

**PETITION TO LIST THE
AZTEC GILIA (*Aliciella formosa*)
UNDER THE U.S. ENDANGERED SPECIES ACT**



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**Petition Submitted to the Secretary of Interior
Acting through the U.S. Fish and Wildlife Service**

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I. Introduction: Petition Request

WildEarth Guardians hereby petitions the Secretary of the Interior and the U.S. Fish and Wildlife Service (“FWS” or “the Service”) to issue a rule listing the Aztec gilia (*Aliciella formosa*) as Threatened or Endangered under the Endangered Species Act, (“ESA”) 16 U.S.C. § 1531 *et seq.* throughout its historic range and to designate critical habitat for the species. This petition is filed under 5 U.S.C. § 553(e), 16 U.S.C. § 1533(b)(3)(A) and 50 C.F.R. § 424.19 (1987), bestowing interested persons the right to petition for issuance of a rule.

The Aztec gilia, also known as the beautiful gilia, is a perennial herbaceous plant endemic to northwestern New Mexico. It has been found only in San Juan County near the towns of Aztec, Bloomfield, and Farmington and also in Kutz Canyon south of Bloomfield. Aztec gilies grow in Nacimiento Formation soils at elevations of 5,000-6,400 ft (1,500-1,950 m). The plant is known to occur on federal Bureau of Land Management (BLM) lands within the Farmington Field Office (FFO) boundary and Navajo Nation lands. It may also occur on New Mexico state and private lands.

A. formosa is rare, imperiled, and possibly declining. Known threats to *A. formosa*'s survival include, but are not limited to, oil and gas exploration and extraction, road construction, off-road vehicle (ORV) use, and electric transmission line construction. The human population in the Aztec gilia's range is growing, and these threats are increasing. Other possible hazards include domestic livestock grazing, surface mining, collection, climate change, and the plant's narrow range. These threats can cause habitat destruction and degradation and also direct plant mortality. Aztec gilies may tolerate and recover from some habitat disturbance. However, NatureServe (2009) reported that habitat disturbances can “decimate a population” in some areas. Plants cannot recover where populations have been eliminated. Habitat mitigation measures, such as reseeded and transplanting, have been unsuccessful. Extensive areas of potential habitat have already been lost to oil and gas development and urbanization. We are concerned about the plant's resilience in the face of increasing threats.

The state of New Mexico and the Navajo Nation have both listed Aztec gilies as endangered (NMEMNRD 1995; Navajo Nation 2008). The state endangered designation primarily regulates plant collection and does not protect plant habitat from destruction or degradation. The designation does not apply to “federal employees working on lands within their jurisdiction” (NMEMNRD 1995, 19.21.2.1). Thus, the BLM has significant discretion over how it manages its Aztec gilia populations. Though it designated *A. formosa* as a sensitive species and special status species, the BLM provided no specific mitigation measures in its current Resource Management Plan (RMP) that would protect the gilies and their habitat from threats (BLM 2003).

Given the precarious status of the species, increasing threats, and insufficient regulatory safeguards, the FWS should grant *A. formosa* immediate protection under the ESA. The plant is at high risk of extinction.

II. Endangered Species Act Implementing Regulations

Section 424 of the regulations implementing the Endangered Species Act (50 C.F.R. § 424) is applicable to this petition. Subsections that concern the formal listing of the Aztec gilia as an Endangered or Threatened species are:

424.02(e) “*Endangered species* means a species that is in danger of extinction throughout all or a significant portion of its range.”... (k) “species” includes any species or subspecies that interbreeds when mature. *See also* 16 U.S.C § 1532(6).

(m) “*Threatened species* means any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” *See also* 16 U.S.C § 1532(20).

ESA Section 4 (16 U.S.C. § 1533(a)(1)) sets forth listing factors under which a species can qualify for ESA protection (see also 50 C.F.R. § 424.11(c)):

- A. The present or threatened destruction, modification, or curtailment of habitat or range;
- B. Overutilization for commercial, recreational, scientific, or educational purposes;
- C. Disease or predation;
- D. The inadequacy of existing regulatory mechanisms; and
- E. Other natural or manmade factors affecting its continued existence.

Multiple factors set forth in 50 C.F.R. § 424.11(c) and in ESA Section 4 (16 U.S.C. § 1533(a)(1)) have resulted in the continued decline of Aztec gilies and are causing the species to face extinction or endangerment in the foreseeable future. A taxon needs to meet only one of the listing factors outlined in the ESA to qualify for federal listing.

III. Species Characteristics

A. Taxonomy

The Aztec gilia (*Aliciella formosa* Green ex Brand) J.M. Porter is also known as the beautiful gilia. Throughout this petition, we refer to this plant as Aztec gilia or *A. formosa*. This plant was once classified in the *Gilia* genus until Porter (1998) reclassified it as part of the *Aliciella* genus. It is still referred to as *Gilia formosa* by some sources (*c.f.* NatureServe 2009). See Table 1 on the next page for an authoritative taxonomic classification of this plant.

Table 1. Taxonomic Hierarchy (USDA 2010)

| | |
|---------------|---|
| Kingdom | <i>Plantae</i> – Plants |
| Subkingdom | <i>Tracheobionta</i> – Vascular Plants |
| Superdivision | <i>Spermatophyta</i> – Seed plants |
| Division | <i>Magnoliophyta</i> – Flowering plants |
| Class | <i>Magnoliopsida</i> – Dicotyledons |
| Subclass | <i>Asteridae</i> |
| Order | <i>Solanales</i> |
| Family | <i>Polemoniaceae</i> – Phlox family |
| Genus | <i>Aliciella</i> Brand |
| Species | <i>Aliciella formosa</i> (Green ex Brand) J.M. Porter Aztec gilia |

B. General Description¹

A. formosa is a perennial flowering plant endemic to northwestern New Mexico. The plant can grow between 3-12 in (7-30 cm) tall. The plant's base can be woody with many branched stems. Leaves are entire, pointed, glandular, and approximately one inch (25 mm) long. Flowers are on average just less than one inch (22 mm) long and trumpet-shaped. The flowers are pinkish to lavender in color. The Aztec gilia flowers in late April and May.

C. Habitat

A. formosa occurs in soils of the Nacimiento Formation (CPC 2010). The Nacimiento Formation occurs within the San Juan Basin of northwest New Mexico and southwest Colorado. The plant is found in piñon juniper woodland-sagebrush rangelands, salt desert scrub communities, or open arid Navajoan Desert at elevations of 5,000-6,400 ft (1,500-1,950 m) (NMRPTC 2005). The plant often occurs with the Brack's hardwall cactus, also known as the smallflower fishhook cactus (*Sclerocactus cloveriae* ssp. *Brackii*) (*Ibid.*). See Figures 1-3.

¹ Information for this section comes from CPC (2010).

