



CHRIS CZIESLA

Senior Principal Marine/Fisheries Biologist

Biosketch

Chris Cziesla has 27 years of experience in West Coast estuaries. He has served as a principal-in-charge, project manager, and in a technical scientific capacity on waterfront modification, aquaculture, dredging, shellfish and invertebrate ecology, estuarine circulation, and tideland and saltmarsh alteration and restoration. Chris' areas of expertise include marine and estuarine ecology, habitat classification and taxonomy, nearshore and estuarine oceanography and circulation, water quality, shellfish monitoring, plankton and larval transport, and research diving. Chris is a certified SCUBA diver and has extensive field and boat experience conducting marine research including eelgrass, geoduck, and forage fish surveys. He has designed and implemented numerous eelgrass and marine habitat assessments using Washington Department of Fish and Wildlife (WDFW) and the U.S. Army Corps of Engineers (Corps) guidance and has participated on several expert panels on the subject of eelgrass mitigation. He has worked on aquaculture and marine projects along the West Coast for years and this has kept Chris at the forefront of ongoing research in the marine setting with respect to sensitive habitats and species including eelgrass, macroalgae, and listed species. Chris has written numerous programmatic and project-specific biological assessments, natural resource sections of SEPA/NEPA environmental impact statements, and habitat conservation plans. He has also developed mitigation and restoration plans for sensitive species and habitats including salmonids, shellfish, eelgrass, macroalgae, and wetlands.

Pacific Herring Egg Identification Training, Pacific Coast Shellfish Growers

Association, Olympia, WA. *Project Manager.* Developed and conducted training on forage fish and egg identification for shellfish growers in Puget Sound and Willapa Bay, Washington. The session was attended by more than 100 shellfish growers. The training included an overview of the biology of the fish, and a photo-intensive presentation to show what the eggs look like and the natural and manmade materials to which the eggs are known to adhere. Topics also included distribution and spawn timing, Puget Sound, Willapa Bay, and Grays Harbor spawning areas and spawning stocks, egg identification, survey procedures, and recommended actions when eggs are found. This training was designed to fulfill the U.S. Army Corps of Engineers NWP 48 recommendation to complete a training class to identify Pacific herring spawn. The survey and reporting methods explained during the training also fulfill County requirements. The methodologies provided in the training needed to be scientifically robust yet accessible by shellfish staff with limited scientific backgrounds. In order to effectively communicate to the diverse audience, photo and graphical information was presented and provided as reference material for later review. The training focused on essential steps for forage fish egg identification while at the same time providing additional in-depth detail for to keep the audience engaged and interested.

Shellfish Aquaculture Circulation Interaction Study, Taylor Shellfish Farms, Willapa Bay, WA. *Principal in Charge.* Oversaw project to design and implement field studies to assess effects of off-bottom cultivation techniques to the local and surrounding



EDUCATION

M.S., Marine Biology, University of Oregon,
Eugene, 1998

B.A., Biology, University of Virginia,
Charlottesville, 1991

CERTIFICATIONS

Research Diver, University of Oregon, 1998

SCUBA Diver, NAUI, WA, 1990

Qualified Senior Writer for Biological
Assessment, WSDOT, 2006 – present

Forage Fish Spawning Survey Training,
WDFW

Geoduck Survey Training, WDFW

EXPERTISE

Local, State, and Federal Permitting
Endangered Species Act Compliance
NEPA/SEPA Strategy and Management
Fisheries Science

Restoration Biology & Mitigation Design
Habitat Assessments

Freshwater/Marine/Estuarine Ecology
Scientific Diving (SCUBA)

ADDITIONAL TRAINING

Eelgrass Delineation Guidance Workshop,
U.S. Army Corps of Engineers, June 2017
Oceanographic equipment (CTD, ADCP etc.),

environment. Studies were conducted during the summer of 2016 to measure effects of off-bottom flip bags to currents and sediment transport, oyster food resources, and shading of submerged aquatic vegetation. Study results indicate the interactions of flip bags with currents do not result in significant effects to currents or sediment transport; that measurable reductions in oyster food resources are only observed during ebb tides and within plots, and remaining food resources are sufficient to support oyster growth within and beyond the flip bag plots; and that flip bags cause a reduction of light levels immediately adjacent to flip bags but, even in shaded areas, light levels remain sufficiently high to support eelgrass growth.

