

Technical Elements—Scope of Work**Puget Sound Nearshore Ecosystem Restoration Study
October 30, 2001****Table of Contents****Technical Elements****Background and Overview****Geographic Scope and Definition of "Nearshore"****Stage I of the Puget Sound Nearshore Ecosystem Restoration Project (The Nearshore)****Technical Framework****Technical Components for Stage I (18 months)****Adaptive Management****Stage II – Refinement of Model, Selection Criteria, Plan Formulation****Technical Elements for Stage II (24 months)****Stage III - Project Specific (Detailed) Study****List of Tables****Table 1. Stage I - Puget Sound Nearshore Science Team Activities and Tasks****Table 2. Nearshore Science Team List — Recommended Members, Alternates and Resource Specialists****Technical Elements****Background and Overview****Geographic Scope and Definition of "Nearshore"**

Estuarine and marine waters of the Puget Sound Basin extend from the city of Olympia at the southern extreme to the Canadian border and westward through the Strait of Juan de Fuca. Technically, Puget Sound is an inland sea that could be considered an "estuarine complex" because it is made up of an intricate mosaic of different kinds of estuaries—drowned river valleys, fjords, bar-build and lagoons. The Puget Sound Nearshore consists of a complex of estuaries, deltas, bays and inlets, lagoons, beaches, bluffs, rocky shores, intertidal flats, and shallow subtidal areas, accompanied by eelgrass beds, seaweeds, kelps and other biological communities. For the sake of simplicity, we can classify these nearshore complexes of habitats into two regimes: 1) Estuaries and deltas—regions of Puget Sound where considerable freshwater discharge from land drainage dilutes the more saline waters of the Sound within a semi-enclosed embayment or broad, shallow delta, or where tidal fluctuation occurs (in the absence of salt water) at the watershed terminus of rivers; and 2) Marine Shorelines—shoreline regions of Puget Sound outside estuaries and deltas, where influence from freshwater inputs is reduced or localized.

For the purposes of this study, the nearshore is defined as the estuarine/delta and marine shoreline and areas of shallow water from the top of the coastal bank or bluffs water ward to a depth of about 10 meters relative to Mean Lower Low Water (average depth limit of photic zone), thereby incorporating those geological and ecological processes, such as sediment movement, freshwater inputs, and subtidal light penetration, that are key to determining the distribution and condition of aquatic habitats. By our definition, the nearshore extends landward into the tidally influenced freshwater heads of estuaries and coastal streams.

This nearshore "estuarine-marine continuum" from tidal freshwater to the marine waters of Puget Sound provides fundamental habitat requirements for juvenile salmon. While some (termed "stream-type") salmon are typically not dependent on this ecosystem other than as a short migratory corridor, those species and life history stages that are dependent to varying degrees (i.e., those with "ocean type" life history patterns) on nearshore habitats use different segments of this continuum to different degrees, and the transitions between these segments might be considered disproportionately important to their survival. Among the breadth of diverse life histories of the five species of Pacific

salmon in this region, ocean-type salmon are those that spend relatively short periods in freshwater after hatching and rear extensively in estuarine and marine nearshore environments of the Sound. In particular, ocean-type populations of juvenile chinook salmon, and all populations of chum and pink salmon, rely extensively on nearshore estuarine-marine habitats during their early life history transition to the ocean. Scientific evidence, albeit not conclusive, suggests that ocean-type salmon use these shallow-water, transitional habitats for physiological adaptation, feeding and to avoid predation. Because these "nearshore dependent" salmon are comparatively small when they enter nearshore estuarine-marine environments, their survival is particularly dependent on their ability to grow rapidly and elude predation by occupying shallow waters with ample prey resources and refuge from predators. Thus, depending on the species and life history type, ocean-type juvenile salmon may rear extensively (weeks to months) in nearshore estuarine and marine habitats. Furthermore, due to the dynamic nature of tidal habitats and the often punctuated migration of the juvenile salmon, the distribution and organization of habitats along the nearshore estuarine-marine continuum is important to the continuity of their migratory corridor, especially when bridging extensive rearing habitats (e.g., estuarine wetlands and deltas).

Stage I of the Puget Sound Nearshore Ecosystem Restoration Project (The Nearshore)

Stage I of The Nearshore was approved and initiated on September 27, 2001, following agreement on and signing of the Feasibility Cost Sharing Agreement (FCSA) by the U.S. Army Corps of Engineers (USACE) and its local sponsor the Washington Department of Fish and Wildlife (WDFW). Within the FCSA, a technical approach to the project was identified and generally defined. This document was designed to serve as technical input to the FCSA.

