Endangered Species Act - Section 7 Consultation

INTRA-SERVICE BIOLOGICAL OPINION

U.S. Fish and Wildlife Service Reference:
01EWFW00-2016-F-0519

The Meier Group LLC Mazama Pocket Gopher Habitat Conservation Plan

Thurston County, Washington

Federal Action Agency:

U.S. Fish and Wildlife Service

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APPENDIX

ACRONYMS AND ABBREVIATIONS

Act	Endangered Species Act of 1973, as amended (16 U.S.C. l531 *et seq.*)
Applicant	The Meier Group, LLC
ATV	all-terrain vehicle
CFR	Code of Federal Regulations
EA	Environmental Assessment
Farm	Bush Prairie Farm
FR	Federal Register
HCP	Habitat Conservation Plan
Opinion	Biological Opinion
Permit	Incidental Take Permit
Service	U.S. Fish and Wildlife Service

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INTRODUCTION

This document represents the U. S. Fish and Wildlife Service's (Service) Biological Opinion (Opinion) based on our review of the proposed Meier Group LLC Mazama Pocket Gopher Habitat Conservation Plan (Ramboll, 2016) (HCP) located in Thurston County, Washington, and its effects on the threatened Olympia subspecies of the Mazama pocket gopher (*Thomomys mazama pugetensis*), in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*). The Meier Group, LLC (Applicant) submitted a complete proposal to the Service for an Incidental Take Permit (Permit).

The Service has determined that issuing the proposed Permit "may affect, and is likely to adversely affect" the Olympia pocket gopher. The effects to this species and their habitat are described in this Opinion.

This Opinion is based on information provided in the July, 2015, HCP, draft Environmental Assessment (Environ, 2015) (EA), field investigations, and other sources of information as detailed below. A complete record of this consultation is on file at the Service's Washington Fish and Wildlife Office in Lacey, Washington.

CONSULTATION HISTORY

From 2014 to 2015, the Service provided technical assistance to the Applicant in developing a HCP for their proposed development project. The Service supported the publication of an EA in the Federal Register on October 26, 2015 (80 FR 65238-65240) along with the draft HCP. Following a comment period ending December 28, 2015, the Service received a final HCP and conducted the Section 7 consultation.

Scope of Analysis

The focus of our analysis is the effect of the proposed development and conservation actions on the Olympia pocket gopher and their habitat. The Service worked with the applicant to design the HCP and reviewed the draft EA (Environ, 2015). Based on internal discussions and review of the draft HCP and EA, the Service agreed that the proposed Permit issuance was ready for consultation upon receipt and review of the final HCP proposal on February 25, 2016. With regard to the proposed Permit issuance, the Service made the following effect determinations:

- **"may affect, likely to adversely affect"** the Olympia pocket gopher, and likely to result in benefits to the Olympia pocket gopher.
- **"no effect"** for the following species: Taylor's checkerspot butterfly (*Euphydryas editha taylori*), streaked horned lark (*Eremophila alpestris strigata*), golden paintbrush (*Castilleja levisecta*), western yellow-billed cuckoo (*Coccyzus americanus*), and Oregon spotted frog (*Rana pretiosa*).

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

A federal action means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas (50 CFR 402.02). The Service proposes to issue a Permit in accordance with our authority and responsibility under section 10(a)(1)(B) of the Act for implementation of the HCP. The purpose of the proposed Federal action is to respond to the Applicant's application for a Permit for the proposed covered species related to activities that have potential to result in take, pursuant to the Act Section 10(a)(1)(B) and its implementing regulations. The Applicant submitted a Permit application based on their proposed plan to conserve habitat for the covered species on a designated mitigation site and to construct an office building and associated infrastructure on a development site, each of which contain suitable habitat for the Olympia pocket gopher, as described in the HCP. The proposed HCP includes measures the Applicant will implement to minimize and mitigate the effects of incidental take.

Project Design and Components

The proposed HCP will: (1) develop the Linderson Way development site for commercial purposes; and (2) implement minimization and mitigation actions on 2.5-acres of the Bush Prairie Farm (Farm), which will serve as a mitigation site.

The Applicant proposes to construct a commercial office building and associated parking areas by clearing, grading, and building on the 6.4-acre development site. Existing conditions on the development site include:

- Degraded grasslands (2.7 acres) that currently support Olympia pocket gophers at low densities.
- Mixed shrubs and grass (0.7 acre) that may support Olympia pocket gophers at a very low density.
- Dense shrubs and trees (2.4 acres) on suitable soils capable of supporting Olympia pocket gophers.
- Developed areas unsuitable for gophers (0.6 acre).

The Applicant will mitigate the impacts to Olympia pocket gophers resulting from developing the Linderson Way site by preserving habitat on the Farm. The Farm is a more productive site for Olympia pocket gopher than the Linderson Way site. The Applicant will acquire a conservation easement guiding Farm management on 2.5 acres of the 5-acre farm to maintain habitat quality and protect the site in perpetuity from development. The remainder of the Farm will operate under a similar conservation easement unrelated to the HCP and development rights on that portion of the farm will also be extinguished. The Farm is currently zoned for

commercial and industrial development and is located immediately adjacent to planned commercial developments, existing residential developments, and an existing habitat site managed to benefit Olympia pocket gopher under the Kaufman HCP (Krippner Consulting, 2016).

The lands proposed for HCP coverage are on the Linderson Way development site. The covered lands are depicted in Figures 2 and 3 in the HCP. Because the Farm is an essential element of the proposed HCP, this Opinion considers the covered lands to include the Linderson Way development site and the 2.5 acres under conservation easement at the Farm.

The proposed Permit issuance will cover HCP implementation with the following covered activities:

- Heavy equipment and truck operation.
- Site preparation
    - Vegetation removal.
    - Clearing and debris removal.
    - Excavation.
    - Grading.
    - Soil re-distribution.
    - On-site soil storage.
- Construction on the Linderson Way development site.
- Mitigation site management for benefits to Olympia pocket gopher.
    - Extinguish development rights.
    - Maintain habitat suitability across 2.5 acres
    - Monitor occurrence of Olympia pocket gopher mounds and responses to site management
    - Employ adaptive management to ensure ongoing benefits for Olympia pocket gopher.
    - Equipment operation for habitat maintenance will commonly employ light equipment, such as walk-behind or hand-held tools, and will occasionally employ heavy equipment in limited areas.

Promptly after Permit issuance, the Applicant will complete any other relevant permit requests (e.g., County-issued building permits) and begin ground preparation activities. The project is expected to be completed in 12 months, however to provide flexibility for unforeseen events during local permitting and construction, the Applicant proposes to complete all construction and to ensure the success of habitat protection on the Farm within five years of Permit issuance.

Conservation Measures

HCP implementation includes measures designed to avoid and minimize effects on covered species. The conservation measures are fully described in the HCP and are briefly summarized here:

1. Prior to the effective date of the proposed Permit:
    a. Execute a conservation easement at the Farm to create a permanent conservation site consisting of no less than 2.5 acres of habitat occupied by the Olympia pocket gopher.
    b. Extinguish future subdivision or development rights associated with the conservation site at the Farm.
    c. Prepare a management plan, described in section 7.2.3 and Appendix A of the HCP, to ensure management of the conservation site at the Farm is compatible with, and benefits, the Olympia pocket gopher, including:
        i. Fund the ongoing management actions or provide documentation verifying that such management actions are provided for.
        ii. Ensure the management actions benefitting Olympia pocket gopher are perpetual.

2. The Service has not authorized translocation of Mazama pocket gophers from occupied Project development sites as a method to minimize impacts to the species at this time. The Applicant commits, however, to allow and support trapping and translocation actions if the Service determines that this practice is beneficial or may aid species recovery efforts. The Applicant will fund translocation activities (as detailed in the Funding Assurances section of the HCP) in the event that the Service authorizes and agrees to allow these activities within the Permit area.

3. Annual monitoring by a designated Land Trust.

The mitigation site is located on the Farm where ongoing agricultural practices have maintained highly productive conditions for Olympia pocket gopher. The Farm uses raised beds and crop rows to grow commercial produce. Tilling and other ground disturbing activities are minimized and heavy equipment is infrequently employed. Heavy equipment (e.g., tractor, tiller) is used periodically to re-construct beds, re-organize agricultural production, till soil, and to conduct general maintenance, though many of these activities are routinely accomplished using light equipment or manual labor (Clark *in litt.* 2016; Reeves *in litt.* 2016). Continued management of the Farm will maintain the accepted agricultural practices that are recognized as providing a net conservation benefit and are therefore specifically exempted from the take prohibitions of Section 9 of the Act as described in the special rule under Section 4(d) of the Act for the Mazama pocket gopher (79 FR 19790-19792). Through monitoring and adaptive management, the Applicant or their agent will ensure that Farm management is benefitting the Olympia pocket gopher on the 2.5 acres under easement.

Action Area

The action area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). In delineating the action area, we evaluated the farthest reaching physical, chemical, and biotic effects of the action on the environment. The action area for this proposed federal action is based on the geographic extent of the Plan Area in the HCP, encompassing the entire area of the Linderson Way development site and the 2.5 acres of the Farm included in the above-referenced conservation easement, as depicted in Figures 2 and 3 of the HCP. The action area comprises two non-adjacent parcels generally divided by the Olympia Airport. The Linderson Way development site is 0.65 mile north-northwest of the Olympia Airport, and the Farm is 0.1 mile east of the Olympia Airport.

The farthest-reaching effects will be the temporary increase in physical disturbance from construction-related activities and habitat management activities on covered lands, beyond which the movement and operation of heavy equipment will be indistinguishable from background levels. Therefore, the action area includes only the covered lands. The action area only includes lands in Thurston County.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

Jeopardy Determination

The following analysis relies on the following four components: (1) the *Status of the Species*, which evaluates the rangewide condition of the listed species addressed, the factors responsible for that condition, and the species' survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (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 species; and (4) *Cumulative Effects*, which evaluates the effects of future, non-federal activities in the action area on the species.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed federal action in the context of the species' current status, 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 both the survival and recovery of listed species in the wild.

The jeopardy analysis in this Opinion emphasizes the rangewide survival and recovery needs of the listed species and the role of the action area in providing for those needs. It is within this context that we evaluate the significance of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

STATUS OF THE SPECIES

On April 9, 2014, the Service listed the Olympia pocket gopher as a threatened species under the Act. The subspecies is associated with glacial outwash prairies in western Washington, an ecosystem of conservation concern (Hartway and Steinberg 1997, p. 1). Steinberg and Heller (1997, p. 46) found that pocket gophers are even more patchily distributed than are prairies, as there are some seemingly high quality prairies within the species' range that lack pocket gophers; e.g., Mima Mounds Natural Area Preserve, and 13th Division Prairie on Joint Base Lewis-McChord.

There are few data on historical or current population sizes of Mazama pocket gopher populations in Washington. Knowledge of the past status of the pocket gopher is limited to distributional information.

The Olympia pocket gopher faces significant threats that contribute to a risk of extinction. Best available scientific and commercial information identifies the following significant threats to the subspecies: (1) destruction, modification, or curtailment of habitat and range including the on-going, cumulative effects of development, military training, and loss or curtailment of natural disturbance processes; (2) poor connectivity between small and isolated populations; and, (3) predation and pest control, including that which is attributable to domesticated pets.

For a detailed account of Olympia pocket gopher biology, life history, threats, demography, and conservation needs, refer to Appendix A: Status of the Species - Mazama Pocket Gopher.

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.

Current Condition of the Species in the Action Area

The entire action area is in the range of the Olympia pocket gopher. The action area comprises two non-adjacent parcels divided by the Olympia Airport, so we use information about Olympia pocket gopher at and near the Olympia Airport, as well as information specific to the action area, to describe the condition of the species in the action area.

The total population abundance of Olympia pocket gopher is unknown. The largest known Olympia pocket gopher population is located on and surrounding the Olympia Airport, in Bush Prairie (WDFW 2013, p. 30). One of the few available data points is from Witmer et al. (1996, p. 96), who estimated Olympia pocket gopher density at approximately 25 individuals per acre by live trapping, radiocollars, and monitoring in the early spring on a site near the Olympia

Airport. We expect that the greatest number of individuals is located on and near the Olympia Airport because the airport represents the largest intact patch of habitat in the subspecies' range. The species' fossorial habits make population counts extremely difficult on a site-specific or rangewide basis. Olympia pocket gophers on the airport are considered a source population for nearby lands.

Other than studies of population density and distribution of Olympia pocket gophers on the Olympia Airport performed in 2005 (McAlister and Schmidt 2005), there is very limited information available on pocket gopher density in the action area. Based on the above information, we could estimate that the 2005 density of pocket gophers at the Olympia Airport was approximately 25 individuals per acre. However, this may not be a suitable estimate for 2016, or for other sites near the Olympia Airport. Site conditions (i.e., habitat quality) are relevant to maintaining a density of individuals, but we lack the information to quantify this relationship. Qualitatively, sites where suitable soils remain uncompacted and herbaceous cover dominates are where the highest mounding densities are typically observed. Throughout the action area, numbers and density likely vary, depending on where the site is located relative to other occupied sites, and how the soil and vegetation are managed. We currently lack a reliable population estimate for the Olympia pocket gopher. Even without a population estimate, the Service did determine that large-scale changes in population and habitat status, including local extirpations and range contraction, threaten the Olympia pocket gopher (79 FR 19775).

Olympia pocket gophers occur in several areas of the Linderson Way development site and throughout the Farm. At Linderson Way, mounds were observed under the existing transmission lines west of an existing pathway, near the northern-most powerline tower, and along the northeast boundary of the mowed area. Gophers at the Linderson Way development site have limited connectivity to other suitable habitat. A powerline right-of-way extending east from the site is the largest connected area of suitable habitat. Within the site, gopher productivity is limited by the high density of woody plants outside the powerline right-of-way.

Mazama pocket gophers remain in their home ranges year round. The average home range size likely varies based on factors such as soil type, climate, and density and type of vegetative cover (Cox and Hunt 1992, p. 133; Case and Jasch 1994, p. B–21; Hafner et al. 1998, p. 279). The best available information describes home ranges for individuals averaging about 1,076 square feet (100 square meters, or 0.02 acre) (Witmer et al. 1996, p. 96), and varying widely in shape, size, and orientation. Home ranges are likely smaller in better quality habitat (Chase et al. 1982; Marsh and Steele 1992), due to better foraging efficiency. Across sites, there is very limited information available on the size and configurations of Mazama pocket gopher home ranges, and there is currently no method to estimate these parameters based on observations of mounds. Therefore, we make no assumptions about home range size or population abundance based on mound presence and density. This further challenges population estimates because mounds are generally the only visible or detectable evidence of activity and/or occupancy.

