

U.S. Fish and Wildlife Service

Post-Delisting Monitoring Plan for Colorado butterfly plant

(*Oenothera coloradensis*, formerly *Gaura neomexicana* subsp. *coloradensis*)



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Anti-Deficiency Act Disclaimer

Post-delisting monitoring is a cooperative effort between the Service, State, and Tribal governments; other federal agencies; and nongovernmental partners. Funding of post delisting monitoring presents a challenge for all partners committed to ensuring the continued viability of the Colorado butterfly plant (*Oenothera coloradensis*, formerly *Gaura neomexicana* subsp. *coloradensis*) following removal of Endangered Species Act, as amended (Act) (50 CFR §402.14) protections. To the extent feasible, the Service and our partners intend to provide funding for post-delisting monitoring efforts through the annual appropriations process. Nonetheless, nothing in this Plan should be construed as a commitment or requirement that any federal agency obligate or pay funds in contravention to the Anti-Deficiency Act, 31, U.S.C. 1341, or any other law or regulation.

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I. Summary of the Roles of all Cooperators in the Post-delisting Monitoring Planning Effort

The Colorado butterfly plant (*Oenothera coloradensis*, formerly *Gaura neomexicana* subsp. *coloradensis*), henceforth referred to as Colorado butterfly plant, occurs mainly on private lands, with a few populations occurring on Wyoming state trust lands, one large population containing a few subpopulations found on U.S. Air Force Lands at F.E. Warren Air Force Base in Cheyenne Wyoming, and three populations on lands owned and managed by the City of Fort Collins Natural Areas Department. Many of the private landowners with Colorado butterfly plant populations on their lands in Wyoming (11) have previously signed 10- or 15-year wildlife extension agreements in 2004 (one was renewed in 2015) to allow U.S. Fish and Wildlife Service (Service) employees access to the populations to conduct monitoring and make management recommendations.

We expect that all cooperators who are currently monitoring and managing lands containing populations of Colorado butterfly plant will continue to conduct or allow for the conduction of monitoring of the study populations. Private lands in Wyoming also contain designated critical habitat for Colorado butterfly plant (70 FR 1940; January 11, 2005), and the private individuals owning and managing those lands may wish to cooperate in this post-delisting monitoring plan.

II. Summary of Species Status at Time of Delisting

A. Demographic Parameters

Found in Boulder, Douglas, Larimer, and Weld Counties in Colorado, Laramie and Platte Counties in Wyoming, and western Kimball County in Nebraska, populations are typically found in habitats created and maintained by streams active within their floodplains, with vegetation that is relatively open and not overly dense or overgrown. Figure 1 presents a map of the historical and current range and the designated critical habitat of Colorado butterfly plant. Populations occur in a range of ecological settings, including streamside, outside of the stream channel but within the floodplain, and spring-fed wet meadows. The plant is often found in but not restricted to early- to mid-succession riparian habitat. Historically, flooding was probably the main cause of disturbances in the plant's habitat, although wildfire and grazing by native herbivores also may have been important. Although flowering and fruiting stems may exhibit increased dieback because of these events, vegetative rosettes appear to be little affected.

The Colorado butterfly plant is semelparous, meaning it remains vegetative for one to a few years, then bolts, flowers, fruits, and then dies. The vegetative state of this species is a low-growing rosette that is easily obscured by taller vegetation, while the reproductive plants bear a reddish, hairy stem with white flowers that is easily detected. Therefore, populations have been monitored by counting the number of reproductive individuals across years.

Populations are defined by the 12-digit hydrologic unit code (HUC) in which they occur. Populations defined this way typically consist of numerous subpopulations, each with dozens to hundreds of flowering stems and rosettes. These subpopulations are often widely scattered and may be isolated by gaps of seemingly suitable habitat, which may make the species better able to respond to stochastic events, which contributes to resiliency of this species. This varies from the characterization of populations in both the listing decision (65 FR 62302; October 18, 2000) and critical habitat designation (70 FR 1940; January 11, 2005), where populations were defined by landowner and/or proximity within a drainage, but follows the proposed delisting rule (FR XXX). We find organizing populations based on 12-digit HUCs to more accurately describe components of population ecology (genetic exchange within a geographic area) and stressors affecting the species tend to vary by watershed. Because of this new organization of population structure, some populations considered distinct and separate during the listing decision are now combined and vice versa, though many populations are retained between the two documents. Table 1 presents information on the known populations of Colorado butterfly plant, including assigning a level of resiliency (high, moderate, or low) for populations based on the number of flowering individuals, trends in the numbers of flowering individuals, and assessment of threats affecting populations.

