U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: Thomomys mazama (ssp. couchi, douglasii, glacialis, louiei, melanops, pugetensis, tacomensis, tumuli, yelmensis)

COMMON NAME: Mazama pocket gopher (Although the common name "western pocket gopher" was once applied to pocket gophers in Washington, "Mazama pocket gopher" is now used to distinguish this complex of subspecies from the "western pocket gopher" subspecies in Oregon and California), including:

Shelton pocket gopher (T. m. couchi)
Brush Prairie pocket gopher (T. m. douglasii)
Roy Prairie pocket gopher (T. m. glacialis)[1]
Cathlamet (or Louie's) pocket gopher (T. m. louiei)[2]
Olympic pocket gopher (T. m. melanops)
Olympia pocket gopher (T. m. pugetensis)[1]
Tacoma pocket gopher (T. m. tacomensis)[1, 2]
Tenino pocket gopher (T. m. tumuli)[1]
Yelm pocket gopher (T. m. yelmensis)[1]

[1] Five subspecies may eventually be renamed as one or two subspecies.
[2] Two subspecies may be extinct. See discussion of taxonomy below.

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: April 2010

STATUS/ACTION:
___ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status
___ New candidate
_X_ Continuing candidate
__ Non-petitioned
_X Petitioned - Date petition received: __December 11, 2002
__ 90-day positive - FR date:
__ 12-month warranted but precluded - FR date:
__ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? yes
b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? _yes
c. If the answer to a. and b. is "yes", provide an explanation of why the action is

precluded.

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for the species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The "Progress on Revising the Lists" section of the current CNOR (*http://endangered.fws.gov/*) provides information on listing actions taken during the last 12 months.

__N__ : Listing Priority Change

Former LP:
New LP: ____

Date when the species first became a Candidate (as currently defined): October 30, 2001

_N/A__ Candidate removal: Former LP: ___

___ A –Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

___U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

___ F – Range is no longer a U.S. territory.

___ I – Insufficient information exists on biological vulnerability and threats to support listing.

___ M – Taxon mistakenly included in past notice of review.

___ N – Taxon does not meet the Act's definition of "species."

___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY:

Rodent; Geomyidae (pocket gophers)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE:

Washington

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE:

Washington (Clallam, Clark, Mason, Wahkiakum, Lewis, Thurston, and Pierce Counties)

LAND OWNERSHIP:

On Federal land, one subpopulation occurs in Olympic National Park (made up of several small populations) and several populations (in about 8 sites) occur on Fort Lewis Military Reservation (Fort Lewis). On State lands, one population occurs at the Scatter Creek Wildlife Area and one population occurs at Meridian Tree Farm. Gophers may still reside at Rocky Prairie Natural Area Preserve, but Washington Department of Fish and Wildlife researchers have not seen consistent occupancy of the area by gophers in recent years (Gail Olson, Washington Department of Fish and Wildlife (WDFW), in litt., 2010). Gophers have been translocated onto the West Rocky Prairie Wildlife Area and at Wolf Haven as part of a research study, but they occur there only in small numbers. On county land, one population occurs at the Port of Shelton, and one population occurs at the Port of Olympia. On city land, one population occurs on land included in the future expansion for the Regional Athletic Complex in Lacey. Approximately 50 percent of the known populations are on public (City, State, or Federal) lands, and 50 percent on private land (Stinson 2005, p. 43). Increased survey effort since 2007 has resulted in significantly more sites being documented on private property, such that private property occupancy may currently be exceeding public property occupancy. Populations on private lands occur in Thurston, Pierce, and Mason Counties. All locations and exact numbers of populations and sizes of populations are not known, although the largest known populations occur at Fort Lewis, Olympia Airport, Shelton Airport, and perhaps in the Olympic National Park. Recent surveys have focused on determining current distribution.

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BIOLOGICAL INFORMATION:

Most of the following biological information is condensed from Steinberg (1995, 1996, 1999).

Species Description

Adult Mazama pocket gophers (Thomomys mazama) are reddish brown to black above, and the underparts are lead-colored with buff-colored tips. Lips, nose, and patches behind the ears are black; the wrists are white. Adults range from 175 to 273 millimeters (mm) (7 to 11 inches (in)) in total length, with tails that range from 45 to 85 mm (2 to 3 in) (Hall 1981, p. 465).

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. Short, nearly hairless tails are highly sensitive and probably assist in navigation in tunnels. Pocket gophers tunnel and burrow with

teeth and claws. Their "pockets" are external, fur-lined cheeks on either side of the mouth. These pockets are used to transport nesting material and carry plant cuttings to storage compartments.

Pocket gophers' diet includes a wide variety of plant material, including leafy vegetation, succulent roots, shoots, and tubers. Although as consumers of crop plants they are considered agricultural pests, in natural settings they play an ecological role by aerating soils and stimulating plant growth. In prairie ecosystems, pocket gopher activity is important in maintaining species richness and diversity.

Pocket gophers rarely surface completely from their burrows, although they do disperse above ground. They are highly asocial and intolerant of other gophers. Each maintains its own burrow system, and occupancy by multiple individuals occurs only for brief periods during mating seasons and prior to weaning young. The mating system is probably polygynous and most likely based on female choice. The adult sex ratio has been reported as biased toward females in pocket gophers, often as much as 4:1, though Witmer et al. (1996, p. 95) reported a sex ratio of close to 1:1 in T. mazama. Sex ratio may vary with population density.

Population density and spatial distribution is generally determined by the distribution of appropriate habitat, patch sizes of suitable soil type, and the number of territories that can be supported by the food resources. One site having a deep soil layer that was much less rocky had a pocket gopher population density five times that of another site having rocky soil (Steinberg 1996, p. 26). A study of the relationship of soil rockiness and the distribution of pocket gophers revealed the proportion of the weight of soil samples due to medium (greater than 12.7 mm (0.5 in) but less than 50.8 mm (2.0 in)) rocks correctly predicted presence or absence of pocket gophers in eight of nine prairies sampled (Steinberg 1996, p. 32). In observations of the distribution of pocket gophers on Fort Lewis Military Reservation (Fort Lewis), pocket gophers did not occur in areas with high vegetation cover of Scot's broom (Cytisus scoparius), a highly invasive nonnative shrub, or where mole Scapanus spp. populations were particularly dense (Steinberg 1995, p. 26).

Taxonomy

Prior to 1960, the pocket gophers of western Washington were considered to be subspecies of T. talpoides. Based on characteristics of the bacula (penis bone), Johnson and Benson (1960) found the western Washington complex of pocket gophers to be more similar to T. mazama, which occurs in western Oregon and northwestern California. Subsequently, the western Washington populations have been classified as subspecies of T. mazama.

Nine western Washington subspecies of Thomomys mazama (listed on page 1 of this assessment) have been identified (Hall 1981, p. 467). Two of these subspecies, the Cathlamet (T.m. louiei) and Tacoma (T.m. tacomensis) pocket gophers, may be extinct. Genetic analyses indicate that the south Puget Sound pocket gopher subspecies (T.m. glacialis, T.m. pugetensis, T.m. yelmensis, and T.m. tumuli) are not substantially genetically differentiated and may actually represent one subspecies (Steinberg and Heller 1997, p. 45; Welch and Kenagy 2008, p.7). This subspecies may also include the Tacoma pocket gopher (T.m. tacomensis), if it still exists. The

Shelton pocket gopher (T.m. couchi) is in a separate clade from the other south Puget Sound pocket gopher subspecies, and connectivity allowing gene flow between it and the other south Puget Sound subspecies is lacking. More genetic work needs to be done to determine how closely related the various south Puget Sound subspecies are. Subpopulations with different chromosome numbers are potentially unable to successfully breed (i.e., they would produce no fertile offspring).

Based on recent genetic analyses, T.m. melanops may warrant consideration as a separate species (Welch and Kenagy 2006, pp. 5-6). It is significantly genetically distinct from all other subspecies, and has very low genetic diversity compared to other extant subspecies (Welch and Kenagy 2008, p. 7). Due to its low genetic diversity, isolation, and potential for natural habitat alterations in the future (Woodward et al. 1995, p. 224; Zolbrod and Peterson 1999, pp. 1970-71), T.m. melanops is susceptible to small population effects such as genetic drift and founder effects.

The Brush Prairie pocket gopher was only recently discovered to have been erroneously assigned (Hall 1981, p. 458) to another species, T. talpoides douglasii (a northern pocket gopher). Mitochondrial DNA (mtDNA) analysis determined that it may actually be a subspecies of T. mazama (G.J. Kenagy, Ph.D., University of Washington, in litt. 2007). The Brush Prairie pocket gopher is found in Clark County, where it is isolated from other subspecies, and faces the same issues as other Mazama pocket gopher subspecies. Some researchers have said that this population is identical to Oregon populations of T.m. oregonus located across the Columbia River, but there has not been enough work done in regards to this statement to prove or disprove it. Karyotyping, morphological measurements, and mtDNA sequencing are recommended to clarify the genetic relationship between the Brush Prairie pocket gopher and other subspecies (Corey Welch, Ph.D., University of Kansas, pers. comm. 2008).

Habitat

The Mazama 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 subalpine meadows. Steinberg and Heller (1997, p. 46) found that Mazama pocket gophers are even more patchily distributed than are prairies. 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 Fort Lewis). Pocket gopher distribution has probably always been highly patchy. Their prairie habitat has a patchy distribution, and there is an even patchier distribution of soil rockiness within the prairie expanses (Steinberg and Heller 1997, p. 45; WDFW 2009a).

Historical and Current Range/Distribution

Steinberg (1995, p. 26) assessed the distribution of the Mazama pocket gopher and found that many of the historical populations had disappeared or diminished substantially enough in size that their presence was not evident. The Cathlamet pocket gopher is known only from the type locality in Wahkiakum County. The Cathlamet pocket gopher was originally found in a large burn that subsequently regenerated to forest. The forest has recently been clearcut, but pocket gophers have not been found at this site since 1956, despite brief survey efforts in the 1970s,

1980s, and 1990s (Stinson 2005, p. 34). This subspecies may be extinct.

The Olympic pocket gopher is found in the Olympic National Park in Clallam County where it is restricted to subalpine habitat of the higher Olympic Mountains. Although this is probably the most secure of the subspecies in Washington, three populations were extirpated by 1951, and one was extirpated by 1976 (Johnson 1977). Johnson (1977) suggested extirpations of Olympic pocket gopher populations may have been related to fire suppression, avalanches, landslides, or weather cycles. Steinberg (1995, p. 27; 1996, p. 8) and Corey Welch (Ph.D., in litt. 2009) documented Olympic pocket gophers at several sites, and the Burke Museum's records show that pocket gophers have been gathered from multiple locations in the Park (Burke Museum 2009). However, no complete inventory has been done in the Park.

One population of the Shelton pocket gopher was detected at the Shelton airport in Mason County, and mounds were found on penitentiary grounds near Shelton. The airport population was estimated to include 990 pocket gophers. However, this population estimate was based on using apparent gopher mounds to delineate the number of territories, a method that has not been tested (Stinson 2005, pp. 40-41). Another population, estimated to include several hundred pocket gophers, was in a regenerating clearcut colonized by pocket gophers after 1992 (Stinson 2005, p. 41). The latter site may no longer support pocket gophers (Derek Stinson, WDFW, pers. comm. 2004). Other patchy populations may occur nearby on private land (Steinberg 1995, p. 27).

The Roy Prairie pocket gopher is found in the vicinity of the Roy Prairie and on Fort Lewis in Pierce County. They were described as plentiful in 1983 but were reduced to a small population by 1993 (Stinson 2005, p. 38). The Tacoma pocket gopher was known to occur in Pierce County. The last recorded specimens of the Tacoma pocket gopher were killed by cats in Wapato Hills in 1974; none were detected during a survey conducted in 1998 (Stinson 2005, p. 120).

The Olympia, Tenino, and Yelm pocket gophers are known from Thurston County. Several populations of the Yelm pocket gopher have been found south of the city of Olympia. Gophers have been found on the Rocky Prairie Natural Area Preserve, near Tenino (Stinson 2005, pp. 19, 33, 38). Gophers in the area were originally described as Tenino pocket gophers (T.m. tumuli). Surveys conducted in 1996 found no gophers near the towns of Vail or Rochester, but populations could still occur on private land (Steinberg 1995, p. 28).

Steinberg (1996, p. 9) surveyed all historical and many of the currently known sites and all sites listed by the Washington Department of Natural Resources (WDNR) as having Carstairs, Nisqually, or Spanaway gravelly or sandy loam soil, and which WDNR determined to have vegetation that was intact prairie or restorable to prairie. Two previously unidentified populations were found at Scatter Creek Wildlife Area and at Rocky Prairie, which is within the range of the Tenino pocket gopher. The Rocky Prairie site was degraded, but a small patch of pristine mounded prairie dominated by native plants supported a small population of pocket gophers. A number of sites surveyed had rocky and compacted soils and no evidence of pocket gophers were found (Steinberg 1996, pp. 23-24). In 2005, Kelly McAllister (WDFW, in litt. 2005) found gophers to be present, but at unaccountably low numbers. However in 2010, Gail

Olson (in litt. 2010) stated that in recent memory they have not seen consistent occupancy of the area by gophers. WDFW maintains information on gopher locations based on survey and research information. This information is updated frequently, and can be requested online from WDFW's at http://www.wdfw.wa.gov/hab/release.htm

Pocket gophers have limited dispersal capabilities. A study of other Thomomys gophers found that most will only disperse within 40 meters (m) of their natal territory (Daly and Patton 1990, p. 1291). Some have been found to move greater than 300 m (Daly and Patton, p. 1286), which is still not very far when considering the distances and barriers between some of the subpopulations. The loss and degradation of additional patches of appropriate habitat could result in further isolation of populations, increasing their vulnerability to extinction.

Population Estimates/Status

There are few data on historical or current population sizes of Mazama pocket gopher populations in Washington. Several populations and two subspecies are believed to be extinct. Knowledge of the past status of the Mazama pocket gopher is limited to distributional information. Recent surveys have focused on determining current distribution. Total population numbers for all subspecies may be approximately 5,000 to 10,000 individuals in multiple locations (Stinson 2005, p. 42; Derek Stinson, in litt. 2007; Derek Stinson in litt. 2010a; G.J. Kenagy, in litt. 2007; McAllister and Schmidt 2005). Increased survey effort since 2007 has resulted in numerous additional sites having been found on private lands, especially in Thurston, Pierce, and Mason Counties. Some of these are satellite locations to larger populations such as that on the Olympia Airport, and may be population sinks. Others are separate locations, seemingly unassociated (physically) with known populations (Michelle Tirhi, WDFW, pers. comm. 2008). The largest populations occur on Fort Lewis, at the Olympia and Shelton airports, and possibly in the Olympic National Park.

A translocated population of Mazama pocket gophers occurs on Wolf Haven International's land near Tenino, Washington. Between 2005 and 2008, over 200 gophers were trapped from two sites and released into the 38-acre mounded prairie site. The property did not previously contain Mazama pocket gophers, but the source populations were very nearby. Most of the gophers were Passive Integrated Transponder (PIT)-tagged, but subsequent trapping found mainly non-PIT-tagged animals. Therefore, the fates of the tagged individuals are unknown, aside from the fact that some of them bore young. Gophers continue to occupy the site in low numbers (Mary Linders, WDFW, in litt. 2009).

THREATS:

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

The prairies of south Puget Sound are one of the rarest habitats in the United States (Dunn and Ewing 1997, p. v). Drastic changes have occurred in the southern Puget lowland landscape over the last 150 years, including a 90 to 95 percent reduction in prairie habitat. The acreage occupied by south Puget Sound prairies that resemble original grasslands may only be ten percent of the distribution of prairie soil types, when viewed in terms of native species composition and

dominance (Crawford and Hall 1997, p.14). The basic ecological processes that maintain prairies have disappeared from, or have been altered on, the few protected prairie sites. Fire regimes have been altered, and prairie habitat has been invaded by nonnative plant species (Dunn and Ewing 1997, p. v). Fire suppression allows Douglas-fir (Pseudotsuga menziesii) to encroach on and overwhelm prairie habitat (Stinson 2005, p. 7).

One of the most common soils that support the prairies where Mazama pocket gophers reside are Nisqually loamy soils (Derek Stinson, in litt. 2010). The vast majority of these soil types occur in developed areas of Thurston County, and/or in the Urban Growth Areas for the cities of Olympia, Tumwater, and Lacey (WDFW 2009a; Thurston County 2004).

Several fairly large populations of the Yelm pocket gopher have been identified on Fort Lewis. Their absence from some sites may be related to compaction of the soil due to years of mechanized training which impedes burrowing activities of pocket gophers (Steinberg 1995, p. 36). The extremely patchy distribution of pocket gophers where they occur on Fort Lewis is related to local habitat conditions. In observations of the distribution of pocket gophers on Fort Lewis, pocket gophers did not occur in areas with thick Scot's broom or where mole (Scapanus spp.) populations were particularly dense (Steinberg 1995, p. 26).

The glacial outwash gravels underlying the south Puget Sound prairies are deep and valuable for use in construction and road building. One of the historic Tacoma pocket gopher sites became a large gravel pit. Two gravel pits are now operating on part of the remaining Roy Prairie pocket gopher habitat (Stinson 2005, p. 42), and another is in operation near Tenino (Derek Stinson, in litt. 2010b), in the vicinity of Tenino pocket gopher sites.

Residential development and subsequent predation by dogs and cats, as well as trapping and poisoning by homeowners may have been responsible for the extinction of the Tacoma pocket gopher. Many areas once occupied by the Yelm pocket gopher have been similarly lost to development (Stinson 2005, p. 26). One Yelm pocket gopher site was cleared in 2006 and has been partially developed in Olympia (at Rich Road and Yelm Highway). An additional portion of the site had already been built to homes previously (in 2004 and 2005). Although the developer agreed to a set-aside, it is unknown if any gophers will remain on the site due to the small size of the set-aside, and the extensive grading that occurred on the site. Several other private properties in Thurston County, known to have been occupied by pocket gophers prior to development, currently contain similar gopher set-aside areas (Michelle Tirhi, pers. comm. 2008).

The status of T.m. douglasii is unknown, but its location in a matrix of towns means that if it's still extant, it's likely threatened by encroaching development from all sides.

There are two populations of Yelm and Shelton pocket gophers located at and around airports (Port of Olympia and Port of Shelton) that are currently threatened by development. The Port of Olympia is realigning the airport runway, and would like to develop large portions of the existing grassland that likely supports the largest population in Washington (Derek Stinson, in litt. 2007). They continue to work with WDFW on mitigating airport expansion activities that may impact gophers (Michelle Tirhi, in litt. 2010). The Port of Shelton hopes to develop the area now occupied by the Mazama pocket gopher. The Port of Shelton has identified a separate area where

Scot's broom and other woody vegetation would be controlled in order to benefit Mazama pocket gophers, but the quality of the soil has yet to be investigated, and so potential use by Mazama pocket gophers is unknown (Stinson 2005, p. 47).

Only the Olympic pocket gopher, occurring entirely within the Olympic National Park, and the Scatter Creek Wildlife Area population of the Yelm pocket gopher, is currently secure from these sorts of development pressures. The Rocky Prairie Wildlife Area site, to where gophers have been recently translocated, is also secure from development.

In summary, most of the habitat used by current subpopulations of Mazama pocket gopher continues to be threatened by invasion of nonnative plant species and conversion to residential and commercial development.

B. Overutilization for commercial, recreational, scientific, or educational purposes.

Although not currently known to be a factor, one population at Lost Lake Prairie in Mason County may have been extirpated as a result of collecting by Dalquest and Scheffer in 1944 (Stinson 2005, p. 32). The U.S. Department of Agriculture collected Mazama pocket gophers for research purposes as recently as 2001 (Derek Stinson, pers. comm. 2003).

C. Disease or predation.

Disease is not known to be a threat to Mazama pocket gophers. Predation, specifically house cat predation, is a threat to Mazama pocket gophers. Urbanization, particularly in the south Puget Sound area, has resulted in not only habitat loss, but the exposure of this species to domestic and feral house cats. Domestic cats are known to have serious impacts on small mammals and birds and have been implicated in the decline of several threatened and endangered mammals, including marsh rabbits in Florida and the salt-marsh harvest mouse in California (Ogan and Jurek 1997, p. 89). At least two of the Mazama pocket gopher locations were found as a result of house cats bringing home pocket gopher carcasses (WDFW 2001). The last specimens and last known individuals of the Tacoma pocket gopher were carcasses brought home by cats (Stinson 2005).

Many of the gopher populations in Thurston County occur in rapidly developing areas. Subpopulations that survive commercial and residential development (adjacent and within habitat) may be extirpated by domestic cats and dogs and trapping and poisoning by humans.

In summary, predation continues to be a threat to the species, particularly where development abuts gopher habitat.

D. The inadequacy of existing regulatory mechanisms.

Three of the Mazama pocket gopher subspecies (Roy Prairie, Louie's (Cathlamet), and Tacoma) were included as Category 2 species in the Federal Notice of Reviews until 1996 (61 FR 7596), when we discontinued the designation of Category 2 species as candidates. The species was made a candidate again in 2001 (66 FR 54808) as a result of a listing petition.

There is no State Endangered Species Act in Washington. The Mazama pocket gopher is listed as threatened by the Washington Department of Fish and Wildlife (WDFW), but its habitat receives little protection under State law. Under State law, State listed species are protected from direct take, but are not provided protection for their habitat (RCW 77.15.120). Due to its state listed status, gophers are included in most county and many city critical area ordinances, which do protect species' habitats. As such, development applications in suspected gopher areas have spurred surveys and habitat assessments by WDFW and/or contractors in Thurston and Pierce Counties at least. Although there is no consistent survey technique across the entire range of the Mazama pocket gopher (Michelle Tirhi, pers. comm. 2008), most occupied development properties have set aside fenced, signed areas for pocket gopher protection that must be maintained into the future. Fencing often doesn't exclude predators, and the size of the set-asides may or may not be large enough to sustain a population of gophers over time. Also, there is no law enforcement follow-up to ensure that landowners are complying with the habitat maintenance requirements, and so the habitat may become unsuitable over time. A few properties have been considered by the WDFW for an emergency translocation. Destruction of occupied habitats (outside of the set-asides) likely results in death of individuals due to the gopher's underground existence and sedentary nature, which makes them vulnerable in situations where their burrows are crushed.

Mazama pocket gophers are listed as critically imperiled (S1) by the Washington Natural Heritage Program. It is also a species of greatest conservation need under Washington's Comprehensive Wildlife Conservation Strategy (CWCS) (WDFW 2005, p. 70). The CWCS is a non-regulatory statewide approach to conservation and fulfills a requirement for access to two new Federal grant programs. The draft strategy describes basic biology and distribution, general and specific problems facing the species, and general conservation strategies for the species. It also identifies specific conservation actions for the species. WDFW is refining a planning process with the development of Fish and Wildlife Conservation Action Priorities, which will identify and prioritize actions statewide and at the watershed scale (Derek Stinson, in litt. 2010). Because the species is state-listed, however, the WDFW will continue to protect Mazama pocket gophers where they are able, regardless of completion of the Wildlife Conservation Action Priorities.

In summary, there continue to be ongoing threats to the species due to the inadequacy of regulatory mechanisms.

E. Other natural or manmade factors affecting its continued existence.

Most species' populations fluctuate naturally, responding to such factors as weather events, disease, and predation. Johnson (1977) suggested these factors, however, have less impact on a species with a wide and continuous distribution. 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 and cumulative effects and to genetic effects that plague small populations, collectively also 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 certain "bad" traits), and

genetic bottlenecks leading to increasingly lower genetic diversity. The T.m. melanops subpopulation is already known to have low genetic diversity (Welch and Kenagy 2008, p. 7), and most of the remaining subpopulations are small, fragmented, physically isolated from one another, and/or threatened by further loss or fragmentation.

Historically, Mazama pocket gophers probably persisted by continually recolonizing habitat after local extinctions. The loss and fragmentation of habitat patches, resulting in widely separated populations, has likely stopped much of the recolonization that historically occurred (Stinson 2005, p. 46).

Pocket gophers are often considered a pest because they sometimes damage crops and seedling trees, and their mounds can create a nuisance. The type locality for the Cathlamet pocket gopher (now considered likely to be extinct) was on a commercial tree farm. Several site locations on the WDFW wildlife survey database were found as a result of trapping on Christmas tree farms, a nursery, and in a livestock pasture (WDFW 2001). Activities occurring on such lands (e.g., use of heavy equipment, use of pesticides and herbicides, overgrazing, succession to forest) can crush burrows and/or render areas largely unsuitable, thus reducing overall gopher numbers at a site and thus in a subpopulation. Mazama pocket gophers in Washington were used in a rodenticide experiment as recently as 1995 (Witmer et al. 1996, p. 97).

In summary, there are likely to be ongoing threats to the species due to factors such as small population effects (risk of population loss due to catastrophic or stochastic events), poisoning, trapping, trampling, and crushing of burrows by heavy equipment.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED:

Fort Lewis has identified several grassland management goals for its ownership, and is currently working with the U. S. Fish and Wildlife Service (Service) on a draft Candidate Conservation Agreement in partnership with The Nature Conservancy (TNC). These include no net reduction in the quantity or quality of moderate- and high-quality prairie; restoration of moderate to high quality native prairie; and, the restoration and maintenance of populations of prairie-dependent and prairie-associated species, including Mazama pocket gophers.

TNC has been working with Fort Lewis on prairie habitat enhancement, and with help from the Service purchased 125 acres of prairie habitat adjacent to Fort Lewis in 2005 (http://www.nature.org/wherewework/northamerica/states/washington/press/press2044.html). Since its acquisition, TNC has been working to restore the grassland, Tenalquot Prairie Preserve (formerly known as Morgan Prairie Preserve), which is currently occupied by Mazama pocket gophers.

TNC is involved in habitat restoration with Thurston County on Black River-Mima Prairie-Glacial Heritage Preserve and is working with Wolf Haven to restore the 40-acre prairie parcel on their land to high quality native grassland. WDFW has initiated restoration work on Scatter Creek and West Rocky Prairie Wildlife Areas, initially focusing on invasive vegetation control, including Scot's broom and tall oatgrass. WDNR has repeatedly removed Douglas-fir and planted native prairie grasses and forbs on the Rocky Prairie Natural Area Preserve with a grant

from the Service. They also conducted prescribed burning on Mima Mounds Natural Area Preserve. Restoration and maintenance for native prairie, where it exists, means it will be protected from loss or destruction, although other risks (e.g., predation) may still exist. Restoration efforts are in place on prairies throughout western Washington, not all of which are known to be occupied by Mazama pocket gophers. Fort Lewis, Scatter Creek Wildlife Area, Tenalquot Prairie Preserve, Wolf Haven International, and Rocky Prairie Natural Area Preserve are all known to have Mazama pocket gophers. Gophers should benefit from the improved vegetation quality on these sites. It is unknown if the Black River-Mima Prairie-Glacial Heritage Preserve or Mima Mounds Natural Area Preserve contain Mazama pocket gophers.

WDFW recently added land to the Scatter Creek Wildlife Area. WDFW has recently acquired 800 acres of land in the area informally known as "West Rocky Prairie," 300 acres of which was the largest and best remaining south Puget Sound prairie in private hands. WDFW has acquired 130 acres of prairie habitat in Thurston County for the management of prairie-dependent species. This property is being managed by TNC. These purchases will protect Mazama pocket gopher populations from future development.

Experimental translocation of gophers to land owned by Wolf Haven International took place between 2005 and 2009. This was a joint effort between WDFW, TNC, and Wolf Haven. Over 200 gophers have been released. As of March 2010, at least some of the gophers or their young have persisted, based on mounding activity at the site. WDFW conducts presence surveys there on a quarterly basis (Mary Linders, WDFW, in litt. 2010). The long-term success of this endeavor is unknown. This site did not previously contain gophers.

In 2008, WDFW completed a study to develop an occupancy model for the Mazama pocket gopher, using habitat characteristics to estimate the probability of occupancy of a site. They also investigated the relationship between pocket gopher mounds and gopher numbers to better assess the use of mound surveys to index gopher populations. Both occupied and unoccupied sites were surveyed in the spring and fall at two locations: at Olympia Airport and at Wolf Haven International. The month the survey was conducted was the most significant factor in detectability. Those surveys conducted in the fall had a higher probability of detectability than those conducted in the spring. Other important factors affecting probability of occupancy were broom cover (negatively affecting) and percent of soil (positively affecting). Such information will be useful when surveying other locations and when assessing the suitability of sites for recolonization or translocation. The Army Compatible Use Buffer program and Department of Defense Legacy Program funded this research.

In 2010 and 2011, WDFW will continue research to evaluate the feasibility of using translocation as a tool for reducing the likelihood of extinction of Mazama pocket gopher in south Puget Sound. This will be accomplished by reintroducing gophers to protected sites and monitoring their survival and site fidelity. A previous attempt to translocate Mazama pocket gophers revealed that a large sample size and intensive monitoring is required to document survival due to low natural survival rates and the challenges of monitoring a fossorial rodent. Research done in 2009 reinforced this fact. Initial translocations resulted in death of all animals within 3 days. But improved release techniques, including additional supplemental feeding (i.e., both at release and beyond) and better protective enclosures, resulted in much-improved survival rates later in

the year (Olson 2009, p. 4). The primary objective of this project is to conduct a well-monitored translocation study to establish survival rates at 30 days post-release and to breeding. This research is being funded by the Service.

In 2010, WDFW will also research the degree of connectivity between populations of Mazama pocket gophers in Thurston and Pierce Counties. These populations represent a probable single subspecies which have undergone increased fragmentation in recent years. Results from this study could be used to evaluate the long-term viability of the current population as well as predict the effects of both additional habitat fragmentation and enhancements. The objectives of the dispersal study are to determine patterns of dispersal for Mazama pocket gophers, identify dispersal barriers and corridors, and determine fates of dispersers. This research is being funded by the Service.

SUMMARY OF THREATS (including reasons for addition or removal from candidacy, if appropriate):

The following information is based on information in our files as of May 2010 and from the original petition received December 11, 2002. Seven of the nine subspecies of pocket gopher are associated with glacial outwash prairies in western Washington (T. m. melanops is found on alpine meadows in Olympic National Park, and T. m. douglasii is found in extreme southwest Washington). Of these seven subspecies, five are likely still extant (couchi, glacialis, pugetensis, tumuli, and yelmensis). Few of these glacial outwash prairies remain in Washington today. Historically, such prairies were patchily distributed, but the area they occupied approximately 170,000 acres (Stinson 2005, p. 64). Now, residential and commercial development, and ingrowth of woody and/or nonnative vegetation have further reduced their numbers. In addition, development in or adjacent to these prairies has likely increased predation on Mazama pocket gophers by dogs and cats.

We find that the nine subspecies of Mazama pocket gopher are each warranted for listing throughout all of their respective ranges, and, therefore, find that it is unnecessary to analyze whether the subspecies are threatened or endangered in a significant portion of their ranges.

RECOMMENDED CONSERVATION MEASURES:

The Service completed a Spotlight Species Action Plan for the Mazama pocket gopher in 2009. This plan was developed to identify conservation goals and tasks that are needed to improve this species' conservation over the next several years. This plan can be found on the Service's website at: http://ecos.fws.gov/docs/action_plans/doc3085.pdf

- Preserve existing Mazama pocket gopher habitat, both occupied and unoccupied. This may include providing management recommendations and/or incentives to landowners, development of a long-term landscape plan, and/or development of a mitigation bank.
- Continue to survey habitat to document new populations of pocket gophers.
- Survey T.m. melanops populations to determine population range and size.
- Restore historic and existing Mazama pocket gopher habitat where it has been invaded by woody vegetation, especially in areas where Mazama pocket gophers still occur.

- Identify those habitat characteristics that are important to manage and/or conserve for long-term recovery of the species (e.g., key food plants, favored vegetation structure, level and type of disturbance that is beneficial to gophers).
- Protect Mazama pocket gophers from trapping, poisoning, and predation, by developing a Mazama pocket gopher fact sheet with information about gophers, non-lethal means of protecting plants, and including information on protecting gophers from domestic pets.
- Target outreach and education to private landowners with property(ies) that might provide connectivity between occupied and potential sites. Highlight the status of the gopher as well as the possibilities for co-existence.
- Continue studies to determine subspecific taxonomy and genetic relationships between subpopulations.
- Conduct demographic studies to determine population vital rates, how populations are structured (characteristics of dispersal that affect population structure and viability; effective population size; minimum viable population size relative to habitat patch size and quality).
- Develop a spatially explicit connectivity model for all subpopulations.
- Karyotype, take morphological measurements, and conduct mtDNA sequencing to clarify the genetic relationship between the Brush Prairie pocket gopher and other subspecies.

LISTING PRIORITY:

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	**Imminent**	Monotypic genus	1
		Species	2
		Subspecies/population	**3***
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: The high magnitude of threat is due to populations with patchy and isolated distributions in habitats highly desirable for development and subject to a wide variety of human activities that permanently alter the habitat. The threat of invasive plant species to the quality of a highly specific habitat requirement is high and constant. There are few known populations of each subspecies. A limited dispersal capability, and the loss and degradation of additional

patches of appropriate habitat will further isolate populations and increase their vulnerability to extinction. Loss of any of the subspecies will reduce the genetic diversity and the likelihood of continued existence of the Thomomys mazama subspecies complex in Washington.

Imminence: Threats to this group of subspecies continues to be imminent because they are ongoing. Two (Cathlamet and Tacoma), and possibly three, subspecies are apparently extinct. (The status of T.m. douglasii is unknown, but if it's still extant, its location in a matrix of towns means it's threatened by encroaching development.) Two gravel pits are now operating on part of the remaining habitat of the Roy pocket gopher (Stinson 2005, p. 42). Populations of two other subspecies (Shelton and Olympia), including the largest known population, are located on airports, both with planned development. T.m. melanops may be susceptible to small population effects due to its low genetic diversity, isolation, and potential for habitat alteration in the future.

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted? No. Although there are few populations, they are widely scattered such that there is no single threat likely to result in extinction simultaneously. Management actions to restore and maintain prairie habitat have been initiated at several locations by State and Federal agencies and conservation organizations, including WDFW, Fort Lewis, and The Nature Conservancy. WDFW has prepared a status report for the Mazama pocket gopher (Stinson 2005), as well as management guidance for landowners (WDFW 2009b).

DESCRIPTION OF MONITORING:

We maintain contact with the responsible agencies and species experts and annually request their reviews and updates to the candidate assessment forms during the revision process. Relevant literature and data for this species are obtained principally from contacts with responsible agencies and experts and their reports. A Mazama pocket gopher workshop was held in December 2008 by TNC in coordination with the WDFW, and funded by the Service, at which agencies and experts shared information gathered and research conducted in the past few years. Using information gained at this workshop, the Service has developed a draft 5-year "Action Plan" which prioritizes research and/or other actions that need to be taken in order to improve the conservation status of the species. This will be an ongoing product, updated annually at a minimum with the help of our partners. For this CNOR, we directly contacted WDFW (Scott Pearson, Ph.D., Derek Stinson, Mary Linders, Gail Olson, Ph.D., Michelle Tirhi), TNC (Hannah Anderson), UW (Jim Kenagy, Ph.D.), and Wolf Haven (Linda Saunders-Ogg) for any updates on the species' status. Any comments received were incorporated into this document. Regular web-based literature searches for this species are also completed. This level of monitoring is appropriate, as these are the primary entities (also including the Service) responsible for conservation of the species.

COORDINATION WITH STATES:

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: Washington

Indicate which State(s) did not provide any information or comments: None

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions, or removals of species from candidate status, and listing priority changes.

Approve:

Acting Carolyn A. Bohan
Regional Director, Region 1, Fish and Wildlife Service 5/18/10
Date

Rowan W. Gould
ACTING
Director, Fish and Wildlife Service October 22, 2010

Concur:

Do not concur: _____
Director, Fish and Wildlife Service Date

Director's Remarks:

Date of annual review: April 19, 2010
Conducted by: Kim Flotlin
Wildlife Biologist, WFWO

Reviewed by: Jodi Bush Date: April 29, 2010
Division Manager, Listing and Recovery, WFWO

Ken Berg Date: May 3, 2010
Manager, WFWO