US Army Corps
of Engineers
Portland District

# Programmatic Biological Assessment

for
Categories of Activities
Requiring Department of the Army Permits

March 2000

Prepared by:

**Portland District**
**U.S. Army Corps of Engineers**
**Regulatory Branch**

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# Purpose and Need

## Purpose of this Consultation

The purpose of this biological assessment is to describe and assess certain categories of activities which are subject to regulation by the Portland District, U.S. Army Corps of Engineers under the authority of Section 10 of the River and Harbor Act and Section 404 of the Clean Water Act, and to describe proposed standard operating procedures for those categories of activities to assure compliance with the requirements of the Endangered Species Act through the Corps permitting process.

Section 10 of the Rivers and Harbors Act of 1899 requires authorization from the Secretary of the Army, acting through the Corps of Engineers, for the construction of any structure in or over any navigable water of the United States. Structures or work outside the limits defined for navigable waters of the United States require a Section 10 permit if the structure or work affects the course, location, or condition of the water body. The law applies to any dredging or disposal of dredged materials, excavation, filling, rechannelization, or any other modification of a navigable water of the United States, and applies to all structures, from the smallest floating dock to the largest commercial undertaking. It further includes, without limitation, any wharf, dolphin, weir, boom breakwater, jetty, groin, bank protection (e.g. riprap, revetment, bulkhead), mooring structures such as pilings, aerial or subaqueous power transmission lines, intake or outfall pipes, permanently moored floating vessel, tunnel, artificial canal, boat ramp, aids to navigation, and any other permanent, or semi-permanent obstacle or obstruction.

Section 404 of the Clean Water Act requires authorization from the Secretary of the Army, acting through the Corps of Engineers, for the discharge of dredged or fill material into all waters of the United States, including wetlands, both adjacent and isolated. Discharges of fill material generally include, without limitation: placement of fill that is necessary for the construction of any structure, or impoundment requiring rock, sand, dirt, or other material for its construction; site-development fills for recreational, industrial, commercial, residential, and other uses; causeways or road fills; dams and dikes; artificial islands; property protection or reclamation devices such as riprap, groins, seawalls, breakwaters, and revetments; beach nourishment; levees; fill for intake and outfall pipes and subaqueous utility lines; fill associated with the creation of ponds; and any other work involving the discharge of fill or dredged material. A Corps permit is required whether the work is permanent or temporary. Examples of temporary discharges include dewatering of dredged material prior to final disposal, and temporary fills for access roadways, cofferdams, storage and work areas.

The majority of permits issued by Portland District are for activities which are relatively minor in scope and in their potential environmental effects. This biological assessment identifies measures which can be incorporated into individual projects to ensure that the permitted actions will not adversely affect species listed as threatened or endangered. With the appropriate measures, as determined through this categorical consultation, incorporated into individual projects, further consultation with NMFS or USFWS would not be required. This would result in a significant savings of time for both the Corps and the Services, allowing all agencies to more effectively allocate their resources to the evaluation of a smaller number of projects with greater potential to adversely affect threatened or endangered species.

The intended outcome of this consultation is the adoption by Portland District of standard local operating procedures for endangered species (SLOPES) to allow efficient handling of a large number of similar, relatively minor actions while ensuring protection for listed species in compliance with the Endangered Species Act and reducing the time required to process permit actions.

## Authorities

### Statutes and Regulations

The permitting program administered by the U.S. Army Corps of Engineers is based on the statutory requirements of Section 10 of the River and Act of 1899 (33 U.S.C. 403), Section 404 of the Clean Water Act (33 U.S.C. 1344) and Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972. Waters subject to regulation under Section 10 of the River and Harbor Act include those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce. Corps jurisdiction under Section 404 of the Clean Water Act includes all Section 10 waters plus their tributaries and adjacent wetlands and isolated waters where the use, degradation or destruction of such waters could affect interstate or foreign commerce. Activities regulated by Section 103, which include the transportation of dredged material for ocean disposal, are not included in this programmatic consultation.

In accordance with Section 404(b)(1) of the Clean Water Act, the U.S. Environmental Protection Agency in 1980 promulgated "Guidelines for Specification of Disposal Sites for Dredged or Fill Material," (40 CFR 230), which are the substantive criteria used in evaluating discharges of dredged or fill material under Section 404.

The Corps of Engineers has promulgated regulations for the implementation of these statutory requirements. These regulations are found in the Code of Federal Regulations at 33 CFR 320 through 331.

### Other Agreements and Guidance

The Corps of Engineers has entered into Memoranda of Agreement with other federal agencies, including Department of Interior, Department of Commerce, and Environmental Protection Agency. Section 404(q) of the Clean Water Act requires the Department of the Army to enter into interagency agreements to minimize duplication, needless paperwork, and delays in the Section 404 permit process. Current agreements allow EPA and the Department of Commerce and the Interior to request higher level review within the Department of the Army when they disagree with a permit decision which is about to be made by the district engineer. Higher level review can only be requested when certain criteria are met and must be conducted within time limits specified in the agreements. The agreements also provide for the elevation of policy issues. The decision on such requests is made by the Assistant Secretary of the Army for Civil Works.

In October 1999 the Corps of Engineers adopted Standard Operating Procedures for the Regulatory Program. These procedures are intended to facilitate consistent program implementation across the country by highlighting important existing procedures and policy.

Pending Regulations

On March 9, 2000. the Corps of Engineers published in the Federal Register (FR 12818 – 12899) a Final Notice of Issuance and Modification of Nationwide Permits. The new and modified nationwide permits will become effective June 5, 2000. At that time, nationwide permit 26 will expire. Portland District will issue a public notice of the regional conditions which will be applied to the new and modified nationwide permits.

Other Consultations

The Portland District, U.S. Army Corps of Engineers, is also preparing to submit a biological assessment to address a proposed statewide programmatic general permit (SPGP) for Oregon. That BA, entitled Programmatic Biological Assessment for the State of Oregon's Removal-Fill Program, has been prepared by Oregon Division of State Lands (DSL) acting as the Corps' designated non-Federal representative. That BA addresses the permitting program administered by DSL under the authority of the State Removal-Fill Law (Oregon Revised Statutes 196.800-196.990) and the effects of that program on all species listed as threatened or endangered within the state of Oregon. The state permitting program is similar in many respects to the Corps permitting program; the analyses contained in that BA, particularly with respect to the numbers and distribution of permit actions throughout the state, are relevant to the subject of this categorical BA.

A preliminary final draft of the Oregon Removal-Fill BA was provided to NMFS and USFWS for review on February 23, 2000. The final BA will be submitted and initiation of formal consultation requested on or about March 31, 2000.

As part of the Oregon Removal-Fill BA, two atlases were prepared to map the locations of the various listed species within the state and the incidents of permitting which have occurred in those locations as well as statewide. Those atlases, as well as the full text and other appendixes to that BA, are incorporated by reference into this categorical BA.

**Need for This Consultation**

The large majority of Corps permit actions involve relatively small projects. Many of these are authorized through nationwide and regional general permits which have been established to authorize smaller projects with minimal environmental effects. In a typical year, Portland District will process 600 to 800 nationwide permit authorizations, many of which require informal Section 7 ESA consultation. This level of permitting and consultation activity has resulted in workload backlogs at the reviewing agencies and has caused substantial delays in Corps permit processing.

Portland District's database of permit actions provides data for the size of impact of issued permits in terms of either area (acres) or linear feet affected. An analysis of the database for a two-year period ending June 30, 1999 was done to determine the distribution of numbers of permits relative to the size of the permitted impacts (see Table 1). For those permits in which impacts were measured in acres (734), 86 percent affected 0.5 acres or less. For permits in which impacts were measured in linear feet, 52 percent (235) affected no more than 100 linear feet.

The types of activities which are most frequently authorized are reflected by the data in Table 2, which shows Nationwide permit activity for the years 1995 through 1999. The most frequently used nationwide permits were those for maintenance of existing structures, bank stabilization, fills above headwaters and in isolated waters, road crossings, utility lines and minor discharges. In addition, Portland District has used regional general permits for fish habitat enhancement and wetland restoration and enhancement, which have accounted for several hundred additional minor projects annually.

A review of the above data shows that there is a large segment of the permitting workload which is minor in scope and impact. It is this segment of the workload which is the focus of this programmatic consultation.

**Table 1**

Corps permits issued from 7-1-97 through 6-30-99 (2 years)
( impacts measured in acres)

| | # permits | subtotal | % of total |
|---|---|---|---|
| 0.01 to 0.10 acre | 441 | 441 | 60% |
| 0.11 to 0.5 acre | 190 | 631 | 86% |
| 0.51 to 1.0 acre | 37 | 668 | 91% |
| 1.1 to 2.0 acres | 29 | 697 | 95% |
| >2.0 acres | 37 | 734 | 100% |
| Total | 734 | | |

Corps permits issued from 7-1-97 through 6-30-99 (2 years)
(for impacts measured in linear feet)

| | # permits | subtotal | % of total |
|---|---|---|---|
| 0.01 to 100 l.f. | 235 | 235 | 52% |
| 101 to 200 | 88 | 323 | 71% |
| 201 to 300 | 34 | 357 | 79% |
| 301 to 400 | 13 | 370 | 82% |
| 401 to 500 | 10 | 380 | 84% |
| 501 to 1000 | 30 | 410 | 91% |
| 1001 to 10000 | 39 | 449 | 99% |
| >10000 | 3 | 452 | 100% |
| Total | 452 | | |

Table 2

| Nationwide Permit Activity by Year | | | | | | |
|---|---|---|---|---|---|---|
| NW | Authorized Activity | 1995 | 1996 | 1997 | 1998 | 1999 |
| 1 | Aids to Navigation | | 1 | | 2 | 2 |
| 2 | Structures in Artificial Canals | | | | | |
| 3 | Maintenance | 76 | 325 | 205 | 284 | 124 |
| 4 | F&W Harvesting Activities | 6 | 4 | 3 | 9 | 3 |
| 5 | Scientific Measurement Devices | 6 | 2 | 1 | 4 | 1 |
| 6 | Survey Activities | | | | 3 | 2 |
| 7 | Outfall Structures | 5 | 13 | 10 | 20 | 24 |
| 8 | Oil and Gas Structures | | | | | |
| 9 | Structures in Mooring Areas | | | | 2 | 1 |
| 10 | Mooring Buoys | | | | | |
| 11 | Temporary Recreational Structures | | | 1 | | |
| 12 | Utility Line Backfill and Bedding | 41 | 69 | 55 | 51 | 78 |
| 13 | Bank Stabilization | 54 | 260 | 235 | 145 | 88 |
| 14 | Road Crossings | 58 | 64 | 64 | 91 | 63 |
| 15 | Coast Guard Approved Bridges | 1 | | | | |
| 16 | Return Water from Upland Disposal | 2 | 2 | 2 | 1 | 2 |
| 17 | Hydropower Projects | | | | | |
| 18 | Minor discharges | 19 | 28 | 19 | 39 | 88 |
| 19 | Minor Dredging | 1 | | 2 | 2 | 1 |
| 20 | Oil Spill Cleanup | | | | | |
| 21 | Surface Mining Activities | | | | | |
| 22 | Removal of Vessels | | | | | 1 |
| 23 | Approved Categorical Exclusions | | | | | |
| 24 | State Administered 404 Programs | | | | | |
| 25 | Structural Discharges | | 1 | | 1 | |
| 26 | Headwaters & Isolated Waters | 87 | 125 | 127 | 146 | 110 |
| 27 | Wetland Restoration Activities | 2 | | | 5 | 4 |
| 28 | Modification of Existing Marinas | | 2 | | 1 | 2 |
| 29 | Single-Family Housing | | 1 | 2 | 4 | 3 |
| 30 | Moist Soil Management for Wildlife | | | | | |
| 31 | Maintenance of Flood Control Projs. | | | | 1 | |
| 32 | Completed Enforcement Actions | | | 1 | 1 | 1 |
| 33 | Temporary Construction & Access | 5 | 1 | 3 | 8 | 14 |
| 34 | Cranberry Production Activities | | | | | |
| 35 | Maintenance Dredging of Basins | 4 | 5 | 7 | 7 | 7 |
| 36 | Boat Ramps | | | 1 | 1 | |
| 37 | Emergency Watershed Protection | | 70 | 80 | 12 | |
| 38 | Cleanup of Hazardous & Toxic Waste | 3 | 2 | 4 | 1 | 2 |
| 40 | Farm Buildings | | | | | |
| | | | | | | |
| Totals | | 370 | 975 | 822 | 841 | 621 |

# Proposed Action

The proposed action includes: 1) the categories to be considered in this consultation, with specific and general conditions to avoid or minimize potential effects on listed species; and 2) the proposed standard local operating procedures for endangered species (SLOPES) for these categories of activities.

A detailed description of the Corps permit program and procedures has not been included in this biological assessment because it is assumed that the reviewers at NMFS and USFWS are sufficiently familiar with the program. The Corps regulations and EPA's 404(b)(1) Guidelines which provide the basis for these procesdure are incorporated by reference into this BA. If additional information or clarification is needed, the Corps will be glad to provide any requested information.

**Categories of Activities with Conditions**

This section includes descriptions of the categories of activities included in this consultation. Most of these categories include specific conditions which would be applied to individual permits and verifications of nationwide permit authorizations to ensure that adverse effects to threatened or endangered species will be avoided or reduced to minimum levels. This section also includes general conditions which are applicable as appropriate to all categories of activities. These conditions will be applied to a proposed action only after the permit application has been reviewed individually to ensure that all practicable alternatives have been considered and impacts have been avoided and minimized as much as possible.

Erosion Control Activities. Erosion control activities include the placement of material along or adjacent to banklines for the purpose of preventing erosion of the bank either by lining the face of the bank with a hard surface, by altering the face of the bank using bio-engineering methods, or by creating structures in the water to divert the current or to reduce the effects of wave action. Erosion control projects may include the construction of bulkheads, groins, retaining walls, or the placement of revetment. These types of actions could involve excavation, placement of bedding material, rock, concrete, sheetpile, wood or plant material.

Conditions:

- The design must incorporate bioengineering principles. Options to avoid or minimize stabilization and maximize riparian vegetation must be fully explored and implemented. The analysis must consider "no build" options, i.e. address erosion by eliminating the cause when it is within the ability of the property owner, and when the solution is practicable and accomplishes the project purpose.

- The bank slope and bank protection measures shall be designed to provide a stable slope under the full range of design flows and predicted bed elevation changes. The applicant must provide documentation which demonstrates that the proposed measures will be stable and will provide the required level of bank protection.

- Repairs of previously authorized projects which involve reconstruction shall comply with the conditions for new construction. Minor repairs shall incorporate bioengineering principles and revegetation of the bankline whenever practicable.

Water Control Activities. Water control activities include the placement of material on the bankline and/or in the stream to control the flow of water for the purpose of preventing or reducing the risk of flooding, or to maintain drainage, and may include dikes, levees, tide gates, pump stations and related structures. These types of actions could involve excavation, grading, fill, or placement of concrete for tidegates and pump station.

Utility Lines. A utility line is any pipe or pipeline for the transportation of any gaseous, liquid, liquifiable, or slurry substance, for any purpose, and any cable, line, or wire for the transmission for any purpose of electrical energy, telephone and telegraph messages, and radio and television communication. Utility line construction or repair could involve excavation, temporary sidecasting of excavated material, placement of pipeline or cable in the trench, backfilling of the trench, and restoration of the work site to pre-construction contours and vegetation. The term "utility line" does not include activities which drain a water of the United States, such as drainage tile; however, it does apply to pipes conveying drainage from another area.

Conditions:

- Directional drilling shall be the preferred method of crossing any waterways. If directional drilling is not feasible, the work shall be performed when the stream bed is dry. Open trenching in running waters or temporary stream diversions are not covered under this consultation.

- There must be no change in preconstruction contours.

- The top 12 inches of soil from the excavation shall be stockpiled and replaced into the top of the trench.

- Associated roads or other encroachments into the riparian area must be restricted to the maximum extent practicable and located to minimize their impact. Temporary roads must be removed in their entirety, and the site restored as soon as construction is completed.

- Banklines shall be returned to original slopes and revegetated with native vegetation.

- The applicant shall provide documentation that shows that the utility line will not be exposed due to any lateral migration, head cutting or general scour in the stream.

Road Construction, Repairs, and Improvements. This includes new highway construction or improvement of an existing highway, road, street or bridge, including widening, repairing, realigning, reconstructing or removing existing roads and bridges, or replacing culverts under roads including temporary fills and access fills. It could involve excavation, grading, filling, placement of culverts, construction of bridges, and construction of drainage features.

Conditions:

- No bridge piers or abutments will be constructed within the 2 year floodplain. Culvert replacements or modifications shall be done in the dry, unless it can be demonstrated that no listed or proposed fish are present during project activities. The preferred culvert designs and their order of preference are found in ODFW's Standards and Criteria for Stream-Road Crossings.

- In streams that contain anadromous fish, or in streams listed or proposed for listing as critical habitat under the Endangered Species Act, the crossing must be designed to comply with the Oregon Department of Fish and Wildlife (ODFW) Standards and Criteria for Stream-Road Crossings as approved by NMFS.

- Unless otherwise approved, passage must be designed to meet the requirements of the weakest salmonid species, or life stage, present at the time(s) migration or movement occur.

- Road crossing and bridge structures shall be designed to direct surface drainage into areas or features (such as biofiltration swales or other treatment facilities) to prevent erosion of soil and other pollutants directly into waterways or wetlands.

-The width of the fill must be limited to the minimum necessary for the actual crossing.

- Road maintenance must comport with Oregon Department of Transportation (ODOT) Maintenance Best Management Practices Guide.

<u>Site Preparation for Construction of Buildings and related Features (Such As Driveways, Parking areas, and Walkways)</u>. This category includes excavation, filling and grading for the purpose of preparing a site for construction of any type of building, as well as fills for driveways, parking areas, garages, storage and utility buildings, etc. which are related to the purpose of the primary structure.

<u>Conditions</u>:

- Buildings or other structures may be placed no closer than 75 feet from the top-of-bank of any fish-bearing stream, and no closer than 25 feet from the top-of-bank of any nonfish-bearing tributary to such a stream.

- Any vegetated area which is temporarily disturbed during construction within designated critical habitat shall be replanted with native plants. Areas along stream banks shall be restored and maintained with native riparian vegetation.

<u>Stream and Wetland Restoration and Enhancement</u>. This category may include installation, removal and maintenance of small water control structures, dikes, and berms; installation of current deflectors; enhancement, restoration or creation of riffle and pool stream structure; placement of in-stream habitat structures; modifications of the stream bed and/or banks to restore or create stream meanders; the backfilling of artificial channels and drainage ditches; removal of existing drainage structures; construction of small nesting islands; construction of open water areas; activities needed to reestablish vegetation; and other activities as described in Nationwide Permit 27, Stream and Wetland Restoration Activities.

Conditions:

- Water will not be withdrawn from any waterbody containing anadromous fish.

- The work shall not create an impediment to fish passage and there shall be no change to stream gradient.

- Any outfall structures associated with this activity shall be placed to prevent discharge water from affecting aquatic vegetation.

- Water being discharged into an anadromous fish bearing stream shall not exceed 4 fps at an outfall or diffuser port to avoid attracting fish.

- The slope of the facility should be designed such that fish cannot be trapped in the impoundment or wetland.

Boat Ramps. Construction of boat ramps may include excavation, grading, and placement of poured or pre-cast concrete, and the construction of related features including docks, floats and piers.

Conditions:

- Use of non-treated wood, plastics, steel and concrete for structures is required.

- Flotation shall be encapsulated to permanently prevent the breakup of loss of flotation material.

Other Minor Discharges and Excavations. This category includes minor discharges and excavations such as small structural fills, minor excavations or dredging such as that necessary for culvert maintenance, installation of outfall structures and minor repairs of previously authorized structures or fills.

Conditions:

- All dredged or excavated material must be removed to an upland location where it cannot re-enter the waterbody.

- Maintenance of culverts shall be done in a manner such that there shall be no equipment in the stream. Any roads placed to access the culvert shall be removed and vegetation restored.

- Structural fills with materials such as concrete or sand shall be placed into tightly sealed forms or cells

- Stream diversions are not covered by this consultation.

- Effluent from outfall structures umst be authorized, conditionally authorized, specifically exempted or otherwise in compliance with regulations issued under the National pollutant Discharge Elimination System program.

- Discharged water shall not exceed 4 fps at either the outfall or diffuser port.

- Any intake structure shall meet NMFS screening criteria.

- Areas of high benthic productivity shall be avoided to the maximum extent practicable. If the project occurs in an estuary or other typically highly productive area, benthic sampling is required.

Installation and Repair of Navigational Aids

Activities under this category include the placement of permanent and temporary navigational aids such as mooring buoys and channel markers.

Maintenance of Existing Structures and Marinas.

This category includes the maintenance, repair and relocation of existing structures within an authorized marina,

Conditions:

- Walkways wider than 4 feet shall include grating or translucent panels to maintain a minimum of 60% of the ambient open water light.

- Use of non-treated wood, plastics, steel and concrete for structures is required.

- Flotation shall be encapsulated to permanently prevent the breakup or loss of flotation material.

- Structures may only be moved within the existing footprint of the moorage or into deeper water. Structures may not be moved to water shallower than 20 feet (MLLW). Where the water along the shoreline is deeper than 20 feet, all structures shall be located at least 30 feet away from the shoreline.

- All floats shall be placed in water deep enough to ensure they do not ground out at low water. At least a foot of depth shall be maintained between the river bed and the bottom of any float. Mooring buoys shall be placed in water deep enough so that moored boats never ground out or prop wash the bottom.

Installation Of Small Temporary Floats:

This category includes temporary buoys, markers, small floating docks, and similar structures placed for recreational use during specific events such as water skiing competitions and boat races or seasonal use provided that such structures are removed within 30 days after use has been discontinued.

Conditions:

- Floats may not be installed more than 7 days in advance of the event and must be removed within 5 days of the end of the event.

- Floats or other structures are not allowed in areas with submerged aquatic vegetation.

- Floats shall not ground out at low water, and at least a foot of depth shall be maintained between the river bed and the bottom of any float.

- Flotation shall be entirely contained and encapsulated to permanently prevent the breakup or loss of flotation material.

- Floating storage units or boat houses are not included in this consultation.

Structures In Fleeting And Anchorage Areas.

This category includes buoys, floats and other devices placed within anchorage or fleeting areas to facilitate storage of vessels where such areas have been established for that purpose by the U.S. Coast Guard.

Maintenance Dredging:

This category includes maintenance dredging of existing marinas to maintain the authorized depth for ingress and egress.

Conditions:

- Dredging shall not be deeper than the authorized project depth and shall be conducted during the approved in-water work period. The side slopes of the dredged area shall be graded to a maximum slope of 3 feet horizontal to 1 foot vertical to prevent the deepening of shallow water areas by sloughing.

- Dredging during the approved work window may be done by any method.

- If dredging outside of the approved window is warranted the following will apply:

- In waters with depths between 20 and 30 feet a clamshell dredge shall be used during periods of peak juvenile out migration times (as defined by ODFW). In waters deeper than 30 feet dredging may be conducted by either a clamshell or hydraulic dredge at any time. In waters less than 20 feet, dredging shall be conducted during the approved work window only.

- When using a hydraulic dredge, the intake of the dredge should be operated at or below the surface of the material being removed. It can be raised a maximum of 3 feet above the bed for brief periods of purging or flushing.

- Material shall be placed in an approved upland site.

Return Water from Upland Contained Disposal Areas

This category includes return water from an upland, contained dredged material disposal area. The return water from a contained disposal area is administratively defined as a discharge of dredged material by 33 CFR 323.2(d) even though the disposal itself occurs on the upland and thus does not require a Section 404 permit.

Conditions:

- Water being discharged shall not exceed 4 cfs at either the outfall or diffuser port.

Fish and Wildlife Harvest, Attraction Devices and Activities. This category includes the installation and use of fish and wildlife harvesting devices and activities.

Conditions:

- Areas of high benthic productivity shall be avoided. If the project occurs in an estuary or other typically highly productive area, benthic sampling is required prior to any activities.

- The project must not result in a major change in substrate (i.e. sand bottom to rocky reef, etc.).

- Commercial harvest of shellfish by means of a mechanical or hydraulic escalator type of equipment is not covered by this consultation.

**General Conditions**

Fish Passage. Work shall not inhibit fish passage. All culverts and other structures must be consistent with the passage standards found in "Oregon Department of Fish and Wildlife Standards and Criteria for Stream Road Crossings." Channel modifications which could adversely affect fish passage, such as by increasing water velocities, are not covered by the categorical consultation.

Suitable Material. Only clean, suitable material shall be used as dredged or fill material (e.g., no trash, debris, car bodies, asphalt, etc.,). Material must be free from toxic pollutants.

Removal of Temporary Fills. Any temporary fills must be removed in their entirety and the affected areas returned to their preexisting elevation.

In-Water Work Period. All in-water work shall occur within the approved in-water work period. Work outside the wetted perimeter of the stream, but below the ordinary high water mark, may be authorized outside of the normal in-water work period, if shown to be less damaging.

In-Stream Work Prohibited. Work shall be done from the top of the bank. Operation of heavy equipment directly in the active flowing channel is not covered by this categorical consultation.

Restrictions on Heavy Equipment. Permittee shall use equipment having the least impact. Hand labor rather than heavy equipment will be used when possible. Heavy equipment working in wetlands must be placed on mats, or other measures must be taken to minimize soil disturbance and compaction.

No Dumping. Material shall be carefully placed, not dumped, into the stream

Discharges in Special Areas. Discharges into fish spawning areas or areas with submerged aquatic vegetation are not authorized.

Erosion Control. Permittees must ensure they take all practicable steps to control erosion during construction, and establish permanent erosion protection upon completion of the work, or during extended work stoppages. Erosion and siltation controls (such as hydro seeding, filter bags, organic or fabric soil detention systems, leave strips, berms, etc.) must be used and maintained in effective operating condition during construction to protect all exposed soil, stock piles and fills from erosion. Permittees are expected to implement the following erosion control measures as appropriate:

- Stockpiles shall be constructed in a manner which minimizes erosion, and permanently stabilized at the earliest practicable date.

- Permittee shall install and maintain temporary erosion control.

- If plants are utilized for temporary erosion control, species selected shall be non-persistent and non-invasive. Sterile straw or hay bales shall be used when available to prevent introduction of weeds.

- Construction access roads and associated staging areas shall be protected with a gravel blanket or other suitable material. Temporary access roads and staging areas shall be restored with native vegetation after construction is completed.

-All excess dredged or excavated material shall be placed in an upland location.

Site Restoration. Construction impacts shall be confined to the absolute minimum area necessary to complete the project. The site must be rehabilitated the next planting period (generally either the fall or early spring). Steps to minimize unnecessary impacts and rehabilitate the site upon completion of the work include:

- Damaged areas shall be restored to pre-work conditions. Where the site is to be revegetated or restored, top soil shall be stockpiled for re-distribution on the project area.

- Disturbed areas will be revegetated with native plant species. The species used should be specific to the project vicinity or the region of the state where the project is located, and comprise a diverse community structure (plantings should include both woody and herbaceous species).

- Where necessary, fencing shall be installed to control livestock access to revegetated sites.

**Proposed Standard Operating Procedures for Endangered Species**

Applications for individual Corps permits will be submitted to the Corps on a standard permit application form (Form ENG 4345). Requests for verification of nationwide permit authorizations may be submitted by letter or using the standard application form. In either case, the Corps permit evaluator will review the proposed action to determine whether any proposed threatened or endangered species may be present, and if so, whether those species may be affected by the proposed action.

For fish species, the permit evaluator will consult maps and listing data to determine whether the proposed action is on or adjacent to a stream which provides habitat for any listed or proposed fish species. If it is, the permit evaluator will determine whether the proposed action may affect the listed or proposed species.

For species other than fish, the Corps project manager will query the database maintained by Oregon Natural Heritage Program to determine whether any listed or proposed species are likely to occur in the project area. If any listed or proposed species are identified through this query, the project manager will determine whether the proposed action may affect the listed species.

If effects are anticipated, the permit evaluator will condition the permit or nationwide permit verification to include construction, maintenance and/or mitigation requirements intended to avoid or minimize any potential effects to listed or proposed species. No consultation with NMFS or USFWS would be initiated, subject to the terms and limitations which result from this programmatic consultation.

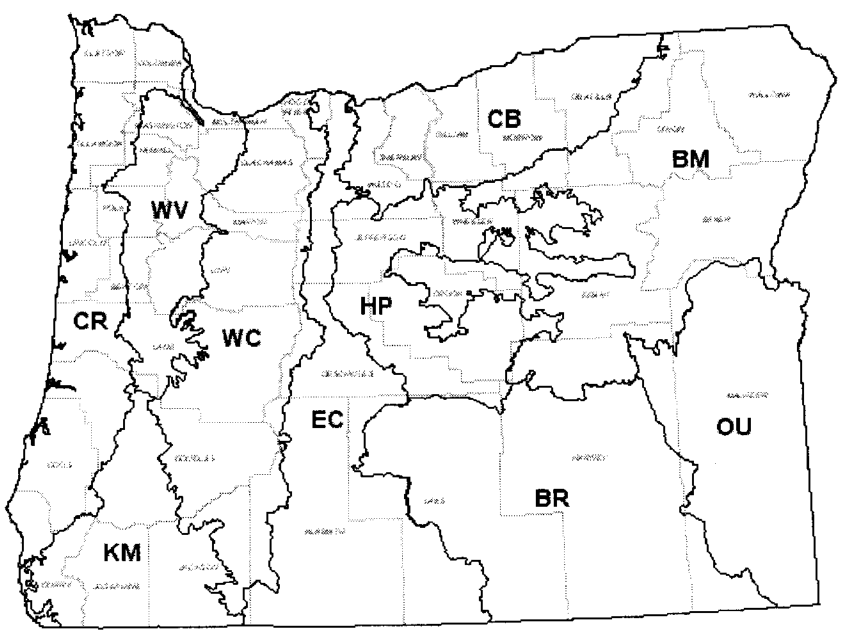
The Corps will maintain a database of permits issued, and report this information periodically to NMFS and USFWS to determine the effectiveness of this categorical consultation in avoiding or minimizing the effects of regulatory decisions on federal threatened and endangered species.

# Description Of The Existing Environment

The geographical area within the jurisdiction of Portland District, U.S. Army Corps of Engineers, includes the entire state of Oregon. The following discussion of ecoregions provides a basis for understanding the existing environment within the state of Oregon.

Ecoregions are geographic areas with similar features, such as climate, vegetation, geology, geomorphology, soils, and ecosystem processes, together with characteristic natural communities of plant and animal life. There are 10 ecoregions (Figure 1) in Oregon. These were adopted from the most recent work by Omernik (Pater *et al.* 1997) for western Oregon and by Bailey (1995) for eastern Oregon. They are the same as those used by the Oregon Department of Fish and Wildlife in their Wildlife Diversity Plan and they have been the basis for most Oregon biodiversity planning efforts. A brief description of each ecoregion's ecology, biology and major land uses, taken from the Oregon Natural Heritage Plan (Oregon Natural Heritage Advisory Council 1998) follows.

**Figure 1. Map of Oregon Ecoregions**




| | | | |
|---|---|---|---|
| Coast Range | CR | Willamette Valley | WV |
| Klamath Mountains | KM | West Slope Cascades | WC |
| East Slope Cascades | EC | Blue Mountains | BM |
| Basin and Range | BR | High Lava Plains | HP |
| Owyhee Uplands | OU | Columbia Basin | CB |

## Coast Range

The Coast Range Ecoregion includes the entire Oregon coastline and the northern and central Oregon Coast Range Mountains, and extends north though the state of Washington to southwestern British Columbia on Vancouver Island, and south almost to Mendocino, California. Elevations in the Oregon Coast Range Ecoregion range from sea level to 4,000 feet, and the marine climate creates the most moderate and wettest habitats in the state. Average annual precipitation of 60 to 180 inches supports spectacular stands of temperate rainforests. Vegetation is characterized by forests of Sitka spruce, western hemlock, Douglas fir and red alder.

The Oregon coast has other unique ecological features. Sand deposits from coastal streams and rivers (primarily the Umpqua and Columbia Rivers) have created major coastal dune systems, the largest located at the Oregon Dunes National Recreation Area. In the north coast, steep headlands and cliffs are separated by stretches of flat coastal plain and large estuaries. The south coast includes the warmest areas, with rugged headlands and very mild winters, supporting local endemic species such as the coast redwood and Port Orford cedar. Coastal bogs and wetlands support unique species, including the endangered *Lillium occidentale.*

Almost 40% of the region is in public ownership, primarily in National Forest and State Forest lands. Population is dispersed in many small towns, most located within a few miles of the ocean. Forest products, tourism and fisheries are the mainstays of the local economy.

## Willamette Valley

The Willamette Valley Ecoregion is located between the Coast Range and the Western Cascades in northwestern Oregon and includes Oregon's largest river valley. From Oregon it extends north to include the Vancouver, Washington bottomlands. The valley is characterized by broad, alluvial flats and low basalt hills. Soils include deep alluvial silts from river deposits and dense heavy clays from pluvial deposits in the valley bottom's numerous oxbow lakes and ponds.

The abundant rainfall and fertile soils make the valley Oregon's most important agricultural region. This has been the case since the first settlers began arriving via the Oregon trail. As a result, the Willamette Valley is Oregon's most altered ecoregion.

Originally, the valley was a mosaic of gallery riparian forests and wetlands, open white oak savannas and prairie, with valley margins of oak, ponderosa pine and Douglas fir woodlands. Native Americans maintained the prairies, oak savannas and woodlands by regularly burning most of the valley. With settlement, the prairies have been largely farmed and the open oak savannas and oak-conifer woodlands have been logged or become closed canopy forests. This loss of savanna and prairie habitat has led to the decline of many of Oregon's sensitive species, including the Willamette daisy and Fender's blue butterfly.

The Willamette Valley is home to most Oregonians, with more than 70% of the state's population, the majority of its industry, and almost half of its farmland. It is also the fastest growing ecoregion, with the human population expected to double in the next 25 years (Gregory and Sedell 1994).

The Willamette Valley's location on the Pacific Flyway makes it an important area for migrating and wintering waterfowl. Geese and shorebirds benefit from flooded agricultural lands, and the Willamette River and its many tributaries support salmon and steelhead runs, mostly of hatchery origin due to the large number of dams in the system. The valley's few remaining fragments of native prairie support many special plant species and endemic invertebrates, while the remaining wetlands provide habitat to the Oregon chub, the western pond turtle and many other sensitive animal species.

