

Habitat Evaluation and Surveys for Listed Plant and Animal Species at Pecos National Historical Park Pigeon's Ranch and Cañoncito Subunits



Final Report

Kristine Johnson, Jacqueline Smith, and Phil Tonne
Natural Heritage New Mexico
University of New Mexico, Albuquerque, NM 87131
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Abstract

Surveys for the Santa Fe cholla, cyanic milkvetch, and grama grass cactus were conducted in 2008, 2009, and 2010. None of the three species was detected on any of the surveys. The low hills of the Cañoncito survey area appear to contain the most likely habitat for rare plants. While the Santa Fe cholla could occur within this area, it has not been observed and is not expected to occur here. The other species are much more cryptic and are more likely to have escaped detection.

Evaluation of riparian habitats in the Pigeon's Ranch and Cañoncito Subunits did not detect suitable breeding habitats for Southwestern Willow Flycatchers or Yellow-billed Cuckoos. Riparian patches lacked the necessary structure and area for either species. Several emerging coyote willow patches along the Pecos River are also deficient in area and height but show promise for the future if they are left to develop. Two years of surveys of the riparian habitat adjoining the Pecos River revealed 77 bird species in four vegetation types, but we detected no Southwestern Willow Flycatchers or Yellow-billed Cuckoos. Habitat in the Pigeon's Ranch Subunit was not suitable for breeding Gray Vireos. Piñon-juniper habitat in the Cañoncito Subunit appeared marginal, primarily due to slope and area, and 2009 and 2010 surveys did not detect Gray Vireos.

Introduction

Pecos National Historical Park (PECO) contains a main unit and two smaller subunits, Cañoncito and Pigeon's Ranch. Together, the subunits cover about 283 ha (700 ac). To support park project planning for these subunits, we evaluated habitat for listed plant and animal species in the two subunits and, where suitable habitat existed, conducted inventories for listed species with potential to occur in those habitats. Habitat evaluations will allow the park to focus inventory effort and resources on the highest priority species and habitats.

Plants

One listed plant species of piñon-juniper (*Pinus edulis*, *Juniperus* spp.) habitat could occur at PECO. The Santa Fe cholla (*Opuntia viridiflora*) is listed as endangered by the State of New Mexico. This species is known from only two areas in northern Santa Fe County, Fort Marcy Park in Santa Fe and the Pojoaque Reservation to the north (NHNM database 2009, New Mexico Rare Plant Technical Council 1999). Because it is difficult to identify when not flowering, surveys for the Santa Fe cholla need to be conducted in July when it is flowering. We conducted surveys over three years.

The cyanic milkvetch (*Astragalus cyaneus*) is not formally listed but is considered sensitive by the State of New Mexico. It is listed by both US Fish and Wildlife Service (USFWS) and US Forest Service (USFS) as a Species of Concern. It is endemic to north-central New Mexico, occurring in Rio Arriba, Santa Fe, and Taos Counties. Natural Heritage New Mexico rare plant botanist Phil Tonne recommended that the surveys include this species. It inhabits dry hillsides and gullied banks in sandy or gravelly soils in piñon-juniper habitat (New Mexico Rare Plant Technical Council 1999). It flowers in April and May. We conducted surveys for this species over two years.

A third species, the grama grass cactus (*Sclerocactus papyracanthus*), has no state or federal listing status, has been dropped as a species of concern by the USFS, but is retained as a species of concern by the Bureau of Land Management. BLM botanist Mike Howard and Phil Tonne have noted that this species has disappeared from areas of the state where it was formerly present. This species has a widespread distribution oriented from north-central New Mexico near Abiquiu to Dell City, Texas and south to the Mexican border (NHNM database 2009, New Mexico Rare Plant Technical Council 1999). It also occurs near Holbrook, Arizona, and southward towards the Mogollon Rim. Although it is possible that a seed bank exists in these areas and favorable weather will bring the cactus back, there is concern that the species may be in trouble. This species is difficult to find because of its small size and tendency to grow within grass tufts. Thorough surveys targeting this species would require surveying in multiple above-average-precipitation years. In our experience, re-locating known populations of this plant has recently proven difficult. Opportunities to find new locations may be limited due to a possible bottleneck throughout its range. Declining populations appear to coincide with rangewide shifts in the abundance and timing of precipitation.

Birds

Three bird species that are either federally listed, state listed, or federal candidates for listing could occur at PECO. The Southwestern Willow Flycatcher (SWFL, *Empidonax traillii extimus*), a federally endangered subspecies, breeds in dense riparian habitats of the southwestern US. Occupied SWFL breeding sites always have dense vegetation in the interior, and the densest vegetation typically occurs within 3-4 m above ground. Native riparian habitat is often characterized by an overstory of broadleaf trees such as cottonwood (*Populus* spp.) and an understory of willow (*Salix* spp.) or other shrubs. Slow-moving water and/or saturated soil is typically present at breeding sites. Linear riparian habitat less than 10 m wide has not been found to contain SWFL nests (Sogge et al. 1997). SWFLs are threatened by loss of riparian habitat due to water diversion, impoundment, and channelization; livestock grazing; and brown-headed cowbird (*Molothrus ater*) brood parasitism. Willow flycatchers have previously been identified at PECO on three days in June 2002 (Johnson et al. 2003), but because they were detected during the migration season, they could not be identified as the southwestern subspecies.

The western distinct population segment (DPS) of the Yellow-billed Cuckoo (YBCU, *Coccyzus americanus*), is a candidate for federal listing by the USFWS under the Endangered Species Act, with a listing priority of 3 (USFWS 2009). It breeds in large blocks of dense riparian habitat in the western US. Dense understory vegetation, including willow, is important for nest sites, and cottonwood overstory is used as foraging habitat (Hughes 1999). The YBCU is threatened by loss of riparian habitat to agricultural development, livestock grazing, water diversion and impoundment, and tropical deforestation on its wintering grounds (USFWS 2009 and references therein). The USFWS considers YBCUs that occur in the western US to be members of the western DPS (USFWS 2009). The area for this DPS is west of the crest of the Rocky Mountains, which in New Mexico coincides with the Continental Divide. This area excludes the drainage of the Pecos River. Thus, if YBCUs were detected at PECO, they

would technically not be considered part of the western DPS and would thus not be candidates for listing. However, because the boundary between the eastern and western population segments is somewhat vague and PECO lies near that boundary, we evaluated habitat at PECO while we were evaluating habitat for SWFL. The New Mexico Ornithological Society Field Notes Database includes 12 YBCU records in San Miguel County between 1969 and 2008 (New Mexico Ornithological Society 2009), but four separate riparian bird surveys since 1989 have failed to detect them at PECO (Mukai 1989, Johnson et al. 2003, National Park Service [NPS] 2009, this study).

