JONATHAN P. HOUGHTON, PhD

Senior Principal Marine/Fisheries Biologist

EXPERTISE

Mitigation planning

Benthic ecology

Salmonid life history

Ecological risk assessment

Permitting assistance

NEPA/SEPA/ESA compliance

Fisheries ecology

Habitat restoration

NRDA investigations

Marine/estuarine ecology

EDUCATION

PhD, Intertidal Ecology, College of Fisheries, University of Washington, 1973.

AB *cum laude*, Biology, Harvard University, 1964

Ecological Risk Assessment Short Course - Society of Environmental Chemistry and Toxicology, 1994

AFFILIATIONS

Washington Public Ports Association

Society of Environmental Toxicology and Chemistry

American Institute of Fisheries Research Biologists, (former chapter vice-director)

Western Society of Naturalists

Society for Ecological Restoration

Pacific Estuarine Research Society

Jon is a senior biologist with 36 years of consulting experience in the Pacific Northwest, the Rocky Mountains, and Alaska. This experience has met a wide range of client needs, including baseline studies, environmental impact assessment, natural resources injury assessment, ecological risk assessment, and mitigation and remediation planning. He is equally comfortable working in freshwater, marine, or estuarine environments. He has special expertise in the ecology of salmonids in the Pacific Northwest and Alaska, as well as in the effects of perturbations, especially metals and habitat alterations, on coldwater fish populations. He has frequently been called on as an expert witness. A founding Pentec principal, he has a solid history of successfully managing large multidisciplinary environmental projects.

REPRESENTATIVE PROJECT EXPERIENCE

Shoreline Habitat Assessments, Lake Washington, King County, WA. Conducted assessments of shoreline habitats and effects on fish habitat of existing and planned shoreline activities at several sites on Lake Washington; prepared BEs assessing effects on ESA-listed species. The project included expert testimony.

Renton Seaplane Base, Biological Evaluation, Renton, WA. Directed preparation of biological evaluation of a proposed rebuilding of several on and overwater structures associated with a seaplane base docking facility adjacent to the mouth of the Cedar River for the FAA. Negotiated acceptable project conditions to protect ESA-listed species.

Port of Everett, Natural Resources Consultant. Everett WA. As a primary natural resources consultant to the Port of Everett, Dr. Houghton has been involved in developing baseline information, designing mitigation actions, and providing permitting assistance to the Port since 1985. Over this time, he has played a major role in the successful permitting most of waterfront projects undertaken by the Port. These projects have ranged from the 1987 dredging of Pier 3 North to ongoing monitoring work on Jetty Island, Mt. Baker Terminal, and the 12th Street Yacht Basin. In between, he managed the consulting team that brought the new Pacific Terminal into being by using an innovative approach: Sediments between Piers 1 and 3 were cleaned up by placing them in a nearshore confined disposal area that could be capped to become the terminal uplands; a key element in this success was the development of the Union Slough Restoration site as a *de facto* mitigation bank. He has aided the Port in receipt the national recognition with two AAPA Environmental awards for innovative mitigation approaches. In addition to providing assistance in the localized, but essential smaller projects necessary for the Port's function (fender pile replacements, sewage pumpout stations, bulkhead repairs and rebuilding), he has

represented the Port (and City) of Everett at the technical level in support of salmon recovery in the Snohomish watershed and in the recovery of Puget Sound through the Puget Sound Partnership.

CEMEX (Rinker) Delta Site Redevelopment, Everett WA. Currently directing Pentec's work to permit redevelopment of a former mill site along the Snohomish River. To mitigate for necessary bulkhead repairs and for overwater coverage of a new barge offloading pier, designed an innovative restoration of bulkheaded shorelines to maximize habitat values by cutting back banks, reducing slopes, improving substrate to promoting development of a brackish marsh with riparian buffer along the shoreline.

Riverside Business Park Redevelopment, Everett WA. Currently directing Pentec's work related to redevelopment of a former mill site along the Snohomish River. Designed an innovative restoration of bulkheaded and disturbed shorelines to maximize habitat values by cutting back banks, reducing slopes, and improving substrate to promoting development of a brackish marsh with riparian buffer along the shoreline.

City of Edmonds, Stream Outfall Extension, Baseline Surveys and BE, Edmonds, WA. Directed underwater diver and video surveys of the culverted outfall from Willow Creek—an anadromous fish stream and a major conveyance for stormwater from the Edmonds bowl. Mapped eelgrass and prepared a Biological Evaluation of the effects of a project to lengthen the outfall to eliminate clogging from nearshore sediment movement.

ESA Response Planning, Puget Sound, WA. Assisted multiple clients, including the Ports of Seattle, Everett, Edmonds, and Olympia, in assessing their ESA responsibilities and appropriate response strategies in a regional context. Represented ports on Water Resource Inventory Areas 7 and 9 technical committees engaged in preparation of watershed salmon recovery plans.

