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

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

5-YEAR REVIEW

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

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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.

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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