

Martin Miller, Greg Williams, Ronald Thom

Recommendations to Better Manage Shoreline Stabilization and Habitat Restoration in Puget Sound

Biography of Dr. Martin Miller

Dr. Martin Miller, Manager of the Coastal and Ocean Processes Technical Group, is an oceanographer specializing in coastal sedimentation, coastal physical processes, port and harbor design, wave generation and propagation, and oil spill and pollution transport. He has over 20 years experience in management of programs involving dredging and disposal, coastal engineering, beach protection, remediation, and restoration. Topics have included ocean and coastal wave climate hindcasting, nearshore wave and current prediction, harbor design, and beach and coastal processes. He also served nearly 10 years as Chief of the Coastal Hydrodynamics Branch at the Coastal and Hydraulics Laboratory, Waterways Experiment Station, Vicksburg, Mississippi. In addition, Dr. Miller has managed physical oceanographic and ocean engineering research projects for offshore and nearshore construction and operations in Alaska, along the Pacific Coast, the North Sea, and the Gulf of Mexico, for Exxon Production Research Company, Houston, Texas. Dr. Miller serves as an adjunct professor of oceanography at Texas A&M University, has taught graduate physical oceanography courses at the WES Graduate Institute and the Coastal Engineering Education Program, and has served as Chairman and Co-Chairman for several Coastal Zone conferences.

Biography of Mr. Greg Williams

Mr. Greg Williams, fish ecologist, has focused on several important issues in the Pacific Northwest, including nearshore habitat, restoration issues (both saltmarsh and eelgrass), and salmonid/fish behavior studies. His research interests are directed toward understanding the functional attributes of natural marsh/nearshore marine systems, especially to juvenile life history stages of various fish species, and how to restore and monitor these attributes over the long term. Mr. Williams' current restoration projects involve developing and critically examining marsh restoration plans and monitoring protocols, and monitoring eelgrass restoration projects, including an analysis and synthesis of previous eelgrass restoration data (e.g., Clinton ferry terminal, Eagle Harbor). He is also conducting assessments of benthic

and rocky marine habitats, including geoduck, rockfish, benthic invertebrate, and macroalgae surveys (e.g., Hood Canal Bridge, Clinton ferry terminal). His recent fish behavior studies involve examining the behavior of outmigrating juvenile salmonids past shoreline structures like ferry terminals and developing field protocols for assessing successful juvenile salmonid passage through retrofitted culverts, both of which are for the Washington State Department of Transportation. In addition, Mr. Williams is addressing issues relative to shoreline armoring, more specifically, developing monitoring studies to assess the effects of shoreline modifications/armoring techniques on various taxa (vegetation, fish, epibenthos, benthos), and conducting literature surveys and paper studies of the Puget Sound nearshore ecosystem, including a white paper for the State of Washington that summarizes the state of the science regarding biological effects of shoreline armoring, and a comprehensive assessment of the state of the nearshore ecosystem off of King County. A member of the MSL Dive Team, Mr. Williams has 10 years experience as a research diver and has conducted numerous underwater surveys and field sampling efforts.

Biography of Dr. Ronald Thom

Dr. Ronald Thom, who leads the Marine/Wetlands Research area, has over 25 years of professional experience as an algologist, wetlands ecologist, toxicologist, and fisheries biologist. Dr. Thom's research includes benthic primary production; the effects of pollution on nearshore marine systems in California, Washington, and Alaska; habitat construction and restoration of marine and estuarine systems; effects of climate change on estuarine systems; and ecology of fisheries resources in nearshore systems. Recent programs have included the Washington State Department of Transportation Marine Biology program, which received a national award of excellence, and the Corps of Engineers Institute of Water Resources environmental monitoring programs, which included an evaluation of habitat restoration projects across the country, as well as the development of a training module for agency administrators that uses an adaptive approach to the planning and management of restoration programs. Dr. Thom is currently a member of the King County Nearshore Technical Committee, which is providing technical guidance to the Central Puget Sound Watershed Forum and WRIAs 8 and 9. The Committee is looking at nearshore habitat and endangered species recovery issues and recommending studies of the nearshore environment to determine needed nearshore preservation, acquisition, and restoration projects. Dr. Thom has recently been appointed to the Technical Advisory team that is developing a framework for prioritizing nearshore and estuarine salmon habitat restoration projects. This framework would be

used by the Salmon Recovery Funding Board to make decisions on projects that are funded. Dr Thom also serves on the Nearshore PRISM working group. This working group is providing research directions through the University of Washington for nearshore systems in Puget Sound.

