

Interim Core Map Documentation for the MacFarlane's four-o'clock

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Interim Core Map Developer: U.S. Environmental Protection Agency (EPA), Office of Pesticide Programs (OPP)

Species Summary

The MacFarlane's four-o'clock (*Mirabilis mafarlanei*; Entity ID #777) is a threatened terrestrial plant (dicot). There is no designated critical habitat for this species. This species inhabits low to mid elevation canyon grassland habitats on gravelly to loamy and sandy soils. It is endemic to west-central Idaho and northeastern Oregon. The MacFarlane's four-o'clock flowers from May to June and may be pollinated by insects. Additional information is provided in **Appendix 1**.

Description of Core Map

The core map for the MacFarlane's four-o'clock is based on species range, which includes three distinct canyons in Idaho and Oregon. The species range represents areas important for this species' conservation. The current range was updated in 2023 and is based on suitable habitat modeling. Populations of this species are found throughout its range (see Appendix 1). There are 13 known populations of this species, and they are all located within the range (5-Year Review, 2022). There is no designated critical habitat. **Figure 1** depicts the interim core map for the MacFarlane's four-o'clock. The core map represents approximately 565,000 acres spread out in canyons in Idaho and Oregon.

MacFarlane's four-o'clock plants occupy canyon grassland characterized by regionally warm and dry conditions at elevations between 300 to 900 meters (1,000 to 3,000 feet). Plants can be found in all aspects but often on southeast to western exposures on steep to nearly flat slopes (Revised Recovery Plan 2000). Landcover categories within the core map area are included in **Table 1**. Landcover is predominantly grassland/herbaceous, which are generally consistent with the habitat of this species.

The core map developed for the MacFarlane's four-o'clock is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the MacFarlane's four-o'clock. This core map incorporates information developed by the U.S. Fish and Wildlife Service (FWS) and made available to the public; however, the core map has not been formally reviewed by FWS. This interim core map may be revised in the future to incorporate expert feedback from FWS. This interim core map has a "none" best professional classification because it consists of the species' range without additions or subtractions. There is confidence in the core map because the species' range is highly refined, represents areas important for this species' conservation, and contains all four known populations of this species. This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.

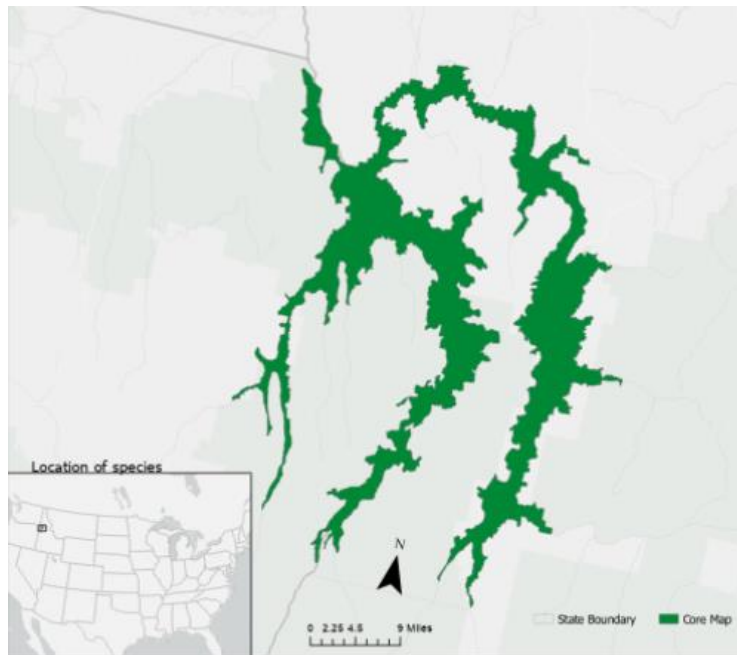


Figure 1. Interim core map for the MacFarlane's four-o'clock. The total acreage of the interim core map is approximately 565,000 acres.

