5-YEAR REVIEW
Malheur Wire-Lettuce (*Stephanomeria malheurensis)*

GENERAL INFORMATION:
Species: *Stephanomeria malheurensis*
Date listed: November 10, 1982
FR citation(s): 47 FR 50881 – 50886. Determination of *Stephanomeria malheurensis* (Malheur Wire-Lettuce) To Be an Endangered Species, With Determination of Its Critical Habitat.
Classification: Endangered

BACKGROUND:
Most recent status review: The most recent status review was completed September 20, 2011. Citation: U.S. Fish and Wildlife Service. 2011. Malheur wire-lettuce (*Stephanomeria malheurensis*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Oregon Fish and Wildlife Office, Portland, Oregon. 25 pages. (see Appendix A).

FR Notice citation announcing this status review: 82 FR 18665 – 18668, April 20, 2017. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews for 138 Species in Hawaii, Oregon, Washington, and California.

Recovery Plan: Malheur Wire Lettuce (*Stephanomeria malheurensis*) Recovery Plan. U.S. Fish and Wildlife Service, Region 1, Portland, Oregon. March 21, 1991. 40 pages.

For additional information regarding the species' listing history and other facts, please refer to the U.S. Fish and Wildlife Service's Environmental Conservation On-line System (ECOS) database for threatened and endangered species (*http://ecos.fws.gov/tess_public*).

ASSESSMENT:
Information acquired since the last status review: This 5-year review was conducted by the U.S. Fish and Wildlife Service's (USFWS or Service) Oregon Fish and Wildlife Office. We solicited data for this review from interested parties through a *Federal Register* notice published April 20, 2017. We also contacted members of the Malheur wire-lettuce working group on April 20, 2017, to request any data or new information we should consider in our review. The Malheur wire-lettuce working group is an informal group comprised of members from The Nature Conservancy (TNC), Oregon Department of Agriculture (ODA), the Service, the Burns District Bureau of Land Management (BLM) and Rae Selling Berry Seed Bank and Plant Conservation Program at Portland State University (seed storage only). However, this group has not met in several years due to lack of funding to carry out projects. Additionally, we conducted a literature search and a review of information in our files. We based this 5-year review on an evaluation of the most current scientific information that has become available since the last 5-year review for Malheur wire-lettuce that was completed in 2011.

Review Analysis: Please refer to the previous 5-year review for Malheur wire-lettuce published on September 20, 2011, for a complete review of the species' status, threats, and management efforts (Appendix A). No significant new information regarding the biological status of Malheur wire-lettuce has become available since listing or since the last 5-year review that would warrant any change from its current endangered status.

Background: Malheur wire-lettuce is an annual plant in the family Asteraceae. It is known solely from its type location (site of original discovery), a broad hill top on BLM lands near Narrows, Oregon (south of Burns in Harney County), and has never been found outside of this one site despite efforts to locate potential additional populations. Critical habitat is designated on a 160-acre (65-hectare) area at this site, within what is now the South Narrows Area of Critical Environmental Concern. When we listed Malheur wire-lettuce as an endangered species in 1982, there were an estimated 50 individuals present, but the next year the population had dropped to only 9 plants, and by 1985 the species was considered extinct in the wild (Oregon Department of Agriculture 2012, p. 1). Seeds had been collected and were available from storage, and between 1986 and 1990 more than 1,300 seedlings were outplanted (Oregon Department of Agriculture 2012, p. 2 and Appendix). The reintroduced population was left to persist on its own after 1990, and declined over the years until in 2004 the species was once again considered extinct in the wild (Oregon Department of Agriculture 2012, p. 2). Subsequent efforts to recover the species are described in our most recent 5-year review for the species (Appendix A) as well as below in the section **New Status Information**.

We published a recovery plan for Malheur wire-lettuce in 1991 (U.S. Fish and Wildlife Service 1991; available at *https://ecos.fws.gov/docs/five_year_review/doc3963.pdf*). In 2018, we drafted a supplemental finding for the recovery plan (U.S. Fish and Wildlife Service 2018; see Appendix B). In this finding, we acknowledged that the development of delisting criteria is impracticable for Malheur wire-lettuce because the repeated failed attempts to restore the species to its only known habitat clearly indicate that we do not adequately understand the life history requirements of the species, nor do we have sufficient information to identify and address the limiting factors acting on the species such that it appears to be incapable of sustaining itself in the wild.

New Status Information: Between 2007 and 2011, an intensive multi-year restoration program for Malheur wire-lettuce took place in the protected 160-acre critical habitat location. More than 4,500 seedlings were planted and hand-watered for 8 weeks following planting. Approximately 46,000 seeds were directly sown, and more than 150,000 seeds produced by transplants were estimated to have been contributed to the soil seed bank at the restoration site (U.S. Fish and Wildlife Service 2011, p. 17; Oregon Department of Agriculture 2012, entire). Despite these efforts, annual surveys in 2016 found only three individuals in poor condition, leading the ODA to declare the species "functionally extinct" (Oregon Department of Agriculture 2017, p. 2). In a subsequent visit by Service biologists in 2017, again no representatives of the species were observed (Brumbelow and Mauer, pers. obs. 2017). Furthermore, a closely related species *Stephanomeria exigua* subsp. *coronaria*, which formerly co-occurred throughout the site in relative abundance, has not been observed since 2005 (Oregon Department of Agriculture 2012, p. 11), leading to speculation that the site has for some reason become unsuitable to support *Stephanomeria* spp., as discussed further below.

ODA submitted comments in response to our 2017 initiation of the 5-year review stating "We have determined STMA [*Stephanomeria malheurensis*] is functionally extinct in the wild. We recommend suspending recovery efforts for this species until the quality of habitat can be improved. Given that the large-scale input of seed-producing transplants and seed plots, conducted by ODA from approximately 2007 to 2011, did not result in the re-establishment of a self-sustaining STMA population, we believe it's likely that the natural site has been rendered unsuitable. The infestation of cheatgrass [*Bromus tectorum*] at the site, in addition to other non-

native species, may be responsible for the decline of STMA, but other undetected factors may also be responsible." (Brown, *in litt.* 2017, p. 2).

Two Service biologists visited the Narrows site in 2017, and noted that Malheur wire-lettuce was absent not only in areas with cheatgrass infestation, but was also absent from numerous plots where it had been planted where no cheatgrass was present (Brumbelow and Mauer, pers. obs. 2017). This observation indicates that some factor other than, or in addition to, competition with cheatgrass is negatively affecting the persistence of Malheur wire-lettuce in its native habitat. What that factor may be, however, remains unknown.

There is still a large supply of Malheur wire-lettuce seed in seed storage. If it were not for these seed banks the species would likely be considered extinct, because we lack evidence that Malheur wire-lettuce is surviving and reproducing in the wild. For reasons not fully understood, the only known habitat of Malheur wire-lettuce appears to have become unsuitable for supporting the species (U.S. Fish and Wildlife Service 2018, pp. 3-4). Given the repeated failures of previous population reintroduction efforts and limited understanding of the cause of habitat unsuitability for the species, the use of any substantial portion of stored seed for further restoration attempts at this time may result in a reduction of the only known living Malheur wire-lettuce genetic material. While seed-bulking in a nursery or greenhouse setting is possible, the use of such techniques over multiple generations carries the risk of the species losing genetic adaptations to a wild environment in favor of adaptation to an artificial controlled setting. However, absent such attempts, extinction of the species is virtually certain.

Synthesis: Since our last 5-year review of Malheur wire-lettuce in 2001, we have received a limited amount of new information regarding the status of the species. This new information is limited to two reports from field visits by ODA and the Service, both of which state that no individuals of Malheur wire-lettuce remain in the wild at the only known location of the species. To the best of our knowledge, the species now exists only in seed banks, and its native habitat has become unsuitable to support the species for unknown reasons. There is no new information to inform our understanding of the threats to the species. Thus, none of the new information that has become available to us since our 2011 review alters our understanding of the threats to the species, or its current distribution or status.

The status assessment of Malheur wire-lettuce raises some challenging questions. Since the time of its discovery, Malheur wire-lettuce has been held forth as a rare example of sympatric speciation (e.g., Gottlieb 1973, p. 552; Gottlieb 1991, pp. 11-12). The species *Stephanomeria malheurensis* is thought to have arisen by way of a mutation event in a single plant from the obligate outcrossing parent species, *Stephanomeria exigua* subsp. *coronaria*, resulting in an individual capable of self-pollination. Originally differentiated from its putative progenitor by only a single allele, chromosomal rearrangement in the descendent inbreeding lineage likely resulted in reproductive isolation between the two *Stephanomeria* despite their lack of geographic isolation (Gottlieb 1973, pp. 550, 552; Gottlieb 1977, p. 879; Gottlieb 1978, entire). Malheur wire-lettuce was accepted as a valid species at the time of listing due to the combination of reproductive isolation and distinctive morphological characters (e.g., Gottlieb 1973, p. 552; Gottlieb 1978, entire; Gottlieb and Bennett 1983, p. 276), but it appears that the species was discovered in its nascency. The genome of Malheur wire-lettuce is a slender subset of the variability observed in the parent species, and its original discoverer, Dr. Leslie Gottlieb,

described the species as "still within a bottleneck state having to do with its recent origin" (Gottlieb 1973, p. 553). Furthermore, the recently evolved species displayed several characteristics that Gottlieb (1973, p. 553) and later Sherman (2009, p. 81) described as "maladaptive." These include, among others, a relaxation of seed germination requirements that can result in Malheur wire-lettuce sprouting in the fall rather than spring, with consequent high levels of seedling mortality over the cold winters (Gottlieb 1973, p. 553). Citing to the perennially low numbers of Malheur wire-lettuce and its potentially maladaptive traits, Sherman (2009, p. 81) states that the species "may be predisposed to extinction, as is the case with many neospecies." Even relatively soon after its initial discovery, Dr. Gottlieb reflected "without additional genetic augmentation stemming from mutation or hybridization, and in its present harsh environment, the probability that "Malheurensis" will persist seems small" (Gottlieb 1973, p. 553).

