Mike Liquori
Principal

Mike Liquori is a Watershed Geomorphologist and Hydrologist with a multi-disciplinary background in forest watershed ecology, environmental facilitation and restoration design. He has planned management strategies at the site, watershed, regional, and statewide scales, and has led management projects in restoration/mitigation design, watershed analysis, habitat conservation planning, monitoring & adaptive management. He has developed numerous stream and floodplain restoration and mitigation projects to manage sediment, improve fish & riparian habitat, and restore channel stability & integrity. He has been a principal investigator for studies in fluvial geomorphology, hydrology, riparian ecology, salmonid habitat, and BMP effectiveness, among others. He commonly negotiates with outside interests and has proven facilitation skills, often developing out-of-the-box, win-win solutions among contentious parties. He has extensive technical, watershed-scale modeling, and GIS capabilities, which he has used to develop objective watershed-scale criteria for watershed stewardship and land-use planning. Mike has taught courses in Forest & Fisheries Interactions, River Ecology and Wildland Hydrology at the University of Washington.

Education	Doctoral Program (1999-2005)	Forest Hydrology & Engineering, University of Washington, Seattle, Washington
	M.S., 1995	Geology (fluvial geomorphology), Colorado State University, Fort Collins, Colorado
	B.S., 1993	Earth Sciences (Geology) University of California, Santa Cruz, California
Professional Societies	American Geophysical Union – Hydrology Section American Water Resources Association Geological Society of America Society for Ecological Restoration Society of American Foresters	
Professional Registration & Certifications	Washington Licensed Engineering Geologist No. 731 Certified Level II Analyst for Washington State DNR Watershed Analysis Certified Advanced Negotiator - Champion International Corporation Qualified Facilitator – Champion International Corporation Certified Trainer – Peak Potentials	

SELECTED PROJECT EXPERIENCE

Quincy Library Group Peer Review Panel

US Forest Service Pacific Southwest Research Station/Pinchot Institute

Lead scientist reviewing hydrology, riparian ecology and watershed issues for an independent peer review of forest management policies associated with the Quincy Library Group – the largest experimental community forestry project in the country. The group has been working to establish forest management practices that address fire risk, ecosystem functions, and other issues of importance to the community. The peer review consists of detailed analysis and audit of existing monitoring data to determine how well the project has been meeting its goals.

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California Board of Forestry Riparian Literature Review Project

CALFIRE

Project manager and contributing scientist for a comprehensive review of riparian literature related to forest management in California's forested landscape. The purpose of the literature review is to support the development and adoption of riparian rules to protect water quality and fish species.

Cooperative Monitoring Evaluation & Research (CMER)

Timber Fish & Wildlife Cooperative

Provided technical leadership to the forest sector in Washington State. CMER was responsible for recommending ways to integrate scientific principles into forest management. We answered directly to the Forest Practices Board, and were administered through the Washington State Department of Natural Resources. We managed a $17M budget for scientific monitoring and research projects that addressed specific concerns associated with forest impacts with a particular focus on fish habitat, water quality and wildlife. Chaired several sub-committees and tasks associated with these projects.

Pilarcitos Integrated Watershed Management Plan

San Mateo Resource Conservation District

Leading an effort to integrate facilitated stakeholder involvement into a comprehensive integrated watershed management plan. The Pilarcitos is a major water supply for the City of San Francisco, the City of Half Moon Bay and many local users. The watershed suffers from an overallocated water supply, degrading fish habitat, and constraining land-uses. The Integrated Management Plan will identify additional data needs and opportunities for resolving these key issues to meet watershed goals.

Napa Yountville Concept Design

California Stewardship Institute

Senior geomorphologist for a restoration design on 10 miles of the Napa River between Oakville Crossing and Oak Knoll. The Napa River has incised over 30 feet since agricultural land-use practices began. Incision has simplified the channel, reduced salmonid spawning habitat, and degraded water quality. Recent bank erosion is continuing to degrade water quality and fish habitat. Our design will integrate landowner constraints and geomorphic principles to establish a sustainable configuration for the Napa River that will be more resilient.

Lower Squaw Creek Concept Design

Placer County Planning Department

Project Manager for a conceptual restoration plan along a sensitive sub-alpine meadow with significant historic and current land-use impacts. The stream has been extensively incised due to numerous land-use impacts, and erosion control efforts have experienced mixed success. Project goals are to restore eco-geomorphic functions by identifying restoration opportunities and constraints and developing alternatives that meet ecological, economic, social and political objectives. Design solutions for the site include an integrated set of features designed to improve floodplain interactions, restore bank stability, and regulate natural sediment loads in a manner that is consistent with a dynamically stable channel system.