Port of Seattle, King County, and City of Tacoma, Salmon Recovery Planning, Technical Assistance, Water Resource Inventory Areas 8, 9, and 10, Central Puget Sound, WA. Played active role on interagency fish technical committees engaged in salmon recovery planning for four central Puget Sound watersheds and adjacent nearshore areas. Prepared sections of technical committee reports related to estuary and nearshore areas including the Duwamish River, and provided input on appropriate restoration actions and modeling of salmon population recovery. Was a co-author of a comprehensive evaluation of the state of marine habitats and species in central Puget Sound.

Skagit River Salmonid Life History Studies, Skagit Co. WA. Conducted 3-year study of life history of anadromous and resident salmonids in lower Skagit River and several tributaries.

Salmon Enhancement Program, Western WA. Prepared three programmatic EISs regarding the effects of salmon enhancement via hatcheries, rearing ponds, gravel restoration, and egg incubation boxes.

Port of Vancouver, Vancouver Lake Restoration Project, Vancouver, WA. Performed fisheries evaluations for restoration of tidal function and circulation to Vancouver Lake in southwest Washington.

Benthic Community Analysis, Baltimore Harbor, MD. Conducted analysis of benthic infaunal samples from contaminated areas of inner Baltimore harbor for the Maryland Port Authority.

Snohomish Estuary Fish Study, Everett, WA. Directed multiyear studies of juvenile salmonid use of wetlands and channels of the lower Snohomish estuary and of juvenile salmonid, crab, and bird use of mudflat habitats, for the Port of Everett.

Fish Protection Strategies for Alaska Natural Gas Transportation System, AK. Evaluated measures necessary to protect migrating fish during the design and construction of a major cross-state gas pipeline. Developed culvert velocity criteria for upstream migration of resident and anadromous fish. Compiled best management practices and mitigation measures for road, pipeline, and culvert installation, and described a set of rationales for applying them.

North Fork Snoqualmie Water Supply Project, King County, WA. Directed studies of the effects of a proposed water supply/hydropower project on fish habitat in the reservoir and downstream areas for the City of Bellevue. Studies included application of instream flow incremental methodology (IFIM) to assess effects of flow changes on resident and anadromous salmonids, as well as assessment of mitigation/enhancement options for small tributary streams.

West Dock Environmental Assessment, Prudhoe Bay, AK. Led an effort that used available survey data to model the effects the West Dock and Endicott causeways on nearshore water quality and fish movement patterns for Sohio Alaska Corp. Used habitat suitability approach.

Vancouver Lake Restoration Project, Vancouver, WA. Performed fisheries evaluations of Vancouver Lake in southwest Washington.

Community Impacts Assessments, Whatcom County, WA. Evaluated fisheries-related impacts of recreational and residential developments on several small streams and Lake Whatcom.

Snohomish County Work Group, Snohomish River Basin Conditions and Issues Report, Snohomish River, WA. Described the status of salmon usage of the lower Snohomish Estuary and served as technical reviewer for other sections of a comprehensive evaluation of the overall status of the Snohomish River system. The focus was on historic and current limitations of stream flows and habitat on anadromous salmonids.

Milwaukee Waterway Fill Project, Commencement Bay, Tacoma, WA. Conducted studies of salmonid outmigrant distribution and feeding in Commencement Bay in relation to the proposed fill of Milwaukee Waterway.

Snohomish River Char Monitoring Study, Snohomish River, WA. Designed the pre-monitoring reconnaissance and monitoring program for a native char study in the Snohomish River. Participated in pre-monitoring reconnaissance to identify little known char overwintering habitats and determined the most effective sampling methods for the species. Provided senior oversight and technical review of the second phase of the program that included tagging and acoustic tracking of char in the estuary and nearshore areas.

Swan Creek Habitat Improvement, Tacoma, WA. Provided senior oversight on project to create a new channel for Swan Creek, a lowland tributary of the Puyallup River. The new channel gives rearing juvenile salmonids

access to a previously inaccessible wetland area. Adult chum salmon spawned in the new channel in the first fall following project completion.

Various Shoreline Property Owners, Shoreline Habitat Assessments, Lake Washington, King County, WA. Conducted assessments of shoreline habitats and effects on fish habitat of existing and planned shoreline structures at two sites on Lake Washington; included expert testimony.

Lake Tapps Reservoir Water Right, WA. Assisted the Department of Ecology in evaluating impacts on aquatic and estuarine habitat and fish populations of proposed changes in White River water rights and Lake Tapps operations that would result from a proposal to divert flow from the lake for regional water supply.

Vancouver Lake Restoration Project, Vancouver, WA. Performed fisheries evaluations for restoration of tidal function and circulation to Vancouver Lake for the Port of Vancouver.

