

2019
STATUS REPORT
NEW MEXICO

Zuni Fleabane (Erigeron rhizomatus)



DANIELA ROTH
EMNRD-Forestry Division
Santa Fe, NM
for the
USFWS, Region 2
Albuquerque, NM

INTRODUCTION



Zuni fleabane (*Erigeron rhizomatus* Cronquist) is a rare regional endemic plant that is listed threatened under the federal Endangered Species Act (50 FR 16680-16682). It is also listed endangered by the State of New Mexico (NMAC 19.21.2). Zuni fleabane is known from three widely scattered population centers: two in western New Mexico (Figure 1) and one on Navajo Nation lands in northeastern Arizona. The largest and southernmost population occurs in the Sawtooth and Datil mountains of northern Catron County (Datil/Sawtooth meta-population). There are two small populations in the Zuni Mountains of McKinley County (Zuni meta-population). The majority of the known New Mexico locations occur on lands managed by the Cibola National Forest. One location is known from BLM lands, in the Sawtooth Mountains.

The Zuni fleabane recovery plan (USFWS 1988) and 5-year review (USFWS 2007) identify the greatest potential threat to this species as uranium exploration and mine development. Although uranium mining remains an active threat, the 2014 status report listed prolonged drought as the primary threat to the species and the likely main cause for significant documented declines (Roth & Sivinski 2014).

The purpose of this status survey was to sample a subset of sites documented in 2014 to determine the current status of the 2 New Mexico meta-populations and to test a suitable habitat model developed by the NM Natural Heritage Program in 2018 with the aim of finding previously unknown sites and habitat and expand the 2 known meta-populations (Roth & Sivinski 2014; Leonard & Muldavin 2018). In addition, the survey evaluated individual sites of occupied habitat patches for suitability for population trend monitoring, based on a monitoring plan developed in coordination with the Navajo Natural Heritage Program to provide data collection standards across the entire range of the species.

Previous Surveys

Sivinski and Lightfoot estimated of the population size at 19 locations in the Datil/Sawtooth mountain region in 1991 (Sivinski and Lightfoot 1991). The Datil/Sawtooth metapopulation was estimated at > 12,500 plants distributed in 19 sites. These estimates did not count individual plants in the larger populations and were estimates of relative abundance after walking through suitable habitats. In 1994 the two sites within the Zuni meta-population were estimated to contain 1,300 plants (Sivinski 1994). Sivinski also visited the two Zuni Mountains sites and the 19 Datil/Sawtooth locations in 1999 and 2004 (Sivinski 1999 & 2004). No additional population estimates were made during these visits, but during both surveys all visited sites were considered identical to their conditions in 1991. Except for the BLM Sawtooth ACEC population, additional sites documented in the Datil-Sawtooth meta-population after 1991 had no population estimates prior to 2014 (Roth and Sivinski 2014).

A total of 34 extant sites were documented in 2014 in the Datil/Sawtooth meta-population and two sites in the Zuni meta-population (Roth & Sivinski 2014). The total number of plants counted at all Sawtooth Datil meta-population sites was 3,089 plants. The total number of plants in the Zuni meta-population

was 306. Roth and Sivinski visited the same 19 sites in the Datil/Sawtooth Mountains and the two Zuni Mountains populations during the 2014 field survey and counted the number of individual plants. The 19 sites within the Datil/Sawtooth meta-population contained 2,300 plants in 2014, possibly documenting declines of up to 82% of the populations documented from 1991 to 2004. In addition, significantly fewer plants were found in the Zuni meta-population and the BLM Sawtooth ACEC (76 and 81% respectively). Although original methods of estimating population and survey effort may have differed, there appeared to be significantly fewer Zuni fleabane plants in 2014 than in 1991.

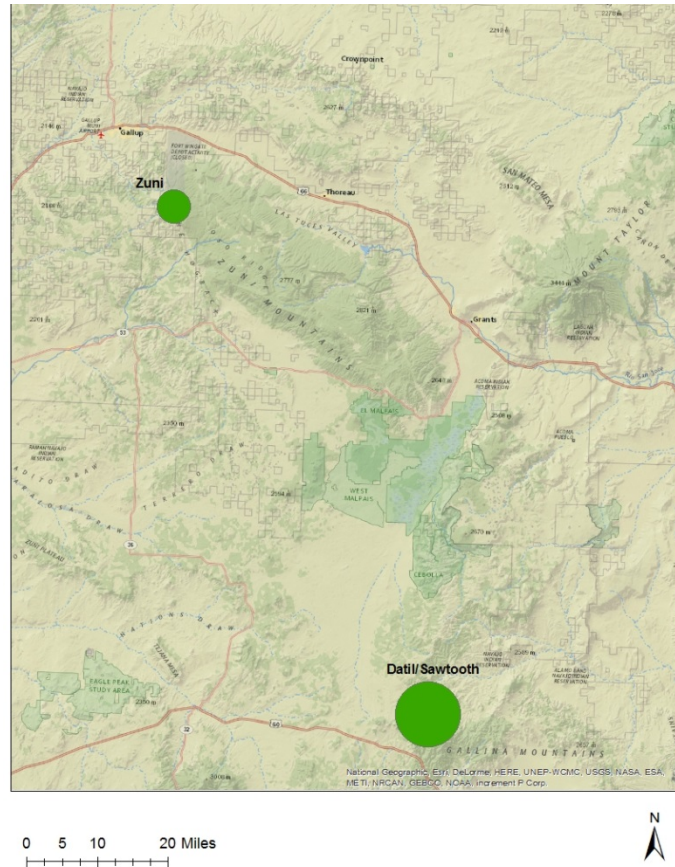


Figure 1. General location of the Zuni and Datil/Sawtooth meta-populations of Zuni fleabane in New Mexico.

METHODS

Nineteen of the 34 known locations of Zuni fleabane Datil/Sawtooth meta-population were surveyed in 2019 (58% of known sites). The 19 sites contained 148 waypoints and 2 polygons recorded in 2014 (Roth & Sivinski 2014). Locations for survey sites were randomly determined, excluding populations documented from private and BLM lands (Figure 2). Both sites containing the Zuni meta-populations were surveyed (100%). All populations were located on US Forest Service lands (Cibola National Forest). Populations were surveyed from mid-May through the end of May to determine current population size and plant vigor, and document new threats to the plants and their habitat. Locational information for 34 sites were obtained from data collected for the 2014 status report (Roth & Sivinski 2014). Potential

monitoring sites were selected to represent the entire distribution of the species in New Mexico, accessibility, and suitability to fit the monitoring protocol developed for the Chuska Mountain meta-population on the Navajo Nation (Christie & McBride, 2020, in prep.).