Figure 1. Historical and current range of Colorado butterfly plant (*O. coloradensis*) in Colorado, Wyoming, and Nebraska. Known populations generalized to 12-digit HUC watersheds and buffered by two miles.

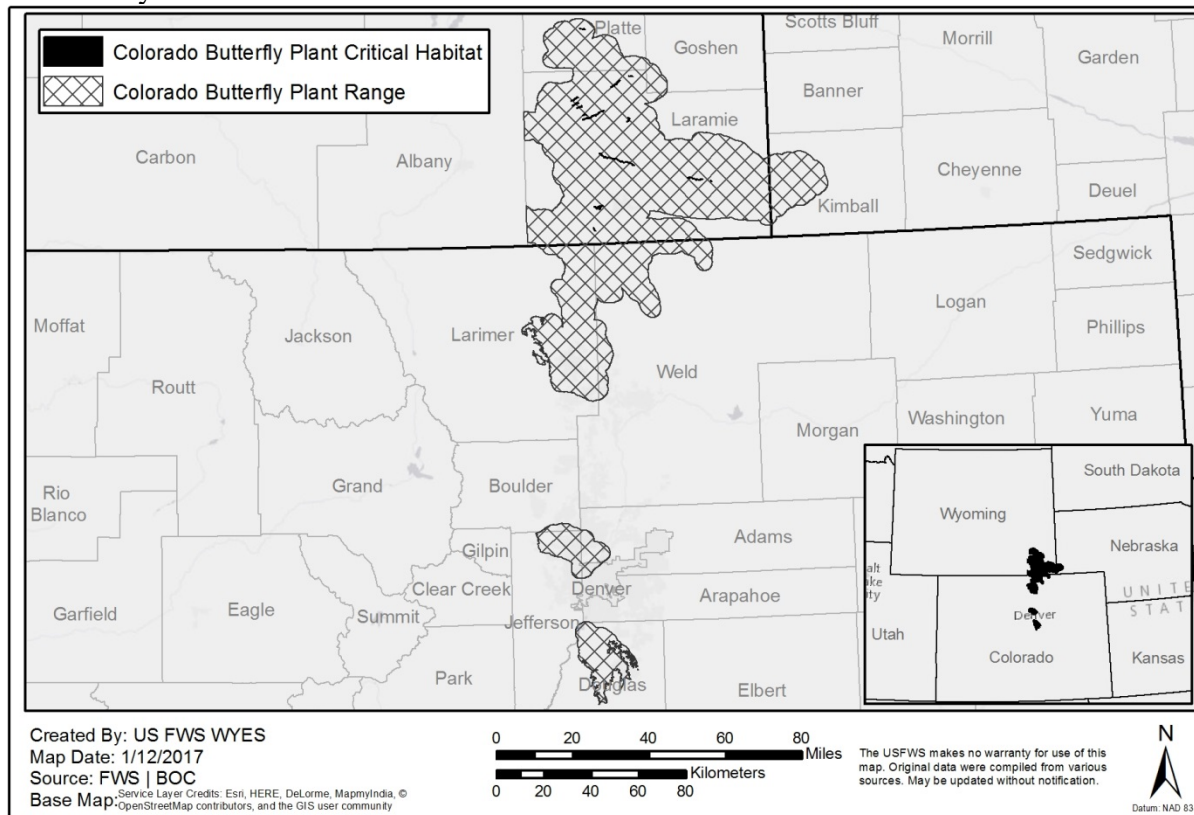


Table 1. All historical and currently known populations of Colorado butterfly plant arranged by 12-digit HUC watershed. Extant populations are based on survey and monitoring data from 2004 to present. A population is historical and presumed extirpated when no individuals have been counted there since 1984; over 30 years. Resiliency is based on average number of reproductive individuals within the survey area (generally having more than 100 reproductive individuals most years indicates high resiliency, between 50 and 100 is moderate, and under 50 is low), trends in population numbers where available, and response to stochastic events. Note that minimum, maximum, and mean census may not provide a count of all flowering plants in a population due to access constraints, and that none of these measurements provide an accurate assessment of resiliency when taken alone due to the natural fluctuations in numbers of reproductive individuals in any given year. Populations within a wildlife extension agreement (WEA) are also noted.