Lake Washington (WRIA 8) Salmon Recovery Planning, King County, WA. Participating on a team of fisheries experts on the Lake Washington drainage in modeling fish habitat responses in the river, lakes, ship canal, and adjacent nearshore areas. Used a previously developed habitat model to characterize the function of estuary and nearshore habitats.

Application of Best Available Science to Riparian Conditions, Tukwila, WA. Analyzed the City of Tukwila's buffer requirements in shoreline areas including the Green and Duwamish Rivers. Evaluated whether the city's current or proposed buffer requirements were consistent with best available science (BAS) and, where not consistent, described potential modification necessary to meet BAS requirements. Provided any justifications for not meeting BAS.

High Rock Quarry Aquatic Assessments, Snohomish County, WA. Directed evaluations of the effects on anadromous and resident fish and aquatic habitat of an aquifer blowout and a planned facilities expansion at a large gravel and rock quarry. The effects on several small salmon-bearing streams were analyzed along with potential measures to mitigate for the effects of the blowout.

Thermal Power Park Environmental Assessment, West Roosevelt, WA. Directed the first preliminary site assessment conducted by the Energy Facility Site Evaluation Council. Evaluated fisheries habitat and assessed the environmental acceptability of the site in terms of ecology, aesthetics, and compatibility with local land-use patterns.

Wetland Impact Assistance, Dupont, WA. Assisted the City of Dupont by evaluating impacts of proposed developments on wetlands under a SEPA EIS. Managed the review of other consultants' work and the proposal of changes to stormwater and trail designs to minimize wetland impacts and comply with the city's wetland regulations.

Portland District, Relocation of the Town of North Bonneville, WA. Wrote the affected environment section of the NEPA EIS for aquatic resources. Evaluated the effects of relocating the town on important salmon-producing streams. The EIS was prepared to allow development of a third powerhouse at Bonneville Dam.

Port of Everett, On-Call Environmental Services, Everett, WA. Directed over 100 projects assisting the Port in project permitting and fulfilling its environmental mission. He has conducted basic research on the Port environment and prepared BEs, NEPA EAs and SEPA EISs, and JARPAs. He conducted resource inventories and mapping for master plan support. He was intimately involved in environmental permit strategic planning, preparation, and submittal; and assistance with agency coordination and negotiation (ESA, Clean Water Act Section 10/404 Water Quality Certifications, Hydraulic Project Approval, shorelines, etc.); mitigation planning, design, and implementation; and threatened and endangered species assessments and studies.

Lake Washington Habitat Assessment, King County, WA. Characterized lacustrine habitats offshore of historical and present industrial areas along the southeast shoreline of Lake Washington. Used the Sea-All™ underwater survey system to map habitat types, fish use, and areas of wood debris. Conducted reconnaissance to assess shoreline habitat quality.

Willow Creek Outlet Channel Improvement Assessment, Edmonds, WA. Directed an evaluation of the potential benefits of daylighting the outlet of an intertidal marsh and the potential for establishment of self-sustaining salmon runs in marsh tributary streams. The work was performed for the Port of Edmonds.

Skagit Nuclear Project Environmental Studies, Skagit County, WA. Directed a multiyear baseline and biological effects study for a nuclear power plant on the Skagit River, a major salmonid-producing river in northwest Washington. The project included extensive testimony at hearings by Washington State Energy Facility Site Evaluation Council.

Union Slough Intertidal Wetland Restoration and Mitigation Bank, Lower Snohomish Estuary, WA. Managed permitting activities for the restoration of a 32-acre agricultural site to a tidally influenced brackish marsh for the Port of Everett. Conducted detailed studies of seasonal use of adjacent habitats by juvenile salmonids, and used the results to develop detailed site restoration plans. Successfully negotiated with agencies to develop a memorandum of understanding to allow the Port of Everett to use the restored saltmarsh/mudflat complex as a mitigation bank. Since completion in 2001, site has met all ecological performance goals for fish, bird, and invertebrate use and for brackish marsh establishment. Currently negotiating with agencies to develop a memorandum of understanding that will allow the Port to use the restored saltmarsh/mudflat complex as a mitigation bank. The project received the 2001 Environmental Improvement Award from the American Association of Port Authorities in the Mitigation category. The project was expanded by 5 acres in 2005 and continues to provide excellent estuarine habitat.

