LOWER DUNGENESS RIVER
SECTION 544
ECOSYSTEM RESTORATION

APPENDIX J

DRAFT Monitoring and Adaptive Management Plan

DRAFT Detailed Project Report and Environmental Assessment

US Army Corps of Engineers®
Seattle District

Lower Dungeness Ecosystem Restoration Project

Draft Monitoring and Adaptive Management Plan

December 2014

This is a draft plan that will be revised during the design phase as necessary to reflect the final design of the project.

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Contents

1. INTRODUCTION 1
1.1 Project Objectives 1
1.2 Location 1
2. CORPS GUIDANCE ON MONITORING 3
3. PURPOSE OF THE PLAN 3
4. PROJECT MONITORING 3
5. EVALUATION OF SPECIFIC OBJECTIVES 4
5.1 Evaluation of Objective 1 4
5.1.1 Monitoring Metric 1: Depth and Velocities 4
5.1.2 Monitoring Metric 2: Substrate Composition 5
5.2 Evaluation of Objective 2: 5
5.2.1 Monitoring Metric 3: Riparian Canopy Cover Along New Side and Back Channels 5
5.2.2 Monitoring Metric 4: Overhanging Vegetation and Instream Cover 6
5.3 Evaluation of Objective 3 6
5.3.1 Monitoring Metric 5: Maintenance of side channel inlet during high flows and outlet year-round. 7
5.3.2 Monitoring Metric 6: Frequency and Size of Pools and Riffles 7
5.3.3 Monitoring Metric 7: Channel Sinuosity 7
6. CONTINGENCY PLANNING AND IMPLEMENTATION 7
7. RESPONSIBLE PARTIES 7
8. LITERATURE CITED 8

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1. INTRODUCTION

The Corps of Engineers and Clallam County (non-Federal sponsor) are proposing to restore ecosystem structure, function and processes to the lower Dungeness River through reconnection of approximately 110 acres of historic floodplain to the main river channel. The proposed work includes realignment of approximately 2600 linear feet of the existing Federal levee. The removed material would be used to rebuild the levee away from the main channel, reconnecting the floodplain to the river. Historic side channels and back channels would be reactivated, and the hydraulic and sediment transport processes that create and sustain suitable fish habitat would be restored. Engineered log jams, large cottonwood livestakes, and anchored large wood clusters would be installed to modulate hydraulic forces with the intent of accelerating development of channels suitable for fish, and to reduce avulsion risk tied to the elevated (aggraded) condition of the existing river bed and site topography. Finally, planting/seeding would be conducted to control erosion, to deter colonization by invasive species, and to accelerate habitat recovery where soils are disturbed due to construction.

1.1 Project Objectives

The following are the objectives of the Lower Dungeness restoration project:

1) Reconnect and restore the reach's historic side channels and back channels to restore fish rearing, spawning, and refuge habitats, and to reestablish groundwater sources to augment low summer flows in the main channel.
2) Improve the quantity, quality, and complexity of native riparian and floodplain habitats in the study area.
3) Reestablish riverine processes that create fish and floodplain habitats and establish the dynamic conditions that sustain the quality of that habitat into the future.

1.2 Location

The proposed project is located along the right bank of the Dungeness River approximately one mile upstream from the river's mouth at Dungeness Bay on the Strait of Juan de Fuca, and about five miles northwest of the city of Sequim, in Clallam County, Washington (Figure 1). The project area extends downstream from approximately river mile (RM) 1.75 to RM 0.8, ending just upstream from the Schoolhouse Bridge where East Anderson Road crosses the Dungeness River.