Comparative Habitat Use of Estuarine Habitats with and without Cultch-on-Longline Gear Present in Humboldt Bay (Saltonstall-Kennedy Competitive Research Program), U.S. Department of Commerce. *Principal in Charge.*

- Providing principal oversight for project including the following work:
- Obtained scientific collection permit (State of California) and ESA scientific research permits.
- Conducted summer and winter sampling of benthic and invertebrate samples from 67 research sites distributed across 3 geographic sub-regions and 4 habitat types. Sampling included core samples, surface samples, pitfall traps and epibenthic samples at each location.
- Developed and tested large-scale enclosures to isolate fish in habitats with and without aquaculture gear.
- Conducted summer and winter fish sampling during low tides.
- Used Ecopath with Ecosim modeling software to evaluate the effect that oyster culture has on the food web and commercial fisheries.
- Species identification and data analysis of invertebrate samples is ongoing, and will be followed by statistical analysis of the data.
- Presented findings at Pacific Coast Shellfish Grower's Association conference.

Quilcene Bay Mussel Raft Expansion, Penn Cove Shellfish, Coupeville, WA. *Project Manager.* Providing technical support to client for responding to public comments regarding expansion of shellfish operations, and participating in the Jefferson County Shoreline Permit Hearing. Work includes reviewing and researching public comments and preparing responses to selected biological and environmental comments. The effort also will include preparing selected materials (e.g., PowerPoint presentations on selected topics) in anticipation of areas of concern needing to be addressed during the hearing, as well as attending and participating in the hearing.

Guemes Island Ferry Terminal Modification Project, Skagit County Public Works, Anacortes to Guemes Island, WA.

Principal in Charge. This project proposes to modify elements of both the Anacortes and Guemes Island ferry terminals to accommodate a larger, battery-electric vessel. To support permitting for the project, Chris developed the permitting strategy and fieldwork plans to survey submerged aquatic vegetation, and oversaw preparation of a JARPA, a biological assessment for ESA Section 7 consultation, and an Essential Fish Habitat (EFH) assessment to satisfy requirements of the Magnuson-Stevens Fishery Conservation and Management Act. Work also included assessing mitigation needs and helped prepare a mitigation plan through application of the National Marine Fisheries Service (NMFS) nearshore mitigation calculator.

Habitat Conservation Plan, Taylor Shellfish Farms, Washington State. *Principal-in-Charge.* Taylor Shellfish is developing an HCP under Section 10 of the Endangered Species Act (ESA) to cover shellfish aquaculture activities in Washington State. Chris is guiding the strategic approach to determining which species and habitats will be included in the habitat conservation plan. He is currently developing the public outreach plan to engage the public, stakeholder agencies, and nongovernmental organizations.

Jefferson County Geoduck Farm Biological Assessment and Permitting Assistance, BDN, Inc., Port Ludlow, WA. *Principal in Charge.* Provided oversight on shellfish aquaculture project on Shine Road, west of the Hood Canal Bridge. Also participated in eelgrass surveys and habitat assessments to determine existing aquatic conditions. Provided senior review of a biological

assessment that Confluence prepared for ESA consultation associated with a Corps permit for the project. Contributed to preparation of permit submittal package and led discussion with permitting agencies and the County.

Investigation of Summer Chum and Groundwater Upwelling Effects, Hood Canal Coordinating Council, Kitsap Peninsula, WA. *Principal in Charge.* Provided senior review of document investigating the effects of groundwater upwelling on summer chum in the Kitsap Peninsula. Work was conducted to support the Hood Canal and Eastern Strait of Juan de Fuca summer chum salmon recovery efforts.

Upper Quinault River Sustainable Floodplain Management Planning Project, Quinault Indian Nation, Quinault, WA. *Principal in Charge.* Chris is providing oversight for project to identify and prioritize actions that will improve channel migration and other geomorphic and habitat-forming processes to improve fish habitat in the developed portions of the Upper Quinault River, upstream of Lake Quinault. Activities will include relocation/abandonment of existing roadways, relocation of facilities, streambank and roadway protection to establish floodplain forests, reconnection of oxbow and other off-channel habitats, and protection of functioning floodplain forests and habitat.

Benthic Invertebrate Survey Protocols for Burley Lagoon Environmental Impact Statement (EIS), Taylor Shellfish Farms/Plauché & Carr, Purdy, WA. *Project Manager.* Managed project to conduct a survey to understand whether the benthic invertebrate community that exists in Burley Lagoon, where geoduck clam aquaculture is proposed, is similar to, or disparate from, the composition of species reported for other parts of south Puget Sound based on a qualitative comparison. This survey will provide information to support the EIS being written for the proposed action of converting a portion existing shellfish aquaculture operations to geoduck aquaculture. Managed process to prepare and obtain a scientific collection permit from WDFW prior to the survey.