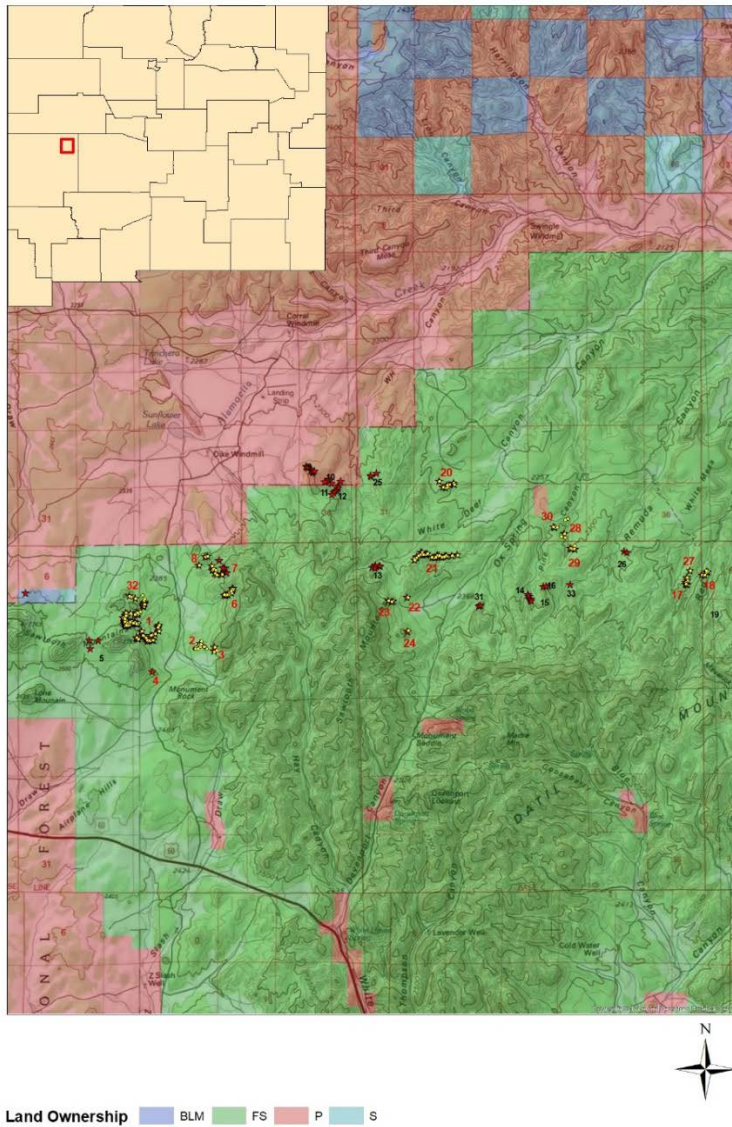


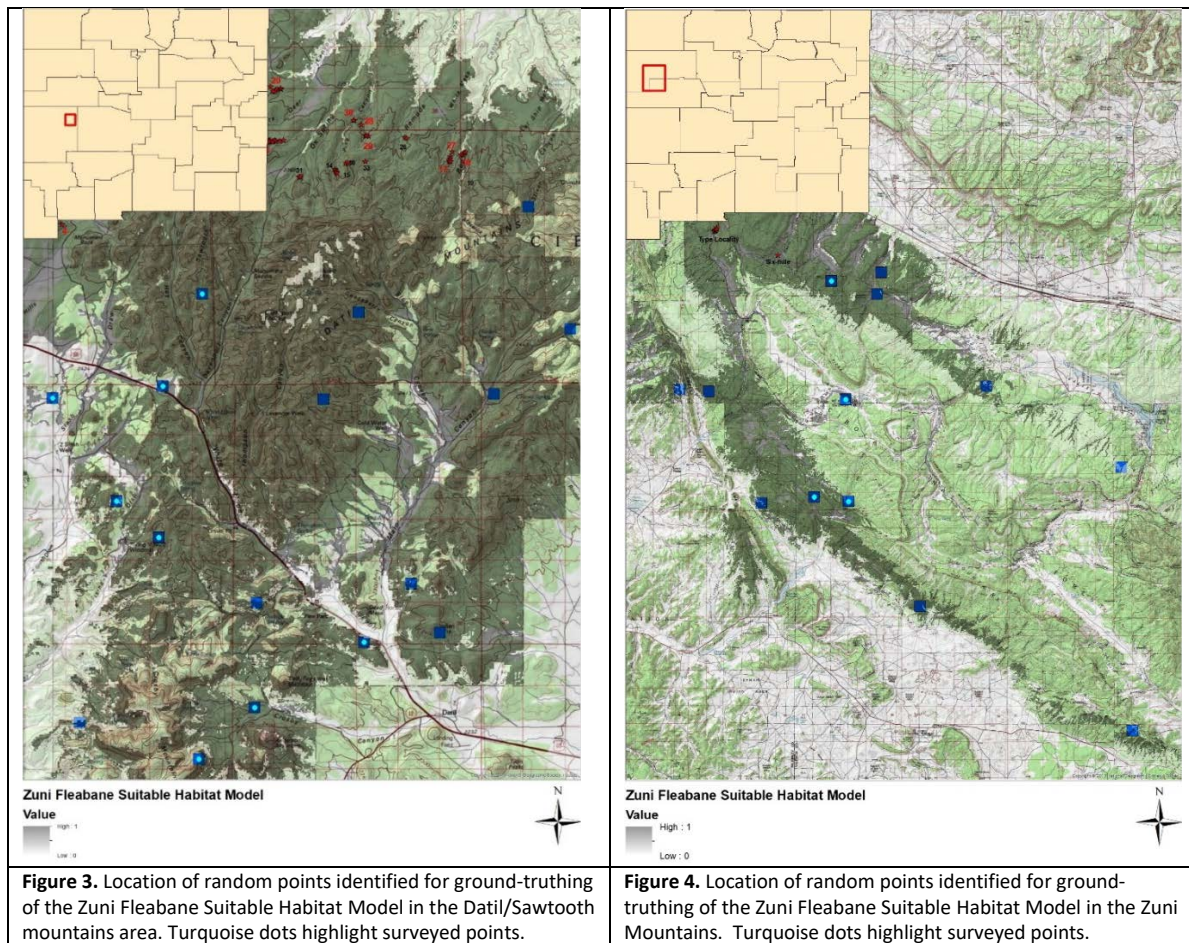
Figure 2. Locations of Zuni fleabane populations within the Datil/Sawtooth meta-population (Roth & Sivinski 2014). Red numbers and yellow stars are sites documented in 2019.