Forest Management

Champion Pacific Timberlands/Campbell Timberland Management

Managed watersheds for as much as 860,000 acres of managed forests in Washington, California and Oregon. Mike designed and implemented scientific programs to guide management strategies and to measure impacts. He guided long-term management plans by ensuring that ecosystem functions and processes were maintained. He coordinated with other landowners, regulators, native tribes, environmentalists and others to facilitate resolution to complex issues.

Forests & Fish Regulatory Reform

Washington Forest Protection Association

Participated as a key scientific advisor to the forest products industry in Washington State during a contentious and multi-year negotiation to reform state-wide forest practice regulations to improve conditions for endangered salmonids, headwater amphibians, and water quality. Stakeholders included 23 native american tribes, state and federal regulators, environmental groups, dozens of industrial forest landowners and thousands of non-industrial private landowners. Reform was focused on resolving issues with Clean Water Act and the Endangered Species Act, and included both NEPA and SEPA components.

Watershed Analysis

Various Clients

Participated in many watershed analysis projects, including the Mashel, Panakanic, Gold Fork, Ohop, Tanwax, Powell, and Palix. Also implemented prescriptions associated with the Kosmos, EF Tilton, WF Satsop, Connolly, and others. Experience in channels, mass wasting, riparian, hydrology, and surface erosion methods specific to watershed analysis. Particularly strong at synthesizing the information from various modules into a coherent management framework. Used watershed analysis tools and products to develop monitoring and adaptive management systems.

Forest Watershed Task Group

National Council for Air & Stream Improvement (NCASI)

Represented a large, multinational Fortune 200 corporation on a national committee of scientists and managers responsible for developing and responding to scientific management issues in forest watersheds. Prioritized and scoped research tasks for 2 staff members, and coordinated a multi-million dollar research agenda.

Mattole Watershed Analysis Review

Mattole Restoration Council

Providing senior technical review for a watershed analysis being sponsored by Pacific Lumber Company on lands owned within the Mattole watershed. The Mattole has been extensively degraded by historic logging practices, and unlike most coastal watersheds, has yet to recover in the 3-5 decades since harvest. Our review provided a science-based review, and included recommendations for improvements to the assessment and associated conclusions.

Upper Truckee River Restoration EIS

California Department of Parks & Recreation

Responsible for evaluating the hydraulic, geomorphic and hydrologic impacts associated with a restoration design of the Upper Truckee River near Washoe Meadows State Park. The project involves a highly complex restoration design intended to restore ecological integrity and geomorphic function along the Upper Truckee River and adjacent meadow within the project site. It involves finding a balanced solution to complex hydraulic, geomorphic and ecological processes.

Northwest Forest Plan Review

University of Washington

Mike participated in a review with Dr. Jerry Franklin of the implementation effectiveness of the Northwest Forest Plan's Adaptive Management Program. We toured several US Forest Service offices and Adaptive Management Areas to identify opportunities and constraints for revised management policies.

Sustainable Forestry Audit

PriceWaterhouseCoopers

Provided an independent, 3rd-party audit for water quality and watershed issues following the Sustainable Forestry Initiative® standards. Reviewed over a dozen harvest units and road sites to evaluate application of sustainable standards. Identified cost-effective improvements to management guidelines that will result in improved sustainability and water quality benefits.

San Lorenzo Fish Passage

City of Santa Cruz

Reviewed two seemingly natural fish passage barriers to identify the source of the barrier. One barrier appears to be associated with historic railroad construction that delivered large boulders into the river. Another barrier appears to be associated with indirect geomorphic modifications associated with a historic dam site. In both cases, the extent of human influence on these features opened the door for restoration actions that would otherwise be unavailable.

Northstar Highlands Mitigation Design

East-West Partners

Developed a mitigation restoration design for a small headwater channel in response to a new road development project. The mitigation design had difficult constraints given the orientation, wide variation in flow requirements, relatively steep slope, historic disturbance, and requirements associated with the mitigation project. Developed a Monitoring and Mitigation Plan for the project site.

Watershed Wide Wastewater Discharge Requirement Testimony

Environmental Protection Information Center

Provided detailed technical support and testimony in support of new watershed-wide wastewater discharge permit requirements for Elk River and Freshwater Creek in coastal California. These new standards sought to limit the cumulative watershed effects associated with timber harvest and road activities. Our testimony resulting in the board accepting the requirements with modest refinements (as recommended), despite heavy opposition to the requirements.