Mid-Barataria Sediment Diversion Project, Coastal Protection and Restoration Authority (CPRA), Plaquemines Parish, Louisiana. *ESA Consultation and EFH Analyses Manager.* The Mid-Barataria Sediment Diversion is a \$2 billion component of the Coastal Louisiana restoration strategy that proposes to divert sediment-laden water from the Mississippi River to restore natural delta processes and increase land area in the Barataria Basin. The structure will be located on the west bank of the river. Chris lead the engagement for CPRA on the aquatic resource analyses, was responsible for the Endangered Species Act (ESA) and Essential Fish Habitat (EFH) consultations associated with the project, and contributed to National Environmental Policy Act (NEPA) review. This project successfully completed ESA and EFH consultations, and the Final EIS is nearing publication. Completed tasks include: reviewed project design information and multiple draft EIS chapters, agency comments from NEPA scoping, and technical analyses from the U.S. Army Corps of Engineers (Corps) third party consultants; reviewed and commented on draft EIS sections including aquatic resources, wetlands, ESA and EFH, and commercial and recreational fishing; evaluated short-term construction effects and short and long-term operational effects over the 50-year design plan for the project; developed Deconstruction Matrix to identify project components and potential mechanisms of effect to ESA listed species and EFH; led ESA working group meetings with NMFS, USFWS, and Trustee Implementation Group representatives; managed preparation of Draft and Final Biological Assessment and EFH documents after review by CPRA, NMFS, USFWS, and the Corps; contributed to the development of the marine mammal sections of the draft environmental impact statement (DEIS) and participated in the agency working groups and associated analyses; developed the DEIS section evaluating implementation of mitigation measures intended to avoid and minimize effects of the project on sensitive resources; and provided responses to public comments on the Draft EIS for aquatic resources, ESA, EFH, and marine mammals. Current work includes providing strategic support to CPRA for ESA/EFH, federal permitting, and overall environmental process and schedule. This effort is being coordinated closely with the Deepwater Horizon Oil Spill Restoration Plan for the project and the third-party NEPA environmental impact statement being developed by the Corps to ensure consistent analyses.

Mid-Breton Sediment Diversion Project, Coastal Protection and Restoration Authority (CPRA), Plaquemines Parish, Louisiana. *ESA Consultation and EFH Analyses Manager.* The Mid-Breton Sediment Diversion proposes to divert sediment-laden

water from the Mississippi River to restore natural delta processes and increase land area in the Breton Basin on the east bank of the Mississippi. Chris is managing the ESA and EFH consultations, NEPA review, and preparation of the Aquatic Resources and Marine Mammal NEPA technical reports. Work has included the following: reviewed preliminary project information including draft EIS chapters and agency comments from NEPA scoping; evaluated short-term construction effects and short- and long-term operational effects over the 50-year design plan for the project; developed a Deconstruction Matrix to identify project components and potential mechanisms of effect to listed species or EFH; produced outlines for Biological Opinion and EFH documents for review by CPRA, NMFS, and USFWS; managed preparation of Draft Biological Assessment and EFH documents; led development of the aquatic resources and marine mammal technical reports; and participated with CPRA and The Water Institute of the Gulf modelers to evaluate modeled projections for water and aquatic resources and the potential effects to aquatic resources and marine mammals. Currently, Chris is providing ongoing strategic support to CPRA for ESA/EFH, federal permitting, and overall environmental process and schedule.

Millennium Bulk Terminals NEPA/SEPA Third-Party Environmental Impact Statement (EIS) Development, Cowlitz County Department of Building and Planning, U.S. Army Corps of Engineers, and Washington Department of Ecology, Longview, WA. *Aquatic/Upland Environmental Lead.* Chris provided technical review and guidance for preparation of the natural resource sections of the third-party EIS for this project to construct a coal export terminal at the site of the former Reynolds Metals aluminum plant adjacent to the Columbia River near Longview, Washington. Work included review and critique of applicant-developed information as well as independent technical analyses for development of the EIS. The proposed project, on approximately 540 acres fronting the Columbia River, would cover approximately 190 acres of the site, and involve extensive work in the Columbia, periodic dredging of a 48-acre ship berthing area, and in-river disposal of the dredged material. This project has been halted.

Blair Waterway Pier 4 Reconfiguration Permitting, Tacoma, WA, Port of Tacoma. *Principal in Charge.* Provided strategic guidance for permitting and habitat mitigation of the Port of Tacoma's reconfiguration of Pier 4 in the Blair Waterway of Commencement Bay. Conducted an ecological effects analysis of alternatives to inform the Port's decision-making using a Habitat Equivalency Assessment (HEA) approach. Worked with the design team and Port representatives on design and construction schedule to support efforts to avoid or minimize project impacts and minimize potential need for compensatory mitigation.