Stage I will be comprised of two major technical efforts designed to lay the foundation for subsequent stages. The first effort, to be completed in the first four months of Stage I, will focus on adopting a Technical Framework needed to guide program research needs. The second effort includes Technical Components designed to scope and implement efforts related to nearshore characterization and assessment. The third effort is characterized as Adaptive Management and will focus on immediate research needs, from which future data collections will be based including monitoring and assessment of existing restoration projects to document lessons learned, improving planning efficiency and gathering relevant information. All major Stage 1 activities and tasks, and the duration of those tasks, are listed in [Table 1](#).

Technical Framework

This task represents the organizational component to Stage I. It will involve review of existing and ongoing efforts to characterize Puget Sound's nearshore environment and adoption by the Nearshore Science Team (NST) of agreed upon next steps as identified by those efforts. The Technical Framework will organize and guide technical program work directly related to the Nearshore Study goals and objectives.

Assemble and Convene a Nearshore Science Team (NST) (3 months). The NST will consist of regional experts and members of relevant scientific disciplines for the purpose of providing broad scientific guidance to The Nearshore Study. Representatives from the USACE and Sponsor or their designees will be considered program facilitators to the NST responsible for completing all administrative tasks including meeting coordination, meeting notes, set-up and execution of scientific workshops. These individuals will be ad hoc members of the Steering Committee and report findings and recommendations to this group on a regular basis. The NST will identify additional scientific expertise in the community for project-specific purposes and maintain communications with the larger group on the overall direction of The Nearshore Study and likely next steps that would require their expertise. Team make-up will include — a mix of disciplines; a group of seven (7) technical members will be considered the "core" members (for maximum team effectiveness; and each core member must represent a body of knowledge (within a discipline or organization) that can be used to network or carry communications to a broader scientific audience. In addition to the core members, experts may be called upon to fulfill other roles as alternates (to the core members) or resource specialists available to support the work of the NST. [Table 2](#) is a list of recommended core members and potential alternate and resource specialists.

Adopt a Set of Guiding Ecological Principles (3 months). The NST will adopt and modify as appropriate a set of Guiding Ecological Principles which set the geographical and ecological sideboards for the program tasks and scope as agreed upon from the outcomes of existing nearshore characterization and assessment reports. An objective set of Guiding Ecological Principles will be required to both frame and evaluate restoration activities. They will be designed to guide all phases of habitat restoration, including the context, planning, design, implementation and monitoring and assessment. These Principles will be restricted to ecological concepts, with the primary purpose of identifying attributes of restoration studies, planning and projects that are most likely to achieve maximum contribution to marine resource recovery of a natural ecosystem within the constraints of the developed Puget Sound Basin.

Written Framework (3 months). The NST will produce a written framework including detailed objectives; description of guiding ecological principles, initial data gaps and research needs, and list of potential partner projects describing specific tasks and schedule for deliverables.

Operate Nearshore Science Team (Ongoing). The function of the NST will be to identify and continue tracking related, ongoing Puget Sound nearshore studies and programs, and develop mechanisms and agreements to coordinate and collaborate on nearshore work that forwards the goals and objectives of The Nearshore Study (partnered projects). The

ultimate goal of this task will be to assure that The Nearshore Study adds to and supports, rather than duplicates or competes with ongoing studies and projects. Work items for the NST include identification of studies and programs that are closely related to The Nearshore Study, and development and implementation of mechanisms to track, coordinate with and collaborate on nearshore work to facilitate efficient use of institutional and human resources. NST core membership and non-federal lead responsibilities will carry a time requirement, for which some members may require compensation. Dispersement guidelines for compensation will be a Steering Committee responsibility.

Technical Components for Stage I (18 months)

These efforts are designed to scope and implement efforts related to nearshore characterization and assessment that will be built upon in later stages. Where possible, deliverables have been scheduled to disseminate results as Stage I progresses. This portion of the program will:

Adopt Conceptual Model of Nearshore Habitat (4 months). Existing scientific models will be adapted to develop a conceptual model of the Puget Sound Nearshore. The model will describe natural functions and processes within the nearshore environment that support salmon and other key species, and describe how these processes interact with human uses. While the conceptual model will focus on the nearshore, it will recognize connections to upland, watershed and offshore systems for potential inclusion in cross system comparisons.