12 Digit HUC	State – ID No.	Watershed	County	Known at time of listing?	Most recent data	Min. Census	Max. Census	Mean census	Extant/ Historical	WEA	CH	Resiliency
101900080105	CO-11	Spring Creek (Meadow Springs Ranch)	Weld	Y	2015	46	1432	324	E			High
101900070903	CO-12	Spotted Creek (Soapstone)	Larimer		2015	77	26189	8867	E			High
101800120301	WY-1 & WY-4	South Fork Bear Creek	Laramie	Y	2004	?	805	?	E		Unit 3	High
101800120302	WY-2	North Fork Bear Creek	Laramie	Y	2004	?	3952	?	E		Unit 3	High
101800120304	WY-1	South Fork Bear Creek	Laramie	Y	2004	?	601	?	E		Unit 2	High
101800120401	WY-3 & WY-5	Little Bear Creek	Laramie	Y	2004	?	1156	?	E		Unit 4	High
101800120402	WY-5	Middle Little Bear Creek	Laramie	Y	2004	?	1323	?	E		Unit 5	High
101900150104	WY-14	Lodgepole Creek	Laramie	Y	2004	?	1262	?	E		Unit 5	High
101800120106	WY-8	Upper Horse Creek	Laramie	Y	2016	156	7472	884	E	Y	Unit 4	High
101900090107	WY-15	Crow, Diamond, Unnamed Creeks (FE Warren)	Laramie	Y	2016	2230	11975	6613	E			High

101900090107	WY-17	Diamond Creek	Laramie	Y	2016	2	11742	2357	E	Y	Unit 7	High
101900090108	WY-18	Spring Creek	Laramie	Y	2016	0	5193	1565	E	Y		High
101900150103	WY-14	Lodgepole Creek	Laramie	Y	2016	0	936	128	E	Y	Unit 5	High
101900150201	WY-10	Lower Lodgepole Creek	Laramie	Y	2016	1	1347	476	E	Y	Unit 6	High
101900150204	WY-10	Lodgepole Creek - Thomas Reservoir	Laramie	Y	2016	22	2101	692	E		Unit 6	High
101800120107	WY-8	Horse Creek	Laramie	Y	2016	10	485	96	E		Unit 4	Moderate
101900080101	WY-19	Lone Tree Creek	Laramie	Y	2016	0	215	49	E	Y	Unit 7	Moderate
101900070903	CO-17	Coal Creek (Jack Springs)	Larimer		2015	0	250	69	E			Low
101900050603	CO-16	Rock Creek (Upper Church Ditch)	Jefferson	Y	2011	1	1	1	E			Low
101900080204	CO-3, 5, 14	Lone Tree Creek (Natural Fort , CO-WY border)	Weld	Y	1984 & 2008	3	280	142	E			Low
101900150206	NE-1 , 5, 9, WY-9	Lower Lodgepole Creek - Pine Bluffs	Laramie	Y	1985 & 2008	0	2065	?	E			Low
101900150208	NE-2, 3, 6, 7	Lower Lodgepole Creek - Bucknell	Laramie	Y	2008	0	?	?	E			Low
101900160101	NE-4, 8	Lower Lodgepole Creek - Oliver Reservoir	Laramie	Y	2008	0	27	?	E			Low
101800110901	WY-22	Teepee Ring Creek	Platte		2001	?	?	?	E		Unit 1	Unknown
101800120102	WY-23	Horse Creek	Laramie		2016	17	17	17	E			Unknown
101900030406	CO-13	Walnut Creek (Chambers Preserve)	Jefferson	Y	2011	?	100	?	E			Introduced
101900030407	CO-X	Private Residence (not on creek)	Adams		2016	?	150	?	E			Introduced

