Summary Fact Sheet
Oaks Bottom Habitat Restoration Study
Corps of Engineers Feasibility Study, 2002-2004

The City of Portland Parks and Recreation requested that the U.S. Army Corps of Engineers undertake a feasibility study to evaluate habitat restoration needs and opportunities at the Oaks Bottom Wildlife Refuge in 2002 under the authority of Section 206 Aquatic Ecosystem Restoration Continuing Authorities Program. A preliminary restoration plan was developed in November 2002 that followed many of the recommendations made in the Oaks Bottom Wildlife Refuge Habitat Assessment (Montgomery Watson Harza 2002) and recommended a more detailed feasibility level analysis of several features including: 1) replace the existing culvert under the railroad with a larger culvert to provide more water flow between the river and the site and improve fish passage; 2) remove or relocate the water control structure to allow fish passage into the existing outlet channel and/or reservoir; 3) redesign the water control structure to allow downstream fish passage following flood events (reduce stranding) and improve on the existing design to allow greater ease of maintenance and resistance to vandalism; 4) evaluate reservoir management options to benefit more species. Factors to be evaluated include water quality conditions, seasonal depths of water, and effects on various fish and wildlife species from alternative management options. 5) Excavate channel(s) north of the reservoir outlet to provide additional fish rearing and refuge habitat. 6) Install one or more culvert**s** under the railroad at the north end of the site to provide additional inlets/outlets to the river to reduce fish stranding. 7) Remove non-native exotic species and replant with native species. 8) Enhance or create new seasonal wetlands in north fill to improve native amphibian and reptile habitat. It was recognized in the preliminary plan that some major issues that would influence the ultimate selection of specific restoration alternatives included the potential contamination of the site from the landfill and other historic uses, the need to minimize/manage mosquito populations, and the need to provide some quantity of habitat for waterfowl and shorebirds.

The feasibility study was undertaken in early 2003 and the following objectives were articulated for the project and wildlife refuge: 1) provide salmonid access to suitable habitats and reduce the occasional entrapment and mortality of salmonids caused by existing infrastructure; 2) enhance fish and wildlife habitat for multiple species; 3) control non-native or pest populations (primarily plants, but also fish and wildlife); and 4) maintain some level of open water and mudflat area for waterbirds. Restoration measures that would address these objectives were then developed (Table 1).

Table 1. Restoration types identified, associated rationale, and the possible components that would achieve restoration.

Restoration Type	Rationale/Need	Possible Components
Fish Passage and Hydrologic Connectivity	Reconfigure culvert and water control structure to allow fish passage and reduce stranding or entrapment of anadromous fish	• Replace culvert with larger culvert(s) • Reconfigure or remove water control structure to reduce entrapment • Change management of water control structure to promote salmon egress • Excavate tidal slough channels
Aquatic Habitat Improvement	Create channels in reservoir and surrounding areas to increase aquatic habitat complexity and diversity	• Excavate channels in reservoir • Excavate channels to and between existing ponds and create tidal slough(s) • Create flow-through side-channel through existing ponds, includes installation of outlet culvert near north fill • Create ephemeral ponds in north part of park • Create islands within reservoir

Vegetation Enhancement	Plant native shrubs and trees and remove non-native vegetation to encourage diversity of native assemblages	• Emergent and scrub-shrub wetland plantings within reservoir • Riparian/upland deciduous and coniferous plantings around reservoir and wetlands • Upland revegetation • Non-native species removal

A total of 15 alternatives were identified from the project objectives and potential components in Table 1. Four of the alternatives address modifications to the water control structure, 4 address revegetation options, and 3 address various reservoir contouring configurations. Remaining alternatives address culvert replacement, side channel construction and ephemeral pond creation.

Table 2. Summary of alternatives and assumptions for combining them into a complete restoration plan.

