

Education

M.S. Forest Engineering, 1990
Oregon State University

B.S. Forest Management, 1987
University of Massachusetts

A.S. Arboriculture & Park Mgt., 1981
Stockbridge School of Agriculture

Additional Training

Watershed Analysis Training, 1992, 1997,
Washington Dept. Natural Resources

Applied Fluvial Geomorphology, 1994,
Rosgen Wildland Hydrology Consultants

Streambank Protection using
Bioengineering 1994,
Washington Dept. of Ecology

Certifications

Washington State Watershed Analysis Level
2 certification in:

Riparian Function, Hydrologic Change,
Stream Channel Condition, Water
Supply/Public Works, and Prescriptions

Professional Affiliations

American Water Resources Association
American Geophysical Union

EDWARD M. SALMINEN

Hydrologist

Mr. Salminen is a hydrologist specializing in stream restoration, watershed analysis, and water quantity assessments; with a focus on Pacific Northwest fisheries issues. Ed has coordinated large projects of interdisciplinary teams with private industry, watershed councils, tribal, state, and federal representation. He has evaluated impacts of land use activities on riverine and wetland environments. Prior to starting his consulting business Ed held positions with tribal, state, and federal agencies, and at academic institutions.

Specific Expertise

Stream Restoration Planning, Design, and Implementation

- Hydraulic and hydrologic analysis and modeling
- Stream channel dynamics and fluvial geomorphology
- GIS data acquisition and analysis
- Project management and construction supervision on stream restoration projects
- Participation in numerous watershed analyses that identified and prioritized restoration opportunities

Watershed Analysis

- Hydrologic assessments; including data acquisition and statistical analyses, stream flow modeling, assessment of land use effects, and development of protection and enhancement opportunities.
- Riparian and wetland assessments; including aerial photo interpretation, field inventory, stand modeling, and development of protection and enhancement opportunities.
- Development of methodology for hydrologic and riparian analysis.
- Project Management, including acquisition of funding, project design, supervision of consultants, coordination with landowners, data acquisition and analysis, and final report preparation.
- GIS data acquisition and analysis

Water Quality / Quantity Assessment

- Water quantity modeling; data acquisition and analysis, modeling of stream flows from un-gauged locations, analysis of land use effects
- Stream temperature assessment; acquisition and analysis of data, temperature modeling
- Water chemistry assessment; acquisition and synthesis of data, analysis of land use effects
- Fish and Aquatic Sciences
- Ecosystem Diagnostic and Treatment (EDT) analyses; acquisition and synthesis of habitat data
- Experience working with interdisciplinary teams to protect aquatic resources

Project Experience (most recent first)

Granite Creek Watershed Analysis. Upper Priest Lake Basin, Washington & Idaho, Kalispel Tribe of Indians. Project duration: 07/2007 to present (ongoing). Ed is part of a team conducting a watershed assessment in Granite Creek, a tributary to Priest Lake. The purpose of the project is to identify restoration and enhancement actions to restore native salmonid fish populations in Granite Creek, a major tributary to lower Priest Lake. The Kalispel Natural Resource Department and US Forest Service have assembled existing data on fisheries and watershed processes, collected data in 2006, and are completing data collection in 2007. Ed will be working with a team to complete a watershed assessment and restoration strategy based on the assembled data. Ed's tasks include summarize existing hydrology and sediment-related data so that it is meaningful at the stream reach, subwatershed and watershed scales, evaluate the factors that are limiting fish populations, aquatic habitats and connectivity, identify tractable remedies, and synthesize these elements into a Granite Creek Restoration Strategy.

Coast Restoration Prioritization. Oregon Coast and Lower Columbia River Basin, Oregon Watershed Enhancement Board. Project duration: 07/2007 to present (ongoing). Ed is part of a team compiling information on limiting factors and restoration opportunities for fisheries resources within the Oregon Coast Coho Salmon Ecologically Significant Unit (ESU). Ed is developing an online database to collect limiting factor and restoration opportunity information from watershed councils, agencies, and other interested parties within the area. Ed also is conducting several area-wide GIS analyses, and providing GIS support and mapping for the project

Wilson River Watershed Analysis. Wilson River Watershed, Oregon, Oregon Department of Forestry. Project duration: 03/2007 to present (ongoing). Ed is part of a team conducting a watershed analysis in the Wilson River, using a modified version of the Oregon Watershed Assessment protocol. Ed is serving as the project hydrologist, modeling peak and base streamflows under a range of forest management scenarios using the Distributed Hydrology Soil Vegetation Model (DHSVM). Ed is also evaluating stream shade and associated water temperatures within the watershed, summarizing other water quality issues, and evaluating the impacts of water use on aquatic resources. Ed will work with other team members to develop preferred/ desired future conditions within the watershed, and to provide recommendations to ODF for future management actions.

