Salmon River Site Conservation Action Plan

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Table of Contents

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Overview

The Salmon River Site Conservation Action Planning process brought a diverse group of stakeholders together to develop a shared vision for conservation and protection of the Salmon River watershed and adjacent nearshore environments, and strategies needed to accomplish that vision. Participants in the process included community members, representatives of state and federal agencies, timber companies, conservation organizations, private landowners, scientists and academics. Over the course of four core team meetings, three technical team meetings and seven months (December, 2006 – July, 2007), participants compiled information and data to profile the current condition of the area, defined the desired conditions that stakeholders envision for the basin and nearby ocean environments, and identified concrete steps that citizens, conservation organizations and conservation partners can take to realize that vision.

Participants were connected by interest in the Salmon River Planning Area and a willingness to work together to achieve a broad conservation vision. Those living within the planning area enjoy a high quality of life in part because of careful management provided by current and past landowners/managers. One of the primary goals of this effort is to see that this continues and to build on this strong foundation.

This report outlines the work of the full planning team, describing the planning approach the team employed, key concepts and ideas generated by the team, as well as important goals the team set for the planning area. The report details conservation actions and activities that the team determined to be significant for the planning area, thereby providing direction and a common vision for conservation partners in the area.

The planning exercise described in this document is meant to be the starting point for developing a long-term vision for conservation of the Salmon River watershed. As our knowledge and experience with the Salmon River conservation targets grows, the plan will be revised and redirected to accommodate this new information. In this manner it is designed to be a working conservation plan, continually informing and informed by our work on the ground.

The planning assessment presented here reflects the views of a diverse group of partners representing a wide range of interests. Throughout the planning process, we strove to be inclusive of the full diversity of ideas brought by every partner, while aiming to come to common agreement on key parts of the plan. In the same manner, this document includes a full range of ideas and suggestions made by all partners in this dialogue. However, it must be acknowledged that not all of the material presented here had unanimous support from team members, and participation in this effort did not imply endorsement of all ideas, proposals and content contained in this report.

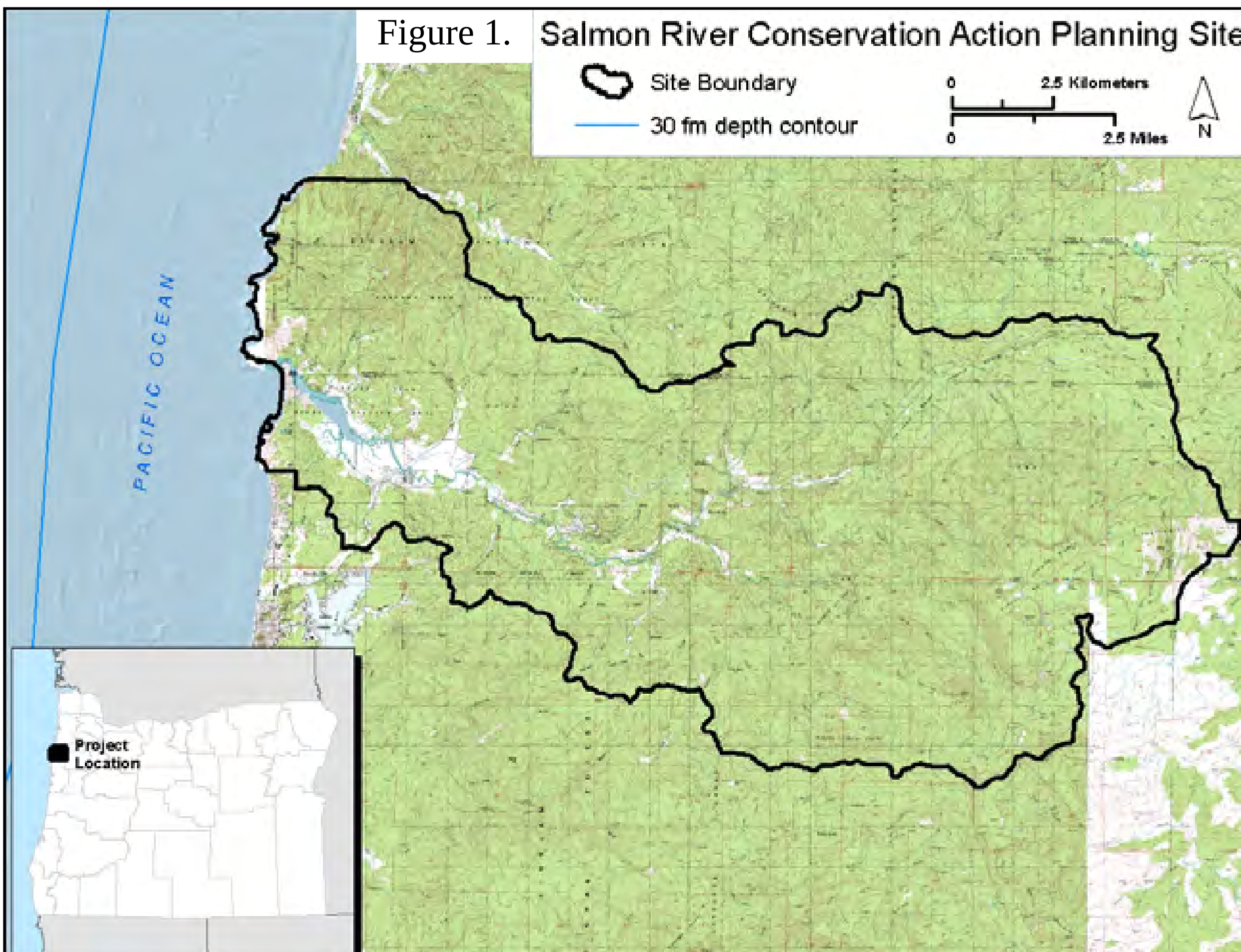
1) Introduction: The Salmon River Site

Planning Area

The planning area addressed through this effort was delineated as a result of a combination of ecological and geopolitical considerations. At its core, it included the Salmon River basin in Lincoln and Tillamook counties, and the nearby marine environment influenced by and influencing the Salmon River. More precisely, the planning area encompassed the 75 square mile (approximately 50,000 acre) Salmon River watershed and selected drainages contained within the Cascade Head Scenic Research Area, the Camp Westwind property, and National Forest lands on the south side of the estuary (Figure 1). This planning effort also covered the nearshore marine environment adjacent to the watershed out to 30 fathoms (or approximately three miles).

The Salmon River is approximately 25 miles long, originating on Saddleback Mountain (in Lincoln County) at about 3,000 feet in elevation. Along its course to the ocean, the river and its eleven tributary drainages carve through geologic substratum consisting of basalts, siltstones and sandstones derived from volcanic activity and marine and coastal plain sedimentation (Orr et al. 1992).

Figure 1. Salmon River Conservation Action Planning Site



The planning area falls within the temperate rainforest zone. The climate is mild but wet, with a mean annual temperature of 50 degrees Fahrenheit with precipitation averaging around 100 inches/year (WRCC 2007). Precipitation falls mainly in the form of rainfall during the winter months when heavy rains and gale force winds can be common. Summer months are very dry; however, heavy summer fog drip on the headlands can add as much as 20 inches of precipitation to those areas (Isaac 1946).

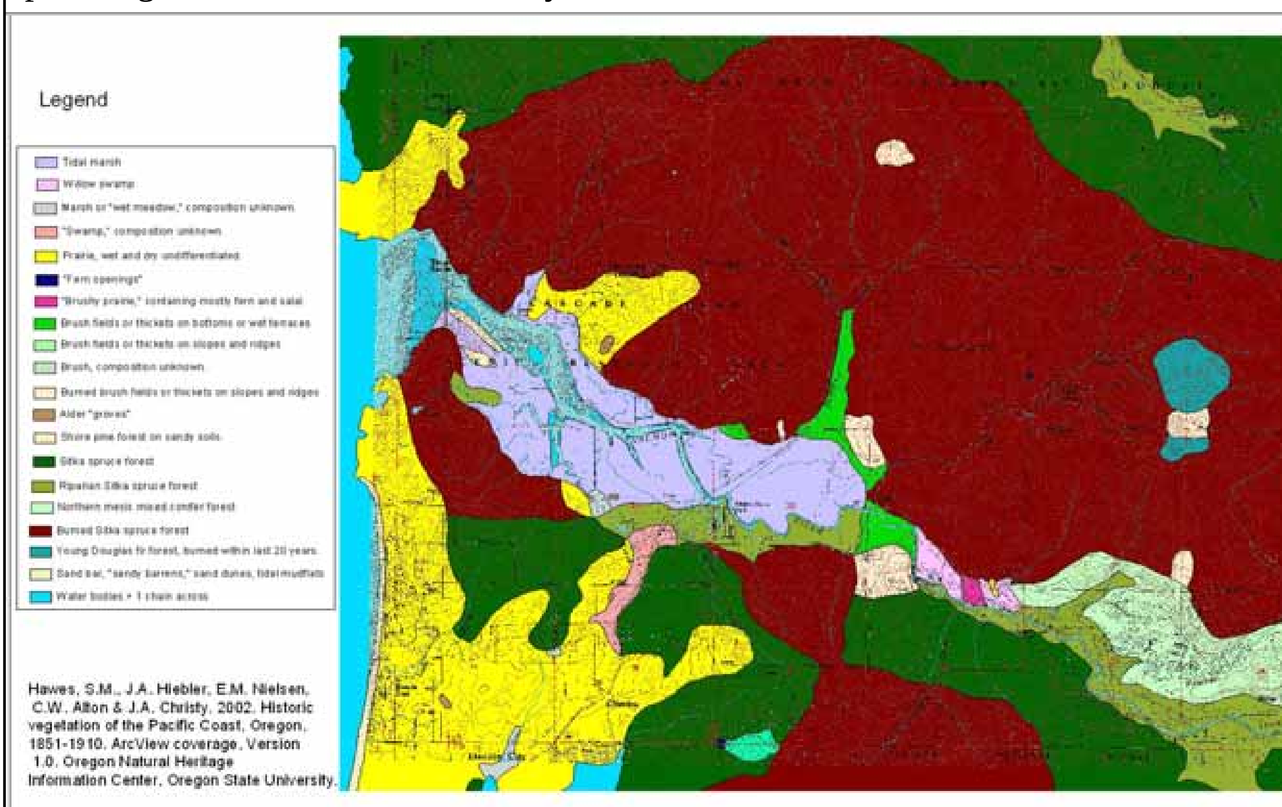
Typical of the coastal province (Franklin and Dyrness 1988), prior to European settlement the coastal portion of the site was covered by Sitka spruce (*Picea sitchensis*)/western hemlock (*Tsuga heterophylla*), while inland, Douglas-fir (*Pseudotsuga menziesii*)/western hemlock forests dominated.

According to interpretation of General Land Office Surveys from the late 1850s, along the lower Salmon River and estuary were extensive areas of salt marsh grading upland into Sitka spruce swamp, willow swamps and other brushy wetlands (Hawes et al. 2002). Broad areas of prairie, believed to be maintained by tribal burning (Ripley 1983, Beckham 1975), were found on the headlands and along the base of Cascade Head. In the mid-1800s, this valley (along with much of the coast range) was burned in massive wildfires (Figure 2) (Teensma et al. 1991).

Current Conservation Significance

In 2006, The Nature Conservancy identified the Salmon River area as an important place for the conservation of biodiversity in the

Figure 2. 1850-1910 vegetation of the western portion of the Salmon River planning area based on GLO surveys.



Pacific Northwest Coast ecoregion (Figure 3) (TNC 2006). This area is a priority in a network of sites required to sustain and support the full range of ecological systems, communities and species found in the ecoregion. The site was selected because it contains a broad diversity of important biological systems and species. It is also remarkable in that it encompasses the full natural elevation and hydrologic continuum from coastal range headwater streams to nearshore/marine environments.

Current land use and land cover conditions are significantly different than they were pre-settlement (Figures 4 and 5), however many significant natural features remain. Among the important natural features on the westernmost edge of the planning area, where the nearshore/marine environments meet the Salmon River, are sandy beaches, grass and forested headlands, rocky intertidal zones, a sand dune spit, and off-shore rocks and kelp beds. Further up the system is the estuary and associated tidal salt marshes, with isolated patches of Sitka spruce swamp and, on adjacent uplands, native Sitka spruce/western hemlock forests. Protected natural areas, small-scale developments, and environmental points of interest in this portion of the basin include the Cascade Head Scenic Research Area, Neskowin Crest Research Natural Area, Cascade Head Experimental Forest, United Nations Biosphere Reserve, Camp Westwind, Cascade Head Ranch, the Sitka Center, Knight Park, and The Nature Conservancy’s Cascade Head Preserve.

In the mid-section of the planning area, significant natural features include tributary streams, the main stem Salmon River’s confluence with the estuary, and Douglas-fir/western hemlock forests primarily in Forest Service ownership. In this area, dense rural residential areas mix with farm and ranchlands and small commercial developments to constitute the most highly developed portion of the basin. Also in this portion of the basin is the Salmon River Hatchery, which annually raises fall Chinook for release into the Salmon and Yaquina rivers and summer steelhead for the Siletz. Starting in 2008, the Salmon River Hatchery plans to no longer release coho into the Salmon River but will continue to rear them for release in Young’s Bay on the lower Columbia River.

The headwaters of the basin are predominantly private timberlands. However, approximately 3,000 acres of BLM lands, including two protected BLM Areas of Critical Environmental Concern (ACEC) Lost

Figure 3. Oregon sites selected in TNC Pacific NW Coast ecoregional assessment.

Figure 4. Current landuse/ownership patterns of Salmon River planning area.

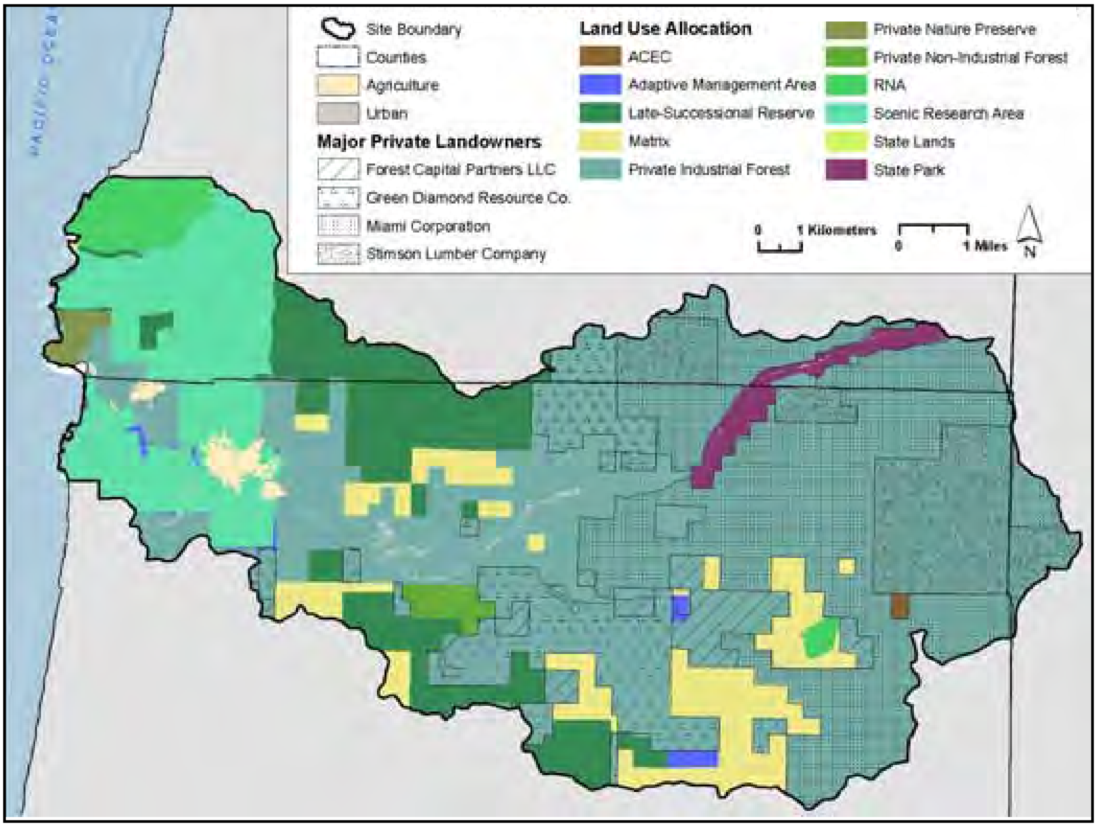
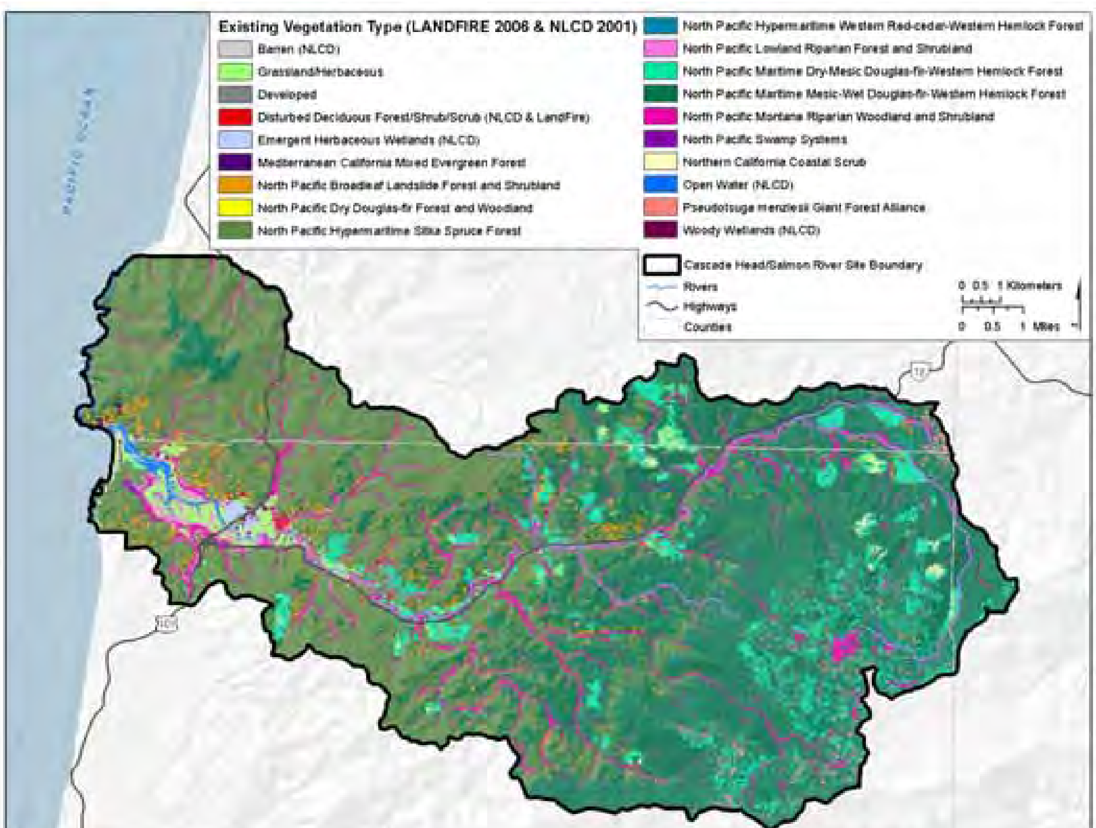


Figure 5. Current vegetation types in the Salmon River planning area.



Prairie and Saddleback Mountain, are found here. Also in this area is the H.B.Van Duzer Forest State Scenic Corridor, administered by Oregon Parks and Recreation Department, which includes 460 acres in two linear parcels ranging from 400 to 1,000 feet wide on either side of Highway 18, along the Salmon River main stem. The corridor was purchased when the highway was built in 1939 prior to logging of the area.

This planning effort builds upon the important conservation work already completed or ongoing in the Salmon River planning area. Conservation in this area has benefited from a number of historic designations, in addition to the ones cited above. The Siuslaw National Forest was established in 1908. Within this National Forest, nearly 12,000 acres were designated as an Experimental Forest in 1934. The Cascade Head Scenic Research Area (CHSRA) was established over an area of nearly10,000 acres in 1974 to provide present and future generations with the use and enjoyment of this area, and to ensure the protection and encourage the study of this significant place. As mandated in the CHSRA management plan, the Siuslaw National Forest and other partners have been removing dikes in the estuary over the past 30 years to restore natural salt marsh habitat and important estuarine function. This restoration work has resulted in a number of ground-breaking studies documenting how marshes recover following dike removal (Frenkel & Morlan 1991) and how juvenile salmon use the restored marshes (Gray et al. 2002).

Among recent or ongoing activities in the basin are:

- The Forest Service continues to lead estuary restoration efforts as detailed in the Lower Salmon River Project restoration plan (Anderson et al. 2006). They have also assessed roads and culverts on their ownership and have begun replacing problem culverts.
- Private commercial timberland owners have spent hundreds of thousands of dollars annually to voluntarily implement a number of conservation projects on their lands, including:
  - stream improvements such as:
    - removing fish barriers
    - putting large logs in streams
    - full-width buffers
    - planting riparian trees
    - pulling out roads
  - placing fish carcasses in streams
  - improving road surfaces to reduce erosion and sedimentation
  - implementing Oregon Plan guidelines for forest streams, and
  - establishing conservation easements on ecologically significant parcels in other coastal watersheds.
- The MidCoast Watersheds Council conducted a watershed assessment in 2000 and did a Rapid Bio-Assessment in 1999. They also worked with Cascade Head Ranch Water District to make fish passage improvements on Crowley Creek.

- The Salmon Drift Creek Watershed Council has been doing water quality monitoring on the Salmon River since 2004, sponsored a Hire the Fishers project to plant trees and control competing vegetation, and assisted with a restoration project on Crowley Creek in partnership with the Sitka Center for Art and Ecology as well as others. The Council also assisted with the Lower Salmon River Project planning and are working with the Forest Service to implement high priority restoration projects recommended in that plan.
- The Nature Conservancy has conducted prairie restoration research and implemented prescribed burns and weed control efforts to restore the prairie habitat on their preserve. Since 1998, they have partnered with the Oregon Zoo and others to help supplement the Oregon silverspot butterfly population at Cascade Head through a captive rearing program. They also conduct regular monitoring of the butterfly and rare plants.

- Camp Westwind was recently purchased by the private non-profit Westwind Stewardship Group. In keeping with one component of their mission, to conserve the ecosystem of the camp, they developed the Westwind Site Conservation Plan and are upgrading their trails and roads and making other adjustments to minimize negative impacts.

- ODOT retrofitted the culvert under Highway 18 at Alder Creek in 1998 to facilitate fish passage and they are currently working with the Siuslaw National Forest to restore connectivity of Fraser and Salmon Creeks to the estuary.
- PISCO has a number of ongoing nearshore research and monitoring projects within the marine system planning area including: temperature, chlorophyll, currents, invertebrate populations and recruitment, and kelp forest monitoring (including fish & benthic community assemblages). Information on these and other special research projects can be found on the PISCO website: www.piscoweb.org/research

In combination, these activities have conferred great benefits to the Salmon River area, sustaining natural ecological systems and the human communities and activities dependent on them. However, increasing population and recreation pressures, demands for timber resources, invasive species and climate change together pose formidable threats to the vitality of natural and human systems in the Salmon River area. This planning exercise aimed to outline critical strategies to conserve and sustain this important area in light of the pressures it faces.

2) Planning for Conservation

Planning Goal

At its first official meeting, the planning team established the following conservation goal for the Salmon River planning area:

Within the context of an economic and culturally vibrant working landscape, restore or maintain ecologically functional (not "pristine") systems that support the full range of native biodiversity found in the Salmon River watershed and nearshore marine environment.

Planning Participants and Teams

The group convened to develop the Salmon River Conservation Plan consisted of a diverse group of partners representing a range of interests and institutions including conservation organizations, academics, federal and state land and resource management agencies, and industrial and commercial resource groups.

To function most efficiently and effectively, participants were divided into different teams, which worked collaboratively on different aspects of the plan. The Core Planning Team was responsible for providing strategic expertise and guidance; reviewing and refining draft analysis products from technical teams; identifying stakeholder issues that needed to be considered in the planning process; providing perspective and advice on strategic priorities for watershed restoration action plan implementation; formulating conservation strategies; and, carrying the final product back to landowner/stakeholder communities.

