of decision support models is gaining support in the Pacific Northwest. The monitoring program has used these models since 2001 and PIBO is going to start applying them to assess watershed condition. Staff from the monitoring program will work with PIBO staff to adopt existing models from the PIBO geographic area (see below) to the PIBO dataset and program objectives.

Streamline the monitoring program – Monitoring program staff is conducting a comprehensive review of field protocols in which the final round of determination and analysis will be complete in early spring 2007. As part of the review process we are considering elements such as: is the attribute used in the decision support models (see below); is the attribute part of the Core Protocol Document (described above); are

there any savings – in time and money – that can be realized by the monitoring program if the attribute is dropped or measured with a different technique; and what does the monitoring program lose, with respect to the program goals, if the attribute is not measured. The refinement process is complex as the answer lies at the intersection between all of these questions. To date, we have evaluated the number of measurements required to determine the reach length and calculate average bankfull width for each site, our ability to measure entrenchment, alternative equipment for measuring gradient (see below), and issues associated with measuring attributes in complex braided channels.

Field sampling accomplishments - 2006

Twenty watersheds spread throughout the Plan area were sampled during 2006 (Figure 1, Table 1). These watersheds were sequentially sampled from the subset of the 250 watersheds originally selected for monitoring the Northwest Forest Plan. The 250 watersheds were selected at random using Generalized Random Tessellation Sampling (GRTS) design, which guarantees a spatially balanced sample (Stevens and Olsen 2003, 2004). Watersheds had to contain a minimum of 25 percent federal ownership (USDA Forest Service, USDI Bureau of Land Management, or USDI National Park Service) along the total length of the stream (1:100,000 National Hydrography Dataset stream layer) to be considered for sampling in the monitoring plan. Twenty sites from 2005 were also surveyed for trend purposes (Table 2).

During the 2006 field season, 18 watersheds were dropped from the sample list for various reasons:

- Six were dropped because most if not all stream channel sites on federal lands were dry;
- Six were dropped due to inaccessibility (crews were unable get into the watershed);
- Two were dropped due to forest fire events;
- Two were dropped because there was too much water to sample safely; *and*
- Two were dropped due to marijuana-growing operations in the watershed (crew safety).

Wolf creek partnership

The monitoring program partnered with the Roseburg BLM to provide stream-channel monitoring for a multi-partner stream habitat restoration project. Wolf Creek, on the lower Umpqua River, is believed to be one of the most productive stream systems for coho salmon historically. Therefore, it was targeted for restoration activities. As a result, the Roseburg BLM Fisheries program funded the monitoring program to conduct sampling to determine the baseline or pre-restoration condition of the watershed. We used our existing field protocols and the statistical site selection so the data collected at the 41 sites will also support the monitoring programs' goal of monitoring watersheds in the Plan area. Restoration work is scheduled for summer of 2007 and a revisit to the monitoring sites is scheduled for 2011.

Decision support models

Program personnel have been working with specialists on the Okanogan-Wenatchee and Colville National Forests and with the forests in the Blue Mountains (Umatilla, Malheur, and Wallowa-Whitman) to apply decision support models in their forest plan revisions. AREMP's watershed condition model is being used by these forests as part of the key watershed designation process. Decision support models are also being used to conduct a sustainability analysis for aquatic focal species, e.g., fishes listed as "threatened" or "endangered" under the Endangered Species Act or are a species of concern. Key watershed determination and the sustainability analysis are requirements of a new proposed Aquatic and Riparian Conservation Strategy that will be applied across Oregon and Washington (US Forest Service Pacific Northwest Region). The new strategy will be part of each forest's plan, and will replace previous management plans such as the Northwest Forest Plan, PacFish, and InFish.