The Gray Vireo (GRVI, *Vireo vicinior*) is listed as threatened by the State of New Mexico. Throughout its range, the GRVI breeds in piñon-juniper, scrubland, or chaparral habitats in arid, mountainous terrain or high plains (Barlow et al. 1999). In New Mexico, it is primarily associated with juniper woodlands and savannahs of the foothills and mesas, usually with a well-developed grassy understory, and in some areas, a piñon or oak component (New Mexico Department of Game and Fish 2005). The GRVI is threatened by clearing of piñon-juniper woodlands, construction and development, habitat alteration for livestock grazing, and brown-headed cowbird brood parasitism. GRVIs have been recorded at PECO, but rarely. Mukai (1989) recorded GRVI twice in piñon-juniper woodland east of Casa Grande, and Parmenter and Lightfoot (1996) report observing a single GRVI “during a separate survey of T & E species on potential NPS Development Sites within Pecos Unit.” Most avian surveys have been concentrated in riparian areas and not in their preferred juniper habitats (Mukai 1989, Johnson et al. 2003, NPS 2009, this study). Large areas of piñon-juniper vegetation on the main unit of PECO may provide habitat for GRVIs.

For this project, we assessed riparian habitats along Galisteo Creek in the Cañoncito Subunit and Glorieta Creek in the Pigeon’s Ranch Subunit and the main unit, with the intention of conducting USFWS protocol SWFL surveys (Sogge et al. 1997) in any appropriate patches of breeding habitat. We conducted protocol SWFL surveys along selected segments of the Pecos River and Glorieta Creek on the main unit, in combination with point count surveys for riparian bird species. Those point counts were sufficient to detect YBCU if they were present. We also evaluated piñon-juniper habitats for GRVI use and conducted playback auditory surveys for GRVI in suitable piñon-juniper nesting habitat in both subunits.

Methods

Plants

We conducted concentrated surveys for target plant species in the spring and summer of 2008, covering the Cañoncito and Pigeon’s Ranch Subunits of the park. These surveys targeted likely habitat but were designed to encounter representative portions of the many plant communities within the survey areas that might contain other rare components of the local flora. We derived survey routes from GIS imagery and modified them in the field in an attempt to hit as much potential habitat as possible. Surveys were repeated in promising areas in 2009 and 2010.

Birds

Between 24 and 26 April 2008 we assessed habitat for three listed or candidate bird species at the Cañoncito and Pigeon's Ranch subunits of the park. We evaluated riparian habitats in both units for use by SWFLs and YBCUs. We assessed coniferous habitats for GRVI in both subunits.

Cañoncito Subunit

We visited the Cañoncito Subunit in the early morning of 25 April 2008. We first walked a ~650 m, 4-point transect through piñon-juniper habitat in the western part of the unit, between the railroad tracks and Interstate 25 (Figure 1). We stopped every ~250 m to listen for GRVI vocalizations. We also surveyed a 5-point transect in piñon-juniper habitat at the base of the mesa on the east side of the tracks. We listened for GRVI vocalizations for 5 minutes at each point; points were ~250 m apart (Figure 1). While conducting rare plant surveys on top of the mesa during the weeks of 14 and 22 May 2008, we conducted a cursory evaluation of habitat on the mesa top, which covers approximately one-third of the Cañoncito Subunit, an area that has not yet been acquired by the park.

Because habitat appeared marginally suitable for GRVIs, on 10 June 2009 we again surveyed in piñon-juniper habitat at the base of the mesa on the east side of the tracks using tape playback. After we had completed two points of the transect, it started to rain and we were unable to complete the survey that morning. We surveyed the area again on 18 and 19 June 2009 using playback. Two observers conducted a third tape playback survey between 0600 and 1100 h on 11 June 2010.

Pigeon's Ranch Subunit

On 24 April 2008 we walked the length of Glorieta Creek within the Pigeon's Ranch subunit to assess potential SWFL and YBCU breeding habitat. On 26 April 2008, we walked the Glorieta Battlefield Overlook Trail on the Pigeon's Ranch subunit to assess habitat for GRVI. We also drove up Pigeon's Ranch Road on the north side of state Highway 50 to look for GRVI habitat. We photographed habitat at all three sites (Figure 2).

Main Unit

On 28 May 2008, we evaluated potential SWFL and YBCU habitat along Galisteo Creek from the Forked Lightning Ranch House to the Visitor Center. We took several photographs to record the range of habitats along the creek. Because some habitat appeared marginal for SWFL, we ran USFWS protocol surveys for SWFL (Sogge et al. 1997) on Glorieta Creek between the Forked Lightning Ranch House and the Trading Post on 28 May, and 6 and 25 June 2008 (Figure 3).

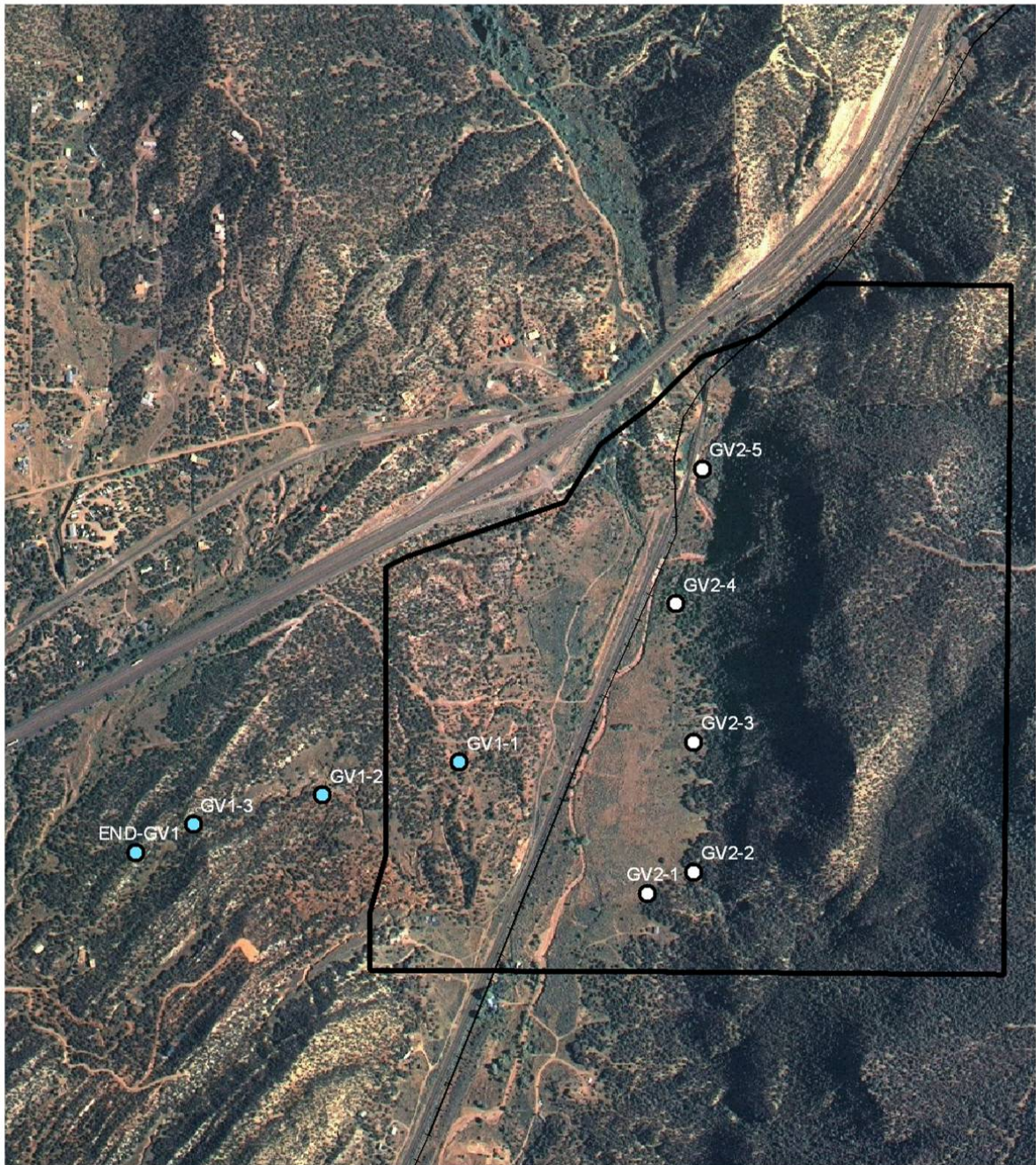


Figure 1. Cañoncito Subunit with Gray Vireo transects.