All of these considerations pose a dilemma in the conservation of Malheur wire-lettuce. The researcher most intimately familiar with the species questioned its ability to survive over the long term, and another considered it predisposed to extinction. Concerted efforts over the years to reintroduce the species to its type locality after it has repeatedly gone extinct in the wild have failed, as have attempts to introduce the species to similar habitat nearby. We are thus left with a species that is of scientific interest as it represents one of the only known examples of sympatric speciation of a diploid species, but that species persists only in the form of stored seed, and it appears incapable of surviving independently in its natural habitat.

Conclusion: After reviewing the best available scientific information, we conclude that Malheur wire-lettuce remains an endangered species. The evaluation of threats affecting the species under the factors in 4(a)(1) of the Act and analysis of the status of the species in our last 5- year review of Malheur wire-lettuce published in 2011 remains an accurate reflection of the species' current status.

RECOMMENDATIONS FOR FUTURE ACTIONS:

- Continue seed bulking to retain current seed supply.
- Halt seedling planting at designated sites until we gain an improved understanding of habitat needs for the species.
- Monitor habitat of Malheur wire-lettuce for signs of survival of the species in the wild.
- Cooperate with The Nature Conservancy to develop an experimental seed planting of Malheur wire-lettuce using novel techniques they are developing for restoration in the harsh desert environments of the Great Basin. For example, they have developed a variety of "seed pods" that are designed to give plants a boost to overcome multiple barriers preventing establishment.
- Monitor planting of "seed pods" or other novel techniques to determine seed to maturation success at the native site.

- Continue "conservation reliant" management and restoration once experimental tactics are validated.
- Adapt techniques and reassess recovery goals as needed.

State Supervisor, U.S. Fish and Wildlife Service, Oregon Fish and Wildlife Office

Approve _____ Date 7/31/19

Appendices:

Appendix A – Malheur Wire Lettuce 5-Year Review, 2011

Appendix B – Supplemental Finding for Malheur Wire Lettuce Recovery Plan, 2018

References

Gottlieb, L.D. 1973. Genetic differentiation, sympatric speciation, and the original of a diploid species of Stephanomeria. American Journal of Botany 60(6): 545-553.

Gottlieb, L.D. 1977. Phenotypic variation in Stephanomeria exigua ssp. coronaria (Compositae) and its recent derivative species "Malheurensis." American Journal of Botany 64(7): 873-880.

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Gottlieb, Leslie D. 1991. The Malheur Wire-Lettuce: a rare, recently-evolved Oregon species. Kalmiopsis 1: 9-12.

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Oregon Department of Agriculture. 2012. Malheur wirelettuce (*Stephanomeria malheurensis*) reintroduction and seed bulking: 2011 recovery efforts. Unpublished report prepared by J. Brown, R. Currin, and R. Meinke, Oregon Department of Agriculture, Native Plant Conservation Program, for the U.S. Fish and Wildlife Service, Region 1 (Grant No. 13420-06-J632), dated March 31, 2012. 41 pages.

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U.S. Fish and Wildlife Service. 2011. Malheur Wire Lettuce (*Stephanomeria malheurensis*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Oregon Fish and Wildlife Office, Portland, Oregon. 25 pages.

U.S. Fish and Wildlife Service. 2018. Supplemental Finding for Malheur Wire Lettuce (*Stephanomeria malheurensis*) Recovery Plan. Unpublished report, U.S. Fish and Wildlife Service, Region 1, dated September 20, 2018.

In Litt. and Personal Observations

Brown, *in litt*. 2017. Recent Findings and Comments for the Five-Year Review of *Stephanomeria malheurensis*. Jordan Brown, Conservation Biologist, Oregon Department of Agriculture, Native Plant Conservation Program. Letter to U.S. Fish and Wildlife Service dated June 27, 2017.

Brumbelow and Mauer, pers. obs. 2017. Tom Brumbelow and Alan Mauer, Fish and Wildlife Biologists, U.S. Fish and Wildlife Service, Oregon Fish and Wildlife Office. Notes from site visit to historical location of *Stephanomeria malheurensis* dated July 26-27, 2017.

APPENDIX A

Malheur Wire Lettuce
(*Stephanomeria malheurensis*)

5-Year Review:
Summary and Evaluation

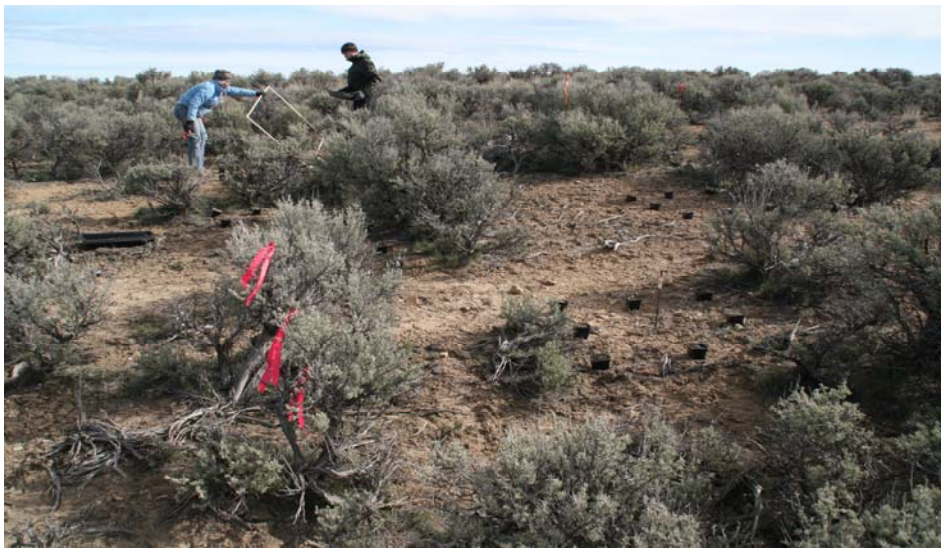
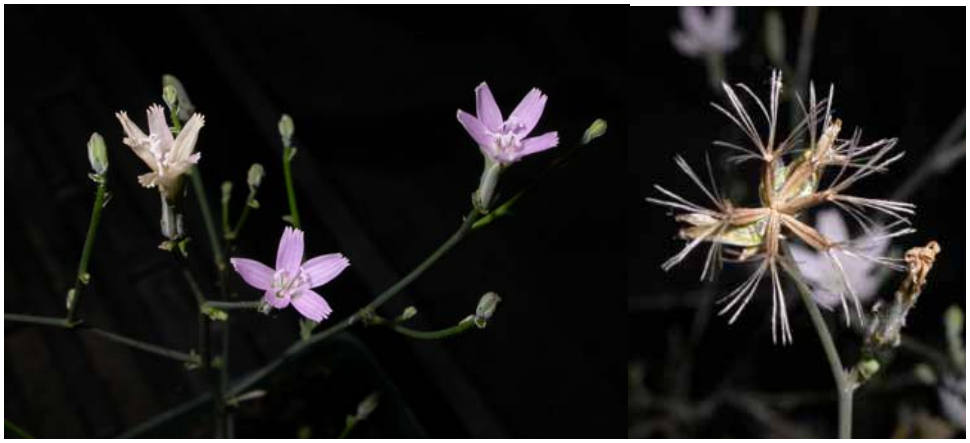


Photo: Alan Mauer/Fish and Wildlife Service



Photos: Melissa Carr, Oregon Department of Agriculture

September 2011

U.S. Fish and Wildlife Service
Oregon Fish and Wildlife Office
Portland, Oregon

5-YEAR REVIEW

Species reviewed: Malheur Wire Lettuce (*Stephanomeria malheurensis*)

OFWO File number: 8197.STMA_4.001

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5-YEAR REVIEW

Malheur Wire Lettuce (*Stephanomeria malheurensis*)

1.0. GENERAL INFORMATION

1.1. Reviewers:

Lead Field Office:
Oregon Fish and Wildlife Office - Bend Field Office
Alan Mauer (541) 383-7146
Nancy Gilbert (541) 383-7146

Cooperating Field Office(s):
Not applicable

Cooperating Regional Office(s):
Not applicable

1.2 Methodology used to complete the review:

In order to conduct this 5-year review for the Malheur wire lettuce, the U.S. Fish and Wildlife Service (Service): gathered information since the time of listing, including progress reports from the Oregon Department of Agriculture (ODA) Plant Conservation Program of information collected on the Malheur wire lettuce restoration project implemented from 2006 through 2011; reviewed activities undertaken since the time of listing to determine if recovery actions have progressed; reviewed new information regarding the status of the threats to the species; reviewed the recovery criteria in the recovery plan; and made recommendations for future actions. This review was conducted by the Oregon Fish and Wildlife Office's Bend Field Office. A draft of this 5-year review was provided to the ODA Native Plant Conservation Program for their review, and their comments were considered in finalizing this document.