In-channel & upslope relationships

AREMP is implementing a GIS/Remote sensing-based option that relies on upslope and riparian indicators as surrogates for watershed condition to address manager's requests. The GIS/Remote sensing-based option

is based on a “double sampling” design consisting analyses of upslope and riparian indicators (roads, vegetation, and landslides) in all watersheds in the Plan area (using GIS and remote-sensing data) combined with field sampling in a subset of watersheds. Condition in each watershed will be determined using a decision support model. A distribution of watershed condition scores will be produced based on data from every watershed in the Plan area. Such distributions are useful because they represent the full range of variability in the study area. Changes in watershed condition will be represented by changes in the distribution. As we implement this alternative, we will work toward developing relationships among the upslope and riparian attributes (e.g., vegetation, roads, and landslides) and in-channel conditions. When the relationships are developed, these upslope and riparian attributes will be used as surrogates for watershed condition. Field data are used to validate the relationships and ensure that the model results accurately reflect conditions on the ground.

The monitoring program has contracted with researchers for a one year project (Oct. 1, 2006 through Sept. 30, 2007) at both the Pacific Northwest Research Station in Corvallis and Oregon State University to develop the relationships between upslope/riparian and in-channel conditions. There are two goals for the project. First, we want to develop upslope/riparian and in-channel relationships in order to use existing GIS data to predict in-channel conditions in non-sampled watersheds. Secondly, if relationships are successfully developed, then we will evaluate the variance structure of the predicted in-channel conditions and recommend how to allocate field samples, i.e., how to best balance the number of sites sampled within watersheds with the number of sampled watersheds.

Quality assessment program

The underlying sample design that the monitoring program utilizes (both in the selection of watersheds and sites within watersheds) allows for repeat in-channel surveys in the same location. Initially resurveys were used for blind checks of crew measurements, i.e., between crew comparisons of attribute measurements at the same site. However, as a function of the design, we were able to extend the utility by resurveying a subset of sites in the following year for trend detection. These analyses are currently in progress and will incorporate the data collected from 2001 - 2006. The results will be posted on the monitoring programs website (http://www.reo.gov/monitoring/report_show.php?show=watershed) when they are completed this fiscal year.

The monitoring program’s Quality Assessment Program (QAP) includes components in addition to the resurveys. For example, there are components of the QAP that are all the steps of processing and handling data. The data manager serves the key role of inspecting data for errors (both correctable and non-correctable) and relay mistakes back to the field crews to prevent further errors in data collection. The data manager is also responsible for inspection of calculated attributes (summarized raw data) for outlying errors. This information feeds into the data collection process at the point of protocol development/updating for the next field season.

Abney level test results

Field crews for the monitoring program conducted a methods comparison test to determine whether the currently used laser rangefinder and electronic compass setup (akin to a surveyor’s total station) could be replaced by inexpensive Abney levels for the purpose of measuring stream gradient. The use of Abney levels for field surveys could potentially result in significant time and cost savings for the program, reduced equipment failure, and less equipment to be carried by field crew members.

Thirty-seven randomly selected stream reaches throughout the Northwest Forest Plan area were surveyed using laser rangefinder / electronic compass setups as well as Abney levels. Stream gradients for the sampled reaches ranged from 0.7 to 44 % with a mean of 6.6 %. Two trials with each instrument were conducted at each site, if the values of the first two trials varied by greater than 10 %, then a third trial was completed.

Analyses are being completed that examine the time required to measure stream gradient with each instrument, inter-tool and intra-tool variation, and the cost associated with each method. Results will be posted on the monitoring program's website when they are completed this fiscal year (http://www.reo.gov/monitoring/report_show.php?show=watershed).

At the time of this writing, there appears to be a difference in the length of time required to measure stream gradient with each instrument. On average, it took the field crew approximately twenty-five minutes longer, per site, to measure the stream gradient with the Abney level than with the laser / compass setup. Also, there appears to be an unexplained difference—the gradient measured at individual sites with the two instruments was different—particularly in sites where stream gradient was less than 6 %.