Technical Teams were established around each of the selected targets. These teams provided technical input and support for the planning process primarily through the health and impact assessments. Thus, their input provided the context and technical underpinning leading to the identification of strategies by the planning team. They also were asked to review and refine the final report.

Conservation in the Salmon River Context

During the first core planning meeting, participants arrived at a list of concepts and ideas that informed the group's collective planning work. Together, they agreed on the following features and definition of "conservation" in the Salmon River planning area:

- Manage, not simply static. (Conservation does not preclude active management and intervention. In fact, in today's world, conservation most often requires management prescriptions to sustain natural processes.)

- Different activities in different areas. (Conservation will require site-specific actions and accommodate different management goals in different areas.)

- Preservation often requires active management; does not mean "lock it up". (Conservation can be accomplished within the context of sensitive and appropriate commercial enterprises with willing landowners; it does not always require that tracts of land be permanently set aside.)

• Identify desired outcomes and manage to them. (Conservation will require different goals and objectives in different areas, and management activities will be designed to achieve these various objectives.)

• Function: ecological, social, economic. (Conservation should focus on restoring natural processes and ecological services that provide the foundation for social and economic concerns)

• People. (Humans are an integral part of the planning area. Conservation actions need to recognize that a sustainable, ecologically functional Salmon River area is key to providing humans with the economic and social resources that make the place special.)

• Maintain. (Conservation, at a minimum, should prevent degradation of the current conditions and ensure that good ecological functioning persists into the long-term future.)

• Urban/Rural Interface – area of focus as we move through this process. (Conservation in the Salmon River context will require specific attention to rural communities and their relationship to the land and water resources.) While the focus of this planning effort was at the watershed scale, it was recognized that this area functions within a larger ecological landscape and social framework.

Planning Methods

The Salmon River planning process utilized and adapted The Nature Conservancy's Conservation Action Planning (CAP) methodology to guide the work of the planning team.

CAP is The Nature Conservancy's approach to developing effective conservation strategies (Parrish et al. 2003). Details about the CAP approach may be found at: **www.conservationgateway.org**.

The Salmon River planning process included six major steps, adapted from the Conservancy's CAP approach. Each step is detailed in later sections of this report and is also captured in greater depth in an associated Excel workbook:

Step 1: **Identification of Targets** (the specific resources on which the planning effort will focus). (Section 3)
Step 2: **Determination of Target Health** (the current status of each target and whether or not that status is within an acceptable range of variation). (Section 4)
Step 3: **Identification of Impacts** (factors that are expected to harm or impair targets in the future). (Section 5)
Step 4: **Assessment of Situation Factors** (including indirect causal factors, stakeholders and drivers) influencing the Impacts and Target Health. (Section 6)
Step 5: **Selection of Conservation and Restoration Actions** (activities and projects that may be undertaken to abate priority Impacts and improve Target Health). (Section 7)
Step 6: **Development of Monitoring Plan** (approach to tracking target health and the effects of conservation actions in the future). (Section 8)

3) Identification of Targets

Target Selection Process

The first step in the Salmon River planning process was the selection of targets, the specific resources upon which the planning effort would focus. Selection of the targets was a critical and pivotal first step, as they would be the center of subsequent planning exercises and become the focus of the Salmon River plan. Ultimately, all conservation and restoration activities would be tied to or directed at sustaining and enhancing these targets within the Salmon River planning area.

The Salmon River core planning team selected five target ecosystems that were believed to encompass and represent the natural resources in the planning area. The five target systems identified by the planning team were:

- Sitka Spruce/Western Hemlock and Douglas-Fir/Western Hemlock Forest Systems
- Freshwater Systems
- Salmon River Estuary System
- Nearshore Marine System
- Prairie Systems

A generalized map of where the target systems, and key species nested within these system targets, occur is presented in Figure 6 (terrestrial targets) and Figure 7 (marine target).

Figure 6. Salmon River planning area approximate locations of terrestrial planning targets.

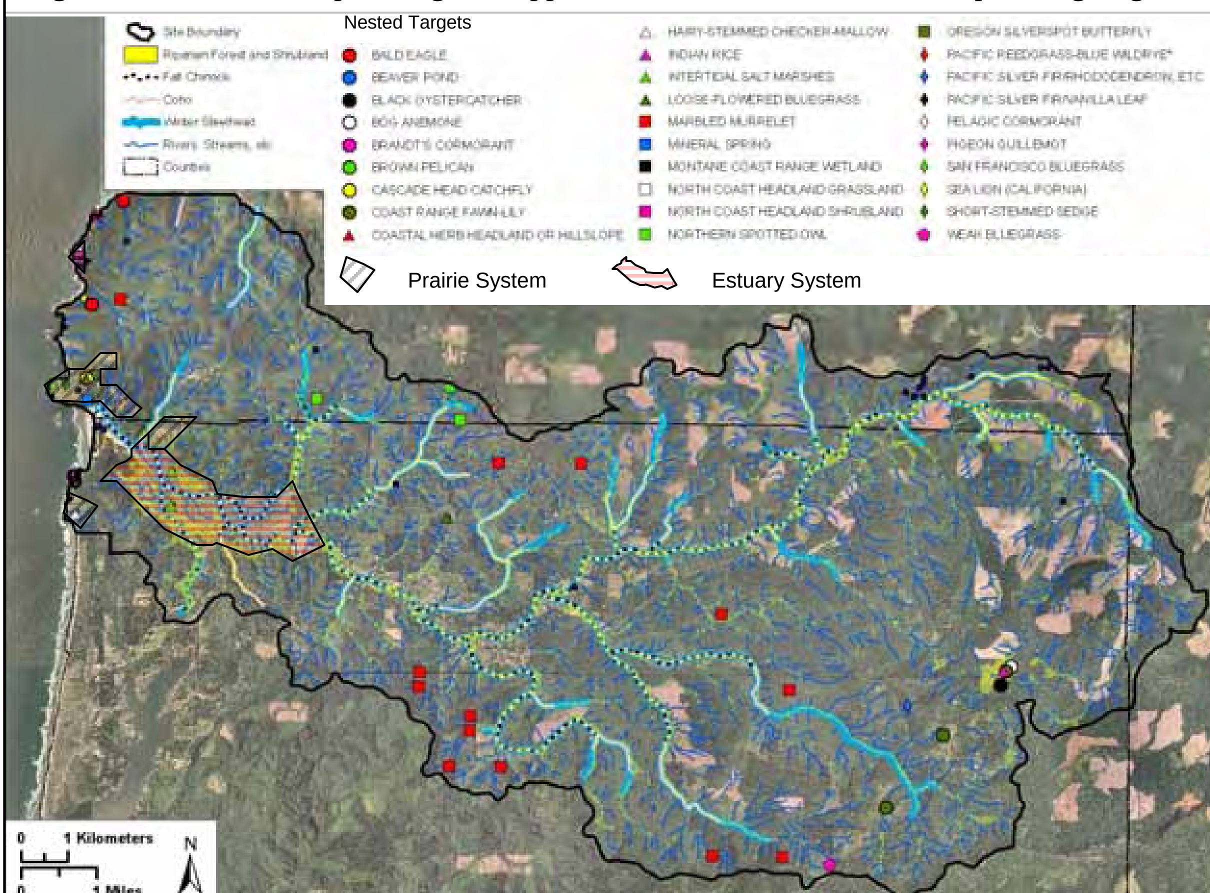
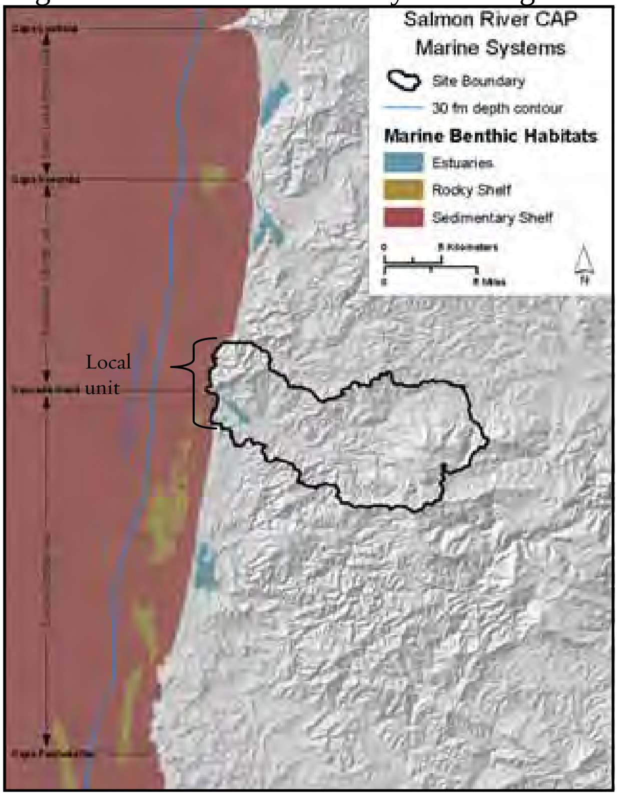


Figure 7. Nearshore Marine System Target



Figures 8-9 & 11-14 provide conceptual ecological models developed by the technical teams for each target.

Sitka Spruce/W. Hemlock and Douglas-Fir/W. Hemlock Forest Systems

Historically, forests covered almost the entire Salmon River planning area, from Coast Range Douglas-fir ridgetops, to Sitka spruce bottomland forests, and along the tidal channels in the estuary. The Sitka Spruce/Hemlock forest system generally occupied lands near the coast, where salt spray and ocean winds precluded the establishment of Douglas-fir. About seven miles inland, the influence of the Pacific Ocean on local climate conditions is lessened sufficiently to allow Douglas-Fir/Hemlock forests to prevail. Across the landscape, both

Figure 8. Sitka spruce/Western Hemlock Forest Ecological Model

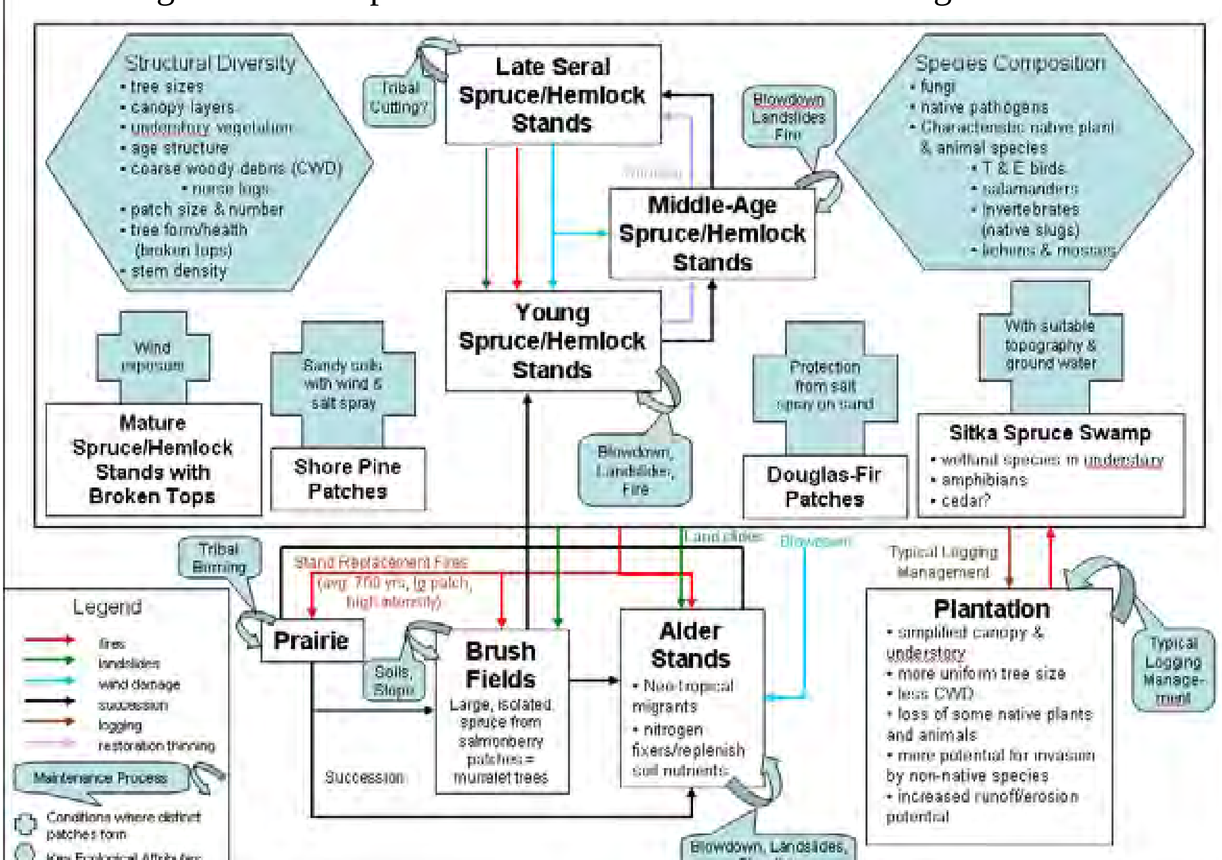
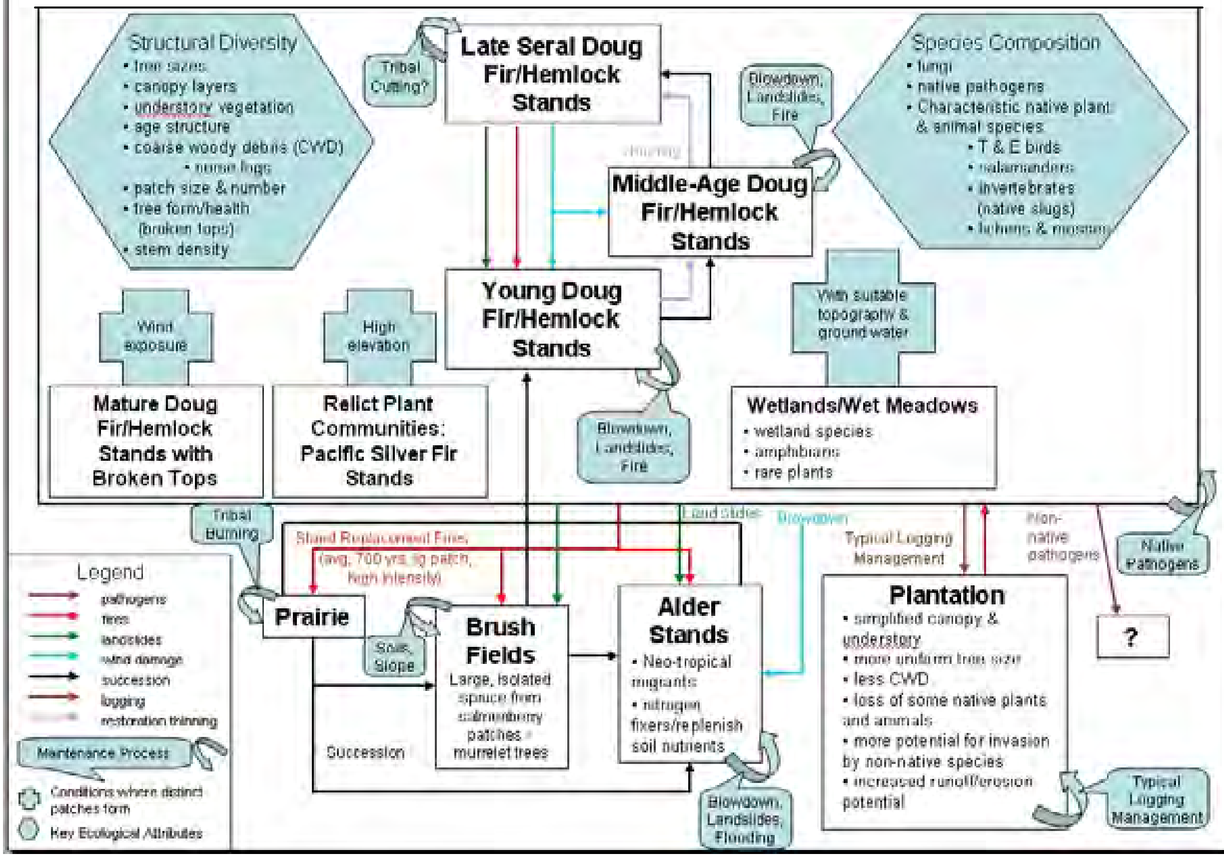


Figure 9. Douglas-Fir/Western Hemlock Forest System Ecological Model



forest types were characterized by diverse aged stands, with a dominance of old growth forest type (Spies et al. 2007). This diversity

of forest age classes was a product of natural disturbance events such as windthrow, disease, pathogens, and, on very rare occasions, fire (Teensma et al. 1991). Uneven-aged forest patches created a wide variety of forest community types supporting a range of species, each dependent on a unique combination of resources found in the forest matrix.

Nested seral stages and communities within the Sitka Spruce/Hemlock forest systems include late, middle and early seral Spruce/Hemlock stands, mature Spruce/Hemlock stands with broken tops, Douglas-fir patches, Sitka spruce swamps, brush fields and alder stands (Figure 8). In the Douglas-fir/Hemlock forest systems, nested seral stages and communities include late, early and middle-seral stands, mature fir/hemlock with broken tops, relict Pacific Silver fir stands, wetland and wet meadows, and alder stands (Figure 9). Key species and species groups within the forests include fungi, native pathogens, and characteristic plant and animal species such as the Northern spotted owl, marbled murrelet, bald eagle, salamanders, invertebrates, lichens and mosses.

Today, forests occupy 98% of the planning area. However the upper watershed is dominated by primarily young plantation forests and the lower watershed is dominated by uneven-aged forests on federal lands under long-term management to create late successional reserves under the Northwest Forest Plan (USDA and USDI 1994) (Table 1; Figure 10). It is expected that within 50 years continued management of these lands for present goals will result in a paucity of structurally diverse early and mid-successional forest types (Spies et al 2007), a concentration of late successional forests in the lower watershed, and little late successional forests in the upper watershed.

Figure 10. Forest succession classes in the planning area.

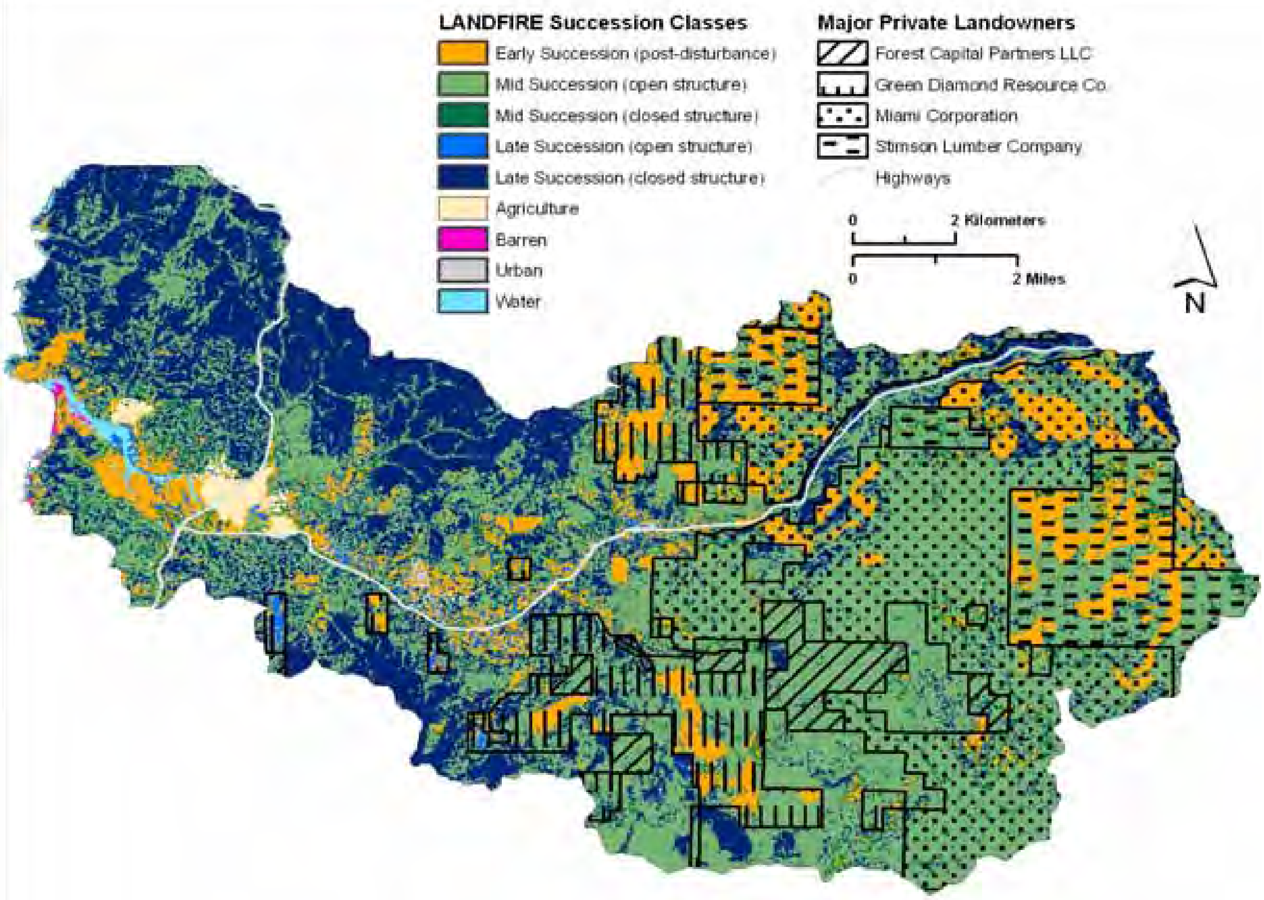


Table 1. The relative amount of forest succession classes in the Salmon River planning area. (Data from LANDFIRE database) (USDA Forest Service 2006)

Succession Class	Description	Acres	Percentage of Planning Area
Succession Class A	Early Succession (post disturbance)	7,227.90	14.08
Succession Class B	Mid Succession (open structure)	26,178.64	50.99
Succession Class C	Mid Succession (closed structure)	2,406.26	4.69
Succession Class D	Late Succession (open structure)	908.69	1.77
Succession Class E	Late Succession (closed structure)	13,631.62	26.55
Total	All Forest Classes	50,353.11	98.08

Forest systems face a variety of issues in the coming decades. Invasive species and pathogens threaten to reduce understory diversity and forest productivity. Roads, development, and infrastructure may fragment and reduce large areas of continuous forest habitats. Management practices on public and private timberlands may reduce age structure and understory diversity. Climate change threatens to alter species composition and forest productivity and resilience.

Freshwater Systems

The freshwater system encompasses the full range of associated communities from the headwaters of the Salmon River in the Coast Range to the estuary including: the 25-mile long main stem and 11 tributary streams, riparian habitats, floodplains, in-stream habitats, associated and isolated wetlands, and seeps and springs. In addition to streams in the Salmon River watershed proper, streams that fall within the planning area but drain directly into the ocean or into the Neskowin Creek drainage (i.e. those that fall within the Cascade Head Scenic Research Area boundary) were included. In the Salmon River planning area, headwater streams are typically steep-gradient fishless systems in narrow valleys, with frequent large wood and rocky substrates. These systems are important sources of sediment, wood, nutrients, and food for downstream ecological communities, which receive these inputs primarily during large flow events. Downstream tributary systems are typically found in moderately steep to very steep valleys, feeding into the low gradient Salmon River main stem. Within larger streams and tributaries, multiple freshwater community types occur, including riparian forests and wetlands, riffles and gravel beds, pools and side channels, and floodplain wetlands. These areas are important habitats for key biota and processes such as amphibian breeding, native fish and lamprey rearing and spawning, and native invertebrate, snail and mussel feeding.