Table 1. Percentage of Interim Core Map Represented by NLCD¹ Land Covers and Associated Example Pesticide Use Sites/Types.

Example pesticide use sites/types	NLCD Landcover (Value)	% of core map represented by landcover	% of core map represented by example pesticide use
Forestry	Deciduous Forest (41)	0%	6%
Forestry	Evergreen Forest (42)	2%	6%
Forestry	Mixed Forest (43)	4%	6%
Agriculture	Pasture/Hay (81)	0%	0%
Agriculture	Cultivated Crops (82)	0%	0%
Mosquito adulticide, residential	Open space, developed (21)	0%	0%
Mosquito adulticide, residential	Developed, Low intensity (22)	0%	0%
Mosquito adulticide, residential	Developed, Medium intensity (23)	0%	0%
Mosquito adulticide, residential	Developed, High intensity (24)	0%	0%
Invasive species control	Woody Wetlands (90)	0%	94%
Invasive species control	Emergent Herbaceous Wetlands (95)	0%	94%
Invasive species control	Open water (11)	0%	94%
Invasive species control	Grassland/herbaceous (71)	85%	94%
Invasive species control	Scrub/shrub (52)	8%	94%
Invasive species control	Barren land (rock/sand/clay; 31)	0%	94%
Total Acres	Interim Core Map Acres	~565,000	

Evaluation of Known Location Information

There are four datasets with known location information for this species:

- Descriptions of locations provided by FWS;
- Occurrence locations included in iNaturalist;
- Occurrence locations included in the Global Biodiversity Information Facility (GBIF); and
- Occurrence locations included in NatureServe.

¹ Dewitz, J., 2023, National Land Cover Database (NLCD) 2021 Products: U.S. Geological Survey data release, <https://doi.org/10.5066/P9JZ7AO3>

EPA evaluated these four sets of data to inform or support the core map. FWS provided the most refined descriptions of the occurrence information and confirmed that all known locations of extant populations are located within the range. iNaturalist had 10 research grade observations, which are consistent with the species range. GBIF's occurrence data consisted only of occurrences that had also been accounted for in iNaturalist. NatureServe included five documented areas, all of which were consistent with the location of the species range. **Appendix 1** includes more information on the available known location information.

Approach Used to Create Core Map

EPA compiled available information for the MacFarlane's four-o'clock from FWS, as well as observation information available from various publicly available sources (including iNaturalist, GBIF and NatureServe). The information compiled for the MacFarlane's four-o'clock is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- The species range is highly refined, following the canyons where the species is known to occur.
- There are 13 known populations in FWS documentation, all of which are within the species' range.
- Occurrence data from other sources are generally consistent with the species range location.

EPA used the compiled information to identify the core map type. EPA compared known location data to the range and found that these known locations are consistent with the species range. Based on the narrow range that includes all occurrence data identified by FWS, EPA selected the range to use as the species core map. EPA used the ECOS species range for the MacFarlane's four-o'clock.

Discussion of Approaches and Data that were Considered but not Included in Core Map

Alternative approaches and data were not considered in the development of this interim core map.

Appendix 1. Information Compiled for Species During Step 1

1. Recent FWS Documents

- 5 year-Review MacFarlane's four—o'clock 2022; https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3946.pdf
- Revised Recovery Plan for MacFarlane's four-o'clock (*Mirabilis macfarlanei*) 2000 - https://ecos.fws.gov/docs/recovery_plan/000630.pdf
- ECOS Environmental Conservation Online System - <https://ecos.fws.gov/ecp/species/813>

2. Background information on Species

- **Status:** Federally listed as endangered in 1979
- **Taxonomy:** Dicot flowering plants that require outcrossing with biotic pollination vectors.
- **Resiliency:** There is no information.
- **Redundancy:** There is no information.
- **Representation:** There is no information.