Point Defiance Right Timber Floating Dolphin Replacement, WSDOT, Tacoma, WA. *Project Manager.* To assist with permitting efforts on project to replace the Point Defiance Right Timber Floating Dolphin, conducted an eelgrass survey and prepared a survey report detailing aquatic resources and mitigation opportunities. Prepared dive plan to survey transects along the centerline of the proposed floating dolphin and each of the proposed anchor and anchor chain alignments meeting WDFW requirements. Recorded observations included eelgrass (presence and shoot count), macroalgae (taxonomic identification and percent cover), dominant and secondary substrate size class (e.g., silt, sand, gravel, cobble, bedrock, shells), depth and time (to allow for conversion to mean lower low water [MLLW] tidal datum), and macrofauna (e.g., clams, crabs, fish). Additionally, debris and derelict gear was located and identified for removal during the construction phase of the project. Completed survey report including all information necessary to satisfy WDFW eelgrass/macroalgae survey guidelines. Post construction, three years of monitoring were conducted to determine effects to adjacent eelgrass beds and confirm recovery in areas disturbed by the project. Survey methods included underwater video and diver transects to map resources according to methods approved by regulatory agencies.

Scientific Assistance, Coast Seafoods, Humboldt Bay, CA. *Marine Ecologist.* Managed and adapted the development of a sampling protocol for evaluating the feasibility of oyster culture at alternate tidal elevations. This project was designed to determine if the grow-out of Pacific oysters was possible at elevations above those where native eelgrass occurs in Humboldt Bay. The study design included a multivariate analysis to provide statistically meaningful outcomes.

Endangered Species Act (ESA) Biological Assessment (BA) Standardization, National Marine Fisheries Service, Northwest Region, Washington, Oregon, and Idaho. *Project Manager.* Assisted NOAA Fisheries with streamlining the ESA

Section 7 formal consultation process by developing the analytical framework and content guidance for biological assessments. The project was designed to result in improved ESA consultations by encouraging the submittal of consistent and standardized BAs by federal action agencies such as the Corps, U.S. Forest Service, Bureau of Land Management, and Departments of Transportation (WSDOT, ODOT, CALTrans, and NYDOT). This project included the development of a BA template to guide preparation of BAs for federal action agencies and a web-based tool to allow adequacy review and provide current information on ESA species. Template development was based on review of ESA legal requirements, completed BAs and resulting biological opinions, relevant existing guidance, and NOAA Fisheries regional experience. Training for NOAA Fisheries and federal action agency staff throughout the Pacific Northwest was also provided as part of this project.

Endangered Species Act (ESA) ESA Consultation Training, NOAA Fisheries, Nationwide. As part of a project to streamline ESA Section 7 formal consultation process, Chris Cziesla developed an analytical framework and template to guide preparation of BAs for federal action agencies. Also developed a web-based tool to allow adequacy review and provide current information on ESA species. Training was then provided for agency staff.

Permit Process Schematics and JARPA Guidance, Washington State Department of Ecology, Lacey, WA. *Principal and Project Manager.* Worked with Ecology and other appropriate regulatory agencies to develop permit schematics which clarify each of the permit processes under Ecology's administration (Air, Noise, Clean Water Act Section 401, National Pollution Discharge Elimination System, etc.). Established the information requirements for all permits associated with the JARPA (e.g., Clean Water Act Section 404, Rivers and Harbors Act Section 10, and Section 401 Water Quality Certifications, Hydraulic Project Approval, and local shoreline permits), and implementing a pilot project focusing on transportation projects. Developed permit process schematics defining each step in the permit process for 10 state and federal permits. As a follow-up to this project, participated in the ongoing JARPA redesign process to clarify content and requested information. To see the permit process schematics, go to <http://www.ora.wa.gov/resources/schematics.asp>. The schematics are web-enabled to provide information including guidance, roles and responsibilities, timelines, and application forms in a consistent and user-friendly manner. This project also included development of guidance and examples to assist in clarifying requirements of the JARPA.

Regulatory Integration Analysis, Office of Regulatory Assistance, Olympia, WA. *Principal and Project Manager.* Identified regulatory integration needs and opportunities. The Washington Competitiveness Council identified environmental permitting as one of the key issues the State of Washington needs to address in order to remain competitive in retaining and attracting businesses. The purpose of this project was to support ongoing efforts aimed at improving state regulatory programs and develop a unifying picture of the multilayered regulatory system. This included a clear depiction of permitting pathways, timelines, and statutory authorities. Narrative/graphic depictions coupled with case studies were used to identify regulatory redundancies, duplicated reviews, and jurisdictional overlaps that provide opportunities for regulatory integration. Outcomes achieved included the identification and recommendation of numerous short-term improvements to the state regulatory system including: application tracking and consolidation (e.g., e-permitting), programmatic permits, JARPA revisions, JARPA drawing guidance; consistent work windows, multi-agency pre-application meetings, and technical normalization. This project ultimately resulted in redesign of the JARPA form which was rolled out in 2010.