Tanwax Rim Wetland Mitigation. Nisqually River Basin, Washington, Boyd Real Estate Investments. Project duration: 11/2005 to present (ongoing). Ed is project manager and hydrologist for a team developing a wetland mitigation design for approximately 5 acres of replacement wetland. Duties include acting as liaison between the client and County environmental staff, managing the project team, and providing input on hydrologic conditions and concerns in the project area.

North Fork Coeur d'Alene River Watershed Assessment. Coeur d'Alene River Basin, Idaho, Idaho Department of Environmental Quality. Project duration: 09/2005 to 07/2007. In 2001 the Idaho Department of Environmental Quality completed a Total Maximum Daily Load (TMDL) assessment of the North Fork Coeur d'Alene River Basin. The TMDL was developed primarily for coarse sediment inputs to the system. Ed worked with a team to further refine our understanding of coarse sediment inputs to and dynamics within the stream system in the Basin. Ed evaluated past hydrologic assessments, and modeled changes in hydrology associated with land management (primarily timber harvest and road construction) in two subwatersheds using the Distributed Hydrology Soil Vegetation Model (DHSVM).

Metro Greenways Assessment. Clackamas River Basin, Oregon, Metro. Project duration: 03/2006 to 06/2006. Ed was part of a team conducting a rapid bio-assessment of aquatic resources in the

Clackamas River Greenway, Clackamas Bluffs, and Deep Creek and Tributaries Target Areas. The goal of these assessments was to evaluate aquatic habitat, vegetation and landscape conditions to determine which portions of this study areas had the highest values for potential open space acquisition by Metro. Ed served as project hydrologist, and provided GIS and mapping support.

Evaluation of Rattlesnake Creek & Snyder Swale Piezometer Data. White Salmon and Klickitat River Basins, Washington, Underwood Conservation District. Project duration: 10/2006 to 03/2007. In 1990 the Underwood Conservation District initiated a series of instream and upland restoration projects in Snyder Swale and Upper Rattlesnake Creek, tributaries to the Klickitat and White Salmon Rivers. The primary method for monitoring and evaluating success of the projects was the use of piezometers to monitor changes in shallow groundwater elevations. The District contracted with Ed to evaluate piezometer data. Tasks included describing watershed characteristics for the contributing area to the piezometer sites, describing characteristics at each piezometer site, statistical analysis of the piezometer data, and summary of conclusions that could be drawn from the data as to the success of the restoration projects, and recommendations for further monitoring

Upper Rogue Watershed Assessment. Rogue River Basin, Oregon, Upper Rogue Watershed Association. Project duration: 10/2005 to 12/2006. Ed worked with a team to complete a watershed assessment of the Upper Rogue Basin. The assessment followed the Oregon Watershed Assessment protocol. Ed's responsibilities included evaluating riparian conditions along major streams in the project area, GIS support for all phases of the analysis, and development and maintenance of a project web page for communicating interim and final products to the client and other interested parties (see <http://upper-rogue.org>).

Columbia Restoration Prioritization. Hood, Deschutes, John Day, Umatilla, Grande Ronde, Powder, Owyhee, and Malheur Basins, Oregon, Oregon Watershed Enhancement Board. Project duration: 04/2006 to 12/2006. Ed was part of a team compiling information on limiting factors and restoration opportunities for fisheries resources within the Hood, Deschutes, John Day, Umatilla, Grande Ronde, Powder, Owyhee, and Malheur Basins. Ed provided GIS support and mapping for the project team.

Drews Creek Watershed Analysis. Goose Lake Basin, Oregon, Fremont-Winema National Forest. Project duration: 10/2005 to 08/2006. The Drew Creek watershed is approximately 160 square miles in size and drains to Goose Lake, near Lakeview, Oregon. Ed Salminen worked with a team conducting a Watershed Analysis following the Federal protocol. Ed's primary responsibility was to serve as project Hydrologist for the assessment, which included characterization of the watershed climate and hydrology, identification of aquatic issues and key questions, description of current and reference water quantity, water quality and channel conditions, and preparation of a final synthesis and recommendations for aquatic issues within the watershed.

Lower Ohop Creek Stream Restoration Planning, Phase II. Nisqually River Basin, Washington, Pierce Conservation District. Project duration: 01/2003 to 08/2006. Ed was project manager and hydrologist for a team that developed a stream restoration design for the lower six miles of Ohop Creek, a tributary to the Nisqually River. This project built on the initial phase I work that is described below. This phase of the project involved organizing the acquisition of design data (both ground survey and LiDAR data), working with private landowners to acquire access and easements, developing specific stream design elements, and coordinating all aspects of the design including hydraulic analysis, wetland restoration, and channel re-construction.