Compilation of and Access to Existing Information (Ongoing, 18 months). High value data sets on nearshore habitats and the resources they support, will be compiled, synthesized and integrated to make them available for use by the public and project partners. Projects to be considered include—compilation of Shore Zone, drift cell, forage fish, oblique photos and other data sets into a comprehensive and accessible data analysis tool. Data integration tasks will bring together currently available information on marine shoreline characteristics to facilitate the use of these data in restoration shoreline management planning. As part of this project, a web portal will be developed that supports the short and long term information access needs of The Nearshore Study and its partners. Data discovery, complete data set retrieval, feedback from data users, the dissemination and support of selected "canned" data products, selected ad hoc data query, and GIS mapping functions will be included.

Limiting Factors Analysis for Salmon and Other Key Species (6 months). This task shall identify factors limiting salmon and other key species in the nearshore by utilizing the analysis of current and historic conditions, the conceptual model, and knowledge of salmon life history and ecology. The analysis will be conducted at multiple spatial scales targeting the key processes and habitat characteristics that are most limiting to salmon in the nearshore habitat of Puget Sound.

Conditions Analysis and Assessment (18 months, Ongoing). Characterization of the current and historic conditions of key nearshore habitats and processes through analyses of information available to federal, state, tribal, local and other groups that are seeking to identify sites for restoration. Developed from the compilation of existing data, the limiting factors analysis and reconstructed historic current conditions.

Selection Criteria for Habitat Restoration (14-months). Evaluate alternative approaches and select criteria for establishing priorities for restoration and conservation projects, based on providing high quality functioning habitats that will contribute to salmon recovery and support other key species. This task will utilize Guiding Ecological Principles to generate specific recommendations for the distribution of restoration actions of various types across the Puget Sound Basin. This task will contain an integration of results from the conceptual model, compilation of existing information, limiting factors analysis, conditions analysis and initial identification of data gaps and information needs. Effort will be tailored to the development of restoration approaches, selection criteria and recommendations.

Action Project List (6 months). Develop a list of areas and actions on an annual basis that are appropriate for habitat restoration and/or an enhanced level of protection derived by applying selection criteria to existing habitat data, and generating a list of the highest priority areas and actions. This task would occur in the final six months of Stage I and will guide in selecting areas and sites for high priority protection or restoration projects.

Identify Data Gaps and Research Needs for Stage II (2 months). Revise and update data gaps and research needs developed under the Technical Framework of Stage I as necessary to complete Stage II. Provides entities working on restoration of nearshore areas a list of the most important weaknesses in the existing data and what new data should be collected if funding becomes available. This will help focus any future data collection efforts.

Adaptive Management

These efforts are designed to scope and implement efforts related to nearshore investigations and data collection activities which would build upon the more programmatic aspects of the technical components listed above. In addition, these efforts would capitalize on research and technical studies, which are consistent with the goals and objectives of The Nearshore Study. Potential studies might include:

1. Assessing the effectiveness of previously completed restoration projects to verify benefits;
2. Development of reference sites to serve as templates of properly functioning conditions; and
3. Incorporation of existing studies (outside The Nearshore Study) that could provide additional information to the

Stage I study components if additional resources were provided.

Stage II – Refinement of Model, Selection Criteria, Plan Formulation

The processes, data, and criteria developed during Stage I will be inserted and manipulated to further calibrate and refine the models, selection criteria, action list and scope of the overall project. It is anticipated that new information collected and synthesized during Stage I might alter the study parameters or direction. Additional data collection may be needed to further understand the processes and functions of Puget Sound during this Stage. Additional modeling exercises may be required to better depict the diverse conditions of the nearshore habitat. Surveys of marine species may be required and/or new methodologies developed to assist in the development of a Sound-wide approach to restoration, enhancement or preservation of key nearshore habitat areas. Some key elements have been identified and include the following:

Technical Elements for Stage II (24 months)

Upon approval, Stage II will be designed to build upon direction given under Stage I by initiating a full-scale planning and environmental studies program. The purpose of Stage II is to begin acquiring program specific data to serve as planning guidance and decision-making tools later in the planning process. It is anticipated that specific areas of investigation will be tailored to outcomes under Stage I however, several specific areas of study have been identified as needing attention. The first effort shall be a continuance of data management functions initiated in Stage I. Secondly, efforts should be made based upon workshops and other discussions held during Stage I to provide direction for studies designed to gain project relevant information for salmonid and other nearshore species use of nearshore resource with a focus on high priority areas. The second effort will synthesize lessons learned and application research of existing restoration projects. Efforts started under Stage II will be tailored where possible to end prior to initiation of Stage III but many of the biological investigations may continue into Stage III.