Component Summary	Assumptions
1. Replace Culvert with larger culvert to reduce entrapment of salmon in the reservoir.	♦ Must be combined with one of 2, 3, 4 or 5
2. Remove Existing Water Control Structure to improve connectivity.	♦ Cannot be combined with 3, 4, or 5
3. Replace Existing Water Control Structure in its current location to improve connectivity and reservoir control.	♦ Cannot be combined with 2, 4, or 5
4. Remove Water Control Structure and Install Step Weirs to allow the most natural and low maintenance connection between river and refuge.	♦ Cannot be combined with 2, 3, or 5
5. Construct Berm Around Reservoir to significantly reduce salmonid access into reservoir and mortality.	♦ Must not be combined with 2, 3, 4
6. Revegetate Reservoir to provide cover, shading, and edge habitat for both aquatic and terrestrial habitat improvements.	♦ Can be combined with all
7. Revegetate Around Ponds to reduce non-native species and provide additional habitat diversity and cover.	♦ Can be combined with all
8. Revegetate North Fill to reduce non-native species and provide additional habitat diversity and cover.	♦ Can be combined with all
9. Revegetate Upland Areas to reduce non-native species and provide additional habitat diversity and cover.	♦ Can be combined with all
10. Contour Limited Reservoir Channels to minimally increase aquatic habitat complexity and diversity.	♦ Cannot be combined with 11, or 12 ♦ Must be combined with 6
11. Contour Reservoir and Create Islands to moderately increase aquatic habitat complexity and diversity.	♦ Cannot be combined with 10, or 12 ♦ Must be combined with 6
12. Extensive Contour of Reservoir to optimize and increase aquatic habitat complexity and diversity.	♦ Cannot be combined with 10 or 11 ♦ Must be combined with 6
13. Excavate Channels between Ponds to provide additional salmonid rearing areas.	♦ Must be combined with 1 and 7
14. Create Side Channel with Downstream Culvert Outlet to provide additional salmonid rearing areas and improve fish passage out of the refuge.	♦ Must be combined with 13
15. Create Ephemeral Ponds in North Fill to provide amphibian habitat and increase habitat diversity.	♦ Must be combined with 8

A Habitat Evaluation Procedure (HEP) analysis was then conducted to score the potential benefits of each alternative. Suitability indices for the following species or groups of species were developed: 1) anadromous salmon (primarily steelhead, chinook and coho); 2) native amphibians (red-legged frog,

Pacific treefrog, rough-skinned newt); and 3) riparian dependent birds (such as yellow warbler, green-backed heron, belted kingfisher, great blue heron). The suitability indices are derived and modified from existing models. The overall HSI is then calculated based on the following equation:

$$\mathbf{HSI_{all} = (HSI_{fish} + HSI_{amph} + HSI_{birds}) /3}$$

The suitability indices for each of the species assemblages are weighted equally. The overall habitat suitability index is then multiplied by the project area (acres) for each alternative to yield outputs for Habitat Units (HUs) for the combined assemblage of species. Alternatives that have a very low HSI for any particular species group were ranked lower, even if their total habitat unit score was higher than another alternative because the purpose of these restoration measures is to restore habitat for all three groups of species.

Each alternative was scored and a conceptual level cost estimate was prepared. The alternatives and costs were then compared using the Corps Cost Effectiveness and Incremental Cost Analysis that compares the quantity of potential habitat benefits to costs. The preliminary recommended plan is shown in Table 3.

Table 3. Preliminary recommended restoration features

Alternative	Identifier Code	Total Cost	Habitat Output
1. Replace Culvert	A1	$471,000	10.1
4. Remove WCS, Install Weirs	D1	$541,000	15.5
6. Revegetate Around Reservoir	F1	$856,000	26.1
7. Revegetation Around Ponds	G1	$859,000	15.7
11. Moderate Reservoir Contouring/Create Islands	K1	$1,014,000	46.1
13. Excavate Channel/Slough	M1	$515,000	23.6
Total		$4,256,000	

The Corps feasibility study was halted in April 2004 due to a lack of federal funding.

References:

Montgomery Watson Harza (MWH). 2002. Oaks Bottom Wildlife Refuge Habitat Assessment. Prepared for the City of Portland Parks and Recreation and Bureau of Environmental Services. Portland, Oregon.