Universal sample design

The monitoring program adopted the first phase of the "universal sample design" for stream reach selection (based on the Generalized Random Tessellation Sampling design; see Stevens and Olsen 2003, 2004 for more information) developed by statisticians at the US EPA – National Health and Environmental Effects Research Laboratory. This selection mechanism is an extension of the previously used selection mechanism; however, it allows the monitoring program to share data with any other program using the same selection mechanism.

Landslide analyses

The monitoring program is in the process of incorporating mass wasting into watershed condition assessments. The assessment consists of extending the landslide models developed by Dan Miller of Earth Systems Institute for the Coastal Landscape Analysis and Modeling Study (CLAMS) to the extent of the Forest Plan and overlaying management activities to determine whether management activities affect landslide frequency. Landslide data were used to calibrate a GIS model that identifies areas within watersheds that have high potential for mass wasting. Adam Dresser (Six Rivers NF) collected data on landslide location from aerial photographs in 14 watersheds. The CLAMS model is limited in that data from only one time period were used to calibrate the model; therefore the model predicts only probable landslide location and not the probability of debris flow. Therefore, in two watersheds, we used data from several time periods to include landslides and debris flows from multiple storm events so we could interpret results in terms of landslide rate, rather than just landslide density. This information allows us to speak directly to management impacts on frequency of landslide events and provide data to relate the effects of a single storm to the cumulative effects of many storm events. The models have been developed and the results are being incorporated into the decision support models used to evaluate watershed condition.

Pacific northwest aquatic monitoring partnership

Support for the cooperative monitoring efforts between state, federal, and tribal agencies within Washington, Oregon, California, and Idaho – known as the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) continued. The monitoring program team lead continued as the lead of the Watershed Workgroup (a subgroup of PNAMP). Relevant to the monitoring program, PNAMP continued worked on an inter-agency protocol test and an integrated inter-agency monitoring program in 2006.

Inter-agency side-by-side protocol test – The Watershed Workgroup continued their efforts to examine data collected using different protocols for commonly collected attributes. Data were collected during summer 2005 in the John Day basin (eastern-central Oregon) to meet the following objectives.
1) identify and recommend a core set of indicators (attributes) and their associated protocols that state, federal, and tribal monitoring programs use for assessing status and trends in watershed condition; 2) conduct a peer-reviewed experiment to determine which of the existing field protocols for each attribute distinguish the most different streams; 3) incorporate additional information into the recommendation of protocols, e.g., cost, precision, accuracy, sensitivity to trend, repeatability, and statistical review; and 4)

In parallel with developing a unified set of protocols, develop calibrations (crosswalks) for older protocols in order to preserve the value of legacy data where possible; and 5) recommend physical and chemical in-channel attributes and appropriate protocols for sampling.

The USDA Rocky Mountain Research Station is also analyzing data collected during intensive surveys of the same segments of stream to establish a baseline set of values from which to compare the results of the different protocols. Data collected using light detection and ranging (LIDAR) technology was also collected and will be compared to the intensively sampled stream data and to the agency/group collected data. Analyses are expected to be completed and presented in January 2007.

Status and Trend Watershed/Stream Integrated Monitoring Program – The Watershed Workgroup held a workshop in September 2006 to explore the possibility of creating an integrated monitoring program for watershed/stream status and trend monitoring efforts. The goal is, within 10 years, to create an integrated, interagency aquatic status and trend monitoring program to provide annual, statistically valid data on a set of agreed-upon stream, riparian, and upslope indicators of the condition of aquatic/riparian resources across the Pacific Northwest at statewide and finer scales of spatial resolution.

Although workshop participants were supportive of the concept, they felt several questions needed to be addressed before fully endorsing such a concept. One key issue is how to integrate various programs' differing, sometimes contradictory, mandates into a unified monitoring program. Therefore, a pilot effort is being proposed to determine how to unify currently existing different programs.

Program Updates

Fiscal year 2006 budget

During the 2006 field season, the program employed 31 persons directly tied to the summer field work; five personnel represent core staff (permanent and TERM employees) and the balance represents temporary employees and SCA interns.