Evaluation of bank erosion hazard along a portion of Whychus Creek. Deschutes River Basin, Oregon, Private party. Project duration: 06/2006 to 06/2006. Ed and a consulting engineer evaluated the erosion potential for a property located along Whychus Creek in the City of

Sisters, Oregon. The purpose of the evaluation was to identify possible reasons for the occurrence of bank erosion at the site and to outline possible solutions to prevent further bank loss. Ed identified upstream and local hydraulic processes impacting the site, and helped with development of bank stabilization opportunities.

Grand Ronde Tribe Nonpoint Source Management Plan. Yamhill River Subbasin, Oregon, Confederated Tribes of the Grand Ronde. Project duration: 04/2006 to 06/2006. The Confederated Tribes of Grand Ronde contracted assistance in completing a non-point source assessment and non-point source management plan for two fifth-field watersheds in the Yamhill River subbasin that intersect the Tribal Reservation. Ed Salminen, as a subcontractor to Adolfson and Associates, conducted GIS analysis and mapping in support of the effort.

Middle Deschutes River Botanical Inventory. Deschutes River Basin, Oregon, Bureau of Land Management. Project duration: 05/2005 to 01/2006. Ed worked with a team to complete an inventory of seeps, springs and riparian plant communities along a 20-mile section of the Middle Deschutes River, from the vicinity of Redmond, Oregon to the southern extent of Lake Billy Chinook. The purpose of the inventory was to gather information regarding the location, extent, and floristic composition of these areas for future comparisons. Ed's responsibilities included all GIS analysis and mapping, including evaluation of FLIR (forward looking infrared) data to identify spring locations.

Willamette Restoration Priorities. Willamette River Basin, Oregon, Oregon Watershed Enhancement Board. Project duration: 01/2005 to 12/2005. Ed was part of a team compiling information on limiting factors and restoration opportunities for fisheries resources within the Willamette River Basin. Ed developed an online database to collect limiting factor and restoration opportunity information from watershed councils, agencies, and other interested parties within the basin. Ed also provided GIS support for the project.

Deep, Goose, Eagle and Wade Creek fish passage inventories. Clackamas River Basin, Oregon, Clackamas River Basin Research and Assessment Group. Project duration: 05/2003 to 11/2005. Ed was part of a team that conducted a fish passage inventory of culverts, bridges and dams in the Deep, Goose, Eagle, and Wade Creek watersheds. Ed conducted detailed field surveys of the 30 barriers with the highest priority for restoration, and used this information to develop cost estimates and preliminary restoration designs. In addition, Ed was responsible for all GIS analysis associated with the project

Upper Scyan Grazing Allotments Environmental Assessment. Sprague River and Summer Lake Sub basins, Oregon, Fremont-Winema National Forest. Project duration: 08/2004 to 08/2005. Ed Salminen was part of a team conducting an Environmental Assessment (EA) to disclose the effects of continued livestock grazing on eight grazing allotments on the Fremont-Winema National Forest. Ed's primary responsibility was to serve as project Hydrologist for the assessment. Duties included identifying channel response segments within and downstream of the grazing allotments, identifying current limiting factors to channel condition, and evaluating likely future conditions under the various management alternatives under consideration.

Clackamas Basin Summary and Action Plan. Clackamas River Basin, Oregon, Clackamas River Basin Research and Assessment Group. Project duration: 07/2004 to 06/2005. Ed was part of a team that developed a restoration action plan for the Clackamas River Basin. The project consisted of two primary parts. The first part was to summarize known conditions that are currently limiting fisheries and water quality resources within the basin, and the second was to work with the client and the larger community to develop specific action items aimed at correcting these limiting factors. The results of this effort were 1) the identification of important strategic issues, opportunities, and locations for actions over the next 10 years; 2) a summary for both the client and the general public of conditions, trends, and key issues affecting fish, wildlife and water quality throughout the Clackamas Basin; and 3) specific

prioritized actions that will help protect and improve fish and wildlife habitat and water quality. Ed was responsible for assisting with the water use, hydrology and fluvial geomorphological portions of the plan, as well as providing GIS support.

Review of Sandy River turbidity data. Sandy River Basin, Oregon, B.T. Romey Associates.

Project duration: 11/2004 to 11/2004. Ed served as a sub-consultant to B.T. Romey and associates, evaluating the quality of turbidity data from two sites within the Sandy River Basin. Ed reviewed the data sets and identified those periods when the instrumentation was likely to be faulty. The approach taken was to compare turbidity records with stream flow and climate records from local stations, and to identify anomalies in the data set of suspect quality.

