

# PUGET SOUND nearshore PROJECT



*A partnership among local, state and tribal governments in Washington state, the U.S. Army Corps of Engineers and other federal agencies, industries and environmental organizations.*

**Our mission:** Protect and restore the functions and natural processes of Puget Sound nearshore ecosystems in support of the natural resources and beneficial uses of Puget Sound and the Puget Sound basin.

## Strategic Principles and Concepts

To meet the mission of the **Puget Sound Nearshore Ecosystem Restoration Project (PSNERP)**, we are working to:

1. Develop an appropriate approach to nearshore ecosystem recovery.
2. Identify and implement restoration actions consistent with this approach.

To meet the first task, PSNERP is developing a document that describes the project's strategic principles and concepts.

The strategic principles and concepts for PSNERP is organized into five sections:

1. Purpose and need.
2. Fundamental assumptions and concepts.
3. Restoration principles.
4. Adaptive management principles.
5. Monitoring principles.



### Fundamental assumptions and concepts

In section two of strategic principles and concepts, PSNERP describes the fundamental assumptions and concepts that frame PSNERP's understanding of nearshore ecosystems and the project's suggested approach to nearshore ecosystem recovery. These assumptions and concepts include:

#### ▼ Properties of nearshore ecosystems

Physical and chemical factors play a strong role in organizing and regulating nearshore ecosystems. Unlike some ecosystems dominated by either bottom-up (regulated by primary production) or top-down (regulated by predation and competition) biotic factors, coastal ecosystems are strongly affected by physical and chemical factors. Structure affects physical, chemical and biological processes; structure is also created and modified by these processes. The availability of habitat for specific plants and animals results from a strong linkage between ecosystem processes and structure.

Biological communities exist at a variety of scales in time and space. Effective nearshore ecosystem recovery requires understanding how communities at each of these scales will or will not be affected.

Natural disturbance events sustain both structures and functions. A view of ecosystems as static, and a restoration approach that does not recognize and incorporate the role of disturbance and change, will fail to achieve a desirable outcome of ecological performance and sustainability.

### ▼ Importance of landscape setting and structure

Ecosystem function depends on setting in the landscape.

Landscape ecology provides concepts that apply to nearshore ecosystems. Principles developed primarily through the study of terrestrial ecosystems are relevant to nearshore ecosystems.

### ▼ Role of population ecology

Species with both simple and complex life histories depend on the integrity of nearshore ecosystems.

Life history diversity is essential to sustaining populations. Nearshore plant and animal populations are vulnerable to unpredictable shifts in ecosystem conditions. Diverse life histories and diverse landscapes provide reservoirs for sustainable populations.

### ▼ Project Follow-through

Use project objectives to build performance criteria and implement a monitoring program that evaluates attributes directly related to these criteria and the objectives they assess.

Employ adaptive management in project development and in revising program goals and objectives.

Incorporate monitoring programs and adaptive management as essential components to effective ecosystem recovery actions.

Take advantage of best, interdisciplinary science and technical knowledge and use a scientific peer-review process.

## Restoration Principles

PSNERP has identified the following principles that should guide our overall ecosystem recovery strategy, and the design and follow-through of individual projects. These principles form the core of our *Guidance for Protection and Restoration of Nearshore Ecosystems of Puget Sound*.

### ▼ Strategic

Focus on restoration of natural processes that create and maintain nearshore ecosystem function.

Promote protection of nearshore habitats and the processes that sustain their functions as a fundamental component of PSNERP.

Incorporate outreach education and public involvement into all steps of PSNERP.

### ▼ Restoration Design

Ecosystem recovery actions should be based on explicitly stated hypotheses.

The design of initial restoration projects should be done as experiments to fill information needs.

Restoration planning should precede project implementation.

Restoration should consider the dynamic character of nearshore ecosystems, including ecological succession.

Projects should recognize the limits on ecosystem potential constrained or limited by irreversible change.

Restoration projects should be based on carefully developed goals and objectives.

