COMMENCEMENT BAY
NATURAL RESOURCE RESTORATION

RESTORATION PLAN

June 1997

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OVERVIEW

The Commencement Bay Conceptual Restoration Plan provides a framework for the Commencement Bay Natural Resource Damage Assessment (CB/NRDA) program to translate the preferred alternative—the Integrated Approach—of the programmatic Environmental Impact Statement (EIS) into on-the-ground restoration projects.

If the preferred alternative is selected, the Conceptual Restoration Plan will become the Final Restoration Plan. The Integrated Approach will be a combination of projects designed to provide maximum benefit to Commencement Bay's injured natural resources and services in accordance with the goals and objectives of the Commencement Bay Natural Resource Trustees (Trustees). The scale of restoration activity that will be taken by this plan will depend upon the funds, property, and services made available through resolution of natural resource damage claims.

The Restoration Plan will focus restoration actions within the primary study area, which covers approximately 25 square miles of Commencement Bay and the immediately surrounding area. This is the area where injury to natural resources of concern from releases of hazardous substances or discharges of oil principally occurred.

CB/NRDA Restoration Goals and Objectives

The CB/NRDA Restoration Panel (Panel) developed four primary objectives upon which this Restoration Plan is based:

1. Provide a functioning and sustainable ecosystem where selected habitats and species of injured fish and wildlife will be enhanced to provide a net gain of habitat function beyond existing conditions.

2. Integrate restoration strategies to increase the likelihood of success.

3. Coordinate restoration efforts with other planning and regulatory activities to maximize habitat restoration.

4. Involve the public in restoration planning and implementation.

Restoration Framework

The Trustees have developed a restoration framework as a dynamic series of concepts for use in restoration planning. The framework focuses on restoring various habitat components, such as vegetated shallows, mudflats and salt marshes, off-channel sloughs and lagoons, tidal creeks, freshwater marshes, adjacent well-stratified upland buffers, and naturalized creek and river channel corridors. In addition, the framework emphasizes restoration through a landscape ecology approach, rather than creating isolated fragments of habitats; each restoration effort is intended to function in concert with other projects. A Trustee team will oversee implementation of the CB/NRDA Restoration Plan, soliciting input from public representatives and experts, as needed.

Habitat Focus Areas

This conceptual Restoration Plan describes habitat focus areas (HFAs) with different NRDA habitat restoration needs and approaches for a variety of restoration habitats. The Trustees acknowledge the limitations of placing restoration in areas adjacent to major commercial or industrial developments that may be contaminated and where source control may have only just begun. The purpose of HFAs is to artificially break up a large, complex, industrial, urban embayment into smaller geographic and functional units to more easily visualize restoration potentials. Each HFA places boundaries around important target habitat features and incorporates other considerations, such as obvious geographic boundaries, restoration site clusters, exposure to wave energy, location, land uses and development, and maritime use.

The Trustees have developed six HFAs for restoring Commencement Bay:

1. The Puyallup River wetlands/corridors, with target habitats of riverine and riparian areas for juvenile and adult salmon migration routes, offstream feeding, rearing, resting, and acclimation areas, migratory and waterfowl nesting, and small mammal corridors.

2. Heads of waterways/river delta with target habitats of intertidal mudflats and shallow subtidal areas for juvenile salmonid acclimation and nursery areas, resident bottom fish, seagrasses, shorebird and raptor feeding, and detritus export.

3. The Hylebos Waterway with target habitats of estuarine channels, intertidal mudflats, and riparian greenways for salmonid acclimation, subtidal resident fish, shorebirds, and raptors.

4. The eastern shoreline with target habitats of intertidal, mudflats, vegetated shallows, subtidal, and riparian greenways for salmonid migration routes, primary and secondary production, waterfowl, shorebirds, and raptors.

5. The western shoreline with target habitats of intertidal, vegetated shallows, subtidal, and riparian greenbelts for salmonid migration routes, primary and secondary production, shorebirds, and raptors.

6. Hylebos and Wapato Creeks wetlands/corridors with target habitats of freshwater channels, wetlands, and riparian corridor for salmonid migration and spawning, waterfowl and wildlife use, and furbearing mammals.

Potential Restoration Site Inventory

The Panel developed criteria to analyze potential restoration sites in the primary study area. The required criteria screen out sites that do not attain a minimum level of (1) land availability, (2) source control, and (3) restoration of injured natural resources or lost services. The preferred criteria are then used to rank suitable restoration sites as one of the following:

- high importance (functional connectivity, physical location in the Bay, distance from sources of contamination or human disturbances, cost-effectiveness, and sustainability;

- medium importance (size, ownership and management, land use compatibility, and water quantity and flow [unique criterion for freshwater stream and riparian sites relating to flooding and erosion potential]); or

- lesser impor[illegible]blic access).

Project Selection

Once potential project sites have been inventoried, suitability for restoration can be assessed. A project-specific vision of what restoration is needed and how it can be carried out is then developed for each site. Site-specific goals are established and specific restoration techniques are conceptualized. Preliminary cost estimates are prepared and compared with available funding. The use of partnering opportunities or economies of scale that reduce costs or improve project benefits will be incorporated into project design and implementation, where feasible.

The Restoration Plan will allow implementation of habitat restoration projects to occur sooner, rather than waiting until all the NRDA efforts are completed. Specific projects will be evaluated according to the selection criteria and feasibility studies (landscape ecology, legal, environmental, contamination), all within a Trustee-directed restoration framework.

Project Implementation

After the site has satisfied the criteria and the decision has been made to initiate a restoration project, a project management plan is developed to implement and monitor the project. A project manager will be named, and detailed surveys, budgets, and plans will be developed. These project documents will include environmental audits, construction diagrams, permit requirements, monitoring, contingency, and adaptive management plans, public awareness and education opportunities, and long-term stewardship and maintenance agreements. If several projects are implemented at the same time, economies of scale may be achieved by coordinating scheduling, construction, and monitoring. The Trustee Council will maintain oversight and financial control over all CB/NRDA restoration projects.

Specific project actions under this Restoration Plan are intended to be consistent with local and state planning documents and regulations, such as adopted land use plans, critical area ordinances, and other development regulations. The project manager will adhere to all appropriate and relevant regulations and permits. The usual public involvement requirements for permit hearings will be observed, and additional public input will be encouraged during project conceptualization and planning.

Monitoring

Each site-specific restoration project will develop a detailed monitoring plan as part of the project management process. Often, permit requirements set out guidelines for monitoring plan needs, as well as criteria for duration, sampling frequency, analytical parameters, and quality assurance and control. Beyond the monitoring requirements set forth in the various permit requirements, the Trustees are responsible for assessing the performance of restoration projects to (1) determine if they are meeting their goals, (2) establish whether adjustments are needed to better meet the goals (adaptive management), and (3) provide information to improve the design and implementation of future projects.

Adaptive Management

The Trustees believe that restoration projects should be based on sound scientific principles. However, sometimes even well-conceived plans can have unforeseen complications requiring mid-course corrections and adaptive management decisions. When a project does not reach an objective, the Trustees will determine if additional construction or plantings are needed or if the objective needs to be modified based on a better understanding of the ecosystem.

Stewardship

Long-term stewardship and protection will ensure that the public's natural resources and services are maintained in perpetuity. Activities that could benefit from citizen participation include the following: project planning through permit reviews and hearings; construction activities, such as vegetation plantings, monitoring, and data entry; public outreach and education, such as production of displays and leading field trips to the site; and maintenance, such as replantings, debris removal, and exotic plant removal.

1.0 FRAMEWORK FOR NRDA RESTORATION ACTIVITIES

1.1 Overview

The Commencement Bay Conceptual Restoration Plan provides a framework for translating the Preferred Alternative of the Programmatic Environmental Impact Statement (EIS) into on-the-ground restoration projects. If the Preferred Alternative (Integrated Approach) is selected, the Conceptual Restoration Plan can become the Final Restoration Plan, following all suitable National Environmental Policy Act (NEPA) review processes. The Integrated Approach will use a landscape ecology approach to combine projects designed to provide maximum benefits while restoring Commencement Bay's natural resources and services in accordance with the goals and objectives of the Natural Resource Trustees (Trustees). The plan will evaluate proposed Commencement Bay Natural Resource Damage Assessment (CB/NRDA) projects developed by the public, potentially responsible parties (PRPs), and the Trustees against a set of restoration criteria. This document is not intended to quantify the extent of restoration needed to satisfy claims under applicable law against responsible parties for environmental injury. The scale of restoration activity that will be taken by this plan will depend upon the funds, property, and services made available through resolution of natural resources damage claims. Specific projects will then be matched with available funds from other settlement resources (in-kind services, property, easements), ecological objectives, feasibility, property accessibility, recontamination potential, stewardship, and public education and support.

This Restoration Plan should become a stand-alone document that complements the Final Programmatic EIS. The Plan discusses the Trustees' role and activities in Commencement Bay and describes the NRDA restoration goals and objectives, including a Commencement Bay-specific Restoration Framework. Over the past several years as part of the Commencement Bay Damage Assessment Phase I activities, the Trustees have evaluated a number of potential restoration sites in the primary study area in conjunction with public and PRP input. Other broad-based action groups, such as Citizens for a Healthy Bay (CHB) and the Commencement Bay Cleanup Action Committee (CBCAC), have also developed visions for Commencement Bay restoration, some components of which are integrated into this Plan. Site screening and selection criteria were developed and applied initially to more than 100 largely undeveloped locations in the primary study area.

For purposes of the Restoration Plan, the Commencement Bay environment (Figure 1-1) is composed of two study areas, as described in detail in the EIS (Section 1, EIS, Vol. I). The primary study area of approximately 25 square miles (16,000 acres) consists of Commencement Bay (the Bay) and the immediately surrounding area, extending from Point Defiance and Brown's Point Hylebos and Wapato Creeks and the Puyallup River to the SR-161 bridge (Figure 1-2). The expanded study area of approximately 1,000 square miles includes the Puyallup River Basin (the Basin), and is comprised of Commencement Bay and its watershed, including the main tributaries (the Puyallup, Carbon, and White Rivers) and

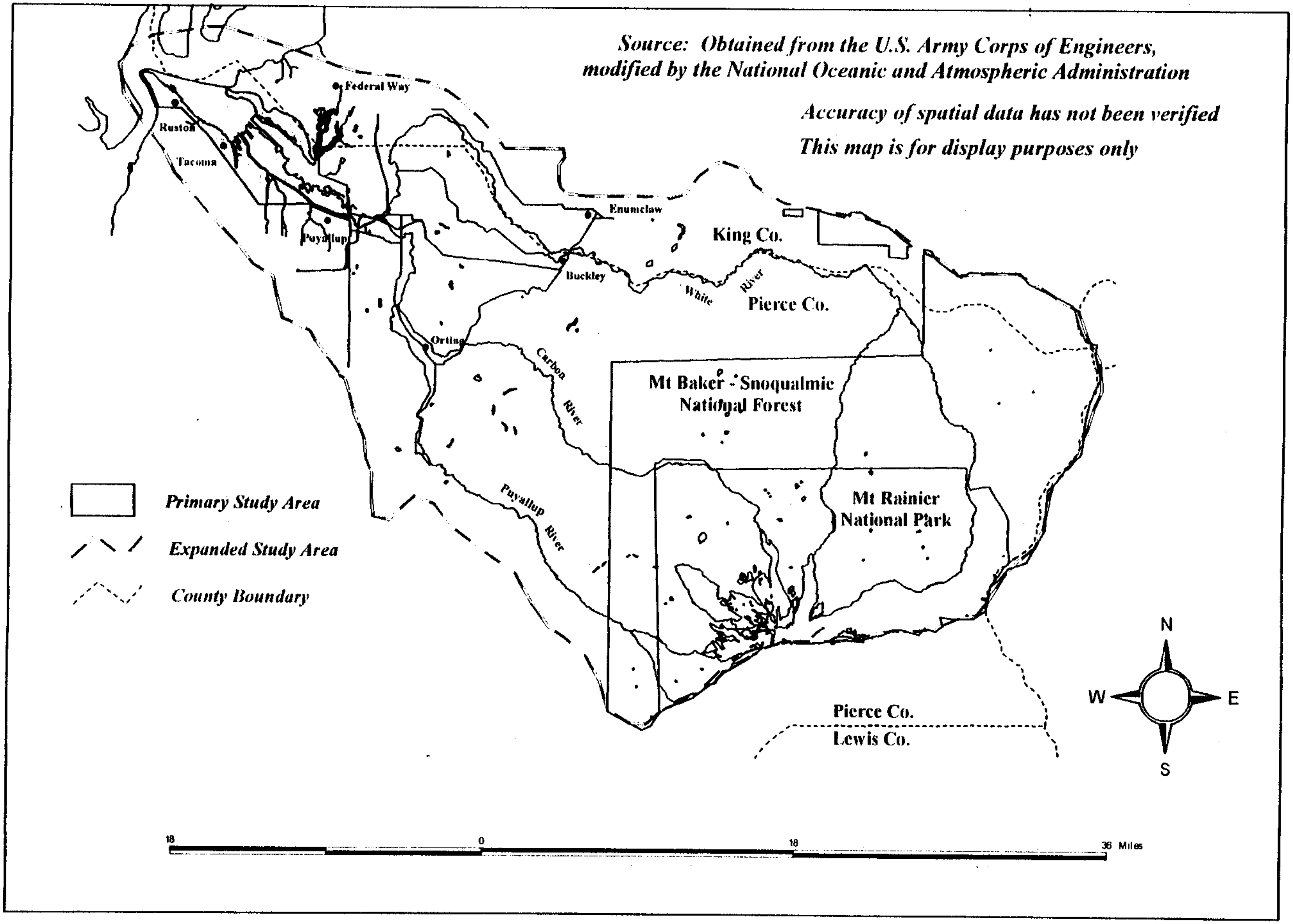

Figure 1-1. Commencement Bay Study Areas.

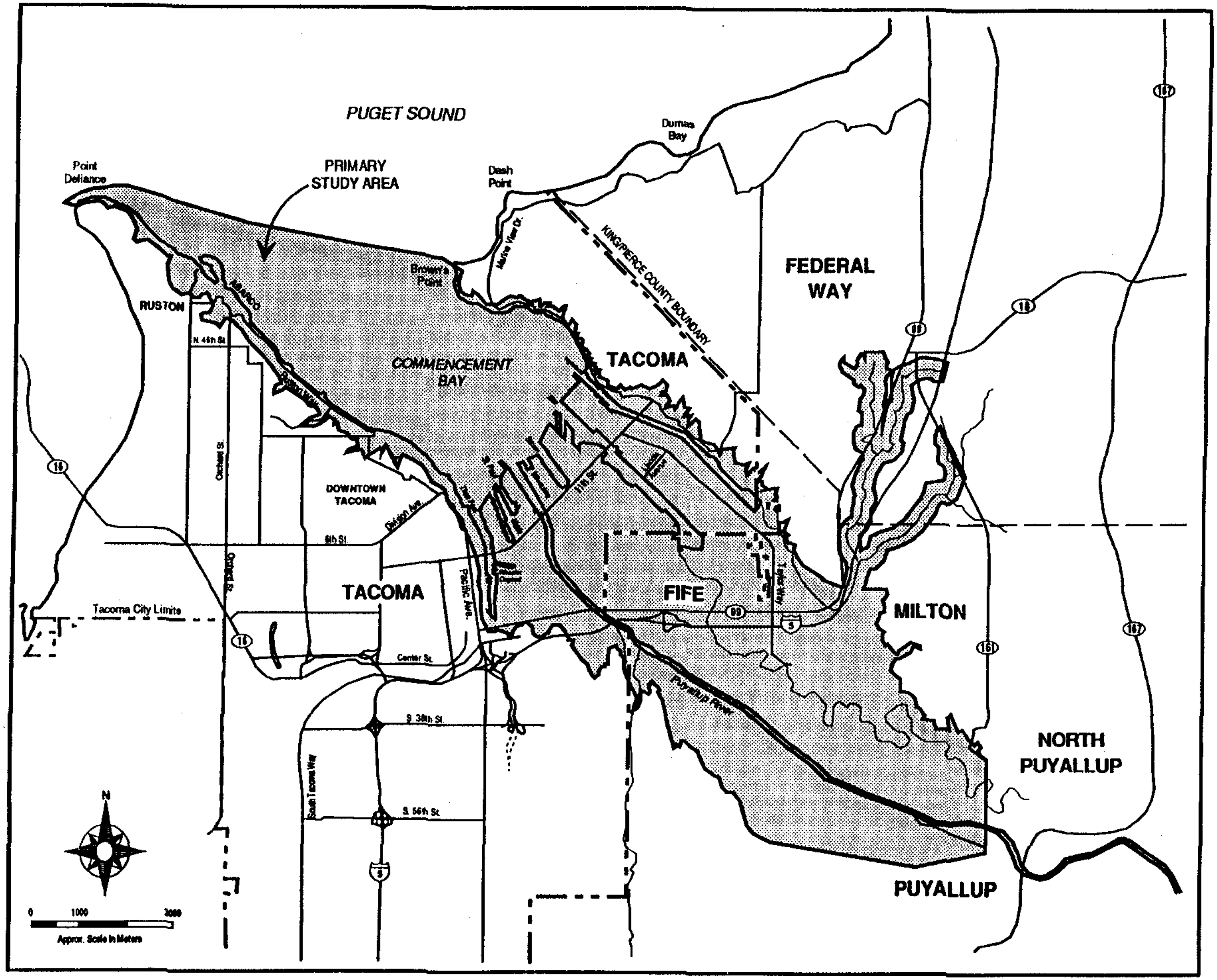

Figure 1-2. Commencement Bay Primary Study Area (shaded).