**Klamath Mountains**

The Klamath Mountains Ecoregion covers most of southwestern Oregon and northwestern California and includes the Siskiyou Mountains, California's Marble Mountains and Trinity Alps and the interior valleys and foothills between these mountain ranges. Elevations range from 100 to over 7,500 feet. Valley bottoms in the interior generally range between 450 feet elevation in the north around Roseburg to almost 2,000 feet at Ashland near the California border.

This ecoregion has the oldest landscapes in Oregon and is one of the few areas of the state not shaped largely by volcanism. It also is by far the most geologically diverse, having large areas of metamorphic and sedimentary rocks such as serpentine, limestone and gabbro, as well as granites and basalt. Topography ranges from steep, dissected mountains and canyons to gentle foothills and flat valley bottoms. The ecoregion also has major climatic extremes. Far western portions receive more than 100 inches of rain per year, with relatively mild temperatures year-round. The southern interior valleys are much drier, with locations receiving less than 20 inches of rain per year and summer high temperatures averaging more than 90 F.

The combination of exceptional climatic, geologic, and topographic diversity supports the most diverse habitats in Oregon. In addition to diverse habitats, the Klamath Mountain Ecoregion is a floristic crossroads, including elements of the Sierra Nevada Mountains, Sacramento Valley and Coast Range Mountains of California; the Cascade Mountains of Oregon and Washington; and the Great Basin to the east.

Due to its geologic age, stable climate, and many unusual habitats, the ecoregion is a major center of species endemism for vascular plants. Of the 4,000 native plant species or subspecies occurring in Oregon, about half are found in this ecoregion, with about a quarter of these known only here. The region is also known for its diversity of conifers, with 30 different species. (In Oregon, the West Cascades has the second largest number of conifer species, with 18 species).

Within the Rogue River basin, the unique Agate Desert area is characterized by shallow, Agate-Winlow complex soils, a relative lack of trees, and sparse prairie vegetation (ONHP 1997). The Agate-Winlow soil landscape consists of a gentle mound-swale topography that develops pools of water in the swales during the fall and winter rainy season. These vernal pools vary in diameter size from 3 to 100 feet (1 to 30 m) and attain a maximum depth of about 12 inches (30 cm) (ONHP 1997). Vernal pools typically form in flat plains where a clay or hardpan layer restricts water percolation so that rainfall is retained for several months of the year (USDI 1994c). Plants native to these pools are adapted to grow, flower, and set seed during the relatively short time that water is available in the spring.

Prior to European settlement, the landscape was dominated by three major vegetation types — Douglas fir forests, oak woodlands and ponderosa pine woodlands. Other significant communities included native grasslands and chaparral which dominated the presettlement valley bottoms, and Port Orford cedar forests, which have been decimated by logging and disease. All of the natural habitats have changed since fire suppression became effective in the early twentieth century. The region has a high frequency of dry, summer lighting storms, leading to natural fire frequency of less than 40 for most of the region, and closer to 20 years in the valleys and eastern portions of the region. Over fifty years of fire suppression have dramatically altered the ecology of the forests, savannas and shrublands in this region.

The human population of the ecoregion is concentrated in the valleys along the Interstate 5 corridor. Forest products, agriculture and tourism are the foundations of the local economy. The region is currently growing at a rate second only to the Willamette Valley.

## West Cascades

The West Cascades Ecoregion extends from southern British Columbia south almost to the California border. This mountainous, heavily forested ecoregion is bounded on the west by the farms and woodlands of the Puget Trough and the Willamette Valley or the drier forests and valleys of the Klamath Mountains. To the east, it spills over the crest of the Cascade Mountains to the drier ponderosa pine forests of the East Cascades Ecoregion.

The crest of the Cascade Range is dominated by a series of volcanic peaks. In Oregon Mount Hood is the highest at 11,240 feet, but a dozen others top 8,000 feet. The western slopes of the range feature long ridges with steep sides and wide, glaciated valleys. Most of the rivers draining the northern two-thirds of the ecoregion flow into the Willamette Valley and then to the Columbia River system; the southern third drains to the Pacific Ocean through the Umpqua and Rogue River systems. The climate varies with elevation and, to a lesser extent, latitude. Higher elevations receive heavy winter snows. The drier southern half has a fire regime similar to the Klamath Mountains, with frequent lightning-caused fires. In the northern half, the natural fire regime has historically produced less frequent but more severe fires.

The ecoregion is almost entirely forested and the flora and fauna are similar to that of the Coast Range Ecoregion. Douglas fir-western hemlock forests dominate large areas up to elevations of about 3,300 feet. However, most of the previously-harvested forests of the lowlands and lower slopes now support mixed conifer-deciduous forests, with young Douglas fir and western hemlock forests found in a mosaic with hardwood species such as bigleaf maple and red alder. Silver fir-mountain hemlock forests occur at mid-elevations. Silver fir, often referred to as a "subalpine forest," is common between 2,600 and 4,200 feet. Mountain hemlock is most common between 2,200 and 6,000 feet. In the higher areas, mountain hemlock or occasionally Alaska yellow cedar, subalpine fir, or whitebark pine woodlands open into alpine parklands with patches of forest interspersed with shrub and meadow communities. Alpine areas feature a variety of habitats ranging from dwarf shrubs, grasses and forbs to wetlands and barren expanses of rocks and ice.

Forests have long been the foundation of the local economy in the West Cascades, and decades of logging put the region at the center of controversies over the northern spotted owl, logging of old growth forests and management of federal lands. Most of the ecoregion's population is found in small towns in the river valleys where increasing recreation use supplements the traditional timber-based economy.

## East Cascades

The East Cascades Ecoregion is a transition zone that extends from below the crest of the Cascade Range east to where the ponderosa pine zone meets the sagebrush-juniper steppe. The ecoregion also extends north into Washington and south into California. In Oregon, the ecoregion is variable, including extensive lodgepole forests on deep Mazama ash, the montane and foothill Ponderosa pine forests, Klamath Basin lakes and wetlands, and many diverse montane forests.

The eastern slopes of the Cascades are drier than the Western Slopes, with annual rainfall ranging from 14-26 inches per year. The ecoregion is less steep and cut by fewer streams than the west side of the mountain range. It is also predominantly covered by conifer forests growing on volcanic soils. The northern two-thirds of the East Cascades is drained by the Deschutes River system, which includes a series of large lakes and reservoirs near its headwaters. The southern third is drained by the Klamath River, which flows south and west into California.

The Klamath Basin, which extends into the Modoc Plateau in California, is a broad, relatively flat mid-elevation valley that historically supported a vast expanse of lakes and marshes. Oregon's largest lake, Upper Klamath Lake, is the biggest remnant of this wetland system. Most of the basin's wetlands have been drained and converted to agriculture.

The mountains on the northern and eastern edges of the Klamath Basin lack a generally accepted name, but include a series of peaks and ridges extending from Paulina Peak near Bend southward through the headwaters of the Williamson, Sprague and Chewaucan rivers to the Warner Mountains east of Lakeview. These mountains are generally forested, but the valleys and flats between them include large marshes, irrigated meadows and pastures, and arid juniper and sagebrush steppes. These habitats are a critical part of the Pacific flyway, supporting vast numbers of shorebirds and waterfowl, the densest wintering concentration of bald eagles in the world, and many other wildlife species.

Also of ecological significance is the broad ecological zone found at the northern end of this region in Oregon, where the Columbia River Gorge created the only Oregon white oak zone in eastern Oregon - and a wealth of diversity. This Columbia Gorge transition zone, the extensive Ponderosa pine forests and woodlands, and the vast wetlands of the Klamath and upper Deschutes basin characterize this region. The ecoregion's human population is concentrated in Hood River, Bend and Klamath Falls. Forest products, agriculture, recreation and tourism are the biggest contributors to local economies.

## Blue Mountains

The Blue Mountains Ecoregion occupies nearly all of northeastern Oregon and extends into small portions of southern Washington and western Idaho. It encompasses three major mountain ranges—the Ochoco, Blue and Wallowa mountains. Landscapes include deep, rocky-walled canyons, glacially cut gorges, dissected plateaus, broad alluvial river valleys, and numerous mountain lakes, forests and meadows. Due to sharp elevational differences, the climate varies over broad temperature and precipitation ranges. Overall, the ecoregion is characterized by short, dry summers and long, cold winters.

The flora is intermediate between the east Cascades and the western Rocky Mountains of Idaho and Montana. Species composition changes with altitude. Sagebrush and grassland steppes dominate the entire eastern length of the region, stands of western juniper occur along the southern reaches, ponderosa pine woodlands are characteristic at mid-elevations and mixed coniferous forests dominate at higher altitudes. More than half the ecoregion is forested, but vast sections at all elevations are treeless due to dry conditions and the harsh climate. Extensive grasslands occur in and north of the Wallowa Mountains.

The region is thinly populated, with small towns in the major valleys and rural residents scattered throughout the smaller valleys among the mountains. Timber, ranching, agriculture and tourism provide the foundations for the local economy in most areas.

The diversity in elevation, soils and climate yields diverse habitats and many endemic plant species. The Wallowa Mountains alone have more than 10 plants species found nowhere else. Bighorn sheep, elk and large mammal populations here are among the largest in the state. The variety in habitats, including low, mid and high elevation grasslands, shrublands and forests results in this ecoregion having more habitat diversity than all but the Klamath Mountains Ecoregion.

**Basin and Range**

The Basin and Range Ecoregion includes much of southeastern Oregon's high desert and extends south into Nevada and extreme northeastern California. The ecoregion's name reflects its topography and geology, with numerous flat basins separated by isolated, generally north-south mountain ranges. Many of the mountains are fault blocks, with gradual slopes on one side and precipitous basalt rims on the other. In Oregon, elevations range from 4,100 feet in the lowest basin to more than 9,700 feet on Steens Mountain. Soils are generally rocky and thin, low in organic matter and high in minerals.

The climate is arid, with extreme ranges of daily and seasonal temperatures -- with the Alvord Desert (Oregon's driest location) receiving as little as 7 inches of rain annually. Runoff from precipitation and mountain snowpacks often flows into flat, alkaline playas, where it forms seasonal shallow lakes and marshes. Also known as the sagebrush desert or high desert, the Basin and Range Ecoregion contains many diverse habitats. The most significant of these are the sagebrush steppe types, salt desert scrub, riparian and wetland types, and mountain mahogany and aspen woodlands.

Much of the ecoregion is uninhabited. The only towns with more than a few hundred residents are Burns and Lakeview, with populations of about 3,000 each. Livestock, agriculture and tourism are the foundations of the regional economy. Lumber production, formerly a major source of employment in the Burns and Lakeview areas, has declined with lower harvests on nearby national forests.

**High Lava Plains**

The High Lava Plains is the only ecoregion contained entirely within Oregon's borders. It is essentially a lava plateau dissected by canyons of the Deschutes, John Day and Crooked rivers. Elevations in most areas are between 3,500 and 4,500 feet, but range from as low as 1,400 feet in the Deschutes River canyon at Warm Springs to as high as 6,500 feet on higher basalt rims and buttes rising from the plateau.

The climate is arid, with 10-20 inches of precipitation per year. Although some of eastern Oregon's major rivers cross the Lava Plains, most of the water originates in adjoining ecoregions. Before the advent of modern reservoirs and irrigation systems, the plateau had no major lakes and few large wetlands.

Western juniper *(Juniperus occidentalis)* achieves its greatest dominance and diversity in this area, where it occurs in more than 30 plant communities. Before European settlement, basin big sagebrush, native grasslands and riparian woodlands were widespread in this region. Today, it is more common to find irrigated alfalfa, grains and mint occupying the region's valley bottoms and plains, while juniper has expanded into many former shrub-steppe vegetation types.

The ecoregion can be divided into three general sections: the western high plateaus, the John Day River basin and the upper Crooked River steppe. The western-most section, the plateau lands along the Deschutes and lower Crooked rivers between Bend and Madras, includes substantial areas that have been converted to irrigated agriculture and urbanization. Rapid population growth and increasing recreational uses have increased development pressures dramatically in the juniper woodlands and sagebrush steppes of this area. Agriculture and recreation are key components of an increasingly diversified economy.

The northeastern arm of the ecoregion extends from the sagebrush steppe and juniper-dominated hills east of the Deschutes plateau to the valleys along the main stem John Day River and the lower reaches of its north and south forks. Most of the bottomlands along the rivers have been converted to agriculture. Small communities along the John Day River are supported by agriculture, grazing, timber processing from the forests of the Ochoco and Blue Mountains, and tourism.

The southeastern portion of the ecoregion, along the tributaries of the South Fork and mainstem Crooked River, is made up of more arid sagebrush steppe. Livestock grazing is the primary land use in this sparsely populated area.

**Owyhee Uplands**

The Owyhee Uplands Ecoregion covers the extreme southeast corner of Oregon, occupying the entire Owyhee River drainage, as well as the lower basin of the Malheur River. The ecoregion also extends into southwestern Idaho and northern Nevada.

The ecoregion has similar vegetation as the adjacent Basin and Range Ecoregion, but differs markedly in its terrain. The Owyhee Uplands landscape is basically a broad, undulating plateau cut by deep riverine canyons. Elevations range from 2,100 to 6,500 feet, with the average elevation of the plateau at about 4,000 feet.

The climate is one of extremes, with generally moist springs and cold winters bringing moisture in the form of snow, resulting in annual precipitation of only 8-12 inches. Summers are hot and dry with temperatures regularly exceeding 90° F, and the occasional thunderstorms producing more lightning than rain. The climate favors sagebrush steppe —the dominant vegetation type throughout the high deserts of the Intermountain West.

Another important influence in the ecoregion is the geology, which is mostly of volcanic origin. Over large portions of the landscape, soils have been derived from underlying layers of basalt and rhyolite, or occasionally from sedimentary layers that have been exposed by erosion. Of more interest than these "normal soils" are soils derived from volcanic ash and welded tuffs, which are found in distinct sites such as Leslie Gulch and Succor Creek near the Idaho border, or the extensive recent lava flows such as Jordan Craters or Saddle Butte Lava Field.

The weathering of the exposed volcanic ash has resulted in unique soils with a high clay content and an unusual chemical composition. The adaptational challenge these peculiar soils present for plants has given rise to a relatively rich flora of endemic species. The welded tuffs in these areas have also produced remarkable rock formations that rival more well-known erosional formations in the national parks of Utah's Colorado Plateau country.

Diverse sagebrush steppe communities dominate most of the ecoregion, including Wyoming big sagebrush, basin big sagebrush, mountain big sagebrush, silver sagebrush, black sagebrush, low sagebrush and rigid sagebrush communities. A few examples of salt desert scrub can be found, but these are much more prevalent in the Basin and Range Ecoregion. Mountain mahogany woodlands are very well developed, and the riparian habitats are very important to fish and wildlife, as they are in most arid regions of the west.

The ecoregion's population is concentrated in the northeastern corner, where irrigated agriculture in the fertile lowlands along the Snake and Malheur rivers is the foundation of the local economy. This area is occasionally considered part of a separate ecoregion called the Snake River Plains. In the remainder of the region, the economy is almost entirely based on local ranching.

## Columbia Basin

The Oregon portion of the Columbia Basin Ecoregion (sometimes referred to as the Umatilla Plateau) extends from the eastern slopes of the Cascades Mountains south and east from the Columbia River to the Blue Mountains. The ecoregion also extends northward throughout most of eastern Washington, including a small portion of west central Idaho. The region includes the Columbia Basin proper, and the Palouse, which is recognized by many geographers as a separate region.

The Columbia River, with its historic floods and large deposits of loess (wind-borne silt and sand) from the end of the last ice age, has greatly influenced the region. Most of the Oregon portion of the ecoregion is a lava plateau broken by basalt canyons carved out by the Deschutes and John Day rivers and other streams that flow into the Columbia River. The climate is arid, with cold winters and hot summers. Most of the ecoregion receives less than 15 inches of precipitation per year (some areas as little as eight inches), much of that in the form of snow.

The majority of the ecoregion's natural vegetation is native bunchgrass prairie, often called palouse prairie because of the deep, loess soils and plentiful bunchgrass. The majority of the ecoregion in Washington was originally sagebrush steppe. Sandy deposits along the Columbia River support open dunes, bitterbrush and steppe and western juniper. A few species of ground-squirrel and plants (milkvetch species among others) are adapted to these habitats. The rivers are generally characterized by intermountain riparian vegetation, with black cottonwood, willows, chokecherry and aspen dominating riverbanks. Less common are riparian habitats dominated by black hawthorn and white alder.

Early travelers along the Oregon trail found vast natural grasslands broken by brushy draws and tree- and rimrock-bordered streams with numerous springs. As a result of the deep loess soils, mild climate (due to low elevations) and the presence of adequate water (either from wells or from the Columbia, Snake and Umatilla rivers), much of this region provided model farmland. The human population is concentrated in the northeastern portion of the ecoregion, where Pendleton, Hermiston and other smaller communities serve as commercial centers for the agricultural economy.

The Columbia Basin Ecoregion is second only to the Willamette Valley in the percentage of landscape converted to non-native habitats and human uses. Protected areas and public lands are very limited in this region -- with the only vegetation types that have not declined dramatically found on lands that cannot be farmed: the steep canyon grasslands and scablands.

## Analysis of Effects for Categories of Activities

Because Corps permits authorize activities on a statewide basis over a prolonged period of time, we can not predict with precision all of the direct, indirect, and interrelated/interdependent effects that may be associated with each action, either individually or cumulatively. Regardless of the nature of the project-specific adverse effects, they will be controlled by the terms and conditions of the permit and each project will be subject to compliance monitoring and enforcement.

### Erosion Control Activities

Erosion control activities include the placement of material along or adjacent to banklines for the purpose of preventing erosion of the bank either by lining the face of the bank with a hard surface, by altering the face of the bank using bio-engineering methods, or by creating structures in the water to divert the current or to reduce the effects of wave action. Erosion control projects may include the construction of bulkheads, groins, retaining walls, or the placement of revetment. These types of actions could involve excavation, placement of bedding material, rock, concrete, sheetpile, wood or plant material.

The following is a brief description of general effects which may occur with these types of projects. A more detailed evaluation of individual projects to be authorized will be conducted by the Corps in its review of individual project applications. In its permit review process, the Corps will work with each applicant to avoid, minimize and compensate for potential adverse impacts of individual projects. The Corps will include appropriate conditions in the permit to ensure that unavoidable adverse effects are minimized and that compensatory mitigation is accomplished.

#### *Physical, chemical and biological characteristics of the aquatic ecosystem*

Construction of erosion control structures or the discharge of dredged or fill material for erosion control may result in the destruction of riparian, wetland or shoreline vegetation. Some vegetation may have to be removed prior to construction while other vegetation may be crushed as a result of various construction activities or smothered by the placement of fill material. Riparian, wetland and shoreline vegetation which is unavoidably disturbed due to activities associated with the authorized work will be restored and enhanced using native plant materials whenever possible.

During construction of erosion control activities fish and other motile aquatic organisms are most likely to avoid the construction area. Benthic, immotile or slow-moving organisms in the path of equipment and building materials will be destroyed. Some organisms will be smothered by the placement of fill material or when suspended material settles to the bottom. Limiting the amount of fill and the total size of the stabilization project is expected to minimize the adverse effects of the activity. Depending on materials used for bank protection, benthic organisms may recolonize the site after construction is complete.

To minimize adverse impacts to fisheries, all in-water work will occur within the time periods recommended by Oregon Department of Fish and Wildlife in the most current version of *Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources*.

Depending on the construction method used with appropriate sedimentation and erosion controls, composition of the bottom, and wind and current conditions during construction, fill material placed in the water and suspended in the water column will temporarily increase the turbidity of the water. Material would once again be suspended in the water column upon removal of the structure or fill. The plume generated will normally be limited to the immediate vicinity of the disturbance and should dissipate shortly after each phase of the construction activity.

During construction of erosion control projects, small amounts of oil and grease may be discharged into the watercourse from construction equipment. Since the activity is short term, the frequency and concentration of these discharges are not expected to have more than minimal adverse effects on water quality.

*Cumulative Impacts*

Cumulative impacts of these activities will depend on the number of permits issued for this type of activity. Permitting statistics will be tracked and reported to NMFS and USFWS periodically to develop a database for evaluating cumulative effects.

**Water Control Activities**

Water control activities include the placement of material on the bankline and/or in the stream to control the flow of water for the purpose of preventing or reducing the risk of flooding, or to maintain drainage, and may include dikes, levees, tide gates, pump stations and related structures. These types of actions could involve excavation, grading, fill, or placement of concrete for tidegates and pump station.

The following is a brief description of general effects which may occur with these types of projects. A more detailed evaluation of individual projects will be conducted by the Corps in its review of individual project applications. In its permit review process, the Corps will work with each applicant to avoid, minimize and compensate for potential adverse impacts of individual projects. the Corps will include appropriate conditions in the permit to ensure that unavoidable adverse effects are minimized and that compensatory mitigation is accomplished.

***Physical, chemical and biological characteristics of the aquatic ecosystem***

Construction of water control structures may result in the destruction of riparian, wetland or shoreline vegetation. Some vegetation may have to be removed prior to construction while other vegetation may be crushed as a result of various construction activities or smothered by the placement of fill material. Riparian, wetland and shoreline vegetation which is unavoidably disturbed due to activities associated with the authorized work will be restored and enhanced using native plant materials whenever possible.

During construction of water control activities, fish and other motile aquatic organisms are most likely to avoid the construction area. Benthic, immotile or slow-moving organisms in the path of equipment and building materials will be destroyed. Some organisms will be smothered by the placement of fill material or when suspended material settles to the bottom. Limiting the amount of fill and the total size of the stabilization project is expected to minimize the adverse effects of the activity. Depending on materials used for bank protection, benthic organisms may recolonize the site after construction is complete.

To minimize adverse impacts to fisheries, all in-water work will occur within the time periods recommended by Oregon Department of Fish and Wildlife in the most current version of *Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources*.

Depending on the construction method used with appropriate sedimentation and erosion controls, composition of the bottom, and wind and current conditions during construction, fill material placed in the water and suspended in the water column will temporarily increase the turbidity of the water. Material would once again be suspended in the water column upon removal of the structure or fill. The plume generated will normally be limited to the immediate vicinity of the disturbance and should dissipate shortly after each phase of the construction activity.

During construction of water control projects, "small amounts" (i.e., minor incidental leakage associated with from engines in good repair and properly performed refueling operations) of oil and grease may be discharged into the watercourse from construction equipment. Since the activity is short term, the frequency and concentration of these discharges are not expected to have more than minimal adverse effects on water quality.

Construction of water control projects would alter the hydrologic characteristics both at the project site and in the area which is intended to be drained or protected from flooding. Dikes and levees prevent flooding of adjacent lands, while tide gates and pump stations maintain drainage from diked areas. The net hydrologic effect of all these structures is to reduce the amount of surface water available to these areas.

***Cumulative Impacts***

Cumulative impacts of these activities will depend on the number of permits issued for this type of activity. Permitting statistics will be tracked and reported to NMFS and USFWS periodically to develop a database for evaluating cumulative effects.

## Utility Lines

A utility line is any pipe or pipeline for the transportation of any gaseous, liquid, liquifiable, or slurry substance, for any purpose, and any cable, line, or wire for the transmission for any purpose of electrical energy, telephone and telegraph messages, and radio and television communication. Utility line construction or repair could involve excavation, temporary sidecasting of excavated material, placement of pipeline or cable in the trench, backfilling of the trench, and restoration of the work site to pre-construction contours and vegetation. The term "utility line" does not include activities which drain a water of the United States, such as drainage tile; however, it does apply to pipes conveying drainage from another area.

The following is a brief description of general effects which may occur with these types of projects. A more detailed evaluation of individual projects will be conducted by the Corps in its review of individual project applications. In its permit review process, the Corps will work with each applicant to avoid, minimize and compensate for potential adverse impacts of individual projects. the Corps will include appropriate conditions in the permit to ensure that unavoidable adverse effects are minimized and that compensatory mitigation is accomplished.

***Physical, chemical and biological characteristics of the aquatic ecosystem***

Material resulting from trench excavation may be temporarily sidecast into jurisdictional waters, provided that the material is not placed in such a manner that it is dispersed by currents or other forces. The area of waters that is disturbed must be limited to the minimum necessary to construct the utility line. In wetlands, the top 12 inches of topsoil will be removed and stockpiled separately from subsurface soils and replaced at the project's completion. Excess material must be removed to upland areas immediately upon completion of construction.

Discharges of material from the excavation of trenches for the installation of utility lines and for backfill or bedding for utility lines may result in the destruction of wetland or riparian vegetation. Some vegetation may be crushed as a result of these activities or smothered by the placement of excavated or fill material. Wetland and riparian vegetation which is unavoidably disturbed due to activities associated with the authorized work will be restored and enhanced using native plant materials whenever possible. Compacted subsoils could result in a change in species diversity at the site. However, the activity is not expected to totally eliminate or adversely alter the species composition of the area.

During construction, small amounts of oil, and grease may be discharged from construction equipment. Because the construction in most cases would be of short-term duration, the frequency and concentration of these discharges are not expected to have more than minimal adverse impacts on overall water quality. For the installation of subaqueous or overhead utility lines, most of the losses of vegetation will be temporary, because vegetation is usually allowed to reestablish after the installation of the utility line. An exception is the installation of utility lines in forested wetlands or riparian zones, which requires the removal of trees. In these areas, the forest vegetation will not return because it is necessary to conduct periodic maintenance and repairs of the utility line, which do not allow trees to grow back. Most utility line right-of-ways are inhabited with either herbaceous or scrub-shrub vegetation because of on-going maintenance and repair. Selective herbicides, periodic mowing, bush hogging, and/or pruning are used to keep the vegetation below a certain height, usually 15 feet or less. Trees are not allowed to reestablish because of their potential adverse effects on utility line. In areas where trees normally grow, plant community succession is suppressed, preventing the return of the original plant community species composition and structure, but this impact on the aquatic environment is likely to be minimal, because the area will remain as a wetland or riparian area.

Permanent losses of vegetation will occur with the construction or expansion of electric or pumping substations, foundations for overhead utility lines, and permanent access roads. These activities cover portions of the wetland, which prevents vegetation from growing in the area of impact. Construction of utility line right-of-ways usually results in clearing long corridors through native plant communities. These corridors increase the amount of edge habitat, which benefits certain species of wildlife. Construction of rights-of-way can also cause fragmentation of habitat, particularly forests, which adversely affects species that require interior habitats.

Wetland and riparian vegetation provides shelter, shade, breeding and rearing areas for various fish and other aquatic organisms, as well as terrestrial vertebrates and invertebrates. Wetland vegetation improves water quality by removing nutrients and pollutants from the water column and by providing habitat for microorganisms that also remove or break down chemical compounds in the water. Riparian vegetation also serves an important role in the water quality of streams by shading the water from the intense heat of the sun. Because of the temporary nature of discharges for utility line installation, the adverse effects on water quality caused by removing or covering wetland or riparian vegetation are expected to be minimal. Permanent impacts to wetland and riparian vegetation for the construction of access roads or substations will be minor, due to the small footprints authorized for these activities and the requirements for the maintenance of surface and subsurface flows.

Soil compaction caused by the use of heavy equipment to construct the utility line could result in changes in species composition, since it may favor colonization by exotic or undesirable species and prevent native species from recolonizing the site. However, construction of utility lines is not expected to totally eliminate or substantially alter the species composition of the area. The requirement for backfilling the top 12 inches of the trench with the original soil is expected to promote the return of species growing at the site prior to construction because of the seeds in the soil.

In areas temporarily impacted by the work, such as temporary staging areas and access roads, wetland and riparian vegetation is expected to reestablish in those areas, provided the fill is removed and the site restored to preconstruction contours and elevations. If the site was an emergent or scrub-shrub wetland or riparian area, the postconstruction species composition may be different if the soil is compacted during construction and exotic or undesirable plant species inhabit the area first. If exotic or undesirable plant species are removed and appropriate plant species are planted at the site, a plant community similar to the preconstruction plant community should become established shortly after construction. If the site was forested, it will take much longer for the forest to reestablish itself, but this process can be accelerated by removing exotic and undesirable plant species and planting seedlings of appropriate tree species.
Fish and other motile animals will avoid the project site during construction. Sessile or slow-moving animals in the path of discharges, equipment, and building materials will be destroyed. Some animals will be smothered by the placement of fill material. Motile animals will return to those areas that are temporarily impacted by the work and restored to preconstruction conditions. Aquatic animals will not return to sites of permanent fills. Benthic and sessile animals are expected to recolonize sites after temporary impacts are restored.

Care must be taken in constructing the utility line trench and selecting the bedding material to avoid creating a french drain effect that would remove wetland hydrology. In addition, access roads must be designed and constructed to minimize the effects on surface and subsurface flows that could adversely affect aquatic organisms. Access roads will be constructed at-grade where possible to avoid the interruption of sheet flow and prevent impoundment of water. Where access roads cannot be constructed at preconstruction contours and elevations, the roads should be adequately culverted to minimize disruption of sheet flow. Culverts should be placed close enough together and be regularly cleared of sediment and debris to maintain surface flows. The requirements for the construction of access roads will result in minimal adverse effects on the aquatic environment.

Depending on the method of construction, sediment and erosion controls, equipment used, composition of the substrate, and wind and current conditions during construction, fill material discharged into the water and suspended in the water column will temporarily increase the turbidity of the water. Material would once again be suspended in the water column upon removal of the fill. The plume will normally be limited to the immediate vicinity of the disturbance and should dissipate shortly after each phase of the construction activity. Impacts to the aquatic environment due to temporary increases in turbidity are expected to be minimal.

During construction of utility lines, substations, tower foundations, and access roads, small amounts of oil and grease may be discharged into the watercourse from construction equipment. Because most of the construction activities will be of short duration, with some periodic maintenance, the low frequency and concentration of these discharges are not expected to have more than minimal adverse effects on overall water quality.

### *Cumulative Impacts*

Cumulative impacts of these activities will depend on the number of permits issued for this type of activity. Permitting statistics will be tracked and reported to NMFS and USFWS periodically to develop a database for evaluating cumulative effects.

## Road Construction, Repairs,and Improvements

This includes new highway construction or improvement of an existing highway, road, street or bridge, including widening, repairing, realigning, reconstructing or removing existing roads and bridges, or replacing culverts under roads including temporary fills and access fills. It could involve excavation, grading, filling, placement of culverts, construction of bridges, and construction of drainage features.

The following is a brief description of general effects which may occur with these types of projects. A more detailed evaluation of individual projects will be conducted by the Corps in its review of individual project applications. In its permit review process, the Corps will work with each applicant to avoid, minimize and compensate for potential adverse impacts of individual projects. the Corps will include appropriate conditions in the permit to ensure that unavoidable adverse effects are minimized and that compensatory mitigation is accomplished.

### *Physical, chemical and biological characteristics of the aquatic ecosystem*

Construction of new highways or the improvement of existing highways, roads, streets or bridges involving the discharge of dredged or fill material may result in the destruction of wetland, riparian or shoreline vegetation. Some vegetation may have to be removed prior to construction while other vegetation may be crushed as a result of various construction activities or smothered by the placement of fill material. Riparian, wetland and shoreline vegetation which is unavoidably disturbed due to activities associated with the authorized work will be restored and enhanced using native plant materials whenever possible.

During construction, fish and other motile aquatic organisms are most likely to avoid the construction area. Benthic, immotile or slow-moving organisms in the path of equipment and building materials will be destroyed. Some organisms will be smothered by the placement of fill material or when suspended material settles to the bottom. Limiting the amount of fill and the total size of the stabilization project is expected to minimize the adverse effects of the activity. Depending on materials used for bank protection, benthic organisms may recolonize the site after construction is complete.

To minimize adverse impacts to fisheries, all in-water work will occur within the time periods recommended by Oregon Department of Fish and Wildlife in the most current version of *Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources*.

Depending on the construction method used with appropriate sedimentation and erosion controls, composition of the bottom, and wind and current conditions during construction, fill material placed in the water and suspended in the water column will temporarily increase the turbidity of the water. Material would once again be suspended in the water column upon removal of the structure or fill. The plume generated will normally be limited to the immediate vicinity of the disturbance and should dissipate shortly after each phase of the construction activity.

During construction of erosion control projects, small amounts of oil and grease may be discharged into the watercourse from construction equipment. Since the activity is short term, the frequency and concentration of these discharges are not expected to have more than minimal adverse effects on water quality.

Construction of linear transportation crossings usually result in clearing corridors through native plant communities. These corridors increase the amount of edge habitat, which benefits certain species of wildlife. Clearing corridors can also cause fragmentation of wetland and riparian habitat, particularly forests, which adversely affects species that require wetland and riparian interior habitats.

Wetland and riparian vegetation improves water quality by removing nutrients and pollutants from the water column and by providing habitat for microorganisms that also remove or break down chemical compounds in the water. Riparian vegetation also serves an important role in the water quality of streams by shading the water from the intense heat of the sun. Overhanging riparian vegetation provides shelter, shade, and breeding and rearing areas for various fish and other aquatic organisms as well as terrestrial wildlife such as birds and small mammals. Riparian vegetation also provides corridors for wildlife movement. Since impacts to wetlands and other special aquatic sites must be the minimum necessary for the crossing and compensatory mitigation must be provided for public linear transportation crossings, adverse effects to wetland and riparian vegetation are expected to be minimal.

Linear transportation crossings constructed over streams may affect sediment transport processes in those streams. Culverts and bridges may alter water flow characteristics in streams, resulting in changes in flow regimes in the vicinity of the structure and aggradation of sediments near the structure. Aggraded sediments can impede the passage of fish and other aquatic animals and increase flooding in the vicinity of the structure. Adverse impacts due to aggradation of sediments will be minimal, because the process takes a long time to occur and the permittee is likely to remove those sediments as part of a regular maintenance plan.

***Cumulative Impacts***

Cumulative impacts of these activities will depend on the number of permits issued for this type of activity. Permitting statistics will be tracked and reported to NMFS and USFWS periodically to develop a database for evaluating cumulative effects.

**Site Preparation for Construction of Buildings and related Features (Such As Driveways, Parking areas, and Walkways)**

This category includes excavation, filling and grading for the purpose of preparing a site for construction of any type of building, as well as fills for driveways, parking areas, garages, storage and utility buildings, etc. which are related to the purpose of the primary structure. The following is a brief description of general effects which may occur with these types of projects. A more detailed evaluation of individual projects will be conducted by the Corps in its review of individual project applications. In its permit review process, the Corps will work with each applicant to avoid, minimize and compensate for potential adverse impacts of individual projects. The Corps will include appropriate conditions in the permit to ensure that unavoidable adverse effects are minimized and that compensatory mitigation is accomplished.

***Physical, chemical and biological characteristics of the aquatic ecosystem***

The discharge of dredged or fill material would result in the destruction of wetland vegetation. Some vegetation may have to be removed prior to construction while other vegetation may be crushed as a result of various construction activities or smothered by the placement of fill material.