Walker River Mediation

Walker River Irrigation District

Representing the client in technical meetings addressing hydrology issues related to a water rights mediation negotiation. Water rights in the Walker River basin are over-allocated, resulting in long-term dewatering of the terminal Walker Lake, endangering the ecological value of the lake. Mr. Liquori is working to find solutions that meet difficult hydrological, political, social, ecological and economic constraints.

Oak Knoll Redevelopment Channel Design

SunCal

Designed a major channel restoration in associated with a residential redevelopment project at the former Oak Knoll Navy Base in Oakland, California. The project was constrained by a large amount of new fill, degraded existing conditions, and a need to realign portions of the channel while retaining the riparian conditions along other sections.

Contra Costa Hydromodification

Contra Costa County

Developed a methodology for evaluation the potential hydrologic modification impacts associated with land development activities. Our method is being adopted by Contra Costa County to establish guidelines for land development that meet water quality and sustainability criteria. Our

method integrates a simple channel typing screen with simple field measurements to identify those sites requiring more detailed analysis. The protocol resulted in an effective stream stability rating using 4 easily collected field channel measures.

Walker River Steering Committee

Walker River Irrigation District

Working with a broad group of stakeholders, the Steering Committee is charged with developing restoration projects that are designed to increase water delivery to Walker Lake. As one of the largest terminal lakes in the United States, Walker Lake has been rapidly declining over the last 150 years, and is now a threatened ecosystem. The complex hydrologic and land-use requirements in this watershed make such an effort a major challenge.

Hillslope Hydrology Studies

Champion Pacific Timberlands

Developed extensive literature reviews and onsite research into the role of timber harvest and roading on hillslope hydrology processes, including subsurface and surface runoff impacts.

Stream Gage Monitoring

Various Clients

Established automated gage systems on streams, wetlands, and floodplain environments. Performed numerous surveys to support data collection efforts, including hydrologic investigations, water quality and fish habitat.

Channel Migration Zone Delineation

Various Clients

Conducted site-based and photo-based delineations of channel migration zones along several reaches of the Puyallup, Hoh, Mowich, Tolt, Snoqualmie, Cispus, Cowlitz, White, Carbon & Queets Rivers. Conducted numerous evaluations along smaller streams. Provided technical content and review for the Washington State Forest Practice Board Manual on channel migration delineation.

Regional Landslide Inventory

Weyerhaeuser Company

Integrated a large spatial database of landslide information for over 1.1 Million acres of company lands in Washington State. Data was provided by various watershed analysis methods, using different standards and protocols. Integrated the data using common protocols and spatial map integration procedures. Data was compiled and analyzed within a GIS framework.

Upland Process Science Advisory Committee

Washington State Department of Natural Resources

Chaired a state-wide committee tasked with managing adaptive management projects in the state's forested domain. Responsibilities included coordinating and developing all scientific and research projects associated with roads, channel migration, hillslope stability, and hydrology issues. Managed a staff member dedicated to this committee.

Watershed-Scale Hydrological Modeling

Various Clients

Modeled hydrologic response for numerous watersheds in association with forest resource management planning, road erosion studies, perennial flow initiation studies and various engineering applications. Model results were used to assess design impacts from peak flow runoff, rain-on-snow, baseflow, flow routing, duration analysis, flood frequency assessments and others. Geomorphic modeling experience includes slope stability, road erosion, landscape evolution,

channel condition, riparian/channel dynamics, wood recruitment and others. Familiar with numerous models including HEC-1, NFF, Rational, TR-55, HSPF, WMS, DHSVM and others.

Water Typing Survey Program

Champion Pacific Timberlands

Managed survey crews that collected stream characteristic and fish use data for over 200 miles of stream in western Washington. Data used to inform timberland operations and support a stream typing model that identified probabilities for fish use based on several landscape factors.

Riparian Zone Effectiveness Study

Kapowsin Tree Farm

Evaluated 20 riparian management zone buffers following timber harvest to determine short-term and long-term impacts on key aquatic variables. Results indicated that long-held assumptions about treefall direction from riparian forests do not apply to riparian buffers. These results have significant implications for wood recruitment modeling and riparian buffer design.

Christmas Valley Erosion Control Project

El Dorado County Department of Transportation

Mr. Liquori was the Project manager for the Existing Conditions phase of a County Transportation Department project that is addressing storm-driven erosion along a county road. The project involves hydrologic modeling for a series of small watersheds that are tributary to the Upper Truckee River that deliver flood flows to a small community of houses and a county road. Major issues include an unstable natural channel distribution system, excessive erosion along existing drainage systems, and complex landowner issues.

