DRAFT RECOVERY PLAN FOR
JONES CYCLADENIA
(*CYCLADENIA HUMILIS VAR. JONESII*)

Photo credit Daniela Roth, USFWS

Mountain-Prairie Region
U.S. Fish and Wildlife Service
Interior Region 7
Denver, Colorado

July 2020 - Draft Recovery Plan

Draft Approved_____ MATTHEW HOGAN Digitally signed by MATTHEW HOGAN Date: 2020.09.09 05:48:36 -06'00' **Date**_____

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This recovery plan can be downloaded free of charge from the U.S. Fish and Wildlife Service website: *https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=3336*

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I. INTRODUCTION

Jones cycladenia (*Cycladenia humilis* var. *jonesii*) is a long-lived, herbaceous plant endemic to the Colorado Plateau in Utah and Arizona. Jones cycladenia are 11–36 centimeters (cm) (4.33–14.17 inches (in.)) tall with hairless stems and leaves that are covered by a whitish or bluish waxy coating with pink flowers that bloom from mid-April to early June. The Service listed the taxon (i.e. variety or subspecies) as threatened on May 5, 1986, (51 FR 16526) under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*; hereafter Act) due to the loss and fragmentation of its habitats from off-highway vehicles (OHV) and oil, gas, and mineral exploration, including uranium mining and tar sands development. Pollinator availability, small populations, and low levels of sexual reproduction, although not considered threats in and of themselves, are vulnerabilities, present and acting on the taxon, which may exacerbate the impacts of existing threats. The Service did not designate critical habitat due to the potential for over collection and vandalism (51 FR 16526, May 5, 1986).

We prepared a biological report for Jones cycladenia (Service 2020), which summarizes the life history, ecology, and threats for the taxon. It also summarizes the plant's biological status based on an assessment of the habitat and demographic resources (factors) and conditions that the subspecies needs to maintain viability, currently and into the future. In the biological report, we considered what the taxon needs to maintain viability by characterizing the current condition of the taxon in terms of its resiliency, redundancy, and representation. Resiliency is the ability for populations to sustain in the face of stochastic events, or for populations to recover from years with low reproduction or reduced survival, and is associated with population size, growth rate, and the quality and quantity of habitats. Redundancy is the ability for the species to withstand catastrophic events, for which adaptation is unlikely, and is associated with the number and distribution of populations. Representation is the ability of a species to adapt to changes in the environment and is associated with its ecological, genetic, behavioral, and morphological diversity.

This streamlined Recovery Plan is derived from the biological report and focuses primarily on the elements required under section 4(f)(1)(B) of the Act:

(i) Objective, measurable criteria which, when met, would result in a determination, in accordance with the provisions of this section, that the species be removed from the list;

(ii) A description of such site-specific management actions as may be necessary to achieve the plan's goal for the conservation and survival of the species; and

(iii) Estimates of the time required and the cost to carry out those measures needed to achieve the plan's goal and to achieve intermediate steps toward that goal.

In cooperation with our partners, we are also preparing a recovery implementation strategy (RIS), which serves as an operational plan for stepping down the higher-level recovery actions into specific tasks, or activities. The RIS is a separate document from this Recovery Plan and can be modified as needed if monitoring reveals that expected results are not being achieved,

thereby maximizing flexibility of recovery implementation. The biological report can also be updated as needed to incorporate the latest scientific information.

To summarize, there are three documents under the Service's recovery planning and implementation (RPI) process: (1) the biological report, which provides the foundational scientific information to guide recovery planning; (2) the recovery plan (this document) which provides the recovery vision, objective and measurable recovery criteria, site-specific management actions, and estimates of time and cost; and (3) the RIS, which is the operational plan of detailed activities for recovery.

Overview of Status and Life History

The following is a brief overview of the natural history and status of Jones cycladenia, as documented in our biological report (Service 2020). Please refer to the biological report (Service 2020) for additional discussion, full analysis, and complete literature citations.