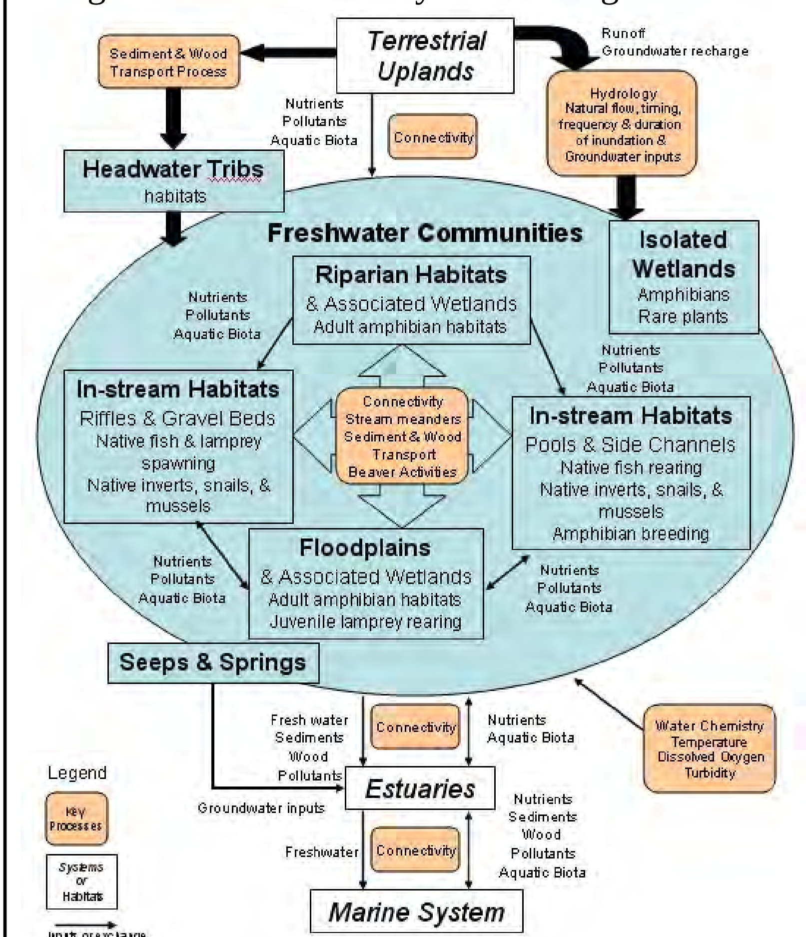
Isolated wetlands host native amphibians, such as red-legged frogs, and rare plant communities. A prime example of this type of wetland is the Lost Prairie ACEC, located at the headwaters of the Salmon River just below Saddleback Mt. This peat-based wetland supports a population of the rare

elegant fawn lily, *Erythronium elegans*, and the southern most occurrence of the Kamchatka fritillary, *Fritillaria camschatcensis* (Flora of North America website). Such wetlands are dependent on maintenance of the local hydrologic regime, particularly recharge zones that provide the groundwater needed for year-round moisture.

Freshwater rivers and streams are conduits of energy, food, nutrients, substrate and wood from the upper basin to the estuary, and, ultimately, nearshore marine system (Figure 11). Conversely, the marine and estuary systems are reverse channels of food, nutrients, biota and energy supplies to freshwater systems. This feature of natural systems makes connectivity among water environments of the Salmon River planning area especially critical. In particular, the annual up and down river migrations of lamprey and salmon are dependent on barrier-free access to all naturally accessible parts of the Salmon River freshwater system.

In the planning area, freshwater systems face numerous challenges. Virtually all streams and rivers have been disconnected by non-natural barriers such as roads, culverts, small dams and diversions. Large woody debris has been removed from most systems, resulting in a loss of in-stream pool, backwater and woody habitats critical for native invertebrates and fishes. Historic hunting of beaver caused very significant effects on wetlands and off channel habitat for fish. Land uses that result in abnormally high amounts of fine sediments can negatively impact salmon spawning areas and egg survival. Water withdrawals are increasingly reducing flow volume, particularly during late summer when flows are naturally low. Stream water temperatures may be unusually warm, inhospitable to native fishes accustomed to colder water. The main stem has unacceptably low levels of dissolved oxygen during periods of the year, possibly resulting from a chain of events that begins with leaky septic systems or agriculture and lawn nutrient runoff into the system.

Figure 11. Freshwater System Ecological Model



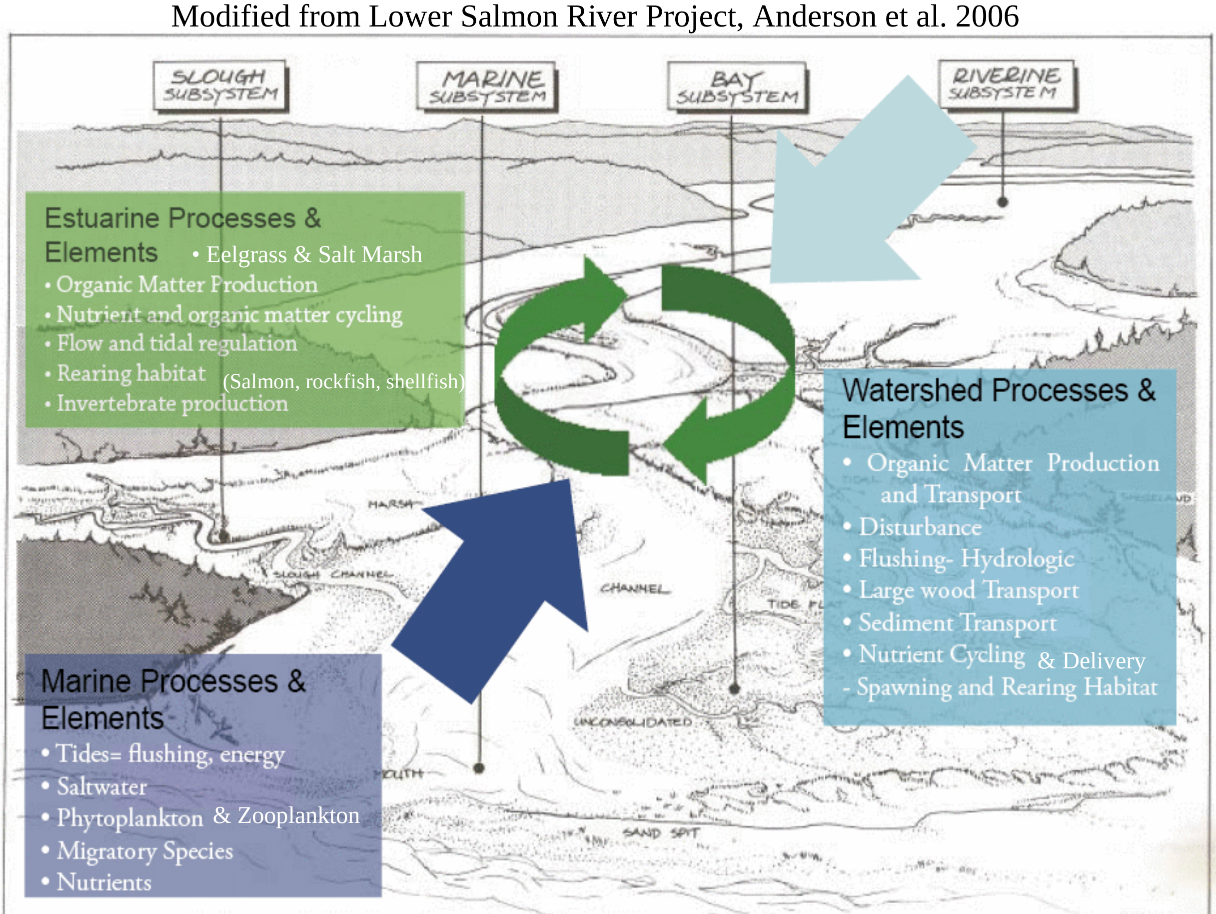
Estuary

The Salmon River estuary system encompasses approximately 900 acres at the lower end of the Salmon River, and is roughly bounded by the head of tide (about where Old Scenic Highway 101 crosses the river near Otis) in its uppermost extent, and the sand spit in its lowermost extent. The estuary is a drowned river mouth system, in which freshwater flows dominate during the winter and saltwater dominates during the summer when river levels are lowest. During the 1960s and 70s, approximately 2/3 of the estuary was diked and drained primarily for grazing and agriculture production. Prior to the diking, marshes in the estuary had been pastured and hayed for 60-70 years. Highway 101 was built in 1961 effectively acting as a dike that cut off about 15% of the upper estuary from regular tidal inundation (Anderson et al. 2006). Following designation of the Cascade Head Scenic Research Area in 1974, most of the original estuary has been restored, with plans underway to restore much of the remaining portions.

The estuary consists of a complex array of eelgrass and salt marshes, mudflats, tidal channels, freshwater marshes, and open water habitats (Figure 12). Daily and seasonal shifts in currents and freshwater flows create a system in constant flux in regards to flows, temperature and salinity. These regular fluctuations establish and foster extraordinarily productive habitats upon which estuarine, freshwater and saltwater species have grown to depend.

Figure 12. Estuarine System Ecological Model

Modified from Lower Salmon River Project, Anderson et al. 2006



Nested species and community targets within the estuary system include salmon, rockfish, herring, shellfish, phytoplankton, zooplankton and migratory species. Estuarine habitats are particularly critical as spawning and rearing habitats for numerous species of fishes and crucibles for invertebrate production. Salt marshes provide an important source of detritus, dead plant material, which forms the base of the estuarine food web.

The estuary system is threatened by roads, invasive species, pollution from upstream sources, overfishing and overharvesting, recreation, ditching and diking, and climate change.

Nearshore Marine

The *Oregon Nearshore Strategy* (ODFW 2005a) defines the nearshore as the area from the coastal high-tide line offshore to the 30 fathom (180 feet or 55 meter) depth contour, which extends approximately three miles from shore. This definition was used to delineate the offshore extent of the nearshore marine system included in the planning area. The long shore extent was bounded by the furthermost extent of two littoral cells, the northernmost one circulating between Cape Kiwanda and Cascade Head (Neskowin Littoral Cell), and the southernmost between Cascade Head and Cape Foulweather (Lincoln Littoral Cell) (Figure 7). In addition, we identified a more localized (sub-littoral cell) unit between and including the Cascade Head and Road's End headlands.

The nearshore system captures nested communities of coastal dunes (Figure 13), sea cliffs, sandy beaches, rocky intertidal zones, offshore rocks and islands, soft sub-tidal substrates, rocky sub-tidal zones and reefs, and the water column and surface water habitats (Figure 14). These zones and communities host key species and critical habitats such as peregrine falcons, seabirds, rare plants (sea cliffs); snowy plover and rare plants (dunes); shorebirds, marine mammals and bivalves (sandy beaches); seabird nesting colonies and marine mammal haul-outs (offshore rocks and islands); Dungeness crab, bivalves, sand dollars, lingcod rearing habitats (soft bottom sub-tidal); invertebrates, algae and kelp, shorebirds, marine mammal haul-outs (rocky intertidal); and rockfish habitat, pacific lamprey, kelp beds (rocky sub-tidal and reefs).

The nearshore system of the Salmon River planning area is increasingly under pressure from commercial and recreational fishing, habitat loss and degradation posed by recreational activities ranging from trampling of tidepools to recreational boating, and the impacts of global climate change.

Figure 13. Sand Dune Spit System Ecological Models

Top – Landscape context; Bottom – Profile Disturbance Regimes

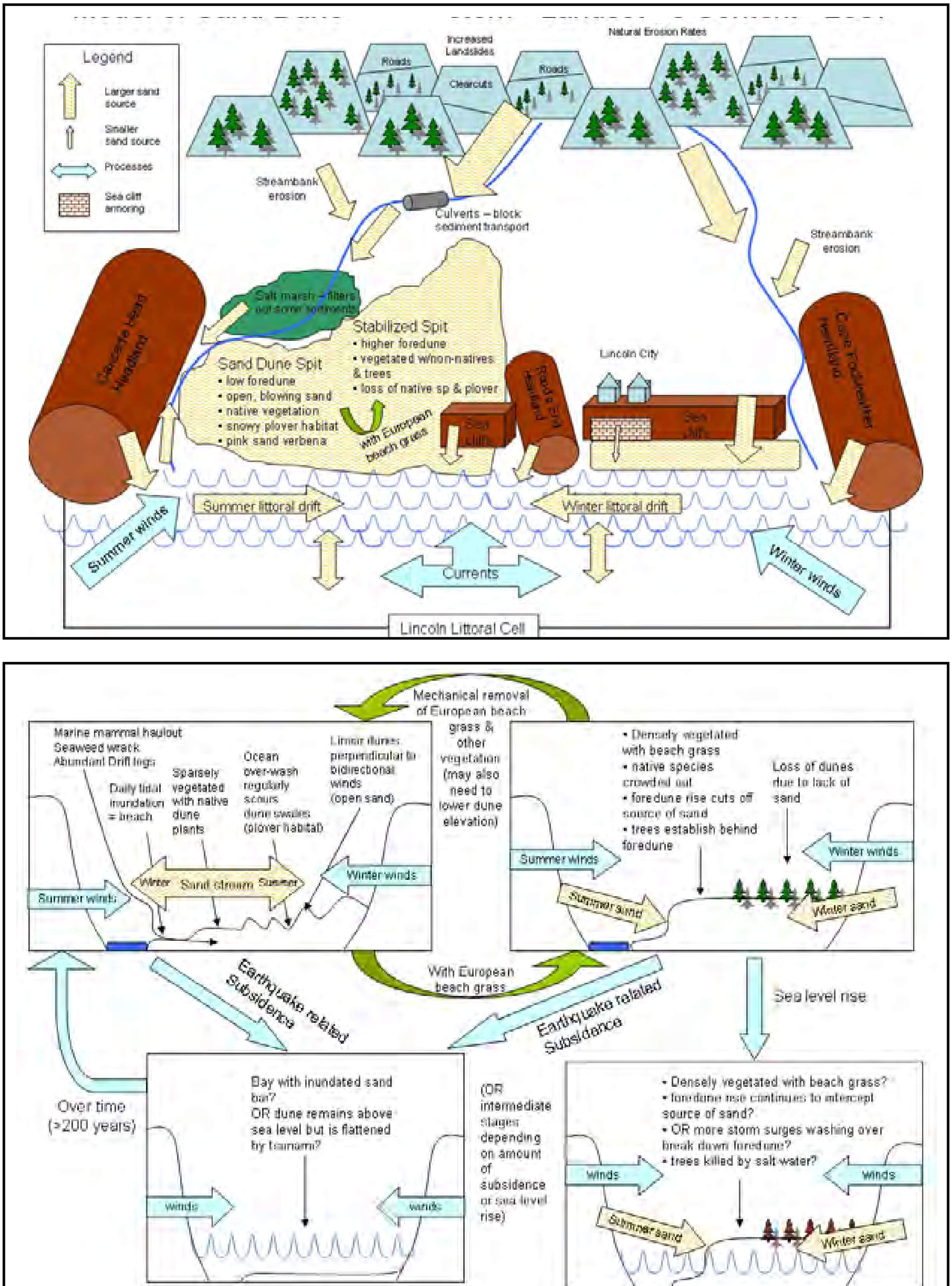


Figure 14. Nearshore System Ecological Model

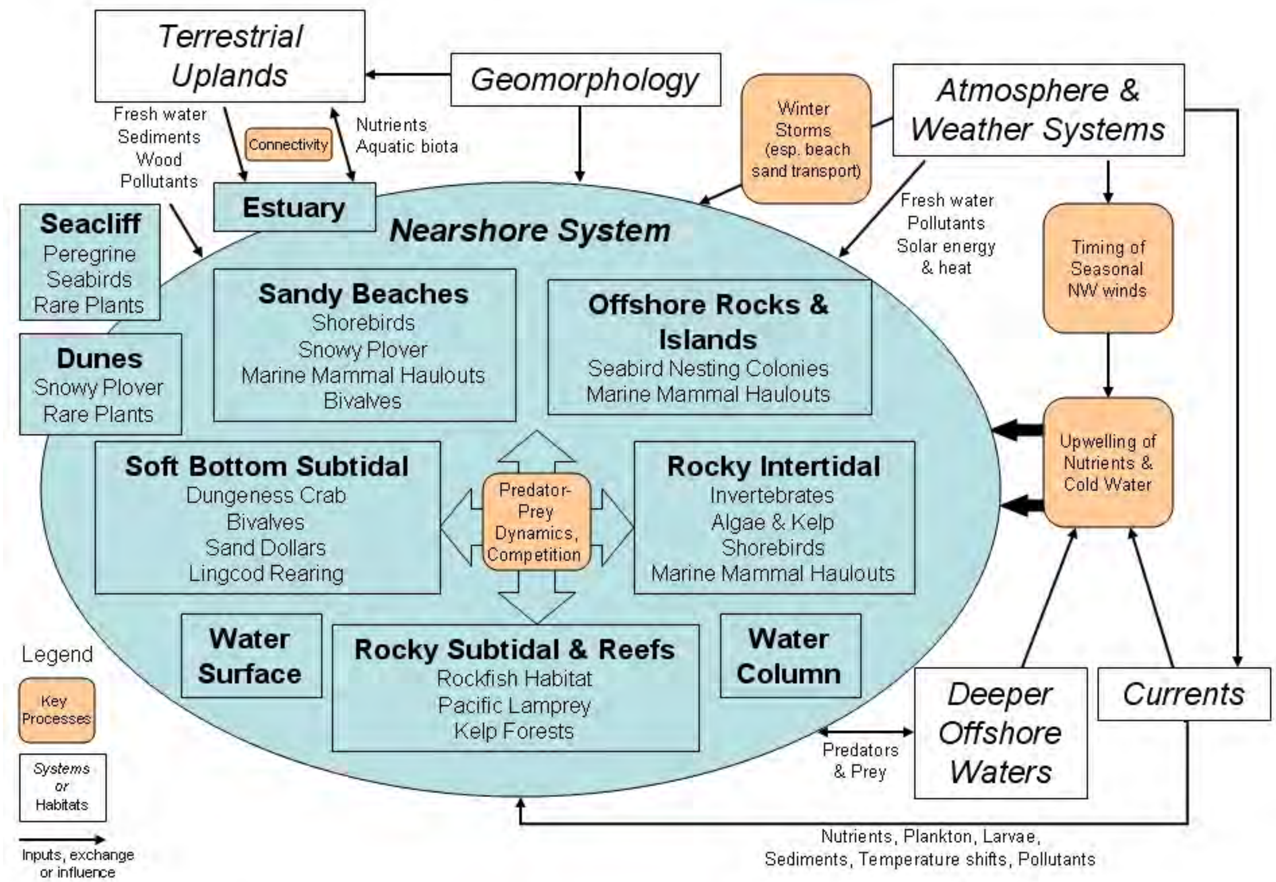
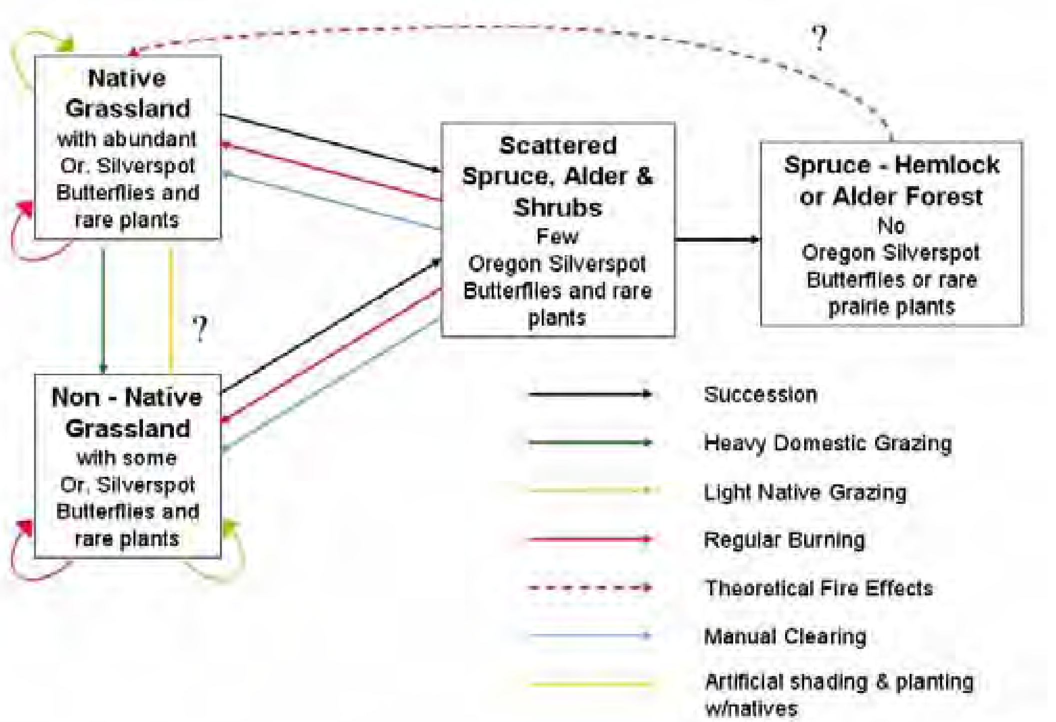


Figure 15. Prairie System Ecological Model



Prairie

Prairie systems of the Salmon River planning area are few and isolated. However, a premier example of coastal prairie exists within the watershed at The Nature Conservancy's Cascade Head Preserve, a 270 acre ecological preserve largely occupied by remnant prairie. Other, more degraded examples of prairie systems in the planning area are found at Road's End headland, Hart's Cove headland, and areas bordering the estuary that have remained open due to historic grazing management.

Nested within the prairie target are the Oregon silverspot butterfly, *Speyeria zerene hipplyta*, and two rare plants: the Cascade Head campion, *Silene douglasii oraria*, and the hairy checkermallow, *Sidalcea hirtipes*. The prairies also provide grazing areas for deer and elk herds, nesting areas for prairie birds such as savannah sparrows, and foraging areas for Northern harriers and red-tailed hawks who feed on the abundant and diverse small mammal populations found there.

Prairie systems are dependent upon regular burning and light native grazing for long-term maintenance (Figure 14).Without these

disturbances, spruce, alder and shrubs invade the grasslands, eventually growing into a spruce-hemlock or alder forest system. At Cascade Head, domestic grazing provided another type of disturbance that kept some of the historic grasslands open by preventing tree and shrub encroachment, but at the same time the cattle and sheep brought in non-native grasses that degraded the quality of the grassland.

With only a few examples of coastal prairie remaining, the greatest threat facing prairie systems is lack of protection and conservation management with regular fire. These systems have become increasingly rare and isolated from one another over the past 100 years

resulting in problems of connectivity and dispersal. At Cascade Head, invasive species, trampling by recreational hikers, and climate change are also significant concerns.

4) Determination of Target Health

Health Assessment Process

Following selection of the five focal conservation targets, the core planning and technical teams sought to ascertain the current health of the targets. This process was akin to a doctor selecting a set of tests to evaluate his/her patients' health: identifying the optimal, or desired, test results; administering the tests to each patient; and then providing each patient with an overall health scorecard. The health assessment allowed the planning team to determine which targets were in better or worse condition, and, consequently, which were in need of priority conservation action. The process of developing health assessment evaluation criteria also laid a framework for measuring the health of the targets over time.

The health assessment for the Salmon River planning area targets began by developing health evaluation criteria for each target. The first step in developing the criteria is identifying Key Ecological Attributes (KEAs), the features of each system that are required for that target to persist over the next 100 years. Each KEA was then assigned an Indicator, a measure of the status of the KEA (for example, one KEA for the freshwater system target was "connectivity" and the indicator for that KEA was "% of total basin stream length blocked by road crossings, dams, culverts or other artificial blockages"). Using the best available scientific information and expert knowledge, the teams determined an acceptable range of variation (the range of conditions that are thought to be suitable for long-term persistence of the target) for each indicator, and used this information to define what could be considered the "good" ranking criteria. Nature Conservancy staff used this as a starting point to then assign indicator values into the rest of the following four indicator rankings:

- poor – the indicator value was outside the range of acceptable variation and required substantial conservation action to restore it to an acceptable condition, if it could be restored at all;
- fair – the indicator was outside of an acceptable range of variation and required human intervention to return it to acceptable limits;
- good – the indicator was within an acceptable range of variation and limited conservation intervention was required for maintenance of the target within acceptable limits;
- very good – ecologically desirable status and very little or no intervention required for maintenance.

Health Assessments per Target

Tables 2-6 summarize the Attributes and Indicators that the teams identified for each target along with a definition of the good ranking criteria and current status when data were available to estimate this. The indicators and attributes for each target were developed through a combination of Technical Team input, literature searches, health assessment tables from other CAP plans with similar targets, and feedback from the Core Team. The primary source of information used to set each indicator, the good ranking value, and current status rating are cited in parentheses and italics under each entry.