Figure 1. Characteristic *A. formosa* Habitat (Roth 2008)



Photo: © Daniela Roth, NNHP

Figure 2. Area of the Nacimiento Formation (adapted from BLM 2001)

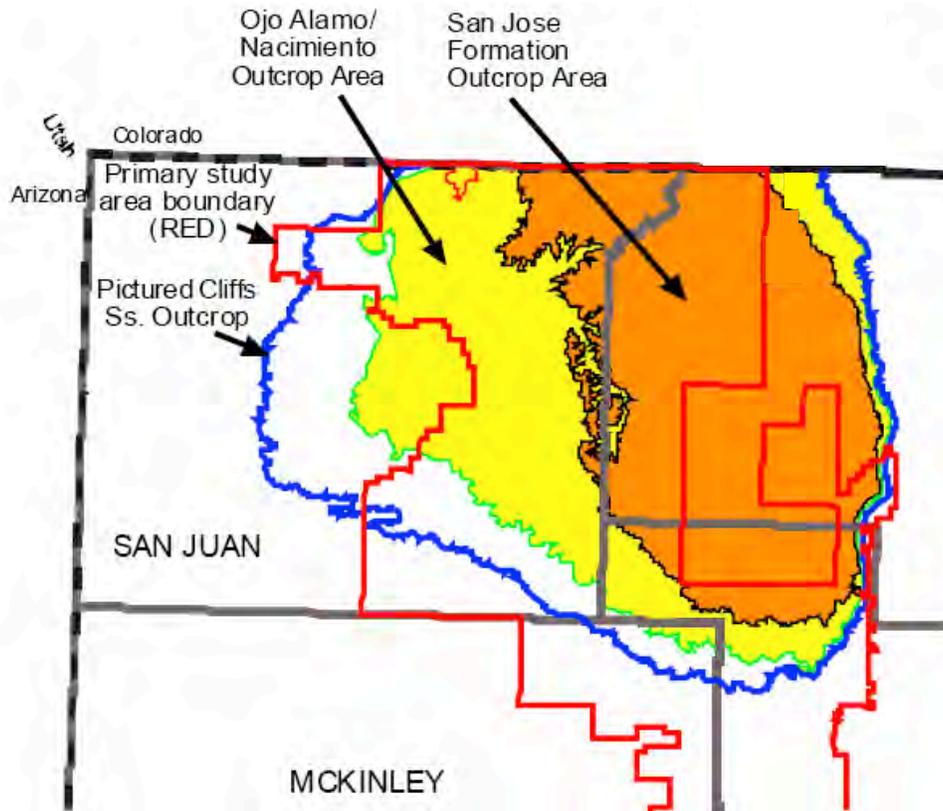
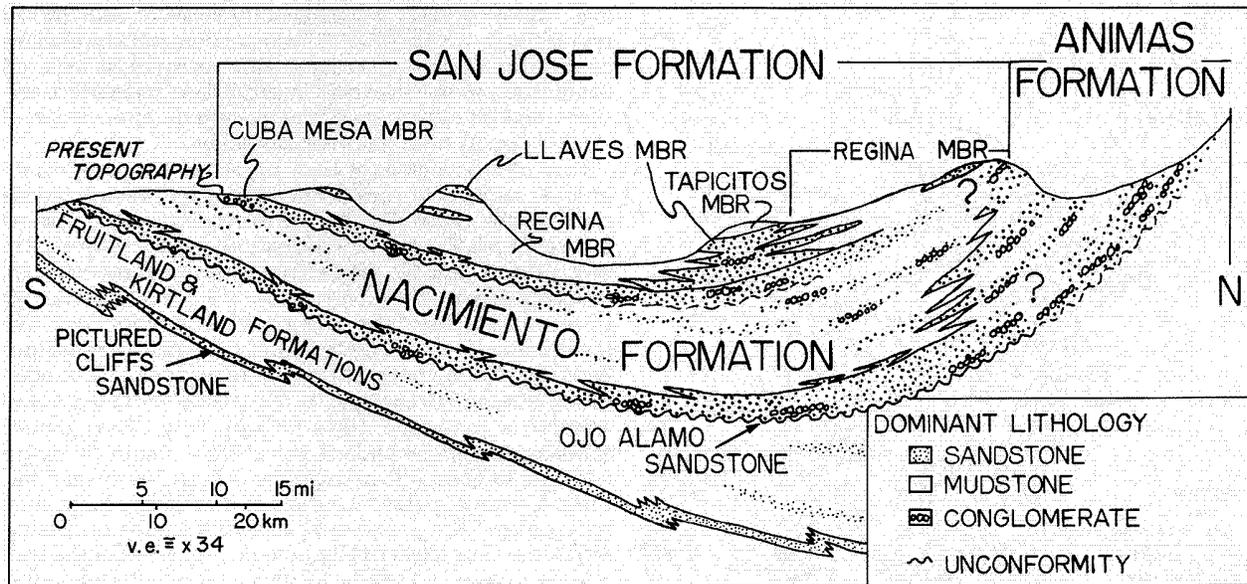


Figure 3. Cross-section of the Nacimiento Formation within Geologic Layers (Engler et al. 2001 citing Smith and Lucas 1991)



IV. Distribution and Population Status

The Aztec gilia occurs only in San Juan County, New Mexico near the towns of Aztec and Bloomfield. Aztec and Bloomfield are surrounded by significant areas of BLM lands. Heil and O’Kane (2005) identified the species in the San Juan River Drainage during their survey of plants in the drainage. Small Aztec gilia populations have been found northwest of Farmington, New Mexico (NMRPTC 2005). See Figures 4 and 5. Within the Navajo Nation, *A. formosa* only occurs in Kutz Canyon, which is south of Bloomfield. There is unoccupied potential habitat south of Bloomfield and Farmington where there are areas of the Nacimiento formation soils (Roth 2008). In their survey of plants of the Aztec Ruins National Monument, Rink and Cully (2008) noted that suitable habitat for the plant existed at the monument but they did not identify the plant there. NatureServe (2009) reported that suitable habitat exists where *A. formosa* does not occur. NatureServe (2009) noted that *A. formosa* had been reported in Mexico, but this had not been confirmed. There are known populations of Aztec gilies on BLM and Navajo Nation Lands. The plant likely occurs on private and state lands as well.

Figure 4. County Occurrence of *A. formosa* in New Mexico (USDA 2010)