Jones cycladenia is endemic to the Colorado Plateau in Utah and Arizona. The taxon was listed as threatened on May 5, 1986 (51 FR 16526), under the Endangered Species Act (Act). Jones cycladenia is in the dogbane family (Apocynaceae) and is one of three varieties within the Sacramento waxy dogbane (*Cycladenia humilis* Benth.) species. The total population contains an estimated 3,567 individuals (79,196 stems) in 20 populations in central and southern Utah (Emery, Grand, Garfield, San Juan, and Kane Counties) and northern Arizona (Mohave County)[1]. These populations are organized geographically into four recovery units for the taxon: San Rafael Swell, Greater Circle Cliffs, Moab, and Pipe Spring recovery units. The following map shows the current range of Jones cycladenia, locations of the four recovery units, and the Joe Hutch Creek population on Tribal lands not in a recovery unit (Figure 1).

Jones cycladenia occurs between 4,000–6,660 feet (ft) (1,220–2,030 meters (m)) in elevation and typically grows on steep slopes. The taxon appears to be restricted to gypsiferous (high gypsum content), saline soils of the Wasatch, Cutler, Summerville, and Chinle formations. This soil is easily degraded, highly erodible, and difficult to rehabilitate after disturbances. Jones cycladenia is found in sparsely vegetated plant communities of mixed desert scrub, juniper, or wild buckwheat-Mormon tea. Jones cycladenia is a clonally reproducing (reproduces asexually by underground rhizomes), long-lived perennial plant and is believed to be a relic of the Tertiary period (66–2.6 million years ago). Individual plants (genets) may have several to a hundred stems (ramets) that occur above-ground. Sexual reproduction occurs infrequently and may be depressed because of the taxon's small population size, a limited gene pool, and potential loss of specialist pollinators. While flowers and seed pods are commonly observed, no seedlings have been documented in the wild.

[1] This document will refer to sites, which are individual areas of occupation within a population that contain one or more Jones cycladenia stems (ramets).