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the Puget Sound coastal areas adjacent to the Bay (southern Vashon and Maury Islands, Dumas Bay, and western approaches to Point Defiance). The Trustees will undertake restoration actions within the expanded study area only when they conclude that they cannot successfully implement the preferred restoration alternative within the primary study area alone (see Section 1, EIS, Vol. I and Section 1.5.5, following).

Once this Restoration Plan is finalized under the NEPA process, nominations for projects will be accepted by the Trustees from within this inventory of sites or other suitable NRDA projects as proposed by governmental entities, PRPs, and the public. The CB/NRDA activities are continuing; as settlements are completed and funds become available, restoration projects will be implemented. The Restoration Plan will allow for implementation to occur sooner, rather than wait years until all the damage assessment efforts are completed. Specific projects will be evaluated according to the selection criteria and feasibility studies (landscape ecology, legal, environmental, contamination), all conducted within a Trustee-directed restoration framework. Once a specific project has been selected, a project manager will be named, and detailed surveys, budgets, and plans will be developed. These documents will include environmental audits, construction diagrams, permit requirements, monitoring, contingency, and adaptive management plans, public awareness and education opportunities, and long-term stewardship and maintenance agreements.

Each project will stand on its own merits and will fit under the overall landscape ecology approach. Habitat management, particularly at the ecosystem or regional level, needs to be integrated with other landscape planning policies and authorities to succeed. For the restoration program to achieve and sustain its goals, this Restoration Plan will be coordinated with other local, regional, tribal, state, and federal management efforts, to the extent possible. The Restoration Plan needs to be consistent with Washington state constitutional and statutory mandates for management of state-owned aquatic lands for projects on such lands to be successful and sustainable (Teissere, 1996, personal communication).

1.2 Natural Resource Trustees' Role and Activities

In the early 1990s, federal and state agencies and tribal governments initiated the CB/NRDA and restoration planning process. These Trustees represent the interests of the public in assessing damages and restoring the public's natural resources and services, including those services directly or indirectly benefiting humans. The Trustees for Commencement Bay are the following: the National Oceanic and Atmospheric Administration; the Department of the Interior, which includes the U.S. Fish and Wildlife Service and the Bureau of Indian Affairs; the State of Washington, including the Departments of Ecology (lead state trustee), Fish and Wildlife, and Natural Resources (WDNR); the Puyallup Tribe of Indians; and the Muckleshoot Indian Tribe. The CB/NRDA process is authorized under the federal Superfund law, and other laws (Section 5, EIS, Vol. I).

Through the NRDA process, the Trustees examine the injuries to natural resources—such as fish, wildlife, shellfish, sediments and water–caused by releases of hazardous substances and discharges of oil. The Trustees calculate damages attributable to the injuries (in terms of dollars, lost acre/years of habitat etc.) and recover the damages from parties who have caused the injuries. By law, the Trustees must use the recovered damages to restore, rehabilitate, replace, or acquire the equivalent of those injured natural resources and services. To determine what type of restoration is appropriate, the NRDA process includes restoration planning. Public participation is an important component of restoration planning by helping the Trustees select, shape, and protect restoration projects.

In 1992 during Phase I of the NRDA process, the Trustees formed a Coordinating Committee for the Commencement Bay NRDA process. It consisted of the Trustees, and certain parties (PRPs) who may have some responsibility for natural resource injuries in the U.S. Environmental Protection Agency's (EPA) Commencement Bay/Nearshore Tideflats Superfund Site (U.S. EPA, 1989), plus two public interest entities: Citizens for a Healthy Bay and the Commencement Bay Cleanup Action Committee. The PRPs included ASARCO Incorporated, Champion International Corporation, the City of Tacoma, ELF ATOCHEM North America Incorporated, Kaiser Aluminum & Chemical Corporation, Mobil Oil Corporation, Occidental Chemical Corporation, the Port of Tacoma, Simpson Tacoma Kraft, and the Weyerhaeuser Company. These PRPs entered into a funding and participation agreement with the Trustees under which the PRPs contributed funds and worked with the Trustees by participating in the damage assessment and restoration planning process.

A restoration technical panel, composed of Trustees, other governmental agencies (U.S. Army Corps of Engineers [Corps] and EPA), and PRPs, developed an approach to identify and evaluate the options available to restoring injured resources in Commencement Bay (1993-95). The philosophy of the restoration panel has been to try to restore natural systems within Commencement Bay ecosystem.

1.3 NRDA Restoration Goals and Objectives

While CERCLA requires the Trustees to seek restoration of injured trust resources, their actions should benefit whole ecosystems by (Commencement Bay Natural Resource Trustees, 1995):

1. Meeting statutory objectives of restoring, replacing, rehabilitating, or acquiring the equivalent of natural resources and services injured or destroyed as a result of the release of hazardous substances and discharge of oil.

2. Providing alternatives for those natural resources that will not recover without efforts above and beyond regulatory requirements for source control, sediment cleanup, and habitat restoration (*e.g.*, certain fish and wildlife species, and water quality).

3. Providing a diversity of sustainable habitat types and species within the Commencement Bay ecosystem to enhance fish and wildlife resources.

Restoration in Commencement Bay is constrained by industrial, other physical developments in the Basin, and other developments along the shorelines. The Integrated Alternative in the Programmatic EIS points out the necessity of considering plans for selected species and natural resources of concern or their services, where habitat restoration and preservation alone are insufficient.

The Restoration Panel developed four primary objectives upon which this Restoration Plan is based:

1.3.1 **Provide a functioning and sustainable ecosystem** where selected habitats and species of injured fish and wildlife will be enhanced to provide a net gain of habitat function beyond existing conditions.

- The restored ecosystem need not be pristine, but must contain the functional elements of a healthy system, support a diversity of habitats and species historically native to the area, and be environmentally sustainable and cost-effective.

1.3.2 **Integrate restoration strategies** to increase the likelihood of success.

- Pursue a *landscape ecology* approach to habitat restoration projects by integrating the projects into their surrounding environment. This approach includes promoting "corridors" between shoreline habitats and adjacent upland habitats. Corridors allow for movement of fish and wildlife, provide connectivity, and increase diversity.

- Set priorities for restoration projects in accordance with sound restoration planning with a focus on habitats that provide functional benefits to injured natural resources. In general, if functioning and diverse habitats similar to natural occurring habitats are provided, the appropriate species will follow.

- Preserve existing threatened habitats while enhancing or creating new habitats.

- Implement pilot projects where appropriate to test innovative design concepts and engineering techniques for habitat development in order to assess the feasibility of specific restoration methods before applying them in a Bay-wide scale.

- Consider constructing restoration projects in phases.

- Require project performance criteria, contingency plans, and monitoring to evaluate the effectiveness in providing increases in habitat attributes.

1.3.3 **Coordinate restoration efforts** with other planning and regulatory activities to maximize habitat restoration.

- Protect habitat restoration and preservation sites in perpetuity.

- Aggressively enforce existing municipal, county, state, tribal, and federal regulatory authorities to ensure that restored habitat is not degraded and remaining habitat is protected,

- Fund restoration projects through the resolution of natural resource damages, augmented where appropriate by other available funds, property, or services by leveraging other funds to expand or enhance CB/NRDA restoration projects.

- Consider non-monetary components, such as land, long-term stewardship, in-kind services, and PRP-constructed projects under Trustee oversight, as part of CB/NRDA settlements.

1.3.4 **Involve the public** in restoration planning and implementation.

- Incorporate public input into restoration planning, implementation, and monitoring.

- Foster greater public understanding and appreciation of indigenous (native) habitat resources,

- Encourage public stewardship of restoration projects and existing natural habitats through education and public involvement.

- Public access at restoration sites should be guided by a concern for controlling disturbances and disruption of the sites.

1.4 Restoration Framework

The Trustees have developed a restoration framework over the past several years as a dynamic series of concepts for use in restoration planning. Final restoration planning and related decisions are being made, in part with this Programmatic EIS, and in part in the future as additional damage assessment activities are completed. The framework focuses on restoring various habitat components, such as vegetated shallows, mudflats and salt marshes, off-channel sloughs and lagoons, tidal creeks, freshwater marshes, adjacent well-stratified upland buffers, and naturalized creek and river channel corridors. In addition, the framework emphasizes restoration through a landscape ecology approach; rather than creating isolated fragments of habitats, each element is intended to function in concert with the other elements.

The status of certain habitat components of the present-day Commencement Bay ecosystem limit fish and wildlife populations. For example, it is estimated that of the approximately 2,100 acres of intertidal mudflats and 4,000 acres of intertidal emergent marsh existing in 1877, less than 2% of these special aquatic habitats still survive (Corps et al., 1993). If surviving habitats are now contaminated or subject to future releases of hazardous substances and oil, these remaining habitats may continue to cause adverse impacts to fish and wildlife through exposure to hazardous substances. Therefore, it is imperative that all future restoration activities be phased and coordinated with the Washington State Department of Ecology's (Ecology) source control efforts under the Model Toxic Control Act, and with the EPA's Superfund cleanup activities. To minimize the potential for continued fish and wildlife exposure to hazardous substances, it is crucial that the areas considered for restoration are sufficiently free of hazardous substances prior to implementing restoration activities.

Pilot projects can be used to explore innovative ideas and technologies for fish and wildlife habitat restoration. Pilot projects, such as the Simpson Tacoma Kraft Company/Champion International/Trustees-sponsored Middle Waterway Shore Restoration Project, help assess specific restoration methods before applying them on a larger Bay-wide scale. In order to evaluate these and subsequent restoration efforts in the Bay, ecological monitoring methods such as the Estuarine Habitat Assessment Protocol (Simenstad et al., 1991) could be expanded and applied on a Bay-wide scale.

Monitoring data will be used to evaluate the success of individual projects and techniques; it will provide guidelines for adaptive management decisions and future restoration projects.

1.5 Elements of the Restoration Framework

1.5.1 Waterways

Restoring habitats in the waterways will entail creating or enhancing habitats to provide ecological benefits to fish and wildlife. Activities could include:

- acquiring potential restoration sites;
- removing artificial debris;
- incorporating natural debris, such as logs and root wads;
- regrading slopes to allow for mudflat and fringing salt marsh establishment;

- landscaping adjacent uplands to provide stratified buffers appropriate for fish and wildlife;

- improving water quality;

- re-creating dendritic channels; and

- increasing connectivity between existing and enhanced habitat components.

Fringing salt marshes and low-gradient mudflats were once extensive in the Bay and provided habitat for bottom-dwelling organisms important in the food web. These organisms are especially important for shorebirds and juvenile salmonids. Shorelines and peninsulas between several of the waterways offer sites for mudflat and salt marsh restoration or enhancement, such as the Middle Waterway Shore Restoration Project, the Milwaukee Waterway mitigation project by the Port of Tacoma, and the Outer Hylebos mitigation project by the Puyallup Tribe of Indians.

Creating off-channel sloughs, lagoons, and dendritic channels provides important refuge and acclimation areas for out-migrating salmon, as well as feeding, loafing, and isolated refuge areas for migratory and resident waterfowl and shorebirds. The scarcity of these habitat features limits efforts to maintain or enhance injured fish populations. Creating viable habitat corridors along the waterways provides the necessary biological requirements for fish and wildlife using the waterways, the Bay, and Puget Sound.

Design changes to and upgrading existing artificial structures (*e.g.*, pilings, piers, etc.) enhances habitat values for fish and wildlife. Examples of these activities include:

- replacing creosote-treated pilings with alternative construction materials, such as concrete or plastic, thereby reducing chemical exposure hazard;

- using steel grids instead of solid concrete decking on piers to minimize shading impacts; and

- encouraging the use of materials to soften the shoreline, such as replacing sheet piling with riprap and graded aggregate rock ("fish mix"), forming an organism-friendly surface covering.

Trustee agencies, in their regulatory and advisory capacities, may be recommending some of these alternatives to the ongoing permitting process outside the bounds of this Restoration Plan.

1.5.2 Creek and river systems

Historically, there were many off-river habitats in the primary study area (See Section 1, EIS, Vol. I), such as sloughs, small streams, and connected wetlands. These habitats allowed for easier downstream migration of salmon by providing staging areas for acclimation, feeding, and refuge from large predators. They also provided feeding, loafing, and isolated refuge for birds, provided wildlife access to water, supported tribal culture and subsistence, and provided overall habitat for a more diverse assemblage of species.

Tidal creeks and rivers provided access routes for organisms using salt and freshwater marshes as nursery and feeding areas. The upper watersheds, including the White and Carbon Rivers and South Prairie Creek in the expanded study area as well as Hylebos, Wapato, Clark's, and Swan/Clear Creeks and other major tributaries of the primary study area, provided spawning sites, large woody debris input to the ecosystem, travel corridors, forage, nesting, and cover for a wide variety of fish and wildlife species.

Numerous opportunities exist for creek and river enhancement and connections to the shoreline approaches and waterways. In order to reestablish successful salmon runs in these systems and improve overwinter survival, removal of barriers to fish passage are necessary (*e.g.*, the Wapato Creek mouth fish ladder and the planned Puget Creek stream enhancement). Basin enhancement activities could include creating well-stratified riparian corridors and buffers, augmenting instream flows to benefit fish movement, creating off-river habitat, and providing spawning gravels. In addition, reconnecting old oxbows and creating other off-river sloughs designed with a variety of habitat features, such as those established at Gog-le-hi-te wetland and proposed for the Port of Tacoma's Clear Creek mitigation project, will provide some of the habitat components currently limiting efforts to enhance the injured fish and wildlife species in the Basin.

1.5.3 Shoreline approaches

Shoreline approaches include the primary study area shorelines between Dash Point and the Hylebos Waterway, and between Point Defiance and the Thea Foss Waterway. The expanded study area includes the shorelines from Dash Point to Dumas Bay, the south facing shores of Maury and Vashon Islands, and from Point Defiance to the railroad tunnel alongside the Tacoma Narrows. Generally, these shorelines have narrow intertidal and shallow subtidal margins around a relatively deep urban bay.

The nearshore margins are important migratory routes for salmon, waterfowl, and shorebirds and serve as rearing areas for juvenile to adult salmonids and their food organisms, as spawning areas for forage fish, and for intertidal and subtidal shellfish and algae production. These important margins should be protected and enhanced to provide connectivity between other habitat components. Although existing habitat may be more intact than the tideflats, potential enhancement efforts could include creek cleanup activities, placing nest boxes, reestablishing fringing marshes, planting eel grass, developing kelp beds, and enhancing substrate for intertidal spawning.

1.5.4 Source control

To prevent recontamination of Commencement Bay as EPA's Superfund cleanup activities proceed, a contaminant source control program is being implemented by Ecology. This program cleans up contaminated upland sites and provides controls for operating facilities using existing authorities under the Model Toxics Control Act, state water quality orders, National Pollution Discharge Elimination System permits, Superfund, Resource Conservation and Recovery Act, and voluntary actions.

1.5.5 Expanded study area restoration options

Section 1 of the EIS (Vol. I) discusses limiting factors that may compel the Trustees to consider potential restoration projects in the expanded study area:

- site use restrictions and lack of available sites for restoration within the primary study area;
- contaminant source control limitations;
- limited functional benefits to the injured natural resources;
- lack of economically and ecologically viable restoration options in the Bay; and
- the necessity for each restoration activity to provide benefits to injured natural resources or services.

The success of meeting CB/NRDA restoration goals by considering expanded study area restoration sites may increase where such sites might:

- increase populations of selected injured species better than restoration sites in the Bay;
- better connect to existing viable habitats, have better buffers, allow greater access, and have a higher probability of long-term self-maintenance; and
- be more cost effective.

1.6 Trustee Management

A Trustee team will oversee the implementation of the Commencement Bay Restoration Plan, soliciting input from public representatives and experts, as needed. To ensure that restoration projects remain viable and productive, measures need to be taken to preserve existing habitat and improve water quality within the Bay. Existing regulations (shoreline permits, land use, zoning, point/nonpoint source control, NEPA and State Environmental

Policy Act [SEPA] review) need to be aggressively enforced by all levels of municipal, county, state, tribal, and federal governments to ensure that restored habitats do not become degraded and that remaining valuable but shrinking habitats and potential habitat areas are preserved.

Long-term stewardship and protection will ensure that the public's natural resources and services are maintained in perpetuity. Coordination with other programs and plans dealing with resources and land use issues in the Commencement Bay study areas will be conducted (Sections 4 and 5, EIS, Vol. I). Coordination with local conservation and public interest groups or land trusts could provide stewardship for specific projects and, ultimately, for the whole system.

The Trustees will promote adaptive project management. Projects will be designed to follow natural habitat processes; mid-course corrections can be made based on monitoring data and professional expertise. Results from pilot and early restoration projects will be integrated into later project designs.

1.7 State-Managed Aquatic Lands

Different statutes, regulations, and guidelines apply to different properties in Commencement Bay. Harbor Areas are an excellent example. Article 15 of the Washington State Constitution established the Harbor Line Commission to create harbor areas to be forever reserved for landings, wharves, streets and other conveniences of navigation and commerce. Section 1 of Article XV states: ". . .nor shall any of the area lying between any harbor line and the line of ordinary high water, within not less than fifty feet and not more than two thousand feet of such harbor line (as the commission shall determine) be sold or granted by the state, not its rights to control the same relinquished. . ." Section 2 of Article XV limits the terms of a lease within a Harbor Area to thirty years. Harbor Area use classes, in descending order of priority, are the following: (1) water-dependent commerce, (2) water-oriented commerce, (3) public access, and (4) interim use (WAC 332-30). A restoration site in a harbor area would be considered an interim use by the Washington State Department of Natural Resources. Therefore, should the space occupied by a restoration area become necessary for water-dependent commerce or water-oriented commerce, that space must be made available for those uses. WDNR is constitutionally restricted to offering 30-year leases in these area (Teissere, 1996). Proposed restoration efforts within the Tacoma Harbor Area will need to consider these public land uses and regulatory, statutory, and constitutional issues.