101900040404	CO-15	Clear Creek (at Broadway Bridge)	Adams	Y	2011	?	11	?	E			Introduced
101900020703	CO-9	Plum Creek (Sedalia)	Douglas		1942	?	?	?	H			Extirpated
101900050406	CO-7	Not on named creek (Lee Hill Rd)	Boulder		1984	?	1	?	H			Extirpated
101900071002	CO-2	Cache La Poudre R. (East of Poudre)	Larimer		1897	?	?	?	H			Extirpated
101900080201	CO-6	Township record: drainages w/ extant records (NE Larimer Co.)	Larimer		1944	?	?	?	H			Extirpated
101900080303	CO-1	Lone Tree Creek (vicinity of Carr)	Weld		1979	?	1	?	H			Extirpated
101900080104	WY-20	Duck Creek	Laramie		1984	?	42	?	H			Extirpated

B. Residual Threats

The primary threats to the species identified at the time of listing include overgrazing by cattle or horses, haying or mowing when the plant has not yet set seed, habitat degradation resulting from vegetation succession or urbanization of the habitat, conversion to cropland (i.e. agricultural practices) or residential subdivision, water diversions and use, herbicide spraying, and competition with exotic plants. Since the time of listing, oil and gas development and climate change have become potential threats to this species. Based on the analysis conducted in our 2016 Biological Report (USFWS 2016) and summarized in the Proposed Rule to Delist the Colorado butterfly plant, none of the threats are affecting the species at a substantial level currently or into the foreseeable future.

Stressors currently fall into one of three categories: (1) Minimized or Mitigated: stressors are adequately managed and existing information indicates that this will not change in the future (residential, urban, and energy development, agricultural practices, water management, overutilization, and herbicide spraying); (2) Avoided: stressor has not occurred to the extent anticipated at the time of listing and existing information indicates that this will not change in the future (restricted range); or (3) Tolerated: the species is tolerant of the stressors and existing information indicates that this will not change in the future (natural succession and competition with nonnative invasive species, disease and predation, and climate change, and herbicide spraying to some degree). The threats that fall into category 3 are those that continue to affect the species at some level. All noteworthy foreseeable factors affecting the status of the species are included in the proposed rule to remove the Colorado butterfly plant from the Federal List of Endangered and Threatened Plants. To ensure impacts remain minor, all monitored populations in this plan will be assessed for the effects of residual threats.

C. Legal and/or Management Commitments for Post-Delisting Conservation

The Service has worked with partners to protect existing populations. Much of this work has been accomplished through voluntary cooperative agreements. For example, since 2004 the Service has entered into 11 wildlife extension agreements (WEAs) with private landowners, representing six populations, to manage riparian habitat for Colorado butterfly plant. Because there are no prohibitions for private activities on private lands that may affect threatened plants, the removal of the Colorado butterfly plant from the listed of federally threatened and endangered species will have very little change for private landowners with this species on their lands. The removal of designated critical habitat from private lands in Wyoming will remove the requirement that federal agencies authorizing, permitting, or carrying out activities on private lands will have to consult with the Service on impacts to the critical habitat.

We also have an agreement with the Department of Defense for the population occurring on F.E. Warren Air Force Base near Cheyenne, Wyoming, and the Bureau of Land Management (BLM) Range Management Plan includes commitments for the protection of the species. Delisting the Colorado butterfly plant removes protections for the plant on federal land. Although this species is not conservation reliant, these partners will continue to monitor and manage the species. Specifically, partners have committed to the following:

- The U.S. Air Force at F.E. Warren Air Force Base will manage for open habitats adjacent to the riparian zone, limit activities to existing use only, weed control will minimize damage and destruction of riparian vegetation, avoid additional changes to local hydrology, and restore local pockets of poor quality habitat (Colorado Natural Heritage Program 2004, p. 53).
- The City of Fort Collins Natural Areas Department (CFCNAD) has a mission to conserve and enhance lands with natural resource, agricultural, and scenic values, while providing meaningful education and appropriate recreation opportunities. The Colorado Water Conservation Board filed an instream flow right on behalf of CFCNAD to help maintain subirrigation of the populations of Colorado butterfly plant (CFCNAD 2016). The CFCNAD with The Nature Conservancy provided the State Land Board with a set of recommendations to protect the species' habitat from oil and gas development (TNC 2013).
- The BLM and Service in Wyoming have developed conservation measures for the Colorado butterfly plant under a statewide programmatic consultation under section 7 of the Act. These conservation measures are incorporated into the BLM's Resource Management Plan (RMP) and include, but are not limited to, (1) buffering individuals and populations from any development activity by 800 m (0.5 mi), (2) implementing Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming, (3) limiting the number of grazing animals within any specified permit area, and (4) protecting surface water through prohibiting surface development in the following areas: within 400 m (0.25 mi) of the North Platte River; within 152 m (500 ft) of live streams, lakes, reservoirs, and canals and associated riparian habitat; and within 152 m (500 ft) of water wells, springs, or artesian and flowing wells (BLM 2005, pp. 4-2 through 4-4). The species has no known populations on lands administered by the BLM, however, the newly discovered population on Wild Horse Creek (WY-23) occurs within the agreement area that BLM developed with the private landowners, and so the conservation measures included in the Rawlins RMP are applied to this population.

III. Public Review and Comment

We will announce the availability of the draft Post-Delisting Monitoring Plan for public review and comment in the publication of the proposed rule to delist the Colorado butterfly plant. After

the comment period closes, we will review each comment received and prepare responses to substantive comments.

IV. Monitoring Design

This section outlines the monitoring design for the Colorado butterfly plant in a subset of presently monitored populations spanning private, local government, and federal government lands. The goal of post-delisting monitoring is to assess population trends over time.

A. Population Trend Monitoring

This section outlines a consistent procedure for conducting population trend monitoring using census methodologies developed and agreed upon by the Colorado butterfly plant Recovery Team.

Selection of monitoring units

Populations selected for monitoring during the post-delisting monitoring period are a subset of the populations that were routinely monitored while the Colorado butterfly plant was listed as a threatened species (see Table 1 and Figure 1). In this way, the number of plants in any population can be compared to the range of population estimates obtained through routine monitoring of that population during the time that the species was listed. The range, mean, and median population size while the species was listed will provide a baseline for information collected on these populations during the post-delisting monitoring period.

Figure 2: Colorado butterfly plant range and the 8-digit HUCs selected for post-delisting monitoring.



Populations selected for post-delisting monitoring fall throughout much of the current range of the species, are spatially distributed throughout the range of the species, and occur within five 8-digit HUCs:

- 1) 10190007: CO-12 and CO-17
- 2) 10190008: CO-11 and WY-19
- 3) 10190009: WY-15, WY-17, and WY-18
- 4) 10190012: WY-8
- 5) 10190015: WY-9, WY-10, WY-14, NE-1, NE-2, NE-3, NE-5, NE-6, NE-7, and NE-9

These five 8-digit HUCs are larger than the species range, but then encompass one or more occupied 12-digit HUC. Because most of the 8-digit HUCs contain more than one identified population based on the state identification numbers (Table 1), we have selected a subset of the monitored populations within each of these 8-digit HUCs, based on accessibility and cooperation with landowners. These populations are: “To be determined (TBD) [Need to be defined based on discussions with landowners. We anticipate forming an agreement with one landowner for each 8-digit HUC. These conversations were initiated in June 2017. For example, (1) will likely be CO-12; (2) will likely be CO-11; (3) will likely be WY-17; (4) will be WY-8; and (5) will likely be WY-10].

Methodology

Monitoring will be conducted by trained surveyors annually at populations representing five 8-digit HUCs (Figure 1), for minimum of five years after Colorado butterfly plant is delisted. A longer monitoring timeframe may be needed if at that time we are not able to confirm that a population is secure.