Olympia pocket gophers are capable of recolonizing sites with suitable soils, adequate forage, and reasonable connectivity to a source population. Juvenile dispersal occurs each year and in each direction from natal sites (unless there are barriers). Dispersal occurs across varied cover types. This dispersal pattern allows for colonization of unoccupied sites, increasing density on

occupied sites, and a constantly shifting mosaic of occupied sites. Therefore, we assume that Olympia pocket gopher density on the Farm is likely similar to the density on the Olympia Airport due to the compatible land-use, and good connectivity of these sites. Density of Olympia pocket gophers is likely much lower on the Linderson Way development site because the site is largely isolated by surrounding development, degraded by woody plant encroachment, and there are varying levels of soil compaction from previous land uses.

Olympia pocket gophers may be particularly sensitive to habitat disturbance during their reproductive season. Mazama pocket gophers breed from March through July, and young are reared with adults until September (Stinson 2013, p. 14). Most young do not survive to breeding age due to high predation rates. Depredation of subterranean rodents mostly occurs when they are surface feeding, pushing soil out of burrows, or dispersing (Baker et al. 2003); especially young of the year that are inexperienced at avoiding predators. Throughout the subspecies' range, construction activities such as grading, excavation, filling, and paving commonly occur between June and September, when juveniles may be particularly sensitive and/or vulnerable to injury. These activities destroy burrows and feeding tunnels, and they remove, damage, or degrade foraging resources, and have the potential to crush individual gophers. These activities may cause individuals to abandon burrow systems and home ranges, possibly exposing them to predators (e.g., coyotes, raptors, dogs, corvids). When habitat disturbance destroys feeding tunnels and food caches, there is an associated increase in the energetic cost to individuals, and possibly measurable effects to survival and reproduction. The intensity of those energetic costs is much less severe in high-quality habitat because those areas provide easy access to productive forage, minimal exposure to non-native predators, and connectivity to less-disturbed habitats.

In the action area, threats to Olympia pocket gopher result from habitat loss and fragmentation (development; succession to unsuitable habitat conditions), loss or curtailment of natural disturbance processes that maintain habitat (e.g., fire suppression), operation of heavy equipment, predation, and low genetic diversity (79 FR 19776-19782). The threats combine to result in the loss of historical habitat and the loss of access to suitable habitat. Therefore, the status of the Olympia pocket gopher in the action area is consistent with the Federal listing of the subspecies as threatened.

Factors Responsible for the Condition of the Species

Olympia pocket gophers are currently threatened by habitat loss, primarily caused by development and woody plant encroachment, throughout the range of the subspecies. Fragmentation reduces their ability to disperse to the decreasing and shrinking patches of suitable habitat. Additionally, most sites used by Olympia pocket gophers require some level of management to maintain suitable habitat conditions. The natural disturbance processes that historically maintained grasslands (principally fire) are now suppressed under modern land management practices.

Habitat losses are driven by development but may be reversed by restoring degraded habitat. Once protected from development, suitable habitat in the action area requires management to prevent encroachment by woody plants and to minimize unauthorized land uses.

Predation is also a significant ongoing threat, especially from domestic animals associated with residential development and recreation. Predation has a population-level impact on Olympia pocket gophers (79 FR 19781). Urbanization in the action area has increased exposure to feral and domestic cats and dogs, which are effective predators.

Domestic cats and dogs are known predators of pocket gophers (Case and Jasch 1994, p. B-21; Henderson 1981, p. 233; Wight 1918, p. 21). At least two pocket gopher locations were found because house cats brought home pocket gopher carcasses (WDFW 2001). Informal interviews with area biologists document multiple incidents of domestic pet predation on pocket gophers (Chan, *in litt.* 2013; Clouse, *in litt.* 2013; Skriletz, *in litt.* 2013; Wood, *in litt.* 2013). There is also one recorded instance of a Washington Department of Fish and Wildlife biologist being presented with a dead Mazama pocket gopher by a dog during an east Olympia site visit in 2006 (Burke Museum 2012; McAllister, *in litt.* 2013). On the proposed development site, some pocket gophers occur in areas where people recreate with dogs, bringing these potential predators into environments that may otherwise be relatively free of them, consequently increasing the risks to individual pocket gophers and populations that may be small and isolated.

Sites in the range of the Olympia pocket gopher can provide high quality habitat if they contain suitable soils, herbaceous vegetation, the site is not developed, and excessive exposure to non-native predators is avoided. The action area is in a rapidly urbanizing setting. Surrounding commercial, light industrial, and residential land uses have steadily increased and this trend is expected to continue. Development within the range of the Olympia pocket gopher occurred slowly and in low density since the mid-1800s. More recent development trends include rapid infill of remaining open-spaces. The result is intensive habitat fragmentation and ongoing habitat losses that negatively affect Olympia pocket gopher in the action area.

The sites proposed for HCP coverage exhibit varying habitat suitability, mostly varying based on the amount or extent of soil compaction (or other damage), the density and areal extent of woody cover (such as Scot's broom (*Cytisus scoparius*)), and the presence of barriers to dispersal and migration (e.g., surrounding urban/suburban infrastructure, highways). Scot's broom and other tall vegetation create a dense overstory that shades understory vegetation, resulting in poor forage conditions (i.e., reduced density and availability of preferred forbs). It is very likely that the presence of woody plants (specifically, the abundance of woody roots) also reduces soil suitability for this burrowing species, but that linkage remains speculative. On covered lands, as is true throughout South Puget Sound prairies, natural disturbance or routine vegetation management is necessary to prevent encroachment of woody plants that degrades habitat suitability for Mazama pocket gophers. Vegetation at the Farm is maintained in low-stature herbaceous cover preferred by Mazama pocket gophers, but by contrast, vegetation is generally not managed on the Linderson Way development site, so shrubs dominate the outside the powerline right-of-way.

The soils on both sites are Nisqually complex soils, and are deep (at least 5 ft deep), loamy, fertile, friable, and well-drained. They are likely to have a small component of rocks, and to be capable of supporting a diversity of grasses and forbs that provide food for the Olympia pocket gopher (based on McAllister and Schmidt 2005, p. 7).

We expect the population of Olympia pocket gophers at the Olympia Airport serves as a source population for the pocket gophers on the Farm. Dispersal from the airport to the Linderson Way development site is not likely to occur due to the distance and severely degraded—if not treacherous—habitat conditions between these sites. Habitat fragmentation is severe. Roadways surrounding the airport present risks from predators and vehicles. Available habitat north of the airport is predominantly found in isolated parcels surrounded by an urban context. Paved areas, compacted soils, excavations, and encroaching shrubs and trees further degrade the habitat value of the development site. It is unknown whether Olympia pocket gophers on the Linderson Way development site are supplemented by dispersal from a specific source population or if they rely on on-site productivity to sustain a presence. However, we do not expect long-term occupancy of the Linderson Way site due to the extremely limited area of currently-suitable habitat, the continuing degradation of habitat from woody plant encroachment, and the minimal connectivity to other suitable habitat.

Pocket gophers in the action area are able to use grasslands that largely lack native vegetation, so the urbanized setting is capable of supporting the entire life cycle of individuals. However, with decreasing connectivity between degraded habitats, the condition of habitat in the action area is a significant factor in the threatened status of the subspecies.

Conservation Role of the Action Area

The conservation role of the action area is to provide a sufficient quantity and quality of secure breeding, rearing, and foraging habitat. Neither the development, nor the mitigation site is within designated critical habitat; however, they can contribute to the recovery of the Olympia pocket gopher because they contain suitable habitat and soils, which are limiting factors for Olympia pocket gopher. Both sites are currently occupied and within the dispersal range of other occupied sites.

The Olympia Airport likely supports the largest population of Olympia pocket gophers (Stinson, in litt. 2007; Port of Olympia and WDFW 2008, p.1; Port of Olympia 2012). The areas surrounding the airport provide demographic support to the population at and around the airport. The proposed development site and the Farm contribute to the conservation of Olympia pocket gopher because they contain suitable soils and are currently occupied. The development site, and the Farm, can each provide breeding, rearing, and dispersal habitats, and they provide demographic support to the rangewide population of the subspecies. However, dispersal to and from the development site is severely constrained by surrounding developments. We expect that sites adjacent to the airport would support similar abundance of gophers as the airport if managed similarly.

Protecting and supporting the local population at and around the Olympia Airport is essential to the recovery of the Olympia pocket gopher. Across the range of the Olympia subspecies, most of their suitable habitat has been permanently lost to development, degraded by encroaching woody plants, or become severely fragmented. Therefore, habitat availability is now the primary limiting factor for the subspecies. The Olympia pocket gopher, though seemingly abundant at the Olympia Airport, are depressed throughout the rest of their range. Because the action area is very near the core area of a subspecies with a localized range, the action area includes lands that are important to the survival and recovery of the Olympia pocket gopher. Recovery can be

achieved through long-term enhancement and protection of suitable habitat, provided this occurs in a connected matrix allowing for dispersal between patches of suitable habitat. Habitat on the lands proposed for coverage can contribute to this objective, but recovery cannot be achieved on the covered lands alone, nor will the action area contain all lands important to recovery. Therefore, the action area contributes to the lands required for recovery. Habitat protection in the action area is significant to survival and recovery of the Olympia pocket gopher.

Climate Change

The Service assessed climate change as a potential threat to the Olympia pocket gopher along with six other extant Mazama pocket gopher subspecies in Washington State, and concluded that the threat is not imminent. Climate change may lead to increased frequency and duration of severe storms and droughts (Golladay et al. 2004, p. 504; McLaughlin et al. 2002, p. 6074; Cook et al. 2004, p. 1015), as well as sea level rise. Downscaled climate change projections for the Puget Sound region, predict consistently increasing annual mean temperatures from 2012 to 2095 and a small increase in annual precipitation over the next 80 years. The Olympia pocket gopher's fossorial lifestyle, and propensity to use well-drained soils, should serve to buffer the subspecies from the anticipated aspects of a changing climate. However, this should not be misconstrued to mean that the Service believes climate change is not a threat in the long term (79 FR 19769). For Mazama pocket gophers, the effects of climate change are likely to be restricted to indirect effects, prompted by changes in vegetative structure, the occurrence of plant invasions, and encroachment. Despite this potential for future environmental change, the Service has not identified any data on an appropriate scale that allows for an evaluation of habitat or population trends, or predictions about whether and how the subspecies will be significantly impacted by climate change (79 FR 19787).

EFFECTS OF THE ACTION

The effects of the action refers to the direct and indirect effects of an action on the species, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

Effects on Olympia pocket gopher resulting from issuance of the Permit for HCP implementation are associated with (1) habitat loss on the Linderson Way development site, and (2) habitat maintenance activities on the Farm that disrupt normal behaviors and cause severe damage or collapse of burrows or nests used by gophers. Due to difficulties quantifying individuals of this subspecies, this analysis describes effects in terms of habitat area (habitat surrogates), rather than numbers of affected individuals.

Effects on the quantity, quality, and connectivity of suitable habitat can serve as effective surrogates for the effects on Olympia pocket gophers. The dispersal patterns of Mazama pocket gophers, including the Olympia subspecies, support natural colonization and re-colonization of suitable habitats where there is short-distance connectivity to a source population (Stinson 2005,

pp 26-27). A primary threat to the subspecies is loss of habitat (Stinson 2005, pp 46-48), so analyzing effects of the action on habitat area, quality, and connectivity addresses the subspecies recovery needs.

Habitat Loss

The land proposed for HCP coverage includes a development site in the range of the Olympia pocket gopher. The Applicant proposes to build within five years of Permit issuance. Therefore, HCP implementation will result in permanent habitat loss on the Linderson Way development site.

The Linderson Way development site totals 6.4 acres and provides a maximum of 5.8 acres of potential habitat for Olympia pocket gophers. High quality habitat for Olympia pocket gophers has non-compacted soils with a diverse community of native forbs to support high-productivity foraging throughout the growing season. By contrast, potential habitat on this site ranges in quality from degraded to temporarily unsuitable. The currently undeveloped areas of this site were likely previously cleared and graded, reducing habitat suitability for Olympia pocket gophers compared to an undisturbed prairie or grassland. The site includes 2.4 acres where a dense cover of woody vegetation makes habitat less suitable or unsuitable for Olympia pocket gophers (Steinberg 1996, Olson 2011, Stinson 2013). The site also includes approximately 3.4 acres that are currently occupied by Olympia pocket gophers and comprised of grassy areas dominated by non-native herbaceous vegetation and areas with mixed shrubs and grass.

Surrounding habitat conditions are expected to lead to juvenile mortality during dispersal because the Linderson Way development site is almost entirely isolated by surrounding development. Aside from residential yards with poor forage and abundant threats (e.g., canine predators), the powerline corridor extending east of the site is the only area providing habitat connectivity. A more detailed description of the habitat conditions on the development site is provided in the HCP (pp. 9-11).

Habitat degradation and isolation leads to low productivity of pocket gophers. Existing site management allows invasive shrubs to increase in density and cover. Without Scot's broom removal, the site will soon be unsuitable for Olympia pocket gophers, so we conclude that existing conditions on the development site are associated with low and declining productivity.

During HCP implementation, all of the suitable Olympia pocket gopher habitat on the development site will be graded, compacted, converted to other uses, and lost. When construction is initiated on development sites, all Olympia pocket gophers present will be permanently displaced, injured, or killed. The potential to injure or kill individuals will be highest during initial site clearing, grading, and excavation, because these activities involve intensive heavy-equipment traffic, and extend below the ground where burrow systems, nests, and food caches are likely to be severely damaged.

The mitigation actions on the Farm, which will maintain habitat quality for Olympia pocket gopher, will offset the mitigation needs related to habitat loss on the development site. The mitigation actions will provide long-term protection on 2.5 acres of high-quality habitat to offset

impacts to the degraded and isolated habitat for Olympia pocket gopher on the development site. Therefore, HCP implementation will result in the permanent loss of a maximum of 3.4 acres of currently occupied Olympia pocket gopher habitat and 2.4 acres of additional area of suitable soils for the subspecies (i.e., potential habitat if managed for grassland or prairie conditions).

The mitigation site has greater productive potential for the Olympia pocket gopher than the habitat on the development site because of the higher quality forage and connectivity to the largest source population in the subspecies range. Barring the proposed development, suitable habitat for the Olympia pocket gopher on the Linderson Way development site would be capable of supporting individuals for a period, but may not support long-term survival and productivity because ongoing woody plant encroachment would overtake the entire site. By contrast, the mitigation site will provide better forage, better connectivity for dispersing juveniles, and it is contiguous with a larger area of high functioning habitat. Long-term protection of the Farm will leverage the existing protections on neighboring sites (Kaufman HCP & Olympia Airport) to establish and support a significantly greater number of individuals and territories. For these reasons, Olympia pocket gophers on the Farm are likely to maintain a self-sustaining population, thereby providing significant long-term and range-wide benefits to the subspecies. By extinguishing the development rights on 2.5 acres of the Farm and maintaining high quality forage, the HCP will result in long-term protection of habitat with greater potential and productivity for the Olympia pocket gopher than is possible at the Linderson Way development site.