A meta-population is defined as a general geographic location composed of one to many occupied sites between which it is reasonable to assume that gene flow may occur via cross pollination. Meta-populations are separated by distance across unsuitable habitat and reasonable distance traveled by pollinators. A site is defined here as a geographically distinct location of Zuni fleabane habitat separated from other sites by unsuitable, unsurveyed, or unoccupied habitat. A site may be composed of one to many patches of occupied habitat, or waypoints.

The 2014 field surveys initially attempted to walk a polygon around the perimeter of each Zuni fleabane patch with a GPS unit to determine the area of occupied habitat (sites 1 (partial), 2 and 4). This method proved to not be regularly feasible. Plant distribution within patches of occupied habitat is scattered and discontinuous, and caprock cliffs and boulders often inhibit access to the edges of habitats. Therefore, single plants and small patches of plants were marked with GPS waypoints at the 2 meta-populations to show the extent of occupied habitat (population patches). Each waypoint usually represents the occupied habitat area containing one to several plants. Patches were separated if the nearest plants were more than 100 ft apart from one another. Rhizomatous plants are often difficult to distinguish as individuals during a population count. For this survey, we followed previous delineations used, plants were considered to be individuals if they were at least two feet from their nearest neighbor (Roth & Sivinski 2014).

Suitable Habitat Model ground truthing

Thirty random points were generated to ground-truth a suitable habitat model obtained from the NM Natural Heritage Program (Leonard & Muldavin 2018). Twenty were aimed for ground-truthing, 10 to allow for flexibility in the field, providing for potential access issues. Locations of random points were restricted to Forest Service lands, within one mile of an existing road, outside the known populations and in areas identified by the model as having the highest potential for plants to occur, based on model results (Figures 3 and 4).





RESULTS

Survey Summary 2019

Twenty-one sites were evaluated for their presence of Zuni fleabane in 2019, two in the Zuni Mountains (Zuni meta-population) and 19 in the Datil/Sawtooth meta-population. A total of 2,603 individual plants were documented in 2019 from these two New Mexico meta-populations (Appendix). Extant plants were documented at all 21 sites, containing a total of 222 waypoints, 32 of which were newly documented. No plants were found at 2 previously documented waypoints at Site 1. The majority of plants (93%) were rated in normal condition, and a few in vigorous condition (6%). Only one population patch was rated in stressed condition (Errh-st-1-32, Site1). Plant numbers at this site decreased from 48 to 11 plants in 5 years. Most plants observed were in a reproductive stage, either budding or flowering (97%). The majority of plants were budding (84%). Only a few (13%) were flowering during the survey period. In general, more plants were budding at the beginning of the survey period progressing towards more flowering plants towards the end of the survey period at the end of May. The number of plants at 150 comparable waypoints in the Datil/Sawtooth meta-population was 2,195 individuals in 2019, which is similar to the 2014 estimate (2,211 plants)(Table 1). The Zuni population declined by more than 50% since the 2014 surveys, declining from 310 individuals to 165 plants in 2019. Based on these results the Datil/Sawtooth meta-population is considered in stable condition while the Zuni meta-population is in continued significant decline.

Datil/Sawtooth Meta-population

The Datil/Sawtooth meta-population contains the largest and southern-most population of Zuni fleabane. It consists of localized outcrops of suitable habitat occupied by groups of plants ranging from less than 10 to several hundred individuals (Roth & Sivinski 2014). A total of 34 large and small sites with Zuni fleabane were documented on Forest Service and BLM lands during the 2014 field survey. Of these, 19 were randomly selected for this status review.

In 2019 the Datil/Sawtooth meta-population contained a total of 2, 438 individuals within 19 sites and 213 waypoints. Thirty-one of the documented sites were newly reported in 2019. These contained a total of 243 plants. A total of 2,211 Zuni fleabane plants were documented in 2014 from the 19 sites (150 waypoints) resurveyed in 2019 in the Datil/Sawtooth meta-population (Table 1). In 2019 2,195

individuals were documented from the previously reported waypoints. Although overall plant number were similar at the comparable 19 sites, 11 showed a declining trend, 7 sites documented increases in plant numbers, and one site had the same number of plants as recorded in 2014. The majority of plants were budding or in early flowering stage.

There were no indications of changed land use in the Datil/Sawtooth meta-population since 2014. Livestock and elk trails were the largest direct disturbance to plants and their habitat. None of the plants observed appeared browsed. No new roads were found through the habitats. Most of the existing backcountry access roads in the Datil Mountains part of the range appear primarily used by the local rancher and perhaps used during hunting season. No invasive exotic species were documented at any of the sites during the 2019 surveys.

Table 1. Comparison of population estimates for 19 sites in the Datil/Sawtooth Zuni fleabane meta-population.

Site Name	Location	Initial Observation Year	Initial Observation Size	2014 SIZE	2019 Size	Trend
1	Sawtooth Mts	1991	>5000	786	740	↓
2	Sawtooth Mts	1991	>1000	345	405	↑
3	Sawtooth Mts	1991	>200	62	54	↓
4	Sawtooth Mts	1991	9	83	122	↑
6	Sawtooth Mts	1991	>200	119	150	↑
7	Sawtooth Mts	1991	>2000	123	159	↑
8	Sawtooth Mts	1991	>1000	26	16	↓
17	Datil Mts	1991	10	77	40	↓
18	Datil Mts	1991	>50	85	72	↓
20	Datil Mts	2009	N/A	49	77	↑
21	Datil Mts	pre-1991	N/A	224	197	↓
22	Datil Mts	pre-1991	N/A	6	4	↓
23	Datil Mts	pre-1991	N/A	55	42	↓
24	Datil Mts	pre-1991	N/A	21	5	↓
27	Datil Mts	2014		18	22	↑
28	Datil Mts	2014		6	6	—
29	Datil Mts	pre-1991	N/A	56	35	↓
30	Datil Mts	pre-1991	N/A	58	31	↓
32	Sawtooth Mts	pre-1991	N/A	12	18	↑
Total				2,211	2,195	

Zuni Meta-population

There are only two locations currently known in the Zuni Mountains and both are relatively small (Table 2). Both sites were surveyed in 2019. The type locality (where originally discovered) had only 143 plants distributed in 8 waypoints or population patches in 2019. One new patch was documented, containing 3 plants. The small patch of plants in Six-mile Canyon was reduced to 22 individuals. All plants were rated in normal condition and all were budding. Original 1994 estimates of the Zuni meta-population was 1,300 plants, when the type locality was estimated to contain 1,000 plants, and the Six-mile Canyon population which was estimated at 300 plants (Sivinski 1994). In 2014 only 231 and 75 plants were found at the two sites, respectively. No new land use threats were identified for the Zuni meta-population during the 2019 survey.