JAMES E. STARKES

Fisheries Biologist

EXPERTISE

NEPA/SEPA/ESA compliance

Fisheries ecology

Habitat restoration

Ecological risk assessment

Project management

EDUCATION

B.S., Fisheries, University of Washington, 1983

REGISTRATIONS

40-Hour Hazardous Waste Operations and Emergency Response Training, 1987

Certified to conduct Forage Fish Spawning Surveys, Washington Department of Fish and Wildlife, 2002

Certified by the Washington Department of Transportation to produce Biological Assessments for Federal highways projects, 2006

AFFILIATIONS

American Fisheries Society

Mr. Starkes has over 20 years of experience as a fisheries biologist, evaluating the effects of anthropogenic activities on fish and their habitats. He has produced environmental assessments (EAs), environmental impact statements (EISs), and environmental baseline documents (EBDs) in compliance with NEPA, SEPA, and ESA in the Pacific Northwest and Alaska. He has managed several baseline nearshore marine biota and habitat studies for transportation and port development projects. Jim has also managed several juvenile salmon monitoring programs to determine the migratory timing and potential exposure of juvenile Chinook salmon to contaminated sediments, as well as determined the use of salmonids within created and restored marine and estuarine habitats. He has conducted numerous field investigations collecting fish, sediments, surface water, and benthic community samples in marine and freshwater environments.

REPRESENTATIVE PROJECT EXPERIENCE

Juvenile Salmon Use in Lake Union, Seattle, WA. Project Manager for conducting a juvenile Chinook salmon study in Lake Union in the vicinity of floating home complexes. Site specific overwater and snorkel surveys were conducted at 9 floating home complexes to determine the actual significance, if any, that these structures have on the outmigration patterns of juvenile salmon. To augment findings, results of recent juvenile Chinook acoustic tagging studies conducted in Lake Union by the U.S. Fish and Wildlife Service were also evaluated and reported. Results found very little association of juvenile salmon with floating home complexes, or in the general nearshore of the lake. These findings were consistent with acoustic tagging which showed a pattern of use in Lake Union and the Ship Canal characterized by a general offshore use of aquatic habitats. A number of physical and biotic factors may be responsible for the offshore presence including prey abundance, predator abundance and location, and the high level of nearshore development already present on the lake.

Buckhorn Mine EIS, Okanogan County, WA. Project and Field Manager for conducting baseline fishery surveys on five streams draining a proposed mine project, for the Washington State Department of Ecology. Conducted baseline habitat and fish surveys using existing bull trout protocols to determine the statistical presence or absence of this federally protected species and other salmonids in project area streams. Stream habitats were also evaluated for potential use by redband rainbow trout, a state species of concern. Prepared an Aquatic Resources Discipline Report in support of the Supplemental EIS process. The impact analysis and report were formatted into Affected Environment and Environmental Consequences sections for seamless incorporation into a SEPA EIS.

Oregon Department of Transportation, Fall Creek Culvert and Bridge Project, Tillamook, OR. Project manager for the preparation of a biological assessment to replace an existing culvert with a bridge over Fall Creek within

the Wilson River basin (U.S. Highway 6). Assessed the potential effects to the ESA-listed Oregon Coast coho salmon ESU. Conducted baseline stream survey on Fall Creek to determine existing stream conditions and provide hydrologic data for stream restoration designs. The existing stream used a poorly functioning fish passage device that would be removed, followed by rechanneling the stream to its historical channel, providing a more appropriate slope for anadromous fish migration. Worked with a multi-agency team to produce the biological assessment and stream restoration designs, construction methodologies, and conservation measures.

Willow Creek Stream Restoration Project, Edmonds, WA. Project Manager for producing engineering designs to repair winter storm damages to Willow Creek, a small stream that flows through Edmonds, Washington, discharging directly to Puget Sound. Designed a new stream channel that included: excavation of existing sediments to removed storm deposits; reline the new channel with gravel and cobbles; use existing sediments to restablilized the stream banks; cut existing snags and anchor into new stream banks to augment stabilization; plant the new stream banks with indigenous riparian vegetation; and place large woody debris and boulder clusters to increase habitat complexity in the new stream channel. Stream restoration and stabilization followed criteria and guidelines outlined in *"Stream Habitat Restoration Guidelines"* prepared by the Washington State Aquatic Habitat Guidelines Program.

Little Bear Creek Streambank Stabilization and Fish Habitat Enhancement, Woodinville, WA. Project Manager for conducting the design and environmental permitting for a streambank stabilization and fish enhancement project on Little Bear Creek, a salmon bearing stream discharging to north Lake Washington. Severe bank erosion and undercutting was threatening a property on the stream; project objectives were to stabilize the streambank in a manner that enhanced salmonid habitat. The proposed design consists of placing and stabilizing large woody debris, rootwads, and boulders along the toe of the eroding slope, creating hydraulic roughness to slow velocity and complexity to diffuse flow in different directions. The net effect of the created in-stream structures will be to create a flow regime along the toe of the slope that will not undercut the streambank and that will simultaneously increase cover and refuge for juvenile salmonids.