2.0 TARGET RESOURCES AND HABITATS

2.1 Key Injured Resources

The Trustees have identified key natural resources and the injuries to these natural resources and services (Commencement Bay Natural Resource Trustees, 1995). Section 2.3 of the EIS (Vol. I) summarizes key natural resources in Commencement Bay to include salmonids, flatfish, invertebrates, and birds. Injuries have been listed (Sec. 2.4, EIS, Vol. I) for salmonids, flatfish, benthic infauna, epibenthic invertebrates, larger invertebrates, and birds. The major service types provided by natural resources within the Bay that may have been injured as identified by the Trustees include recreational services, non-consumptive uses, passive uses, and Tribal services (Commencement Bay Natural Resource Trustees, 1995). The injury and damage assessment process for Commencement Bay is not complete; there may be additions to the list of injured resources.

The Trustees have concluded that cleanup of intertidal and nearshore subtidal contaminated sediment habitats—combined with restoration of lost mudflats, sand/gravel/cobble beaches, and emergent marsh habitats—would directly benefit injured key resources. For example, increased clean intertidal salmon habitat benefits not only juvenile salmonids but also salmon food organisms, crabs, shellfish, and juvenile flatfish, wading and shorebird use, and the overall health of the ecosystem. Increased salmon production in the Commencement Bay ecosystem benefits recreational, commercial, and tribal fishing; increased waterfowl and bird use benefits humans from an aesthetic point of view.

2.2 Habitat Types and Functions

The Restoration Plan focuses on replacing components of the historic ecosystem whose absence limits fish and wildlife populations. The following definitions describe habitats and species that would benefit from restoration.

Estuary — Coastal areas where fresh water enters salt water. They contain a variety of habitats and often support a great diversity of species, which interact in a complex network of predator-prey relationships. These areas serve as spawning and nursery grounds for many species of fish and shellfish. They also support many birds because of the rich food supply, intertidal areas, and diverse habitats.

Deep Subtidal — Deeper water areas of bays, from -30 to -60 feet. Microscopic plants (phytoplankton) are the driving force of the food web produced in these areas. Very small crustaceans feed on the phytoplankton and in turn provide food for a variety of fish including rockfish, cod, flatfish, and sculpin. Marine mammals, such as harbor seals, also use these areas. Migratory birds such as grebes, cormorants and scoters forage in these areas. Clams and worms predominate on the bottom.

Vegetated Shallows

Includes both eelgrass and macroalgae bed habitats as follows:

Eelgrass - Eelgrass beds can occur from low-water level to -30 feet in areas of estuaries sheltered from direct wave action. Eelgrass has several important ecological functions. Eelgrass meadows support a community of microalgae and small seaweeds, and are critical rearing and feeding areas for young fish and crab. Eelgrass releases large quantities of nutrients back into the ecosystem. It is also consumed by waterfowl such as black brant, geese, and ducks.

Macroalgae beds - Macroalgae beds include beds of kelp and other large algae on rock outcroppings and gravel bottoms. These occur mainly in the subtidal zone but also extend into the intertidal zone. Starfish, crabs, shrimp, limpets, mussels, and rockfish commonly use these areas. Also found in these areas are tidepools with diverse plant and animal life.

Mudflats

Intertidal shores without large plants and with loose sediment particles like silt and clay. Microscopic plants encourage production of clams and polychaete worms. Shorebirds feed on these organisms at low tide. Various fish species use the area when the tide is in and, in turn, become food for western grebes, scoters, cormorants, and great blue herons.

Gravel/cobble/sand

Intertidal shores with few large plants and with loose coarse-grained sediments and somewhat mobile gravel and cobble beaches. Bait fish use the areas for spawning and important forage fish inhabit these habitats. Shorebirds, diving birds and other waterfowl feed actively on the benthic and epibenthic plants and animals and debris found here.

Emergent Marshes

Includes low and high saltmarshes and freshwater marshes as follows:

Low & High Saltmarshes - Low and high saltmarshes are intertidal shores where erect, rooted, leafy, and green plants grow. Typical plants include salt grass, tufted hairgrass, bulrush, spike rush, arrowgrass, pickleweed and sedge. This habitat is transitional between lowlands and mudflats. Marshes release large quantities of nutrients to other estuarine habitats during spring tides. Marshes support a food web dominated by insects and provides food and shelter for waterfowl and small mammals.

Brackish Marshes - Freshwater marshes located next to saltmarshes, but with a freshwater influence, providing a mix of salt-tolerant and inland plants. Small mammals and birds of prey are common. Open-water pools and sloughs provide feeding and refuge areas for fish and waterfowl, and adjustment areas for salmon and trout on their way to the salt water. A variety of mammals, birds, reptiles, and amphibians use these areas.

Riverine

The systems of riverbeds and streambeds within channels of the study areas. They are bounded on the landward side by riparian uplands, by the channel banks, including natural and constructed levees, or by wetlands dominated by trees, shrubs, persistent emergents, or mosses. Resident and migratory fishes and some waterfowl use these waterways for passage, foraging, and reproduction and aquatic plants and invertebrates populate their beds

Riparian Systems

Riparian systems occur along rivers and streams with typical vegetation including willow, cottonwood, red alder, and salmonberry. Healthy riparian areas have many animals and plants and high productivity. Trees and shrubs provide nesting, roosting, feeding, and cover. Large trees can become snags providing important habitat, and can provide a supply of large woody debris important to streams and the estuary. Riparian foliage shades the stream providing temperature control, stabilizes the stream bank with roots, and filters out nutrient runoff from uplands. Denser riparian corridors and associated wetlands provide protective pathways for large and small mammals, reptiles, waterfowl, and song birds, and are important breeding, feeding, and migration areas for fish.

Corridors

Corridors are habitat areas that provide a pathway for wildlife movement. Healthy riparian systems provide corridors between the estuary and the Basin. Corridors between remaining and restored fragments of habitat are also important. Corridors can be created by establishing stratified upland buffers (vegetated areas that surround a wetland and reduce adverse impacts from adjacent development). Aquatic environments can also have corridors, linking areas of mudflat, marsh, vegetated shallows, and adjacent uplands.

2.3 Potential Restoration Habitat Types

The Commencement Bay Restoration Panel evaluated potential sites based on existing and desired (target) habitat and their corresponding ecological functions. Table 2-1 lists these habitat types and functions.

Table 2-1. Potential Restoration Habitat Types and Functions

ECOLOGICAL FUNCTION	USED BY	ORGANISMS
Deep Subtidal -60 ft. to -30 ft (NOAA zero sea level datum)		
life cycle	fishes food web	rockfish, cod, flatfish, sculpin, crabs octopus, squid
resting, feeding	birds mammals	cormorants, auklets, grebes, scoters whales, seals, porpoises
Vegetated Shallows -30 ft to +15 ft		
feeding	fishes food web	juvenile fishes, herring, crabs, flounders, sculpin plants, algae, benthos, epibenthos
protection, cover, feeding, nesting, corridors	plants birds mammals	macroalgae, eelgrass, kelp waterfowl, herons, raptors seals, sea lions
Mudflats -14 ft. to +15 ft		
feeding	fishes food web	salmonids, crabs, flatfish, invertebrates algae, plants, benthos, epibenthos
protection, cover, feeding, nesting, corridors	plants birds mammals	macroalgae, eelgrass, kelp waterfowl, waders, diving birds harbor seal, raccoon, opossum, people
Gravel/Cobble/Sand -14 ft. to +15 ft		
feeding	fishes food web	surf smelt, sand lance, forage fishes, invertebrates algae, benthos, epibenthos
protection, cover, feeding, nesting, corridors	plants birds mammals	macroalgae waterfowl, diving birds, shorebirds raccoon, people

Table 2-1. Potential Restoration Habitat Types (continued).

ECOLOGICAL FUNCTION	USED BY	ORGANISMS
Emergent Marsh		
Marine: 0 ft to +15 ft. feeding	fishes food web	juvenile fish, trout algae, plants, benthos, epibenthos
protection, cover, feeding, nesting, corridors	plants birds mammals	macroalgae, eelgrass, kelp waterfowl, waders harbor seal, raccoon, opossum, people
Brackish: 0 ft to +15 ft. feeding	fishes food web	juvenile fish, trout insects, plants
protection, cover, feeding, nesting, corridors	plants birds mammals	wetland plants waterfowl, waders raccoon, opossum, otters, people
Freshwater: 0 ft to +15 ft. feeding	fishes food web	juvenile fish, trout plants, insects
protection, cover, feeding, nesting, corridors	plants birds mammals	wetland plants waterfowl, waders, songbirds, raptors otters, raccoon, beaver, opossum, mice, people
Riverine 0 ft to +15 ft		
feeding	fishes food web	juvenile fish, trout plants, insects, invertebrates
protection, cover, feeding, nesting, corridors	plants birds	wetland and aquatic plants waterfowl, waders, songbirds, raptors
Riparian +15 ft.		
connections to river and to bay: perching, nesting, resting, cover, migration, food, water quality	birds mammals	raptors, herons, ducks, songbirds, birds, otters, raccoon, coyote, mink, beaver, bats, people

2.4 Habitat Focus Areas (HFAs)

Selecting areas that have different habitat restoration needs and approaches for a variety of restoration habitats in a Bay-wide perspective is not new. The Elliott/Duwamish Restoration Program established three geographic focus areas for their $10 million restoration efforts (EB/DRP, 1994). The City of Tacoma has adopted a vision, championed by CBCAC, that delineated a set of habitat goals, principles, and focus areas as part of the City's Shoreline Master Program and land-use standards and plans (McEntee, 1996, personal communication). This conceptual Restoration Plan is not intended to be a land-use master plan for designating specific parcels for restoration in Commencement Bay. The following discussion is intended to show how habitat focus areas (HFAs) in the primary study area could be considered as a means of applying the Trustees' and other groups' framework vision to Bay-wide restoration.

Habitat focus areas reflect functional ecological units in the Commencement Bay environment, as described further below. They should not be misunderstood as suggesting that all of the shorelines or areas within the HFAs will become restoration sites. Rather, locations within these HFAs would be proposed for restoration projects based on the project criteria and updated site inventories discussed in Section 3 (including site availability) and restoration project funding (CBCAC, 1996).

The plan recognizes the urban and industrial use of much of the Bay's shoreline. Much of the area within the HFAs cannot practically be dedicated to substantial areas of fish and wildlife habitat. By establishing HFAs, the Trustees acknowledge the limitations of placing restoration in areas that are adjacent to major commercial or industrial developments which may be contaminated and where source control may have only just begun. One purpose of HFAs is to break up a large, complex, industrial, urban embayment into smaller geographic and functional units to more easily visualize restoration potentials. Each HFA places boundaries around important target habitat features; other considerations, such as obvious geographic boundaries, exposure to wave energy, location, land development, and maritime use were incorporated, where needed.

Certain HFAs are more amenable for a particular habitat emphasis or need than others based on proximity to contamination or compatibility with landscape ecology principles. Establishing HFAs allows for a more rational allocation of restoration sites and flexibility in meeting the Trustees' restoration goals and objectives.

Six HFAs are shown on Figure 2-1 and described below. The edges are by necessity ill-defined but for discussion purposes some preliminary bounds are proposed. These HFAs provide regions in the study areas for emphasizing different habitat restoration needs and approaches. A variety of specific projects could occur in each HFA; similar types of habitat restoration could occur in more than one HFA. Restoration activities are not precluded outside these boundaries if site or service criteria yield a high order of benefits (See Section 1, EIS, Vol. I).

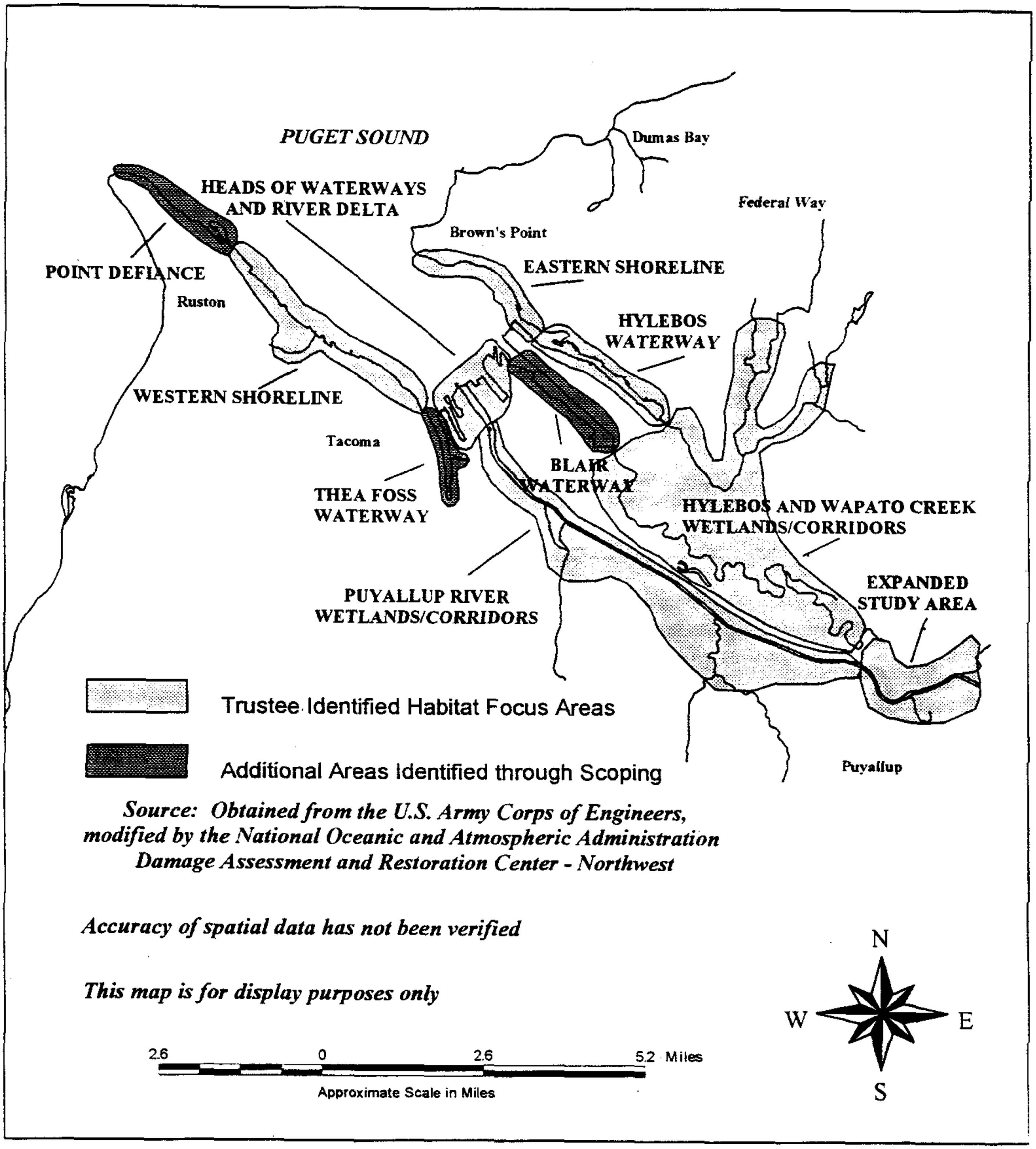

Figure 2-1. Habitat Focus Areas.

Priority is placed on connecting restored habitats rather than on creating isolated fragments of habitats. Typical examples of how some target habitats can be related to restoration objectives are shown in Table 2-2.

2.4.1 Puyallup River wetlands/corridors

Target habitats: **Riverine and riparian** (for juvenile and adult salmon migration routes, offstream feeding, rearing, resting, and acclimation areas, migratory and waterfowl nesting, and small mammal corridors.)

The channelized Puyallup River with its single constricted outflow is a potentially major limiting factor upon Puyallup River salmon runs. Salmon have lost their brackish acclimation intertidal zone and the shallow nearshore areas for feeding in a detritus-based food web. The mouth of the River used to consist of a series of braided channels and marshes, where an inflow of fresh water from the River and streams mixed with the salty Bay waters in a shallow estuary. Historically, there were many off-river habitats. These areas allowed easier downriver migration of juvenile salmon by facilitating saltwater acclimation and providing refuge and feeding locations. They also provided feeding, loafing, and isolated refuge for birds, corridors for small mammals to access the river, and overall, provided habitat for a more diverse assemblage of species.

This HFA runs roughly from the 11th Street Bridge upstream to the SR-161 bridge near the City of Puyallup. It includes the wetlands and riparian habitats adjacent to the heavily channelized river and its tributaries of Clark's and Clear/Swan Creeks. The area contains one of the largest upland sections within the Commencement Bay area and along the Lower Puyallup River. Upland habitat is important for birds and small mammals and provides a link between upland and river dwellers (CHB, 1996). The tributaries, important off-river spawning and resting areas, could be enhanced by increasing wetland areas and functions (Port of Tacoma's proposed Clear Creek mitigation project) and storm water retention and stream cleanup (City of Tacoma and Pierce County efforts on Swan Creek). Building on the results from the successful Gog-le-hi-te project, more extensive dike breaching and relocation could reconnect surviving natural oxbows to the River.