Operate Nearshore Science Team. Continued costs to fund the NST from Stage I. Assumes continued compensation for some employees with additional costs for meetings, workshops and publications.

Compilation and Access to New and Existing Information. Continued compilation, synthesis and integration of high priority information on nearshore habitats and the resources they support especially information on vegetation or other critical habitat distribution and associated species assemblages. Includes technical dissemination of information in the form of workshops, conferences, publications and mass media. This effort would serve as an extension and summary of information management products.

Data Gaps and Research Needs. Under direction of the NST shall continue to scope and execute major research needs that were identified in Stage I to evaluate current and historic conditions, evaluate recovery potential, and guide future restoration decisions.

Adaptive Management. These efforts will continue efforts from Stage I. The intent is to develop, scope and implement efforts related to nearshore investigations and data collection activities which would build upon the more programmatic aspects within the technical components listed in Stage I. In addition, these efforts will continue to capitalize on research and technical studies which are consistent with the goals and objectives of The Nearshore Study.

Stage III - Project Specific (Detailed) Study

Upon approval, Stage III will be designed as a continuance of studies with further refinement based on data gathered under Stage II. Stage III will continue information management functions initiated and carried through in earlier stages. Stage III will consolidate results of field studies to develop tools to be used by the project during design and alternative selection. Stage III will also serve to synthesis planning and biological investigations such that feedback in the form of public dissemination can be given to various stakeholders.

Operate Nearshore Science Team. Continued costs to fund the NST from Stage II. Assumes continued compensation for some employees with additional costs for meetings and publications.

Compilation and Access to New and Existing Information. Continued compilation, synthesis and integration of high priority information on nearshore habitats and the resources they support especially information on vegetation or other critical habitat distribution and associated species assemblages. Includes technical dissemination of information in the form of workshops, conferences, publications and mass media. This effort would serve as an extension and summary of information management products.

Data Gaps and Research Needs. Under direction of the NST, shall continue to scope and execute major research needs that were identified in Stages I and II to evaluate current and historic conditions, evaluate recovery potential, and guide future restoration decisions.

Adaptive Management. These efforts will continue work begun in Stage II. The intent is to develop, scope and implement efforts related to nearshore investigations and data collection activities which would build upon the more programmatic aspects within the technical components listed in Stage II. In addition, these efforts will continue to

capitalize on research and technical studies which are consistent with the goals and objectives of The Nearshore Study.

Table 1. Stage I -Puget Sound Nearshore Science Team Activities and Tasks				
	Duration	Initiate	Complete	NST Costs
Development of Technical Framework	392 days	31-Oct-01	30-Apr-03	\$50,000
Assemble and Convene Nearshore Technical Team	67 days	31-Oct-01	31-Jan-02	\$10,000
Adopt Guiding Ecological Principals	64 days	1-Feb-02	01-May-02	\$10,000
Produce Written Framework	64 days	1-Feb-02	01-May-02	\$20,000
Coordination of Technical Aspects of Project	392 days	31-Oct-01	30-Apr-03	
Operate Nearshore Science Team	130 days	31-Oct-01	30-Apr-03	\$200,000
Technical Components	392 days	31-Oct-01	30-Apr-03	
Adopt Conceptual Model of PS Nearshore Ecosystem	87 days	31-Oct-01	28-Feb-02	\$30,000
Compilation/Access Existing Information	392 days	31-Oct-01	30-Apr-03	\$700,000
Identify Limiting Factors for Salmonids/Other Key Species	130 days	31-Oct-01	30-Apr-02	\$75,000
Conditions Analysis and Assessment	392 days	31-Oct-01	30-Apr-03	\$100,000
Develop Selection Criteria for Habitat Restoration	306 days	28-Feb-02	30-Apr-03	\$50,000
Develop Early Action List	130 days	31-Oct-02	30-Apr-03	\$150,000
Identify Data Gaps/Research Needs-Scope Stage II	130 days	31-Oct-02	30-Apr-03	\$50,000
Adaptive Management	566 days	1-Jan-02	01-Mar-04	
Assessment of Existing Restoration Sites	263 days	1-Jan-02	01-Jan-03	\$200,000
Development of Reference Site Templates	263 days	1-Jan-02	01-Jan-03	\$75,000
Access & Incorporate Existing/New Studies	199 days	1-Apr-02	01-Jan-03	\$250,000
Without Project Condition Report	643 days	31-Oct-01	15-Apr-04	
Draft Existing Condition Report	459 days	1-Apr-02	31-Dec-03	\$97,500
Technical Review	43 days	1-Jan-04	01-Mar-04	\$45,000