- **Habitat Description**

"MacFarlane's four-o'clock occurs in warm and dry river canyons grasslands at elevations between 300 – 900 meters (1,000 to 3,000 feet). Plants are found in all aspects but often on occur on southeast to western exposures. Slopes may be steep or nearly flat. Soils vary from sandy to talus substrate. Other bunchgrass community species present at the *M. macfarlanei* habitat are blue bunch wheatgrass (dominant species) and several other species. The distribution of *M. macfarlanei* appeared to be influenced by slope aspect, topographic position and density of non-native species. Nearly all sites occupied by MacFarlane's four-o'clock contain the non-native *Bromus tectorum*. (Figure A1-1)."

MacFarlane's four-o'clock (*Mirabilis macfarlanei*)



MacFarlane's four- o'clock along the Snake River. Photo by Matt Horning.

Figure A1-1. Picture of the MacFarlane's four-o'clock habitat along the Snake River. (5-year Review)

- **Relevant Life History Information:**

“MacFarlane’s four-o’clock is a long-lived perennial plant. The species blooms from May to June and is pollinated by bumblebees. Seeds are dispersed in June and July and germination probably occurs in early spring. Seed dispersion is believed to occur by rain, gravity, birds or mammals. It is likely that seed establishment varies from year to year depending on environmental conditions. Plants also reproduce clonally (vegetative).” (Revised Recovery Plan, 2000).

- **Ecology**

The MacFarlane’s four-o’clock occurs in warm and dry canyons grassland within a community of several other species. The distribution of the species is influenced by slope aspect, soil development, topographic position and the density of non-native species. (Revised Recovery Plan 2000).

- **Relevant Pesticide Use Sites**

Herbicide use in areas where MacFarlane’s four-o’clock inhabits could potentially have an adverse effect as well as pollinators (bumblebees), especially populations occurring alongside roads that are routinely sprayed with pesticides. An incident was reported in 1997 in the vicinity of Salmon River, Idaho County, Idaho. Affected plants exhibited foliar kill. However, subsequent monitoring (1998) showed that most plants survived (Revised Recovery Plan 2000).

- **Threats**

Current threats include herbicide and pesticide spraying, landslides and flood damage, insect damage and disease, presence of exotic plants, livestock grazing, grazing by wildlife species, fire, trampling by humans, off-road vehicles, roads and trails constructions and maintenance, collecting, mining, competition for pollinators, inbreeding depression. (Revised Recovery Plan 2000)

- **Reclassification Criteria**

The species remains a threatened species. The species is not secure from threat even though there has been numerous conservation and management actions.

- **Delisting Criteria**

A minimum of 11 populations are secure from threats and naturally reproducing with stable or increasing trends for at least 15 consecutive years maintaining the minimum necessary to maintain the viability of the species. The species occurs throughout its range in each of the three geographic areas (Imnaha, Snake and Salmon rivers areas). Management monitoring and conservation of the species is implemented in federal and private lands. Finally, a post-delisting monitoring program is developed and implemented. (Revised Recovery Plan 2000).

- **Recovery Actions (Revised Recovery Plan 2000)**

- Protect essential habitat and control threats.
- Monitor population trends and habitat conditions.
- Conduct research essential to the conservation of the species.
- Conduct surveys in potential habitat areas. Manage and protect any newly discovered populations.
- Establish propagule banks, including a long-term seed storage facility.
- Validate and revise recovery objectives as needed.

3. Description of Species Range

Thirteen officially recognized Elements of Occurrences (EOs) of *M. macfarlanei* are currently known — three of these populations are found in the Snake River Canyon area (Idaho County, Idaho and Wallowa County, Oregon), nine in the Salmon River area (Idaho County, Idaho), and two in the Imnaha River area (Wallowa County, Oregon) (Figure A1-2). In 2015, another population was included, Lower Otto. This last population has not been included in the IFWIS database and has no EO number yet. **Table 2** shows the Element of Occurrences for the 13 populations.

Table 2. MacFarlane's four-o'clock Element Occurrences.