Depending on the method of construction with the appropriate sediment and erosion controls, equipment used, composition of the bottom substrate, and wind and current conditions during construction, fill material placed in the water and suspended in the water column will temporarily increase the turbidity of the water. The plume generated will normally be limited to the immediate vicinity of the disturbance and should dissipate shortly after each phase of the construction activity.

During construction small amounts of oil and grease may be discharged into the waterway from construction equipment. Since the construction in most cases is short term, the frequency and concentration of these discharges are not expected to have more than minimal adverse effects on overall water quality. To further minimize adverse effects of the authorized activity, the Corps can place additional conditions upon the specific activity in order to ensure that impacts are minimized.

Discharges of dredged or fill material into jurisdictional waters for site preparation activities will result in the destruction of wetland and riparian vegetation. Some vegetation may be removed prior to construction while other vegetation may be cut, crushed, or removed as a result of construction activities or smothered by the placement of fill material. For most site preparation activities, such losses of wetland and riparian vegetation will be permanent where buildings, roads, utilities, and other permanent fills are located. Some areas of the development will be graded and filled to install lawns and ornamental plants, thus replacing the natural plant community.

In areas temporarily affected by the work (such as temporary staging areas and access roads), wetland and riparian vegetation is expected to reestablish, provided the fill is removed and the site restored to preconstruction contours and elevations. If the site was an emergent or scrub-shrub wetland or riparian area, the postconstruction species composition may be different (due to soil impaction and invasion by exotic or undesirable plant species. If exotic or undesirable plant species are removed and appropriate plant species are planted at the site, a plant community similar to the preconstruction plant community should become established shortly after construction. If the site was forested, it will take much longer for the plant community to reestablish itself, but this process can be accelerated by removing exotic and undesirable plant species, and planting seedlings of appropriate tree species.

Wetland and riparian vegetation improves water quality by removing nutrients and pollutants from ground or surface waters that flow through the wetland or riparian zone. Wetland and riparian vegetation also provides habitat for microorganisms that remove or break down chemical compounds. Wetland and riparian vegetation provides habitat for many species, including foraging areas, resting areas, corridors for movement of wildlife, and nesting and breeding grounds. Riparian vegetation also serves an important role in the water quality of streams by shading the water from the intense heat of the sun. Riparian vegetation provides organic matter that is consumed by fish and aquatic invertebrates. Woody riparian vegetation creates habitat diversity in streams when trees and large shrubs fall into the channel, forming snags that provide habitat and shade for fish.

Fish and other motile animals will avoid the project site during construction. Sessile or slow-moving animals in the path of discharges, equipment, and building materials will be destroyed. Some animals will be smothered by the placement of fill material. Motile animals will return to those areas that are temporarily impacted by the work and restored or allowed to revert back to preconstruction conditions. Aquatic animals will not return to sites of permanent fills. Benthic and sessile animals are expected to recolonize sites after areas temporarily impacted by the work are restored.

Activities that alter the riparian zone, especially floodplains, may adversely affect populations of fish and other aquatic animals by altering stream flow, flooding patterns, and surface and groundwater hydrology. Site preparation activities in the vicinity of streams may alter habitat features by increasing sediment inputs to the stream, which can reduce the amount of habitat for aquatic organisms and destroy spawning areas. Development activities in the vicinity of streams can also cause more unstable flow regimes, such as higher peak flows, more frequent dry periods, and more frequent flooding, which may decrease the amount of habitat for aquatic animals.

Residential, commercial, and institutional developments can have adverse effects on hydrology in the vicinity of the project. The addition of impervious surface increases runoff and decreases in infiltration, which adversely affect stream channels and groundwater recharge. Stream channels are eroded by higher peak flows and water velocities during and shortly after storms, which results in incised channels and increased sediment loads. Incised stream channels drain groundwater, which can reduce base flows and dry out adjacent wetlands. Incised channels are also disconnected from the floodplain, which adversely affects nutrient cycling and species which depend upon periodic flooding for important stages (e.g., spawning) of their life cycles. Increases in sediment loads to the stream smother animals that live in the stream bed and adversely affect habitat quality. Sediment particle size distribution of stream bed sediments is changed and may result in the destruction of spawning areas.

Site preparation activities in wetlands and waterbodies may have adverse effects on water quality. These activities result in increases in nutrients, sediments, and pollutants in the water. The loss of wetland and riparian vegetation has adverse effects on water quality because these plants trap sediments, pollutants, and nutrients and transform chemical compounds. Wetland and riparian vegetation also provides habitat for microorganisms that are essential for the removal of nutrients and pollutants from water. Wetlands, through the accumulation of organic matter, act as sinks for some nutrients and other chemical compounds, reducing the amounts of these substances in the water column. Wetlands and riparian areas also decrease the velocity of flood waters, removing suspended sediments from the water column and reducing turbidity.

Depending on the method of construction, soil erosion and sediment control measures, equipment, composition of the bottom substrate, and wind and current conditions during construction, fill material placed in open waters will temporarily increase the turbidity of the water. Materials will be resuspended in the water column during removal of the fill. The plume generated will normally be limited to the immediate vicinity of the disturbance and should dissipate shortly after each phase of the construction activity.

During construction of these developments, small amounts of oil and grease from construction equipment may be discharged into the waterway. Since most of the construction will occur in a relatively short period of time, the frequency and concentration of these discharges are not expected to have more than minimal adverse effects on overall water quality.

***Cumulative Impacts***

Cumulative impacts of these activities will depend on the number of permits issued for this type of activity. Permitting statistics will be tracked and reported to NMFS and USFWS periodically to develop a database for evaluating cumulative effects.

**Stream And Wetland Restoration and Enhancement**

This category may include installation, removal and maintenance of small water control structures, dikes, and berms; installation of current deflectors; enhancement, restoration or creation of riffle and pool stream structure; placement of in-stream habitat structures; modifications of the stream bed and/or banks to restore or create stream meanders; the backfilling of artificial channels and drainage ditches; removal of existing drainage structures; construction of small nesting islands; construction of open water areas; activities needed to reestablish vegetation; and other activities as described in Nationwide Permit 27, Stream and Wetland Restoration Activities.

The following is a brief description of general effects which may occur with these types of projects. A more detailed evaluation of individual projects will be conducted by the Corps in its review of individual project applications. In its permit review process, the Corps will work with each applicant to avoid, minimize and compensate for potential adverse impacts of individual projects. the Corps will include appropriate conditions in the permit to ensure that unavoidable adverse effects are minimized and that compensatory mitigation is accomplished.

***Physical, chemical, and biological characteristics of the aquatic ecosystem*:**

Site access, site preparation, and construction may require the removal of wetland and riparian vegetation in the vicinity of the project site. In some areas, the vegetation may already be cleared, possibly as the result of the activity that caused the initial impact to the wetland. Vegetation may also be crushed or cut back during construction. These impacts to vegetation will be temporary, because many of these areas will be seeded or planted to promote the growth of wetland and/or riparian plant species. If soil is compacted during construction, exotic or invasive plant species may inhabit the area first, preventing desirable species from inhabiting the area. If exotic or undesirable plant species are removed and appropriate plant species are planted at the site, a plant community comprised of native wetland and riparian species should become established shortly after construction. Native plant communities benefit local populations of animals by providing appropriate food and habitat.

Wetland restoration, enhancement, and creation activities typically result in changes in the species composition of the project area. Changes in hydroperiod and water depths may affect plant species composition in the area. For example, increasing the duration and/or depth of flooding may kill off certain tree species that cannot tolerate those conditions and favor other plant species. Changes in plant species composition may affect which animal species utilize the project site. Converting uplands to wetlands may also adversely affect local animal populations by eradicating habitat and food sources provided by upland plants.

Stream restoration and enhancement activities often require removal or cutting of existing vegetation to provide access to the stream channel during construction and grading and filling of the stream bed and bank. Stream banks may be stabilized with stone, root wads, or vegetation. Upon completion of the channel work, riparian species should be planted in the riparian zone to ensure the development of a riparian plant community adjacent to the stream.

Wetland and riparian vegetation improves water quality by removing nutrients and pollutants from the water column and providing habitat for microorganisms that also remove or break down chemical compounds in the water. Riparian vegetation also serves an important role in the water quality of streams by shading the water from the intense heat of the sun. Overhanging riparian vegetation provides shelter, shade, and breeding and rearing areas for various fish and other aquatic organisms as well as terrestrial wildlife such as birds and small mammals. Riparian vegetation also provides a source of food for aquatic organisms that feed on detritus. Riparian vegetation creates corridors for wildlife movement. Overall, the adverse effects to wetland and riparian vegetation removal will be minimal, because the vegetation will be allowed to grow back, although the species composition of the plant community may be changed as a result of the restoration, enhancement, or creation activity.

Wetland restoration, enhancement, and creation activities will provide long-term benefits for aquatic animals, but may result in short-term adverse effects during construction. Fish and other motile organisms will avoid the project site during construction. Sessile or slow-moving aquatic organisms may be crushed or smothered as a result of construction activities. Upon completion of construction, fish and other motile animals, as well as sessile or slow- moving animals, will likely recolonize the site, if postconstruction site conditions provide suitable habitat for those animals. Restoration and enhancement of riparian areas will provide corridors for movement of migratory animals, especially birds. Temperature changes in the stream are also reduced by the shading of the water, which improves habitat quality, especially for temperature-sensitive fish and invertebrates. Restoration of riparian areas typically provides woody vegetation that will eventually fall into the stream and create snags that provide habitat for many species. Riparian vegetation benefits aquatic animals that depend on coarse organic particulate matter as a primary source of food.

Stream restoration and enhancement activities will have similar impacts on aquatic animals. Fish and other motile animals will avoid areas of the stream undergoing restoration or enhancement, but will return after construction is complete, especially since most of these activities will provide net benefits to these animals by increasing the amount of aquatic habitat available to them. Sessile or slow-moving aquatic organisms may be crushed, smothered, or removed during construction. These organisms are likely to recolonize the stream bed after construction is complete. Stream restoration should restore periodic flooding, which will benefit those species, particularly fish, that spawn or breed in floodplains or depend on periodic flooding to provide food. Restoration of riffle and pool sequences will recreate habitat patchiness and improve the animal diversity and habitat quality of the stream. Stream restoration may also increase the amount of aquatic habitat by recreating longer meanders that may have been lost due to stream channelization or relocation.

On the other hand, wetland restoration, enhancement, and creation activities and stream restoration and enhancement activities have permanent adverse effects on plants and animals that occupy drier habitats that were previously in the area where the restoration, enhancement, or creation activities are conducted. These organisms would be subject to the same impacts during construction as described above, but if they cannot tolerate the wetter conditions that result from the authorized activity, those species may be unable to recolonize the site. These activities may reduce the amount of available habitat for important upland species.

For most restoration, creation, and enhancement projects, adverse effects to aquatic animals are likely to be temporary and minimal, since the purpose of these activities is to increase the quantity and quality of wetland, riparian, and stream habitat.

Wetland restoration, creation, and enhancement activities may change the hydroperiod and water depths of the site, especially if water control structures are installed. Wetland restoration and creation activities require longer periods of inundation or soil saturation, which will alter the species composition of the plant community, replacing plants adapted for drier soil conditions with hydrophytic vegetation. Longer periods of inundation and changes to plant species composition may also alter which animal species inhabit the area.

Stream restoration and enhancement activities usually alter flow patterns in the stream and may be designed to increase the frequency of flooding by changing the floodplain or terrace to an elevation that is subject to more frequent flooding. These activities benefit the aquatic environment by increasing nutrient cycling and providing additional habitat for aquatic organisms that utilize floodplains for certain portions of their life cycles.

Some activities could result in the retention of water, which may increase the amount groundwater recharge in the area. Wetland and riparian vegetation removes nutrients and pollutants, which improves the quality of water entering the groundwater system. Therefore, local water supplies may be improved and conserved by these activities.

Construction of small water control structures, dikes, and berms and the backfilling of ditches may increase flooding upstream of these structures. Downstream flooding may be reduced by these activities by altering flow patterns and discharge quantities.

Wetland creation, restoration, and enhancement activities will result in improvements in water quality. Wetland vegetation and microorganisms that inhabit wetlands remove nutrients and pollutants from the water column. Restoration of streams and riparian areas will improve water quality by reducing erosion that increases the turbidity of the water column, increasing nutrient uptake by riparian vegetation, and reducing extreme temperature changes by provided shade to the stream channel.

Depending on the type of construction equipment, sedimentation and erosion controls, composition of the bottom substrate, composition of the fill material, water currents, and weather conditions during construction, excavation and filling activities will suspend sediments in the water column, temporarily increasing turbidity. The sediment plume will normally be limited to the immediate vicinity of the construction activity and will dissipate shortly after that phase of construction is complete. These impacts will recur if the landowner chooses to exercise his option to revert the land to prior conditions.

During construction, small amounts of oil and grease may be discharged into the waterway from construction equipment. Because most of the construction activities will be of short duration, with some periodic maintenance, the frequency and concentration of these discharges are not expected to have more than minimal adverse effects on overall water quality.

Restoration, enhancement, and creation of wetlands and riparian areas usually benefits the aquatic environment, although upland ecosystems may be adversely affected. Stream restoration and enhancement activities also improve the local aquatic environment. Most of the adverse effects of these activities will be temporary and occur only during construction.

***Cumulative Impacts***

Cumulative impacts of these activities will depend on the number of permits issued for this type of activity. Permitting statistics will be tracked and reported to NMFS and USFWS periodically to develop a database for evaluating cumulative effects.

**Boat Ramps**

Construction of boat ramps may include excavation, grading, and placement of poured or pre-cast concrete. The following is a brief description of general effects which may occur with these types of projects. A more detailed evaluation of individual projects to be authorized will be conducted by the Corps in its review of individual project applications. In its permit review process, the Corps will work with each applicant to avoid, minimize and compensate for potential adverse impacts of individual projects. The Corps will include appropriate conditions in the permit to ensure that unavoidable adverse effects are minimized and that compensatory mitigation is accomplished.

The following is a brief description of general effects which may occur with these types of projects. A more detailed evaluation of individual projects will be conducted by the Corps in its review of individual project applications. In its permit review process, the Corps will work with each applicant to avoid, minimize and compensate for potential adverse impacts of individual projects. the Corps will include appropriate conditions in the permit to ensure that unavoidable adverse effects are minimized and that compensatory mitigation is accomplished.

***Physical, chemical and biological characteristics of the aquatic ecosystem***

Site preparation for the construction of boat ramps may require the removal or riparian vegetation along the shoreline of the affected waterway. Overhanging riparian vegetation provides shelter, shade, breeding and rearing areas for various fish and other aquatic organisms as well as terrestrial wildlife such as birds and small mammals. It also serves an important role in water quality by shading the water from the heat of the sun. In most cases, the removal of the riparian vegetation will affect a very small area. In some areas, it may diversify the habitat by providing an edge of open water between adjacent vegetated areas. Overall, the adverse effects of removing the riparian vegetation are expected to be minimal.

In most cases, site preparation for expansion of a boat ramp also requires removal of surface material and/or grading of the waterway bottom. During the removal or grading operation, fish and other motile aquatic organisms will most likely avoid the area until the work is completed. Sessile organisms in the path of the equipment will be destroyed or smothered when suspended material settles to the bottom. Under no circumstances is the ramp expansion expected to totally eliminate or adversely alter the species composition of the area. Depending on the method of construction, equipment used, composition of the bottom substrate, and wind and current conditions during construction, material that is suspended in the water column will temporarily increase the turbidity of the water. The plume generated by the turbidity will normally be limited to the immediate vicinity of the disturbance and will dissipate shortly after this phase of the construction is complete. Use of the waterway by boaters may result in the discharge of small amounts of gas, oil and grease from inboard and outboard motors.

***Cumulative Impacts***

Cumulative impacts of these activities will depend on the number of permits issued for this type of activity. Permitting statistics will be tracked and reported to NMFS and USFWS periodically to develop a database for evaluating cumulative effects.

**Other Minor Discharges and Excavations**

This category includes minor discharges and excavations such as small structural fills, minor excavations or dredging such as that necessary for culvert maintenance, installation of outfall structures and minor repairs of previously authorized structures or fills.

The following is a brief description of general effects which may occur with these types of projects. A more detailed evaluation of individual projects will be conducted by the Corps in its review of individual project applications. In its permit review process, the Corps will work with each applicant to avoid, minimize and compensate for potential adverse impacts of individual projects. the Corps will include appropriate conditions in the permit to ensure that unavoidable adverse effects are minimized and that compensatory mitigation is accomplished.

***Physical, chemical and biological characteristics of the aquatic ecosystem***

The discharge of dredged or fill material into waters of the United States may result in the destruction of riparian vegetation. Some vegetation may be disturbed by construction activities while other vegetation may be smothered by the placement of fill material. Overhanging riparian vegetation provides shelter, shade, breeding and rearing areas for various fish and other aquatic organisms as well as terrestrial wildlife such as birds and small mammals. It also serves an important role in water quality by shading the water from the intense heat of the sun.

Emergent vegetation also provides habitat and food for a wide variety of terrestrial and aquatic organisms. Because of the requirement to propose appropriate and practicable measures to mitigate the loss of special aquatic sites, including wetlands, impacts to wetlands are expected to be minimal.

During the discharge of dredged or fill material fish and other motile aquatic organisms are most likely to avoid the area. Benthic, immotile or slow moving organisms in the path of equipment and discharged materials will be destroyed. Some organisms will be smothered by the placement of fill material or when suspended material settles to the bottom. Benthic organisms are expected to recolonize portions of the site after construction is complete.

Depending on the method of construction with the appropriate sediment and erosion controls, equipment used, composition of the bottom substrate, and wind and current conditions during construction, fill material placed in the water and suspended in the water column will temporarily increase the turbidity of the water. The plume generated will normally be limited to the immediate vicinity of the disturbance and should dissipate shortly after completion of the construction activity.

Construction of outfall structures may result in the destruction of riparian vegetation. Some vegetation may have to be removed prior to construction while other vegetation may be crushed as a result of various construction activities or smothered by the placement of fill material. Overhanging riparian vegetation provides shelter, shade, breeding and rearing areas for various fish and other aquatic organisms as well as terrestrial wildlife such as birds and small mammals. Emergent vegetation also provides habitat and food for a wide variety of terrestrial and aquatic organisms. Because excess material must be removed from wetlands, the adverse effects of removing or covering the riparian vegetation are expected to be minimal.

During construction of a outfall fish and other motile aquatic organisms are most likely to avoid the construction area. Benthic, immotile or slow moving organisms in the path of equipment and building materials will be destroyed. Some organisms will be smothered by the placement of fill material or when suspended material settles to the bottom. Benthic organisms are expected to recolonize the site after construction is complete and vegetation should return to the site. Construction of outfall structures is not expected to totally eliminate or adversely alter the species composition of the area.

Depending on the construction method used with appropriate sedimentation and erosion controls, composition of the bottom, and wind and current conditions during construction, fill material placed in the water and suspended in the water column will temporarily increase the turbidity of the water. Material would once again be suspended in the water column upon removal of the cofferdam. The plume generated will normally be limited to the immediate vicinity of the disturbance and should dissipate shortly after each phase of the construction activity.

During work small amounts of oil and grease may be discharged into the watercourse from construction equipment. Because the activity is limited in nature, the frequency and concentration of these discharges are not expected to have more than minimal adverse effects on overall water quality.

### *Cumulative Impacts*

Cumulative impacts of these activities will depend on the number of permits issued for this type of activity. Permitting statistics will be tracked and reported to NMFS and USFWS periodically to develop a database for evaluating cumulative effects.

## **Installation and Repair of Navigational Aids**

Activities under this category include the placement of permanent and temporary navigational aids such as mooring buoys and channel markers.

The following is a brief description of general effects which may occur with these types of projects. A more detailed evaluation of individual projects will be conducted by the Corps in its review of individual project applications. In its permit review process, the Corps will work with each applicant to avoid, minimize and compensate for potential adverse impacts of individual projects. the Corps will include appropriate conditions in the permit to ensure that unavoidable adverse effects are minimized and that compensatory mitigation is accomplished.

*Physical, chemical and biological characteristics of the aquatic ecosystem*

Aids to navigation and regulatory markers are typically displayed on piling or in the form of buoys anchored to the bottom. Piling are typically placed by jetting or driving them into place. In some instances holes may have to be drilled or augered into hard substrate prior to placement of the piles. Equipment used during this phase of the construction may vary from hand held tools to heavy mechanical equipment. During construction fish and other motile aquatic organisms will most likely avoid the area until the work is complete. However, it is likely that benthic organisms especially immotile organisms, in the path of a drill or auger would be destroyed. If the piling are jetted into place the benthic organisms would be jetted away from the path of the piling but may be smothered when suspended material settles to the bottom.

Mooring buoys are typically located in open water and held in place with anchors, weights or a "deadman" buried in the substrate. Anchors or weights would be dropped to the substrate. Anchors would be dragged until they have adequately dug into the bottom. A "deadman" would be placed by excavating a trench and backfilling over the "deadman" or by jetting or driving it into place. In some instances holes may have to be drilled or augered into hard substrate prior to placement of the anchor. Equipment used during this phase of the construction may vary from hand held tools to heavy mechanical equipment. During construction fish and other motile aquatic organisms will most likely avoid the area until the work is complete. Benthic organisms directly in the path of the anchor or weights would be destroyed. Likewise, immotile organisms in the path of a drill or auger would be destroyed. If a "deadman" is jetted into place the benthic organisms would be jetted away from the path of the piling but may be smothered when suspended material settles to the bottom. If minor excavation is required in order to bury an anchor, benthic organisms would be destroyed when the excavated material is placed on the substrate or returned to the trench.

Open water structures often provide habitat for various sessile and motile invertebrates as well as provide shelter, shade and feeding areas for various fish and other aquatic organisms. Birds also use these structures for resting or roosting. Depending upon the type of materials used to construct the mooring buoys, sessile organisms as well as other aquatic organisms may colonize submerged surfaces over time.

Depending on the method of construction, equipment used, composition of the bottom substrate, and wind and current conditions during construction, including appropriate sedimentation and erosion controls, material that is suspended in the water column will temporarily increase the turbidity of the water. The plume generated by the turbidity will normally be limited to the immediate vicinity of the disturbance and will dissipate shortly after this phase of the construction is complete.

Use of the waterways by commercial or recreational users may result in the discharge of small amounts of gas, oil and grease from inboard and outboard motors. The frequency and concentration of these discharges are not expected to increase as a result of the placement of aids to navigation or regulatory markers.

*Cumulative Impacts*

Cumulative impacts of these activities will depend on the number of permits issued for this type of activity. Permitting statistics will be tracked and reported to NMFS and USFWS periodically to develop a database for evaluating cumulative effects.

**Maintenance Of Existing Structures and Marinas**

This category includes the maintenance, repair and relocation of existing structures within an authorized marina.

The following is a brief description of general effects which may occur with these types of projects. A more detailed evaluation of individual projects will be conducted by the Corps in its review of individual project applications. In its permit review process, the Corps will work with each applicant to avoid, minimize and compensate for potential adverse impacts of individual projects. the Corps will include appropriate conditions in the permit to ensure that unavoidable adverse effects are minimized and that compensatory mitigation is accomplished.

***Physical, chemical and biological characteristics of the aquatic ecosystem***

Site preparation for the construction of reconfigured docking facilities within an existing marina may require the removal of existing fixed or floating docking structures. The removal of fixed docking structures may include the removal of existing piling at or below the mudline. Docking structures often provide habitat for various sessile and motile invertebrates as well as provide shelter, shade, breeding and rearing areas and feeding areas for various fish and other aquatic organisms. Sessile organisms and motile organisms that remain attached to the structures that are removed will be destroyed. However, the adverse effects of removing old structures are expected to be minimal.

The reconfiguration of docking facilities may be accomplished by shortening, extending, reorienting of existing docking structures, construction of new docking structures or a combination of these methods within the existing marina. Construction of fixed structures may require the relocation of old piling or placement of new piling. Piling are typically placed by jetting or driving them into place. In some instances holes may have to be drilled or augered into hard substrate prior to placement of the piles. Equipment used during this phase of the construction may vary from hand held tools to heavy mechanical equipment. During construction fish and other motile aquatic organisms will most likely avoid the area until the work is complete. If the piling are driven into place the benthic organisms directly in the path of the piling would be destroyed. Likewise, it is likely that immotile organisms in the path of a drill or auger would be destroyed. If the piling are jetted into place the benthic organisms would be jetted away from the path of the piling but may be smothered when suspended material settles to the bottom.

Depending on the method of construction with the appropriate sediment and erosion controls, equipment used, composition of the bottom substrate, and wind and current conditions during construction, material that is suspended in the water column will temporarily increase the turbidity of the water. The plume generated by the turbidity will normally be limited to the immediate vicinity of the disturbance and will dissipate shortly after this phase of the construction is complete.

Depending upon the type of materials used to construct the docking facility , sessile organisms as well as other aquatic organisms may recolonize submerged surfaces over time.

Use of the docking facilities may result in the discharge of small amounts of gas, oil and grease from inboard and outboard motors. Because the size of the marina or the number of slips cannot increase, limiting the number of boats to no more than those accommodated by the preconstruction configuration, the frequency and concentration of these discharges are not expected to increase.

***Cumulative Impacts***

Cumulative impacts of these activities will depend on the number of permits issued for this type of activity. Permitting statistics will be tracked and reported to NMFS and USFWS periodically to develop a database for evaluating cumulative effects.

**Installation of Small Temporary Floats**

This category includes temporary buoys, markers, small floating docks, and similar structures placed for recreational use during specific events such as water skiing competitions and boat races or seasonal use provided that such structures are removed within 30 days after use has been discontinued.

The following is a brief description of general effects which may occur with these types of projects. A more detailed evaluation of individual projects will be conducted by the Corps in its review of individual project applications. In its permit review process, the Corps will work with each applicant to avoid, minimize and compensate for potential adverse impacts of individual projects. the Corps will include appropriate conditions in the permit to ensure that unavoidable adverse effects are minimized and that compensatory mitigation is accomplished.

***Physical, chemical and biological characteristics of the aquatic ecosystem***

Temporary recreational structures are typically displayed or constructed on piling or in the form of buoys or floats anchored to the bottom. Buoys and floats are typically located in open water and held in place with anchors, weights or a "deadman" buried in the substrate.

Open water structures often provide habitat for various sessile and motile invertebrates as well as provide shelter, shade and feeding areas for various fish and other aquatic organisms. Birds also use these structures for resting or roosting.

Piling are typically placed by jetting or driving them into place. Anchors or weights would be dropped to the substrate. Anchors would be dragged until they have adequately dug into the bottom. A "deadman" would be placed by excavating a trench and backfilling over the "deadman" or by jetting or driving it into place. In some instances holes may have to be drilled or augered into hard substrate prior to placement of the anchor or piling. Equipment used during this phase of the construction may vary from hand held tools to heavy mechanical equipment.

During construction fish and other motile aquatic organisms will most likely avoid the area until the work is complete. If the piling are driven into place the benthic organisms directly in the path of the piling would be destroyed. Benthic organisms directly in the path of the anchor or weights would be destroyed. Likewise, immotile organisms in the path of a drill or auger would be destroyed. If a "deadman" or piling is jetted into place the benthic organisms would be jetted away from the path of the piling but may be smothered when suspended material settles to the bottom. If minor excavation is required in order to bury an anchor, benthic organisms would be destroyed when the excavated is placed on the substrate or returned to the trench.

Depending on the method of construction, equipment used, composition of the bottom substrate, and wind and current conditions during construction, including appropriate sedimentation and erosion controls, material that is suspended in the water column will temporarily increase the turbidity of the water. The plume generated by the turbidity will normally be limited to the immediate vicinity of the disturbance and will dissipate shortly after this phase of the construction is complete.

Depending upon the type of materials used to construct the temporary recreational structures, sessile organisms as well as other aquatic organisms may colonize submerged surfaces over time. The amount of colonization would be limited due to the temporary nature of the structure.

Wetland vegetation where some structures are placed and because of associated activities could be disturbed or destroyed. Because the disturbance will be temporary and limited in nature wetland vegetation will likely return to the site or recover from the disturbance.

Some shorelines could experience erosion due to wave action created by the wakes of racing or speeding boats. This impact should be minor due to the temporary nature of the activity.

Use of the waterways by recreational users may result in the discharge of small amounts of gas, oil and grease from inboard and outboard motors. The frequency and concentration of these discharges are not expected to increase as a result of the placement of temporary recreational structures.

***Cumulative Impacts***

Cumulative impacts of these activities will depend on the number of permits issued for this type of activity. Permitting statistics will be tracked and reported to NMFS and USFWS periodically to develop a database for evaluating cumulative effects.

**Structures In Fleeting And Anchorage Areas**

This category includes buoys, floats and other devices placed within anchorage or fleeting areas to facilitate moorage of vessels where such areas have been established for that purpose by the U.S. Coast Guard.

The following is a brief description of general effects which may occur with these types of projects. A more detailed evaluation of individual projects will be conducted by the Corps in its review of individual project applications. In its permit review process, the Corps will work with each applicant to avoid, minimize and compensate for potential adverse impacts of individual projects. the Corps will include appropriate conditions in the permit to ensure that unavoidable adverse effects are minimized and that compensatory mitigation is accomplished.

***Physical, chemical and biological characteristics of the aquatic ecosystem***

Mooring structures are typically constructed of piling or clusters of piling or buoys anchored to the bottom.

Open water structures often provide habitat for various sessile and motile invertebrates as well as provide shelter, shade and feeding areas for various fish and other aquatic organisms. Birds also use these structures for nesting, resting or roosting.

Piling are typically placed by jetting or driving them into place. In some instances holes may have to be drilled or augered into hard substrate prior to placement of the piles. Equipment used during this phase of the construction may vary from hand held tools to heavy mechanical equipment. During construction fish and other motile aquatic organisms will most likely avoid the area until the work is complete. If the piling are driven into place the benthic organisms directly in the path of the piling would be destroyed. Likewise, it is likely that immotile organisms in the path of a drill or auger would be destroyed. If the piling are jetted into place the benthic organisms would be jetted away from the path of the piling but may be smothered when suspended material settles to the bottom.

Depending on the method of construction, equipment used, composition of the bottom substrate, and wind and current conditions during construction, including appropriate sedimentation and erosion controls, material that is suspended in the water column will temporarily increase the turbidity of the water. The plume generated by the turbidity will normally be limited to the immediate vicinity of the disturbance and will dissipate shortly after this phase of the construction is complete.

Depending upon the type of materials used to construct the mooring structures, sessile organisms as well as other aquatic organisms typically colonize submerged surfaces.

Use of the waterways by commercial users may result in the discharge of small amounts of gas, oil and grease from inboard and outboard motors.

***Cumulative Impacts***

Cumulative impacts of these activities will depend on the number of permits issued for this type of activity. Permitting statistics will be tracked and reported to NMFS and USFWS periodically to develop a database for evaluating cumulative effects.

**Maintenance Dredging**

This category includes maintenance dredging of existing marinas to maintain the authorized depth for ingress and egress.

The following is a brief description of general effects which may occur with these types of projects. A more detailed evaluation of individual projects will be conducted by the Corps in its review of individual project applications. In its permit review process, the Corps will work with each applicant to avoid, minimize and compensate for potential adverse impacts of individual projects. the Corps will include appropriate conditions in the permit to ensure that unavoidable adverse effects are minimized and that compensatory mitigation is accomplished.

***Physical, chemical and biological characteristics of the aquatic ecosystem***

Equipment used during maintenance dredging may vary from small hand held suction pumps to heavy mechanical or hydraulic dredging equipment. The equipment may be barge mounted or working from the bank or docking structures. During dredging fish and other motile aquatic organisms will most likely avoid the area until the work is complete. Benthic organisms inhabiting the material that is being removed will be destroyed.

Depending on the method of construction; equipment used; composition of the bottom substrate; and wind and current conditions during construction, material that is suspended in the water column will temporarily increase the turbidity of the water. The plume generated by the turbidity will normally be limited to the immediate vicinity of the disturbance and will dissipate shortly after this phase of the construction is complete. However, benthic organisms and other sessile organisms in the path of the plume may be smothered when suspended material settles to the bottom.

Benthic organisms as well as other aquatic organisms typically recolonize the newly exposed substrate.

Maintenance dredging may result in the discharge of small amounts of gas, oil and grease from the dredging equipment. Small amounts of gas, oil and grease will also be discharged from inboard and outboard motors. Because the size of the marina cannot increase, the number of boats and concentration of these discharges are not expected to increase.

***Cumulative Impacts***

Cumulative impacts of these activities will depend on the number of permits issued for this type of activity. Permitting statistics will be tracked and reported to NMFS and USFWS periodically to develop a database for evaluating cumulative effects.

**Return Water From Upland Contained Disposal Areas**

This category includes return water from an upland, contained dredged material disposal area. The return water from a contained disposal area is administratively defined as a discharge of dredged material by 33 CFR 323.2(d) even though the disposal itself occurs on the upland and thus does not require a Section 404 permit.

The following is a brief description of general effects which may occur with these types of projects. A more detailed evaluation of individual projects will be conducted by the Corps in its review of individual project applications. In its permit review process, the Corps will work with each applicant to avoid, minimize and compensate for potential adverse impacts of individual projects. the Corps will include appropriate conditions in the permit to ensure that unavoidable adverse effects are minimized and that compensatory mitigation is accomplished.

***Physical, chemical and biological characteristics of the aquatic ecosystem***

Return water from an upland disposal site may be discharged into rivers, streams and other open water areas. The water may also be discharged into ditches or into wetlands. The retention time or other conditions related to the qualities of the effluent designated by the state should be sufficient to assure that most sediments are retained in the disposal site.

If sediments are released from the disposal site this could result in an accretion of sediments in some areas. Some benthic organisms could be smothered when suspended material settles to the bottom. Benthic organisms are expected to recolonize the site after construction is complete.

Depending on the rate of discharge, composition of the bottom, and wind and current conditions during construction, sediments placed in the water and suspended in the water column will temporarily increase the turbidity of the water. The plume generated will normally be limited to the immediate vicinity of the disturbance and should dissipate shortly after the discharge activity.

***Cumulative Impacts***

Cumulative impacts of these activities will depend on the number of permits issued for this type of activity. Permitting statistics will be tracked and reported to NMFS and USFWS periodically to develop a database for evaluating cumulative effects.

**Fish And Wildlife Harvesting, Enhancement, And Attraction Devices And Activities**

This category includes the installation and use of fish and wildlife harvesting devices and activities.

The following is a brief description of general effects which may occur with these types of projects. A more detailed evaluation of individual projects will be conducted by the Corps in its review of individual project applications. In its permit review process, the Corps will work with each applicant to avoid, minimize and compensate for potential adverse impacts of individual projects. the Corps will include appropriate conditions in the permit to ensure that unavoidable adverse effects are minimized and that compensatory mitigation is accomplished.

