Oregon Watershed Enhancement Board Riparian Restoration Effectiveness Monitoring Report

Executive Summary

The results of this Assessment are variable. Site location information was often either to coarse to pin-point the exact project location or was unavailable. Of the restoration projects surveyed most either no longer existed on the landscape (this includes inability to locate and projects where plantings and/or fencings failed) or were in such poor condition that they were likely to fail in the near future. Many plantings were overgrown with invasive/non-native plants and many fences had failed for a variety of reasons. Limited tree mortality occurred all projects and complete tree mortality occurred on many. Mortality was attributed to competition from invasives (Himalayan blackberry (Rubus discolor) and reed canary grass (Phalaris arundinaceae) were the most common and prolific), blow-down from a too-thin planting regime, direct removal from landowner, browse from fencing failures, and beaver activity. Fencing project failure was attributed to destruction from flood events, livestock breaching, and treefall. Fencing projects completed in the Coquille River watershed were most impacted by flood events of the watersheds surveyed, landowners commented that overtopping of the fence by floodwaters was common. Of these causes destruction from flooding was the most common event. Another less common cause of project failure was poor project location choice (i.e. planting a pond with no hydrologic connection to the stream network). The most successful projects were those where the landowner was actively maintaining their project. The most significant reason for project failure was the presence of invasive weeds. Fences were overgrown by blackberry canes at many sites. One landowner specifically intends to remove the fence due to blackberry presence.

Introduction

Background

The Oregon Watershed Enhancement Board (OWEB) is a state agency guided by a policy board whose goal is to support, maintain, and improve watersheds and communities. In addition to providing information and resources to groups with similar goals, OWEB also actively restores watersheds through riparian plantings and fencing. Information regarding these projects is available through the Oregon Watershed Restoration Inventory (OWRI) database. In 2009, OWEB initiated a project to determine the status of a series of riparian improvement projects completed between 1995 and 1999 funded either by OWEB or the Governors Watershed Enhancement Board (GWEB; GWEB became OWEB in 199X) that were not included in the OWRI database. Although the OWRI database was created in 1995, projects whose grant agreements were created before this were not required to be included in the database. The sample frame was designed to collect data from 36 restoration projects in the Grande Ronde River watershed and 20 restoration projects in the South Coast watersheds that were not in OWRI. Although the sample frame was intended to survey sites randomly, access denial and inaccurate project location information prevented this, ultimately resulting in a census of all possible projects in the previously stated watersheds where location information and access permissions made surveys possible. Although each restoration project was completed with the requirement that the landowner allow future access for project monitoring, most sites were dropped as a result of access denial or inability to locate the exact project location. Every project was completed before GPS technology was widely used by the public and while latitude and longitude information was provided in the grant file it was not precise enough to relocate the exact project location.

A modified version of the Washington monitoring protocol was used for this Assessment. The Washington monitoring protocol utilizes a modified version of the Environmental Protection Agency's (EPA) Environmental Monitoring and Assessment Program (EMAP) protocol. For a complete synopsis of the protocol used during this Assessment please refer to the Materials and Methods section of this document. There were multiple goals regarding the outcome of this Assessment as outlined in the request for proposals: determine if the projects continued to exist on the landscape; determine the

condition of the riparian area where the project occurred; and determine the overall success of the project. Success was measured in several ways: the continued existence of the fencing and or planting project; the overall ability of the watershed council to locate the project and gain access permission (refer to outreach discussion); and finally the overall impact of the riparian planting on the 6th field watershed riparian condition. Reference data was collected using the same protocol in ODEQ reference watersheds.

Each restoration project had a unique goal although they all are categorized as either "planting" or "fencing" projects. The primary goal of the planting projects was to reduce stream temperature by increasing effective shade while secondary goals included increasing riparian habitat complexity and increasing bank stability. Planting projects generally included a conifer and a hardwood component using species native to the region. The goals of fencing projects were more varied and included increasing bank stability and reducing riparian browse. Generally fencing was provided to planting projects where livestock grazing was reducing riparian vegetation although some fencing projects did not include a planting component.

Watershed Information

General
Grande Ronde
South Coast
Geology
Grande Ronde
South Coast
Climate
Grande Ronde
South Coast
Landuse
Grande Ronde
South Coast

Materials and Methods

Sampling Methodology

The original project design called for a randomized site selection to be used for all sites in the South Coast and Klamath ecoregions. This sample included a target of 60 sites with and oversample of 20, and a sample frame of 450.

Survey Methodology

Riparian Condition

A modified version of the riparian section of the EMAP protocol was used to collect data regarding riparian condition. The length of the projects were variable and the survey protocol was modified to account for this. An upper survey length limit was set at 1000 meters (m). If projects were longer than 1000m than the survey was conducted in the estimated middle with the survey being conducted on 500m of either side of the middle. Minimum distances were set at the length of the project. Data was collected at 10 transects. Distance between transect length was determined using standard EMAP protocol [(40 * wetted width)/10].

Data collected at each transect included:

- Riparian Vegetation Structure

- Grass Utilization
- Effective Stream Channel Shade
- Bank Erosion

Riparian vegetation structure data was collected in a $10m^2$ area at each transect using the following metrics: the percentage of cover by dominant vegetation type (conifer, hardwood, mixed, none) and story (overstory, >5m; midstory, .5m-5m; and understory, <.5m); tree inventory by species and abundance; effective riparian shade (measured as the percentage of shade cast at noon; <10%, 10-40%, 40-75%, >75%) by story, type, and tree class (large > 0.3m DBH; small ≤ 0.3 meters DBH); and an invasive vegetation inventory by species.