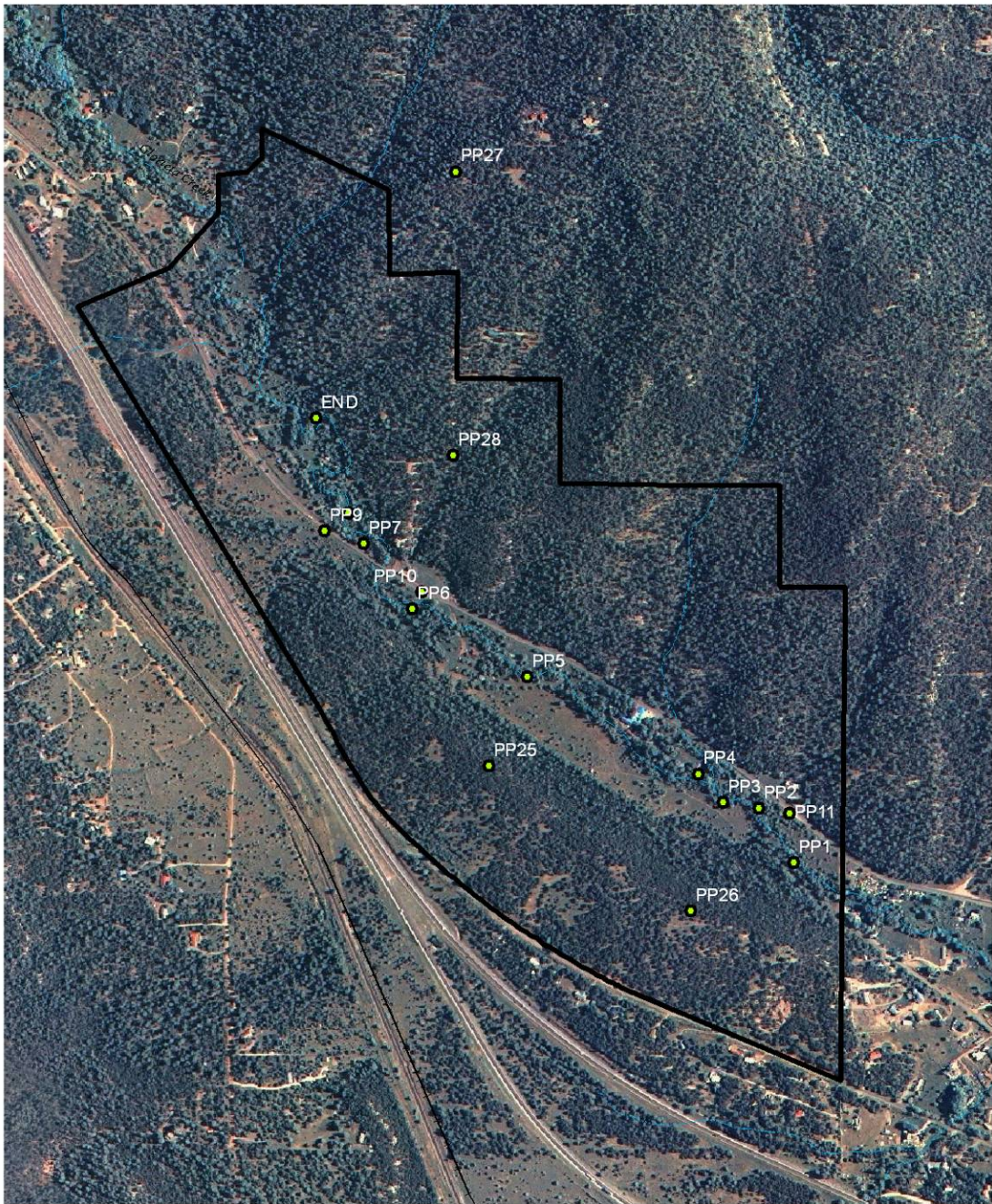


Figure 2. Pigeon's Ranch Subunit with photo/survey points.

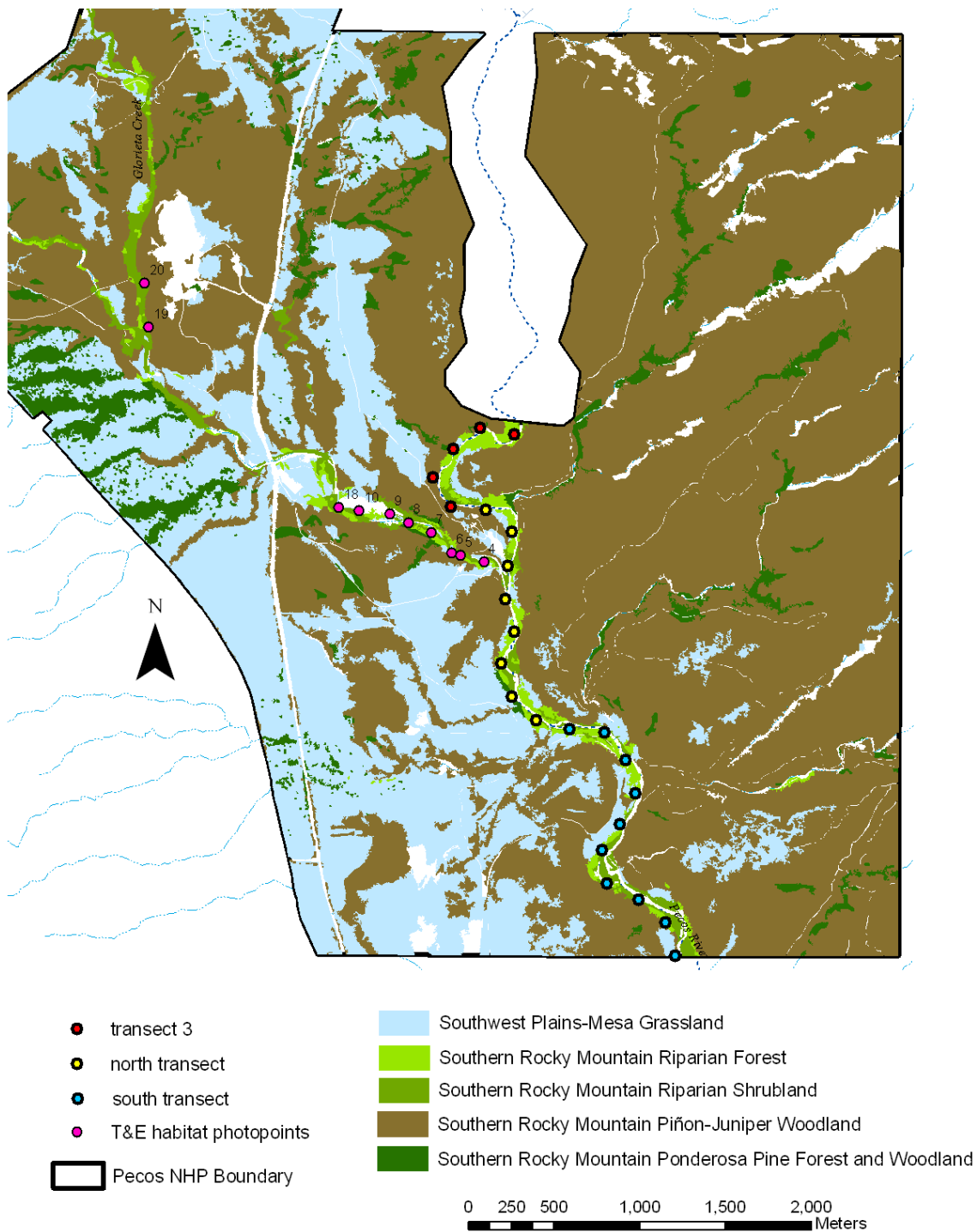


Figure 3. Main unit with riparian survey points and habitat photo points.

Pecos River Riparian Bird Surveys

On 27-28 May, 4-6 and 25-27 June, and 1 July 2008; and 2-4, 9-12, and 16-18 June 2009; we conducted point counts on three transects along the Pecos River in the main park unit (Figure 3). Although the transects are as close to the river as possible, 15 points were situated in riparian habitat, four points in piñon-juniper habitat, two points in grassland habitat, and one in ponderosa pine habitat (23 points total). Surveys were repeated three times during the breeding season in each year. The northern three points of the northernmost transect (Transect 3) were not visited in the second year because they had been set up on private land and a fence was erected the second year. We eliminated the data from those points; therefore, transect 3 effectively had five points instead of eight. Because of a misunderstanding about the exact location of the south park boundary, the south transect in 2008 began about 300 m north of the boundary. In 2009, we added 2 points to the south transect to ensure that the entire reach of the river within the park was surveyed (Figure 3). Thus, the south transect had 8 points in 2008 and 10 points in 2009. As a result of these changes to the south transect and transect 3, there are two more points of bird count data from 2009 than from 2008.

Surveys were conducted between 0600 and 0900 h. Transect points were approximately 200m apart. At each point the surveyor stopped, waited 5 minutes, then recorded every bird heard or seen at the point over the next five minutes. If potential SWFL habitat was visible nearby, we played the tape of a male territorial vocalization as recommended by the survey protocol.

During point counts, we recorded whether a bird was detected in riparian or upland habitat. Using the draft vegetation map for PECO (Muldavin et al. 2009), we assigned more detailed habitats to each observation. Habitats were named according to the proposed group level names of the National Vegetation Classification and assigned based on the draft PECO vegetation map, using GIS (Muldavin et al. 2009). If the bird was detected in riparian habitat, it was in either Southern Rocky Mountain Montane Riparian Shrubland or Southern Rocky Mountain Montane Riparian Forest. Since we did not differentiate these two riparian habitats during surveys, they are lumped as “riparian” in the data. If the bird was observed in upland habitat, we used the draft vegetation map to determine which of the following possibilities was most likely: Southern Rocky Mountain Ponderosa Pine Forest and Woodland (“ponderosa pine”); Southern Rocky Mountain Piñon-Juniper Woodland (“piñon-juniper”); or Southwest Plains-Mesa Grassland (“grassland”). If multiple upland habitats occurred near the point, we assigned the one most likely based on the bird’s usual preferred habitat type (e.g., Western Meadowlark to Grassland).

Results

Plants

While pockets of interesting habitat could support endemic species within the area surveyed, none of the target plants was found within either of the two subunits. The Cañoncito Subunit is more likely to contain rare plants that may be detected in future

surveys. An area of promising habitat in the low hills of this subunit could potentially support the cyanic milkvetch and grama grass cactus (Photo 1). This area was surveyed again in 2010 for the three target plants. While the Santa Fe cholla could occur within this area, it has not been observed and is not expected to occur here. The other species are much more cryptic and are more likely to have escaped detection.

Birds

Cañoncito Subunit

Habitat west of the railroad tracks (Figure 1, transect 1) could be described as primarily “badlands.” The area is hilly and incised by several deep arroyos. Poor, clay soils support little in the way of grasses or forbs. The many dead piñon trees suggest recent impacts by drought or bark beetles. Scattered junipers remain in this habitat. The area is too hilly and bisected by arroyos to qualify as good GRVI habitat. Small patches of piñon-juniper habitat occur on higher quality soils nearer the tracks. We found no juniper savannah or relatively level piñon-juniper habitats. We heard no vireo vocalizations, consistent with the unsuitable nature of the habitat.

The habitat at the base of the mesa (Figure 1, transect 2) was somewhat more appropriate for GRVI, but the gently-sloping strip of piñon-juniper was less than 50 m wide - too narrow to accommodate normal-sized GRVI territories (Photo 2). The sides of the mesa rise steeply to the east (Photo 3). The mouths of small canyons emerging from the side of the mesa looked more promising (Photo 4), but only part of one sizeable canyon mouth was contained within the subunit boundaries. Even there, habitat patches were narrow and trees quite dense. In 2008 we detected no GRVIs on the transect, although we did hear a vireo on the steep mesa side. We followed this bird up the slope and identified it as a Cassin’s vireo (*Vireo cassinii*), likely a migrant. A cursory habitat survey of the mesa top did not detect good GRVI habitat. Patches of ponderosa pine and mixed conifer vegetation, neither typical of GRVI breeding habitat, were scattered through the piñon-juniper woodland, and we detected no juniper savannah vegetation type.

On 10 June 2009 we surveyed in piñon-juniper habitat at the base of the mesa on the east side of the tracks using tape playback. We briefly detected an unidentified vireo at the second survey point, but it started to rain and we were unable to complete the survey that morning. We surveyed the area again on 18 and 19 June 2009 using playback but detected only Plumbeous Vireos (*Vireo plumbeus*) both days. We surveyed the area again using playback on 11 June 2010 and detected only Plumbeous Vireos.

The habitat along Galisteo Creek is arroyo riparian, with bare cutbanks and little riparian vegetation. The dominant species on the arroyo edges was rabbitbrush (*Chrysothamnus nauseosus*, Photo 5), with a few relict cottonwoods (Photo 6). We observed no willow patches. Lacking dense riparian vegetation, the habitat is not suitable for breeding SWFLs or YBCUs.

Pigeon's Ranch Subunit

Glorieta Creek was quite small, not more than 0.5 m wide and a few centimeters deep. The associated riparian corridor along Glorieta Creek is correspondingly narrow and sparse. Scattered cottonwoods and small willow patches are interspersed with junipers and ponderosa pines (*Pinus ponderosa*, Photo 7). Several small willow clumps occur along the creek, but the willows are typically 1-2 m tall (Photo 8). The largest willow patch surveyed was about 200 m long and 30 m wide at the widest point (Photo 9). The cottonwood overstory above this patch was not well developed, and the willows were about 2-2.5 m tall. This patch might harbor flycatchers during migration, and if the willow patch increased in height and width, it would be more suitable for breeding in a few years. Overbank flooding would be necessary for this willow patch to develop substantially.

The Glorieta Battlefield Overlook Trail climbs to a ridge at 7375', higher than the elevations where the GRVI is typically found in northern New Mexico (5800-7200', DeLong and Williams 2006). In contrast to the rolling juniper savannahs and piñon-juniper woodlands that comprise typical GRVI habitat in northern New Mexico, the top of the ridge is narrow, dropping steeply on both sides (Photo 10), with small areas that are more level and open. Dominant trees are dense piñon and juniper. Due to the elevation and density of trees, we would consider habitat along the Glorieta Battlefield Overlook Trail to be marginal GRVI habitat at best and poor for breeding.

The dense coniferous habitat north of Highway 50 grows at an elevation of 7530', higher than the elevations where the GRVI is typically found in northern New Mexico (5800-7200', DeLong and Williams 2006). The Pigeon's Ranch subunit contains primarily ponderosa pine and Douglas fir (*Pseudotsuga menziesii*) trees, with a few Rocky Mountain junipers (*Juniperus scopulorum*), piñons, and oaks (Photo 11). In contrast to typical GRVI habitat in northern New Mexico, which is dominated by piñon-juniper woodland and juniper savannah, the vegetation is tall and dense, with little ground cover and a partially closed canopy (Photo 12). We found the Pigeon's Ranch habitat north of Highway 50 unsuitable for GRVIs.

Main Unit

Glorieta Creek between Forked Lightning Ranch and the Visitor's Center is a wide (40-140m) riparian corridor consisting of young patches of coyote willow (*Salix exigua*), mixed grassland and riparian shrubland, patches of rushes and cattails, and few large cottonwoods and other trees (Photo 13). The coyote willow between the Forked Lightning Ranch and the Trading Post is as tall as 3 m, and the largest patch is 3 m wide by 30 m long with no overstory. The coyote willow between the Trading Post and the Visitor Center occurs in small patches and is only as tall as 2 m with no overstory (Photo 14).

Riparian vegetation along the Pecos River in the main PECO unit currently contains the best SWFL habitat at PECO and shows potential to develop into suitable breeding habitat. Near the south end of the park, willow patches are large enough to support

SWFLs and after several years could attain sufficient height. Cottonwood or other suitable tree overstory is a potential problem there, however; coyote willows and large cottonwoods or Gooding's willow (*Salix gooddingii*) occur together in only a few areas along the riparian corridor.

Main Unit Riparian Surveys

We detected 65 species at transect points during point count surveys in two years (Table 1). Three individual birds (not counted for species totals) were unidentified. Of these three, two unidentified individuals of the genus *Empidonax* were seen in 2008, and another unidentified individual was detected in 2009. Eleven additional species (Table 2) were recorded between points or off the transects, for a total of 76 species detected. We detected 54 species on surveys in 2008 and 57 in 2009. Many birds that were seen in low numbers were only seen on surveys in one of the two years (e.g., Cliff and Bank Swallows and Olive-sided Flycatchers). In addition to detecting three more species on transects during counts in the second year, we also detected more individual birds, 904 in 2009 compared to 671 in 2008.

Fifty-eight species were detected in riparian habitat, and 42, 32, and seven species were detected in piñon-juniper, grassland, and ponderosa pine habitats, respectively (Table 3). Individuals of thirteen species were detected in unknown habitats, but these species were also detected in greater numbers in known habitat types.

Fifty-three species were detected during the two years of surveys on the south transect, 51 on the north transect, and 46 on transect 3 (Table 4). Seven species were seen on both the south and north transects but not on transect 3: Hairy Woodpecker, Black Phoebe, Western Scrub-Jay, Gray Catbird, Northern Mockingbird, Western Meadowlark, and Bullock's Oriole. Four species were seen during counts only on transect 3: Great Blue Heron, Ladder-backed Woodpecker, Downy Woodpecker, and Olive-sided Flycatcher.

Table 1. Bird species detected in first and second year of surveys.

Common name	Genus	Species	Year 1	Year 2
Great Blue Heron	<i>Ardea</i>	<i>herodias</i>	1	1
Mallard	<i>Anas</i>	<i>platyrhynchos</i>	14	14
Red-tailed Hawk	<i>Buteo</i>	<i>jamaicensis</i>	7	7
Spotted Sandpiper	<i>Actitis</i>	<i>macularia</i>	8	14
White-winged Dove	<i>Zenaida</i>	<i>asiatica</i>		3
Mourning Dove	<i>Zenaida</i>	<i>macroura</i>	8	34
Common Nighthawk	<i>Chordeiles</i>	<i>minor</i>		1
Black-chinned Hummingbird	<i>Archilochus</i>	<i>alexandri</i>		4
Broad-tailed Hummingbird	<i>Selasphorus</i>	<i>platycercus</i>	3	2
Ladder-backed Woodpecker	<i>Picoides</i>	<i>scalaris</i>		1
Downy Woodpecker	<i>Picoides</i>	<i>pubescens</i>	1	
Hairy Woodpecker	<i>Picoides</i>	<i>villosus</i>		4
Northern Flicker	<i>Colaptes</i>	<i>auratus</i>	7	6
Olive-sided Flycatcher	<i>Contopus</i>	<i>cooperi</i>	1	
Western Wood-Pewee	<i>Contopus</i>	<i>sordidulus</i>	46	40
Cordilleran Flycatcher	<i>Empidonax</i>	<i>occidentalis</i>	10	24

Common name	Genus	Species	Year 1	Year 2
Black Phoebe	<i>Sayornis</i>	<i>nigricans</i>	9	10
Say's Phoebe	<i>Sayornis</i>	<i>saya</i>	1	
Ash-throated Flycatcher	<i>Myiarchus</i>	<i>cinerascens</i>	19	16
Cassin's Kingbird	<i>Tyrannus</i>	<i>vociferans</i>	16	21
Plumbeous Vireo	<i>Vireo</i>	<i>plumbeus</i>	17	28
Warbling Vireo	<i>Vireo</i>	<i>gilvus</i>	28	25
Steller's Jay	<i>Cyanocitta</i>	<i>stelleri</i>	1	1
Western Scrub-Jay	<i>Aphelocoma</i>	<i>californica</i>	2	3
Piñon Jay	<i>Gymnorhinus</i>	<i>cyanocephalus</i>		2
Common Raven	<i>Corvus</i>	<i>corax</i>	4	36
Violet-green Swallow	<i>Tachycineta</i>	<i>thalassina</i>	179	199
Northern Rough-winged Swallow	<i>Stelgidopteryx</i>	<i>serripennis</i>		4
Bank Swallow	<i>Riparia</i>	<i>riparia</i>	2	
Cliff Swallow	<i>Petrochelidon</i>	<i>pyrrhonota</i>		1
Black-capped Chickadee	<i>Poecile</i>	<i>atricapilla</i>	2	2
Mountain Chickadee	<i>Poecile</i>	<i>gambeli</i>	6	1
Juniper Titmouse	<i>Baeolophus</i>	<i>ridgwayi</i>	10	2
White-breasted Nuthatch	<i>Sitta</i>	<i>carolinensis</i>	1	13
Bewick's Wren	<i>Thryomanes</i>	<i>bewickii</i>	6	4
House Wren	<i>Troglodytes</i>	<i>aedon</i>	7	7
Western Bluebird	<i>Sialia</i>	<i>mexicana</i>	6	7
Mountain Bluebird	<i>Sialia</i>	<i>currucoides</i>		10
American Robin	<i>Turdus</i>	<i>migratorius</i>	18	32
Gray Catbird	<i>Dumetella</i>	<i>carolinensis</i>	3	5
Northern Mockingbird	<i>Mimus</i>	<i>polyglottos</i>	3	2
Orange-crowned Warbler	<i>Vermivora</i>	<i>celata</i>	1	
Virginia's Warbler	<i>Vermivora</i>	<i>virginiae</i>	1	
Yellow Warbler	<i>Dendroica</i>	<i>petechia</i>	30	37
Yellow-rumped Warbler	<i>Dendroica</i>	<i>coronata</i>	1	2
Black-throated Gray Warbler	<i>Dendroica</i>	<i>nigrescens</i>	4	3
MacGillivray's Warbler	<i>Oporornis</i>	<i>tolmiei</i>	1	
Wilson's Warbler	<i>Wilsonia</i>	<i>pusilla</i>	6	9
Yellow-breasted Chat	<i>Icteria</i>	<i>virens</i>	10	17
Western Tanager	<i>Piranga</i>	<i>ludoviciana</i>	15	9
Spotted Towhee	<i>Pipilo</i>	<i>maculatus</i>	37	43
Chipping Sparrow	<i>Spizella</i>	<i>passerina</i>	17	8
Song Sparrow	<i>Melospiza</i>	<i>melodia</i>	27	33
White-crowned Sparrow	<i>Zonotrichia</i>	<i>leucophrys</i>	1	1
Black-headed Grosbeak	<i>Pheucticus</i>	<i>melanocephalus</i>	13	19
Blue Grosbeak	<i>Guiraca</i>	<i>caerulea</i>	1	4
Indigo Bunting	<i>Passerina</i>	<i>cyanea</i>	6	
Red-winged Blackbird	<i>Agelaius</i>	<i>phoeniceus</i>	3	4
Western Meadowlark	<i>Sturnella</i>	<i>neglecta</i>	1	2
Brewer's Blackbird	<i>Euphagus</i>	<i>cyanocephalus</i>	5	24
Brown-headed Cowbird	<i>Molothrus</i>	<i>ater</i>	23	28
Bullock's Oriole	<i>Icterus</i>	<i>bullockii</i>	3	3
House Finch	<i>Carpodacus</i>	<i>mexicanus</i>		1

Common name	Genus	Species	Year 1	Year 2
Red Crossbill	<i>Loxia</i>	<i>curvirostra</i>		9
Lesser Goldfinch	<i>Carduelis</i>	<i>psaltria</i>	17	61
Unidentified Bird				1
Unidentified Empidonax	<i>Empidonax</i>	<i>sp.</i>	2	
total individuals			671	904

Table 2. Bird species detected off survey points.

Genus	Species	Common Name
<i>Cathartes</i>	<i>aura</i>	Turkey Vulture
<i>Pandion</i>	<i>haliaetus</i>	Osprey
<i>Buteo</i>	<i>swainsoni</i>	Swainson's Hawk
<i>Streptopelia</i>	<i>decaocto</i>	Eurasian Collared-Dove
<i>Selasphorus</i>	<i>rufus</i>	Rufous Hummingbird
<i>Ceryle</i>	<i>alcyon</i>	Belted Kingfisher
<i>Psaltriparus</i>	<i>minimus</i>	Bushtit
<i>Catharus</i>	<i>ustulatus</i>	Swainson's Thrush
<i>Chondestes</i>	<i>grammacus</i>	Lark Sparrow
<i>Dolichonyx</i>	<i>oryzivorus</i>	Bobolink
<i>Carduelis</i>	<i>pinus</i>	Pine Siskin

Table 3. Bird species detected by habitat.

Common name	Genus	Species	Riparian	Piñon-Juniper	Grassland	Ponderosa Pine	Unknown	Total
Great Blue Heron	<i>Ardea</i>	<i>herodias</i>	2					2
Mallard	<i>Anas</i>	<i>platyrhynchos</i>	28					28
Red-tailed Hawk	<i>Buteo</i>	<i>jamaicensis</i>	10	2	2			14
Spotted Sandpiper	<i>Actitis</i>	<i>macularia</i>	22					22
White-winged Dove	<i>Zenaida</i>	<i>asiatica</i>		3				3
Mourning Dove	<i>Zenaida</i>	<i>macroura</i>	17	20	5			42
Common Nighthawk	<i>Chordeiles</i>	<i>minor</i>	1					1
Black-chinned Hummingbird	<i>Archilochus</i>	<i>alexandri</i>	1	2	1			4
Broad-tailed Hummingbird	<i>Selasphorus</i>	<i>platycercus</i>	5					5
Ladder-backed Woodpecker	<i>Picoides</i>	<i>scalaris</i>	1					1
Downy Woodpecker	<i>Picoides</i>	<i>pubescens</i>	1					1
Hairy Woodpecker	<i>Picoides</i>	<i>villosus</i>	2		2			4
Northern Flicker	<i>Colaptes</i>	<i>auratus</i>	8	3	1	1		13
Olive-sided Flycatcher	<i>Contopus</i>	<i>cooperi</i>		1				1
Western Wood-Pewee	<i>Contopus</i>	<i>sordidulus</i>	62	17	5		2	86
Cordilleran Flycatcher	<i>Empidonax</i>	<i>occidentalis</i>	16	14	3		1	34
Black Phoebe	<i>Sayornis</i>	<i>nigricans</i>	19					19
Say's Phoebe	<i>Sayornis</i>	<i>saya</i>		1				1
Ash-throated Flycatcher	<i>Myiarchus</i>	<i>cinerascens</i>	23	9	3			35
Cassin's Kingbird	<i>Tyrannus</i>	<i>vociferans</i>	26	1	9		1	37
Plumbeous Vireo	<i>Vireo</i>	<i>plumbeus</i>	8	22	14		1	45
Warbling Vireo	<i>Vireo</i>	<i>gilvus</i>	48	3	2			53
Steller's Jay	<i>Cyanocitta</i>	<i>stelleri</i>	1	1				2
Western Scrub-Jay	<i>Aphelocoma</i>	<i>californica</i>	2	2			1	5
Piñon Jay	<i>Gymnorhinus</i>	<i>cyanocephalus</i>		2				2
Common Raven	<i>Corvus</i>	<i>corax</i>	31	1	3		5	40
Violet-green Swallow	<i>Tachycineta</i>	<i>thalassina</i>	346	13	3		16	378
Northern Rough-winged Swallow	<i>Stelgidopteryx</i>	<i>serripennis</i>	3	1				4
Bank Swallow	<i>Riparia</i>	<i>riparia</i>	2					2
Cliff Swallow	<i>Petrochelidon</i>	<i>pyrrhonota</i>	1					1
Black-capped Chickadee	<i>Poecile</i>	<i>atricapilla</i>		4				4
Mountain Chickadee	<i>Poecile</i>	<i>gambeli</i>		4	3			7
Juniper Titmouse	<i>Baeolophus</i>	<i>ridgwayi</i>	7	4	1			12
White-breasted Nuthatch	<i>Sitta</i>	<i>carolinensis</i>	10	2	2			14
Bewick's Wren	<i>Thryomanes</i>	<i>bewickii</i>	7	1	2			10
House Wren	<i>Troglodytes</i>	<i>aedon</i>	11	1	1		1	14
Western Bluebird	<i>Sialia</i>	<i>mexicana</i>	11		2			13

Common name	Genus	Species	Riparian	Piñon-Juniper	Grassland	Ponderosa Pine	Unknown	Total
Mountain Bluebird	<i>Sialia</i>	<i>currucoides</i>	8		2			10
American Robin	<i>Turdus</i>	<i>migratorius</i>	33	9	5	1	2	50
Gray Catbird	<i>Dumetella</i>	<i>carolinensis</i>	8					8
Northern Mockingbird	<i>Mimus</i>	<i>polyglottos</i>	3	1	1			5
Orange-crowned Warbler	<i>Vermivora</i>	<i>celata</i>	1					1
Virginia's Warbler	<i>Vermivora</i>	<i>virginiae</i>	1					1
Yellow Warbler	<i>Dendroica</i>	<i>petechia</i>	65	1			1	67
Yellow-rumped Warbler	<i>Dendroica</i>	<i>coronata</i>	2	1				3
Black-throated Gray Warbler	<i>Dendroica</i>	<i>nigrescens</i>	1	5	1			7
MacGillivray's Warbler	<i>Oporornis</i>	<i>tolmiei</i>	1					1
Wilson's Warbler	<i>Wilsonia</i>	<i>pusilla</i>	13	2				15
Yellow-breasted Chat	<i>Icteria</i>	<i>virens</i>	26	1				27
Western Tanager	<i>Piranga</i>	<i>ludoviciana</i>	8	13	3			24
Spotted Towhee	<i>Pipilo</i>	<i>maculatus</i>	55	13	11	1		80
Chipping Sparrow	<i>Spizella</i>	<i>passerina</i>	15	3	6	1		25
Song Sparrow	<i>Melospiza</i>	<i>melodia</i>	55	3	1	1		60
White-crowned Sparrow	<i>Zonotrichia</i>	<i>leucophrys</i>	2					2
Black-headed Grosbeak	<i>Pheucticus</i>	<i>melanocephalus</i>	25	5	2			32
Blue Grosbeak	<i>Guiraca</i>	<i>caerulea</i>	4	1				5
Indigo Bunting	<i>Passerina</i>	<i>cyanea</i>	6					6
Red-winged Blackbird	<i>Agelaius</i>	<i>phoeniceus</i>	7					7
Western Meadowlark	<i>Sturnella</i>	<i>neglecta</i>			2	1		3
Brewer's Blackbird	<i>Euphagus</i>	<i>cyanocephalus</i>	21		1		7	29
Brown-headed Cowbird	<i>Molothrus</i>	<i>ater</i>	32	10	2		7	51
Bullock's Oriole	<i>Icterus</i>	<i>bullockii</i>	6					6
House Finch	<i>Carpodacus</i>	<i>mexicanus</i>	1					1
Red Crossbill	<i>Loxia</i>	<i>curvirostra</i>	7	2				9
Lesser Goldfinch	<i>Carduelis</i>	<i>psaltria</i>	59	12	4	1	2	78
Unidentified Bird			1					1
Unidentified Empidonax	<i>Empidonax</i>	<i>sp.</i>	1	1				2
(65 species)			1199	217	105	7	47	1575

Table 4. Bird species detected by transect.

Common name	Genus	Species	South	North	3	Total
Great Blue Heron	<i>Ardea</i>	<i>herodias</i>			2	2
Mallard	<i>Anas</i>	<i>platyrhynchos</i>	7	12	9	28
Red-tailed Hawk	<i>Buteo</i>	<i>jamaicensis</i>	11		3	14
Spotted Sandpiper	<i>Actitis</i>	<i>macularia</i>	13	8	1	22
White-winged Dove	<i>Zenaida</i>	<i>asiatica</i>	3			3
Mourning Dove	<i>Zenaida</i>	<i>macroura</i>	29	8	5	42
Common Nighthawk	<i>Chordeiles</i>	<i>minor</i>	1			1
Black-chinned Hummingbird	<i>Archilochus</i>	<i>alexandri</i>	3		1	4
Broad-tailed Hummingbird	<i>Selasphorus</i>	<i>platycercus</i>	1	2	2	5
Ladder-backed Woodpecker	<i>Picoides</i>	<i>scalaris</i>			1	1
Downy Woodpecker	<i>Picoides</i>	<i>pubescens</i>			1	1
Hairy Woodpecker	<i>Picoides</i>	<i>villosus</i>	2	2		4
Northern Flicker	<i>Colaptes</i>	<i>auratus</i>	1	8	4	13
Olive-sided Flycatcher	<i>Contopus</i>	<i>cooperi</i>			1	1
Western Wood-Pewee	<i>Contopus</i>	<i>sordidulus</i>	32	33	21	86
Cordilleran Flycatcher	<i>Empidonax</i>	<i>occidentalis</i>	14	4	16	34
Black Phoebe	<i>Sayornis</i>	<i>nigricans</i>	16	3		19
Say's Phoebe	<i>Sayornis</i>	<i>saya</i>	1			1
Ash-throated Flycatcher	<i>Myiarchus</i>	<i>cinerascens</i>	21	11	3	35
Cassin's Kingbird	<i>Tyrannus</i>	<i>vociferans</i>	22	14	1	37
Plumbeous Vireo	<i>Vireo</i>	<i>plumbeus</i>	19	18	8	45
Warbling Vireo	<i>Vireo</i>	<i>gilvus</i>	21	12	20	53
Steller's Jay	<i>Cyanocitta</i>	<i>stelleri</i>		1	1	2
Western Scrub-Jay	<i>Aphelocoma</i>	<i>californica</i>	3	2		5
Piñon Jay	<i>Gymnorhinus</i>	<i>cianocephalus</i>	2			2
Common Raven	<i>Corvus</i>	<i>corax</i>	28	11	1	40
Violet-green Swallow	<i>Tachycineta</i>	<i>thalassina</i>	152	124	102	378
Northern Rough-winged Swallow	<i>Stelgidopteryx</i>	<i>serripennis</i>	2	1	1	4
Bank Swallow	<i>Riparia</i>	<i>riparia</i>		2		2
Cliff Swallow	<i>Petrochelidon</i>	<i>pyrrhonota</i>		1		1
Black-capped Chickadee	<i>Poecile</i>	<i>atricapilla</i>	1		3	4
Mountain Chickadee	<i>Poecile</i>	<i>gambeli</i>	3	2	2	7
Juniper Titmouse	<i>Baeolophus</i>	<i>ridgwayi</i>	3	4	5	12
White-breasted Nuthatch	<i>Sitta</i>	<i>carolinensis</i>		6	8	14
Bewick's Wren	<i>Thryomanes</i>	<i>bewickii</i>	4	5	1	10
House Wren	<i>Troglodytes</i>	<i>aedon</i>	5	5	4	14
Western Bluebird	<i>Sialia</i>	<i>mexicana</i>	8	2	3	13
Mountain Bluebird	<i>Sialia</i>	<i>currucoides</i>	9	1		10
American Robin	<i>Turdus</i>	<i>migratorius</i>	15	18	17	50
Gray Catbird	<i>Dumetella</i>	<i>carolinensis</i>	3	5		8
Northern Mockingbird	<i>Mimus</i>	<i>polyglottos</i>	3	2		5
Orange-crowned Warbler	<i>Vermivora</i>	<i>celata</i>	1			1
Virginia's Warbler	<i>Vermivora</i>	<i>virginiae</i>		1		1
Yellow Warbler	<i>Dendroica</i>	<i>petechia</i>	27	19	21	67
Yellow-rumped Warbler	<i>Dendroica</i>	<i>coronata</i>		2	1	3
Black-throated Gray Warbler	<i>Dendroica</i>	<i>nigrescens</i>	1	3	3	7
MacGillivray's Warbler	<i>Oporornis</i>	<i>tolmiei</i>		1		1

