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1. Introduction

This project puts forward an integrated river management strategy that combines flood risk reduction with salmon recovery. The strategy was developed by an interdisciplinary team using the Tillamook Bay Basin as a pilot study area. The resulting approach is intended to be transferable to other watersheds facing similar natural hazard risk and natural resource concerns. Analyses of the fluvial, biological, and institutional elements comprising the Tillamook Bay river system were conducted at a number of spatial scales. The results were used to identify opportunities and constraints and develop a planning level Integrated River Management Strategy (IRMS) for Tillamook. Documentation of the Tillamook IRMS is provided in this report targeted to the lay audience, with a special emphasis on meeting the needs of watershed councils with regard to their growing responsibilities under provisions of the Oregon Plan.

1.1 Background

In recent years, and especially during and after the Pacific Northwest floods of 1996, field staff for the U.S. Fish & Wildlife Service (USFWS) noticed an increasing trend in flood recovery work involving the replacement and new construction of riverbank protection and other flood control works in Oregon's waterways. The cumulative impacts of these interventions conflicts with our increasing efforts and investments to recover and protect the river ecosystem essential for sustaining endangered salmon species.

There is a need to step back and reconcile the growing conflicts between these two activities that are occurring in Oregon's rivers. A proactive strategy needs to be developed for managing our rivers, encouraging actions and activities that can provide mutual benefits for flood risk reduction and salmon recovery.

Fortunately the requirements for this kind of strategy are largely complimentary. Restoring river systems and functions to accommodate flooding and improve the effectiveness of existing flood control works are both key components of a successful river management strategy.

To restore and manage rivers for fish requires protecting the riverine habitat that is sustained by the natural processes of the river system and allowing for some degree of disturbance and sediment movement during floods. This is best accomplished by managing the river system and watershed as a whole. The task of the river manager in the 21st century will therefore be to integrate the requirements of flood management with the enhancement of environmental resources—as well as accomodating other human uses of the river such as water supply and recreation—into a integrated river

management strategy.

The U.S. Fish & Wildlife Service (USFWS) contracted with Philip Williams & Associates, Ltd. (PWA) to assist the USFWS, the U.S. Environmental Protection Agency (USEPA) and the U.S. Army Corps of Engineers (USACE) as a co-sponsors, in conducting this project.

The USFWS, USEPA and USACE are supporting this project to develop and promote a new approach for addressing flood-related issues in Oregon. The IRMS involves a flexible approach by which public officials, watershed groups and others can identify strategies and actions for addressing flood-related issues in ways that also assist the recovery of native fish and wildlife.

1.2 Project Goal and Objectives

1.2.1 Project Goal

This project is unique in that, to date, there has not been a comprehensive approach to floodplain management focusing on both flood risk reduction and salmon recovery. Therefore, the goal of this project is to initiate a fundamental change in the way society has traditionally responded to flooding, so that flood hazards are managed and reduced, but not at the expense of fish and wildlife habitats.

1.2.2 Project Objectives

The goal of this project can best be achieved by pursuing objectives that promote a balance between the use of river systems and floodplain lands by humans, fish and wildlife. These objectives guide the project to results that reduce risk to these populations and would demonstrate how a change in the way things are currently done can actually increase benefits to all and lead to a sustainable use of the land. Accordingly, the

objectives of the project are to:

1. promote a balance between human safety, property protection, and fish and wildlife habitat needs;
2. establish the multiple benefits of floodplain management and salmon recovery;
3. demonstrate floodplain restoration as a viable flood management tool;
4. provide a science-based model for restoration;
5. provide a methodology for adaptation and implementation by watershed councils;
6. identify demonstrated watershed management strategies that reduce losses from future floods in the Tillamook Basin;
7. identify benefits to floodplain resources (especially salmon) occurring from flood management strategies

1.3 Project Approach and Report Overview

In Section 3, the resources and functions of a river system are described and provide the proper context for subsequent development of the IRMS. Elimination of conflicts between river processes and human use of the floodplain is the framework for developing the management strategy and for determining where actions should best be applied.

An interdisciplinary approach was used to analyze flood and habitat-related issues using a number of techniques at a number of spatial scales. The analyses are integrated to identify flood risk reduction and salmon recovery opportunities and constraints in the Tillamook Bay Basin. This approach provides a framework for developing a specific strategy to address flood and habitat-related issues in the Tillamook Bay basin, one that is sensitive to critically important spatial and temporal issues. The steps of the approach and the resulting Tillamook Bay IRMS, are inherently flexible, so that changes can be made based on the results of monitoring as the river system responds to new

management influences.

The project approach had six basic steps which correspond to the major report sections.

Step One: Characterize the Functions of River Systems Specific to Flood Risk and Salmon Recovery

This step reviews the processes by which flooding creates aquatic habitat and how human flood response may disrupt this relationship. This step is covered in Section 3.

Step Two: Characterize Flood Risk and Salmon Distribution in Oregon

This step characterizes Oregon floodplains with respect to flood risk and salmon distribution. Simple geographic information system analyses are performed using available data at the State scale in order to identify floodplains with conditions similar to Tillamook and to help inform our understanding of the Tillamook Bay's position within the region. This step is covered in Section 4.

Step Three: Review the Environmental History Of the Basin

This step describes the evolution of the Tillamook Bay Basin River System using narrative and spatial analyses at the basin and ecoregion scale. The review focuses on the historic pattern of flood and fire and how human management of the forests, rivers, floodplains, and estuaries has degraded aquatic and terrestrial habitat and increased the cost of flooding. This step is covered in Section 5.

Step Four: Characterize the Components of the Tillamook Bay River System

In this step a suite of assessments, including the use of analytic tools, such as GIS, are used at a variety of spatial scales to describe the fluvial, biological, and institutional components of the Tillamook Bay River System and how they interact with the uplands, lowlands, and estuary, the primary expressions of the landscape. Each of the components is described with a number of distinct analyses that include: climate,

landform, hydrology, hydraulics, river morphology, vegetation, salmon, land use, transportation, and damage trends. The assessments most significant in developing the IRMS are covered in Section 6. A more extensive set of assessments is covered in Appendix A.

Step Five: Identify Opportunities and Constraints

Findings from Step Four are used together with spatial analyses to identify conflicts and opportunities within the Basin. These are the foundation of the integrated river management strategy. This step is covered in Section 7.

Step Six: Develop the Integrated River Management Strategy

This step uses the spatial analysis done in Steps Four and Five to identify actions appropriate for the Basin and the most effective locations for the application of those actions. This step is covered in Section 8.

1.4 Applications of the Approach

Application of this approach to the Tillamook system is intended to serve as the basis for the conceptual level development of the IRMS. The approach can then be transferred to other river systems of varying scale and in other geographic regions, to establish other strategies tailored to the particular river system where it is used.

The initial application of this approach to the Tillamook Bay system required that the project team, USFWS and other partners make informed judgements to prioritize the functional importance of various portions of the landscape. These judgements and resulting priorities have been clearly stated, but may differ somewhat from those that might be made during subsequent applications of the approach by a local watershed

council or some other group.

The important point here is that the approach is intended to provide a common starting point from which community-based actions can be taken to develop alternative strategies for addressing flood management; i.e., the strategy developed by the project team is one of several strategies that may eventually be developed for a given river system. However, it is likely that the same general types of strategies and actions for resolving flood and habitat-related issues will be developed for a given system, possibly with somewhat different areas of spatial emphasis.

This anticipated consistency of outcomes is one reason that the application of the approach holds promise as an effective way to address flooding and habitat problems caused by human actions. Another reason is that this type of spatial approach could be used to develop regional, basin, or watershed-specific strategies that could each have its own set of strategies and actions. Many of the strategies may look similar to one another, regardless of spatial scale, although they would vary to some degree depending on specific landscape conditions, patterns of development, or community values.

1.5 USFWS Coordination

The USFWS was a partner with the project team, providing GIS and biological expertise. The project team relied on the USFWS for coordination of the project with the Oregon Plan for Salmon and Watersheds and other ongoing state and federal salmon recovery activities that the USFWS is involved in, as well as other flood reduction strategies being developed by the Corps of Engineers and local governments.