EO Number	EO Name	Land Ownership	River Canyon
Idaho			
ID 1	Skookumchuck	BLM	Salmon
ID 2	Long Gulch	BLM/Private	Salmon
ID 3	Horseshoe Bend	BLM	Salmon
ID 4	Slicker Bar	Private	Salmon
ID 5	Giant's Nose	Private	Salmon
ID 6	Lower Pittsburg Landing	Forest Service	Snake
ID 7*	Lucille Caves	BLM	Salmon
ID 8	Rhett Creek	BLM	Salmon
ID 9	Box Canyon	BLM	Salmon
No number*	Lower Otto	BLM	Salmon
Oregon			
OR 1	Tryon Bar	Forest Service	Snake
OR 2	Buck Creek	Forest Service	Imnaha
OR 3**	Falls Creek	Forest Service/Private	Imnaha
OR 5	Pleasant Valley	Forest Service	Snake

*Established populations

**No Oregon EO 4 likely due to Eos being merged.

It should be noted that MacFarlane's four-o'clock plants are also located at the Idaho Botanical Garden in Boise, Idaho, and the Orton Botanical Garden in Twin Falls, Idaho.

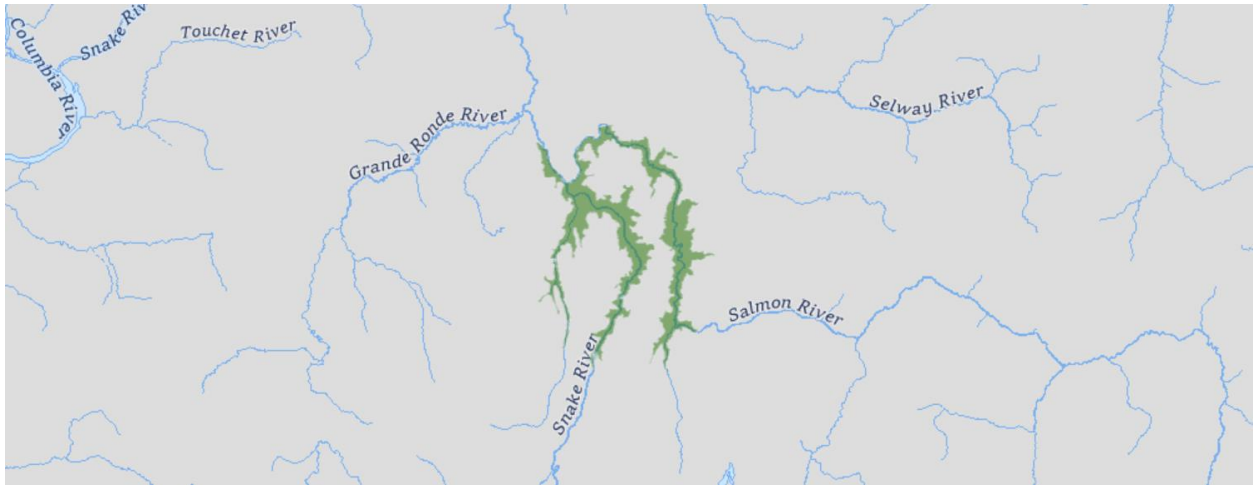


Figure A1-2 depicts the FWS range map of the MacFarlane's four-o'clock. This range was last updated on June 6, 2022, and has an area of approximately 565,000 acres. The most recent update to the range was informed by habitat suitability modeling (5-year review, 2022), which substantially reduced the size of the range map in 2023. **Figure A1-3** from the 2022 5-year review illustrates results from the habitat suitability study.