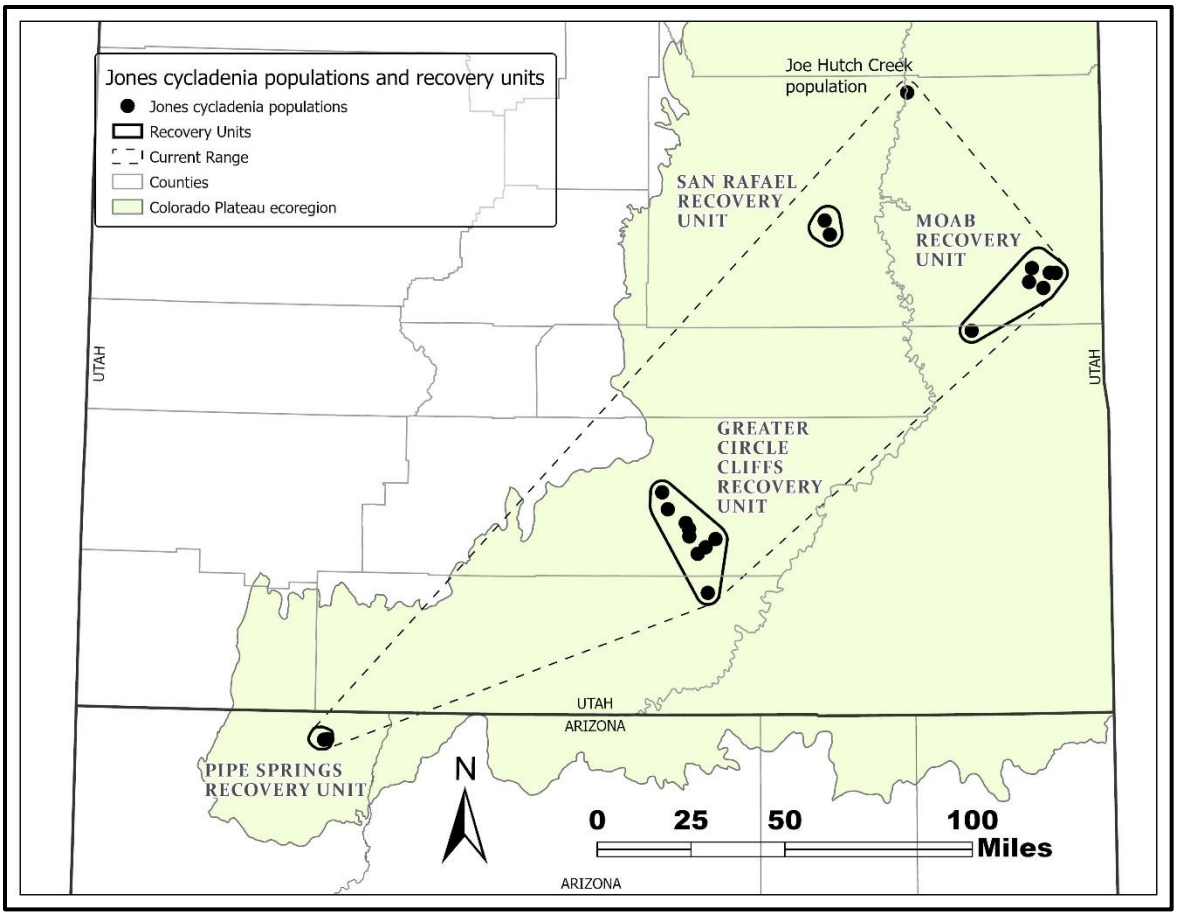

Figure 1. Jones Cycladenia's current distribution and range within the Colorado Plateau ecoregion in Utah and Arizona, four recovery units (San Rafael, Moab, Greater Circle Cliffs, and Pipe Springs) and the Joe Hutch Creek population.

Threats to Jones cycladenia are energy (oil, natural gas, tar sands) and mineral development. Pollinator availability, small populations, and low levels of sexual reproduction, although not considered threats in and of themselves, are vulnerabilities, present and acting on the taxon, which may exacerbate the impacts of existing threats. Climate change is not a threat to Jones cycladenia at this time and we do not have enough information to determine whether it will become a threat in the future.

Recovery Vision

Our recovery vision is the conservation and survival of Jones cycladenia. Recovery would be signified by four (redundant) and persistent (resilient) recovery units across the taxon's range. Recruitment over time would equal or exceed the loss of individuals and ecological and genetic diversity would be maintained (representation). Each recovery unit would include multiple populations of Jones cycladenia. These conditions provide sufficient resiliency, redundancy, and representation.

Recovery Strategy

Jones cycladenia appears to have a high level of redundancy across its range (Service 2020, p. 36). Sixty sites are grouped into 20 populations and are widely spread across the taxon's range throughout the Colorado Plateau ecoregion in Utah and Arizona. We grouped these 20 populations into four recovery units based on geographic location: San Rafael Swell, Greater Circle Cliffs, Moab, and Pipe Spring. Jones cycladenia also maintains a high level of genetic diversity (representation) compared to the two other varieties of *Cycladenia humilis*, with genetic variation distributed among the 20 populations. Populations vary in resiliency; however, overall, the taxon appears to have medium resiliency due to the taxon's inherent vulnerabilities (pollinator availability, small populations and low levels of sexual reproduction).

Although not currently affecting its viability, future energy and mineral development could affect the resiliency, redundancy, and representation of Jones cycladenia. A large percentage of the overall range, across the four recovery units and 20 populations, occurs on Federal lands that are open to energy and mineral development. Given its inherent vulnerabilities to habitat loss from surface disturbance and development, the future resiliency of the taxon could drop from moderate to low condition if energy and mineral development increases. The likelihood of future development is uncertain; it is largely dependent on market prices, which are currently low. If energy and mineral development increases significantly in the future, the loss of individual plants could lead to the loss of any of the 20 populations, which would reduce representation and redundancy for the taxon. Therefore, recovery of Jones cycladenia requires additional habitat protections from surface disturbance and development activities in order to maintain or increase the resiliency of populations and maintain redundancy and representation across the overall range.

Due to the future threat of energy and mineral development, the recovery strategy for Jones cycladenia will focus on conserving known populations, primarily by protecting its habitat. This will improve the resiliency of populations and ensure that the currently high levels of redundancy and representation are maintained. We will also seek to locate additional populations, which could improve redundancy and representation, document any resultant changes in the taxon's range, and conduct research to address biological uncertainties and improve the taxon's ability to achieve recovery. This recovery strategy will require that we:

- Maintain a representative distribution of Jones cycladenia to the extent practicable throughout its current range;
- Effectively manage Jones cycladenia and its habitat, taking into account environmental changes and new information;
- Monitor population trends, emerging stressors and threats to the taxon, and the effectiveness of conservation measures;
- Ensure that *ex-situ* (off-site) measures are in place to minimize extinction risk and loss of genetic diversity from population declines or catastrophic events; and
- Engage partners in the commitment to the conservation and recovery of Jones cycladenia.