## Adaptive Management Principles

Adaptive management is a process that employs research and monitoring to allow certain projects and activities to proceed, despite some uncertainty and risk regarding their consequences. Adaptive management can be used during ecosystem restoration to learn about the affected ecosystem. In order to learn, actions are designed as studies or experiments to evaluate ecosystem responses.

PSNERP has identified the following principles that describe how the project is to be guided by adaptive management.

- ▼ Adaptive management should be employed to develop and change individual projects, underlying strategies and even the overall program.

Project-specific monitoring should be designed and implemented so that information returned can be used to make changes in the existing project.

Information on the success of ecosystem recovery actions should be used to design future projects.

Adaptive management should be used to continually revise and update PSNERP goals.

- ▶ Adaptive management is best accomplished at large scales (e.g., watershed, regional).
- ▶ Adaptive management should be used to help reduce uncertainty and risk of ecosystem recovery actions and to increase our knowledge about nearshore ecosystems.
- ▶ Adaptive management requires that all ecosystem recovery actions be viewed, implemented and monitored as tests of hypotheses about ecosystem responses to restoration actions.



Photos courtesy of Curtis Tanner,  
U.S. Fish and Wildlife Service

*Effectiveness monitoring at the Spencer Island restoration project has evaluated the presence of juvenile salmon and their prey (food) resources. This monitoring attempts to answer the question: "Do juvenile salmon have access to the restored habitats?"*



- ▶ An adaptive management approach is preferred where data are available at multiple steps and are used to structure a range of alternative response models.
- ▶ Environmental thresholds or triggers are essential in adaptive management. These must be agreed upon ahead of time, must be measurable and must be unequivocally linked to goals of the ecosystem recovery action or program.
- ▶ Science, monitoring and management institutions should be engaged in adaptive management. Scientists and managers must be prepared to accept that some actions will not go as expected.

## Monitoring Principles

A final group of principles relate to monitoring and information management aspects of ecosystem recovery. PSNERP and other restoration and recovery programs define three types of monitoring:

- ▼ Implementation monitoring
  - Designed to determine whether the actions were implemented as designed.
  - Was the project built as planned?
- ▼ Effectiveness monitoring
  - Designed to determine whether the actions are producing the conditions expected.
  - Are the ecosystem processes and the habitats that result being restored?
- ▼ Validation monitoring
  - Designed to evaluate cause-and-effect relationships between the action and the resulting resource conditions.
  - Are there more fish, birds, etc., as a result of the habitat or processes restored?

Principles of monitoring and information management include:

- ▶ Monitoring should be driven by specific questions, goals and objectives.
- ▶ Monitoring should determine if restoration goals are being met.
- ▶ Project objectives should be used to build performance criteria and implement a monitoring program that evaluates attributes directly related to these criteria and the objectives they assess.
- ▶ Adaptive management should be employed in project development and drive revisions of program goals and objectives.
- ▶ Monitoring must be a long-term effort.
- ▶ Monitoring should be interdisciplinary. Because ecosystems are complex aggregations of biotic and abiotic components, those involved in monitoring efforts must represent a broad enough suite of disciplines to cover the range of necessary expertise.
- ▶ Monitoring should occur at multiple scales of time and space to provide data that characterize the variability of the ecosystem and its processes.
- ▶ Reference or control sites should be included in monitoring plans wherever possible to account for natural or background variation and to gauge development of the site.
- ▶ Monitoring must be interinstitutional.
- ▶ Data must be well documented, described and available. Data libraries form the foundation for integration between data users, use of multiple data sets and understanding of error and quality control.





Photo courtesy of Jane Rubey, Washington Department of Ecology

*Vegetation sampling attempts to answer the question: "What effects has restoration of tidal hydrology had on vegetation community patterns and plant species composition?"*

This fact sheet provides a brief introduction to one of the early products of the Puget Sound Nearshore Ecosystem Restoration Project (PSNERP) Nearshore Science Team.

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