Upper Williamson River Sub-Basin Watershed Assessment. Upper Klamath River Basin, Oregon & California, Klamath Basin Ecosystem Foundation. Project duration: 02/2004 to 08/2004. As a sub-consultant to David Evans and Associates, Ed Salminen completed a Hydrologic Analysis of the Upper Klamath Basin, and assisted with a watershed assessment of the Upper Williamson River Subbasin. The Hydrologic Analysis was focused on identification of the macro-scale processes affecting hydrologic response within the Basin and provided a framework for understanding the hydrologic processes within the Upper Williamson River Subbasin and other sub basins throughout the Basin. The Hydrologic Analysis was designed to characterize the stream flow regime, flood history, water availability and climatic setting within the Upper Klamath Basin. The second phase of the project, the Upper Williamson River Watershed Assessment, was conducted using the Oregon Watershed Assessment methodology. Ed was responsible for conducting the channel habitat typing, assisting with the evaluation of wetland conditions, evaluating water use and hydrology and summarizing restoration priorities.

Malheur Subbasin Assessment and Management Plan. Malheur River Basin, Oregon, Malheur Watershed Coalition. Project duration: 08/2003 to 06/2004. Ed was part of a team that conducted a subbasin assessment and developed a management plan for the Malheur River subbasin. The project was conducted using funding and planning protocol developed by the Northwest Power and Conservation Council. The Malheur subbasin plan was developed in a public process that included the participation of a wide range of state, federal and tribal governments, local managers, landowners, local governments, and other stakeholders. The plan will drive NPCC program implementation within the subbasin for the following ten year period. Ed conducted the aquatic assessment, which included gathering existing information on habitat conditions and watershed processes affecting resident fish species within the basin, and organized this information using the Qualitative Habitat Assessment (QHA) protocol developed by Mobrand Biometrics. Ed also conducted all GIS analysis for the project team.

Deep and Goose Creek Watershed Assessment. Clackamas River Basin, Oregon, Clackamas River Basin Research and Assessment Group. Project duration: 05/2003 to 06/2004. Ed worked with a team to complete a watershed assessment of the Deep and Goose Creek watersheds, using the Oregon Watershed Assessment methodology. Ed was responsible for providing an assessment of the hydrologic and water use characteristics of the watershed, an analysis of the effects of water withdrawals and land use on stream flows, an assessment of current riparian and wetland conditions, and recommendations for improving streamflow, riparian, and wetland conditions. In addition, Ed conducted all GIS analysis for the project team.

Mashel River Stream Restoration Planning, Phase I. Nisqually River Basin, Washington, Pierce Conservation District. Project duration: 01/2003 to 06/2004. Ed was project manager and hydrologist for a team that developed a stream restoration design for approximately 4 miles of the Mashel River, a tributary of the Nisqually River, in the vicinity of the city of Eatonville, Washington. The project area was identified in earlier analyses (described below) as being a high priority for restoration to benefit Steelhead, Fall Chinook Salmon, and Coho Salmon. The

purpose of the project was to develop conceptual restoration alternatives for the project reach, and to provide specific designs for a selection of pilot restoration projects. Tasks included organizing the acquisition of design data, working with private landowners to identify local interest in restoration projects, and coordinating the overall restoration plan. The results from this project were successfully used to acquire funding for the implementation phase.

Patawa and Tutuilla Creek Hydrologic Assessment and Restoration Recommendations. Umatilla River Basin, Oregon, Confederated Tribes of the Umatilla. Project duration: 07/2003 to 11/2003. The Tutuilla/Patawa Creek watershed is a tributary of the Umatilla River, draining approximately 60 square miles of the Blue Mountain foothills. The watershed includes a significant portion of the Confederated Tribes of the Umatilla Indian Reservation. Land use within the watershed is predominately dry land agriculture, and in-stream sediment levels are high. Ed worked with a team to conduct a hydrologic assessment of watershed conditions and to prepare a detailed plan of restoration recommendations for the watershed. The overall purpose of the project was to increase understanding of current stream channel, floodplain, water quality, and aquatic habitat conditions within the watershed, and provide recommendations for watershed restoration. Ed Salminen completed much of the hydrologic assessment, including a description of hydrologic setting, a summary of the field sample data, current channel classifications, and the assessment of current, reference, and likely future conditions.

Canyon Creek Watershed Assessment. John Day River Basin, Oregon, Malheur National Forest. Project duration: 11/2002 to 06/2003. The Canyon Creek watershed is 115 square miles in size, draining an area on the north and west slopes of the Strawberry Mountains. Canyon Creek is tributary to the John Day River, the confluence being located within the city of John Day. The majority of the watershed contains lands administered by the US Forest Service, with a mix of rangeland, rural residential, and urban areas. Ed Salminen sub-contracted with a Duck Creek Associates / David Evans and Associates team in conducting a Federal watershed assessment for the US Forest Service, Malheur National Forest. The focus of the analysis was the implementation of the president's "Healthy Forest Initiative". Ed's primary responsibility was to serve as project Hydrologist for the assessment, which included characterization of the watershed climate and hydrology, identification of aquatic issues and key questions, describing current and reference water quantity, water quality and channel conditions, and preparing a final synthesis and recommendations for aquatic issues within the watershed.