Table 2. Number of Zuni fleabane plants at the Zuni meta-population, from 1994 through 2019.

SITE NAME	LOCATION	No of Plants 1994	No of Plants 2014	No of Plants 2019	Trend
Type	Zuni Mts	1000	231	143	↓
Six-Mile	Zuni Mts	300	75	22	↓
Total		1300	306	165	

Habitat Model

Of the 30 random points provided, 5 were not attempted, 2 in the Datil/Sawtooth area, and 3 in the Zuni Mountains. Seven of the Datil/Sawtooth points and 6 of the Zuni points could not be accessed largely due to locked gates along access roads crossing sections of private lands. None of the remaining 12 points (8 in the Datil/Sawtooth area, 4 in the Zuni Mountains) contained actual suitable habitat for the species (Figures 3 & 4). Therefore, no new sites or habitat were documented using the suitable habitat model.

Population Trend Monitoring Sites

Twenty-one possible monitoring locations were identified within 10 of the 21 sites surveyed (Zuni/Type, 6-Mile, 1, 2, 4, 6, 20, 23, 30, 32) (Figure 5; Appendix). Regular monitoring of Zuni fleabane populations is challenging because of the steep and remote terrain, fragility of the habitat and soils, and the rhizomatous nature of the species, making it difficult to discern individuals (Figure 6). A monitoring protocol developed for the Chuska Mountain meta-population on the Navajo Nation is considered effective and feasible (Christie & McBride, 2020, in prep.). It consists of establishing up to 5 2 x 4 m permanently marked photoplots at each proposed site and estimates cover of Zuni fleabane plants within the plot using Image J or a similar image processing program. Set-up and processing should allow for close observation of population trends through time with minimum disturbance to the plants and their habitat and is not depended on an observer's interpretation of what is an individual.

Table 3. Proposed monitoring sites for Zuni fleabane on Cibola National Forest Service lands

Meta-population	Site Name	Location Name	UTM NAD 13
Zuni	Sixmile	Sixmile	-12,076,551.235 4,221,993.655
Zuni	Type	Type 1	-12,083,600.106 4,224,665.646
Zuni	Type	Type 5	-12,083,370.793 4,225,054.480
Datil/Sawtooth	6	Errh-ST-6-1	-12,019,644.157 4,073,724.892
Datil/Sawtooth	6	pop6a	-12,019,608.075 4,073,733.913
Datil/Sawtooth	6	errh-st-6-2	-12,019,700.536 4,073,733.913
Datil/Sawtooth	1	Errh-ST-1B	-12,021,927.253 4,072,653.222
Datil/Sawtooth	23	RF3A	-12,013,968.903 4,073,517.798
Datil/Sawtooth	2	Pop 2	-12,020,660.624 4,071,951.281
Datil/Sawtooth	4	POP4A	-12,022,059.744 4,071,138.479
Datil/Sawtooth	32	rf-1-2-14	-12,022,681.913 4,073,609.626
Datil/Sawtooth	1	POP1A	-12,021,895.834 4,072,699.524
Datil/Sawtooth	1	POP1C	-12,021,905.425 4,072,613.534
Datil/Sawtooth	32	rf-1-14	-12,022,886.965 4,073,689.001
Datil/Sawtooth	1	Errh-ST-1A	-12,021,899.472 4,072,708.123
Datil/Sawtooth	1	POP1B	-12,021,927.253 4,072,643.300
Datil/Sawtooth	20	errh-dr-20-19	-12,012,153.456 4,077,373.564
Datil/Sawtooth	20	Pop 20C	-12,012,089.807 4,077,466.144
Datil/Sawtooth	20	Pop 20B	-12,011,939.365 4,077,510.505
Datil/Sawtooth	20	Pop 20A	-12,011,922.007 4,077,466.144
Datil/Sawtooth	30	errh-dr-30-19	-12,008,086.997 4,076,332.295

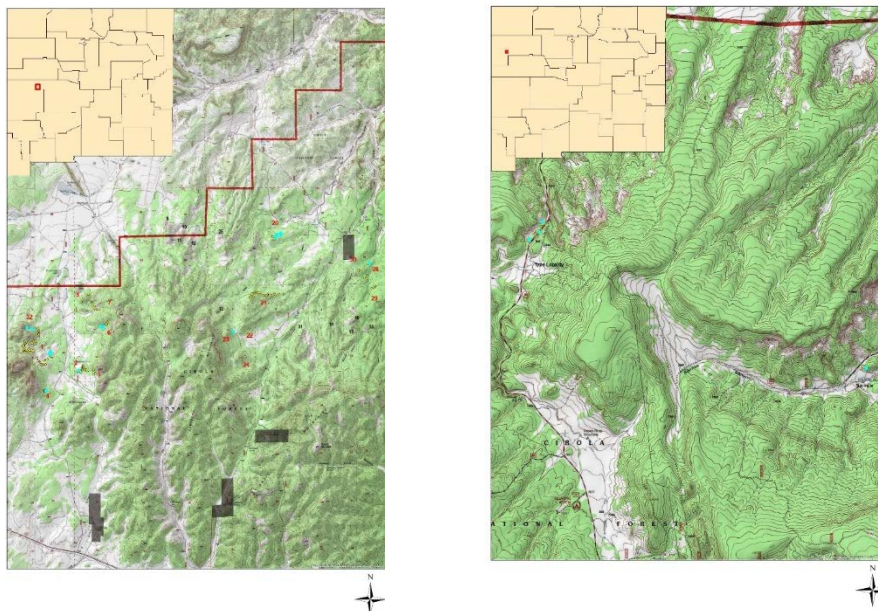


Figure 5. 2019 surveyed Zuni fleabane population sites (red numbers) and occupied habitat patches (yellow points) in the Datil/Sawtooth and Zuni meta-populations. Turquoise highlighted points are proposed monitoring sites.