Fish Salvage Operation, Hidden Lake and Boeing Creek, Shoreline, WA. Project and Field Manager for this bi-annual fish salvage operation, which was necessary to allow maintenance dredging of a forebay of Hidden Lake for flood control purposes. Fish removal was conducted in two phases. In the first phase, a 70-meter reach of Boeing Creek was isolated with sandbags and block nets and electrofished to remove juvenile Coho salmon and other fish species. In the second phase, the forebay of Hidden Lake was isolated by placing a silt barrier across one end and using a beach seine to capture fish. Several overlapping sets of the beach seine were conducted to ensure that most fish were captured. Juvenile coho salmon, residualized Chinook salmon, resident cutthroat trout, and other fish were collected from the forebay. The captured fish were held in containers of ambient water to recover and were released unharmed downgradient of proposed dredging operations. Fish removal occurred in a timely manner and allowed dredging to occur on schedule.

Ruston Way Office Building Remodel Permitting, Tacoma, WA. Project Manager for all aspects of environmental permitting of the 4041 Ruston Way Waterfront Office Building for GLY Construction. The building is situated over the intertidal zone of Commencement Bay and project proponents wanted to rebuild the structure on the existing piling foundation. Jim prepared the biological evaluation for ESA consultations, negotiated cost-effective mitigation actions with the Washington Department of Fish and Wildlife (WDFW), produced an

approved mitigation plan, and conducted extensive shade modeling to determine the degree of shadow cast by various building designs. The final building design incorporated several conservation measures including grated decking to increase light penetration to the intertidal zone, removal of overwater parking, reduction in the number of building walkways, riparian revegetation, and removal of derelict pilings and debris from the intertidal zone. In 2008, a monitoring report was submitted to WDFW showing improved light penetration beneath the building, no significant effects to outmigrating juvenile salmonids, and a thriving indigenous and attractive vegetation community.

Port of Everett, Union Slough Restoration Project Biological Monitoring, Snohomish County, WA. Field Manager for conducting biological monitoring of the Union Slough Restoration Project in the lower Snohomish River basin. The Project is a 32-acre saltmarsh/mudflat complex created by breaching a dike on Union Slough, a distributary channel of the Snohomish River, in early 2001. Monitoring included collecting quantitative data on juvenile salmon use and abundance, collecting epibenthic data, crab surveys, and water fowl surveys. Sampling of the Spencer marsh system in the basin was also conducted to compare usage of created vs. natural marsh environments. Prepared the fisheries portion of monitoring reports over the next 5 years. Monitoring results show a thriving and maturing saltmarsh and tidal side channel used extensively by several species of juvenile salmonids, juvenile Dungeness crab, and several species of sea birds and waterfowl.

U.S. Army Corps of Engineers, Migratory Behavior and Habitat Use of Bull Trout in Marine Habitats, WA. Project manager of a study to determine the distribution and migratory movements of subadult and adult bull trout in the Snohomish estuary and marine habitats. Subadult and adult bull trout were collected using beach seine and hook and line techniques, surgically implanted with acoustic tags, and released. Tagged fish were monitored with fixed receiver/hydrophones deployed at more than 20 locations in the Snohomish estuary and marine areas of Puget Sound. Mobile tracking of individual fish was also conducted in the mainstem river and major tidal sloughs, and marine areas. In addition, monitoring of upper watershed spawning areas was conducted to determine migratory timing of spawning runs. Studies indicate that native bull trout range widely between tidal freshwater areas to the marine nearshore, using a variety of nearshore habitats, often using more than one watershed during their marine residency periods.

Port of Everett, Environmental Permitting, Everett Rail Barge, Everett, WA. Project and Field Manager assisting the Port of Everett in environmental permitting for the Everett Rail Barge, a 61,000 square foot pier facility in Port Gardner, Everett, Washington. Since the proposed pier facility is a new development in an under developed area, substantial mitigation requirements were necessary to compensate for the unavoidable increase in overwater coverage. Collected baseline eelgrass data using Hart Crowser's Sea All underwater camera system. Conducted baseline forage fish spawning surveys using WDFW guidelines to characterize the spawning period for Pacific sand lance in the project area. Conducted pilot eelgrass transplant studies to determine the suitability and success of eelgrass transplants in the project area. Subsequently conducted successful transplants to expand existing eelgrass beds to compensate for the potential loss of eelgrass from shading of proposed overwater structures. Conducted juvenile salmonid monitoring of restored marine habitats. Prepared the biological evaluation and assisted in the production of the SEPA Environmental Impact Statement.