2.4.2 Heads of waterways/river delta

Target habitats: **Intertidal mudflats and shallow subtidal, vegetative shallows and emergent marsh** (for juvenile salmonid acclimation and nursery areas, resident bottom fish, seagrasses, shorebird and raptor feeding, and detritus export.)

This HFA incorporates the lands and channels north of 11th Street between the Thea Foss and the Blair Waterways. Fringing marshes and low-gradient mudflats were once extensive in the Bay and provided habitat for epibenthic fauna important to the food web, especially to juvenile salmonids.

Table 2-2. Relationship of HFA Target Habitats to Restoration Objectives

Objective	HFA target habitats
Reduce input of local sources of chemical contamination to the sites, such as untreated urban and road runoff and agricultural fertilizers and pesticides.	all
Connect existing fragments of habitat originally associated with larger habitats, thereby improving movement of organisms, increasing species diversity by providing habitat for species with larger home ranges, and lessening potential disturbances.	all
Remove non-native plants and aquatic organisms (where feasible).	all
Stabilize steep banks that may fail; soften edges.	all
Provide additional nesting sites for migratory and resident bird species along shorelines, such as nest boxes, platforms, snags, etc.	riparian
Maintain suitable flows: moderate peak flows and guarantee minimum stream and river summer low flows, possibly even by augmentation.	river, stream
Construct pools, lagoons, marshes, mudflats or lakes: reconnect old oxbows or sloughs to further supplement the carrying capacities of the systems and reduce probability of juvenile salmon reaching the estuary prematurely.	all
Replace channelized ditches with meanders; divert ditches carrying urban runoff into bioswales or to other treatment facilities.	river, stream
Improve natural spawning sites by creating spawning channels, supplementing gravels, and creating pools.	river, stream
Supplement natural spawning areas by stocking and egg boxes.	river, stream
Improve substrates for productive food organisms	all
Increase dissolved oxygen levels by building stream bars and falls.	river, stream
Restore riparian vegetation to provide corridors to control sediment load, buffering from disturbance, suitable large woody debris, wildlife corridors, nesting, roosting and feeding structures, and shading to provide thermal control for in-stream resources.	riparian, stream

The peninsulas between several of the waterways offer opportunities for mudflat and salt marsh restoration through removal of debris and decaying pilings, substrate regrading and enhancement, and vegetative plantings. Surveys by the Puyallup Tribal Fisheries Department found outmigrant salmonids using nearly all available shallow subtidal and intertidal shorelines of the peninsulas and adjacent waterway approaches (Sullivan, 1994, personal communication). Because of their proximity and connectivity, these habitats should be considered together. Development in one waterway should complement restoration efforts at adjacent ones and should integrate the substantial habitat development already existing in this HFA.

The Milwaukee Waterway mouth is a major compensatory mitigation intertidal and shallow subtidal site constructed in 1994-95. The habitat covers some 20+ acres between the mouth of the Puyallup River and the peninsula between the former Milwaukee and the remediated Sitcum Waterways. Mitigation sites at Slip 5 and Slip 1 on the peninsula between the Sitcum and the Blair Waterways are important to the Wapato Creek salmon run.

The peninsula between the Blair and the Hylebos Waterways has some disturbed intertidal habitat in the vicinity of unused marine slipways. Destined for Port of Tacoma marine transportation development (Port of Tacoma, Blair Waterway 2010 Plan, 1991) this peninsula is not included in this HFA.

In the last decade, serious sediment contamination located off the peninsula between the Puyallup River and the St. Paul Waterway caused by pulpmill effluent was cleaned up in a model remediation and restoration effort implemented by Simpson Tacoma Kraft Company and Champion International. This restoration project will become a significant component in the Trustees' Bay-wide restoration plan, when this plan is finalized. On the east side at the head of the waterway, another major plan component will be the Middle Waterway Shore Restoration Project, which was completed in 1995 by the same companies, in direct cooperation with the Trustees. The City of Tacoma (1995a) has publicly expressed an interest in restoring a similar portion of the western shore of the head of the Middle Waterway, and this proposal has gained considerable support (CHB, 1996). The outer peninsulas between Middle Waterway and the Thea Foss and St Paul Waterways are not in active maritime or commercial use. They have desirable intertidal and eelgrass resource characteristics interspersed with remnants of old docks, wharves, and buildings.

The Puyallup River Delta is another potential restoration resource. The River carries a large load of clean sediment to the Bay, either as suspended glacial flour from Mount Rainier or as coarser bed load sand from intermediate sources. These relatively contaminant-free materials are deposited as the river loses velocity when it enters the Bay, forming an intertidal delta. The delta is dynamic in shape, influenced by waves, storm actions, river flows, deposition, and erosion. Its permanency is a function of its location on the top of a steep slope adjacent to deeper parts of Commencement Bay; the delta may be susceptible to tectonic disturbances, such as earthquakes. It might be possible to accelerate natural delta building processes by stabilizing the southern face of the delta and planting vegetation (CBCAC, 1993), but careful studies would be necessary before substantial human interference of these processes were undertaken. Even if no active restoration projects are undertaken on the delta, it is critical that the last major active portion of the original Puyallup River sand and mudflats be preserved because of its productivity, its importance to the food web, and its use by local fish, birds, and wildlife.

2.4.3 Hylebos Waterway

Target habitats: **Estuarine channels, intertidal mudflats, and riparian greenway** (for salmonid acclimation, subtidal resident fish, shorebirds, and raptors.)

The Hylebos Waterway HFA stretches from the 11th Street Bridge to the approximate head of tidal influence near SR-99 in Fife. This salmon-carrying system has experienced serious physical modification and chemical contamination. The Puyallup Tribe stocks upper Hylebos Creek with chum, coho, and pink salmon to partially overcome loss of upstream spawning habitat caused by stormwater flooding, suburban development, and declining water quality. Once the intertidal sediments of the waterway are cleaned of their toxic materials, restoration could include the following: acquiring selected large shoreline sites; removing artificial debris and riprap; incorporating natural debris (such as logs and root wads); regrading slopes to allow for mudflat and fringing marsh establishment; landscaping adjacent uplands to provide stratified buffers appropriate for fishes, birds, and wildlife; making water quality improvements; recreating dendritic channels; and increasing connectivity between existing and enhanced habitats.

Restoration should include improving the estuarine interface between the Waterway and Hylebos Creek by creating intertidal ponds or lagoons. Off-channel sloughs and lagoons provide important refuge and acclimation areas for out-migrating salmon, as well as feeding, loafing, nesting, and isolated refuge areas for migratory and resident waterfowl and shorebirds.

Saddling the eastern approaches to the 11th Street Bridge on the Hylebos Waterway are two mudflat areas. These mudflats provide intertidal habitat within the waterway and a resting area for salmon migrating to and from Hylebos Creek. The southern mudflat is used for log storage with grounded logs laying on the intertidal flats during some low tides. Elimination of grounding of logs on these mudflats would significantly increase the production of offchannel juvenile salmonid food organisms and improve other ecological functions of the flats (Carleton, 1996, personal communication). A restrictive covenant permitting use of the eastern 100-foot-wide margin of the channelized mouth of Hylebos Creek, where it discharges into the waterway, has been provided to the Trustees as part of the Port of Tacoma's CB/NRDA settlement. Upstream of the SR-509 bridge over Hylebos Creek, the Washington State Department of Transportation has completed a compensatory mitigation site, by creating a two-acre intertidal marsh from uplands surrounded by a two-acre riparian buffer.

2.4.4 Eastern shoreline

Target habitats: **Intertidal, mudflats, vegetated shallows, subtidal, and riparian greenway** (for salmonid migration routes, primary and secondary production, waterfowl, shorebirds, and raptors.)

The eastern shoreline HFA, including the area of the Bay between the 11th Street Bridge on the Hylebos Waterway and Brown's Point, has narrow intertidal and shallow subtidal margins broken by commercial marinas and log storage activities bordering a relatively deep urban bay. The Bay's eastern edge is an important migratory route for salmonids, waterfowl, and shorebirds; it needs to be protected and enhanced to provide connectivity between other components of Puget Sound, including adjacent uplands and Bay-wide restoration activities. Although existing habitat is relatively intact in the northern reaches, the potential exists for additional enhancement efforts, including eelgrass plantings, kelp bed development, nest box installation, enforcement of local regulations against marine contamination from some of the over-water commercial activities, and deep-water substrate enhancements. Restoration activities that would preserve the Outer Hylebos habitat (Puyallup Tribe of Indians conservancy area) in perpetuity would conserve one of the largest areas of original tideflats in the Bay. The vegetated shallows south of Brown's Point also need to be preserved and could be enhanced. Removal or other restrictions in the future on log rafting could greatly enhance the overall productivity and function of this area (Carleton, 1996, personal communication).

The North Shore Spit at the mouth of the Hylebos waterway is a 1995 compensatory mitigation site provided by the Puyallup Tribe for intertidal substrate enhancement and riparian buffer plantings. Immediately north of 11th Street is one of the largest remaining mudflats of the Bay (about 60 acres). The Puyallup Tribe has placed this mudflat in a natural resource conservancy. In addition to providing a reference site for selected restoration projects elsewhere in the Bay, this location could become a nursery to provide native aquatic plants for future restoration projects.

2.4.5 Western shoreline

Target habitats: **Intertidal, vegetated shallows, subtidal, and riparian greenbelt** (for salmonid migration routes, primary and secondary production, shorebirds, and raptors.)

The western shoreline HFA includes the relatively narrow intertidal and shallow subtidal environs from the former ASARCO smelter site southward along the City of Tacoma's shoreline park to the Grain Terminal. This shoreline had substantial historical development, largely in the form of sawmills, which no longer exist. Removing relatively steep riprapped shorelines, bulkheads, and abandoned structures and excavating to intertidal levels in various locations along the shoreline could reestablish mudflats, nearshore emergent marshes, and vegetated shallow habitats (CBCAC, 1993). Removal of derelict over-water structures in the area could result in substantial increases in nearshore productivity as well as increased use by juvenile salmonids and, potentially, sand lance if appropriate substrate is available in the upper intertidal zone (Carleton, 1996, personal communication). Habitat improvements could include enhancements similar to those listed above for the eastern shoreline. In addition, several creeks enter the Bay in this HFA. Historically, they provided salmon spawning habitat, which has been lost to stream diversion and obstructions to fish passage. For example, Puget Creek provides an opportunity for stream enhancement and connectivity to the shoreline, along with wildlife corridors along the green belt of the hillside. CBCAC is coordinating restoration in this system.

2.4.6 Hylebos and Wapato Creeks wetlands/corridors

Target habitats: **Freshwater channels, wetlands, and riparian corridor** (for salmonid migration and spawning, waterfowl and wildlife use, and furbearing mammals.)

The lower creeks have been severely affected by channelization and surrounding land uses. The lower reaches need to be cleaned of shoreline and in-stream debris; meanders and pools can then be recreated and complemented by planting stratified riparian buffers.

The streams need to be restored by removing migration and spawning obstructions and by eliminating untreated inflows. King County's Department of Surface Water Management has developed a stormwater management plan for headwaters of several branches of Hylebos Creek. When implemented by local jurisdictions, the plan would start to reverse past trends of declining water quality. The Trustees have worked with the county to identify potential restoration efforts in conjunction with their management plans. The Trustees are concerned that land development does not increase future peak flows, and that current peak flows are reduced in an effort to lessen adverse effects upon spawning and rearing habitats.

The Wapato Creek system has been severely affected by reduced instream flows, channelization, agricultural runoff, and reduced riparian vegetation. The Port of Tacoma, as part of the Puyallup Tribe's Land Claims settlement, is constructing a new fish-ladder style mouth to the creek where it discharges to the Blair Waterway. However, migrating salmon still have to navigate through 1,200 feet of concrete pipe before daylighting into a heavily impacted drainage ditch along Alexander Way, a mile short of joining the natural creek bed. One suggestion that may be considered is to divert Wapato Creek to the east (along the path of one CB/NRDA settlement option with the Port of Tacoma) before joining Hylebos Creek upstream from its mouth (CBCAC, 1993).

This HFA probably will require the greatest cooperation with local landowners and protective watershed groups because of the urban, suburban, and agricultural nature of the land use, which includes residential landscaping of the creek banks. These systems also have the potential for some of the broadest based stewardship by the same landowners. Existing regulations for land use, point/nonpoint source control, and water rights need to be fully implemented to ensure that restored and existing habitats do not become more degraded.

2.4.7 Expanded study area

Target habitats: **Freshwater riverine, channels, wetlands, and riparian corridor** (for salmonid migration and spawning, waterfowl and wildlife use, and furbearing mammals.)

Further up the Puyallup River Basin, additional off-river spawning and resting habitats could be constructed, gravel extraction made more salmon-sensitive, and water quantity for rearing and migration maintained or improved (*i.e.*, Electron Dam diversion). Section 1.5.5 discusses expanded study area criteria.

2.4.8 Non-NRDA areas

Additional habitat focus areas are being considered by other groups and agencies for development, remediation, and restoration (CBCAC, 1996). The Trustees encourage natural resource restoration efforts in these areas, but do not have specific plans to devote settlement funds in these areas.

Blair Waterway. The Blair Waterway has been designated by the Port of Tacoma's 2010 Master Plan as a major marine transportation area. However, this waterway also supports a series of mitigation and treaty settlement habitat sites (south of 11th Street). Mitigation sites at the old Fairliner Marina and Rhône-Poulenc sites provide compensation for the West Blair Development Project and widening of the waterway channel when the Blair Bridge is removed. As part of their Puyallup Tribe land rights settlement, the Port is also providing the fish ladder under the Pierce County Terminal apron for an improved connection to Wapato Creek.

Also, as long as Wapato Creek discharges into the Blair Waterway, the regulatory and resource agencies will monitor and evaluate the waterway as a migrating salmon channel. Currently, the Trustees do not contemplate any major restoration projects in this area.

Thea Foss Waterway. The Thea Foss Waterway is experiencing active remediation planning and major redevelopment by the City of Tacoma under Superfund (City of Tacoma, 1995b). Historically, the mouth of the Puyallup River was a series of braided channels, providing important migration corridors for salmonids. Wheeler-Osgood Waterway was an original primary discharge of the River to the Bay. The lower Puyallup River was channelized into the middle of the tideflats to reduce siltation in the old City Waterway, which had required dredging by the U.S. Government for marine commerce. Restoration ideas have included reconnecting the Puyallup River to the six-acre Wheeler-Osgood mudflat (CHB, 1996) or to the Middle Waterway, possibly through controlled flow systems to minimize siltation. Such ideas could provide several small intertidal sloughs of the type that historically have been lost. A small area of intertidal habitat remains at the head of the waterway but the contaminant contribution from twin 96-inch-diameter storm drains has not been fully assessed. Restoration actions as suggested by CBCAC (1993), once contamination is eliminated, could provide a substantial area of intertidal habitat at the head of Thea Foss

Waterway. Pocket beaches of fine-grained intertidal and shallow subtidal habitat along the shorelines of the waterways could also be developed.

Since there is already a substantial start at remediating the sediment contamination combined with urban redevelopment and stewardship exercised by the City of Tacoma and other interested parties, the Trustees will coordinate their primary restoration efforts in areas lacking the City's civic direction for the Thea Foss.

Point Defiance. The shoreline from the southern boundary of the former ASARCO mill north to Point Defiance could also be considered as a habitat focus area. The remediation of the mill site, including the slag spit, should consider restoration options as part of the remedial actions. The area north of the Washington State Department of Transportation's ferry pier is the relatively undisturbed shoreline of Point Defiance Park and probably requires little additional modification.

3.0 PROJECT SELECTION

Up to this point, the discussion has been largely programmatic as to overall restoration goals and objectives, criteria, and habitat focus areas within the CB/NRDA restoration planning effort. The next level defines the specifics necessary for selecting and evaluating on-the-ground restoration projects.

Restoration site selection is a systemic but dynamic process. Once potential project sites have been inventoried, their suitability for restoration can be assessed. A project-specific vision of what restoration is needed and how it can be carried out is then developed for each site. Site-specific goals are established and, based on these goals, specific restoration techniques are conceptualized. Preliminary cost estimates are prepared and compared with available funding. The use of partnering opportunities or economies of scale that reduce costs or improve project benefits will be incorporated into project design and implementation, where feasible.

The restoration site planning process is an iterative process. As each site is assessed using the decision matrix (Section 3.2, below), disadvantages can be identified. Restoration is a long-term process. Each component is monitored for results and confirmation of the technical concepts and approach. Throughout the course of project implementation, a continuing review of the results offers the opportunity to reassess the conceptual model, management practices, and implementation schemes. The new information and assessment are basic parts of adaptive management designed to achieve the maximum restoration benefits for the costs. Figure 3-1 illustrates the basic steps in the process and Sections 3 and 4 below explain the various tasks associated with each step. Restoration projects typically take nine months to two years to plan and implement, not including project stewardship (performance monitoring, maintenance, and adaptive management).

3.1 Planning

Planning is the initial phase of the project selection CB/NRDA restoration assumes that an injury to a natural resource or service can be restored, replaced, rehabilitated, or the equivalent acquired. Financial support for a restoration project is based on receipt by the Trustees of damages from PRPs. The level of definition, as well as the type, size, location, and complexity for the effort provided at the onset will dictate the level of effort needed in the planning process. The main steps in the planning phase include the following: selecting the site, developing a project vision and goals, determining optimum habitat and restoration techniques, designing a conceptual model, conducting environmental audits, and developing performance criteria, engineering design and costs. The effort can be defined broadly (*i.e.*, restoration of salmonid spawning habitat in the Basin), or narrowly and specifically (*i.e.*, construction of a seasonal net pen facility within a pre-selected area).

