Programmatic Formal Consultation on the U.S. Fish and Wildlife Service's Vernal Pool Conservation Strategy for Jackson County, Oregon

(FWS Reference Number 13420-2011-F-0064)

U.S. Department of the Interior
U.S. Fish and Wildlife Service
Oregon Fish and Wildlife Office
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Signature: Monty Knudsen

Date Signed: 1/26/2011

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INTRODUCTION

This Biological Opinion (Opinion) is developed pursuant to section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 U.S. C. 1531 *et seq.*)(Act) in response to requests for Intra-Service consultation from the U.S. Fish and Wildlife Service's (Service) Oregon Fish and Wildlife Office's (OFWO) Roseburg Field Office and for interagency consultation from the U.S Army Corps of Engineers (Corps). These requests for consultation focus on activities of the agencies related to conservation and development within vernal pool habitat near Jackson County, Oregon and the impacts of these activities on vernal pool complex (VPC) species listed under the Act, specifically: vernal pool fairy shrimp (*Branchinecta lynchi* (fairy shrimp or VPFS)); Cook's Lomatium (*Lomatium cookii* (Lomatium)); and large-flowered woolly meadowfoam (*Limnanthes flocossa ssp. grandiflora*) (meadowfoam)). Collectively, these species are referred to as the listed vernal pool species.

Activities of the Oregon Department of State Lands (DSL) and some private entities are also included in this Opinion by virtue of being interdependent and interrelated to the activities of the Corps and the Service, and/or being necessary components of the overall vernal pool conservation strategy for Jackson County, Oregon that will be implemented by those agencies.

This Opinion is a programmatic biological opinion: a broad suite of similar, related, and largely predictable activities and entities will be addressed in the Opinion and accompanying incidental take statement (ITS); the overall effect of these activities and associated impacts is expected to be consistent with and supportive of recovery of listed vernal pool species; and tracking of the impacts of individual projects and overall activities over time will be utilized to ensure this expectation is realized. However, the coverage afforded to specific activities by the ITS will vary, with some activities covered up-front *in toto* without project-level analysis or review, and with some activities covered only partially and requiring some additional project-level review in order to be in compliance with the Act via this Opinion.

In order to ensure that the cumulative effect of the activities and associated impacts covered in this Opinion are consistent with and supportive of recovery of listed vernal pool species, the Opinion is premised on implementation of an overall conservation strategy for vernal pool habitats and species. This strategy includes:

- Targets for vernal pool complex (VPC) habitat protection, restoration and enhancement;
- Guidance, best management practices, and performance standards for VPC and vernal pool species restoration and management;
- Prioritized use of credits available from conservation banks, mitigation banks, or equivalent conservation or mitigation projects (in conjunction with on-site best management practices and performance standards) as the most credible method to minimize the effects and significance of unavoidable impacts to listed vernal pool species that might result from otherwise lawful development activities in VPC;
- Thresholds, criteria, ratios and other factors that will determine establishment of appropriate credits and credit allocation to banks or equivalent conservation or mitigation projects, and appropriate and effective use of these credits to address the adverse impacts of development projects;

- Enabling Corps and/or DSL-approved wetland banks and credits established consistent with the above factors to also serve as species conservation banks and credits under the Act;
- Streamlined regulatory review and approval of certain conservation and development activities within VPC via use of a single suite of standards and processes by the Corps, DSL, and the Service, and programmatic permitting and compliance products by each agency, including this programmatic Opinion produced by the Service, as well as a Regional General Permit (RGP) and General Permit (GP) produced by the Corps and DSL, respectively; and
- Common expectations and reasonable certainty about the standards and requirements for engaging in VPC development and conservation activities for landowners, developers, habitat managers, and others.

Collectively, the components above represent the Service's preferred/priority conservation strategy (PCS) for listed VPC species in Jackson County, Oregon. The PCS is based on and is intended to support the Service's broader final recovery plan for vernal pool ecosystems of California and Southern Oregon (USFWS 2005). That recovery plan established specific goals, objectives and tasks to direct recovery efforts for vernal pool fairy shrimp, including the described recovery criteria and actions for the Klamath Mountains Vernal Pool Region (KMVPRA)(which covers Jackson County), tailored over time, to address more locally specific information and conditions. The criteria and actions that have been subsequently established by the Service for the KMVPRA include:

- Protection of approximately 2,000 acres of remaining and currently unprotected/unsecured VPC;
- Approximately 500 of those 2,000 acres should be protected in the form of conservation banks.
- Approximately 1,000 of the 2,000 acres should be protected in the form of conservation easements or agreements.
- Protected areas should consist of the largest, most functionally and physically intact, and highest quality VPC.
- Protected areas should be located within the historical range of the Agate-Winlo soil type.
- Enhancement of the quality and function of existing vernal pool habitat and restoration of the function of previously degraded habitat.

The PCS is also based on and is intended to support the Service's draft recovery plan for the listed species of the Rogue Valley Vernal Pool and Illinois Valley Wet Meadow Ecosystems (USFWS 2006). This draft recovery plan addresses recovery efforts for Cook's Lomatium and large-flowered woolly meadowfoam.

Projects implemented consistent with the PCS (as defined by being in compliance with this Opinion and the applicable reasonable and prudent measures and the terms and conditions of its ITS) will be prioritized and expedited for Service review, technical assistance, and regulatory

determinations. Projects that propose to use alternate strategies will not necessarily receive such prioritization and will need to demonstrate conservation of vernal pool species that is equivalent to or better than would be realized through the measures described in this Opinion.

DEFINITIONS

Agency Permits: For purposes of this Opinion, agency permits refer to a permit issued by the U.S. Army Corps of Engineers, pursuant to Section 404 of the Clean Water Act (CWA) of 1973, or a permit issued by the Oregon Department of State Lands, pursuant to the Oregon Fill and Removal Law (R-FL). These types of permits address impacts to wetlands—in these specific cases, vernal pools.

Augmentation: The introduction of a listed plant within 0.6 miles of an existing occurrence of that listed plant.

Combination Credits: Credits that have been approved by the Corps and DSL as wetland mitigation credits and by the Service as endangered species credits. Such credits may be used only once—for wetlands, for listed species, or for both concurrently. Following use for any of these purposes, they will be retired. Refer to definitions of Endangered Species Credit and Wetland Mitigation Credit, below.)

Conservation Banks: A site, or suite of sites, that contain natural resource values that are conserved and managed in perpetuity for specified endangered, threatened, or other at-risk species expressly for the purpose of offsetting impacts occurring elsewhere to the same resource values. The establishment, operation and use of a conservation bank are governed by a conservation bank agreement. In exchange for permanently protecting the bank lands and managing them for listed species, the conservation bank owners may sell credits to developers or others who need to compensate for the environmental impacts of their projects. (Also refer to Mitigation Banks, below.)

Conservation Easement: A recorded legal document established to conserve biological resources in perpetuity, and which requires certain habitat management obligations for the conservation bank lands. State regulations ORS 271.715 to 271.795 provide a useful, more detailed definition.

Conservation/Mitigation: For purposes of this Opinion, the terms conservation and mitigation are inter-changeable.

Endangered Species Credit (ESC): A unit of measure representing the quantification of species or habitat conservation values within a conservation bank or permittee-responsible mitigation project (see definition below) and which can be used to offset specified types and amounts of impacts to listed species that result from projects elsewhere. Through this Opinion, wetland mitigation credits approved by the Corps and DSL and that are consistent with all criteria for ESCs will also be considered to function as ESCs by the Service (Refer to definitions of Combination Credits, above and Wetland Mitigation Credits, below.)

Endowment: An investment fund maintained by a designated party approved by the Service as a non-wasting endowment to be used exclusively for the management of conservation bank lands in accordance with the management plan and the conservation easement.

Incidental Take: Any take of listed species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. (see *"Take"*). Incidental take may be authorized through section 7 or 10 of the Endangered Species Act.

Individual (or Permittee-Responsible) Mitigation Projects: Actions undertaken by a permittee to compensate for impacts resulting from a specific project. The permittee performs the mitigation after a permit is issued and before or concurrent with impacts for development. The permittee has ultimate legal and fiscal responsibility for implementation and success of the mitigation.

Listed Species: Species listed as threatened or endangered under the Endangered Species Act or under similar State laws that provide legal protection for species. In the case of this Opinion, Vernal pool fairy shrimp (*Branchinecta lynchi* (fairy shrimp)), Cook's Lomatium (*Lomatium cookii* (Lomatium)) and large-flowered woolly meadowfoam (*Limnanthes flocossa ssp. grandiflora*) (meadowfoam)).

Loss of waters of the United States: Waters of the United States that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a water body, or change the use of a water body.

Mitigation Banks: A site, or suite of sites, where natural resources are restored, established, enhanced, and/or preserved for the purpose of providing compensatory mitigation for impacts to similar resources authorized by Federal or state permits. This general term is often used synonymously with more specific terms such as "wetland mitigation bank" or "conservation bank." Banks are established through a formal agreement or Instrument signed by the regulatory Agencies and a bank sponsor. Once a bank is approved, the sponsor performs the restoration, enhancement, or protection and management activities to generate credits which can be used to compensate for the environmental impacts of other projects.

Mitigation Project: For the purposes of this Opinion, individual or permittee-responsible mitigation, wetland mitigation banks, and conservation banks.

Occurrence: For purposes of this Opinion, a collection (population, patch, location, or occurrence) of the listed plant species. All individual plants within 0.6 miles of each other are considered to be a single occurrence.

Preferred/Priority Conservation Strategy (PCS): The collection of products, processes, and standards the Service will emphasize to support the final recovery plan for vernal pool ecosystems in Oregon and California, the draft recovery plan for the listed species of the Rogue Valley Vernal Pool and Illinois Valley Wet Meadow Ecosystems, and related locally specific criteria and actions subsequently established by the Service. Projects implemented consistent with the PCS will be prioritized and expedited for Service review, technical assistance, and

regulatory determinations. The PCS is summarized in the **Introduction** section of this Opinion and in more detail through the remainder of the document.

Protect and Manage Mitigation: Projects which result in permanent protection and maintenance of established habitat and species attributes via a conservation easement with a recognized land stewardship trust or equivalent, a long term management plan, and a secure ongoing funding source such as an endowment.

Qualified Mitigation Project: Mitigation projects that satisfy the applicable standards and criteria described in this Opinion (or that utilize standards determined by the Service to result in equivalent or better conservation of VPC habitat and species), thereby allowing them to be used under the terms of the Opinion to compensate for the environmental impacts of other projects.

Reintroduction: The introduction of plants, within the historical range, but outside of a known plant occurrence.

Restore and Manage Mitigation: Projects which re-establish functioning vernal pool topography, hydrology, and other species and habitat attributes that were degraded through previous activities. This applies to any area where pools have been filled, leveled, drained, or drowned, but the hardpan is still intact. The reestablished attributes are then permanently protected and maintained via a conservation easement with a recognized land stewardship trust or equivalent, a long term management plan, and a secure ongoing funding source such as an endowment.

Single and Complete Project: Consistent with 33 CFR 330.2(i), the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete project must have independent utility and its constituent elements or phases will not be considered separate projects that can be reviewed or approved independently.

Take: As defined in the Act, means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect a federally listed species, or to attempt to engage in any such conduct. Harass is defined as an intentional or negligent act that creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering.

Vernal Pool Complex Habitat (VPC): Any areas that seasonally pond water in which one or more of the listed species could exist. Such areas include, but may not be restricted to, vernal pools and swales. Vernal pools and swales are ephemeral wetlands that typically form in shallow depressions underlain by a substrate near the surface that restricts the percolation of water. They are characterized by a barrier to overland flow that causes water to collect and pond. These depressions fill with rainwater and runoff from adjacent areas during the winter and may remain inundated until spring or early summer, sometimes filling and emptying more than once during the wet season. Vernal pools and swales are frequently clustered into assemblages known as vernal pool complexes. Individual pools within a complex are mutually interdependent in supporting listed vernal pool species; when a species is extirpated from an individual pool, other pools in the complex may serve as re-colonization sources. Upland habitat, mounds and swales

around and within a vernal pool complex are essential to the hydrological and biological integrity of the complex. For purposes of this consultation, vernal pool complex habitat includes vernal pools and all surrounding upland mound areas within 100 feet from the edges of the vernal pools. (See Figure 2. for example.)

Wetland Mitigation Credit: A unit of measure (e.g., a functional or areal measure or other suitable metric) representing the aquatic habitat values or functions at a wetland mitigation bank, permittee-responsible wetland mitigation project, or other compensatory wetland mitigation site and that can be used to offset specified types and amounts of impacts to aquatic resources that result from projects elsewhere. The Corps and/or DSL determine how many credits would be generated by the proposed protection and restoration activities at the bank site, and approve their establishment and utilization under the requirements of the CWA and R-FL, respectively. Through this Opinion, wetland mitigation credits approved by the Corps and DSL and that are consistent with all criteria for ESCs will also be considered to function as ESCs by the Service (Refer to definitions of Combination Credits and ESCs, above.)

CONSULTATION HISTORY

This Opinion is based on information provided to the Service through discussions with Service staff, the Corps and DSL since the spring of 2007, and contained in the final recovery plan for vernal pool ecosystems of California and Southern Oregon (USFWS 2005) and draft recovery plan for the listed species of the Rogue Valley Vernal Pool and Illinois Valley Wet Meadow Ecosystems (USFWS 2006). Information obtained during site visits and meetings between Service staff, agency personnel, applicants, and other federal and state entities has been used. These meetings resulted in the development of measures outlined in the Description of the Proposed Action section below.

The Service determined formal consultation was appropriate since some activities specifically included in the proposed action (or that would occur as an outcome of those included activities) "may affect, likely to adversely affect" the threatened vernal pool fairy shrimp (*Branchinecta lynchi* (fairy shrimp)), designated critical habitat for fairy shrimp, and two plant species listed as endangered: Cook's Lomatium (*Lomatium cookii* (lomatium)) and large-flowered woolly meadowfoam (*Limnanthes floccosa ssp. grandiflora*) (meadowfoam)) (Listed Plants, collectively referred to as the listed vernal pool species). Critical habitat for the Listed Plants was designated by the Service on July 29, 2010 (USFWS 2010).

In the Opinion, the Service concludes that the proposed action is not likely to jeopardize the continued existence of the listed vernal pool species, or result in the destruction or adverse modification of fairy shrimp designated critical habitat or listed plant proposed critical habitat.

DESCRIPTION OF THE PROPOSED ACTION

As discussed in the Introduction, the proposed action includes a number of activities directly or indirectly and/or interdependently related to conservation and development within vernal pool habitat in the Agate Desert area of Jackson County, Oregon (Figure 1), as implemented by the Service, Corps, DSL and some nongovernmental entities. The primary objectives of the action are improved implementation of the Service's preferred/priority conservation strategy (PCS) for

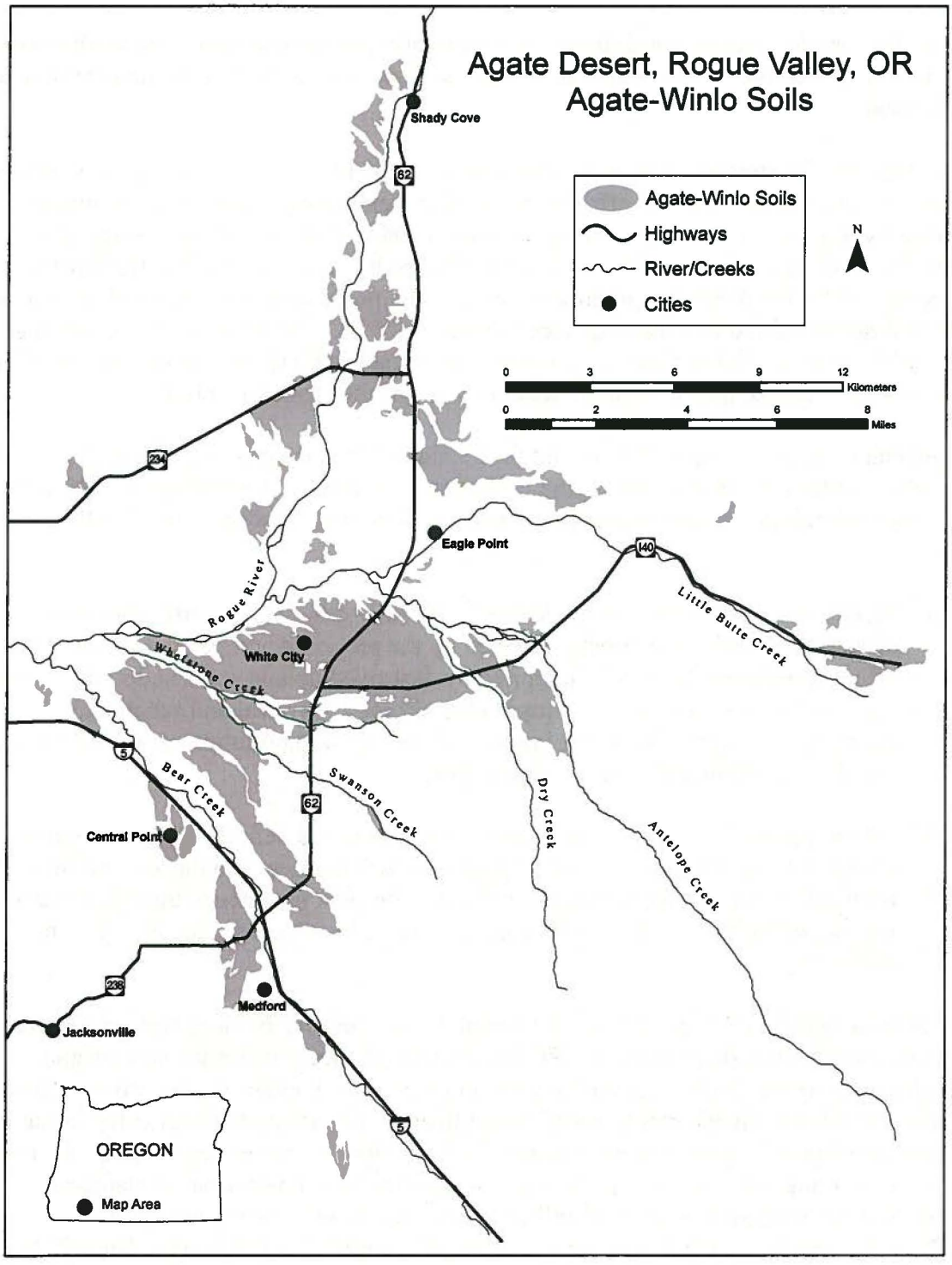
listed VPC species and increased likelihood that losses of VPC habitat to development occur in a manner consistent with and supportive of the PCS.

Specific components of the proposed action include:

1. Corps, Service, and DSL signing/approval of conservation banks, wetland mitigation banks, and equivalent permittee-responsible mitigation (collectively, mitigation projects) for vernal pool species and habitats;
2. Corps, Service, and DSL release of credits from individual banks and equivalent permittee-responsible mitigation.
3. Implementation of the Corps' Vernal Pool Wetlands RGP, individual Corps' permits for vernal pools, the Interdependent and Interrelated DSL Vernal Pool Wetlands General Permit and individual projects approved under these permits.
4. Mitigation sponsor/steward implementation of mitigation project activities and Corps and/or DSL permitting associated with such activities.
5. Other activities implemented by Federal or non-federal entities for the dominant purposes of protecting, preserving, restoring, enhancing, or maintaining the habitat and listed species attributes of VPC and Corps and/or DSL permitting associated with such activities.
6. Other activities implemented by Federal or non-federal entities that the Service determines are necessary to support the PCS for listed VPC species.

Components 1-3 will be fully covered via an incidental take statement in this Opinion, without additional project-specific information, analysis, or review, although real-time reporting and periodic post-facto reviews will occur to provide the Service opportunity to monitor implementation of the Opinion. Components 4 - 6 may require project-level reviews. If so, this will occur in an expedited/streamlined fashion. (See **Approval and Implementation of Mitigation Projects, Voluntary Restoration and Enhancement Actions** and **Projects and Activities Not Covered Under Agency Permits** later in this document.)

Figure 1. Agate-Winlo Soils in the Rogue Valley



General Parameters

The general parameters, specific standards and criteria the components above must adhere to in order to be considered part of the proposed action and therefore covered under this Opinion are described below.

1. This Opinion will remain in effect for five years or until 110 acres of vernal pool wetlands (or up to 550 acres of VPC) are affected by development actions and associated mitigation actions, whichever occurs first. During this time an additional 110 acres of vernal pool wetlands (or up to 550 acres of VPC) may be affected by voluntary (non-mitigation) actions implemented for the dominant purposes of protecting, preserving, restoring, enhancing, or maintaining the habitat and listed species attributes of VPC. When these time or acreage thresholds are reached, the Service may renew or revise the Opinion or reinitiate consultation if necessary or appropriate to support the objectives of the proposed action.

2. Single and complete projects that are not for the dominant purposes of protecting, preserving, restoring, enhancing, or maintaining the habitat and listed species attributes of VPC may adversely affect less than 5 acres of vernal pools or less than 15 acres of VPC, whichever is less.

    a. These acreage thresholds include habitat filled or otherwise destroyed (directly affected) and habitat indirectly affected by the proposed action. Habitat indirectly affected includes all habitat supported by destroyed upland areas and swales, and all habitat otherwise damaged by impaired hydrology, physical and functional connectivity, human intrusion, introduced species, and pollution caused by the project (see Effects of the Proposed Action below).

    b. Where the reach of these effects cannot be determined definitively, all vernal pool complex habitat within 250 feet of proposed development should be considered to be affected. If any habitat within a vernal pool complex is affected, then all remaining habitat within the complex will be considered to be affected. (See Figure 2. for example.)