Sitka spruce/hemlock and Douglas-fir/hemlock Forest Systems

To define the health of the forest system focus was primarily on the size of characteristic communities, species composition, physical structure, insects/pathogens, and connectivity. For the size of each of the overall forest communities, a benchmark from the Oregon Department of Forestry's Sustainable Forests Indicators was used (ODF 2007a). We also wanted to make sure that smaller patch communities such as Sitka spruce swamp (see model; Figure 8) and characteristic seral stages were represented. Recent articles resulting from the Coastal Landscape Analysis and Modeling Study (CLAMS) provided us with many of the indicators used for the species composition attributes (especially for diverse early/mid seral stands) as well as indices they developed for rating the structural components of old growth, patch type diversity, and connectivity (Spies et al 2007). They also provided estimates of the historic range of variability in the percent of the coast range landscape that was in different age classes, which informed our rating criteria for the frequency of seral stages indicator (Spies et al 2007, Wimberly et al. 2000). Data are not yet available or have not been analyzed to provide a current status for many of these indicators. However some of them we might be able to get the CLAMS team to summarize for our planning area and others may be determined through GIS analyses that we have not yet had time to complete.

Table 2. Forest System Health Assessment

Key Attribute	Indicator *(Source)*	"Good" Condition *(Source)*	Current Status Rating *(Source)*
Connectivity	juxtaposition index score for the planning area *(Spies et al. 2007)*		
Connectivity	road density *(Technical Team Recommendation; Reeves et al. 2004)*	< 2 mi/mi^2 and no valley bottom roads *(NOAA Benchmark {PFMC 1999})*	Poor: avg. 4.6 *(MidCoast 6th Field Assessment 2002)*
Infestations and pathogens	long-term trend in the extent or severity of insects, disease or pathogens across forest lands in the planning area	The 3 year running mean over the past 5 years of aerial survey data shows a level or declining trend *(Consultation with Dave Shaw)*	Good *(ODF 2007b)*
Physical structure of ecological communities & seral stages	weighted (by block size) Old Growth Habitat Index (OGHI) score for late seral stands across the planning area	average OGHI score for late seral stands ranges from 70-79 *(Spies and Pabst 2002)*	
Species composition/ abundance	number of spotted owl pairs in late successional reserves in the planning area *(Technical Team Recommendation)*	the number of owl pairs equals the capacity of the NWFP late successional reserves in the Salmon River Planning area - 5 pairs *(USDA and USDI 1994)*	Fair: 3 pair *(ONHIC data 1996)*
Species composition/ abundance	trend in marbled murrelet habitat area *(USDA and USDI 1994)*	stable or increasing *(USFWS 1997)*	*(Huff et al. 2006 data)*

Table 2. Forest System Health Assessment (cont.)

Key Attribute	Indicator *(Source)*	"Good" Condition *(Source)*	Current Status Rating *(Source)*
Species composition/ abundance	percent of planning area forest lands dominated by invasive species understory	< 5% *(Technical Team Recommendation)*	
Species composition/ abundance	plantation forest species composition (type and genetics of trees planted) *(Technical Team Recommendation)*	species mix approximates species composition appropriate for each site, with seedling stock grown from local genetic sources in 90% of the plantations in the planning area *(Technical Team Recommendation)*	Good *(Team opinion)*
Species composition/ abundance	presence/abundance of animal species characteristic of early/mid-seral stands *(Technical Team Recommendation)*	50- 70% of early/mid seral stands support appropriate numbers of W. bluebirds, olive-sided flycatchers, & red tree voles *(Spies et.al. 2007)*	
Species composition/ abundance	presence/abundance of plant species characteristic of early/mid seral stands *(Technical Team Recommendation)*	70-90% of early/mid seral stands have widespread distribution of moderate mobility lichens (e.g., epiphytic macrolichens in the genera of Platismatia & Hypogymnia) *(Spies et.al. 2007)*	
Species composition/ abundance	presence/abundance of plant species characteristic of late seral stands *(Technical Team Recommendation)*	70-90% of late seral stands have widespread distribution of late seral herbs, lichens and mosses *(McCune 1993; Halpern and Spies 1995)*	
Size/extent of characteristic communities	acres of Sitka spruce swamp, high-elevation fir, hardwood patches, and wetlands &/or Patch Type Diversity Index score *(Spies et.al. 2007)*	no net loss of characteristic communities *(Technical Team Recommendation)*	
Size/extent of characteristic communities	amount of late seral forest (OGHI>50) *(Spies and Pabst 2002)* in stands greater than 600 acres in size (or use the largest patch index?)	50- 70% of mature growth (OGHI>50) is in 600 acre or greater size stands *(Spies et al. 2007)*	Good (65%) *(USDA Forest Service 2006)*
Size/extent of characteristic communities	amount of planning area in forest land use and contiguous Douglas fir forest blocks greater than 640 acres *(ODF 2007a)*	> 95% of baseline (1974) *(ODF 2007a)*	
Size/extent of characteristic communities	amount of planning area in forest land use and contiguous Sitka spruce forest blocks greater than 640 acres *(ODF 2007a)*	>95% of baseline (1974) *(ODF 2007a)*	
Size/extent of characteristic communities	proportion of planning area in different seral stages (early, mid, late, plantation) *(Tech. Team Recommendation; Reeves et al. 2004)*	At least 40% of the planning area is in late seral condition and 15-40% in diverse early or mid seral *(Spies et al. 2007; Wimberly et al. 2000)*	Fair to Poor (28% late) *(USDA Forest Service 2006)*

Freshwater System

Factors that are key to the health of this system include maintaining enough clean water in the system, ensuring that organisms, energy, wood, nutrients, and sediments are able to move unimpeded through the system, and ensuring the structure of the habitats in the system are sufficient to sustain healthy fish populations. The indicators and ranking criteria we used came from a variety of sources including the Forest Service, the Coastal Landscape Analysis and Modeling Study (CLAMS), Pacific Fishery Management Council (1999), and the Oregon Coastal Coho Assessment (ODFW 2006) as well as expert opinion represented by our Tech Team. For the water quality indicator, Oregon Dept. of Environmental Quality (DEQ) developed an index that analyzes a defined set of water quality variables (temperature, dissolved oxygen, bio-chemical oxygen demand, pH, total solids, nitrogen, total phosphorus, and e. coli) to produce a score describing general water quality (Cude 2001).

Table 3. Freshwater System Health Assessment

Key Attribute	Indicator *(Source)*	"Good" Condition *(Source)*	Current Status Rating *(Source)*
Connectivity	% of total basin stream length blocked by road crossings, dams, culverts, or other artificial blockages	5-15% *(Technical Team Recommendation)*	
Connectivity	presence of a thermal barrier in the lower main stem that prevents migration/movement of fishes into main stem from estuary during warm periods *(Technical Team Recommendation)*	no thermal barrier occurs on the main stem (7 day moving mean of daily summer max temp is less than 20° C) *(Keefer et al. 2008)*	Good (summer max <19°C) *(SDCWC monitoring data 2006)*
Hydrologic/ mixing regime	five year running mean # days/year that flow levels in the main stem fall below in-stream flow rights for Salmon River	<5 days/year *(Technical Team Recommendation)*	
Hydrologic/ mixing regime; Sediment dynamics and geomorphology	% of forest roads in watershed that meet Forest Service road criteria *(USDA Forest Service 1999)*	70-90% *(Technical Team Recommendation)*	
Sediment dynamics and geomorphology	amount of planning area that is at high risk for accelerated erosion (percent of CLAMS delivery-weighted debris torrent model high-risk areas potentially impacted by timber harvest)	Less than half of the high risk areas for debris torrents are likely to be logged *(Technical Team Recommendation)*	Fair (61-72%) *(CLAMS model & GIS land use analysis)*
Sediment dynamics and geomorphology	% of assessment units meeting "good" large wood rating by NOAA/NMFS standards (i.e., >80 key pieces > 24" in diameter and >50' in length per mile of stream) *(PFMC 1999)*	50-75% of assessment units	

Table 3. Freshwater System Health Assessment (cont.)

Key Attribute	Indicator *(Source)*	"Good" Condition *(Source)*	Current Status Rating *(Source)*
Sediment dynamics and geomorphology	% of depositional stream reach assessment units where side/off channel length is 1.5 to 2 X that of main channel length *(Technical Team Recommendation)* Or use entrenchment ratio? *(Reeves et al. 2004)*	50-75% *(Technical Team Recommendation)*	
Species composition/ abundance	coho population viability (number of passing scores for the six viability criteria in the Oregon Coastal Coho Assessment) *(ODFW 2006)*	6 *(ODFW 2006)*	Poor *(ODFW 2005b)*
Species composition/ abundance	cutthroat population size and distribution	80% of expected locations are occupied by cutthroat *(Technical Team Recommendation)*	
Water quality	DEQ Oregon Water Quality Index rating *(Cude 2001)*	85-89 *(Cude 2001)*	Good *(Mrazik 2006)*
Size/extent of characteristic communities	% of 6th field basins with > 50% of riparian area in late seral (*MidCoast Assessment {Garono & Brophy 2001} updated based on LANDFIRE data)*	50-75% *(Technical Team Recommendation based on information in Wimberly et al. 2000)*	Fair *(USDA Forest Service 2006)*

Estuary System

As indicated in all three of the aquatic systems' models, the estuary is a very pivotal system in the planning area. It plays a key role in exchange of water, nutrients, and biota with the freshwater and marine systems. As such, connectivity among all these systems is key, so we identified indicators for each one. The team felt structural changes brought by European beach grass may be preventing natural exchange between the estuary and ocean except at the mouth of the river (i.e. the ocean may no longer wash over the spit as in the past) (Figure 13). If barriers can be removed and freshwater inputs and water quality maintained, the size and distribution of the estuarine habitat types should take care of themselves.

Table 4. Estuary System Health Assessment

Key Attribute	Indicator *(Source)*	"Good" Condition *(Source)*	Current Status Rating *(Source)*
Connectivity	between estuary/ocean - % cover of European beach grass *(Technical Team Recommendation)*	< 10% *(Westwind Conservation Plan 2007)*	Poor *(Westwind Conservation Plan 2007)*
Connectivity	between primary/secondary tidal channels - % of total estuary area NOT impacted by levees, dikes, or roads *(Technical Team Recommendation)*	> 90% of historic/natural estuary area *(Anderson et al. 2006)*	Fair *(Anderson et al. 2006)*

Table 4. Estuary System Health Assessment (cont.)

Key Attribute	Indicator *(Source)*	"Good" Condition *(Source)*	Current Status Rating *(Source)*
Connectivity	between uplands and freshwater wetlands/estuary – % of total basin stream length blocked by road crossings, dams, culverts, or other artificial blockages *(Technical Team Recommendation)*	5-15% *(Technical Team Recommendation)*	
Hydrologic/ mixing regime	five year running mean # days/year that flow levels in the main stem fall below in-stream flow rights for Salmon River	< 5 days/year *(Technical Team Recommendation)*	
Sediment dynamics and geomorphology	sinuosity/diversity of streams and tidal channels - feet of stream channel per acre or miles per square mile and width to depth ratio *(Technical Team Recommendation, Brophy 2007)*	within 10% of reference marsh levels?	
Species composition/ abundance	Presence/abundance of priority non-native species (*Spartina* sp., reed canarygrass, purple loosestrife, Japanese eelgrass, green crab) *(Brophy 2007)*	No new species introductions & current infestations have declining population trends	
Species composition/ abundance	macro-invertebrate species composition and density *(Technical Team Recommendation, Brophy 2007)*	within 10% of reference marsh levels?	
water quality	DEQ Oregon Water Quality Index rating *(Cude 2001)*	85-89 *(Cude 2001)*	Good *(Mrazik 2006)*
Size/extent of characteristic communities	% of historic or potential native habitats currently present in appropriate locations *(Brophy 2007)*	> 80% of historic or potential *(PFMC 1999)*	Fair *(Anderson et al. 2006)*

Nearshore Marine System

Given the diversity of habitat types and species represented within the nearshore marine system, it is difficult to determine a limited number of indicators that can sufficiently track the health of this system. The Oregon Nearshore Strategy (ODFW 2005a) was used to identify species for each of the aquatic habitat types (see Figure 14). One species group of concern are rockfish whose life history traits, which include being long lived (some rockfish species live to be over 100 years old) and late to mature (some species take 20 years or more before they are sexually mature), make them more vulnerable to overfishing. We identified a sub-set of rockfish species to serve as indicators based on expert opinion: black rockfish (*Sebastes melanops*)

and canary rockfish (*S. pinniger*) because

they are schooling-behavior species whose populations have been assessed, and copper rockfish (*S. caurinus*) which are more territorial, and more closely associated with nearshore habitats. We also included lingcod (*Ophiodon elongatus*) because they are good indicators of predator/prey relationships and their juveniles are found in the estuary. In the rocky intertidal habitat, mussels and barnacles are important keystone species that

provide the physical structure important for many other intertidal invertebrates, and sea stars are important predators in this environment. Much of this data is not yet available or has not yet been summarized. Kelp beds provide important habitat within the nearshore system. Currently there is no reliable method of monitoring this community since it can vary greatly in extent from one year to the next but ODFW is very interested in pursuing monitoring.

The occurrence of hypoxic water (low oxygen water, where amount of oxygen is < 1.4 ml/l of seawater) close to shore (the inner shelf, less than 50 m (165') of water) is highly unusual along the Oregon coast and not reported prior to 2002 (PISCO website 2007). Severely hypoxic waters (oxygen levels < 0.5 ml/l of seawater) that persist for weeks can result in serious biological and ecological effects (including marine organism die-offs). If the severe hypoxia affects only a small area, lasts a short time, and if many animals can escape to other places while the low-oxygen water is present, it is possible that there may be little long-term impact.

The sand dune spit habitat needs an adequate supply of sand (which can be reduced by shoreline armoring) that is free to move across the spit for its formation and maintenance. Non-native European beach grass (*Ammophila arenaria*) is a habitat-modifying invasive plant that captures the blowing sand and stabilizes the foredune. As more sand is captured, the height of the dune increases cutting off the sand supply needed for the maintenance of the active dune field inland from the foredune. This results in the dunes becoming vegetated and the subsequent loss of native species and communities (see Figure 13). Therefore, we chose the area of active dune field, occurrence of European beach grass, and indicator species to track the health of this habitat.

Table 5. Nearshore Marine System Health Assessment

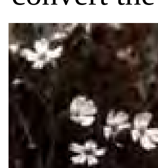
Key Attribute	Indicator *(Source)*	"Good" Condition *(Source)*	Current Status Rating *(Source)*
Soil / sediment stability & movement	% of shoreline hardened in relevant littoral cells *(Technical Team Recommendation)*		
Population structure & recruitment	modal size/age & size/age distribution of black rockfish population *(Yellow Is. CAP; Technical Team Recommendation; ODFW 2005a)*	medium/sub-adult & age distribution includes Big Old Fat Females *(Yellow Is. CAP; Technical Team Recommendation; ODFW 2005a)*	Good *("healthy stock" according to ODFW {Burke 2008})*
Population structure & recruitment	modal size/age & size/age distribution of the canary rockfish population *(Yellow Is. CAP; Technical Team Recommendation; ODFW 2005a)*	medium/sub-adult & age distribution includes Big Old Fat Females *(Yellow Is. CAP; Technical Team Recommendation; ODFW 2005a)*	Poor *("depleted stock" according to ODFW {Burke 2008})*
Population structure & recruitment	modal size/age & size/age distribution of the copper rockfish population *(Yellow Is. CAP; Technical Team Recommendation; ODFW 2005a)*	medium/sub-adult & age distribution includes Big Old Fat Females *(Yellow Is. CAP; Technical Team Recommendation; ODFW 2005a)*	
Population structure & recruitment	modal size/age & size/age distribution of the lingcod population *(Yellow Is. CAP; Technical Team Recommendation; ODFW 2005a)*	medium/sub-adult & age distribution includes Big Old Fat Females *(Yellow Is. CAP; Technical Team Recommendation; ODFW 2005a)*	Good *("healthy stock" according to ODFW {Burke 2008})*
Population structure & recruitment	modal size/age & size/age distribution of female Dungeness crab *(Technical Team Recommendation; ODFW 2005a)*	medium/sub-adult *(Technical Team Recommendation; ODFW 2005a)*	
Population structure & recruitment	recruitment of dominant intertidal space occupiers in suitable habitats *(Technical Team Recommendation)*	within 20% of baseline (2008) size and extent *(Technical Team Recommendation)*	
Species composition/ abundance	% cover of dominant space occupiers in rocky intertidal areas (i.e. mussels and barnacles) *(Technical Team Recommendation; ODFW 2005a)*	within 10% of baseline (2008) size and extent *(Technical Team Recommendation)*	
Species composition/ abundance	% cover of European beach grass *(Westwind Conservation Plan 2007)*	< 10% *(Westwind Conservation Plan 2007)*	Poor *(Westwind Conservation Plan 2007)*
Species composition/ abundance	number of Ochre sea star (Pisaster ochraceus)/unit area *(Technical Team Recommendation; ODFW 2005a)*	within 10% of baseline (2008) size and extent *(Technical Team Recommendation)*	
Species composition/ abundance	presence of gorse on sea cliffs *(Technical Team Recommendation)*	none *(Technical Team Recommendation)*	
Species composition/ abundance	trend in marbled murrelet population over 10 yr period in the marine planning area *(USDA and USDI 1994; USFWS 1997)*	Stable to increasing *(USFWS 1997)*	Good *(Huff et al. 2006)*

Table 5. Nearshore Marine System Health Assessment (cont.)

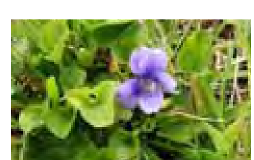
Key Attribute	Indicator *(Source)*	"Good" Condition *(Source)*	Current Status Rating *(Source)*
Species composition/ abundance	presence of indicator plants or animals in the dune field (pink & yellow sand verbena, Am. sea rocket, large-headed sedge, W. snowy plover) *(Weidemann et al. 1969)*	4 species present with 3 at viable levels *(Westwind Conservation Plan 2007)*	Poor *(Westwind Conservation Plan 2007)*
Species composition/ abundance	presence of indicator plants or animals in the sea cliff habitat (peregrine falcon, leather-leaved fern, sea pink, seaside plantain, coastal mugwort, Bolander's groundsel, seacliff bluegrass) *(Hitchcock & Cronquist 1987)*	5 species present with 4 at viable levels	
Water quality	mean % of samples (ave across all sampled beaches from Cape Kiwanda to Cape Foulweather) exceeding the Or. daily maximum enterococcus standard *(NRDC 2007)*	1-5%	Good (2.8%) *(NRDC 2007)*
Water quality	hypoxia (DO<1.4 ml/L) occurrence within the inner shelf area (< 50 m depth) during any 5 yr period *(Technical Team Recommendation; PISCO website 2007)*	hypoxia occurs but does not result in nearshore dead zones *(PISCO website 2007)*	Fair *(PISCO website 2007)*
Size/extent of characteristic communities	acres of open sand with characteristic dune structure *(Westwind Conservation Plan 2007)*	> 50 acres *(Westwind Conservation Plan 2007)*	Poor *(Westwind Conservation Plan 2007)*
Size/extent of characteristic communities	spatial extent and location of bull kelp beds *(Technical Team Recommendation; ODFW 2005a)*	within 10% of baseline (2008) size and extent *(Technical Team Recommendation)*	

Prairie System

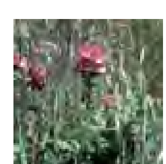
As a Threatened species, the Oregon silverspot butterfly (OSB), can be considered an important indicator of the health of the prairie system. The Revised Recovery Plan for the Oregon silverspot butterfly (USFWS 2001) calls for at least two viable OSB populations in the Cascade Head area as one of the recovery criteria. They consider a population size of 200-500 butterflies for at least 10 years to be viable. Based on mapping and analysis The Nature Conservancy has done since 1992 (Macdonald and Pickering 1994), we extrapolated the amount of larval host plants (*Viola adunca*) and total acres of grassland needed to support viable populations of OSB based on the conditions at the largest and most stable OSB population. Other important species composition indicators are the abundance of rare plants (Cascade Head catchfly, *Silene douglasii oraria*, & hairy checkermallow, *Sidalcea hiritpes*) and non-native species. Another defining aspect of the prairie is the physical structure indicated by the encroachment of trees or shrubs, which can convert the grassland to forest.



Silene



Viola adunca



Sidalcea

Table 6. Prairie System Health Assessment

Key Attribute	Indicator *(Source)*	"Good" Condition *(Source)*	Current Status Rating *(Source)*
Physical structure of ecological communities and seral stages	% of 1991 grassland area invaded by trees or shrubs *(Pickering 1994)*	< 10% *(Technical Team Recommendation)*	
Species composition/ abundance	% frequency and distribution of priority non-native species *(Pickering 1994)*	5-25% *(TNC 2006 Monitoring data)*	Fair *(TNC 2006 Monitoring data)*
Species composition/ abundance	Abundance of Oregon silverspot butterfly larval host plant (% of 200' x 200' grid cells with category 3 violet abundance) *(Macdonald & Pickering 1994)*	16-20% *(Macdonald & Pickering 1994)*	Very Good for TNC preserve *(Pickering 2008)* Poor for whole site *(Macdonald & Pickering 1994)*
Species composition/ abundance	number of Oregon silverspot butterfly populations with 200-500 butterflies for at least 10 years *(USFWS 2001)*	2 *(USFWS 2001)*	Poor *(Pickering 2008)*
Species composition/ abundance	rare plant abundance (% frequency and distribution of priority native species) *(Pickering 1994)*	> 20% for catchfly and 40-80% for checkermallow *(TNC 2006 Monitoring data)*	Poor for catchfly Good for checkermallow *(TNC 2006 Monitoring data)*
Size/extent of characteristic communities	Total acres in grassland (acres of areas dominated by grasses and forbs) *(USFWS 2001)*	200-300 acres *(Macdonald & Pickering 1994)*	Good

Target Health Reports

Ideally, after developing each target's health evaluation criteria (its KEAs, indicators and indicator values for each ranking) and determining current status, all of the indicator ranking scores (poor, fair, good, very good) for each target would be calculated into an overall health score for each system. While the team successfully identified key ecological attributes and draft indicators, much of the indicator data and information needed to fully evaluate the health of the targets was unavailable or simply did not exist. Given these limitations, the planning team was not able to complete a full health assessment and develop a target health scorecard. However, this effort allowed the team to consider the range of factors critical to supporting each target and provided the team with an elevated sense of the conservation needs of the targets. It also identifies additional monitoring activities that should be implemented in the future to provide a more thorough assessment of the health of this planning area. The planning team intends to incorporate additional data into future iterations of the health assessment as it becomes available, and will use portions of the health evaluation criteria to track future condition and status of the systems, particularly after actions and activities are undertaken, to determine if those actions are working. Future iterations will also consider using other indicators in case these never have good or sufficient data or better ones are found.

5) Identification of Impacts

Impact Assessment Process

In the next phase of planning, the teams sought to identify and prioritize “impacts”, the factors expected to degrade and impair the condition of the target systems during the next 50 years. Identification of these factors allowed the team to focus on developing activities and actions that would address the greatest priorities and result in the greatest benefit to the target systems.

In the first step of the Impacts Assessment, the team identified primary Stresses (changing ecological conditions or alterations to KEAs that adversely affect the target) and Sources (the activities that create or drive the stresses). For each target, the planning team drafted preliminary lists of stresses and sources impacting each target, highlighting the top two to three stresses and sources related to each target. Technical teams reviewed the drafts, recommending additions and modifications as appropriate. These lists were then compiled into target situation diagrams, which illustrate the presumed relationships and causal linkages among sources, stresses, key ecological attributes and targets. These diagrams showing the full range of stresses and sources identified are provided in Appendix A.

Impacts to Targets

A preliminary rating of the intensity of each source and stress to a system target was completed using CAP evaluation criteria. Specifically, each stress was evaluated and assigned a rating based on its scope (geographic extent) and severity (intensity of impact), and each source was rated according to its contribution (the amount each source contributes to a stress relative to other sources) and irreversibility (likelihood of being reversed). Further explanation and descriptions of these ratings are provided in Appendix B. The ratings were then rolled up to identify the highest-ranked sources and stresses for each target. The priority impacts identified through the rating process were compared against those highlighted by the planning team as priorities during development of the situation diagrams (described in the paragraph above). Discrepancies were identified and resolved by a final round of planning team review and refinement before a final list of priority stresses was approved by the team (Table 7).

Invasive species were identified as the highest overall future impact to the Salmon River planning area, impacting every target ecosystem to a high or very high degree. Invasives include organisms that affect every major habitat realm, from terrestrial (e.g., Diffuse knapweed, *Brachipodium*, English ivy, Scotch broom, gorse, Sudden Oak Death, yellow starthistle, Japanese knotweed), to freshwater (e.g., Purple loosestrife, Eurasian watermilfoil) and marine (e.g., *Spartina*, Japanese eelgrass, European green crab, Chinese mitten crab,

Table 7. Summary of highest-ranked Sources of Stress to target systems
(see Appendix B for an explanation of how ranks are determined)

Sources		Sitka Spruce/Hemlock and Douglas-Fir/Hemlock Forest Systems	Freshwater Systems	Prairie Systems	Near-shore Marine System	Estuary System	Overall Source Rank
		1	2	3	4	5	
1	Invasive Species	High	High	Very High	High	High	Very High
2	Roads	Very High	High			Very High	Very High
3	Recreation	High	Medium	Very High	Medium	High	High
4	Development	Very High	High	Low		Medium	High
5	Pollution	Medium	High		Medium	High	High
6	Forest Management	High	High			Medium	High
7	Fishing and Harvesting		Low		High	High	High
8	Grazing		High	High		Low	High
9	Climate Change	Medium	Medium		High	Medium	Medium
10	Surface and Groundwater Withdrawals	Medium	High			Medium	Medium
11	Ditching and Diking		Low			High	Medium
12	Fire Suppression or Increase	Medium		High			Medium
13	Shore Armoring		Low		Medium		Low
14	Dams and Reservoirs		Medium				Low
15	Earthquakes					Medium	Low
16	Hatchery		Medium				Low
17	Swiss Needle Cast	Low					Low
Impact Status for Targets and Project		Very High	Very High	Very High	High	Very High	Very High

Asian mussels and clams, New Zealand mudsnails) systems (Oregon's list of the 100 most dangerous invasives can be found at http://www.oregon.gov/OISC/most_dangerous.shtml). Impacts from invasives are potentially widespread and extremely damaging, altering ecosystem processes, native species composition, predator-prey relationships, production and ecosystem function. These impacts can have devastating economic effects also, permanently impairing important services (e.g. commercial species production) that ecosystems provide to the local communities and economies. Because removal and control of established invasives can be cost-prohibitive, prevention and early detection and control are the best means of addressing invasives.

Roads were considered the second highest potential impact to the planning area. Road construction and maintenance has the potential to fragment ecosystems, alter water delivery and supply, create changes to sediment supply and movement, destabilize slopes, serve as a barrier to migrations and movement of native species, and as a conduit for invasive species. The impacts of roads are concentrated in forest, freshwater and estuary ecosystems. In the Salmon River planning area, roads are widespread and pervasive and their impacts can range from slight (e.g. ridgetop trails) to extremely high (e.g. Highway 101 diking of the estuary system).

However, these impacts can be reversed or mitigated by careful placement and construction of new roads, replacement and installation of fish passage culverts or bridges, and decommissioning of roads in sensitive areas, such as along streams and rivers.

Recreation was identified as a potentially high impact in the Salmon River planning area, affecting all five target ecosystems. Recreational activities in the area include ATV riding, fishing, hunting, boating, wildlife viewing, hiking, crabbing, collecting and camping. These activities can impair ecosystems by altering species composition, destroying or damaging vegetation, increasing erosion and runoff, introducing waste, pollution and invasive species, harassing or harming wildlife and placing unusual stress and strain on ecosystems.

Recreation in the Salmon River planning area is widespread, but concentrated along the beaches, estuaries, prairie, river corridors, and road access areas. The damages caused by recreationists can be very light (e.g. harassment of wildlife by hikers) to extremely high (e.g. crushing organisms in rocky tidal areas, ATV destruction of forest vegetation, removal of riparian vegetation in popular fishing areas). The impacts of recreational activities can be effectively managed with proper laws and enforcement, education and appropriate restrictions.

Development activities were projected to highly impact the planning area, affecting mainly the forest and freshwater systems. Development includes the impacts of construction activities and the long-term impacts of occupied urban, exurban and rural residential areas. Construction activities frequently impart excessive sediments to streams and rivers. Occupied development permanently destroys ecosystems, reducing available habitats for a diverse array of native species. In addition, development fragments existing ecosystems,

preventing the movement, dispersal and flow of organisms, genes, seeds and water. Development places additional strains and demands on ecosystems, such as water extraction and pollution. In the Salmon River planning area, dense development is mostly concentrated in the lower basin, near estuary and stream ecosystems. Dispersed development can be found throughout the basin, particularly in forest ecosystems. Efforts to weaken Oregon's land use laws may result in additional development occurring in upper basin timberlands in the future. The impacts of development, particularly poorly planned, sited and executed development activities, can impact ecosystems far beyond the immediate site, and can have permanent impacts on ecosystem composition, structure and function. Reversing the impacts of development is rarely feasible, so proactive planning and appropriate, environmentally sensitive construction methods are the key ways to address this impact. Some impacts (such as inappropriate management of riparian vegetation) can be mitigated through education of landowners and restoration of damaged areas.

Another highly ranked future impact to the planning area was ***pollution***, including garbage and waste, industrial and residential chemicals, sewage, and lawn and agricultural fertilizers, pesticides and herbicides. Because pollutants are frequently disposed of or washed into waterways, freshwater and estuary ecosystems in the Salmon River are most heavily impacted by this threat, however forest and nearshore marine ecosystems are also affected. Pollutants can alter water chemistry and quality, degrade sediment quality and lead to bio-accumulation, disease, stress or sickness in organisms that come into contact with pollutants. In some cases, pollution can be reversed, however cleanup and treatment is often far more costly than prevention and control.

Forest management also ranked highly. This threat encompasses numerous management activities, from herbicide spraying, which reduces understory vegetation needed by wildlife, to planting trees of inappropriate genetic stock, clearcutting, and management directions driving harvest regimes that result in a skewed distribution of seral stages and

even-aged stands. These activities are perceived as future impacts because they are or have been, and many will continue to be, widely practiced on both private and public lands, and will cumulatively affect a large portion of the watershed. Forest management primarily affects the forest systems target, but many impacts are transferred downhill to the freshwater and estuary systems. For example, clearcutting on landslide prone slopes can alter the transfer of sediments and wood through the freshwater system. Additionally, clear cutting and even-aged stand management affect overall forest structure, composition, and health by reducing habitat diversity and the range of appropriate conditions necessary for a full spectrum of native plants and animals. As has been demonstrated across the Salmon River watershed, forest management activities can be effectively modified to lesson their impact on the surrounding environment and improve the ability of forests to support biodiversity.

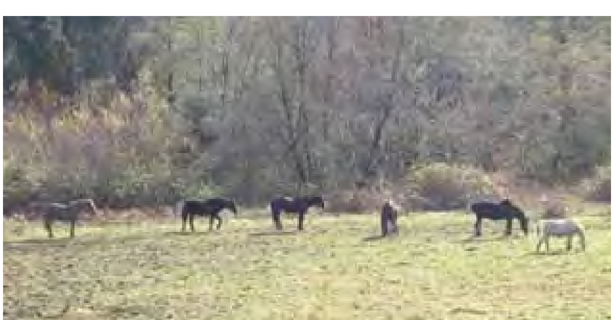
Fishing and harvesting was also included in the suite of highly ranked threats. Activities encompassed in this category include commercial and recreational fishing in the nearshore, estuary and freshwater systems,

harvesting of mussels, clams, and crabs, and the historic extirpation of sea otters, which is still having effects on the structure and foodwebs of the nearshore environment. Fishing and harvesting affect the size and/or extent of target populations and may reduce the ability of these populations to sustain themselves over time. In the Salmon River planning area, fishing and harvesting activities are widespread and can be severe, in some locations. The impact of fishing and harvesting can be mediated or avoided by strong legal and enforcement actions establishing and protecting scientifically defensible quotas on harvest amounts/ techniques and/or marine protected areas.

The team also considered the impact of the hatchery but felt this did not warrant a high ranking since coho releases have been halted. There were some concerns about continuing chinook releases and water quality and temperature but these were of less concern.

Grazing is considered a high future impact to the planning area, particularly where it occurs in riparian and stream-side zones. These areas are particularly vulnerable to grazing because it often leads to simplification of vegetation, reduced herbaceous and woody cover, nutrient loading into nearby streams and rivers, introduction of invasives, bank destabilization and increased rates of soil erosion and sedimentation. In terms of scope

and severity, grazing activities occur frequently along the banks of the main stem and large tributary systems and widely along the periphery of the estuary. This threat can be reversed through proper fencing and protection of riparian areas, proper management of grazing animals and zoning and regulations that preclude these activities in sensitive areas. The impacts of grazing are relatively easy to address, but the land often requires long periods of time to recover.



Vulnerability of the Pacific Coast to changes due to future rise in sea-level. (Thieler & Hammar-Klose 2001)

While not highly ranked, the team also recognized ***climate change*** as a future impact with the potential to adversely affect nearly all targets in varying ways and degrees. Among the impacts anticipated are sea level rise and estuary migration up-river, altered timing and volume of rainfall and freshwater flows in streams and rivers, and altered temperature regimes (IPCC 2007). These physical changes are expected to impact biological systems in ways ranging from shifts in habitats such as forest composition and structure, to alterations to numerous species' life history patterns, including date of emergence of leaves and flowers, to the timing of migrations and developmental cycles. Unlike other impacts discussed here, the impacts from climate change will be widespread and severe in scope and severity, and usually irreversible. At this time, we are unable to predict with much accuracy when and how these effects will occur. However, it is generally accepted that diverse and healthy ecological communities tend to be more resilient to change.

6) Assessment of Situation Factors

A key element of planning for conservation actions within a landscape where people live and work is to consider the special circumstances and opportunities the local situation presents and include key players from the community in the planning process. As mentioned in the introduction, during this planning effort we involved major private landowners in the watershed and others who have land management responsibilities or jurisdiction over key interests there.

Once the teams did an assessment of the basic biological health of the target ecological systems and potential impacts to them, they related the results of those assessments to the local situation, through the use of situation diagrams mentioned in the impact assessment section above (see Section 5 and Appendix A). The objective of this exercise was to look for opportunities to abate the potential impacts by thinking about causal factors that may be driving those impacts now and into the future. Often the most effective strategies result from identifying secondary influences that are driving the more obvious day-to-day actions. Having a diverse core planning team was invaluable during this process. The following paragraphs attempt to highlight some of the situations that ultimately drove the selection of specific actions.

The arrangement of landownership and land use patterns in the watershed had a direct influence on the planning process. Since much of the land in the lower watershed and estuary is in Forest Service ownership (as outlined in the Introduction; see Figure 4) and is federally designated to be managed with a conservation-driven approach, the Technical Team was comfortable that the restoration actions identified in the 2006 Lower Salmon River Project Plan (Anderson et al 2006) and the Westwind Site Conservation Plan (Westwind 2007), when implemented would go a long way towards improving the health of that portion of the planning area. Therefore, for the estuary system target, the Core Team focused efforts on identifying any actions that could be taken to address potential impacts that might arise from outside of those planning areas such as water quality issues.

Planning for the Nearshore Marine system was constrained by a number of factors including: lack of inventory, life history, and water quality information; many outside influences; and developing a concise set of measures for such a broad, diverse system. Regional and oceanic effects greatly influence the nearshore marine system such as altered weather patterns driving the process of upwelling. These and policies that impact fisheries and other ocean uses make it difficult to develop meaningful actions that we can take to maintain or improve the health of the local nearshore system. Therefore, many of the actions are focused on the shoreline habitats. One of the nearshore community types (e.g. sand dune spit) at this site occurs solely on private land. Restoration of this unique ecological community is addressed in the Westwind Conservation Plan and will be up to the Westwind Stewardship Group Board to determine the degree to which they wish to work with others to implement that plan and restore this important habitat type.

The primary land use in the upper watershed is private industrial timber management. Commercial timber companies working in the Salmon River planning area have been very cooperative and forthcoming in their conservation efforts, as highlighted in section 1. Timber harvesting operations are regulated by the Oregon Forest Practices Act (FPA), which sets limits on the size of clearcuts, replanting requirements, pesticide use, road building, stream buffers, and other factors (ODF 2007c). While the FPA buffers have helped, headwater riparian areas remain vulnerable for a number of reasons (see sidebar summary). During this planning process, the Core Team tried to find voluntary measures landowners could take to improve on the FPA requirements in key areas. These areas are generally characterized by the opportunity to address specific needs identified in the health and impact assessments for targets such as the freshwater system. One particular insight identified by representatives of industrial timber companies and discussed during this process is that the Federal land management focus on Late Successional Reserves, coupled with economic concerns, are driving timber managers to shorter and shorter rotations. These factors may ultimately result in a lack of diverse, early and mid-seral stages (Spies et al. 2007) represented in the forest systems target. It was also noted by some participants that the current tax structure in Oregon may be acting as a disincentive that is further contributing to this situation.

Or. Forest Practices Act Riparian Area Summary:

- Fish use streams -must retain:
  - understory veg. w/in 10' of high water level,
  - all trees w/in 20', &
  - all trees leaning over the channel.

  Within riparian mgmt area (100' wide on large streams to 50'on small streams) must retain:
  - at least 30-40 live conifers of 8-11" DBH (med & lg streams respectively)/1000' of stream with 20-230 ft2 basal area &
  - all down wood and snags that aren't safety hazards.

  Pre-commercial thinning is allowed and these amounts may be reduced if large wood is placed in the stream (or a nearby stream) instead.
- Large & Medium Non-fish use streams - must retain:
  - understory veg. w/in 10' of high water level,
  - all trees w/in 20', &
  - all trees leaning over the channel.

  Within riparian mgmt area (70' wide on lg streams to 50' med streams) must retain:
  - at least 10-30 live conifers of 8-11" DBH (med & large streams respectively)/1000' of stream with 50-90 ft2 basal area &
  - all down wood and snags that aren't safety hazards.

  Pre-commercial thinning is allowed and these amounts may be reduced if large wood is placed in the stream (or a nearby stream) instead.
- Small Non-fish use streams - no vegetation retention required in Coast Range. Although Operators are encouraged whenever possible to retain understory vegetation, non-merchantable trees, and required leave trees along these stream types within harvest units.

(There is a new rule apparently going into effect Oct. 2007 that allows the State Forester to require retention of live leave trees to be clustered within 50' of these small streams that are subject to rapidly moving landslides w/in 500' of a riparian mgmt area of a fish use stream.)

The most developed portion of the planning area is in the Otis/Rose Lodge area between the estuary and the uplands. This area of about 50 acres is dominated by rural residential development with some agricultural use (mostly grazing). It is primarily zoned Residential or Rural Residential with limits of 1 house on 2 acres, and very small areas of Retail Commercial and Public Facilities (the hatchery and Knight Park) (Figure 16). There is no sewer system so all properties in this area are on septic systems. Water is provided by several small surface water districts, individual water rights, or private groundwater wells. The highest housing densities occur in a number of mobile home parks along the lower main stem and along Panther Creek. Many of these highly developed areas coincide with prime potential coho habitat making them important areas for future restoration and conservation activities.

The nature of this development made it difficult to define specific entities to participate in the planning process. As a result, the Core Team identified as an important component of our strategy development, the need to implement effective ways to outreach to this community. Some opportunities for outreach include the Panther Creek Community Center where Christmas bazaars and monthly pancake breakfasts are held. Nearby entities like the Sitka Center, Westwind Stewardship Group, and Neskowin Valley School have experience developing and delivering educational messages to the general public. This type of public outreach is identified through goals and objectives in the Salmon Drift Creek Watershed Council Strategic Plan. The MidCoast Watersheds Council has an active Education Program that could provide resources such as examples of outreach materials and techniques.

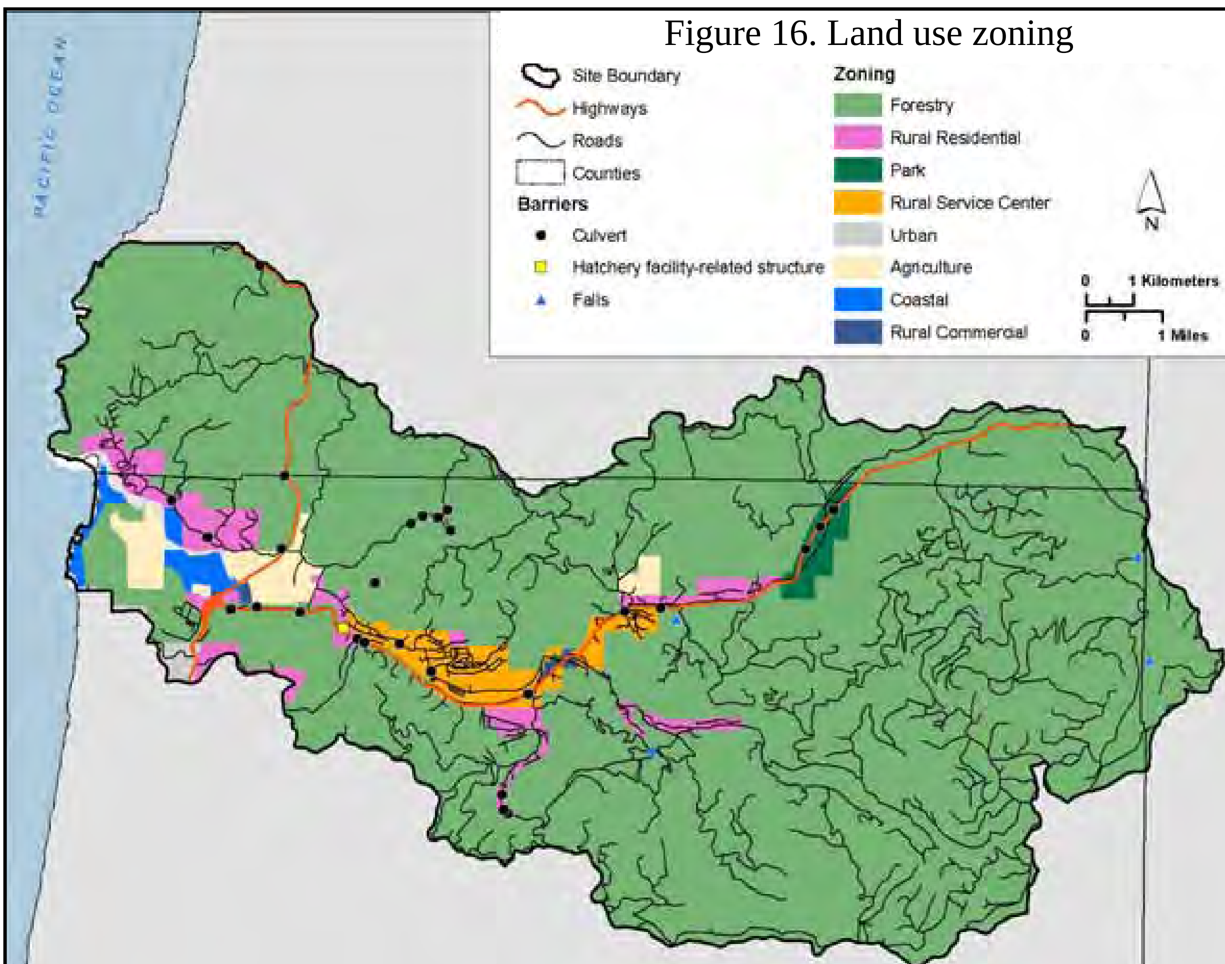


Figure 16. Land use zoning

7) Selection of Conservation and Restoration Actions

Based on the foregoing background information, the Core Team brainstormed a list of potential actions that could be taken to address some of the issues identified during the health and impact assessments. Team members were then asked to identify which potential actions they or their company/organization were interested in working on or seeing implemented.

The Nature Conservancy planning team facilitators organized the resulting list into overarching "Strategic Actions" and related "Action Steps" (see Tables 8 & 9). The Strategic Actions were added to the following simplified situation diagrams to illustrate how they address the priority impacts to each target.

Figure 17. Forest system situation diagram of priority actions

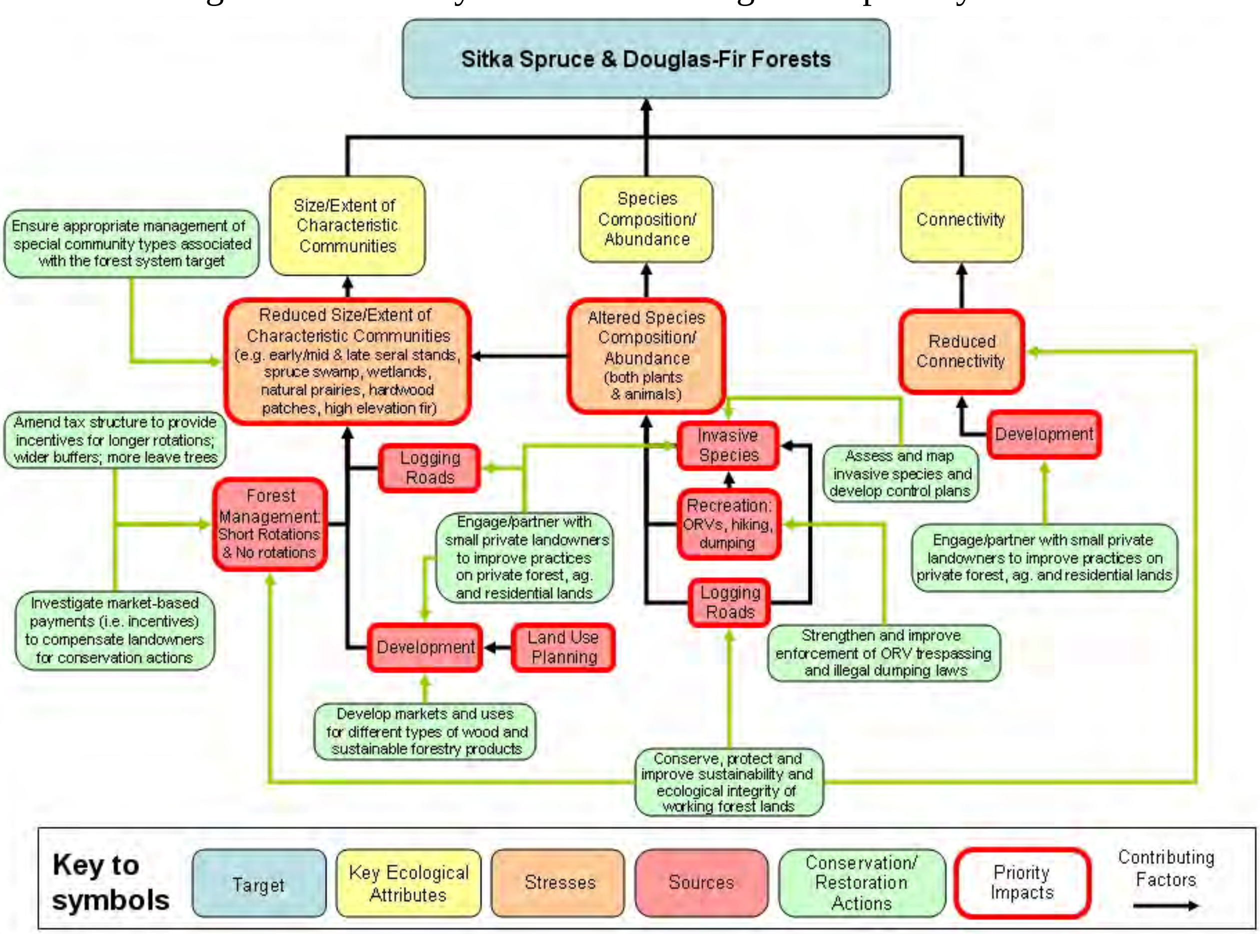


Figure 18. Freshwater system situation diagram of priority actions

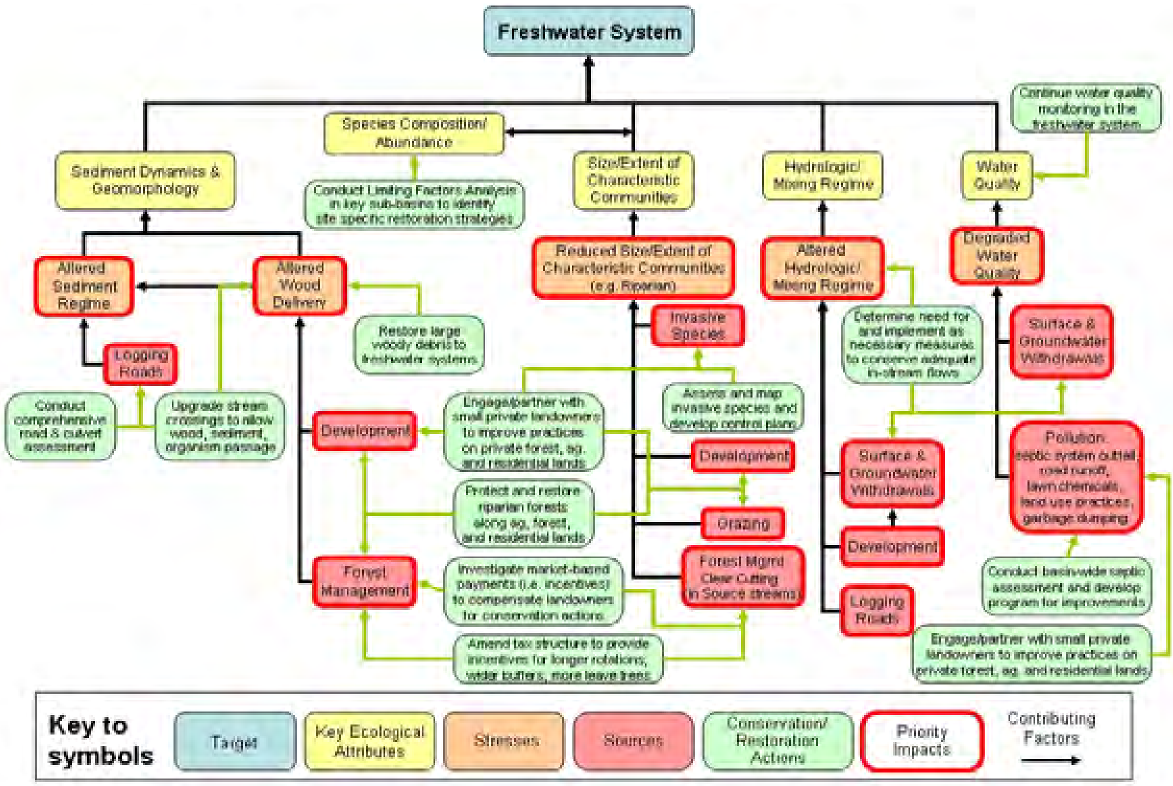


Figure 19. Estuary system situation diagram of priority actions

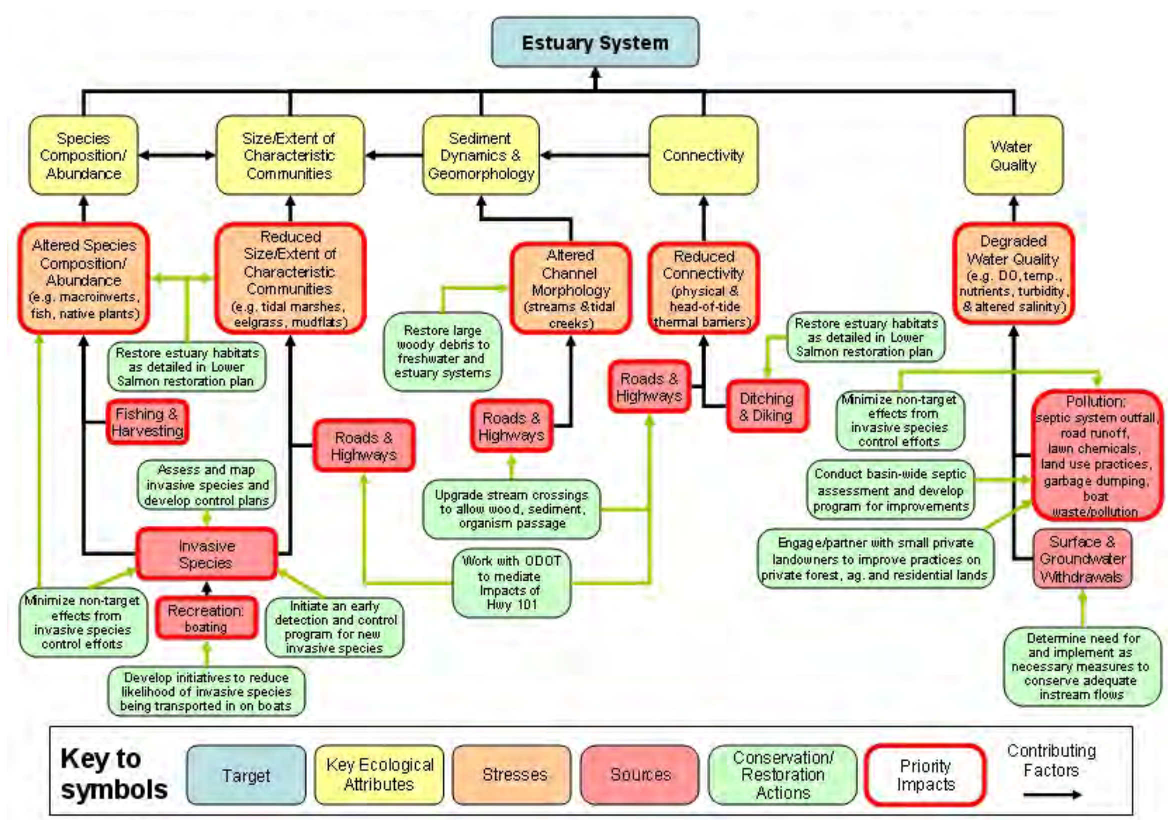


Figure 20. Nearshore marine system situation diagram of priority actions

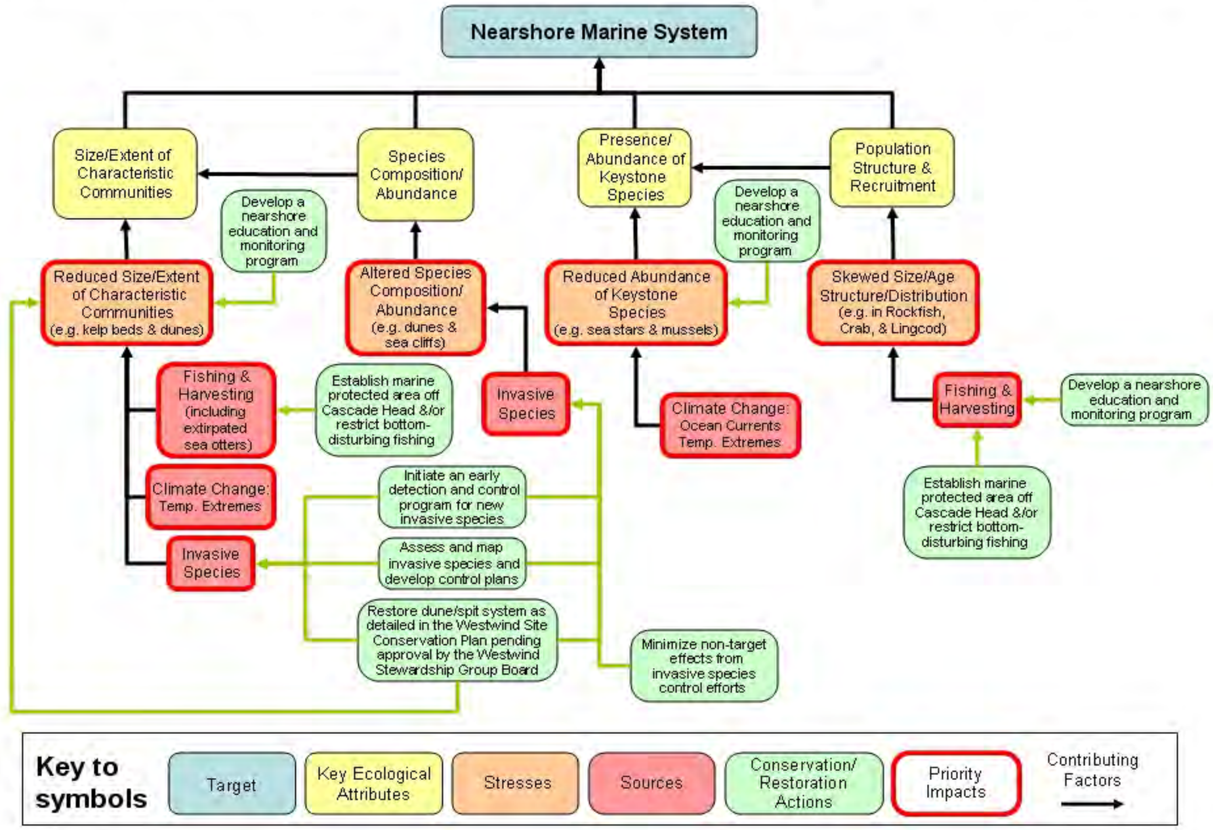
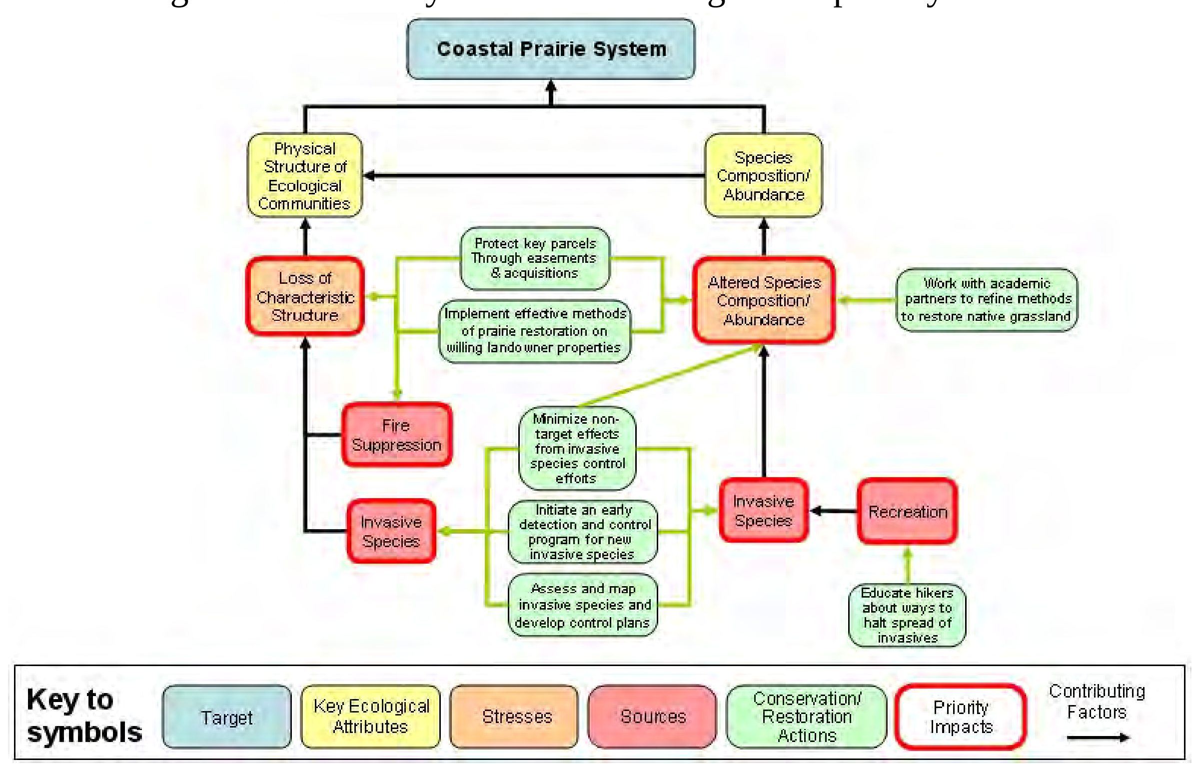


Figure 21. Prairie system situation diagram of priority actions



In order to ensure that these actions are focused on achieving the overall goal of improving or maintaining the health of the targets, The Nature Conservancy, in consultation with representatives of the Salmon Drift Creek Watershed Council and the MidCoast Watersheds Council, developed a set of objectives or desired outcome statements. These were developed based on the criteria that were used to define the “good” ranking categories in the health assessment process (see Section 4) along with some that addressed key potential impacts. These objectives and the strategic actions that may help to achieve them are listed in Table 8. Many of the strategic actions would help advance multiple objectives so they are repeated under each objective where they seem applicable. Table 9 lists the action steps relating to each strategic action, a potential timeline, and entities who expressed an interest in participating in implementation of the action step. Objectives and strategic actions are listed in alphabetical, not priority, order.

Table 8. Objectives and Strategic Actions

Objective A	**By 2016, reduce the cover of European beach grass to < 10% on the Salmon River spit and prevent gorse invasion on the sea cliffs and other susceptible habitats.**
	Targets Addressed - Nearshore Marine System
	Impacts Addressed - Invasive Species
Strategic action	Comprehensively assess and map plant and animal invasive species distributions and develop an integrated control plan for each
Strategic action	Minimize non-target effects from invasive species control efforts
Strategic action	Restore dune/spit system as detailed in the Westwind Site Conservation Plan pending approval by the Westwind Stewardship Group Board
Strategic action	Update CHSRA management plan in concert with the Siuslaw Forest plan update to address invasive species, population growth and climate change
Objective B	**Correct artificial barriers to restore connectivity, hydrology, and natural sediment flow so that < 5% of total basin stream length, including small headwater streams, is disconnected by non-natural blockages by 2027.**
	Targets Addressed - Freshwater
	Impacts Addressed - Roads
Strategic action	Assess and prioritize roads/culverts across the watershed
Strategic action	Re-engineer hatchery weir to supply hatchery water needs while providing juvenile fish passage and minimizing temperature increases above weir
Strategic action	Support Siuslaw National Forest management and restoration of Cascade Head Scenic Research Area
Strategic action	Upgrade stream crossings to allow wood, sediment, organism passage and address problematic roads

Table 8. Objectives and Strategic Actions (cont.)	
Objective C	**Ensure that both spruce and Doug-fir forest types continue to occupy at least 95% of 1974 levels with < 5% of understory dominated by invasive species and stable or declining extent of serious insect/pathogen outbreaks.**
	Targets Addressed - Sitka Spruce & Douglas Fir Forests
	Impacts Addressed - Development, Forest Management, Recreation, Invasive Species
Strategic action	Amend statewide tax structure to provide incentives for good forest and ag stewardship (longer rotations; wider buffers; more leave trees) and eliminate disincentives for conservation easements at both state and county levels
Strategic action	Conserve, protect and improve sustainability and ecological integrity of working forest lands
Strategic action	Develop markets and uses for different types of wood and sustainable forestry products
Strategic action	Engage and partner with small private landowners to improve management practices and activities on private forest, ag and residential lands
Strategic action	Strengthen and improve enforcement of ORV trespassing and illegal dumping laws
Objective D	**Increase/maintain the modal (value that occurs most often in a sample) size/age distribution of black, copper, & canary rockfish, lingcod, and Dungeness crab to at least medium/sub-adults by 2030.**
	Targets Addressed - Nearshore Marine System
	Impacts Addressed - Fishing & Harvesting
Strategic action	Establish marine protected area(s) and/or restrict bottom-disturbing fishing within Cascade Head/Salmon R. nearshore marine target planning area
Objective E	**Maintain at least a "good" rating for DEQ Water Quality Index within the nearshore marine, estuarine, and freshwater aquatic systems.**
	Targets Addressed - Freshwater, Estuary, & Nearshore Marine Systems
	Impacts Addressed- Degraded Water Quality
Strategic action	Conduct basin-wide septic assessment and develop program for improvements as needed.
Strategic action	Engage and partner with small private landowners to improve management practices and activities on private forest, ag and residential lands
Strategic action	Establish water quality monitoring and assessment in the nearshore and estuary systems and continue monitoring in the freshwater system

Table 8. Objectives and Strategic Actions (cont.)	
Objective F	**Maintain cover/depth of dominant space occupiers in rocky intertidal areas (i.e. mussels & barnacles) to within 10% of base year (2008) levels.**
	Targets Addressed - Nearshore Marine System
	Impacts Addressed - Recreation: Wildlife Trampling; Fishing & Harvesting
Strategic action	Develop a nearshore education and monitoring program
Objective G	**Maintain size/extent of bull kelp beds.**
	Targets Addressed - Nearshore Marine System
Objective H	**Maintain water flows in depositional reaches of the main-stem Salmon River such that the number of days/year that flow levels fall below instream flow rights is < 5.**
	Targets Addressed - Freshwater System; Estuary System
	Impacts Addressed - Surface & Groundwater Withdrawals
Strategic action	Determine need for and implement as necessary measures to conserve adequate instream flows
Objective I	**Manage forests in the watershed to achieve high quality old growth on at least 40% of the forested areas and diverse early successional stages on 15-40%, along with associated characteristic community types.**
	Targets Addressed - Sitka Spruce & Douglas-Fir Forests
	Impacts Addressed - Forest Management; Development
Strategic action	Amend statewide tax structure to provide incentives for good forest and ag stewardship (longer rotations; wider buffers; more leave trees) and eliminate disincentives for conservation easements at both state and county levels
Strategic action	Conserve, protect and improve sustainability and ecological integrity of working forest lands
Strategic action	Engage and partner with small private landowners to improve management practices and activities on private forest, ag and residential lands
Strategic action	Ensure appropriate management of special plant community types associated with the forest system target
Strategic action	Investigate market-based payments (i.e. incentives including carbon credits) to compensate landowners for conservation actions (e.g. additional leave trees in whole riparian mgmt areas, headwalls, landslide prone areas)
Strategic action	Support Siuslaw National Forest management and restoration of Cascade Head Scenic Research Area

Table 8. Objectives and Strategic Actions (cont.)	
Objective J	**Prevent new infestations of priority invasive species and control established infestations as necessary and feasible to prevent significant ecological damage.**
	Targets Addressed - Sitka Spruce & Douglas Fir Forests; Freshwater, Estuary, Prairie, and Nearshore Marine Systems
	Impacts Addressed - Invasive Species
Strategic action	Comprehensively assess and map plant and animal invasive species distributions and develop an integrated control plan for each
Strategic action	Engage and partner with small private landowners to improve management practices and activities on private forest, ag and residential lands
Strategic action	Initiate an early detection and control program for new invasive species
Strategic action	Minimize non-target effects from invasive species control efforts
Strategic action	Update CHSRA management plan in concert with the Siuslaw Forest plan update to address invasive species, population growth and climate change
Objective K	**Restore &/or maintain native populations of coho, chinook, chum, steelhead, lamprey, and cutthroat such that they have passing scores for all 6 viability criteria being tracked in the Or. Native Fish Status Report or Coho Conservation Plan.**
	Targets Addressed - Freshwater & Estuary Systems
	Impacts Addressed - Development; Ditching & Diking; Roads; Forest Management; Surface & Groundwater Withdrawals; Fishing & Harvesting
Strategic action	Conduct Limiting Factors Analysis in key sub-basins to identify site specific restoration strategies
Strategic action	Determine need for and implement as necessary measures to conserve adequate instream flows
Strategic action	Re-engineer hatchery weir to supply hatchery water needs while providing juvenile fish passage and minimizing temperature increases above weir
Strategic action	Restore estuarine habitats as detailed in the Lower Salmon River Project restoration plan
Strategic action	Restore large woody debris to freshwater and estuary systems where this is essential to meet clearly stated short-term restoration goals that cannot be met by recovering riparian forests
Strategic action	Restore native beaver populations
Strategic action	Upgrade stream crossings to allow wood, sediment, organism passage and address problematic roads

Table 8. Objectives and Strategic Actions (cont.)	
Objective L	**Restore natural levels of connectivity to at least 90% of historic/natural estuary area by 2020.**
	Targets Addressed- Estuary System
	Impacts Addressed - Ditching & Diking; Roads & Highways
Strategic action	Restore estuarine habitats as detailed in the Lower Salmon River Project restoration plan
Strategic action	Support Siuslaw National Forest management and restoration of Cascade Head Scenic Research Area
Objective M	**Restore stream conditions such that > 50% of stream reaches meet NOAA Habitat Benchmarks for large wood (in fish-bearing streams) and riparian condition (on all streams) by 2057.**
	Targets Addressed - Freshwater System
	Impacts Addressed - Development; Grazing; Forest Management; Roads; Invasive Species
Strategic action	Engage and partner with small private landowners to improve management practices and activities on private forest, ag and residential lands
Strategic action	Protect and restore riparian forests along ag, forest, and residential lands on both fish-bearing and non-fish-bearing headwater stream riparian areas
Strategic action	Restore large woody debris to estuary and freshwater systems where this is essential to meet clearly stated short-term restoration goals that cannot be met by recovering riparian forests
Strategic action	Support Siuslaw National Forest management and restoration of Cascade Head Scenic Research Area
Objective N	**Restore the area of open sand dunes to at least 50 acres on the Salmon River spit by 2016 and reestablish viable populations of at least 3 sand dune indicator plant species by 2020.**
	Targets Addressed - Nearshore Marine System
	Impacts Addressed - Invasive Species
Strategic action	Restore dune/spit system as detailed in the Westwind Site Conservation Plan pending approval by the Westwind Stewardship Group Board
Objective O	**Restore/maintain characteristic species and disturbance regime over at least 200 ac of historic grassland areas arranged to support at least 2 populations of Oregon silverspot butterflies by 2037.**
	Targets Addressed - Prairie System
	Impacts Addressed - Invasive Species
Strategic action	Protect and enhance remnant grassland systems

Table 9. Strategic Actions, Steps & Timeline		Entities Interested in Participating	Start Date	End Date
Strategic action (obj. C&I)	Amend statewide tax structure to provide incentives for good forest and ag stewardship (longer rotations; wider buffers; more leave trees) and eliminate disincentives for conservation easements at both state and county levels		Jan-07	Dec-09
Action step #1	Continue statewide efforts to address these issues and explore need/options for tailoring to good forest and ag stewardship	TNC	Jan-07	Dec-09
Strategic action (obj. B)	Assess and prioritize roads/culverts across the watershed		Dec-07	Sept-10
Action step #1	Contact private landowners for permission to evaluate roads	SDCWC	Dec-07	Apr-08
Action step #2	Identify who has up-to-date information they are willing to share	SDCWC	Dec-07	Apr-08
Action step #3	Apply for OWEB Technical Assistance grant	SDCWC	Mar-08	Apr-08
Action step #4	Implement/participate in Technical Assistance grant	SDCWC, ODF, FS, Forest Capital, WSG, ODOT, Green Diamond	Sept-08	Sept-10
Action step #5	Prioritize culvert replacement projects based on results of basin-wide stream crossing assessment	SDCWC	Jul-10	Sep-10
Strategic action (obj. A&J)	Comprehensively assess and map plant and animal invasive species distributions and develop an integrated control plan for each			
Action step #1	Develop Invasives Coordination Group to streamline and coordinate current agencies/ organizations activities			
Action step #2	Compile maps of invasive species already completed for planning area	TNC; FS, WSG, SWCD, ODOT, Green Diamond		
Action step #3	Conduct additional mapping as necessary to fill gaps	TNC, FS, WSG, SWCD, ODOT, Green Diamond		
Action step #4	Prioritize species to focus on	TNC, FS, WSG, SWCD, ODOT, Green Diamond		
Action step #5	Develop control plans for priority species	TNC, FS, WSG, SWCD, ODOT, Green Diamond		

Table 9. Strategic Actions, Steps & Timeline		Entities Interested in Participating	Start Date	End Date
Action step #6	Implement priority species control plans			
Strategic action (obj. E)	Conduct basin-wide septic assessment and develop program for improvements as needed.		Oct-08	Dec-10
Action step #1	Evaluate water monitoring data to identify septic problem areas	SDCWC	Oct-08	Nov-08
Action step #2	Apply for OWEB grant to provide funding for basin-wide septic assessment and identify funding for low-interest loans/grants for repair (DEQ?)	SDCWC	Oct-09	Dec-10
Action step #3	Encourage County to disseminate info re: maintenance of septic systems and alternative toilets	SDCWC, Lincoln County		
Action step #4	Work with County to tighten buffer regulations, close loopholes in current regulations and preclude variances and conditional use permits that bypass regulations	TNC		
Strategic action (obj. K)	Conduct Limiting Factors Analysis in key sub-basins (i.e. important salmon habitats) to identify site specific restoration strategies		Oct-07	Dec-09
Action step #1	Apply for OWEB TA grant to fund Limiting Factors Analysis in Upper Salmon and Bear Cr. sub-basins (chosen based on MidCoast Assessment and Tech Team recommendations)	SDCWC	Oct-07	Oct-07
Action step #2	Encourage ODFW to complete Aquatic Habitat Inventories for all sub-basins in planning area.	ODFW, SDCWC	Oct-07	Dec-09
Strategic action (obj. C&I)	Conserve, protect and improve sustainability and ecological integrity of working forest lands		Dec-07	Dec-13
Action step #1	Develop a protection plan for the planning area that is spatially explicit and identifies an appropriate approach for each entity/need along with potential funding sources	TNC	Dec-07	Jun-08
Action step #2	Protect key parcels (including additional leave trees in key areas on private timberlands) through easements and acquisitions (i.e. implement Protection Plan)	(to be defined in Protection plan)	Jul-08	Dec-13
Action step #3	Install green bridges and passage culverts for animal passage (ungulates, birds); fencing	ODFW - Wildlife, ODOT		

Table 9. Strategic Actions, Steps & Timeline		Entities Interested in Participating	Start Date	End Date
Action step #4	Promote ESA Safe Harbor Agreements – or some other mechanisms that would allow timberland owners to manage for longer rotations in exchange for the guarantee that they won't be restricted from logging if/when an endangered species moves onto their land.	TNC, ODOT, Green Diamond		
Strategic action (obj. H&k)	Determine need for and implement as necessary measures to conserve adequate instream flows		Oct-07	Dec-09
Action step #1	Work with Lincoln City to plug leaks in water supply system and improve efficiency and water conservation across the whole system	SDCWC	Oct-07	Dec-09
Action step #2	Assess historic flow regimes, current flow conditions and potential future flow changes due to the full exercise of in-stream rights.	TNC, SDCWC	Mar-08	Mar-09
Action step #3	Work with state and/or federal agencies (OWRD, USGS, EPA?) to install a continuously recording device (or at least a staff gauge) on the lower main-stem as part of the USGS gauging network	SDCWC or TNC	Mar-08	Dec-08
Strategic action (obj. F)	Develop a nearshore education and monitoring program			
Action step #1	Establish monitoring of kelp beds	PISCO? ODFW-Marine?		
Action step #2	Establish monitoring of mussel and seastar populations	PISCO?		
Strategic action (obj. C)	Develop markets and uses for different types of wood and sustainable forestry products			
Action step #1	Encourage buying of local (OR) wood; develop marketing process	Green Diamond		
Action step #2	Encourage education about and use of sustainable wood certifications	Westwind (WSG)		
Strategic action (obj. C, E, I, J & M)	Engage and partner with small private landowners to improve management practices and activities on private forest, ag and residential lands			
Action step #1	Develop sense of community (fair, fun day, community breakfast)	SDCWC, WSG, Sitka, Nesk V School		
Action step #2	Disseminate info re: power boat pollution, yard clipping waste, lead, lawn chemicals, cattle/horses	SDCWC, ODFW, NCAP, ODA, SWCD		

Table 9. Strategic Actions, Steps & Timeline		Entities Interested in Participating	Start Date	End Date
Action step #3	Identify community leaders	SDCWC, District Grange, OR Small Woodlot Owners; 4-H		
Action step #4	Outreach and education of Fishers	ODFW, Salmon Riverkeepers		
Action step #5	Partner with OSU Extension, SWCD, & ODF to disseminate Ag and Forestry info	SDCWC, OSU, SWCD, ODF		
Action step #6	Raise awareness/educate general public about all priority invasives (plants, animals, pathogens, inverts, etc.)	OSU Extension, SDCWC; Lincoln SWCD		
Strategic action (obj. I)	Ensure appropriate management of special plant community types associated with the forest system target			
Action step #1	Comment on BLM management plans to ensure ACECs have appropriate/ necessary management	TNC	Jul-07	Jan-08
Action step #2	Restoration/veg management/invasive control in small patch open habitats			
Action step #3	Restore Sitka spruce swamp communities	FS		
Action step #4	Work with FS to encourage age class diversity on federal lands as appropriate under NWFP	TNC, FS		
Strategic action (obj. D & obj. G)	Establish marine protected area(s) and/or restrict bottom-disturbing fishing within Cascade Head/Salmon R nearshore marine target planning area	TNC		
Strategic action (obj. E)	Establish water quality monitoring and assessment in the nearshore and estuary systems and continue monitoring in the freshwater system			
Action step #1	Establish standardized and centralized basin-wide citizen/school monitoring efforts related to water quality (i.e., Adopt-a-Stream)	WSG, SDCWC		
Action step #2	Modify ongoing water monitoring, as necessary, to help inform DEQ efforts to establish TMDLs	SDCWC, ODFW, FS	Mar-07	Dec-08
Action step #3	Monitor sediment loading during storms	SDCWC		
Strategic action (obj. J)	Initiate an early detection and control program for new invasive species		May-07	Jun-10
Action step #1	Enlist Volunteer Naturalists in early detection of new invasives on Cascade Head Preserve	TNC	May-07	Jun-10

Table 9. Strategic Actions, Steps & Timeline		Entities Interested in Participating	Start Date	End Date
Action step #2	Develop initiatives to reduce likelihood of invasive species being transported in on boats	TNC, ODFW-Wildlife, Green Diamond		
Action step #3	Educate hikers about ways to prevent the spread of invasives	TNC, ODFW-Wildlife, Green Diamond		
Strategic action (obj. I)	Investigate market-based payments (i.e. incentives including carbon credits) to compensate landowners for conservation actions (e.g. additional leave trees in whole riparian mgmt areas, headwalls, landslide prone areas; diversity plantings)			
Action step #1	Establish economic drivers for local carbon mitigation to fund restoration (e.g., Westwind charging carbon credits for folks who travel here)	WSG, TNC	Oct-07	
Action step #2	Investigate how to measure sequestration and potential national vehicles to facilitate carbon credits	WSG	Jan-08	
Strategic action (obj. A&J)	Minimize non-target effects from invasive species control efforts			
Action step #1	Establish group of diverse stakeholders to discuss current herbicide use and develop education and research programs to explore alternatives to herbicides	ODFW - Wildlife, Green Diamond		
Action step #2	Work with ODOT, rural landowners, and others to minimize the use of chemical treatments within the riparian management zone and ensure compliance with existing regulations.	ODOT		
Strategic action (obj. O)	Protect and enhance remnant grassland systems		Dec-07	Dec-13
Action step #1	Develop a protection plan for the planning area that is spatially explicit and identifies an appropriate approach for each entity/need along with potential funding sources	TNC	Dec-07	Jun-08
Action step #2	Protect key parcels through easements and acquisitions (i.e. implement Protection Plan)	TNC (TBD in Protection Plan)	Jul-08	Dec-13
Action step #3	Work with academic partners to test & refine methods to restore native grassland species	TNC, Lewis & Clark College	Mar-08	Dec-09
Action step #4	Implement effective methods of prairie restoration on willing landowner properties	TNC	Jan-10	Dec-13

Table 9. Strategic Actions, Steps & Timeline		Entities Interested in Participating	Start Date	End Date
Strategic action (obj. M)	Protect and restore riparian forests along ag, forest, and residential lands on both fish-bearing and non-fish-bearing headwater stream riparian areas		Dec-07	Dec-13
Action step #1	Develop a protection plan for the planning area that is spatially explicit and identifies an appropriate approach for each entity/need along with potential funding sources	TNC	Dec-07	Jun-08
Action step #2	Work with private landowners to establish riparian and stream connectivity between federal lands and estuary systems	TNC, SDCWC, ODF, FS	Dec-07	Dec-09
Action step #3	Protect key parcels (including additional leave trees in key areas on private timberlands) through easements and acquisitions (i.e. implement Protection Plan)	TNC (TBD in Protection Plan)	Jul-08	Dec-13
Action step #4	Restore riparian forests along ag, forest, and residential lands by offering free riparian plantings to private landowners	SDCWC, MidCoast, Green Diamond	Dec-08	Dec-09
Action step #5	Develop potential climate change adaptation strategies for forest lands & riparian areas, such as mixed plantings (anticipate species that will thrive in new climate regime).			
Action step #6	Increase Or. Dept. of Ag. enforcement of riparian protections on ag. lands			
Action step #7	Provide education and incentives to ag industry to fence and restore riparian areas	SDCWC		
Action step #8	Work with county planning & development permitting entities to ensure consistent application of buffer requirements across land uses (e.g., < variances and conditional use permits on forest, ag, residential lands; > enforcement) and close loopholes in current regs re: riparian areas	TNC		
Strategic action (obj. B & obj. K)	Re-engineer hatchery weir to supply hatchery water needs while providing juvenile fish passage and minimizing temperature increases above weir			
Strategic action (obj. A & obj. N)	Restore dune/spit system as detailed in the Westwind Site Conservation Plan pending approval by the Westwind Stewardship Group Board			
Strategic action (obj. k&L)	Restore estuarine habitats as detailed in the Lower Salmon River Project restoration plan		Jan-07	Sep-12

Table 9. Strategic Actions, Steps & Timeline		Entities Interested in Participating	Start Date	End Date
Action step #1	Work with ODOT to mediate impacts of Hwy 101	ODOT, FS, TNC	Jan-07	Sep-12
Action step #2	Replace culverts and remove fill at Knight Park & restore Crowley Cr.	FS, SDCWC	Apr-07	Sep-09
Action step #3	Restore Pixieland	FS, MidCoast, & SDCWC	Aug-07	Sep-10
Action step #4	Restore Tamara Quays	FS, SDCWC	Aug-07	Sep-09
Action step #5	Replace culverts in estuary road system	FS, ODOT, WSG	Jul-08	Sep-11
Action step #6	Prioritize and remove remaining dikes and ditches	FS, ODOT	Oct-08	Sep-11
Action step #7	Investigate need/feasibility to restore keystone invertebrate populations in estuarine habitats	TNC	Nov-08	May-09
Action step #8	Restore riparian buffers in estuary systems	FS & ODOT		
Strategic action (obj. K & obj. M)	Restore large woody debris to estuary and freshwater systems where this is essential to meet clearly stated short-term restoration goals that cannot be met by recovering riparian forests			
Action step #1	Place large wood in streams; esp. in areas already identified in previous assessments (such as ODFW 1995 plan)	ODFW, MidCoast, SDCWC, Forest Capital Partners		
Action step #2	Work with ODOT to ensure they deal with log jams threatening the highway in ways that minimize negative effects on the freshwater system (e.g. move wood to downstream side of bridge or culvert rather than removing from the system; address structures that do not allow passage of woody debris)			
Strategic action (obj. K)	Restore native beaver populations			
Action step #1	Educate private landowners about benefits of beaver and ways to live with their alterations	ODFW, SDCWC, OSU Extension		
Action step #2	Encourage State & County agencies to accommodate beaver through the use of innovative technologies	ODFW, ODOT, County Road Dept.		
Action step #3	Identify sources of funds to help private landowners deal with effects of beavers on their property	ODFW, SDCWC, Lincoln SWCD		

Table 9. Strategic Actions, Steps & Timeline		Entities Interested in Participating	Start Date	End Date
Strategic action (obj. C)	Strengthen and improve enforcement of ORV trespassing and illegal dumping laws			
Action step #1	Get word out to public about how to report violations	ODF		
Action step #2	Increase illegal dumping fines	Green Diamond		
Action step #3	Lobby legislature to amend regs regarding no trespassing posting laws and liability	Green Diamond, TNC		
Action step #4	Provide funding for additional surveillance cameras			
Action step #5	Provide vouchers for free garbage dumping (help people who can't afford); amnesty day	Green Diamond		
Action step #6	Work with law enforcement to let them know needs that aren't being met under current system and find out how we can help them	Green Diamond, ODFW - Wildlife, FS, ODF		
Strategic action	Support Siuslaw National Forest management and restoration of Cascade Head Scenic Research Area			
Action step #1	Partner on restoration projects	SDCWC, ODFW, MidCoast, ODOT, TNC		
Action step #2	Provide support for Forest Service budgets as necessary and appropriate to meet the goals of this plan	TNC		
Strategic action (obj. J)	Update CHSRA management plan in concert with the Siuslaw Forest plan update to address invasive species, population growth and climate change			
Strategic action (obj. B & obj. K)	Upgrade stream crossings to allow wood, sediment, organism passage and address problematic roads		Oct-10	Dec-13
Action step #1	Apply for OWEB grants for priority replacement projects and implement projects	SDCWC	Oct-10	Oct-12
Action step #2	Encourage ODOT to use rock check dams on steeper ditches running into culverts	ODOT		
Action step #3	Work with ODOT to ensure they deal with log jams threatening the highway in ways that minimize negative effects on the freshwater system (see examples above)	ODOT		

8) Development of a Monitoring Plan

In order to track success over time, appropriate data needs to be used to monitor the health of the targets, the status of key impacts, and progress toward reaching objectives. During the health assessment process, indicators and ranking criteria that defined healthy states for the targets were identified. Those will be used to help define a monitoring plan for the Salmon River planning area. Over the next year, The Nature Conservancy will meet with the Salmon Drift Creek Watershed Council, the MidCoast Watersheds Council, and other key partners to develop a monitoring plan that details the methods to be used for each indicator as well as frequency/timing, who will do the monitoring, where the monitoring will take place, the annual cost, funding sources, etc.

The process of developing this detailed monitoring plan may lead to refinement of some of the indicators that were not well defined during the planning process. These adjustments will be captured in the next iteration of this plan.

Since the measurable components of the objectives are based on the health assessments, the monitoring conducted as a result of this plan will be targeted towards providing an efficient measure of how close we are to reaching our desired outcomes and will provide an essential part of an adaptive management feedback loop.

9) Conclusion and Next Steps

The planning effort was hampered by a lack of data, especially relating to the nearshore marine system where site specific information for the planning area has not been gathered and the freshwater system where Oregon Department of Fish and Wildlife has not completed Aquatic Habitat Inventory surveys for most of the sub-basins in the planning area. For the Forest System, recent articles have highlighted the potential loss of diverse early to mid-seral stages, but valuable indices for measuring those seral stages have not been developed. In most cases, we tried to identify target health indicators that used measures that were already being gathered by someone. But, in a number of cases, the metric we thought would be most useful for measuring the key ecological attribute was not currently being monitored. In some cases, even though the data have been gathered, we did not have sufficient time during this planning process to gain access to the relevant data and summarize it in a meaningful way to evaluate the current status of a particular indicator within the planning area. This led to identifying the filling of these information gaps as strategic actions or action steps. As these steps get implemented, we will begin to develop a database that will better inform the health assessment and our ability to measure the effectiveness of actions in future iterations of this plan.

It is anticipated that members of the Core Team who participated in this planning effort, along with others, will come together in individual partnerships to implement specific actions identified in this plan. This process has already begun as the watershed councils work to coordinate potential proposals for the Oregon Watershed Enhancement Board's Oct. 2007 and April 2008 rounds of grants. We hope to keep this effort alive by having annual meetings with the Core Team to discuss activities that have been implemented during the year and we may wish to conduct a full-scale update of the plan after 5 years.

10) Glossary

Acceptable Range of Variation – Key ecological attributes of focal targets naturally vary over time. The acceptable range defines the limits of this variation which constitute the minimum conditions for persistence of the target (note that persistence may still require human management interventions). This concept of an acceptable range of variation establishes the minimum criteria for identifying a conservation target as “conserved” or not. If the attribute lies outside this acceptable range, it is a degraded attribute.

Action Steps – Specific tasks required to advance and make progress toward a strategic action.

CAP – Shorthand for Conservation Action Planning.

CAP Excel Workbook – An Excel-based software program developed by The Nature Conservancy to facilitate the CAP process, automate the roll-up of summary results, and serve as a consistent repository for CAP information. Can be downloaded at http://conserveonline.org/workspaces/cbdgateway/cbdmain/cap/resources/3/CAP_v5a.xls/download.

Conservation Action Planning (CAP) – The Nature Conservancy’s process for helping conservation practitioners develop strategies, take action, measure success, and adapt and learn over time

Current Status – An assessment of the current “health” of a target as expressed through the most recent measurement or rating of an indicator for a key ecological attribute.

Focal Conservation Targets – A limited suite of species, communities, and ecological systems that are chosen to represent and encompass the full array of biodiversity found in a project area. They are the basis for setting goals, carrying out conservation actions, and measuring conservation effectiveness. In theory, conservation of the focal targets will ensure the conservation of all native biodiversity within functional landscapes. Often referred to as Focal Targets.

Impacts – Agents or factors that directly or indirectly degrade targets.

Indicators – Measurable entities related to a specific information need (for example, the status of a key ecological attribute, change in a threat, or progress towards an objective). A good indicator meets the criteria of being: measurable, precise, consistent, and sensitive.

Integrity – The status or “health” of an ecological community or system. Integrity indicates the ability of a community or system target to withstand or recover from most natural or anthropogenic disturbances and thus to persist for many generations or over long time periods. See also viability for species.

Irreversibility – One of the criteria used to rate the impact of a source of stress. The degree to which the effects of a source of stress can be restored or recovered. Typically includes an assessment of both the technical difficulty and the economic and/or social cost of restoration. See also contribution.

KEA – Short for Key Ecological Attribute.

Key Ecological Attributes (also Key Attributes, or KEAs) – Aspects of a target’s biology or ecology that, if missing or altered, would lead to the loss of that target over time. As such, KEAs define the target’s viability or integrity. More technically, the most critical components of biological composition, structure, interactions and processes, environmental regimes, and landscape configuration that sustain a target’s viability or ecological integrity over space and time. The word “attribute” is sometimes used as shorthand for KEA in this document.

Nested Targets – Species, ecological communities, or ecological system targets whose conservation needs are subsumed in one or more focal conservation targets. Often includes targets identified as ecoregional targets.

Objectives – Specific statements detailing the desired accomplishments or outcomes of a particular set of activities within a project. A typical project will have multiple objectives. Objectives are typically set for abatement of critical threats and for restoration of degraded key ecological attributes. They can also be set, however, for the outcomes of specific conservation actions, or the acquisition of project resources. If the project is well conceptualized and designed, realization of all the project’s objectives should lead to the fulfillment of the project’s vision. A good objective meets the criteria of being: specific, measurable, achievable, relevant, and time limited.

Priority Impacts – Sources of stress that are most problematic. Most often rated “very high” and “high” based on the rating criteria of their impact on the focal targets.

Scope (in the context of impact assessment) – One of the measurements used to rate the impact of a stress. Most commonly defined spatially as the proportion of the overall area of a project site or target occurrence likely to be affected by a stress within 10 years. See also severity.

Severity – One of the criteria used to rate the impact of a stress. The level of damage to the conservation target that can reasonably be expected within 10 years under current circumstances (i.e., given the continuation of the existing situation). See also scope.

Sources of Stress – The proximate activities or processes that directly have caused, are causing, or may cause stresses and thus the destruction, degradation and/or impairment of focal conservation targets.

Strategic Actions – Interventions undertaken by project staff and/or partners designed to reach the project's objectives. A good action meets the criteria of being: linked to objectives, focused, strategic, feasible, and appropriate.

Stresses – Impaired aspects of conservation targets that result directly or indirectly from human activities (e.g., low population size, reduced extent of forest system; reduced river flows; increased sedimentation; lowered groundwater table level). Generally equivalent to degraded key ecological attributes (e.g., habitat loss).

Targets – Elements of biodiversity which can include species, ecological communities, and ecological systems. Strictly speaking, refers to all biodiversity elements at a project site, but sometimes is used as shorthand for focal conservation targets.

Viability – The status or "health" of a population of a specific plant or animal species. More generally, viability indicates the ability of a conservation target to withstand or recover from most natural or anthropogenic disturbances and thus to persist for many generations or over long time periods. Technically, the term "integrity" should be used for ecological communities and ecological systems with "viability" being reserved for populations and species.

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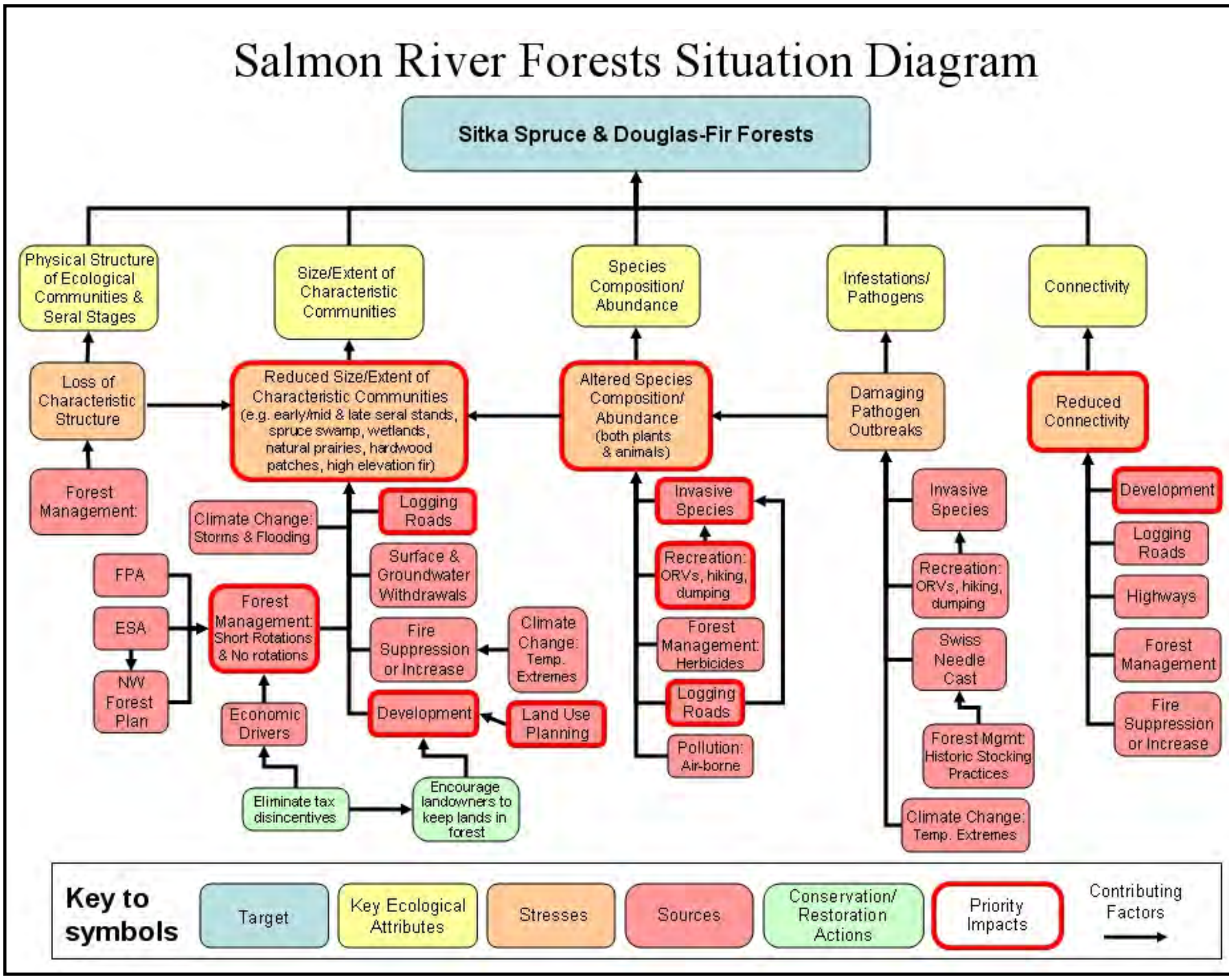
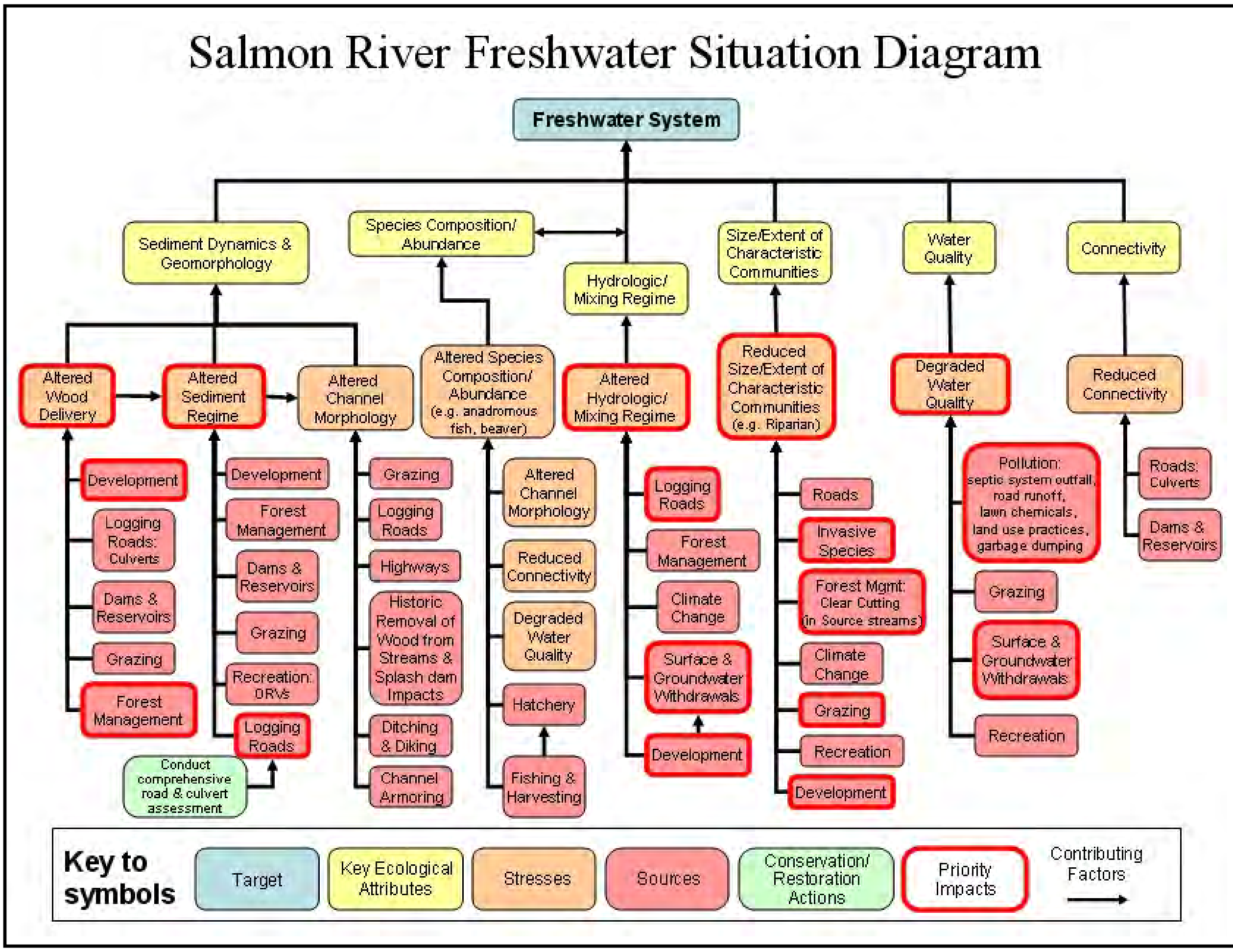
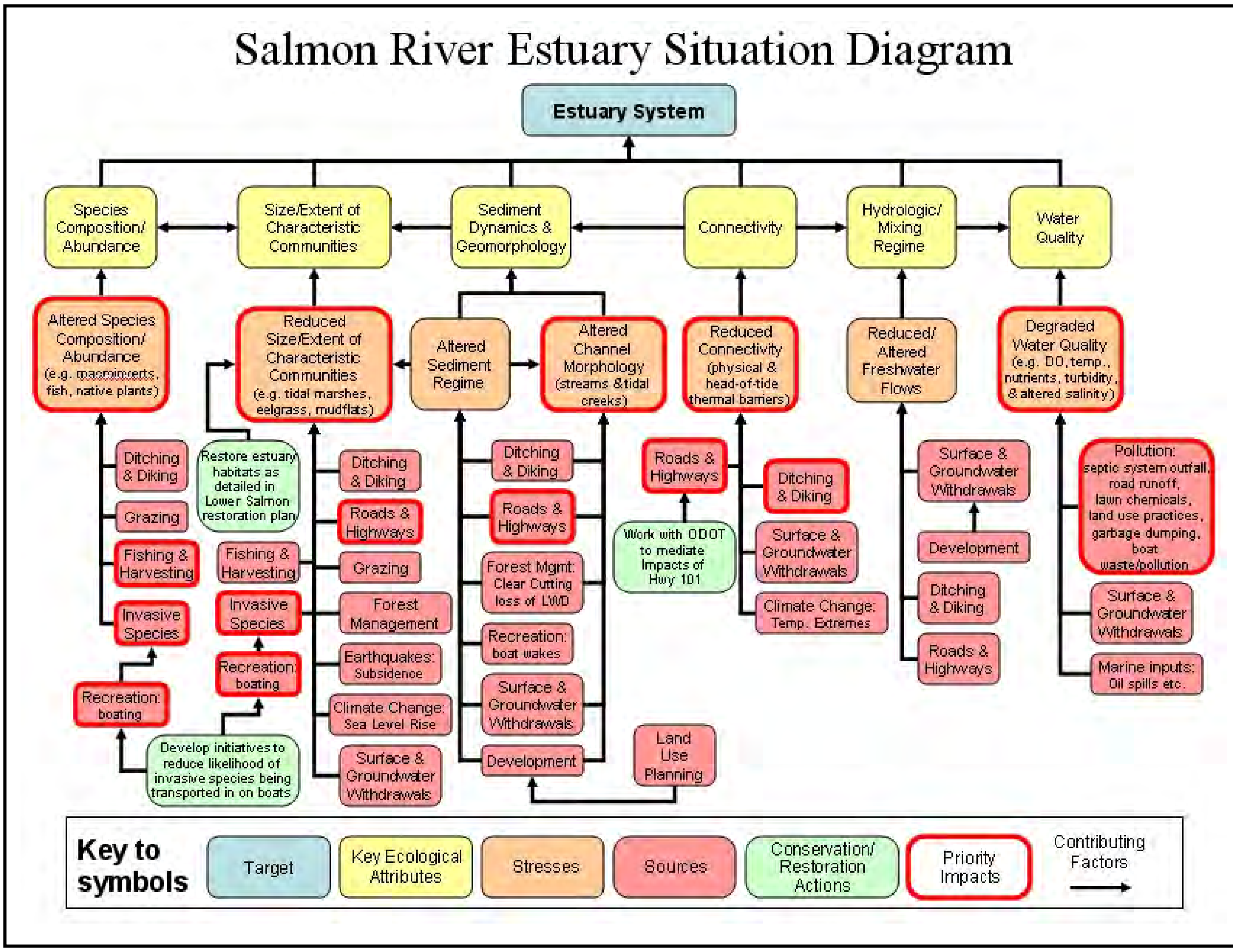
Appendices

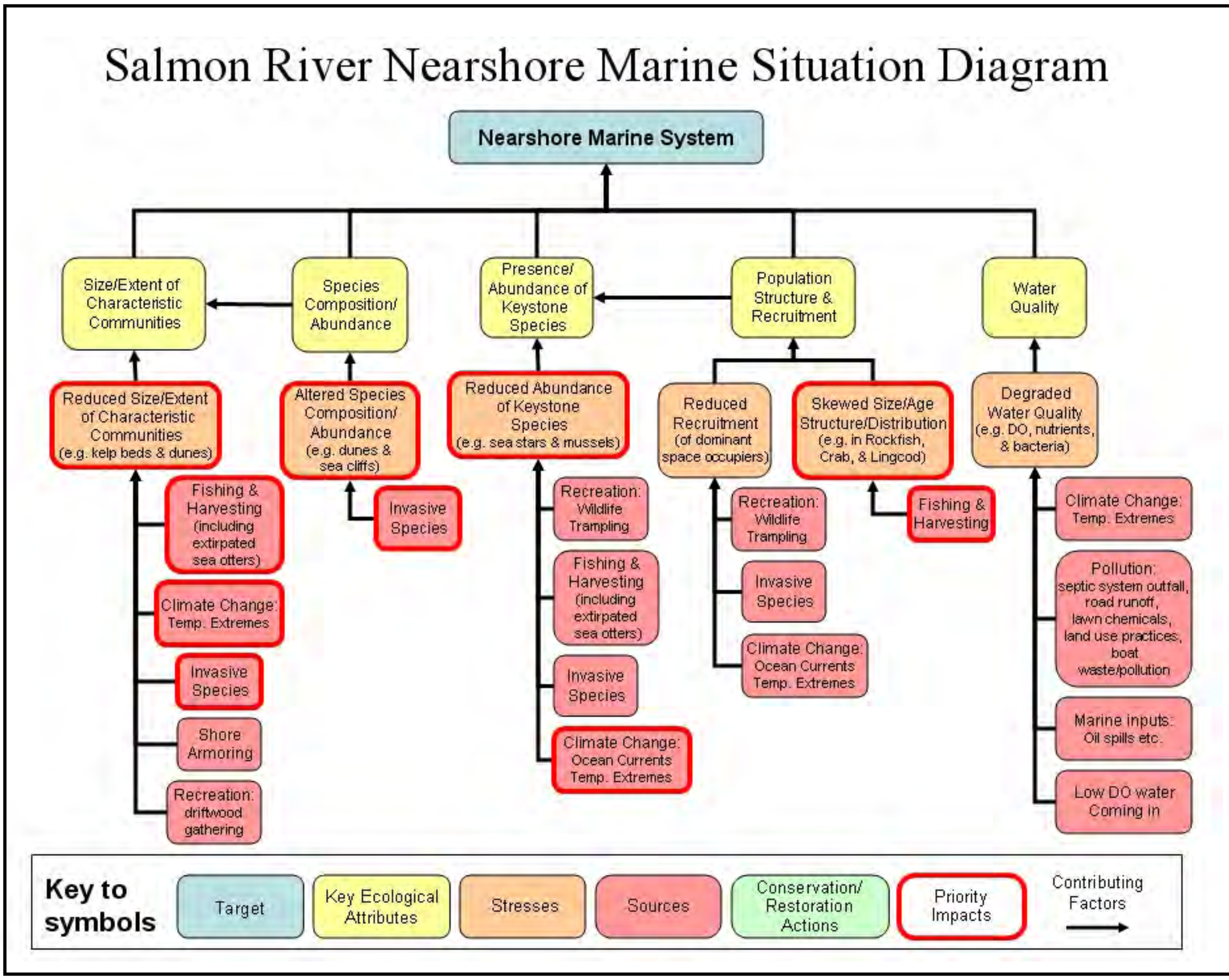
Appendix A. Situation Diagrams with full range of impacts identified



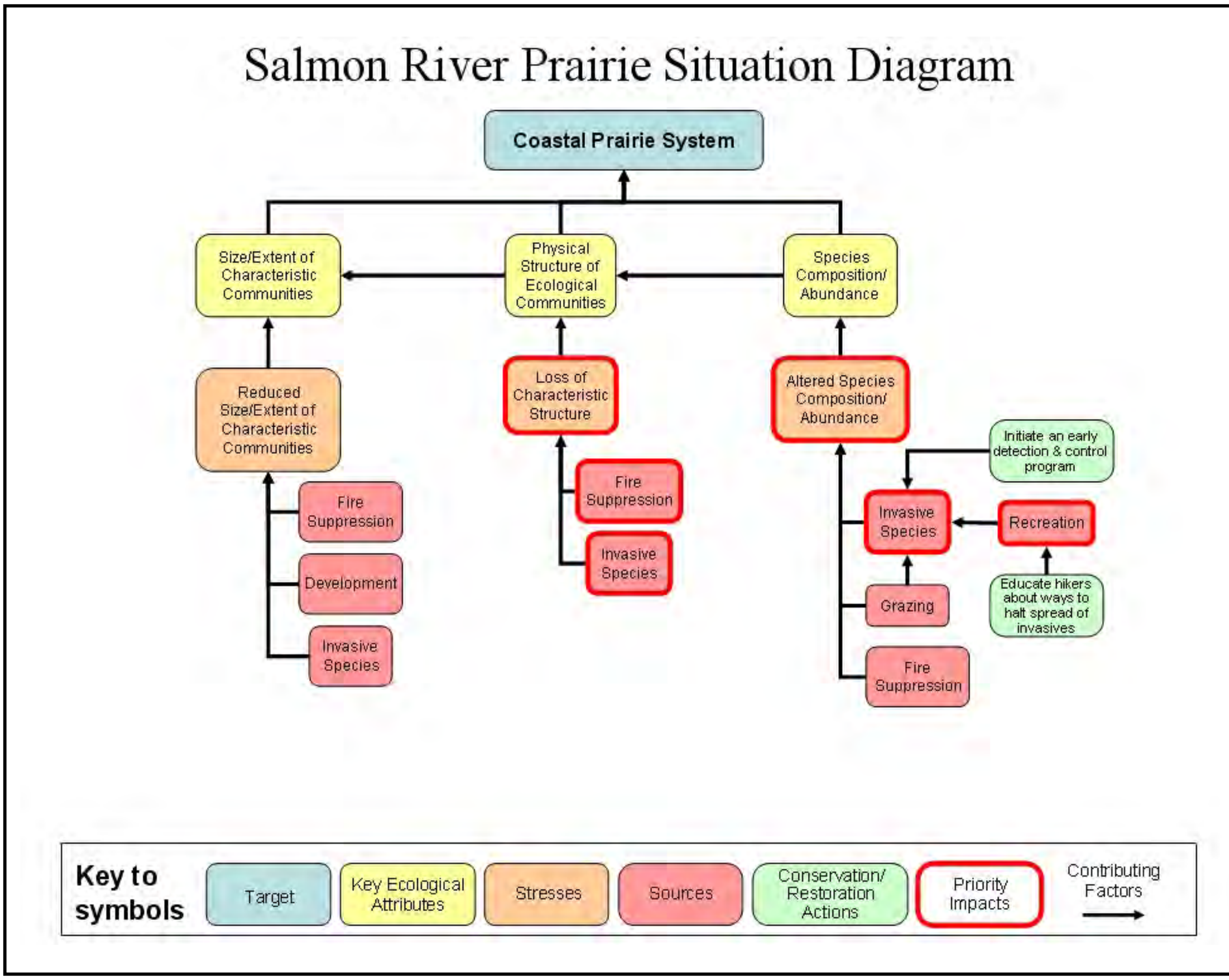


Salmon River Freshwater Situation Diagram
Freshwater System
Sediment Dynamics & Geomorphology
Species Composition/ Abundance
Hydrologic/ Mixing Regime
Size/Extent of Characteristic Communities
Water Quality
Connectivity
Altered Wood Delivery
Altered Sediment Regime
Altered Channel Morphology
Altered Species Composition/ Abundance (e.g. anadromous fish, beaver)
Altered Hydrologic/ Mixing Regime
Reduced Size/Extent of Characteristic Communities (e.g. Riparian)
Degraded Water Quality
Reduced Connectivity
Development
Logging Roads: Culverts
Dams & Reservoirs
Grazing
Forest Management
Development
Forest Management
Dams & Reservoirs
Grazing
Recreation: ORVs
Logging Roads
Conduct comprehensive road & culvert assessment
Grazing
Logging Roads
Highways
Historic Removal of Wood from Streams & Splash dam Impacts
Ditching & Diking
Channel Armoring
Altered Channel Morphology
Reduced Connectivity
Degraded Water Quality
Hatchery
Fishing & Harvesting
Logging Roads
Forest Management
Climate Change
Surface & Groundwater Withdrawals
Development
Roads
Invasive Species
Forest Mgmt: Clear Cutting (in Source streams)
Climate Change
Grazing
Recreation
Development
Pollution: septic system outfall, road runoff, lawn chemicals, land use practices, garbage dumping
Grazing
Surface & Groundwater Withdrawals
Recreation
Roads: Culverts
Dams & Reservoirs
Key to symbols
Target
Key Ecological Attributes
Stresses
Sources
Conservation/ Restoration Actions
Priority Impacts
Contributing Factors


Salmon River Estuary Situation Diagram
Estuary System
Species Composition/ Abundance
Size/Extent of Characteristic Communities
Sediment Dynamics & Geomorphology
Connectivity
Hydrologic/ Mixing Regime
Water Quality
Altered Species Composition/ Abundance (e.g. macroinverts, fish, native plants)
Reduced Size/Extent of Characteristic Communities (e.g. tidal marshes, eelgrass, mudflats)
Altered Sediment Regime
Altered Channel Morphology (streams & tidal creeks)
Reduced Connectivity (physical & head-of-tide thermal barriers)
Reduced/ Altered Freshwater Flows
Degraded Water Quality (e.g. DO, temp., nutrients, turbidity, & altered salinity)
Ditching & Diking
Grazing
Fishing & Harvesting
Invasive Species
Recreation: boating
Restore estuary habitats as detailed in Lower Salmon restoration plan
Fishing & Harvesting
Invasive Species
Recreation: boating
Develop initiatives to reduce likelihood of invasive species being transported in on boats
Ditching & Diking
Roads & Highways
Grazing
Forest Management
Earthquakes: Subsidence
Climate Change: Sea Level Rise
Surface & Groundwater Withdrawals
Ditching & Diking
Roads & Highways
Forest Mgmt: Clear Cutting loss of LWD
Recreation: boat wakes
Surface & Groundwater Withdrawals
Development
Land Use Planning
Roads & Highways
Work with ODOT to mediate Impacts of Hwy 101
Ditching & Diking
Surface & Groundwater Withdrawals
Climate Change: Temp. Extremes
Surface & Groundwater Withdrawals
Development
Ditching & Diking
Roads & Highways
Pollution: septic system outfall, road runoff, lawn chemicals, land use practices, garbage dumping, boat waste/pollution
Surface & Groundwater Withdrawals
Marine inputs: Oil spills etc.
Key to symbols
Target
Key Ecological Attributes
Stresses
Sources
Conservation/ Restoration Actions
Priority Impacts
Contributing Factors



Salmon River Nearshore Marine Situation Diagram
Nearshore Marine System
Size/Extent of Characteristic Communities
Species Composition/ Abundance
Presence/ Abundance of Keystone Species
Population Structure & Recruitment
Water Quality
Reduced Size/Extent of Characteristic Communities (e.g. kelp beds & dunes)
Altered Species Composition/ Abundance (e.g. dunes & sea cliffs)
Reduced Abundance of Keystone Species (e.g. sea stars & mussels)
Reduced Recruitment (of dominant space occupiers)
Skewed Size/Age Structure/Distribution (e.g. in Rockfish, Crab, & Lingcod)
Degraded Water Quality (e.g. DO, nutrients, & bacteria)
Fishing & Harvesting (including extirpated sea otters)
Climate Change: Temp. Extremes
Invasive Species
Shore Armoring
Recreation: driftwood gathering
Invasive Species
Recreation: Wildlife Trampling
Fishing & Harvesting (including extirpated sea otters)
Invasive Species
Climate Change: Ocean Currents Temp. Extremes
Recreation: Wildlife Trampling
Invasive Species
Climate Change: Ocean Currents Temp. Extremes
Fishing & Harvesting
Climate Change: Temp. Extremes
Pollution: septic system outfall, road runoff, lawn chemicals, land use practices, boat waste/pollution
Marine inputs: Oil spills etc.
Low DO water Coming In
Key to symbols
Target
Key Ecological Attributes
Stresses
Sources
Conservation/ Restoration Actions
Priority Impacts
Contributing Factors


Salmon River Prairie Situation Diagram
Coastal Prairie System
Size/Extent of Characteristic Communities
Physical Structure of Ecological Communities
Species Composition/ Abundance
Reduced Size/Extent of Characteristic Communities
Loss of Characteristic Structure
Altered Species Composition/ Abundance
Initiate an early detection & control program
Fire Suppression
Fire Suppression
Invasive Species
Recreation
Development
Invasive Species
Grazing
Educate hikers about ways to halt spread of invasives
Invasive Species
Fire Suppression
Key to symbols
Target
Key Ecological Attributes
Stresses
Sources
Conservation/ Restoration Actions
Priority Impacts
Contributing Factors

Appendix B. Impact rating criteria

Severity of Damage -- the level of damage to the conservation target that can reasonably be expected within 10 years under current circumstances (i.e., given the continuation of the existing situation).

- Very High: Likely to destroy or eliminate the conservation target over some portion of the target's occurrence at the site.
- High: Likely to seriously degrade the conservation target over some portion of the target's occurrence at the site.
- Medium: Likely to moderately degrade the conservation target over some portion of the target's occurrence at the site.
- Low: Likely to only slightly impair the conservation target over some portion of the target's occurrence at the site.

Scope of Damage -- the geographic scope of impact on the conservation target at the site that can reasonably be expected within 10 years under current circumstances (i.e., given the continuation of the existing situation).

- Very High: Likely to be very widespread or pervasive in its scope, and affect the conservation target throughout the target's occurrences at the site.
- High: Likely to be widespread in its scope, and affect the conservation target at many of its locations at the site.
- Medium: Likely to be localized in its scope, and affect the conservation target at some of the target's locations at the site.
- Low: Likely to be very localized in its scope, and affect the conservation target at a limited portion of the target's location at the site.

Irreversibility -- reversibility of the stress caused by the Source of Stress.

- Very High: Not reversible (e.g., wetlands converted to a shopping center).
- High: Reversible, but not practically affordable (e.g., wetland converted to agriculture).
- Medium: Reversible with a reasonable commitment of resources (e.g., ditching and draining of wetland).
- Low: Easily reversible at relatively low cost (e.g., off-road vehicles trespassing in wetland).

Contribution -- expected contribution of the source, acting alone, to the full expression of a stress (as determined in the stress assessment) under current circumstances (i.e., given the continuation of the existing management/ conservation situation).

- Very High: The source is a very large contributor of the particular stress.
- High: The source is a large contributor of the particular stress.
- Medium: The source is a moderate contributor of the particular stress.
- Low: The source is a low contributor of the particular stress.

Appendix B (cont.): Overall Source Ranking - Summary Across All Targets

Overall Source ranks are determined by combining Source ranks across all targets affected by that Source. The Overall Source rank is found in the far right column of Table 7.

The Overall Source rank is determined by the "2 Prime" rule which is as follows:

- Two Very High rankings yield an Overall Source Rank of Very High
- One Very High or Two High rankings yield an Overall Source Rank of High
- One High or Two Medium rankings yield an Overall Source Rank of Medium
- Less than Two Medium rankings yield an Overall Source Rank of Low.

Multiple ranks are first aggregated using the "3-5-7" rule prior to calculation of the Overall Source Rank. Thus,

- Three High rankings equal one Very High,
- Five Medium rankings equal one High, and
- Seven Low rankings equal one Medium.

For example, assume that a Source has three High rankings and five Medium rankings across the eight target columns. The five Medium rankings equal one High ranking, thus equating to four High rankings. Since three High rankings equal a Very High rank, this equates to one Very High and one High. Under the "2 Prime" rule a Very High Overall Source Rank requires two Very High's, so the Overall Source Rank would be only High.

Impact Status for the Entire Conservation Project

The Impact Status for the Project is determined using the "2 Prime" rule explained above. It is based on the ranking of the eight highest Overall Sources. The Impact Status for a Site is found in the lower right corner of Table 7.

Summary ranks are also provided for each Conservation Target in the bottom row of Table 7. These ranks are provided to characterize the overall Impact status for each target. The ranks are determined using the "2 Prime" rule explained above in the Overall Source Ranking. These ranks, however, are NOT used to calculate the overall Impact Status for the Site, which is calculated from the ranks in the Overall Source Rank column.