Essential Fish Habitat (EFH) Assessment for Puget Sound Dredged Disposal Analysis Program (PSDDA), U.S. Army Corps of Engineers, Seattle District, Seattle, WA. *Project Manager.* Analyzed the potential effects EFH of the PSDDA. The Magnuson-Stevens Fisheries Conservation and Management Act requires all federal agencies to consult with NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency that may adversely affect EFH. The PSDDA program was designed to provide publicly acceptable guidelines governing environmentally safe unconfined, open-water disposal of "clean" dredged material. This project analyzed the potential effects of dredged material disposal at both dispersive and non-dispersive sites throughout the Puget Sound region, as they relate to EFH for Pacific salmon, coastal pelagic and groundfish species.

SR 520 Bridge Replacement Program, WSDOT, Role: ESA Program Lead. Responsibilities: Directed ESA compliance for all SR 520 Program activities for three major projects: Eastside Transit and HOV; SR 520 HOV and Bridge Replacement; and Pontoon Construction. Included extensive collaboration with resource agencies and recognized experts to utilize best scientific and commercial data available for evaluation of program activities such as in-water pile driving and noise, stormwater, vessel traffic, and overwater construction on listed species and designated critical habitat. Analyses within the consultation and supporting documents were closely coordinated with NEPA and permitting analyses to ensure consistency throughout the regulatory processes.

Habitat Conservation Plan, King County Wastewater Treatment Division, King County, WA. Endangered Species Act Strategist. Developed a habitat conservation plan for the operations of the King County Wastewater Treatment Division. Analysis included extensive cataloging of natural resources in the Puget Sound region, focusing on critical habitats of covered species in freshwater and marine environments. This project included ongoing negotiations with NOAA Fisheries, USFWS, and EPA to establish water quality objectives and mitigation alternatives that could be considered protective of covered species.

Endangered Species Act (ESA) Review and Streamlining, U.S. Army Corps of Engineers, Seattle District, Seattle, WA. Project Manager. Developed ESA review streamlining tools for the Seattle Corps Regulatory Branch. These tools are designed to meet the requirements set forth under ESA for consultation between federal action agencies (i.e., Corps) and the Services (NMFS and USFWS). Tools include reference biological assessments, impact reduction guidelines, and informational checklists to ensure comprehensive review of potential impacts to federally listed threatened and endangered species for all projects permitted by the Corps.

Endangered Species Act (ESA), Clean Water Act, and Magnuson-Stevens Act (Essential Fish Habitat) Compliance Assistance, Pacific Coast Shellfish Growers Association, Alaska to California. Project Manager and Primary Scientist. Provided ESA and Clean Water Act (CWA) compliance assistance to the Pacific Coast Shellfish Growers Association (PCSGA) and their individual members. PCSGA members operate along the West Coast from Alaska to southern California. This project initially focused on synthesizing the scientific literature regarding the interactions of oyster culture operations with ESA-listed species, water quality, and Essential Fish Habitat (EFH). This process was used to develop a West Coast programmatic process for compliance with ESA, CWA, and EFH requirements, and included involvement from the Corps and NOAA Fisheries at the national, regional, and local level to ensure consistency and efficiency for the federal agencies as well as PCSGA members. The long term goal of the project was to provide a clear and consistent framework to facilitate compliance with environmental regulations. Project products and activities included technical papers summarizing existing literature, discussions with research scientist on ongoing and preliminary research results, technical and strategic meetings with resource agencies at local and national levels, and biological assessments and EFH analyses.

Biological Assessment Review and Development of Programmatic Biological Assessments (BAs), and Regional General Permits (RGPs), U.S. Army Corps of Engineers Seattle District, Seattle, WA. Project Manager. All projects requiring a permit from the U.S. Army Corps of Engineers (Corps) need to be reviewed for potential impacts to species listed as “threatened” or “endangered” under the Endangered Species Act (ESA). Projects reviewed include all work in navigable Waters of the U.S. (Section 10 of Rivers and Harbors Act) or in wetlands (Section 404 of Clean Water Act), such as dock modifications, dredging, marine facilities construction or improvements, culvert replacements, restoration projects, and bank stabilization. Led the adequacy review of over 600 BAs submitted by applicants, prior to informal and formal consultation with the Federal Services (National Marine Fisheries Service and U.S. Fish and Wildlife Services) that is required under the ESA. Additionally, assisted the Corps in developing Programmatic BAs and Regional General Permits (RGPs) to cover activities commonly permitted in Washington State. Activities covered by the Programmatic BAs and RGPs include: routine maintenance activities for commercial piers (ports, ferries, marinas); installation of overwater structures in Puget Sound; freshwater and marine restoration activities; and bank stabilization. These programs allow Corps permits to be issued without lengthy individual consultation efforts.