3. The Service assumes that all vernal pool wetlands are occupied by fairy shrimp, and that all activities which degrade or remove VPC habitat will adversely affect the species and therefore require incidental take authorization under the Act, either via the provisions of this Opinion or other available mechanisms, as applicable. Efforts undertaken at the initiative of project proponents to demonstrate that specific VPC sites are not occupied, or as required by the Service to measure baseline occupancy and species-based performance standards included in the proposed action will utilize Service-approved species survey protocols. In the first case (demonstrating non-occupancy), five consecutive years of survey data will be required. In the latter cases (determining baseline occupancy and compliance with performance standards), the length and frequency of survey efforts will vary depending on the specific VPC site and the issue the survey data will address. These specific survey requirements are described in subsequent sections of this Opinion.

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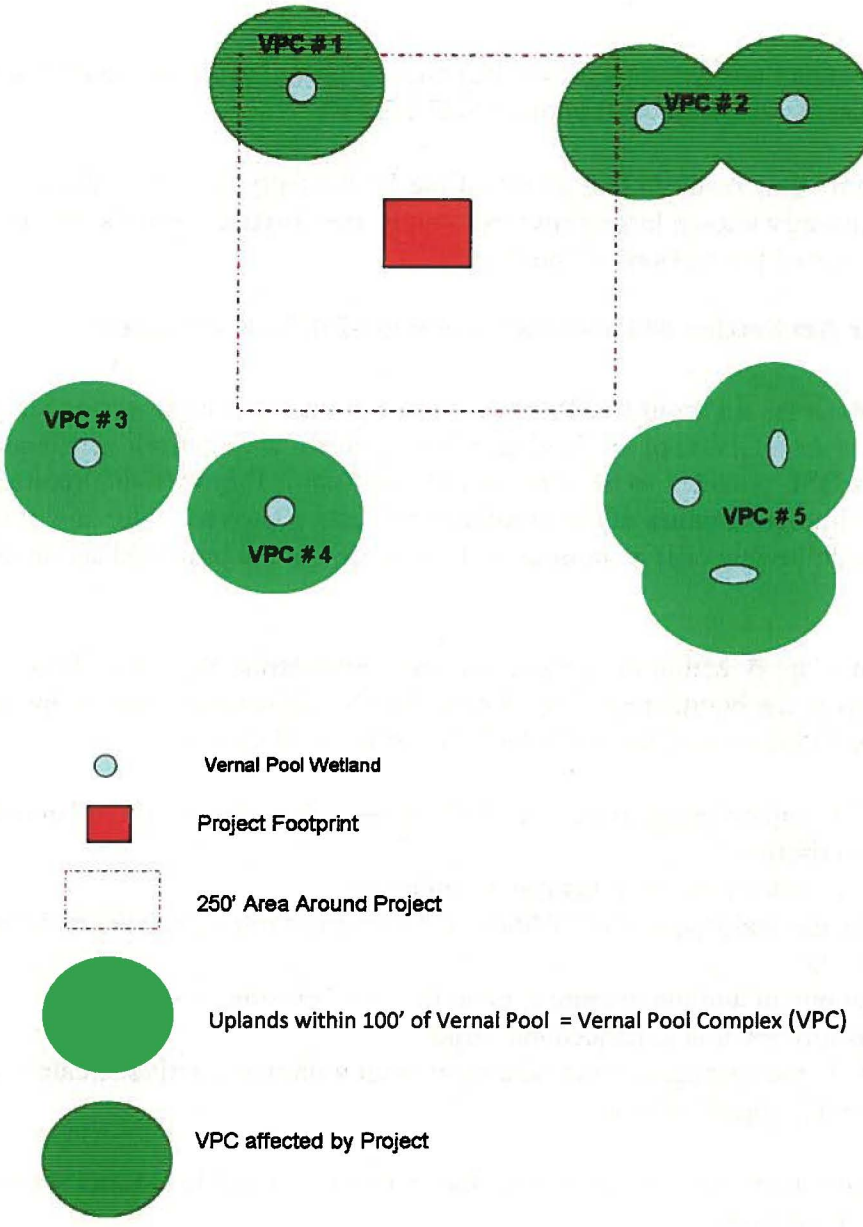
Figure 2. Extent of Vernal Pool Complex Habitat around Vernal Pool Wetlands and Area of Vernal Pool Complex Habitat Affected by Projects[1].



1 The 100' and 250' distances demonstrated above are considered default standards in the absence of site-specific conditions and information that suggest consideration of alternate measures.

4. Acreage for both impact site and/or mitigation site will be determined based on a jurisdictional delineation of the wetlands at each site, before and after the project is implemented.

5. Uplands between wetlands (pools) and within 100 feet from the edges of the pools must be included under the same land protection measures as the associated vernal pools. (See Figure 2. for example.)

6. All proposed impact and mitigation sites will be assessed using the Agate Desert Vernal Pool Function and Values Assessment Methodology (ESA 2007).

7. No project or activity may result in loss of any of the 13 currently known lomatium populations, 23 currently known large-flowered woolly meadowfoam populations or subsequently discovered populations of these species.

Federal Clean Water Act Section 404 and State Removal-Fill Law Permitting

Issuance of a Regional General Permit (RGP) or individual permits by the Corps under Section 404 of the Clean Water Act (CWA) of 1973, of an interdependent and interrelated General Permit (GP) issued by DSL pursuant to the Oregon Fill and Removal Law (R-FL)(collectively, Agency Permits), and implementation of the individual projects approved under any of these permits must meet the following criteria in order to be included in the proposed action addressed in this Opinion:

1. The Agency Permits apply within the geographic area identified in Figure 1. This area generally conforms to the boundaries of the Agate-Winlo soil series as mapped by the Natural Resources Conservation Service's Jackson County soil survey.

2. The Agency Permits authorize the discharge of fill material into waters of the United States for the following activities:
    a. commercial, residential, or industrial development;
    b. installation and maintenance of utilities, and infrastructure associated with such developments;
    c. road development and maintenance, including road crossings;
    d. wetland restoration and enhancement[2]; and
    e. sand, gravel, and aggregate removal except from within any active stream channel, bed or channel migration zone.

3. The Agency Permits authorize discharges into the following wetlands or other waters:
    a. vernal pool wetlands,
    b. ditches or other water conveyance structures constructed solely to drain vernal pool lands,
    c. roadside ditches that are not part of a stream tributary system,

2 This purpose includes activities associated with vernal pool mitigation projects, the creation of vernal pool mitigation/conservation banks and the associated habitat restoration and ongoing management activities to maintain mitigation/conservation areas and banks throughout the life of these areas.

d. channels excavated through uplands for irrigation water and return flows, and
e. palustrine emergent wetlands that were historically vernal pool wetlands.

4. The Agency Permits do not authorize discharges into the following waters of the U.S:
   a. wetlands associated with stream systems,
   b. streams (including those that have been manipulated or man-altered),
   c. bogs and fens,
   d. native wet prairie, and
   e. mature forested wetlands.

5. The Agency Permits are consistent with the previously described General Parameters of the proposed action and will apply requirements contained in the Mitigation Requirements, Performance Standards, Approval and Implementation of Mitigation Projects, Voluntary Restoration and Enhancement Actions, Monitoring and Reporting Requirements, and Best Management Practices sections described below in this Opinion and in the Reasonable and Prudent Measures and Terms and Conditions of the ITS to permitted projects, as applicable.

6. Individual projects covered under Agency Permits and that result in unavoidable impacts to listed species will be provided compliance with the Act through this Opinion if the Agency Permits and the individual projects satisfy all applicable criteria. Project-level review and approval by the Service will not be necessary except as noted in **Approval and Implementation of Mitigation Projects** and **Voluntary Restoration and Enhancement Actions**.

Approval and Implementation of Mitigation Projects

This Opinion will provide compliance with the Act for activities necessary to establish and implement qualified mitigation projects (see **Mitigation Requirements** later in this Opinion), specifically:

1. Service, Corps, and DSL approval of Instruments, credit releases, and equivalent actions necessary to implement the projects.

   This suite of activities will be fully covered by the ITS associated with this Opinion absent additional project-level review.

2. Management activities undertaken by the mitigation project sponsor or long-term steward necessary to achieve and maintain the objectives of the projects, including—

   - Activities necessary and appropriate to restore or enhance VPC habitat (including vegetation management, hydrologic and/or topographic alteration);

   - Activities necessary and appropriate to move, transplant, and introduce (or reintroduce) listed species from occupied, functional vernal pool habitat to unoccupied, functional vernal pool habitat; and

- Activities necessary and appropriate to maintain VPC habitat amount and function and vernal pool listed species occurrences (including livestock grazing, mowing, and/or prescribed burning).

This suite of activities will be covered under this Opinion subject to the following:

The mitigation project sponsor or long-term steward proposing to implement proposed restoration, enhancement, or maintenance activities (or the Corps or DSL if such activities will be covered under an Agency Permit or individual permit(s) from those agencies) will notify the Service and indicate whether the activities will achieve the objectives of a long-term management plan (LMP) that has been approved by the Service for the mitigation project and whether the activities and their impacts on vernal pool listed species and habitat are specifically described in the LMP—

- If the subject activities and impacts are specifically described in a Service-approved LMP, they will be fully covered by the ITS associated with this Opinion absent additional project-level review; or

- If the subject activities and impacts are not specifically described in the LMP, the mitigation project sponsor, long-term steward (or the Corps or DSL if such activities will be covered under an Agency Permit or individual permit from those agencies) will need to provide additional information to enable a project-level assessment by the Service of consistency with the LMP and relevant aspects of this Opinion, and; if determined consistent by the Service, will be covered via a project-specific ITS developed as an amendment to this Opinion.

Voluntary Restoration and Enhancement Actions

This Opinion will provide compliance with the Act for voluntary activities (not associated with mitigation projects) (see **Mitigation Requirements** later in this Opinion) implemented by other entities for the dominant purposes of protecting, preserving, restoring, enhancing, or maintaining the habitat and listed species attributes of VPC. These activities include:

1. Activities necessary and appropriate to restore or enhance VPC habitat (including vegetation management, hydrologic and/or topographic alteration);
2. Activities necessary and appropriate to move, transplant, and introduce (or reintroduce) listed species from occupied, functional vernal pool habitat to unoccupied, functional vernal pool habitat; and
3. Activities necessary and appropriate to maintain VPC habitat amount and function and vernal pool listed species occurrences (including livestock grazing, mowing, and/or prescribed burning).

These activities will be covered under this Opinion subject to the following:

a. The entity proposing to implement the activities (or the Corps or DSL if such activities will be covered under an Agency Permit or individual permit from those agencies) will notify the Service and provide information necessary to enable a project-level assessment by the Service of consistency with this Opinion, and;

b. If determined consistent by the Service, will be covered via a project-specific ITS developed as an amendment to this Opinion.

Projects and Activities Not Covered Under Agency Permits

Other activities implemented by Federal or non-federal entities which are not covered by general or individual Corps or DSL permits but are determined by the Service to be necessary to support the PCS for listed VPC species and to ensure that any loss of VPC habitat to development occurs in a manner consistent with and supportive of the PCS may also be provided compliance with the Act subject to the following:

1. The entity proposing to implement the activities notifies the Service and provides information necessary to enable a project-level assessment by the Service of consistency with this Opinion, and;

2. If determined consistent by the Service, will be covered via a project-specific ITS developed as an amendment to this Opinion.

Mitigation Requirements

1. Mitigation actions will be necessary to minimize the effects and significance (to listed species) of adverse impacts that cannot be adequately avoided, eliminated, or reduced through other measures. Mitigation will consist of measures/actions that offset or compensate for adverse affects to listed species and critical habitat by protecting, restoring, and/or enhancing certain amounts of VPC habitat, and managing to maintain that habitat in perpetuity.

2. Use of habitat-based credits available from conservation banks, mitigation banks, or equivalent permittee-responsible conservation or mitigation projects is the most reliable and credible method to adequately reduce the effects and significance of unavoidable impacts and therefore will be required in order for activities that produce such impacts to be included in the proposed action considered in this Opinion.

3. Specific mitigation site ratios and impact site ratios will apply to the utilization of the habitat-based credits. These ratios (described in sections of this Opinion that follow) are established to ensure impacts to vernal pool habitat complex are offset or compensated for to an extent necessary to adequately contribute to reaching the conservation goal of 4,300 acres of protected VPC. They are also intended to deter impacts within areas of high functioning vernal pool habitat.

4. In order to qualify as mitigation under this Opinion, projects must also satisfy the requirements of the remaining sections under **Mitigation Requirements** as well as the requirements of the applicable components of the **Voluntary Restoration and Enhancement Actions** and **Terms and Conditions** sections described in this Opinion and ITS, or utilize standards determined by the Service to result in equivalent or better conservation of VPC habitat and species. Projects that satisfy these criteria will be referred to as qualified mitigation projects.

Basic Criteria for Establishment of Banks and Other Mitigation Projects

Conservation banks, mitigation banks, and equivalent permittee-responsible projects (hereafter collectively referred to as mitigation projects) proposed for use as mitigation for the purposes of this Opinion and the proposed action must be consistent with the guidance developed by the Service for the establishment, use and operation of conservation banks (USFWS 2003a).

To satisfy the permanent protection requirements, a mitigation project sponsor must establish a Service approved conservation easement and/or fee-simple donation in cooperation with a qualified land steward(s), a long-term management plan, and a secure funding source such as an endowment. These requirements must be met before the mitigation project receives final approval from the Service.

Any vernal pool wetland mitigation project determined to be adequate for the purposes of compliance with the Federal Clean Water Act and state Removal-Fill Law and that satisfies the applicable criteria of this Opinion for mitigation projects, will be considered adequate by the Service for the purposes of the **Mitigation Requirements** section of this Opinion. For example, a wetland mitigation bank approved for Clean Water Act compliance would also serve as a conservation bank for Endangered Species Act compliance. The Interagency Review Team (IRT) process and standards established for wetland mitigation banking, implemented consistent with this Opinion, will be utilized by the Service to formalize such a determination. Additional processes or documents specific to the Service will not be required. This includes situations in which the Service is a co-chair of an IRT established for review of a mitigation project specifically intended to serve both wetland and listed species purposes, and situations in which an IRT (with or without Service participation) evaluates a wetland-only mitigation project that has nonetheless been determined by the Service to satisfy the criteria of this Opinion.

It is also possible that a mitigation sponsor may choose to develop a mitigation project solely for the purposes of listed species. In this case, the Service would also utilize a similar IRT process.

Site Suitability Criteria for Mitigation Projects

1. Wetland components of mitigation projects must meet Corps jurisdictional criteria to be waters of the United States once the mitigation work is completed.

2. Mitigation projects must be of sufficient size to provide a high likelihood of maintaining ecological value and function in perpetuity. The actual size and conditions that will allow a specific parcel of land to satisfy the criteria above will vary depending on the specific impacts the project is intended to mitigate, and the current and likely long-term uses of adjacent and nearby lands. However, in general, it is assumed large, contiguous parcels of 70 acres or more of VPC have a higher likelihood of providing adequate functions over the long-term than smaller parcels when located within areas in which the surrounding land uses are not compatible with long-term VPC conservation. Smaller parcels may be adequate when they exist as ecologically connected "satellite" areas to the larger sites described above. Smaller parcels (10-70 acres) of VPC may also be adequate in isolation if they exist within

areas in which surrounding land uses are expected to be compatible with long-term VPC conservation.

To be acceptable under this Opinion, the total effective size of a mitigation project must therefore be at least 70 contiguous acres of VPC. Effective size means the agencies will consider adjacent, permanently protected parcels dedicated to vernal pool conservation as part of the acreage total even if they are owned and managed by another party. For example, a 10-acre mitigation proposal could be approved under this proposal if it has uninterrupted continuity of soils, water flows, and topography with an adjacent approved mitigation or conservation project of 60 acres.

3. The mitigation project parcel(s) must include sufficient area to maintain the hydrologic regime, soils, topography, and vegetative conditions providing suitable habitat for the typical suite of vernal pools species. This will necessitate inclusion of not only the wetland portion of the vernal pools, but also surrounding upland mounds and adjacent areas that adequately buffer the vernal pool habitats against ecological edge effects and effects from adjacent and nearby land us. This buffer or "protective fringe" will be particularly important with regard to protecting the vernal pool habitat from disruptions in water supply and hydrology, and degradation of the quality of the water within the vernal pool habitats. Generally, uplands between wetlands (pools) and within 100 feet from the edges of the pools must be included under the same land protection measures as the associated vernal pools.

4. All sites proposed as mitigation projects must demonstrate some level of occupancy by at least one of the listed species. This must include fairy shrimp occupancy of at least 10% of vernal pools by the time the site is approved. Proposed management actions can include introduction of additional listed species or enhancement of current population levels.

5. All sites proposed as mitigation projects must meet the 70th percentile ranking of the function assessment scores to qualify, or it must be demonstrated sustainable restoration or management could raise the site to meet this threshold level of functionality.

6. All mitigation project sites must have an intact hardpan layer. If the hardpan layer is perforated at the perimeter of the site, or if activities such as road crossings are anticipated that would perforate the hardpan, the area of the mitigation site that is within 100 feet of the edge of the hardpan shall generate half as many mitigation credits.

7. Mitigation projects proposed for lands that are already designated for conservation purposes must provide benefits to vernal pool habitats and species above and beyond those resulting from the current conservation status of the lands as determined by the Service.

8. To the extent possible, mitigation projects should be sited and/or managed in such a way those activities proposed for establishment and maintenance of the sites will not result in adverse effects to federally listed species or vernal pool habitats outside of the proposed area.

9. Mitigation projects may be composed of a single contiguous parcel of land or several geographically separate parcels provided each parcel satisfies the criteria described above.

10. Restoration of historically altered or lost vernal pool wetlands at all mitigation projects, even those primarily based on protection, is encouraged and will be credited as described above.

Impact and Crediting Ratios

The amount of offsetting actions (as defined in terms of ESCs, wetland mitigation credits, or combination credits) required to address impacts to listed species will depend on both the type of actions conducted and by the relative conservation values of the vernal pool sites being affected. More credits will be required to address impacts to vernal pools with higher conservation value and, similarly, more credits will be approved for mitigation projects with higher conservation value. Impacts and credits will be based on wetland acreage as determined through a Corps or DSL jurisdictional wetland delineation.

Mitigation Site Base Ratios

The following will be used to quantify credits generated by various conservation actions conducted at a mitigation project:

Protect & Manage	1.5:1= 1.5 acres of vernal pool wetland protected will be required to generate *one ESC or combination credit.*
Restore & Manage[3]	1:1= 1 acre of vernal wetland restored will be required to generate *one ESC or combination credit.*

For some situations in which the Service determines that a mitigation project will provide an especially high level of benefit to the conservation of vernal pool habitats and listed species, lower ratios (i.e. generation of additional credits) may be acceptable. This may occur when a mitigation project meets two or more of the following criteria:

- Includes actions that result in the successful reestablishment and/or enhancement of viable populations of both vernal pool fairy shrimp (VPFS) and at least one listed vernal pool plant species; for VPFS, occupancy of >25% of pools must initially exist and >30% of pools must be likely to be established and maintained (within natural range of variability) over time via proposed management actions[4]; for plants, a population of at least 500 plants must exist or a population of at least 200 plants must be established if a population does not currently exist and these populations must be likely to be maintained over time via proposed management actions;
- By virtue of the nature of the project, will serve as a significant demonstration of the viability of private-entity conservation banking for VP species and thereby encourage establishment

3 Specific to Restore and Manage, no more than 20% of the total credits generated through mitigation projects cumulatively, or credits based on 20 wetted acres cumulatively, whichever is less, shall result from restoration activities. It is expected that the Service and Corps will work together to track and monitor the approval and use of credits generated through restoration and, if the above thresholds are reached, to determine whether additional restoration-based credits could be approved. This determination will be based on an assessment of whether use of restoration-based credits result in substantial numbers of projects that yield < 60% protection of the vernal pool complex acres involved in the subject mitigation transactions and whether such projects are impairing attainment of the vernal pool recovery plan/conservation strategy target of protecting ~60% of remaining vernal pool complex acreage, and for that 60% to be comprised largely of the best remaining habitat.

4 Refer to note regarding determining occupancy under *Monitoring of Performance Standards*

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of other such banks, and/or will in some other fashion represent a significant precedent for conservation of VP species;

- Protect >100 sponsor owned/managed acres of physically or functionally contiguous[5] VP complex habitat in an area that currently lacks a large, contiguous, protected block of habitat or where creation of such a block is otherwise determined to substantially benefit the conservation of VP species; and
- Completes the protection of a designated critical habitat unit or other geography prioritized for conservation of VP species by permanently preserving an area of VP complex habitat that otherwise represented a significant (by virtue of its size, quality, function, location, etc) gap in the protection of the subject critical habitat unit or priority geography.

It is expected that additional credits based on the above criteria will apply to a very limited number of mitigation projects; most will be subject to the mitigation site base ratios. However, even in situations where the criteria for additional credits are satisfied, at no time should the total credits (ESCs, wetland mitigation credits, or ESC/wetland combination credits) awarded to mitigation sites result in less than (~3):1 vernal pool complex ratio *(3 acres of vernal pool complex habitat protected per credit)*(or equivalent wetted-acre:wetted-acre ratio) for any mitigation site, project, or bank.

Impact Site Ratios[6]

The amount of offsetting actions (or equivalent credits) that will be required to address impacts will based on the relative conservation values of the vernal pool sites being impacted. More offsets will be required to address impacts to higher quality or higher conservation value vernal pools.

- 2 *ESCs or combination credits* will be required to offset impacts to one acre of vernal pool wetland for vernal pool impact sites where composite function assessment score is in lowest 30th percentile, and less than ½ acre of vernal pool wetland will be impacted.