II. RECOVERY CRITERIA

Delisting Criteria

The following recovery criteria for delisting, when met, would indicate that Jones cycladenia may no longer need the protections of the Act:

1. The San Rafael Swell, Greater Circle Cliffs, Moab, and Pipe Spring recovery units each maintain stable or increasing population growth rates (lambda equal to or greater than 1) and evidence of viable seed production (seeds with mature embryos) over a consecutive 10-year period. Population growth rates will be assessed using a population viability analysis based on measures of plant abundance (measured by the number of stems (ramets)).

    a. Plant abundance may annually fluctuate within sites and populations, but each recovery unit should be stable or increasing over the consecutive 10-year time period.

    b. Evidence of viable seed production, as measured by the documented presence of at least one seed in the wild with a mature embryo, at least once during the consecutive 10-year period for each recovery unit.

    Justification: A consecutive 10-year period of stable or increasing population growth rates accounts for variability in the timing and extent of rainfall that occurs in the taxon's range, and for other stochastic events and stressors. The 10 year period will capture current cycles of dry and wet periods while encompassing variability in other stressors. The presence of viable seeds serves as a proxy for the sexual recruitment potential of the taxon because it is not possible to non-destructively distinguish between seedling recruitment and clonal recruitment in the field. Evidence of viable seeds would indicate that the taxon is able to sexually reproduce, which is needed to maintain the current levels of genetic diversity important to the taxon's representation.

2. The estimated, range-wide total population size maintains or exceeds 3,400 individuals (genets) (approximately 75,480 stems (ramets)) for at least 5 consecutive years.

    Justification: Our population target is based on best available information for the species including: life history characteristics, population trend, and expert opinion. A consecutive 5-year minimum period is needed to calculate a population mean and confidence interval estimate for the population target (Elzinga *et al.* 1998).

3. Each of the four recovery units (San Rafael Swell, Greater Circle Cliffs, Moab, and Pipe Spring) have regulatory mechanisms or conservation plans in place that address habitat loss and degradation from energy and mineral development. Regulatory mechanisms or conservation plans should provide protections for the five medium and large populations of Jones cycladenia and small populations, as needed, to meet the population trend and abundance targets identified in criteria 1 and 2.

a. These regulatory mechanisms and conservation plans may include no surface occupancy (NSO), controlled surface use (CSU), and closed stipulations for fluid mineral leasing; mineral withdrawals; Area of Environmental Concern (ACEC) designation; long-term management agreements, conservation agreements, or memoranda of understanding (MOU) in accordance with their authorities. Protections should be applied to the entire population area. The priority area for energy development protections is the San Rafael Swell recovery unit. The priority areas for mineral development protections are the San Rafael Swell and Moab recovery units.

Justification: Regulatory mechanisms and conservation plans will provide future protection to each of the recovery units from habitat loss and degradation due to energy and mineral development.

4. Each of the four recovery units (San Rafael Swell, Greater Circle Cliffs, Moab, and Pipe Spring) are represented in an *ex-situ* (off-site) seed or tissue collection to preserve the genetic diversity (or representation) of Jones cycladenia and provide added protection from potential stochastic events. *Ex-situ* collections should represent at least 75 percent of the genetic diversity, as measured by the number of unique alleles, represented in the recovery unit.

   Justification: Having off-site preservation of Jones cycladenia will help preserve the representation and adaptive capacity of the taxon. This criterion provides additional redundancy to enable the taxon to withstand catastrophic (unpredictable and highly consequential) events for which adaptation is unlikely.

III. PRIORITIZED RECOVERY ACTIONS

The following is a list of prioritized actions, including site-specific management actions, that when fully implemented are expected to result in recovery of Jones cycladenia. Priority 1 actions are defined as those actions that currently available information suggests must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future. Priority 2 actions are those that must be taken to prevent a significant decline in population size or habitat quality or some other significant negative impact. Priority 3 actions are all other actions necessary to provide for full recovery of the species. The assignment of priorities does not imply that some recovery actions are of low importance, but instead implies that lower priority items may be deferred while higher priority items are being implemented. Please refer to Table 1 for a clear association among recovery actions and the threats addressed by these actions. The RIS contains the specific tasks required to implement these recovery actions.

Priority 1 Actions

1. Maintain or expand Jones cycladenia populations on Federal and State lands in all four recovery units (Criteria 1, 2, and 3).