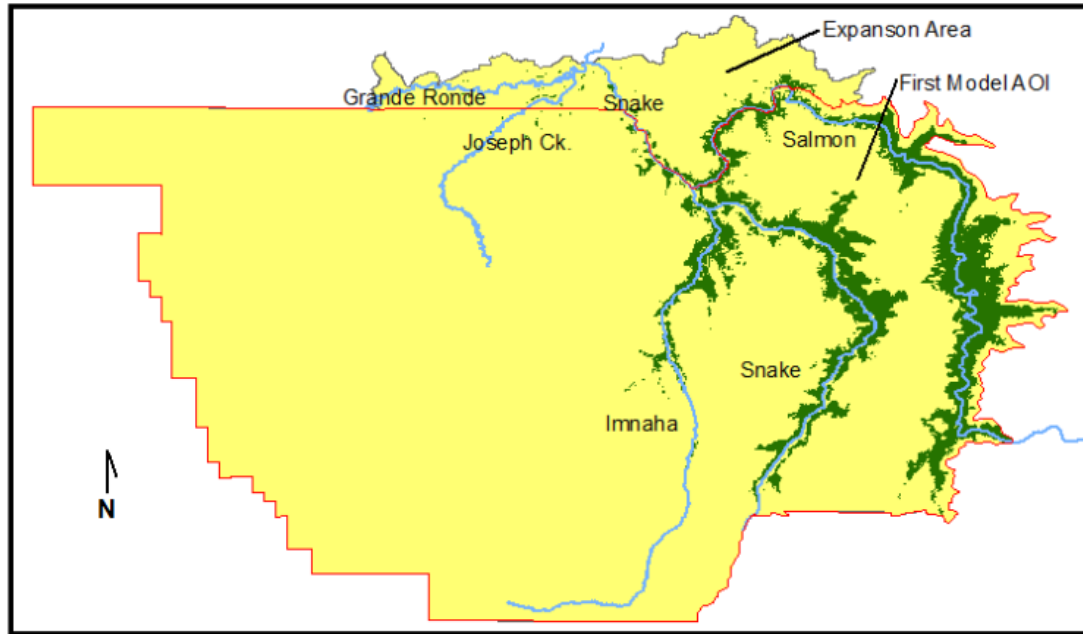


Figure 1. Macfarlane's four-o'clock Habitat Suitability Model output. Suitable habitat is shown in green. The previous USFWS general range map boundary is shown in red. Note the expansion area to the north which now includes Washington.

Figure A1-3. Macfarlane's four-o'clock Habitat Suitability Model output. Suitable habitat is shown in green. The previous FWS general range map boundary is shown in red. Note the expansion area to the north which now includes Washington.

A soil study was done in ten of the Macfarlane's four-o'clock populations. It provided information about site names, river canyon, elevation slope and aspect. The information is provided in the table below (5-year Review 2022).

Table 3. Location, elevation, slope, and aspect of the ten MacFarlane's four-o'clock populations sampled.

Site Name	River Canyon	Elevation (m)	Slope (°)	Aspect (°)
McKinzie Creek	Salmon	554	35	309
Long Gulch N	Salmon	555	35	194
Long Gulch S	Salmon	591	35	324
Skookumchuck	Salmon	479	40	264
West Creek	Snake	485	30	314
Sumac	Snake	557	30	314
Mine Gulch	Snake	410	20	239
Flood Deposit	Snake	377	35	239
Imnaha 1	Imnaha	725	35	124
Imnaha 2	Imnaha	549	30	129

4. Critical Habitat

There is no designated critical habitat for this species.

5. Known Locations

Tables 2 and 3 mention sites where the species has been found.