- 2.5 *ESCs or combination credits* will be required to offset impacts to one acre of vernal pool wetland under any one of the following conditions:

  - composite function assessment score is in lowest 30th percentile and more than ½ acre of vernal pool wetland will be impacted;
  - the composite function assessment score is between the 30th and 70th percentiles;
  - vernal pool wetland within a designated critical habitat unit will be impacted; and
  - vernal pool wetland impacted is functionally part of [7] or physically contiguous with any VP complex of 10-30 acres

5 Parcel(s) of a size and configuration adequate to sustain the hydrological regime, soils, topography, and vegetative conditions that provide suitable habitat for the typical suite of vernal pool species. In this case, the sponsor owned/managed acreage must be capable of providing these conditions independent of the functions provided by any other adjacent or proximal ownership.

6 Also referred to as "multipliers" in some mitigation strategies.

7 Located and functioning on the landscape in such a way as to contribute to the hydrological regime, soils, topography, and vegetative conditions (that provide suitable habitat for the typical suite of vernal pool species) of the adjacent or proximal vernal pool complex.

- 3 *ESCs or combination credits* will be required to offset impacts to one acre of vernal pool wetland for vernal pool impact sites where the composite function assessment score is over 70th percentile or where vernal pool wetland impacted is functionally part of *(see footnote # 2)* or physically contiguous with any VP complex >30 acres.

- 3.5 *ESCs or combination credits* will be required to offset impacts to one acre of vernal pool wetland for vernal pool impact sites functionally part of or physically contiguous with any VP complex of >30 acres under special management designations described above.

    - This provision will not apply to the Corps or DSL for projects covered under an Agency Permit, but will apply to the project applicant in order for the particular project covered by the Agency Permit to be covered under this Opinion[8].

For any of the ratio criteria above based on physical or functional continuity with vernal pool complexes of certain sizes, the size of those complexes on the date this biological opinion is finalized will be used to determine if the stated threshold has been exceeded. For instance, if an impacted vernal pool occurs within a complex that was 30 acres in size on the date of this biological opinion, but by the time of the proposed impact has been reduced to 20 acres in size by previous degradation, criteria applicable to 30-acre complex will still apply to the proposed impact. The Service will utilize credible and best information available, either from its own sources or as provided by a project proponent or another party, to make this determination.

The methods for assessing and scoring vernal pool complexes as well as the composite function assessment score for previously inventoried vernal pool complexes are available in the Guidance Document on the USFWS website.

Total Effective Mitigation Ratios

In summary, the combination of impact site ratios (multipliers) and mitigation site base ratios will result in the following Total Effective Vernal Pool Mitigation Ratios:

- For the lowest quality functioning conservation value or lowest vernal pool habitat (as described above):
    - Three acres of preservation for one acre of impact; and/or
    - Two acres of restoration for one acre of impact.

- For the mid-range or medium quality functioning or conservation value vernal pool habitat—
    - 3.75 acres of preservation for one acre of impact; and/or
    - 2.5 acres of restoration for one acre of impact.

- For high quality functioning or high conservation value vernal pool habitat—
    - 4.5 acres of preservation for one acre of impact; and/or
    - 3 acres of restoration for one acre of impact.

- For the highest quality functioning or highest conservation value vernal pool habitat—

8 The agencies will be considered in compliance with the Act if the Agency Permits require 3 *ESCs or combination credits* to offset impacts to one acre of vernal pool wetland in these situations.

- 5.25 acres of preservation for one acre of impact; and/or
- 3.5 acres of restoration for one acre of impact.

Using Credits in Combination

Where there is overlap in the numbers of credits available for mitigating wetland impacts and those available for addressing impacts to listed species, those overlap credits *(i.e. combination credits)* may be used only once—for wetlands, for listed species, or for both concurrently. Following use for any of these purposes, they will be retired.

Performance Standards

Performance standards are necessary to support the goal of sustaining and/or improving high quality function of vernal pool wetland complex. The standards help target actions to improve and sustain highly functional vernal pools and mounded prairie habitat to sustain populations of appropriate native species, especially the listed species and the habitat characteristics needed for their continued survival (i.e., topography, hydrology and vegetative conditions).

These performance standards will apply during the establishment and regulatory life phases of mitigation projects. During the long-term, post-regulatory life of the mitigation project, these performance standards will also serve as the default performance standards unless alternate standards that achieve equivalent or better conservation are approved by the Service. In general, the Service expects that long-term performance standards will be designed to improve conditions for listed species and habitats over time as practicable and appropriate.

Exceptions to meeting the performance standards below may be allowed at the discretion of the Service (and Corps, if applicable) if the applicant provides monitoring data from appropriate reference sites to support a finding that regional factors such as drought or abnormal weather may be influencing the monitoring data and the data are within the expected normal variability of the region. Also, a mitigation provider may request utilization of a different reference site and reference data set for the standards below if such a change is more relevant to the particular mitigation project.

Hydrology and Topography Standards

The goal is to restore and sustain the natural range of variability in topography and hydrology of least-disturbed reference site vernal pools. An applicant may use the reference site data in the topography standard below, or request the agencies to approve an alternate reference data set that better matches the specific project.

1. Hydrology

- The acreage of vernal pool wetlands meeting the hydrology criterion in the Corps 1987 wetland identification and delineation manual and the Arid West Supplement on the mitigation or bank site shall not decline below the initial baseline acreage.
- Each vernal pool meets the hydrology criterion in the U.S. Army Corps of Engineers 1987 Wetland Identification and Delineation manual and approved supplements in effect at the date the mitigation project or was started or bank was established.

2. Vernal Pool Depth and Side Slope Steepness

- Eighty-five (85) percent of the vernal pools will have a mean high water depth of 4 to 11 inches in January. Mean high water can be determined by water depth measurements or upper extent of hydrophytic plants or vernal pool vegetation association.
- For restored vernal pools, the height of the top of mound to bottom of the vernal pool ranges between 22 and 32 inches and the side slopes for the vernal pool are no steeper than 7:1.

Vegetation Standards

The goal is to restore and maintain plant communities dominated by native species typical of least-disturbed reference site vernal pool wetlands and surrounding uplands. Specifics on the vegetation criteria described below can be found in the Guidance Document located at http://www.fws.gov/oregonfwo/FieldOffices/Roseburg. The outer boundary of a vernal pool shall be considered the same as the jurisdictional wetland boundary.

2. Vernal Pool Vegetation

- Absolute extent of exposed substrate is no more than 75 percent;
- Native vernal pool species relative percent cover (excluding substrate) is at least 70 percent.
- Non-native invasive species relative percent plant cover is no more than 15 percent; and,
- At least 15 native vernal pool species are present in existing vernal pools designated for protection and management and at least 10 native vernal pool species are present in restored and managed vernal pools. To be evaluated in the same sample of plots needed to meet the statistical confidence described below. See Table 1 for list of native vernal pool habitat plants.

2. Upland (Mound) Vegetation

- Native species relative percent plant cover is at least 25 percent;
- Medusahead (*Taeniatherum caput-medusae*) relative percent cover is no more than 25 percent,
- Non-native invasive species (other than Medusahead) total relative percent plant cover is no more than 25 percent;
- At least 20 native upland herbaceous species are present (Table 1),
- Less than five percent relative plant cover shall be comprised of woody species other than oak and/or chaparral; and,
- For areas dominated by chaparral[9] or oak at the beginning of the mitigation project, the relative cover of chaparral and/or stem count of oak shall be within 20 percent of the baseline amount at the end of the monitoring period[10].

9 Chaparral is defined as a native shrub community such as buckbrush (Ceanothus cunneatus) and may contain manzanita, native cherry, and madrone.

10 Oak and chaparral restoration actions, such as thinning can reduce the percent cover by more than 20 percent from the original baseline if action is planned as part of the original vernal pool habitat restoration strategy for the

Federally Listed Species

The goal is to sustain or increase local populations of listed and rare species.

1. Vernal Pool Fairy Shrimp Standard

   - Long-term management of mitigation projects and conservation sites must result in improved conditions for and occupancy by vernal pool fairy shrimp:
     - Occupancy by vernal pool fairy shrimp must be increased to and maintained above 20 percent if a lower baseline level of occupancy exists at the time of establishment of the conservation site or bank[11];
     - Occupancy by vernal pool fairy shrimp must be increased and maintained at an increased level if occupancy at the time of establishment of the conservation site or bank is already at 20 – 30 percent;
     - Occupancy by vernal pool fairy shrimp must be maintained at the baseline level at the time of establishment of the conservation site or bank or improved if the baseline level of occupancy is 30 percent or greater.
     - Occupancy by vernal pool fairy shrimp will not fall below five percent of the performance standard occupancy level applicable to a conservation site or bank (or to less than the natural range of variability associated with that site if the range is greater than 5 percent).
     - The standards for vernal pool fairy shrimp occupancy must be satisfied within 5 years of the establishment of the conservation site or bank.
     - The number of vernal pools used to calculate vernal pool fairy shrimp occupancy rates will be established within five years of establishment of the conservation site or bank and approved by the Service.
     - The occupancy level will be determined by the percentage of documented vernal pools with vernal pool fairy shrimp presence based upon the results of the first five years of surveys (the "baseline level") using the approved species specific protocols.

2. Lomatium Standard

   - Lomatium occupancy will be maintained within the natural range of variation. Occupancy will not fall below 5 percent of the established baseline level. The occupancy level will be determined by the average number of individual plants observed in the first five years of surveys using the approved species specific protocols.

3. Meadowfoam Standard

   - Meadowfoam occupancy will be maintained within the natural range of variation. Occupancy will not fall below 5 percent of the established baseline level. The occupancy level will be determined by the average number of individual plants observed in the first five years of surveys using the approved species specific protocols.

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land parcel involved.

11 Refer to note about determining occupancy under *Monitoring of Performance Standards*

Monitoring of Performance Standards

1. Short-term (first 5-years of life of project):

   a. For all features (vegetation, hydrology/topography, uplands, and listed species)—annual monitoring until applicable standards satisfied for 3 consecutive years, then every other year. Non-performance in any year which requires remedial/corrective action, or non-performance in any 2-consecuitve years triggers re-start of annual monitoring.

   b. For VPFS— sample size of ½ to 1 pool per acre of complex (minimum 50 pools). Monitoring methodology should be designed to avoid error introduced by seasonal variation in the number of distinct pools. Preferably, this would be accomplished by utilizing a randomized sample grid of pools distributed throughout the bank and representative of the range of depth classes present during a year with normal rainfall. Adjustment of the sample locations may be needed during the first few years to establish the baseline. Other methods that yield equally or more accurate measures of occupancy may be appropriate.

   c. For all features— the requirement for 3 consecutive years may be partially satisfied by monitoring/surveys that occurred in year immediately prior to formal approval/establishment of project as long as accepted protocols and design used.

2. Long-term:

   a. For all features— 1 year effort in year 10 and every 5-yrs thereafter; **or** 2 (consecutive) year effort in year 10 and every 7 years thereafter; **or** every 5-yrs in years 5-15 and 1 year every 10-yrs thereafter,

   b. Non-performance which requires remedial/corrective action or non-performance in any 2-consecutive years triggers start of annual monitoring until performance re-established for 3 consecutive yrs; **or** triggers implementation of Service-approved contingency measures to re-establish performance within 2 yrs;

   c. For vernal pool fairy shrimp— as per Short-term above.

Table 1. Native Plant Species in Agate Desert vernal pools and mounds

Common Name	Scientific Name	Habitat
Plants		
American pillwort	*Pilularia americana*	vernal pools
Annual hairgrass	*Deschampsia danthonioides*	vernal pools
Austin's popcornflower	*Plagiobothrys austiniae*	vernal pool edges
Barestem biscuitroot; Indian celery	*Lomatium nudicaule*	Mounds
Bicolored lupine	*Lupinus bicolor*	Mounds
Blow-wives	*Achyracheana mollis*	Mounds
Bluebunch wheatgrass	*Pseudoroegneria spicata*	Mounds

Common Name	Scientific Name	Habitat
Bracted popcornflower	*Plagiobothrys bracteatus*	vernal pools
Bristly Pogogyne	*Pogogyne zizyphoroides*	Mounds
California goldfields	*Lasthenia californica*	vernal pool edges and mounds
California oatgrass	*Danthonia californica*	Mounds
California sandwort	*Minuartia californica*	vernal pool edges
Cascade calicoflower	*Downingia yina*	vernal pools
Common woolly meadowfoam	*Limnanthes floccosa* ssp. *floccosa*	vernal pools
Cook's lomatium; Cook's desert parsley	*Lomatium cookii*	vernal pools
Coyote thistle; Coyote rush-lily	*Eryngium petiolatum*	vernal pools
Dwarf woollyheads	*Psilocarphus brevissimus*	vernal pools
Dwarf woolly meadowfoam	*Limnanthes floccosa ssp. pumila*	vernal pool edges
Elegant tarweed	*Madia elegans*	Mounds
Fitch's tarweed	*Centromadia fitchii*	Mounds and pools
Fringe pod	*Thysanocarpus curvipes*	Mounds
Foothills desert parsley	*Lomatium utriculatum*	Mounds
Fulvous popcornflower	*Plagiobothrys fulvus*	Mounds
Green's popcornflower	*Plagiobothrys greenei*	vernal pool edges
Harvest brodeaia	*Brodeaia elegans*	Mounds
Henderson's bentgrass	*Agrostis hendersonii*	vernal pool edges
Herman's dwarf rush	*Juncus hemiendytus*	vernal pools
Iris leaved rush	*Juncus xiphiodes*	vernal pools
Junegrass	*Koeleria macrantha*	Mounds
Large-flowered woolly meadowfoam	*Limnanthes floccosa ssp. grandiflora*	vernal pools
Least mousetail	*Myosurus minimus*	vernal pools
Lemmon's needlegrass	*Achnatherum lemmonii*	Mounds
Menzies' larkspur	*Delphinium menziesii*	mounds (in oak woodland)
Miner's lettuce	*Claytonia perfoliata*	Mounds
Mules ears	*Wyethia angustifolium*	Mounds
Narrow-leaved montia	*Montia linearis*	Mounds
Oregon white Oak	*Quercus garryana*	Mounds
Oregon woolly-heads	*Psilocarphus oregonus*	vernal pools
Pacific foxtail	*Alopecurus saccatus*	vernal pools
Pointed rush	*Juncus oxymeris*	vernal pools
Poverty clover, cow's udder clover	*Trifolium depauperatum*	Mounds
Purple clarkia	*Clarkia purpurea*	Mounds
Quillwort	*Isoetes nuttallii*	vernal pools
Ribbed fringe-pod	*Thysanocarpus radians*	Mounds
Roemer's fescue	*Festuca roemeri*	Mounds
Rough-seeded popcornflower	*Plagiobothrys glyptocarpus* var. *glyptocarpus*	vernal pool edges
Rusty popcornflower	*Plagiobothrys nothofulvus*	Mounds
Slender clarkia	*Clarkia gracilis*	Mounds
Slender cottonweed	*Micropus californicus*	Mounds
Slender hareleaf	*Lagophylla ramosissima*	Mounds

Common Name	Scientific Name	Habitat
Slimpod rush	*Juncus diffusissimus*	vernal pools
Smooth goldfields	*Lasthenia glaberinna*	vernal pools
Soft rush	*Juncus effusus*	vernal pools
Southern Oregon buttercup	*Ranunculus austro-oreganus*	mounds (in oak woodland)
Spinster's blue-eyed mary	*Collinsia sparsiflora*	vernal pool edges and uplands
Stipitate popcornflower	*Plagiobothrys stipitatus*	vernal pools
Tehama navarretia	*Navarretia heterandra*	vernal pool edges
Toadrush	*Juncus bufonius*	vernal pools and along edges
Tomcat clover	*Trifolium willdenovii*	vernal pool edges
Turkey mullein	*Eremocarpus setigerus*	mounds and pools
Vinegar weed	*Trichostema lanceolatum*	mounds and pools
Water chick-weed	*Montia fontana*	vernal pools
Wedge-leaf buckbrush	*Ceanothus cuneatus*	Mounds
White brodiaea	*Triteleia hyacinthina*	mounds and pools
White-flowered navarretia	*Navarretia leucocephala* ssp. *Leucocephala*	vernal pools

STATUS OF THE SPECIES AND ENVIRONMENTAL BASELINE

Status of the species

Vernal pool fairy shrimp

Descriptions of the vernal pool fairy shrimp are found in 59 FR 48136, the publication of the final rule to list the species under the Act. Fairy shrimp are restricted to vernal pools, swales, and other seasonal pools in California and Jackson County, Oregon. Eng et al. (1990) and Simovich *et al.* (1992) provide further details on the life history and ecology of the vernal pool fairy shrimp.

Fairy shrimp have delicate elongate bodies, large stalked compound eyes, no carapace, and 11 pairs of swimming legs. They swim or glide gracefully upside down by means of complex beating movements of the legs that pass in a wavelike, anterior-to-posterior direction. Nearly all fairy shrimp feed on algae, bacteria, protozoa, rotifers, and bits of detritus. The females carry the eggs in an oval or elongate ventral brood sac. The eggs are either dropped to the pool bottom or remain in the brood sac until the female dies and sinks. The "resting" or "summer" eggs are known as "cysts." They are capable of withstanding heat, cold, and prolonged desiccation.

When the pools refill in the same or subsequent seasons, some, but not all, of the cysts may hatch. The cyst bank in the soil may comprise the cysts from several years of breeding. The cysts hatch when the vernal pools fill with rainwater. The early stages of the fairy shrimp develop rapidly into adults. These non-dormant populations often disappear early in the season long before the vernal pools dry up.

The vernal pool fairy shrimp inhabits vernal pools with clear to tea-colored water, most commonly in grass or mud bottomed swales, or basalt flow depression pools in unplowed grasslands. The vernal pool fairy shrimp has been collected from early December to early May.

After winter rainwater fills the pools, the populations are reestablished from diapaused cysts which lie dormant in the dry pool sediments. Sexually mature adults have been observed in vernal pools three to four weeks after the pools had been filled. Some of the cysts hatch immediately and the rest enter diapause and remain in the soil to hatch during later rainy seasons.

The fairy shrimp are imperiled by habitat loss caused by a variety of human-caused activities, primarily urban development, water supply/flood control projects, and conversion of land to agricultural use. Only a small proportion of the habitat of these species is protected from these threats. State and local laws and regulations have not been passed to protect these species, and other regulatory mechanisms necessary for the conservation of the habitat of these species have proven ineffective.

Vernal Pool Species Critical Habitat

On August 8, 2003, the Service issued a final rule designating critical habitat for 15 vernal pool species, including fairy shrimp. A total of approximately 1,184,513 acres of land falls within the boundaries of designated critical habitat. Approximately 7,574 acres occur in Oregon and 1,186,969 acres occur in California (USFWS 2003b). Due to legal challenges filed in 2004 the Service was court ordered to reconsider the final designation. On September 12, 2005, the Service issued a final rule addressing the issues raised by the court and finalized the designation of critical habitat for the 15 vernal pool species. Approximately 858,846 acres of land are now designated as critical habitat. The critical habitat designated in Oregon (7,574 acres) did not change (USFWS 2005)

Critical habitat is defined in Section 3 of the Act as:

> (i) The specific areas within the geographic area occupied by a species at the time it is listed in accordance with the Act, on which are found those physical or biological features
>
> (I) essential to the conservation of the species; and,
>
> (II) may require special management considerations or protection; and
>
> (ii) Specific areas outside the geographic area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.[12]

The physical or biological features include, but are not limited to, the following: (1) space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and (5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species. Our regulations at 50 CFR 424.12(b) further direct that when considering the designation of critical habitat, we are to focus on the principal biological or

[12] "Conservation," as defined by the Act, means the use of all methods and procedures that are necessary to bring an endangered or a threatened species to the point at which listing under the Act is no longer necessary.

physical constituent elements (PCE) within the defined area that are essential to the conservation of the species, and we are to list known PCEs with the critical habitat description. Our regulations describe known PCEs in terms that are more specific than the description of physical and biological features. Specifically, PCEs may include, but are not limited to, the following: roost sites, nesting grounds, spawning sites, feeding sites, seasonal wetland or dryland, water quality or quantity, host species of plant pollinator, geological formation, vegetation type, tide, and specific soil types.

Because it is logistically difficult to determine how extensive the cyst or seed bank is at any particular site, and because hatched vernal pool crustaceans or above-ground vernal pool plants may or may not be present in all vernal pools within a site every year, we cannot quantify in any meaningful way what proportion of each critical habitat unit may actually be occupied by the vernal pool crustaceans or vernal pool plants. Therefore, areas of unoccupied habitat are probably interspersed with areas of occupied habitat in each unit. The inclusion of unoccupied habitat in our critical habitat units reflects the dynamic nature of the habitat and the life history characteristics of the vernal pool crustaceans and vernal pool plants. Unoccupied areas provide areas into which populations might expand, provide connectivity or linkage between groups of organisms within a unit, and support populations of pollinators and seed dispersal organisms. Both occupied and unoccupied areas that are designated as critical habitat are essential to the conservation of the species.

Based on our current knowledge of the life history and ecology of the 15 listed vernal pool species, the relationship of their essential life history functions to their habitat, and the ecological and hydrologic functions of vernal pool complexes, we determined that all of the 15 vernal pool species share the following two PCEs. These are:

(1) Vernal pools, swales, and other ephemeral wetland features of appropriate sizes and depths that typically become inundated during winter rains and hold water for sufficient lengths of time necessary for the 15 species to complete their life cycle.

(2) The geographic, topographic, and edaphic features that support aggregations or systems of hydrologically interconnected pools, swales, and other ephemeral wetlands and depressions within a matrix of surrounding uplands when taken together form hydrologically and ecologically functional units called vernal pool complexes. These features contribute to the filling and drying of the vernal pool, maintain suitable periods of pool inundation, and maintain water quality and soil moisture to enable the 15 vernal pool species to carry out their lifecycles.