***Physical, chemical and biological characteristics of the aquatic ecosystem***

Many of these activities will occur in open water areas while some will be limited to intertidal shorelines, mudflats and wetlands.

Structures often provide habitat for various sessile and motile invertebrates as well as provide shelter, shade, breeding and rearing areas and feeding areas for various fish and other aquatic organisms. Sessile organisms may attach to structures such as duck blinds and fish concentrator devices. These structures may also provide important habitat for other, motile organisms comprising various levels of the food chain.

The discharge of dredged or excavated material resulting from the use of fish and wildlife harvesting devices will temporarily increase the turbidity of the water by suspending material in the water column. Benthic organisms living in the substrate where the excavation or discharge occurs will be destroyed. Immotile organisms covered by the discharge of dredged or fill material will be smothered. Soon after the harvesting activity has been completed benthic organisms will likely recolonize the project site.

Depending on the method of construction with the appropriate sediment and erosion controls, equipment used, composition of the bottom substrate, and wind and current conditions during construction, material that is suspended in the water column will temporarily increase the turbidity of the water. The plume generated by the turbidity will normally be limited to the immediate vicinity of the disturbance and will dissipate shortly after this phase of the construction is complete.

Wetland vegetation which may have established itself in areas where excavation or discharge will occur as a result of harvesting activities will be disturbed or destroyed. Because the disturbance will be temporary and limited in nature wetland vegetation will likely return to the site or recover from the disturbance.

Maintenance and use of the harvesting devices may result in the discharge of small amounts of gas, oil and grease from inboard and outboard motors. The frequency and concentration of these discharges are not expected to increase over those which would occur for activities which would likely be authorized under regional general permits or individual permits.

***Cumulative Impacts***

Cumulative impacts of these activities will depend on the number of permits issued for this type of activity. Permitting statistics will be tracked and reported to NMFS and USFWS periodically to develop a database for evaluating cumulative effects.

# Description of Oregon's Threatened or Endangered Species

The listing status of the species included in this consultation are summarized below in Table 3. Species descriptions follow Table 3.

Table 3. Status of Oregon's Sensitive Species

| Scientific Name | Common Name | Status |
|---|---|---|
| **Plants** | | |
| *Arabis macdonaldiana* | McDonald's rock-cress | Endangered |
| *Astragalus applegatei* | Applegate's milk-vetch | Endangered |
| *Castilleja levisecta* | Golden indian-paintbrush | Threatened |
| *Erigeron decumbens var. decumbens* | Willamette daisy | Endangered |
| *Fritillaria gentneri* | Gentner's fritillaria | Proposed endangered |
| *Howellia aquatilis* | Howellia | Threatened |
| *Lomatium bradshawii* | Bradshaw's lomatium | Endangered |
| *Lomatium cookii* | Cook's lomatium | Candidate for listing |
| *Lilium occidentale* | Western lily | Endangered |
| *Limnanthes floccosa ssp grandiflora* | Big-flowered wooly meadowfoam | Candidate for listing |
| *Lupinus sulphureus ssp. kincaidii* | Kincaid's lupine | Threatened |
| *Mirabilis macfarlanei* | Macfarlane's four-o'clock | Threatened |
| *Plagiobothrys hirtus* | Rough popcorn flower | Endangered |
| *Sidalcea nelsoniana* | Nelson's checkermallow | Threatened |
| *Stephanomeria malheurensis* | Malheur wire-lettuce | Endangered |
| *Thelypodium howellii ssp spectabilis* | Howell's spectacular thelypody | Threatened |
| **Invertebrates** | | |
| *Branchinecta lynchi* | Vernal pool fairy shrimp | Threatened |
| *Icaricia icarioides fenderi* | Fender's blue butterfly | Endangered |
| *Speyeria zerene hippolyta* | Oregon silverspot butterfly | Threatened |
| **Fish** | | |
| *Catostomus warnerensis* | Warner sucker | Threatened |
| *Chasmistes brevirostris* | Shortnose sucker | Endangered |
| *Deltistes luxatus* | Lost River sucker | Endangered |
| *Gila bicolor* ssp 1 | Hutton Spring tui chub | Threatened |
| *Gila boraxobius* | Borax Lake chub | Endangered |
| *Oncorhynchus clarki henshawi* | Lahontan cutthroat trout | Threatened |
| *Oncorhynchus clarki* population 1 | Umpqua River cutthroat trout | Endangered |
| *Oncorhynchus clarki* population 2 | Coastal cutthroat trout | Proposed threatened |
| *Oncorhynchus clarki* population 4 | SW Washington/Columbia River cutthroat trout | Proposed threatened |
| *Oncorhynchus keta* population 3 | Chum salmon (Columbia River run) | Threatened |

| Scientific Name | Common Name | Status |
|---|---|---|
| *Oncorhynchus kisutch* population 1 | Coho salmon(lower Columbia River/SW Washington Coast runs) | Candidate for listing |
| *Oncorhynchus kisutch* population 2 | Coho salmon(Southern Oregon/Northern California coast) | Threatened |
| *Oncorhynchus kisutch* population 3 | Coho salmon (Oregon coastal runs) | Threatened |
| *Oncorhynchus mykiss* population 1 | Klamath Mountains province steelhead | Candidate for listing |
| *Oncorhynchus mykiss* population 13 | Snake River basin steelhead | Threatened |
| *Oncorhynchus mykiss* population 14 | Lower Columbia river steelhead | Threatened |
| *Oncorhynchus mykiss* population 15 | Oregon coast steelhead | Candidate for listing |
| *Oncorhynchus mykiss* population 17 | Middle Columbia River steelhead | Threatened |
| *Oncorhynchus mykiss* population 20 | Upper Willamette River steelhead | Threatened |
| *Oncorhynchus tshawytscha* population 1 | Chinook salmon (lower Columbia River fall runs) | Threatened |
| *Oncorhynchus tshawytscha* population 16 | Chinook salmon (upper Willamette River runs) | Threatened |
| *Oncorhynchus tshawytscha* population 2 | Chinook salmon (Snake River, fall run) | Threatened |
| *Oncorhynchus tshawytscha* population 8 | Chinook salmon(Snake River, spring/summer run) | Threatened |
| *Oregonichthys crameri* | Oregon chub | Endangered |
| *Rhinichthys osculus* ssp 3 | Foskett Spring speckled dace | Threatened |
| *Salvelinus confluentus* | Bull trout | Threatened |
| **Amphibians** | | |
| *Rana luteiventris* | Columbia spotted frog | Candidate for listing |
| *Rana pretiosa* | Oregon spotted frog | Candidate for listing |
| **Birds** | | |
| *Brachyramphus marmoratus marmoratus* | Marbled murrelet | Threatened |
| *Branta canadensis leucopareia* | Aleutian Canada goose | Threatened |
| *Centrocercus urophasianus phaios* | Western sage grouse | Species of concern |
| *Charadrius alexandrinus nivosus* | Western snowy plover | Threatened |
| *Haliaeetus leucocephalus* | Bald eagle | Threatened |
| *Pelecanus occidentalis* | Brown pelican | Endangered |
| *Strix occidentalis caurina* | Northern spotted owl | Threatened |
| **Mammals** | | |
| *Lynx canadensis* | Canada lynx | Proposed threatened |
| *Odocoileus virginianus leucurus* | Columbian white-tailed deer | Endangered |

The descriptions of individual species in this section contain references to maps included in the Corps' biological assessment for the Oregon Removal-Fill Program. That biological assessment was provided to NMFS and USFWS as a preliminary final draft on February 23, 2000, and is expected to be submitted in final form March 31, 2000. The maps referenced in this section, which are incorporated by reference into this programmatic biological assessment, are included in the Oregon Removal-Fill Program BA as Map Atlas Set B.

## Plants

**McDonald's rock-cress (*Arabis macdonaldiana*)** McDonald's rock-cress is a perennial member of the mustard family (Brassicaceae) and can be distinguished by its relatively large, conspicuous lavender to purplish flowers, flattened rosette, glabrous simple leaves, and seeds with wings on the distal end. McDonald's rock-cress is restricted to soils derived from ultramafic rocks, commonly referred to as serpentine. McDonald's rock-cress is commonly found in open areas around manzanita in open canopied mixed conifer forest with various mixes of ponderosa pine, Jeffrey pine, sugar pine and incense cedar. McDonald's rock-cress is known from Mendocino County, California, and, recently, from Josephine and Curry Counties, Oregon (Refer to Oregon Removal-Fill Program BA, Map B-17).

McDonald's rock-cress is a poor competitor for the scant resources of serpentine soils and is restricted in distribution for this reason. The recovery plan for this species (USDI 1990b) cites mining and road widening/maintenance as the two main threats to this species' survival, which is why the U. S. Fish and Wildlife Service listed this plant as endangered in 1978 (USDI 1978). At that time the Josephine County population was unknown. A proposed nickel mine, however, also threatens this population. While all the known populations of McDonald's rock-cress in Oregon are on federal land, it is possible that this species occurs on private land, as well (J. Kagan pers. comm. 1998). Critical habitat has not been proposed for this species.

**Applegate's milk-vetch (*Astragalus applegateii*)** A member of the pea family (Fabaceae), Applegate's milk-vetch is a slender, herbaceous perennial, often decumbent (laying on the ground), with stems ten to 33 inches (2.5-8 dm.) long and with seven to thirteen narrow, linear leaflets, sparingly strigose (small hairs) below. The flowers are pea-like, light purple, about ¼-inch (6-7 mm.) long with the lower petal almost perpendicular to the flower stalk. The seed pods are about 1/3 to ½-inch (8-13 mm.) long with purple mottling and grow on a short stalk. Mature plants have been seen growing as a circular mat with a radius of 1-3 feet (3-9 dm.) Applegate's milk-vetch blooms and produces seeds from June to early August. Other sympatric *Astragalus* species noted are *Astragalus filipes*, *A. purshii*, and *A. lemmonii*. *A. filipes* is more erect and about 1-2.5 feet (3-7 dm.) tall with cream-colored flowers. *A. purshii* is also more erect but only 1-4 inches (3-10 cm.) tall with very hairy (wooly) seed pods. The flowers of *A. lemmonii* are arranged in short, crowded racemes (flower stalk), and the seed pods are sessile (not stalked).

Applegate's milk-vetch was discovered near Klamath Falls, Oregon in 1927 and is currently known from three sites near the city of Klamath Falls in southern Klamath County in the south-central portion of Oregon (Refer to Oregon Removal-Fill Program BA, Map B-19). The largest and best population is situated in an expanding industrial area of Klamath Falls.

Applegate's milk-vetch was listed as Federally endangered on July 28, 1993 (USDI 1993a). It is also state listed endangered by the Oregon Department of Agriculture (ODA 1990). Critical habitat has not been proposed for this species.

Applegate's milk-vetch grows in flat, open, seasonally moist alkaline grasslands within the former floodplain of the Klamath River. The substrate is poorly drained, fine silt loam, with an underlying hardpan 20 to 40 inches below (Yamamoto 1985, USDI 1993a). Populations are now limited to remnant grassy patches dominated mainly by introduced grasses and other weeds. The species may be adversely affected by lack of seasonal flooding, which may have been instrumental in reducing competition and providing openings for colonization. Irrigation withdrawals and water control structures along the Klamath River have eliminated the area's natural flooding regimes. The largest population of this species, comprising about 7200 plants (90% confidence) plants on 6 acres, has been impacted by road construction; the area it occupies is zoned for commercial or industrial use (D. Salzer pers. comm. 1999).

**Golden indian-paintbrush (*Castilleja levisecta*)** This species, a member of the figwort family (Scrophulariaceae) is an herbaceous perennial that can reach about 12 inches (30 cm) in height. Its "flowers" (technically not the flowers but the bracts) are golden or yellow in color making it very distinctive from any of the other paintbrushes growing in the Willamette Valley.

Although currently not known to occur in Oregon, *Castilleja levisecta* has been collected six different times in five different areas from the counties of Marion, Linn, and Multnomah (Refer to Oregon Removal-Fill Program BA, Map B-21). The most recent collection is dated 1938. All extant populations are found in Thurston County, Washington northward through the Puget Sound to Vancouver Island, British Columbia. It is federally listed as threatened (USDI 1997a) and state listed as endangered (ODA 1995). Critical habitat was not designated at the time of listing (USDI 1997a).

Golden indian-paintbrush occurs in open grasslands, elevation from sea level to about 328 feet (100 m) of the Puget Trough of the Pacific Northwest. In Oregon, the herbarium collections state "wet meadow", "wet pasture", and "damp ground". Since this species is distinctive--fairly easily noticed (when in "flower") and easily identified--and field botanists have been searching unsuccessfully for this plant for the past 20 years, it is for all intents and purposes extinct from Oregon.

**Willamette daisy *(Erigeron decumbens* var. *decumbens)*** A member of the sunflower family (Asteraceae), this plant is a perennial herb, 6-24 inches (15-61 cm) tall. Basal leaves are 2 to 7 inches (5 to 18 cm) long and less than ½ inch (1. 3 cm) wide, becoming gradually shorter along the stem. The flowering stems, which are taller than the vegetative stems, produce 2 to 5 flower heads in June and July. The flowers are daisy-like, with yellow centers and 25 to 50 pinkish to blue rays, often fading to white with age. This is the only pink-purple rayed *Erigeron* that occurs in the bottomland habitats of the Willamette Valley (Kagan and Yamamoto 1987).

The Willamette daisy is endemic to the state of Oregon, where it is known only from the Willamette Valley (Refer to Oregon Removal-Fill Program BA, Map B-22). The Willamette daisy is listed as endangered at the state and federal levels (ODA 1990, USDI 2000a). Critical habitat has not been proposed.

Historically, this plant, as well as its habitat, likely was widespread throughout the Valley. It grows both on the upland grassland prairies and on the flat, open, seasonally flooded, clayey soiled bottomland grasslands. These grasslands are usually classified as tufted hairgrass (*Deschampsia caepsitosa*) prairies. Prior to European settlement, these prairies were maintained by periodic flooding and fires, which prevented the establishment of woody species. Prairie remnants are considered to be among the rarest habitats in western Oregon and are threatened by fragmentation, agriculture and urban growth. Most sites are small and privately owned. Only four sites are in secure ownership (Clark *et al.* 1993).

Presently, 18 sites are known, distributed between the city of Grande Ronde, Polk County in the north and west to the city of Goshen, Lane County in the south. The plant is known to have been extirpated from an additional 19 historic locations (Clark *et al.* 1993).

**Gentner's fritillary (*Fritillaria gentneri*)** A member of the lily family (Family: Liliaceae), Gentner's fritillary flowers from April to June, producing striking reddish-purple flowers, with yellow streaks. This species occurs in rather dry, open woods dominated by Oregon white oak and madrone often with ponderosa pine and Douglas fir at elevations less than 3000 feet. This species can grow in open grasslands/chaparral but is usually found with shrubs. Gentner's fritillary is often found in habitat that has had some historic disturbance, e.g. old road cuts or along trails. It is not known to occur on droughty sites (W. Rolle pers. comm. 1988). It is known only from a few scattered localities along the Rogue, Applegate and Illinois River drainages, in Jackson and Josephine Counties (Refer to Oregon Removal-Fill Program BA, Map B-24).

Gentner's fritillary is proposed for listing as an endangered species (USDI 1998b) and is state listed as endangered (ODA 1990). Critical habitat has not been proposed. *Fritillaria recurva* grows in the same area but its flower petals are smaller, more orange-red and with recurved tips. Gentner's fritillary has deeper red-purple flowers with tips that are spreading but not recurved.

**Howellia (*Howellia aquatilis*)** This small water annual of the bellflower family (Campanulaceae) grows in the shallower waters of sloughs, oxbows and ponds of Montana, Washington, Idaho and historically Oregon. *Howellia aquatilis* grows to about 4-24 inches (10-60 cm) in length with narrow linear leaves, 0. 4-2 inches (1-5 cm) in length and up to a little over 1/16 inch (1.5 mm) wide. The plants are rooted in the bottom mud of the pond or slough, at first from a single stem then with mutiple stems branching a few inches from the base and extending and floating to the water surface. There are two types of flowers, an inconspicuous one found below the water surface and a more noticeable white-colored flower on the surface of the water. These white flowers have five petals and are about ¼ inch (6 mm) in diameter.

Howellia is a federally listed as threatened (USDI 1994a) but has no state status. Critical habitat has not been proposed. Water depths in which this species grows are generally shallow (< 3.28 feet (1m ) deep) but have been reported up to 6.56 feet (2 m). As its habitat dries up later in the growing season, it can be found persisting in the remaining muck (Shelley and Moseley 1988). Surrounding vegetation is usually characterized as some kind of broad-leaf tree, i.e. black cottonwood (*Populus trichocarpa*), quaking aspen (*Populus tremuloides*), paper birch (*Betula papyrifera*) in Montana and Oregon ash (*Fraxinus latifolia*) in Washington. Elevational range is from 10 feet (3 m) in Washington to 4420 feet (1350 m) in Montana (Shelley and Moseley 1988).

In Oregon, howellia was last collected in 1935 from Salem, Marion County (Refer to Oregon Removal-Fill Program BA, Map B-21). There are eight other collections, an additional two from the Salem area, five from Sauvie Island, Multnomah/Columbia County, and one from Lake Oswego, Clackamas County. There is also a 1977 unsubstantiated report from the Salem area.

The closest extant population to Oregon is in Clark County, Washington at the Ridgefield National Wildlife Refuge, which is directly across the Columbia River from Sauvie Island.

Oregon surveys should focus on vernal ponds or the shallow water margins of deeper ponds and other slow-moving water bodies, such as oxbows, sloughs, and channels, especially if these sites are near Oregon ash plant communities. Due to its historic range in the Willamette Valley, it is encumbent upon field botanists to survey for this species in this province but it is not certain to what extent it is needed in the other provinces. However, there is some speculation that the seeds of this species may be dispersed on the feet of waterfowl so wherever these creatures may land could be potential habitat (Shelley and Moseley 1988; K. Chambers pers. comm.).

**Western Lily** ***(Lilium occidentale)*** The western lily, a perennial in the lily family (Liliaceae), grows from a short unbranched, rhizomatous bulb, reaching a height of up to 5 feet (1. 8 m). Leaves grow along the unbranched stem singly or in whorls and are long and pointed, roughly 3/8 inch (1 cm) wide and 4 inches (10 cm) long. The nodding flowers are crimson red, sometimes deep orange, on the outer portions with yellow to green centers in the shape of a star and with purple spots. The six petals (actually "tepals", lookalike petals) are 1 to 1.5 inches (3 to 4 cm) long and strongly recurved (curving backwards).

Other lilies in the area are *Lilium pardalinum* and *L. columbianum*. The former also has flowers that have an orange-red outer portion and an orange-yellow or yellow-green inner portion but does not present the center "golden star" because the lighter colored inner portion is more irregularly distributed than in the western lily (Guerrant *et al.* 1997). The flowers of *L. columbianum* are almost always pure orange.

The western lily was listed as Federally endangered on August 17, 1994 (USDI 1994b); it is listed by the state of Oregon as endangered (ODA 1990). Critical habitat has not been proposed. The western lily has an extremely restricted distribution within 3.2 km (2 miles) of the Pacific coast, from Hauser, Coos County, Oregon to Loleta, Humboldt County, California (Refer to Oregon Removal-Fill Program BA, Map B-30). This range encompasses approximately the southern one-third of the Oregon coast and the northern 100 miles (161 km) of the California coast. The plant is currently known from 7 widely separated regions along the coast, and occurs in 31 small, isolated, densely clumped populations. Of the 25 populations known in 1987 and 1988, 9 contained only 2 to 6 plants, 5 contained 10 to 50 plants, 6 contained 51 to 200 plants, 4 contained 201 to 600 plants, and 1 contained almost 1,000 plants (Schultz 1989). At some sites, particularly the sites with more than 200 plants, the majority of plants were non-flowering, which is probably an indication of stress (Schultz 1989). Since then, an estimated total of 1,000 to 2,000 flowering plants have been discovered at 4 sites near Crescent City, California, where none were previously known (D. Imper pers. comm. 1991). In addition, a population of about 125 flowering plants was discovered near Brookings, Oregon, in 1991 (M. Willis pers. comm. 1991), and a population of 13 flowering plants was discovered near Bandon, Oregon, in 1992.

The western lily grows at the edges of sphagnum bogs and in forest or thicket openings along the margins of ephemeral ponds and small channels. It also grows in coastal prairie and scrub near the ocean where fog is common. Historical records indicate that the western lily was once more common than it is today. After the ice age, rising sea levels flooded marine benches, creating much more extensive bogs and coastal scrub than exist today. That may account for the patchiness of the western lily's current distribution. It is known or assumed extirpated in at least nine historical sites, due to forest succession, cranberry farm development, livestock grazing, highway construction, and other development. These factors continue to threaten the lily, with development taking a primary role. Two known populations near Brookings, Oregon were partially or totally destroyed by unpermitted development-related wetland fill activity in 1991. The largest known population and three smaller populations near Crescent City, California are currently threatened by housing and recreation development.

**Big-flowered wooly meadowfoam (*Limnanthes floccosa* ssp. *grandiflora*)**
The big-flowered wooly meadowfoam is a delicate annual in the meadowfoam family (Limnanthaceae), 2 to 6 inches (5 to 15 cm) tall, with 2 inch (5 cm) leaves divided into 5 to 9 segments. The stems and leaves are sparsely covered with short, fuzzy hairs, while the flowers and, especially, the calyx are densely covered with wooly hairs. Each of the five yellowish to white petals is ¼-1/2 inches (5-10 mm) long and has two rows of hairs near its base.

The US Fish and Wildlife Service designated the big-flowered wooly meadowfoam as a candidate species on December 15, 1980 (USDI 1980a). It is listed endangered by the Oregon Dept. of Agriculture (1990). The big-flowered wooly meadowfoam occurs in and around vernal pools of the Agate Desert near the city of Medford, Jackson County in southwestern Oregon (Refer to Oregon Removal-Fill Program BA, Map B-32). In size the Agate Desert is approximately 32 square miles or about 20,000 acres and also contains the federal candidate plant species, *Lomatium cookii*. Within the Rogue River basin, the Agate Desert is characterized by shallow, Agate-Winlow complex soils, a relative lack of trees, and sparse prairie vegetation (ONHP 1997). The Agate-Winlow soil landscape consists of a gentle mound-swale topography that develops pools of water in the swales during the fall and winter rainy season. These vernal pools vary in diameter size from 3 to 100 feet (1 to 30 m) and attain a maximum depth of about 12 inches (30 cm) (ONHP 1997). Plants native to these pools are adapted to grow, flower, and set seed during the relatively short time that water is available in the spring.

There are only 10 known occurrences of big-flowered wooly meadowfoam in the Agate Desert where mapped habitat for this species totals 198 acres (ONHP 1999b). However, due to recent alteration and destruction of Agate Desert vernal pools (ONHP 1997), habitat currently occupied by big-flowered wooly meadowfoam is considerably less, at an estimated 116 acres (ONHP 1999b). Vernal pool habitat, formerly widespread south of the Rogue River, is now almost completely eliminated (ONHP 1997).

Five occurrences of *Limnanthes floccosa* ssp. *grandiflora* are located on non-federal lands. Two occurrences are on state land, primarily the Ken Denman Wildlife Area, where much of the habitat has been altered and planted to grasses. Portions of three occurrences are on lands owned by the City of Medford, within an area designated as the Whetstone Industrial Park. Portions of two occurrences are located in State or county-maintained highway rights-of-way, or in powerline rights-of-way (ONHP 1999b), where they are subject to herbicide spraying and other maintenance activities.

**Bradshaw's lomatium (*Lomatium bradshawii*)** Bradshaw's lomatium, a member of the parsley family (Apiaceae), is about eight to twenty inches (2-4 dm.) tall, with mature plants having only two to six leaves. Leaves are chiefly basal and are divided into very fine, almost threadlike, linear segments. The yellow flowers are small, measuring about 1 mm long and 0.5-0.7 mm across and are grouped into asymmetrical umbels. Each umbel is composed of 5 to 14 umbellets, which are subtended by green bracts divided into three's. This bract arrangement differentiates *L. bradshawii* from other lomatiums. Bradshaw's lomatium blooms during April and early May, with fruits appearing in late May and June. Fruits are oblong, about one-half inch long, corky and thick-winged along the margin, and have thread-like ribs on the dorsal surface. This plant reproduces entirely from seed (Kagan 1980).

The majority of Bradshaw's lomatium populations occur on seasonally saturated or flooded prairies, adjacent to creeks and small rivers in the southern Willamette Valley (Refer to Oregon Removal-Fill Program BA, Map B-26). Soils at these sites are dense, heavy clays, with a slowly permeable clay layer located 6 to 12 inches (15 to 30 cm) below the surface. This clay layer results in a perched water table during winter and spring and is a major wetland characteristic of tufted hair-grass (*Deschampsia*) prairies. Insects observed to pollinate this plant include a number of beetles, ants, and some small native bees.

Bradshaw's lomatium was listed as Federally endangered on September 30, 1988 (USDI 1988a). It was listed endangered by the state in 1990 (ODA 1990). Critical habitat has not been proposed. Once endemic to and widespread in the wet, open areas of the Willamette Valley of western Oregon, Bradshaw's lomatium is limited now to a few sites in Lane, Marion, and Benton Counties with a recently discovered population in Clark County, Washington. The greatest concentrations of remaining sites and plants occur in and adjacent to the Eugene metropolitan area.

**Cook's lomatium (*Lomatium cookii*)** Cook's lomatium, a member of the parsley family (Apiaceae) is a perennial herb that grows to a height of 6 to 20 inches (1.5-5 dm.) from a slender, twisted taproot. Flowers are yellow, fruits are oblong 5/8-1/2 inch (8-13 mm) long and 3/8-1/4 inch (4-6 mm) wide, with lateral thick, corky wings. Involucels (leaf subtending the flower umbel) are 6-10 mm long, linear and green. Blooming time ranges from mid-March to mid-May; fruits are present from late May through July (Kagan 1986a).

*Lomatium cookii* occurs with two other lomatium species: *Lomatium utriculatum* and *L. macrocarpum. Lomatium utriculatum* can be differentiated from Cook's lomatium by its obovate (egg shaped but widest above the middle) involucels, cauline habit (leaves and flowers arise from stem) and fruits with thin wings. *Lomatium macrocarum* is hairy with pale white to tan flowers and narrow, thin-winged fruits (Kagan 1986a). Total area occupied by Cook's lomatium is 264 acres (Refer to Oregon Removal-Fill Program BA, Map B-28). Cook's lomatium is a federal candidate species (USDI 1999a). It is listed as state endangered by the Oregon Dept. of Agriculture (ODA 1990). Critical habitat has not been proposed.

The plants occur in two disjunct clusters in southwestern Oregon: the Illinois Valley (Josephine County) and the Agate Desert (Jackson County). In the Agate Desert, the species grows in a vernal pool-mound topography, where it mainly occurs along the vernal pool margins and less frequently on the pool bottom or on top of the mound. These pools have stony bottoms or shallow layers of clay, allowing for standing water from December through March, often into May. The mounds are relatively rock free with loam and clay loam soils (ONHP 1999a).

In the Illinois Valley, Cook's lomatium grows on seasonally flooded alluvial plains, amongst ponderosa pine-Oregon white oak savannas. Upland areas are almost always serpentine soiled with Jeffrey pine savannas.

Since Cook's lomatium was only first collected in 1981, estimates of historic population size are difficult. However, based on known historic distribution of vernal pools in the area, it may be that over 99 percent of the species' habitat has been lost (J. Kagan pers. comm. 1997). The Nature Conservancy (TNC) owns and actively manages two sites in the Agate Desert, the Agate Desert Preserve (approximately 12.5 acres of habitat) and the recently acquired Whetstone Savannah Preserve (about 1.2 acres of habitat).

Cook's lomatium is imminently threatened by habitat destruction, primarily from residential and industrial development, including road and powerline construction. With many plants, in cases of inevitable habitat loss, transplantation may be an option of last resort in preserving individuals and maintaining genetic diversity. However, transplantation does not appear to be feasible for Cook's lomatium. The plant's twisted taproot is so horizontally extensive above the pan layer and the root hairs so interwoven with the rocky substrate that a tremendous amount of material would have to be moved with the plant to avoid root injury and subsequent mortality. Where transplantation has been attempted, the plants have died (D. Borgias pers. comm., 1997).

**Kincaid's lupine (*Lupinus sulphureus* ssp. *kincaidii*)** There are about 50 sites for Kincaid's lupine spread throughout the Willamette Valley and one site in southern Washington, which implies a close association with native upland prairie sites (Refer to Oregon Removal-Fill Program BA, Map B-34). Its aromatic flowers are yellowish-cream colored, often showing shades of blue on the keel. The upper calyx (collective sepals) lip is short, yet unobscured by the reflexed banner when viewed from above. The leaflets tend to a deep green with an upper surface that is often glabrous. The plants are 16-32 inches (4-8 dm) tall, with single to multiple unbranched flowering stems and basal leaves that remain after flowering (Kuykendall and Kaye 1993, USDI 1998a). Kincaid's lupine is a long-lived perennial species, with a maximum reported age of 25 years (USDI 1998a) and is pollinated by solitary bees and flies (P. Hammond pers. comm. 1994, USDI 1998a). Seed set and seed production are low, with few (but variable) numbers of flowers producing fruit from year to year (Liston *et al.* 1995, USDI 1998a). Seeds are dispersed from fruits that open explosively upon drying.

The primary loss of habitat for *Lupinus sulphureus* ssp. *kincaidii* has resulted from the extensive alteration of native prairie in the Willamette Valley that has occurred over the last 140 years. Over 99 percent of the native prairie in the Willamette Valley, the only known habitat area of Kincaid's lupine, has been lost (E. Alverson pers. comm. 1994). Habitat at 80 percent of the sites containing Kincaid's lupine (e.g., 68) is rapidly disappearing due to agriculture practices, development activities, forestry practices, grazing, roadside maintenance, and commercial Christmas tree farms. As a result of these threats the U.S. Fish and Wildlife Service and Oregon Department of Agriculture listed Kincaid's lupine as a threatened species (ODA 1990, USDI 2000a). Critical habitat has not been proposed.

**MacFarlane's Four-o'clock (*Mirabilis macfarlanei*)** MacFarlane's four-o'clock is an endangered perennial with freely branched stems (swollen at the nodes) forming hemispherical clumps 24-47 inches (6-12 dm) in diameter. The leaves are opposite, somewhat succulent, green above and glaucescent (film covered) below. The lower leaves are orbicular or ovate-deltoid in shape and become progressively smaller toward the tip of the stem. Flowers bloom between May and early June with an inflorescence that is a 4-7 flowered cluster subtended by an involucre. The flowers are striking in their large size, up to 1 inch by 1 inch (25 mm by 25 mm wide) and rose-purple color. They are funnel-form in shape with a widely expanding limb. The flower is 5-merous, stamens 5, generally exerted. The root is a stout, deep-seated taproot (USDI 1985b).

This species was listed as endangered by the U.S. Fish and Wildlife Service in 1979 (USDI 1979) and by the state of Oregon in 1990 (ODA 1990). In 1996, the USFWS changed its status from Endangered to Threatened (USDI 1996c). Critical habitat has not been proposed. MacFarlane's four-o'clock has been found in 25 sites: Eleven sites on the banks of the Snake River in Hell's Canyon, Wallowa County, Oregon and Idaho County, Idaho; two sites above the Imnaha River, Wallowa County, Oregon; and 12 sites above the Salmon River in adjacent Idaho County, Idaho (Refer to Oregon Removal-Fill Program BA, Map B-36).

All of the populations of MacFarlane's four-o'clock known at this time grow as scattered plants on open, steep (50%) slopes of sandy soils, generally having west to southwest aspects. One colony has been found having an east aspect. Talus rock underlies the soil in which the plants are rooted. The soil type is unknown. The plant community is a transition between bluebunch wheatgrass - Sandberg's bluegrass (*Agropyron spicatum - Poa secunda*) and smooth sumac - bluebunch wheatgrass (*Rhus glabra - Agropyron spicatum*). The native bluegrass (*Poa secunda*) of this community has been replaced by the exotic cheatgrass (*Bromus tectorum*). Recovery actions for MacFarlane's four-o'clock include conducting censuses, securing each colony with habitat management plans, establishing new colonies at suitable sites, and establishing propagule banks.

**Rough Popcornflower (*Plagiobothrys hirtus*)** An annual herb in the borage family (Boraginaceae), the rough popcornflower has a stout stem, erect or reclining, that grows 1 to 2 feet (3 to 6 dm) long. The leaves are linear, the lower paired and the upper alternate, 4 to 10 inches (10 to 25 cm) in length. The flowers are white with yellow centers, 5-petaled, radially symmetrical, up to a little over ¾ inch (20 mm) across, and are arranged in curled racemes typical of the borage family. The nutlets (seeds) are ovate, <1/16 inch (2 mm) long, with a prominent dorsal keel. It can be distinguished from other sympatric *Plagiobothrys* species by its distinctive, wide-spreading hairs, in contrast to the appressed hairs of the other species. The species is an annual or creeping perennial with rooting stems, a unique trait for the genus.

Rough popcorn flower is listed as endagered by both the U.S. Fish and Wildlife Service and the state of Oregon (ODA 1990, USDI 2000b). Critical habitat has not been proposed. The rough popcornflower had a narrow range historically and currently occurs at only 4 known sites in Oregon's Umpqua Valley, near Sutherlin, in Douglas County (Refer to Oregon Removal-Fill Program BA, Map B-38). The sites are all located within 5 miles of one another and total less than 10 acres in area. Fewer than 3,000 plants exist. The species occurs in moist, open areas on poorly drained silty clay soils in flat valley bottoms. Its habitat is maintained by the seasonal ponding of water.

**Nelson's checkermallow (*Sidalcea nelsoniana*)** Nelson's checkermallow is a perennial herb in the mallow family (Malvaceae) with pinkish-lavender to pinkish-purple flowers borne in clusters at the end of 1 to 2.5 foot (0.3 to 0.76 dm) tall stems. The majority of sites for the species occur in the Willamette Valley of Oregon; the plant is also found at several sites in the Coast Range of Oregon and at one site in the Coast Range in Cowlitz County, Washington. Thus the range of the plant extends from southern Benton County, Oregon, north to Cowlitz County, Washington, and from central Linn County, Oregon, west to just west of the crest of the Coast Range (Refer to Oregon Removal-Fill Program BA, Map B-40).