Construction activities associated with developing the Linderson Way site will significantly disturb, permanently displace, injure, or kill all of the Olympia pocket gophers on the above described 3.4 acres of occupied habitat. Construction will also preclude the future use of the entire site (5.8 acres of suitable soils) by Olympia pocket gopher. We anticipate that most individuals will be displaced when development activities begin. Any individuals that remain on-site will be injured or killed, most likely as the result of severe damage or collapse of burrows and nests by heavy equipment operations. Likewise, displaced individuals will be subject to a significantly increased risk of injury or mortality from predation, vehicles, or an inability to locate suitable habitat nearby. Therefore, habitat loss (i.e., reduced amounts and quality of suitable Mazama pocket gopher habitat) will injure or kill all Olympia pocket gophers on 3.4 acres of the development site.

Habitat Maintenance

The HCP includes conservation measures to maintain suitable habitat for Olympia pocket gophers on the Farm. Olympia pocket gophers were known to occur on the Farm before HCP implementation and are expected to persist on the Farm throughout HCP implementation. Management activities to maintain Olympia pocket gopher habitat on the Farm will include normal agricultural activities described in the special rule published under section 4(d) of the Act (79 FR 19790-19796). These agricultural practices promote conservation of Olympia pocket gopher and are specifically exempted from take prohibitions of section 9 of the Act because they are necessary and advisable for the conservation of the subspecies. Therefore, the effects of management for habitat maintenance are described below, but are not addressed in the subsequent incidental take statement.

After more than 160 years of ongoing agricultural operations, the Farm is densely occupied by Olympia pocket gopher, as evidenced by the observed number of Olympia pocket gopher mounds (Romanski *pers. com.*. 2016). Under the HCP, operations on the Farm will be monitored and adaptively managed to maintain or enhance the baseline habitat quantity and quality, associated with high productivity of Olympia pocket gophers within the 2.5-acre conservation easement. The Farm uses raised beds and crop rows to grow commercial produce, minimizing tilling and other ground disturbing activities. Heavy equipment is infrequently employed. Heavy equipment (e.g., tractor, tiller) is used periodically to re-construct beds, re-organize agricultural production, till, and to conduct general maintenance, though many of these activities are routinely accomplished using light equipment or manual labor. The limits on Farm management under the HCP are the same limits on agricultural activities covered by the 4(d) special rule (79 FR 19790-19796). Ongoing agricultural operations and ongoing occupancy of the site by Olympia pocket gopher demonstrate the long-term suitability of 4(d)-authorized agricultural activities to maintain productive habitat for the subspecies.

Management activities intended to maintain or improve habitat for Olympia pocket gophers may injure individual gophers or damage their burrow system. Damage to burrow systems can represent an increased energetic demand with related decreases in reproductive potential, though we lack specific data to quantify this relationship. Damage to burrows also forces some individuals to the surface where predation risks are greater.

While equipment operation for habitat maintenance and Farm management activities are likely to severely damage and/or collapse some burrows, and thereby injure or kill some individuals, we do not expect that every burrow and every individual will be adversely affected. The pocket gopher's fossorial habit makes it difficult to determine response and outcomes for individuals. In most cases, it will be difficult or impossible to determine whether any, or how many, individuals have suffered physical injury or mortality as a result of burrow or nest collapse. Therefore, we instead use a habitat surrogate to describe and quantify the area where Olympia pocket gophers would be present and adversely affected.

Pocket gophers rely on burrowing, and the maintenance of burrows, as their only means of locating and acquiring seasonal food resources, and locating and interacting with potential mates (Vleck 1979, p. 122; Bandoli 1981, p. 301; Reichman et al 1982, p. 692). Burrowing is energetically "expensive" (Vleck 1979, pp. 122-123, 133). The behavioral traits and characteristics which have been documented in closely related fossorial species (e.g., small home range sizes, repeated use of the same foraging tunnels, aggressive territoriality) demonstrate an adaptive response to resource scarcity and/or the need for rigorous control of energetic demands (Vleck 1979, p. 133; Vleck 1981, p. 391; Kelt and van Vuren 1999, pp. 337, 339). Pocket gopher densities almost certainly reflect a complex set of interactions between habitat quality, resource/food availability, and aspects of social proximity (i.e., mate-searching and territoriality) (Reichman et al. 1982, pp. 687-688, 692; Huntly and Inouye 1988, p. 787; Case and Jasch 1994, p. B-21; Kelt and van Vuren 1999, p. 337, 339).

Heavy equipment operation for vegetation management and habitat maintenance clearly result in measurable impacts to vegetation and forage resources. Equipment operation may also, at some locations, result in rutting or compaction of soils, damage to shallow foraging tunnels, and/or a

measurable temporary reduction of available forage resources. However, where effects to pocket gophers and their habitat are concerned, these activities also result in significant long-term benefits by maintaining the low-statured, early seral vegetation that pocket gophers rely on.

The Service expects that equipment operation for habitat maintenance and Farm management will have significant beneficial effects for Olympia pocket gophers, their habitat, and forage resources. While some individuals may find fewer food resources for a period, pocket gophers store plant material in below-ground food caches and the Service expects that individuals that are temporarily affected will continue to have adequate available food reserves. The Service concludes that vegetation management, as proposed, will not have measurable adverse effects to forage resources for Olympia pocket gophers.

Damage and destruction of shallow foraging tunnels imposes an energetic cost on affected individuals. Where the occupied habitat is low-quality and supports sparse forage resources, there is a greater potential for measurable effects to individuals. "In less productive environments, a fossorial rodent tunneling a given distance will encounter fewer food resources than it would in more productive areas" (Vleck 1979, p. 133). Several factors are likely to influence the response and outcomes in specific cases, including physical extent (i.e., how much of the individual's home range is affected), site fertility and productivity, and timing and frequency of disturbance. Timing and temporal considerations will be important in most cases, since Mazama pocket gophers store food in caches and exhibit other adaptive responses to natural, seasonal patterns of resource scarcity.

Site-specific soil properties, soil disturbance history, and climatic factors all substantially influence vulnerability to compaction, shrinkage, loss of porosity, and structural destabilization (Rab 2004, p. 337). Fine-grained soils containing substantial clay or silt fractions are particularly vulnerable, especially when wet (Ampoorter et al. 2010, pp. 2, 17). Some findings indicate that relatively coarse-grained gravelly or sandy loams, which are typical of some sites supporting the pocket gophers, are not particularly vulnerable to effects resulting from the operation of mechanized equipment (Wass and Smith 1997, pp. v, 1, 4, 6, 12).

Aboveground loads can compress, collapse, and/or destabilize soil profile structure. Studies demonstrate that heavier equipment tends to rut and compact soils (Ampoorter et al. 2010, pp. 1-3, 22); more frequently or intensively trafficked areas become more compacted, and/or compacted at greater depth (Ampoorter et al. 2010, pp. 1-3, 19); wet soils (in particular, wet, fine-grained soils) are more vulnerable to rutting and compaction than dry soils (Miller et al. 1996, pp. 226-229, 235); and previously disturbed soils are likely more vulnerable to compaction. Available information indicates that Olympia pocket gophers will be affected by damage or destruction of shallow foraging tunnels. Exposure is not discountable ("extremely unlikely") and available information is not sufficient to demonstrate that these exposures will result in insignificant or immeasurable effects.

The Service concludes that equipment operation for habitat maintenance on the Farm will compact, rut, or otherwise physically disturb surface and subsurface soils at some locations. Shallow foraging tunnels will be extensively damaged, imposing a measurable and significant energetic demand on some individuals. However, not all of the mechanized equipment that is likely to be used poses the same risk of extensively damaging soils and foraging tunnels. With consideration for these factors, the Service has reached the following conclusions:

- In most cases, activities conducted with light mowers or all-terrain vehicles (ATVs) ("three-" or "four-wheelers"; "side-by-sides") will not extensively damage soils or foraging tunnels. If vulnerable soils (e.g., fine-grained Nisqually and Spanaway-Nisqually complex soils) have intensive traffic with light ATVs while soil moisture content is high, this activity may result in damage. When soil moisture content falls within an acceptable range, light ATVs will not cause significant soil rutting, compaction, or other damage regardless of soil type or texture.

- Activities conducted with heavier tractors or tree removal equipment are more likely to extensively damage soils and foraging tunnels:

    - When vulnerable soils (e.g., fine-grained Nisqually and Spanaway-Nisqually complex soils) driven over with heavier tractors or tree removal equipment, extensive damage to foraging tunnels is expected. This damage will significantly disrupt normal behaviors (i.e., the ability to successfully feed, move, and/or shelter) and impose a significant energetic cost on affected individuals. Affected individuals will experience measurable adverse effects to energetics, growth, fitness, or long term survival, creating a likelihood of injury.
    - If vulnerable soils (e.g., fine-grained Nisqually and Spanaway-Nisqually complex soils) are driven over with heavier tractors or tree removal equipment while soil moisture content is high, significant compaction, rutting, and other damage to soil conditions that are important to Olympia pocket gophers (soil properties and suitability) is likely and foreseeable. These impacts will degrade habitat function and may persist for months or years.
    - When less vulnerable and more resilient soils (e.g., coarse-grained Spanaway and Spanaway-Nisqually complex soils) are driven over with heavier tractors or tree removal equipment, extensive damage to foraging tunnels and significant soil compaction and rutting can be avoided. The frequency and intensity of traffic, and soil moisture content, will both influence outcomes.
    - If less vulnerable and more resilient soils (e.g., coarse-grained Spanaway and Spanaway-Nisqually complex soils) are driven over while soil moisture content is high, when soils are saturated, or experiencing freeze-thaw conditions, this activity may result in significant compaction, rutting, and other damage to soil conditions that are important to Olympia pocket gophers (soil properties and suitability).

Soil types and vulnerability to damage vary across the development and mitigation sites.

Equipment used on the Farm includes heavy and light machinery, although a significant majority of Farm operations only employ light equipment, such as a walk-behind mower (Clark, *in litt.* 2016). Heavy equipment is used infrequently on the Farm (i.e., not every year), but it may occur under the HCP. If monitoring and adaptive management determines that equipment operation threatens mitigation effectiveness, the ongoing activities will be adjusted to ensure maintained or enhanced habitat suitability and productivity for Olympia pocket gophers. While heavy equipment operation on the Farm is likely to injure individual Olympia pocket gophers or to collapse burrows, equipment operation for habitat maintenance will more commonly employ light equipment, such as walk-behind or hand-held tools, which will result in, at most, short-term disturbances to gophers by temporarily increasing energetic costs of normal behaviors. The effects of disturbance will cause an individual to forage in a different location or at a later time, which will not result in a measureable effect on individuals or on productivity of Olympia pocket gophers at any other scale. Additionally, equipment operation is used to maintain habitat structure and forage production for Olympia pocket gophers. Therefore, habitat maintenance on the farm will result in both positive and negative effects on Olympia pocket gopher. The positive effects of habitat maintenance will outweigh the adverse effects of short-term disturbance or injury from equipment operation, and result in continued high productivity of Olympia pocket gophers on the Farm.

Equipment operation in crop rows and elsewhere around the Farm will occasionally damage burrows. It is not possible to estimate the number of times equipment will operate on the Farm, though HCP implementation will not directly alter the baseline level of operations, nor the number of times equipment operation will interrupt foraging behaviors or collapse a segment of a burrow. These normal agricultural activities are responsible for maintaining the habitat suitability by preventing encroachment of woody plants via natural succession or non-native species invasions and these activities are covered by the 4(d) special rule (79 FR 19790-19796). The important consideration here is that Farm management under the HCP will ensure habitat persistence in perpetuity on a parcel that otherwise faces severe and immediate development pressures. The measures to maintain habitat are those agricultural activities that the Service already determined to be necessary and advisable for protection and recovery of Olympia pocket gophers. Equipment operation within raised beds is not likely to injure individuals because only light equipment is employed within the beds.

Within the raised beds and existing crop rows, Olympia pocket gophers will use the available habitat for foraging. Burrow networks extending outside the raised beds and crop rows will occur in areas without below-ground disturbance, so individuals will be exposed to agricultural operations in portions of the Farm. As a result, Farm operations will cause periodic disturbance to individual Olympia pocket gophers foraging in agricultural production areas during equipment operation. This will interrupt or delay foraging missions on the order of hours, not days or weeks, and we do not expect that these disruptions will not result in injury or fitness impacts to foraging individuals or their offspring because this species maintains food caches beyond the immediate dietary needs of an individual. Ongoing interruptions to foraging could have measurable impacts on individuals if the disturbance persists for so long as to affect the seasonal energy demands of an individual. However, due to the limited duration of the activities (hours of equipment operation at any given time and extended periods without equipment operation), interruptions to foraging will not result in measurable effects to individuals.

The above-described activities will maintain 2.5 acres of densely occupied Olympia pocket gopher habitat. Maintaining high-quality habitat on the Farm will protect greater numbers of Olympia pocket gophers than occur on the Linderson Way development site. In addition to greater numbers, the HCP will also maintain better gopher productivity on the Farm than occurs on the Linderson Way development site. Protecting the Farm as a site with significant abundance and high productivity for Olympia pocket gophers, will impart long-term positive effects on the subspecies' abundance. The adverse effects of equipment operation for habitat maintenance will occur infrequently during HCP implementation and are neither quantifiable, nor prohibited under the Act. Damage to tunnels is an unavoidable effect of managing habitat to maintain or enhance the productivity of Olympia pocket gophers. The proposed agricultural activities will be monitored and their frequency, intensity, or locations will be adjusted to avoid reducing survival and reproduction of Olympia pocket gophers on covered lands. The effects of the proposed equipment operation for habitat maintenance on the Farm are neither quantifiable, nor prohibited under the Act. Because the Farm activities that disturb individuals are also necessary to maintain habitat suitability and productivity, they are covered by the 4(d) special rule (79 FR 19790-19796), and associated impacts are not "prohibited take." Therefore, we do not quantify the anticipated take from those activities in this opinion. Instead, we conclude that the proposed habitat maintenance activities will significantly benefit Olympia pocket gophers in the action area.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The Service is not aware of any specific future actions that are reasonably certain to occur in the action area. The Service is not aware of any specific future actions that are likely to contribute to cumulative effects on Olympia pocket gophers.

INTEGRATION AND SYNTHESIS OF EFFECTS

In the range of the Olympia pocket gopher, the proposed permit issuance for HCP implementation will result in commercial development of 6.4 acres on the proposed development site, and permanent maintenance of habitat on the 2.5-acre conservation easement on the 5-acre Farm mitigation site. The development site includes 5.8 acres of potential habitat for Olympia pocket gophers, of which 3.4 acres directly supports Olympia pocket gophers. The development site is degraded in terms of habitat quality and connectivity, and some areas are severely degraded by compaction or woody plant encroachment.

The mitigation site will provide 2.5 acres of highly productive Olympia pocket gopher habitat at the start of HCP implementation and in perpetuity. The mitigation site is a single patch of high-quality habitat with good connectivity to other protected habitats and to the largest source

population of Olympia pocket gophers. Compared to the development site, the better forage on the mitigation site and its connectivity to other high-quality habitat will serve to maintain a highly productive site for Olympia pocket gophers.