Vernal Pool Fairy Shrimp Critical Habitat

Fairy shrimp is the only species addressed in the Service's 2003 critical habitat designation regarding vernal pool species occurring in Oregon. Four critical habitat units in Oregon are designated as essential to the conservation of fairy shrimp, and there are 29 units in California. The Oregon units are comprised of 7,574 acres in Jackson County (Figure 3). These units occur approximately 125 miles north of the nearest unit designated for this species in California. The Service identified critical habitat areas essential to the conservation of fairy shrimp to reflect the species geographic distribution and varying habitat types and species associations across its range. Maintaining fairy shrimp across their full geographic distribution would make the species

less susceptible to environmental variation or negative impacts associated with human disturbances or natural catastrophic events across the species entire range at any one time.

The following critical habitat unit descriptions are taken from the Service's final rule designating critical habitat for vernal pool species in California and southern Oregon (USFWS 2003b):

Unit 1A, B, C, D, E, F, and G, North Agate Desert Unit, Jackson County (2,130 ac)
This unit consists of seven subunits, all located to the north of Little Butte Creek. This unit represents the northern limit of the species' distribution. It is of sufficient size to sustain the natural ecosystem processes (*e.g.*, fires) that have historically influenced vernal pool habitat, and is separated from the nearest other unit designated for Oregon, Unit 4, by over 2 miles. Three of the subunits are west of the Rogue River, and the remaining four are to the east. All but one of these subunits is located to the south of U.S. Route 234 (Sam's Valley Highway). The one remaining unit is located to the east of the Rogue River, about 1.5 miles north of the confluence with Reese Creek.

Unit 2A, B, C, D, and E, White City East Unit, Jackson County (2,251 ac)
This unit consists of five subunits, located east of U.S. Route 62 (Crater Lake Highway) and south and southeast of Dutton Road. This unit provides the easternmost extent of the species' range in Oregon. It represents a significant component of the species' original range in the State and is of a sufficient size to sustain the natural ecosystem processes (*e.g.*, fires) that have historically influenced vernal pool habitat. The largest and easternmost of the subunits occurs just to the east and north of Agate Lake. It is separated by more than 1 mile from Unit 3, White City West, and by approximately 3.5 miles from the North Agate Desert Unit.

Unit 3A, B, and C, White City West Unit, Jackson County (2,301 ac)
This unit consists of three subunits, located west of Agate Road, south of the Rogue River, and east of Bear Creek. This unit contains the least fragmented intact examples of the original Agate Desert mounded vernal pool grassland habitat. It is of sufficient size to sustain the natural ecosystem processes (*e.g.*, fires) that have historically influenced vernal pool habitat; it is separated from the White City East Unit by more than 1 mile and from the Table Rocks Unit by over 1.5 miles. Taken together, the designated Agate Desert units (Units 1–3) comprise a functional vernal pool complex consisting of vernal pools, mounded grassland and associated uplands, where natural processes, including connectivity, function within or near the natural range of variability. Each of the three designated Agate Desert units is essential to the conservation of vernal pool fairy shrimp in the Agate Desert area.

Unit 4A and B, Table Rocks Unit, Jackson County (892 ac)
This unit consists of two subunits, located on two flat-topped mesas known as Upper and Lower Table Rocks, situated north and west of the Rogue River. These rimrock features are remnants of ancient lava flows that filled portions of the Rogue River nearly 10 million years ago. Subsequent erosion of softer geologic layers has left these harder andesite (volcanic rock) formations rising some 800 feet above the present Rogue Valley. Vernal pools on the Table Rocks differ from those of the Agate Desert, in that they are formed over an impervious layer of bedrock. This unit represents a unique habitat for vernal pool fairy shrimp in Oregon. The Table Rocks Unit is disjunct from the North Agate Desert Unit by over 2 miles, and from the White City West Unit by approximately 1.5 miles

The vernal pool habitat within these four units was selected based on information provided by a wetland function and values assessment and habitat integrity analysis completed in 1999. Information describing the physical (i.e., parcel size, presence of intact hydrology) and biological (i.e., species diversity, presence and composition of native vegetation) condition of the vernal pool habitat, species inventory information detailing the presence fairy shrimp, cook's lomatium and meadowfoam, and parameters describing the potential long term sustainability of habitat (defensibility of the parcel, ownership, and positioning of the parcel relative to nearby habitat parcels) was used to identify specific parcels for inclusion as critical habitat.

Cook's Lomatium

A perennial forb in the carrot family (Apiaceae), Cook's lomatium grows 15 to 50 centimeters (cm) (6 to 20 in) tall, from a slender, twisted taproot. Leaves are smooth, finely dissected, and strictly basal (growing directly above the taproot on the ground, not along the stems). One to four groups of clustered, pale yellow flowers produce boat-shaped fruits 8 to 13 mm (0.3 to 0.5 in.) long with thickened margins. The taproot can often branch at ground level to produce multiple stems. The branching taproot distinguishes Cook's lomatium from *Lomatium bradshawii* (indigenous to wet prairies from southern Willamette Valley, Oregon to southwest Washington) and *L. caruifolium var. denticulatum* (found in vernal pools in northern California). *L. utriculatum*, found on mounds adjacent to pools in the Agate Desert, is distinguished from Cook's lomatium by its more intense yellow flowers, the different shape of its involucel bracklets (leaf-like structures below the flowers), and thin-winged fruits. *L. tracyi*, occurring in California and the Illinois Valley, has a similar appearance to Cook's lomatium, but *L. tracyi* has slender-margined fruits and can grow on dry sites. Cook's lomatium has boat or pumpkin-shaped fruits and grows on seasonally wet sites (Lincoln Constance, pers. comm. April 17, 1992). Recent genetic research has shown Cook's lomatium to be most closely related to *L. bradshawii*. *L. marginatum* and probably *L. tracyi* are likely the next closely related species (Matthew Gitzendanner, pers. comm. August 1, 2002). In the Agate Desert, Cook's lomatium flowering and fruiting time occurs from approximately the beginning of May to mid-June.

Cook's lomatium was first collected in 1981 from vernal pools in the Agate Desert, Jackson County, Oregon. Additional populations were found at French Flat in the Illinois Valley, Josephine County, Oregon in 1988 (ONHP Database, 1998). Cook's lomatium is believed to occur at 13 locations in Jackson and 33 in Josephine County (ONHP Database, 2008). Of the 13 lomatium occurrences known from the Agate Desert area of Jackson County, three are robust and include over 10,000 plants within at least 7-acre areas of intact habitat. The largest occurrence includes over 500,000 plants and the largest area includes 53 acres of suitable habitat. Five of the 13 lomatium occurrences are small to moderate size and range from 25 to 300 plants. The last five lomatium occurrences are small (less than 25 plants) or have not been located in recent years and could be extirpated. Plants in the Illinois Valley/French Flat occurrences grow on seasonally wet soils. Slight morphological differences exist between Cook's lomatium occurrences in the Agate Desert and French Flat, but these differences are not considered significant enough to separate the species into subspecies. Recent genetic research found no evidence of significant genetic differences between the Agate Desert and French Flat Cook's lomatium populations, thus not warranting the separation of the species into subspecies (Matthew Gitzendanner, pers. comm. August 1, 2002). Cook's lomatium was listed as endangered on November 7, 2002.

Cook's Lomatium Critical Habitat

The Service published the final critical habitat rule for lomatium on July 21, 2010 (USFWS 2010, FR 75: 42490 - 42569). The final rule describes the location of approximately 7,100 acres of lomatium proposed critical habitat units; all located in Jackson and Josephine counties of Oregon. The Proposed critical habitat units for lomatium in Jackson County are shown on Figure 4.

The rule describes the primary constituent elements of the proposed critical habitat as:

(1) Vernal pools or ephemeral wetlands and the adjacent upland margins of these depressions that hold water for a sufficient length of time to sustain meadowfoam germination, growth, and reproduction, occurring in the Agate Desert vernal pool landscape. These vernal pools or ephemeral wetlands are seasonally inundated during wet years but do not necessarily fill with water every year due to natural variability in rainfall, and support native plant populations. Areas of sufficient size and quality are likely to have the following characteristics: a) elevations from 1,220 to 1,540 feet, b) association with the dominant native plants; and, c) minimum area of 20 acres to provide intact hydrology and protection from development and weed sources.

(2) The hydrologically and ecologically functional system of interconnected pools, ephemeral wetlands, or depressions within a matrix of surrounding uplands that together form vernal pool complexes within the greater watershed. The associated features may include the pool basin or depressions; an intact hardpan subsoil underlying the surface soils up to 0.75 m (2.5 ft) in depth; and surrounding uplands, including mound topography and other geographic and edaphic features, that support these systems of hydrologically interconnected pools and other ephemeral wetlands (which may vary in extent depending on site-specific characteristics of pool size and depth, soil type, and hardpan depth).

(3) Silt, loam, and clay soils that are of alluvial origin, with a 0 to 3 percent slope, primarily classified as Agate–Winlo complex soils, but also including Coker clay, Carney clay, Provig–Agate complex soils, and Winlo very gravelly loam soils.

(4) No or negligible presence of competitive nonnative invasive plant species. Negligible is defined for the purpose of this rulemaking as a minimal level of nonnative plant species that will still allow lomatium and/or meadowfoam to continue to survive and recover.

The need for space for individual and population growth, germination, seed dispersal, and reproduction is provided by PCEs 1 and 4; the need for soil moisture for growth, germination, reproduction, and seed dispersal is provided by PCE 2 (but not necessarily every year); the need for other nutritional or physiological requirements for the species is met by PCE 3; habitat free from disturbance that allows for sufficient reproduction and survival opportunities is provided by PCEs 1 and 4. All of the above described PCEs do not have to occur simultaneously within a unit for the unit to constitute critical habitat for lomatium and/or meadowfoam.

Large-flowered Woolly Meadowfoam

A delicate annual in the meadowfoam family (Limnanthaceae), large-flowered woolly meadowfoam grows 5 to 15 centimeters (cm) (2 to 6 in.) tall; with 5 cm (2 in.) leaves divided into 5 to 9 segments. The stems and leaves are sparsely covered with short, fuzzy hairs. The flowers, and especially the sepals, are densely covered with woolly hairs. Each of the five yellowish to white petals has two rows of hairs near their base. In the Agate Desert, Large-

flowered woolly meadowfoam flowering and fruiting time occurs in early spring, from March to mid-April.

Mason (1952) described three varieties of *Limnanthes floccosa*, but did not recognize *ssp. grandiflora* as distinct. Based on studies of specimens grown under controlled conditions from field-collected seed, these varieties were later elevated to subspecies and described two additional subspecies, *californica* and *grandiflora*. *Grandiflora* was further distinguished from the other subspecies of *L. floccosa* by a combination of: petal length 7.5 to 9 mm (0.30 to 0.35 in.); sepal length 8.5 to 9 mm (0.33 to 0.35 in.); sepal pubescence (dense on inner surface and sparse to absent on outer surface); sparsely hairy stems and leaves; two lines of hairs at the petal base; relative flowering time; and, occurrence relative to soil moisture. Over much of its range, *ssp. grandiflora* is sympatric or closely related with *L. floccosa ssp. floccosa*; however, *ssp. floccosa* grows on the slightly drier, outer fringes of the pools, whereas *ssp. grandiflora* grows on the relatively wetter, inner fringe of the pools.

Researchers knew of only about 15 occurrences of Large-flowered woolly meadowfoam in the Agate Desert at the time the species was listed as endangered (USFWS 2002). Currently there are 23 known meadowfoam occurrences in the Agate Desert area (Friedman, pers. comm. 2009). The continued existence of meadowfoam is endangered primarily by destruction of its habitat by urban development, including road, utility and power line construction and maintenance. Agricultural conversion, certain grazing practices, off-road vehicle use, and competition with nonnative plants also contribute to population declines. Large-flowered woolly meadowfoam was listed as endangered on November 7, 2002.

Large-flowered Woolly Meadowfoam Critical Habitat

The Service published the final critical habitat rule for meadowfoam on July 21, 2010 (USFWS 2010, FR 75: 42490 - 42569). The proposed rule describes the location of approximately 6,300 acres of meadowfoam proposed critical habitat units; all located in Jackson County, Oregon. The Proposed critical habitat units for meadowfoam are shown on Figure 5.

The rule describes the primary constituent elements of the proposed critical habitat as:

(1) Vernal pools or ephemeral wetlands and the adjacent upland margins of these depressions that hold water for a sufficient length of time to sustain meadowfoam germination, growth, and reproduction, occurring in the Agate Desert vernal pool landscape. These vernal pools or ephemeral wetlands are seasonally inundated during wet years but do not necessarily fill with water every year due to natural variability in rainfall, and support native plant populations. Areas of sufficient size and quality are likely to have the following characteristics: a) elevations from 1,220 to 1,540 feet, b) association with the dominant native plants; and, c) minimum area of 20 acres to provide intact hydrology and protection from development and weed sources.

(2) The hydrologically and ecologically functional system of interconnected pools, ephemeral wetlands, or depressions within a matrix of surrounding uplands that together form vernal pool complexes within the greater watershed. The associated features may include the pool basin or depressions; an intact hardpan subsoil underlying the surface soils up to 0.75 m (2.5 ft) in depth; and surrounding uplands, including mound topography and other geographic and edaphic features, that support these systems of hydrologically interconnected pools and other

ephemeral wetlands (which may vary in extent depending on site-specific characteristics of pool size and depth, soil type, and hardpan depth).

(3) Silt, loam, and clay soils that are of alluvial origin, with a 0 to 3 percent slope, primarily classified as Agate–Winlo complex soils, but also including Coker clay, Carney clay, Provig–Agate complex soils, and Winlo very gravelly loam soils.

(4) No or negligible presence of competitive nonnative invasive plant species. Negligible is defined for the purpose of this rulemaking as a minimal level of nonnative plant species that will still allow lomatium and/or meadowfoam to continue to survive and recover.

The need for space for individual and population growth, germination, seed dispersal, and reproduction is provided by PCEs 1 and 4; the need for soil moisture for growth, germination, reproduction, and seed dispersal is provided by PCE 2 (but not necessarily every year); the need for other nutritional or physiological requirements for the species is met by PCE 3; habitat free from disturbance that allows for sufficient reproduction and survival opportunities is provided by PCEs 1 and 4. All of the above described PCEs do not have to occur simultaneously within a unit for the unit to constitute critical habitat for lomatium and/or meadowfoam.

Figure 3. Map of Designated Vernal Pool Fairy Shrimp Critical Habitat in the Agate Desert area.

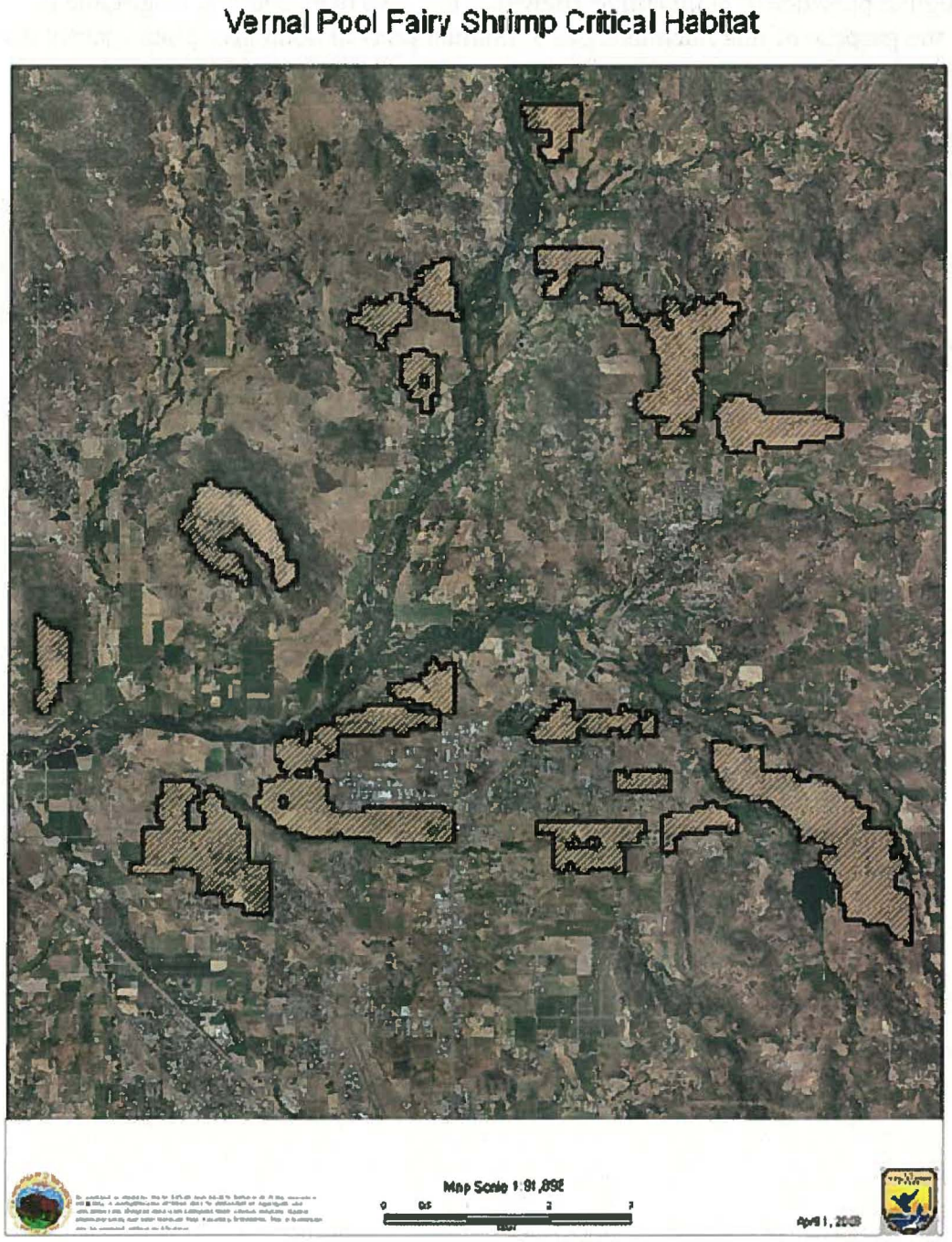


Figure 4. Map of Designated Cook's Lomatium Critical Habitat in the Agate Desert area.

