NORTH SANTIAM WATERSHED COUNCIL

Watershed Restoration Action Plan

Date Approved:

Council Chair Signature:

Contents

List of Tables

List of Figures

Acronyms

AIS- Aquatic Invasive Species
BLM- Bureau of Land Management
BPA- Bonneville Power Administration
BOR- Bureau of Reclamation
CREP- Conservation Reserve Enhancement Program
CWA- Clean Water Act
DEQ- Oregon Department of Environmental Quality
DHS- Oregon Department of Human Services
DSL- Oregon Department of State Lands
EPA- Environmental Protection Agency
ESA- Endangered Species Act
HUC- Hydrologic Unit Code
MMT- Meyer Memorial Trust
NFWF- National Fish and Wildlife Foundation
NOAA/NMFS- National Oceanic and Atmospheric Administration Fisheries/National Marine Fisheries Service
NRCS- Natural Resource Conservation Service
NSW- North Santiam Watershed
NSWC- North Santiam Watershed Council
NSR- North Santiam River
ODA- Oregon Department of Agriculture
ODFW- Oregon Department of Environmental Quality
ODOT- Oregon Department of Transportation
OPRD- Oregon Parks and Recreation Department

ORS- Oregon Revised Statute
OSU- Oregon State University
OWEB- Oregon Watershed Enhancement Board
PWS ID#- Public Water System Identification Number
SWCD- Soil and Water Conservation District
TMDL- Total Maximum Daily Load
USACE- United States Army Corps of Engineers
USFS- United States Forest Service
USFW- United States Fish and Wildlife Service
WHIP- Wildlife Habitat Incentive Program
WRD- Oregon Water Resource Department
WRP- Wetland Reserve Program

---

1. Introduction

The North Santiam Watershed (NSW) is a fourth field watershed within the Willamette Basin. It covers approximately 766 square miles (approximately 500,000 acres) on western slopes of the Cascade Mountains to the Willamette Valley floor. This includes the small subbasin draining a 12-mile reach of the mainstem Santiam River downstream of the confluence with South Santiam River. The North Santiam and mainstem Santiam Rivers together are approximately 100 miles long and enter the Willamette River at River Mile 108. The NSW is characterized by steep forested uplands and flat alluvial lowlands. Approximately 75 percent of the land is publicly owned and managed by federal and state agencies (primarily USFS, BLM, ODF and ACE). Land and water uses are diverse, including timber, agriculture, recreation, rural residential and urban areas, which merge with the following complex mix of features and regulations that intersect in this watershed:

- Drinking water source to Salem and 9 small communities within the watershed
- Willamette National Forest
- Federally designated Detroit Lake
- Detroit and Big Cliff Dams
- Marion Forks Hatchery
- Stayton Complex Dams and Diversions
- Wild and Scenic waterway on the Little North Santiam
- Essential Salmonid Habitat
- Federally protected old growth forest in Opal Creek
- Forest Practices Act and Northwest Forest Plan
- USACE Willamette Project Biological Opinion
- ESA listed plants- e.g. Bradshaw's Lomatium, Oregon Larkspur, White-topped Aster and Willamette Valley Daisy
- ESA listed animals- e.g. Bald Eagle, Spotted Owl, Chinook salmon and Steelhead
- DEQ's Three Basin Rule
- 303 (d) list of water quality impaired water bodies and TMDL Plan
- Water laws and water rights
- ODFW's Conservation Strategy
- Natural Heritage Resource Area that is also a Bird Conservation Area

As a result, the North Santiam Watershed is a crossroads of a diversity of natural resource related challenges. [(1) (2) (3)]

The North Santiam Watershed Council (NSWC) is a citizen organization of watershed stakeholders as described in ORS 541.350. The Council is local volunteers that share an interest in improving the health of the watershed in partnership with interested landowners. They facilitate projects based on scientific analysis that improve watershed health by developing partnerships and resources to plan, fund and implement projects. The NSWC provides a place for working together in a non-regulatory setting to find common grounds, address natural resource related challenges and achieve the goal of healthy water and healthy natural resources. Because at the end of the day we all use water and, therefore, want it to remain healthy to support our uses.

This Watershed Restoration Action Plan is a compilation of limiting factors and potential projects identified by the NSWC and other agencies and local organizations working on natural resource concerns in the North Santiam Watershed. This document is intended to guide the NSWC in prioritizing and strategizing data collection and restoration projects to ensure actions address limiting factors identified for the North Santiam Watershed. This document is a living document that will be updated on a regular basis as new information is obtained and projects are implemented. Potential projects identified are conceptual unless indicated otherwise. The NSWC will only move forward on projects with willing landowners' consent. The NSWC welcomes new project proposals to incorporate into this action plan.

2. Priority Issues for the North Santiam Watershed

Table 1. Summary of Documentation and Sources for Identifying Priority Issues

Agency/Organization	Driver	Document
North Santiam Watershed Council	Oregon Plan for Salmon and Watersheds	North Santiam Watershed Assessment
Army Corps of Engineers (ACE)	Dam operations impact on Endangered Species Act (ESA)-listed fish species	Biological Opinion ("The BiOp")
OR Department of Environmental Quality (DEQ)	Clean Water Act (CWA) 303(d) list of water quality impaired water bodies	Total Maximum Daily Load (TMDL) Plan
OR Department of Environmental Quality (DEQ) and OR Department of Human Services (DHS)	Safe Drinking Water Act	Source Water Assessments
OR Department of Fish & Wildlife (ODFW)	ESA listing of salmon and steelhead	Upper Willamette Chinook and Steelhead Recovery Plan
OR Department of Fish & Wildlife (ODFW)	Overarching state strategy for conserving fish and wildlife	OR Conservation Strategy

OR Watershed Enhancement Board	Legislator request	Willamette Restoration Priorities
Northwest Power and Conservation Council/Bonneville Power Administration	Energy production impact on ESA-listed fish species	Willamette Sub-Basin Plan Willamette Mitigation Agreement
OR Department of Agriculture	Water quality and Senate Bill 1010	Molalla-Pudding-French Prairie- North Santiam Ag Water
United States Forest Service		Watershed analyses for sub-basins about Detroit Dam
Bureau of Land Management		Little North Santiam Watershed Analysis
The Nature Conservancy	Delineate priority terrestrial and freshwater sites where investment in conservation and restoration would contribute to: (1) health of historically significant habitats, (2) survival and recovery of imperiled plant and wildlife habitats, (3) improved floodplain connectivity to benefit water quality for aquatic biodiversity and (4) overall watershed health	"The Synthesis Map"

2.1. Chinook Salmon and Winter Steelhead

Pattern of declining salmon and steelhead abundance trends and range reductions provided scientific evidence that supported listing of numerous groups of West Coast salmon and steelhead under the U.S. Endangered Species Act (ESA) in the 1990s. Two of these groups occur in the Upper Willamette River Basin and the North Santiam Watershed specifically, including: Upper Willamette River Chinook salmon (threatened, 1999—see 64 FR 14308) and Upper Willamette River steelhead (threatened, 1999—see 64 FR 14517; reaffirmed, 2006—see 71 FR 834). [(4)]

Section 4(f) of the ESA requires that a recovery plan be developed and implemented for species listed as endangered or threatened under this statute. These plans must, at a minimum, contain:

1) A description of site-specific management actions necessary to achieve the plan's goal for the species' conservation and survival
2) Objective, measurable criteria which, when met, would result in a determination that the species be removed from the list
3) Estimates of time required and cost to carry out the measures needed to achieve the plan's goal and to achieve intermediate steps toward that goal.

The Upper Willamette Recovery Plan for Salmon and Steelhead was developed to address these legal requirements for recovery planning under the ESA and Oregon's Native Fish Conservation Policy. The NSW is identified as a key basin in this plan for restoration actions leading towards recovery. [(4)]

Overall strategies from the Draft Recovery Plan:

- Act to alleviate impacts of threats to the viability of Chinook salmon and steelhead populations throughout their entire life cycle
- Set aside or protect highest quality habitats
- Do not let habitat conditions degrade further and restore degraded ecosystems
- Maintain or restore critical ecological and evolutionary processes
- Develop goals and objectives based on interaction of ecological properties of the system
- Manage fisheries and hatchery programs adaptively so their impacts on wild salmon and steelhead populations are compatible with recovery goals
- Reduce impacts of predation related to anthropogenic alterations to the ecosystem, and prevent establishment of non-native species, and where necessary eliminate non-native species that have become established
- Act as quickly as possible to achieve the goals of this Recovery Plan [(4)]

Anadromous fish are considered indicator species, therefore, their decline is a barometer to understanding overall watershed health. Implementing restoration actions that address salmonid population declines could build watershed resiliency that results in sustainability of the water and land resources human communities rely on to support economies and communities.

2.2. Water Quality and Quantity

Clean Water Act Background

To meet federal Clean Water Act (CWA) requirements, Oregon Department of Environmental Quality (DEQ) assesses water quality and reports to the Environmental Protection Agency (EPA) every two years on the condition of Oregon's waters. DEQ prepares a report that meets CWA Section 305(b) and Section 303(d) requirements, which describes overall conditions of State waters and identifies waters that do not meet water quality standards where a Total Maximum Daily Load (TMDL) needs to be developed. Numeric and narrative water quality criteria are applied to protect the most sensitive beneficial uses, which include:

- Domestic water supply
- Fishing
- Industrial water supply
- Boating
- Irrigation
- Hydropower
- Water contact recreation
- Livestock watering
- Aesthetic quality
- Fish and aquatic life
- Wildlife and hunting
- Commercial navigation and transportation

Beneficial uses are assigned by basin in Oregon Administrative Rules for water quality. At a minimum, beneficial uses are considered attainable wherever feasible or attained historically.

Once a waterway or body is determined to not meet a water quality standard to protect the most sensitive beneficial use, it is place on the 303 (d) list and a TMDL is developed. [(5) (6)]

North Santiam Water Quality Listing

The most sensitive beneficial uses identified for the North Santiam Sub-basin for which these listings are intended to protect are:

1) Resident fish and aquatic life
2) Salmonid spawning, rearing and migration
3) Anadromous fish passage. [(5)]

The North Santiam Subbasin has nine stream segments on the 303(d) list for exceeding summer time water temperature criterion, including:

- Bear Branch
- Blowout Creek
- Boulder Creek
- Chehulpum Creek
- Stout Creek
- Elkhorn Creek
- Little North Santiam River
- Marion Creek
- unnamed tributary to Marion Creek upstream of Detroit Reservoir

The Santiam River is listed for dissolved oxygen levels lower than the standard. [(5)]

Temperature Related Concerns

The temperature standard is designed to prevent the following 3 levels of thermally induced fish mortality:

1. *Instantaneous Lethal Limit*- Occurs when stream temperatures become greater than >90°F, causing fish mortality almost instantly due to denaturing of critical enzyme systems in their bodies.
2. *Incipient Lethal Limit*- Occurs when temperatures are between 70°F to 77ºF, causing fish mortality in hours to days due to breakdown of physiological regulation vital to fish health, such as respiration and circulation.
3. *Indirect or Sub-Lethal Limit*- Occurs in stream temperatures of 64°F to 74°F, causing fish mortality in weeks to months after onset of elevated temperature due to interactive effects such as decreased or lack of metabolic energy for feeding, growth, and reproductive behavior; increased exposure to pathogens (viruses, bacteria and fungus); decreased food supply because macroinvertebrate populations are also impaired by high stream temperature; and increased competition from warm water species. [(5)]