Knik Arm Bridge and Toll Authority/Port of Anchorage, Marine Studies in Knik Arm, Anchorage, AK. Field Manager for work to expand understanding of the distribution, abundance, and feeding relationships of fish and

invertebrates of marine areas in the Knik Arm to evaluate potential impacts of two major projects: a planned bridge crossing the Arm, and a 136-acre port expansion. Nearshore beach seining, offshore tow-netting and otter trawling were conducted at numerous stations within the Arm over a three year period. Also conducted intensive sampling within the marine nearshore to determine the migratory behavior of juvenile Chinook and coho salmon migrating out of Ship Creek. Conducted data analyses of juvenile salmon outmigration and marine resident fish ecology. Prepared two baseline marine fish and benthic community reports for the Toll Authority and Port.

Pile Driving and Fish Exposure Study, Port of Anchorage, Anchorage, AK. Task and field manager for permitting aspects of the proposed 136 acre Port of Anchorage marine transportation project. As part of permitting requirements, the Port was required to conduct live cage exposures of juvenile salmonids to pile driving to determine the potential impacts of pile driving steel sheet pilings on outmigrating juvenile salmonids. Managed the construction of a wetlab facility on Port property to hold juvenile salmonids and conduct short- and long-term observations of fish exposed to pile driving noise and conduct necropsies of exposed fish. Field manager for deployment of live cages during pile driving activities and coordinating with acoustics personnel for collecting noise data during impact pile driving. The field study documented worse-case scenarios of very near field exposures (<10m) to pile driving and dynamic scenarios of exposures occurring as the live cages drift past pile driving operations with the strong currents in the area.

City of Bellingham, Post Point Lagoon Habitat Restoration Project, Bellingham, WA. Task Manager for conducting the environmental permitting and design of the restoration of the Post Point Lagoon, a 3.2-acre pocket estuary along the marine nearshore in north Puget Sound. The design proposes to excavate upland soils and grade new beaches to increase water volume in the lagoon and allow for the recolonization of high marsh vegetation. Enhancement of the existing riparian zone was conducted to repair erosion damage from a former off leash dog park. An existing eelgrass bed within the lagoon was also expanded by transplants from a donor bed in the nearshore.

MICHELLE A. HAVEY

Fisheries Biologist

EDUCATION

MS, Fishery Science, University of Washington, 2008

BS, Fishery Science, University of Washington, 2003

EXPERTISE

Salmonid Ecology

Behavioral Science

Freshwater Ecology

Database Management

Statistical Analyses

CERTIFICATIONS

Forage Fish Spawning Surveys (WDFW), 2010

AFFILIATIONS

American Fisheries Society

Michelle Havey is a fisheries biologist with a broad background in ecosystem monitoring, salmon ecology, and behavioral science in the Northwest. She has conducted many stream, riparian and lake surveys within Southwest Alaska and Washington State. Previous project experiences include stream and riparian surveys, habitat assessments, fish behavioral assays, stomach content analysis, freshwater sampling, and fish rearing. Several of her projects have required the use of databases, and analysis of large datasets. Currently, Michelle is involved in ecological baseline studies and habitat assessments of aquatic systems throughout the Pacific Northwest.

REPRESENTATIVE PROJECT EXPERIENCE

Lake Union Juvenile Salmon Study, Seattle, WA. The purpose of this project was to determine the extent to which migrating juvenile salmon utilize the structure and habitat provided by floating structures in an urban freshwater lake. Performed systematic surveys of the fish species encountered at several floating home communities by snorkel survey, overwater observation, and minnow traps.

Stream Habitat and Riparian Assessment, Libby, MT. Michelle serves as project manager for a biological assessment of the impacts to freshwater fish and their habitat from the replacement of an underwater power cable in a Montana lake. Conducted an on-site assessment of existing habitat for ESA-listed bull trout, and evaluated the potential impacts of in-water construction on that habitat. Also surveyed and evaluated streamside vegetation and riparian habitat, developed potential mitigation strategies to offset construction-related disturbance, and currently assisting with obtaining necessary state and federal permits for construction.

Port of Everett Mount Baker Terminal Rail Barge, Everett, WA. The Port of Everett constructed a 61,000 square foot pier facility in Port Gardner, Everett, Washington. Because the proposed pier facility was a new development in an under developed area, substantial mitigation was required to offset the unavoidable increase in overwater structure. The purpose of this project is to monitor the presence of juvenile salmonids and forage fish in the nearshore restored habitats. Assisted with field sampling of restored beaches and reference sites, and lab identification of forage fish eggs and salmonid epibenthic prey.

Alaska Salmon Program, Aleknagik, AK. The Alaska Salmon Program through the University of Washington (formerly Fisheries Research Institute) has a long-term monitoring program of several freshwater systems in Southwest Alaska. She assisted with daily stream habitat and salmon spawner surveys, juvenile salmonid distribution and feeding ecology studies, mark-recapture studies for tracking fine-scale upstream movement of spawning salmon, limnological surveys, and fecundity assessment.