Presentation Abstract

Our review of the available research literature shows that although explicit documentation is limited, adequate evidence exists to suggest that shoreline modifications have a high potential for severely impacting nearshore biological resources in Washington State. Accordingly, we recommend that a comprehensive strategy be developed to better protect, restore, and enhance associated nearshore and estuarine habitats in the region. This strategy should be guided by existing datasets and inventories, with achievable goals that are periodically evaluated using an adaptive management framework. Simultaneously, a research and monitoring/assessment program must be undertaken to identify and fill critical data gaps to better understand nearshore biological functions and restoration needs, with an emphasis on how changes in habitat opportunity or capacity affect biological resources at a landscape scale. To achieve these ends, the following specific recommendations are offered:

A thorough physical assessment on a site-specific basis must be carried out to fully understand and document the potential direct, indirect and cumulative impacts prior to allowance of any shoreline modifications. Evaluations of potential effects of proposed shoreline modifications for a region must consider carefully how these functions will be affected prior to allowance of any modifications to take place. The assessment must be site-specific and scientifically rigorous enough to fully document the need for the modification, balanced by potential (including cumulative) impacts. Measures for protecting critical habitats must incorporate principles of landscape connectivity and extend to activities outside of their conveniently defined boundaries. When definitive scientific information is lacking but potential impacts are likely to occur, regulatory agencies should err on the side of caution to reach conservative decisions that favor natural, ecological functions.

Protect and restore sensitive marine nearshore and estuarine habitat and ecological functions by avoiding shoreline structural modifications altogether. Protection and conservation of ecologically important natural areas must be prioritized from a landscape perspective,

especially those sites recognized for their importance to shoreline processes (e.g., sediment dynamics) and biological functions (e.g., fish migratory corridors or spawning and nursery habitats).

Where new shoreline modifications must occur, impacts should be minimized by pursuing alternative techniques (e.g., beach nourishment) and placement strategies. Advantages of alternative shoreline armoring techniques and guidelines for implementing them should be published in an easy to read format and distributed to shoreline property owners. Tide gates should be designed to minimize restrictions while affording flood protection. Manually-operated, latched, or self-regulated tide gates should be used in conjunction with culverts that maintain natural estuarine processes and afford passage (both upstream and downstream) to fishes during most flow events. Where possible, wastewater should be recycled and reused in upland areas to minimize the impacts of outfalls on the marine environment.

Phased restoration of natural processes and ecological functions should be achieved through the strategic removal of unnecessary shoreline structures, especially in areas with particularly high rates of shoreline armoring and habitat structural modification. Restoration project planning must be complete and include a site assessment to assure that the site is as correct as possible for the type of restoration planned and that any modifications needed to correct problems with the site are fully understood and carried out. Restoration is intended to result in a net benefit to the ecosystem, but restoration actions should be considered relative to the potential for success in order to maximize the net benefits.

Restoration projects are uncertain and must be planned and evaluated carefully. Site assessments to evaluate the suitability of a site for restoration must be conducted. This can include small-scale experiments that test the ability of selected plants to grow at the site. Experiments can be incorporated directly into restoration projects to test factors that may be important in the long-term development of the site. Control of undesirable species, as well as herbivores and predators, should be considered and implemented as needed. All restoration projects should be monitored under an adaptive management program that allows for adjustment of the site or goals during system development. This will greatly improve the probability of success of the project.

Existing documents (Dethier et al. 1990, Simenstad et al. 1991a) should be used to provide a solid scientific basis for assessing the potential effects of changes caused by shoreline modifications and restoration on habitats and resources. It is further recommended that these documents be periodically reviewed and updated on a regular schedule with new information.

Existing baseline inventories (e.g., WDNR 2000, ShoreZone Inventory database) should be used for determining habitat trends, locating critical areas for protection or restoration, and identifying nearshore ecosystems most at risk to cumulative impacts. Maps of a similar type should be developed and updated for all marine and estuarine shorelines in the state.

We have recently initiated field studies to address shoreline armoring effects on juvenile salmonids. This work will investigate the effects of structures in open coast, estuarine and freshwater systems on predation pressure and migration. This study will be described.