It cost $49,915 to sample each of the 20 watersheds, or $8,319 per sample site (based on sampling an average of 6 sites in each watershed). These figures were derived from taking our total budget and dividing by the number of watersheds sampled. Therefore, the figures include sampling the trend sites and QA/QC sites, as well as overhead and other non-field related costs. The funds (and costs) to sample Wolf Creek are not included since that project was financed with additional funds provided by the Roseburg BLM.

Student conservation association (SCA) interns

Ten Student Conservation Association (SCA) interns were hired as crewmembers during the 2006 field season. Compared to hiring GS-0404-05 Biological Science Technicians, there was a $80,000 cost savings to the program. We continued to collect high quality data and provided valuable work experience to the interns. Two of the GS-grade employees we hired in 2006 were SCA interns in 2005. Overall, this was a very successful partnership and one we hope to continue in 2007.

Annual watershed reports and data available on program website

In order to better facilitate the use of field and GIS data by local area managers, the program continues to place the annual Watershed Reports and the associated data onto the monitoring program's website. Data from 2002 to 2005, as well as the 2006 field data are now available on the website. The current web page will be updated to show links to the reports and data. At the writing of this document, the reports will be posted at http://www.reo.gov/monitoring/reports.htm#watershed while the data will be posted under http://www.reo.gov/monitoring/maps.htm (this is subject to change depending on constraints of the website). Individual measurement data will not be posted on the web, however it is available by contacting the data manager, Jake Chambers (541.750.7067), who will provide individuals with requested information.

Data requests

In 2006, the monitoring program continued to provide data from our field surveys to local management units, Oregon Department of Fish and Wildlife, and other state and federal offices. The following are the filled data requests for 2006:

- Provided water quality data, temperature data, and sample locations to the Oregon Department of Environmental Quality for their annual reports.
- Provided two years of water temperature data for Mosby Creek (a tributary to the Upper Coast Fork Willamette River) to the Oregon Department of Fish and Wildlife (ODF&W) in support of a possible re-introduction project of spring Chinook salmon.
- Completed several data requests regarding terrestrial amphibians and sample locations for Natural Resource Information System (FS corporate data storage) Fauna module and GeoBOB (BLM Oregon State Office corporate data storage for animal data).
- Provided fish measurement data in support of the ODF&W (Central Point, OR office) project to collect genetic samples of steelhead and cutthroat (*Oncorhynchus mykiss* and *O.clarkii*) trout in the Rogue River basin.
- Provided the US Geologic Survey Biological Research Division with digital photos of captured Cascade Frogs (*Rana cascadae*) for use in a photographic key to discriminate *Rana species*.
- Watershed Sciences (a private consultant associated with the inter-agency protocol test (see above)) requested sample locations and channel morphology data for sites in the John Day river

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Acknowledgements

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Jake Chambers oversaw data processing and database management. Sarah Hippenstiel and Anna Dominguez provided valuable assistance with data processing and handled travel and timesheets for the program during the field season. Steve Wilcox developed the field maps for the crews. Kris Fausti, Ted Sedell, and Peter Gruendike handled field crew coordination. Brian Dwyer led, Anson Friar assisted, Billy Wood and Mitch Bohn supported the successful implementation of the Field Reconaissance component of the summer field effort. Summer field staff included: Cathy Gewecke, Greg Huchko, Scott Venables, Erik Meyer, Jon Nott, Eric McNeill, Morgan Garay, TJ Krug, Jeff O'Leary, Zack Reeves, Samantha Laskey, Brian Hanson, Jack Holmberg, Andrew Janos, Emily Lang, Josh Donato, Gina Botello, Forest Kaye, William Hurst, Tim Koch, Marguerite Harden, and Jeff Metzger.