Sediment Supply Studies

Pacific Northwest and California Regions

Evaluated sediment supply from various watershed management practices, including agricultural, hydro-electric, and forestry operations. Developed protocols and methods used for state-wide adaptive management and monitoring systems, and for local operational management. Evaluated sediment supply from road systems, forest harvest, cumulative sediment supply, landslide inventories, and sediment budgets. Integrated watershed-scale sediment supply evaluations with in-channel assessments to determine effects on channel morphology, transport capacity, aquatic habitat, and riparian functions.

Big Creek Road Project

Southern California Edison

Inventoried project roads for a FERC relicense applicatant in the Big Creek Hydropower project area. Developed semi-quantitative rating of sediment production from roads, and delivery ratings to streams. Captured data in real-time GIS/GPS system that provided the client with a database of culverts and sediment sources for use in operational management of the road network.

Forest Slope Stability

Various Clients

Conducted 100+ site reviews of forest road and/or harvest operations to ensure management actions did not exacerbate hillslope stability in sensitive areas. Identified sensitive sites and unstable slopes based on field evidence, aerial photo interpretation, and various geologic, soils & hydrology data. Developed review protocols applied at the company and statewide level. Also developed innovative site prescriptions to reduce potential impacts within the constraints imposed by operational feasibility and landscape geometry. Developed tools to improve and/or inform analysis and provided slope stability training.

Wetland Identification Handbook

Boise Cascade

Developed a *Wetland Identification Handbook: A Guide for Pacific Northwest* Forestlands for Boise Cascade Corporation for use throughout their operating region in Washington, Idaho and Oregon. Described primary wetland types, outlined classification methods, and described characteristic communities for wetland identification, including obligate and facultive species specific to various ecotones within the Pacific Northwest Region.

Perennial Flow Initiation Studies

Washington State Department of Natural Resources

Conducted studies in Pierce, Lewis and Klickitat Counties, and co-chaired a larger state-wide study to improve identification of the location where perennial flows begin in forested headwaters to support regulatory requirements and guide policy decisions. Provided data and guidance to economic models. Developed implications for adaptive management policies and impacts to land-use management constraints.

Stream Temperature Monitoring Program

Champion Pacific Timberlands

Managed a stream temperature monitoring program in a managed forest landscape. Results were used for compliance and effectiveness monitoring, and were used to test several management hypotheses. Data supported numerous policy negotiations and management planning processes.

Headwater Geomorphology Studies

Champion Pacific Timberlands

Conducted research on nearly 1000 stream reach sites to evaluate trends in characteristics for managed headwater streams. Integrated these results with studies addressing biological needs for headwater amphibians to develop management standards and strategies for protecting key ecosystem functions and processes. Presented results at conferences in Washington, Oregon and British Columbia.

Riparian Large Woody Debris Recruitment Models

Various Clients – Pacific Northwest

Developed large woody debris recruitment models to guide riparian management practices and policies in forested environments. Implemented the model over numerous timber harvest locations and long-term harvest planning. The model provided short-term and long-term estimates of recruitment and residual riparian stand composition by integrating calibrated data with regionally based estimates and local geometry of the site.

Stream Temperature Workshop

Timber Fish & Wildlife Cooperative

Facilitated a contentious workshop to resolve stream temperature monitoring and modeling guidelines associated with forest management policies. Over 50 scientists from the timber industry, government agencies, tribal governments, and environmental advocates attended this two-day event. The outcome identified a broad consensus for monitoring and research activities that would support a rigorous adaptive management framework.

Road Maintenance & Abandonment Programs

Various Clients

Played a major role in the development of a formal Road Maintenance & Abandonment Program (RMAP) that was implemented by the Washington State Department of Natural Resources as part of the “Forests & Fish Agreement”. The program requires all forest roads in the state to undergo rigorous review and repairs to minimize sediment production, disconnect road runoff from stream networks, ensure fish passage, and restore hydrologic conditions. Helped to set state

standards, developed guiding documentation, provided training, and chaired the committee responsible for adaptive management of the program.

Klickitat Habitat Conservation Plan

Glenwood Tree Farm

Provided lead for aquatic conservation strategy on 30,000 acres of timberlands within the Klickitat River watershed. Developed riparian management strategies that support aquatic management goals using high-quality scientific data and hypotheses. Developed plan to restore ecological integrity and diversity in a fire-suppressed riparian community. Established monitoring programs to efficiently evaluate long-term effectiveness of management strategies. Also negotiated unique approaches to resolving difficult problems.

