

***Mimulus gemmiparus* W.A. Weber(Rocky Mountain monkeyflower)**

Species Conservation Assessment Update

Title of Assessment: *Mimulus gemmiparus* W.A. Weber(Rocky Mountain monkeyflower): A Technical Conservation Assessment, USDA Forest Service, Rocky Mountain Region

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Update Author: Karin Decker

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Update Summary: Recent survey work has greatly increased the estimated population size, and better documented occupied areas, although no new occurrences as defined by NatureServe and Heritage Program methodology have resulted. This knowledge has resulted in clarification of some management concerns. Some updated taxonomic information has been published, but this does not substantially alter the information presented in the original assessment. Genetic/demographic work on material collected from all populations is ongoing.

Distribution: New Information Provided

References: New References Provided

Taxonomic Status: New Information Provided

Agency Status: Unchanged

Other: See Below

Significance of Changes Relative to Original Assessment: Known occurrences are now better documented, and the total population number is larger than that presented in the original assessment. However, the conservation status of the species has not changed. No new management or monitoring activities are planned. A complete revision of the assessment is not warranted at this time.

Positive Findings of New or Updated Information and Their Sources

(Note: The Table A checklist attached to this update provides a summary of all sources consulted)

Source 1

Sources of information relevant to review of this Technical Conservation Assessment for updates include databases, experts, personal communications, published and unpublished literature. Positive results are discussed in detail in the Summary of Addendum to the Technical Conservation Assessment.

Summary of New Information

In the summer of 2005, David Steingraeber, Mark Beardsley and several colleagues visited all previously known occurrences of *Mimulus gemmiparus*, and documented the location (in degrees and decimal minutes, WGS84), size, and condition of populations, as well as searching for additional populations in nearby areas. This work resulted in the discovery of at least 15 new population-patches (separated from other populations by at least 30 m): 13 in Middle Saint Vrain Canyon (Roosevelt National Forest), and two in Horseshoe Park (Rocky Mountain National Park). Some of the additional patches located in RMNP may also be new, but the imprecision of the original records makes this impossible to determine. Steingraeber and Beardsley were unable

to relocate the type locality in the Fall River Road area, and the population known from the alluvial fan in Horseshoe Park was also not found.

The 2005 inventory work increased the estimated total abundance of *Mimulus gemmiparus* to more than 125,000, distributed as shown in the table below.

Steingraeber and Beardsley believe that additional occurrences are likely to be found, and recommend the following actions:

Site name	Management	Population-patches	Number of plants	Occupied area (m ²)
Middle Saint Vrain Canyon	USFS Roosevelt NF	14	14,660	68
Hankins Gulch	USFS Pike NF	1	102,000	13
Guanella Pass	USFS Pike NF	1	600	10
Horseshoe Park	NPS Rocky Mountain NP	2	3,200	38
North Inlet Trail	NPS Rocky Mountain NP	3	4,400	25
East Inlet	NPS Rocky Mountain NP	2	800	13
Staunton State Park	State of Colorado DPOR	1	73	1
Totals:		24	125,733	168

- 1) The search for additional populations should continue, especially in areas such the Middle Saint Vrain Canyon, Horseshoe Park, and the North Inlet and East Inlet drainages, where additional populations seem likely.
- 2) Efforts to minimize adverse human impacts on populations should be enhanced. For instance, we strongly recommend that the Hankins Gulch Trail, which crosses the Hankins Gulch Population in the Pike National Forest, be rerouted to the opposite side of Hankins Gulch Creek in the vicinity of the population to eliminate trampling of plants by hikers. Trails adjacent to populations in RMNP are probably less easily moved, given the more severe aspect at the sites, but such populations should be regularly monitored for signs of human disturbance.
- 3) In order to determine more definitively the sizes of populations (and whether they are highly dynamic over short time periods, as our observations suggest), fine-scale demographic sampling of populations should be undertaken, with sampling repeated several times within a growing season. Similarly, fine-scale genetic analysis of populations and patches should be undertaken to provide more definitive information on population structure and gene flow.
- 4) Given that much suitable, but currently unoccupied habitat for *M. gemmiparus* appears to exist, and that plants are easily propagated in the lab or greenhouse, *ex situ* propagation of bulbils followed by experimental planting would appear to be feasible. Such a “captive breeding”/reintroduction program could well result in the establishment of additional experimental populations at modest cost or effort.

Relevant Sections of the Conservation Assessment Affected by the Updates

Distribution and Abundance, Conservation Status, Implications and Potential Conservation Elements, Tools and Practices

Source 2

Personal communication with David A. Steingraeber, Professor, Department of Biology, Colorado State University, Fort Collins, CO.

Summary of New Information

Steingraeber and Paul Beardsley (Mark's brother, now at Idaho State Univ.) are continuing genetic analyses of populations using AFLPs (Amplified fragment length polymorphism). Their preliminary analyses show 3 clades, corresponding to: 1) RMNP (East Inlet & North Inlet) and St. Vrain populations; 2) Guanella Pass & Staunton SP populations; and 3) the Hankins Gulch population. They are currently replicating the analyses, and will be adding analyses of the "new" populations found last summer."

Relevant Sections of the Conservation Assessment Affected by the Updates

Demography, Implications and Potential Conservation Elements, Tools and practices.

Source 3

Beardsley, P.M., S.E. Schoenig, J.B. Whittall, R.G. Olmstead. 2004. Patterns of evolution in western North American *Mimulus* (Phrymaceae). *American Journal of Botany* 91:474-489.

Summary of New Information

The original assessment cited a personal communication for work in progress on a molecular phylogeny for the genus *Mimulus*. This study was published in 2004, and the analysis shows that *M. gemmiparus* is not closely related to any other *Mimulus* species, and hence does not really belong in the section (Simiolus) in which it has traditionally been classified.

Relevant Sections of the Conservation Assessment Affected by the Updates

Classification and description

Additional Unabstracted Sources – pre-Assessment

(citations pre-dating Assessment publication that were not referenced in it).

None.

Additional Unabstracted Sources – post-Assessment

(citations post-dating Assessment publication that refer to the target genus but were determined by the reviewer to contain no information requiring an update of the original assessment)

The following references are of interest in the biology and taxonomy of *Mimulus* species in general:

Beardsley P.M., and W.R. Barker. 2005. Patterns of evolution in Australian *Mimulus* and related genera (Phrymaceae similar to Scrophulariaceae): a molecular phylogeny using chloroplast and nuclear sequence data. *Australian Systematic Botany* 18:61-73.

Elder B.D., D.F. Doak. 2006. Comparing the direct and community-mediated effects of disturbance on plant population dynamics: flooding, herbivory and *Mimulus guttatus* *Journal of Ecology* 94:656-669.

Eubanks M.D., D.E. Carr, and J.F. Murphy. 2005. Variation in the response of *Mimulus guttatus* (Scrophulariaceae) to herbivore and virus attack. *Evolutionary Ecology* 19:15-27.

Hall M.C., C.J. Basten, and J.H. Willis. 2006. Pleiotropic quantitative trait loci contribute to population divergence in traits associated with life-history variation in *Mimulus guttatus*. *Genetics* 172:1829-1844.

Holeski L.M., and J.K. Kelly.2006.Mating system and the evolution of quantitative traits: An experimental study of *Mimulus guttatus*.*Evolution* 60:711-723.

Ivey C.T., and D.E. Carr.2005.Effects of herbivory and inbreeding on the pollinators and mating system of *Mimulus guttatus* (Phrymaceae). *American Journal of Botany* 92: 1641-1649.

Checklist of Sources Consulted for Updates to the *Mimulus gemmiparus* Conservation Assessment

Guidelines for Producing Updates

Sources of information relevant to review of this Technical Conservation Assessment for updates include databases, experts, personal communications, published and unpublished literature. Positive results are discussed in detail in the Summary of Addendum to the Technical Conservation Assessment.

Internet Literature Searches: The minimal search for each update consisted of Google Scholar, Federal Register, plus a minimum of three other available online literature databases. Search terms included at a minimum: species common name, genus, and recent synonyms. Other keywords were used at the discretion of the reviewer. Searches were constrained to the time beginning two years prior to publication of the Technical Conservation Assessment to the present.

Two attempts were made to contact experts and agency personnel.

Search terms used included: “*Mimulus*”, “*Mimulus gemmiparus*”, “Rocky Mountain monkeyflower”, “Weber monkey-flower”.

Table A. Sources of information consulted for updates to the Species Conservation Assessment.

Source Category	Source/ Name	Date	Results
Announcement from R2 to all FS personnel (including species list)			No announcement was made
Internet based literature databases	Google	7/10/06	No new information
	Google Scholar	7/10/06	No new sources
	Google Book Search	7/10/06	No new sources
	Federal Register	7/10/06	No new information
	CSU Library Catalog	7/10/06	No new sources
	Prospector (searches multiple university libraries in Colorado)	7/10/06	No new sources
	Web of Science	7/10/06	New information, see unabstracted references
	Agricola	7/10/06	New information, see unabstracted references
	Biological Abstracts	7/10/06	No new sources not already found by other searches
CSA Illumina! – Plant Science	7/10/06	No new sources not already found by other searches	
NatureServe affiliate program databases and personnel	Colorado Natural Heritage Program BIOTICS database, staff botanists	7/10/06	No new information
State Agency Personnel	Rob Billerbeck Colorado State Parks	7/27/06	No new information
Federal Agency Personnel	Steve Olson PSICC Botanist	8/4/06	No new information
	Steve Popovich ARNF Botanist	7/21/06	No new information
	Jeff Connor NPS	7/25/06	No new information
Primary experts	David A Steingraeber Associate Professor CSU 970-491-5115 David.Steingraeber@Colorado.State.EDUColorado	7/17/06	New information – see reference 1 and 2

Source Category	Source/ Name	Date	Results
	Paul Beardsley Assistant Professor Ph.D., University of Washington; Plant Genetics, Systematics, and Evolution, Biology Education E-mail: bearpau2@isu.edu Phone: 208-282-2164	7/20/06	New information – see reference 3
Museums and Herbaria	University of Colorado (COLO)	7/10/06	No new specimens
	Colorado State University (CS)	7/10/06	No new specimens
Internal USFS Intranet search	--	--	Not searched
Original Authors	Brenda Beatty, CDM (303) 295-1237	No response to contacts	No new information

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