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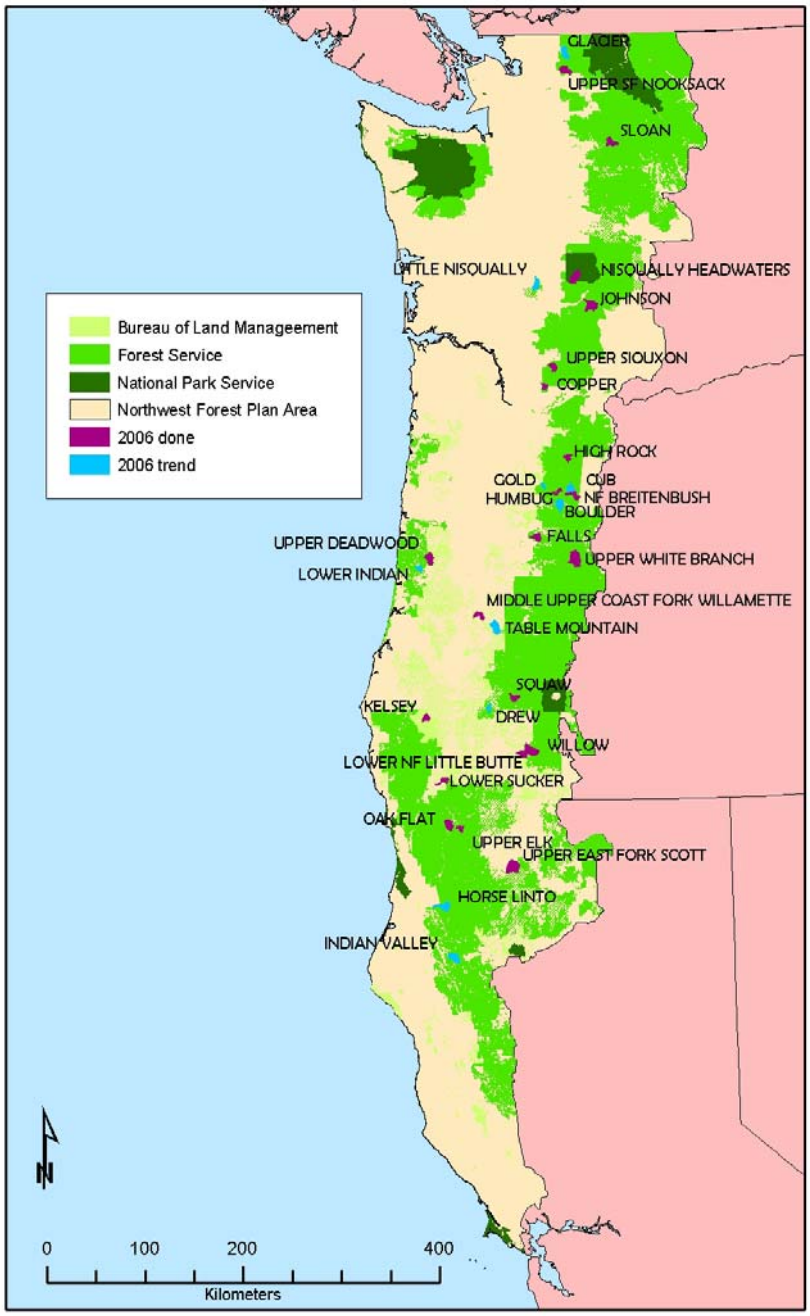

Figure 1. Map of the watersheds surveyed during 2006 summer field season. Watersheds coded in purple represent those in which initial surveys took place. Watersheds coded in blue indicate watersheds where a site was surveyed in 2005 to assess our quality control efforts and then was resurveyed in 2006 for use in detecting watershed condition trends.

Table 1. Watersheds surveyed in 2006 as original surveys with the number of sites surveyed in each watershed.