Washington Department of Natural Resources, Forest Practices Act appeal. White Salmon River Basin, Washington, Private party. Project duration: 08/2002 to 05/2003. Ed provided expert opinion to a private landowner in an appeal of a Forest Practices Application granted by the WDNR for a timber harvest on an adjacent property. The issues involved included slope stability, protection of domestic water supplies, and potential impacts to downslope fish-bearing streams. Ed provided technical evaluation of potential hazards to the client, as well as development of alternatives. The appeal was resolved out of court by the affected parties

Crystal Springs zone of contribution delineation. Hood River Basin, Oregon, Crystal Springs Water District. Project duration: 03/2002 to 02/2003. Crystal Springs provides domestic water for approximately 25% of the residents of Hood River County, Oregon. Potential resort development in the area upslope of the spring prompted the Water District managers to investigate the source area for the spring. Ed worked with Hydrogeologist Mark Yinger to delineate the zone of contribution to the spring. Ed's duties included field-measurements of surface water discharge from the area, climatic analysis, and evaluation of flow records; all of which was used to develop an annual water balance for the contributing area.

Meacham Creek Restoration Planning. Umatilla River Basin, Oregon, Confederated Tribes of the Umatilla. Project duration: 05/2001 to 12/2002. Meacham Creek (drainage area = 180 square

mile) is a tributary of the Umatilla River located east of Pendleton, Oregon. The watershed drains the west slopes of the Blue Mountains, and is a mixture of forest and range land. Meacham Creek is an important tributary for anadromous fish in the Umatilla River basin, however, the productivity of the system has been impaired due to railroad construction projects that have encroached on the floodplain. Ed Salminen worked with Water Work Consulting and Duck Creek Associates to develop a restoration and enhancement plan for improving fish production along the mainstem of Meacham Creek. The project area is predominantly privately owned. The project required landowner contact and sensitivity to private property rights issues.

Klickitat River Basin (WRIA 30) Level I Assessment. Klickitat River Basin, Washington, Klickitat Basin Planning Unit. Project duration: 07/2002 to 11/2002. Washington HB 2514 established a framework for addressing the State's water quantity, water quality, instream flow, and salmon habitat needs. Ed Salminen worked with a team to conduct a Level I assessment within the Klickitat River Basin that addressed the issues identified in HB 2514. Ed led the water quantity assessment for the basin, which included a hydrologic overview of the basin (description of major streams and rivers; summarization of watershed characteristics affecting streamflow), an assessment of seasonal variability and long-term trends in precipitation; summarization of seasonal surface water availability, analysis of trends in streamflow, and an assessment of the effects of land uses in the basin on water quantity.

Lower Ohop Creek Stream Restoration Planning, Phase I. Nisqually River Basin, Washington, Nisqually Indian Tribe. Project duration: 08/2000 to 11/2002. Ohop Creek drains an area 44 square miles, comprised primarily of commercial forest, small farms, and rural residential lands; and is tributary to the Nisqually River. The lower 6 miles of the Ohop Creek valley was extensively used for dairy farming, and most of the Creek in this reach had been ditched in the 1930's. Ohop Creek and its tributaries are used by most species of anadromous fish in the Nisqually Basin, including Fall Chinook and coho salmon, and steelhead. The Nisqually Indian Tribe was interested in developing a restoration plan for lower Ohop Creek. In 2000 the Nisqually Tribe contracted with Ed Salminen to develop a restoration plan for this reach. Ed led a team to develop an analysis of alternatives and conceptual designs for 6-miles of this salmon stream. The alternatives ranged from full, valley-wide channel relocation and floodplain restoration to simple in-stream spawning and rearing habitat improvements. This project also included alternatives for the enhancement of the adjacent wetlands and off-channel spawning areas.

Nisqually River Basin Ecosystem Diagnostic and Treatment (EDT) Project. Nisqually River Basin, Washington, Nisqually Indian Tribe. Project duration: 07/1997 to 11/2002. The Nisqually Indian Tribe co-manages the fisheries resources in the Nisqually River basin along with State of Washington. As part of an effort to develop comprehensive and integrated multi-species management plans for the Nisqually River Basin, the Nisqually Indian Tribe in 1997 began an analysis of salmon and steelhead production using the Ecosystem Diagnosis and Treatment (EDT) method developed by Mobrand Biometrics, Inc. The purpose was to identify constraints and opportunities for rebuilding salmon and steelhead runs. The Nisqually Tribe contracted with Ed Salminen to provide information on fish habitat conditions within the watershed, and to help with assessing the impacts of land management on fish habitat. Ed has worked with the Tribe in synthesizing basic habitat parameters (e.g., stream temperature data, substrate quality, stream survey data) and sources of impacts to fish habitat. A Fall Chinook recovery plan was developed for the basin in 1999, and a multi-species recovery plan for the remaining anadromous species in 2002.