Inflorescences of plants from the Willamette Valley are usually somewhat spike-like, usually elongate and somewhat open (Hitchcock 1957). Inflorescences of plants from the Coast Range are shorter and not as open (K. Chambers pers. comm.). Plants have either perfect flowers (male and female) or pistillate flowers (female). The plant can reproduce vegetatively, by rhizomes, and produces seeds that drop near the parent plant. Flowering can occur as early as mid-May and extend into September in the Willamette Valley. Fruits have been observed as early as mid-June and as late as mid-October. The Coast Range populations generally flower later and produce seed earlier, probably because of the shorter growing season ($CH_2M$ Hill 1991).

Nelson's checkermallow was federally listed as threatened on February 12, 1993 (USDI 1993b) by the U.S. Fish and Wildlife Service; it is also a state listed threatened species (ODA 1990). Within the Willamette Valley, Nelson's checkermallow most frequently occurs in Oregon ash (*Fraxinus latifolius*) swales and meadows with wet depressions, or along streams. The species also grows in wetlands within remnant prairie grasslands. Some sites occur along roadsides at stream crossings where exotics such as blackberry (*Rubus* spp.) and Queen Anne's lace (*Daucus carota)* are also present. Nelson's checkermallow primarily occurs in open areas with little or no shade and will not tolerate encroachment of woody species.

Prior to European colonization of the Willamette Valley, naturally occurring fires and fires set by Native Americans maintained suitable Nelson's checkermallow habitat. Current fire control and prevention practices allow succession of introduced and native species, which may gradually replace habitat for Nelson's checkermallow (BLM 1985). Any remnant prairies in the Willamette Valley have been modified by livestock grazing, fire suppression, or agricultural land conversion (Moir and Mika 1972). Stream channel alterations, such as straightening, splash dams, and rip-rapping cause accelerated drainage and reduce the amount of water that is diverted naturally into adjacent meadow areas. As a result, areas that would support Nelson's checkermallow are lost. The species is now known to occur in 48 patches within five relict population centers in Oregon, and at one site in Washington ($CH_2M$ Hill 1991). Four additional sites with occurrences recorded since 1985 apparently have been extirpated as a result of plowing, deposition of fill material or yard debris, or intense roadside vegetation management.

**Malheur wire-lettuce *(Stephanomeria malheurensis)*** Malheur wire-lettuce is an annual plant, geographically restricted to one site in Harney County, Oregon, and federally listed as Endangered by the U.S. Fish and Wildlife Service (USDI 1982). Critical habitat was designated at the same time as its listing and covers 160 acres contained in parts of Section 11 and 12 of Township 27 South and Range 30 East of the Willamette Meridian (USDI 1982).

Malheur wire-lettuce is a member of the Asteraceae or composite family, and grows up to 20 inches tall with pink to white flowers. It is very similar to a more abundant and similar species, *Stephanomeria exigua* ssp. *coronaria*, with which it also grows. It is surmised that *Stephanomeria malheurensis* is closely related to and has just recently evolved from *S. exigua* ssp. *coronaria* (Gottlieb 1991, USDI 1982). Its habitat is open on a broad hill with soil derived from a volcanic tuff layered with thin crusts of limestone (USDI 1982). Associated vegetation, in addition to the already mentioned *Stephanomeria exigua* ssp. *coronaria*, includes *Artemisia tridentata* (big sagebrush), *Chrysothamnus nauseos* (gray rabbitbrush), *C. viscidiflorus* (green rabbitbrush), *Salsola kali* (tumbleweed), and *Bromus tectorum* (cheatgrass). Competition from cheatgrass may be a major threat to this species.

As is the nature of annuals, plant numbers can fluctuate widely from year to year depending on precipitation levels during the winter and spring prior to the growing season. For *Stephanomeria malheurensis* plant numbers for its single population has steadily decreased since first being described in 1978 to a period from 1985 to 1986 when no plants were found. In 1987, 500 seedlings were transplanted from seeds collected in previous years and then nurtured off-site (Taylor pers. comm. 2000).

In addition to competition from cheatgrass, other threats include mining (claims dot the surrounding area) and grazing from small herbivores. The Burns District of the Bureau of Land Management currently manages the site and has also designated it as the South Narrows Area of Critical Environmental Concern.

**Howell's spectacular thelypody (*Thelypodium howellii* ssp. *spectabilis*)**
Howell's spectacular thelypody is a biennial plant in the mustard family (Brassicaceae) that grows to approximately 2 feet (60 cm) tall, with branches arising from near the base. The four-petalled flowers are about ¾ inch (5-8.5 mm) long, mostly spatulate in shape, lavender to purple in color. Basal leaves are arranged in a rosette and are from ¾-4 inches (2-10 cm) long. Cauline leaves (leaves borne on stem) are lanceolate, entire, and usually sagittate (arrowhead-shaped) at the base and are 2/5-4 inches (1-10 cm) long. Flowering typically takes place from June through July.

*T. howellii* ssp. *spectabilis* may be distinguished from *T. howellii* ssp. *howellii* by the former's larger petals 3/5-3/4 inch vs. 5/16-1/2 inch (16-20 mm vs. 8-12 mm), more spatulate petal shape, and the more deeply colored flowers. Since there are no known populations for *T. howellii* ssp. *howellii* in Oregon and only a few in California, this subspecies is also considered rare throughout its range by the Oregon Natural Heritage Program (1998).

*Thelypodium howellii ssp. spectabilis* is federally listed as a threatened species (USDI 1999b) and state listed as endangered (ODA 1990). This plant is found in valley bottomlands and wet meadows of the Powder River Valley in northeastern Oregon, Baker and Union Counties, Oregon (Refer to Oregon Removal-Fill Program BA, Map B-42). These areas are alkaline meadow habitats, typically growing salt tolerant species such as *Sarcobatus vermiculatus* (greasewood), *Elymus cinereus* (giant wild rye), and alkali saltgrass (*Distichlis stricta*). *Thelypodium howellii* ssp. *spectabilis* appears dependent on periodic flooding because it rapidly colonizes areas adjacent to streams that have flooded (Kagan 1986b). It is known from 18 extant sites located near the communities of North Powder, Haines, and Baker. The plant has been extirpated from about one-third of the historic sites, including the type locality in Malheur county. All populations occur on private property with two close to state highway right-of-ways.

## Invertebrates

**Vernal pool fairy shrimp (*Branchinecta lynchi*)** The vernal pool fairy shrimp was found for the first time in the Agate Desert vernal pool ecosystem in the Rogue Valley near Medford and White City, Oregon, in February of 1998 (Borgias *et al.* 1999) (Refer to Oregon Removal-Fill Program BA, Map B-44). The fairy shrimp (Family: Brachinectidae) was previously known from numerous sites in California, with the nearest site 80 miles south near Mt. Shasta, California, and was listed by the U.S. Fish and Wildlife Service as threatened in 1993 (USDI 1994c). It is in decline throughout its range.

Fairy shrimp inhabit vernal pool wetlands, shallow depressions underlain by impervious substrate that ephemerally retain water in the winter and spring, often into early summer. Vernal pools typically form in flat plains where a clay or hardpan layer restricts water percolation so that rainfall is retained for several months of the year (USDI 1994c). On the Agate Desert landform, vernal pools tend to vary in size from 1 to 30 meters across and are often oriented linearly in swales where the surface has insufficient slope. The maximum depth of water is about 30 cm, but many pools never are deeper than a few centimeters (Borgias *et al.* 1999).

In California, the vernal pool fairy shrimp generally occurs in small, ephemeral wetlands (<200 sq. m) that are shallow (mean = 5cm) with a wide range of variation (Helm 1998). The species has a short maturation period (mean = 26 days), and is found free swimming during the cold months of the year (Helm 1998).

This fairy shrimp ranges in size from 10.9 to 25.0 mm (0.4 to 1.0 inches), and requires clear or semi-clear water with low total dissolved solids, conductivity, alkalinity, and chloride. Fairy shrimp feed on algae and plankton which are scraped from vegetation within vernal pools, and lay thick-shelled eggs which withstand heat, cold, and desiccation and can remain dormant for decades until appropriate conditions occur to trigger emergence (USDI 1994c).

**Fender's blue butterfly *(Icaricia icarioides fenderi)*** Fender's blue butterfly, a federally endangered species, was first described as *Plebejus maricopa fenderi*, from specimens collected in Yamhill County, Oregon. The genus *Plebejus* has since been split, with some of its members, including the Fender's blue butterfly, assigned to the genus *Icaricia.* Only a limited number of collections were made between the time of the subspecies' discovery and Macy's last observation on 23 May, 1937 in Benton County, Oregon (Hammond and Wilson 1992). Searches were made, but a lack of information on the butterfly's host plant prevented researchers from focusing their efforts. Finally, in 1989, Dr. Paul Hammond rediscovered the Fender's blue butterfly at McDonald Forest, Benton County, Oregon on Kincaid's lupine, an uncommon plant species.

Prior to the rediscovery of this species in 1989, the taxonomy of the Fender's blue butterfly was unclear due to the limited number of specimens available. The confusion arises from the similarity in appearance between the Fender's blue butterfly and the Pardalis blue butterfly (*Icaricia icarioides pardalis*), an inhabitant of the central California Coast Range near San Francisco. Recent comparison of specimens (Hammond and Wilson 1993) indicates significant morphological differentiation between populations of Fender's blue butterflies and Pardalis blue butterflies, confirming the status of these two taxa as distinct subspecies.

The historic distribution of the Fender's blue butterfly is unknown due to the limited information initially collected on this species. Recent surveys, however, indicate that the Fender's blue butterfly is confined to the Willamette Valley and currently occupies 21 sites in Yamhill, Polk, Benton and Lane counties (Hammond and Wilson 1992) (Refer to Oregon Removal-Fill Program BA, Map B-46). One population at Willow Creek (Lane Co.) is found in wet, tufted hair grass (*Deschampsia caespitosa*) type prairie, while the remaining sites are found on drier upland prairies characterized by fescue grasses (*Festuca* spp.). Sites occupied by the Fender's blue butterfly are located almost exclusively on the valley's western side, within 26 km (16.15 mi.) of the Willamette River.

This butterfly's life cycle appears to parallel that described for other subspecies of *Icaricia icarioides* (Hammond and Wilson 1993). Adult butterflies lay their eggs on host plants during May and June. Newly hatched larvae feed for a short time, reaching their second instar in the early summer, at which point they enter an extended diapause. Diapausing larvae remain at or near the base of the host plant through fall and winter and become active again the following March or April. Once diapause is broken, the larvae feed and grow through three to four additional instars, metamorphosing into adult butterflies in April and May. This life cycle allows for the completion of only one generation per year.

Behavioral observations of Fender's blue butterfly larvae indicate an extremely cautious nature, with individuals noted to drop from their feeding position on lupine leaves to the base of the plant at the slightest sign of disturbance (C. Schultz pers. comm. 1994). This tendency needs to be considered when surveying for Fender's blue butterfly. Though ants tend many Lycaenids during their larval stage, observations of Fender's blue butterfly larvae in the field have failed to document such a mutualistic association.

The preference of the Fender's blue butterfly for Kincaid's lupine has been supported through extensive searches of other neighboring lupine species throughout the butterfly's range. Of the many lupine species examined, secondary use of only two additional lupine species has been documented: *L. laxiflorus* (spurred lupine) and *L. albicaulis* (sickle-keeled lupine). Feeding on these two lupines has been noted at seven of 21 sites that support Fender's blue butterflies. At each site, however, *L. sulphureus* ssp. *kincaidii* is present nearby and is the predominant lupine species in all but one instance (Hammond and Wilson 1992).

The Fender's blue butterfly is limited in range to upland prairie remnants in western Oregon. Current estimates indicate that less than 400 ha. (1,000 acres) of native upland prairie remain in the Willamette Valley, only one-tenth of 1 percent of the original upland prairie once available to the Fender's blue butterfly. The immediate threat of habitat loss has been well documented.

**Oregon silverspot butterfly (*Speyeria zerene hippolyta*)** The Oregon silverspot butterfly is a darkly marked coastal subspecies of the Zerene fritillary, a widespread species in montane western North America. The historical range of the subspecies extends from the Long Beach Peninsula, Pacific County, Washington, south to Del Norte County, California. Within its range, the butterfly is known to have been extirpated from at least 11 colonies (two in Washington, eight in Oregon, and one in California). The Service listed the Oregon silverspot butterfly as a threatened species with Critical Habitat in 1980. For a complete discussion of the ecology and life history of this subspecies, see that final rule (USDI 1980b). The information below is extracted from that document.

Historically, the Oregon silverspot butterfly was distributed along the Washington and Oregon coasts from Westport in Grays Harbor County south to about Heceta Head in Lane County. In addition, there is a disjunct cluster of populations north of Crescent City in Del Norte County, California. At least 20 separate localities were known for the butterfly in the past. The butterfly and its coastal grassland habitat were probably much more common in the past.

At present, the subspecies is currently well established at only five sites (Refer to Oregon Removal-Fill Program BA, Map B-48). They include one in Del Norte County, two in Lane County (Rock Creek-Big Creek and Bray Point), and two in Tillamook County (Cascade Head and Mt. Hebo). A sixth site in Clatsop County (Clatsop Plains) is still extant. In addition, surveys in 1990 confirmed continued presence of a population on the Long Beach Peninsula. A new site was tentatively established on Fairview Mountain in Lane County, Oregon.

The current distribution of the Oregon silverspot butterfly includes three distinct (but in some cases co-occurring) types of grassland habitats -- montane grasslands, marine terrace and coastal headland "salt spray" meadows, and stabilized dunes. The latter two ecosystem types are strongly influenced by proximity to the ocean and are subject to mild temperatures, high rainfall, and persistent fog. In contrast, the montane sites have colder temperatures, significant snow accumulations, less coastal fog, and no salt spray.

Adult emergence starts in July and extends into September. Many males appear several weeks before most females emerge, as is typical of *Speyeria* butterflies. Mating usually takes place in relatively sheltered areas. Adults will often move long distances for nectar or to escape windy and foggy conditions. The Oregon silverspot differs from related taxa in physiology and slow larval development rates. These differences appear to be specific adaptations to a harsh, coastal environment characterized by fog and cold wind throughout much of the year. A slow caterpillar development rate synchronizes the adult flight season with best coastal weather conditions.

Caterpillars of the Oregon silverspot butterfly feed primarily on western blue violets (*Viola adunca*), but are known to feed on a few other species of the genus *Viola* as well. Nectar plants most frequently used by the Oregon silverspot adults are members of the aster (Composite) family, including goldenrod (*Solidago canadensis*), dune goldenrod (*Solidago spathulata*), California aster (*Aster chilensis*), pearly everlasting (*Anaphalis margaritacea*), and yarrow (*Achillea millefolium*).

Historically, fire is thought to be the dominant factor that maintained Oregon's coastal grassland communities and their endemic species. Other disturbances such as landslides, small mammal activities, wind throw, and herbivory by invertebrates, small mammals and large native ungulate grazers are thought to have played a secondary role in opening early successional habitat conditions. Severe fires in 1845 and 1910 converted substantial portions of Mt. Hebo from forest to grassland. Since that time fire frequencies on the Oregon coast have been greatly reduced and the extent of coastal grasslands has declined dramatically.

## Fish

**Warner sucker (*Catostomus warnerensis*)** The Warner sucker occurs in water bodies within the Warner Basin of south-central Oregon (Refer to Oregon Removal-Fill Program BA, Map B-50). This species is in decline due to modifications of the native habitat and was federally listed as threatened in September 1985. Critical habitat was designated at that time (USDI 1985c). Critical habitat includes the following areas: Twentymile Creek from the confluence of Twelvemile and Twentymile Creeks upstream for about 4 stream miles; Twentymile Creek starting about 9 miles upstream of the junction of Twelvemile and Twentymile Creeks and extending downstream about 18 miles; Spillway Canal north of Hart Lake and continuing about 2 miles downstream; Snyder Creek, from the confluence of Snyder and Honey Creeks upstream for about 3 miles; Honey Creek, from the confluence Hart Lake upstream for about 16 miles.

The probable historic range of the Warner sucker includes the main Warner Lakes (Pelican, Crump, and Hart), and other accessible standing or flowing water in the Warner Valley, including the low to moderate gradient reaches of the tributaries which drain into the basin. These tributaries include Deep Creek, the Honey Creek drainage, Snyder Creek and the Twentymile Creek drainage, including Greaser Reservoir (White *et al.* 1990).

The Warner sucker currently inhabits the lakes and low gradient stream reaches of the Warner Valley, and is represented by a larger lake morph and a smaller stream morph. Studies have shown that when adequate water is present, Warner suckers may inhabit all the lakes, sloughs, and potholes in the Warner Valley. The species is also known to occur in large irrigation canals. The documented range of the sucker extended as far north into the ephemeral Flagstaff Lake during high water in the early 1980's, and again in the 1990's (Allen *et al.* 1996).

The larger, presumably longer-lived, lake morphs are capable of surviving through several continuous years of isolation from stream spawning habitats due to drought or other factors. Similarly, stream morphs probably serve as sources for recolonization of lake habitats in wet years following droughts. The loss of either lake or stream morphs to drought, winter kill, excessive flows and a flushing of the fish in a stream, in conjunction with the lack of safe migration routes and the presence of predaceous exotic fishes, may strain the ability of the species to rebound (White *et al.* 1990, Berg 1991).

Warner sucker larvae have terminal mouths and short digestive tracts, enabling them to feed selectively in midwater or on the surface. Invertebrates, particularly planktonic crustaceans, make up most of their diet. As the suckers grow, they develop subterminal mouths, longer digestive tracts, and gradually become generalized benthic feeders of diatoms, filamentous algae, and detritus. Adult stream morph suckers forage nocturnally over a wide variety of substrates such as boulders, gravel, and silt. Adult lake morph suckers are thought to have a similar diet, but feed over predominantly muddy substrates (Tait and Mulkey 1993a,b).

Sexual maturity occurs at an age of 3 to 4 years (Coombs *et al.* 1979). Spawning usually occurs in April and May when fish migrate up streams, although variations in water temperature and stream flow may result in either earlier or later spawning. Temperature and flow cues appear to trigger spawning, with most spawning taking place at 14-20°C (57-68°F) when stream flows are relatively high. The Warner sucker spawns in sand or gravel beds in slow pools (White *et al.* 1990, 1991; Kennedy and North 1993). In years when access to stream spawning areas is limited by low flow or by physical in-stream blockages (such as beaver dams or diversion structures), suckers may attempt to spawn on gravel beds along the lake shorelines.

Larvae are found in shallow backwater pools or on stream margins where there is no current, often among or near macrophytes. Young of the year are often found over deep, still water from midwater to the surface, but also move into faster flowing areas near the heads of pools (Coombs *et al.* 1979). Juveniles (1 to 2 years old) are usually found at the bottom of deep pools or in other habitats that are relatively cool and permanent such as near springs and like adults, prefer areas that are protected from the main flows. It has been suggested that juveniles do not migrate down from streams until 2 to 3 years of age (Coombs *et al.* 1979).

Adult suckers in streams prefer long pools with undercut banks, containing high macrophytic coverage of substrates (>70%) and root wads or large boulders, with a maximum depth of 1.5 meters (5 ft), a 2°C (35.6°F) differential between the surface and the pool bottom, and overhanging vegetation (often *Salix* sp.). Suckers were also found in smaller and shallower pools lacking some of the above mentioned characteristics but only when a larger pool was within close proximity (~0.4km) (USDI 1997b). Habitat use by suckers in lakes resembles that of stream residents and adults are generally found in the deepest available habitat where food is plentiful (USDI 1997b).

**Shortnose sucker (*Chasmistes brevirostris*)** The shortnose sucker is characterized by a terminal mouth with thin lips having weak or no papillae. It historically occurred in Upper Klamath Lake and its tributaries (Miller and Smith 1981). Its historic range likely included Lake of the Woods, Oregon, and fprobably the Lost River system (Scoppettone and Vinyard 1991). Early records from the Upper Klamath River Basin indicate that the shortnose suckers was common and abundant. Several commercial operations processed "enormous amounts" of suckers into oil, dried fish, canned fish, and other products (Andreasen 1975, Howe 1968). The current distribution of the shortnose sucker includes Upper Klamath Lake and its tributaries, Klamath River downstream to Iron Gate Reservoir, Clear Lake Reservoir and its tributaries, Gerber Reservoir and its tributaries, the Lost River, and Tule Lake (Refer to Oregon Removal-Fill Program BA, Map B-52). Gerber Reservoir represents the only habitat with a shortnose sucker population that does not also have a Lost River sucker population.

The shortnose sucker was listed as endangered by the U.S. Fish and Wildlife Service in 1988 (USDI 1988b). Critical habitat has not been designated. The shortnose sucker is primarily a lake resident that spawns in associated rivers, streams, or springs. Individuals in spawning condition occur in swift current over gravel and rubble bottom (Lee *et al. 1*980). Spawning runs have been observed from mid-April to mid-May. After hatching, larval suckers migrate out of spawning substrates, which are usually gravels or cobbles, and drift downstream into lakes. Vegetated river and lake shoreline habitats are known to be important during larval and juvenile rearing (Klamath Tribe 1991, Markle and Simon 1993).

They are omnivorous bottom feeders whose diets include detritus, zooplankton, algae and aquatic insects (Buettner and Scoppettone 1990). Most shortnose suckers reach sexual maturity at age 6 or 7 (Buettner and Scoppettone 1990). Additionally, this species appears not as tolerant of high pH levels as are other native Klamath Basin fishes (Falter and Cech 1991).

**Lost River sucker (*Deltistes luxatus*)** The only species in the genus *Deltistes*, the Lost River sucker is native to Upper Klamath Lake and its tributaries (Refer to Oregon Removal-Fill Program BA, Map B-54). This sucker also historically inhabited the Lost River watershed, Tule Lake, Lower Klamath Lake, and Sheepy Lake (Moyle 1976), but is not considered native to the Klamath River, although it is now found there, at least downstream to Copco Reservoir (Beak 1987). The Lost River sucker is a large sucker that may reach over 0.9 m (3 ft). It is characterized by a long, slender head with a subterminal mouth and long, rounded snout. The coloring is dark on the back and sides, fading to white or yellow on the belly.

Early records from the Upper Klamath River Basin indicate that the Lost River sucker was common and abundant. Gilbert (1898) noted that the Lost River sucker was "the most important food-fish of the Klamath Lake region". Several commercial operations processed "enormous amounts" of suckers into oil, dried fish, canned fish, and other products (Andreasen 1975, Howe 1968). Currently, less than 75,000 acres of wetlands remain in the Basin (USDI 1992b). The majority of the population occurs in Upper Klamath Lake, with a few in J.C. Boyle Reservoir and Copco Reservoir.

The Lost River sucker was listed as endangered by the U.S. Fish and Wildlife Service in 1988 (USDI 1988b). Critical habitat has not been designated. They are primarily deep lake and impoundment residents that spawn in associated rivers, streams, or springs, including the Williamson and Sprague Rivers. They spawn in swift stretches with rubble or compacted cobble substrate, preferentially on loose gravel when available. They also spawn along the shore of Upper Klamath Lake (e.g., at spring inflows). Spawning has been observed between April and early May.

After hatching, larval suckers migrate out of spawning substrates, which are usually gravels or cobbles, and drift downstream into lakes. Vegetated river and lake shoreline habitats are known to be important during larval and juvenile rearing (Klamath Tribe 1991; Markle and Simon 1993). The Lost River sucker is an omnivorous bottom feeder whose diet includes detritus, zooplankton, algae and aquatic insects (Buettner and Scoppettone 1990). Sexual maturity for Lost River suckers sampled in Upper Klamath Lake occurs between the ages of 6 to 14 years with most maturing at age 9.

**Hutton tui chub (*Gila bicolor* ssp 1)** The Hutton tui chub is found only in Hutton Spring in the Alkali Subbasin of the Chewaucan Basin in south-central Oregon (Refer to Oregon Removal-Fill Program BA, Map B-56). An unnamed spring that previously contained a second population was not located in 1996 and this population's existence is now considered questionable (USDI 1997b). Hutton Spring has been diked and has a pool approximately 12 meters (40 feet) wide, 4.5 meters (15 feet) deep, and is surrounded by rushes. Bills (1977) estimated 300 Hutton tui chub in Hutton Spring.

The Hutton tui chub was listed as threatened in 1985 due to declines in the species' habitat (USDI 1985a). Critical habitat has not been designated. There is very little information regarding the ecology of the Hutton tui chub. Bills (1977) examined gut content and found the Hutton tui chub to be omnivorous with a majority of food eaten being filamentous algae. It appears that dense aquatic algae are needed for spawning and rearing of young (J. Williams, pers. comm., 1995). No information is available on growth rates, age of reproduction or behavioral patterns.

Hutton Spring is privately owned and the habitat is in good condition primarily due to conscientious, long-term land stewardship by the landowner. This habitat is currently fenced from cattle use and is in stable condition (USDI 1997b).

**Borax Lake chub (Gila boraxobius)** The Borax Lake chub is endemic to Borax Lake, and has been found in lower Borax Lake and the associated wetlands in Harney County, in southeastern Oregon (Refer to Oregon Removal-Fill Program BA, Map B-58). All of these habitats comprise approximately 260 ha. This small (up to 93 mm, 3.6 in) chub is restricted to the geothermally heated Borax Lake system that reaches temperatures typically between 35° and 40°C (95° to 104°F) at the inflow and from 17° to 35°C elsewhere throughout the lake. The lake system also has a water chemistry that makes it an unusual habitat within the surrounding desert landscape.

Borax Lake chubs are listed as endangered by the U.S. Fish and Wildlife Service. The entire 260ha area has been designated critical habitat by the federal government (Williams 1995). Chubs are fairly evenly distributed throughout the lake, though there is a tendency toward avoidance of shallow water (< 40 mm in depth) and areas of sparse vegetation; there are times when virtually the entire population occurs within or under the flocculent-like algal layer covering the bottom of much of the lake (USDI 1995). Young are common in shallow coves around the lake margin in spring. At temperatures above 30°C, fishes form loose schools around algae-coated carbonate nodules. While Borax lake chub are adapted to the warm water of Borax Lake, temperature fluctuations impact where the fish can be found within the lake (Williams *et al.* 1989).

Population counts conducted in 1995 and 1997 estimated that there were 34,634 and 10,631 individuals, respectively, which represents a 69 percent fluctuation. Casual visual surveys in January (night snorkel) and June (shore survey) of 1999 indicate that the population appears to be doing well (Dan Salzer, pers. comm. 1999). Borax Lake chub reproduce year-round, although primarily in the spring (Williams 1995). The Borax Lake chub is an opportunistic omnivore (Williams & Williams 1980). Insects comprise the chub's diet in the spring and summer while allochthonous material is the primary diet item in the fall and winter (USDI 1995).

**Lahontan cutthroat trout (*Oncorhynchus clarki henshawii*)** Lahontan cutthroat trout is one subspecies of the wide-ranging cutthroat trout that includes at least 14 recognized forms in the western United States. The spotting pattern on Lahontan cutthroat helps distinguish the Lahontan cutthroat from other subspecies of cutthroat trout (Behnke 1992). The Lahontan cutthroat inhabiting Oregon were originally classified as Willow Whitehorse cutthroat trout. Genetic and taxonomic investigations led to its re-classification as Lahontan cutthroat in 1991 (Williams 1991). Willow-Whitehorse cutthroat were afforded protection and threatened status as Lahontan cutthroat on November 4, 1991 (USDI 1994e). Critical habitat has not been designated. The Lahontan cutthroat occurs in the following Oregon streams: Willow Creek, Whitehorse Creek, Little Whitehorse Creek, Doolittle Creek, Fifteen Mile Creek (from the Coyote Lake Basin) and Indian, Sage, and Line Canyon Creeks (tributaries of McDermitt Creek in the Quinn River (NV) basin) (Refer to Oregon Removal-Fill Program BA, Map B-60).

Cutthroat trout have the most extensive range of any inland trout species of western North America (Behnke 1992), and occur in anadromous, non-anadromous, fluvial, and lacustrine populations. Many of the basins in which cutthroat trout occur contain remnants of much more extensive bodies of water which were present during the wetter period of the late Pleistocene epoch (Smith 1978). In Oregon, Lahontan cutthroat reside in approximately 70 miles of streams flowing north through the Trout Creek and Oregon Canyon Mountains in the southeast portion of the state. The Willow-Whitehorse populations are geographically and genetically isolated from other populations in Nevada but are considered the same subspecies of cutthroat trout.

In streams, Lahontan cutthroat generally inhabit areas characterized by cool water, pools in close proximity to cover and velocity breaks, well vegetated and stable stream banks, and relatively silt free, rocky substrate in riffle areas (USDI 1994e).

The Lahontan cutthroat trout is an obligatory stream spawner. Spawning occurs from April through July over gravel substrate in riffle areas with water temperatures ranging from 5 to 16°C (41 to 61°F) (USDI 1994e). Spawning and nursery habitat are characterized by cool water, approximate 1:1 pool-riffle ratio, well-vegetated and stable stream banks, and relatively silt-free rocky substrate in riffle-run areas (USDI 1994e). Fine sediment can clog spawning gravel, reduce oxygen supply, and greatly reduce the survival rate of salmonid eggs. Juvenile salmonids feed on invertebrates that fall into the stream from overhanging vegetation and benthic invertebrates that thrive in pools.

The eggs hatch in 4 to 6 weeks, and fry emerge 13 to 23 days later (USDI 1994e). In some fluvial adapted fish, fry may remain in nursery streams for 1-2 years (Rankel 1976; Johnson *et al.* 1983; Coffin 1983). Intermittent tributary streams are occasionally utilized as spawning sites by Lahontan cutthroat, and in good water cycles fry develop until flushed into the main stream during higher runoff (Coffin 1981, Trotter 1987).

Juvenile salmonids feed on invertebrates that fall into the stream from overhanging vegetation and benthic invertebrates that thrive in pools. Stream resident Lahontan cutthroat are opportunistic feeders, with diets consisting of drift organisms, typically terrestrial aquatic insects (Moyle 1976; Coffin 1983).

Sources and mechanisms of stream colonization outside of the Lahontan basin by Lahontan cutthroat are uncertain, but human transport is suspected. Resident stream populations have been used to stock other Willow-Whitehorse area streams during the seventies and early eighties. These transplanted populations are considered threatened unless they are determined to be "experimental populations" released outside of the native range of the species for conservation purposes (USDI 1997e). Transplanted populations exist on a few streams on the east side of Steens Mtn.

Oregon Department of Fish and Wildlife surveys indicated that Lahontan cutthroat populations were reduced from 1985 to 1989 (USDI 1997e). Declining numbers of Lahontan cutthroat prompted ODFW to close area streams to fishing (by special order) in 1989. This closure remains in effect. Fish surveys of area streams were conducted again in October of 1994. Although methods vary between the conducted surveys (1985, 1989 and 1994), fish numbers have increased in general from approximately 8,000 fish in the mid 1980s to approximately 40,000 fish in 1994. However, in many areas stream conditions remain less than favorable for the cutthroat; of the 70 miles surveyed, less than 20 miles supported adequate densities of fish (USDI 1997e).

**Sea-run cutthroat trout *(Oncorhynchus clarki clarki)*** Sea-run cutthroat are listed as an endangered species in the Umpqua River basin (USDC 1996a), but have been proposed for delisting based on research that indicates the Umpqua population is actually part of the larger Oregon Coastal ESU (north of Cape Blanco), which is considered a candidate for listing. The Southwest Washington/Columbia River ESU is proposed as threatened (USDC 1999a). Critical habitat has not been proposed for the Coastal and Southwest Washington/Columbia River ESUs (Refer to Oregon Removal-Fill Program BA, Map B-1).

Critical habitat for the Umpqua River ESU is designated to include all river reaches accessible to listed Umpqua River cutthroat trout in the Umpqua River from a straight line connecting the west end of the South jetty and the west end of the North jetty and including all Umpqua River estuarine areas (including the Smith River) and tributaries proceeding upstream from the Pacific Ocean to the confluence of the North and South Umpqua Rivers; the North Umpqua River, including all tributaries, from its confluence with the mainstem Umpqua River to Soda Springs Dam; the South Umpqua River, including all tributaries, from its confluence with the mainstem Umpqua River to its headwaters (including Cow Creek, tributary to the South Umpqua River). Critical habitat includes river substrate and the adjacent riparian zone. Excluded are areas above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for several hundred years). Watersheds containing spawning and rearing habitat for this ESU comprise approximately 4,500 square miles in Oregon. The watersheds lie partially or wholly within the following counties: Coos, Douglas, Jackson, and Lane. More detailed critical habitat information (i.e., specific watersheds, migration barriers, habitat features, and special management considerations) for this ESU can be found in the January 9, 1998 Federal Register notice (USDC 1998a).

The information that follows was taken from Pauley *et al.* (1989a), except as noted. Sea-run cutthroat are anadromous salmonids, spawning and rearing in small tributaries of small or large streams, and migrating to the near-coastal ocean where they spend less than one year before returning to their natal streams to spawn. Sea-run cutthroat are unlike most other salmonids in that they do not die after spawning, but can repeat the migration to and from the ocean several times to spawn.

After spending one growing season in the ocean, sea-run cutthroat return to their natal streams from July to March (timing varies with geographic location; within-stream returns occur within in a fairly close time-frame). Spawning occurs in late winter and spring. Spawning usually occurs in gravel stream riffles where the female digs a nest (redd) in the gravel. Juveniles migrate down-river from March to June, although this species may migrate several times within the river before migrating to the ocean. Most Umpqua Basin cutthroat enter seawater as 2- or 3-year-olds, but some remain in fresh water up to 5 years before entering the sea, and others may remain as residents in small headwater tributaries or may migrate only into rivers or lakes; in the Umpqua River, anadromous, resident, and potamodromus life-history forms have been reported (USDC 1996a).

Habitat conditions important to the survival and success of salmon include cool water temperatures, low turbidity, high levels of dissolved oxygen, gravel size, and stream-side vegetation and submerged cover for protection from predation and disturbance as well as providing shade. Cutthroat trout prefer stream water temperatures of 9 to 12 C (48.2 to 53.6 F), depending on life stage, and a spawning gravel size of 0.6 to 10.2 cm (0.24 to 4.02 in) in diameter (Emmett *et al.* 1991).

Salmonids spawn in clean gravel beds which provide protection and aeration for developing eggs. Fine sediment can clog spawning gravel, reduce oxygen supply, and greatly reduce the survival rate of salmonid eggs. Juvenile salmonids feed on invertebrates that fall into the stream from overhanging vegetation and benthic invertebrates that thrive in pools. Pools behind woody debris and in overflow channels, and seasonal ponding in adjacent wetlands that are hydrologically connected to streams provide important winter storm flow refuge areas and rearing habitat. Riparian forests and floodplains play a critical role in the life of salmonids. Trees provide shade to maintain cool water temperatures. Litter fall and insect drop from riparian vegetation significantly contributes to the food supply of stream fish. When trees die and fall into the stream, they provide structure for pools creating channel complexity. Roots stabilize streambanks and protect them from chronic sediment loss. Riparian forests and marshes filter pollutants from overland flow and subsurface flows.