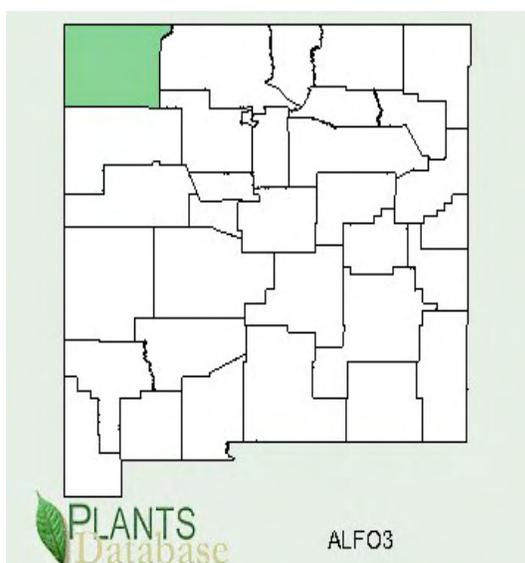
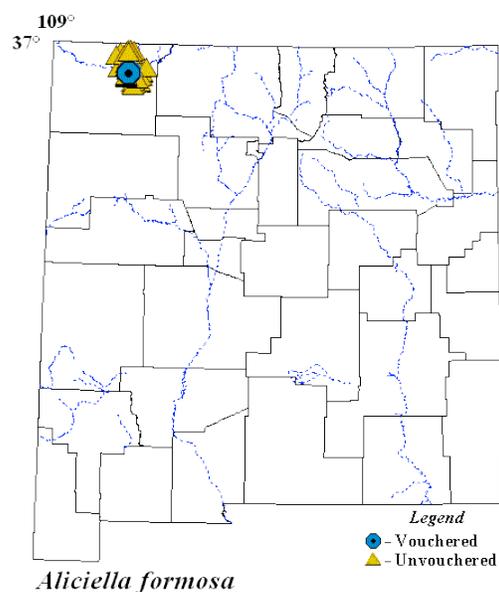


Figure 5. Distribution of *A. formosa* in San Juan County, New Mexico (NMRPTC 2005)



In 1993, the FWS reported that *A. formosa*'s population trend was declining (58 Fed. Reg. 51144-51190, September 30, 1993). NatureServe (2009) reported:

Although over 140 occurrences of this plant have been recorded for the U.S., it is a very narrow endemic; dependent on soil type. Locally it can be very abundant but the degree of development and disturbance makes its distant future less than secure.

However, NatureServe (2009) noted that the number of occurrences is misleading, because these are not all discrete populations.

V. Endangered Species Listing Factors

A. The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range

A. formosa can be vulnerable to disturbance. NatureServe (2009) noted, “some disturbance seems to decimate a population in one region but in another area it can tolerate and recover from [sic] substantial disturbance.” However, disturbances such as oil and gas activities, pipeline construction, road building, and off-road vehicle use are increasing in the region. The problem is that all of these activities kill plants along with disturbing habitat. No plant can recover in places where it has been removed and is unable to reseed. As discussed in more detail below, mitigation efforts to manually start plants from seed and translocate plants have failed.

1. Oil and Gas Exploration and Extraction

The BLM is responsible for granting oil and gas leases on public and private lands to corporations that will exploit these resources. The agency has facilitated extensive oil and gas drilling in the San Juan Basin, within which occurs the Nacimiento Formation. See Figure 3 and Figure 6. According to the BLM (2003), by 2003, the San Juan Basin contained about 18,000 active oil and gas wells. The Nacimiento Formation is drilled for natural gas (Engler et al. 2001), but oil and gas formations occur above, below, and around the formation. The Fruitland Formation that lies underneath is a major reservoir for coalbed methane gas (*Ibid.*). Oil and gas activities in and around the *A. formosa* range are abundant and highly concentrated. See Figures 7 and 8.

In their Reasonable Foreseeable Development (RFD) report on the San Juan Basin in New Mexico prepared for the BLM, Engler et al. (2001: vi) stated, “Natural gas produced from the basin in 1999 totalled 1.135 Tscf [trillion standard cubic feet] which was 68% of the natural gas produced in the state of New Mexico. In addition, 3.2 million barrels of oil were produced from the basin.”

Engler et al. (2001) predicted that 12,461 new oil and gas wells could be drilled between 2002-2022 based on estimates of available resources within the New Mexico region of the San Juan Basin. On federal lands, they predicted 9,970 new wells would be completed in that 20-year timeframe. The BLM authorized 9,942 additional wells in its 2003 FFO RMP (BLM 2003). This means that the agency expects to exploit nearly 100% of the available oil and gas resources within the New Mexico portion of the San Juan Basin. Engler et al. (2010) estimated that 3,600 mi (5794 km) of new pipeline would be needed with an accompanying disturbance footprint of at least 11,636 ac (4709 ha).

According to the 2003 Farmington RMP, the BLM would keep 2,597,193 million ac (1,051,046 ha) of its land opened for oil and gas leasing, about 93% of its land holdings in the planning area (BLM 2003). The RMP rescinded the designation of its former Aztec Gilia Area of Critical Environmental Concern (ACEC), which was approximately 7,000 ac (2833 ha). See Figure 9. Oil and gas development is now open to this area known to host the plant. There are as many as 153 well sites within that single township (T30N, R11W) where the Aztec Gilia ACEC was once

located (GO-TECH 2010a). Townships are generally 23,040 ac (9,324 ha). There are up to 395 well sites within the four primary townships (T27N, R10W; T27N, R11W; T28N, R10W; T28N, R11W) that host Kutz Canyon, another area where *A. formosa* is known to occur (GO-TECH 2010b; 2010c; 2010d; 2010e).

Oil and gas extraction causes destruction and degradation of *A. formosa* habitat and can also cause direct plant mortality. The roads, well pads, pipelines, waste pits, power lines, railroad tracks, and other infrastructure needed for oil and gas operations cause significant disturbance (Weller et al. 2002).

Figure 6. Schematic of Nacimiento Formation with Geologic Layers (source unknown)

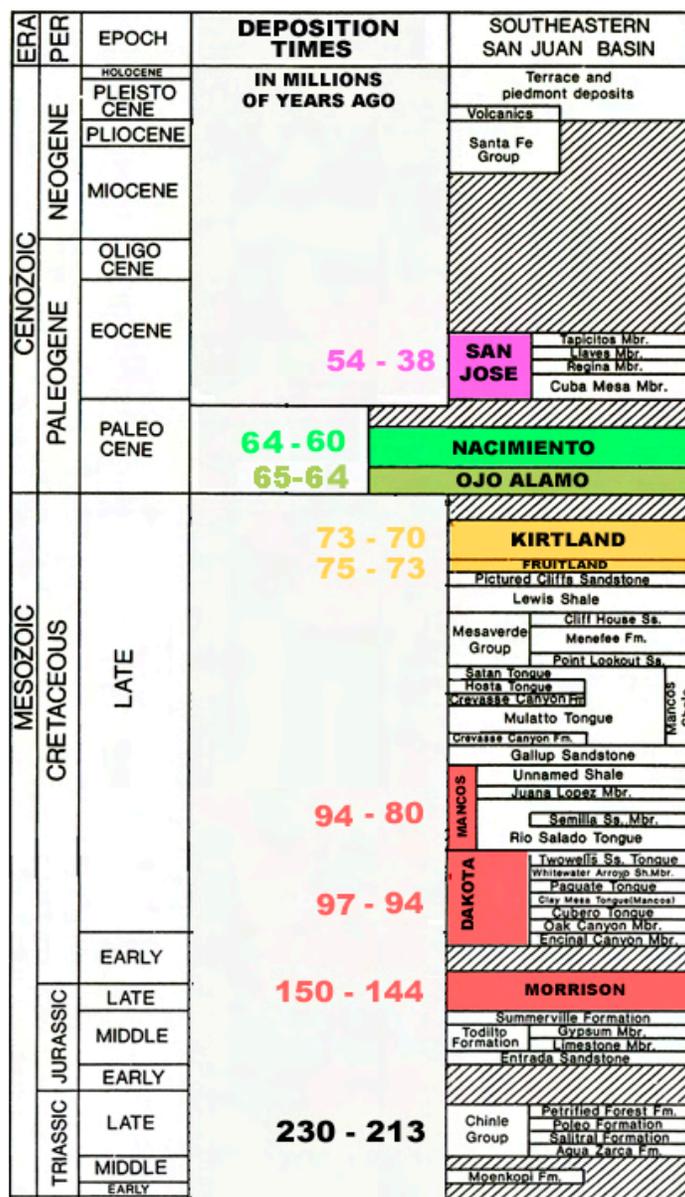


Figure 7. New Mexico Oil and Gas Wells on Public Land
(□ = General Region of the Nacimiento Formation)