Causes of Temperature Pollution

Sources of heat pollution can be nonpoint and point sources. Nonpoint sources are more diffuse in nature and cannot be traced back to a particular location. Riparian vegetation, stream morphology, hydrology (including groundwater interactions), climate and geographic location influence stream temperature. While climate and geographic location are outside of human control; riparian condition, channel morphology and hydrology are affected by land use activities that lead to nonpoint sources of heat pollution. Disturbance or removal of vegetation near a stream reduces stream surface shading due to decreased vegetation height, width and density. This results in greater amount of solar radiation reaching stream surfaces. Riparian

vegetation also influences channel morphology because it supports stream banks during erosive, high flow events, slows floodwaters and promotes sediment deposition when floodwaters overtop stream banks. Riparian vegetation loss or disturbance may allow more lateral stream bank erosion and channel widening. This decreases effectiveness of remaining vegetation to shade the stream and increases stream surface area exposed to heat exchange processes, particularly solar radiation. [(5)]

Dams and reservoir operations are included as nonpoint sources of pollution, even though their effects on water quality are generally more identifiable than dispersed land use activities. Dams and reservoir operations affect stream temperature by modifying flow regimes and delivery of heat stored within the system (i.e. reservoirs stratify and solar radiation heats the surface). Flow augmentation during low flow periods may be beneficial to stream segments below the dam as higher flows increase stream volume and, therefore, loading capacity of that segment. Also, higher volumes correspond to greater stream velocities and shorter travel times through stream reaches exposed to solar radiation. However, operations that retain water during low flow periods may substantially diminish stream loading capacities while also increasing solar loading to the stream because of lower velocities and greater travel times through exposed reaches. Water releases from reservoirs may increase downstream temperatures as heat held by impounded water is also released. The timing, duration and magnitude of such impacts are dependent upon reservoir characteristics such as surface area, depth, and whether water is released from the bottom of the reservoir or may be selectively withdrawn at various depths. Detroit Dam and Big Cliff Dam are part of a large storage and re-regulating reservoir complex located in the upper subbasin. These dams affect water quantity, water quality and beneficial uses in the mainstem North Santiam River and Santiam River. [(5)]

Point sources are individual facilities that discharge a pollutant from a defined conveyance (e.g. an outfall pipe) and are regulated by permit. Point source discharges play a role in stream heating in the NSW from 5 individual permitted and 21 general permit point sources. The Three Basin Rule was adopted to protect the pristine watersheds of the North Santiam, Clackamas and McKenzie River Subbasins, which provide drinking water to over seventeen percent of Oregonians. In order to preserve or improve existing high quality water for municipal water supplies, recreation and preservation of aquatic life, new or increased waste discharges (i.e. any discharge that requires and National Pollutant Discharge Elimination System (NPDES) permit) is prohibited under this rule without specific Environmental Quality Commission and DEQ findings to protect water quality. [(5) (6)]

Temperature TMDL Approach

Under the TMDL strategy to addressing 303(d) listings, DEQ looks at water quality of the entire river and watershed rather than whether or not a specific discharge meets its permit requirements. DEQ calculates pollution load limits, which is the TMDL, for each pollutant entering a water body. TMDLs describe the amount of each pollutant a waterway can receive and still not violate water quality standards. TMDLs take into account pollution from all sources, including discharges from industry and sewage treatment facilities; runoff from farms, forests and urban areas; and natural sources such as decaying organic matter or nutrients in

soil. TMDLs include a safety margin for uncertainty and growth that allows for future discharges to a river or stream without exceeding water quality standards. [(5) (6)]

The North Santiam Subbasin stream temperature TMDL is focused on protecting cold water salmonids, specifically steelhead and salmon. For point sources of heat, heat allocations or discharge limits are developed for individual point source permits that ensure combined increase in temperature for all discharges does not exceed water quality standards. Removal or disturbance of riparian vegetation is the primary nonpoint source activity affecting stream temperatures in this subbasin. The temperature model, Heat Source, was used to calculate load allocations associated with nonpoint source pollution. While heat from solar radiation in excess of natural background rates is considered the pollutant, effective shade is used as a surrogate measure to represent nonpoint source heat loads. Effective shade (i.e. is the percent of daily solar radiation that is blocked by vegetation and topography) targets, through the use of shade curves can be translated into site-specific load allocations. Both shade curves and potential vegetation objectives were developed for geomorphic units and upland forest areas in the North Santiam Subbasin. [(5)]

Agricultural Water Quality Plan

The Agricultural Water Quality Act directed Oregon Department of Agriculture (ODA) to work with farmers and ranchers to develop Agricultural Water Quality Management Area plans and rules for watersheds. ODA began the planning process once water quality issues in a watershed were identified and a watershed plan was required by state or federal law, for example, listing under section 303(d) of the federal CWA. ODA developed watershed plans utilizing local advisory committees consisting of stakeholders residing in the watershed to address water quality issues arising from agricultural activities in its area. [(7)]

The NSW is included in the Mollalla-Pudding-French Prairie-North Santiam Sub-Basin Plan, which provides guidance for agriculture to meet or exceed water quality standards set by the DEQ while maintaining agricultural viability. The plan cites the following agricultural factors affecting water quality: crop type, fertilization practices, hydrologic modifications (including farm ponds, ditches and drain tile) and riparian alteration. Plan objectives include reducing, minimizing and controlling water pollution from agricultural activities and soil erosion to achieve applicable water quality standards. This can be accomplished by:

1) Controlling pollution as close to its source as possible.
2) Minimizing erosion and sediment delivery from agricultural and rural lands.
3) Reducing pesticide and nutrient discharge from agricultural and rural lands.
4) Controlling irrigation and run-off and tail water discharges to waters of the state.
5) Eliminating direct livestock waste discharges to waters of the state, and ensure proper animal waste storage, utilization or disposal.
6) Limiting livestock access to streams, wetlands and riparian areas.
7) Promoting restoration, enhancement and protection of wetland, riparian and wildlife habitat.
8) Focus on education and monitoring to achieve water quality goals. [(8)]

Water Quantity

Water rights in the NSW have been issued for a variety of uses, including: industrial, agricultural, domestic, municipal and hydroelectric power generation. [9] The largest water appropriations in the NSW are for irrigation and municipal use, about 35% of consumptive water use (excluding power rights) in the lower and middle reaches is associated with municipal water rights and 44% is associated with irrigation water rights. [1]

Oregon Water Resources Department (WRD) adopted minimum perennial stream flows in the NSW to support aquatic life and minimize pollution, and establish restrictions on new surface water appropriation to maintain these minimum perennial stream flows. WRD has established instream water rights for the protection of fisheries, aquatic life and pollution abatement, however, these instream water rights are junior to most other water rights. [1] (9)

Groundwater Limited Areas established by WRD and identified in Oregon Administrative Rules sets limitation of future groundwater use in specified areas to uses related to meeting individual family needs. This designation is intended to protect existing water rights by preventing excessive groundwater declines, restoring aquifer stability, and preserving aquifers with limited storage capacity for designated high public value uses. There are 3 Groundwater Limited Areas in the NSW including: (1) Stayton-Sublimity, (2) South Salem Hills and (3) Kingston. [10]

Drinking Water Source

DEQ and DHS jointly administer a Drinking Water Protection Program in which source water assessments are completed to meet 1996 amendment objectives in the federal Safe Drinking Water Act. These assessments identify potential sources of contamination from both non-point and point sources so that individual communities can use results to voluntarily develop strategies to protect source areas. "Drinking water protection does not mean prohibiting other uses in the watershed or groundwater recharge area. It means identifying the highest risks that could potentially affect the public water system, and seeking to reduce those risks." [11]

The NSW serves as a drinking water source to 18 community and non-transient non-community public water systems through surface and groundwater sources (see Table 2). [6]

Table 2. Public Water Systems in the NSW

Public Water System Name	*County*	*System Type*	*Source Type*	*PWS ID#*
Idanha City Water	Marion	Community	Surface Water	4100394
Detroit Water System	Marion	Community	Surface Water	4100257
Breitenbush Hot Springs	Marion	Community	Surface Water	4193461
Stayton Water Supply	Marion	Community	Surface Water	4100843
City of Jefferson	Marion	Community	Surface Water	4100408
Salem Public Works	Marion	Community	Surface Water	4100731
Lyons Mehama Water District	Linn	Community	Surface Water	4100493
City of Gates	Marion	Community	Surface Water	4100317

Mill City Water Department	Linn	Community	Groundwater	4100520
Century Farm Court	Marion	Community	Groundwater	4101326
Frank Lumber Co., Inc.	Linn	Nontransient noncommunity	Groundwater	4194873
Freres Lumber Company	Linn	Nontransient noncommunity	Groundwater	4194872
Jefferson Mobile Acres	Marion	Community	Groundwater	4100409
Marion Elementary	Marion	Nontransient noncommunity	Groundwater	4193754
Oakdale Trailer Park	Marion	Community	Groundwater	4101416
Scravel Hill Water Coop	Linn	Community	Groundwater	4100018
USFS Detroit Ranger Station	Marion	Nontransient noncommunity	Groundwater	4101224
West Stayton Elementary	Marion	Nontransient noncommunity	Groundwater	4190577

For public water systems served by NSRs water sources, the top 10 most threatening "potential contaminant sources" from higher risk categories of inventoried sites are listed in Table 3. [12]

Table 3. Potential Contaminant Sources to Drinking Water

SURFACE WATER SOURCES	
Rank	***Potential Contaminant Sources***
1	Above ground storage tanks – excluding water and residential ASTs
2	Automobiles – gas stations
3	Transportation – freeways/state highways
4	Known contamination sites/plumes/spills (ECSI)
5	Junk/scrap/salvage yards
6	Wells – Residential/municipal and commercial/industrial
7	Transmission lines – right-of-ways
8	Large capacity septic systems (serves >20 people) – Class V UICs
9	Housing – high density (>1 house/0.5 acre)
10	Wood/pulp/paper processing and mills
10	Managed forest land – clearcut harvest (<35 years
10	Mining activities – gravel mines/gravel pits
10	Grazing animals (>5 large animals or equivalent/acre)
10	Drinking water treatment plants
10	Schools
10	Automobile – repair shops
GROUNDWATER SOURCES	
Rank	***Potential Contaminant Sources***
1	Housing – high density (>1 house/0.5 acre)
2	Crops – irrigates (including orchards, vineyards, nurseries, greenhouses)

3	Known contamination sites/plumes/spills (ECSI)
4	Fleet/trucking/bus terminals
5	Septic systems – high density (>1 system/acre)
6	Metal plating/finishing/fabrication
7	Parking lots/malls (>50 spaces)
8	Wood/pulp/paper processing and mills
9	Large capacity septic systems (serves >20 people) – Class V UICs
10	Above ground storage tanks – excluding water and residential ASTs
10	Transportation - railroads
10	Transportation – freeways/state highways

2.3. US Army Corps of Engineers Detroit and Big Cliff Dams

Detroit and Big Cliff Dams are owned and operated by US Army Corps of Engineers (USACE). The primary purpose of Detroit Dam is flood control, therefore, water is released from the dam in the fall to create additional capacity in the reservoir for winter/spring flood control. After threat of floods has decreased, the reservoir is allowed to refill. Big Cliff Dam is used to regulate large water flows from Detroit Dam and to generate hydropower. Bonneville Power Administration (BPA) markets power generated by the dams. These dams are also operated for irrigation, recreation, navigation and to augment natural flows in the river for water quality and fish and wildlife purposes. The Bureau of Reclamation (BOR) manages only irrigation contracts for water stored behind Detroit Dam because irrigation is the only beneficial use listed on BOR's water rights for Detroit Reservoir. [(9)]

The ESA requires any federal agency proposing to do anything that might affect an ESA-listed species (such as issuing a permit, spending money or taking a direct action) to first seek opinions from US Fish and Wildlife (USFW) or National Marine Fisheries Services (NMFS) about effects of the action on the species. USFW and NMFS issue biological opinions to the agencies making the proposal. The primary goal of a biological opinion is to ensure that the proposed federal action will not reduce likelihood of survival and recovery of listed species. [(13)]

NMFS completed a consultation with USACE, BPA and BOR (identified as the "Action Agencies") July 11, 2008 on impacts of the Willamette River Basin Project on species listed for protection under the ESA. NMFS found that USACE, BPA and BOR Proposed Action alone was not sufficient to avoid jeopardy or adverse modification of critical habitat for ESA-listed Upper Willamette River Chinook salmon and the Upper Willamette River steelhead. Furthermore, Proposed Action would destroy or adversely modify their critical habitat. As a result, NMFS provided additional measures to mitigate for the projects' effects. [(14)]

Since the North Santiam Watershed contains two USACE dams and is an important basin for salmon and steelhead recovery, this biological opinion identifies several actions within the NSW to mitigate impacts of the dams on these ESA-listed fish species.