Monitoring will take place during the flowering period (late June through mid-August, depending on the phenology of the population based on its location within the species' range) and be conducted by qualified and trained individuals able to distinguish Colorado butterfly plant from similar species of *Gaura* and/or *Oenothera* in the area. The agency biologists who are currently conducting monitoring for populations of Colorado butterfly plant will continue to monitor the populations under their jurisdiction or agreement for management and monitoring. Monitors will complete a Site Visit Account Form (SVA Form) (Appendix B) to collect information about each population in the field.

Monitoring will include counting all reproductive individuals within the entire 12-digit HUC population or monitoring agreement area, where access has been granted. Monitoring became standardized through annual monitoring while the species was listed. Non-bolted, basal rosettes will not be counted due to the difficulty in seeing them in tall or dense vegetation. Similarly, no assessment will be made of the seedbank for this species, though while it is likely responsible for much of the population resiliency, counting or estimating a seedbank in the field would prove too onerous in this monitoring plan. In cases where flooding, hail, grazing, or other impacts remove the bolted/flowering portion of a plant, that plant will be counted as if it were reproductive in that year and damage will be noted. Because precipitation has both acute and long-term effects on population size (Heidel 2017, pp. 5-9), we will also record growing season precipitation (April through August) and annual precipitation for the weather station nearest to each monitored population.

Information to be collected on the SVA Form includes:

- 1) Site Data: Population surveyors will record site attributes on the SVA Form, such as date monitored, total time spent monitoring, and the names of surveyors on the team.
- 2) Population Size: Surveyors will record the number of individual plants within the reproductive life history class. Where possible, surveyors will use a global positioning system (GPS) unit to record locations of individual plants or groups of plants, ensuring that each datapoint includes the number of plants represented by that location. An individual plant is discerned from neighboring plants within a clump by the presence of a distinct basal rosette.
- 3) Quantification of stressors: herbivory, natural damage (e.g. flooding and hail), human impacts (e.g. changes in human use of the area, water diversions, water irrigation, etc.).

After surveys have been completed, GPS files from the field will be uploaded into the geodatabase that currently contains information on the locations of specific plants and/or groups of plants in currently monitored populations. A map from the uploaded GPS waypoints points

overlain onto a 1:24,000 scale topographic map to depict locations of plants and/or groups of plants will compare pre-delisting and post-delisting plant locations on an annual basis.

Data analysis

The data collected will be analyzed annually to determine trends. Each year, the data will be entered into a database maintained by the Service and will be shared with all cooperators after all data have been analyzed. These population trend data will be analyzed under the context of the trends in each population while the species was listed.

- 1) Total number of reproductive plants will be summed for each population. This number will be compared to the reproductive plant range, mean, and median across years.
- 2) Annual precipitation from the nearest weather station will be recorded and compared with population estimates to determine if population fluctuations are tracking precipitation amounts.
- 3) Herbivory, insect outbreaks, human disturbance, or other population-level effects will be quantified and compared across years for each population.
- 4) After five years of post-delisting data are collected, we will formally assess population trends. Because the number of reproductive individuals present during the flowering period vary substantially from year to year for this species, trends will be discerned based on mean, median, and the range of values across years. These trends post-delisting will be compared each populations' specific population-level trends while the species was still listed.

B. Data Compilation and Reporting Procedures

Annual reports will be submitted by the Wyoming Ecological Services Field Office of the Service by the 31st of December each year to partners involved in the recovery of the species. Each annual report will synthesize all monitoring data including population trends and comment on the status of the Colorado butterfly plant. Information on any recorded disturbance or stressors within the population will be included so that we can determine if new factors may be negatively affecting the species. After five years of PDM data are available, the next annual report will additionally contain an analysis of overall population trend (see Data Analysis in Section IV, Monitoring Design) and apply the appropriate thresholds for the monitoring outcomes and conclusions for the five years of monitoring data (see section V, Definitions of Thresholds/Triggers for Potential Monitoring Outcomes and Conclusions).

V. Definition of Thresholds/Triggers for Potential Monitoring Outcomes and Conclusions

Effective PDM requires timely evaluation of data and responsiveness to observed trends. In order to assure timely response to observed trends, it is necessary to identify possible outcomes

from monitoring that could be anticipated and general approaches for responding to these scenarios.