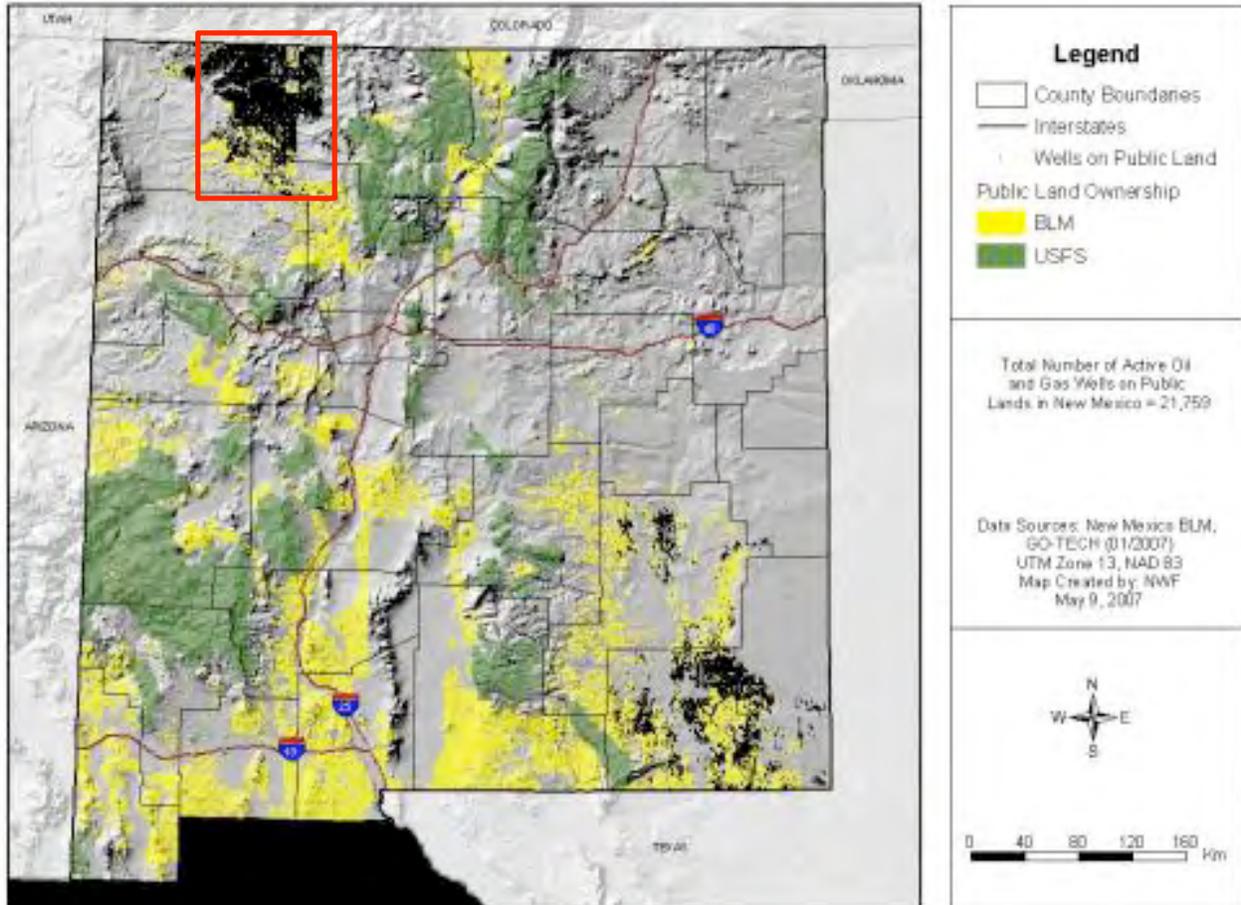


Figure 8. Oil and Gas Wells within the San Juan Basin as of 2004 (BLM and USFS 2004)