2.4. Oregon Department of Fish and Wildlife Conservation Strategy

Background

ODFW's Conservation Strategy provides a "long-term, big picture 'blue print' for conserving Oregon's natural resources to maintain or improve environmental health for today and future generations." [15]

Strategy Habitats within the NSW include:

- *Late successional conifer forests (especially Douglas-fir)*- Older forests (hundreds of years old), generally occurring below 3,500 feet, but sometime occurring up to 4,000 feet. Western hemlock is almost always co-dominant and usually dominates the understory. Other common trees include grand fir and western red cedar. The understory has shrub and forb species such as vine maple, salal, sword fern, Oregon grape, western rhododendron, huckleberries, twinflower, deerfoot vanillaleaf and oxalis. In the absence of disturbance, Douglas-fir forests eventually will convert to western hemlock. Based on a comparison between historic (1850) and current vegetation map, 23 percent remains in the West Cascades and less than 10 percent of historic low-elevation and mid-elevation (more than 4,500 feet) late-successional forests remain. [15]
- *Oak woodlands*- Oak woodlands are characterized by an open canopy dominated by Oregon white oak with relatively open understory of shrubs, grasses and wildflowers. Oak habitats are maintained through fire, which removes small conifers and maintains a low to moderate shrub cover. Oak woodlands grade into oak savannas which are characterized by upland prairie with widely-spaced large Oregon white oak and conifers. The Willamette Valley has less than 7% of oak woodland remaining. These woodlands have been impacted by conversion to other land uses, invasive species and vegetation changes due to fire suppression. As a result of conifer plantings and changes in fire frequency and intensity after European settlement, Douglas-fir now dominates many areas. Because much of remaining oak woodlands are in private ownership and maintenance of these habitats require active management, cooperative incentive-based approaches are crucial to conservation. [15]
- *Grasslands*- Native grasslands are one of the most imperiled habitats in the western United States. In Oregon, greatest losses of grasslands have been in valley bottoms and foothills due to impacts by conversion to agriculture, development and invasive plant species. An estimated 1% remains in the west Cascades and Willamette Valley. Grasslands include upland grass-dominated habitats in well drained, dry soils, such as upland prairies and montane grasslands. Montane grassland habitats in the western Cascades occur in a matrix of mixed conifer forests and woodlands. Mid- and high-elevation meadows tend to be dominated by grasses and wildflowers, such as green, Roemer, alpine or western fescue; California brome; timber oatgrass; broadleaf lupine; and beargrass. Balds and bluffs occur on south- to west-facing slopes on shallow, well-drained soils and are dominated by bunchgrasses, forbs and mosses. In the Willamette Valley, upland prairies are dominated by grasses, forbs and wildflowers. Oak savannas are grasslands with scattered Oregon white oaks, only one or two trees per acre. Common impacts to grasslands include

disruption of historical fire regimes allowing shrubs or trees to encroach, replacing grasslands with forest, foothill grasslands have been converted to forests through tree planting and non-native species were seeded for livestock forage, decreasing abundance and diversity of native plants. Carefully managed grazing can maintain grassland structure where prescribed fire is not practical or desired. [15]

- *Wetlands*- Includes lands covered with water during all or part of the year. West Cascades wetlands are generally in excellent condition, while almost all remaining wetlands in the Willamette Valley have been degraded to some degree by altered water regimes, pollution and invasive plants and animals. [15]

Table 4. Wetland Types

	Habitats/Features	***Dominant Vegetation***	***Location on Landscape***
Permanently Wet	Backwater sloughs, oxbow lakes and marshes	Water adapted- sedges, bulrush, spikesedges, rushes, cattails and floating vegetation	Off-channel areas created as rivers change course, water moves slowly providing quiet aquatic habitats.
Seasonally Wet	Seasonal ponds, vernal pools, swamps and wet prairies and meadows	Woody vegetation dominated- willows, hardhack, alder, red-osier dogwood, Pacific crab apple and ash Meadows and prairies dominated by- tufted hairgrass, sedges, reedgrass, spikesedge, rushes and wildflowers	Wet prairies occur in lowlands, especially in floodplains where-as wet meadows occur in depressions surrounded by forests and are associated with snowmelt. Wet meadows occur on gentle slopes near stream headwaters, in mountain valleys, bordering lakes and streams, near seeps, in large river valley bottoms, and in open wet depressions among montane forests.

- *Riparian*- Riparian habitats are adjacent to rivers and streams or on nearby floodplains and terraces at all elevations. They are shaped and maintained through seasonal flooding, scour and soil deposition. Plant composition is influenced by elevation, stream gradient, floodplain width and flooding events. Riparian vegetation is mostly dominated by deciduous trees and shrubs, such as bigleaf maple, alders, aspen, cottonwood, dogwood, willows and Oregon white ash. Conifers, such as pines and spruce, dominate some riparian woodlands at higher elevations. Riparian areas have important ecological functions because healthy riparian vegetation protects banks from erosion, influences in-channel aquatic habitats, maintains favorable water temperature for fish through shading, filters runoff and provides nutrients. Riparian habitats are greatly reduced in area and connectivity, especially in low-elevation areas and valley bottoms. Development, logging,

road building, agriculture and pasture use have degraded riparian habitat by decreasing riparian vegetation, increasing sedimentation and reducing large wood in streams. Runoff containing anthropogenic contaminants further impact habitat. [15]

- *Aquatic*- Freshwater aquatic habitats include rivers, streams, ponds, lakes and reservoirs. In many locations, flow and hydrology have been impacted by barriers (e.g., roads, dams and culverts) and irrigation diversions reducing water flow and interfere with fish and wildlife migration. Channelization and development can restrict natural ability of streams and riparian habitats to meander over time, limiting quality and availability of these habitats, as well as affecting floodplain function. Large, cool freshwater pools, often associated with streams, are also in decline. Adjacent riparian habitats affect aquatic habitats by providing shade and filtering runoff and precipitation. [15]

Table 5. Conservation Opportunity Areas Identified Within the NSW

Location	***Key Habitats***	***Key Species***	***Recommendations***
Lower Reach – Santiam & North Santiam Rivers	▪ Aquatic ▪ Floodplain Forests ▪ Riparian ▪ Wetlands and Wet Prairie	▪ Riparian Birds ▪ Oregon Chub (fish) ▪ Winter Steelhead (fish)	▪ Maintain or enhance in-channel watershed function, connection to riparian habitat, flow and hydrology. ▪ Maintain or restore riparian habitat and ecological function; ensure sufficient habitat complexity for wildlife.
Kingston Prairie Area	▪ Grasslands and Oak Savanna ▪ Oak Woodlands ▪ Riparian ▪ Wetland and Wet Prairie	▪ Western Meadowlark (bird) ▪ Bradshaw's Lomatium (plant) ▪ Oregon Larkspur (plant) ▪ White-topped Aster (plant) ▪ Willamette Valley Daisy (plant)	Initiate or continue wet meadow conservation and restoration efforts.
Bull of the Woods	▪ Aquatic ▪ Late Successional Douglas-fir Forests	▪ Cascade Torrent Salamander (amphibian) ▪ Great Gray Owl (bird) ▪ Northern Goshawk (bird)	
Central Cascades Crest	▪ Late Successional Douglas-fir Forests ▪ Montane Grasslands	▪ Cascade Torrent Salamander (amphibian) ▪ Cascades Frog (amphibian) ▪ Coastal Tailed Frog (amphibian) ▪ Oregon Slender Salamander	Initiate or continue wet meadow conservation and restoration.

	▪ Wetlands and Wet Meadows	(amphibian) ▪ Oregon Spotted Frog (amphibian) ▪ Black Swift (bird) ▪ Bufflehead (bird) ▪ Northern Goshawk (bird) ▪ Sanhill Crane(bird) ▪ American Marten (bird) ▪ Fisher (bird)	

2.5. Noxious and Invasive Species

Noxious Weeds

Noxious, invasive plant species are a common problem throughout the North Santiam Watershed and are a challenge for restoring habitats. When landscapes are disturbed, the area can become inundated with noxious weed species creating plant monocultures that reduce habitat diversity. Along streams, populations of Reed Canary Grass, Himalayan Blackberry and Japanese Knotweed can prevent establishment of riparian bottomland forest species and shrubs, which reduces shade and large wood recruitment critical to water quality and habitat complexity. Noxious weeds can also have economic and public health concern due to their effects on the landscape in agricultural and timber areas and affects to humans when touched (e.g. Giant Hogweed causes burns).

Marion County created a weed control district, pursuant to ORS 569.360, giving the County authority to work with private landowners to assist them in controlling noxious weeds on their lands. The Marion County Weed Control District has established the following priority weed lists: [16]

Educate and Control
- False brome
- Giant, Japanese and Himalayan or Bohemian knotweeds
- Meadow knapweed
- Spotted knapweed
- Milk thistle
- Puncturevine
- Purple loosestrife
- Tansy Ragwort
- Yellow flag iris
- Yellow toadflax

Immediate Action/Eradicate
- Common gorse
- Diffuse knapweed
- Garlic mustard
- Giant Hogweed
- Italian thistle
- Kochia
- Oblong Spurge
- Paterson's curse
- Rush skeletonweed
- Yellow starthistle

Aquatic Invasive Species (AIS)

Due to increasing number of lakes and waterways across the nation impacted by zebra and quagga mussels, the Oregon Marine Board developed an Aquatic Invasive Species program to protect Oregon waterways from introduction of these invasive species. This program focuses on education on these AIS and adequately cleaning boats before launching them since early detection and prevention are the effective and least costly method for addressing AIS concerns. Oregon has also passed a "Clean Launch law" (ORS. 830.560) that prohibits launching a boat if there are any visible aquatic species on the hull, motor, trailer or related equipment, or any invasive species inside the boat. The goal of the law is to prevent aquatic invasive plants, shellfish or other organisms from being released into un-infested waters. Several aquatic invasive species, such as Eurasian watermilfoil and New Zealand mud snails, are already present in Oregon. These AIS damage waterways and cost managers, taxpayers, boaters and anglers millions of dollars in addition to the complete habitat destruction they cause. [17]

Detroit Lake is one of the top 3 lakes for recreation use in Oregon, causing it to be vulnerable to potential introduction of AIS. Therefore, these early prevention measures are important to protecting the quality of this recreation and economic resource.