Figure 6. Zuni fleabane plants and habitat, Datil/Sawtooth meta-population.

DISCUSSION & RECOMMENDATIONS

Population Trend

The 2019 field survey visited 21 previously known locations of Zuni fleabane, documenting two extant sites of plants in the Zuni Mountains and 19 extant sites in the Datil/Sawtooth Mountains. No new sites were found but an additional 31 waypoints documented additional plants near existing sites in the Datil/Sawtooth meta-population. No new sites were documented from the Zuni Mountains, one waypoint documented three previously unrecorded plants at the type locality (Type 3). The newly documented plants at additional waypoints within existing sites are not likely plants that have established since the 2014 survey, but are more likely plants that were previously not detected because surveyors approached a site over a different route. Complete surveys of the habitat were not undertaken in 2014 nor 2019, due to surveyor limitations (time and staff).

Although more sites were apparently declining than increasing, the overall population trend for the Datil/Sawtooth meta-population in 2019 appears to be stable, documenting similar numbers of plants to those reported during the 2014 surveys. However, the Zuni met-population showed significant declines from 2014 numbers, with an overall decline of over 50% within 5 years, likely in response to drought conditions. Based on current observations, it is possible that this meta-population may be extinct within 10 years, especially if drought conditions continue into the future.

Repeat surveys provide for only a limited analysis of population trend over time due to location uncertainties and survey effort differences. Original surveys in the early 1990s were performed prior to GPS and exact locations were often not available. However, the habitat of Zuni fleabane is narrowly

defined and easily recognizable in the field. Although original surveys may have been overestimates to some extent, the best data available still indicates a significant decline in populations from original estimates, continuing into 2019. The use of GPS over the past 2 decades has significantly aided in the precise relocation of previously documented sites, making comparisons between 2014 and 2019 more accurate than previous reported numbers. In addition, the Zuni population is rather small and both sites occur in well-defined areas, making a complete census of the population highly feasible and counts are considered accurate and valid for comparison. Although declines may be overall halted for now in the Datil-Sawtooth meta-population, the Zuni meta-population continues on a precipitous downward trend. In addition to sporadic repeat surveys of populations, close monitoring of all populations is highly recommended.

Threats

In 2019 the majority of plants observed were in normal or vigorous condition. Stressed plants were only reported from one waypoint, at the largest of the Datil/Sawtooth meta-population sites, Site 1. The number of plants at this location had decreased from 48 plants in 2014 to 11 plants in 2019, for unknown reasons. The other 90 waypoints reported from Site 1 were considered to be in normal condition. No obvious dead or drought stressed plants were reported from either of the 2 meta-populations. Although the Datil-Sawtooth meta-population appeared stable since the 2014 counts, the Zuni meta-population is on a perilous decline. The cause for the continued decline is somewhat unclear, but no direct impacts to the plants or their habitat were observed in 2014 nor in 2019 that may explain the cause. Drought conditions prior to the 2014 and 2019 surveys are likely responsible. Although drought and climate change were not listed as a threat in the original listing, recovery plan, or 5-year review for the species (50 FR 16680 16682; USFWS 1988, 2007), the 2014 status report recognized drought as a main threat to the species (Roth & Sivinski 2014). In response to the 2014 status report, the USFWS acknowledged in their 2019 amended recovery criteria that drought may be threat (USFWS 2019). Unfortunately, no reliable rainfall data is available for the remote area where the Datil-Sawtooth population exists. Rainfall amounts near the Zuni-metapopulation at the Gallup airport were somewhat below the annual average (10.97 inches) for the past 3 years and above average the 2 years following the 2014 surveys. 2014 was well below the average rainfall (7.64 inches), as was the year 2010 (5.45 inches). The US Drought Monitor lists significant parts of 2013 through 2015 in extreme drought for McKinley County, and in exceptional drought for the year prior to the 2019 survey (Figure 7; <https://droughtmonitor.unl.edu/Data/Timeseries.aspx>). Catron County fared somewhat better the year before the 2019 survey, although significant parts of that year were listed in extreme drought conditions. However, extreme drought and exceptional drought conditions were also reported in the 3 years prior to the 2014 surveys.