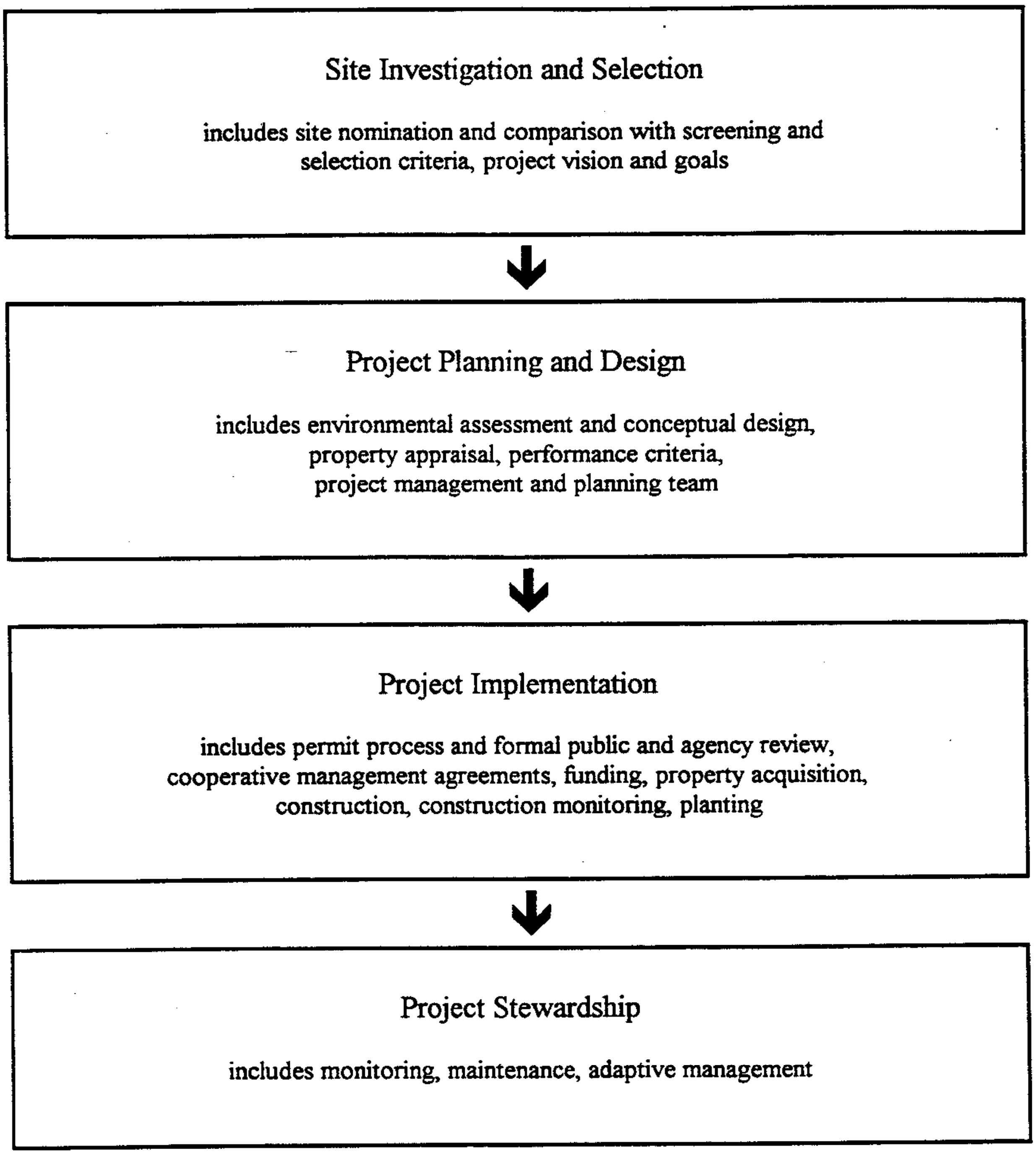

Figure 3-1. Restoration Project Planning Process

3.2 Screening and Selection Criteria

The Trustees' Phase I CB/NRDA process created the Commencement Bay Restoration Panel. This Panel developed a set of criteria for analyzing potential restoration sites in the primary study area. These criteria were shared with the public during an informational meeting in May of 1993. The required criteria initially screen out sites that do not attain a minimum level of land availability, source control, or adequately address injured natural resources. The preferred criteria are then used to rank suitable restoration sites based upon a site's ability to meet the listed criteria. This approach was used in Elliott Bay as a way to compare potential restoration sites using a landscape ecology approach (EB/DRP Concept Document, 1994; Clark, 1995).

3.2.1 Required criteria

- Site is or can be made available for restoration. In general, available sites are those that may not contain substantial structures or pavement.

- Source control is or will be sufficient. In general, source control is sufficient if an environmental audit or similar report demonstrates that the site has limited potential for recontamination.

- Restoration of the site will provide functional benefits to injured natural resources. Site restoration efforts may include restoration and preservation of habitat or enhancement of physical or biological conditions.

3.2.2 Preferred criteria

3.2.2.1 High importance

- Functional connectivity - Potential for target resources to use other habitats with connection to the potential restoration site.

  Guideline: Greater weight is given to sites benefiting multiple species or services and having functional connectivity with existing or potential habitat sites, *i.e.*, are contiguous to other habitats or can become a part of an existing or potential wildlife corridor. For example, a surface-water connection to wetland or riparian habitats is considered beneficial.

  Rationale: Potential restoration sites adjacent or proximate to existing habitat areas will provide greater habitat value. Sites that offer a potential connection to mudflats, streams, riparian corridors, or freshwater wetlands are especially important.

- Location - Physical location of potential restoration site.

  Guideline: Greater weight is given to sites that are located in ecologically critical areas of the Bay or Basin, *i.e.*, sites necessary for increasing populations of selected species. If the location of the site in the system ensures that the habitat will be utilized, the site should receive a high rating.

  Rationale: Habitat types and their location within the Bay or Basin should be determined based on principles of landscape ecology.

- Separation from sources of contamination or human disturbances.

  Guideline: If a site contains contaminated sediment, is in a mixing zone of an ongoing source, or is near disturbing human activities, it should be rated as disadvantaged.

  Rationale: Restoration activities should not be undertaken at sites with a high risk of contaminating target organisms until sources are controlled or sites cleaned up. Noise, bright lights, or other human disturbances may reduce habitat value. Greater weight is given to sites sufficiently separated from such source of disturbances so as not to cause long-term problems for fish and wildlife.

- Cost-effectiveness - Site attributes impacting cost.

  Guideline: Greater weight is given to sites that may be restored more cost effectively and productively than other sites, *i.e.*, sites that allow for enhancement of existing rather than creation of new change (for example, less earthmoving, less engineering, less cost) and less maintenance while providing the same levels of benefits should receive a high score.

  Rationale: Enhancing a site that already provides some beneficial habitat functions is regarded as more certain of success than creating habitat where none exists. The latter is more expensive in most cases.

- Sustainability - Site attributes impacting the likelihood of success include elevation, currents/deposition, wave energy, topography, and shoreline condition.

  Guideline: Greater weight is given to sites that achieve natural functions without long-term human intervention or dependence on engineered structures.

Rationale: Specific sites are part of a dynamic system and will change; natural processes and successions and principles of adaptive management will enable restoration goals to be met.

3.2.2.2 Medium importance

- Size - Amount of potential restorable habitat types.

  Guideline: Greater than two acres is regarded as beneficial; more weight is given to sites that form larger areas of contiguous habitat.

  Rationale: Larger sites allow for a greater heterogeneity of habitat attributes. It may be desirable to focus Trustee restoration activities on larger sites that would not be restored through other processes, such as §404 mitigation or noncompensatory restoration.

- Ownership and management - Accessibility of potential restoration site.

  Guideline: More weight is given to sites whose ownership and management promotes restoration sooner and in perpetuity; public ownership or amenable private owner or operator is regarded as beneficial.

  Rationale: CB/NRDA settlements may provide for public, private, or land trust ownership. It is desirable to restore sites that involve least complex land acquisition problems.

- Land-Use Compatibility - The nature and condition of existing surrounding land use and future concerns such as shoreline designation, zoning, comprehensive or project-specific planning.

  Guideline: More weight is given to sites that avoid conflicts with probable land and shoreline uses, plans, and designations. Sites where existing land uses of adjacent properties do not have an adverse impact on aquatic resources are scored high.

  Rationale: Noise, bright lights, or other human disturbances and conflicting land uses may reduce habitat value of restoration sites.

- Water quantity and flow - This is a unique criterion for freshwater stream and riparian sites relating to flooding and erosion potential.

  Guideline: More weight is given to sites that would resist seasonal flooding impacts and stream bank erosion.

Rationale: Natural stream hydrology has been seriously impacted by human upland developments which have reduced native stormwater retention capacities.

3.2.2.3 Lesser importance

- Public access - Physical ability of public to access or view the restoration site.

  Guideline: Weight is given to sites that allow for public access compatible with restoration goals.

  Rationale: Sites that would accommodate nonintrusive (*e.g.*, minimal disturbance to fish and wildlife) public access might provide educational and recreational amenities while promoting long-term public stewardship.

3.2.3 Site ranking

To establish project priorities, it is possible to use a weighting and scoring system in which the first step is to assign a numerical weight to each habitat development criterion. Criterion each receives a numerical weight of 1 to 3, with a 3 for high importance, a 2 for medium importance, and an 1 for low importance.

The next step reflects how well a specific site ranks for each criterion, with 3 considered a high match, 2 a medium or "okay match," and 1 a "maybe" or poor match. Then, each site score is multiplied by the weighting factor of the criterion and summed for all criteria in order to obtain an aggregate project score. Based on these scores, the HFA projects can be divided into about equal groups of high priority, medium priority, and low priority.

This ranking process is dynamic; changing conditions and new information may result in a site receiving a higher or lower priority in the future. New sites can be added at any time using the same criteria; grouping of several nearby small sites into a larger project can also be considered. Prospective sites can be dropped as circumstances change, such as restoration projects being completed, vacant land being developed commercially, or site contamination being uncovered.

3.3 Initial Inventory of Potential Restoration Sites

The CB/NRDA Restoration Panel identified potential sites in the primary study area through a review of existing information contained in a list of potential restoration sites from the Cumulative Impact Study (Corps et al., 1993). This step was followed up with site visits by boat and from land where possible. Two aerial video surveys were made of the entire shoreline from Dash Point to Point Defiance during the lowest tide of July 1993.

A determination of consistency of potential restoration sites with CB/NRDA goals and objectives (required criteria, Section 3.2.1) was made, followed by a description of the site characteristics (ownership, size, use, shoreline environment, history, available habitats, presence of on-site or nearby sources of contamination, and cleanup schedule). Ideas for potential restoration attributes and connectivity to other restoration or natural sites were discussed to estimate the site's importance to the Commencement Bay landscape. Cost and sustainability were only considered in a rough ballpark fashion for comparison purposes.

The result was an initial map (Figure 3-2) and a matrix (Table 3-1) of possible sites in the primary study area. This inventory was evaluated under the full set of screening and site selection criteria, which helped to shape the overall landscape concept. The inventory of potential habitat sites is dynamic in this Conceptual Restoration Plan, with additional sites being evaluated when proposed, and restored or developed sites removed when appropriate.

Rationale for conducting restoration in the expanded study area will be based on the criteria set forth in Section 1 of the EIS (Vol. I) and Section 1.5.5 above; selection of potential projects will be based on the criteria set forth in Section 3.2 above.

3.4 Site Objectives

When a new site is nominated, it should be evaluated by the criteria identified in Sections 3.2.1 and 3.2.2 above. For example, if a parcel of vacant land is made available for restoration, the location, size, and proximity to other habitats (e.g., distance to the main channel of a river) constrains the types of habitats that could be constructed and the resources potentially benefitted by the restoration. In the Bay and Basin where more than one site may be available, the site selection process can be used to prioritize sites using the decision matrix.

Two objectives of the site selection process are to:

1. find the location that contains conditions suitable for the types of habitats to be restored, and

2. assure that the location maximizes benefit from natural resources, services, or habitat processes.

The key is not to "force" a habitat or system into a location that would be difficult to make suitable for the habitat. The general procedure for determining the suitability of a location for a particular habitat type is to develop the following:

1. understanding of the attributes and processes that produce habitats historically present at the location;

2. understanding of the present chemical and physical conditions of the location;

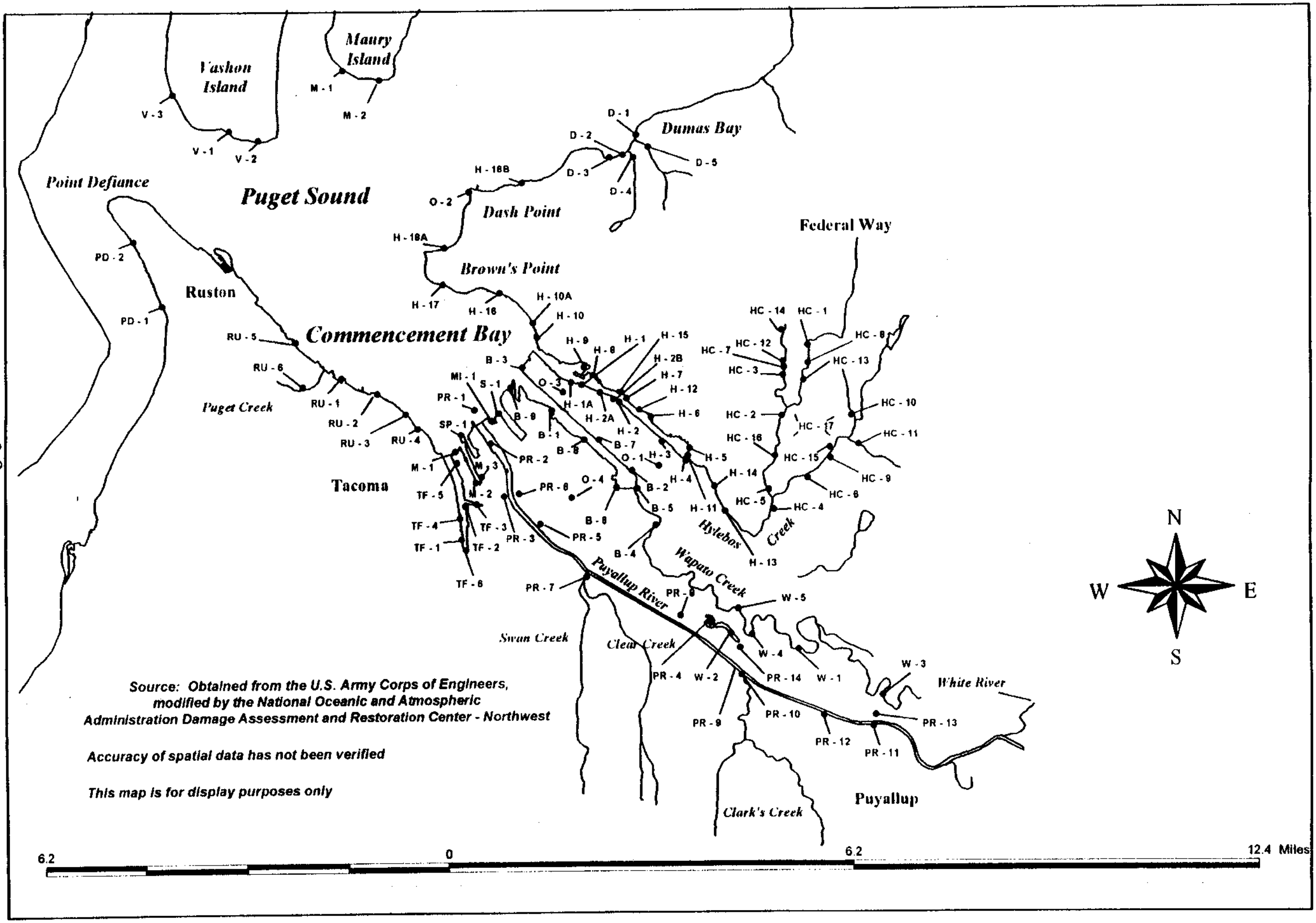

Figure 3-2. Preliminary Inventory of Potential Commencement Bay Restoration Sites.