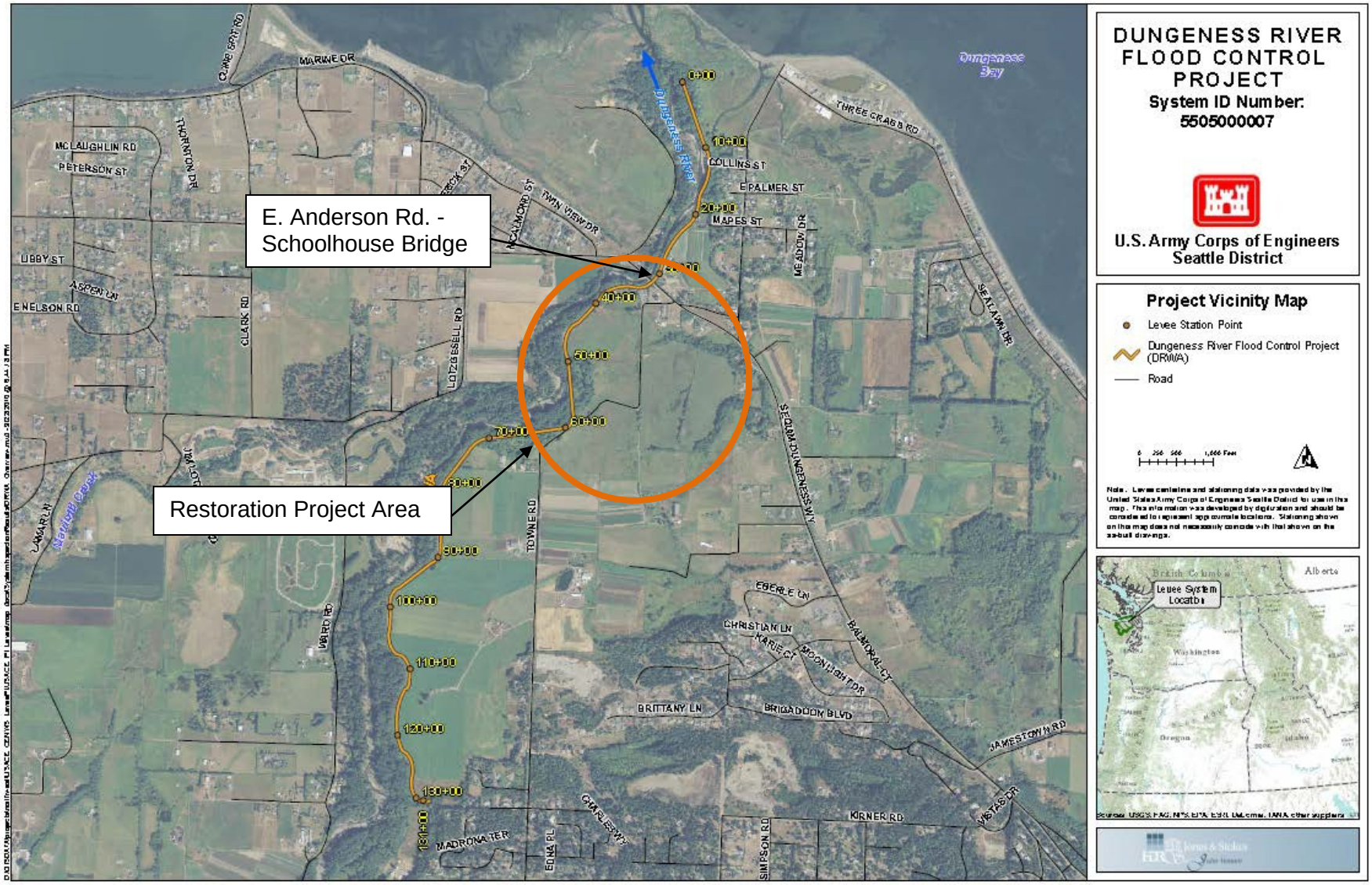

Figure 1. Restoration Project Area

2. CORPS GUIDANCE ON MONITORING

Monitoring guidance for Corps projects was detailed in ER1105-2-100 in 2000 (USACE 2000). Since then, Implementation Guidance for Section 2039 of WRDA 2007- Monitoring of Ecosystem Restoration (USACE 2009) was issued and supersedes the 2000 guidance. The 2009 guidance states that a plan for monitoring ecological success must be included in the decision document, must include the rationale for monitoring and must identify key project-specific parameters and how they relate to achieving the desired outcomes for making a decision about the next phase of the project. The guidance also states that the monitoring and adaptive management costs will be included in the project cost estimate and cost-shared accordingly; allowing for a monitoring period of up to, but not exceeding, ten years. The monitoring plan should also identify the criteria for success and when adaptive management is needed.

3. PURPOSE OF THE PLAN

As described in the previous section on Corps guidance, the purpose of this plan is to demonstrate ecological success of the project. This success is determined by monitoring metrics that are specifically tied to project objectives, and in most cases, setting performance targets. The plan will also identify what adaptive management is necessary if the performance targets are not met.