Grass utilization data was collected at each riparian transect in a 10m transect perpendicular to the stream channel. The height of the grass (a tolerance of .1m) was measured at every meter along the transect.

Effective stream channel shade was measured at each transect by estimating the percentage of shade cast by riparian vegetation on the stream channel.

Bank erosion was measured in a $10m^2$ area at each transect by estimating the percent of active erosion.

Metrics

Grass utilization:
% Fenced Grass: The percentage of the riparian area inside the fence made up of grass.
% Fenced Invasives: The percentage of the riparian area inside the fence made up of invasives.
Mean Grass Height: The average grass height inside the fence.
Delta Height: The difference in grass height immediately inside and outside of the fence.
% Grazed: The percentage of the survey which was grazed.
% Grazed and Accessible: The percentage of the survey which was both grazed and accessible.
% Grazed and Inaccesible: The percentage of the survey which was grazed (or browsed) but appeared inaccessible.
% Ungrazed: The percentage of the survey which was ungrazed.
% Ungrazed and Accessible: The percentage of the survey which was both ungrazed and accessible.
% Ungrazed and Inaccesible: The percentage of the survey which was ungrazed (or browsed) but appeared inaccessible.

Fencing metrics:
# of Failures: The total number of failures encountered along the fence surveyed
Length of Faliure: The total length of the surveyed fence which had failed
% Failure: The percentage of the fence surveyed which had failed, equal to Length Failure divided by % Failure.

Bank Condition:
% Bank erosion: The percentage of the bank which was actively eroding.

Shade:
% Canopy: The visually estimated proportion of shade over the survey reach. Although the standard EMAP protocol calls for the use of a densitometer, many of the stream reaches surveyed were unwadeable, making this type of measurement impossible. Additionally, landowner permissions were often not obtainable for the opposing bank, which would need to be accessed in order to conduct

standard EMAP canopy measurements. For these reasons, a visual estimation of channel shade was conducted from the bank.

Species Diversity:
The Shannon Index was calculated for all South Coast and Klamath ecoregion sites (those with the majority of the planting projects).

Riparian Vegetation:
A variety of metrics were calculated using the field data collected. Standard EMAP metrics included the percentage of each canopy layer made up of each vegetation class. Listed below if a definition of terms used to describe EMAP riparian metrics.

Canopy Layer: The portion of the vegetation above 5 meters
Mid-story Layer: The portion of the vegetation below 5 meters and above 0.5 meters.
Ground Layer: The portion of the vegetation below 0.5 meters
Cover: The estimated areal cover based on the amount of shadow that would be cast by a particular layer alone if the sun were directly overhead.
Large Tree: Trees over 0.3 meters diameter at breast height.
Small Tree: Trees under 0.3 meters diameter at breast height.
Woody Veg: Woody vegetation.
Herb Veg: Non woody vegetation.
Barren Duff: Non vegetated ground.
Invasives: Non native invasive species such as Himalayan Blackberry or Knotweed

Evaluation of Effectiveness

The most effective monitoring protocols for projects of this type utilize a Before-After-Control-Impact (BACI) design. Under the BACI design, field surveys would be conducted prior to project implementation (Before) and at regular intervals following (After) at the project location (Impact) and at a location immediately upstream of the project location (Control). The control survey provides a means to separate changes due to factors unrelated to the project location (e.g. flooding, fire, or disease). For this project, Neither before nor control data was available. An alternate approach was utilized was judge effectiveness. Minimally disturbed reference data was used to set desired targets for riparian conditions. Reference site selection is based on the concept of minimal anthropogenic disturbance. The process explicitly recognizes that there are few if any pristine watersheds remaining. Reference watersheds are selected as those with the lowest road densities and urban, agricultural, or residential land uses (based on GIS analysis) in the ecoregion level III. Local professional judgment and field verification are included to ensure that the GIS metrics are correct. The Oregon Department of Environmental Quality has identified reference watersheds throughout the state. These pre-identified watersheds were the basis for the riparian reference surveys. The conditions within these watersheds were used to set desired targets for riparian condition.

Existing EMAP data collected by ODEQ and EPA were used to estimate the average condition of locations throughout the ecoregion for similar sites which have not had active restoration (based on existing OWRI info). All sites within the ecoregions (Coast Range & Klamath) with similar land-uses were analyzed (e.g. Agricultural. It is assumed that these are generally representative of pre-restoration conditions at the project sites.

The data collected from project sites was compared to both the reference data and the broader pool of similar EMAP sites. Means were compared using standard hypothesis testing techniques. Cases where a large effect was observed but a high variance rendered the results not significant were identified. Synoptic statistics and cumulative distribution functions were generated using software and

algorithms available for the EPA.

The original OWEB/GWEB grant files were synthesized to collect information regarding the initial planting (planting regime) and fencing (fence type, setback distance) projects. Planting projects were assessed to determine how many trees and of what species survived. Fencing projects were assessed to determine if breaching occurred and if so then where and for what length.All fencing sites were classified as either failed or successful. Grass utilization metrics were compared between these populations using standard statistical hypothesis testing techniques.

Analytical Methodology

Results

General
Grande Ronde
South Coast
Reference Comparison
Success Analysis

Discussion