Big Beef Creek Research Station, NOAA Fisheries, Seabeck, WA. Michelle was the hatchery manager at the Big Beef Creek Research Station for approximately one year. The hatchery was used for primarily for rearing salmon (i.e., sockeye and coho) from the eyed-egg stage to maturity for genetic and behavioral studies. She was responsible for fish care and general maintenance of the facility, which included weekly water quality checks, oversight of the well/pump providing water to the hatchery and regular monitoring of fish health, as well as maintaining the flow regime in an artificial spawning channel. In addition to her time as manager, Michelle has conducted several studies at the BBC facility between 2003 and 2007 that required her to live at the University cabins for months at a time, and in various seasons. This experience led to a familiarity with both the workings of the UW facility and the Big Beef Creek watershed.

Salmon Imprinting and Homing Research, UW/NOAA Fisheries, WA. She was in charge of on-going research exploring the factors behind imprinting and homing in salmonids. Fish rearing and experiments were conducted at the UW Big Beef Creek Fish Station. Behavioral assays were conducted with juvenile coho salmon in the spring of 2007, and with adult sockeye salmon in the fall of 2003 and 2007. Michelle helped design and build experimental observation tanks, conducted the experiments, analyzed the data and wrote up the results in a report and thesis.

Salmon Homing and Site Fidelity Research, NOAA Fisheries, Seattle, WA. Assisted with river surveys of wild and hatchery spring Chinook spawning distributions, lab work, and data analysis. The purpose of this project is to monitor site fidelity of returning hatchery fish to various release sites in the Yakima Basin. Spawning distributions of both wild and hatchery Chinook salmon were assessed via annual carcass surveys along the Yakima River and the release site origin for each hatchery fish determined by individual tag recovery.

Port of Anchorage Marine Terminal Redevelopment, Knik Arm, AK. The Port of Anchorage is upgrading and expanding the Port facilities, and construction requires pile driving of sheet piles in both submerged and tidally influenced zones. The purpose of this project was to determine the effects of pile driving noise in the marine environment on juvenile coho salmon. Constructed a wet lab at the Port of Anchorage for post-exposure behavioral observations and necropsies of test fish. Also assisted with study design, implementation, analysis, and reporting.

Sitka Airport Runway Extension, Sitka, AK. The Sitka Airport plans to construct a new runway extension and sea plane pullout requiring the mitigation and restoration of various shoreline and intertidal habitats. Developed a computer model to calculate the Habitat Equivalency Analysis (HEA) for determination of habitat value that will be lost during the construction and operation of the new runway. Also, applied the model to determine potential mitigation actions/projects to offset the losses incurred for the duration of the project.

Ecological Baseline Study, Western Cook Inlet, AK. The purpose of this project is to survey marine and shoreline habitats that could be impacted by construction and operation of a new port facility. Monitoring interannual variability of species and resources in nearshore, intertidal, and subtidal habitats. Assisting with field sampling of fish and macroinvertebrates, database management, data analysis, stomach content analysis, species identification, and report writing.

Point Thomson Oil/Gas Development, North Slope, AK. Michelle analyzed potential impacts of a proposed oil and gas development on freshwater streams and lakes, as well as freshwater fish near the Beaufort Sea. She performed a literature review of previous freshwater studies in the area, and then a detailed examination of project impacts from the construction and use of ice roads, bridges and culverts. She analyzed the impacts of a proposed 50 mile long ice road along the Beaufort nearshore and evaluated potential effects on migratory patterns of anadromous fish. Michelle's analysis was included in an environmental report that is currently being used to prepare the Affected Environment, Environmental Consequences, and Cumulative Effects sections of an EIS for the project.

BRANDON M. JENSEN

Fisheries Biologist

EXPERTISE

Marine and Aquatic Ecology

Habitat Restoration

Water Quality

Fish Health

EDUCATION

MS, Marine and Estuarine Science, Western Washington University, 2007

BS, Biology, University of Puget Sound, 1999

AFFILIATIONS

Pacific Estuarine Research Society

American Fisheries Society (AFS)

Brandon Jensen is a fisheries biologist with a broad background in water quality, ecosystem monitoring, and salmonid health in Puget Sound. He has participated in many subtidal and intertidal habitat survey projects within Puget Sound, the outer coast of Washington State, and Alaskan bays and estuaries. Previous project experiences include phytoplankton studies, marine nutrient analyses, scientific diving, aquatic habitat/fish surveys, fish disease monitoring, aquaculture, and marine technical support. Currently, Brandon is involved in ecological baseline studies of marine and freshwater systems throughout the Pacific Northwest, nearshore habitat restoration projects, eelgrass mitigation, and fish ecology studies.