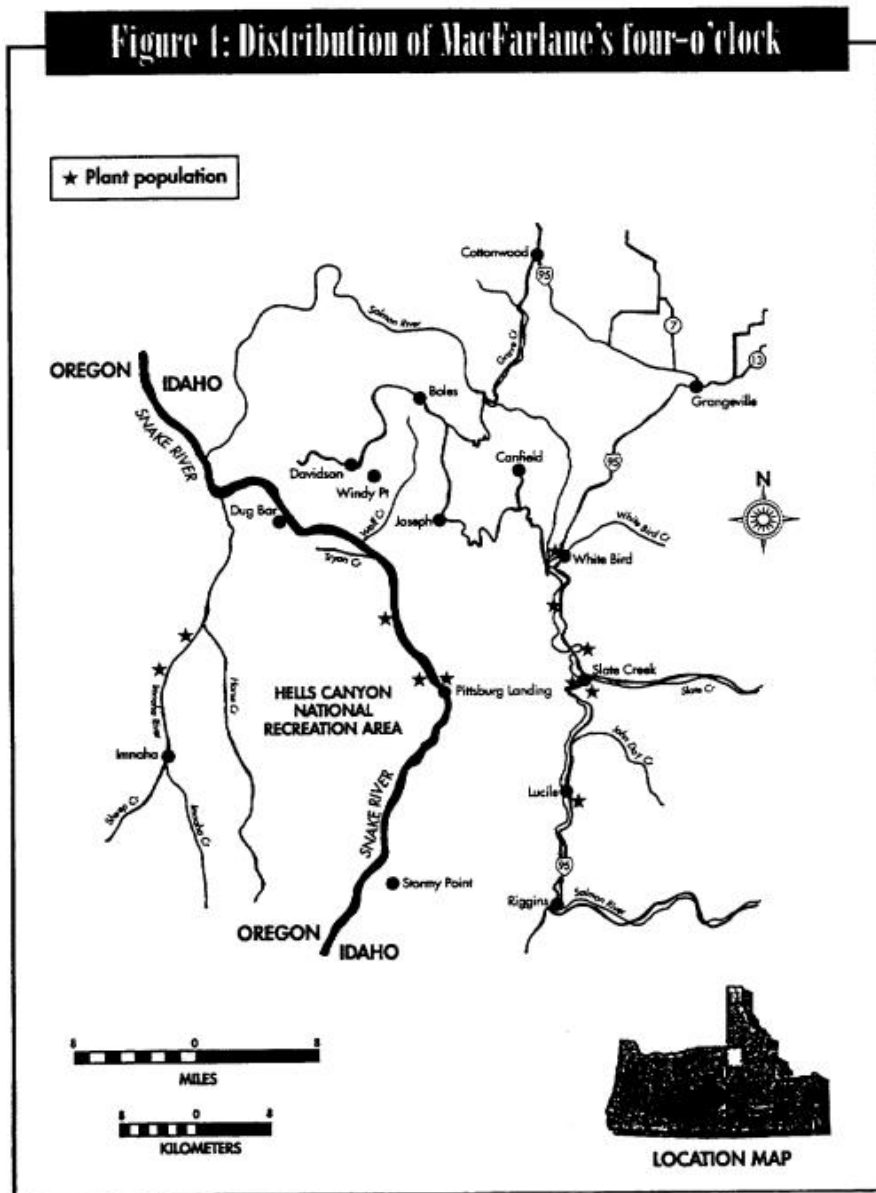


Figure A1-4. Locations of Populations from FWS (2000) Recovery Plan.

- Occurrences Described in iNaturalist:
 - iNaturalist includes 10 observations consistent with the indigenous locations.
 - All dates were included.

- https://www.inaturalist.org/observations?place_id=1&quality_grade=research&subview=map&taxon_id=165464&verifiable=any
- Occurrences Described in GBIF: <https://www.gbif.org/>
 - There are 11 observations in GBIF, all from iNaturalist
 - All dates were included.
 - https://www.gbif.org/occurrence/map?basis_of_record=OCCURRENCE&basis_of_record=HUMAN_OBSERVATION&basis_of_record=OBSERVATION&taxon_key=3086159
- Occurrences Described in NatureServe: <https://explorer.natureserve.org/pro/Welcome>
 - NatureServe has several documented locations consistent with the indigenous range.
 - https://explorer.natureserve.org/pro/Map?taxonUniqueid=ELEMENT_GLOBAL.2.148885

Taken together, the public element occurrence data did not support further refining or expanding the core map.