Clear and Foster Creek Watershed Assessment. Clackamas River Basin, Oregon, Clackamas River Basin Research and Assessment Group. Project duration: 10/2001 to 06/2002. The Clear and Foster Creek watersheds drain to the Clackamas River near Estacada, Oregon. Ed Salminen worked with a team to complete a watershed assessment of the area using the Oregon

Watershed Assessment methodology. Ed was responsible for providing an assessment of the hydrologic and water use characteristics of the watershed, an analysis of the effects of water withdrawals and land use on stream flows, an assessment of current riparian and wetland conditions, and project recommendations for improving streamflow, riparian, and wetland conditions.

Clean Water Act, Section 404 Violation, Expert Witness and stream and wetland restoration.

Salmon River Basin, Idaho, Private party. Project duration: 06/2001 to 06/2002. In his role as Expert Witness, Ed Salminen provided an analysis of the effects of an illegally constructed side channel on the function of the Salmon River near Stanley, Idaho, and developed mitigation recommendations. Ed worked with a team to restore disturbed wetland areas and to restore the illegally placed channel.

Trout Creek Watershed Assessment. Deschutes River Basin, Oregon, Bonneville Power Administration. Project duration: 05/2001 to 04/2002. Trout Creek is a 700 square mile watershed that drains to the Deschutes River near Madras, Oregon. Ed Salminen worked with a team to complete a watershed assessment of the area using the Oregon Watershed Assessment methodology. Ed was responsible for providing an assessment of the hydrologic and water use characteristics of the watershed, an analysis of the effects of water withdrawals and land use on stream flows, an assessment of current riparian and wetland conditions, and project recommendations for improving streamflow, riparian, and wetland conditions.

Elk River Preliminary Hydrologic Change Analysis. Humboldt County, California, Pacific Lumber Company. Project duration: 01/2001 to 04/2002. Elk River is a 46 square mile watershed that drains to Humboldt Bay near Eureka, California. Pacific Lumber Company contracted with Ed Salminen to complete a preliminary analysis of the area using the watershed assessment methodology that he developed in an earlier project (described below). The purpose of the analysis was to evaluate current hydrologic conditions, and to evaluate the additional effects of proposed timber harvest on peak stream flows within the watershed.

Nisqually River Basin (WRIA 11) Level I Assessment. Nisqually River Basin, Washington, Nisqually Basin Planning Unit. Project duration: 02/2001 to 12/2001. Ed Salminen was part of a team that conducted a Level I assessment within the Nisqually River Basin using the framework for addressing the State's water quantity, water quality, instream flow, and salmon habitat needs established in Washington HB 2514. Ed was responsible for leading the water quantity assessment for the basin, which included a hydrologic overview of the basin (description of major streams and rivers; summarization of watershed characteristics affecting streamflow), an assessment of seasonal variability and long-term trends in precipitation; summarization of seasonal surface water availability, analysis of trends in streamflow, and an assessment of the effects of land uses in the basin on water quantity.

Freshwater Creek Watershed Analysis. Humboldt County, California, Pacific Lumber Company. Project duration: 08/1999 to 04/2001. Freshwater Creek is a 31 square mile watershed that drains to Humboldt Bay near Eureka, California. Ed Salminen was part of a team that conducted a watershed analysis of the area using methodology he helped develop for Pacific Lumber Company (discussed below). Ed served as the Hydrologic Change module leader for the analysis, which included an assessment of the effects of forest harvest and road construction on peak stream flows.

Development of Habitat Conservation Plan, Watershed Analysis Manual. Humboldt County, California, Pacific Lumber Company. Project duration: 04/1999 to 04/2001. In March 1999 Pacific Lumber Company signed a Habitat Conservation Plan (Headwaters HCP) with National Marine Fisheries Service, U.S. Fish and Wildlife Service and California Fish and Game for 200,000 acres of timberland on the northern California coast. The HCP obligated Pacific Lumber to conduct watershed analyses within all portions of their ownership to identify the

sources of impact to aquatic systems, and to design future management practices that would limit these impacts. Prior to undertaking a complete analysis of this area, it was necessary to develop a watershed analysis methodology that would be used. Ed Salminen was part of a team that provided technical expertise in the development of the manual. Ed was specifically responsible for development of the Hydrologic Change module, which included an approach for evaluating possible changes in peak flows due to forest harvest and road construction.