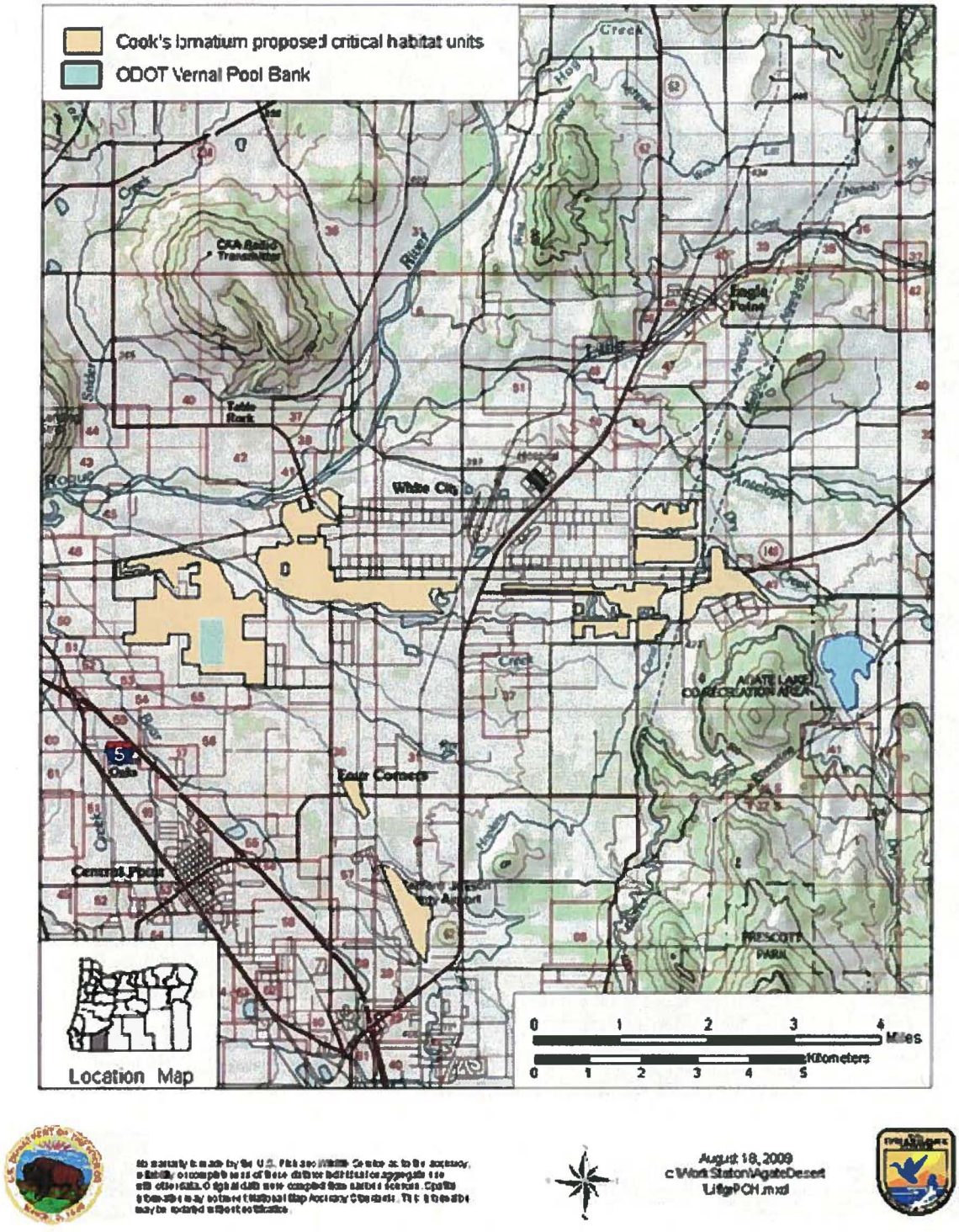
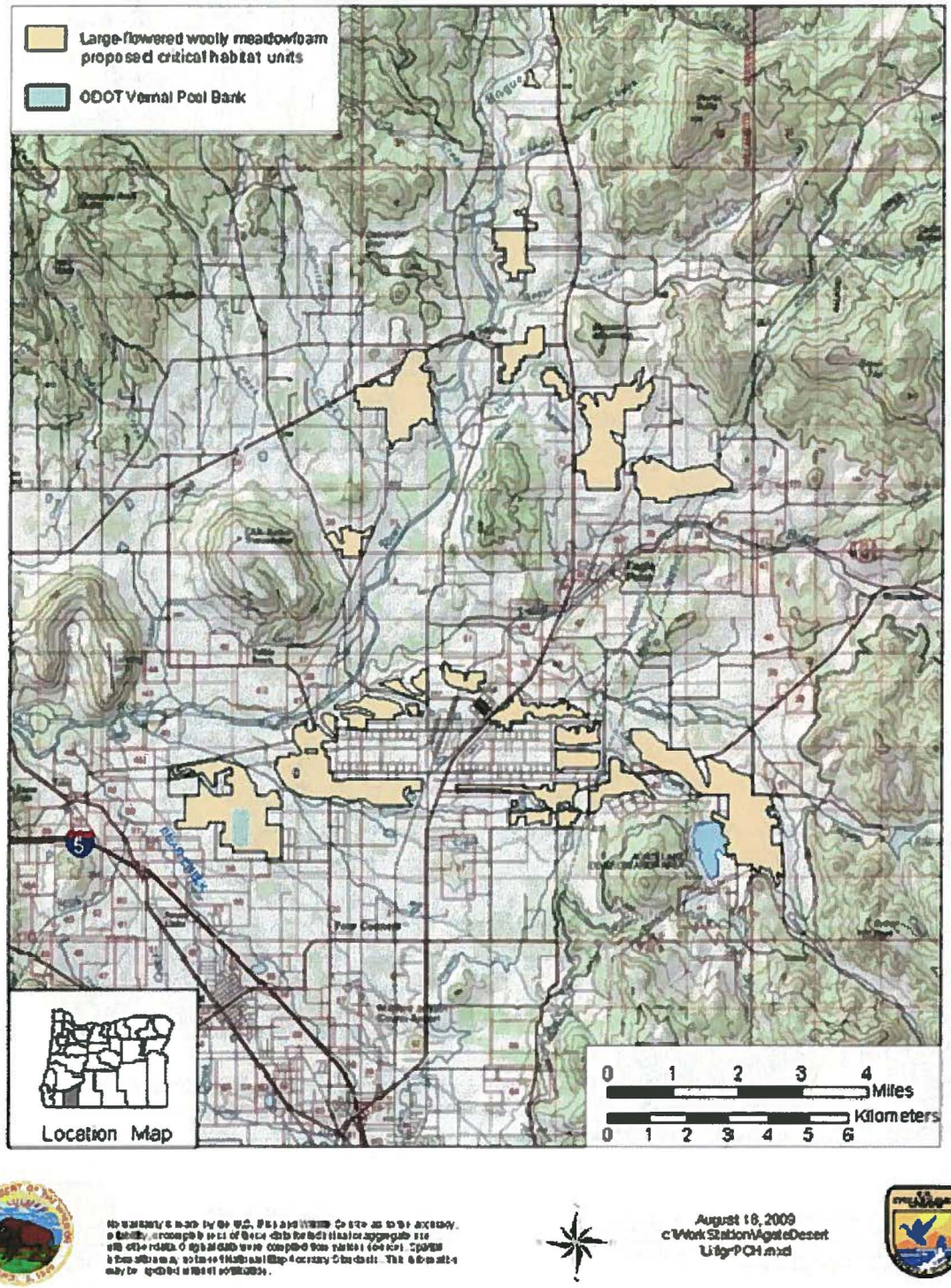


Figure 5. Map of Designated Large-flowered Woolly Meadowfoam Critical Habitat in the Agate Desert area.



Environmental Baseline

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the past and present impacts of all federal, state, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed federal projects in the action area that have undergone section 7 consultation, and the impacts of state and private actions which are contemporaneous with the consultation in progress. The following summarizes the environmental baseline for this consultation.

Vernal Pool Fairy Shrimp

Vernal pools are seasonal wetlands that form only in regions where specialized soil and climatic conditions exist. During fall and winter rains typical of modified Mediterranean climates, water collects in shallow depressions in areas where downward percolation of water is prevented by the presence of a duripan below the soil surface. Later in the spring when rains decrease and the weather warms, the both water evaporates and percolates downward, the pools generally disappear by May or June. These shallow depressions then remain relatively dry until late fall and early winter with the advent of greater precipitation and cooler temperatures. Vernal pools thus consist of unusual "flood and drought" habitat conditions to which certain plants and animals have specifically adapted.

The fairy shrimp are imperiled by habitat loss caused by a variety of human-caused activities, primarily urban development, water supply/flood control projects, and conversion of land to agricultural use. Only a small proportion of the habitat of these species is protected from these threats. State and local laws and regulations have not been passed to protect these species, and other regulatory mechanisms necessary for the conservation of the habitat of these species have proven ineffective.

The habitat of the fairy shrimp is highly fragmented throughout their range due to conversion of natural habitat for urban and agricultural uses. This fragmentation results in small isolated fairy shrimp populations. Ecological theory predicts that such populations will be highly susceptible to extinction due to chance events, inbreeding depression, or additional environmental disturbance (Gilpin and Soule 1986; Goodman 1987*a*, *b*). Should an extinction event occur in a population that has been fragmented, the opportunities for recolonization are thought to be greatly reduced due to physical (geographical) isolation from other (source) populations.

California

Holland (1978) estimated that between 60 and 85 percent of the vernal pool habitat in California had been destroyed by 1973. In the ensuing thirty years, a substantial amount of remaining habitat has been converted for human uses. The rate of loss of vernal pool habitat in the state has been estimated at two to three percent per year (Holland and Sain 1988). Rapid urbanization of the Central Valley of California currently poses the most severe threat to the continued existence of the listed vernal pool crustaceans. It is estimated that within 20 years 60 to 70 per cent of these will be destroyed by human activities (Coe 1988).

Oregon

Vernal pools are a prominent feature of the Agate Desert landform in the Agate Desert. They provide a link in the food chain for migrating waterfowl, shorebirds, birds of prey, frogs, toads, salamanders and pollinating insects. The Oregon Natural Heritage Information Center (ONHIC, formerly the Oregon Natural Heritage Program (ONHP)) conducted a study, funded by the Oregon Division of State Lands, completed in 1997 that provided a preliminary mapping and assessment of the integrity of the topography and vegetation of the vernal pools. ONHIC concluded that only 23 percent of the original vernal pool topography and hydrology in the Agate Desert remains intact where the vegetation is not severely altered. Residential, commercial, and industrial development, along with land leveling (primarily for agriculture), has altered nearly 60 percent of the historic range of the Agate Desert landform. The remainder of the habitat is either severely altered by historic and continuing land uses, or occurs along the fringes of the landform where vernal pools are weakly expressed. Results of the ONHIC study are presented in Table 2.

Originally, vernal pool habitat covered approximately 21,000 acres in the Agate Desert-Rogue River Plains region. Of the remaining 8,032.4 acres of vernal pool topography (intact, weakly expressed, or altered or weak), 59.2 percent is in the "*intact topography/hydrology and altered vegetation*" class and another 15.7 percent is in the "*intact topography/hydrology and severely altered vegetation*" class. This means that a total of 6,019.8 acres (74.9 %) has intact topography and hydrology. Only 2,012.6 acres (25.6 %) of the remaining habitat has altered or weakly expressed topography and hydrology (Table 2).

Communities of highly specialized autotrophic, non-vascular plants occupy the open spaces between higher plants in arid and semi-arid lands throughout the world. Although these crusts commonly occur, they have only recently been recognized as having a major influence on terrestrial systems. Soil crust communities are commonly a complex mosaic of cyanobacteria, algae, lichens, liverworts, mosses, fungi, and other bacteria.

Biological soil crusts are generally regarded as indicative of healthy landscapes due to the resistance they impart to the soil surface against wind and water erosion. On the Agate Desert, the crust appears to also function as living mulch by retaining soil moisture, fixing atmospheric nitrogen, and discouraging annual weed growth. The crust's structural matrix is generally left intact following low-intensity fire, indicating that a lightly burned crust still functions to maintain stability against erosive forces for both vascular plants and biological soil crusts during the recovery period. Several species of bryophyte have been collected and identified from the Agate Desert, suggesting the Agate Desert mound and pool topography contains characteristics of the club-moss carpet typical of grasslands in the North American mid-west.

Disturbance can directly and indirectly affect many aspects of the structure and function of biological soil crust communities, including cover, species composition, and carbon and nitrogen fixation. The impact of a given disturbance depends on its severity, frequency, timing, and type, as well as the climatic conditions during and after it occurs. There is no standard for measuring crust disturbance or recovery rates; the literature contains widely variable values for recovery, and either appears to show no pattern of recovery or often appear

contradictory. Agate Desert soil crusts have not been thoroughly examined, but early surveys suggest that their proper management may be a critical factor in maintaining habitat viability.

The recovery rate for biological soil crusts is widely variable. Two accepted methods with the best chance for success when a significant bryophyte layer is present are: 1) transplanting soil plugs, and 2) collecting, drying, and hand-broadcasting the dried bryophytic material over the appropriate substrate (John Christy pers. comm. 2005).

Table 2. Summary of Vernal Pool Habitat Integrity Classes in the Agate Desert.

Topography/Hydrology	Vegetation	Acres	% of Total Acres
Intact	Intact	0.0	0.0
Intact	Altered	4,755	23.1
Intact	Severely altered	1,263	6.1
Weakly expressed	Altered	1,507	7.3
Altered or weak	Severely altered	505	2.4
Undetermined		604	2.9
Leveled		3,516	17.0
Developed		8,474	41.1
Total		20,628	100.0

Vernal Pool Fairy Shrimp Critical Habitat

Table 3 and 4 provides a summary of efforts to protect, conserve or restore fairy shrimp critical habitat by CHU and ownership; and the type of efforts underway. CHU #1, at the present time, contains 100 acres benefiting from a conservation easement between The Nature Conservancy (TNC) and a private landowner. CHU #2, #3 and #4 have varying amounts of habitat protected by current ownership or land use restrictions. Approximately 31 designated critical habitat acres within CHU #2 and 14 acres within CHU #3 are being restored, enhanced, and conserved under the terms and conditions of various wetland fill and removal permits, pursuant to section 404 of the Clean Water Act.

As described in the vernal pool critical habitat description section above, the 7,574 acres of vernal pool habitat designated as critical habitat in Oregon was selected due to the high probability of long term sustainability of the function and habitat value, based on current biological and physical conditions present at the site.

Approximately 2,300 acres of fairy shrimp critical habitat are protected through ownership or conservation easement by federal, state or municipal agencies or TNC, or as compensatory mitigation for wetland impacts associated with the filling of vernal pool habitat within the Agate Desert area (Tables 3 and 4).

The Service is working with the Bureau of Land Management (BLM), Bureau of Reclamation (USBR), Oregon Department of Fish and Wildlife (ODFW), and Oregon Department of Transportation (ODOT) to finalize management plans for these areas which will provide more

protections for listed species and their associated habitats. Species and habitat surveys, wetland function and value assessments and restoration efforts are currently underway on these land parcels as part of efforts to conserve and protect critical habitat and the associated PCEs.

Table 3. Amount of Fairy Shrimp Critical Habitat receiving protective measures, by CHU and type of protective measure.

Unit	Size (acres)	Acres Protected	Type of Protection
CHU 1	2,130	200	-100 acre TNC conservation easement -250 acre Wildlands Conservation Bank
CHU 2	2,251	196	-34 acres protected as compensatory mitigation under section 404 of the CWA -154 acres managed by USBR -8 acres managed by ODOT
CHU 3	2,301	1,005	-197 acres owned by TNC -720 acres managed by ODFW with final management plan -8 acres protected as compensatory mitigation under section 404 of the CWA -80 acre ODOT bank
CHU 4	892	892	-Managed by BLM and TNC, management plans under consideration
Total	7,574	2,293	

Table 4. Acres of Vernal Pool Fairy Shrimp Critical Habitat, by CHU, by ownership, Providing Habitat Protection for Vernal Pool Fairy Shrimp, Cook's Lomatium and Large-flowered Woolly Meadowfoam.

Land Parcel	CHU#	Ownership/ Management	Acres Of Critical Habitat
Agate Reservoir	CHU 2	U.S. Bureau of Reclamation	154
Table Rocks	CHU 4	BLM/TNC	892
Agate Desert Preserve	CHU 3	The Nature Conservancy	53
Whetstone Preserve	CHU 3	The Nature Conservancy	144
Rogue River Plains Preserve	CHU 1	The Nature Conservancy	100
Wildlands	CHU 1	Wildlands, Inc.	100

Land Parcel	CHU#	Ownership/ Management	Acres Of Critical Habitat
Bank			
Denman Wildlife Area[13]	CHU 3	Oregon Department of Fish & Wildlife	720
Highway 140 SMA	CHU 2	Oregon Department of Transportation	8
ODOT Conservation Bank	CHU 3	Oregon Department of Transportation	80
Jackson County School District #9	CHU 2	Jackson County School District #9	25
Hornecker	CHU 2	Private	5
ODOT	CHU 2	Oregon Department of Transportation	4
City of Medford	CHU 3	City of Medford	3
Bear Creek Valley Sanitary Authority	CHU 3	City of Medford	5
Total			2,293

Cook's Lomatium

Reasons for decline of lomatium include industrial, commercial, and residential development, public utility construction and development of utility corridors, land conversion for agricultural uses, weed invasion, roadside spraying, and mowing (USFWS 2002).

The historical range of lomatium may have encompassed over 50 square miles in the Agate Desert area. The vernal pool habitat upon which this species depends has almost been completely eliminated in Jackson County, Oregon. An estimated 2,300 acres of lomatium habitat is present within the Agate Desert area. However, the 2002 ONHIC database showed that the area of known occupied habitat had decreased to an estimated 69 acres within the Agate Desert area (USFWS 2002).

Cook's lomatium habitat is currently protected from development at the Denman Wildlife Management Area, which is managed by ODFW; a Special Management Area (SMA) at

13 This Area is composed of the Military Slough Tract (1178 acres) and the Hall Tract (620 acres). A 12-acre wetland mitigation site is also located within the Military Slough Tract for impacts associated with the filling of 3 acres of wetlands at the Medford Airport.

Highway 140 in White City, managed by ODOT; and the Agate Desert and Whetstone Savanna Preserves managed by TNC (Table 5).

ODFW is conducting inventories of the Denman Wildlife Management Area to gain a better understanding of the quality of vernal pool habitat within the area. These inventories include surveys for native plants, including meadowfoam (Doino pers. comm. 2004). ODFW revised the current management plan of the area to address conservation needs for the meadowfoam (Stauff pers. comm. 2004). ODOT is coordinating specific management actions with the Service's Roseburg Office for the two plant species at the 8-acre SMA. The two plant species are protected from development by the state of Oregon's endangered species regulations.

Although habitat loss is the primary threat to Cook's lomatium, water projects may have an adverse effect on this species as well. Diversion or blockage of watershed runoff feeding the pools can result in premature dry-down before these plants are able to produce seeds prior to going dormant. Supplemental water from outside the natural watershed into vernal pools can change the habitat into a marsh-dominated or permanent aquatic community where marsh plants may out compete lomatium (Borgias pers. comm. 2004).

Physical barriers such as roads and canals may unsuitably deepen a vernal pool upstream of a barrier. Surface runoff can be altered by trenching and other activities that change amounts, patterns, and direction of runoff to ephemeral swales and pools.

Cook's Lomatium Critical Habitat

The habitat of the Lomatium is highly fragmented throughout its range due to conversion of natural habitat for commercial and agricultural uses. This fragmentation results in small isolated lomatium populations. Ecological theory predicts that such populations will be highly susceptible to extinction due to chance events, inbreeding depression, or additional environmental disturbance (Gilpin and Soule 1986; Goodman 1987*a*, *b*). Should an extinction event occur in a population that has been fragmented, the opportunities for recolonization are thought to be greatly reduced due to physical (geographical) isolation from other (source) populations.

Human population growth in Jackson County is occurring at a very rapid rate. Much of this growth is taking place near Medford and White City in the heart of the Agate Desert with an increase in residential, commercial, and industrial development and subsequent loss of vernal pool habitat. Several of the Jackson County and City of Medford development projects destroyed vernal pool habitat and eliminated populations of Cook's lomatium.

Invasion of nonnative annual plants in Agate Desert has altered native perennial plant communities (USFWS 2000) where lomatium grows. Introduced European grasses such as brome grass, medusahead, dogtail, and bluegrass have replaced native bunch grasses on mounds between vernal pools. Medusahead competes with lomatium on seasonally wet mounds between the pools. The seeds of lomatium are not able to germinate under the dense thatch produced by these introduced annual species.

Of the 2,300 acres of designated lomatium critical habitat present on the Agate Desert, approximately 588 acres of habitat are protected (Table 5).

Large-flowered Woolly Meadowfoam

Habitat loss and, to a lesser degree, certain livestock grazing practices, off-road vehicle use, and competition with nonnative plants, have decreased the acreage occupied by meadowfoam (USFWS 2000). An estimated 6,300 acres of habitat suitable for meadowfoam is present within the Agate Desert area. However, the species is not distributed across all of this acreage and occurrences of the species at specific locations have been found to vary from year to year.

Currently, 23 meadowfoam occurrences are known in the Agate Desert area of Jackson County. These occurrences range from 200,000 plants to five plants. The largest occurrences occupy an approximately 200-acre area of contiguous intact vernal pool complex. The smallest occurrence occupies just a few square feet of poor quality wetlands, formerly vernal pool habitat.

Mapped habitat for meadowfoam decreased from 198 acres in 1998 to 116 acres as reported in the ONHIC database (USFWS 2002a). Suitable meadowfoam habitat currently protected from development is located on the Denman Wildlife Management Area (the 620-acre Hall Tract and the 1,178-acre Military Slough Tract) and the recently created 80-acre ODOT vernal pool conservation bank area. ODFW conducted inventories of the Denman Wildlife Management Area to gain a better understanding of the quality of vernal pool habitat within the area. These inventories included surveys for native plants, including meadowfoam (Doino pers. comm. 2004). ODFW has also revised the management plan of the area to address conservation needs for the meadowfoam and received funding through section 6 of the Act to develop a restoration plan for vernal pool habitat within the wildlife management (Stauff pers. comm. 2008).

As described for Cook's lomatium, residential, commercial, and industrial development and development of game habitat at Denman Wildlife Area have eliminated large tracts of suitable habitat for this species (USFWS 2000).

Large-flowered Woolly Meadowfoam Critical Habitat

As with Lomatium, the habitat of the meadowfoam is highly fragmented throughout its range due to conversion of natural habitat for commercial and agricultural uses. This fragmentation results in small isolated lomatium populations. Ecological theory predicts that such populations will be highly susceptible to extinction due to chance events, inbreeding depression, or additional environmental disturbance (Gilpin and Soule 1986; Goodman 1987*a*, *b*). Should an extinction event occur in a population that has been fragmented, the opportunities for recolonization are thought to be greatly reduced due to physical (geographical) isolation from other (source) populations.

Community development pressure brought about much of this habitat loss. Much of this growth is taking place near Medford and White City in the heart of the Agate Desert with an increase in residential, commercial, and industrial development and subsequent loss of vernal pool habitat. Several of the Jackson County and City of Medford development projects destroyed vernal pool habitat and eliminated populations of meadowfoam.

Invasion of nonnative annual plants in Agate Desert has altered native perennial plant communities (USFWS 2000) where meadowfoam grows. Introduced European grasses such as brome grass, medusahead, dogtail, and bluegrass have replaced native bunch grasses on mounds

between vernal pools. Medusahead competes with meadowfoam on seasonally wet mounds between the pools. The seeds of meadowfoam are not able to germinate under the dense thatch produced by these introduced annual species.

Of the 6,300 acres of designated meadowfoam critical habitat present on the Agate Desert, approximately 1,373 acres of habitat are protected (Table 6).

Table 5: Acres of Critical Habitat, by CHU, by ownership, providing Habitat Protection for Cook's lomatium.

Land Parcel	CHU#	Ownership	Acres Of Critical Habitat
Highway 140 SMA	RV6	Oregon Department of Transportation	20
Agate Desert Preserve	RV6	The Nature Conservancy	53
Denman Wildlife Area[14]	RV6	Oregon Department of Fish & Wildlife	283
Whetstone Preserve	RV8	The Nature Conservancy	144
ODOT Conservation Bank	RV8	Oregon Department of Transportation	80
City of Medford	RV6	City of Medford	3
Bear Creek Valley Sanitary Authority	RV8	City of Medford	5
Total			588

14 This Area is composed of the Military Slough Tract (1178 acres) and the Hall Tract (620 acres). A 12-acre wetland mitigation site is also located within the Military Slough Tract for impacts associated with the filling of 3 acres of wetlands at the Medford Airport. A 19-acre wetland mitigation site is also proposed for the Hall tract, with implementation scheduled for summer of 2009.