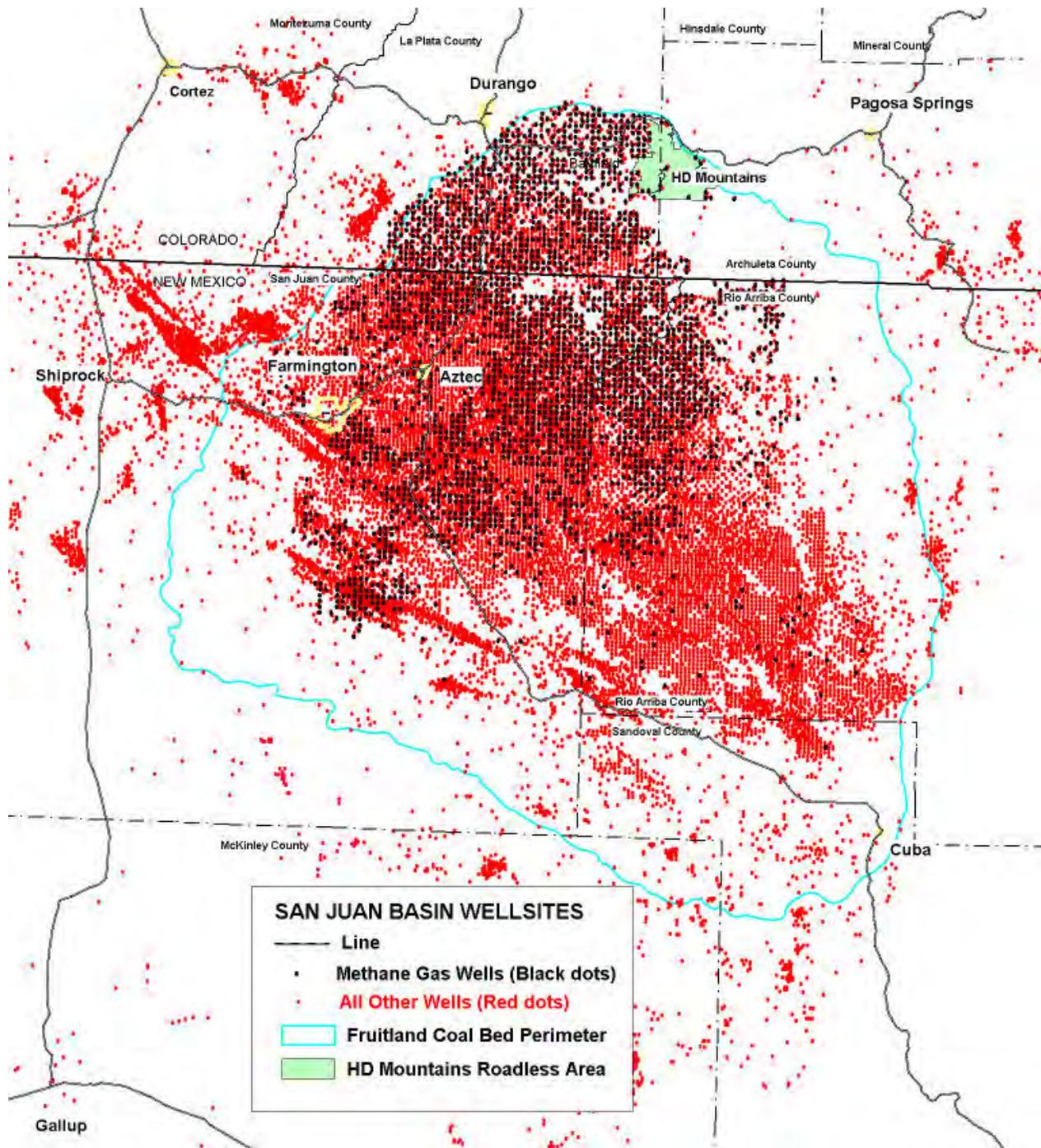
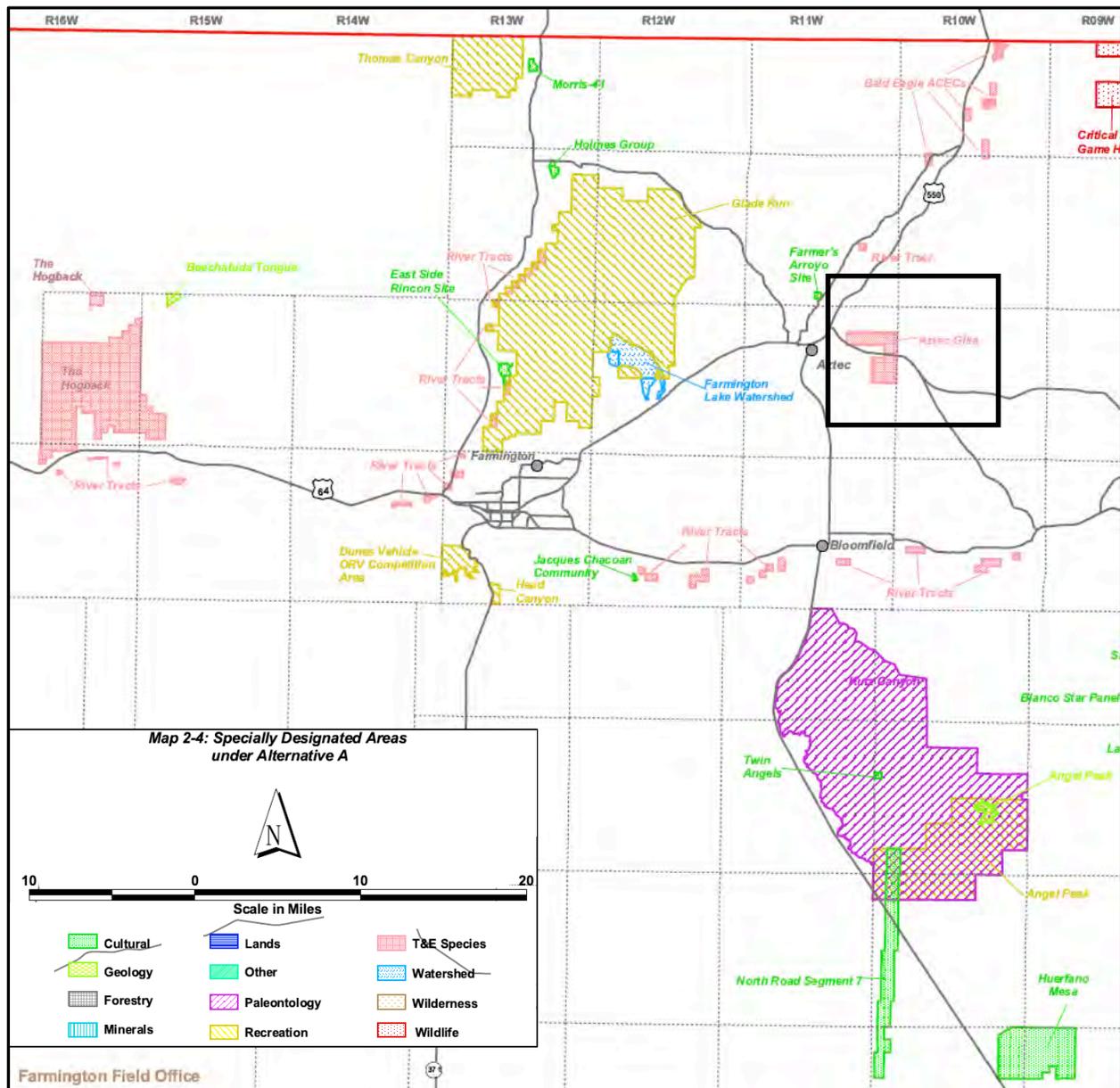


Figure 8. Location of the Former Aztec Gilia ACEC (adapted from BLM 2003 SDA Map)



2. Roads

Road construction and use can detrimentally impact imperiled plants, including *A. formosa*. Some effects include compacting soils, causing soil erosion, promoting the spread of noxious weeds and invasive plants, causing heavy metals and dust pollution, altering water flows, destabilizing slopes, and providing greater access to off-road use by vehicles (Forman and Alexander 1998; Trombulak and Frissell 2000; Gelbard and Belknap 2003).

The road density across *A. formosa*'s range is high (See Figures 10 and 11) and increasing. As described above, oil and gas activities are increasing in the region, which often entails increased road building. Additionally, one of the BLM's RMP objectives is to improve existing roads, which would require increased disturbance to areas with road maintenance occurring.

Populations in the towns of Farmington, Bloomfield, and Aztec are growing. In 2008, Farmington's population was 42,637, a 12.7% increase since 2000; Bloomfield's population was 7,234, a 12.7% increase; and Aztec's population was 6,927, an 8.6% increase. Growing human populations mean more roads. For example, the City of Aztec is building a road that will destroy 16 Aztec gilia plants that biologists identified during a biological survey and assessment (Marron and Associates 2008). The assessment report recommended that seeds be collected from these plants for re-seeding prior to their destruction. However, there has been no record of success with *A. formosa* reseeded as a mitigation tool. The Federal Highway Administration issued a Finding of No Significant Impact in 2009 (FHWA 2009).