REPRESENTATIVE PROJECT EXPERIENCE

Ecological Baseline Study, Western Cook Inlet, AK. Assisted with fish and invertebrate sampling, fish identification, invertebrate taxonomy, data analysis, and report writing. The purpose of this project was to survey marine habitats that may be impacted by construction and operation of a new port. Monitored interannual variability of marine species and conditions in nearshore, benthic, and pelagic habitats. Experienced in operating small vessels, beach seining, gill/trammel netting, trawling, and the deployment of scientific instrumentation.

Reynolds Creek Hydroelectric Project, Prince of Wales Island, AK. Assisted with salmonid/char surveys using angling techniques, trap setting, electroshocking, and snorkel surveys. Performed spawner and carcass surveys of Pacific Salmon. Assembled field equipment, logistical coordination of field effort, and final report editing. The purpose of this study was to evaluate the potential environmental risk to Arctic grayling and salmon populations from hydroelectric development of a small creek for a native corporation.

Ketchikan Airport Expansion, Ketchikan, AK. Involved in multiple aspects of a runway expansion that necessitated the re-alignment of an existing salmonid stream and enhancement of a tidal estuary. Project duties included mapping of the existing stream and estuary habitat for native salmon, preparing baseline documentation, and interacting with regulatory agencies. Baseline documentation includes GPS mapping and GIS analysis of pre-construction eelgrass beds and salt marsh vegetation.

Bellingham Bay Oceanographic/Nooksack River Bathymetry, Bellingham, WA. Provided the Washington State Department of Ecology with oceanographic data of Bellingham Bay and Northern Puget Sound. Also conducted bathymetric surveys of the lower Nooksack River. Data were incorporated into the Bellingham Bay Hydrodynamic model to support nearshore habitat restoration and estimate salmonid out-migration patterns in the region.

Khayyam Mine Engineering Evaluation/Cost Analysis, Prince of Wales Island, AK. Lead biologist for benthic macroinvertebrate stream investigation of heavy metal impacts from historical mining activities. Followed EPA's rapid bioassessment protocol (RBP) to evaluate potential ecological impacts to steam biota. Collected water, sediment, and soil samples for heavy metal analysis. Water quality measurements included depth, temperature, specific conductivity, pH, and salinity using handheld probes.

South Puget Sound Geoduck Survey. Carr Inlet, WA. Coordinated survey dive teams and directed the operations of multiple support craft for a 700 acre survey of proposed geoduck harvest area in South Puget Sound for the Washington State Dept. of Natural Resources. Ensured quality and completeness of field data and maintained strict conformity to the Washington Department of Fish and Wildlife's geoduck survey methods employed for this project. Responsibilities included collecting GPS/GIS data, establishing accurate field positions via GPS/fathometer/navigation instruments, communicated directly with client during planning/debriefing meetings. Deliverables included field notes/data sheets, GIS/GPS data, electronic data (Access), report, and field photographs.

Mount Baker Terminal Facility Monitoring and Eelgrass Restoration, Mukilteo, WA. The Port of Everett constructed a new rail/barge terminal requiring the monitoring and restoration of various subtidal and intertidal habitats. This project included restoring a large section of beach and transplanting eelgrass to restore potentially affected habitat. Involved in nearshore salmonid/forage fish surveys, forage fish egg surveys, epibenthic invertebrate sampling, data analysis, and reporting.

Fish Health Monitoring Program, American Gold Seafoods, Anacortes, WA. Designed and conducted a fish health monitoring program for pen-raised salmon operations in Puget Sound, the Strait of Juan de Fuca, and Skagit Bay. Systemic population sampling was conducted for one full year to evaluate and quantify seasonal fish diseases. Performed fish dissections, pathological analyses, and microbiological techniques. Findings were reported to management and staff for improved husbandry.

Water Quality and Phytoplankton Productivity Study, Orcas Island, WA. Identified critical environmental forces and limiting factors that regulate phytoplankton production in the shallow, temperate fjord of East Sound, near Orcas Island. Lead research cruises to East Sound to collect oceanographic data and water samples. Responsible for calibrating, maintaining, and deployment of oceanographic instrument package. Prepared and performed laboratory analyses of water samples for nutrient studies and Chlorophyll a analyses. Measured phytoplankton carbon uptake rates using 14C isotope and Packard 1900 TR liquid scintillation analyzer. Major findings of this study included a description of resource partitioning between two major size fractions of phytoplankton and identified critical environmental forces and limiting factors that regulate phytoplankton production in East Sound.

Inter-annual Variability of Groundfish Populations in Proposed Marine Reserves, Skagit County, WA. Assisted with a year-long underwater population study of groundfish species including rockfish, kelp greenling and lingcod to evaluate six proposed marine reserves in Skagit County. The purpose of this project was to monitor inter-annual variability of groundfish populations and to relate seasonal density fluctuations to biological and environmental factors. Substrate observations, macroalgae, and associated invertebrate communities were also documented throughout the year however the greatest drivers of groundfish density were seasonality and habitat depth.