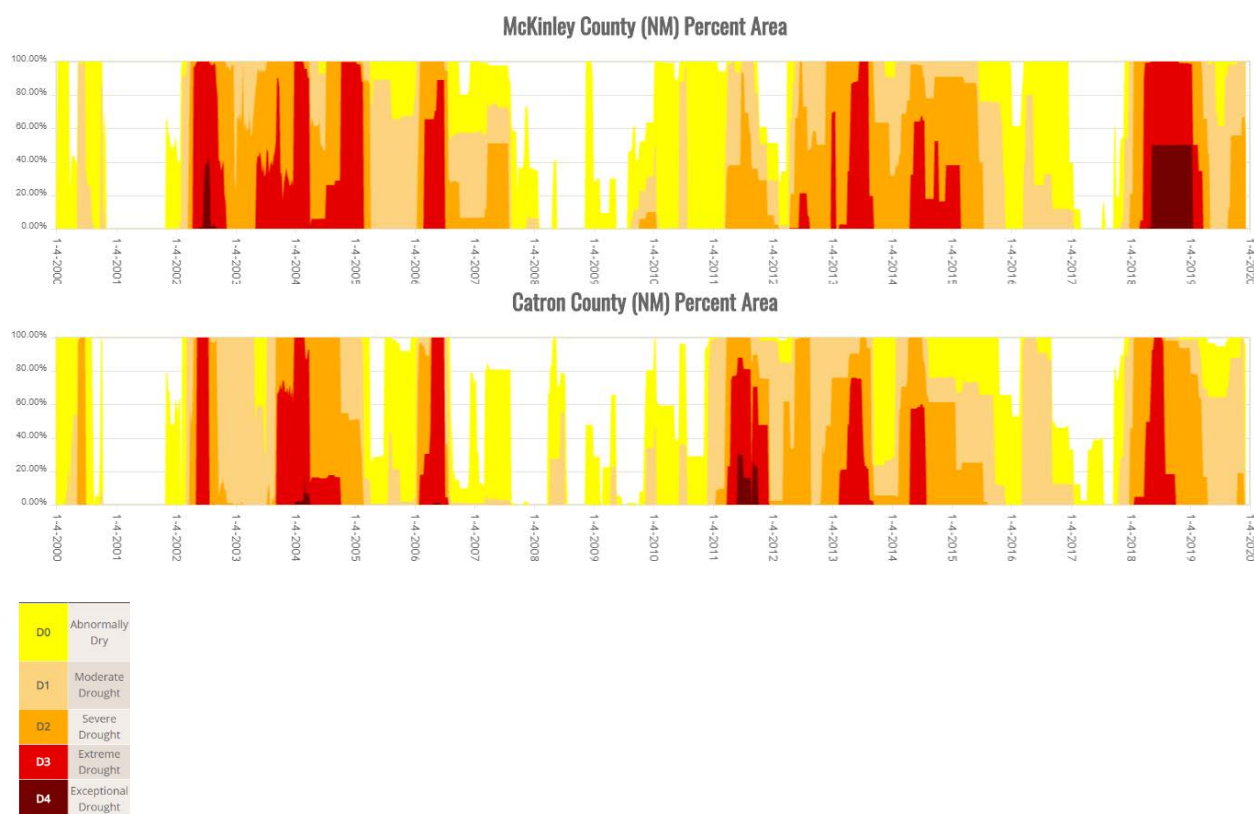


Figure 7. Drought status of McKinley and Catron counties, NM, between 2000 and 2019
<https://droughtmonitor.unl.edu/Data/Timeseries.aspx>

Additional threats associated with climate change may include increased catastrophic wildfires and associated firefighting activities, as well as forest restoration projects before or after fires. The Zuni meta-population is especially susceptible to stochastic extinction events due to its small size and location of both sites immediately adjacent to roads.

No new land use threats were found at any location, but uranium exploration remains active in the Datil/Sawtooth Mountains. The US Forest Service continues to work on proposed mineral withdrawals for most of the occupied habitat of the species, but no final decisions have been made at the time of this report. It is expected that more persistent droughts and other impacts associated with climate change will become the most serious threat to the survival of this species rangewide.

Drought is apparently the largest current threat to the species range-wide and little can be done for these plants in response to drought through land management practices. Hence on-the-ground conservation practices need to be maximized. It is recommended that all habitat and occupied sites of Zuni fleabane be protected in perpetuity either through withdrawal of mineral claims or other methods of protecting habitat. All land use management activities, including livestock use and the possible rerouting of a segment of the Continental Divide Trail through the habitat of the species need to be carefully evaluated.

Monitoring

A monitoring protocol was developed for the Chuska Mountain meta-population on the Navajo Nation in northeastern Arizona in 2019 (Christie & McBride, 2020, in prep.). Thirty-five monitoring plots were established within 15 known sites. This protocol should be easily executed with minor impacts to plants or their habitat over time, with reasonable effort. Close science-based monitoring will inform management actions needed based on long-term population trends and observed threats, throughout the range of the species, if that monitoring plan will also be implemented and executed on Forest Service lands in New Mexico.

Habitat Model

As documented in the 2014 and 2019 surveys, additional populations of Zuni fleabane may be found in suitable habitat on the Cibola National Forest and BLM lands. A Forest Service suitable habitat model in the Datil/Sawtooth Mountains was field tested during the 2014 surveys, but did not correlate well with suitable habitat on the ground. This was also true for the habitat model developed by the New Mexico Natural Heritage Program in 2018. This was likely a result of inaccurate geology GIS and soils layers. Based on on-the-ground observations, there is more unsurveyed habitat in the Zuni and Datil/Sawtooth mountains. Although only a fraction of habitat may be occupied, there is potential to discover additional sites in the vicinity of the existing meta-populations and perhaps other areas in the overall region. A more refined model taking into account all known habitat aspects in combination with satellite imagery and reflective radiation techniques to enhance differences in surficial geology might help identify suitable habitat and prioritize future surveys.

Additional Recommendations

We have no knowledge on pollinators or pollination success, although sexual reproduction may be infrequent (USFWS 1988). Research into reproductive success and possible inbreeding depression may shed some additional light into the potential causes of the observed decline. Considering the current status of the species, especially the Zuni meta-population, collecting seeds and maintaining an ex-situ seed bank by permanently storing seeds in a Center for Plant Conservation approved storage facility would allow for potential future reintroduction projects or ex-situ propagation and conservation of plants. Propagation from seed has not been attempted in the past and developing a propagation protocol to cultivate plants from seed is essential for future augmentation and reintroduction projects.

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APPENDIX

Waypoints (population name) from 21 Zuni fleabane sites in the Cibola National Forest in 2019.

Site No	Population Name	2014 Plant Count	2019 Plant Count	Plant Health	Phenology	Comments
1	nj 1b		2	Normal	Budding	New
1	dr2-19		3	Vigorous	Budding	New
1	dr4-19		2	Normal	Budding	New
1	dr6-19		16	Normal	Budding	New
1	dr6-19		2	Normal	Budding	New
1	dr7-19		15	Normal	Budding	New. Elk trampling all over
1	Errb-ST-1-30	2	2	Normal	Flowering	
1	errh-st-1-1	5	4	Normal	Budding	Elk tracks all over
1	errh-st-1-10	10	7	Normal	Budding	
1	errh-st-1-11	2	1	Normal	Budding	
1	Errh-ST-1-12	3	5	Normal	Budding	
1	Errh-ST-1-12	3	3	Normal	Budding	
1	Errh-ST-1-13	22	15	Normal	Budding	
1	errh-st-1-14	3	6	Normal	Budding	
1	errh-st-1-15	10	6	Normal	Budding	
1	errh-st-1-16	15	8	Normal	Budding	
1	errh-st-1-17	9	16	Normal	Budding	
1	Errh-ST-1-18	7	2	Normal	Budding	
1	Errh-ST-1-19	1	2	Normal	Budding	
1	Errh-ST-1-2	9	8	Normal	Budding	
1	Errh-ST-1-20	15	7	Normal	Budding	
1	Errh-ST-1-21	9	0			No Plants found
1	errh-st-1-22	11	1	Normal	Budding	
1	errh-st-1-23	12	10	Normal	Budding	
1	errh-st-1-24	10	6	Normal	Budding	
1	Errh-ST-1-25	3	12	Normal	Budding	
1	errh-st-1-25b		4	Normal	Budding	New
1	errh-st-1-27	35	39	Normal	Budding	
1	errh-st-1-28	6	10	Normal	Budding	
1	Errh-ST-1-29	1	14	Normal	Budding	
1	Errh-ST-1-3	3	3	Normal	Budding	
1	Errh-ST-1-31	22	18	Normal	Flowering	
1	errh-st-1-32	48	11	Stressed	Budding	
1	Errh-ST-1-33	15	14	Normal	Budding	
1	errh-st-1-34-	2	3	Normal	Budding	