2.6. Summary of North Santiam Restoration Priorities

In addition to reviewing various state, federal and local agency planning efforts summarized above, additional restoration priority information to the NSW was collected from technical advisors through an online survey and a technical advisory meeting. The following table summarizes priority habitat restoration identified:

Table 6. NSWC Restoration Priorities

Primary Restoration Priorities	*Secondary Restoration Priorities*
1. *Aquatic/In-Channel Habitat*- including substrate conditions, channel complexity, connectivity and off channel	1. *Water Quantity and Quality*
2. *Floodplain/Riparian Habitats*- including canopy, plant diversity, large wood recruitment and channelization	2. *Wetlands*
3. *Fish Species Recovery*	3. *Upland Habitat*

<u>*North Santiam Watershed Council Restoration Priority Focus*</u>
Based on available NSW information and technical advisors input, the NSWC restoration priority focus is on the following:

1) *Tributaries*- Generally, projects will occur in tributaries starting at the top of the watershed, just below USACE dams, and work down to the Willamette.
2) *Side Channels*- Efforts will focus on mapping current and historic aerials of the mainstem North Santiam to identify locations to reopen side channels and restoring instream and riparian conditions of these side channels.

3) *Connectivity*- This includes connecting waterways that have been disconnected by undersized culverts, restoring contiguous corridors of riparian vegetation and connecting riparian and upland habitats.

Reasons for this focus are as follows:

- Tributaries at the top of the watershed are less impacted and require less investment for ecological uplift. These areas are more likely to provide spawning habitat similar to areas above the dams that historically provided 75% of anadromous fish habitat in the NSW.
- Scale of tributaries and side channels tends to be more responsive to restoration efforts providing more benefit for the cost compared to mainstem projects.
- The mainstem is predominately influenced by USACE dams affecting flow and temperature, which influences habitat forming processes and timing of biological cycles (e.g. anadromous fish migration and emergence from eggs).
- Monitoring effectiveness will likely be attainable.

3. Restoration Principles, Strategies and Project Process

The overarching principles describe what restoration is needed to address priority resource concerns in the NSW, strategies describe how the principles will be achieved and the process explains steps to implementation.

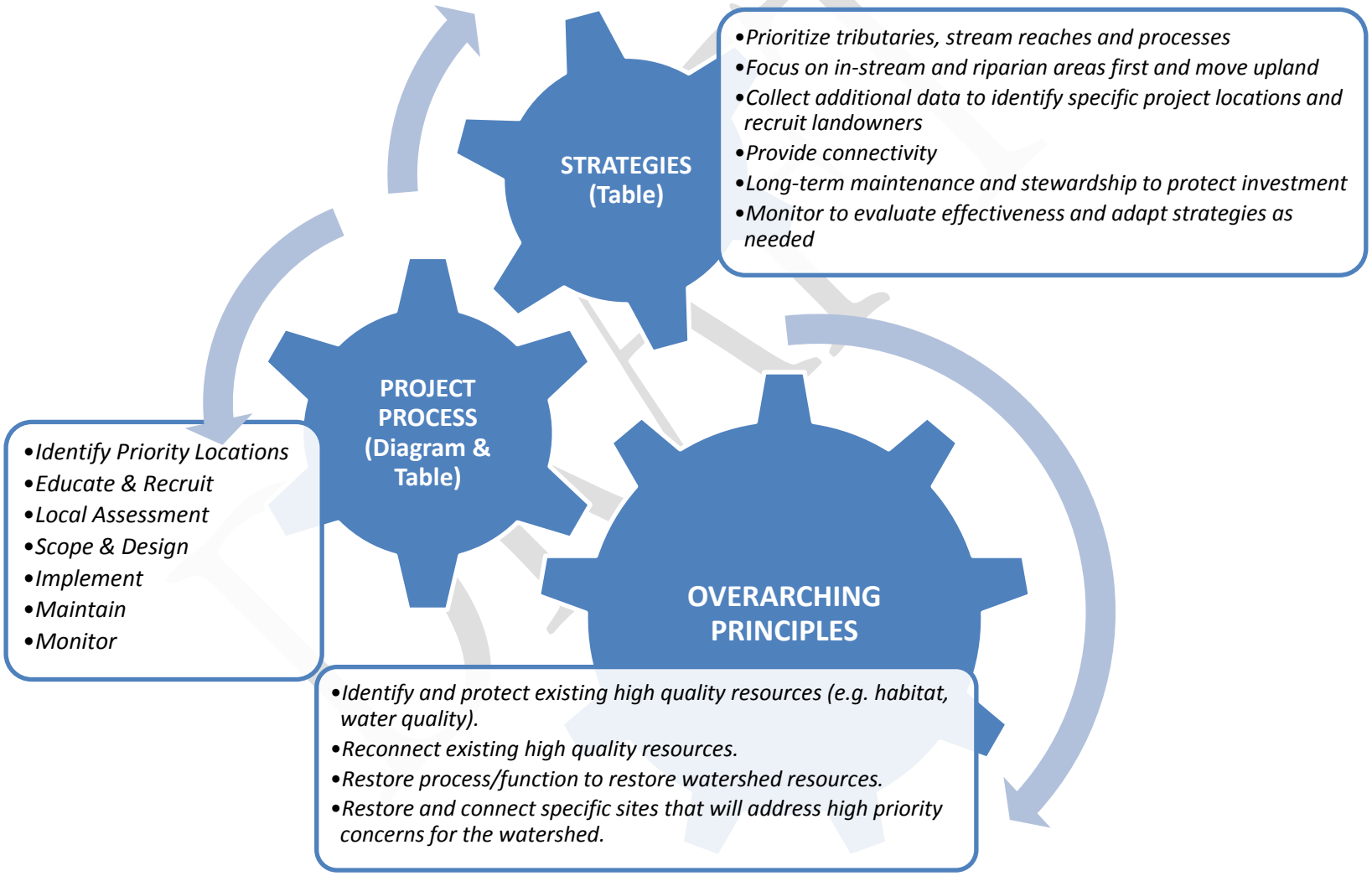

Figure 1. Connecting Restoration Principles, Strategies and Project Process

Table 7. Restoration Strategies

Strategies		
1 *Prioritize tributaries, stream reaches and processes* – using watershed assessments, GIS data, agency priorities and documents (e.g. TMDL plan) and technical advisor input.	***2*** *Focus on in-stream and riparian areas first and move upland* - to provide a landscape treatment that addresses entire watershed ecosystem.	***3*** *Collect additional data to identify specific project locations and recruit landowners* – to promote strategic and contiguous restored areas.
4 *Provide connectivity* – reconnecting waterways, streams with floodplains, restored habitats and restored processes to increase effectiveness in addressing causes of watershed processes degradation.	***5*** *Long-term maintenance and stewardship to protect investment* – by supporting landowners and assisting with resources necessary to maintain project sites.	***6*** *Monitor to evaluate effectiveness and adapt strategies as needed* – to inform and improve restoration strategies while providing accountability to watershed communities.

Figure 2. Restoration Project Process

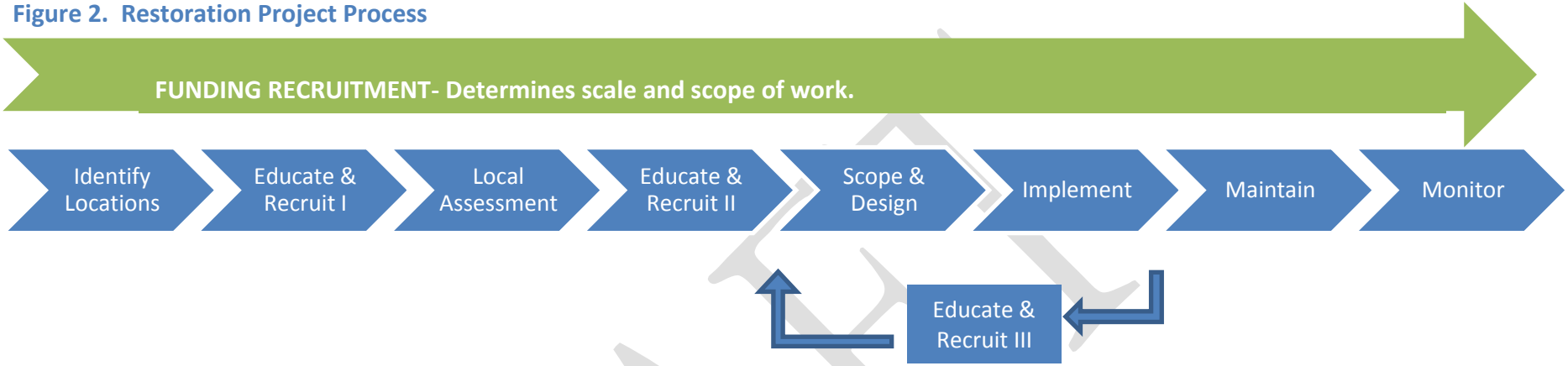

Table 8. Project Phase Descriptions

Project Phase	***Description***
Identify Priority Locations	Use technical documents (e.g. action plans, assessments and recovery plans) to identify prioritized areas for restoration. For the NSWC, tributaries and side channels have been identified as top priority.
Educate & Recruit	The following 3 phases of education and recruitment is incorporated to achieve the objective of recruiting adjacent landowners along a waterway so that restoration efforts have connectivity, providing the best cost benefit of efforts. ▪ *Phase I*- This is the first contact with landowners in a prioritized area, such as a 6th field tributary, and typically includes letters to secure permission for assessments on the tributary. Landowners are asked to send responses on enclosed post cards to give permission for access. Letters are followed up with phone calls to landowners that do not respond or request a phone call on the post card. ▪ *Phase II*- After assessments are completed, landowners are sent letters inviting them to a community meeting to learn results, provide input and collaboratively identify restoration opportunities on their property. ▪ *Phase III*- Occurs after restoration projects occur on a tributary to grow efforts and create contiguous corridors of restored habitat along that tributary and to begin recruitment in neighboring tributaries. Invitations are sent to landowners in the area for tours with landowners with completed projects. Partnering landowners share their experience in restoration and the NSWC project manager shares information on process, design and project benefits to the watershed.
Local Assessment	Most agency generated documents provide general information on restoration priorities for the North Santiam (e.g. add large wood to tributaries or replace culverts determined to be fish passage barriers). More localized assessments on a side channel or 6th field HUC scale are completed to understand stream conditions, identify site specific restoration opportunities

	and prioritize projects. These assessments are used to create a "blue print" or localized action plan for a tributary or side channel that becomes a landowner recruitment tool. These "blue prints" provide landowners a visual of restoration recommendations within the context of their stream community. Landowners are more willing to commit to projects when they can see the data collected and effort made to understand the stream before working on it. These restoration "blue prints" also provide a planning tool for determining where projects can be grouped on grant and permit applications and for mobilization of engineers and equipment operators. This creates a cost savings and results in less impact to streams from restoration activities since it reduces the number of occasions required to enter the stream for restoration. If there is not momentum towards landowner commitment to full instream conditions assessment, the Watershed Council has found that starting with a noxious weed inventory is typically a good first step. Most landowners share a concern for noxious weeds as they can dramatically impact their land uses and are willing to allow access to inventory and treat weeds. This opens the door to discussing other restoration opportunities with landowners.
Scope & Design	When landowners express interest in restoration, site visits are arranged to walk the site, talk with the landowner and listen to their concerns, goals and interests. Restoration opportunities are identified, technical advisors consulted and design process initiated. Depending on project type and funding sources, design for in-stream projects (e.g. culvert replacement or large wood placement) are completed by certified engineers and riparian projects (e.g. plantings and fencing) are designed by NSWC project managers or NRCS planners if project is enrolled through one of their programs. Project scoping and design includes securing landowner agreements that describe project plans and objectives, along with roles, responsibility and expectations. Site plans and tributary strategies are to be presented to the NSWC for approval.
Implement	Project implementation includes securing necessary permits for in-stream projects (typically includes DSL, USACE and Marion County Floodplain), hiring equipment operators and coordinating on-the-ground implementation of restoration activities.
Maintain	Maintenance is critical for achieving objectives for riparian planting projects and protecting investments in restoration. Even though maintenance is difficult to fund, the NSWC has a goal of maintaining planting projects for 2 to 5 years. Maintenance includes watering, weed control and replanting locations with high mortalities until plants are free to grow.
Monitor	Monitoring project effectiveness is also limited by funding availability. At a minimum to meet grant funding requirements, the NSWC will monitor projects for 5 years through annual photo-point monitoring. A few tributaries of the NSW are selected for more extensive effectiveness monitoring and are described in Section 5.
Funding Recruitment	Recruiting funding is necessary for each project phase to occur and funding availability can impact scale and scope of work accomplished. The NSWC can recruit funding in a number of ways. If the project is large scale and complex, the NSWC can apply for technical assistance type grants to complete stream reach analysis, modeling and/or design. If a project is smaller scale and straight forward, the NSWC can incorporate design costs into a restoration grant, which typically expedites on-the-ground implementation. Another consideration the NSWC and landowners should make while planning and funding a project is potential programs to leverage funds and implementation, such as a farm bill program like the Conservation Reserve Enhancement Program (CREP), Wildlife Habitat Incentive Program (WHIP) or Wetland Reserve Program (WRP).