Table 3-1
Preliminary Inventory of Potential Restoration Sites

Site (1)	Narrative Description	Ownership (2)	Existing Habitat (3)	Existing Use	Surrounding Land Use	Potential Future Use	Outfalls (4)	Clean Now (5)	Ranking (6)	Possible Restoration Options (7)
RU-1	Dickman Mill	State/Tacoma Parks/Dave Page	VS	Vacant pier (poor shape)	Park/public access	Mixed public/private		Y	M	
RU-2 (#41)	National Guard	U.S. Army #890002361	VS/DS	Vacant	Park/private	Park (potential transfer to Tacoma Parks) harbor area		Y	M	Enhancement of existing habitat
RU-3	Sperry Mill	Private		Active Use	Public(federal) /private	Private industrial/ marine		Y	L	
RU-4	Grain terminal	Port of Tacoma?	VS/DS	Upland active;shoreline vacant	Public/private	Public/private		Y	L	Preservation?
RU-5 (#42)	Old Tacoma/ Ruston Shoreline	Mixed public/private	MF / VS / DS	Mixed	Mixed	Mixed harbor area		Y		Restoration of mudflats and vegetative shallows
RU-6	Puget Creek	City, Pud/Metro Parks/ Private	RI	Residential/Metro Park/Open Space	Residential	Park/Open Space		Y?	H	Stream restoration
TF-1	Harmon Pond	Dock Street Partners	MF / VS / EM						L	
TF-2	Martinac	State/Martinac #16530080	MF/VS						L	
TF-3 (#38)	Wheeler-Osgood	Wattles Co. #16530050 BNRR #16539205,-210	MF/VS	Tideflats	General industrial				L	
TF-4 (#37)	Concrete lot	Tacoma Met. Park District		Vacant	Marina and boat moorage	Harbor area			M	
TF-5 (#39)	D Street Petroleum	Puget Sound Plywood	MF	Vacant	Petroleum storage	Harbor area			L	Restoration of mudflats and nearshore emegent marsh
TF-6 (#36)	Head of Thea Foss	State/City of Tacoma	MF	Park	Vacant	Park/SR-509?	Y		L	
M-1 (#40)	Thea-Foss-Middle Peninsula	Private/state	MF/VS	Upland active industrial, shoreline vacant	Private / public; bulk petroleum / boat and ship repair	Private industrial/public marine lease (DNR)		Y	M	Preserve/enhance intertidal habitat
M-2 (#33)	Middle Waterway Mudflats	State # 16515005	MF / VS / EM	Tideflats			Y		H	
M-3 (#35)	Middle Waterway Shore	State/Simpson	MF/VS	Lumber storage	Lumber and pulp mills/boat building and repair	Lumber and pulp mills			M	Remove pillings and rubble
SP-1 (# 34)	St. Paul-Middle Penninsusula	State/Simpson	MF	Upland active industrial, shoreline vacant (old piles, log storage)	Private/public	Private industrial/public marine lease (DNR)		Y	H	Remove pillings and rubble
PR-1	Mouth Puyallup	Public/state (DNR)	MF	Natural delta	Public (navigation)	Public (navigation)		Y	M	Build bar accretion zone
PR-2	Mouth Puyallup	Private/Simpson	EM	Upland active industrial, river vacant, log rafts	Private (river navigation)	Private (Public navigation)		Y	M	Notched channel
PR-3	Simpson wetland	Private	EM	Wetland	Private industrial	Private industrial		Y	H	Increase size

Table 3-1
Preliminary Inventory of Potential Restoration Sites

Site (1)	Narrative Description	Ownership (2)	Existing Habitat (3)	Existing Use	Surrounding Land Use	Potential Future Use	Outfalls (4)	Clean Now (5)	Ranking (6)	Possible Restoration Options (7)
PR-4 (#3)	Oxbow	Puyallup Tribe?	EM/RI	Natural wetland	Agriculture	Agriculture/SR-167 Project?		Y	H	River/Wapato Creek connection
PR-5 (#4)	Old Tacoma Landfill	USA (Puyallup Tribe) Port of Tacoma	EM	Vacant	Vacant / Industrial / restored wetland	Industrial/SR-509 Project?				Expand existing wetland
PR-6 (#5)	Puyallup River Dike Wetland	USA	EM	Vacant	Industrial	Industrial			L	Build "Simpson" type wetland
PR-7 (#1)	Swan Creek (lower)	Private	EM	Vacant residential	Residential	Residential		Y	M	Breach dike
PR-8 (#2)	Puyallup River Valley North	Private/USA (Puyallup Tribe)	Agricultural fields	Agricultural/residential	Agricultural / residential	Agricultural/residential; SR-167 project?		Y		Breach dike
PR-9 (#6)	Puyallup River banks	USA	RI	Vacant	Mixed private use			Y		Riparian plantings/dechannelization
PR-10 (#P1)	Clark's Creek	River Road Landscape Supply?	RI	Commercial			N	Y	L	Relocate railroad ties;enhance stream buffer
PR-11 (#P2)	11th St NW wetland		EM	Degraded wetland	Commercial		N	Y	L	Revegetate and protect wetland
PR-12 (#P3)	Puyallup Sewage Treatment Plan	City of Puyallup?		Treatment plant			Y	Y?		Remediation,monitoring
PR-13 (#P4)	Puyallup River Valley South	Variable public/private ownership	Agricultural fields	Agriculture	Agriculture		N	Y	M	Modify levee; create wetlands; connect to Wapato Creek
PR-14 (#P5)	Puyallup River Channel Wetland	Variable private ownership	EM/RI agricultural fields	Agriculture	Agriculture		N	Y	M	Modify levee;create wetlands;connect to Wapato Creek
MI-1 (#43)	Milwaukee Waterway	State/Port of Tacoma			Marine	Port fill		Y		Establish intertidal habitat associated with Port fill project
S-1 (#32)	Sitcum/Milwaukee Peninsula	Port/State	MF	Upland marine commerce,shoreline vacant/seaplane ramp	Marine commerce / navigation	Port expansion - 2010 Plan		Y	M	Preservation and enhancement of existing mudflats
B-1	Blair Bridge	Port/DOT/DNR?	MF/VS	Upland marine commerce,shoreline vacant	Marine commerce / navigation	Blair Bridge Removal Project		Y		Blair Bridge removal
B-2	Head of Blair	Port	MF/VS	Upland marine commerce,shoreline vacant	Marine commerce / navigation	Port expansion - 2010 Plan		Y	M	
B-3	Hylebos Peninsula	Port/DNR	MF/VS	Upland marine commerce,shoreline vacant marine ways	Marine commerce / navigation	Port expansion - 2010 Plan		Y	M	
B-4 (#23)	Wapato Creek	Private	RI	Mixed residential/industrial	Mixed residential / industrial	Mixed industrial/residential		Y		Riparian planting/stormwater treatment
B-5 (#24)	Mouth of Wapato Creek	Port of Tacoma		TNT Auto Warehousing	Industrial/marine commerce				L	Uncover creek/reroute creek
B-6 (#26)	Plum Creek Timber Shore	State/Port of Tacoma	MF	Log storage and sorting	Marine			Y	L	Preserve/enhance existing habitat

Table 3-1
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Site (1)	Narrative Description	Ownership (2)	Existing Habitat (3)	Existing Use	Surrounding Land Use	Potential Future Use	Outfalls (4)	Clean Flow (5)	Ranking (6)	Possible Restoration Options (7)
B-7 (#27)	Blair Waterway Pond	Port of Tacoma	EM	Vacant	Industrial					Establish mudflat and marsh,connect to Wapato Creek
B-8 (#28)	Blair Waterway Shore	Rhone Polene Basic Chemical Co/State		Industrial/petroleum refining	Industrial	Industrial				Intertidal marsh enhancement/Port of Tacoma mitigation
B-9 (#30)	Slip 5 Mitigation Site	State/Port of Tacoma		Marine	Marine	Marine/harbor area		Y	M	Preservation
W-1	Wapato Creek	Variable ownership	RI	Mixed agriculture/development	Agriculture / development			Y?		Stream enhancement;wetland creation
W-2	NWI Wetland		RI/EM	Agriculture	Agriculture		N	Y		Preserve wetland
W-3	East Wapato Creek	Variable public/private ownership	Upland grasses	Piped creek,agriculture	Agriculture		N	Y		Wildlife corridor/stream restoration
W-4	Wapato Creek Oxbow	Variable private ownership	RI	Open space	Agriculture		N	Y		Creek restoration;link to Puyallup River
W-5	Wapato Valley	Port of Tacoma Land Association	Disturbed grasses	Agriculture	Agriculture		N	Y		Wetland creation
H-1	Hylebos/11th Street Bridge S	State/City of Tacoma	MF/VS						M	
H-1A (#17)	Hylebos/11th Street Bridge N	State/Port of Tacoma	MF/VS	Vacant	Industrial	Industrial			L	Establish intertidal wetlands
H-2 (#12)	Lincoln Avenue S	State/Murray Pacific/Pan Pacific #321264018	MF/VS	Vacant log storage and sorting yard	Industrial	Industrial			L	Restoration of intertidal wetlands
H-2A	Lincoln Avenue N	State/Buffelen Woodworking #32164006	MF/VS						L	
H-2B (#14)	Taylor Way Properties	State/Taylor Way Properties	MF/VS	Vacant industrial	Industrial	Industrial			L	Restoration of intertidal wetlands and mudflats
H-3 (#11)	Kaiser Ditch Area	Atochem/?	EM	Vacant log storage yard/drainage ditch	Industrial	Industrial			L	Intertidal wetland establishment;connect to Wapato Creek
H-4 (#9)	Hylebos Creek	State/Louisiana Pacific #321364024	MF/VS						L	
H-5 (#10)	Upper Hylebos Turning Basin	Puyallup Tribe	MF/VS	Vacant industrial	Industrial	Industrial			L	Intertidal mudflats, intertidal marsh, forested buffer
H-6	General Metals	State/General Metals? #321362037	MF/VS						L	
H-7	Oline	Private/Oline	MF/VS	Upland salvage;shoreline vacant					M	
H-8 (#15)	Hylebos Waterway Log Storage Mudflat	Private/Sound Refining	MF/VS	Upland industrial,shoreline log rafts	Upland industrial, marine navigation / log rafts	Upland industrial; marine navigation / log rafts		Y	M	Enhancement of existing mudflats and vegetative shallows

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Site (1)	Narrative Description	Ownership (2)	Existing Habitat (3)	Existing Use	Surrounding Land Use	Potential Future Use	Outfalls (4)	Clean Now (5)	Ranking (6)	Possible Restoration Options (7)
H-9 (#16)	Hylebos Mudflats	Puyallup Tribe/Port of Tacoma/William Sny	MF/VS	Mixed public/private;upland road;shoreline modified	Mixed public / private; marine navigation	Mixed public/private;marine navigation		Y	H	Preserve/enhance existing habitat
H-10 (#18)	East Commencement Bay Mudfl	Puyallup Tribe/Foss Maritime #2275200081	MF/VS	Natural mudflat	Marina/mudflat/log raft	Marina/mudflat/log raft		Y	H	Preservation of mudflat;enhancement of fringing marsh vegetation
H-10A (#19)	Marine View Drive Beaches	State/private (DNR leases)	MF/VS	Mudflat with log rafts	Residential; mudflat / log raft	Residential;mudflat/log raft		Y	H	Preservation of mudflat;enhancement of beach areas
H-11 (#9)	Mouth of Hylebos Creek	State/Port of Tacoma #321354017,-026	MF/VS	Vacant log storage yard	Vacant industrial/log storage yard	Industrial			H	Restoration of intertidal wetlands
H-12	Modutech		MF/VS							Mitigation site
H-13 (#7)	Matich/Evanich	Private	RI	Vacant	Residential	Residential		Y	H	Riparian enhancement
H-14 (#8)	Gider Associates	Private	RI/EM	Agricultural	Agricultural/vacant residential	Residential / light manufacturing		Y	H	Riparian/wetland enhancement
H-15 (#13)	Cascade Pole	Cascade holdings	EM (Shoreline)	Vacant log storage yard?	Industrial	Industrial		Y	M	Establishment of mudflats and intertidal marsh
H-16 (#20)	Tyee Marina Beach	Richard Oline	VS	Vacant	Tidelands/marina			Y	M	Preservation
H-17 (#21)	Bluff Beach	Richard Oline	VS	Vacant	Tidelands			Y	M	Preservation
H-18A (#B1)	Browns Point Outfalls	Private	VS	Residential	Residential		Y	Y?		Remediation/monitoring
H-18B (#22) (#B2)	Browns Point Beach	Pierce County	VS	Vacant	Tidelands / residential			Y	M	Preservation
HC-1	West Branch near SR 99	Variable private ownership	Disturbed vegetation	Open space	Development		Y	Y?		Habitat enhancement;biofiltration
HC-2	West Branch near S. 373rd	Variable private ownership	RI/disturbed meadow	Pasture				Y		Riparian/wetland habitat enhancement;fence stream
HC-3	West Branch adjacent to S. 361st	Variable private ownership	RI	Logged streambank				Y		Channel stablization, stream enhancement
HC-4	South of Juniper St.	H&H Diesel Services	EM	Commercial	Commercial			Y?		Stream enhancement
HC-5	Bingo dome	Not available	EM/RI	Filled wetlands				Y		Remove fill/enhance stream buffer
HC-6	Gravel quarry	Corridor Enterprises	RI	Gravel quarry				Y		Revegetate stream banks;restrict access
HC-7	West Branch near S. 358th	Donald Barovic	RI	Grazing				Y		Fence stream/streambank restoration

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Site (1)	Narrative Description	Ownership (2)	Existing Habitat (3)	Existing Use	Surrounding Land Use	Potential Future Use	Outfalls (4)	Clean Now (5)	Ranking (6)	Possible Restoration Options (7)
HC-8	West Branch at 359th	Variable private ownership	RI	Insufficient culvert				Y		Modify culvert;stablize channel banks
HC-9	East Branch Hylebos	Private	RI	Residential	Residential			Y		Retrofit detention ponds; riparian plantings;stablize channel
HC-10	East Branch Tributary One	Private	RI	Residential	Residential			Y		Modify detention facility;stablize channel
HC-11	East Branch Tributary Two	Private	RI	Residential	Residential			Y		Modify detention facility
HC-12	East Branch Ravine	Variable private ownership	RI	Residential	Residential			Y		Enlarge detention facility;stream habitat restoration
HC-13	Spring Valley wetland	Variable state/private ownership	RI/EM	Wetland				Y		Preservation
HC-14	West Hylebos wetlands	Variable private ownership	RI/EM	Wetland				Y		Preservation
HC-15	East Branch forested ravine	Corridor Enterprises	RI	Forested ravine				Y		Preservation
HC-16	West Branch near Bird St.	Variable private/public ownership	RI	Forested ravine				Y		Preservation
HC-17	Other Hylebos Creek wetlands	Numerous landowners	RI/EM	Wetlands and riparian areas				Y		Preservation
O-1 (#25)	BPA Wetland	Tacoma/BPA	VS/EM	Industrial/wetland	Industrial	Industrial		Y	L	Preservation;connection to Wapato Creek
O-2	Dash Point	DNR	VS	Residential/natural	Mixed private / public; natural shoreline	Mixed private/public;natural shoreline		Y	H	Preservation of existing kelp beds
O-3 (#29)	Dan Oline Landfill	City of Tacoma	EM	Vacant	Industrial	Industrial			L	Establish hydraulically-isolated forested wetland
O-4 (#31)	Fire Department Wetland	Puget Sound Trucking	EM	Industrial/wetland	Industrial	Industrial			L	Preserve/enhance existing wetland
MI-1	S. Maury Island outfalls	Private	VS/DS	Residential	Residential		Y	Y?		Remediation/monitoring
MI-2	So. Maury Island	Public/private	VS/DS	Natural	Mixed public/private	Mixed public/private		Y	H	Preservation
V-1	S. Vashon Island Ferry Terminal	Public	VS/DS	Ferry dock	Residential/natural			Y?		Remediation/monitoring
V-2	S. Vashon Island outfalls	Private	VS/DS	Residential	Residential		Y	Y?		Remediation/monitoring
V-3	S. Vashon Island	Public/private	VS/DS	Natural	Mixed public/private	Mixed public/private		Y	H	Preservation

Table 3-1
Preliminary Inventory of Potential Restoration Sites

Site (1)	Narrative Description	Ownership (2)	Existing Habitat (3)	Existing Use	Surrounding Land Use	Potential Future Use	Outfalls (4)	Clean Now (5)	Ranking (6)	Possible Restoration Options (7)
DB-1	Lakota Sewage Treatment Plant	Federal Way Water & Sewer District	VS/DS	Treatment plant	Residential		Y	Y?		Remediation/monitoring
DB-2	Dumas Bay outfall	Unknown	VS/DS				Y	Y?		Remediation/monitoring
DB-3	Dumas Bay	Public/private	EM / VS / DS	Residential/natural	Mixed public/private	Mixed public/private		Y	H	Preservation
DB-4	Joe's Creek	Variable private ownership	RI					Y?		Stream restoration
DB-5	Lakota Creek	Sisters of the Visitation	RI					Y		Stream restoration
PD-1	Point Defiance outfalls	Private	VS/DS	Residential	Residential		Y	Y?		Remediation/monitoring
PD-2	Point Defiance/Salmon Beach	Public/private	VS/DS	Residential/natural	Mixed public/private	Mixed public/private		Y	H	Preservation

1 Site number in parentheses is designation given to site in Commencement Bay Cumulative Impacts Study (November/December 1992).
2 Ownership information is preliminary and subject to verification.
3 MF (Mudflat -14' to +15'); VS (Vegetated Shallow -30' to +5'); EM (Emergent Marsh 0' to +15'); DS (Deep Subtidal -60' to -30'); RI (Riparian).
4 NPDES/stormwater outfalls discharging into immediate vicinity of the site.
5 Source control and cleanup likely complete; subject to verification.
6 Ranking is based upon analysis of potential site's suitability for restoration.
Unranked sites did not have adequate information for ranking
7 Possible restoration options are preliminary and subject to verification.

3. information on the physical and chemical requirements of the targeted species for that location; and,

4. a list of measures needed at the location in order to match the species requirements.

These steps also apply to structures that benefit specific species or services, such as fish benches, oxbows in rivers and streams, and egg boxes. In this case, the physical setting may be the most important factor to consider when siting the project.