Biological Assessment (BA) for Submarine Electrical Transmission Cable Replacement Project, Bonneville Power Administration, San Juan Islands, WA. *Project Manager.* Prepared a BA for listed species including chinook and coho salmon and bull trout, as well as marine mammals and reptiles. Assessed potential impacts and developed a mitigation plan for sensitive shoreline and marine habitats including eelgrass beds, shellfish beds, rocky intertidal zones, and deep marine areas. Conducted consultations with NMFS, WDFW, and WSDNR to identify areas of concern. Developed a “Habitat Disturbance Minimization and Monitoring Plan” approved by WDFW to establish cable route and construction guidelines in the marine environment. Conducted dive surveys along cable right-of-way to document existing habitats and species present including eelgrass and geoducks.

Point Roberts Lighthouse Park Marine Eelgrass Mitigation Design and Shoreline Restoration, British Columbia Transmission Corporation (BCTC), Point Roberts, WA. *Restoration Scientist.* Assisted BCTC with regulatory compliance and restoration design for the U.S. portion of a submarine electrical transmission line traversing sensitive shoreline and intertidal habitats. This included the preparation of the SEPA documentation, JARPA, and county shoreline and major project permit applications. As part of this larger permitting effort, participated in the design of eelgrass mitigation and shoreline restoration at Lighthouse Park at Point Roberts. Restoration design included shoreline modifications such as sediment enhancement, large woody debris, shoreline planting, and habitat creation for numerous species and the creation of a 5-acre eelgrass restoration area.

Pile Driving Effects on Fish Expert Review Panel and Lake Washington Test Pile Project, WSDOT/FHWA, Seattle, WA (*Project Manager*). As part of the NEPA and ESA analyses, Chris assembled and facilitated an expert review panel on the effects of underwater sound generated by pile driving on fish. The panel included national experts on bioacoustics and fish behavior and resulted in the development of a test pile project. The test project focused on gathering site specific data to refine analyses of proposed projects in the test vicinity or with similar site characteristics. Data collected included the measurement of underwater sound at various distances from active pile driving and testing two sound attenuation systems, a bubble curtain and a novel design. Water quality measurements were also taken to evaluate dissolved oxygen and turbidity levels. Data collected from this project was used in the ESA and NEPA analyses to characterize potential effects to sensitive species.

Estuarine Restoration Feasibility Study, Maxwelton Estuary (Maxwelton Salmon Adventure), Whidbey Island, WA. *Project Manager.* Conducted a restoration feasibility study examining historic conditions and the current state of the estuary and tide gate system on the lower reach of Maxwelton Creek. This study characterized current and historic conditions and the resulting impacts on fish, habitat, agricultural land use, drainage, siltation, and the nearshore environment. A range of alternatives was presented to local stakeholders from no action to full ecological restoration.

Estuarine Circulation Research, University of Oregon, Coos Bay, OR. *Principal Investigator.* Researched the transportation and distribution of toxic phytoplankton in West Coast estuaries. Specifically looked at the relationship between an estuarine area with restricted circulation and the larger estuary and nearshore, to determine if primary productivity was endogenous or being imported with diurnal tidal circulation.

Elephant Seal Tagging and Breeding Range Expansion Study, Oregon Institute of Marine Biology and Oregon Department of Fish and Wildlife, Charleston, OR. *Project Scientist.* Worked together with the Oregon Department of Fish and Wildlife to tag 6-week-old elephant seal pups at Shell Island, Oregon. This breeding site is the northernmost site with successful pup survivorship for the northern elephant seal. Weighed, measured, and tagged pups for future identification and tracking. Subsequently conducted a study investigating the effects of significant wave height on pup survivorship and breeding range expansion of the endangered northern elephant seal.

Dive Survey and Impact Assessment, British Columbia Telecommunications Corporation, Point Roberts, WA. *Marine Resource Lead and Research Diver.* Conducted multi-phased impact assessment and dive survey evaluating the impacts associated with the installation of a submarine power cable. The dive surveys included alignment reconnaissance, pre- and post-installation documentation, and eelgrass recovery verification. The cable alignment traversed more than a kilometer of intertidal

and shallow subtidal habitat with robust eelgrass beds and other sensitive habitats present. The data collected through these efforts was incorporated into a Habitat Disturbance Avoidance, Minimization, and Recovery Plan which was approved by the U.S. and Canadian regulatory agencies, allowing the project to proceed as scheduled while protecting sensitive resources.