Site No	Population Name	2014 Plant Count	2019 Plant Count	Plant Health	Phenology	Comments
	14					
1	errh-st-1-35-14	3	3	Normal	Budding	
1	errh-st-1-4	15	8	Normal	Budding	Trampled by elk
1	errh-st-1-5	10	15	Normal	Budding	
1	Errh-ST-1-6	3	7	Normal	Budding	
1	errh-st-1-7	26	18	Normal	Budding	
1	errh-st-1-8	3	2	Normal	Budding	
1	errh-st-1-9	7	5	Normal	Budding	
1	Errh-ST-1A	6	6	Normal	Budding	Possible monitoring site
1	Errh-ST-1B	5	9	Normal	Budding	Possible monitoring site
1	Errh-ST-26	5	5	Normal	Flowering	
1	Err-ST-1-32	32	34	Normal	Budding	
1	nj1		21	Normal	Budding	New
1	nj2		1	Normal	Budding	New
1	nj4		6	Normal	Budding	New
1	nj5		1	Normal	Budding	New
1	pop 1V	15	7	Normal	Budding	
1	pop1 dd2		12	Normal	Budding	New
1	pop1 jj	8	3	Normal	Budding	
1	pop1 kk	11	11	Normal	Budding	
1	pop1 LL	7	3	Normal	Budding	
1	pop100	5	11	Normal	Budding	
1	POP1A	5	3	Normal	Budding	Possible monitoring site
1	POP1AA	4	9	Normal	Budding	
1	POP1B	4	6	Normal	Budding	Possible monitoring site
1	POP1BB	15	9	Normal	Budding	
1	POP1C	4	5	Normal	Budding	Possible monitoring site
1	POP1CC	19	27	Normal	Budding	
1	POP1D	18	11	Normal	Budding	
1	POP1DD	16	4		Budding	
1	POP1DD	16	11	Normal	Budding	
1	POP1EE	2	2	Normal	Budding	
1	pop1f	4	5	Normal	Budding	Elk tracks throughout
1	POP1FF	8	13	Normal	Budding	

Site No	Population Name	2014 Plant Count	2019 Plant Count	Plant Health	Phenology	Comments
1	POP1G	1	1	Normal	Budding	
1	POP1GG	12	14	Normal	Budding	
1	POP1H	13	13			Elk tracks
1	POP1HH	6	10	Normal	Budding	
1	POP1I	3	4	Normal	Budding	
1	POP1II	5	15	Normal	Budding	
1	POP1J	10	14	Normal	Budding	
1	POP1K	65	63	Normal	Budding	Polygon in 2019
1	POP1L	4	2	Normal	Budding	
1	POP1M	5	3	Normal	Budding	
1	POP1MM	2	3	Normal	Budding	
1	POP1N	12	12	Normal	Budding	
1	POP1NN	3	4	Normal	Budding	
1	POP1O	2	4	Normal	Budding	
1	pop1p	12	9	Normal	Budding	
1	POP1Q	3	2	Normal	Budding	
1	POP1R	5	4	Normal	Budding	
1	pop1s	27	29	Normal	Budding	
1	POP1T	7	13	Normal		
1	POP1U	7	14	Normal	Budding	
1	POP1X	3	18		Budding	
1	POP1Y	3	4	Normal	Budding	
1	POP1Z	2	0			None seen
2	Pop 2		2			Polygon in 2019
2	Pop 2		0		Budding	Polygon in 2019
2	Pop 2		7		Budding	Polygon in 2019
2	Pop 2		4		Budding	
2	Pop 2		4	Normal	Budding	Polygon in 2019. Possible monitoring site
2	Pop 2		5	Normal	Budding	Polygon in 2019
2	Pop 2		9	Normal	Budding	Polygon in 2019
2	pop2	345	31			Polygon in 2019
2	pop2		9			Polygon in 2019
2	pop2		3		Budding	Polygon in 2019. Livestock trails
2	pop2		14		Budding	Polygon in 2019
2	pop2		36		Budding	Polygon in 2019
2	pop2		32		Budding	Polygon in 2019
2	pop2		9		Budding	Polygon in 2019

Site No	Population Name	2014 Plant Count	2019 Plant Count	Plant Health	Phenology	Comments
2	pop2		11		Budding	Polygon in 2019
2	pop2		33		Budding	Polygon in 2019. Livestock trails
2	pop2		26	Normal	Budding	Polygon in 2019
2	pop2		10	Normal	Budding	Polygon in 2019
2	pop2		3	Normal	Budding	Polygon in 2019
2	pop2		15	Normal	Budding	Polygon in 2019. Livestock trails
2	pop2		45	Normal	Budding	Polygon in 2019. Livestock trails
2	pop2		24		Early Growth	Polygon in 2014. Livestock trails
2	pop2		2		Early Growth	Polygon in 2014
2	pop2		1	Normal	Early Growth	Polygon in 2014. NW facing
2	pop2		20	Normal	Early Growth	Polygon in 2014. Livestock trails
2	pop2		20	Normal	Early Growth	Polygon in 2014
2	pop2		30	Normal	Vegetative	Polygon in 2014
3	pop3a	4	4		Budding	Errh-ST-POP3A
3	pop3b	9	11		Budding	Polygon in 2014.
3	pop3c	49	39	Normal	Budding	Polygon in 2014. Same as Errhi-ST-3C. Livestock trails
4	POP4A	83	122	Vigorous	Budding	Polygon in 2014. Elk tracks. Possible monitoring site
6	Errh-ST-6-1	7	13	Vigorous	Flowering	Possible monitoring site
6	errh-st-6-2	31	36	Vigorous	Budding	Possible monitoring site
6	Errh-ST-6-3	28	33	Vigorous	Budding	
6	Errh-ST-6-4	2	3	Normal	Budding	
6	Errh-ST-6-5	10	5	Normal	Budding	Too steep to access. counted from other side.
6	nj6		10	Normal	Budding	New
6	nj7		8	Normal	Budding	New