Table 6: Acres of Critical Habitat, by CHU, by ownership, providing Habitat Protection for Large–flowered Woolly Meadowfoam

Land Parcel	CHU#	Ownership	Acres Of Critical Habitat
Wildlands Bank	RV3	Wildlands, Inc.	120
Parson's Easement	RV3	Private	40
Agate Reservoir	RV7	U.S. Bureau of Reclamation	154
Highway 140 SMA	RV6	Oregon Department of Transportation	20
Jackson County School District #9	RV6	Jackson County School District #9	25
Hornecker	RV6	Private	5
ODOT Dutton road mitigation area	RV6	Oregon Department of Transportation	4
Agate Desert Preserve	RV6	The Nature Conservancy	53
Denman Wildlife Area[15]	RV6	Oregon Department of Fish & Wildlife	720
Whetstone Preserve	RV8	The Nature Conservancy	144
ODOT Conservation Bank	RV8	Oregon Department of Transportation	80
City of Medford	RV6	City of Medford	3
Bear Creek Valley Sanitary Authority	RV8	City of Medford	5
Total			1,373

15 This Area is composed of the Military Slough Tract (1178 acres) and the Hall Tract (620 acres). A 12-acre wetland mitigation site is also located within the Military Slough Tract for impacts associated with the filling of 3 acres of wetlands at the Medford Airport. A 19-acre wetland mitigation site is also proposed for the Hall tract, with implementation scheduled for summer of 2009.

ANALYTICAL FRAMEWORK FOR JEOPARDY DETERMINATIONS

Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this Opinion is made by evaluating the effects of the proposed Federal action in the context of the current status of fairy shrimp, lomatium and meadowfoam, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of the survival and recovery of these species in the wild.

The jeopardy analysis in this Opinion places an emphasis on consideration of the range-wide survival and recovery needs of the fairy shrimp, lomatium and meadowfoam and the role of the action area in the survival and recovery of these species as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Adverse Modification Determination

In accordance with policy and regulation, the adverse modification analysis in this Opinion relies on four components: (1) the *Status of Critical Habitat*, which evaluates the rangewide condition of designated critical habitat for the fairy shrimp in terms of primary constituent elements (PCEs), the factors responsible for that condition, and the intended recovery function of the critical habitat overall; (2) the *Environmental Baseline*, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the PCEs and how that will influence the recovery role of affected critical habitat units; and (4) *Cumulative Effects* which evaluates the effects of future, non-Federal activities in the action area on the PCEs and how that will influence the recovery role of affected critical habitat units.

For purposes of the adverse modification determination, the effects of the proposed Federal action on fairy shrimp critical habitat are evaluated in the context of the range-wide condition of the critical habitat, taking into account any cumulative effects, to determine if the critical habitat range-wide would remain functional (or would retain the current ability for the PCEs to be functionally established in areas of currently unsuitable but capable habitat) to serve its intended recovery role for the fairy shrimp.

The analysis in this Opinion places an emphasis on using the intended range-wide recovery function of fairy shrimp critical habitat and the role of the action area relative to that intended function as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the adverse modification determination.

Service Vernal Pool Species Recovery Plan and Conservation Strategy for Jackson County, Oregon

The Service published a final recovery plan for vernal pool ecosystems of California and Southern Oregon in 2005 (USFWS 2005). The recovery plan sets out specific goals, objectives and tasks to direct recovery efforts for fairy shrimp. The Jackson County vernal pool area, known as the Klamath Mountains Vernal Pool Region, is composed of three core areas (Agate Desert, White City and Table Rocks) and is considered a zone 2 area (USFWS 2005). Recovery recommendations within Zones 2 and 3 are considered more flexible than Zone 1 area and recovery criteria specific to Zone 2 core areas may be modified on a case-by-case basis as information becomes available.

The overall recovery goal for fairy shrimp in the Klamath Mountains Vernal Pool Region is to protect 85 percent of the approximately 5,000 acres of remaining suitable vernal pool habitat (4,300 acres). As stated above, the Klamath Mountain vernal pool region should be a significant contributor to the recovery of vernal pool fairy shrimp. Protection of this amount of vernal pool habitat, because of the overlapping nature of the fairy shrimp, lomatium and meadowfoam in the Agate Desert, is expected to also meet the overall recovery objective for the listed plants. As such The Service has developed the following guidance for vernal pool conservation in this area:

- A minimum of 4,300 acres of vernal pool habitat should be protected through ownership, management; or conservation easement or agreement.
- This conservation effort should be distributed throughout the Agate Desert, White City and Table Rocks area. Table 7 and Figure 7 depict 17 focal areas the Service recommends for conservation efforts. The arrangement of the protected parcels shall allow for a network of protected parcels with a maximum distance of two miles from the nearest parcel.
    - Approximately 2,300 acres is currently protected See environmental baseline section below). Management plans for several of these protected areas need to be finalized and implemented.
    - Approximately 2,000 acres still need to be protected to meet the recovery objective for the Klamath Mountain Vernal Pool region.
        - A minimum of 500 acres should be protected in the form of conservation banks.
            - Conservation banks should be a minimum of 70 acres. Banks can be composed of discontinuous parcels, with a core parcel of a minimum of 50 acres.
            - Conservations banks or bank parcels shall be located within the historical range of the Agate-Winlo soil type.
        - A minimum of 1,000 acres should be protected in the form of conservation easements or agreements.

- Existing vernal pool habitat can be conserved and restored. Re-creation of vernal pool habitat (re-creation of surface topography where the underlying duripan layer is intact), may be considered on a case-by-case basis.

The Service is preparing the final recovery plan for the listed species of the Rogue Valley Vernal Pool and Illinois Valley Wet Meadow Ecosystems. The draft recovery objectives include protection and conservation of existing populations, research and promotion of natural ecosystem functions such as local hydrology and native vegetation to aid in the direct recovery for lomatium and meadowfoam. The Agate Desert includes nine high priority core areas for lomatium and meadowfoam (Figure 6). At least 85 percent of the suitable habitat acreage within these nine core areas should be protected to meet recovery objectives for the listed plants (USFWS 2006).

Figure 6 depicts the draft recovery core areas described within the draft recovery plan. The core areas were selected to direct focused restoration and conservation actions to achieve recovery for the two listed plant species. Core area boundaries were identified based on the location of listed plant occurrences, the distribution of appropriate vernal pool habitat and identification of vernal pool topography from aerial photography of the region. The listed plant core areas overlap to a high degree with vernal pool areas previously identified as core habitat for vernal pool fairy shrimp recovery (USFWS 2005).

Figure 6. Recovery Core Areas from the Draft Recovery Plan for Listed Species of the Rogue Valley Vernal Pools and Illinois Valley Wet Meadow Ecosystems.

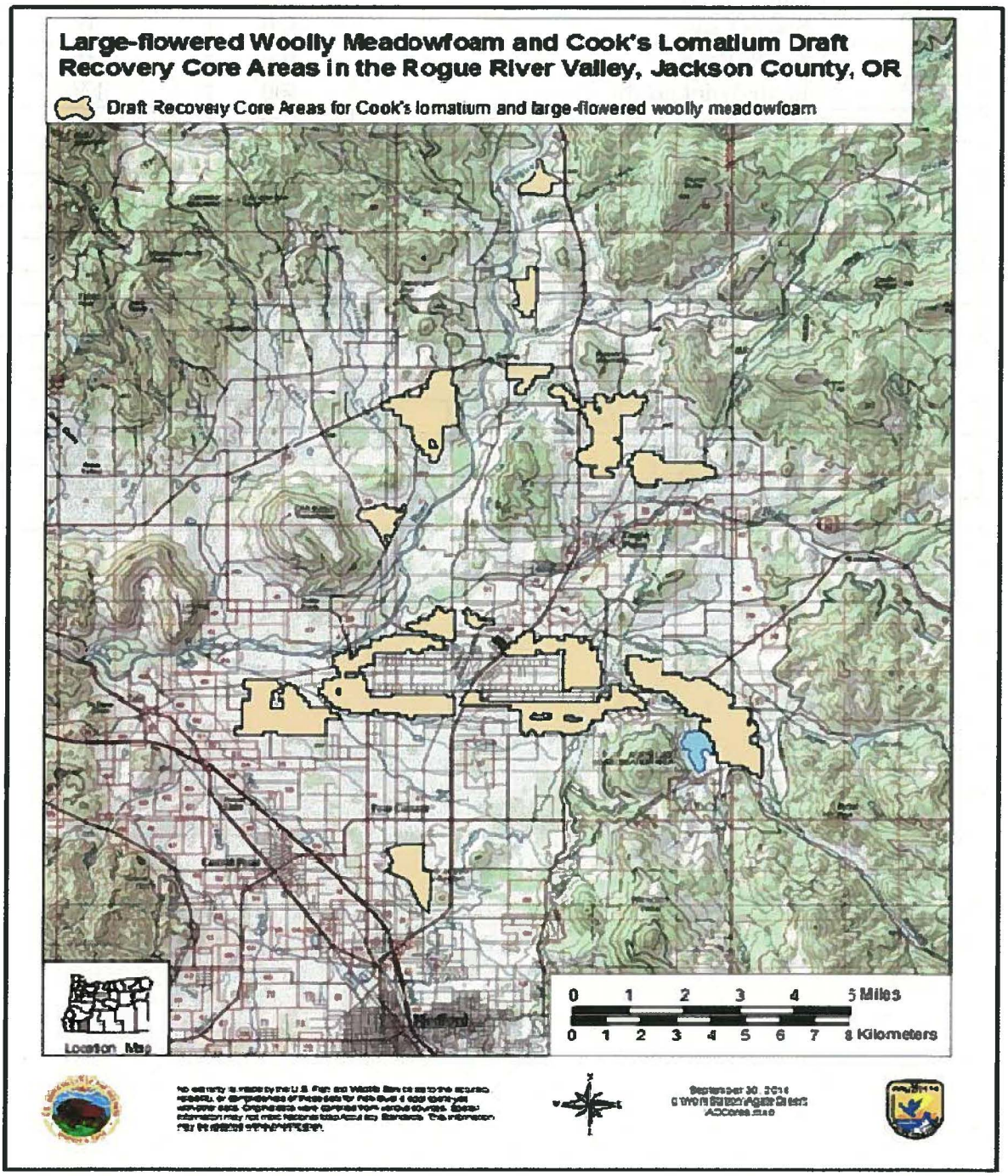


Table 7. Service Focal Areas for Vernal Pool Conservation and Recovery

ID #	Area	Target Acreage	Acreage currently protected
1	Table Rocks (upper & lower)	400	892
2	Sam's Valley	400	100
3	Shady Cove	400	0
4	Staley Road	200	0
5	Eagle Point north	400	130
6	Eagle Point south	100	0
7	Dutton Road	100	34
8	Brigham-Brown/Avenue H	100	0
9	Highway 140 corridor	100	10
10	Dry Creek, north of Hwy. 140	400	0
11	Agate Reservoir	200	154
12	Corey Road	100	0
13	Denman north (Military Slough)	400	400
14	Denman south (Hall Tract)	300	300
15	Table Rock Road/Antelope Road	300	61
16	Kirtland Road	200	20
17	Truax Road/Newland Road	200	224
Total Acres		4,300	2,325

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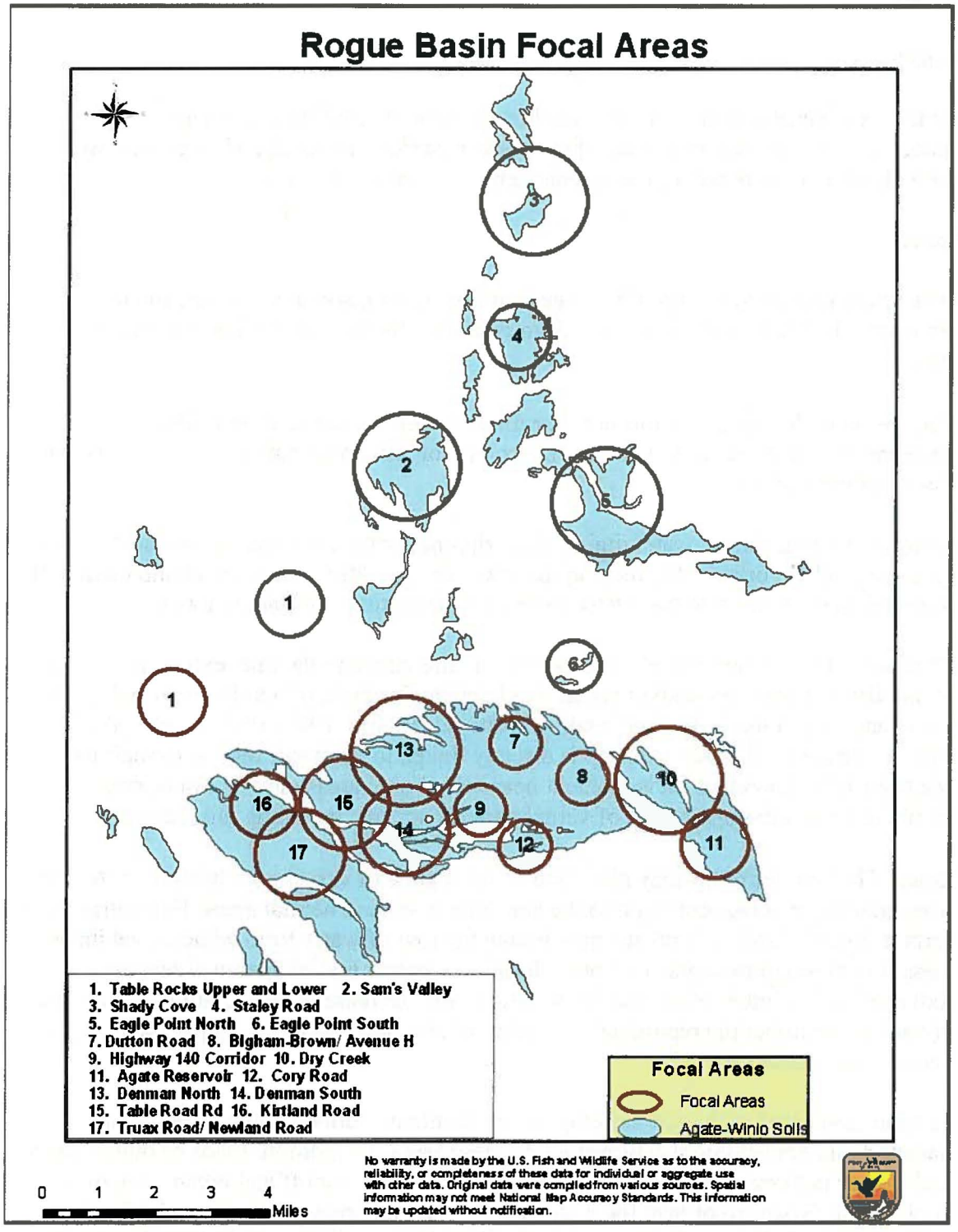
Figure 7. Vernal Pool Habitat Focal Areas in Jackson County, Oregon.



EFFECTS OF THE PROPOSED ACTION

Fairy Shrimp

Direct effects

Individual fairy shrimp and their cysts may be directly injured or killed by activities leading to the destruction (i.e., the filling of habitat) of the pools in which they exist and or by activities associated with protection, restoration and management of vernal pool habitat.

Indirect effects

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Individuals and their cysts may be injured or killed by several indirect effects:

- Changes in hydrology: In addition to the direct impacts associated with filling, development can have impacts on the hydrology of remaining habitat (e.g., pools/swales) and surrounding areas.

  Projects involving storm water drains, deep ripping, or the coverage of land surfaces with concrete, asphalt, or irrigated recreation parks, etc., can affect the amount and quality of water available to the perched water tables characteristic of vernal pool areas.

  Changes to the perched water table can lead to alterations in the rate, extent, and duration of inundation (water regime) of remaining habitat. The biota of vernal pools and swales can change when the hydrologic regime is altered (Bauder 1986, 1987). Survival of aquatic organisms like fairy shrimp is directly linked to the water regime of their habitat (Zedler 1987). Therefore, development near vernal pool areas may, at times, result in the failure of local sub-populations of vernal pool organisms, including fairy shrimp.

- Roads: Grading for roads may affect the water regime of vernal pool habitat, particularly when grading involves cutting into the substrata in or near habitat areas. Exposure of sub-surface layers of soil at road cuts may hasten the loss of water from adjacent habitat by mass flow through networks of cracks, lenses of coarser material, animal burrows, old root channels, or other macroscopic channels. Any decrease in the duration of inundation of habitat can affect the reproductive success of species present, including the listed vernal pool crustacean.

  Erosion associated with road building can contaminate vernal habitat through the transport and deposition of sediments into these areas. In addition, roads or other changes in drainage patterns could result in an increase in surface runoff and conversion of vernal pool habitat. Roads in or near the watersheds of habitat areas can lead to additional impacts through the introduction of chemically laden runoff (i.e., petroleum products) from the road surfaces.

Chemical contamination of habitat can kill listed species by poisoning. Roads in close proximity to habitat areas may encourage additional impacts through other human activities.

- Human intrusion: Development frequently results in human intrusion into surrounding areas. Human intrusion is a mechanism by which trash or hazardous waste can be introduced into remaining habitat areas (Bauder 1986, 1987). Disposal of waste materials can eliminate habitat, disrupt pool hydrology, or release substances into pools that are toxic or that adversely affect water chemistry. In addition, off-road vehicle use and other recreational activities associated with humans can lead to wheel ruts, soil compaction, increased siltation, destruction of native vegetation, introduction of undesirable non-native plants, and an alteration of pool hydrology.

- Pesticides/Herbicides: Development often results in the introduction of pesticides or herbicides into the environment. These chemical compounds are thought to have adverse effects on fairy shrimp and/or their cysts. Individuals may be killed directly or suffer reduced fitness through physiological stress or a reduction in their food base due to the presence of these chemicals.

- Introduced predators: Development may produce conditions that are favorable for exotic predators such as bullfrogs, and mosquito fish. The stomachs of bullfrogs captured in vernal pools near Chico, California were found to contain large numbers of vernal pool tadpole shrimp (Hayes, pers. com., 1993 in 59 **FR** 48136). Mosquito fish can be equally devastating as predators when introduced into vernal pool habitat. Thus, listed species and their cysts may be adversely affected by the introduction of exotic predators.

The proposed action may directly or indirectly affect all fairy shrimp associated with up to 220 acres of vernal pool wetland (or 1100 acres of vernal pool complex) in Jackson County, Oregon.

Of this acreage, 110 acres of vernal pool wetland (or 550 acres of vernal pool complex) impact result from development actions and associated mitigation. Depending on the functional value of the involved wetlands and the applicable mitigation ratios, this will entail 20-38 acres of wetland negatively impacted by the development actions and 75-90 acres of wetland affected by protection, restoration, and management for associated mitigation. An additional 110 acres of vernal pool wetland (or 550 acres of vernal pool complex) impact may be affected by voluntary (non-mitigation) actions implemented for the dominant purposes of protecting, preserving, restoring, enhancing, or maintaining the habitat and listed species attributes of VPC.

The negative impacts resulting from development actions are anticipated to be permanent and to preclude the utilization of the affected habitat by vernal pool fairy shrimp. The impacts associated with both the required mitigation actions and non-mitigation voluntary actions are anticipated to be positive and beneficial for the conservation and recovery of the species. Short-term adverse affects resulting from these otherwise beneficial actions are inherently very near-term and temporary in nature (occurring over less than 5-years), and will be significantly constrained by the standards, practices, and conditions in this Opinion.

Vernal Pool Fairy Shrimp Critical Habitat

The primary constituent elements of fairy shrimp critical habitat are affected by 1) alterations in local hydrology, and 2) Introduction of invasive, non-native vegetation in the area. Hydrology and invasive species are closely associated.

Changes in hydrology (such as filling or draining of pools) will be exhibited by the loss of the typical wet/dry cycle of the pool and surrounding mound habitat area. Loss of this wet/dry cycle will result in the degradation and loss of function of the habitat in terms of providing the fairy shrimp with the necessary life cycle elements to sustain over the long term.

Introduction of invasive, non-native vegetation can alter the soil chemistry, compete for nutrients and crowd out native vernal pool plants. Alteration of hydrology can exacerbate the spread of, and provide a competitive edge to non-native vegetation in vernal pool habitat affected by a small change in hydrology.

The proposed action may directly or indirectly affect all fairy shrimp associated with up to 220 acres of vernal pool wetland (or 1100 acres of vernal pool complex) in Jackson County, Oregon.

Of this acreage, 110 acres of vernal pool wetland (or 550 acres of vernal pool complex) impact result from development actions and associated mitigation. Depending on the functional value of the involved wetlands and the applicable mitigation ratios, this will entail 20-38 acres of wetland negatively impacted by the development actions and 75-90 acres of wetland affected by protection, restoration, and management for associated mitigation. An additional 110 acres of vernal pool wetland (or 550 acres of vernal pool complex) impact may be affected by voluntary (non-mitigation) actions implemented for the dominant purposes of protecting, preserving, restoring, enhancing, or maintaining the habitat and listed species attributes of VPC.

It is not possible to determine exactly how much of the acreages above will occur within designated critical habitat. An extrapolation based on the fact that approximately 80 percent of currently existing vernal pool habitat is contained within designated critical habitat for the vernal pool fairy shrimp could lead to the conclusion that a similar proportion of the impacts covered under this Opinion will occur with designated critical habitat. This would equate to 16-30 acres, 60-72 acres, and 88 acres of vernal pool wetland within critical habitat being affected by development actions, associated mitigation, and voluntary (non-mitigation) actions, respectively.

However, this Opinion also contains standards, criteria, and other factors intended to discourage development action in vernal pools designated as critical habitat and to incentivize mitigation and restoration actions within designated critical habitat. Therefore, the actual range of impacts to critical habitat is likely to be less than estimated above for development actions and equal to or greater than estimated above for mitigation, and voluntary (non-mitigation) actions.

The negative impacts resulting from development actions are anticipated to be permanent and to preclude the utilization of the affected habitat by vernal pool fairy shrimp. The impacts associated with both the mitigation actions and non-mitigation voluntary actions are anticipated to be positive and beneficial for the conservation and recovery of the species. Short-term adverse affects resulting from these otherwise beneficial actions are inherently very near-term and

temporary in nature (occurring over less than 5-years), and will be significantly constrained by the standards, practices, and conditions in this Opinion.

Cook's Lomatium

Direct effects

Individual lomatium plants may be directly harmed or killed by activities leading to the modification (i.e., the filling of habitat) of the pools in which they exist and or by activities associated with protection, restoration and management of vernal pool habitat.

Indirect effects

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Individual plants and their seed may be injured or killed by several indirect effects:

- Changes in hydrology: In addition to the direct impacts associated with filling, development can have impacts on the hydrology of remaining habitat (e.g., pools/swales) and surrounding areas.

- Loss of controls of non-native invasive plant species could result in over-shading and exclusion of Lomatium from patches.

- Projects involving storm water drains, deep ripping, or the coverage of land surfaces with concrete, asphalt, or irrigated recreation parks, etc., can affect the amount and quality of water available to the perched water tables characteristic of vernal pool areas.

The proposed action may directly or indirectly affect all Cook's lomatium associated with up to 220 acres of vernal pool wetland (or 1100 acres of vernal pool complex) in Jackson County, Oregon.

Of this acreage, 110 acres of vernal pool wetland (or 550 acres of vernal pool complex) impact result from development actions and associated mitigation. Depending on the functional value of the involved wetlands and the applicable mitigation ratios, this will entail 20-38 acres of wetland negatively impacted by the development actions and 75-90 acres of wetland affected by protection, restoration, and management for associated mitigation. An additional 110 acres of vernal pool wetland (or 550 acres of vernal pool complex) impact may be affected by voluntary (non-mitigation) actions implemented for the dominant purposes of protecting, preserving, restoring, enhancing, or maintaining the habitat and listed species attributes of VPC.

The negative impacts resulting from development actions are anticipated to be permanent and to preclude the utilization of the affected habitat by lomatium. The impacts associated with both the mitigation actions and non-mitigation voluntary actions are anticipated to be positive and beneficial for the conservation and recovery of the species. Short-term adverse affects resulting from these otherwise beneficial actions are inherently very near-term and temporary in nature (occurring over less than 5-years), and will be significantly constrained by the standards, practices, and conditions in this Opinion.

The General Parameters included in this Opinion require that none of the above impacts will result in loss of any of the 13 currently known lomatium populations or any subsequently discovered populations. Adverse impacts will be in the form of decreases in the number of individual plants or in the spatial area of occurrences of the species. Depending on the specific nature of the action, such decreases will either be permanent or short-term and temporary as described above.

Cook's Lomatium Critical Habitat

The primary constituent elements of lomatium critical habitat are affected by 1) alterations in local hydrology, and 2) introduction of invasive, non-native vegetation in the area. Hydrology and invasive species are closely associated.

Changes in hydrology (such as the filling or draining of pools) will be exhibited by increases in the amount and percent cover by non-native plant species and/or loss of the wet/dry cycle which is vital to the functionality of the vernal pool habitat.

Introduction of invasive, non-native vegetation can alter the soil chemistry, compete for nutrients and crowd out native vernal pool plants. Alteration of hydrology can exacerbate the spread of, and provide a competitive edge to non-native vegetation in vernal pool habitat affected by a small change in hydrology.

The proposed action may directly or indirectly affect all Cook's lomatium associated with up to 220 acres of vernal pool wetland (or 1100 acres of vernal pool complex) in Jackson County, Oregon.

Of this acreage, 110 acres of vernal pool wetland (or 550 acres of vernal pool complex) impact result from development actions and associated mitigation. Depending on the functional value of the involved wetlands and the applicable mitigation ratios, this will entail 20-38 acres of wetland negatively impacted by the development actions and 75-90 acres of wetland affected by protection, restoration, and management for associated mitigation. An additional 110 acres of vernal pool wetland (or 550 acres of vernal pool complex) impact may be affected by voluntary (non-mitigation) actions implemented for the dominant purposes of protecting, preserving, restoring, enhancing, or maintaining the habitat and listed species attributes of VPC.

It is not possible to determine exactly how much of the acreages above will occur within designated critical habitat. An extrapolation based on the fact that approximately 30 percent of currently existing vernal pool habitat is contained within designated critical habitat for Cook's lomatium could lead to the conclusion that a similar proportion of the impacts covered under this Opinion will occur with designated critical habitat. This would equate to 6-11 acres, 23-27 acres, and 33 acres of vernal pool wetland within critical habitat being affected by development actions, associated mitigation, and voluntary (non-mitigation) actions, respectively.

However, this Opinion also contains standards, criteria, and other factors intended to discourage development action in vernal pools designated as critical habitat and to incentivize mitigation and restoration actions within designated critical habitat. Therefore, the actual range of impacts

to critical habitat is likely to be less than estimated above for development actions and equal to or greater than estimated above for mitigation, and voluntary (non-mitigation) actions.

The negative impacts resulting from development actions are anticipated to be permanent and to preclude the utilization of the affected habitat by Cook's lomatium. The impacts associated with both the mitigation actions and non-mitigation voluntary actions are anticipated to be positive and beneficial for the conservation and recovery of the species. Short-term adverse affects resulting from these otherwise beneficial actions are inherently very near-term and temporary in nature (occurring over less than 5-years), and will be significantly constrained by the standards, practices, and conditions in this Opinion.

The General Parameters included in this Opinion require that none of the above impacts will result in loss of any of the currently known or subsequently discovered lomatium populations within critical habitat. Therefore, the function and value of critical habitat derived from occurrences of populations of the species will not be reduced.

Large-flowered Woolly Meadowfoam

Direct effects

Individual meadowfoam plants may be directly harmed or killed and their seed destroyed by activities leading to the modification (i.e., the filling of habitat) of the pool edge habitat where they occur and or by activities associated with protection, restoration and management of vernal pool habitat.

Indirect effects

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Individuals and their seed may be harmed or killed by several indirect effects:

- Changes in hydrology: In addition to the direct impacts associated with filling, development can have impacts on the hydrology of remaining habitat (e.g., pools/swales) and surrounding areas.

- Loss of controls of non-native invasive plant species could result in over-shading and exclusion of Lomatium from patches.

- Projects involving storm water drains, deep ripping, or the coverage of land surfaces with concrete, asphalt, or irrigated recreation parks, etc., can affect the amount and quality of water available to the perched water tables characteristic of vernal pool areas.

The proposed action may directly or indirectly affect all meadowfoam associated with up to 220 acres of vernal pool wetland (or 1100 acres of vernal pool complex) in Jackson County, Oregon.

Of this acreage, 110 acres of vernal pool wetland (or 550 acres of vernal pool complex) impact result from development actions and associated mitigation. Depending on the functional value of the involved wetlands and the applicable mitigation ratios, this will entail 20-38 acres of wetland

negatively impacted by the development actions and 75-90 acres of wetland affected by protection, restoration, and management for associated mitigation. An additional 110 acres of vernal pool wetland (or 550 acres of vernal pool complex) impact may be affected by voluntary (non-mitigation) actions implemented for the dominant purposes of protecting, preserving, restoring, enhancing, or maintaining the habitat and listed species attributes of VPC.

The negative impacts resulting from development actions are anticipated to be permanent and to preclude the utilization of the affected habitat by meadowfoam. The impacts associated with both the mitigation actions and non-mitigation voluntary actions are anticipated to be positive and beneficial for the conservation and recovery of the species. Short-term adverse affects resulting from these otherwise beneficial actions are inherently very near-term and temporary in nature (occurring over less than 5-years), and will be significantly constrained by the standards, practices, and conditions in this Opinion.

The General Parameters included in this Opinion require that none of the above impacts will result in loss of any of the 23 currently known meadowfoam populations or any subsequently discovered populations. Adverse impacts will be in the form of decreases in the number of individual plants or in the spatial area of occurrences of the species. Depending on the specific nature of the action, such decreases will either be permanent or short-term and temporary as described above.

Large-flowered Woolly Meadowfoam Critical Habitat

The primary constituent elements of meadowfoam critical habitat are affected by 1) alterations in local hydrology, and 2) introduction of invasive, non-native vegetation in the area. Hydrology and invasive species are closely associated.

Changes in hydrology (such as the filling or draining of pools) will be exhibited by increases in the amount and percent cover by non-native plant species and/or loss of the wet/dry cycle which is vital to the functionality of the vernal pool habitat.

Introduction of invasive, non-native vegetation can alter the soil chemistry, compete for nutrients and crowd out native vernal pool plants. Alteration of hydrology can exacerbate the spread of, and provide a competitive edge to non-native vegetation in vernal pool habitat affected by a small change in hydrology.

The proposed action may directly or indirectly affect all meadowfoam associated with up to 220 acres of vernal pool wetland (or 1100 acres of vernal pool complex) in Jackson County, Oregon.

Of this acreage, 110 acres of vernal pool wetland (or 550 acres of vernal pool complex) impact result from development actions and associated mitigation. Depending on the functional value of the involved wetlands and the applicable mitigation ratios, this will entail 20-38 acres of wetland negatively impacted by the development actions and 75-90 acres of wetland affected by protection, restoration, and management for associated mitigation. An additional 110 acres of vernal pool wetland (or 550 acres of vernal pool complex) impact may be affected by voluntary (non-mitigation) actions implemented for the dominant purposes of protecting, preserving, restoring, enhancing, or maintaining the habitat and listed species attributes of VPC.

It is not possible to determine exactly how much of the acreages above will occur within designated critical habitat. An extrapolation based on the fact that approximately 80 percent of currently existing vernal pool habitat is contained within designated critical habitat for large-flowered woolly meadowfoam could lead to the conclusion that a similar proportion of the impacts covered under this Opinion will occur with designated critical habitat. This would equate to16-30 acres, 60-72 acres, and 88 acres of vernal pool wetland within critical habitat being affected by development actions, associated mitigation, and voluntary (non-mitigation) actions, respectively.

However, this Opinion also contains standards, criteria, and other factors intended to discourage development action in vernal pools designated as critical habitat and to incentivize mitigation and restoration actions within designated critical habitat. Therefore, the actual range of impacts to critical habitat is likely to be less than estimated above for development actions and equal to or greater than estimated above for mitigation, and voluntary (non-mitigation) actions.

The negative impacts resulting from development actions are anticipated to be permanent and to preclude the utilization of the affected habitat by large- flowered woolly meadowfoam. The impacts associated with both the mitigation actions and non-mitigation voluntary actions are anticipated to be positive and beneficial for the conservation and recovery of the species. Short-term adverse affects resulting from these otherwise beneficial actions are inherently very near-term and temporary in nature (occurring over less than 5-years), and will be significantly constrained by the standards, practices, and conditions in this Opinion.

The General Parameters included in this Opinion require that none of the above impacts will result in loss of any of the currently known or subsequently discovered meadowfoam populations within critical habitat. Therefore, the function and value of critical habitat derived from occurrences of populations of the species will not be reduced.

CUMULATIVE EFFECTS

Cumulative effects are those impacts of future State, local, and private actions affecting endangered and threatened species that are reasonably certain to occur in the action areas. Future Federal actions will be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project.

Because the vernal pool fairy shrimp are endemic to vernal pools in Jackson County, Oregon, the Service anticipates that a wide range of activities will be determined to affect these species. Such activities include, but are not limited to, urban, water, flood control, highway, and utility projects, chemical contaminants, as well as conversion of vernal pools to agricultural use. Many of these activities will be reviewed under section 7 of the Act as a result of the Federal nexus provided by section 404 of the Federal Water Pollution Control Act, as amended (Clean Water Act). The Service is currently unaware of any State, local, or private actions which, when considered in conjunction with the known environmental baseline for these species, would likely peclude the survival and recovery of the fairy shrimp.

CONCLUSION

Fairy Shrimp and Fairy Shrimp Critical Habitat

After reviewing the current status of the threatened vernal pool fairy shrimp; the environmental baseline for the area within the jurisdiction of the Service; the effects of the proposed action; and the cumulative effects; it is the Service's biological opinion that the proposed action, as described in this document, is not likely to jeopardize the continued existence of the species or to adversely modify fairy shrimp critical habitat.

This conclusion is based on the following:

- The general parameters, best management practices, standards, measures, other criteria, and the overall conservation strategy contained within the proposed action are based on and consistent with the goals and objectives of the Final Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon and associated strategies developed for Jackson County, Oregon.

- The general parameters, best management practices, standards, measures, other criteria of the proposed action are expected to significantly constrain the overall amount and extent of adverse affects to the species, to ensure that the majority of such adverse affects are near-term and temporary in nature (occurring over less than 5-years), and to promote a broader amount and extent of impacts that benefit the conservation and recovery of the species.

- The individual and combined effects of the activities included in the proposed action will therefore have a net positive impact on the species via— a) protection and maintenance of existing properly functioning habitats; b) restoration and enhancement of currently impaired habitats; c) increased occurrence of these beneficial activities in habitat areas (including critical habitat) identified as high-value/high-priority for conservation action; d) reduction of ongoing adverse impacts that are currently not subject to appropriate mitigation; and d) constraining remaining adverse impacts to scale, scope, and location determined by the recovery plan and associated local conservation strategy to be consistent with long-term survival and recovery of the species.

- Collectively, the above factors will result in the proposed action not appreciably reducing the size, distribution, or viability/productivity of vernal pool fairy shrimp at the local, regional, or rangewide scales, or not appreciably reducing the function and value of designated critical habitat or its primary constituent elements.

Cook's Lomatium, Large-Flowered Wooly Meadowfoam, and Designated Critical Habitat

After reviewing the current status of these endangered plant species; the environmental baseline for the area within the jurisdiction of the Service; the effects of the proposed projects; and the cumulative effects; it is the Service's biological opinion that the proposed projects, as described in this consultation document, are not likely to jeopardize the continued existence of these species or to adversely modify designated critical habitat.

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This conclusion is based on the following:

- The geographic area covered by the proposed action does not include the entire range of Cook's lomatium in Oregon or the entire extent of designated critical habitat for the species in the state.
- None of the impacts associated with the proposed action will result in loss of any of the currently known or subsequently discovered populations of either species.
- The general parameters, best management practices, standards, measures, other criteria, and the overall conservation strategy contained within the proposed action are based on and consistent with the goals and objectives of the Draft recovery Plan for Listed Species of the Rogue Valley Vernal Pools and Illinois Valley Wet Meadow Ecosystems and associated strategies developed for Jackson County, Oregon.
- The general parameters, best management practices, standards, measures, other criteria of the proposed action are expected to significantly constrain the overall amount and extent of adverse affects to both species, to ensure that the majority of such adverse affects are near-term and temporary in nature (occurring over less than 5-years), and to promote a broader amount and extent of impacts that benefit the conservation and recovery of both species.
- The individual and combined effects of the activities included in the proposed action will therefore have a net positive impact on these species via— a) protection and maintenance of existing properly functioning habitats; b) restoration and enhancement of currently impaired habitats; c) increased occurrence of these beneficial activities in habitat areas (including critical habitat) identified as high-value/high-priority for conservation action; d) reduction of ongoing adverse impacts that are currently not subject to appropriate mitigation; and d) constraining remaining adverse impacts to scale, scope, and location determined by the recovery plan and associated local conservation strategy to be consistent with long-term survival and recovery of both species.
- Collectively, the above factors will result in the proposed action not appreciably reducing the size, distribution, or viability/productivity of Cook's lomatium or large-flowered woolly meadowfoam at the local, regional, or rangewide scales, or not appreciably reducing the function and value of designated critical habitat or its primary constituent elements.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act prohibits take (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harass is defined as an intentional or negligent act that creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined to include significant habitat modification or degradation that results in death or injury to

listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering.

Incidental take is any take of listed animal species which result from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered a prohibited taking provided that such taking is in compliance with this incidental take statement.

As discussed above, sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the Act and the implementing regulations prohibit the removal and reduction to possession of federally listed threatened or endangered plants or the malicious damage of endangered plants on areas under federal jurisdiction, or the destruction of endangered plants on non- federal areas in violation of state law or regulation or in the course of any violation of a state criminal trespass law. Neither incidental take authorization nor recovery permits are needed for implementation of the proposed action.

The measures described below are nondiscretionary, and must be implemented by the Service so that they become binding conditions of any grant or permit issued, as appropriate, in order for the exemption in section 7(o)(2) to apply. The Service has a continuing duty to regulate the activity covered by this incidental take statement. If the Service (1) fails to require adherence to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take

The Service anticipates take of fairy shrimp in the form of harm, injury, and harassment to individual cysts and adults due to direct and indirect impacts in up to 220 acres of vernal pool wetland (or 1100 acres of vernal pool complex) in Jackson County, Oregon. The best scientific and commercial data available is not sufficient to enable the Service to estimate a specific amount of fairy shrimp adults or cysts that will be taken associated with this acreage.

However, as previously discussed: a) only the development actions occurring on 20-38 acres of wetland are anticipated to be permanent and to preclude the utilization of the affected habitat by vernal pool fairy shrimp in the future; b) the impacts associated with both the mitigation actions and non-mitigation voluntary actions are anticipated to be positive and beneficial for the conservation and recovery of the species; c) short-term adverse affects resulting from these otherwise beneficial actions are inherently very near-term and temporary in nature (occurring over less than 5-years), and will be significantly constrained; and d) the individual and combined effects of the activities included in the proposed action will have a net positive impact on the species. Therefore the amount of take that does occur is not anticipated to appreciably reduce the size, distribution, or productivity of vernal pool fairy shrimp in the short- or long-terms.

Moreover, some of the activities included in the proposed action, specifically components 4-6 under Description of the Proposed Action, will be subject to project- and site-specific assessments to better determine specific impacts, including amount and extent of take, and

consistency with this Opinion. Any take resulting from these activities is not authorized until such assessments have occurred. At that time, the Service will determine whether the amount and extent of take is covered under this Incidental Take Statement or should be subject a project-specific Incidental Take Statement developed as an amendment to this Opinion.

Effect of the Take

In the accompanying Opinion, the Service has determined that this level of anticipated take is not likely to result in extinction or a reduction of opportunity for recovery of fairy shrimp.

Reasonable and Prudent Measures

The following reasonable and prudent measures are necessary and appropriate to minimize incidental take of fairy shrimp:

1. The impact of habitat loss to vernal pool species shall be minimized;
2. Loss of listed vernal pool habitat shall be confined to the proposed project site, and habitat and associated upland remaining on site shall be protected from adverse impacts;
3. Loss of vernal pool fairy shrimp (adults and cysts) shall be minimized;
4. The baseline condition for vernal pool species shall be adequately tracked to ensure that impacts to vernal pool wetland and vernal pool complex habitat do not exceed the parameters of this Opinion; and
5. Actions to conserve and/or restore vernal pool complex shall be adequately tracked to ensure these actions result in a net gain of vernal pool complex function and value compared to baseline conditions.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the following terms and conditions, which implement the reasonable and prudent measures described above, must be complied with:

Monitoring and Reporting of Effects

1. Real-time reporting and periodic post-facto reviews of activities covered under components 1-3 of the Description of the Proposed Action will be necessary for the Service to adequately monitor implementation of this Opinion. These activities will be mostly related to Agency Permits and agency approval of mitigation banks, credits, and projects.

    - Within 90-days of implementation of this Opinion or at the time of Issuance of a RGP by the Corps, whichever occurs later, the Service and the agencies will have collaboratively developed and be ready to implement procedures and products necessary for the above.

2. For components 4-6 of the Description of the Proposed Action, reporting will occur as described under Approval and Implementation of Mitigation Projects (#2), Voluntary Restoration and Enhancement Actions, and Projects Not Covered Under Agency Permits.

Best Management Practices

The following guidelines and best management practices (BMPs) will be applied in the design, planning and implementation of development, restoration, and protection/conservation actions in VPC habitat.

General Practices

1. A formal project plan developed by project developers/applicants and approved by the Service will dictate and guide the activities of all projects. The project plan will be adequate to enable a project-level assessment by the Service of impacts to VPC habitat and species and consistency with this Opinion. The project plan will include all relevant BMPs described below and other elements described previously in this Opinion for the type of project that will occur.

2. All on-site construction personnel will receive instruction regarding the presence of listed species and the importance of and methods for avoiding impacts to these species and their habitat.

3. Actions undertaken on or near habitat that is intended or required to be protected must not adversely affect such habitat. Actions that have substantial potential to produce such adverse effects, and that will need to be eliminated or designed specifically to preclude these effects in order to be in compliance with this Opinion include: (a) alteration of existing topography or any other alteration or uses for any purposes, including the exploration for or development of mineral extraction; (b) placement of new structures; (c) dumping, burning, and/or burying of rubbish, garbage, or other wastes or fill materials; (d) building of new roads or trails; (e) killing, removal, alteration, or replacement of existing native vegetation; (f) placement of storm water drains; (g) fire protection activities not required to protect existing structures at the project site; and (h) use of pesticides, herbicides or other toxic chemicals.

4. Earth work will only occur during the dry summer months (i.e., from July 1 to September 30) to minimize the potential for both direct (e.g., surface destruction) or indirect (e.g., siltation or sedimentation) impacts to the site.

5. Fencing adequate to prevent impacts from vehicles during management activities will be placed and maintained around any vernal pool complex habitat that is intended or required to be protected. The construction contract specifications will require that tracked vehicles used for excavation of fill material will not enter any vernal pools on- or off-site; only rubber-tired vehicles may enter identified vernal pools and only during the dry season. If needed, heavy equipment (i.e., trucks, backhoes) will only have access to upland sites to prevent damage to sensitive habitat. A wetland biologist or soil scientist with local knowledge and experience working with vernal pool restoration on the Agate-Winlo soil complex will be on-site during periods of any construction activities in the restoration area or in the immediate vicinity of the mounded swale complexes to ensure compliance with all guidelines. This individual need not be present during construction only taking place on the development site.

6. A site sediment and erosion control plan will be prepared and implemented by a soil scientist and/or a qualified wetland biologist to prevent any sediment from entering adjacent vernal pools during and after construction and management actions. A copy of the site sediment and erosion control plan will be part of the permit application package.

7. Soil inoculum will be taken prior to construction/impacts from all pre-existing pools and depressions that have potential to support populations of vernal pool fairy shrimp. These samples will then be introduced into pools throughout the restoration area to transfer potential cysts into the restored habitat. Soil samples will be collected and dispersed by a qualified wetland biologist following the methods outlined by the Service below.

8. Native, naturally-occurring topsoils and any associated biological layers or cryptobiotic crusts will not be destroyed or buried, and the underlying duripan not disturbed during any grading activities. Waste fill material removed from a swale or pool will be hauled away to a designated upland disposal site.

Native Plant and Weed Management

1. All equipment will be washed before entering the restoration area.

2. Treatment for control of noxious and invasive weeds will occur through hand pulling, or other approved, hand-operated, mechanical means.

3. The upland mounds (except for sensitive and endangered species areas) will be hand raked only where appropriate to facilitate new seeds to germinate in early autumn (after minor rainfall). The upland mounds will be seeded with bunch grass and native forbs, such as Lemon's needlegrass, lupine, etc., (See Table 8).

4. Hand-collected native seed, obtained from local sources will be broadcast in the vernal pools, if necessary. The seeding and any hand raking deemed necessary will only occur during the fall after excavation, just prior to the rainy season (for best germination and survival). (See Table 8 for proposed seeding mix information)

5. A noxious weed management plan will be developed for the entire project area pursuant to the details outlined in the mitigation plan within six months of the start of construction.

a. Before the noxious weed management plan is developed, a list of primary target species will be identified (Table 9).

b. Before implementation, the final noxious weed management plan will be reviewed and approved by the Service.

Herbicide Use

As noted above, use of pesticides, herbicides or other toxic chemicals is an action with substantial potential to adversely affect habitat that is intended or required to be protected and, for this reason, treatment for control of noxious and invasive weeds is expected to occur through hand pulling, or other approved, hand-operated, mechanical means. However, in some situations such methods may not be effective and limited herbicide use may be appropriate. This will occur only following concurrence from the Service and subject to practices that minimize adverse impacts, including distance thresholds from pools or certain native or listed species, spot spray application, consideration of weather conditions, etc.

Scheduled Maintenance or Repairs

1. Any scheduled maintenance or repairs to the project area will be completed before the onset of the following rainy season. The wetland consultant will recommend the nature of the required corrective actions.

2. Any replacement plantings will be installed during the following dormant season.

3. Any amendments to the project plan will be documented and submitted to the regulatory agencies for review and approval.

Table 8. Seed mixtures and plantings to be utilized for vernal pool restoration areas[16].

Vernal Pool Mitigation Plantings		
Common / Scientific Name	Planting	Anticipated Quantity
Vernal Pools		
Western mannagrass (*Glyceria occidentalis*, OBL)	Seed	1.0 lbs. /acre
Saccate foxtail (*Alopecurus saccatus*, OBL)	Seed	1.0 lbs. /acre
Annual hairgrass (*Deschampsia danthoniodes*, OBL)	Seed	1.0 lbs. /acre
Cascade downingia (*Downingia yina*, OBL)	Seed	0.25 lbs. /acre
Water foxtail (*Alopecurus geniculatus*, OBL)	Seed	0.5 lbs. /acre
Coyote thistle (*Eryngium petiolatum*, OBL)	Seed	0.5 lbs. /acre
Stipitate popcornflower (*Plagiobothrys stipitatus*, OBL)	Seed	0.5 lbs. /acre
White brodiaea (*Triteleia hyacinchina*, FAC)	Seed/bulb	0.5 lbs. /acre
California goldfields (*Lasthenia californica*, FACU)	Seed	2.0 lbs. /acre

16 Plantings in this table are a guide. Other native species of local-provenance, include all guilds (grasses, forbs, annuals, perennials, early-mid-late season nectar producers to support viable pollinator species, etc.) may be appropriate.

UPLAND MOUND / MITIGATION BUFFER		
Buckbrush (*Ceanothus cuneatus*, NL)	Bareroot	
California brome (*Bromus carinatus*, NL)	Seed	4.0 lbs. /acre
California oatgrass (*Danthonia californica*, NL)	Seed	2.0 lbs. /acre
Roemer's fescue (*Festuca roemeri*, NL)	Seed	4.0 lbs. /acre
Two-colored lupine (*Lupinus bicolor*, NL)	Seed	1.5 lbs. /acre
Fitch's tarweed (*Hemizonia fitchii*, NL)	Seed	2.0 lbs. /acre
California goldfields (*Lasthenia californica*, FACU)	Seed	2.0 lbs. /acre
Lemmon's needlegrass (*Achnatherum lemmonii*, NL)	Seed	2.0 lbs. /acre
Purple clarkia (Clarkia purpuria, NL)	Seed	0.5 lbs/acre
Rusty popcornflower (*Plagobothrys nothofulvus*, NL)	Seed	0.5 lbs/acre

Table 9. Non-native, invasive plant species common to the Agate Desert vernal pool area.

Species	Method of Control
1. Yellow star thistle (*Centaurea solstitialis*)	Multiple hand removal, mowing or burning efforts (between June 1 and August 1); managed grazing; herbicide use[2]; and/or native plant re-seeding.
2. Medusahead (*Taeniantherum caput-medusae*)	Mowing or burning in spring (In May); managed grazing; and/or native plant re-seeding.
3. Curly dock (*Rumex crispus*)	Hand removal, mowing or burning (between May 15 and July 15); managed grazing; herbicide use[17]; and/or native plant re-seeding.
4. Seaside barley (*Hordeum marinum* ssp. *gussonianum*)	Frequent hand removal, mowing or burning (between May 15 and June 15); herbicide use[2]; managed grazing; and/or native plant re-seeding.
5. Stork's bill, fillary (*Erodium cicutarium/Erodium botrys*)	Frequent hand removal, mowing or burning (between May 1 and June 15); managed grazing; herbicide use[2]; and/or native plant re-seeding.
6. Italian rye grass (*Lolium multiflorum*)	Frequent mowing or burning (between June 1 and August 1); managed grazing; herbicide use[2]; and/or native plant re-seeding. Do not till.
7. Russian thistle, tumbleweed (*Salsola kali*)[18]	Hand removal, mowing or burning (between June 1 and September 1); managed grazing; herbicide use[2]; and/or native plant re-seeding.
8. Milk thistle (*Silybum marianum*)	Hand removal, mowing or burning (between May 1 and June 15); managed grazing; herbicide use; and/or native plant re-seeding.

Vegetation Sampling

1. Vegetation will be sampled to acquire the following data at sample plots or points:
    a. Relative (see definitions) percent cover of vegetation,
    b. Percent cover of exposed substrate (indicate soil, rock),

17 Herbicide use will require concurrence from the Service.

18 Russian thistle, while not prevalent in vernal pool habitat, could become a threat and should be managed when documented.

c. Relative (see definitions) percent cover of native, non-native, or non-native invasive plant species,
d. Relative percent cover of dead plant material (indicate leaves, thatch, woody debris), and
e. Relative percent cover of vegetation types (indicate grass, herb, moss, algae, etc.).

2. Vegetation results acquired from any third-party random sampling will corroborate with vegetation data results at the subject habitat.

3. Annual sampling will occur for five years after the completion of the initial restoration phase of the project. Monitoring site visits will be completed as necessary to evaluate the success of the project and identify corrective measures necessary to meet performance criteria to be attained by the end of the post-construction five-year maintenance and monitoring period.

4. Seeding success will be measured by visually estimating percent vegetative cover for each plant species observed within a five-foot radius for herbaceous ground cover. Tree and shrub success will be evaluated using stem counts.

5. A vegetation sampling report will be compiled each year and provided to the Service within 90 days of the conclusion of sampling. The report will include:

   a. A description of methods used to sample vegetation,

   b. Native vegetation establishment goals and status (as compared to the plant and weed composition of a reference site),

   c. Non-native invasive plant goals and status,

   d. A complete list of plant species encountered during the vegetation monitoring,

   e. Photographs and description of photo locations (permanent photo locations to document onsite conditions for progress and comparative purposes),

   f. A tabulation of the sum total of vegetation percent cover at each habitat type, indicating:

      i. Relative percent cover of vegetation.

      ii. Percent cover of exposed substrate.

      iii. Relative percent cover of native, non-native, or non-native invasive plant species.

      iv. Relative percent cover of dead plant material.

      v. A tabulation of target functions and values to demonstrate if goals are being met.

Fairy Shrimp Sampling

1. Except as otherwise approved by the Service, will be conducted consistent with vernal pool fairy shrimp survey and sampling procedures described at:

   http://www.fws.gov/oregonfwo/FieldOffices/Roseburg/Documents/Guidance-vernalpool-June08.pdf

2. Sampling for the presence of fairy shrimp will be conducted after the restoration phase as part of a monitoring program. This sampling will be conducted to recognized standards by a qualified individual and reported to the Service.

Vernal Pool Restoration Inoculum Collection

1. Collection of soil from vernal pools will not be conducted at any project site unless the surveyor receives prior written permission from the Service.

2. The following inoculum collection protocol will be utilized:

   a. Inoculum will be collected when it is dry to avoid damaging or destroying fairy shrimp cysts. A hand trowel or similar instrument will be used to collect the soil. Whenever possible soil will be collected in chunks. The trowel will be used to pry up intact chunks of soil rather than loosening soil by raking or shoveling. Criteria for the appropriate quantity of inoculum to be collected will be specified through coordination with the Service. Soil will not be collected from any ponds until approved by the Service.

   b. The soil from each pond will be stored individually in labeled bags or boxes that are adequately ventilated and archived out of direct sunlight to avoid the occurrence of fungus or excessively heating the soil.

   c. A minimum of 24 soil samples of approximately one square foot by approximately one inch in depth (144 cubic inches, or 2,360 cubic centimeters) each should be taken from each pool (see Figure 8), for a total sample volume of approximately 2 cubic feet (0.06 cubic meters) per pool. In the case of a large vernal pool (>0.05 acres), the Service may authorize the removal of more than 2 cubic feet of soil. If a pool has a diameter of less than 3 meters (~10 feet), the total soil sample taken should not exceed one cubic foot per pool.

   d. Samples should be collected from the following locations (See Figure 8):

      i. At least 8 soil samples should be taken from equidistant points along the longest transect of the pool, including a minimum of 1 sample from the edge of the pool.
      ii. At least 6 soil samples should be taken from equidistant points along the widest transect of the pool, including a minimum of 1 sample from the edge of the pool.

iii. If neither the longest nor widest transect encompasses the deepest part (or parts) of the pool, then at least 2 soil samples should be taken from the deepest part (or parts) of the pool.
iv. The remaining soil samples should be taken from pool edges; additional locations in the deepest part of the pool, and/or along the aforementioned transect lines.

e. The soil samples should be stored individually in paper bags or boxes labeled with the specific location within the pool from where each sample was taken. The paper bags or boxes containing the soil samples should be adequately ventilated and kept out of direct sunlight in order to prevent the occurrence of fungus or excessively heating the sample. A sketch of the pool showing the specific location of each sample should be included as documentation.

f. The sampler should provide the Service with all of the following information in writing for each sample site at least ten (10) working days prior to the anticipated start date of the collection work:

i. The precise location of the project site clearly delineated on either an original or high quality copy of a U.S. Geological Survey topographic map (exact scale, 7.5 minute, 1"=2,000 feet). The map should contain the project name, estimated area (acreage) of the project site and an estimated number or area (acreage) of pools/swales on the site, quad name, and county name.

ii. The names of all vernal pool biologists and associated personnel associated with the active collection of the samples.

g. The sampler should provide the Service the following information in writing no more than sixty (60) calendar days after completing the dry collection sampling:

i. The location of the project site clearly delineated on an original or high quality copy of a U.S. Geological Survey topographic map (1.5 minute, 1"=2,000 ft.)

ii. Two representative photographs illustrating the general landscape of each vernal pool site at the time of sampling. The following information should be legibly written on each slide with permanent ink: precise location on the project site, direction from which the photograph was taken, date of photograph, and initials of photographer.

iii. Careful labeling and record keeping are an important part of the collecting. Data collected during the collection visit, including: date, air temperature, weather conditions, average and maximum depth of each pool/swale, size (area in square meters) of each pool. A photograph of each pool for a visual record of the habitat type should also be included. Photographs should include a pool number, date, and brief description on the back of the photo.

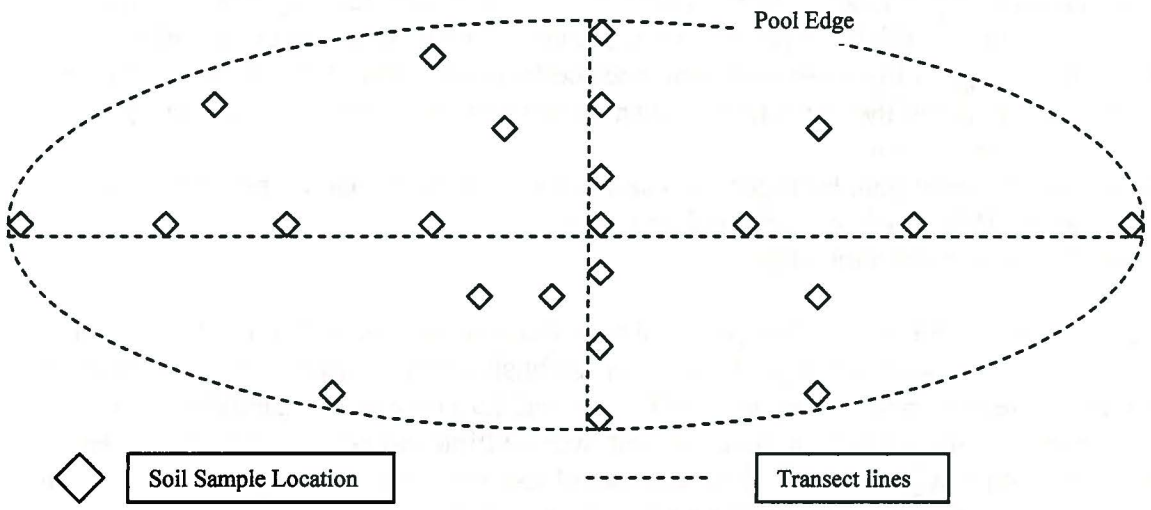
iv. Samples should be stored in a safe, cool, dry place, preferably in the dark.

v. Samples shall be stored a maximum of one season (year).

h. Specific circumstances may justify or necessitate revision of these survey guidelines. At the discretion of the Service, such a variance may be allowable under these guidelines if (1) the permittee explains in writing why a variance to the guidelines is needed, and (2) the Service concurs, in writing, with the variance request.

3. This soil collection protocol should not be used for collection of dry season cysts samples.

Figure 8. Location of possible soil samples for restoration activities (see sample location information).



Listed Plant Seed Collection and Restoration Methodology

Augmenting existing listed plant populations and establishing listed plants into new areas through seed is a more effective and preferable method than plant salvage and relocation. Relocation of the two listed plants has never been successfully achieved and is problematic due to difficulties in keeping plant tap roots intact and maintaining annual plants in restored habitat. Planting of seeds is also a more cost-efficient method than transplanting greenhouse grown plants.

Unless otherwise authorized by the Service in writing, this guidance will be utilized for seed collection of Cook's lomatium and large-flowered woolly meadowfoam in the Agate Desert area for purposes of seed storage at an approved facility or for restoration efforts:

1. The Service must receive and approve a seed collection plan prior to all seed-collection efforts. The entity conducting seed collection will provide the appropriate Service office (see Service Contacts section) with all of the following information in the seed-collection plan in

writing for each project site at least 10 working days prior to the anticipated start date of seed collection efforts. A seed collection plan should include:

a. Names of plant species to be collected;
b. Purpose of seed collection;
c. Timing of collections;
d. Collection methods;
e. Desired amount of seed;
f. Precise location of source populations and restoration site, preferably transmitted as an electronic file in a GIS format (preferably reported in UTM Zone 10 NAD 83 (Meters) coordinates), or clearly delineated on either an original or high quality copy of a U.S. Geological Survey topographic map (exact scale, 7.5 minute, 1"=24,000 ft.) with the quad name clearly indicated. Other information needed includes: (1) project name; (2) name of county in which the project site is located; (3) type of project (e.g., urban development, agricultural development, seed collection for long-term storage); (4) the estimated acreage of the project site and an estimate of the number and acreage of vernal pools/swales on the site;
g. Names of all vernal pool biologists and associated personnel conducting field work and their section 10(a)(1)(A) permit number(s); and
h. Desired goal of restoration effort.

2. Seed Collection Guidelines— The amount of seed that can be collected in the field during one collection in one year is rarely sufficient to establish a new population without depleting a population's seed source. To achieve sufficient seed for population establishment, it is recommended to collect small amounts of seed over multiple collections in multiple years or to propagate seed in a greenhouse. For plant populations that are less than 100 plants, even moderate seed collection can be detrimental to the population.

a. Collect from plant populations with a minimum of 300 flowering lomatium plants or from 300 meadowfoam plants,
b. Collect from plant occurrence nearest to restoration site,
c. Collect few seed from many plants rather all seed from a few plants to maximize the genetic complement of the original population,
d. Collect several times within the year,
e. Collect in multiple years, and
f. Bulk seed in greenhouse or approved seed-bulking site if necessary to obtain enough seed for population establishment.
g. Gather loose seed from Cook's lomatium and seed (nutlet) clusters of meadowfoam.
h. Collect seed by hand. Loose seed from plants or from ground may be gathered by hand or assisted by hand-held harvesting tools such as flails and hoppers (seed containers).
i. All seed will be bagged immediately, kept dry, and stored in coolers immediately.

3. Seed Collection Reporting:

a. An annual status report on the success of plant establishment, growth, and monitoring will be required for 10 years. A status report will be provided to the Service within 90 days of a seed collection effort or the completion of restoration monitoring efforts that includes:

i. The seed collection methods and strategies (equipment used, number of collections, targeted size of population)
ii. Locations of plant occurrences from where seed was collected,
iii. The amount of seed collected,
iv. Restoration description (if initiated)
v. Status of restoration efforts (if initiated). This should include success of establishment and loss.

Grazing

Livestock grazing within vernal pool habitat areas may be used as a vegetation management technique to maintain or improve habitat conditions for plants and wildlife. Grazing can provide beneficial effects for vernal pool species and habitat. These include:

- Grazing vernal pool complexes during the wet season leads to increased inundation periods for the pools, which provides better growing conditions for the native vernal pool plants and a better environment for vernal pool invertebrates (Marty 2005).
- Creation of microdepressions that increase habitat diversity for vernal pool plants and animals (Barry 1998).
- Reduction of thatch build up leading to better completion of native plants (Borgias 2004).

1. To achieve these possible beneficial effects of grazing, the objectives of implementing a vernal pool grazing management strategy will include:

   a. Maintain or improve habitat conditions in and around vernal pools and associated mounds;
   b. Maintain or increase diversity of native plant species; and
   c. Reduce or control the presence of invasive, non-native plant species.

2. The following best management practices will be included in a vernal pool grazing strategy:

   a. Livestock grazing may include different age classes of cattle, sheep and/or goats. Making changes in livestock type could be effective. Sheep tend to select and crop vegetation differently than cattle. Changes in species and age class of livestock with different effects on soil and vegetation could be used to introduce variation that may offer relief from grazing related stresses or change the competitive dynamics between plant species.
   b. Livestock grazing should be late fall/winter/early spring (November 1 through April 30).
   c. Livestock stocking rates should be calibrated to rainfall and temperature patterns each year in order to control thatch buildup but not adversely affect target native species. In general, this may be possible at 1-2 cow/calf pair per acre. Spread over the normal six month grazing period this translates to 6 to 12 animal units. The total annual forage production on Agate Desert soils amounts to approximately 800 pounds per acre (NRCS 1994). This amount of forage is just over the estimated requirements for a cow and calf pair for a month (i.e. 780 lbs [26 lbs./day] / "animal unit month" (AUM)). However, the

specific stocking rate for any site should be developed and adjusted based on results from monitoring vegetation response.

d. Livestock grazing areas will not be used as livestock holding areas or feedlots.
e. Salt or nutrient blocks will be placed in containers to minimize soil contamination.
f. Supplemental livestock feeding will not be allowed.
g. Livestock access to watering facilities away from vernal pools.
h. Rest/rotation of grazing areas.

Reporting

1. Management activity notes will be developed and available for Service review.

2. Post-construction review of completed work will be conducted to verify that the project plan was properly implemented. The results of this review will be described in a report provided to the Service for review. This report will also include:

   a. Any deficiencies to the original plan will be noted; and recommendations provided as to how these deficiencies might be addressed; and
   b. As-built drawings and other relevant information documenting that authorized impacts were not exceeded.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. The term "conservation recommendations" has been defined as suggestions from the Service regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information.

The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's 7(a)(1) responsibilities for these species:

1. The Service should fund and support efforts to provide incentives to private landowners willing to conserve and protect vernal pool habitat in the Agate Desert area.

2. The Service should seek opportunities to partner with state and local governments in Jackson County to promote conservation and recovery efforts benefiting vernal pool associated species.

3. The Service should seek opportunities to introduce meadowfoam and lomatium seeds or plants onto willing private landowners properties. An assessment of the potential introduction site should include soil type, local hydrologic conditions and ability to sustain a viable local population over the long term (10 to 20 years).

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the project described in this biological opinion. As provided for in 50 CFR §402.16, reinitiation of formal consultation is required where

discretionary federal agency involvement or control over the action has been maintained (or is authorized by law), and if (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take should cease pending reinitiation.

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