4. Process For Project Proposals From Potential Partners

The NSWC is regularly approached by potential partners to collaborate on projects. To ensure these projects meet a restoration priority, partners should provide information outline in the project proposal form (see Appendix A) and present it at a NSWC meeting. The NSWC will evaluate project proposals using the form in Appendix B and technical advisor input to determine its feasibility and whether it is appropriate for the NSWC to commit resources.

5. Monitoring Progress

Basic Monitoring

At a minimum the NSWC will complete post project implementation monitoring requirements outlined in grant agreements. This typically includes photo point monitoring for up to 5 years after project completion reports are submitted (see http://oweb.state.or.us for guidance). Grant agreements typically require status reports describing whether project is meeting goals and if any maintenance has been completed. In addition to collecting this information, the NSWC also plans to collect data on plant survival to assist with assessing maintenance needs.

10-Year Effectiveness Monitoring on Selected Tributaries

The NSWC's partnership with the Calapooia and South Santiam Watershed Councils was accepted into the Meyer Memorial Trust (MMT) Willamette Model Watershed Program. The purpose of the MMT Willamette River Initiative is to achieve meaningful, measurable improvements. As part of this program the NSWC selected three 6th field tributaries to the North Santiam River. These tributaries are being assessed and 10 year restoration strategies developed. The MMT Willamette Model Watershed Program provides capacity for this long term planning and monitoring to measure ecological uplift as a result of restoration activities. The tributaries selected are Stout Creek, Valentine Creek and Bear Branch. Restoration priorities on these 3 tributaries are similar to other parts of the watershed, therefore, data collected in these areas will inform effectiveness of restoration efforts across the watershed and adapt strategies accordingly. Monitoring data being collected in these 3 sub-watersheds include:

Table 9. Monitoring Parameters Collected in Model Locations

Restoration Project Type	***Parameter***
In-stream Projects- e.g. large wood placement	Thalweg profile
Riparian Planting Projects	▪ Temperature ▪ Canopy
In-stream and Planting Projects	▪ Substrate ▪ Wetted width ▪ Riparian condition ▪ Macroinvertebrates

6. Key Limiting Factors, Actions and Progress

Table 7 is a compilation of key limiting factors and recommended actions described in various science-based references and plans created by agencies addressing natural resource concerns in the North Santiam Watershed, including ODFW, ODEQ, USFS, USACE, BLM and NPCC. The actions are those recommended for the North Santiam Watershed, however, the Watershed Council will not likely be lead on all actions. Specific potential Watershed Council led projects and partnerships are described in Section 7.

Table 10. Key Limiting Factors, Actions, Status and Watershed Council Priority

Key Limiting Factor/Issues	Actions	Progress	Council Priority
Habitat Connectivity			
Fish passage barriers (e.g. culverts) block access to habitat and habitat connectivity. [1] [2] [4] [15] [18]	**Data Gaps:** Inventory and prioritize barriers. [1] **Projects:** ▪ Remove or retrofit barriers on tributaries. [1] ▪ Improve function and efficiency of fishways at Upper and Lower Bennett dams. [2] [4] ▪ Reduce fish loss and migration delays of juvenile and adult fish at Santiam Water Control District irrigation canal/hydro projects. [2] [4] ▪ Replace following culverts: Little Rock Creek, mouth of Mad Creek, [19] under Mehama Rd on Valentine Creek, under NE Alder Rd on Cedar Creek, on Sydney Ditch under Libby Ln near headwaters of Marion Creek. [20] [21]	**Data Gaps:** ▪ Inventory in partnership with South Santiam Watershed Council and Oregon State University completed for middle reach and Little North Santiam. ▪ Marion County and City of Salem have culvert surveys [20] [21] and Linn County is working on culvert surveys. **Projects Completed:** ▪ City of Salem modified Upper Bennett Dam with a new fish ladder and plans to complete a similar project on Lower Bennett Dam. ▪ Santiam Water Control District completed a fish screen project on Stayton Canal. ▪ NSWC replaced 5 barriers on prioritized tributaries and side channel.	Hi

	▪ Determine potential habitat upstream of barriers on following tributaries of the Little North Fork: Polly Creek, Jeeter Creek and Kiel Creek. Replace culverts if habitat connected would benefit listed fish species. [20] [21] ▪ Screen diversion on Rock Creek. [4]	These included one on Mad Creek (2001), Hatch Side Channel (2007 and 2008) and Snake-Deford (2010). **NSWC Planned Projects:** ▪ Replace 2 culverts on Cold Creek (Summer 2011). ▪ Replace Little Rock Creek Culvert (Summer 2011 or 2012). ▪ Replace 3 culverts on Snake Deford (Summer 2012).	
Reduced floodplain connectivity limits floodplain function as a result of: ▪ Channel confinement by riprap, dikes and revetments. ▪ Channel downcutting downstream of Army Corps dams. ▪ Reduced frequency in floodplain inundation with overbank flow and side channel connectivity. ▪ Reduced magnitude in flow preventing floodplain exchange of nutrients, organic matter and sediment with stream. [1] [2] [4] [15] [22]	**Data Gaps:** ▪ Identify and map channel modifications, such as riprap and dikes. [1] Concentrations of riprap and revetments occur in the upper watershed adjacent to Highway 22, around Stayton bridge and downstream of Stayton through the mainstem Santiam. Much of the lower North Santiam River downstream of Mehama has been diked. [2] ▪ Evaluate risks in removing some riprap to reconnect floodplain. [1] **Projects:** ▪ Work with willing landowners to remove structures and reconnect floodplain, historic side channels and off-channel refuge areas. [1] [4] ▪ Work with landowners to address erosion by shaping banks and placing large wood instream. [1] [4]	**Projects Completed:** NSWC completed projects to reconnect channels with floodplains that incorporate bank shaping/sloping, adding large wood and reconnecting waterways by replacing undersized culverts. Projects are in the following areas: ▪ Hatch Side Channel (2008) ▪ Snake-Deford Creeks (2009) ▪ Stout Creek (2009 and 2010) **NSWC Planned Projects:** NSWC is continuing work to reconnect channels with floodplains in the following areas: ▪ Stout Creek (2011) ▪ Valentine Creek (2012) ▪ Bear Branch	Hi

Riparian/Aquatic Habitat Quality and Complexity			
Lack of large wood in-stream to provide habitat structure, pool formation and capture gravel for spawning. (1) (2) (18) (4) (15) (22)	**Projects:** Add large wood to suitable, moderate-gradient streams to increase habitat complexity. (1) (4) Priority locations include side channels and following recommended candidate streams: Snake Deford, Bear Branch, Stout, Rock, Mad, Sinker and Elkhorn. (4)	**Projects Completed:** Large structures placed in following areas: ▪ Hatch Side Channel (2008) ▪ Snake-Deford Creeks (2009) ▪ Stout Creek (2009 and 2010) **NSWC Planned Projects:** Additional large wood structure is planned for the following: ▪ Stout Creek (Summer 2011) ▪ Cold Creek (Summer 2011) ▪ Valentine Creek (Summer 2012) ▪ Bear Branch	Hi
Reduced spawning gravel due to entrapment behind Army Corp dams and removal by mining, results in streambed coarsening downstream. Gravel provides spawning habitat and hyporheic flow through gravel bars can cool water, which provides cool water rearing habitats. (2) (4) (22)	**Projects:** Restore substrate recruitment downstream of dams. (4)	Feasibility study for gravel augmentation completed through USACE Section 22 program (2009).	Med
Loss of wetland, floodplain, and off-channel/side channel habitats (stream habitat conditions have been simplified). (1) (2) (4) (15) (22)	**Data Gap:** ▪ Field verify wetland, channel habitat and riparian GIS data. Update wetland and riparian maps. (1) ▪ Map existing and historic side channels using aerials to determine potential areas for re-opening side channels and restoring instream and riparian habitats in these areas.	**Data Gap:** Riparian and in-stream conditions have been or are in the processed of being assessed and mapped in Stout Creek, Valentine Creek, Bear Branch and Snake Deford. **Projects Completed:** ▪ Restoration of wetland and off-channel habitats completed in Hatch Side	Hi

	Projects: ▪ Identify sites to design and implement wetland and off-channel habitat restoration. (1) (4) ▪ Restore natural function of North Santiam River at old Stayton acclimation pond site. (4) ▪ Identify restoration opportunities and partner on projects with Stayton on Stayton Riverfront Park. (15)	Channel and Stout Creek. ▪ Assisted with Stayton Riverfront Plan identifying habitat restoration opportunities (2011). **NSWC Planned Projects:** Additional projects are planned for the following: ▪ Stout Creek (Summer 2011) ▪ Cold Creek (Summer 2011)	
Lack of floodplain/riparian forests and large wood recruitment. (1) (2) (4) (15) (22)	**Projects:** ▪ Identify sites to design and implement riparian and floodplain vegetation restoration. (1) (4) ▪ Identify restoration opportunities and partner on projects with Stayton on Stayton Riverfront Park. (15)	**Projects Completed:** Floodplain forest/riparian buffer restoration completed in: ▪ Hatch Side Channel (2008, 2009 and 2010) ▪ Snake-Deford Creeks (2009) ▪ Stout Creek (2009 and 2010) ▪ Bear Branch (2007) ▪ Mainstem at Fishermen's Bend (2007 and 2008) ▪ Mainstem at Stayton Riverfront (2010) **NSWC Planned Projects:** Additional floodplain forest/riparian buffer restoration planned for: ▪ Stout Creek (2011) ▪ Valentine Creek (2011) ▪ Snake-Deford Creeks (2011 and 2012) ▪ Bear Branch	Hi
Noxious weeds create monocultures of vegetation that	**Data Gaps:** Inventory noxious weeds to identify treatment opportunities and	**Data Gaps:** ▪ Inventories completed on Little North	Med

decreases habitat quality and shade along waterways. [1] [2] [15]	monitor progress. [1] **Projects:** Partner with landowners, land managers and agencies to eradicate and control weeds. [1] Target riparian areas and weed control in re-establishing riparian vegetative buffers.	Santiam and mainstem North Santiam from top of watershed to Willamette on Marion County side of the river by Marion SWCD. ▪ Marion County Weed Control District inventoried False Brome on public lands along mainstem North Santiam River. ▪ Weed inventories completed on Stout (2009) and Valentine Creeks (2010). **Projects Completed:** ▪ Marion County treated false brome on approximately 30 acres along the North Santiam River 2006 to on mainstem North Santiam River, primarily on public lands. ▪ Japanese knotweed treated in Stout Creek (2009 and 2010). ▪ City of Salem completed extensive Yellow Flag Iris removal on Geren Island. ▪ Partnership among Marion SWCD, Marion County and NSWC has provided landowner education on noxious weeds and funding to treat priority weeds (2010 and 2011). ▪ Coordinated Ivy removal event on Stout Creek (2009). **NSWC Planned Projects:** ▪ Continued work with Marion SWCD	

		and Marion County to outreach to landowners and assist with weed control. ▪ Secondary weed inventory and treatment on Valentine Creek (2011).	
Lack of protected intact riparian areas. [4]	**Data Gaps:** Identify and map existing conservation easements (i.e. obtain NRCS data) to determine priority areas that connect existing projects. **Projects:** ▪ Educate landowners on Best Management Practices and programs available to them (e.g. grants or CREP) to recruit riparian projects. [4] [8] ▪ Identify and protect high quality habitat utilizing conservation easement programs. [1] [4] ▪ Assist interested landowners in enrolling in Farm Bill programs that provide easements. ▪ Protect riparian areas by assisting landowners with fencing and other Best Management Practices. [1] [4] ▪ Identify restoration opportunities and partner on projects with Stayton on Stayton Riverfront Park. [15]	**Completed Projects:** ▪ Projects incorporate farm bill with easements when possible to protect riparian restoration. Currently, 8 landowners have or are in the process of enrolling in a program. ▪ Council Coordinator assisted Mill City with riparian codes that will offer protection of waterways that the Council is planning restoration on (i.e. Snake Deford). ▪ Management plan for Stayton Riverfront identifies restoration opportunities (2011).	Hi
Recreation impacts watershed through misuse of camping areas, improper trash disposal and impacting river banks. [1,18]	**Data Gaps:** Map location and extent of existing trails and human use to identify priority areas. [1] **Projects:**	**Completed Projects:** ▪ Annual North Fork Clean-up-Watershed Council collaborate with local landowners, BLM and USFS to coordinate clean-up event along Little	Med

(Check BLM and USFS doc)	▪ Coordinate trash clean-ups to promote prevention. [1] ▪ Use Respect-The-River program to educate recreational users to protect stream and watershed resources and implement stream restoration and protection projects (e.g. fencing). This is a USFS program.	North Santiam where recreation has significant impact. (2004 to 2010) ▪ USFS completed Respect the River projects that restore and protect riparian corridors impacted by disbursed recreation activities (2008 and 2009). ▪ NSWC assisted USFS with Breitenbush summer home owner interviews to identify potential projects in the upper watershed.	
Water Quality/Quantity			
Portions of North Santiam Watershed waterways are listed on the 303(d) for ***too high summer temperatures*** for salmonid survival. [1] [2] [5]	**Data Gaps:** Obtain cities and counties TMDL implementation plans to determine partnership opportunities. **Projects:** Implement projects that implement TMDL. [1]		Med
Lack of riparian canopy and shade affects temperature by allowing more sun exposure that can heat waters above water quality standards. Only 25 percent of the original extent of floodplain forest remain in lower portion of the watershed. [1] [2] [4] [15] [22]	**Data Gaps:** ▪ Field verify GIS data layer for shade and riparian vegetation. [1] ▪ Obtain DEQ shadolator data and NRCS data to determine locations where landowners have restored riparian areas and areas likely to provide most benefit with restoration. Use to prioritize project recruitment to restore riparian buffers. ▪ Monitor temperatures, especially at project sites. [1] **Projects:** Increase shade along mainstem and tributaries. [5] [8] Candidate streams	**Projects Completed:** Riparian buffer restoration completed on: ▪ Hatch Side Channel (2008, 2009 and 2010) ▪ Snake-Deford Creeks (2009) ▪ Stout Creek (2009 and 2010) ▪ Bear Branch (2007) **NSWC Planned Projects:** Additional Riparian buffer restoration planned for: ▪ Stout Creek (2011) ▪ Valentine Creek (2011) ▪ Bear Branch ▪ Hatch Side Channel	Hi

	below the dam include: Bear Branch, Valentine, Stout, Snake-Deford, Marion, Chehulpum, Elkhorn and Little North Santiam. Candidate streams above the dam include: Boulder, Blowout and Marion.[1,5, 18]	▪ Snake-Deford Creeks (2011 and 2012) ▪ Maintain existing projects until they are free to grow.	
During low flow months (July to October) domestic water used combined with irrigation may significantly ***reduce streamflow***. (1) (2) (4) (22)	**Data Gaps:** Identify water rights not in use. (1) **Projects:** ▪ Explore leasing water rights along selected tributaries to increase water in the stream during summer. Candidate streams include Rock and Stout Creeks. (1) (4) ▪ Water conservation education to citizens and landowners.	**Projects Completed:** ▪ NSWC provides water conservation information in education outreach materials and at workshops. ▪ 1 landowner is in process of in-stream water right lease as part of CREP (2010). **NSWC Planned Projects:** Collaborate with Oregon Consensus and stakeholders on North Santiam Water Management Planning. Emergency Planning summit planned for April 2011.	Lo
Dissolved Oxygen concentrations do not meet criteria for salmon spawning at river mile 9.3 and river mile 11.2 in the mainstem Santiam River. Low dissolved oxygen may be related to elevated temperature. (2) (22)	**Data Gaps:** Water quality data. **Projects:** Implement projects that address temperature issues, e.g. restoring riparian buffers.		
Salmon carcasses are reduced from historic levels, limiting nutrient inputs to the system and thus food availability for rearing fish. (2)	**Data Gaps:** Water quality data. **Projects:** Identify locations and place salmon carcass instream.	**Projects Completed:** ODFW and Santiam Flycasters completed salmon carcass placement projects for nutrient enhancement (2010, other?).	
Pesticides and nutrients could	**Projects:**		

potentially impact water quality.[5]	▪ Implement Oregon Association of Nurseries agricultural land spraying proposals. (4) ▪ Provide education on Best Management Practices in partnership with NRCS, OSU Extension and SWCDs. (8)		
Turbidity/Sediment Source	**Data Gaps:** ▪ Map debris flows, landslides and streambank erosion and instability. (1) ▪ Consolidate turbidity data and reports to identify opportunities. **Projects:** ▪ Address sediment input due to slope instability, streambank erosion and rural road runoff – high priority for Fox Valley. ▪ Replace culverts at risk of washing out. ▪ Provide education on Best Management Practices in partnership with NRCS, OSU Extension and SWCDs to reduce agricultural sources of sediment. (8)	**Data Gaps:** Turbidity data collected by City of Salem, USGS, USACE and USFS. **Projects Completed:** Projects on Stout Creek and Snake Deford addressed streambank erosion issues. **NSWC Planned Projects:** Work with City of Salem to collect and analyze turbidity data to identify project opportunities.	
Drinking water	**Projects:** Collaborate with communities to identify opportunities for source water protection.	**Projects Completed:** Revegetation projects on Snake-Deford, Stout Creek, Valentine Creek, Bear Branch, Hatch Side Channel and mainstem sites contribute to drinking water source protection. **NSWC Planned Projects:** Collaborate with Oregon Consensus and stakeholders on North Santiam Water Management Planning. Emergency Planning summit planned for April 2011.	

Upland Habitat			
Noxious weeds create monocultures of vegetation that decreases habitat quality. [1] [15] [3] See priority species in section 2.5.	**Data Gaps:** ▪ Inventory noxious weeds to identify treatment opportunities and monitor progress. [1] [3] ▪ Monitor progress of eradication efforts. [1] **Projects:** Partner with landowners, land managers and agencies to eradicate and control weeds. [1] [3]	**Projects Completed:** ▪ Jefferson Oak Savannah project incorporated weed removal and control on 55 acres (2006 to 2010). ▪ Partnerships formed with Marion SWCD, Marion County Weed Control District and USFS to inventory and eradicate weeds. **NSWC Planned Projects:** ▪ Partner with Marion County on upland False Brome containment project on forest lands (grant submitted). ▪ Partner with USFS to inventory and treat weeds in upper watershed communities (i.e. Detroit and Idhana) (2011).	Med
Oak Savanna and prairie habitats have been significantly reduced in Willamette Valley. Primary limiting factors include: ▪ Fire suppression ▪ Fir encroachment ▪ Land use conversion causing habitat loss due to development and agriculture ▪ Loss of habitat structure because large diameter oaks require a long time to grow ▪ Invasive species [15]	**Data Gaps:** Identify priority areas and project opportunities. [15] **Projects:** Identify landowners to cooperatively plan and implement projects that maintain and restore oak woodlands and savannas. [15]	**Completed Projects:** NSWC partnered with landowner near Jefferson to restore ESA-listed plant species in 55 acres of oak savannah and prairie habitat. Project is located within a priority area for this habitat type in the ODFW Conservation Strategy.	Med

Priority wildlife and plant species include- ▪ Plants- Bradshaw's Lomatium, Oregon Larkspur, White-topped Aster and Willamette Valley Daisy ▪ Amphibian- Cascade Torrent Salamander, Cascade Torrent Salamander, Cascades Frog, Coastal Tailed Frog, Oregon Slender Salamander and Oregon Spotted Frog ▪ Birds- Western Meadowlark, Great Gray Owl, Northern Goshawk, Black Swift, Bufflehead, Northern Goshawk, Sanhill Crane, American Marten and Fisher [15]	**Data Gaps:** Inventory priority wildlife and plant species to identify restoration opportunities. [1] [3] **Projects:** Protect and restore habitat for priority wildlife and plant species. [1]		Med
Moderate to high road density, primarily managed by ODOT and USFS. [1] [3] [22]	**Data Gaps:** ▪ Update and field verify road data. ▪ Create road condition database to map surface types, use, side slope gradient, proximity to streams and road density. [1] **Projects:** Reduce road densities or restore roads through reconstruction, decommissioning and obliteration- high priority for Fox Valley and Sevenmile Creek subwatersheds since they have the highest road densities and length within 200 feet of a stream. [1]		Lo
Forests are dominated by early-	This is primarily a policy and management		

to mid-successional stages with ***few late- successional forests***. Disturbance regime is dominated by timber harvesting, which has increased sediment delivery to streams while decreasing large wood input. [(2) (3) (15) (22)] Limiting factors for late-successional forests are: ▪ Timber harvest ▪ Altered fire regime ▪ Loss of habitat connectivity [(15)]	issue for state and federal agencies.		Lo
Dams			
Dam operation ***change stream temperature patterns***; which affects upstream distribution of adults and timing of spawning, fish egg incubation and emergence, and migration. [(2) (4) (13)]	Add from BiOp…		
Dam ***prevents floodplain connectivity*** by reducing magnitude and frequency of peak flows. Reduced over-bank flow and side channel connectivity limit rearing and refuge habitat. [(2) (13)]			
Dam ***prevents anadromous fish access*** to an estimated 71 percent of historical habitat. [(2) (4) (11) (13)]		ODFW transports adult Chinook salmon and steelhead past the dams by trucking them up Highway 22 to designated location upstream of Detroit reservoir.	

Channel/habitat forming processes limited due to dams effects on natural hydrograph resulting in habitat simplification. A reduction in frequency and magnitude of peak flows has caused a reduction of channel complexity and diversity of rearing habitats. (2) (4) (13)			
Flow fluctuations as result of dams occur at rates rapid enough to ***entrap and strand juvenile anadromous fish***. Fish spawn in areas that dewater during active flood control operation, reducing rearing area and survival. (2) (4) (13)			

7. Watershed Restoration Actions by Fifth Field Subwatersheds

7.1. Lower North Santiam (HUC 1709000506)

The Lower North Santiam River Watershed drains a 113 square mile (72,319 acres) area. This area is the most heavily populated in the NSW and includes the communities of Jefferson, Marion, Stayton and Lyons. Geren Island, the drinking water facility for the City of Salem, is also located in this area. Land ownership is mostly private with agricultural land use accounting for 67% of the area, forest land 25% and urban areas only 4%. The North Santiam River flows into the Santiam River just upstream of Jefferson, at the confluence with the South Santiam River. The lower watershed provides habitat for spring Chinook, fall Chinook, coho, summer steelhead and winter steelhead. There are two USGS real-time flow gages, one in the Santiam River at Jefferson (gage #14189000) and the other in the North Santiam River at Mehama (gage #14183000). [(5)]

Map 1. Lower North Santiam (insert map)

Table 11. Lower North Santiam Restoration Actions

COMPLETED PROJECTS/PROJECTS UNDERWAY				
6th Field HUC	***Limiting Factor***	***Project(s)***	***Partners/ Funding Sources***	***Next Steps***
Lower NSR- Jefferson Upland HUC 170900050604	▪ Upland noxious weeds ▪ Oak savanna and prairie habitats	▪ Reintroduced 8 federal and/or state listed plant species to 80 acres ▪ Eradicated and controlled noxious weeds	Heritage Seedling, Inc., ODFW, USFW, OWEB, BLM, OSU Extension and NFWF	Post project status reporting and monitoring to fulfill grant requirements
Cold Creek HUC 170900050603	▪ Fish passage barriers ▪ Floodplain connectivity ▪ Lack of large wood and large wood recruitment ▪ Loss of wetland, floodplain and off-channel habitat ▪ Lack of	▪ Replace 2 culverts (2011) ▪ Place large wood in-stream (2011) ▪ Restore riparian and wetland vegetation ▪ Restore and protect wetlands as part of Wetland Reserve Program	2 landowners, WRP, OWEB, Marion SWCD, USFW and NRCS	Project design and implementation (2011)

	floodplain/riparian forests			
Lower NSR- Hatch Side Channel HUC 170900050602	▪ Fish passage barriers ▪ Floodplain connectivity ▪ Lack of large wood and large wood recruitment ▪ Loss of wetland, floodplain and off-channel habitat ▪ Lack of floodplain/riparian forests ▪ Lack of riparian canopy and shade	▪ Replaced 3 culverts ▪ Replaced livestock crossing ▪ Restored riparian buffer ▪ Placed large wood in-stream	5 landowners, WHIP, CREP, OWEB, Salem, Marion SWCD, NRCS, Marion County, ODFW, USFW, USFS, OPRD and Albany	Plant maintenance (2011 and 2012) Monitoring- annual photo points and plant survival count
Valentine Creek HUC 170900050601	▪ Fish passage barriers ▪ Floodplain connectivity ▪ Lack of large wood and large wood recruitment ▪ Loss of wetland, floodplain and off-channel habitat ▪ Lack of floodplain/riparian forests ▪ Lack of riparian canopy and shade ▪ Noxious weeds	▪ Inventoried priority invasive weeds ▪ Secondary weed inventory and treatment (2011) ▪ Restore riparian vegetation (2011)	Landowners, OWEB, Salem, MMT, TNC, ODEQ and NFWF	Recruit landowners to restore riparian buffers, determine if there are fish passage barriers at road crossings and identify opportunities to place large wood instream
Stout Creek HUC 170900050601	▪ Floodplain connectivity ▪ Lack of large wood and large wood recruitment ▪ Loss of wetland,	▪ Restored eroding streambank (2009) ▪ Placed large wood in-stream (2010)	Landowners, OWEB, MMT, ODFW, CREP, Marion County, OR	Design 2011 in-stream projects with secured funding including additional large wood

	floodplain and off-channel habitat ▪ Lack of floodplain/riparian forests ▪ Lack of riparian canopy and shade ▪ Noxious weeds	▪ Restored riparian buffer at 2 sites ▪ Eradicated Japanese Knotweed (2009 and 1020)	Governor's Fund, NFWF, ODA, ODEQ City of Salem and TNC	placement, removing dike/fill material restoring riparian buffer
Bear Branch HUC 170900050602	▪ Floodplain connectivity ▪ Lack of large wood and large wood recruitment ▪ Loss of wetland, floodplain and off-channel habitat ▪ Lack of floodplain/riparian forests ▪ Lack of riparian canopy and shade ▪ Noxious weeds	▪ Restoring riparian buffers	Landowners, CREP, ODEQ, City of Salem, TNC and NFWF	Recruit landowners to restore riparian buffers, determine if there are fish passage barriers at road crossings and identify opportunities to place large wood instream
POTENTIAL PROJECTS				
6th Field HUC	***Limiting Factor***	***Project(s)***	***Potential Partners/ Funding Sources***	***Next Steps***
Lower NSR HUC 170900050604	▪ Riparian vegetation ▪ Floodplain connectivity ▪ Loss of wetland, floodplain and off-channel/side channel habitat	Map historic side channels and current conditions to determine opportunities to open and restore side channels		
Sydney Ditch HUC 170900050603	Fish passage barrier	Replace culvert under Libby Ln. [(20) (21)]	County OWEB	▪ Determine priority ▪ Recruit landowner

				(Marion County?)
Marion Creek HUC 170900050603	▪ Large wood ▪ Riparian vegetation ▪ Floodplain connectivity	▪ Place large wood instream. (1) (4) ▪ Eradicate and control noxious weeds. (1) (4) ▪ Restore native riparian buffer for shade. (1) (4) ▪ Shape bank to reduce erosion.	Landowners OWEB NRCS Marion SWCD	Recruit landowners
Bear Branch HUC 170900050602	▪ Large wood ▪ Riparian vegetation ▪ Floodplain connectivity	▪ Place large wood instream. (4) ▪ Eradicate and control noxious weeds. (1) (4) ▪ Restore native riparian buffer for shade. (1) (4) ▪ Shape bank to reduce erosion.	Landowners OWEB OR Gov Fund/NFWF ODEQ ODFW	▪ Work with volunteer landowners to recruit neighbors ▪ Scope and design projects
Mainstem NSR-Stayton Riverfront HUC 170900050602	▪ Riparian canopy ▪ Wetlands ▪ Grasslands ▪ Prairies	▪ Restore native riparian vegetation. ▪ Restore other plant communities. ▪ Education about the watershed in natural resource issues.	Stayton OWEB	Work with City of Stayton to identify and implement projects.
Bear Branch HUC 170900050602	Fish passage barrier	Possible culvert under Kingston-Jordan Rd.[17]	County OWEB	▪ Determine priority ▪ Recruit landowner (Linn County?)
Stout Creek HUC 170900050601	Fish passage barriers	▪ Hwy 22 may be potential barrier. [17] ▪ Second potential barrier upstream of Hwy 22. [17]	Landowner OWEB ODOT	▪ Determine priority ▪ Recruit landowner

Valentine Creek HUC 170900050601	Fish passage barriers	▪ Replace culvert under Old Mehama Rd. [12,16] ▪ Culvert under Hwy 22 may be barrier.[17]	County ODOT OWEB	▪ Determine priority ▪ Recruit landowner (Marion County?)
Valentine Creek HUC 170900050601	▪ Large wood ▪ Riparian vegetation	▪ Place large wood instream. [(4)] ▪ Eradicate and control noxious weeds. [(1) (4)] ▪ Restore native riparian buffer for shade. [(1) (4)]	Landowners OWEB NRCS	▪ Recruit landowners

7.2. Middle North Santiam (HUC 1709000504)

The Middle North Santiam River Watershed drains an 86 square mile (55,039 acres) area of the Cascade Range and includes Mill City, Gates, Mehama and a portion of the City of Lyons. The area is dominated by private ownership, however, 11% of the watershed is owned by BLM, and land use is primarily forestry. The flow in the North Santiam River is supplemented from Rock Creek, the largest tributary in this watershed. The Middle North Santiam provides habitat to spring Chinook, summer steelhead, winter steelhead, resident cutthroat, rainbow trout, Oregon chub and bull trout. There is one USGS real-time flow gages in the upper Middle North Santiam River Watershed at Niagara (gage # 14181500). [(5)]

Map . Middle North Santiam (insert map)

Table 12. Middle North Santiam Restoration Actions

COMPLETED PROJECTS/PROJECTS UNDERWAY				
6th Field HUC	***Limiting Factor***	***Project(s)***	***Partners/ Funding Sources***	***Next Steps***
Mainstem-Fishermen's Bend HUC 170900050404	▪ Lack of floodplain/riparian forests ▪ Lack of riparian canopy and shade	Restored riparian floodplain forest vegetation.	BLM, OSU Extension and OWEB	Post project monitoring

Snake Deford HUC 170900050404	▪ Fish passage barriers ▪ Floodplain connectivity ▪ Lack of large wood and large wood recruitment ▪ Loss of wetland, floodplain and off-channel habitat ▪ Lack of floodplain/riparian forests ▪ Lack of riparian canopy and shade ▪ Lack of protested intact riparian areas	▪ Replaced fish passage barrier ▪ Place large wood instream ▪ Restored riparian vegetation ▪ Replaced livestock crossings ▪ Fenced riparian area	Landowners, OWEB, NRCS, FSA, Mill City, ODOT, Albany and BLM.	Continue to recruit landowners for riparian vegetation restoration and replace 3 additional culverts
Mad Creek HUC 170900050402	Fish passage barriers	▪ Replaced culverts with bridge ▪ Replace additional fish passage barriers on tributary to Mad Creek and at confluence with NSR	Landowners, Linn County, OWEB and ODOT (More)	Recruit additional funding to match ODOT funds and collaborate with Linn County on culvert replacement
POTENTIAL PROJECTS				
6th Field HUC	***Limiting Factor***	***Project(s)***	***Potential Partners/ Funding Sources***	***Next Steps***
Fox Valley HUC 170900050404				
Cedar Creek HUC 170900050404	Fish passage barrier	Replace culvert on Cedar Creek beneath NE Alder Rd. (21)	Landowners OWEB	▪ Determine priority ▪ Recruit landowner
Rock Creek HUC 170900050403	▪ Fish passage barriers ▪ Large wood	▪ Screen diversion on Rock Creek. (4)	Landowner OWEB	▪ Determine priority ▪ Recruit landowner

		▪ Add large wood. [4]	ODFW	
Mad Creek HUC 170900050402	▪ Fish passage barriers ▪ Large wood	▪ Continue replacing culverts that are barriers.[17] ▪ Add large wood. [4]	Landowner OWEB	▪ Determine priority ▪ Recruit landowner
7-Mile HUC 170900050401				

7.3. Little North Fork (HUC 1709000505)

The Little North Santiam River Watershed drains a 113 square mile (72,319 acres) area. Forestry accounts for almost all of the land use. Land ownership is dominated by USFS Willamette National Forest lands (50%) and BLM (18%) with the remaining 32% in private ownership. There is a protected old growth forest and five major tributaries that flow into the Little North Santiam River: Elkhorn Creek, Cedar Creek, Big Creek, Battle Ax Creek and Opal Creek. The Little North Santiam River is a tributary to the North Santiam River, with its confluence located at Lyons. The Little North Fork provides habitat for spring Chinook, summer steelhead and winter steelhead. There is one USGS real-time flow gage in the Little North Santiam River Watershed, Little North Santiam River near Mehama, USGS # 14182500. [5]

Map . Little North Fork (insert map)

Table 13. Little North Fork Restoration Actions

COMPLETED PROJECTS/PROJECTS UNDERWAY				
6th Field HUC	***Limiting Factor***	***Project(s)***	***Partners/ Funding Sources***	***Next Steps***
All	Recreation impacts	Coordinated annual trash clean up	USFS, BLM, Marion County, ODF and SOLV	Continue coordinating event pending partner interest
	Recreation impacts	Respect the River	USFS, OWEB	Post project monitoring
PROTENTIAL PROJECTS				
6th Field HUC	***Limiting Factor***	***Project(s)***	***Potential Partners/***	***Next Steps***

			Funding Sources	
Lower LNSR- Polly, Jeeter and Kiel Creeks HUC 170900050506	Fish passage barrier	Replace culverts on Polly, Jeeter and Kiel Creeks. [20] [21]		▪ Determine priority ▪ Recruit landowner (Marion County?)
Middle LNSR- Canyon Creek HUC 1709000505				
Elkhorn HUC 170900050504	▪ Large wood ▪ Riparian canopy ▪ Noxious weeds	▪ Place large wood instream. [4] ▪ Eradicate and control noxious weeds. [1] [4] ▪ Restore native riparian buffer for shade. [1] [4]	BLM, OWEB	▪ Recruit landowners at mouth. ▪ Work with BLM to plan restoration from mouth upstream into BLM land.
Gold Creek HUC 170900050503				
Battle Ax HUC 170900050502				
Opal Creek HUC 170900050501				

7.4. Detroit Reservoir/Blowout Divide Creek (HUC 1709000503)

The Detroit Reservoir/Blowout Divide Creek Watershed drains a 112 square mile (71,679 acres) area and includes the City of Detroit and Detroit Reservoir. Forestry is the dominant land use in this area and Detroit Reservoir serves as a major recreational waterbody. Over 50% of the watershed is in public ownership and is administered primarily by the USFS Willamette National Forest. There are six major tributaries that flow into the reservoir: Breitenbush River, North Santiam River, Box Canyon Creek, Blowout Creek, Kinney Creek and French Creek. The Detroit Reservoir/Blowout Divide Creek is habitat for winter steelhead and resident fisheries in the North Santiam River. There are two USGS real-time flow gages in the watershed, Blowout Creek near Detroit (gage # 14180300) and French Creek near Detroit (gage # 14179100). [5]

Map . Detroit Reservoir/Blowout Divide Creek (insert map)

Table 14. Detroit Reservoir/Blowout Divide Creek Restoration Actions

PROTENTIAL PROJECTS				
6th Field HUC	***Limiting Factor***	***Project(s)***	***Potential Partners/ Funding Sources***	***Next Steps***
Kinney Creek HUC 170900050304				
French Creek HUC 170900050303				
Lower Blowout HUC 170900050302	Riparian Canopy	Restore native riparian buffer for shade. [4]	USFS	▪ Determine project priority ▪ Work with USFS to implement project.
Upper Blowout HUC 170900050301				

7.5. North Fork Breitenbush (HUC 1709000502)

The North Fork Breitenbush River Watershed is 108 square miles (69,119 acres). This area has several hot springs, including Breitenbush hot springs. Forest lands primarily publicly owned and managed by the USFS dominate this area. Breitenbush River flows into Detroit Reservoir. The South Fork and North Fork Breitenbush River are the major tributaries, draining the upper Cascade Mountains, as well as Humbug and Devils creeks. The Breitenbush provides habitat to winter steelhead. There is one real-time USGS flow gage in the North Fork Breitenbush River Watershed located on Breitenbush River above French Creek (gage # 14179000). [5]

Map . North Fork Breitenbush (insert map)

Table 15. North Fork Breitenbush Restoration Actions

PROTENTIAL PROJECTS

6th Field HUC	*Limiting Factor*	*Project(s)*	*Potential Partners/ Funding Sources*	*Next Steps*
Lower Breitenbush HUC 170900050205				
Middle Breitenbush HUC 170900050204				
Humbug Creek HUC 170900050203				
North Fork HUC 170900050202				
South Fork HUC 170900050201				

7.6. Upper North Santiam (HUC 1709000501)

The Upper North Santiam River Watershed is 229 square miles (146,559 acres) flowing from the upper Cascade Mountains. The area is dominated by USFS ownership, however, 8% of the watershed is privately owned. The North Santiam River flows into Detroit Reservoir and is supplemented by the Marion Creek drainage, the largest tributary in the Upper North Santiam. The Upper North Santiam provides habitat to resident fisheries. There is one USGS real-time flow gage in the watershed, USGS flow gage #14178000, North Santiam River below Boulder Creek near Detroit. [(5)]

Map . Upper North Santiam (insert map)

Table 16. Upper North Santiam Restoration Actions

COMPLETED PROJECTS/PROJECTS UNDERWAY				
6th Field HUC	*Limiting Factor*	*Project(s)*	*Partners/ Funding Sources*	*Next Steps*
Marion Creek HUC 170900050103	▪ Reduced spawning gravels ▪ Lack of large wood and	▪ Augment spawning gravels ▪ Add large wood to mainstem NSR	USFS, OWEB	Design and implement project (2011)

	large wood recruitment ▪ Lack of floodplain/riparian forests ▪ Lack of riparian canopy	▪ Restore riparian vegetation		
PROTENTIAL PROJECTS				
6th Field HUC	***Limiting Factor***	***Project(s)***	***Potential Partners/ Funding Sources***	***Next Steps***
Boulder/Marys Creek HUC 170900050107	▪ Riparian canopy ▪ Large wood	▪ Restore native riparian buffer for shade. [5,18] ▪ Add large wood to maintain habitat structure.[18]	USFS	▪ Determine project priority ▪ Work with USFS to implement project.
Whitewater Creek HUC 170900050106				
Pamelia Creek HUC 170900050105				
Bugaboo Creek HUC 170900050104	▪	▪		▪
Marion Creek HUC 170900050103	▪ Riparian canopy ▪ Large wood	▪ Restore native riparian buffer for shade. [5] ▪ Add large wood to maintain habitat structure.[18]		▪ Determine project priority ▪ Work with USFS to implement project.
Straight Creek HUC 170900050102				
Headwaters HUC 170900050101				

References

1. **E&S Environmental Chemistry Inc.** *North Santiam Watershed Assessment: Middle and Lower Reach Subwatersheds.* 2002.
2. **Northwest Power and Conservation Council.** *Draft Willamette Subbasin Plan.* s.l. : Prepared by Willamette Restoration Initiative, 2004. pp. 3-344 to 3-362.
3. **Bureau of Land Management.** *Appendix to North Santiam Watershed Assessment.* 2001.
4. **Oregon Department of Fish and Wildlife.** *Draft Oregon ESA Recovery Plan for the Upper Willamette River Domain Chinook Salmon and Winter Steelhead.* 2010.
5. **Oregon Department of Environmental Quality.** *Willamette TMDL Plan: Chapter 8-North Santiam Subbasin TMDL.* 2006. pp. 8-1 to 8-39.
6. —. [Online] http://www.deq.state.or.us.
7. **Oregon Department of Agriculture.** Water Quality. [Online] http://www.oregon.gov/ODA/NRD/water_quality_front.shtml.
8. **Oregon Deparment of Agriculture.** *Mollalla-Pudding-French Priarie-North Santiam Subbasins Agricultural Water Quality Management Area Plan.* 2008.
9. **Oregon Consensus.** *North Santiam Basin Water Management: Interview Summary.* 2009.
10. **Oregon Water Resources Department.** [Online] http://www.wrd.state.or.us/.
11. **Oregon Department of Environmental Quality.** Fact Sheet: Introduction to Oregon's Drinking Water Protection Program. *Oregon Drinking Water Protection Program.* [Online] http://www.deq.state.or.us/wq/dwp/invresults.htm.
12. Oregon Drinkng Water Protection Program. [Online] Oregon Department of Environmental Quality. http://www.deq.state.or.us/wq/dwp/invresults.htm.
13. **United States Army Corps of Engineers.** Biological Opinions. [Online] http://www.nwp.usace.army.mil/environment/home.asp.
14. —. *Executive Summary 2008 Willamette Project Biological Opinion.* 2008.
15. **Oregon Department of Fish and Wildlife.** *Oregon Conservation Strategy.* 2006.
16. **Marion County.** Marion County Weed Control District. [Online] http://www.co.marion.or.us/PW/Operations/weeds/.
17. **Oregon Marine Board.** [Online] http://www.boatoregon.com/.
18. **Oregon Watershed Enhancement Board.** OWEB Restoration Priorities. [Online] http://www.oregon.gov/OWEB/restoration_priorities.shtml.
19. **Andersen, Eric.** *Santiam Fish Passage Barrier Inventory.* s.l. : Oregon State University Masters Thesis, 2010.
20. **Marion County.** Marion County Culvert Survey. [Online] http://www.co.marion.or.us/NR/rdonlyres/90878BB7-9D10-4E7A-B8B6-E79457E30D93/3927/culvertSurvey.doc.
21. **Mason, Bruce and Girard, Inc.** *Historic Salmon Study, In Marion County Oregon, Volume 1 Technical Report.* s.l. : Prepared for City of Salem, Marion County and Mid-Willamette Valley Council of Government, 2003.
22. **United States Army Corps of Engineers, Bonneville Power Administration and Bureau of Reclamation.** *Supplemental Biological Assessment of the Effects of the Willamette River Basin Flood Control Project on Species Listed on the Endangered Species Act.* 2007.

Appendices

Appendix A: Project Proposal Form
Appendix B: Project Evaluation Form

Appendix A: Project Proposal Form

Organization:
Contact:
Phone:
E-mail:
Project Name: _____

Project Description (project background, need, proposed actions and anticipated outcomes such as stream miles, acres, barriers removed, etc.)**:**

Potential Funding Sources and Partners:

Anticipated Timeline (e.g. grant deadlines, implementation, etc.)**:**

Potential Challenges:

Type of Assistance Requesting (check all that apply)**:**

- ☐ Sponsor Grant (i.e. applicant)
- ☐ Grant Writing
- ☐ Support Letter for Grant
- ☐ Other:
- ☐ Project Planning
- ☐ Technical Assistance (Design)
- ☐ Project Management

Appendix B: Project Evaluation Form

1.	Does the proposed project have a likelihood of success?	Yes +3	No -3
2.	Is the proposed project technically or practically feasible?	Yes +3	No -3
3.	Is there a presence of fish or other endangered or threatened species at the proposed project site?	Yes +3	No -3
4.	Is the proposed project site adjacent to location of currently existing intact, high quality habitat, therefore, will connect areas of high quality habitat?	Yes +2	No -2
5.	Does the proposed project address multiple resource concerns (e.g. fish passage, water quality, floodplain connectivity, riparian buffer, protection, etc.)?	Yes +2	No -2
6.	Is the proposed project cost efficient (# of acres or stream miles restored per cost)?	Yes +2	No -2
7.	Does the proposed project have a likelihood of engaging local citizens, organizations, and/or agencies to partner in implementation?	Yes +2	No -2
8.	Does the proposed project have a likelihood of securing funds?	Yes +2	No -2
9.	Is the proposed project site in areas that have historically been known to have high quality habitat, high fish productivity or other endangered or threatened species?	Yes +2	No -2
10.	Does the proposed project address higher or lower priority resource need or concern? For example, does project restore habitat for endangered fish species versus a species of concern such as pond turtle?	Higher +1	Lower -1
11.	Will the proposed project have the fastest, most measurable effect?	Yes +1	No -1
12.	Will the project impact local economy positively or negatively?	No +1	Yes -1
		Column Totals	
		Project Total	