3.5 Developing the Project Vision

Developing a project vision simply means stating what the project will ultimately do and how the project will generally appear. To develop the vision, an initial understanding of the restoration opportunity is required, including a semiquantitative evaluation of the scope and scale of the project. In other words, how extensive will the effort be in terms of its construction and the area it will cover. Also relevant is whether this project is feasible for the potential money available. Other attributes of the project beyond those of primary importance should be listed. For example, if the project is for shorebirds, salmonids and small mammals may also be benefitted with only minor adjustments in the vision. At this point it is also useful to determine whether project performance can be measured.

The product of this step should be a clear statement of the vision. An sample vision statement is: *"We will construct an emergent estuarine marsh that forms a continuous high-quality transition habitat from upland through buffer habitat to tidal sand/mudflats for the benefit of shorebirds, waterfowl, and juvenile salmon."* This statement allows one to "see" the project and understand the intended outcome of the restoration effort. The vision statement is extremely important in communicating the intentions of the project to others and for guiding the rest of the planning process. It is also useful to produce a preliminary drawing of the project.

3.6 Developing Project Goals

Establishing goals for the project is the most important step in the planning process (Section 1, EIS). Goals guide the definition of needed physical actions as well as the performance expected or predicted from the restoration effort. The goal statement generally restates, more specifically, that part of the vision dealing with what the effort will ultimately accomplish.

Goals need to address the fact that the geographic extent of potential restoration actions encompasses restoration of lost natural resources and services as well as restoration of habitats. Restoration at this expanded level means that areas outside of the immediate primary study area must be considered in the restoration plan. These sets of goals, with modifications, provide a clear framework for establishing goals for each specific restoration effort. Once the goals are developed at the project level, the objectives can be developed into measurable parameters, which would then monitored for success and the ultimate satisfaction of performance criteria.

One good example is the Middle Waterway Shore Restoration Project since it was the first project specifically implemented under the CB/NRDA program. It provides a model of how Trustees can work with business to develop, implement, and steward successful restoration projects. Primary project goals were long-term environmental restoration and an early pilot study. The project's main objective was to provide valuable estuarine habitat within Commencement Bay. This objective was accomplished with three major features: (1) at a location adjacent to one of the largest remaining areas of original intertidal mudflat (nearly 20 acres), (2) as being functionally related to an intertidal habitat constructed at the north shore of the Tacoma Kraft Mill in 1988, the Puyallup delta, and other nearby intertidal and shallow subtidal habitats, and (3) in perpetuity. Other environmental objectives of the project included the following:

- Converting approximately 1.5 acres of previously-filled upland from existing industrial use to estuarine intertidal wetland.

- Increasing the length of the natural shoreline edge along the +9 to +13 foot contour from 840 to 960 feet.

- Establishing approximately 1.2 acres of habitat at known high and low salt marsh elevations.

- Providing a riparian buffer and transition zone from tideflat to upland to screen, protect, and support the integrity of the remaining original Middle Waterway mudflat and the diverse species that use this biologically productive area of the estuary.

- Restoring a minimum of 0.23 acres of estuarine intertidal mud/sand habitat as mitigation for placing fill on a like acreage of intertidal mud/sand habitat at similar elevations.

- Providing the opportunity to experiment with different planting regimes in the upper intertidal and riparian buffer areas. These regimes included salvage plantings, soil amendments, supplemental watering, weed control, test seed plots, reclaimed sediment top-dressing, native seed banks, recolonization from adjacent habitats, and transplantings from reference areas.

- Providing a laboratory (pilot project) to study the long-term feasibility of constructing intertidal habitat in an urban environment in close proximity to contaminated sediments. and

- Developing a variety of long-term stewardship opportunities through a cooperative agreement between the companies and the Trustees, and through programs with citizen and conservation groups.

3.7 Developing the Project Conceptual Model

The next step in converting the project vision and goals into an on-the-ground project is the development of a conceptual model. This model applies the basic understanding of how the chemical, physical, and biological components of the system interact. Given the project vision and goals, the conceptual model lays out the factors needed to meet the goals. For example, the vision statement above indicated that an estuarine marsh would be constructed. Estuarine marshes have definable limits in terms of elevation, salinity, nutrients, slope, light, physical disturbance (i.e., waves), etc. The model identifies these factors and lists the range of values for these factors which are optimal for the survival and establishment of the marsh. Development of the critical factor information is paramount before undertaking restoration of a habitat. These factors define the conditions required in the area where the marsh is to be constructed.

If the goals call for enhancement of selected natural resource species or functions (*e.g.,* water quality improvement), then the model must include suitable target species or functions (Figure 3-3). Habitat requirements for the target species need to be defined. Landscape ecology considerations, such as habitat (patch) size, patch shape, proximity to corridors of migration and corridors of access, are then incorporated. In addition, habitat characteristics such as plant stem density, species composition, degree of heterogeneity, and soil conditions, are included in defining the optimal conditions for the target species. A very useful document for relating habitats to target resources is the Estuarine Habitat Assessment Protocol (EHAP; Simenstad et al., 1991). The EHAP contains lists of animal species documented to utilize the major estuarine habitat types in the Pacific Northwest. From these lists, predictions can be made as to the species that will benefit from inclusion of each of these habitats in a restoration effort (See Appendices C and D, EIS, Vol. I).

Once the conditions are defined in terms of target resources, habitats or other needed features, and the physical and chemical conditions needed to support habitat development, then the site can be evaluated for habitat development.

3.8 Site Design

In this step, the conceptual model information step is combined with the site selection information to produce a design for the project. The objective of this phase is to provide as much specific information on the project as possible to enable engineers to produce the project specifications. A design typically consists of detailed drawings of the proposed habitats and other features of the project such as channel location, substrata types, morphology, hydrological features, buffer areas, viewing areas, and location of adjacent connected habitats. Three dimensional drawings produced with computer software are particularly useful in this phase.

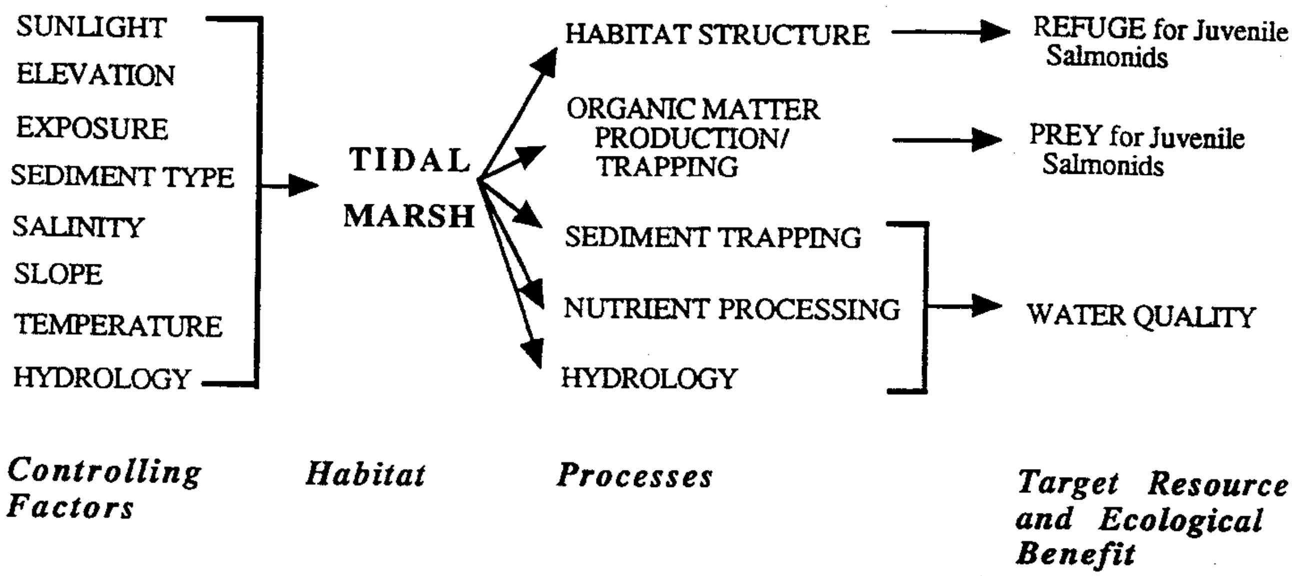

Figure 3-3. Conceptual Model of a Tidal Marsh System, Showing Relationship Between Habitat Factors and Juvenile Salmon and Water Quality.

3.9 Site Assessment

Regulatory permit requirements, land acquisition or easement requirements, zoning limitations, and structural and construction requirements must be considered as part of the site selection process. The proposed site must be investigated to confirm the types and distribution of habitat, along with other features and characteristics critical to the design concept and the proposed action. This assessment will lead to the understanding of the site-specific issues to help determine engineering and other project requirements.

Where contamination is known or believed to exist, the site will be formally characterized (Level 1 or Level 2 environmental assessment) prior to property acquisition or project implementation. In such a case, the assessment may be extended to confirm and evaluate the level of contamination on the site and the location of any potential sources or non-point sources that may impact the effectiveness of the restoration project. The permitting process may require a site-specific environmental assessment or other environmental review documents.

In instances where the restoration project(s) are not part of CB/NRDA settlement, property access rights must be acquired; a records search must be conducted to identify the legal owners, liens, and any restrictive covenants on the property. Removal of liens or restrictive covenants may affect negotiations or incur additional costs.

3.10 Cultural Resources

Due to the unique nature of prehistoric and historic sites and Native American traditional cultural values, it is essential to consider cultural resources during the site selection phase. If significant historical or cultural resources are affected by the proposed project, it will be necessary to coordinate and possibly mitigate actions prior to initiation of ground-disturbing activities. Depending on the number and types of historical or cultural resources involved, this process can take several months and can add considerably to the project cost. In some cases, it may not be possible to mitigate for project impacts given the unique nature or significance of a particular historical or cultural resource site. In those instances, the Trustees will abandon the site. Consideration of historical or cultural resources early in the site selection process is intended to prevent unnecessary expenditures of time and funding on sites where it would be prohibitively expensive or impossible to mitigate impacts to historical or cultural resources.

3.11 Performance Criteria

Once the site has been selected and the habitat types, sizes, and distribution have been determined, performance criteria can be established. Performance criteria are measures that assess the progress of the restoration effort toward the goals of the restoration plan. Performance criteria must be directly related to the goals for the project. The basis for the relationship is developed during the conceptual model phase; the level of detail and specificity of the criteria will be established on a project-by-project basis.

Performance criteria should include a time estimate to reach the predicted performance level. Because we generally lack data on the time needed for habitats to fully develop, the best available information must be used. For example, some information shows that a breached dike wetland will reach general stability within 15 years after dike breaching (Morlan and Frenkel 1992). Studies with juvenile salmonids have shown that they will occupy new habitats almost immediately upon gaining access to the system (Shreffler et al., 1990).

Reference sites may be useful for developing performance criteria. If the goal is to establish a functional sedge marsh, data on a range of parameters (stem density, above ground biomass, below ground biomass) from adjacent natural sedge marshes would be used to establish target ranges for these parameters. In lieu of adjacent reference sites, literature values from the region may be used.

3.12 Potential Funding Sources

Funds may come directly from CB/NRDA settlements (usually held in Court Registry Accounts) or the project may be funded directly by a PRP, with Trustee oversight as part of a negotiated settlements or from other recoveries. The Trustees intend to use settlement funds judiciously to leverage additional funds to expand restoration efforts in Commencement Bay. A review of potential funding sources for ecological restoration to complement or supplement Trustee-funded projects has been compiled by the Seattle District of the Corps of Engineers for habitat restoration at the Duwamish River Turning Basin Number 3 (Seattle District, U.S. Army Corps of Engineers, unpublished document, June 23, 1995). The report contains an exhaustive listing of private and public agencies that have programs for providing full or partial funding for restoration efforts. These sources will be evaluated for their suitability on a case-by-case basis.

The Trustees have developed protocols for evaluating other forms of compensation for NRDA damages through case-by-case negotiated settlements, such as contribution of real property, in-kind services, and long-term maintenance and stewardship commitments with PRPs through cooperative agreements. The Middle Waterway Shore Restoration Project is one example where the site continues to be owned and maintained by the company and the construction costs were shared by the company and the Trustees. Another example is the Port of Tacoma CB/NRDA settlement, fashioned so that funds from other sources could be deposited with the Registry of the Court for use by the Trustee Council for restoration projects. This mechanism also serves to reduce transaction and oversight costs.

3.13 Coordination with Other Agencies and Plans

The intent of this Restoration Plan is to coordinate with other natural resource enhancement and preservation programs so that public investments under different programs can be focused in the same areas and can complement each other. Therefore, an important part of project planning is coordinating with other programs in the study areas related to site remediation, habitat enhancement, and compensatory mitigation. Because many regulatory agencies are participating as Trustees, a number of possible regulatory issues can be anticipated and discussed in advance. As discussed in the Section 5 of the EIS (Vol. I), both program level interagency and locality-specific coordination will be conducted.

Several important habitat mitigation, enhancement or restoration projects in the Commencement Bay area have either been implemented, are being implemented, or are well along in the planning stage. These projects are intended as mitigation for actions that adversely impact habitat, mitigation for chemical contamination of habitat, NRDA-related pilot projects, or possible partial compensation for NRDA-related damages. Additional information on these projects can be found in the Commencement Bay Cumulative Impact Study (Corps et al., 1993), particularly reports by David Evans and Associates (1991) and Shapiro and Associates (1992a and 1992b). Some of these projects use sites already identified as potential NRDA-related restoration sites (Section 3.3 above). Project sites are shown on Figure 3-4. The Trustees intend to coordinate use of sites, avoid duplication of effort, resolve institutional issues, and coordinate the goals and design of the various restoration projects to maximize ecological benefit.

The state, acting through the WDNR, has facilitated existing and planned restoration projects by providing use of state-owned aquatic lands based on their proprietary trustee interests. The WDNR support for the Slip 1, Milwaukee Waterway, Simpson Middle Waterway Shoreline, and City of Tacoma projects has been based on their public interest in seeing both a healthy productive estuary and a healthy economy.

3.13.1 **Completed projects**

3.13.1.1 Gog-le-hi-te Wetland (Lincoln Avenue Wetland), Port of Tacoma
This is an approximately 10-acre combined wetland/upland restoration project, located adjacent to the lower Puyallup River channel. It was implemented in 1986 by the Port of Tacoma as off-site mitigation for filling of a 10-acre site containing both wetland and upland habitats.

3.13.1.2 Slip 5 Mitigation Area, Port of Tacoma
In 1987, the Port of Tacoma constructed 2.5 acres of intertidal beach in Slip 5 near the mouth of Blair Waterway to mitigate for loss of juvenile salmonid habitat caused by the filling of Slip 2.

3.13.1.3 Slip 1 Mitigation Area, Port of Tacoma
Approximately 5,600 square feet of fish mitigation area was created to compensate for a dredging project elsewhere in the Blair Waterway.

3.13.1.4 St. Paul Cleanup and Restoration Project, Simpson/Champion
More than 17 acres of seriously-contaminated bottom sediments were remediated on-site in the St. Paul Waterway adjacent to the Tacoma Kraft Mill. More than six acres of new and productive intertidal habitat were reconstructed over a portion of the cap along the shoreline. Clean shallow saltwater habitat was provided over the remaining 11 acres.

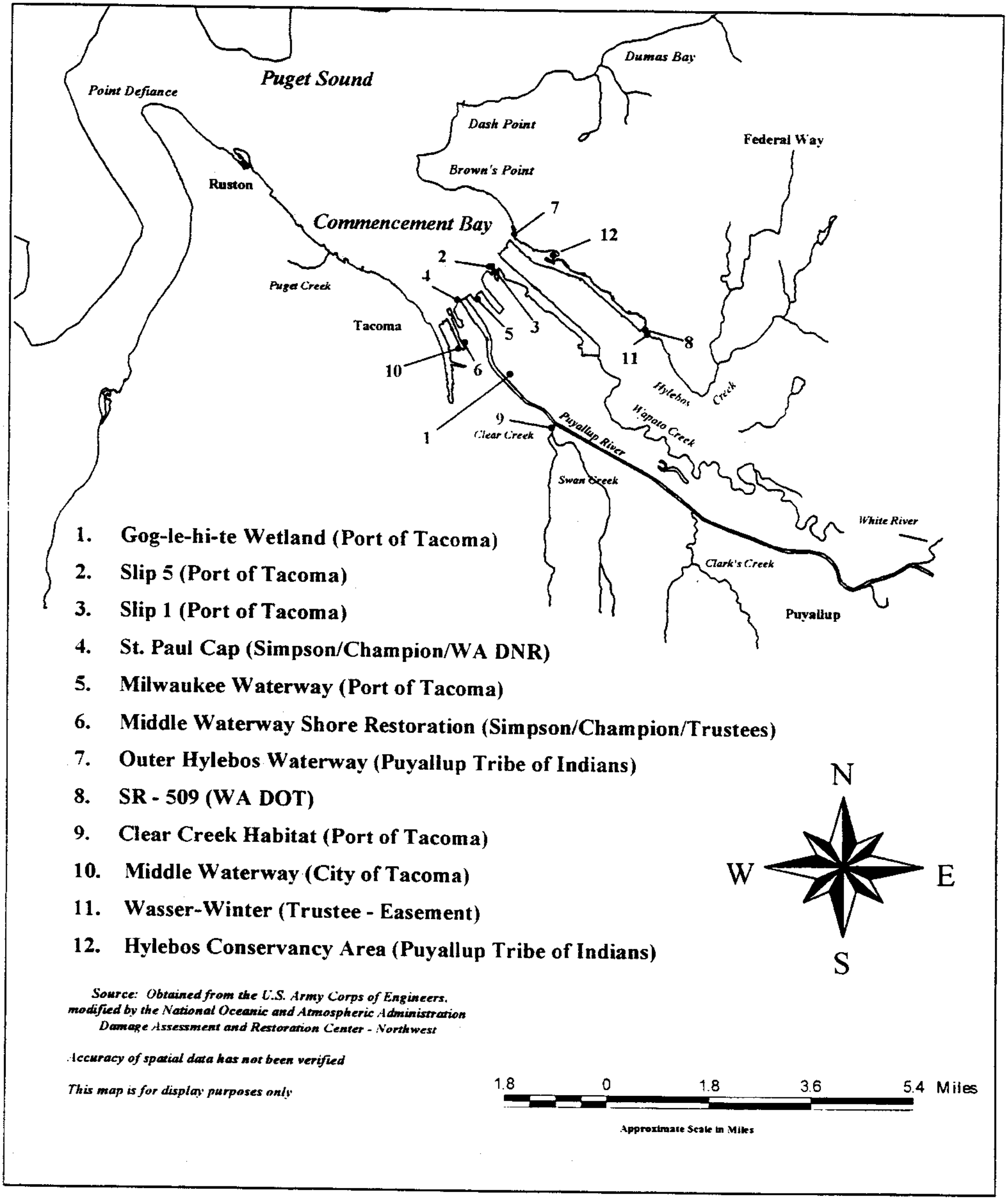

Figure 3-4. Existing and Planned Habitat Project Sites.