Site No	Population Name	2014 Plant Count	2019 Plant Count	Plant Health	Phenology	Comments
6	nj8		13	Normal	Budding	New
6	nj9		10	Normal	Budding	New
6	pop6a	26	32	Normal	Budding	Possible monitoring site
6	POP6B	3	6	Normal	Budding	
6	POP6C	6	16	Normal	Budding	
6	POP6D	6	6	Normal	Budding	
7	Errh-ST-7-4	1	28	Normal	Budding	
7	Errh-ST-7B	30	30	Normal	Budding	
7	nj12		1	Normal	Budding	New
7	POP7A	22	17	Normal	Budding	Not recommended for revisit
7	POP7D	26	29	Normal	Budding	
7	POP7E	5	4	Normal	Budding	
7	POP7F	12	24	Normal	Budding	New
7	POP7G	27	27	Normal	Budding	
8	Errh-ST-8A	18	14	Normal	Budding	Access difficult. Revisit not recommended.
8	POP8A	8	2	Normal	Budding	Access difficult. Revisit not recommended
17	Pop 17B	1	2	Normal	Flowering	
17	Pop 17-1-14	17	1	Vigorous	Flowering	Dense clusters
17	Pop 17-2-14	38	12	Vigorous	Flowering	
17	Pop 17A-14	15	17	Normal	Budding	
17	Pop 17C	3	5	Normal	Flowering	
17	Pop 17C2		3	Normal	Budding	New
17	Pop 17D	3	3	Normal	Budding	
18	errh-dr-38-19		5	Normal	Flowering	New
18	errh-dr-38-19		10	Vigorous	Flowering	New
18	Pop 18-1-14	20	18	Normal	Flowering	
18	Pop 18-2-14	56	48	Vigorous	Flowering	
18	Pop 18-3-14	6	4	Normal	Flowering	
18	Pop 18A	3	2	Normal	Flowering	
20	errh-dr-20-19		43	Normal	Budding	New. Possible monitoring site

Site No	Population Name	2014 Plant Count	2019 Plant Count	Plant Health	Phenology	Comments
20	Pop 20A	7	7	Normal	Budding	Possible monitoring site
20	Pop 20B	18	19	Normal	Budding	Possible monitoring site
20	Pop 20C	4	11	Normal	Budding	Possible monitoring site
20	Pop 20D	2	8	Normal	Budding	
20	Pop 20E	10	23	Normal	Budding	
20	Pop 20F	4	6	Normal	Budding	
20	Pop 20G	4	3	Normal	Budding	
21	errh-dr-10-19		2	Normal	Budding	New
21	errh-dr-11-19		6	Normal	Budding	New
21	errh-dr-13-19		3	Normal	Budding	New
21	Pop 21k	21	21	Normal	Budding	
21	Pop 21-39-14	5	5	Normal	Budding	
21	Pop 21-40-14	5	10	Normal	Budding	
21	Pop 21-42-14	6	5	Normal	Budding	
21	Pop 21-42b-14	3	6		Budding	
21	Pop 21-44-14	3	4	Normal	Flowering	
21	Pop 21-47-14	8	3	Normal	Budding	
21	Pop 21-47b-14	14	13	Normal	Budding	
21	Pop 21-49-14	6	8	Normal	Budding	
21	Pop 21-49b-14	3	3	Normal	Budding	
21	Pop 21-50-14	3	2	Normal	Budding	
21	Pop 21-51-14	4	4	Normal	Flowering	
21	Pop 21A	22	21	Normal	Flowering	
21	Pop 21B	10	6	Normal	Budding	
21	Pop 21C	6	8	Normal	Budding	
21	Pop 21d	4	2	Normal	Budding	
21	Pop 21E	45	39	Normal	Budding	
21	Pop 21F	15	9	Normal	Budding	
21	Pop 21G	10	10	Normal	Budding	
21	Pop 21H	21	6	Normal	Budding	
21	Pop 21I	4	4	Normal	Budding	
21	Pop 21J	3	6	Normal	Budding	
21	POP. 21-52-14	3	2	Normal	Budding	
22	Errh4-14	6	4	Normal	Flowering	

Site No	Population Name	2014 Plant Count	2019 Plant Count	Plant Health	Phenology	Comments
23	RF3A	19	17	Normal	Budding	Possible monitoring site.
23	RF3B	15	14	Normal	Budding	
23	RF3C	21	11	Vigorous	Budding	
24	RF5A	21	5	Vigorous	Budding	
27	errh-27-14	18	22	Vigorous	Flowering	
28	errh-28-14	6	6	Normal	Flowering	
28	errh-dr-34-19		3	Normal	Flowering	New
28	errh-dr-35-19		5	Normal	Flowering	New
29	errh-dr-36-19		9	Normal	Flowering	New
29	errh-rf-9c	19	12	Normal	Budding	
29	RD 9B	9	9	Normal	Flowering	
29	RF9A	28	14	Normal	Budding	
30	errh-8-2-14	12	6	Normal	Budding	
30	errh-dr-30-19		10	Normal	Flowering	New. Possible Monitoring site
30	errh-dr-31-19		1	Normal	Flowering	New
30	errh-dr-33-19		6	Normal	Flowering	New
30	RF8A	46	25	Normal	Flowering	
32	rf-1-14	2	8	Normal	Budding	Possible monitoring site
32	rf1-19		10	Normal	Budding	New
32	rf-1-2-14	10	10	Normal	Budding	Possible monitoring site
Zuni	errh-zuni-2-3	1	1	Normal	Budding	
Zuni	Sixmile	75	22	Normal	Budding	No disturbances. All plants within 100 ft of point. Monitoring site.
Zuni	Type 1	118	68	Normal	Budding	Polygon too large for accurate count. Possible monitoring site
Zuni	Type 2	1	1	Normal	Budding	
Zuni	Type 3		3	Normal	Budding	New
Zuni	Type 3	3	3	Normal	Budding	
Zuni	Type 4/ErrhZuni2-2	4	1	Normal	Budding	

Site No	Population Name	2014 Plant Count	2019 Plant Count	Plant Health	Phenology	Comments
Zuni	Type 5	60	22	Normal	Budding	Normal to separate. Possible monitoring site
Zuni	Type 6	48	44	Normal	Budding	Monitoring site. Most plants within 15 ft of road.
			2603			