After a period of five years of monitoring, all years of data will be analyzed for trend information and factors that may be influencing population trend (e.g., precipitation and herbivory). From this analysis, it will be possible to categorize observations into one of the following four possible PDM outcomes (which are summarized in Table 2):

A. Category I:

Colorado butterfly plant remains secure without Act protections.

This would be true if:

(1) The population trend for all five monitored populations is stable, increasing, or negligibly declining (<50 percent decline) over five years;

and

(2) No new or increasing stressors to the species are observed.

For this category, the PDM would be concluded at the end of the five-year timeframe specified in this plan.

B. Category II:

The Colorado butterfly plant species may be less secure than anticipated at the time of delisting, but information does not indicate that the species meets the definition of threatened or endangered.

This would be true if:

(1) The population trends for one or two of the five monitored populations are substantially negative (>50 percent decline) over five years, but may be correlated with precipitation, or insect herbivory levels;

and

(2) The population estimate for one of the monitored populations was zero for more than one non-consecutive year;

or

(3) There are new or increasing stressors that are considered to be of a magnitude and imminence that may threaten the continued existence of Colorado butterfly plant within the foreseeable future.

For this category, the PDM period will be extended for an additional three to five years, depending on the degree of decline, fluctuation, and presence of stressors, as agreed to by the Service and cooperating partners. If necessary, sampling intensity will be increased or additional populations will be monitored to provide greater precision in detecting trends. Existing data will be analyzed to determine if any management interventions are available that would be expected to reverse declines and stabilize or improve trends.

C. Category III:

The PDM yields substantial information indicating that stressors may be causing a decline in the status of Colorado butterfly plant since the time of delisting.

This would be true if:

- (1) The population trend for three or four of the five monitored populations is substantially negative (>50 percent decline) over the monitoring period (five or more years) and does not appear to be correlated with precipitation or insect herbivory levels;

and

- (2) The population estimate of one of the monitored populations was zero for two or more consecutive years;

or

- (3) There are new or increasing stressors that are contributing to substantially declining population numbers or trends in three or four of the five monitored populations.

For this category, if any one of these conditions is true, then the Service should initiate a formal status review to assess changes in the status of the species to determine whether a proposal for relisting is appropriate.

D. Category IV:

The PDM documents a decline in the species' probability of persistence, such that the species once again meets the definition of a threatened or endangered species under the Act.

This would be true if:

- (1) The population trend for all five of the monitored populations is substantially negative (>50 percent decline) over the monitoring period (five + years) and does not appear to be correlated with precipitation or insect herbivory levels;

and

- (2) The population estimate of three or more of the monitored populations was zero for two or more consecutive years;

or

- (3) There are new or increasing stressors that are contributing to substantially declining population numbers (> 50 percent decline) or trends in all five monitored populations.

For this category, the Service will begin the process to relist the species.

Table 2. Triggers and PDM outcomes for Colorado butterfly plant (COBP).

PDM Outcome	Description	Measurement 1		Measurement 2		Measurement 3	Result
Category I	COBP remains secure without Act protections.	Trend for all 5 monitored populations is stable or increasing over 5 years	A N D	No new or increasing stressors to the species are observed	O R		PDM would be concluded after 5 years
Category II	COBP may be less secure than anticipated at the time of delisting, but information does not indicate that the species meets the definition of threatened or endangered	Trends for 1 or 2 of the 5 monitored populations are negative over 5 years, but may be correlated with precipitation, or insect herbivory levels	A N D	The population estimate for 1 population was 0 for more than 1 non-consecutive year	O R	There are new or increasing stressors that are considered to be of a magnitude and imminence that may threaten the continued existence of COBP within the foreseeable future	PDM will be extended for an additional 3-5 years. If necessary, sampling intensity will be increased or additional populations will be monitored
Category III	The PDM yields substantial information indicating that stressors may be causing a decline in the status of COBP since the time of delisting	Trends for 3 or 4 of the 5 monitored populations is negative over the monitoring period (5 or more years) and does not appear to be correlated with precipitation or insect herbivory levels	A N D	The population estimate of 1 of the monitored populations was 0 for 2 or more consecutive years	O R	There are new or increasing stressors that are contributing to declining population numbers or trends in 3 or 4 of the 5 monitored populations	Service should initiate a formal status review to assess changes in the status of the species to determine whether a proposal for relisting is appropriate
Category IV	The PDM documents a decline in the species' probability of persistence, such that the species once again meets the definition of a threatened or endangered species under the Act.	The population trend for all 5 of the monitored populations is negative over the monitoring period (5 + years) and does not appear to be correlated with precipitation or insect herbivory levels	A N D	The population estimate of 2 or more of the monitored populations was 0 for 2 or more consecutive years	O R	There are new or increasing stressors that are contributing to declining population numbers or trends in all five monitored populations	Service will begin the process to relist the species.