This plan presents the framework for the above methodology, but it will continue to evolve as the Lower Dungeness Ecosystem Restoration Project progresses to further levels of design, including more detailed methods for monitoring, and potential changes in monitoring metrics, performance criteria, and adaptive management. It will also be refined in collaboration with the non-Federal sponsor, as well as per requirements issued in the project's environmental permits.

4. PROJECT MONITORING

As a restoration project, it is expected that this site will be dynamic and evolve. Thus, for some parameters strict achievement of predetermined "performance standards" will not necessarily predict the success or reveal the failure of the restoration effort. The monitoring and evaluation will focus on determining whether the overall project objectives of the restoration are being met. Monitoring efforts will be performed by using "monitoring metrics" listed in Section 5 (Evaluation of Specific Objectives); some have specific performance targets associated with them and others measure the more unpredictable aspects of the development and use of the site. All post construction monitoring will be performed by qualified biologists and hydraulic engineers.

Evaluating the evolution of restored habitats will be based on the establishment of the targeted habitat within the restoration site and on the ecologic functioning of those habitats. All post-construction monitoring will be conducted in years 1, 2, 4, 7, and 10 and will be cost shared

between the Corps and the non-Federal sponsor. Five years of monitoring over a ten year period will provide useful information on how the site evolves, with more frequent monitoring in the beginning to track immediate and short-term changes. The non-Federal sponsor may choose to monitor beyond this ten year period, although the cost effort would be 100% their responsibility. Data collection will be used to determine success of the project, as well as further the understanding of riverine and floodplain restoration, with the focus on the development of in-stream and riparian habitats and their use by fish and wildlife. The Corps and the non-Federal sponsor will use the knowledge gained through this monitoring effort to adaptively manage the project site.

There are typically two types of monitoring, described below:

> *Compliance Monitoring*- Often prescribed in permits such as Clean Water Act Section 401certification or Endangered Species Act Section 7(a) ESA consultation.
>
> *Effectiveness Monitoring*- To demonstrate how well the habitat is developing according to performance criteria and being utilized by targeted biota.

Both provide insight on project success and are incorporated into this plan. The following section lists monitoring metrics, performance targets, and potential adaptive management associated with effectiveness monitoring.

5. EVALUATION OF SPECIFIC OBJECTIVES

The monitoring metrics listed below are grouped by the project objectives listed in Section 1.1.

5.1 Evaluation of Objective 1

Reconnect and restore the reach's historic side channels and back channels to restore fish rearing, spawning, and refuge habitats, and to reestablish groundwater sources to augment low summer flows in the main channel.

5.1.1 Monitoring Metric 1: Depth and Velocities

Methods and timing: Measure seasonal depths and velocities in restored side channels in winter, spring, summer, and fall.

Performance Target: Coho salmon will be used for this metric since they tend to spawn and rear in smaller streams and juveniles spend a full year in freshwater before out-migrating to the ocean. The following performance criteria apply:

- Spawning (to be measured in late fall/early winter) : 18 cm or greater depth, 30-91 cm/s velocity in riffles (Thompson 1972)
- Rearing (to be measured in the spring, summer, and early fall): >30 cm depth, <30 cm/s velocity in pools and glides (Thompson 1972, Nickelson and Reisenbichler 1977)

This target may not be met in the earlier monitoring years since the habitat is expected to evolve over time. Through annual channel change, more valuable habitat will develop. Not every riffle will meet criteria because in a naturally functioning system some riffles will be steeper and others will be flatter. Locations of measurement may change based on re-arrangement of side channel(s) by floods, increased flow, sedimentation, vegetation growth, etc.

Adaptive Management: If target depths and velocities are not achieved then wood may need to be added to encourage microhabitat or additional excavation may be necessary to route more water to side channels.

5.1.2 Monitoring Metric 2: Substrate Composition

Methods and timing: Measure substrate size and composition in the fall. This metric will use spawning substrate as the performance criteria, hence the fall timeframe. Spawning substrate requirements tend to be more conservative, as rearing can occur over a variety of substrate types.

Performance Target: In riffles, up to 80% of the substrate should be in 1.3-15 cm in diameter (Meehan1991). This criterion is based on requirements for all salmon species. Percent fines in riffles should be <15%[1] (McMahon 1983). This target may not be met in the earlier monitoring years.

Adaptive Management: If the substrate in riffles does not meet targets then wood could be added to encourage pool/riffle formation and uncover gravel substrate through scour of fines. If existing substrate exposed by activation of the side channel is found to differ significantly from desired gradation then imported material may be necessary to provide suitable spawning habitat. Area of the channel near the outlet may be exposed to deposition of fine material (sand and silt) from backwater off the main river. Intervention in this area is not sustainable and observation efforts should be focused outside of backwater influence.

5.2 Evaluation of Objective 2:

Improve the quantity, quality, and complexity of native riparian and floodplain habitats in the study area.

5.2.1 Monitoring Metric 3: Riparian Canopy Cover Along New Side and Back Channels

[1] Based on suitability index of approximately 0.8 for 15% fines for coho salmon spawning.

Methods and timing: Measure percent cover of the riparian corridor during late summer/early fall.

Performance Target: It is expected that cover will increase as planted and volunteer species grow. Planted and desirable volunteer trees and shrubs should be healthy and have:

- Year 1: 100% survival of planted species (per typical one year guarantee on plant materials)
- Year 2: 15% aerial cover of native species
- Year 4: 30% aerial cover of native species
- Year 7: 50% aerial cover of native species
- Year 10: 70% aerial cover of native species

Adaptive Management: If the above cover targets are not met, then additional plantings could be implemented and/or changes in species planted from original planting plan if survival of certain species is low. Invasive species removal effort may need to increase if they appear to be outcompeting native species.

5.2.2 Monitoring Metric 4: Overhanging Vegetation and Instream Cover

Methods and timing: Measure percent cover, including overhanging vegetation, boulders, and logs, in the late spring in a standardized section of stream that is adjusted for width.

Performance Target: Cover is expected to increase as the vegetation grows and large woody debris (LWD) recruits along the banks. The performance target for this metric in a standardized section of stream is[2]:

- Year 1: >3% instream cover
- Year 2: >5% instream cover
- Year 4: >10% instream cover
- Year 7: >15% instream cover
- Year 10: >20% instream cover

Adaptive Management: If target cover is not met than more plantings may be necessary and/or the addition of more LWD.

5.3 Evaluation of Objective 3

Reestablish riverine processes that create fish and floodplain habitats and establish the dynamic conditions that sustain the quality of that habitat into the future.

[2] Based on a suitability index of 0.8 for 10% cover for juvenile steelhead (Raleigh et al. 1984) and a suitability index of 0.8 for 20% cover for juvenile Chinook (Raleigh et al 1986).

5.3.1 Monitoring Metric 5: Maintenance of side channel inlet during high flows and outlet year-round.

Methods and timing: Observe connection of inlet during late fall/early winter, and connection of the outlet in spring, summer, fall, and winter. Measure depths in the side channel inlet and outlet in winter and spring.

Performance Target: Connection at the inlet during typical higher flows that occur regularly October through April and connection at the outlet year-round. Rearing depths >30 cm depth (based on juvenile coho rearing).

Adaptive Management: If connections are not observed during indicated time periods than additional excavation at the inlet and/or outlet may be required. Additional stabilizing logs at the opening may be needed.

5.3.2 Monitoring Metric 6: Frequency and Size of Pools and Riffles

There are no specific performance standards for this metric. Parameters such as width to depth ratio of pools and riffles, volume of pools, number of and length of pools and riffles, and distances between will be collected in the summer.

5.3.3 Monitoring Metric 7: Channel Sinuosity

There are no specific performance standards for this metric. Sinuosity will be measured in late fall.

6. CONTINGENCY PLANNING AND IMPLEMENTATION

Contingency measures (adaptive management) will be implemented if the monitoring program (or any other documented observations by qualified personnel) indicates performance targets are not being met and cannot be explained y extraneous variables. The Corps and the non-Federal sponsor, in coordination with regulatory and funding agencies, would then assess monitoring metric parameters and initiate the implementation of corrective actions to address the identified issue.

7. RESPONSIBLE PARTIES

The contingency plan may require extension of the monitoring phase of the project, especially if major changes in the plan are required. As applicable, Corps project biologists and engineers, in consultation with agency personnel, will make adaptive management recommendations. The parties responsible for implementation of the restoration plan and any associated contingencies are as follows:

Project Manager Clallam County: Cathy Lear
Clallam County
360-417-2361

Project Manager Corps: Leah Wickstrom
U.S. Army, Corps of Engineers, Seattle District
206-764-3652

Project Biologist Corps: Melissa Leslie
U.S. Army, Corps of Engineers, Seattle District
206-764-6587

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