Burley Lagoon Eelgrass and Macroalgae Video Surveys, Western Oyster Company, Purdy, WA. *Project Manager.* Managed the design and implementation of eelgrass and macroalgae surveys using underwater video techniques in a large estuarine lagoon. Rapid field deployment was necessary to complete the surveys during the appropriate seasonal window for eelgrass surveys. Assessment of eelgrass and macroalgae using conventional diver methods was problematic due to high current velocities and large areas to be surveyed. High-resolution underwater video was used to identify and document eelgrass and macroalgae distribution. The initial effort was targeted at surveying for eelgrass and macroalgae; however, additional information on geoduck distribution was subsequently requested by the client. The underwater videos were reviewed for geoduck presence to satisfy this need.

Eelgrass Study Evaluating Interactions with Shellfish Aquaculture, Taylor Shellfish Company, Willapa Bay, WA. *Marine Ecologist.* Designed a multi-year study evaluating the interaction between eelgrass beds and various shellfish aquaculture methods. Eelgrass surveys, physical, and chemical data were collected to compare shellfish culture areas to control locations. Eelgrass recovery after disturbance was also documented and evaluated.

Habitat Assessment and Eelgrass/Geoduck Dive Surveys, Bonneville Power Administration, San Juan Islands, WA. *Project Manager.* Designed and conducted dive surveys for habitat assessment and monitoring to determine potential impacts of a submarine electrical transmission cable replacement project on sensitive nearshore marine habitats. This dive program was used to establish baseline conditions for sensitive or valuable species, including eelgrass beds and geoduck clams prior to construction, and to align the cable route to minimize damage to marine and shoreline habitats. Five-year monitoring included assessments of eelgrass recovery after project completion, and eelgrass transplantation in areas where full recovery had not occurred. All impacts to eelgrass were successfully restored after project completion.

Marine Habitat and Gravel Spillage Assessment Dive Survey at Gravel Mine, King County, Dupont, WA. *Lead Marine Biologist.* Designed and conducted habitat and gravel spillage assessment at the marine loading dock of an active gravel mine. This dive study was used to evaluate the potential effects of gravel spillage on marine benthic communities near the loading facility.

Pacific Oyster Abundance Study, Oregon Institute of Marine Biology, Charleston, OR. *Project Scientist.* Investigated the abundance and distribution of the native Pacific oyster in the Coos Bay estuary. Used dive surveys to ascertain recruitment success of this native oyster species, which has been largely displaced by the aquaculture of the giant Pacific oyster.

Eelgrass Restoration and Monitoring, Nichols Brothers Boat Builders, Holmes Harbor, WA. *Marine Ecologist and Research Diver.* During vessel launching, a 5-acre portion of a subtidal and intertidal eelgrass bed was destroyed. Initial eelgrass surveys were completed to document the damage and a restoration plan was developed. Eelgrass was harvested from nearby donor locations and cultured at Battelle Marine Sciences lab. Eelgrass was transplanted using the bare root method throughout the restoration area. Additional restoration techniques were explored such as floating seed baskets. Follow-up eelgrass monitoring was conducted to evaluate restoration success.

Mercer Island Shoreline Habitat Evaluation, City of Mercer Island, Mercer Island, WA. *Principal and Project Manager.* Conducted shoreline inventory by boat and underwater diving, recorded information on shoreline vegetation, bank armoring, submerged and emergent vegetation, and sediment characteristics, and documented these conditions with digital photographs. Mitigation and shoreline restoration, such as riparian improvements, bulkhead removal, invasive species removal, and substrate augmentation were also included as part of the project.

Pile Driving Effects on Fish Expert Review Panel and Lake Washington Test Pile Project, WSDOT, Seattle, WA. *Project Manager.* Assembled and facilitated an expert review panel on the effects of underwater sound generated by pile driving on fish. The panel included national experts on bioacoustics and fish behavior and resulted in the development of a test pile project in Lake Washington. The test project focused on gathering site specific data to refine analyses of proposed projects in the test vicinity or with similar site characteristics. Data collected included the measurement of underwater sound at various distances from active pile driving and testing two sound attenuation systems, a bubble curtain and a novel design. Water quality measurements were also taken to evaluate dissolved oxygen and turbidity levels. Data collected from this project was used in the ESA and NEPA analyses to characterize potential effects to sensitive species.