The adverse effects on Olympia pocket gophers from HCP implementation will result from habitat loss on the development site and habitat maintenance on the mitigation site. Construction activities on the development site will fill, grade, and otherwise destroy soil conditions that are important to the Olympia pocket gophers occupying that site. When construction begins, all individuals present on the development site will be permanently displaced, injured, or killed. *Construction activities associated with developing the Linderson Way site immediately after Permit issuance will significantly disturb, permanently displace, injure, or kill all of the Olympia pocket gophers, including all life history stages, on the 3.4 acres of suitable habitat.*

Because we anticipate the Olympia pocket gopher on the development site has low long-term productivity and resilience, it is extremely unlikely that the habitat losses will amount to a measurable demographic effect for the subspecies. In fact, we expect that HCP implementation will have a positive demographic effect for the Olympia pocket gopher because of productivity and resilience as a result of perpetual management for higher-quality habitat on the mitigation site. The adverse effects of equipment operation for habitat maintenance (i.e., agricultural activities) include collapsing tunnels. These are unavoidable effects of managing habitat to maintain or enhance the productivity of Olympia pocket gophers. These agricultural activities will be monitored and their frequency, intensity, or locations will be adjusted to avoid reducing survival and reproduction of Olympia pocket gophers on covered lands. The effects of the proposed equipment operation for habitat maintenance on the Farm are neither quantifiable, nor prohibited under the Act. The proposed habitat maintenance activities will significantly benefit Olympia pocket gophers in the action area.

The Farm has good connectivity to other protected habitat (i.e., Kaufman HCP mitigation site and Olympia Airport). Maintaining habitat connections is important for this territorial species because juveniles must disperse from their natal site to establish an individual territory. In contrast to the proposed development site, the Farm's proximity and connectivity to large areas of suitable habitat will allow successful dispersal of juveniles to and from suitable habitat. Juveniles dispersing from natal sites on the Farm will establish territories on the Farm or on neighboring sites, which include significant habitat areas protected for Olympia pocket gopher. The development site is largely isolated in a matrix of residential and commercial developments with abundant threats (e.g., vehicles, non-native predators, unfavorable land management). Non-management of the development site is resulting in a Scot's broom invasion and unauthorized recreation that will result in declining productivity until the site no longer supports Olympia pocket gopher. For these reasons, there are likely very low numbers of juveniles produced on the development site and even fewer successfully dispersing from there to other sites. Therefore, the Farm contributes significantly more to the abundance and distribution of the subspecies than the Linderson Way development site does. Habitat maintenance on the Farm will provide for long-term maintenance of Olympia pocket gopher productivity and distribution on a site with good connectivity and habitat structure, which provides for long-term benefits to the subspecies.

Although the net effect of HCP implementation is positive for Olympia pocket gophers, the Service expects that habitat management on the Farm mitigation site will disrupt normal foraging behaviors, cause moderate to severe damage to soils and/or forage resources in some instances, and will have measurable adverse effects to all life stages of Olympia pocket gopher occupying portions of the site. These effects are anticipated and covered by the 4(d) special rule for Olympia pocket gophers because these actions are necessary and advisable for the conservation of the subspecies. Therefore, we do not quantify the take associated with those 4(d)-covered activities here. Likewise, we do not issue an incidental take permit for activities covered by the 4(d) special rule because the associated take is not prohibited by the Act. Development on the Linderson Way site is not covered by the 4(d) special rule and is addressed in the Incidental Take Statement below.

CONCLUSION

After reviewing the current status of the Olympia pocket gopher, the environmental baseline for the action area, the effects of the proposed Permit issuance, and the foreseeable cumulative effects, it is the Service's Opinion that the HCP, as proposed, is not likely to jeopardize the continued existence of the Olympia pocket gopher. Critical habitat for this subspecies has been designated outside the action area (79 FR 19712-19757). This action does not affect those areas and no destruction or adverse modification of designated critical habitat is anticipated.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. *Harm* is defined by the Service as an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). *Harass* is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. 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 to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The proposed Meier HCP and its associated documents clearly identify anticipated impacts to affected species likely to result from the proposed taking and the measures that are necessary and appropriate to minimize those impacts. All conservation measures described in the proposed HCP, together with the terms and conditions described in any associated Implementing Agreement and any section 10(a)(1)(B) permit or permits issued with respect to the proposed HCP, are hereby incorporated by reference as reasonable and prudent measures and terms and

conditions within this Incidental Take Statement pursuant to 50 CFR §402.14(i). Such terms and conditions are non-discretionary and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) of the Act to apply. If the permittee fails to adhere to these terms and conditions, the protective coverage of the section 10(a)(1)(B) permit and section 7(o)(2) may lapse. The amount or extent of incidental take anticipated under the proposed Meier HCP, associated reporting requirements, and provisions for disposition of dead or injured animals are as described in the HCP and its accompanying section 10(a)(1)(B) permit.

AMOUNT OR EXTENT OF TAKE

The Service anticipates incidental take of Olympia pocket gophers will be difficult to detect for the following reasons: Olympia pocket gophers are fossorial, and as such finding a dead or injured specimen is unlikely. However, the following level of take of this species can be anticipated by habitat loss due to construction on the development site:

Take of Olympia pocket gophers is anticipated in the form of harm because clearing and grading for construction on the Linderson Way development site will injure or kill individuals on 3.4 acres of occupied habitat and destroy 5.8 acres of potential habitat based on the presence of suitable soils (including the previously-described 3.4 acres). This effect will occur at the onset of site preparation for construction, which the Applicant will implement as early as possible after Permit issuance.

EFFECT OF THE TAKE

In the accompanying Opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to Olympia pocket gopher.

REASONABLE AND PRUDENT MEASURES, AND TERMS AND CONDITIONS

The Service believes that no more than the numbers described above of Olympia pocket gopher, will be incidentally taken as a result of the proposed action. The reasonable and prudent measures (see the *Description of the Proposed Action* in this document) with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Applicant must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

The Service is to be notified within three working days upon locating a dead, injured or sick endangered or threatened species specimen. Initial notification must be made to the nearest U.S. Fish and Wildlife Service Law Enforcement Office. Notification must include the date, time, precise location of the injured animal or carcass, and any other pertinent information. Care should be taken in handling sick or injured specimens to preserve biological materials in the best

possible state for later analysis of cause of death, if that occurs. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed. Contact the U.S. Fish and Wildlife Service Law Enforcement Office at (425) 883-8122, or the Service's Washington Fish and Wildlife Office at (360) 753-9440.

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. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. Within the scope of the proposed action, we have no conservation recommendations beyond those that are part of the proposed HCP.

REINITIATION – CLOSING STATEMENT

This concludes formal consultation on the issuance of a Permit for the actions outlined in the Meier Group LLC Mazama Pocket Gopher HCP. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (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 the listed species or critical habitat not considered in this opinion; or 4) a new species is listed or critical habitat 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 must cease pending reinitiation.

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APPENDIX A: STATUS OF THE SPECIES - MAZAMA POCKET GOPHER

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Appendix A: Status of the Species - Mazama Pocket Gopher

Status of the Species

On December 11, 2012, the U.S. Fish and Wildlife Service (Service) proposed to list four subspecies of the Mazama pocket gopher (*Thomomys mazama ssp.*) as threatened species under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act). The Service determined that the listing of four subspecies, with a present range in Pierce and Thurston Counties, Washington, is warranted (77 FR 73770; 11 December 2012): *T. m. pugetensis* (Olympia pocket gopher), *T. m. tumuli* (Tenino pocket gopher), *T. m. yelmensis* (Yelm pocket gopher), and *T. m. glacialis* (Roy Prairie pocket gopher). The Service also determined that the Tacoma pocket gopher (*T. m. tacomensis*) is extinct, and that the listing of three other subspecies of Mazama pocket gopher is not warranted at this time: *T. m. couchi* (Shelton pocket gopher), *T. m. louiei* (Cathlamet pocket gopher), and *T. m. melanops* (Olympic pocket gopher).

On April 9, 2014, the Service published a final rule in the Federal Register listing four subspecies of the Mazama pocket gopher as threatened throughout their ranges in the State of Washington (79 FR 19760; April 9, 2014). The Service also published a final rule designating critical habitat for three of the four subspecies (79 FR 19712; April 9, 2014).

Species Information - Taxonomy

Although the species *Thomomys mazama*, or Mazama pocket gopher, includes numerous subspecies that are found in the States of Washington, Oregon, and California, only the subspecies found in the State of Washington have recently been considered for listing. The Mazama pocket gopher complex consists of 15 subspecies, eight of which occur only in Washington, five of which occur only in Oregon, one that occurs only in California, and one subspecies with a distribution that spans the boundary between Oregon and California (Hall 1981, p. 467).

The first pocket gophers collected in western Washington were considered subspecies of the northern pocket gopher (*Thomomys talpoides*)(Goldman 1939), until 1960 when the complex of pocket gophers found in western Washington was determined to be more similar to the western pocket gopher (*T. mazama*)(Johnson and Benson 1960, p. 20). Eight western Washington subspecies of Mazama pocket gopher (*T. mazama, ssp. couchi, glacialis, louiei, melanops, pugetensis, tacomensis, tumuli*, and *yelmensis*) have been identified (Hall 1981, p. 467).

Thomomys mazama is recognized as a valid species by the Integrated Taxonomic Information System (ITIS 2012). Although there have been suggestions that potential changes to the classification of some of these subspecies should be considered, we have no information to suggest that any of the presently recognized subspecies are the subject of serious dispute.

We follow the subspecies designations of Verts and Carraway (2000), as this text represents the currently accepted taxonomy for the species *T. mazama*. Verts and Carraway (2000, p.1) recognize *T. m. glacialis*, *pugetensis*, *tumuli*, and *yelmensis* as separate subspecies (the Roy Prairie, Olympia, Tenino, and Yelm pocket gophers, respectively) based on morphological

characteristics, distribution, and differences in number of chromosomes. Due to the close proximity of the four subspecies located in Thurston and Pierce Counties, and the fact that at least three of them occur in the same clade, we refer to these four subspecies (*T. m. glacialis*, *pugetensis*, *tumuli*, and *yelmensis*) as "the four Thurston/Pierce subspecies" of the Mazama pocket gopher.

Adult Mazama pocket gophers are reddish brown to black above, and the underparts are lead-colored with buff-colored tips. The lips, nose, and patches behind the ears are black; the wrists are white. Adults range from 7 to 9 inches (189 to 220 millimeters (mm)) in total length, with tails that range from 2 to 3 inches (45 to 85 mm)(Verts and Carraway 2000, p.2). Mazama pocket gophers are morphologically similar to other species of pocket gophers that exploit a subterranean existence. They are stocky and tubular in shape, with short necks, powerful limbs, long claws, and tiny ears and eyes. Their short, nearly hairless tails are highly sensitive and probably assist when navigating tunnels. The "pockets" are external, fur-lined cheek pouches on either side of the mouth that are used to transport nesting material and plant cuttings. Mazama pocket gophers reach reproductive age in the spring of the year after their birth and produce litters between spring and early summer. Litter size ranges from one to nine (Wight 1918, p. 14), with an average of five (Scheffer 1938, p. 222). They do not hibernate in winter; they remain active throughout the year (Case and Jasch 1994, p. B-20).

In Washington, Mazama pocket gophers are found west of the Cascade Mountain Range, in the Olympic Mountains and in the Puget Sound trough, with an additional single locality known from Wahkiakum County (Verts and Carraway 2000, p.3). Their populations are concentrated in well-drained friable soils often associated with glacial outwash.

Species Information - Habitat and Life History

The Mazama pocket gopher (pocket gopher) is associated with glacial outwash prairies in western Washington, an ecosystem of conservation concern (Hartway and Steinberg 1997, p. 1), as well as alpine and subalpine meadows and other meadow-like openings at lower elevations. Steinberg and Heller (1997, p. 46) found that pocket gophers are even more patchily distributed than are prairies, as there are some seemingly high quality prairies within the species' range that lack pocket gophers; e.g., Mima Mounds Natural Area Preserve (NAP), and 13th Division Prairie on Joint Base Lewis-McChord (JBLM).

Pocket gopher distribution is affected by the rock content of soils, drainage, forage availability, and climate (Case and Jasch 1994, p. B-21; Hafner et al. 1998, p. 279; Reichman 2007, pp. 273-274; Steinberg and Heller 1997, p. 45; Stinson 2005, p. 31; WDFW 2009). Prairie and meadow habitats used by pocket gophers have a naturally patchy distribution. In their prairie habitats, there is an even patchier distribution of soil rockiness which may further restrict the total area that pocket gophers can utilize (Steinberg and Heller 1997, p. 45; WDFW 2009). We assume that meadow soils have a similarly patchy distribution of rockiness, though the soil surveys to support this are, at this time, incomplete.

In western Washington, pocket gophers currently occupy the following soils series: Alderwood, Cagey, Carstairs, Everett, Everett-Spanaway complex, Everett-Spanaway-Spana complex, Godfrey, Grove, Indianola, Kapowsin, McKenna, Murnen, Nisqually, Norma, Shelton, Spana, Spana-Spanaway-Nisqually complex, Spanaway, Spanaway-Nisqually complex, and Yelm. No soil survey information is currently available for occupied sites in the Olympic National Park, so the soils occupied there are unknown.

We purposely avoid using specific map unit names, because we know that there are imperfections in soil mapping. Maps are based on the technology, standards, and tools available at the time soil surveys were conducted, sometimes up to 50 years ago. We recognize that soil survey boundaries may be adjusted in the future, and that soil series names may be added or removed to soil survey maps and databases. As a result, the overlap of pocket gopher locations with soil series names may be different in the future. The soils information presented here is based on best scientific data available at the time of listing.

We also recognize that some of these soil series or soil series complexes are not typically either deep or well-drained. For a variety of reasons, mapped soil types may or may not have all of the characteristics described by the U.S. Department of Agriculture, Natural Resources Conservation Service, and the actual soils that occur on sites may have characteristics that make them more or less habitable by pocket gophers. These reasons may include: map boundary or transcription errors, map projection errors or differences, map identification or typing errors, soil or hydrological manipulations that have occurred since mapping took place, and small-scale inclusions that are different from the mapped soil. Because soils are mapped at large scales, mapped soils may not identify smaller inclusions.

Any of the soil series or soil series complexes listed above could potentially be suitable for the four Thurston/Pierce subspecies of the Mazama pocket gopher. And, the four Thurston/Pierce subspecies of the Mazama pocket gopher may also inhabit soil series not included in the above list. Although some soils are sandier, more gravelly, or may have more or less silt than described, most all soils used by pocket gophers are friable (easily pulverized or crumbled), loamy, and deep, and generally have slopes less than 15 percent.

There have been reports of pocket gophers (subspecies unknown) occurring on other types of soils, on managed forest lands in Capitol State Forest (owned by the Washington State Department of Natural Resources, WDNR) and Vail Forest (owned by Weyerhaeuser) in Thurston County. These were subsequently determined to be moles (*Scapanus spp*.), based on trapping conducted in these areas by the Washington State Department of Fish and Wildlife (WDFW) during 2012 (Thompson, pers. comm. 2012b).