VI. Estimated Funding Requirements and Sources

Field work for annual monitoring is estimated at approximately (5 populations)(5 people each)(4 hours each population) = 100 person hours per year, which is approximately \$4,800 per year, plus transportation.

Data entry, analysis, and report writing is estimated at approximately 40 person/hours per year (\$1,920). Table 3 provides an estimate of costs for monitoring activities.

Table 3. Estimated Costs for Monitoring Activities (over 5 years)¹.

Action	Cost per year	Over 5 years	Service contribution
Conduct Population Trend Monitoring Studies	\$4,800	5 years	\$24,000
Data Entry, analysis and Report Writing	\$1,920	5 years	\$9,600
TOTAL	\$6,720	5 years	\$33,600

VII. Post-delisting Monitoring Implementation Schedule

Table 4 provides a timeline for implementation of the monitoring plan.

Table 4. Monitoring Implementation Timeline.

Action	FY19	FY 20	FY21	FY22	FY23
Conduct Population Trend Monitoring Studies					
Database Maintenance and Report Writing					
Analyze Cumulative Data and Produce Final Report					

¹ This represents an estimate of costs at the time of this writing and may be subject to change. All actions are funding dependent. If the Service is unable to provide funding for the monitoring program and no monitoring occurs, the status of Colorado butterfly plant will need to be re-evaluated after five years to determine if re-listing is necessary.

VIII. Literature Cited

Colorado Natural Heritage Program. 2004. Conservation and management plan for Colorado butterfly plant and Preble's meadow jumping mouse on F.E. Warren Air Force Base. Prepared by Colorado Natural Heritage Program, Fort Collins, Colorado for F. E. Warren Air Force Base, Wyoming. 79 pp. + Appendices.

Heidel, B., J. Handley and D. Tuthill. 2017. 29-year population trends of Colorado butterfly plant (*Oenothera coloradensis*; Onagraceae), a short-lived riparian species on F.E. Warren Air Force Base, Laramie County, Wyoming. Prepared for U.S. Fish and Wildlife Service and F.E. Warren Air Force Base by the Wyoming Natural Diversity Database (University of Wyoming), Laramie, WY. 26 pp.

U.S. Fish and Wildlife Service (USFWS). 2016. Species biological report for Colorado butterfly plant (*Oenothera coloradensis*; formerly *Gaura neomexicana* subsp. *coloradensis*). Prepared by Julie Reeves of the Wyoming Ecological Services Field Office, Cheyenne, WY. 49 pp. + appendix.

IX. Signature Approval

[Will be added in final document.]

Appendix A. Responses to Public Comments

[No public comments at this time.]

Appendix B. Data Collection Form
Site Visit Account Form (SVA Form) Example for Colorado butterfly plant PDM

Date	
Time begin	
Time end	
Site Name	
State, County	
Township(s), Range(s), Section(s)	
Surveyor's Name	Surveyor's Agency
GPS unit(s) used	
GPS file name(s)	
Description of population vigor (density, health, overall wellbeing)	
Total number of reproductive plants counted	

Stressor Quantification	0 not affecting	1 1%-10% of population impacted	2 11%-44% of population impacted	3 45%-65% of population impacted	4 66-99% of population impacted	5 100% of population impacted
Herbivory (ungulate)						
Herbivory (insect)						
Hail						
Flood						
Human disturbance						

Description of habitat, current land use, recent stochastic events, evidence of human disturbance, and/or other relevant location information:
