

Ivey's Bladderpod

(Physaria iveyana)

Status Survey and Report 2014



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INTRODUCTION

Physaria iveyana (Iveys' bladderpod) is a long-lived perennial herb in the mustard family (Brassicaceae). It forms small ground-hugging tufts from a simple or usually sparsely and closely branched underground caudex (O'Kane *et al.* 2012). *Physaria iveyana* was recently described from two sites on the Sandia Crest in the Sandia Mountains of Bernalillo County, New Mexico (O'Kane *et al.* 2012). Management responsibility lies solely with the Sandia Ranger District of the Cibola National Forest.

Physaria iveyana is restricted to the west-facing Sandia Crest of the Sandia Mountains, where it occurs along the wind-swept barren grey limestone escarpment of the Madera Formation (O'Kane *et al.* 2012) (Figure 1). It grows from fractures in the exposed limestone or in limestone rubble surrounded by mixed conifer forest including *Pinus flexilis*, *Quercus gambelii*, *Pseudotsuga menziesii*, *Pinus ponderosa* and *Populus tremuloides* (Figure 2). Other associated species include *Allium geoyeri*, *Symphoricarpos*, *Arenaria fendleri*, *Pedicularis centranthera*, *Poa fendleri*, *Hymenoxys richardsonii*, *Erigeron vetensis*, *Achillea millefolium*, *Ribes wolfii*, *Berberis repens*, *Heuchera pulchella*, *Penstemon inflatus*, *Pseudocymopterus montanus*, *Aletes acaulis*, *Potentilla pulcherrima*, *Penstemon strictus*, *Tetraneuris acaulis*, *Trifolium dasyphyllum*, *Taraxacum officinalis*, *Verbascum thapsus*, *Oxytropis lambertii* var. *bigelovii*, *Bromus tectorum* and *Bromus inermis*.

Due to its limited known distribution and close proximity of the only two known sites to a parking lot and hiking trails, the species was described as possibly endangered (O'Kane *et al.* 2012). The goal of this status report is to provide baseline information for evaluating the species' threats and potential need for protection under the federal Endangered Species Act. The primary objective of this study was to survey suitable habitats along the Sandia Crest to determine the status, abundance, and distribution of the species and to determine the level of threat it is exposed to.

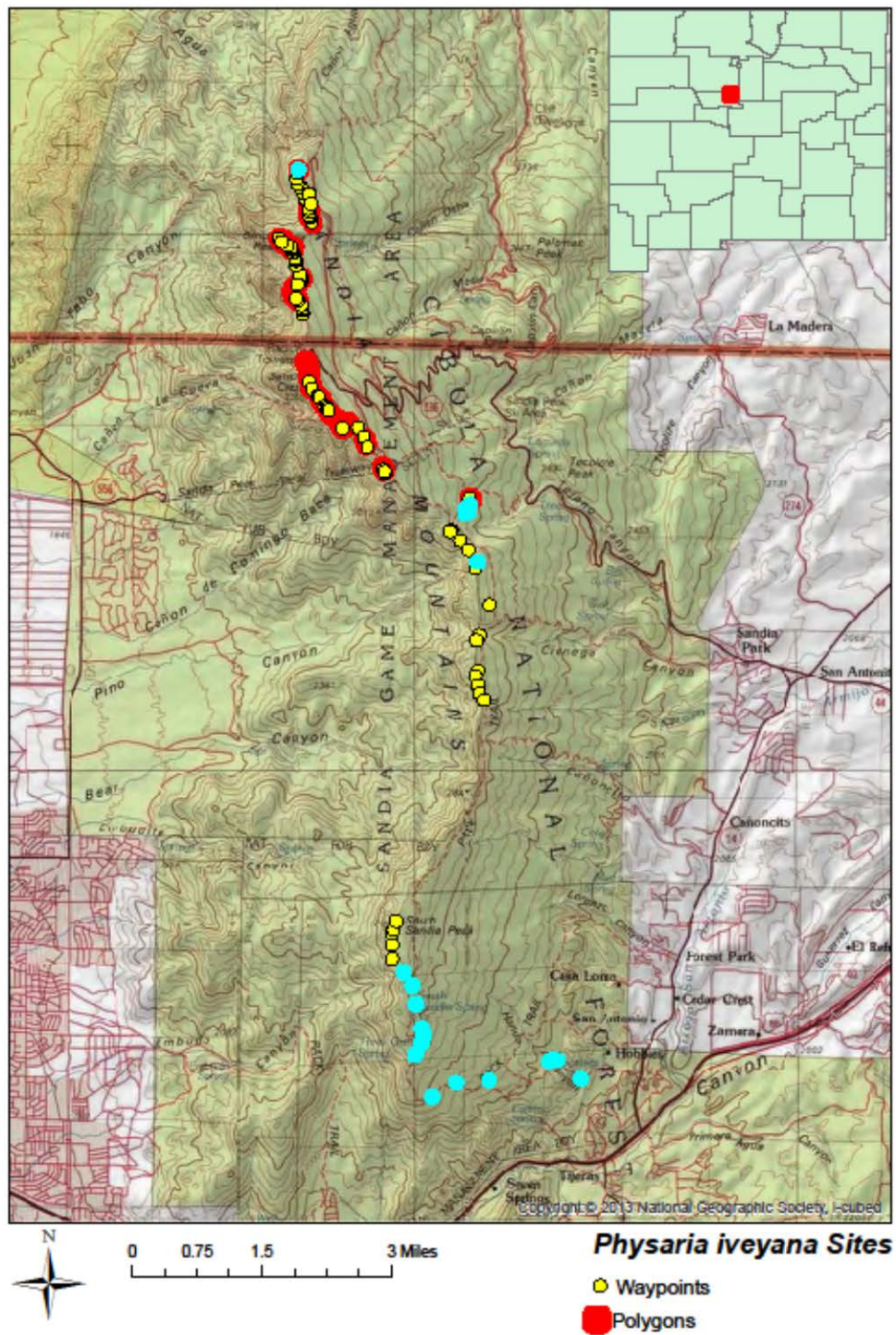


Figure 1. 2014 Distribution of *Physaria iveyana* along the Sandia Crest, Bernalillo County, NM. Blue highlighted waypoints represent sites where plants were growing in protected areas, exhibiting *Physaria pinetorum* morphology.



Figure 2. *Physaria iveyana* habitat, Sandia Crest, Bernalillo County, NM.

METHODS

Suitable habitat was surveyed by foot for approximately 15 miles along the Sandia Crest and access trails in late May and early June of 2014 (Figure 1). Survey period was timed to coincide with the flowering & fruiting period of the species to maximize detection and proper identification. Sites were documented and mapped using a hand held Garmin Montana GPS. Small sites were documented using waypoints. Plants were counted within an approximate 10m radius of each waypoint. In large occupied sites the number of plants was estimated and mapped by walking around the perimeter of a site using the Track function of the GPS and mapping polygons. Voucher specimens were collected for documentation purposes and to verify identification. Specimens were deposited at the University of New Mexico Herbarium (UNM).

RESULTS

Based on the species description, it was largely not possible to separate *Physaria iveyana* from *Physaria pinetorum* (O’Kane *et al.* 2012). The majority of plants observed, including those at the type locality had short, subumbellate infructescences and elongated infructescences, on the same plant (Figures 6 & 7). Length of infructescence appeared more of a function to environmental factors, such as wind and sun exposures. Plants grown in protected sites away from the rims tended to have longer infructescences than those grown in open, exposed areas along the rim. Therefore all plants found in the appropriate exposed habitat along the Sandia Crest with short or mixed infructescences were considered *Physaria iveyana*, although even that distinction is questionable. Plants with morphologies tending more towards *Physaria pinetorum* and growing in protected areas or away from the Crest were considered *P. pinetorum* (Figures 1 & 8).

A total of 12,476 *Physaria iveyana* plants were documented along the Sandia Crest, 11,383 were estimated to occur within the 17 mapped polygons and a total of 1,093 were mapped in the immediate vicinity of 59 mapped waypoints (Table 1, Appendix). The number of plants counted at waypoints ranged from 1 to 217 plants, the number of plants estimated within polygons ranged from 30 to 4,000 plants. The largest populations occurred between the Kiwanis Cabin (and Kiwanis Meadow) north toward the North Sandia Peak area, a linear distance of approximately 2.5 miles. Otherwise plant sites were widely scattered in small clusters on limestone outcrops along the Crest. Plants could be found reliably in most exposed limestone outcrop areas, along the Sandia Crest and along access trails.

Based on the presence of plants and suitable habitat the distribution of *Physaria iveyana* can be grouped into 2 general populations, those occurring north of Arroyo Armijo and those occurring on and south of South Sandia Peak. The populations are separated based on the unsuitability of habitat between the two. No or only minor limestone outcrops exist in the 2.5 miles along the rim between the two populations. However, there is a potential that additional plants may be found on small limestone rock outcrops between these two populations, making them essentially one. The largest sites within these 2 populations occurred in the northern population. Plants were generally in full flower (90 – 95%) and some contained developing or maturing seed pods. Plants occurred in disturbed and undisturbed areas, always in association with limestone outcrops.

Table 1. Summary of the largest population sites of *Physaria iveyana* along the Sandia Crest, Bernalillo County, NM.

Track Name	Number of Plants	Threats	Comments
Phyive-1-5-27-14	1090	<i>Bromus inermis</i> , trampling, erosion	Sandia Crest visitor & parking area; type locality
Phyive-2-5-27-14	1437	<i>Bromus inermis</i> , <i>Taraxacum officinale</i> , trampling, erosion, infrastructure maintenance and development	Radio towers
Phyive-3-5-27-14	275	Some <i>Bromus inermis</i>	
Phyive-4-5-27-14	1500	Trail, campsite	
Phyive-5-5-28-14	200	Trail	
Phyive-6-5-28-14	250	<i>Taraxacum officinale</i> , trail	
Phyive-7-5-28-14	130	none	
Phyive-8-5-28-14	200	trail	
Phyive-9-5-28-14	100	trail	
Phyive-10-5-28-14	30	trail	
Phyive-11-5-28-14	300	trail	
Phyive-12-5-28-14	75	trail	
Phyive-14-5-28-14	300	none	
Phyive-16-5-29-14	102	<i>Bromus inermis</i> , trail, trampling	Trail to Kiwanis Cabin
Phyive-18-5-29-14	4000	<i>Bromus inermis</i> , trail, trampling	Trail to Kiwanis Cabin, Kiwanis Cabin area, Kiwanis Meadow
Phyive-19-5-29-14	725	<i>Bromus inermis</i> , trail, trampling	
Phyive-20-5-29-14	669	Trampling	Sandia Tramway, ski lifts
Total	11,383		

Infrastructure development/Trailing/Trampling

Physaria iveyana has been impacted by infrastructure development and is currently impacted by maintenance activities and trampling by visitors along the Sandia Crest. The largest occupied sites occur at or near heavily impacted areas, including the Sandia Crest visitor and parking area, the radio communications facilities, the Sandia Tramway terminal and ski lift area, and the Kiwanis Cabin and trails between these sites. Its presence alongside buildings, underneath radio towers and informational signs, and in areas heavily impacted by foot traffic indicates that it can tolerate a certain amount of ground disturbance (Figures 3 & 4). However, it does not appear to be able to tolerate compacted soils associated with trailing, trampling, and associated erosion (Figure 3 & 4).

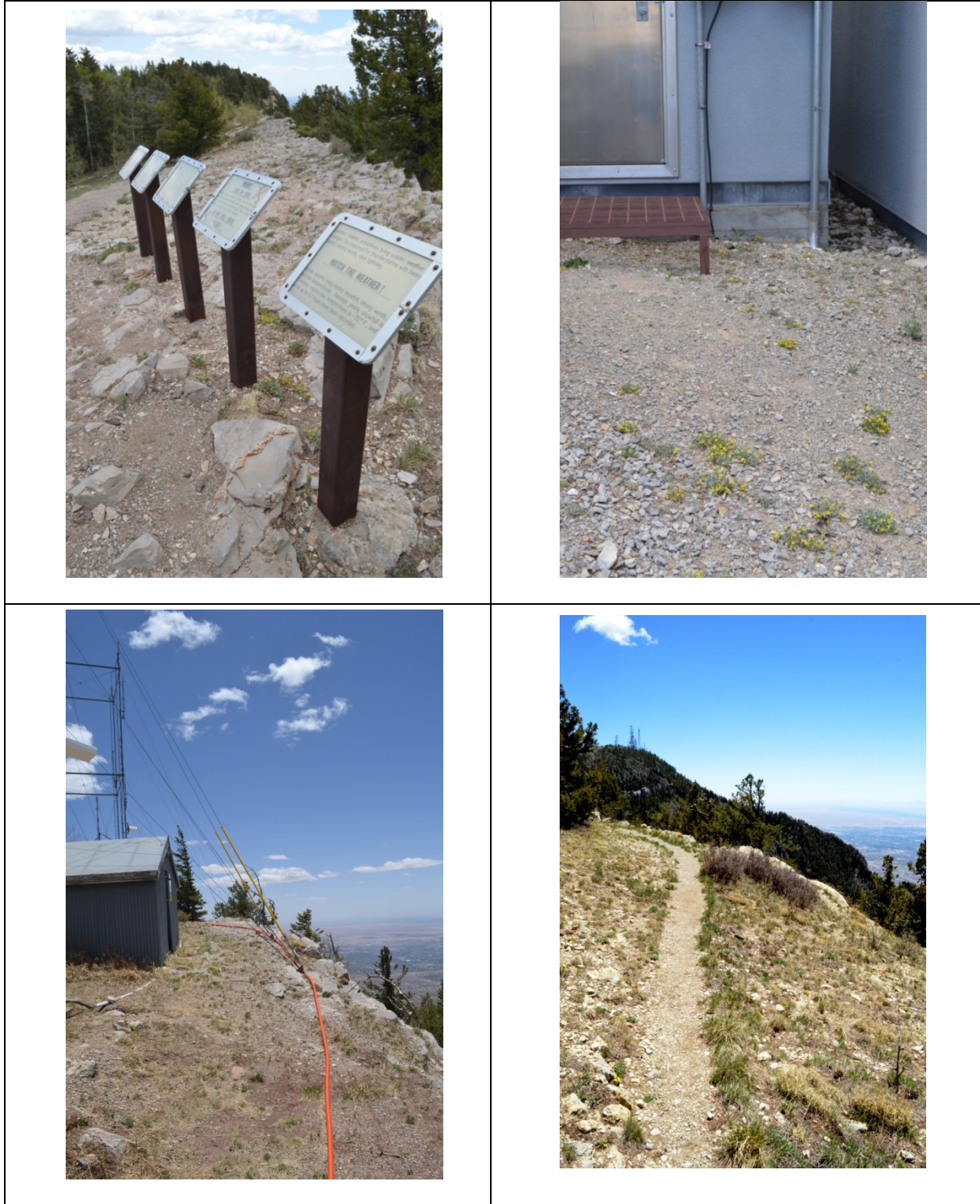


Figure 3. Disturbed sites with *Physaria iveyana* along the Sandia Crest, Bernalillo County, NM.



Figure 4. Type locality of *Physaria iveyana*, erosion caused by trailing and trampling of visitors, Sandia Crest, Bernalillo County, NM.

Invasive Species

The primary invasive species in the habitat of *Physaria iveyana* is smooth brome (*Bromus inermis*), a perennial grass native to Europe. At the type locality and several other sites between the Sandia Crest parking lot and the Kiwanis Cabin, *Physaria iveyana* co-occurs with smooth brome (Figure 5). It has been widely planted by the Forest Service for erosion control and rehabilitation purposes. It is an aggressive invader and reproduces vegetatively through horizontal stems growing below the soil surface. It readily outcompetes native grasses and forbs, including *P. iveyana*, which was largely absent from areas of heavy infestation, including the type locality, where it was likely planted for erosion control (Figure 5). Other invasive non-native species observed in the habitat of *Physaria iveyana* include dandelion (*Taraxacum officinale*), mullein (*Verbascum thapsus*), and cheatgrass (*Bromus tectorum*). These were only documented in low densities. Invasive species were largely confined to areas surrounding parking lots, along trails, roads, and buildings. Smooth brome was scattered within a ½ mile of the developed areas and was apparently planted in Kiwanis Meadow.



Figure 5. Type locality of *Physaria iveyana*, largely invaded by smooth brome (*Bromus inermis*), Sandia Crest, Bernalillo County, NM.

Browsing

Physaria iveyana does not appear to be browsed by wildlife. No browsed plants were observed.

DISCUSSION

According to the species description, *Physaria iveyana* differs from *P. pinetorum* in that it has subumbellate infructescences (rather than obviously racemose) that do not elongate (rather than elongate) and that do not or only barely exceed (rather than exceed) the basal leaves, forms dense rock-hugging tufts (rather than forming looser tufts), and occurs at a higher elevation and in a more extreme wind-swept habitat (rather than occurring generally below 9,500 ft elevation in more protected spots) (O’Kane *et al.* 2012).

Based on this description, it was largely not possible to separate *Physaria iveyana* from *Physaria pinetorum*. The majority of plants observed, including those at the type locality had short, subumbellate infructescences and elongated infructescences, on the same plant (Figure 7). Length of infructescence appeared more of a function to environmental factors, such as wind and sun exposures. Plants grown in protected sites away from the rims tended to have longer infructescences than those grown in open, exposed areas along the rim. Plants resembling the described morphology of *P. pinetorum* were found on limestone outcrops away from the immediate high exposure vicinity from the Sandia Crest and along the trails away from the Crest among limestone rock outcrops, including sites well above 9,500 ft (Figure 8). A population of

P. pinetorum along the Blue Ribbon Trail in the Manzano Mts immediately to the south was visited as a reference population for *P. pinetorum*. Although plants at this lower elevation site were generally more typical for *P. pinetorum*, exhibiting long, upright infructescences exceeding the leaves, mixed plants with short and long infructescences were found on the same plant (D. Roth 2416).



Figure 6. Typical *Physaria iveyana* morphology at the type locality, Sandia Crest, Bernalillo County, NM.



Figure 7. Variation of infructescence length of at the Sandia Crest, Bernalillo County, NM.



Figure 8. *Physaria pinetorum* growing in a protected area at 9,800ft on the Sandia Crest.

Based on these observations, *Physaria iveyana* is not likely a valid taxon, but an environmentally induced phenotype of *Physaria pinetorum*. Molecular analysis is currently underway (O’Kane *et al.* 2012, O’Kane pers. com. 2015). Results of this analysis will clarify the uncertainty of the taxon’s current status.

Although many plants were found in disturbed areas and the species appears to have a high degree of tolerance to these disturbances, it is not clear whether these disturbances are merely tolerated, or may be improving habitat conditions by reducing competition with other, more aggressive species. *Physaria iveyana* is able to tolerate extreme environmental conditions, likely enabling it to thrive in sites disturbed by human activities, at least to a certain degree. However, management of high impact areas, such as the type locality, may benefit the species by improving habitat conditions.

Competition with smooth brome may be the biggest threat to some of the largest population sites, including the type locality and Kiwanis Meadow. Management of these areas and avoiding additional plantings of this aggressive invader may be beneficial to the species and improve habitat conditions.

Based on our updated knowledge of the actual distribution and abundance of *Physaria iveyana* along the Sandia Crest, in combination with documenting occurrences away from human disturbances, it is not believed that the species is threatened or endangered with extinction. However, if *Physaria iveyana* is a distinct species, it remains a rare species with a very limited distribution. Pending clarification of the taxonomic status of the species, the species should be managed as a sensitive species and therefore considered during environmental project reviews.

LITERATURE CITED

O’Kane, S.L. Jr., K.N. Smith, and K. A. Arp. 2012. *Physaria iveyana* (Brassicaceae), a new species from the Sandia Mountains, New Mexico. *Phytoneuron* 2012-53:1-6

APPENDIX

Waypoint Name	Number of Plants	Waypoint Name	Number of Plants
Phyive71	50	Phyive55	10
Phyive72	10	Phyive56	10
Phyive73	10	Phyive58	21
Phyive74	20	Phyive59	10
Phyive74	5	Phyive60	3
Phyive75	5	Phyive61	12
Phyive3	6	Phyive62	25
Phyive4	15	Phyive63	2
Phyive5	13	Phyive63	6
Phyive6	5	Phyive63	3
Phyive9	17	Phyive64	25
Phyive10	200	Phyive65	25
Phyive11	10	Phyive66	3
Phyive12	3	Phyive67	5
Phyive13	10	Phyive68	1
Phyive14	8	Phyive69	3
Phyive15	5		
Phyive16	20		
Phyive17	8		
Phyive18	16		
Phyive19	3		
Phyive20	5		
Phyive21	25		
Phyive22	8		
Phyive28	11		
Phyive29	7		
Phyive31	30		
Phyive33	1		
Phyive33b	5		
Phyive34	5		
Phyive35	3		
Phyive36	3		
Phyive37	4		
Phyive38	13		
Phyive39	9		
Phyive41	4		
Phyive42	6		
Phyive43	25		
Phyive45	37		
Phyive47	4		
Phyive48	58		
Phyive51	10		
Phyive53	217		