Expert Panel on Effects to Salmonids from Over and In – Water Structures, WSDOT, Seattle, WA. *Project Manager.* Led an expert review panel of scientific researchers and regulatory agency biologist evaluating the influence of overwater and in water structures on salmonids in Lake Washington. Factors such as shading, predator prey relationships and migratory behavior were explored. The information from the panel and existing scientific literature will establish the Best Available Science on this topic.

Expert Review Panel for WSDOT Alaskan Way Viaduct Replacement Program, WSDOT, Seattle, WA. *Regulatory Permit Expert.* Chris was invited to participate in an expert panel assembled to review the Alaskan Way Viaduct proposed project approach. His specific role on the panel was to evaluate the project's strategies to comply with state, local, and federal regulatory permits. The review panel reviewed project environmental documents and met with project engineers and environmental staff in a workshop setting to assess project status. After a discussion and review the panel provided detailed risk analysis feedback to program senior management. The panel's recommendations resulted in a validation of certain elements of the project regulatory compliance strategy as well as some areas requiring additional attention due to identified risks.

Beach Sewer Line Evaluation and Replacement, City of Bainbridge Island, Bainbridge Island, WA. *Regulatory Compliance Manager.* Provided regulatory compliance strategy for the evaluation and replacement of a failing sewer line along the Bainbridge Island shoreline. The existing line is located in sensitive habitats including marine intertidal and eelgrass areas. As part of the project team determining how best to replace the existing sewer line, Chris evaluated existing habitat conditions in the current as well as potential new alignments in order to facilitate obtaining permits for the planned replacement. Potential options were being screened to ensure a cost effective and timely solution can be undertaken.

ESA Biological Assessment Standardization, National Marine Fisheries Service, NW Region, WA, OR, and ID. *Project Manager.* Assisted NMFS with streamlining the ESA Section 7 formal consultation process by developing the analytical framework and content guidance for biological assessments. The project was designed to result in improved ESA consultations by encouraging the submittal of consistent and standardized biological assessments by federal action agencies such as the Corps, U.S. Forest Service, Bureau of Land Management, and Departments of Transportation (including Washington, Oregon, California, and New York). This project included the development of a template to guide preparation of biological assessments for federal action agencies and a Web-based tool to allow adequacy review and provide current information on ESA species. Template development was based on review of ESA legal requirements, completed biological assessments and resulting biological opinions, relevant existing guidance, and NMFS regional experience. Training for NMFS and federal action agency staff throughout the Pacific Northwest was also provided as part of this project.

Community Shellfish Garden, Puget Sound Restoration Fund, Bainbridge Island, WA. *Project Manager.* Provided permitting, ESA, and scientific support to the Puget Sound Restoration Fund in establishing a community shellfish garden along a portion of the marine intertidal area of Bainbridge Island. This project included site evaluation, including eelgrass and forage fish assessments and habitat characterization of the site. Interactions between the proposed activities and sensitive species and habitats were analyzed and evaluated and avoidance and minimization measures were developed. Expertise provided: design, conduct, and report on intertidal surveys of marine habitat, flora, and fauna; assess potential impacts to habitat, flora, and fauna; habitat impact avoidance and minimization measures; fish habitat assessment; and interagency project and permit coordination.

Mukilteo Ferry Terminal Replacement Project Eelgrass and Macroalgae Surveys, WSDOT Ferries, Mukilteo, WA. *Project Manager.* Designed and implemented eelgrass and macroalgae surveys to support both National Environmental Policy Act (NEPA) environmental impact statement (EIS) alternative analyses and currently for final design phase. Three alternative locations were surveyed by SCUBA and underwater video to determine benthic habitat including eelgrass and macroalgae presence. Prepared detailed reports summarizing the study results and authored appropriate summaries to satisfy WDFW eelgrass/macroalgae preliminary survey guidelines

Shellfish Aquaculture Regulatory Compliance, Pacific Shellfish Growers Association, Taylor Shellfish, and Coast Seafoods, Northern California and Western Washington . *Scientific Director.* Chris has worked with shellfish growers for many years to provide regulatory compliance and permitting strategies; develop biological assessments, habitat plans, and permitting documents; research shellfish ecology; and develop study designs for a wide range of shellfish aquaculture activities including interactions with eelgrass and other sensitive habitats. Work with the shellfish industry has kept Chris at the forefront of ongoing research in the marine setting with respect to sensitive habitats and species including eelgrass and listed species. Budget and schedule requirements have consistently been met.

Mammal Identification Training, Seattle Shellfish, Shelton, WA. *Principal Marine/Fisheries Biologist.* Led on-site training to help Seattle Shellfish comply with its Marine Mammal Monitoring Plan (MMMP) required by permit conditions. The training included MMMP review and identification techniques for Puget Sound marine mammals for marine mammal observers. Training materials were developed and training sessions were held with both field and classroom components.