3.13.1.5 Milwaukee Mitigation Habitat Area, Port of Tacoma

Seventy percent of the former Milwaukee Waterway was utilized for disposal and capping of contaminated sediments from the Sitcum and Blair Waterways. The remaining 30 percent of the waterway was enhanced as partial mitigation for the fill. The mouth of the waterway was brought up to intertidal and shallow subtidal elevations. Rock was placed to provide fish habitat and additional habitat complexity, 0.7 acres of saltmarsh were developed, and a riparian buffer was planted on the berm surrounding the created habitat.

3.13.1.6 Middle Waterway Shore Restoration Project, Simpson/Champion/Trustees

The project is located at the head of the waterway along 11th Street and the eastern shoreline. It was constructed in June and July of 1995 and reestablished over three acres of intertidal mudflat, saltmarsh, and riparian habitat. Riparian buffer planting was conducted in October 1995, and will isolate the area from surrounding industrial activities and provide cover and food for birds and mammals. The intertidal areas will provide a food source for young marine fish, migrating salmonids, and shorebirds.

3.13.1.7 Outer Hylebos Waterway, Puyallup Tribe of Indians

This project is habitat enhancement as mitigation for the filling of Lincoln Ditch on the Blair Waterway. The site is located waterward of Marine View Drive at the mouth of Hylebos Waterway. Approximately 0.17 acres of low and high saltmarsh were created by excavating upland area, and one acre of intertidal marsh was enhanced by the addition of saltmarsh vegetation. A buffer planting was conducted adjacent to the project.

3.13.1.8 SR-509 Mitigation (Hylebos), Washington Department of Transportation

This project was constructed as mitigation for wetland impacts resulting from the construction of SR-509. The project is located at the mouth of Hylebos Creek upstream of the East-West Road. Approximately two acres of upland were excavated and planted to create additional intertidal marsh; two acres of upland were planted to create a buffer.

3.13.2 In planning projects

3.13.2.1 Clear Creek Habitat Area, Port of Tacoma

The Port will restore this 9.5-acre property along the Puyallup River into a wetland habitat area, as partial mitigation for filling of Milwaukee Waterway and is expected to be implemented in 1996. This project was originally identified as a potential restoration site (Shapiro and Associates, 1992b)

3.13.2.2 Middle Waterway Estuarine Natural Resources Restoration Project, City of Tacoma

The City proposes an enhancement of intertidal mudflat and emergent vegetation habitat (1995a). This project would excavate and regrade 1.7 acres of industrial fill to reestablish intertidal marsh, provide habitat for juvenile fish and shorebirds, and create a riparian buffer around the project. It is located along the western shore at the head of Middle Waterway.

4.0 PROJECT IMPLEMENTATION

After the site has satisfied the preceding criteria and the decision has been made to initiate a restoration project, a project management plan is developed to implement and monitor the project. Typically, each project has a unique mix of requirements identified through project development. The management plan may cover a wide range of issues, such as property access, environmental audits, permitting and regulatory review, construction scheduling and costing, and coordination with appropriate agencies.

Some of these activities are initiated while the prospective project is being conceptualized. For example, preliminary property and construction costs and permitting time lines may be critical to setting the restoration priorities and project selection. Negotiating a letter of intent with the current landowner(s) to acquire appropriate real property interest in a potential site should be considered. Before Trustees begin to expend funds in designing and permitting a project, they should be confident that the property can be acquired at an acceptable cost of money and time.

Engineering design concepts evolve for the proposed site, starting with the conceptual model. Once a commitment is made to go forward with the project, the design is further defined and cost estimates become more specific. If several projects are being implemented at the same time, economies of scale may be achieved by coordinating scheduling, construction, and monitoring.

4.1 Selection of a Project Manager

As site selection is finalized, the Trustees must designate a project manager to undertake the necessary evaluations and studies leading to the development of the project management plan. The project manager may be one or more of the Trustees, an outside contractor hired by the Trustees, another governmental body, a non-profit conservancy organization, or a PRP. Formal agreements will be needed depending on the specifics of the site and the financial arrangement of project manager. The Trustee Council will maintain oversight and financial control over all CB/NRDA restoration projects.

Effective project management is essential for timely and efficient completion of each project. By setting project cost and scheduling milestones, the project manager has a quantitative measure of the project's progress and the necessary information to identify and rectify problem areas. Given this type of information the project manager can adjust the management strategy as necessary in a shorter amount of time.

The Middle Waterway Shore Restoration Project demonstrated the benefits of providing the program manager with a small scientific/technical team of restoration specialists drawn from Trustee representatives, consultants, the property owner, and the public. The project manager will be responsible for applying for project permits and overseeing construction of the project.

4.2 Regulatory and Permitting Compliance

Specific project actions under this Restoration Plan are intended to be consistent with local and state planning documents and regulations such as adopted land use plans, criteria area ordinances, and other development regulations. The project manager will adhere to all applicable and relevant regulations and permits for the jurisdiction of the site. The usual public involvement requirements for permit hearings will be observed and additional public input during project conceptualization and planning will be encouraged. See Sections 1 and 5 of the EIS (Vol. I) for additional information on tiering NEPA environmental documents from the EIS and on potential regulations and permits associated with Commencement Bay restoration sites, respectively.

The project manager will be responsible for coordinating site sampling to support permit applications and project monitoring. Because sampling can be very expensive, the project team should work closely with the regulatory agencies to ensure that any site sampling is done in a manner that fully supports permit applications and project monitoring.

4.3 Property Access/Acquisition

Each agency may have its own internal procedures and requirements for acquiring ownership or gaining property access for restoration. Common procedures include fee-simple purchase, long-term lease, conservation easements, intergovernmental agreements, land exchanges, purchase/transfer of development rights, tax incentive for preservation, or combinations. The choice of approach will depend on the current owner, the agency or entity who is acquiring the rights, and the type of access that is needed. For example, potential sites in Commencement Bay may be owned by a party with CERCLA liability or held in trust by a land trust organization.

Such procedures will determine the exact steps for any acquisition as well as the organizations and agencies involved in the transfer. Typical real estate transactions may involve conducting surveys to determine exact location of the boundaries, an appraisal to determine property values, and legal review to insure that the ownership transfer or leasing agreements are legally sufficient and meet the requirements of the CB/NRDA process.

In coastal areas, property acquisition applies to upland and tideland areas only. Tidelands are located between the normal high tide and the extreme low tide mark. Bottom lands seaward of tidelands are considered harborlands and are owned by the State and managed by the Washington Department of Natural Resources (WDNR). Tideland ownership generally coincides with adjacent land ownership, most of which in Commencement Bay is by private individuals or local governments. If tideland structures extend into harbor areas, the affected harbor property must be leased or acquired from WDNR. Because legal definitions of tidelands and harborlands are not always mutually exclusive, WDNR advises tideland owners to consult with the agency prior to conducting any construction activity in tidal areas.

The Middle Waterway Shore Restoration Project combined a number of procedures for site acquisition with project construction, long-term monitoring, and management defined in a Cooperative Agreement between Simpson Tacoma Kraft Company and the Trustees. Simpson furnished the 4.9-acre site to the Trustees but retained title with deed restrictions on the property. The company is responsible for property taxes, liability insurance, and other consequences of property ownership, and for routine property maintenance. Simpson was responsible for obtaining all permits for constructing the project and for the earthmoving project construction completed in July 1995. In October, planting materials were purchased by Simpson and planted with local volunteer help under joint company/Trustee/Citizens for a Healthy Bay sponsorship. Simpson will be responsible, as part of the permit requirements, for carrying out the Project's five-year monitoring program but the Trustees will undertake adaptive management (post-construction modifications), as required through annual project reviews. Simpson will not undertake any actions to compromise the project and has also agreed to avoid taking actions on adjoining properties that might create a trespass on the project property. Simpson can transfer the property to a third party along with the obligations to perform maintenance and to complete the monitoring program. Trustees have right of access to the property. Construction costs were shared between the company and the Trustees.

4.4 Engineering Design/Cost Analysis

The smaller the size of the project area, the less likely that procurement and management economies of scale can be realized. The working environment may also differ significantly among sites. For example, where large equipment may damage a sensitive site, work may have to performed manually, resulting in higher costs than might be expected at a more easily accessible site. Similarly, scheduling with respect to seasonal requirements, or tidal fluctuations may limit the amount of work performed in a day, thereby extending the work effort and costs. Aside from cost estimates developed from the project management side, construction bids will vary from the cost estimate, based on the bidder's perception of the risk of successfully completing the work. When the construction is unique and the site requirements new and unusual, project uncertainty factors will add to the cost.

Typically, a project is divided into a set of major activities. Starting with gross parametric estimates for a rough order of magnitude estimate, the design is refined as the concepts take shape with greater specificity. Cost estimates include the specific sub-components of each major activity. The more detailed work breakdown will generally lead to an improved cost estimate and from the project management perspective, permit more detailed tracking of costs and cost control. To illustrate the cost estimating process, a project's typical costs are divided into three phases: Preliminary Stage, Construction Stage, and Post-Construction Stage.

The project's preliminary stage includes a site assessment and the environmental audits, conceptual project design and engineering for the selected site, costs associated with obtaining the required permits and the legal process, and the cost of acquiring the land.

The project's construction stage includes all work performed on the site. Initially, excess or contaminated soil, plants and other material may need to be removed from the site for disposal; the site may then be improved through grading, addition of topsoil, and other activities to make it suitable for the habitat. The final construction phase involves installation of features and planting that will comprise the restored habitat. Construction of any structures is also included in this phase.

After construction is completed, there will be costs associated with the ongoing operations, maintenance, and monitoring of the site. The cost of each of the above activities (if they are necessary) is wholly dependent on conditions of the chosen site and scale of the project being undertaken. The costs of overall management and planning may be considered separately from the site-specific activities.

4.5 Monitoring and Documentation

Project monitoring, performance evaluation, documentation, and adaptive management should not be theoretical, academic exercises, but should be focused on two practical questions: (1) Is a project performing as planned? and (2) How is the project contributing to the overall plan and next round of project decisions? Monitoring should be designed to generate useful information, recognizing that definitive answers or information may be unavailable or impractical to obtain. Where appropriate and possible, monitoring should be coordinated with other habitat programs in the Bay to enable the least cost, widest sharing of data (CBCAC, 1996).

4.5.1 Monitoring plans

Each site-specific restoration project will develop a detailed monitoring plan as part of the project management process. Often, permit requirements set out guidelines for monitoring plan needs, as well as criteria for duration, sampling frequency, analytical parameters, quality assurance. and control, etc. Of considerable concern is the chemical contaminant analysis, since many projects in the Bay will occur near known sources of contamination or at recently cleaned up sites. Chemical contaminant analyses can be expensive and time-consuming so their use must be part of a well-designed and properly-funded monitoring plan. Where feasible, it may be possible to develop an umbrella monitoring plan for multiple projects so as to achieve benefits of scale. However, it is premature to predict how successful this approach may be.

Protocols for sampling restoration sites have been developed for this area. Three major local efforts include the Estuarine Habitat Assessment Protocol (EHAP; Simenstad et al., 1991), the Coastal America Program in the Duwamish River Estuary (Cordell et al., 1994; Hood et al., 1995), and the Puget Sound Wetlands and Stormwater Management Research Program based at the University of Washington (headed by Dr. Richard Horner).

EHAP details methods for sampling the major ecological and biological attributes of estuarine habitats. EHAP provides guidance on how, when, and where to sample habitats to assess performance of these habitats and their linkages to associated animal resource species. The use of the EHAP (or equivalents) will be the primary protocol guidance for resource-based performance monitoring of restoration projects in the tidally influenced portions of Commencement Bay. With appropriate modifications, EHAP methods can be applied to palustrine and lacustrine systems.

The use of such methods in restored and comparison wetlands is strongly recommended to monitor a system's hydrology. This information is critical, especially in palustrine systems, for interpreting changes in the vegetation over time. The monitoring stations for hydrology can also be used to gather samples for analysis of chemical contamination at sites where contamination is suspected of being an ongoing problem.

4.5.2 Performance evaluation

Beyond the monitoring requirements set forth in the various permit requirements, the Trustees are responsible for assessing the performance of restoration projects to (1) determine if they are meeting their goals, (2) establish whether adjustments are needed to better meet the goals (adaptive management), and (3) provide information to improve the design and implementation of future projects.

Monitoring results must be reviewed periodically to assess a system's performance. Typically, these reviews consist of a written summary of methods and results, along with associated tables and figures. Data from comparison sites should be included in the reports. Most projects require annual reviews. However, systems that may have an initial phase of development that is critical or has a high potential for failure may need to be assessed more often during this phase. The project manager is responsible for the performance review.

4.5.3 Documentation

It is critical to document a project in order to assure long-term management of the program and to disseminate project information that can help in the planning of future projects and evaluating the performance of existing projects. This information exchange is essential to successful development of restoration efforts in the future.

Protocol, methods, and results must be maintained in a systemic manner. Although there are no universal methods for doing this, a project file should contain copies of the management plan, the protocols used, the sampling plan, analytical methods, the data in raw and summarized form, photographs, and copies of the project reports. A scheme will be developed to define the organization of the project files.

The costs for planning, constructing, monitoring, and managing the project should also be kept as a data base. This information is very useful for planning future projects. Correspondence on the project can also be kept in this file. It is prudent to keep hard copies as well as electronic copies of the data in at least two places (*e.g.*, separate buildings) in order to minimize chances of all copies of the data being destroyed or lost.

4.6 Adaptive Management and Contingency Planning

The Trustees believe that restoration projects should be based on sound scientific principles. However, sometimes even well-conceived plans can have unforeseen complications requiring mid-course corrections and adaptive management decisions. Projects must work within their environment using the best professional and local knowledge available. When a project doesn't reach a preconceived objective, the Trustees need to determine if additional construction or plantings are needed or if the objective needs to be modified based on a better understanding of the ecosystem. The project will not be forced to meet human expectations; the Trustees will try to understand why the system responded in the fashion that it did. Simple modifications may be made to the project, or nature may be allowed to take its course. Future projects can be modified based on the new information. Funds will be set aside during the project design phase for mid-course corrections; unspent funds will invested in project expansions or subsequent projects.

4.7 Stewardship Potential

Stewardship opportunities will be pursued through all avenues available to the Trustees in order to maximize benefits to the projects. Long-term stewardship needs to be developed for each project. Generally, the Trustees will not undertake stewardship responsibilities for individual projects. Therefore, each project will depend on finding a viable steward during the project planning efforts. Stewards may include local public interest groups, non-profit conservancy organizations, parks departments, the settling PRP(s), governmental agencies, or various combinations.

4.8 Outreach

Activities that could benefit from citizen participation include the following: project planning through permit reviews and hearings; construction activities, such as vegetation plantings, monitoring, data entry; public outreach and education, such as production of displays, leading field trips to the site; and maintenance, such as replantings, debris removal, exotic plant removal.

The Trustees strongly support an active public involvement throughout the implementation of this Restoration Plan. Public involvement will vary with different projects, but as a minimum this will involve public informational meetings and the required regulatory public notices and hearings. Specific projects may involve additional public involvement depending on guidelines from the project manager, responsible contracting agency, or the Trustees.

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6.0 LIST OF ACRONYMS AND ABBREVIATIONS

Basin, the	Puyallup River Basin
Bay, the	Commencement Bay
CBCAC	Commencement Bay Cleanup Action Committee
CB/CIS	Commencement Bay Cumulative Impact Study
CB/NRDA	Commencement Bay Natural Resource Damage Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CHB	Citizens for a Healthy Bay
Corps	U.S. Army Corps of Engineers
Ecology	Washington State Department of Ecology
EIS	Commencement Bay Programmatic Environmental Impact Statement (Volume I)
EPA	U.S. Environmental Protection Agency
EHAP	Estuarine Habitat Assessment Protocol
HFA	Habitat Focus Area
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NRDA	Natural Resource Damage Assessment
PRPs	potential responsible parties
River, the	Puyallup River
SEPA	Washington State Environmental Policy Act
SR	state highway route, as in SR-99
Superfund	EPA National Priorities List of Contaminated Sites
Trustees	Commencement Bay Natural Resource Damage Assessment Trustees
WDNR	Washington State Department of Natural Resources
§404	Section 404, Clean Water Act