State	Province	Local Unit	6th Field HUC	6th Field HUC Name	Creek Code	County	Number of Sites
CA	Klamath Siskiyou	Klamath NF	180102080101	Upper East Fork Scott River	CAEFS	Siskiyou	7
CA	Klamath Siskiyou	Klamath NF	180102090302	Upper Elk Creek	CAELK	Siskiyou	8
CA	Klamath Siskiyou	Klamath NF	180102090501	Oak Flat Creek	CAOAK	Siskiyou	5
OR	Coast range	Roseburg BLM	171003030104	Wolf Creek	ORWLF	Douglas	41
OR	Coast range	Siuslaw NF	171002060501	Upper Deadwood Creek	ORUDC	Lane	6
OR	High Cascades North	Rogue River NF	171003070403	Willow Creek	ORWLW	Jackson	6
OR	Klamath Siskiyou	Medford BLM	171003070802	Lower North Fork Little Butte Creek	ORNBT	Jackson	6
OR	Klamath Siskiyou	Medford BLM	171003100405	Kelsey Creek	ORKSY	Josephine	8
OR	Klamath Siskiyou	Medford BLM	171003110304	Lower Sucker Creek	ORSUC	Josephine	8
OR	Western Cascades	Eugene BLM	170900020304	Middle Upper Coast Fork Willamette River	ORUMC	Lane	6
OR	Western Cascades	Mt Hood NF	170900110304	High Rock Creek	ORHRK	Clackamas	9
OR	Western Cascades	Umpqua NF	171003020203	Squaw Creek	ORSQW	Douglas	8
OR	Western Cascades	Willamette NF	170900040107	Upper White Branch	ORUWB	Lane	5
OR	Western Cascades	Willamette NF	170900050202	North Fork Breitenbush River	ORNFB	Marion	7
OR	Western Cascades	Willamette NF	170900050203	Humbug Creek	ORHUM	Marion	6
OR	Western Cascades	Willamette NF	170900060604	Falls Creek	ORFLS	Linn	8
WA	Northern Cascades West	Mt Baker – Snoqualmie NF	171100040301	Upper South Fork Nooksack River	WANOO	Whatcom	9
WA	Northern Cascades West	Mt Baker – Snoqualmie NF	171100060101	Sloan Creek	WASLN	Snohomish	7
WA	Western Cascades	Gifford Pinchot NF	170800020401	Upper Siouxon Creek	WASXO	Skamania	6
WA	Western Cascades	Gifford Pinchot NF	170800020503	Copper Creek	WACOP	Skamania	8
WA	Western Cascades	Gifford Pinchot NF	170800040205	Johnson Creek	WAJHN	Lewis	8
WA	Western Cascades	Mt Rainer NP	171100150101	Nisqually Headwaters	WANSQ	Pierce	6

Table 2 Watersheds surveyed in 2006 as trend surveys along with the number of sites surveyed in each watershed.

State	Province	Local Unit	6th Field HUC	6th Field HUC Name	Creek Code	County	Number of Sites
CA	Klamath Siskiyou	Shasta/Trinity NF	180102120204	Indian Valley Creek	CAINV	TRINITY	2
CA	Klamath Siskiyou	Six Rivers NF	180102111203	Horse Linto Creek	CALIN	HUMBOLDT	2
OR	Coast Range	Siuslaw NF	171002060602	Lower Indian Creek	ORLIN	LANE	2
OR	Western Cascades	Eugene BLM	170900020201	Table Mountain	ORTBL	LANE	2
OR	Western Cascades	MT Hood NF	170900110201	Cub Creek	ORCUB	MARION	2
OR	Western Cascades	Umpqua NF	171003020403	Drew Creek	ORDRE	DOUGLAS	2
OR	Western Cascades	Willamette NF	170900050107	Boulder Creek	ORBLD	LINN	2
OR	Western Cascades	Willamette NF	170900050503	Gold Creek	ORGOL	MARION	2
WA	Northern Cascades West	Mt Baker-Snoqualmie NF	171100040104	Glacier Creek	WAGLA	WHATCOM	2
WA	Western Cascades	Gifford Pinchot NF	171100150110	Little Nisqually River	WANIS	LEWIS	2