A study of the relationship between soil rockiness and pocket gopher distribution revealed a strong negative correlation between the proportion of medium-sized rocks in the soil, and the presence of pocket gophers (eight of nine prairies sampled); medium sized rocks were considered greater than 0.5 inch (12.7 mm), but less than 2 inches (50.8 mm) in diameter (Steinberg 1996, p. 32). In observations of pocket gopher distribution on JBLM, pocket gophers did not occur in areas with a high percentage of Scot's broom cover (*Cytisus scoparius*), or where mole populations were particularly dense (Steinberg 1995, p. 26). A more recent study on

JBLM also found that pocket gopher presence was negatively associated with Scot's broom; however, the researcher found no relationship between pocket gopher presence and mole density (Olson 2011a, pp. 12, 13).

Pocket gopher burrows consist of a series of main runways, off which lateral tunnels lead to the surface of the ground (Wight 1918, p. 7). Pocket gophers dig their burrows using their sharp teeth and claws and then push the soil out through the lateral tunnels (Case and Jasch 1994, p. B-20; Wight 1918, p. 8). Nests containing dried vegetation are generally located near the center of each pocket gopher's home tunnel system (Wight 1918, p. 10). Food caches and store piles are usually placed near the nest, and excrement is piled into blind tunnels or loop tunnels, and then covered with dirt, leaving the nest and main runways clean (Wight 1918, p. 11).

A variety of natural predators prey on pocket gophers, including weasels (*Mustela* spp.), snakes, badgers (*Taxidea taxus*), foxes (*Vulpes* spp.), skunks (*Mephitis mephitis*), bobcats (*Lynx rufus*), coyotes (*Canis latrans*), great horned owls (*Bubo virginianus*), barn owls (*Tyto alba*), and several hawks (Case and Jasch 1994, p. B-21; Fichter et al. 1955, p. 13; Hisaw and Gloyd 1926; Huntly and Inouye 1988, p. 792; Stinson 2005, pp. 29, 30). In addition to natural predators, predation by feral and domestic dogs (*Canis lupus familiaris*) and cats (*Felis catus*) is an increasing problem for the four Thurston/Pierce subspecies of the Mazama pocket gopher. Pocket gophers are exposed to increased levels of predation in developed semi-urban and rural environments.

Pocket gophers are generalist herbivores and their diet includes a wide variety of plant material, including leafy vegetation, succulent roots, shoots, and tubers. In natural settings pocket gophers play a key ecological role by aerating soils, activating the seed bank, and stimulating plant growth, though they can be considered pests in agricultural systems. In prairie and meadow ecosystems, pocket gopher activity plays an important role in maintaining species richness and diversity.

Foraging primarily takes place below the surface of the soil, where pocket gophers snip off roots of plants before occasionally pulling the whole plant below ground to eat or store in caches. If above-ground foraging occurs, it's usually within a few feet of an opening and forage plants are quickly cut into small pieces and carried back to the nest or cache (Wight 1918, p. 12). Any water they need is obtained from their food (Gettinger 1984, pp. 749-750; Wight 1918, p. 13). The probability of pocket gopher occupancy is much higher in areas with less than 10 percent woody vegetation cover (Olson 2011a, p. 16), presumably because such vegetation will shade out the forbs, bulbs, and grasses that pocket gophers prefer to eat, and high densities of woody plants make travel both below and above the ground difficult.

The pocket gopher's home range is composed of suitable breeding and foraging habitat. Home range size varies based on factors such as soil type, climate, and density and type of vegetative cover (Case and Jasch 1994, p. B-21; Cox and Hunt 1992, p. 133; Hafner et al. 1998, p. 279). Little research has been conducted regarding home range size for individual pocket gophers in western Washington. Witmer et al. (1996b, p. 96) reported an average home range size of approximately 1,076 square feet (100 square meters) for one location in Thurston County, Washington. Pocket gopher density varies greatly due to local climate, soil suitability, and

vegetation types (Case and Jasch 1994, p. B-21; Howard and Childs Jr. 1959, pp. 329-336), and densities are likely to be higher when habitat quality is better. Therefore, this one report (Witmer et al. 1996b) is unlikely to represent the average density across all soil types, vegetation types, and other unique site characteristics across the ranges of the four Thurston/Pierce subspecies of the Mazama pocket gopher.

Research on other species of *Thomomys* pocket gophers show a wide range of home range sizes, from approximately 80 to 14,370 square feet (7.4 to 1,335 square meters). Studies that have included live-capture and enumeration continue to find that densities of the four Thurston/Pierce subspecies of the Mazama pocket gopher vary significantly, between sites with dissimilar characteristics, between sites with similar characteristics, and within the same sites over time.

In the absence of studies demonstrating the minimum possible patch size for persistence of pocket gophers, we used 50 acres (20 hectares (ha)) as the smallest area necessary for recovery of populations, which was the agreed upon estimate of an expert panel assembled to assist with the construction of a prairie habitat modeling exercise (Converse et al. 2010, pp. 14, 15). We acknowledge uncertainty with this estimate, but there are currently no studies regarding minimum patch size, nor are there any obvious means by which a better answer can be obtained. Thus, the best available scientific data in this case is the opinion of an informed expert panel.

Pocket gophers reach sexual maturity during the spring of the year following their birth, and generally produce one litter per year (Case and Jasch 1994, p. B-20), though timing of sexual maturity has been shown to vary with habitat quality (Patton and Brylski 1987, p. 502; Patton and Smith 1990, p. 76). Gestation lasts approximately 18 days (Andersen 1978, p. 421; Schramm 1961, p. 169). Young are born in the spring to early summer (Wight 1918, p. 13), and are reared by the female. Aside from the breeding season, males and females remain segregated in their own tunnel systems. There are 1-9 pups per litter (averaging 5), born without hair, pockets, or teeth, and they must be kept warm by the mother or "packed" in dried vegetation (Case and Jasch 1994, p. B-20; Wight 1918, p. 14). Juvenile pelage starts growing in at just over a week (Andersen 1978, p. 420). The young eat vegetation in the nest within three weeks of birth, with eyes and ears opening and pockets developing at about a month (Andersen 1978, p. 420; Wight 1918, p. 14). At six weeks they are weaned, fighting with siblings, and nearly ready to disperse (Andersen 1978, p. 420; Wight 1918, p. 15), which usually occurs at about two months of age (Stinson 2005, p. 26). They attain their adult weight between four and five months of age (Andersen 1978, pp. 419, 421). Most pocket gophers live only a year or two, with few living to three or four years of age (Hansen 1962, pp. 152, 153; Livezey and Verts 1979, p. 39).

Pocket gophers rarely surface completely from their burrow except as juveniles, when they disperse above ground from spring through early fall (Howard and Childs Jr. 1959, p. 312; Ingles 1952, p. 89). They are highly asocial and intolerant of other pocket gophers. Each pocket gopher maintains its own burrow system, and occupancy of a burrow system by multiple individuals occurs only for brief periods during mating seasons and prior to weaning young (Ingles 1952, pp. 88, 89; Marsh and Steele 1992, p. 209; Witmer and Engeman 2007, p. 288).

The mating system is probably polygynous (a single male mates with multiple females) and most likely based on female choice. The adult sex ratio has been reported as biased toward females in most species of pocket gophers that have been studied, often as much as 4:1 (Howard and Childs Jr. 1959, p. 296; Patton and Feder 1981, p. 917), though Witmer et al. (1996a, p. 95) reported a sex ratio of close to 1:1. Sex ratio may vary with population density, which is often influenced by forage density and soil suitability for burrowing (Patton and Smith 1990, p. 6). One site having a deep soil layer with considerably less rock was estimated to have a pocket gopher population density five times that of another site having rocky soil (Steinberg 1996, p. 26).

Pocket gophers have limited dispersal capabilities (Williams and Baker 1976, p. 303). Mazama pocket gophers are smaller in size than other sympatric or peripatric *Thomomys* species (Verts and Carraway 2000, p. 1). Both dispersal distance and home range size are therefore likely to be smaller than for other *Thomomys* species. Dispersal distances may vary based on surface or soil conditions and size of the animal. For other, larger, *Thomomys* species, dispersal distances average about 131 feet (40 meters) (Barnes Jr. 1973, pp. 168, 169; Daly and Patton 1990, pp. 1286, 1288; Williams and Baker 1976, p. 306). Initial results from research being conducted on JBLM indicate that juvenile pocket gophers usually make movements from 13.1 to 32.8 feet (4-10 meters), though these may not be dispersal movements. One juvenile made a distinct dispersal movement of 525 feet (160 meters) in a single day (Olson 2012, p. 5).

Suitable dispersal habitat is free of barriers to movement, and may need to contain foraging habitat if an animal is required to make a long-distance dispersal movement. Potential barriers include, but are not limited to, forest edges, roads (paved and unpaved), abrupt elevation changes, Scot's broom thickets (Olson 2012, p. 3), highly cultivated lawns, inhospitable soil types or substrates (Olson 2008, p. 4), development and buildings, slopes greater than 35 percent, and open water. Barriers may be permeable, meaning that they impede movement from place to place without completely blocking it, or they may be impermeable, meaning they cannot be crossed. Permeable barriers, as well as lower quality dispersal habitats, may present a risk of mortality for animals that use them (e.g., open areas where predation risk is increased, or a paved area where vehicular mortality is high).

The WDFW conducted a study to determine dispersal distances of juvenile pocket gophers on JBLM. Twenty-eight juveniles were radio-collared and tracked for 17 to 56 days, with all but three animals tracked for more than 30 days. Of these, only nine gophers moved more than 32.8 feet (10 meters), and 10 gophers were never found more than 13.1 feet (4 meters) from any previous location (Olson 2012, p. 5). Only one animal dispersed what would be considered a larger distance, moving 525 feet (160 meters) in a single day.

Historical and Current Range and Distribution

The following general description of the distribution of the four Thurston/ Pierce subspecies of Mazama pocket gopher (*Thomomys mazama glacialis*, *pugetensis*, *tumuli*, and *yelmensis*) is based on our current knowledge. Steinberg (1996, p. 9) surveyed all historical and many currently known sites. This included all current and formerly known occupied sites listed by the WDNR as having Carstairs, Nisqually, or Spanaway gravelly or sandy loam soil, and that WDNR determined to have vegetation that was intact prairie or restorable to prairie. WDFW

and a group of consultants have surveyed areas of potential pocket gopher habitat in both counties, usually associated with proposed development (WDFW 2012). WDFW has also surveyed areas in relation to various research studies, as well as conducting distribution surveys across five counties in 2012 (Thompson, in litt. 2012a).

The Roy Prairie pocket gopher occurs generally south and east of I-5, south of State Highway 512, and west of State Highway 7. There are prairie-type areas within this described area that have been surveyed multiple times with no detections, so this description is likely to be an overestimate of the subspecies' range. This description also includes areas thought to be within the historical range of the Tacoma pocket gopher, which is presumed extinct. Few surveys have been conducted off JBLM lands in this area, and our specific knowledge of the range of this subspecies could change in the future.

In Thurston County, the Olympia, Tenino, and Yelm pocket gophers are known to occur east of the Black River and south of Interstate 5 and State Highway 101. There are no historical records of pocket gophers occurring outside of these areas within Thurston County. Soil series and soil series complexes that are known to support pocket gophers do occur outside of these areas. Multiple surveys conducted west of the Black River have consistently yielded negative results (WDFW 2013a). For that reason, there is some confidence that the Black River is a range-restrictive landscape feature. Fewer surveys have been conducted north of Interstate 5 and State Highway 101 (WDFW 2013a), but those also yielded negative results. It is possible that pocket gophers may occur north of these highways in Thurston County, but we presently have no data to support that conclusion.

The present outermost boundaries of the ranges of each of the four Thurston/Pierce subspecies of the Mazama pocket gopher are likely approximately the same as they were historically. However, entire prairie areas or portions thereof within those outer perimeters have been lost to development and woody plant encroachment. Therefore, at present pocket gophers likely occupy fewer total acres than they did historically, and also occupy fewer total areas (that is, there are fewer populations within the area of their diminished range). The four subspecies are known to still occur in their type locality locations (described below), and the areas immediately around those locations are considered to still be part of each subspecies' range. Beyond these areas, uncertainty remains as to the entire areal extent of each subspecies' range, and where or if populations of the subspecies coexist or abut one another. Each subspecies' range is presumed to extend beyond their type localities. For this reason, the list of soils given for each subspecies (below) is shorter than the list given in our final designation of critical habitat.

The type locality for the Olympia pocket gopher (*Thomomys mazama pugetensis*) was the prairie on and around the Olympia Airport (Dalquest and Scheffer 1944, p. 445). Gophers continue to occupy this area. Soil series and soil series complexes in and around this area that may support pocket gophers include Alderwood, Cagey, Everett, Indianola, McKenna, Nisqually, Norma, Spana, Spanaway- Nisqually complex, and Yelm.

The Roy Prairie pocket gopher (*Thomomys mazama glacialis*) is found in the vicinity of the Roy Prairie and on JBLM in Pierce County. The subspecies was described as plentiful in 1983 but by 1993 the type locality was described as a "small population" (Steinberg 1996, p. 24). Due to

proximity to the subspecies' type locality, it is likely that the 91st Division Prairie and Marion Prairie in Pierce County support this subspecies. Soil series and soil series complexes in and around this area that may support pocket gophers include Alderwood, Everett, Everett-Spanaway complex, Everett-Spanaway-Spana complex, Nisqually, Spana-Spanaway-Nisqually complex, and Spanaway.

Tenino pocket gophers (*Thomomys mazama tumuli*) were originally found in the vicinity of the Rocky Prairie NAP, near Tenino (Dalquest and Scheffer 1942, p. 96), a relatively small prairie area. Gophers still reside there, but WDFW researchers have not seen consistent occupancy of the area in recent years (Olson, in litt. 2010), suggesting that the activity intermittently detected in the NAP may be attributable to individuals dispersing from a currently unidentified nearby source. Soil series and soil series complexes in this area that may support pocket gophers include Everett, Nisqually, Norma, Spanaway, and Spanaway-Nisqually complex.

Yelm pocket gophers (*Thomomys mazama yelmensis*) were originally found on prairies in the area of Grand Mound, Vail, and Rochester (Dalquest and Scheffer 1944, p. 446). Surveys conducted during 1993 and 1994 found no pocket gophers near the towns of Vail or Rochester (Steinberg 1995, p. 28). More recent surveys have reported pocket gophers near Grand Mound, Littlerock, Rainier, Rochester, and Vail (Krippner 2011, p. 31), though WDFW biologists question the validity of the reports near Littlerock and Vail (WDFW 2013b, enclosure 1, p. 3). Soil series and soil series complexes in and around these areas that may support pocket gophers include Alderwood, Everett, Godfrey, Kapowsin, McKenna, Nisqually, Norma, Spana, Spanaway, Spanaway-Nisqually complex, and Yelm.

Population Estimates

There are few data on historical or current population sizes of Mazama pocket gopher (pocket gopher) populations in Washington, although several local populations and one subspecies are believed to be extinct. Knowledge of the past status of the pocket gopher is limited to distributional information.

Recent surveys have focused on determining current distribution, primarily in response to development applications. In addition, in 2012, WDFW initiated a five county-wide distribution survey. Because the object of all of these surveys has mainly been presence/absence only, total population numbers for each subspecies are unknown. And, the precise boundaries of each subspecies' range are not currently known.

Local population estimates have been reported but are based on using apparent gopher mounds to delineate the number of territories, a method that has not been validated (Stinson 2005, pp. 40, 41). Olson (2011a, p. 2) evaluated this methodology on pocket gopher populations at the Olympia Airport and Wolf Haven International. Although there was a positive relationship between the number of mounds and number of pocket gophers, the relationship varies spatially, temporally, and demographically (Olson 2011a, pp. 2, 39). Based on the results of Olson's 2011 study, we believe past population estimates (Stinson 2005) may have been too high. As there is no generally accepted standard survey protocol to determine population size for pocket gophers, it is not currently possible to obtain an estimate of subspecies population sizes or trends. Overall

habitat availability has declined, however, and habitat has a finite ability to support pocket gophers. For these reasons, the Service concludes that the overall population trend of each of the four Thurston/Pierce subspecies of the Mazama pocket gopher is negative.

Increased survey effort since 2007 has resulted in the identification of numerous additional occupied sites located on private lands, especially in Thurston County (WDFW 2013a).

Some of these new detections are adjacent to other known occupied sites, such as the population at the Olympia Airport. The full extent of these smaller discontiguous sites is currently unknown, and no research has been done to determine whether or not these aggregations are "stepping stone" sites that may facilitate dispersal into nearby unoccupied suitable habitat, or if they are population sinks (sites that do not add to the overall population through recruitment). Others of these additional occupied sites are separate locations, seemingly unassociated (physically) with known populations (Tirhi, in litt. 2008). The largest known expanse of areas occupied by any subspecies in Washington occur on JBLM (Roy Prairie and Yelm pocket gophers), and at the Olympia and Shelton airports (Olympia and Shelton pocket gophers, respectively).

A translocated population occurs on Wolf Haven International's land near Tenino, Washington. Between 2005 and 2008, over 200 gophers from a variety of areas in Thurston County (some from around Olympia Airport (Olympia pocket gopher, *T. m. pugetensis*)) and some from near the intersection of Rich Road and Yelm Highway (assumed to be Olympia pocket gophers) were released into the 38 acres (15 ha) mounded prairie site. Based on the best available information, we do not believe the property previously supported pocket gophers. Today pocket gophers continue to occupy the site (Tirhi, in litt. 2011); however, current population estimates are not available.

Another site, West Rocky Prairie Wildlife Area, has received a total of 560 translocated pocket gophers (*T. m. pugetensis*) from the Olympia Airport between 2009 and 2011. Initial translocation efforts were unsuccessful; a majority of the pocket gophers died within three days due to predation (Olson 2009, p. 3). Modified release techniques used in 2010 and 2011 resulted in improved survival rates (Olson 2011b, p. 4). It is too soon to know if the population will become self-sustaining, or if additional translocations of gophers will be necessary. This research is ongoing.

Factors and Threats Affecting the Species

The four Thurston/Pierce subspecies of Mazama pocket gopher (*Thomomys mazama glacialis*, *pugetensis*, *tumuli*, and *yelmensis*) face significant threats that contribute to a risk of extinction. Best available scientific and commercial information identifies the following significant threats to the subspecies; each of these threats is discussed in greater detail below:

1. Destruction, modification, or curtailment of habitat and range, including the on-going, cumulative effects of development, military training, and loss or curtailment of natural disturbance processes;

2. Poor connectivity between small and isolated populations; and,

3. Predation and pest control, including that which is attributable to domesticated pets.

Destruction, Modification, or Curtailment of Habitat and Range

The primary long term threats to the pocket gopher are the loss, conversion, and degradation of habitat, particularly to urban development, successional changes to grassland habitat, and the spread of invasive plants. The threats also include increased predation pressure, which is closely linked to habitat degradation.

The prairies of south Puget Sound are one of the rarest ecosystems in the United States (Dunn and Ewing 1997b, p. v; Noss et al. 1995, p. I-2). Dramatic changes have occurred on the landscape over the last 150 years, including a 90 to 95 percent reduction in the extent of the prairie ecosystem. In the south Puget Sound region, where most of western Washington's prairies historically occurred, less than 10 percent of the original prairie persists, and only three percent remains dominated by native vegetation (Crawford and Hall 1997, pp. 13, 14).

Development: Native prairies and grasslands have been severely reduced throughout the range of the four Thurston/Pierce subspecies of Mazama pocket gopher, especially as a result of conversion to residential and commercial development and agriculture. Prairie habitat continues to be lost, particularly to residential development (Stinson 2005, p. 70), by removal and fragmentation of native vegetation, and the excavation, and/or heavy equipment-caused compaction of surfaces and conversion to non-habitat (e.g., buildings, pavement, other infrastructure), rendering soils unsuitable for burrowing.

Residential development is associated with increased infrastructure, such as new road construction, which is one of the primary causes of landscape fragmentation (Watts et al. 2007, p. 736). Activities that accompany low-density development are correlated with decreased levels of biodiversity, mortality to wildlife, and facilitated introduction of nonnative invasive species (Trombulak and Frissell 2001; Watts et al. 2007, p. 736). In the south Puget Sound lowlands, the glacial outwash soils and gravels underlying the prairies are deep and valued for use in construction and road building, which leads to their degradation and destruction.

In the south Puget Sound, Nisqually loamy soils appear to support high densities of pocket gophers (Stinson, in litt. 2010a Olson 2008, p. 6), the vast majority of which occur in developed areas of Thurston County, or within the Urban Growth Areas for the cities of Olympia, Tumwater, and Lacey (WDFW 2009), where future development is most likely to occur. Where pocket gopher populations presumably extended across an undeveloped expanse of open prairie (Dalquest and Scheffer 1942, pp. 95, 96), areas currently occupied by the four Thurston/Pierce subspecies of the Mazama pocket gopher are now isolated to small fragmented patches due to development and conversion of suitable habitat to incompatible uses.

The presumed extinction of the Tacoma pocket gopher is likely linked directly to residential and commercial development, which has replaced nearly all pocket gopher habitats in the historical range of the subspecies (Stinson 2005, pp. 18, 34, 46). One of the historical Tacoma pocket

gopher sites was converted to a large gravel pit and golf course (Steinberg 1996, pp. 24, 27; Stinson 2005, pp. 47, 120). In addition, two gravel pits are now operating on part of the site recognized as the type locality for the Roy Prairie pocket gopher (Stinson 2005, p. 42), and another is in operation near Tenino (Stinson, in litt. 2010b) in the vicinity of the type locality for the Tenino pocket gopher.

Multiple pocket gopher sites in Pierce and Thurston Counties may be, or have been, lost to gravel pit development, golf course development, or residential and commercial development (Stinson, in litt. 2005; Stinson 2005, pp. 26, 42; Stinson, in litt. 2010b). Multiple prairies that used to contain uninterrupted expanses of prairie habitat suitable for pocket gophers within the range of the four Thurston/Pierce subspecies have been developed to cities, neighborhoods, agricultural lands, or military bases, and/or negatively impacted by such development, including Baker Prairie, Bush Prairie, Chambers Prairie, Frost Prairie, Grand Mound Prairie, Little Chambers Prairie, Marion Prairie, Roy Prairie, Ruth Prairie, Woods Prairie, Violet Prairie, and Yelm Prairie. Some of these prairie areas still contain smaller areas that support pocket gophers, and some appear to no longer support pocket gophers at all (WDFW 2012).

Where their properties coincide with pocket gopher occupancy, many private lands developers and landowners in Thurston County have agreed to create set-asides or agree to other mitigation activities in order to obtain development permits from the County (Tirhi, in litt. 2008). However, it is unknown if any pocket gophers will remain on these sites due to the small size of the set-asides, extensive grading in some areas adjacent to set-asides, lack of dedicated funding for enforcement or monitoring of set-aside maintenance (Thurston County Long Range Planning and Resource Stewardship, in litt. 2011, p. 2), and lack of control of predation by domestic or feral cats and dogs. In addition, some landowners have received variances from Thurston County that allowed development to occur without a requirement to set aside areas for pocket gophers.

A population of Olympia pocket gophers is located at and around the Port of Olympia's Olympia Airport, which is sited on the historical Bush Prairie. Gophers on Bush Prairie are currently vulnerable to negative impacts from proposed future development by the Port of Olympia and ongoing development by adjacent landowners. The Port of Olympia has plans to develop large portions of the existing grassland that likely supports the largest population of the Olympia pocket gopher in Washington (Stinson 2007, in litt.; Port of Olympia and WDFW 2008, p.1; Port of Olympia 2012). The Olympia Airport is realigning the airport runway, which is in known occupied habitat. They continue to work with the Service and WDFW on mitigating airport expansion activities that may negatively impact gophers (Tirhi, in litt. 2010).

The Olympia pocket gopher has a population at the Olympia Airport that spans several hundred acres, and there are two translocated populations: one at West Rocky Prairie Wildlife Area (some individuals from the Olympia Airport) and one at Wolf Haven (individuals from the Olympia Airport and some from near the intersection of Rich Road and Yelm Highway). The population centered on the Olympia Airport could be negatively impacted by plans for development both on and off the airport, while the two translocated populations are currently secure from intense commercial and residential development pressures as they occur on conserved lands.

The Roy Prairie pocket gopher is known to occur across a large expanse of prairie on JBLM, which is currently secure from the threat of development. The Tenino pocket gopher has a single known population, which has been detected during surveys on the Rocky Prairie NAP, although the intermittent nature of these detections suggests it must be part of a larger metapopulation that occurs across nearby areas that have not been accessible for surveys. No known development poses a threat to the NAP, but any future conversion of the surrounding area to incompatible land use would likely hinder the recovery of this subspecies. The Yelm pocket gophers on Tenalquot prairie (which is owned in large part by JBLM) and Scatter Creek Wildlife Area are also secure from such residential and commercial development, but the Yelm pocket gopher habitat on Rock Prairie north of Old Highway 99 is in an area that is likely to be developed soon, which may negatively affect any local populations in the vicinity.

Loss or Curtailment of Natural Disturbance Processes: The suppression and loss of ecological disturbance regimes across vast portions of the landscape, such as fire, has resulted in altered vegetation structure in the prairies and meadows and has facilitated invasion by native and nonnative woody vegetation, rendering habitat unusable for the four Thurston/Pierce subspecies of Mazama pocket gopher. The basic ecological processes that maintain prairies and meadows have disappeared from, or have been altered on, all but a few protected and managed sites.

Historically, the prairies and meadows of the south Puget Sound region are thought to have been actively maintained by native peoples, who lived here for at least 10,000 years before the arrival of Euro-American settlers (Boyd 1986; Christy and Alverson 2011, p. 93). Frequent burning reduced the encroachment and spread of shrubs and trees (Boyd 1986; Chappell and Kagan 2001, p. 42), favoring open grasslands with a variety of native plants and animals. Following Euro-American settlement of the region in the mid-19th century, fire was actively suppressed on grasslands, allowing encroachment by woody vegetation into the remaining prairie habitat and oak woodlands (Agee 1993, p. 360; Altman et al. 2001, p. 262; Boyd 1986; Franklin and Dyrness 1973, p. 122; Kruckeberg 1991, p. 287).

Fires on the prairie create a mosaic of vegetation conditions, which serve to maintain native prairie plant communities. In some prairie patches fires will kill encroaching woody vegetation and reset succession back to bare ground, creating early successional vegetation conditions suitable for many native prairie species. Early succession forbs and grasses are favored by pocket gophers. The historical fire frequency on prairies has been estimated to be 3 to 5 years (Foster 2005, p. 8). On sites where regular fires occur, there is a high complement of native plants and fewer invasive species. These types of fires maintain the native short-statured plant communities favored by pocket gophers.

The result of fire suppression has been the invasion of the prairies and oak woodlands by native and nonnative plant species (Dunn and Ewing 1997a, p. v; Tveten and Fonda 1999, p. 146), notably woody plants such as the native Douglas-fir (*Pseudotsuga menziesii*) and the nonnative Scot's broom. On tallgrass prairies in midwestern North America, fire suppression has led to degradation and the loss of native grasslands (Curtis 1959, pp. 296, 298; Panzer 2002, p. 1297). On northwestern prairies, fire suppression has allowed Douglas-fir to encroach on and outcompete native prairie vegetation for light, water, and nutrients (Stinson 2005, p. 7). This increase in woody vegetation and nonnative plant species has resulted in less available prairie

habitat overall and habitat that is unsuitable for and avoided by many native prairie species, including pocket gophers (Olson 2011a, pp. 12, 16; Pearson et al. 2005, pp. 2, 27; Tveten and Fonda 1999, p. 155).

Pocket gophers prefer early successional vegetation as forage. Woody plants shade out the forbs and grasses that pocket gophers prefer to eat, and high densities of woody plants make travel both below and above the ground difficult. In locations with poor forage, pocket gophers tend to have larger territories, which may be difficult or impossible to establish in densely forested areas. The probability of pocket gopher occupancy is much higher in areas with less than 10 percent woody vegetation cover (Olson 2011a, p. 16).

On JBLM alone, over 16,000 acres (6,477 ha) of prairie has converted to Douglas-fir forest since the mid-19th century (Foster and Shaff 2003, p. 284). Where controlled burns or direct tree removal are not used as a management tool, this encroachment will continue to cause the loss of open grassland habitats for pocket gophers and is an ongoing threat to the species.

Restoration in some of the south Puget Sound grasslands has resulted in temporary control of Scot's broom and other invasive plants through the careful and judicious use of herbicides, mowing, grazing, and fire. Fire has been used as a management tool to maintain native prairie composition and structure and is generally acknowledged to improve the health and composition of grassland habitat by providing a short-term nitrogen addition, which results in a fertilizer effect to vegetation, thus aiding grasses and forbs to sprout.

Unintentional fires ignited by military training burn patches of prairie grasses and forbs on JBLM on an annual basis. These light ground fires create a mosaic of conditions within the grassland, maintaining a low vegetative structure of native and nonnative plant composition, and patches of bare soil. Because of the topography of the landscape, fires create a patchy mosaic of areas that burn completely, some areas that do not burn, and areas where consumption of the vegetation is mixed in its effects to the habitat. One of the benefits of fire in grasslands is that it tends to kill regenerating conifers, and reduces the cover of nonnative shrubs such as Scot's broom, although Scot's broom seed stored in the soil can be stimulated by fire (Agee 1993, p. 367). Fire also improves conditions for many native bulb-forming plants, such as *Camassia spp.* (Agee and Dunwiddie 1984). On sites where regular fires occur, such as on JBLM, there is a high complement of native plants and fewer invasive species. These types of fires maintain the native, short-statured plant communities favored by pocket gophers.

Management practices such as intentional burning and mowing require expertise in timing and technique to achieve desired results. If applied at the wrong season, frequency, or scale, fire and mowing can be detrimental to the restoration of native prairie species. Excessive and high-intensity burning can result in a lack of vegetation or encourage regrowth of nonnative grasses. Where such burning has occurred over a period of more than 50 years on the artillery ranges of JBLM, prairies are covered by nonnative forbs and grasses instead of native perennial bunchgrasses (Tveten and Fonda 1999, pp. 154, 155).

Pocket gophers are not commonly found in areas colonized by Douglas-fir trees because pocket gophers require forbs and grasses of an early successional stage for food (Witmer et al. 1996a, p. 96). Pocket gophers observed on JBLM did not occur in areas with high cover of Scot's broom (Steinberg 1995, p. 26). A more recent study on JBLM also found that pocket gopher presence was negatively associated with Scot's broom (Olson 2011a, pp. 12, 13, 16). Some subspecies may disperse through forested areas or may temporarily establish territories on forest edges, but there is currently not enough data available to determine how common this behavior may be or which subspecies employ it. The four Thurston/Pierce subspecies of the Mazama pocket gopher occur on prairie-type habitats, many of which, if not actively managed to maintain vegetation in an early-successional state, have been invaded by shrubs and trees that either preclude pocket gophers or limit their ability to fully occupy the landscape. Typical management at civilian airports prevents woody vegetation from encroaching onto surrounding areas for flight safety reasons. Woody vegetation encroachment is therefore not a threat at civilian airports.

Military Training: Pocket gopher populations occurring on JBLM are exposed to differing levels of training activities on the base. The Department of Defense's (DOD) proposed actions under their "Grow the Army" initiative include stationing 5,700 new soldiers, new combat service support units, a combat aviation brigade, facility demolition and construction to support the increased troop levels, and additional aviation, maneuver, and live fire training (75 FR 55313, September 10, 2010). The increased training activities will affect nearly all training areas at JBLM, resulting in an increased risk of accidental fires, and habitat destruction and degradation attributable to vehicle use in occupied areas, mounted and dismounted training, bivouac activities, and digging. Even though the training areas on the base are degraded, with implementation of agreed-upon conservation measures, these areas still provide habitat for the Roy Prairie and Yelm pocket gopher.

JBLM's recently signed Endangered Species Management Plan (ESMP) for the Mazama pocket gopher will serve to minimize threats across the base by redirecting some training activities to areas outside of occupied habitat, designating areas where no vehicles are permitted, designating areas where vehicles will remain on roads only, and designating areas where no digging is allowed, among other conservation measures. JBLM has further committed to enhancing and expanding suitable habitat for the Roy Prairie and Yelm pocket gophers in "priority habitat" areas on base (areas that were proposed as critical habitat); enforcing restrictions on recreational use of occupied habitat by dog owners and horseback riders; and continuing to support the off-base recovery of the four Thurston/Pierce subspecies of the Mazama pocket gopher.

Several moderate- to large-sized areas supporting pocket gophers have been identified on JBLM. These areas are within the historical ranges of the Roy Prairie (Pierce County) and Yelm (Thurston County) pocket gophers. Their absence from some sites of what is presumed to have been formerly suitable habitat may be related to compaction of the soil due to years of mechanized vehicle training (Steinberg 1995, p. 36).

Training infrastructure (e.g., roads, firing ranges, bunkers) also degrades pocket gopher habitat and may lead to reduced use of these areas by pocket gophers. For example, JBLM has plans to add a third rifle range on the south impact area where it overlaps with a densely occupied pocket

gopher site. The area may be usable by pocket gophers when the project is completed; however, construction of the rifle range may result in removal of forage and direct mortality of pocket gophers through crushing of burrows (Stinson, in litt. 2011).

Recent survey access to the center of the artillery impact area on 91st Division Prairie, where bombardment is presumably of the highest intensity, did detect some unspecified level of occupancy by the Roy Prairie pocket gopher (WDFW 2013b, enclosure 1, p. 6). This apparently suitable central portion of the 91st Division Prairie is subject to repeated and ongoing bombardment, which may create an ecological trap for dispersing juveniles.

JBLM training areas have varying levels of use; some allow excavation and off-road vehicle use, while other areas have restrictions that limit off-road vehicle use. The ESMP specifically requires coordination between the JBLM Fish and Wildlife personnel and the JBLM entities responsible for training activities (e.g., Range Support, battalion commanders, and/or first field grade officers) to ensure all parties are aware of where occupied areas occur in relation to training activities, the effects of training, and the potential ramifications of habitat destruction or animal mortality. Since military training has the potential to directly or indirectly harm or harass pocket gophers, we conclude that these activities will negatively impact the Roy Prairie and Yelm pocket gophers.

JBLM has committed to operational restrictions on portions of the base in order to avoid and minimize potential impacts to Roy Prairie and Yelm pocket gophers. Currently-occupied areas will be buffered from training activities, with an emphasis on occupied habitat in "priority habitat" areas. Regular surveys will be conducted with the goals of determining distribution, protecting pocket gophers and their habitat from disturbance or destruction, and determining population status. Where possible, JBLM will alleviate training pressure by transferring activities to unoccupied areas where encroaching forest has been removed. This strategy has the effect of both releasing large areas of land that were historically prairie and providing unoccupied areas where training is free of the risk of negatively impacting Roy Prairie or Yelm pocket gophers. While the Service fully supports the implementation of these impact minimization efforts and will continue to collaborate with DOD to address all aspects of training impacts on the species, not all adverse impacts on pocket gophers can be fully avoided. Military training continues to pose a threat to the Roy Prairie and Yelm subspecies at this time. No military training occurs in the ranges of the Olympia or Tenino subspecies of the Mazama pocket gopher.

Poor Connectivity Between Small and Isolated Populations

Most species' populations fluctuate naturally, responding to various factors such as weather events, disease, and predation. Populations that are small, fragmented, or isolated by habitat loss or modification of naturally patchy habitat, and other human-related factors, are more vulnerable to extirpation by natural randomly occurring events, cumulative effects, and to genetic effect (collectively known as small population effects). These effects can include genetic drift (loss of recessive alleles), founder effects (over time, an increasing percentage of the population inheriting a narrow range of traits), and genetic bottlenecks leading to increasingly lower genetic diversity, with consequent negative effects on evolutionary potential.

To date, of the eight subspecies of Mazama pocket gopher in Washington, only the Olympic pocket gopher has been documented as having low genetic diversity (Welch and Kenagy 2008, p. 7), although the six other extant subspecies have local populations that are small, fragmented, and physically isolated from one another.

The four Thurston/Pierce subspecies of the Mazama pocket gopher face threats from loss or fragmentation of habitat. Historically, pocket gophers probably persisted by continually recolonizing habitat patches after local extinctions. However, widespread development and conversion of habitat has resulted in widely separated populations, and intervening habitat corridors are now gone, with the effect of impeding or stopping much of the natural recolonization that historically occurred (Stinson 2005, p. 46).

Although pocket gophers are not known to have low genetic diversity, small population sizes at most sites, coupled with disjunct and fragmented habitat, may contribute to further population declines. Little is known about the local or rangewide reproductive success of pocket gophers found in Washington State.

Predation and Pest Control

Predation: Predation influences the distribution, abundance, and diversity of species in ecological communities. Generally, predation leads to changes in both the population size of the predator and that of the prey. In unfavorable environments, prey species are stressed or living at low population densities such that predation is likely to have negative effects on all prey species, thus lowering species richness. In addition, when a nonnative predator is introduced to the ecosystem, negative effects on the prey population may be higher than those from co-evolved native predators. The effect of predation may be magnified when populations are small, and the disproportionate effect of predation on declining populations has been shown to drive rare species even further towards extinction (Woodworth 1999, pp. 74, 75).

Predation has an impact on populations of the four Thurston/Pierce subspecies of Mazama pocket gopher. Urbanization, particularly in the south Puget Sound region, has resulted in not only habitat loss, but also increased exposure to feral and domestic cats and dogs. Domestic cats are known to have serious impacts on small mammals and birds and have been implicated in the decline of several endangered and threatened mammals, including marsh rabbits (*Sylvilagus palustris*) in Florida and the salt-marsh harvest mouse (*Reithrodontomys raviventris*) in California (Ogan and Jurek 1997, p. 89).

Domestic cats and dogs have been specifically identified as common predators of pocket gophers (Case and Jasch 1994, p. B-21; Henderson 1981, p. 233; Wight 1918, p. 21) and at least two pocket gopher locations were found as a result of house cats bringing home pocket gopher carcasses (WDFW 2001). Informal interviews with area biologists document multiple incidents of domestic pet predation on pocket gophers (Chan, in litt. 2013; Clouse, in litt. 2012 Skriletz 2013 in litt., Wood 2013 in litt.). There is also one recorded instance of a WDFW biologist being presented with a dead Mazama pocket gopher by a dog during an east Olympia, Washington, site visit in 2006 (Burke Museum 2012 McAllister 2013 in litt.). Some local populations of the pocket gopher occur in areas where people recreate with their dogs, bringing

these potential predators into environments that may otherwise be relatively free of them, consequently increasing the risks to individual pocket gophers and populations that may be small and isolated

The four Thurston/Pierce subspecies of Mazama pocket gopher occur in rapidly developing areas. Local populations that survive commercial and residential development (adjacent to and within habitat) are potentially vulnerable to extirpation by domestic and feral cats and dogs (Case and Jasch 1994, p. B-21; Henderson 1981, p. 233).

As stated previously, predation is a natural part of the pocket gopher's life history; however, the effect of predation may be magnified when populations are small and habitat is fragmented. The disproportionate effect of additional predation on declining populations has been shown to drive rare species even further towards extinction (Woodworth 1999, pp. 74, 75). Predation, particularly from nonnative species, will likely continue to be a threat to the four Thurston/Pierce subspecies of the Mazama pocket gopher now and in the future. This is particularly likely where development abuts gopher habitat, resulting in increased numbers of cats and dogs in the vicinity, and in areas where people recreate with their dogs – particularly if dogs are off-leash and not prevented from harassing wildlife. In such areas, where local populations of pocket gophers are already small, this additional predation pressure (above natural levels of predation) is expected to further negatively impact population numbers.

Pest Control: Pocket gophers are often considered a pest because they sometimes damage crops and seedling trees, and their mounds can create a nuisance. Several site locations were found as a result of trapping conducted on Christmas tree farms, a nursery, and in a livestock pasture (WDFW 2001). The type locality for the Cathlamet pocket gopher is on a commercial tree farm. Pocket gophers from Thurston County were used in a rodenticide experiment as recently as 1995 (Witmer et al. 1996a, p. 97).

In Washington State it is currently illegal to trap or poison Mazama pocket gophers, or to trap or poison moles where they overlap with Mazama pocket gopher populations, but not all property owners are cognizant of these laws, nor are most citizens capable of differentiating between moles, pocket gophers, or the signs of their habitation (e.g., soil disturbance). In light of this, it is reasonable to believe that mole trapping or poisoning still has the potential to adversely affect pocket gopher populations. Local populations that survive commercial and residential development (adjacent to and within habitat) may be subsequently extirpated by trapping or poisoning. Lethal control by trapping or poisoning is most likely to be a threat to the four Thurston/Pierce subspecies where their ranges overlap residential properties.

Status of Critical Habitat

On April 9, 2014, the Service published a final rule in the Federal Register listing four subspecies of the Mazama pocket gopher as threatened throughout their ranges in the State of Washington (79 FR 19760; April 9, 2014). The Service also published a final rule designating critical habitat for three of the four subspecies (79 FR 19712; April 9, 2014). In conjunction

with the listing and designation, the Service evaluated current habitat conditions across the range of the four subspecies in Pierce and Thurston Counties, Washington, and the need for a critical habitat designation that would ensure long term recovery and conservation of the subspecies.

On April 9, 2014, the Service designated critical habitat for three subspecies of the Mazama pocket gopher (the Olympia pocket gopher, *Thomomys mazama pugetensis*; the Tenino pocket gopher, *T. m. tumuli*; and the Yelm pocket gopher, *T. m. yelmensis*). In total, approximately 1,607 acres (650 ha) in Thurston County, Washington, fall within the boundaries of the final critical habitat designation for the Olympia, Tenino, and Yelm pocket gophers (79 FR 19712; April 9, 2014). All critical habitat proposed for the Roy Prairie pocket gopher (*T. m. glacialis*), in Pierce County, Washington, is exempted under section 4(a)(3)(B)(i) of the Act.

Physical and Biological Features

In determining which areas to designate as critical habitat, we identify the physical or biological features that are essential to the conservation of the species and which may require special management considerations or protection. These include, but are not limited to:

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, or rearing and development of offspring; and,

5. Habitats that are protected from disturbance or are representative of the historical, geographical, and ecological distributions of a species.

We derive the specific physical or biological features required for each subspecies from studies of their habitat, ecology, and life history.

Pocket gophers have low vagility, meaning they have a limited dispersal range (Williams and Baker 1976, p. 303). *Thomomys mazama* pocket gophers are smaller in size than other sympatric (occurring within the same geographic area; overlapping in distribution) or parapatric (immediately adjacent to each other but not significantly overlapping in distribution) *Thomomys* species (Verts and Carraway 2000, p. 1). Both dispersal distances and home range size are therefore likely to be smaller than for other *Thomomys* species.

Potential barriers to dispersal include, but are not limited to, forest edges, roads (paved and unpaved), abrupt elevation changes, Scot's broom (*Cytisus scoparius*) thickets (Olson 2012, p. 3), highly cultivated lawns, inhospitable soil types (Olson 2008, p. 4) or substrates, development and buildings, slopes greater than 35 percent, and open water. Barriers may be permeable, meaning that they may impede movement from place to place without completely blocking it, or they may be impermeable, meaning they cannot be crossed. Permeable barriers, as well as

lower-quality dispersal habitats, may present an intensified risk of mortality to animals that use them (e.g., open areas where predation risk is increased during passage or a paved area where vehicular mortality is high).

The home range of a pocket gopher is composed of suitable breeding and foraging habitat. Home range size varies based on factors such as soil type, climate, and density and type of vegetative cover (Case and Jasch 1994, p. B-21; Cox and Hunt 1992, p. 133; Hafner et al. 1998, p. 279). Little research has been conducted regarding home range size for individual Mazama pocket gophers. Witmer et al. (1996b, p. 96) reported an average home range size of about 1,076 square feet (100 square meters) at one location in Thurston County, Washington. Pocket gopher density varies greatly due to local climate, soil suitability, and vegetation types (Case and Jasch 1994, p. B-21; Howard and Childs Jr. 1959, pp. 329-336), and densities are likely to be higher when habitat quality is better. Therefore, this one report on the Mazama pocket gopher (Witmer et al. 1996b) is unlikely to represent the average density across all soil types, vegetation types, and other unique site characteristics across the ranges of the four Thurston/Pierce subspecies of the Mazama pocket gopher.