**Chum salmon *(Oncorhynchus keta)*** Chum salmon is listed as a threatened species in the Columbia River basin, which includes chum that spawn in Oregon's tributaries to the lower Columbia River (USDC 1998b) (Refer to Oregon Removal-Fill Program BA, Map B-2). Critical habitat for the Columbia River ESU is proposed to include all river reaches accessible to listed chum salmon (including estuarine areas and tributaries) in the Columbia River downstream from Bonneville Dam, excluding Oregon tributaries upstream of Milton Creek at river km 144 near the town of St. Helens. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 4,426 square miles in Oregon and Washington. The following Oregon counties lie partially or wholly within these basins: Clackamas, Clatsop, Columbia, Hood River, Multnomah, and Washington. More detailed critical habitat information (i.e., specific watersheds, migration barriers, habitat features, and special management considerations) for this ESU can be found in the March 10, 1998 Federal Register notice (USDC 1998b).

Chum are anadromous salmonids, rearing in rivers of varying sizes, typically within 200 km (124 mi.) of the sea, and migrating to the ocean where they live for about 2 to 4 years before returning to their natal streams to spawn before dying.

After spending a majority of its life in the ocean, chum begin migrating upstream in summer and late fall (there are both summer and fall runs of chum). Spawning occurs within 6 weeks. The female digs a redd, or nest, in gravel riffles by displacing gravel and making depressions in an area of about 2.25 sq. meters (Moyle 1976). Fry migrate directly to the sea soon after emergence (Salo 1991). In the spring, juvenile fry emerge from the gravel, and typically begin their migration downstream shortly after spawning. They winter in spawning grounds as alevins, then swim to salt water, often without feeding. Young chum salmon spend some time in estuaries to grow and possibly to acclimate to saltwater prior to entering the open ocean.

Habitat conditions important to the survival and success of chum salmon include cool water temperatures, low turbidity, high levels of dissolved oxygen, gravel size, and stream-side vegetation and submerged cover for protection from predation and disturbance as well as providing shade. Salmonids spawn in clean gravel beds which provide protection and aeration for developing eggs. Fine sediment can clog spawning gravel, reduce oxygen supply, and greatly reduce the survival rate of salmonid eggs. Chum prefer stream water temperatures of 4.4 to 15.6 C (39.9 to 60.1 F), depending on life stage, and spawning gravel size of 1.3 to 10.2 cm (.51 to 4.02 in) in diameter (Emmett *et al.* 1991).

**Coho salmon (*Oncorhynchus kisutch*)**. Coho salmon are listed as a threatened species in Oregon coastal streams (south and north of Cape Blanco), and are considered a candidate for listing in the streams draining into the Columbia River (USDC 1997a). Critical habitat has not been proposed for the Lower Columbia River/Southwest Washington Coast ESU (Refer to Oregon Removal-Fill Program BA, Map B-3).

Critical habitat for the Southern Oregon/Northern California coastal ESU is designated to include all river reaches accessible to listed coho salmon between Cape Blanco and Punta Gorda. Critical habitat includes river substrate and adjacent riparian zones. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 18,090 square miles in California and Oregon. The following Oregon counties lie partially or wholly within watersheds inhabited by this ESU: Coos, Curry, Douglas, Jackson, Josephine, and Klamath. More detailed critical habitat information (i.e., specific watersheds, migration barriers, habitat features, and special management considerations) for this ESU can be found in the May 5, 1999 Federal Register notice (USDC 1999b).

Critical habitat for the Oregon coastal ESU is proposed to include all river reaches accessible to listed coho salmon from south of the Columbia River and north of Cape Blanco, Oregon. Critical habitat includes river substrate and adjacent riparian zones. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 10,604 square miles in Oregon. The following Oregon counties lie partially or wholly within these basins: Benton, Clatsop, Columbia, Coos, Curry, Douglas, Jackson, Josephine, Lane, Lincoln, Polk, Tillamook, Washington, and Yamhill. More detailed critical habitat information (i.e., specific watersheds, migration barriers, habitat features, and special management considerations) for this ESU can be found in the May 10, 1999 Federal Register notice (USDC 1999c).

The information that follows was taken from Laufle *et al.* (1986), except as noted. Coho are anadromous fish that rear in small, and occasionally large, streams, and migrate to the ocean where they live for 2 years before returning to their natal streams to spawn.

After spending 2 (range 1-3) growing seasons in the ocean, coho return to coastal waters from the open ocean beginning in July. With a few exceptions, most streams in the range of the Southern Oregon/Northern California Coastal ESU tend to have a short duration of peak flow (USDC 1995). Most streams in the range of the Oregon Coastal ESU have a single peak in flow in December or January and have relatively low flow in summer and early fall (USDC 1995). Coho exhibit strong fidelity to natal streams; however, rapid colonization of newly accessible habitat has been observed. They return to their natal streams between August and February, where spawning occurs from late September to March (most spawning occurs from September to December). Coho generally spawn in forested areas, with water at 6-12 C in loose coarse gravel at head of a riffle (or tail of pool) in a rounded trough excavated by the female where water is 10-54 cm deep. Females deposit eggs in each of several redds. Optimal temperature for embryo development is 6-10 C. Juvenile coho emerge from the gravel between March and July, and spend a few weeks to 2 years (varies geographically) in freshwater before migrating to sea from April to August. Juveniles spend a longer time in fresh water in the north than in the south. Juveniles prefer pools at least 1 m deep with plenty of overhead cover and temperatures of 10-15 C. They are most numerous among woody debris in pools and runs, where oxygen and invertebrate populations remain high (Moyle *et al.* 1989). Hatchlings that have left the spawning site seek shallow water, usually along stream margins; juveniles move into stream pools.

Habitat conditions important to the survival and success of salmon include cool water temperatures, low turbidity, high levels of dissolved oxygen, gravel size, and stream-side vegetation and submerged cover for protection from predation and disturbance as well as providing shade. Coho prefer stream water temperatures of between 4.4 and 15.6 C (39.9 to 60.1 degrees F), depending on life stage, and spawning gravel size of 1.3 to 10.2 cm (.51 to 4.02 in) in diameter (Emmett *et al.* 1991).

Salmon and trout depend on cool water and inhabit shaded, overhanging banks or spring outflows during the summer. Salmonids spawn in clean gravel beds that provide protection and aeration for developing eggs. Fine sediment can clog spawning gravel, reduce oxygen supply, and greatly reduce the survival rate of salmonid eggs. Juvenile salmonids feed on invertebrates that fall into the stream from overhanging vegetation and benthic invertebrates that thrive in pools. Pools behind woody debris and in overflow channels, and seasonal ponding in adjacent wetlands that are hydrologically connected to streams provide important winter storm flow refuge areas and rearing habitat. Riparian forests and floodplains play a critical role in the life of salmonids. Trees provide shade to maintain cool water temperatures. Litter fall and insect drop from riparian vegetation significantly contributes to the food supply of stream fish. When trees die and fall into the stream, they provide structure for pools creating channel complexity. Roots stabilize streambanks and protect them from chronic sediment loss. Riparian forests and marshes filter pollutants from overland flow and subsurface flows.

**Steelhead trout *(Oncorhynchus mykiss)*** Steelhead are listed as a threatened species in the Snake River basin (USDC 1997b), the Lower Columbia River (USDC 1998c), the Middle Columbia

River, and the Upper Willamette River (USDC 1999d) (Refer to Oregon Removal-Fill Program BA, Map B-4). They are a candidate for listing in the Klamath Mountains Province and in the Oregon coastal streams (USDC 1998c). Critical habitat has not been proposed for the Klamath Mountains Province and Oregon Coastal ESUs.

Critical habitat for the Snake River Basin ESU is proposed to include all river reaches and estuarine areas accessible to listed steelhead in the Snake River and its tributaries in Idaho, Oregon, and Washington. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the confluence with the Snake River. Critical habitat includes river substrate and the adjacent riparian zone. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 29,282 square miles in Idaho, Oregon, and Washington. The following Oregon counties lie partially or wholly within these basins: Umatilla, Union, and Wallowa. More detailed critical habitat information (i.e., specific watersheds, migration barriers, habitat features, and special management considerations) for this ESU can be found in the February 5, 1999 Federal Register notice (USDC 1999e).

Critical habitat for the Lower Columbia River ESU is proposed to include all river reaches and estuarine areas accessible to listed steelhead in Columbia River tributaries between the Cowlitz and Wind Rivers in Washington and the Willamette and Hood Rivers, Oregon (inclusive). Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the Hood River in Oregon. Critical habitat includes river substrate and the adjacent riparian zone. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 5,017 square miles in Oregon and Washington. The following Oregon counties lie partially or wholly within these basins: Clackamas, Columbia, Hood River, Marion, Multnomah, and Wasco. More detailed critical habitat information (i.e., specific watersheds, migration barriers, habitat features, and special management considerations) for this ESU can be found in the February 5, 1999 Federal Register notice (USDC 1999e).

Critical habitat for the Middle Columbia River ESU is proposed to include all river reaches accessible to listed steelhead in Columbia River tributaries (except the Snake River) between Mosier Creek in Oregon and the Yakima River in Washington (inclusive). Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the Yakima River. Critical habitat includes river substrate and the adjacent riparian zone. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 26,739 square miles in Oregon and Washington. The following Oregon counties lie partially or wholly within these basins: Baker, Clackamas, Crook, Gilliam, Grant, Harney, Hood River, Jefferson, Morrow, Sherman, Umatilla, Union, Wallowa, Wasco, and Wheeler. More detailed critical habitat information (i.e., specific watersheds, migration barriers, habitat features, and special management considerations) for this ESU can be found in the February 5, 1999 Federal Register notice (USDC 1999e).

Critical habitat for the Upper Willamette River ESU is proposed to include all river reaches accessible to listed steelhead in the Willamette River and its tributaries above Willamette Falls. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to and including the Willamette River in Oregon. Critical habitat includes river substrate and the adjacent riparian zone. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 4,872 square miles in Oregon. The following counties lie partially or wholly within these basins: Benton, Clackamas, Columbia, Lane, Lincoln, Linn, Marion, Multnomah, Polk, Tillamook, Washington, and Yamhill. More detailed critical habitat information (i.e., specific watersheds, migration barriers, habitat features, and special management considerations) for this ESU can be found in the February 5, 1999 Federal Register notice (USDC 1999e).

The information that follows was taken from Pauley *et al.* (1986), except as noted. Steelhead are an anadromous species, typically rearing in large streams, and migrating to the ocean where they live for 1 to 3 (and occasionally 4) years before returning to their natal streams to spawn. Steelhead are unlike most other salmonids in that they may return to their natal streams several times to spawn before they die.

After spending 1 to 3 years in the ocean, steelhead return to their natal streams. There are two runs of steelhead: a winter and a summer run. Winter steelhead return to their natal stream in the late fall or winter and spawn by May. Summer steelhead migrate to their native stream during spring and summer, and spawn the following spring. Eggs are laid in gravel in a depression made by the female. Fry emerge from the gravel four to eight weeks later and spend 1 to 4 years in freshwater before migrating to the ocean.

Most middle Columbia River steelhead smolt at two years and spend 1-2 years in salt water prior to re-entering fresh water, where they remain up to a year before spawning. The summer steelhead are dominated by fishes that spend two years in salt water, whereas in most other rivers in this region fishes that spend one year in salt water are about as common as those that spend two years (USDC 1996b). In the Klamath Mountains ESU, juveniles remain in freshwater streams for 2-3 years (most often 2 years) before migrating to Pacific Ocean, where they spend 1-3 years (most often 2 years) before returning to natal stream to spawn (Spahr *et al.* 1991). Some Snake River basin steelhead spend one year in salt water whereas others spend two years (USDC 1996b).

Habitat conditions important to the survival and success of salmonids include cool water temperatures, low turbidity, high levels of dissolved oxygen, gravel size, and stream-side vegetation and submerged cover for protection from predation and disturbance as well as providing shade. Steelhead usually require a gravel stream riffle for successful spawning, with cool, clear, well-oxygenated water (natal stream), flowing 23-155 cm/sec and 10-150 cm deep, usually at the tail of a pool or at the riffle at the head of a pool. Stream water temperatures of 8 to 21 C (46.4 to 69.8 F) appear best for steelhead depending on life stage, and they prefer a spawning gravel size of less than 0.85 cm (0.33 in) in diameter, with rubble for rearing (Emmett *et al.* 1991). They do best where dissolved oxygen concentration is at least 7 ppm. Salinity of 8 ppt is the upper limit for normal development of eggs and alevins (Morgan *et al.* 1992). They favor areas with well-vegetated banks and abundant instream cover such as boulders, logs, and undercut banks. Steelhead can spawn in intermittent streams (juveniles move to perennial sections soon after hatching); this is common in the Rogue River system. Close to the ocean, spawners return to sea between spawning periods (Spahr *et al.* 1991). Smaller, usually immature, individuals may enter streams in late summer and early fall after spending only a few months in the ocean; these fishes return to the ocean in spring and migrate upstream again in summer or fall (Barnhart 1986). Migrating individuals require deep (at least 3 m) holding pools with cover; these are used during the period between upstream migration and spawning; optimally 4-5 undisturbed pools per river mile (Moyle *et al.* 1989). In winter, deep pools with low water velocity and extensive cover are important for shelter (Spahr *et al.* 1991, Sublette *et al.* 1990 ).

Riparian forests and floodplains play a critical role in the life of salmonids. Trees provide shade to maintain cool water temperatures. Litter fall and insect drop from riparian vegetation significantly contributes to the food supply of stream fish. When trees die and fall into the stream, they provide structure for pools creating channel complexity. Roots stabilize streambanks and protect them from chronic sediment loss. Riparian forests and marshes filter pollutants from overland flow and subsurface flows.

**Chinook salmon** ***(Oncorhynchus tshawytscha)*** There are four Evolutionarily Significant Units (ESU) of chinook that are listed as threatened in Oregon (Refer to Oregon Removal-Fill Program BA, Map B-5). These are the Lower Columbia River fall run, the Snake River fall run, the Snake River spring/summer run, and the Upper Willamette River run (USDC 1992, USDC 1999f).

Critical habitat has been designated for the Snake River spring/summer ESU. Critical habitat is designated to include river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River spring/summer chinook salmon in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to Hells Canyon Dam. Critical habitat includes river substrate and the adjacent riparian zone. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 22,390 square miles in Idaho, Oregon and Washington. The following Oregon counties lie partially or wholly within these basins: Baker, Umatilla, Union, and Wallowa. More detailed critical habitat information (i.e., specific watersheds, migration barriers, habitat features, and special management considerations) for this ESU can be found in the December 28, 1993 (USDC 1993) and October 25, 1999 Federal Register notices (USDC 1999g).

Critical habitat has been designated for the Snake River fall run ESU and includes river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River fall chinook salmon in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; the Snake River, all river reaches from the confluence of the Columbia River, upstream to Hells Canyon Dam; the Palouse River from its confluence with the Snake River upstream to Palouse Falls; the Clearwater River from its confluence with the Snake River upstream to its confluence with Lolo Creek; the North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam. Critical habitat includes river substrate and the adjacent riparian zone. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 13,679 square miles in Idaho, Oregon, and Washington. The following Oregon counties lie partially or wholly within these basins: Baker, Union, and Wallowa. More detailed critical habitat information (i.e., specific watersheds, migration barriers, habitat features, and special management considerations) for this ESU can be found in the December 28, 1993 Federal Register notice (USDC 1993).

Critical habitat for the Lower Columbia River fall run ESU is proposed to include all river reaches accessible to chinook salmon in Columbia River tributaries between the Grays and White Salmon Rivers in Washington and the Willamette and Hood Rivers in Oregon, inclusive. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to The Dalles Dam. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Critical habitat includes river substrate and the adjacent riparian zone. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 6,338 square miles in Oregon and Washington. The following Oregon counties lie partially or wholly within these basins: Clackamas, Clatsop, Columbia, Hood River, Marion, Multnomah, Wasco, and Washington. More detailed critical habitat information (i.e., specific watersheds, migration barriers, habitat features, and special management considerations) for this ESU can be found in the March 9, 1998 Federal Register notice (USDC 1998d).

Critical habitat proposed for the Upper Willamette fall run ESU includes all river reaches accessible to chinook salmon in the Willamette River and its tributaries above Willamette Falls. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to and including the Willamette River in Oregon. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Critical habitat includes river substrate and the adjacent riparian zone. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 8,575 square miles in Oregon. The following counties lie partially or wholly within these basins: Benton, Clackamas, Columbia, Douglas, Lane, Lincoln, Linn, Marion, Multnomah, Polk, Tillamook, Washington, and Yamhill. More detailed critical habitat information (i.e., specific watersheds, migration barriers, habitat features, and special management considerations) for this ESU can be found in the March 9, 1998 Federal Register notice (USDC 1998d).

The information that follows was taken from Beauchamp *et al.* (1983) except as noted. Chinook are anadromous salmonids, typically rearing in large streams, and migrating to the ocean where they live for an average of 3 to 4 years before returning to their natal streams to spawn before dying.

After spending most of its adult life in the ocean, the chinook returns to its natal stream. The timing on the return to the natal streams and subsequent spawning varies depending on which of the three chinook runs is involved. The spring chinook returns to freshwater beginning in February, and spawns from August to November. The summer chinook enters freshwater during the late spring to mid-summer, and spawns in the fall. The fall chinook returns to its natal streams in fall and spawns in the fall or winter. Most spawning occurs at temperatures of 40-55 F in gravel riffles in cool, clear, main stems, typically at the tail end of a pool (beginning of riffle), where the female forms a redd, or nest, in the gravel. Salinity of 8 ppt is the upper limit for the normal development of chinook eggs and alevins (Morgan *et al.* 1992). Juvenile fry emerge from the gravel during the winter or early spring. Juveniles remain in streams, using vegetation, large organic material, and boulders for cover, for 1 to 18 months before migrating to the ocean.

Habitat conditions important to the survival and success of salmonids include cool water temperatures, low turbidity, high levels of dissolved oxygen, gravel size, and stream-side vegetation and submerged cover for protection from predation and disturbance as well as providing shade. Chinook prefer stream water temperatures of 4 to 14.4 C (39.2 to. 57.2 F), depending on life stage, and spawning gravel size of 1.3 to 10 cm (.51 to 4.02 in) in diameter (Emmett *et al.* 1991).

Salmon and trout depend on cool water and inhabit shaded, overhanging banks or spring outflows during the summer. Salmonids spawn in clean gravel beds which provide protection and aeration for developing eggs. Fine sediment can clog spawning gravel, reduce oxygen supply, and greatly reduce the survival rate of salmonid eggs. Juvenile salmonids feed on invertebrates that fall into the stream from overhanging vegetation and benthic invertebrates that thrive in pools. Pools behind woody debris and in overflow channels, and seasonal ponding in adjacent wetlands that are hydrologically connected to streams provide important winter storm flow refuge areas and rearing habitat. Riparian forests and floodplains play a critical role in the life of salmonids. Trees provide shade to maintain cool water temperatures. Litter fall and insect drop from riparian vegetation significantly contributes to the food supply of stream fish. When trees die and fall into the stream, they provide structure for pools creating channel complexity. Roots stabilize streambanks and protect them from chronic sediment loss. Riparian forests and marshes filter pollutants from overland flow and subsurface flows.

**Oregon chub (Oregonichthys crameri)** The Oregon chub is a small minnow endemic to the Willamette River Basin in western Oregon (Refer to Oregon Removal-Fill Program BA, Map B-62). The U.S. Fish and Wildlife Service listed the chub as endangered in 1993 (USDI 1993c). Critical habitat has not been designated for this species. Oregon chub typically occupy off-channel habitats such as beaver ponds, oxbows, side channels, backwater sloughs, low gradient tributaries, and flooded marshes. This species was formerly distributed throughout the Willamette River Valley as far downstream as Oregon City and as far upstream as Oakridge. Formerly it may have been carried to pond and slough breeding habitats during winter and spring flooding (Markle *et al.* 1991).

Oregon chub habitats usually have little or no water flow, silty and organic substrate, and considerable aquatic vegetation as cover for hiding and spawning (Markle *et al.* 1991; Scheerer and Jones 1997). The average depth of Oregon chub habitats is typically less than 2 m and the summer temperatures typically exceed 16° C (60.8° F). Adult Oregon chub seek dense vegetation for cover and frequently travel in beaver channels or along the margins of macrophyte beds. In the early spring, fish are most active in the warmer, shallow areas of the ponds. Larval chub congregate in shallow areas near the shore (Pearsons 1989, Scheerer 1997). Juvenile Oregon chub venture farther from shore into deeper water (Pearsons 1989). In the winter months, Oregon chub are found buried in detritus or concealed in the limited aquatic vegetation (Pearsons 1989). Fish of similar size classes school and feed together.

Oregon chub spawn from April through September. Males defend territories in or near aquatic vegetation but before and after spawning, chub are social and non-aggressive. Spawning activity has only been observed at temperatures exceeding 16° C (60.8° F). Males >35 mm have been observed exhibiting spawning behavior. Egg masses have been found to contain 147 to 671 eggs (Pearsons 1989).

Oregon chub feed throughout the day, mostly on water column fauna, and stop feeding after dusk (Pearsons 1989). The diet for Oregon chub adults collected in a May sample consisted primarily of copepods, cladocerans, and chironomid larvae (Markle *et al.* 1991). The diet of juvenile chub consisted of rotifers, copepods, and cladocerans (Pearsons 1989).

Historical records report Oregon chub were collected from the Clackamas River, Molalla River, South Santiam River, North Santiam River, Luckiamute River, Long Tom River, McKenzie River, Mary's River, Coast Fork Willamette River, Middle Fork Willamette River, and the mainstem Willamette River from Portland to Eugene. The current distribution of Oregon chub is limited to 20 naturally occurring populations and four recently reintroduced populations. The naturally occurring populations are found in the Santiam River, Middle Fork Willamette River, Coast Fork Willamette River (a single population at Camas Swale), and several small tributaries to the mainstem Willamette River. These tributaries include Gray Creek at William L. Finley National Wildlife Refuge and two populations in Muddy Creek in Linn County. Only seven of these populations have more than 1000 fish, and 12 populations contain fewer than 50 individuals. Three populations of Oregon chub were introduced into habitats in the Middle Fork Willamette River drainage at Wicopee Pond, East Ferrin Pond, and Fall Creek Spillway Pond. A fourth population was recently reintroduced to Beaver Creek at Dunn Wetland in the mainstem Willamette River Sub-basin.

In the last 80 years, backwater and off-channel habitats typically occupied by the Oregon chub have disappeared rapidly because of changes in seasonal flows resulting from the construction of dams throughout the basin, channelization of the Willamette River and its tributaries, removal of snags for river navigation, and agricultural practices. As a result, available Oregon chub habitat was reduced, existing Oregon chub populations were isolated, and recolonization of habitat and mixing between populations was reduced. In addition, a variety of non-native aquatic species were introduced to the Willamette Valley over the same period. The establishment and expansion of these non-native species, in particular, largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomicu*), crappie (*Pomoxis* sp. ), bluegill (*Lepomis macrochirus*), western mosquitofish (*Gambusia affinis*) and bullfrog (*Rana catesbiana*), has contributed to the decline of the Oregon chub and limits the species' ability to expand beyond its current range.

**Foskett speckled dace (*Rhinichthys osculus* ssp 3)** The Foskett speckled dace is a threatened species found in south-central Oregon (Refer to Oregon Removal-Fill Program BA, Map B-64). Critical habitat has not been designated for this species. There are two known populations of the Foskett speckled dace found in Foskett and Dace Springs, isolated spring habitats in the Coleman Subbasin of the Warner Valley.

Both Foskett and Dace Spring are extremely small and shallow with limited fish habitat due to extensive macrophytes (USDI 1997b). Foskett Spring has the only known native population of Foskett speckled dace. In 1979 and again in 1980, 50 Foskett speckled dace were transplanted to Dace Spring. No other transplant attempts have been made and this population in Dace Spring is now confined to a water trough where the outflow of the spring now terminates. In 1997 there were an estimated 27,000 individuals in Foskett Spring (mostly in an ephemeral lower pool) and 19 dace were found in the nearby outplanted population in Dace Spring (J. Dambacher, pers. comm., 1998).

Very little is known about the biology and ecology of the Foskett speckled dace. The only habitat information available regards plant species found around the springs including rushes, sedges, *Mimulus*, Kentucky bluegrass (*Poa pretensis*), thistle and saltgrass (*Distichlis spicata*). Foskett Spring is a cool-water spring with temperatures recorded at a constant 18°C (64.4°F) over a 2-year period. No information is available on growth rates, age of reproduction or behavioral patterns (USDI 1997b).

Foskett and Dace Springs occur on public land and are managed by Lakeview BLM. This habitat is currently fenced from cattle use and is in stable condition (USDI 1997b). The Foskett speckled dace was listed as threatened in 1985 due to its small population, restricted range and degraded habitat due to the effects of grazing (USDI 1985a).

**Bull Trout (*Salvelinus confluentus*)** Bull trout are char native to the Pacific Northwest. The bull trout was first described by Girard in 1856 from a specimen collected on the lower Columbia River. Cavender (1978) presented morphometric, meristic, osteological, and distributional evidence to document the separation between Dolly Varden (*Salvelinus malma*) and bull trout, and resurrected the species name *confluentus*, as first proposed by Suckley in 1858. Based on this work, taxonomists have recognized bull trout as a separate species from the coastal Dolly Varden since 1978 (Bond 1992). On July 10, 1998, the Fish and Wildlife Service listed the Columbia River and Klamath River populations of bull trout as threatened under the Endangered Species Act (USDI 1998c) (Refer to Oregon Removal-Fill Program BA, Map B-6). Critical habitat has not been designated for these populations.

Bull trout populations are known to exhibit four distinct life history forms: resident, fluvial, adfluvial, and anadromous. Resident bull trout spend their entire life cycle in the same (or nearby) streams in which they were hatched. Fluvial and adfluvial populations spawn in tributary streams where the young rear from one to four years before migrating to either a lake (adfluvial) or a river (fluvial) where they grow to maturity (Fraley and Shepard 1989). Anadromous fish spawn in tributary streams, with major growth and maturation occurring in salt water.

Bull trout are habitat specialists, especially with regard to preferred conditions for reproduction. While a small fraction of available stream habitat within a drainage or subbasin may be used for spawning and rearing, a much more extensive area may be utilized as foraging habitat, or seasonally as migration corridors to other waters. Habitat components that appear to influence bull trout distribution and abundance include water temperature, cover channel form and stability, valley form, spawning and rearing substrates, and migratory corridors (USDI 1998c). Structural diversity is a prime component of good bull trout rearing streams (Pratt 1992). Several authors have observed highest juvenile densities in streams with diverse cobble substrate and low percentage of fine sediments (Shepard *et al.* 1984, Pratt 1992).

Bull trout depend on cool water and inhabit shaded, overhanging banks or spring outflows during the summer. They spawn in clean gravel beds which provide protection and aeration for developing eggs. Fine sediment can clog spawning gravel, reduce oxygen supply, and greatly reduce the survival rate of eggs. Juvenile bull trout feed on invertebrates that fall into the stream from overhanging vegetation and benthic invertebrates that thrive in pools. Riparian forests and floodplains play a critical role in the life of salmonids. Trees provide shade to maintain cool water temperatures. Litter fall and insect drop from riparian vegetation significantly contributes to the food supply of stream fish. When trees die and fall into the stream, they provide structure for pools creating channel complexity. Roots stabilize streambanks and protect them from chronic sediment loss. Riparian forests and marshes filter pollutants from overland flow and subsurface flows.

Bull trout spawn in the fall, primarily in September or October when water temperatures drop below 9°C (48°F). Typically, spawning occurs in gravel, in runs or tails of spring-fed pools. Adults hold in areas of deep pools and cover and migrate at night (Pratt 1992). After spawning, fluvial and adfluvial adults return to the lower river and lake.

Bull trout eggs are known to require very cold incubation temperatures for normal embryonic development (McPhail and Murray 1979). In natural conditions, hatching usually takes 100 to 145 days and newly-hatched fry, known as alevins, require 65 to 90 days to absorb their yolk sacs (Pratt 1992). Consequently, fry do not emerge from the gravel and begin feeding for 200 or more days after eggs are deposited (Fraley and Shepard 1989), usually in about mid-April.

Fry, and perhaps juveniles, grow faster in cool water (Pratt 1992). Fraley and Shepard (1989) reported that juvenile bull trout were rarely observed in streams with summer maximum temperatures exceeding 15°C (59°F). Juvenile bull trout are closely associated with the substrate, frequently living on or within the streambed cobble (Pratt 1992). Along the stream bottom, juvenile bull trout use small pockets of slow water near high velocity, food-bearing water. Adult bull trout, like the young, are strongly associated with the bottom, preferring deep pools in cold water rivers, as well as lakes and reservoirs (Thomas 1992).

Juvenile adfluvial fish typically spend one to three years in natal streams before migrating in spring, summer, or fall to a large lake. After traveling downstream to a larger system from their natal streams, subadult bull trout (age 3 to 6) grow rapidly but do not reach sexual maturity for several years. Growth of resident fish is much slower, with smaller adult sizes and older age at maturity.

Juvenile bull trout feed primarily on aquatic insects (Pratt 1992). Subadult bull trout rapidly convert to eating fish and, as the evolution of the head and skull suggest, adults are opportunistic and largely nondiscriminating fish predators. Historically, native sculpins *(Cottus* spp.), suckers *(Catostomus* spp.), and mountain whitefish *(Prosopium williamsoni)* were probably the dominant prey across most of the bull trout range. Today, throughout most of the bull trout's remaining range, introduced species, particularly kokanee *(Oncorhynchus nerka)* and yellow perch *(Perca flavescens),* are often key food items (Pratt 1992).

Persistence of migratory life history forms and maintenance or re-establishment of stream migration corridors is crucial to the viability of bull trout populations (Reiman and McIntyre 1993). Migratory bull trout facilitate the interchange of genetic material between populations, ensuring sufficient variability within populations. Migratory forms also provide a mechanism for reestablishing local populations that have been extirpated. Migratory forms are more fecund and larger than smaller non-native brook trout, potentially reducing the risks associated with hybridization (Reiman and McIntyre 1993). The greater fecundity of these larger fish enhances the ability of a population to persist in the presence of introduced fishes.

Bull trout distribution has been reduced by an estimated 40 to 60 percent since pre-settlement times, due primarily to local extirpations, habitat degradation, and isolating factors. The remaining distribution of bull trout is highly fragmented. Resident bull trout presently exist as isolated remnant populations in the headwaters of rivers that once supported larger, more fecund migratory forms. These remnant populations have a low likelihood of persistence (Reiman and McIntyre 1993). Many populations and life history forms of bull trout have been extirpated entirely.

Highly migratory, fluvial populations have been eliminated from the largest, most productive river systems across the range. Stream habitat alterations restricting or eliminating bull trout include obstructions to migration, degradation of water quality, especially increasing temperatures and increased amounts of fines, alteration of natural stream flow patterns, and structural modification of stream habitat (such as channelization or removal of cover).

In Oregon, bull trout were historically found in the Willamette River and major tributaries on the west side of the Oregon Cascades, the Columbia and Snake rivers and major tributaries east of the Cascades, and in streams of the Klamath Basin (Goetz 1989). Presently, most bull trout populations are confined to headwater areas of tributaries to the Columbia, Snake, and Klamath rivers (Ratliff and Howell 1992). Major tributary basins containing bull trout populations include the Willamette, Hood, Deschutes, John Day, and Umatilla (Columbia River tributaries), and the Owyhee/Malheur, Burnt/Powder, and Grande Ronde/Imnaha Basins (Snake River tributaries). Of these eight major basins, large fluvial migratory bull trout are potentially stable in only one, the Grande Ronde, and virtually eliminated from the remaining 7, including the majority of the mainstem Columbia River. The only known increasing population of bull trout is an adfluvial migrant population located in Lake Billy Chinook, and spawning and rearing in the Metolius river and tributaries. The Klamath River population segment is limited to seven geographically isolated stream areas representing a fraction of the historical habitat (USDI 1998c).

## Amphibians

**Columbia spotted frog (*Rana luteiventris*)** The Great Basin population of the Columbia spotted frog is a candidate for Endangered Species Act protection (USDI 1997f). Critical habitat is not proposed for candidate species. This species occurs in Oregon in the Owyhee, Wallowa, and Blue Mountains (Refer to Oregon Removal-Fill Program BA, Map B-66). Like the Oregon spotted frog, the Columbia spotted frog is highly aquatic and is dependent on wetlands for overwintering, breeding, and foraging habitats. Habitat in the Great Basin is seasonally xeric. Spotted frogs commonly use areas such as spring heads and deep undercuts with overhanging vegetation. Adults move to breeding areas in the spring, which may be hundreds of meters away from overwintering sites. Breeding typically takes place in pooled water with floating/emergent vegetation. This may occur as soon as snow or ice melts from water surface, and may be completed within 2 days at higher elevations. Successful egg production, development, and metamorphosis of spotted frogs depend on hydration, adequate water depth, overhanging vegetation, appropriate pH and temperature, and the absence or low density of non-native fish and bullfrogs (USDI 1997f).

**Oregon spotted frog (*Rana pretiosa*)** This highly aquatic species is estimated to have disappeared from over 90% of its range in Oregon, largely due to hydrological modification and introduced predators (Hayes 1994a). The Oregon spotted frog is a candidate for Endangered

Species Act protection (USDI 1997f). Critical habitat is not proposed for candidate species. It is estimated that over 95 percent of the habitat that is suitable for the Oregon spotted frog has been surveyed across its range (Hayes 1997). The Oregon spotted frog historically ranged from extreme southwestern British Columbia, Canada, south through the eastern side of the Puget/Willamette Valley trough and the Columbia River gorge, to the central Cascade mountains of Oregon, south into the Klamath Basin and northeastern California. In Oregon, the species is now limited to higher elevation sites in the Cascades and Klamath County (Refer to Oregon Removal-Fill Program BA, Map B-66).

The Oregon spotted frog is usually found in permanent quiet water, often at the grassy margins of streams, lakes, ponds, springs, and marshes (Hodge 1976, Licht 1986). The Oregon spotted frog seems to prefer waters with emergent vegetation and a bottom layer of dead and decaying vegetation.

The timing of breeding depends on temperature, and has been recorded from February to June. Oregon spotted frogs are now limited to higher elevation sites, thus one would expect them to become active and begin mating relatively later. Males are not territorial and may gather in large groups of 25 or more individuals at specific locations. Females lay egg masses in communal clusters at locations that may be used in successive years (Hayes 1994b). This makes the Oregon spotted frog extremely sensitive to modifications made to breeding sites. Tadpoles metamorphose during their first summer.