Development of Oregon Watershed Assessment Manual. Oregon (Statewide), Oregon Watershed Enhancement Board. Project duration: 06/1998 to 03/2001. As part of an 8-person team, Ed Salminen developed the riparian assessment methodology for the State of Oregon's watershed assessment manual. The manual is designed to provide a consistent methodology that can be used within Oregon for assessing the sources of impairment to aquatic systems, and for prioritizing restoration activities. This manual is designed for use by Oregon Watershed Councils to provide: 1) an educational tool to help council members understand watershed processes, 2) watershed "baseline" information, and 3) an evaluation of watershed conditions to identify appropriate watershed restoration projects. The assessment process focuses on evaluating instream fisheries and water quality resources to aid watershed councils addressing endangered species issues and TMDL development. Ed and other team members also developed a companion document describing hydrologic and riparian conditions in the level IV EPA ecoregions in the State of Oregon.

Lower Hood River Watershed Assessment. Hood River Basin, Oregon, Hood River Watershed Council. Project duration: 03/1999 to 06/1999. The Hood River drains a watershed area of approximately 340 square miles, joining the Columbia River near the city of Hood River, Oregon. Ed completed a riparian and wetlands assessment of the Lower Hood River subbasin for the Hood River Watershed Council using the Oregon Watershed Assessment methodology that he helped develop. Ed was responsible for providing an assessment of current riparian and wetland conditions, and project recommendations for riparian and wetland restoration / enhancement projects.

Big Elk Pilot Watershed Assessment. Yaquina River Basin, Oregon, Oregon Watershed Enhancement Board. Project duration: 06/1998 to 06/1999. Big Elk Creek is a 89 mi² watershed that is tributary to the Yaquina River in the Oregon Coast Range. Ed Salminen worked with a team to complete a watershed assessment of the area using the Oregon Watershed Assessment methodology. Ed served as the Riparian Function module team leader, in which capacity he analyzed current riparian conditions and provided recommendations for possible restoration/ enhancement projects.

Culvert Replacement, Siskiyou National Forest. Siskiyou National Forest, Oregon, Siskiyou National Forest (as sub consultant to Logging Engineering International, Inc). Project duration: 09/1998 to 03/1999. Ed Salminen was hired as a subcontractor by LEI, Inc. to consult on culvert replacement projects in the Siskiyou National Forest, Oregon. He modeled peak and base stream flows and culvert hydraulics, and provided design recommendations to project engineers on fish passage designs.

Silver Creek Level II Watershed Analysis. Cowlitz River Basin, Washington, Murray Pacific Corporation. Project duration: 05/1998 to 01/1999. Silver Creek drains a watershed area of approximately 53 square miles, and is tributary to the Cowlitz River near the town of Randle, Washington. Ed Salminen led the Hydrologic Change analysis for the assessment using the Washington Department of Natural Resources Watershed Analysis methodology. Duties included acquisition and analysis of historic climactic and streamflow records, modeling changes in peak flows due to forest practices, assessment of potential hazards to public resources from changes in streamflow, and determination of appropriate monitoring projects.

Upper Little Klickitat Level II Watershed Analysis. Klickitat River Basin, Washington, Boise Cascade Corporation.. Project duration: 09/1997 to 09/1998. The analysis covered a watershed area of approximately 94 square miles, upstream of the city of Goldendale, Washington. Ed Salminen, along with other team members, conducted a watershed analysis of the area using the Washington Department of Natural Resources Watershed Analysis methodology. Ed completed the hydrology assessment that addressed water quantity, natural stream flows, and land use effects on peak flows. Prescriptions were developed to address identified problems in the basin. Assessment participants included DNR, WDFW, and the Yakama Indian Nation.

Ohop/Tanwax/Powell Level II Watershed Analysis. Nisqually River Basin, Washington, Nisqually Indian Tribe. Project duration: 08/1997 to 07/1998. The project area (110 square miles) included several small tributaries to the Nisqually River in Pierce and Thurston Counties, Washington. As a consultant to the Nisqually Indian Tribe, Ed served as Project Manager for this watershed analysis which was conducted using the Washington Department of Natural Resources Watershed Analysis methodology. In addition to coordinating the activities of the resource assessment team Ed also served as the Riparian Function module team leader, which involved analyzing current and historic riparian conditions, determining delivered hazards due to forest practices on large organic debris recruitment and streamside shade, and determining appropriate monitoring and restoration projects.

West Fork Tilton/Nineteen Creek Level II Watershed Analysis. Cowlitz River Basin, Washington, Murray Pacific Corporation. Project duration: 07/1997 to 11/1997. The analysis encompassed an area of approximately 33 square miles, located in the headwaters of the Tilton River in Lewis County, Washington. Ed Salminen led the Hydrologic Change analysis for the assessment using the Washington Department of Natural Resources Watershed Analysis methodology. Duties included acquisition and analysis of historic climactic and streamflow records, modeling changes in peak flows due to forest practices, assessment of potential hazards to public resources from changes in streamflow, and determination of appropriate monitoring projects.