    1.1 Develop biologically-relevant avoidance buffers and surface disturbance caps to protect plants, populations, habitat function, and seedbanks.
    1.2 Develop or improve land management plan conservation measures to reduce habitat loss and fragmentation from energy and mineral development.
    1.3 Restore habitats or develop new habitats.

2. Monitor 19 populations (excluding the Joe Hutch Creek population on Tribal lands) across all 4 recovery units, and monitor additional populations, as needed (Criteria 1 and 2).

    2.1 Determine population abundance and trends.
    2.2 Monitor quantity and quality of available habitat.
    2.3 Evaluate stressors.
    2.4 Coordinate with the Ute Tribe to determine their interest in monitoring the Joe Hutch Creek population.

Priority 2 Actions

3. Develop *ex-situ* (off site) collections of seeds and tissues to preserve Jones cycladenia's genetic diversity (representation) and provide the capability to augment existing populations or introduce new populations in the wild, if necessary. (Criterion 4).

    3.1 Select and contract with organizations to collect and preserve seeds and tissues.
    3.2 Investigate seed viability, germination requirements, and tissue propagation.

4. Conduct research into the biology and life history of Jones cycladenia. (Criteria 1, 2 and 4).

    4.1 Study pollinators and their role in seed production.

4.2 Complete genetic tracking of individuals (genets).

5. Survey for additional populations of Jones cycladenia. (Criterion 2).

5.1 Identify suitable habitat and perform surveys to inform land management and project planning, and recovery efforts.

Priority 3 Actions

6. Maintain consistency and momentum of conservation efforts for Jones cycladenia through Service communication and collaboration across jurisdictions and agencies with partners and stakeholders. (Criteria 1, 2, 3, and 4).

6.1 Conduct meetings (virtual or in-person as appropriate) a minimum of twice yearly.
6.2 Complete and share annual status report with partners.

7. Develop and implement a range-wide strategy for population augmentation and/or introductions, if necessary. (Criteria 1 and 2).

7.1 This action will be considered if populations decline or loss has occurred.

The relationship between threats to Jones cycladenia, delisting criteria, and recovery actions is summarized in the following table (Table 1).

Table 1. Factors affecting the survival of Jones cycladenia, delisting criteria, and associated recovery actions.

Listing Factors under the Act	Description	Delisting Criteria	Recovery Actions
Factor A The present or threatened destruction, modification, or curtailment of its habitat or range	Future Energy and Mineral Development	1, 2, 3, 4	1, 2, 6
	Pollinator availability	1	1
	Small populations	1, 2, 4	1, 2, 3, 4, 5, 7
	Low levels of sexual reproduction	1, 2	2, 4
Factor D The inadequacy of regulatory mechanisms	Regulatory mechanisms and conservation measures that reduce future impacts from energy and mineral development.	3	All

IV. ESTIMATED TIME AND COSTS TO ACHIEVE RECOVERY

We summarized the estimated time and costs to achieve recovery of Jones cycladenia (Table 2). The values in this table are derived from estimates of time and costs of actions similar to those described as recovery actions. These estimates will be described more specifically in the actions to be developed collaboratively with Federal, State, non-governmental organizations (NGOs), and local stakeholders in the Recovery Implementation Strategy (RIS). Costs include financial as well as volunteer and in-kind support. Table 2 shows only the actions to be implemented specifically for the recovery of Jones cycladenia. We estimate that the full implementation of these actions would improve the status of Jones cycladenia so that it could be delisted within 15 years following the adoption of this plan. Table 2 projects estimated costs through years 1 to 15.

Table 2. Estimated Recovery Cost by Recovery Action and Fiscal Year (in thousands).

Fiscal Year (FY)	**Recovery Action**							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**Total Cost by FY**
FY01	235	132	62	135	30	8	15	**617**
FY02	235	67	60	60	15	8	50	**495**
FY03	235	67	60	60	15	8	50	**495**
FY04	235	67	60	25	15	8	50	**460**
FY05	235	67	60	25	30	8	15	**440**
FY06-15	3,050	670	100	2	150	80	60	**4,110**
Total Cost by Recovery Action	**4,225**	**1,070**	**402**	**305**	**225**	**120**	**240**	**6,617**

Estimated Date of Recovery:

If the recovery actions are accomplished on schedule, full recovery of Jones cycladenia can be achieved by the year 2036. However, it should be recognized that the recovery program may change over time or the timeframe to achieve the recovery actions may take longer than expected.