Long-term Forest Management Planning

Champion Pacific Timberlands

Participated in a team of land-use managers to guide sustainable forest management planning for a 300,000-acre industrial forest in Washington state and another ownership of 860,000 acres in Washington, Oregon and California. Combined economic, ecological and operational opportunities and constraints within the context of a sustainable management policy that was required to meet rigorous environmental metrics and standards.

Road Inventory Programs

Champion Pacific Timberlands

Worked with scientists and operational road engineering staff to develop tools for estimating road sediment production & delivery and to identify/prioritize road system repairs and maintenance. Established systems for data collection and analysis, as well as protocols and standards that were ultimately used to support adaptive management systems.

Watershed Analysis Design Team

Timber Fish Wildlife Cooperative

Selected to participate in a team of scientific experts to refine watershed analysis procedures for the Washington State Watershed Analysis program. Prior experience working with operational and planning elements in managed forestlands supported the ability to develop cutting-edge approaches to collecting scientific information to support management prescriptions. Work lead to design improvements for channels, mass wasting, riparian, hydrology, and surface erosion methods specific to watershed analysis. Developed watershed analysis tools and products to inform specific management strategies that improved conditions for sensitive aquatic systems.

Adaptive Management Systems

Timber Fish Wildlife Cooperative

Played a leading role in implementing a state-wide, science-based adaptive management program in Washington State. Chaired a committee of industry, agency, and tribal representatives who designed studies and programs to evaluate the effectiveness of current regulations on resources of concern. Established protocols and standards for adaptive management systems. Also designed studies and analyzed data to draw inferences relevant to policy decision-making. Facilitated resolution to contentious issues between advocates.

Landscape-Scale Due Diligence

Various Clients

Evaluated target acquisition properties for several timber management firms, primarily focused on evaluating harvest and roading constraints associated with riparian protections, forest slope stability issues, road erosion and fish passage, and accurate stream typing. Modeled landscapes to identify productive acreage, economic costs & benefits, and land-use issues. Identified risks to acquisition and conducted Phase 1 Environmental Reviews.

Sustainable Forestry Programs

Various Clients

Called on by several forest management organizations to assisted company executives and senior management in developing standards for sustainable forestry programs, including audit procedures and standards. Provided guidance to executive leadership during implementation of the Sustainable Forestry Initiative™, including components of 3rd-party audits, defining standards, and establishing protocols.

Large Woody Debris Placement

Various Clients

Evaluated and designed large woody debris placement projects in several northwest streams. Project objectives have included bank protection, pool formation, sediment retention, spawning gravel development, fish cover, and others. Project scope has varied from small, non-fish streams to large rivers.

Forest Road Engineering

Kapowsin Tree Farm

Assisted in the development of stream crossing structures and slope stabilizing structures in the aftermath of a flood of record on a 180,000 acre tree farm in western Washington. Stuctures included bridges, bottomless culverts, box culverts, log-crib structures, arch-pipes, retaining walls and re-routed roads. Evaluated elements of structural design related to hydrologic and sedimentologic issues.

Channel Designs

Various Clients

Involved in several design and design-build projects to restore or enhance channels for fish passage, habitat improvement, pool generation, wood placement, spawning habitat, step/cascade features, sediment regulation and other objectives.

Riparian Design

Various Forestry Clients

Designed riparian buffer strategies at site, regional and state-wide scales. Helped establish riparian buffer regulations in Washington State for the Forest Practices Board. Developed and implemented voluntary riparian buffer standards for a Fortune 200 forest products firm, and for a 30,000 acre Habitat Conservation Plan. Developed modeling tools to guide buffer design, including site-based and watershed-scale models.

Erosion Control Program

International Paper

Responsible for implementing erosion control systems for 300,000 acres of industrial forestlands. Measures included unpaved road erosion controls, drainage system design, monitoring and analysis. Source control methods included vegetation control, buffer strip management, bioengineering, geotextiles, hydroseeding, and others.

Fox Creek Canyon Wetland Design

Champion Pacific Timberlands

Involved as part of a team of scientists in the design of a wetland improvement project to restore or enhance habitat for fish and wildlife in the Fox Creek Canyon. Improvements included fish passage, habitat augmentation, wood placement, vegetation planting & control (including exotic removal). The project included a public trail and interpretive signage.