## Birds

**Marbled Murrelet (*Brachyramphus marmoratus marmoratus*)** Designated as a threatened species, marbled murrelets have a life history strategy unique among seabirds. Although they feed on fish and invertebrates primarily in nearshore marine waters, they nest as far as 52 miles inland from the marine environment, on large limbs of mature conifers. Marbled murrelets are mostly pelagic during the winter.

Nests often are in mature/old growth coniferous forest near the coast on a large mossy horizontal branch, mistletoe infection, witches broom, or other structure providing a platform high in a mature conifer (e.g., Douglas-fir, mountain hemlock). Most nesting occurs in large stands of old growth. Nest sites generally have good overhead protection. See Quinlan and Hughes (1990), Singer *et al.* (1991), and USDI (1996c) for characteristics of nest trees. While they are not colonial nesters, these birds are frequently observed in groups of three or more. Silent individuals flying below the forest canopy indicate nesting in the immediate area (Levy 1993). Less than 2,400 pairs are thought to nest in Oregon. The murrelet breeds at scattered groves along the Oregon coast (Refer to Oregon Removal-Fill Program BA, Map B-69). Nesting pairs exchange nest duties to feed in the ocean at dawn and dusk. They are more difficult to detect at dusk due to reduced vocalizations. Eggs are laid over an extended period of time. Incubation takes about 30 days; young are found at sea about 22 days after hatching. Colonies are isolated between patches of suitable habitat. Detailed accounts of the taxonomy, ecology, and reproductive characteristics of the murrelet are found in the final rule designating the species as threatened (USDI 1992a), and the US Fish and Wildlife Service's biological opinion for Alternative 9 of the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (FSEIS) (USDI 1994d). Critical habitat has been designated (USDI 1996c) and includes individual trees with potential nesting platforms, forested areas surrounding and contiguous to potential nest trees, forested areas with at least one half the average maximum tree height for the area, and many Late Successional Reserve areas. Critical habitat occurs primarily on federal, but also on state and private lands.

The Forest Service has published the *Ecology and Conservation of the Marbled Murrelet* (Ralph *et al.* 1995), a peer-reviewed, comprehensive summary of the status of the species. This document makes several key points regarding the status of the murrelet. Population trends are clearly downward. Ralph *et al.* (1995) and the Marbled Murrelet Recovery Team believe that possible reasons for the decline include the species' dependence for nesting on older forests that are now scarce and heavily fragmented, its low reproductive rate, and adult mortality due to predation, capture in gill nets, and encounters with oil spills. The amount and distribution of the remaining suitable [nesting] habitat is considered to be the most important determinant of the long-term population trend; further loss may severely hamper the stabilization and recovery of the species.

Murrelets have approximately 979 known occupied sites within Washington, Oregon, and California (S. Holzman, pers. comm. 1996). The total number of acres of suitable habitat in these three states is unknown. Currently, suitable habitat for the murrelet is estimated at 2,561,500 acres on Federal lands in the listed range of this species (Ralph *et al.* 1995). The entire Coast Range Province supports approximately 400,000 acres of suitable murrelet habitat (based on suitable spotted owl habitat). Approximately 591 known murrelet sites occur within this province, of which roughly 418 (71 percent) are on Federal land (S. Holzman, pers. comm. 1995).

The FEMAT (USDA *et al.* 1993) identified two zones of murrelet habitat based on observed use and expected occupancy. In Oregon, Zone 1 extends 0-35 miles inland from the marine environment. The majority of murrelet occupied sites and sightings occur in this zone. Zone 2 encompasses areas inland from the eastern boundary of Zone 1 and is typified by relatively low numbers of murrelet sightings, which is partially a function of fewer inventories (USDA *et al.* 1993).

**Aleutian Canada goose (*Branta canadensis leucopareia*)** Aleutian Canada geese are listed as threatened, but have been proposed for delisting. Critical habitat has not been proposed for this species. They breed exclusively on a small number of Aleutian islands (USDI 1991). During migration and on wintering grounds, the geese are commonly found in marshes, harvested agriculture fields, and flood-irrigated and nonirrigated land (USDI 1991). The geese winter in and use pastures and grain fields along the coasts of Oregon and northern California and in California's Central Valley (Refer to Oregon Removal-Fill Program BA, Map B-71). Prior to the northward spring migration, almost the entire population stages near Lake Earl in Crescent City. They arrive in early February and head north in April. Thousands of birds heading north along the southern coast of Oregon stop to graze in the New River pastures on the Coos/Curry county line. At night, the geese roost on the coastal rocks near Bandon. It is presumed that the geese migrate between the Aleutian Islands and their wintering grounds by flying non-stop over the Pacific Ocean, a distance of nearly 2,000 miles.

A unique population of Aleutian Canada geese breed in the Semidi Islands, southwest of Kodiak Island, and winter only at Nestucca Bay, near Pacific City, Oregon. This population consists of fewer than 150 individuals (ODFW 1998).

**Sage grouse (*Centrocercus urophasianus phaios*)** The sage grouse is a candidate for listing as a threatened or endangered species under the endangered Species Act. The sage grouse has declined throughout its range due to habitat loss, degradation and fragmentation (Braun 1998) (Refer to Oregon Removal-Fill Program BA, Map B-73). Although primarily a dryland species, sage grouse depend on springs, seeps and wet meadows adjacent to sagebrush habitat for brood rearing (Idaho Sage Grouse Task Force 1997). Sage grouse require sage interspersed with native grasses and forbs. They avoid overgrazed areas, but moderate grazing can be beneficial in maintaining a mix of forbs, grasses and sage.

**Western snowy plover (*Charadrius alexandrinus nivosus*)** Coastal populations of the western snowy plover are listed as threatened (USDI 1993d). Critical habitat has recently been designated for coastal populations of the snowy plover. The primary constituent elements for the western snowy plover are those habitat components that are essential for the primary biological needs of foraging, nesting, rearing of young, roosting, and dispersal, or the capacity to develop those habitat components. The primary constituent elements are found in areas that support or have the potential to support intertidal beaches (between mean low water and mean high tide), associated dune systems, and river estuaries. Important components of the beach/dune/estuarine ecosystem include surf-cast kelp, sparsely vegetated foredunes (beach area immediately in front of a sand dune), interdunal flats (flat land between dunes), spits, washover areas, blowouts (a hole or cut in a dune caused by storm action), intertidal flats (flat land between low and high tides), salt flats, flat rocky outcrops, and gravel bars. Several of these components (sparse vegetation, salt flats) are mimicked in artificial habitat types used less commonly by snowy plovers (i.e., dredge spoil sites and salt ponds and adjoining levees) (USDI 1999c).

Western snowy plovers in the Pacific Coast population breed in loose colonies primarily on coastal beaches from southern Washington to southern Baja California, Mexico. Snowy plovers nest on the ground on broad open beaches or salt or dry mud flats, where vegetation is sparse or absent (small clumps of vegetation are used for cover by chicks).

There are about 2,000 Snowy Plovers that may breed along the US Pacific Coast (Page *et al.* 1995), and approximately an additional 2,000 along the west coast of Baja California (Palacios *et al.* 1994). The majority of the breeding sites in the US occur from San Francisco Bay south. In Oregon, there are currently 10 breeding and/or wintering sites, supporting approximately 100 adult birds, ranging from 72 in 1993 to 141 in 1997, as determined by tracking of banded individuals (Castelein *et al.* 1998) (Refer to Oregon Removal-Fill Program BA, Map B-75). Eight of these sites were active during the breeding season in 1999, with 97 adults present, producing 53 fledglings (K. Popper, pers. comm.).

The breeding season of the coastal population of the western snowy plover extends from mid-March through mid-September. Nest initiation and egg laying occurs from mid-March through mid-July (Wilson 1980, Warriner *et al.* 1986). The usual clutch size is three eggs. Incubation averages 27 days (Warriner *et al.* 1986). Both sexes incubate the eggs. Nests are often subject to flooding. Plover chicks are precocial, leaving the nest within hours after hatching to search for food. Fledging requires an average of 31 days (Warriner *et al.* 1986). Broods rarely remain in the nesting territory until fledging (Warriner *et al.* 1986).

Coastal populations suffer chronic low productivity. Page *et al.* (1977) estimated that snowy plovers must fledge 0.8 young per nest to maintain a stable population. Reproductive success falls far short of this threshold at many nesting sites (Page 1990). Fledging success was 34 percent in Oregon in 1996 (Estelle *et al.* 1997). Oregon's coastal breeding plovers may either migrate south to the California coast or reside year-round at breeding sites.

Coastal breeding populations have declined due to loss of habitat, principally invasion of European beachgrass and resultant dune stablizations, off-road vehicle use, dogs, crows, gulls and human disturbance. Historic records indicate that nesting western snowy plovers were once more widely distributed in coastal California, Oregon, and Washington than they are currently. In Oregon, snowy plovers historically nested at 29 locations on the coast (C. Bruce, pers. comm., 1991). In 1990, only 6 nesting colonies remained, representing a 79 percent decline in active breeding sites.

In addition to loss of nesting sites, the coastal plover breeding population itself has declined significantly. Breeding season surveys along the Oregon coast from 1981 to 1992 show that the number of adult snowy plovers has declined at an average annual rate of about 7 percent (ODFW 1996). The number of adults and young declined from a high of 142 adults in 1978 to a low of 30 adults in 1992, but have since rebounded to 72 in 1995 (ODFW 1996). A number of habitat enhancement projects and conservation measures have been implemented to increase chick survival and minimize human disturbance. In 1996, plover numbers had increased to an estimated 132-137 adults in Oregon (Estelle *et al.* 1997).

**Bald eagle (*Haliaeetus leucocephalus*)** The bald eagle is listed as threatened in Oregon, but has been proposed for delisting. Delisting is scheduled to occur in July, 2000. In Oregon, bald eagles typically nest in multi-layered, coniferous stands with old-growth trees, close to water supporting primary food sources including fish, waterfowl, and seabirds (Andrew and Mosher 1982, Green 1985, Campbell *et al.* 1990) (Refer to Oregon Removal-Fill Program BA, Map B-77). Most nests were within 1. 6 km of water, usually in largest tree in stand (Anthony and Isaacs 1989). Availability of suitable trees for nesting and perching is necessary to maintain bald eagle site fidelity and populations. Perch trees are also needed by eagles for hunting and resting. These trees typically provide an unobstructed view of the surrounding area and are in proximity to feeding areas. About 0.9 young are produced per occupied nest site per year in Oregon (Anthony and Isaacs 1989).

Oregon and Washington support approximately 25 percent of the wintering bald eagles in the conterminous United States. Wintering sites, primarily concentrated around wildlife refuges, are typically in the vicinity of concentrated food sources such as anadromous fish runs, high concentrations of waterfowl, or mammalian carrion. Winter roost sites provide protection from inclement weather conditions and are characterized by more favorable microclimate conditions. Communal roost sites used by two or more eagles are common, and some may be used by 100 or more eagles during periods of high use. Winter roost sites vary in their proximity to food resources (up to 33 km) and may be determined to some extent by a preference for a warmer microclimate at these sites. Available data indicate that energy conservation may or may not be an important factor in roost-site selection (Buehler *et al.* 1991).

**Brown pelican (*Pelecanus occidentalis*)** This species is highly visible in limited numbers along the entire Oregon coast in summer and fall. It does not breed in Oregon but disperses northward from California breeding grounds after nesting and migrates south again to winter. The brown pelican feeds mostly in shallow estuarine waters, less often up to 40 miles from shore. The diet consists almost entirely of fish. Types of fish known to be important in some areas include menhaden, smelt, and anchovies. Some crustaceans may also be taken. It makes extensive use of sand spits, offshore sand bars, and islets for nocturnal roosting and daily loafing, especially by nonbreeders and during the non-nesting season (Refer to Oregon Removal-Fill Program BA, Map B-80)

**Northern spotted owl (*Strix occidentalis caurina*)** The northern spotted owl breeds in forest communities of the Pacific Northwest (Refer to Oregon Removal-Fill Program BA, Map B-82). This subspecies ranges from southern British Columbia, south to Marin County, California. Thomas *et al.* (1990) found that typical habitat characteristics include "moderate to high canopy closure; a multilayered, multispecies canopy dominated by large overstory trees; a high incidence of large trees with large cavities, broken tops, and other indications of decadence; numerous large snags; heavy accumulations of logs and other woody debris on the forest floor; and considerable open space within and beneath the canopy". Generally these conditions are found in old growth (at least 150-200 years old), but sometimes they occur in younger forests that include patches of older growth. In Washington and Oregon, conifer forests begin to develop conditions suitable for spotted owls about 80-120 years after clearcutting; coastal redwood forests are exceptional in that stands that are 50-80 years old or so may provide suitable conditions. Spotted owls can tolerate some degree of habitat fragmentation (e.g., as on BLM lands in western Oregon) (Thomas *et al.* 1990). In southwestern Oregon, almost all owls consistently selected old forest for foraging and roosting (Carey *et al.* 1992).

Spotted owls do not build their own nests; they depend upon suitable naturally occurring nest sites available in older-aged forests, such as broken-top trees and cavities. Less frequently, they will also nest in abandoned squirrel or raptor nests or on platforms formed by mistletoe brooms or debris accumulations. In western Oregon, the proportion of old-growth and mature forest was significantly greater at nest sites than at random sites (Ripple *et al.* 1991). Pairs tend to occupy the same nesting territories in successive years, as long as habitat remains suitable (Thomas *et al.* 1990). A detailed account of the taxonomy, ecology and reproductive characteristics of the spotted owl is found in the Fish and Wildlife Service Status Reviews (USDI 1987, 1990c); the 1989 Status Review Supplement (USDI 1989); the ISC Report (Thomas *et al.* 1990); and the final rule designating the spotted owl as a threatened species (USDI 1990a). Critical habitat has not been designated for the Northern spotted owl.

There are approximately 5,600 pairs of spotted owls and resident singles (activity centers) and 8. 1 million acres of "suitable" habitat (older age forest) currently estimated across the range of the species (S. Holzman, pers comm., 1996). Recent demographic studies suggest that the metapopulation is declining (Burnham *et al.* 1994, Lande 1988); however, the U.S. Fish and Wildlife Service anticipates that implementation of the Northwest Forest Plan will provide for the conservation of the species in the long term.

## Mammals

**North American lynx (*Lynx canadensis*)** The North American lynx is a candidate for listing as a threatened or endangered species. In Oregon, it is associated with boreal forests in the higher elevations (4000 ft or greater) of the Cascade Mountain Range, historically as far south as Klamath County and through Eastern Oregon (USDA 1994; Oregon Natural Heritage Program 1988) (Refer to Oregon Removal-Fill Program BA, Map B-84). Lynx habitat is typically composed of young, dense forests for foraging, and late successional forests (with down logs) for denning and cover. Intermediate stage forests are used for travel and possibly foraging. The main prey item is the snowshoe hare, although the lynx is somewhat opportunistic and does eat other small mammals and birds (USDA 1994). As a forest-dependent species, alterations to lynx habitat pose the greatest threat to its survival.

The lynx was considered extirpated from Oregon (ORNHP), although there have been several sightings in eastern Oregon since 1991 (C. Lee, pers. comm.). The lynx has always been rare in Oregon.

**Columbian white-tailed deer (*Odocoileus virginianus leucurus*)** The endangered Columbian white-tailed deer has declined along with its the riverine woodland habitat along the Columbia River (USDI 1967) (Refer to Oregon Removal-Fill Program BA, Map B-84). Historically, the Columbian white-tailed deer ranged from the southern end of Puget Sound to the Willamette Valley of Oregon and throughout the river valleys west of the Cascade Mountains. Following European settlement, conversion of land to agriculture forced the deer into the small vestiges of habitat where they are found today. Logging, vehicular fatalities, poaching, and flooding events also have contributed to the decline of this subspecies. Today, only two populations exist, one near Roseburg, Oregon, and another on a few small islands and in isolated areas of the lower Columbia River, near Cathlamet, Washington. The Douglas County population has been proposed for delisting (USDI 1999d).

Efforts to save the Columbian white-tailed deer from extinction began in 1972, when the Service established the 4,800-acre Julia Butler Hansen Refuge for the Columbian White-tailed Deer near Cathlamet, Washington. Total numbers of the deer in the lower Columbia River population have increased in recent years. However, the flood of 1996 dealt these deer a setback, possibly eliminating up to half of this population (USDI 1996a). Based on aerial surveys, biologists estimated a post-flood population of 60 deer on the Refuge mainland unit and 100 deer on 2,000-acre Tenasillahe Island in the Columbia River. Before the onset of winter and the February 1996 flooding, deer populations were estimated at 115 to 120 on the mainland and more than 200 on the Tenasillahe Island. Fortunately, flooding of the Julia Butler Hansen Refuge does not appear to have had a major effect on vegetation in the area. Bottomland pastures on the refuge regularly flood during winter, and the flood did not kill the woody shrubs on which the deer browse.

Columbian white-tailed deer prefer wet prairie and lightly wooded bottomlands or "tidelands" along streams and rivers; woodlands are particularly attractive when interspersed with grasslands and pastures. Along the Columbia River, Sitka spruce, dogwood, cottonwood, red alder, and willow dominate the vegetation. In inland habitats, along the Umpqua River, the tree community consists of Oregon white oak, madrone, California black oak, and Douglas-fir, with a shrubby ground cover of poison oak and wild rose (Matthews and Moseley 1990). The deer use hay meadows and grassy areas near cover in NW Oregon. In the southern Willamette Valley the deer use oak woodlands.

## Effects Determinations

**Plants** (see Table 4a,4b, and 4c for a summary of effects determinations)

**McDonald's rock-cress** – This species occurs on upland sites and should not be directly impacted by most activities associated with the Corps permit program. Mechanical damage to McDonald's rock-cress habitat could occur in the process of road construction activities or utility projects. Such impacts should be entirely avoidable by first consulting with Oregon Natural Heritage Program data bases and by surveying for McDonald's rock-cress. Any project occurring on serpentine soils in Josephine or Curry Counties should include properly timed surveys conducted by a knowledgeable botanist to determine presence or absence of this species. Due to the extreme rarity of this species, any site with McDonald's rock-cress should be avoided. Based on a policy of avoidance, we expect no adverse impacts to McDonald's rock-cress from activities authorized through the Corps permit program.

**Applegate's milk-vetch** - This species requires seasonally wet habitats near Klamath Falls and will be adversely affected by any activities that alter the remaining seasonal hydrologic regime. This species could be directly impacted by mechanical disturbance occurring as a result of road repair/maintenance or utility projects. Because of the extreme rarity of this species, all populations should be protected. No mechanical activity should be allowed within the populations. No activity that may affect the sites' hydrology should be permitted. Projects proposed for Southern Klamath County in the former Klamath River floodplain will require appropriately timed field surveys by knowledgeable botanists to determine the presence or absence of Applegate's milk-vetch. Based on a policy of avoidance, we expect no adverse impacts to Applegate's milk-vetch from activities authorized through the Corps permit program.

**Golden Indian-paintbrush** - This species is not known to occur in Oregon at this time, and therefore it is not expected to be impacted by removal/fill activities. Field surveys for this particular species should be incorporated with field surveys for other rare Willamette Valley species, e.g. Bradshaw's lomatium (*Lomatium bradshawii*), Willamette daisy (*Erigeron decumbens* ssp. *decumbens*), (Kincaid's lupine) *Lupinus suphureus* ssp. *kincaidii*, Nelson's checkermallow (*Sidalcea nelsoniana*), and Fender's blue butterfly (*Icaricia icarioides fenderi*).

**Willamette daisy** - The Willamette daisy may be negatively affected by projects that alter hydrology at native prairie sites. This species may also be directly damaged by roadside maintenance activities or utility projects. This species has a relatively limited distribution and occurs only on an extremely rare habitat type. Impacts should be avoided by identifying Willamette daisy sites and modifying projects to avoid these sites. To determine presence or absence of the Willamette daisy, proposed projects in the Willamette Valley should include properly timed field surveys conducted by knowledgeable botanists. Based on a policy of avoidance, we expect no adverse impacts to the Willamette daisy from activities authorized through the Corps permit program.

**Gentner's fritillary** – This species occurs on upland sites. Prized by collectors, this rare lily is threatened by over-collection, especially as some populations are located adjacent to well-traveled roadways. Rural residential development is a large threat in parts of its range while grazing and logging are potential threats. It is possible that road maintenance/improvement or utility projects associated with the Corps permit program could cause direct negative impacts to this species. However, given the species' extremely limited distribution, such impacts could be entirely avoided by combining properly timed field surveys conducted by knowledgeable botanists with checks of the

Oregon Natural Heritage Program data bases. Based on a policy of avoidance, we expect no adverse impacts to Gentner's fritillary from activities authorized through the Corps permit program.

**Howellia** – Howellia is believed to be extirpated from Oregon, thus activities related to the Corps permit program are not expected to have any impact on the species. Any activities that alter the surface or subsurface hydrology of howellia's wetland habitat could negatively affect populations which have yet to be identified (USDI 1994a). Should howellia be rediscovered in Oregon, its extremely limited distribution should be avoided entirely.

**Western Lily** – In Oregon, the Western lily has an extremely limited range and is highly endangered. This species occurs in wet sites and could be negatively impacted by water and erosion control projects, road building/maintenance work, wetland fills, wetland enhancement projects, and utility projects. All populations should be protected from any kind of disturbance. Based on a policy of avoidance, we expect no adverse impacts to the western lily from activities authorized through the Corps permit program.

**Big-flowered wooly meadowfoam** – The continued existence of the big-flowered wooly meadowfoam is at risk, primarily from destruction of the specialized habitat by industrial and residential development, including road and powerline construction and maintenance. Agricultural conversion, certain grazing practices, off-road vehicle use, and competition with non-native plants also contribute to population declines.

This species may be negatively affected by road construction/maintenance activities and utility projects authorized through the Corps permit program. Wetland fill activities in the Agate Desert could remove habitat for this species. Big-flowered wooly meadowfoam occurs at so few sites, all populations should be protected from any kind of disturbance. Prior to permitting, all projects occurring in the Agate Desert should conduct properly-timed surveys by competent botanists to determine presence/absence of big-flowered wooly meadowfoam. Based on a policy of avoidance, we expect no adverse impacts to the big-flowered wooly meadowfoam from activities associated with the Corps permit program.

**Bradshaw's lomatium** – Bradshaw's lomatium occurs in wet prairie habitat. Most of its habitat has been destroyed by land development for agriculture, industry, and housing. In addition, water diversions and flood control structures have changed historic flooding patterns, which may be important to seedling establishment. Reductions in natural flooding cycles also permit invasion of trees and shrubs, and eventual conversion of wet prairies to woodlands. Corps permit program activities that may negatively impact this species include erosion and water control projects, utility projects, road building/maintenance, wetland fills and wetland enhancement projects. Any activity that directly destroys plants or changes the present hydrology of the habitat should be avoided. To determine presence or absence of Bradshaw's lomatium, proposed projects in the Willamette Valley should include properly timed field surveys conducted by knowledgeable botanists. Based on a policy of avoidance, we expect no adverse impacts to Bradshaw's lomatium from activities authorized through the Corps permit program.

**Cook's lomatium** - Cook's lomatium is imminently threatened by habitat destruction, primarily from residential and industrial development, including road and powerline construction. Within the past 10 years, numerous populations have been bisected by roads, powerlines and sewer lines, lost to department store and sports park complexes, and destroyed by residential construction. Other factors contributing to habitat loss include off-road vehicle use, gold mining, and overgrazing. Development in southwestern Oregon is escalating. Since the federal listing package was submitted, a large population [500 plants] in the Illinois Valley (Josephine County) was destroyed by a housing development during the summer of 1996. Additionally, one of three subpopulations north of Rough and Ready Creek in Josephine County (containing 250 plants) was lost to agriculture (D. Borgias pers. comm. 1997). Permit-related activities that may negatively impact Cook's lomatium include erosion and water control projects, road building/maintenance, wetland fills and enhancement projects, and utility projects.

Cook's lomatium is predominantly found on unprotected private lands although 3 of the 7 largest populations are on state land (Denman WMA), protected private land (TNC) and federal land (Bureau of Land Management). Some of the other populations occur on the rights-of-way of state highways and may have limited protection. Gold mining operations threaten some 600 plants on BLM land. Mining activities could result in direct habitat loss, or could alter hydrologic regimes upon which the species depends.

Due to the extremely limited range of this plant, all populations should be protected by public agencies whenever possible. No mechanical disturbance should be permitted within the populations. Although accidental environmental manipulation of the mound-vernal pool topography has resulted in some man-made, albeit fortuitous, habitat, it is not recommended that land managers attempt this. To determine presence or absence of Cook's lomatium, proposed projects in the Illinois Valley and Agate Desert should include properly timed field surveys conducted by knowledgeable botanists. Based on a policy of avoidance, we expect no adverse impacts to Cook's lomatium from activities associated with the Corps permit program.

**Kincaid's lupine** – Over 99 percent of the native prairie in the Willamette Valley, the only known habitat area of Kincaid's lupine, has been lost (E. Alverson pers. comm. 1994). Habitat at remaining sites containing Kincaid's lupine is rapidly disappearing due to agriculture practices, development activities, forestry practices, grazing, roadside maintenance, and commercial Christmas tree farms. Permit-related activities that may negatively impact Kincaid's lupine include road development/maintenance and utility projects. Impacts should be avoided by identifying Kincaid's lupine sites and modifying projects to avoid these sites. To determine presence or absence of Kincaid's lupine, proposed projects in the Willamette Valley should include properly timed field surveys conducted by knowledgeable botanists. Based on a policy of avoidance, we expect no adverse impacts to Kincaid's lupine from activities associated with the Corps permit program.

**MacFarlane's Four-o'clock** – This species is vulnerable to trampling due to increased recreational use of a hiking trail (along the Snake River in OR); collection of plants; grazing pressure (cattle trampling resulting in soil erosion); inhibitory effects on seed germination, growth and development by exotic plants (cheatgrass); fungal disease (two species of fungi); ovary predation by a lepidopteran; and damage by spittle bugs. This species occurs in remote areas on steep slopes, making it unlikely that it will be impacted by permit-related activities. There is some potential for damage from road building/maintenance and utility activities. Prior to permitting, properly timed surveys should be conducted by competent botanists for any proposed projects involving slopes greater than 40% in Wallowa County.

**Rough Popcornflower** - The rough popcornflower is highly threatened by development, ditching, road building and maintenance, grazing, and competition with non-native weeds. One population actually occurs within the town of Sutherlin, on a vacant lot surrounded by residential areas. Another population occurs along the shoulder of Interstate 5, at the Sutherlin exit. The third population is transversed by a series of drainage ditches, with seasonal pool areas leveled with fill dirt, which has introduced non-native weeds to the site. The fourth site has a history of sheep grazing, and is presently grazed by cattle (Gamon and Kagan 1985). Activities which may be authorized through the Corps permit program could negatively impact the rough popcornflower include road development/maintenance, utility projects, wetland fills, and water control projects. All populations for this species should be protected; no activity that might affect water drainage patterns in or around the populations should be allowed. Prior to permitting, properly timed surveys should be conducted by competent botanists for any proposed projects in the Umpqua Valley of Douglas County. Based on a policy of avoidance, we expect no adverse impacts to the rough popcornflower from activities authorized through the Corps permit program.

**Nelson's checkermallow** - Nelson's checkermallow occurs in open areas in the Coast Range and Willamette Valley. The largest remaining populations appear to be located in larger open meadows and other openings in or near the Coast Range. These relatively lower lying wet areas are also attractive for the placement of small dams and other water diversions that can destroy habitat for Nelson's checkermallow. Stream channel alterations, such as straightening, splash dams, and rip-rapping cause accelerated drainage and reduce the amount of water that is diverted naturally into adjacent meadow areas. As a result, areas that would support Nelson's checkermallow are lost. Current threats to this species include plowing, deposition of fill material or yard debris, and intensive roadside management. Permit-related activities that may negatively impact Nelson's checkermallow include water control projects, wetland fills, road construction/maintenance, utility projects, and erosion control projects. Due to this species rarity and its extremely limited habitat, all impacts should be avoided. Careful plant surveys, appropriately timed and conducted by competent botanists,should be conducted in the north Coast Range area before any mechanical disturbance to the soil is allowed. Based on a policy of avoidance, we expect no adverse impacts to Nelson's checkermallow from activities associated with the Corps permit program.

**Malheur wire-lettuce** – Malheur wire-lettuce occurs at only one site that receives some protection from the Burns District of the Bureau of Land Management. This species is threatened by competition from cheatgrass, mining (claims dot the surrounding area) and grazing from small herbivores. Any permit-related activities that would mechanically alter this site would have negative impacts on the species, but all such impacts should be entirely avoidable. It is not likely that any permit projects would occur near this dry hilltop site.

**Howell's spectacular thelypody** - Threats to this species include: 1) habitat loss due to modification or loss to urban and agricultural development; 2) habitat degradation due to livestock grazing and hydrological modification; 3) consumption by livestock; 4) use of herbicides or mowing during the growing season; and 5) competition with exotic species such as *Dipsacus sylvestris* (teasel), *Cirsium vulgare* (bull thistle), *C. canadensis* (Canada thistle), and *Melilotus officinalis* (yellow sweet clover).

Permit-related activities that may impact Howell's spectacular thelypody include road construction/maintenance activities, utility projects, and erosion and water control projects. Because of its extreme rarity and endangerment, all Howell's spectacular thelypody populations should be protected. No activities that would change hydrologic patterns within or near the populations should be allowed. Prior to permitting, properly timed surveys should be conducted by competent botanists for any proposed projects in the Powder River Valley of Baker and Union Counties. Based on a policy of avoidance, we expect no adverse impacts to Howell's spectacular thelepody from activities authorized through the Corps permit program.

Table 4a - Sensitive Plant Species - Anticipated Effects of Permitted Activities

| | McDonald's rock-cress | Applegate's milk-vetch | Golden indian-paintbrush | Willamette daisy | Gentner's fritillaria | Howellia |
|---|---|---|---|---|---|---|
| **Activity** | | | | | | |
| Erosion Control Activities | 2 | 2 | 1 | 2 | 1 | 1 |
| Water Control Activities | 2 | 2 | 1 | 2 | 1 | 1 |
| Utility Lines | 2 | 2 | 1 | 2 | 2 | 1 |
| | | | | | | |
| Road Construction, Repairs and Improvements | 2 | 2 | 1 | 2 | 2 | 1 |
| Site Preparation | 1 | 2 | 1 | 2 | 1 | 1 |
| | | | | | | |
| Stream and Wetland Restoration & Enhancement | 1 | 2 | 1 | 2 | 1 | 1 |
| Boat Ramps | 1 | 1 | 1 | 1 | 1 | 1 |
| Other Minor Discharges | 1 | 2 | 1 | 2 | 1 | 1 |
| | | | | | | |
| Installation and Repair of Navigational Aids | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | |
| Maintenance of Existing Structures and Marinas | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | |
| Installation of Small Temporary Floats | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | |
| Structures in Fleeting and Anchorage Areas | 1 | 1 | 1 | 1 | 1 | 1 |
| Maintenance Dredging | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | |
| Return Water from Upland Contained Disposal Areas | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | |
| Fish and Wildlife Harvest, Attraction Devices & Activities | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | |
| *Legend:* | | | | | | |
| *1 = No effect* | | | | | | |
| *2 = May affect but is not likely to adversely affect species or critical habitat* | | | | | | |
| *3 = May affect and is likely to adversely affect species or critical habitat* | | | | | | |

Table 4b - Sensitive Plant Species - Anticipated Effects of Permitted Activities

| | Western lily | Big-flowered wooly meadowfoam | Bradshaw's lomatium | Cook's lomatium | Kincaid's lupine | Macfarlane's four-o-clock |
|---|---|---|---|---|---|---|
| **Activity** | | | | | | |
| Erosion Control Activities | 2 | 2 | 2 | 2 | 1 | 2 |
| Water Control Activities | 2 | 2 | 2 | 2 | 1 | 1 |
| Utility Lines | 2 | 2 | 2 | 2 | 2 | 2 |
| | | | | | | |
| Road Construction, Repairs and Improvements | 2 | 2 | 2 | 2 | 2 | 2 |
| Site Preparation | 2 | 2 | 2 | 2 | 1 | 1 |
| | | | | | | |
| Stream and Wetland Restoration & Enhancement | 2 | 2 | 2 | 2 | 1 | 1 |
| Boat Ramps | 1 | 1 | 1 | 1 | 1 | 1 |
| Other Minor Discharges | 2 | 2 | 2 | 2 | 1 | 1 |
| | | | | | | |
| Installation and Repair of Navigational Aids | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | |
| Maintenance of Existing Structures and Marinas | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | |
| Installation of Small Temporary Floats | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | |
| Structures in Fleeting and Anchorage Areas | 1 | 1 | 1 | 1 | 1 | 1 |
| Maintenance Dredging | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | |
| Return Water from Upland Contained Disposal Areas | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | |
| Fish and Wildlife Harvest, Attraction Devices & Activitie | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | |
| *Legend:* | | | | | | |
| *1 = No effect* | | | | | | |
| *2 = May affect but is not likely to adversely affect species or critical habitat* | | | | | | |
| *3 = May affect and is likely to adversely affect species or critical habitat* | | | | | | |

Table 4c - Sensitive Plant Species - Anticipated Effects of Permitted Activities

| | Rough popcorn flower | Nelson's checkermallow | Malheur wire-lettuce | Howell's spectalular thelypody |
|---|---|---|---|---|
| **Activity** | | | | |
| Erosion Control Activities | 2 | 2 | 1 | 2 |
| Water Control Activities | 2 | 2 | 1 | 2 |
| Utility Lines | 2 | 2 | 2 | 2 |
| | | | | |
| Road Construction, Repairs and Improvements | 2 | 2 | 2 | 2 |
| Site Preparation | 2 | 2 | 1 | 2 |
| | | | | |
| Stream and Wetland Restoration & Enhancement | 2 | 2 | 1 | 2 |
| Boat Ramps | 1 | 1 | 1 | 1 |
| Other Minor Discharges | 2 | 2 | 1 | 2 |
| | | | | |
| Installation and Repair of Navigational Aids | 1 | 1 | 1 | 1 |
| | | | | |
| Maintenance of Existing Structures and Marinas | 1 | 1 | 1 | 1 |
| | | | | |
| Installation of Small Temporary Floats | 1 | 1 | 1 | 1 |
| | | | | |
| Structures in Fleeting and Anchorage Areas | 1 | 1 | 1 | 1 |
| Maintenance Dredging | 1 | 1 | 1 | 1 |
| | | | | |
| Return Water from Upland Contained Disposal Areas | 1 | 1 | 1 | 1 |
| | | | | |
| Fish and Wildlife Harvest, Attraction Devices & Activities | 1 | 1 | 1 | 1 |
| | | | | |
| *Legend:* | | | | |
| *1 = No effect* | | | | |
| *2 = May affect but is not likely to adversely affect species or critical habitat* | | | | |
| *3 = May affect and is likely to adversely affect species or critical habitat* | | | | |

**Invertebrates** (See Table 5 for a summary of effects determinations)

**Vernal pool fairy shrimp -** In the Rogue Valley, urban development, transportation projects, cattle grazing and municipal waste discharge (D. Borgias pers. comm. 1997) threaten the vernal pool ecosystems and the unique species they support. Any activities that alter the hydrology of the vernal pools will have negative impacts on the fairy shrimp. Permit activities that may negatively impact the species include road construction/maintenance, wetland fills, wetland enhancement, and utility projects. Since eggs can remain dormant for extended periods, all vernal pool wetlands need to be considered potential fairy shrimp habitat, whether they contain water or not. Based on a policy of avoidance, we expect no adverse impacts to the vernal pool fairy shrimp from activities authorized through the Corps permit program.