Work done by Converse et al. (2010, pp. 14, 15) estimated that a local population of pocket gophers could persist for at least 50 years if it occurred on a habitat patch that was equal to or greater than 50 acres (20 ha) in size. We acknowledge the uncertainty with this estimate, but there are currently no studies regarding minimum patch size available for the pocket gopher, nor are there any obvious means by which a better answer can be obtained. Thus, the best available scientific data in this case is the opinion of an informed expert panel. Based on this information, we identify patches of breeding and foraging habitat that are equal to or greater than 50 acres (20 ha) in size, or within dispersal distance of each other, as well as corridors of suitable dispersal habitat, as physical or biological features essential to the conservation of the four Thurston/Pierce subspecies of the Mazama pocket gopher.

Of the glacial outwash prairie soils or prairie-like soils present in western Washington, the four Thurston/Pierce subspecies of Mazama pocket gopher are most often found in deep, well-drained, friable soils capable of supporting the forbs, bulbs, and grasses that are the preferred forage for pocket gophers (Stinson 2005, pp. 22, 23). Areas supporting these forage plants tend to be largely free of shrubs and trees.

Although some soils used by pocket gophers are relatively sandy, gravelly, or silty, those most frequently associated with the four Thurston/Pierce subspecies of Mazama pocket gopher are loamy and deep, have slopes generally less than 15 percent, and have good drainage or permeability. Soil series or soil series complexes where individuals of the four Thurston/Pierce subspecies of the Mazama pocket gopher may be found include, but are not limited to Alderwood, Cagey, Everett, Everett-Spanaway complex, Everett-Spanaway-Spana complex, Godfrey, Indianola, Kapowsin, McKenna, Nisqually, Norma, Spana, Spana-Spanaway-Nisqually complex, Spanaway, Spanaway-Nisqually complex, and Yelm.

Predation, specifically feral and domestic cat and dog predation, is a threat to the four Thurston/Pierce subspecies of the Mazama pocket gopher. Urbanization exacerbates this threat with the addition of feral and domestic cats and dogs into the matrix of pocket gopher habitat.

Many pets are not controlled by their owners in the semi-urban and rural environments. Where local populations of native wild animals are small or declining, predation can drive populations farther toward extinction (Woodworth 1999, pp. 74, 75). Due to their solitary and territorial nature, many sites occupied by pocket gophers may contain a small number of individuals, and occur in a matrix of residential and agricultural development with feral and domestic pets in the vicinity. Some occupied areas may also occur in places where people recreate with their dogs, bringing these potential predators into environments that may otherwise be relatively free of them. Pocket gophers need areas free of the threat of predation by feral and domestic cats and dogs.

Primary Constituent Elements

The primary constituent elements (PCEs) of critical habitat are those elements of physical or biological features that provide for a species' life-history processes and which are essential to the conservation of the species. The Service has identified the following PCEs for the four Thurston/Pierce subspecies of Mazama pocket gopher:

1. Soils that support the burrowing habits of the Mazama pocket gopher, and where the four Thurston/Pierce subspecies of the Mazama pocket gopher may be found. These are usually friable, loamy, and deep soils, some with relatively greater content of sand, gravel, or silt, all generally on slopes less than 15 percent. Most are moderately to well-drained, but some are poorly drained. The range of each subspecies of the Mazama pocket gopher overlaps with a subset of potentially suitable soil series or soil series complexes. Here we describe the suitable soil series or soil series complexes that may occur within the range of each subspecies. All of the soil series or soil series complexes listed above could potentially be suitable for any of the four Thurston/Pierce subspecies of the Mazama pocket gopher.

    a. Olympia pocket gopher (*T. m. pugetensis*) soils include the following soil series or soil series complex:
        i. Alderwood;
        ii. Cagey;
        iii. Everett;
        iv. Godfrey;
        v. Indianola;
        vi. Kapowsin;
        vii. McKenna;
        viii. Nisqually;
        ix. Norma;
        x. Spana;
        xi. Spanaway;
        xii. Spanaway-Nisqually complex; and
        xiii. Yelm.

b. Roy Prairie pocket gopher (*T. m. glacialis*) soils include the following soil series or soil series complexes:
    i. Alderwood;
    ii. Everett;
    iii. Everett-Spanaway complex;
    iv. Everett-Spanaway-Spana complex;
    v. Nisqually;
    vi. Spana-Spanaway-Nisqually complex; and
    vii. Spanaway.

c. Tenino pocket gopher (*T. m. tumuli*) soils include the following soil series or soil series complex:
    i. Alderwood;
    ii. Cagey;
    iii. Everett;
    iv. Indianola;
    v. Kapowsin;
    vi. Nisqually;
    vii. Norma;
    viii. Spanaway;
    ix. Spanaway-Nisqually complex; and
    x. Yelm.

d. Yelm pocket gopher (*T. m. yelmensis*) soils include the following soil series or soil series complex:
    i. Alderwood;
    ii. Cagey;
    iii. Everett;
    iv. Godfrey;
    v. Indianola;
    vi. Kapowsin;
    vii. McKenna;
    viii. Nisqually;
    ix. Norma;
    x. Spanaway;
    xi. Spanaway-Nisqually complex; and
    xii. Yelm.

2. Areas equal to or larger than 50 acres (20 ha) in size that provide for breeding, foraging, and dispersal activities, found in the soil series or soil series complexes listed in (1), above, that have:

    a. Less than 10 percent woody vegetation cover;

b. Vegetative cover suitable for foraging by pocket gophers. The pocket gophers' diet includes a wide variety of plant material, including leafy vegetation, succulent roots, shoots, tubers, and grasses. Forbs and grasses that pocket gophers are known to eat include, but are not limited to: *Achillea millefolium* (common yarrow), *Agoseris* spp. (agoseris), *Cirsium* spp. (thistle), *Bromus* spp. (brome), *Camassia* spp. (camas), *Collomia linearis* (tiny trumpet), *Epilobium* spp. (several willowherb spp.), *Eriophyllum lanatum* (woolly sunflower), *Gayophytum diffusum* (groundsmoke), *Hypochaeris radicata* (hairy cat's ear), *Lathyrus* spp. (peavine), *Lupinus* spp. (lupine), *Microsteris gracilis* (slender phlox), *Penstemon* spp. (penstemon), *Perideridia gairdneri* (Gairdner's yampah), *Phacelia heterophylla* (varileaf phacelia), *Polygonum douglasii* (knotweed), *Potentilla* spp. (cinquefoil), *Pteridium aquilinum* (bracken fern), *Taraxacum officinale* (common dandelion), *Trifolium* spp. (clover), and *Viola* spp. (violet); and

c. Few, if any, barriers to dispersal within the unit or subunit. Barriers to dispersal may include, but are not limited to, forest edges, roads (paved and unpaved), abrupt elevation changes, Scot's broom thickets (Olson 2012, p. 3), highly cultivated lawns, inhospitable soil types (Olson 2008, p. 4) or substrates, development and buildings, slopes greater than 35 percent, and open water.

Critical Habitat Units and Subunits

For each of the Thurston/Pierce subspecies of the Mazama pocket gopher we proposed critical habitat only in areas within the geographical area we consider likely occupied at the time of listing. All units and subunits that were proposed as critical habitat for the Olympia, Tenino, and Yelm pocket gopher were currently occupied as determined by recent surveys, within 5 years prior to the publication of the proposed rule (Krippner 2011, pp. 25–29, JBLM 2012, WDFW 2012), and all provide one or more of the physical or biological features that may require special management considerations or protection. As the result of exclusions under section 4(b)(2) of the Act, the areas that best met our criterion for documented occupancy in two of the proposed subunits (proposed Subunit 1–D and 1–H) are no longer included in this final designation; therefore the occupancy of the remaining critical habitat is more uncertain. Although we conclude the areas in question are likely occupied, to be conservative we have additionally evaluated these remaining areas as if they are not occupied at the time of listing, and determined that they are nonetheless essential to the conservation of the species. Finally, although critical habitat proposed for the Roy Prairie pocket gopher also met these fundamental criteria for occupancy, critical habitat proposed for the Roy Prairie pocket gopher has been exempted from this final designation under section 4(a)(3)(B)(i) of the Act.

In accordance with section 4(a)(3)(B)(i) of the Act, we have determined that the lands subject to the JBLM INRMP, and the conservation efforts identified in the ESMP under the INRMP, will provide a conservation benefit to the Mazama pocket gopher (Roy Prairie and Yelm pocket gopher) that occur on DOD lands in Thurston and Pierce Counties. Therefore, lands within this installation are exempt from critical habitat designation under section 4(a)(3)(B)(i) of the Act.

The Service has designated three units totaling 1,607 acres (650 ha) as critical habitat for the Olympia, Tenino, and Yelm subspecies of the Mazama pocket gopher (critical habitat for the Roy Prairie subspecies is exempted). Each unit is presently occupied, or likely to be occupied, by the subspecies for which it is designated, and contains one or more of the PCEs to support essential life-history processes for that subspecies. Some areas designated as final critical habitat may not be considered occupied at the time of listing. In these cases, we have evaluated each of these areas applying the standard under section 3(5)(A)(ii) of the Act, and have determined that all such areas included in this designation are essential to the conservation of the species.

The critical habitat areas we describe constitute our current best assessment of areas that meet the definition of critical habitat for the Olympia, Tenino, and Yelm pocket gophers. The three units we designate as critical habitat are: (1) Olympia Pocket Gopher Critical Habitat - Olympia Airport Unit; (2) Tenino Pocket Gopher Critical Habitat - Rocky Prairie Unit; and (3) Yelm Pocket Gopher Critical Habitat - Tenalquot Prairie Subunit and Rock Prairie Subunit. The approximate area and landownership for each critical habitat unit and subunit is described in Table 1.

Table 1. Designated Critical Habitat Units and Subunits for the Olympia, Tenino, and Yelm Subspecies of the Mazama Pocket Gopher (79 FR 19712; April 9, 2014).

Critical habitat unit	Location name	Subunit as identified in proposed rule	Federal	State	Private	Other*
			Ac (Ha)	Ac (Ha)	Ac (Ha)	Ac (Ha)
Olympia Pocket Gopher Critical Habitat.	Olympia Airport Unit	1–C	0	0	0	676 (274)
Tenino Pocket Gopher Critical Habitat.	Rocky Prairie Unit	1–D	0	0	399 (162)	0
Yelm Pocket Gopher Critical Habitat.	Tenalquot Prairie Subunit	1–E	0	0	154 (62)	135 (55)
	Rock Prairie Subunit	1–H	0	0	243 (98)	0
Totals			0	0	796 (322)	811 (329)

*Other = Local municipalities and nonprofit conservation organization.
Note: Area sizes may not sum due to rounding.

All units are subject to some or all of the following threats: Development on or adjacent to the unit; incompatible management practices; predation; and habitat degradation or destruction as the result of the inadequacy of existing regulatory mechanisms. The threats of loss of ecological disturbance processes, invasive species and succession, and control as a pest species are threats to the Tenino pocket gopher in the Rocky Prairie Unit and the Yelm pocket gopher in the Tenalquot Prairie and Rock Prairie Subunits.

In all units, the physical or biological features essential to the conservation of each subspecies may require special management considerations or protection to restore, protect, and maintain the essential features found there. Special management considerations or protection may be required to address: Direct or indirect habitat loss due to conversion to other uses; invasion of woody plant species; use of equipment that may compact soils; development; construction and maintenance of roads and utility corridors; habitat modifications; predation by feral or domestic animals; or use of trapping or poisoning techniques by landowners or land managers of the units themselves or adjacent landowners or land managers.

Olympia Pocket Gopher Critical Habitat - Olympia Airport Unit: This unit consists of 676 acres (274 ha) and is made up of land owned by the Port of Olympia, a municipal corporation. The Olympia Airport Unit is located south of the cities of Olympia and Tumwater, in Thurston County, Washington. This unit is occupied by the Olympia pocket gopher and contains the physical or biological features essential to the conservation of the subspecies due to the underlying soil series (Cagey, Everett, Indianola, and Nisqually), suitable forb and grass vegetation present onsite, and its large size. The physical or biological features in this subunit are threatened by: Loss of habitat through conversion to incompatible uses, such as development; predation; and the habitat degradation or destruction due to the inadequacy of existing regulatory mechanisms.

Tenino Pocket Gopher Critical Habitat - Rocky Prairie Unit: This unit consists of 399 acres (162 ha) and is owned by one commercial land owner and Burlington Northern Santa Fe Railroad. The Rocky Prairie Unit is located north of the city of Tenino, Thurston County, Washington; is likely occupied by the Tenino pocket gopher; and contains the physical or biological features essential to the conservation of the species due to the underlying soil series or soil series complex (Everett, Nisqually, Spanaway, and Spanaway-Nisqually complex), suitable forb and grass vegetation present onsite, and its large size. The physical or biological features in this subunit are threatened by: Loss of habitat through conversion to incompatible uses, such as pit mining; development on adjacent or surrounding areas; the loss of natural disturbance processes and invasion by woody plants; predation; small or isolated populations as a result of habitat fragmentation; habitat degradation or destruction as the result of the inadequacy of existing regulatory mechanisms; and control as a pest species. We additionally evaluated this area as if it were presently unoccupied by the Tenino pocket gopher, and have determined that it is nonetheless essential to the conservation of the species.

Yelm Pocket Gopher Critical Habitat - Tenalquot Prairie Subunit: This subunit consists of 289 acres (117 ha) and contains lands owned by one commercial landowner and The Nature Conservancy. This subunit is located northwest of the city of Rainier, Thurston County, Washington. As proposed, subunit 1–E (Tenalquot Prairie Subunit) included 1,505 acres (609 ha) of JBLM land, which has been exempted based on a completed ESMP. This 4(a)(3)(B)(i) exemption, based on this species specific management plan, has been determined to provide a conservation benefit to the Yelm pocket gopher. The Tenalquot Prairie Subunit is occupied by the Yelm pocket gopher and contains the physical or biological features essential to the conservation of the species due to the underlying soil series (Spanaway), suitable forb and grass vegetation present onsite, and its large size. The physical or biological features in this subunit are threatened by: Loss of habitat through conversion to incompatible uses, such as development; the loss of natural disturbance processes and invasion by woody plants; inadequacy of existing regulatory mechanisms; and control as a pest species.

Yelm Pocket Gopher Critical Habitat - Rock Prairie Subunit: This subunit consists of 243 acres (98 ha) and contains lands owned by one private residential and commercial landowner. As proposed (subunit 1–H), this subunit included 378 acres (153 ha) of private ranch land, which has been excluded under section 4(b)(2) of the Act. The Rock Prairie Subunit is likely occupied by the Yelm pocket gopher and contains the physical or biological features essential to the conservation of the species due to the underlying soil series or soil series complex (Spanaway and Spanaway-Nisqually complex), suitable forb and grass vegetation present onsite, and its size. The physical or biological features in this subunit are threatened by: Loss of habitat through conversion to incompatible uses, such as development; the loss of natural disturbance processes and invasion by woody plants; predation; inadequacy of existing regulatory mechanisms; and control as a pest species. We additionally evaluated this area as if it were presently unoccupied by the Yelm pocket gopher, and have determined that it is nonetheless essential to the conservation of the species.

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