Tribal Biologist/Hydrologist. Nisqually River Basin, Washington, Nisqually Indian Tribe (as an employee). Project duration: 11/1992 to 06/1997. From 1992 to 1997 Ed Salminen was employed by the Nisqually Indian Tribe. Among Ed's duties was the review of planned projects on state and private lands within the Nisqually Basin to determine possible impacts to fisheries from mass wasting, soil erosion, and alteration of riparian areas. In this capacity Ed worked on numerous interdisciplinary teams to prevent or avoid impacts to the Tribe's fisheries resource.

Muck Creek Restoration Project. Nisqually River Basin, Washington, Nisqually Indian Tribe (as an employee). Project duration: 10/1997 to 05/1997. Ed Salminen worked with tribal staff on a Department of Defense project to enhance salmon and trout habitat along several miles of Muck Creek, a tributary of the Nisqually River in Pierce County, Washington. Ed designed appropriate restoration projects in cooperation with U.S. Army environmental staff, supervised sub-contractors, and Tribal restoration crews. Projects included removal of reed canarygrass and riparian plantings.

Keechelus/Mosquito Creek Level II Watershed Analysis. Yakima River Basin, Washington, Plum Creek Timber Co.. Project duration: 07/1996 to 03/1997. The analysis covered a watershed area of approximately 78 square miles, located in the headwaters of the Yakima River near Snoqualmie Pass, Washington, and was conducted using the Washington Department of Natural Resources Watershed Analysis methodology. Ed Salminen completed the Hydrologic Change assessment that addressed changes in water quantity (both peak and low stream flows) associated with forest harvesting.

Nisqually Resource Management Plan wetland inventory. Nisqually River Basin, Washington, Nisqually Indian Tribe (as an employee). Project duration: 04/1994 to 08/1996. While employed by the Nisqually Indian Tribe, Ed Salminen served as Project Manager of a wetlands inventory that covered approximately 140 square miles of commercial forest land in the mid-Nisqually River basin, Washington. In addition to overseeing the consultants hired for the project, Ed acquired and analyzed wetland data for the project area and co-authored the final project report which included prioritized recommendations for wetland protection and restoration.

Mashel River Level II Watershed Analysis, Washington. Nisqually River Basin, Washington, Nisqually Indian Tribe (as an employee). Project duration: 06/1995 to 05/1996. The Mashel River is a 90 square mile tributary of the Nisqually River in Pierce County, Washington. The Mashel River is an important Fall Chinook and steelhead stream. While employed by the Nisqually Indian Tribe, Ed Salminen served as Project Manager for this Watershed Analysis which was conducted using the Washington Department of Natural Resources Watershed Analysis methodology. His duties included acquisition of funding, project design, supervision of consultants, coordination with land owners, data acquisition and analysis, and final report preparation.

Review of the effects of forest management on in-stream phosphorus levels in the Pacific Northwest. Tualatin River Basin, Oregon, Oregon Department of Forestry (as an employee of Oregon State University). Project duration: 04/1991 to 01/1992. In the late 1980's, deteriorating water quality conditions in the Tualatin River basin, a 710 square mile tributary of the Willamette River near Portland, Oregon, led the Oregon Department of Environmental Quality (DEQ) to establish total maximum daily loads (TMDLs) for phosphorus inputs from all land uses and activities in the basin. The Oregon Department of Forestry (ODF) was charged with developing a phosphorus control plan for phosphorus inputs associated with forest management activities. However, numerous uncertainties existed as to the extent to which forest management activities contributed to in-stream phosphorus levels. This uncertainty was due to the lack of any systematic synthesis and summary of existing research and regional data. In 1991 ODF contracted with Oregon State University College of Forestry to review the effects of forest management on in-stream phosphorus levels in the Pacific Northwest. Ed Salminen, at that time employed as an Assistant Research Hydrologist at Oregon State University, conducted the review, and was lead author of the final report to the ODF. This project included an extensive review and synthesis of peer-reviewed and "gray" literature on forest management contributions to in-stream phosphorus loading, and collection and analysis of unpublished regional data sets.

Water Use Inventory; US Forest Service Siuslaw National Forest, Oregon. Siuslaw National Forest, Oregon, Siuslaw National Forest (as an employee). Project duration: 06/1990 to 01/1991. While employed as a Hydrologist for the US Forest Service, Ed Salminen conducted a water use inventory of the Siuslaw National Forest, Oregon. This included coordinating with state and federal agencies to assemble existing information, assembling a database and mapping water use. Final products included a water users layer in the Forest GIS and a database of water users.