**Fender's blue butterfly -** The Fender's blue butterfly is limited in range to upland prairie remnants in western Oregon. Current estimates indicate that less than 400 ha. (1,000 acres) of native upland prairie remain in the Willamette Valley, only one-tenth of 1 percent of the original upland prairie once available to the Fender's blue butterfly. The immediate threat of habitat loss has been well documented. Habitat in western Polk County is rapidly disappearing due to housing and tree farm development (Hammond 1996). Between 1990 and 1992, three occurrences of both the Fender's blue butterfly and Kincaid's lupine were lost to the expansion of Christmas tree farming operations (Hammond 1996). Conversion of these three sites destroyed approximately 3 hectares (7 acres) of private and roadside habitat that comprised the nucleus of two Fender's blue butterfly populations. The two roadside occurrences of the butterfly that remain nearby are no longer considered viable due to the loss of the source butterfly populations and host plants. Urban development, agriculture, and tree farm cultivation have removed habitat from several additional populations since 1992, causing the butterflies to be extirpated or reduced to very low numbers. Housing development is also planned for the Dallas site in Polk County (Hammond 1996).

Fender's blue butterfly populations are additionally threatened by virtue of their small size. Over half of the sites occupied by these butterflies are parcels of 3 hectares (7.4 acres) or less. These occurrences, predominantly roadsides and fence line/boundary sites, face an immediate threat of destruction through development, agriculture, roadside maintenance and herbicide application. Of the 21 sites, only three are considered secure, and two of these are facing management problems. Even without habitat destruction, such extremely small population fragments would be subject to the adverse effects of low genetic variability, as well as extirpation due to stochastic events.

With the exception of the Willow Creek site, Fender's blue butterflies are not associated with wetland habitats. Therefore, negative impacts from permitted projects should be incidental and entirely avoidable. Road improvement, utility, and erosion control projects need to avoid known populations. Based on a policy of avoidance, we expect no adverse impacts to the Fender's blue butterfly from activities associated with the Corps permit program.

**Oregon silverspot butterfly -** Oregon silverspot butterflies are not associated with wetland habitats. Therefore, negative impacts from permitted projects should be incidental and entirely avoidable. Road improvement, utility, and erosion control projects need to avoid known silverspot populations.

Table 5 - Sensitive Invertebrate Species - Anticipated Effects of Permitted Activities

| Activity | Vernal pool fairy shrimp | Fender's blue butterfly | Oregon silverspot butterfly | |
|---|---|---|---|---|
| Erosion Control Activities | 1 | 2 | 2 | |
| Water Control Activities | 1 | 1 | 1 | |
| Utility Lines | 2 | 2 | 2 | |
| Road Construction, Repairs and Improvements | 2 | 2 | 2 | |
| Site Preparation | 2 | 1 | 1 | |
| Stream and Wetland Restoration & Enhancement | 1 | 1 | 1 | |
| Boat Ramps | 1 | 1 | 1 | |
| Other Minor Discharges | 2 | 1 | 1 | |
| Installation and Repair of Navigational Aids | 1 | 1 | 1 | |
| Maintenance of Existing Structures and Marinas | 1 | 1 | 1 | |
| Installation of Small Temporary Floats | 1 | 1 | 1 | |
| Structures in Fleeting and Anchorage Areas | 1 | 1 | 1 | |
| Maintenance Dredging | 1 | 1 | 1 | |
| Return Water from Upland Contained Disposal Areas | 1 | 1 | 1 | |
| Fish and Wildlife Harvest, Attraction Devices & Activities | 1 | 1 | 1 | |
| *Legend:* | | | | |
| *1 = No effect* | | | | |
| *2 = May affect but is not likely to adversely affect species or critical habitat* | | | | |
| *3 = May affect and is likely to adversely affect species or critical habitat* | | | | |

**<u>Fish</u>** (see Table 6a and 6b for a summary of effects determinations)

**Warner sucker** - The major threats to the continued existence of the Warner Sucker are human induced stream channel and watershed degradation, irrigation diversion practices and predation and competition from introduced fishes. Cattle grazing is ubiquitous throughout the interior basins of Oregon, and has had profound impacts on the streams in the Warner Valley (White *et al.* 1991). Not only do cattle trample streamside vegetation, destroy undercut banks and increase erosion in spawning streams, but their cumulative impacts often result in the dropping of water tables. This can cause disruptions in the flood process, nutrient inflow, peak and dry season flows and their velocities, and has resulted in stream downcutting in many areas within the range of the Warner Sucker.

Water diversion structures (which first appeared in the Warner Valley in the 1930's) can block upstream migration to spawning grounds and divert water and fish of all ages into fields and adjacent uplands where they are destined to perish. Diversion screening has been attempted by ODFW, but no screens have remained in place due to maintenance problems (USDI 1997b). Over a series of drought years, reduced flows can cause drops in lake levels and sometimes, especially in conjunction with lake pumping for irrigation, cause complete dry-ups, as was the case with Hart Lake in 1992.

The introduction of exotic piscivorous fishes disrupted this balance and the native ichthyofauna has suffered. In the early 1970s, ODFW stocked white crappie (*Pomoxis annularis*), black crappie (*P. nigromaculatus)*, and largemouth bass (*Micropterus salmoides*), in Crump and Hart Lakes. Prior to this, brown bullhead (*Ameiurus nebulosus*) and non-native rainbow trout were introduced into the Warner Valley. The adults of all five species feed on small fishes to varying degrees (Wydoski and Whitney 1979), while the larvae of the crappie and bullhead compete directly with young suckers for food.

Permitted activities that involve in-channel work could result in direct take of individual fish or larvae. Temporary increases in turbidity associated with projects could interfere with the species' foraging or spawning behavior. Spilling of small amounts of toxins into the water can result in take of individual fish or larvae. Temporary water diversions made at the wrong time of year could interfere with the suckers' migration patterns. Projects altering bank structure, or removing aquatic vegetation, overhanging vegetation or coarse woody debris can make habitat unsuitable. Within critical habitat, no additional water diversion structures should be allowed. Restoration of access to favorable spawning habitat is the only effort likely to restore a naturally sustainable population of this species.

**Shortnose sucker** - Construction of dams, instream diversion structures, irrigation canals, and the general development of the U. S. Bureau of Reclamation's Klamath Project and related agricultural processes have fragmented the historical range of the shortnose sucker. The Sprague River Dam in particular appears to prevent spawning migration. Habitat fragmentation limits or prevents genetic interchange among populations, thus extinction could result as genetic diversity decreases and populations become more susceptible to environmental change. The combined effects of damming of rivers, instream flow diversions, draining of marshes, dredging of Upper Klamath lake, and other water manipulations have threatened the species with extinction (USDI 1988b). Additionally, water quality degradation in the Upper Klamath Lake watershed has led to large-scale fish kills related to algal bloom cycles in the lake (Kann and Smith 1993). Introduced exotic fishes may reduce recruitment through competition with, or predation upon, suckers (USDI 1993e, Dunsmoor 1993).

Projects that involve in-channel work could result in direct take of individual suckers. Further, temporary increases in turbidity associated with projects could interfere with the species' foraging or spawning behavior. Any temporary water diversions, if made at an inappropriate time of year, could interfere with the species' migration patterns. Spilling of small amounts of toxins into the water can result in take of individual fish or larvae. Removal of shoreline vegetation can make habitat unsuitable. Restoration of access to favorable spawning habitat is the only effort likely to restore a naturally sustainable population of this species.

**Lost River sucker -** Construction of dams, instream diversion structures, irrigation canals, and the general development of the U. S. Bureau of Reclamation's Klamath Project and related agricultural processes have fragmented the historical range of the Lost River sucker. Specifically, spawning runs into rivers are often blocked by dams. Habitat fragmentation limits or prevents genetic interchange among populations, thus extinction could result as genetic diversity decreases and populations become more susceptible to environmental change. The combined effects of damming of rivers, instream flow diversions, draining of marshes, dredging of Upper Klamath lake, and other water manipulations has threatened this species with extinction (USDI 1988b). Additionally, water quality degradation in the Upper Klamath Lake watershed has led to large-scale fish kills related to algal bloom cycles in the lake (Kann and Smith 1993). Introduced exotic fishes may reduce recruitment through competition with, or predation upon, suckers (USDI 1993e, Dunsmoor 1993).

Projects that involve in-channel work could result in direct take of individual suckers. Further, temporary increases in turbidity associated with projects could interfere with the species' foraging or spawning behavior. Any temporary water diversions, if made at an inappropriate time of year, could interfere with the species' migration patterns. Restoration of access to favorable spawning habitat is the only effort likely to restore a naturally sustainable population of this species.

**Hutton tui chub -** Hutton Spring is privately owned and the habitat is in good condition primarily due to conscientious, long-term land stewardship by the landowner. This habitat is currently fenced from cattle use and is in stable condition (USDI 1997b).

Hutton Spring is about 2 miles north of a metallurgical waste disposal site and a chemical waste disposal site. Wastes from the metallurgical dump were removed and the site cleaned. The chemical contamination is mainly herbicides. After an unsuccessful attempt in 1976 to have the private company responsible for the wastes clean the site, the state subsequently purchased the land (10. 3 acres) when it was declared unsafe. A plume of contamination has migrated about 600 m (2000 feet) west-northwest and has reached West Alkali Lake. The state bought an additional 400 acres to monitor movement of the plume and the Oregon Department of Environmental Quality has assessed the area and reported that the catastrophic spread of contamination into surrounding springs appeared to be extremely remote (USDI 1997b).

Given the extremely limited range of this species, permitted activities are extremely unlikely to impact the Hutton tui chub. Based on a policy of avoidance, we expect no adverse impacts to the Hutton tui chub from activities associated with the Corps permit program.

**Borax Lake chub** - Water diversions for agricultural purposes have, in the past, been a danger to this species, but the 1993 purchase of the lake by The Nature Conservancy has put an end to that threat. Future geothermal energy exploration could threaten the species. Heavy recreational uses are also considered a threat to the species. Since all critical habitat is protected, this species should not be impacted by activities related to the Corps permit program.

**Lahontan cutthroat trout** - The severe decline in range and numbers of Lahontan cutthroat is attributed to a number of factors, including hybridization and competition with introduced trout species; loss of spawning habitat due to pollution from logging, mining, and urbanization; blockage of streams due to dams; channelization; de-watering due to irrigation and urban demands; and watershed degradation due to overgrazing of domestic livestock (Gerstung 1986; Coffin 1988; Wydoski 1978). Declining Lahontan cutthroat populations in the Whitehorse and Trout Creek Mountains are a result of decades of season-long intensive livestock grazing, recreational over-fishing, and more recently drought conditions from 1985 to 1994. Riparian fencing & removal of cows from the area, as well as a good water year in 1992 has stabilized populations in Willow/Whitehorse creeks.

Permit-related projects that involve in-channel work could result in direct take of individual fish. Further, temporary increases in turbidity associated with projects could interfere with the species' foraging or spawning behavior. Projects altering stream structure (pool/riffle ratio) could prove deleterious to Lahontan cutthroat. Spilling of small amounts of toxins into the water could result in take of individual fish or larvae. Gravel removal beyond that which is seasonally replaced can render streams unsuitable for spawning.

**Sea-run cutthroat trout** – Permit-related projects that involve in-channel work could result in direct take of individual fish or larvae. Temporary increases in turbidity associated with projects could interfere with the species' foraging or spawning behavior. Projects altering stream structure (pool/riffle ratio) could prove deleterious and make habitat unsuitable. Tree/overhanging vegetation removal resulting in increased temperature can reduce productivity. Spilling of small amounts of toxins into the water can result in take of individual fish or larvae. Temporary water diversions made at the wrong time of year could interfere with migration patterns. Removal of aquatic vegetation or coarse woody debris can make habitat unsuitable. Gravel removal beyond that which is seasonally replaced can render streams unsuitable for spawning.

**Chum salmon** - Since chum spend a relatively short period in freshwater, survival and growth are less dependent on freshwater conditions than on estuarine and marine conditions. Potential impacts from activities related to the Corps permit program should be minimal if work can be done while chum are not occupying streams. Permit-related projects that involve in-channel work could result in direct take of individual fish or larvae. Projects altering stream structure (pool/riffle ratio), or causing a long-term increase in turbidity could prove deleterious and make habitat unsuitable. Tree/overhanging vegetation removal resulting in increased temperature can reduce productivity. Spilling of small amounts of toxins into the water can result in take of individual fish or larvae. Temporary water diversions made at the wrong time of year could interfere with migration patterns. Removal of aquatic vegetation or coarse woody debris can make habitat unsuitable. Gravel removal beyond that which is seasonally replaced can render streams unsuitable for spawning.

**Coho salmon** – Permit-related projects that involve in-channel work could result in direct take of individual fish or larvae. Temporary increases in turbidity associated with projects could interfere with the species' foraging or spawning behavior. Projects altering stream structure (pool/riffle ratio) could prove deleterious and make habitat unsuitable. Tree/overhanging vegetation removal resulting in increased temperature can reduce productivity. Spilling of small amounts of toxins into the water can result in take of individual fish or larvae. Temporary water diversions made at the wrong time of year could interfere with migration patterns. Removal of aquatic vegetation or coarse woody debris can make habitat unsuitable. Gravel removal beyond that which is seasonally replaced can render streams unsuitable for spawning.

**Steelhead trout** – Permit-related projects that involve in-channel work could result in direct take of individual fish or larvae. Temporary increases in turbidity associated with projects could interfere with the species' foraging or spawning behavior. Projects altering stream structure (pool/riffle ratio) could prove deleterious and make habitat unsuitable. Tree/overhanging vegetation removal resulting in increased temperature can reduce productivity. Spilling of small amounts of toxins into the water can result in take of individual fish or larvae. Temporary water diversions made at the wrong time of year could interfere with migration patterns. Removal of aquatic vegetation or coarse woody debris can make habitat unsuitable. Gravel removal beyond that which is seasonally replaced can render streams unsuitable for spawning.

**Chinook salmon** – Permit-related projects that involve in-channel work could result in direct take of individual fish or larvae. Temporary increases in turbidity associated with projects could interfere with the species' foraging or spawning behavior. Projects altering stream structure (pool/riffle ratio) could prove deleterious and make habitat unsuitable. Tree/overhanging vegetation removal resulting in increased temperature can reduce productivity. Spilling of small amounts of toxins into the water can result in take of individual fish or larvae. Temporary water diversions made at the wrong time of year could interfere with migration patterns. Removal of aquatic vegetation or coarse woody debris can make habitat unsuitable. Gravel removal beyond that which is seasonally replaced can render streams unsuitable for spawning.

**Oregon chub** – The Oregon chub's backwater habitats have disappeared in recent years due to changes in seasonal flows resulting from the construction of dams throughout the basin, channelization of the Willamette River and its tributaries, removal of snags for river navigation, and agricultural practices. Populations have been isolated and are threatened by the presence of non-native fish. Many of the known extant populations of Oregon chub occur near rail, highway, and power transmission corridors and within public park and campground facilities. These populations are threatened by chemical spills from overturned truck or rail tankers; runoff or accidental spills of brush control chemicals; overflow from chemical toilets in campgrounds; siltation of shallow habitats from logging and construction activities; and changes in water level or flow conditions from construction, diversions, or natural desiccation.

Permit-related projects that involve in-channel work could result in direct take of individual fish or larvae. Temporary increases in turbidity associated with projects could interfere with the species' foraging or spawning behavior. Spilling of small amounts of toxins into the water can result in take of individual fish or larvae. Removal of aquatic vegetation or coarse woody debris can make habitat unsuitable. Activities that change the hydrology of these backwater habitats can have negative impacts on the Oregon chub.

**Foskett speckled dace -** Foskett and Dace Springs occur on public land and are managed by Lakeview BLM. This habitat is currently fenced from cattle use and is in stable condition (USDI 1997b). Minor mechanical manipulations of the springs such as channelization or further diversions of the spring for cattle watering could lead to loss of habitat (USDI 1997e). No permitted activities should occur at these sites, thus there should be no permit-related affects.

**Bull Trout -** The decline of the bull trout is primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, and the introduction of non-native species (USDI 1998c).

Projects that involve in-channel work could result in direct take of individual bull trout. Further, temporary increases in turbidity associated with projects could interfere with the species' foraging or spawning behavior. Any temporary water diversions associated with projects, if made at an inappropriate time of year, could interfere with the bull trout's migration patterns. Gravel removal or disturbance should not be allowed at any time in spawning areas. Removal of riparian vegetation can cause increases in stream temperature and increased sedimentation, which will reduce bull trout recruitment. Structural modification to bull trout streams should not be allowed.

Table 6a - Sensitive Fish Species - Anticipated Effects of Permitted Activities

| | Warner Sucker | Shortnose Sucker | Lost River Sucker | Hutton tui chub | Borax Lake chub | Lahontan cutthroat trout | Sea-run cutthroat trout |
|---|---|---|---|---|---|---|---|
| **Activity** | | | | | | | |
| Erosion Control Activities | 3 | 3 | 3 | 1 | 1 | 3 | 3 |
| Water Control Activities | 3 | 3 | 3 | 2 | 1 | 3 | 3 |
| Utility Lines | 3 | 3 | 3 | 2 | 2 | 3 | 3 |
| | | | | | | | |
| Road Construction, Repairs and Improvements | 3 | 3 | 3 | 2 | 1 | 3 | 3 |
| Site Preparation | 2 | 2 | 2 | 1 | 1 | 3 | 3 |
| | | | | | | | |
| Stream and Wetland Restoration & Enhancement | 2 | 2 | 2 | 1 | 1 | 2 | 2 |
| Boat Ramps | 3 | 3 | 3 | 1 | 1 | 3 | 3 |
| Other Minor Discharges | 2 | 2 | 2 | 2 | 1 | 3 | 3 |
| | | | | | | | |
| Installation and Repair of Navigational Aids | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| | | | | | | | |
| Maintenance of Existing Structures and Marinas | 1 | 2 | 2 | 1 | 1 | 1 | 2 |
| | | | | | | | |
| Installation of Small Temporary Floats | 1 | 2 | 2 | 1 | 1 | 1 | 2 |
| | | | | | | | |
| Structures in Fleeting and Anchorage Areas | 1 | 2 | 2 | 1 | 1 | 1 | 2 |
| Maintenance Dredging | 1 | 2 | 2 | 1 | 1 | 1 | 2 |
| | | | | | | | |
| Return Water from Upland Contained Disposal Areas | 1 | 2 | 2 | 1 | 1 | 1 | 2 |
| | | | | | | | |
| Fish and Wildlife Harvest, Attraction Devices & Activitie | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | | |
| *Legend:* | | | | | | | |
| *1 = No effect* | | | | | | | |
| *2 = May affect but is not likely to adversely affect species or critical habitat* | | | | | | | |
| *3 = May affect and is likely to adversely affect species or critical habitat* | | | | | | | |

Table 6b - Sensitive Fish Species - Anticipated Effects of Permitted Activities

| | Chum salmon | Coho salmon | Steelhead trout | Chinook salmon | Oregon chub | Foskett speckled dace | Bull trout |
|---|---|---|---|---|---|---|---|
| **Activity** | | | | | | | |
| Erosion Control Activities | 2 | 3 | 3 | 3 | 3 | 1 | 3 |
| Water Control Activities | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| Utility Lines | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| | | | | | | | |
| Road Construction, Repairs and Improvements | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| Site Preparation | 2 | 3 | 3 | 3 | 3 | 1 | 2 |
| | | | | | | | |
| Stream and Wetland Restoration & Enhancement | 2 | 2 | 2 | 2 | 2 | 1 | 2 |
| Boat Ramps | 2 | 3 | 3 | 3 | 3 | 1 | 3 |
| Other Minor Discharges | 2 | 3 | 3 | 3 | 3 | 1 | 2 |
| | | | | | | | |
| Installation and Repair of Navigational Aids | 2 | 2 | 2 | 2 | 2 | 1 | 2 |
| | | | | | | | |
| Maintenance of Existing Structures and Marinas | 2 | 2 | 2 | 2 | 2 | 1 | 2 |
| | | | | | | | |
| Installation of Small Temporary Floats | 2 | 2 | 2 | 2 | 2 | 1 | 2 |
| | | | | | | | |
| Structures in Fleeting and Anchorage Areas | 2 | 2 | 2 | 2 | 2 | 1 | 2 |
| Maintenance Dredging | 2 | 2 | 2 | 2 | 2 | 1 | 2 |
| | | | | | | | |
| Return Water from Upland Contained Disposal Areas | 2 | 2 | 2 | 2 | 2 | 1 | 2 |
| | | | | | | | |
| Fish and Wildlife Harvest, Attraction Devices & Activities | 2 | 2 | 2 | 2 | 2 | 1 | 2 |
| | | | | | | | |
| *Legend:* | | | | | | | |
| *1 = No effect* | | | | | | | |
| *2 = May affect but is not likely to adversely affect species or critical habitat* | | | | | | | |
| *3 = May affect and is likely to adversely affect species or critical habitat* | | | | | | | |

**Amphibians** (see Table 7 for a summary of effects determinations)

**Columbia spotted frog -** Threats to Columbia spotted frogs include livestock grazing, habitat fragmentation and loss, degraded water quality, and predation by nonnative species. Mismanagement of grazing livestock may result in the removal of cover vegetation, degradation of water quality, breakdown of bank overhangs, rechanneling of water and desiccation of meadows and ponds. A 1994 spotted frog survey in southeastern Oregon found spotted frogs only in a stream protected by a cattle exclosure. Other reports indicate that responsible grazing practices may, in some cases, maintain suitable spotted frog habitat by controlling some aquatic plants (Bull and Hayes, pers. com, 1998). Spotted frog habitat may be lost or fragmented by spring development, wetland loss, road construction, and a reduction in beaver populations. Degradation of water quality as a result of seepage through from mine spoils can reduce/eliminate Columbia spotted frog populations. Predation by nonnative species is a serious threat to Columbia spotted frog populations. Both bullfrogs and non-native salmonid and bass species occur in the Great Basin and are suspected predators of the spotted frog. The bullfrog may also compete for breeding sites, or interrupt spotted frog courtship (Hayes, pers. comm., 1998).

Activities that cause small meadows and ponds to dry up will adversely affect Columbia spotted frogs. Small amounts of toxins spilled into wetland habitat can result in take of individual frogs, eggs, or larvae. Temporary water diversion, if done in the spring or summer can result in take of larvae or eggs. Work in wetlands used by Columbia spotted frogs for breeding has the potential to destroy egg masses, especially at the edges of the wetland.

**Oregon spotted frog -** The Oregon spotted frog faces threats to its warm water marsh habitat from development, changes in hydrology and water quality, introduced predators, and overgrazing. Although moderate livestock grazing in some instances benefits the spotted frog by maintaining openings in the vegetation, overgrazing can adversely affect the habitat causing severe hydrologic modification.

Adverse affects from hydrologic changes are a significant threat to the Oregon spotted frog. Modification of river hydrology from the series of dams in the Willamette Valley and the Puget Trough has significantly reduced the amount of shallow overflow wetland habitat historically used by the spotted frog. In the Cascades, reservoirs have inundated large marsh complexes and fragmented remaining marshes, thereby reducing the survival of the Oregon spotted frog in these areas. Rangewide, over 50 percent of the extant Oregon spotted frog sites face threats from changes in hydrology.

Predation by exotic species such as warm water fishes and bullfrogs (*Rana catesbeiana*) adversely affect the Oregon spotted frog. The spotted frog requires warm water habitat, which is also habitat for a number of introduced fish. During recent surveys in Oregon, at least one exotic predator occupied 17 of 19 sites where spotted frogs were found (Hayes 1997). Brook trout was the most frequently recorded exotic aquatic predator, occurring at 16 of the sites. These introduced fish prey on the tadpoles of native amphibians. The Oregon spotted frog did not evolve with these fish and does not have mechanisms to deter their predation. Evidence that exotic fish adversely affect the Oregon spotted frog comes from 1) demographic data that show sites that contain a disproportionate ratio of older spotted frogs to juvenile frogs (i.e., poor recruitment) also have significant numbers of brook trout; and 2) results of studies on other native amphibians that show lower densities of larvae or egg masses in areas containing high densities of fish (Tyler *et al.* 1996). The invasion of such exotic plants as reed canary grass may eliminate areas of suitable breeding habitat for the Oregon spotted frog by creating such dense vegetation that the frogs cannot gain access for breeding. Drought causes seasonal loss of habitat and degradation of essential shoreline vegetation and is considered a threat to the species. During extended droughts, spotted frogs are more vulnerable to predation as a result of reduced cover. Further, reduced water levels confine the frogs to smaller areas where they are more vulnerable to predators such as introduced fish.

The majority of the Oregon spotted frog populations are small, which makes them vulnerable to temporary changes in habitat or stochastic events such as drought and disease. Only 5 of 21 populations are considered large (greater than 1,000 individuals). Six populations contain fewer than 100 individuals. One site (Jack Creek, Klamath Co.) contains a relatively large number of larvae and juveniles, but very few adult frogs. There appears to be either a lack of adult survivorship or a lack of recruitment after the juvenile stage. Poor recruitment could lead to the loss of this site. Two of the five large sites face imminent threats from either brook trout predation or habitat degradation.

Permit-related activities that alter hydrology of existing Oregon spotted frog wetlands can have a negative impact on the species. Even temporary alterations may affect reproductive success or overwintering frogs. In-water work, especially at the edges of wetlands can disturb egg masses. Reduced water levels can cause increased predation and competition. Spilling of small amounts of toxins into spotted frog habitat can result in take.

Table 7 - Sensitive Amphibian Species - Anticipated Effects of permitted Activities

| Activity | Columbia Spotted Frog | Oregon Spotted Frog | | |
|---|---|---|---|---|
| Erosion Control Activities | 3 | 3 | | |
| Water Control Activities | 3 | 3 | | |
| Utility Lines | 3 | 3 | | |
| | | | | |
| Road Construction, Repairs and Improvements | 3 | 3 | | |
| Site Preparation | 3 | 3 | | |
| | | | | |
| Stream and Wetland Restoration & Enhancement | 2 | 2 | | |
| Boat Ramps | 3 | 3 | | |
| Other Minor Discharges | 3 | 3 | | |
| | | | | |
| Installation and Repair of Navigational Aids | 1 | 1 | | |
| | | | | |
| Maintenance of Existing Structures and Marinas | 1 | 1 | | |
| | | | | |
| Installation of Small Temporary Floats | 1 | 1 | | |
| | | | | |
| Structures in Fleeting and Anchorage Areas | 1 | 1 | | |
| Maintenance Dredging | 1 | 1 | | |
| | | | | |
| Return Water from Upland Contained Disposal Areas | 1 | 1 | | |
| | | | | |
| Fish and Wildlife Harvest, Attraction Devices & Activities | 1 | 1 | | |
| | | | | |
| *Legend:* | | | | |
| *1 = No effect* | | | | |
| *2 = May affect but is not likely to adversely affect species or critical habitat* | | | | |
| *3 = May affect and is likely to adversely affect species or critical habitat* | | | | |

**Birds** (see Table 8 for a summary of effects determinations)

**Marbled Murrelet -** The primary threat to marbled murrelet populations is loss of nesting habitat. Noise above ambient levels during breeding season could have negative impacts on the marbled murrelet. Such disturbance could be particularly harmful during the nesting season, if it caused incubating adults to flush from the nest, allowing the eggs to cool. Habitat fragmentation may further isolate murrelet populations, reducing genetic exchange, and may increase predation (Nelson and Hammer 1995). Permitting activities that may adversely impact this species road construction/maintenance and utility projects. Other activities associated with the Corps permit program may impact the murrelet indirectly by increasing ambient noise levels or increasing traffic through murrelet-occupied areas.

**Aleutian Canada goose -** Projects that alter the hydrology of coastal wetlands used by wintering Aleutian Canada geese can have a negative impact on the species by reducing foraging habitat. Aleutian Canada geese habitually use pastures for foraging. Activities that disturb these migratory/winter feeding areas can have a negative impact on the species. Noise above ambient levels may temporarily disturb feeding flocks, reducing survivorship. Aleutian Canada geese use a few well-known sites (several of which are off-shore) and adverse affects can be minimized by avoiding these important sites.

**Sage grouse** – Most permitted activities will not negatively impact sage grouse. Activities that alter springs or seasonally wet areas can have a negative impact on sage grouse by degrading brood rearing habitat. Permitted activities that may negatively impact the sage grouse include road construction/maintenance and utility projects. These projects serve to further fragment habitat.

**Western snowy plover** – Activities proposed for permitting on coastal beaches is generally limited to erosion protection and road construction or maintenance along the landward edge of the beach. These activities may affect but are not likely to adversely affect breeding or wintering coastal snowy plovers.

**Bald eagle -** Currently the primary threats to bald eagles are habitat degradation and environmental contaminants. Statewide goals set by the Pacific Bald Eagle Recovery Plan (USDI 1986) have been met. Because of the bald eagle's broad distribution throughout the state, and its affinity for riverine habitats, most permitted activities may negatively impact the species. Disturbance to bald eagles could occur from project activities that produce noise above ambient levels. Such disturbance could be particularly harmful during the nesting season, if it caused incubating adults to flush from the nest, allowing the eggs to cool. Streamside removal of existing vegetation, especially large trees, could render habitat unsuitable for bald eagles. Obviously, the vicinity of known nest trees should be avoided during the nesting season. Small amounts of toxins, spilled into water, could have a negative impact on individual eagles if the toxins cause fish kills and the eagles eat the carrion. Activities that alter the eagle's prey base could negatively impact the population.

**Brown pelican -** Disturbance to brown pelicans in their foraging or loafing areas could occur from project activities that produce noise above ambient levels, or otherwise flush the birds, thus interfering with loafing or foraging behavior.

**Northern spotted owl -** The primary threat to spotted owl populations is loss of nesting habitat. Disturbance to spotted owls could occur from project activities that produce noise above ambient levels. Such disturbance could be particularly harmful during the nesting season, if it caused incubating adults to flush from the nest, allowing the eggs to cool. Habitat fragmentation may expose owls to increased competition and predation. Permitted activities that may adversely impact this species road construction/maintenance and utility projects. Other activities associated with the Corps permit program may impact the spotted owl indirectly by increasing ambient noise levels or increasing traffic through occupied areas.

Table 8 - Sensitive Bird Species - Anticipated Effects of Permitted Activities

| Activity | Marbled Murrelet | Aleutian Canada Goose | Western Sage Grouse | Western Snowy Plover | Bald Eagle | Brown Pelican | Northern Spotted Owl |
|---|---|---|---|---|---|---|---|
| Erosion Control Activities | 2 | 2 | 2 | 1 | 2 | 1 | 2 |
| Water Control Activities | 2 | 2 | 1 | 1 | 2 | 1 | 2 |
| Utility Lines | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Road Construction, Repairs and Improvements | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Site Preparation | 1 | 2 | 3 | 1 | 2 | 1 | 1 |
| Stream and Wetland Restoration & Enhancement | 1 | 2 | 2 | 1 | 2 | 1 | 1 |
| Boat Ramps | 1 | 1 | 1 | 1 | 2 | 1 | 1 |
| Other Minor Discharges | 1 | 2 | 2 | 1 | 2 | 1 | 1 |
| Installation and Repair of Navigational Aids | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Maintenance of Existing Structures and Marinas | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Installation of Small Temporary Floats | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Structures in Fleeting and Anchorage Areas | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Maintenance Dredging | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Return Water from Upland Contained Disposal Areas | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| Fish and Wildlife Harvest, Attraction Devices & Activities | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

*Legend:*
*1 = No effect*
*2 = May affect but is not likely to adversely affect species or critical habitat*
*3 = May affect and is likely to adversely affect species or critical habitat*

**Mammals** (see Table 9 for a summary of effects determinations)

**North American lynx -** Lynx are wide ranging mammals and are not likely to suffer from the small, localized projects authorized through the Corps permit program. Any permanent alterations to the lynx's forest habitat would be detrimental to the species long-term survival, but should be entirely avoidable.

**Columbian white-tailed deer -** Brush removal is a serious threat to the Columbia River population of Columbian white-tailed deer (USDI 1983). Any projects further altering the hydrology within the range of the Columbian white-tailed deer could impact the species. The primary threats to the Douglas County populations of Columbian white-tailed deer are the subdivision and residential development of native riparian habitats and livestock development activities in lowlands (USDI 1983). Permitted activities that are likely to adversely impact the Columbia River populations include any activities that clear brush from lowland areas.

Table 9 - Sensitive Mammal Species - Anticipated Effects of Permitted Activities

| | Canada Lynx | Columbia white-tailed deer | | |
|---|---|---|---|---|
| **Activity** | | | | |
| Erosion Control Activities | 2 | 3 | | |
| Water Control Activities | 2 | 3 | | |
| Utility Lines | 2 | 3 | | |
| | | | | |
| Road Construction, Repairs and Improvements | 2 | 3 | | |
| Site Preparation | 1 | 3 | | |
| | | | | |
| Stream and Wetland Restoration & Enhancement | 2 | 2 | | |
| Boat Ramps | 1 | 3 | | |
| Other Minor Discharges | 1 | 2 | | |
| | | | | |
| Installation and Repair of Navigational Aids | 1 | 1 | | |
| | | | | |
| Maintenance of Existing Structures and Marinas | 1 | 1 | | |
| | | | | |
| Installation of Small Temporary Floats | 1 | 1 | | |
| | | | | |
| Structures in Fleeting and Anchorage Areas | 1 | 1 | | |
| Maintenance Dredging | 1 | 1 | | |
| | | | | |
| Return Water from Upland Contained Disposal Areas | 1 | 1 | | |
| | | | | |
| Fish and Wildlife Harvest, Attraction Devices & Activities | 1 | 1 | | |
| | | | | |
| *Legend:* | | | | |
| *1 = No effect* | | | | |
| *2 = May affect but is not likely to adversely affect species or critical habitat* | | | | |
| *3 = May affect and is likely to adversely affect species or critical habitat* | | | | |

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