The notice of initiation of a 5-year review was published in the *Federal Register* on November 24, 2010, and again on April 20, 2011. This notice requested any information concerning the status of the Malheur wire lettuce and two other species. The comment period was reopened because some emailed comments may not have been received. An additional announcement and request for information was sent via email on January 18, 2011, to the Malheur Wire Lettuce Working Group formed for recovery plan implementation. The second notice reopening the comment period was sent to the Malheur wire lettuce Working Group on May 4, 2011. One comment was received in response to the *Federal Register* requests for additional information.

1.3 Background:

1.3.1 Federal Register Notice citation announcing initiation of this review:

The Service announced the initiation of a 5-year review of 58 species including the Malheur wire lettuce, under section 4(c)(2)(B) of the Endangered Species Act (Act) in two *Federal Register* notices (75 FR 71726-71729) and (76 FR 22139-22140) on November 24, 2010, and April 20, 2011, respectively.

1.3.2 Listing History:

Original Listing

Federal Register notice: Endangered and threatened wildlife and plants; Determination that the Malheur wire lettuce is an Endangered species and designation of its critical habitat (Fish and Wildlife Service 1982 pp. 50881-50886).

Date listed: November 10, 1982.

Entity listed: The species Malheur wire lettuce (*Stephanomeria malheurensis*), listed wherever found.

Classification: Endangered.

Revised Listing, if applicable
Not applicable.

1.3.3 Associated Rulemakings:

Malheur wire lettuce was listed effective on November 10, 1982, with critical habitat designated (50 CFR 17.96). No "Special rules" were designated for Malheur Wire Lettuce.

1.3.4 Review History:

This is the first 5-year review for the Malheur wire lettuce.

1.3.5 Species' Recovery Priority Number at Start of this 5-year Review:

The Malheur wire lettuce was assigned a recovery priority number of 2. A priority number 2 means the species has a high degree of threat and a high potential for recovery.

1.3.6 Current Recovery Plan or Outline:

Name of plan or outline: "Malheur Wire Lettuce (*Stephanomeria malheurensis*) Recovery Plan"

Date issued: March 21, 1991

Dates of previous revisions, if applicable: Not applicable

2.0 REVIEW ANALYSIS

2.1. Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?
____ ***Yes***
_X_ ***No***

2.1.2 Is the species under review listed as a DPS?
____***Yes***
_X_***No***

2.1.3 Was the DPS listed prior to 1996?
Not applicable

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?
____***Yes***
_X_ ***No***

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved Recovery Plan containing objective, measurable criteria?
_X_ ***Yes***
___ ***No***

The recovery criteria focus on downlisting to threatened (see 2.2.3 below for the recovery criteria).

2.2.2 Adequacy of Recovery Criteria

2.2.2.1 Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat?
_X_ ***Yes***
___ ***No***

The "Malheur Wire Lettuce (*Stephanomeria malheurensis*) Recovery Plan" (Recovery Plan) was finalized in 1991. New biological information on the Malheur wire lettuce and its habitat includes annual population estimate surveys conducted by the Bureau of Land Management (BLM) from 1987 through 2006, and information gathered by ODA as part of the restoration effort conducted from 2007 through 2011. In 2005, the BLM reported that no Malheur wire lettuce plants were observed during monitoring activities in either 2004 or 2005 (BLM 2005). Although new information has been gathered on the trend and survival of transplanted plants, the information does not suggest changes to the recovery criteria. (See section 2.3.1.1)

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?

_X_ ***Yes***
____ ***No***

2.2.3 List the recovery criteria as they appear in the Recovery Plan, and discuss how each criterion has or has not been met, citing information:

The Recovery Plan provides information to guide recovery for Malheur wire lettuce (Fish and Wildlife Service 1991). The Recovery Plan states the recovery objective as: "Downlisting", and the recovery criteria as: "The Malheur wire lettuce may be downlisted when the 160-acre Critical Habitat is secure from the threats of fire, mining, grazing, and introduced exotic species for five years and flowering plants produce seeds in at least four separate locations within the Critical Habitat" (Fish and Wildlife Service 1991, p. 11).

1. The 160-acre Critical Habitat is secure from the threats of fire:

   A buffer zone or fire lane was established and is being maintained around the critical habitat of Malheur wire lettuce to enhance the plant's survival (Fish and Wildlife Service 1991, p. 12). The BLM currently maintains native surface roads which roughly follow the boundary of the South Narrows Area of Critical Environmental Concern (ACEC) on three sides, with State highway 205 on the fourth side. Fire lines are generally successful in holding a fire (Meinick 2011).

2. The 160-acre Critical Habitat is secure from the threats of mining:

   The ACEC was designated to incorporate the designated critical habitat into BLM management. All present and future mining claims have been withdrawn (Fish and Wildlife Service 1991, p. 12). All mining claim activity within the ACEC remains inactive (Meinick 2011).

3. The 160-acre Critical Habitat is secure from the threats of grazing:

The area was fenced to keep livestock from the ACEC. The fence is maintained by BLM. Plantings of Malheur wire lettuce conducted within the ACEC in 1987 and 1989 were protected by rodent proof fencing (Fish and Wildlife Service 1991, p. 12). Transplanting seedlings into plots surrounded by rabbit exclosure fencing had little effect on the survival and reproduction of the seedling transplants (Currin et al. 2007, p 47 and Currin and Meinke 2008, p. 15). The livestock fence is still maintained, but current restoration efforts do not rely on rodent fencing to protect seedlings from natural herbivory (Currin and Meinke 2008, p. 15; and Currin et al. 2009, p. 14).

4. The 160-acre Critical Habitat is secure from the threats of introduced exotic species for five years:

   Cheatgrass (*Bromus tectorum*), an exotic species, was identified as a threat to Malheur wire lettuce that competes for water, and is possibly allelopathic (inhibition of growth in one species of plant by chemicals produced by another species of plant). Reducing its influence was considered necessary in the recovery plan. The recovery plan recommended a study of allelopathy to determine the extent of impact cheat grass has on Malheur wire lettuce. A study was initiated in 1987 and preliminary results indicted a slight allelopathic affect from cheat grass on lettuce seeds, used as a proxy rather than using seeds of Malheur wire lettuce, and recommended continued investigation using Malheur wire lettuce seeds to test significance of allelopathy (Davidson and Bargen 1987, pp. 4-5). No additional studies of allelopathy have been conducted for Malheur wire lettuce.

   The recovery plan also recommended rogueing (weeding out) of cheatgrass throughout the growing season within 1-2 ft. radius of existing Malheur wire lettuce plants. Before the Narrows fire in 1972, Malheur wire lettuce inhabited the open areas between shrubs and bunchgrasses (Currin and Meinke 2007, p. 8). After the fire, cheatgrass invaded the site and at times formed an almost complete groundcover in the open areas. Higher levels of cheatgrass corresponded with a decline in Malheur wire lettuce (Brauner 1988, pp. 4 and 21-23). Several treatments to reduce cheatgrass were conducted with varying results (Gottlieb 1991, p. 12). According to Taylor (1997), the act of weeding may have negative impacts on Malheur wire lettuce plants due to disturbance during weeding activities. No additional cheatgrass removal activities have been conducted (Fish and Wildlife Service 1991, p. 12).

   The BLM reported a reduction in the amount of cheat grass plants present at the designated critical habitat area in comparison with the amount reported after the Narrows Fire in 1972, but also noted an

increase in other exotic annual forbs including burr buttercup (*Ranunculus testiculatus*), jagged chickweed (*Holosteum umbellatum*), pale alyssum (*Alyssum alyssoides*), and tumble mustard (*Sisymbrium altissimum*) (BLM 2005). During the restoration activities conducted from 2007 to present, selection of transplant site plots were located in areas observed to have reduced amounts of cheatgrass present.

The designated critical habitat is not free from exotic species at this time. Additional restoration work, monitoring, and analysis is needed to determine if the exotic plants present at the site constitute a continued threat to Malheur wire lettuce.

5. Flowering plants produce seeds in at least four separate locations within the designated critical habitat:

   No Malheur wire lettuce plants were observed in surveys conducted in 2004 through 2007. The restoration efforts have focused on planting seedlings in plots scattered in two different areas within the ACEC and the designated critical habitat. The success of the planting has varied from year to year and among the various plots. Currently there are three plots with reproducing plants located within the ACEC and designated critical habitat boundary (See section 2.3.1.1).