Figure 10. Bureau of Land Management Road Density (adapted from BLM 2008)

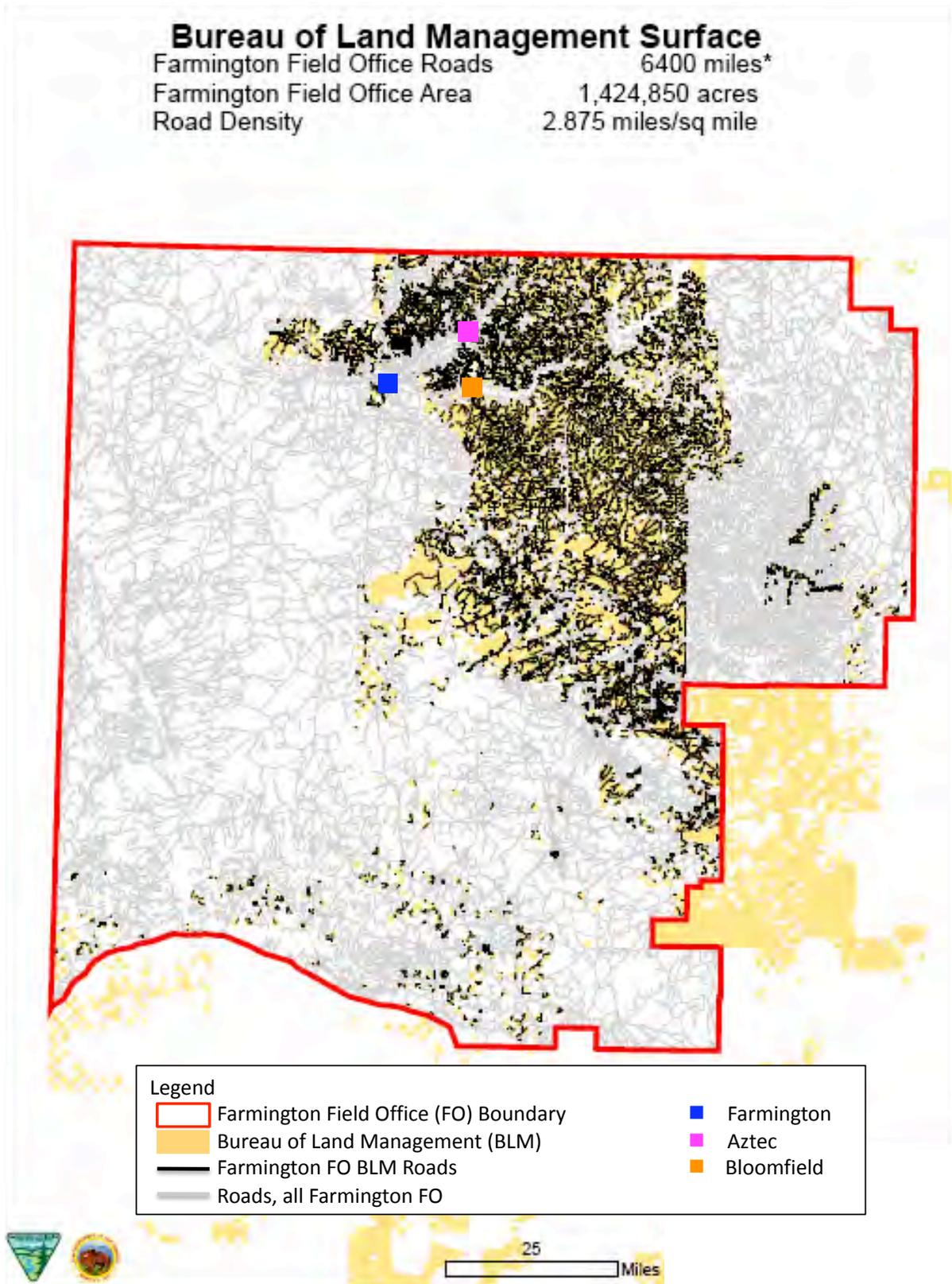
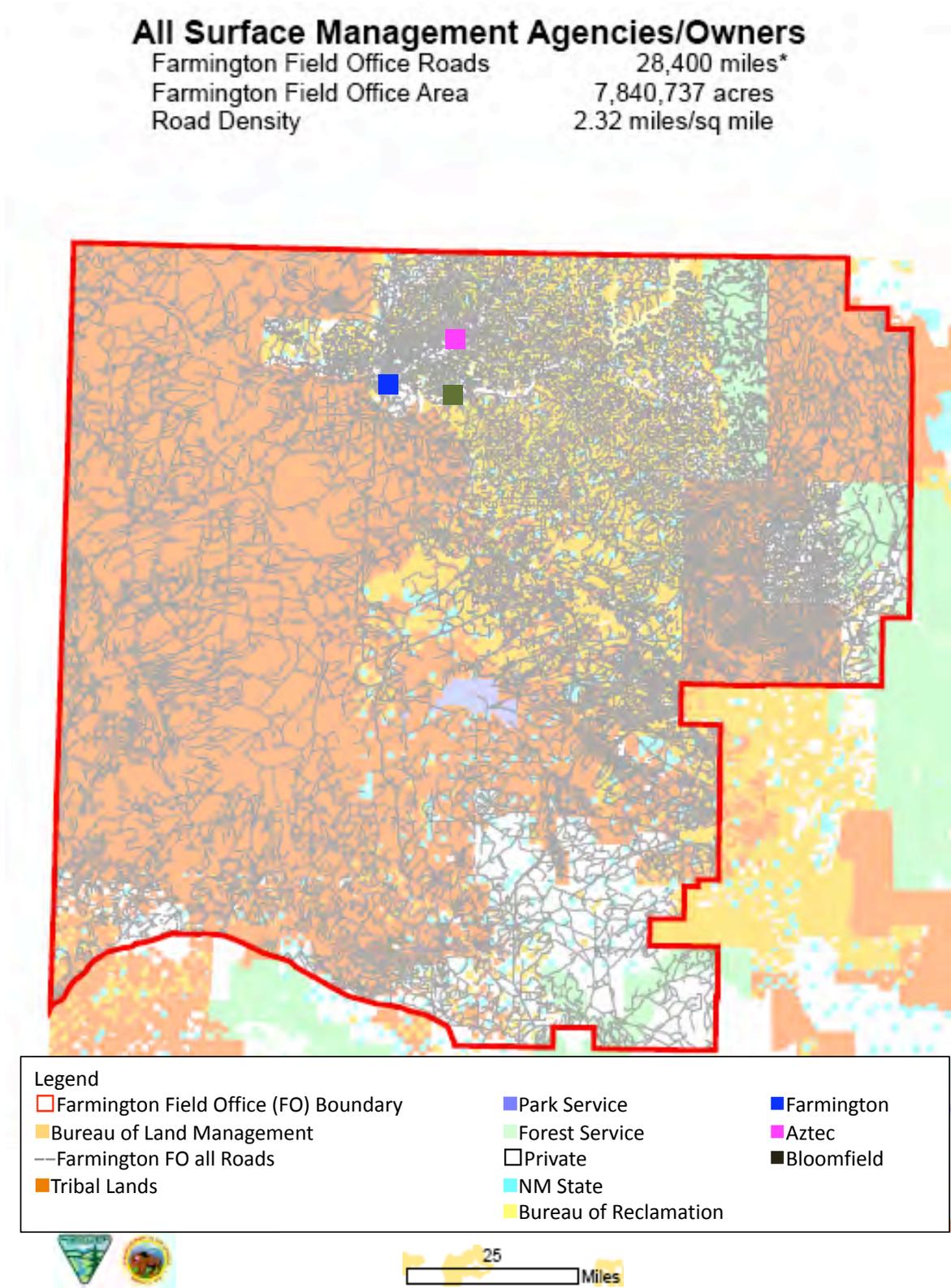


Figure 11. All Roads within the BLM Farmington Field Office (adapted from BLM 2008)



3. Off-Road Vehicles

The amount of ORV use of FFO BLM lands is increasing (BLM 2003). ORV use is detrimental to native vegetation and imperiled plants for a variety of reasons summarized in Stokowski and LaPointe (2000) and also noted in the BLM's La Plata Travel Management Plan (BLM 2006).

The BLM allows ORVs access to areas with known *A. formosa* populations and habitat, including areas near Aztec, Bloomfield, Farmington, and Kutz Canyon (BLM 2003; BLM 2006). The FFO RMP provided direction for travel management plans to be created for 14 Off-Highway Vehicle management units in order to limit ORV use of off-road areas not designated for ORVs. At least four and possibly six of these management units contain Aztec gilia habitat and plants (BLM 2003). The petitioner found only one completed plan, the La Plata Travel Management Plan (BLM 2006). The management plan includes a large area of potential *A. formosa* habitat in an "open travel area" where ORV use is not limited to designated trails (BLM 2006: 66). The plan acknowledged that Aztec gilies existed in the planning area, but it contained no monitoring or mitigation measures.

4. City of Farmington 115KV Transmission Line

In 2008, the City of Farmington, New Mexico, opened bidding to construct a 14-mile electric transmission line between Turley and Jemez (City of Farmington 2008). Occurrences of *A. formosa* are known to be within the project area (*Ibid.*). In 2009, the city awarded the contract to Hamlin Electric Company (City of Farmington 2009).

5. Domestic Livestock Grazing

Domestic livestock grazing occurs within *A. formosa*'s range on private, Navajo Nation, New Mexico state, and BLM lands. Livestock grazing can destroy and degrade Aztec gilia habitat by promoting the spread of noxious weeds and invasive plants that could outcompete the gilia and by trampling soil, leading to compaction and erosion (Fleischner 1994; Belsky and Gelbard 2000; DiTomaso 2000; Parker et al. 2006). Additionally, livestock can kill plants by trampling and eating them.

The BLM's FFO manages several grazing allotments that overlap with Aztec gilia habitat and areas with plants. Some of these include 56,306 ac (22,786 ha) Angel Peak; 13,960 ac (5,649 ha) Crouch Mesa; 5,217 (2,111 ha) East Bloomfield; 19,620 ac (79,40 ha) Flora Vista; 32,266 (13,058 ha) Jacquez Canyon Community; 35,869 (14,516 ha) Knickerbocker; and 11,940 (4,832 ha) Kutz Canyon (WildEarth Guardians 2010a; WildEarth Guardians 2010b).

It is apparent that the BLM disregards livestock grazing as a potential threat to Aztec gilia. For example, the BLM issued an Environmental Assessment (EA) for the East Bloomfield and Potter Canyon grazing allotments in 2009 (BLM 2009). Both allotments are within the boundaries of the Nacimiento Formation, and therefore, have suitable habitat for *A. formosa* and may contain populations of the plants. Though the EA acknowledged that the allotments included Aztec gilia habitat, it contained no plant survey data or mitigation measures to protect plants and their habitat.

6. Other Potential Threats to *A. formosa* Habitat

The growing human population of the Aztec, Bloomfield, and Farmington region will continue to increase its impacts on *A. formosa* habitat. In a full status review of the Aztec gilia, the FWS should investigate the effects of commercial and residential construction, farming, recreation, and other potential threats to the plant's habitat. The BLM allows a variety of land uses that could detrimentally affect Aztec gilia habitat. Some of these include mining, motorized and non-motorized vehicle use on roads and trails, hiking, horseback riding, camping, and infrastructure developments, such as picnic grounds and camping areas (BLM 2003). The impact of noxious weed and invasive species encroachment should also be investigated.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Because the Aztec gilia is a New Mexico state endangered species, it may only be collected for scientific purposes with a permit (NMEMNRD 1995). The petitioners were unable to determine the extent of legal or illegal collection of the plant for any purpose. Plants and seeds have been collected in the past by permit for mitigation efforts (*c.f.* Murray 2006; CPC 2010). The FWS should investigate the extent of overutilization as a potential threat to the species.

C. Disease or Predation

The petitioner did not find any accounts of diseases affecting *A. formosa*. However, with the increased threats to the plant's habitat and the growing threat of climate change (see below), Aztec gilia may become more vulnerable to disease. The FWS should also investigate whether livestock eat Aztec gilia.

D. The Inadequacy of Existing Regulatory Mechanisms

New Mexico has designated the Aztec gilia as an endangered species (NMEMNRD 1995). The Navajo Nation also lists the species as endangered (Navajo Nation 2008). NatureServe (2009) classifies it as G2, globally imperiled; N2, nationally imperiled; S1, critically imperiled in the Navajo Nation, and S1, imperiled in New Mexico. The Fish and Wildlife Service once listed the plant as a Category 2 species, indicating that the Service believed that listing the species may be appropriate (50 Federal Register 39526, September 27, 1985; 55 Federal Register 6184-6229, February 21, 1990; 58 Federal Register 51144-51190, September 30, 1993). It is now a Fish and Wildlife Service species of concern. *A. formosa* is also a BLM sensitive species and special management species (SMS) (BLM 2003). The BLM (2009: 22) described the purpose of the SMS designation:

In accordance with BLM Manual 6840, the Farmington Field Office of the Bureau of Land Management (FFO) has prepared a list of special management species to focus species management efforts toward maintaining habitats under a multiple use mandate, called FFO Special Management Species (SMS). The BLM manages certain sensitive species not federally listed as threatened or endangered in order to prevent or reduce the need to list them as threatened or endangered in the future. The authority for this policy and guidance is established by the

Endangered Species Act of 1973, as amended; Title II of the Sikes Act, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; and Department of Interior Manual 235.1.1A.

Despite the sensitive species and SMS designations, the BLM has adopted no management direction to protect *A. formosa* in its RMP (BLM 2003). Project plans within specific management units that include known plant locations have not included mitigation or even monitoring measures (c.f. BLM 2006; 2009). Additionally, state listing by New Mexico does not change the status or protection provided by BLM. State listing only protects the species from collection but does not require the BLM or other federal agencies to adopt measures that avoid jeopardizing the species' survival.

A sufficient regulatory framework to prevent *A. formosa* extinction is lacking. None of these designations provide the crucial habitat protections that would be enabled by Endangered Species Act listing.

E. Other Natural or Manmade Factors Affecting its Continued Existence

1. Direct Destruction of Plants

Several of the threats that degrade and destroy the Aztec gilia's habitat can also cause plant mortality. For example, oil and gas wells could be constructed over plant populations. ORV users could run over and kill plants. NatureServe (2009), "recreational off-road vehicles pose a significant threat. It has been observed that in areas with high off-road vehicle traffic the number of juvenile plants is reduced." Plants could be paved over by road construction.

2. Reseeding and Replanting Problems

As noted above, *A. formosa* mitigation is difficult because the plants are difficult to reseed and replant manually (NMRPTC 1999; CPC 2010). CPC (2010) reported:

The Bureau of Land Management asked an oil/gas company to remove *Aliciella formosa* for mitigation purposes. The plant was moved to a greenhouse for one year and then transplanted back into the field. Only 12 percent of the plants survived. It was advised that agencies should generally avoid transplanting for mitigation purposes since these projects rarely succeed. (US Army Corps of Engineers. 1997)

Murray (2006) reported that an expedition to find *A. formosa* seeds for a seed banking project with the Flagstaff Arboretum yielded no seeds. The collectors for the project went to locations where BLM staffers had observed and been monitoring the plants. Murray (2006) noted that prime seed collection time might have come earlier than expected due to drought. But, her report also described other problems that could have impeded collection (page 2):

We then headed north to try and find some *Aliciella* that had produced seeds. We drove west on Hwy 64, and stopped at a site between Blanco and Bloomfield.

There was much disturbance, high OHV use, and we did not find either species.

We drove north of Bloomfield on Hwy 550, and looked at a site east of the Hwy near some private land, and did not find any plants.

We then drove down the Glade Road north of Farmington, east of Hwy 170 and northwest of San Juan College. Many an OHV passed us in a flurry of dust. We did find the *Aliciella* at an oil pad. These plants had been tagged by John previously. He noted that many were missing from the plot, and most plants did not look great.

3. Climate Change

A. formosa evolved in a arid environment, but the plant may not be able to withstand the rate of rising temperatures and increased drought lengths predicted in various climate change scenarios. Climate change is already causing a rise in temperatures across the United States and an increase in extreme weather events, such as extended droughts in the southwestern U.S. (Parmesan et al. 2000; NSC 2003; CCSP 2008; Karl et al. 2009). Karl et al. (2009: 129) stated, “Human-induced climate change appears to be well underway in the Southwest. Recent warming is among the most rapid in the nation, significantly more than the global average in some areas.” The effects of climate change on ecosystems in New Mexico are also being tracked (Enquist and Gori 2008). Temperatures during the latter period of warming have increased at a rate comparable to the rates of warming that conservative projections predict will occur during the next century with continued increases of greenhouse gases. A 2007 report from the Intergovernmental Panel on Climate Change described the rising temperature trend (IPCC 2007: 30):

Eleven of the last twelve years (1995-2006) rank among the twelve warmest years in the instrumental record of global surface temperature (since 1850). The 100-year linear trend (1906-2005) of 0.74 [0.56 to 0.92]°C is larger than the corresponding trend of 0.6 [0.4 to 0.8]°C (1901-2000) given in the TAR (Figure 1.1). The linear warming trend over the 50 years from 1956 to 2005 (0.13 [0.10 to 0.16]°C per decade) is nearly twice that for the 100 years from 1906 to 2005.

As climate change progresses, maximum high and minimum low temperatures are expected to increase, as are the magnitude and duration of regional droughts (IPCC 2001). The most recent IPCC report (IPCC 2007: 48) predicted the follow impacts on ecosystems from climate change:

- The resilience of many ecosystems is *likely* to be exceeded this century by an unprecedented combination of climate change, associated disturbances (e.g. flooding, drought, wildfire, insects, ocean acidification) and other global change drivers (e.g. landuse change, pollution, fragmentation of natural systems, overexploitation of resources).
- Over the course of this century, net carbon uptake by terrestrial ecosystems is *likely* to peak before mid-century and then weaken or even reverse, thus amplifying climate change.

- Approximately 20 to 30% of plant and animal species assessed so far are *likely* to be at increased risk of extinction if increases in global average temperature exceed 1.5 to 2.5°C (*medium confidence*).
- For increases in global average temperature exceeding 1.5 to 2.5°C and in concomitant atmospheric CO₂ concentrations, there are projected to be major changes in ecosystem structure and function, species' ecological interactions and shifts in species' geographical ranges, with predominantly negative consequences for biodiversity and ecosystem goods and services, e.g. water and food supply.

Allen and Breshears (1998) predicted that climate change would cause unprecedented rates of vegetation shifts due to die off, especially along boundaries of semi-arid ecosystems. The IPCC (2007) report also predicted that species ranges will shift. The Aztec gilia may not be able to adapt to changing climate given its restricted range over the Nacimiento Formation and given the loss and fragmentation of habitat already caused by the prolific oil and gas development across the plant's range.

4. Narrow Range

The FWS has routinely recognized that small population size and restricted range increase the likelihood of extinction (*c.f.* FWS 2005; 2008; 2009a; 2009b; 2009c; 2009d). The Aztec gilia has a small global population and a narrow range. For the Langford's tree snail (*Partula langfordi*), the Service (FWS 2009d: 5) stated:

Even if the threats responsible for the decline of this species were controlled, the persistence of existing populations is hampered by the limited number of known individuals of this species. This circumstance makes the species more vulnerable to extinction due to a variety of natural processes. Small populations are particularly vulnerable to reduced reproductive vigor caused by inbreeding depression, and they may suffer a loss of genetic variability over time due to random genetic drift, resulting in decreased evolutionary potential and ability to cope with environmental change (Lande 1988; Pimm et al. 1988; Center for Conservation Update 1994; Mangel and Tier 1994).

Here, the Service relies on citations not specific to *Partula langfordi* that indicate the threat to survival presented by limited population numbers even without other known threats. The Service similarly notes for a snail called Sisi (*Ostodes strigatus*), "Even if the threats responsible for the decline of this species were controlled, the persistence of existing populations is hampered by the small number of extant populations and the small geographic range of the known populations" (FWS 2009b: 4). Because the Aztec gilia's range is limited and is vulnerable to weather events such as drought and storms, FWS should consider this plant's narrow range as itself a threat to the taxon.

VI. Conclusion

The increased human population in the towns around and within *A. formosa* habitat, increased recreational use of BLM lands in the FFO, prolific oil and gas development, and other threats are all putting the species at risk of extinction. Existing regulations are not protecting the species' habitat or individual plants from harm.

1. Requested Designation

WildEarth Guardians hereby petitions the U.S. Fish and Wildlife Service under the Department of Interior to list the Aztec gilia as an Endangered or Threatened species pursuant to the Endangered Species Act. This listing action is warranted, given the numerous threats this species faces. Aztec gilies are threatened by at least three of the five listing factors: present and threatened destruction, modification and curtailment of habitat and range; the inadequacy of existing regulatory mechanisms; and other natural or manmade factors affecting their continued existence.

2. Critical Habitat

Given that habitat destruction and degradation are significant threats, Petitioner requests that critical habitat be designated for this species concurrent with final ESA listing.

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