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

Information collected on Malheur wire lettuce since the implementation of a restoration project in 1987 and the completion of the recovery plan in 1991 include: population monitoring (see Section 2.3.1.2), restoration techniques and effectiveness of the restoration project. Raven (2001) summarized results of 11 years of population monitoring from 1987 through 1997 conducted for the BLM. Population monitoring data collected by BLM from 1995 through 2006 was summarized in the *Stephanomeria malheurensis* Reports by BLM (1998, 1999, 2000, 2003, 2005, and 2006) (see Section 2.3.1.2).

ODA's Native Plant Conservation Program staff has worked extensively on propagation and outplanting techniques for Malheur wire lettuce since 2007 (Currin et al. 2007; Currin and Meinke 2008; Currin et al. 2009; and Currin and Meinke 2010). This conservation work has contributed to our understanding of the plant's life history and effectiveness of restoration using transplanted seedlings.

In 2007, the ODA started a restoration project to re-establish Malheur wire lettuce within designated critical habitat and the South Narrows Area of Critical and

Environmental Concern (ACEC) at Narrows, Oregon. ODA acquired seed to be used in the restoration project from the Burke Lab at University of Georgia and from Berry Botanical Garden in Portland, Oregon. Seeds were grown in a greenhouse at Oregon State University (OSU) and in the yard at Berry Botanic Garden in 2007 (BBG) (Currin et al. 2007).

In spring 2007, ODA outplanted 428 seedlings at the Narrows, Oregon restoration site (Currin et al. 2007). An additional 435 seedlings were planted at a site referred to as the "Dunes" approximately 10 miles south west of Narrows. The Dunes site was selected because of the presence of *Stephanomeria. exigua* subsp. *coronaria* and was established to test the survivability and production of Malheur wire lettuce at an alternate site.

Planting sites were selected and plots were laid out in order to monitor seedling survival and productivity of the plants (i.e., number of seeds [achenes] produced). Approximately 23 percent of the transplanted seedlings (195 seedlings) survived the transplantation and were alive after six weeks. A total of 105 (12%) of the transplants were observed to produce achenes. Effectiveness of transplant survival was attributed to a variety of factors ranging from seed source to environmental conditions, and discussed by ODA in the annual report (Currin et al. 2007, pp. 44-58).

ODA continued the restoration project in 2008 through 2011. In 2008, 1,200 seedlings were planted: 608 at the Narrows and 592 at the Dunes. The Narrows transplants survived better than those at the Dunes site, with 390 transplants (64%) reproducing at the Narrows, and 248 transplants (42%) reproducing at the Dunes site. This is most likely due to the fact that the environment at the Dunes site is slightly harsher to growing transplanted seedlings due to the hot and desiccate conditions (Currin and Meinke 2008, p. 39). A total of 638 plants survived at both sites. An estimated 27,037 achenes were produced by Malheur wire lettuce plants at the Narrows site in 2008 (see Table 1). At the Dunes, an estimated total of 15,978 achenes were produced.

Introduction of Malheur wire lettuce at the Dunes site was discontinued after the 2008 season, because of lower productivity and survival success, and difficulty in distinguishing Malheur wire lettuce from *S. exigua* subsp. *coronaria* in the field (Currin et al. 2009). Although monitoring of the site was conducted in 2009, it was discontinued in the 2010 field season (Currin and Meinke 2010). A concentrated effort at restoring the plants at the Narrows sites contributes directly to the recovery objective for re-establishing Malheur wire lettuce at four locations within the designated critical habitat.

In 2009, ODA planted 1,096 seedlings at the Narrows. The Narrows transplants were planted at two different sites (Narrows 1 and Narrows 2). Overall, 440 transplants (40%) reproduced at the two sites in that year (Currin et al. 2009, pp. 23-25).

In 2010, ODA planted 1,224 seedlings at the Narrows. The Narrows transplants were planted at three different sites (Narrows 1, Narrows 2, and Narrows 3). Monitoring results showed that 691 transplants (56%) reproduced at the three sites (Currin and Meinke 2010, pp. 26-27).

Since Malheur wire lettuce is an annual, all plants die by the end of the growing season. ODA monitored the plant growth through the summer and determined the optimal time to monitor survival and seed production to be at approximately 16 weeks. Table 1 shows the results of the monitoring at approximately 16 weeks to show survival to reproduce and seed production at that point in time. It is not possible for the survey crews to be on site for monitoring for the duration of the seed production period, so the amount of seed produced is an estimate based on observations of plants producing seed at one point in time.

Table 1. Transplant survival and seed production.

Plants	2007 Narrows	2007 Dunes	2008 Narrows	2008 Dunes	2009 Narrows	2010 Narrows
Number of seedlings	428	435	608	592	1,096	1,224
Survived to produce seed (16 weeks)	69 (16%)	36 (8%)	390 (64%)	248 (42%)	440 (40%)	691 (56%)
Estimated seed produced	5,418	778	27,037	15,978	68,168	53,572

(Table from Currin et al. 2007, Currin and Meinke 2008, and 2010, p. 33)

Each year of the restoration project a portion of the Malheur wire lettuce seedlings were used to bulk (produce extra) seed. Approximately 129,647 seeds were produced during these years for use in future recovery efforts (see Table 2) (Currin et al. 2007, p. 59; Currin and Meinke 2008, pp. 36-37; Currin et al. 2009, p. 30; and Currin and Meinke 2010, pp. 35-36). Berry Botanical Garden grew 24 plants for seed bulking in 2007, and produced over 5,000 seeds to be stored in their seed bank facilities (Currin et al. 2007, p. 59).

Table 2. Number of Malheur wire lettuce seeds produced and bulked by plants cultivated by OSU greenhouse for future conservation purposes.

	2007	2008	2009	2010	Totals
Number of Plants	89	198	155	471	913
Total seeds collected	16,520	23,028	18,276	71,850	129,674
Seeds per plant	186	116	118	153	Avg. = 143

(Table taken in part from Currin and Meinke 2010, p. 36)

A small pilot study investigating the possibility of direct sowing of seed was initiated in 2007, with a total of 2,000 seeds sown within 10 different plots (five at the Narrows and five at Dunes; Currin et al. 2007). Surveys of the plots and the area surrounding them revealed no Malheur wire lettuce seedlings in 2008 (Currin

and Meinke 2008, p. 35). In 2009, five recruited plants were located in one of the seed plots at the Narrows (Currin et al. 2009, p. 28) and an additional two recruited plants were observed in 2010 (Currin and Meinke 2010). Based on the results of the experiment, additional information should be gathered on seed sowing to determine if it is a useful technique for future conservation strategies.

Monitoring of plots previously planted in 2007 through 2009 has indicated additional recruitment of new seedlings the subsequent years following seedling planting and is summarized in Table 3. In 2008, nine recruits were found from the prior planting in 2007. An additional 54 recruits from previous plantings in 2007 and 2008 were documented in 2009, and an additional 684 recruits from previous plantings were documented in 2010 (Currin and Meinke 2010).

Table 3. Number of recruited *S. malheurensis* plants found within and near the Narrows 1 (N1) and Narrows 2 (N2) transplant sites.

Site	Year planted	Recruits in 2008	Recruits in 2009	Recruits in 2010
N1	**2007**	9	6	40
N1	**2007 Seed plots**	0	5	2
N1	**2008**	na	43	436
N1	**2009**	na	na	30
	Subtotal N1	**9**	**54**	**508**
N2	**2009**	na	na	176
	Total	**9**	**54**	**684**

(Table taken in part from Currin and Meinke 2010, p. 35)

An additional site (Narrows 3) was selected and planted in close proximity and partly overlapping the Narrows 2 site in the spring of 2010. Results showing the recruited seedlings from the planting at Narrows 3 in 2010 are not yet available (Currin and Meinke 2010, p. 26).

In 2010, 45,000 seeds were distributed within three separate plots at the Narrows sites. Each 10 by 10 meter plot had 15,000 seeds sown evenly by hand (Currin and Meinke 2010, p. 19). Monitoring results are not available to show the results of this seed sowing experiment.

The reports completed by ODA conclude that the restoration of Malheur wire lettuce is feasible but apparently requires some level of supplemented seedling planting or seed sowing to make up for seasons of poor seed production due to drought or lack of retention of seeds in the soil seed bank to assure natural reproduction. (Also see Sections 2.3.1.5, 2.3.2.1, and 2.3.2.3).

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

Historical data on abundance are limited. Since the plant was first described in 1966, several population estimates have been conducted. Malheur wire lettuce likely did not exist on more than several acres with few individuals (approximate range of 250 to 500 individuals) at any one time (Gottlieb 1973, p. 546). Table 4 summarizes the population estimates conducted from 1968 to present.

Table 4. Malheur wire lettuce counts at Narrows. Italicized numbers are estimates by Dr. L.D. Gottlieb. Bolded text indicates greenhouse- grown transplants that were planted at the site. N1 = original Narrows site, N2 = second Narrows outplanting site (established in 2009), N3 = third Narrows outplanting site (established in 2010).

Year	Number of *Stephanomeria*	Number of *S. malheurensis*	Source
1968	*100*	*3*	Gottlieb 1974
1969	*5,000*	*150*	Gottlieb 1974
1970	*5,000*	*150*	Gottlieb 1974
1971	*25,000*	*750*	Gottlieb 1974
1972	*<500*	*<15*	Gottlieb 1974
1973	No count	No count	
1974	*12,000*	*228*	Gottlieb 1977
1975	*35,000*	*1,050*	Gottlieb 1977
1976	No count	No count	
1977	No count	No count	
1978	375	*20+*	USFWS 1991
1979	24	*0*	USFWS 1991
1980	No count	No count	
1981	No count	50+	USFWS 1991
1982	12	9+	USFWS 1991
1983	No count	No count	
1984	No count	No count	
1985	No count	0	Brauner 1988
1986	No count	**34 transplants**	Davidson 1986
1987	12	**1,000 transplants**	Brauner 1988
1988	No count	31	Raven 2001
1989	No count	939 (**80 transplants**)	Raven 2001
1990	No count	0 (**200 transplants**)	Raven 2001
1991	No count	387	Raven 2001
1992	No count	105	Raven 2001
1993	No count	280	Raven 2001
1994	No count	36	Raven 2001
1995	No count	413	Raven 2001
1996	No count	24	Raven 2001
1997	No count	0	Raven 2001
1998	No count	52	BLM 1999
1999	No count	0	BLM 1999
2000	210	113	BLM 2000
2001	No count	28	BLM 2003

2002	No count	17	BLM 2003
2003	No count	5	BLM 2003
2004	0	0	Hall 2006
2005	5	0	BLM 2005
2006	0	0	Hall 2006
2007	0	**428 transplants**	Currin et al. 2007
2008	0	**608 transplants +** 9 recruits	Currin and Meinke 2008
2009	0	**520 transplants** + 54 recruits (N1) **576 transplants** (N2)	Currin et al. 2009
2010	0	**1,224 transplants** (N1, N2, N3) + 684 recruits	Currin & Meinke 2010

(Table taken from Currin and Meinke 2010, p. 46)

The size of the Malheur wire lettuce population fluctuates over time and was monitored intermittently from 1973 to 1985. During and after the restoration project of 1986 to 1990, population monitoring was conducted on a regular basis and showed a slow decline from 1989 to 2004 (Currin and Meinke 2010, p. 46). Population numbers from 2007 to present are the result of the ongoing restoration project (See section 2.3.1.1). No long term monitoring plan is currently in place.

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

Genetic studies (DNA sequence and isozyme studies) indicate that Malheur wire lettuce originated by an abrupt speciation from a population of *S. exigua* subsp. *coronaria* that also grew at the type (i.e., original single location of *S. malheurensis*) location (Gottlieb 1973 and 1978). The origin of Malheur wire lettuce has been relatively recent based on the very close similarity of the two species of *Stephanomeria* (Gottlieb 1973, p. 551). Malheur wire lettuce's breeding system, genetic variability and reproductive relationship to its progenitor have been well documented (Gottlieb 1973, 1974, 1977, 1977a, 1978, 1991, Gottlieb and Bennett 1983, Brauner and Gottlieb 1987, Brauner and Gottlieb 1989, and Ford et al. 2006). *S. exigua* subsp. *coronaria* was observed at the type site during most of the years that observations of Malheur wire lettuce were conducted through 2005. There have been no observations of *S. exigua* subsp. *coronaria* at the type location since 2005 (Currin and Meinke 2010, p. 46).

Analysis of nuclear rDNA sequences by Joongku Lee et al. (2002) provides significant information that corroborates the hypothesis regarding the parentage of Malheur wire lettuce (Gottlieb 1973; 1977; 1977a; 1978; Brauner and Gottlieb, 1989). Malheur wire lettuce and its parental species *S. exigua* subsp. *coronaria* have different breeding systems; Malheur wire lettuce is predominantly self-pollinating and *S. exigua* subsp. *coronaria* is obligately outcrossing. The two species are very similar in morphological attributes. Electrophoretic analyses of their isozymes suggested that the genome of Malheur wire lettuce is a subset of its sympatric congener, *S. exigua* subsp. *coronaria*. Early evidence suggested

Malheur wire lettuce arose directly from the sympatric population of *S. exigua* subsp. *coronaria* following a mutation that modified its outcrossing breeding system. Such a mutation in the sympatric population of the proposed parent was discovered and documented (Brauner and Gottlieb 1987). Joongku Lee et al. (2002) show that the two taxa are components of a single subclade, with 96% bootstrap support. The bootstrap values showed a much smaller difference between Malheur wire lettuce and *S. exigua* subsp. *coronaria* than between any other taxon (Joongku Lee et al. 2002, pp. 165 and 167).

2.3.1.4 Taxonomic classification or changes in nomenclature:

At the time of listing, the Malheur wire lettuce was considered to be the species *S. malheurensis.* Malheur wire lettuce was first discovered in 1966 and subsequently described by Gottlieb in 1978 (Gottlieb 1978). Gottlieb used prior publications (Gottlieb 1973, 1973a, 1974, 1977, and 1978) to support the hypothesis that the diploid annual plant referred to as "*malheurensis*" evolved from the population of *S. exigua* subsp. *coronaria* (Greene). Gottlieb examined morphometric and meristic characters in samples and determined that the data supports classification of Malheur wire lettuce as a distinct species (Gottlieb 1978). Additional research and published results support the classification of Malheur wire lettuce as a species (Gottlieb 1977a, 1991, 2003, Gottlieb and Bennett 1983, Brauner and Gottlieb 1987, Brauner and Gottlieb 1989, and Joongku Lee et al. 2002). Malheur wire lettuce is accepted as a species by Integrated Taxonomic Information System (ITIS) and The International Compositae Alliance through the Smithsonian Institution in collaboration with the USDA National Plant Data Center and is listed on the ITIS website (Integrated Taxonomic Information System 2011).

Technical Description: "Plants annual; taproot with lateral branches often >30 cm long; the basal leaf rosette generally <15 cm in diameter at bolting; herbage glabrous; rosette leaves generally entire to pinnatifid, oblanceolate to spatulate; stem single, generally <60 cm long; branches averaging 23 in number; length of branch between adjacent heads averaging 1.9 cm; heads on short peduncles 5-15 mm long, often having shorter secondary peduncles also bearing heads; involucres cylindrical or oblong with a series of equal-sized phyllaries averaging 8.0-9.5 mm long, equivalent in number to the number of florets, subtended by fewer appressed calyculate bractlets; florets 5-6 per head; ligules averaging 8.2-9.4 mm long and 3.2-3.6 mm wide, dark pink, pink, very light pink, white or rarely orange-yellow; styles white or pink; anther apex most often dark pink, occasionally white; achenes tan or light brown, averaging 3.3-3.8 mm long, five-sided with a narrow longitudinal groove on each side, the surface generally rugose-tuberculate; pappus bristles generally 9-12 (-15) in number, thickened and often connate in groups of 2-4 at their bases, averaging 5-6 mm long, plumose on their distal 50-60%. Chromosome number $n = 8$" (Gottlieb 1978, pp. 44-45).

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g., increasingly fragmented, increased numbers of corridors), or historic range (e.g.,

corrections to the historical range, change in distribution of the species' within its historic range):

The Malheur wire lettuce is endemic to an area near Narrows, Oregon, approximately 27 miles south of Burns, in southeastern Oregon. Malheur wire lettuce was discovered at one location in Narrows, Oregon in 1966 (Gottlieb 1973, pp. 545-546). The type location is within the South Narrows ACEC managed by the Burns BLM. Malheur wire lettuce has been transplanted to two additional locations within the ACEC since restoration efforts began in 2007. Malheur wire lettuce also was transplanted to a site called The Dunes, located approximately 10 miles south west of Narrows, in 2007. Transplant efforts were discontinued at this site due to the lack of successful recruitment following initial outplantings (probably because of the harsher environmental conditions at this site) and the difficulty in distinguishing *S. malheurensis* from *S. exigua* ssp. *coronaria*, which was also found at the site (See section 2.3.1.1).

Although the maximum historical range of the species is unknown, suitable habitat is likely to exist throughout the probable historic range (Owen 1993, p. 12). Searches for Malheur wire lettuce were conducted, and although populations of *S. exigua* subsp. *coranaria* were found, no additional populations of Malheur wire lettuce were detected (Brauner 1987, no pagination and Brauner 1988, p. 21). Expansion of the current range has been initiated through the restoration project. Sites selected for re-introduction 2007 through 2011 have resulted in expanding the Malheur wire lettuce distribution from the originally observed location to several sites located within the designated critical habitat and the ACEC as well as the Dunes sites (Currin and Meinke 2010, pp. 12-14).

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

The Malheur wire lettuce's habitat is limited primarily to one 160 acre location on a broad hill top about 500 feet above the surrounding areas within the South Narrows ACEC and designated critical habitat area. The site is located at township 27 south, range 30 east, within portions of sections 11 and 12, approximately 27 miles south of Burns, west of state highway 205 between mile markers 25 and 26 (Fish and Wildlife Service 1991, p. A1).

The habitat for Malheur wire lettuce is the high desert environment typical of the northern portion of the Great Basin. The substrate consists of an azonal soil derived from volcanic tuff layered with thin crusts of limestone. Surrounding soils are derived from basalt (Gottlieb 1973, pp.545-546).

Malheur wire lettuce habitat is within the widespread Oregon steppe and shrub steppe communities which dominate the southeastern quarter of Oregon (Fish and Wildlife Service 1991, p. 7). The type location is dominated by big sagebrush (*Artemisia tridentate*), common or gray rabbitbrush (*Chrysothamnus nauseosus*), green rabbitbrush (*Chrysothamnus viscidiflorus*) (Gottlieb 1973, p. 546), and

recently, cheatgrass (*Bromus tectorum*) (Griffith and Hohn 1979, p. 3). An interesting aspect of Malheur wire lettuce life history is its ability to survive on and around otherwise barren harvester ant mounds located at the site (Fish and Wildlife Service 1991, p. 8). The animal community of the region is dominated by black-tailed jackrabbits (*Lepus californicus*), pocket mice and kangaroo rats (family Heteromyidae), songbirds including Brewer's sparrows (*Spizella breweri*), and coyotes (*Canis latrans*) (Fish and Wildlife Service 1991 p. 8).

2.3.1.7 Other:

The State of Oregon enacted an Endangered Species Act (Oregon ESA) in 1987 and amended it in 1995. All plants currently on the Federal Endangered Species Act (ESA) within Oregon were added to the State's list. (See section 2.3.2.4).

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

The original listing of 1982 stated: "*Stephanomeria malheurensis* has been known from only one 70-acre location south of Burns in Harney County, Oregon, since its discovery in 1966. The restricted range of the species makes it vulnerable to many types of habitat alteration. Zeolite mining in the area is possible in the future, as mining claims cover the entire area of this species' habitat as well as all adjacent areas. Protection of the habitat of *Stephanomeria malheurensis* and its immediate surroundings is imperative to the conservation of the species. The Anaconda Minerals Company has recently indicated that it is willing to cooperate with the Service to conserve the species, and that mining is not imminent." (Fish and Wildlife Service 1982, p. 50883).

The BLM designated the South Narrows ACEC to protect the area in 1974 (Currin et al. 2007). According to the recovery plan, all mining claims within the ACEC were withdrawn (Fish and Wildlife Service 1991). BLM staff describes the goal of the current South Narrows ACEC management strategy as being: "to provide protection in order to preserve the characteristics of the habitat and maintain the suitability of the site to support *Stephanomeria malheurensis*. To this end, fencing has been erected, signage has been posted and research has been conducted to determine stressors as well as the interrelationship between the [Malheur wire lettuce] and its habitat" (Meinick 2011).

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

The original listing of 1982 stated: "Not applicable to this species" (Fish and Wildlife Service 1982, p. 50883). No new information is available to change this statement.

2.3.2.3 Disease or predation:

The original listing of 1982 stated: "Disease or predation (including grazing). A 160-acre tract of land including the entire population of *Stephanomeria malheurensis* has been fenced, which prevents grazing of the species by livestock. Larvae of an unidentified insect have been found foraging on the species, but their effect is unknown. Grazing by mammalian herbivores (suspected to be jackrabbits) has been noted on some individual plants. This grazing caused severe stress to the few plants of this species that grew in 1981 (Franklin, 1981 [cited in Fish and Wildlife Service 1982])" (Fish and Wildlife Service 1982, p. 50883).

A large portion of the designated critical habitat was fenced to prevent or reduce impacts from cattle grazing. During attempts to restore Malheur wire lettuce in 1987, rabbit and rodent proof exclosures were installed to keep herbivores away from seedlings. These exclosures worked to varying degrees and in some instances, trapped herbivores within the fencing (BLM 1987). Subsequent restoration activities have not included small mammal fences with the acknowledgement that Malheur wire lettuce will need to be abundant and productive enough in the wild to overcome the impacts from naturally occurring herbivores (Currin et al. 2009, p. 14).

Observations made by Brauner (1988, pp. 15, 16, and 20) and BLM (1987, no pagination) indicate harvester ants (*Pogonomyrmex owyheei*) contribute to loss of seed through granivory, but also may to a lesser extent contribute to seed dispersal. Additional observations of harvester ants collecting seed have been made by ODA staff during the ongoing restoration activity (Currin et al. 2009, pp. 29-30). Granivory could be a hindrance to seed recruitment, but it is possible that harvester ants facilitate seed burial or possibly facilitate seed germination. Further investigation on harvester ant influence on Malheur wire lettuce is recommended (Currin et al. 2009, p. 30).

A separate study conducted by Crist and McMahon (1992, p 1,777) found that harvester ants in Wyoming consume from 9 to 26 percent of the standing crop of all species of seed within their study, depending upon production from one year to another. Additional studies of harvester ants have shown that they act as dispersers as well as aid in preserving seed in the soil bank by caching seed in the area of the ant mound disk (Mull and McMahon 1996, p. 190). Cached seed may last longer when stored within ant mounds than in surrounding soils and will germinate in abandoned ant nests suggesting the harvester ant can be an important

disperser of some sage steppe plant species (Mull 2003, pp. 358-361). Additional investigations will be needed to determine if harvester ants are mutualists or predators of Malheur wire lettuce.

2.3.2.4 Inadequacy of existing regulatory mechanisms:

The original listing of 1982 stated: "The Bureau of Land Management (BLM) administers all of the land supporting this species, and in August 1974 it gave notice of the closure of the 160 acres necessary for the species' survival (40 FR 39536- 39537). However, zeolite was determined to be a locatable mineral in June 1977 under mining law. In consequence, access to the zeolite ore is regulated by the Mining Law of 1872, as amended. The adequacy of the Federal Land Policy and Management Act of 1976 (Pub. L. 94-579), often called the BLM Organic Act, to protect *Stephanomeria malheurensis* should zeolite mining become active is unclear in these circumstances".

As a Federally-endangered species, regulatory measures are undertaken to conserve this species. All Federal agencies are required to actively pursue efforts to conserve listed species (section 7(a)(1) of the ESA) and ensure that activities they fund, authorize, or carry out are not likely to jeopardize the continued existence of the species nor destroy or adversely modify its designated critical habitat (section 7(a)(2) of the ESA). The Act also regulates interstate and foreign trade of Malheur wire lettuce, prohibits willful destruction in violation of State trespass laws on all lands, and prohibits removal and reduction to possession on federal lands. The Act provides limited protection to plants on private lands, but since the only known natural site for Malheur wire lettuce is currently on BLM administered lands, the protections of the ESA apply to the entire range of the species.

Oregon Endangered Species Act:
The Malheur wire lettuce was listed as endangered by the State of Oregon as part of the original enactment of the Oregon Endangered Species Act in 1987 (ORS 496.172). The Oregon ESA prohibits the "take" (kill or obtain possession or control) of listed species without an incidental take permit. The Oregon ESA applies to actions of State agencies on State-owned or leased land, and does not impose any additional restrictions on the use of private land (ORS 496.192 and ORS 564.135) except in the case of wildflower protection under ORS 564.020.

Wildflowers and threatened and endangered plants are further protected under ORS chapter 564.020(2) which protects vegetation growing upon the right of way of public highways. "It shall be unlawful for any person in this state to willfully or negligently cut, dig up, trim, pick, remove, mutilate or in any manner injure or mar any plant, flower, shrub, bush, fruit or other vegetation growing upon the right of way of any public highway within this state, or upon public lands, or upon the land of another, within 500 feet of the center of any public highway, without the written permit of the owner, signed by the owner or the authorized agent of the owner" (ORS 564.020).

Several small patches of Malheur wire lettuce are also found on the Oregon Department of Transportation-managed right-of-way located adjacent to the ACEC. The Oregon ESA provides some additional protection for Malheur wire lettuce located in the State highway right-of-way.

2.3.2.5 Other natural or manmade factors affecting its continued existence:

The 1982 listing rule stated: "Other natural or man-made factors affecting its continued existence. The small size of the only known population causes this species to be in significant danger of extinction due to natural fluctuations. Since this species is an annual, its numbers vary greatly from year to year, depending largely on the amount of precipitation prior to and during the spring growing season. In 1974 and 1975, individuals of all *Stephanomeria* at the site numbered 12,000 and 35,000, respectively (Gottlieb. 1977). New fieldwork showed only a few dozen individuals in August 1980 (Gottlieb, 1980). In addition, Gottlieb, (1980) discussed the effects of a 1972 controlled burn which inadvertently burned much of the colony area. Cheat grass (*Bromus tectorum*) has invaded the burnt area, thereby impacting the habitat of *Stephanomeria*. The 1981 field reports indicated the species was still very low in numbers (about 50 individuals), and the exotic cheat grass invasion was a severe problem" (Fish and Wildlife 1982, pp. 50883-50884).

The Malheur wire lettuce population continues to be small and remains vulnerable to natural fluctuations. Cheat grass that invaded Malheur wire lettuce habitat in the early 1970s persists within the habitat and likely affects the site conditions for re-establishing Malheur wire lettuce (BLM 2005 and 2006). Between 1986 and 1990, over 1,300 seedlings were planted within the ACEC and designated critical habitat in an attempt to restore the plant in the wild. As of 1989, there were 939 seedlings established through these efforts. After 1990, the population was left to persist on its own and was extirpated in the wild after 13 years (Currin et al. 2007).

The restoration project being implemented by the ODA has made progress toward meeting the recovery criteria for establishment of Malheur wire lettuce at a minimum of four locations within the designated critical habitat area described in the recovery plan (Fish and Wildlife Service 1991). Narrows 1, Narrows 2, and Narrows 3 sites have been installed, and currently support Malheur wire lettuce within the designated critical habitat (see section 2.3.1.1.). Over the past four years, nearly 4,000 seedlings have been planted, and 46,000 seeds have been sown within the Narrows ACEC. ODA estimates the planted seedlings have contributed over 154,000 seeds to the soil seed bank at the Narrows restoration sites (Currin and Meinke 2010, p. 33). Whether the seeds are able to successfully germinate, grow, reproduce and ultimately create a self-sustaining population of Malheur wire lettuce over time (for at least 15 years) without human assistance remains to be seen. The additional site known as the "Dunes" site was planted in 2007 and 2008, but is not within the designated critical habitat. An additional

5,000 seeds have been added to the conservation seed bank at Berry Botanical Garden.

Recent monitoring of the transplants has shown that recruitment of new seedlings from year to year is somewhat lower than the numbers of seedlings planted. Malheur wire lettuce appears to have a limited ability to persist without management. To assure the recovery of Malheur wire lettuce, it is likely that some level of supplementation in the form of seed sowing or additional transplantation of seedlings will be necessary, even after meeting the downlisting criteria of establishing four populations within the designated critical habitat.

The consensus among climate projections for the next 90 years is that the Great Basin and Mojave Desert will warm, and that annual precipitation will remain near historical values in the north and decrease in the south. Summer is expected to warm slightly more than winter. Precipitation decreases are expected to be greater in spring and summer and smaller in winter. Winter is currently the wettest season in much of the region (Redmond 2010). Elevated CO_2 is well known to stimulate plant production in desert systems, but changes in rainfall amount and patterns impose an important additional driver in this response (Smith 2010).

It is unknown what effects the results of climate change will have on Malheur wire lettuce. It is possible that if warmer temperatures and greater precipitation occur, climate change would benefit Malheur wire lettuce, but may also benefit invasive plant species, resulting in adverse effects to Malheur wire lettuce. If warmer temperatures occur but the precipitation decreases, causing greater drought conditions, it may be detrimental to Malheur wire lettuce.

2.4 Synthesis

The Malheur wire lettuce was listed as endangered in 1982 because of its restricted range, potential threats from mining, impacts from herbivores, limited number of individuals in the population, and encroachment of introduced cheatgrass (Fish and Wildlife Service 1982, pp. 50883-50884).

Of the threats described in the listing rule, only threats from mining and livestock grazing have ceased (see section 2.3.2.1). Since listing there have been several attempts at conserving Malheur wire lettuce. Over a 23 year period, restoration activities included seed bulking, seedling outplanting, and seed sowing (see section 2.3.1). Although progress has been made toward restoration, additional supplementation by seedling transplant or seed sowing to assure the soil seed bank is maintained would aide greatly in assuring the conservation and recovery of Malheur wire lettuce in the future. In consideration of the uncertainty of Malheur wire lettuce's ability to produce enough seed to assure long term reproduction, the plant should be managed as a "conservation reliant" species.

Conservation reliance is a fairly new concept in conservation biology coined by Scott in a 2005 publication in Frontiers in Ecology and Environment (Scott et al. 2005). The premise of the concept is that despite meeting recovery objectives for a species (e.g., recovery criteria presented in a recovery plan) continued management may be necessary to sufficiently counter remaining threats that inhibit the species' full recovery (Scott et al. 2005).

Because of the altered state of the habitat which has been invaded by cheat grass, low population size, and difficulty in re-establishing Malheur wire lettuce through restoration efforts from 1987 through 2010 (section 3.3.1), continued active restoration is likely necessary to meet recovery objectives for Malheur wire lettuce and maintain it in a recovered state. The past restoration effort conducted 1986 through 1990, concluded with a slow decline of the population. It is likely that Malheur wire lettuce has, at least in the near term, become conservation reliant and would benefit from continuation of conservation activities. Therefore, for all of the reasons identified above, the designation of Malheur wire lettuce as an endangered species remains appropriate.

3.0 RESULTS

3.1 Recommended Classification:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
_____*Extinction*
_____*Recovery*
_____*Original data for classification in error*
_X_ No change is needed

3.2 Recovery Priority Number: 2

Brief Rationale:

We recommend maintaining the recovery priority number at 2 which is a high degree of threat with a high potential for recovery based on the on-going threats described in section 2.3.2. and the potential for recovery through the continuation of planting and seeding the Malheur wire lettuce in the wild. It has become apparent that the Malheur wire lettuce has become a "conservation reliant" species. Through careful planning and continued bulking of seed in a controlled greenhouse environment, conservation of the species may continue by outplanting seedlings and direct sowing of seed within the designated critical habitat. The recovery criterion calls for the Malheur wire lettuce to be established in four different locations within the designated critical habitat area. Current restoration work has established the plant in three different sites. One additional site can be established. Once the four sites are established and other threats are affirmed to be reduced adequately, the Malheur wire lettuce may be downlisted to a threatened species.

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

1. Continue to work with ODA, BLM, and Native Plant Society to accomplish restoration and monitoring activities benefitting Malheur wire lettuce. Plant seedlings and supplement seed on four sites within the designated critical habitat and ACEC site (recovery plan objectives 1 and 5).

2. Continue to bulk seed for use in implementation of future recovery efforts as well as to increase and replace stored seed of Malheur wire lettuce (recovery plan objective 51).

3. Continue annual census of Malheur wire lettuce. Sampling should occur starting in April when rosettes are observable and continue through July to detect flowering plants. Additional monitoring should be conducted during flowering to estimate seed production. Continuation of monitoring is needed to observe the demography of the species and to assess its responses to climate changes, particularly drought conditions, over time.

4. Work with the BLM and ODA to develop a long-term management and monitoring plan for the Malheur wire lettuce and its habitat. The plan should address the threats described in the original listing (restricted range, mining, herbivores, limited population, and cheatgrass) and recovery plan. Monitoring should be sufficient to track fluctuations in available habitat, and abundance of nonnative or invasive plant species.

5. Evaluate the potential for control of introduced non-native and competing plant species particularly cheat grass. Also consider potential for preventing introduction and spread of other invasive species.

6. Evaluate granivore – seed interactions related to harvester ants and dispersal of seed. Determine whether harvester ants are a hindrance to restoration of if they aide in recovery through caching and dispersal of viable seed.

5.0. REFERENCES

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Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Stephanomeria malheurensis.*

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
__X__ No change needed

Appropriate Listing/Reclassification Priority Number, if applicable:

Review Conducted By: Alan Mauer

Nancy Gilbert Date 9/20/2011
Lead Field Supervisor, Fish and Wildlife Service

Approve Paul Henson Date 9/20/11
Lead State Supervisor, Fish and Wildlife Service

APPENDIX B

Supplemental Finding
for
Malheur Wire Lettuce (*Stephanomeria malheurensis*) Recovery Plan

Original Approved: March 21, 1991
U.S. Fish and Wildlife Service
Region 1
Portland, Oregon

Acting _____ 9/30/15
Robyn Thorson **Date**
Regional Director

BACKGROUND INFORMATION

Section 4(f)(1)(B)(ii) of the Endangered Species Act (Act) requires that each recovery plan shall incorporate, to the maximum extent practicable, "objective, measurable criteria which, when met, would result in a determination…that the species be removed from the list." It is possible that for some species, however, delisting cannot be foreseen at the time a recovery plan is written. In some rare cases, the best available information is so seriously limited that it is truly not possible to identify delisting criteria. This would be an unusual case, such as one in which the species' threats are not understood well enough to identify priorities and appropriate mitigation. For example, the natural habitat may have been so reduced for an endangered species that captive propagation and active management is necessary for the life of a reasonable recovery plan. In another example, the population of a long-lived, slow growing species may be so depleted that possible recovery may be beyond the life of a reasonable recovery plan.

A 2006 Government Accountability Office (GAO) audit of the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service's (FWS) endangered species recovery programs recommended that the Secretaries of the Department of Commerce and the Interior direct their staff to ensure that all new and revised recovery plans have either recovery criteria evidencing consideration of all five delisting factors or a statement regarding why it is impracticable to do so (GAO 2006). Since the 2006 GAO audit, we have updated our recovery planning and implementation guidance (NMFS and FWS 2010), and new plans have included determinations regarding the feasibility or possibility of incorporating delisting criteria related to each of the five factors, as recommended by the GAO. Active recovery plans remain, however, that lack delisting criteria and contain either an incomplete determination regarding the practicability of incorporating delisting criteria, or are silent about the absence of delisting criteria in the recovery plan. In this document, we clarify why it remains impracticable to incorporate delisting criteria for Malheur wire lettuce in the Malheur wire lettuce (*Stephanomeria malheurensis*) Recovery Plan.

METHODOLOGY USED TO COMPLETE THE FINDING

This finding is based on a review of all best available scientific data relevant to recovery planning for Malheur wire lettuce, including but not limited to the 1991 recovery plan (FWS

1991), the 2011 5-year review for the species (FWS 2011), numerous survey and monitoring reports from the Bureau of Land Management (BLM) and Oregon Department of Agriculture (ODA) (as summarized and referenced in FWS 2011 and ODA 2012), information received from ODA in response to the 2017 notice of initiation of the 5-year review for the species (J. Brown *in litt.*, 2017), and personal observations of FWS biologists (T. Brumbelow and A. Mauer, pers. obs. 2017). The review was conducted by Dr. Michele Zwartjes, Recovery Coordinator for the Oregon Fish and Wildlife Office of the FWS, and Alan Mauer, Fish and Wildlife Biologist for the Oregon Fish and Wildlife Office-Bend, and lead biologist for Malheur wire lettuce.

BACKGROUND

Malheur wire lettuce, an annual plant in the family Asteraceae, was discovered by Dr. Leslie Gottlieb at a single 70-acre location on BLM lands near Narrows, Oregon, in 1966 (Gottlieb 1973, pp. 545-546) where it was growing in association with the more widespread and presumed parent species, *Stephanomeria exigua* subsp. *coronaria* (Greene). Dr. Gottlieb described Malheur wire lettuce as a separate species *Stephanomeria malheurensis* in 1978 (Gottlieb 1978, entire), and this classification is generally accepted (e.g., Integrated Taxonomic Information System (ITIS) 2018). Malheur wire lettuce is known solely from its type location (site of original discovery), and has never been found outside of this one site despite efforts to locate potential additional populations. The original population was found on a hillside of volcanic tuff (consolidated volcanic ash) layered with thin crusts of limestone, an atypical and isolated soil type differing from the surrounding soils derived from basalt (ODA 2012 and references therein, pp. 5-6). Relatively few individuals of the species have ever been observed in naturally occurring populations (an estimated three individuals at the first count in 1968; rarely more than a few hundred individuals; ODA 2012, p. 6 and Appendix).

The FWS listed Malheur wire lettuce as an endangered species, with critical habitat, in 1982 (47 FR 50881) when there were an estimated 50 individuals present, but the next year the population had dropped to only 9 plants, and by 1985 the species was considered extinct in the wild (ODA 2012, p. 1). Seeds of Malheur wire lettuce had been collected and stored, however, and between 1986 and 1990 more than 1,300 seedlings were outplanted at the Narrows site (ODA 2012, p. 2 and Appendix). The reintroduced population was left to persist on its own as of 1990, and declined over the years until the species was once again considered extinct in the wild in 2004 (ODA 2012, p. 2).

In 1991, the FWS released a recovery plan for Malheur wire lettuce (FWS 1991). That plan set only downlisting criteria for the species, however. The continued existence of Malheur wire lettuce was so tenuous that the primary objective of the plan was to restore the species from endangered to threatened status, based on the following criteria: "160-acres of critical habitat is secure from threats of fire, mining, grazing from domestic and native herbivores, and introduced exotic species for five years, and flowering plants produce seeds in at least four separate locations within the secured 160-acre critical habitat. No delisting objective can be established at this time" (FWS 1991, p. 11).

Past extinction events occurred despite the amelioration of several of the presumed threats to the species, including wildfire, the potential for surface mining, and grazing by domestic and native

herbivores. In 1974, the BLM protected 160 acres of land surrounding the original population as the South Narrows Area of Critical Environmental Concern (ACEC). All mining claims for this area were withdrawn, and the entirety of the area was fenced to protect the plants from grazing by livestock (FWS 2011, pp. 4-5, 14). Test exclosures utilized during reintroduction attempts demonstrated that grazing by native herbivores (e.g., jackrabbits) does not have a significant impact on the survival and reproduction of Malheur wire lettuce, as originally thought (FWS 2011, p. 5; ODA 2012, p. 12). The threat of wildfire is reduced by a buffer zone or fire lane to protect the ACEC from fire (FWS 2011, p. 4). However, in 1972, a controlled burn inadvertently moved through the area occupied by Malheur wire lettuce, followed by an invasion of the exotic cheatgrass (*Bromus tectorum*). Researchers have noted a negative association between the abundance of Malheur wire lettuce and cheatgrass over time (e.g., references in ODA 2012, p. 6, and FWS 2011, p. 17). Malheur wire lettuce historically occurred in open areas between shrubs and bunchgrasses, but cheatgrass now forms relatively continuous cover in the area (FWS 2011, p. 5; ODA 2012, p. 6). Competition with cheatgrass remains a likely threat to Malheur wire lettuce, as does the increased risk of fire associated with cheatgrass (FWS 2011, p. 17). Some preliminary studies suggested only a slight allelopathic effect of cheatgrass on lettuce seeds, used as a surrogate for Malheur wire lettuce (FWS 2011, p. 5).

In 2007, ODA's Native Plant Conservation Program embarked on a 5-year intensive restoration program for Malheur wire lettuce at the Narrows site, supported by FWS. Between 2007 and 2011, more than 4,500 seedlings were planted and hand watered for 8 weeks following planting, approximately 46,000 seeds were directly sown, and more than 150,000 seeds produced by transplants were estimated to have been contributed to the soil seed bank at the restoration site (FWS 2011, p. 17; ODA 2012, entire). Despite these efforts, by 2016 only three individuals in poor condition were found (J. Brown *in litt.* 2017, pp. 1-2), and in 2017 no representatives of the species were observed (T. Brumbelow and A. Mauer, pers. obs. 2017). It may be notable that not only is Malheur wire lettuce absent from the site, but the closely related subspecies *Stephanomeria exigua* ssp. *coronaria*, which formerly co-occurred in relative abundance, has not been observed since 2005 (ODA 2012, p. 11).

ODA submitted comments in response to our 2017 initiation of the 5-year review for the species stating "We have determined STMA [*Stephanomeria malheurensis*] is functionally extinct in the wild. . . We recommend suspending recovery efforts for this species until the quality of habitat can be improved. Given that the large-scale input of seed-producing transplants and seed plots, conducted by ODA from approximately 2007 to 2011, did not result in the re-establishment of a self-sustaining STMA population, we believe it's likely that the natural site has been rendered unsuitable. The infestation of cheatgrass at the site, in addition to other non-native species, may be responsible for the decline of STMA, but other undetected factors may also be responsible" (J. Brown *in litt.* 2017, p. 2). Similarly, on their site visit to the Narrows site in 2017, T. Brumbelow and A. Mauer (pers. obs. 2017) noted that Malheur wire lettuce was absent not only in areas with cheatgrass infestation, but also in numerous plots where it had been planted where no cheatgrass was present. This observation lends support for the suggestion that there are likely additional undetermined habitat factors on-site that could be limiting persistence of Malheur wire lettuce.

FINDING

As described above, we have reviewed all relevant data and reports for the purposes of evaluating the feasibility of developing delisting criteria for Malheur wire lettuce at present. Based upon this review, we conclude that the development of delisting criteria remains impracticable, and in fact may present more difficulty today than at the time the recovery plan was initially developed. Malheur wire lettuce historically occurred at only one site with habitat characteristics (specifically soil type) not replicated elsewhere, and despite repeated intensive attempts at restoration, reintroduced populations have declined to extinction on multiple occasions. The species is currently believed to be once again extinct in the wild. These repeated failed attempts to restore the species to its only known habitat clearly indicate that we do not adequately understand the life history requirements of the species, nor do we have sufficient information to identify and address the limiting factors acting on the species such that it appears to be incapable of sustaining itself in the wild. The simultaneous disappearance of the formerly common and closely related subspecies *Stephanomeria exigua* ssp. *coronaria* additionally suggests that the habitat at the one known historical location for the species has become unsuitable to support *Stephanomeria* spp. Furthermore, if cheatgrass is having a serious deleterious effect on habitat suitability for Malheur wire lettuce, as suspected, this poses a particular challenge as there is as yet no known mechanism to effectively and permanently eradicate cheatgrass. For all of these reasons, it is not possible to anticipate the actions and conditions that might lead to meeting the identified downlisting criteria for Malheur wire lettuce, much less to describe with any credibility the conditions required for delisting the species.

The immediate need for Malheur wire lettuce recovery is to determine why past attempts at reintroduction have been unsuccessful, what threat factors are acting on the species or its habitat so as to render reintroduced populations inviable over time, and to evaluate the feasibility of eliminating those threat factors, once identified, at the only known historical location of the species. See further Recommendations for Future Actions in the 2011 5-Year Review of Malheur Wire Lettuce (FWS 2011, p. 20).

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