Common name	Genus	Species	South	North	3	Total
Wilson's Warbler	<i>Wilsonia</i>	<i>pusilla</i>	6	4	5	15
Yellow-breasted Chat	<i>Icteria</i>	<i>virens</i>	23	3	1	27
Western Tanager	<i>Piranga</i>	<i>ludoviciana</i>	6	3	15	24
Spotted Towhee	<i>Pipilo</i>	<i>maculatus</i>	29	36	15	80
Chipping Sparrow	<i>Spizella</i>	<i>passerina</i>	17	6	2	25
Song Sparrow	<i>Melospiza</i>	<i>melodia</i>	22	24	14	60
White-crowned Sparrow	<i>Zonotrichia</i>	<i>leucophrys</i>	1		1	2
Black-headed Grosbeak	<i>Pheucticus</i>	<i>melanocephalus</i>	19	8	5	32
Blue Grosbeak	<i>Guiraca</i>	<i>caerulea</i>	2	2	1	5
Indigo Bunting	<i>Passerina</i>	<i>cyanea</i>	1	1	4	6
Red-winged Blackbird	<i>Agelaius</i>	<i>phoeniceus</i>	1	4	2	7
Western Meadowlark	<i>Sturnella</i>	<i>neglecta</i>	1	2		3
Brewer's Blackbird	<i>Euphagus</i>	<i>cyanocephalus</i>		24	5	29
Brown-headed Cowbird	<i>Molothrus</i>	<i>ater</i>	23	15	13	51
Bullock's Oriole	<i>Icterus</i>	<i>bullockii</i>	3	3		6
House Finch	<i>Carpodacus</i>	<i>mexicanus</i>	1			1
Red Crossbill	<i>Loxia</i>	<i>curvirostra</i>	7	2		9
Lesser Goldfinch	<i>Carduelis</i>	<i>psaltria</i>	38	21	19	78
Unidentified Bird				1		1
Unidentified Empidonax	<i>Empidonax</i>	<i>sp.</i>		1	1	2
Total Individuals/Species			687/53	513/51	375/46	1575



Photo 1. Low Hills of the Cañoncito Subunit.



Photo 3. Piñon-juniper grassland vegetation at the Cañoncito Subunit, showing steep slope on side of mesa.



Photo 2. Piñon-juniper, grassland vegetation at the base of the mesa, Cañoncito Subunit.



Photo 4. Canyon mouth, Cañoncito Subunit



Photo 5. Rabbitbrush on banks of Galisteo Creek, Cañoncito Subunit.



Photo 8. Willow clump along Glorieta Creek, Pigeon's Ranch Subunit.



Photo 6. Cottonwoods along Galisteo Creek, Cañoncito Subunit.



Photo 9. Largest willow patch observed along Glorieta Creek, Pigeon's Ranch Subunit.



Photo 7. Vegetation along Glorieta Creek, Pigeon's Ranch Subunit, showing small cottonwood, willows, juniper, and ponderosa pine.



Photo 10. Piñon-juniper vegetation at top of Glorieta Battlefield Overlook Trail, Pigeon's Ranch Subunit.



Photo 11. Ponderosa pine, Douglas fir vegetation on Pigeon's Ranch Subunit.



Photo 13. Example of the mosaic of habitats in Glorieta Creek: many young and few older cottonwood trees, small patch of young coyote willow, and old field (point 18 looking north).



Photo 12. Dense vegetation, little ground cover on Pigeon's Ranch Subunit north of highway 50.



Photo 14. Small patch of willow in Glorieta Creek east of the Trading Post (point 10 looking west).

Discussion

Plants

Our surveys did not detect any of the three target plant species. While it is possible that the Santa Fe cholla could exist within the subunits, all of the cholla encountered was tree cholla (*Cylindropuntia imbricata*). The main focus of our 2010 surveys was to visit areas containing cholla during the flowering period to verify that none of the plants was Santa Fe cholla, a species found in close association with tree cholla. No plants were found.

The survey sites are diverse in the plant communities they contain. Varied geology and soils, combined with differences in elevation and hydrology, create many small and distinctive biological communities. There is still a good chance that a regional endemic or otherwise interesting but undetected component of the local flora will be discovered within the survey sites. Further exploration during various times of year may reveal the presence of rare entities but so far we have not found them.

Birds

Riparian

The habitat along Galisteo Creek in the Cañoncito Subunit resembles arroyo riparian more than stream riparian habitat. The incised banks are lined primarily by rabbitbrush, with a few scattered relict cottonwoods and small willows. This stream is clearly unsuitable for either SWFL or YBCU breeding.

The riparian habitat on Glorieta Creek in the Pigeon's Ranch Subunit lacks the proper structure for SWFL breeding. The shrub layer along Glorieta Creek is sparse and spotty, and the few scattered cottonwoods fail to form the overstory typical of native SWFL habitat. With the possible exception of one larger patch, willow patches were too small to support nesting SWFLs. The willows comprising the largest patch were not uniformly tall enough and lacked overstory trees. However, this willow patch could develop sufficient height in several years. The absence of a dense shrub layer along most of the creek also renders it unsuitable for YBCU nesting.

The riparian habitat along Glorieta Creek between the Forked Lightning Ranch and the Visitor Center is not suitable for either SWFL or YBCU breeding. Although there are a few patches of coyote willow, these patches do not have adequate overstory for SWFL breeding. However, these patches may provide suitable stopover habitat for migrant SWFL. Because YBCU forage in large trees in riparian habitat, none of the habitat in this area is suitable for YBCU. After a few years, this habitat may develop into suitable breeding habitat for SWFL if the coyote willow, Gooding's willow, and cottonwoods are allowed to develop.

Riparian vegetation along the Pecos River in the main PECO unit shows potential to develop into suitable SWFL breeding habitat. Two breeding seasons of riparian surveys along the Pecos River failed to detect SWFL or YBCU. However, the fact that migrant willow flycatchers (not necessarily of the southwestern subspecies) have been detected along the Pecos River suggests that this area holds the most potential for future use (Johnson et al. 2003).

Avian biodiversity is substantial in the riparian corridor along the Pecos River. The riparian habitat had the highest species richness of any of the four habitats, but more than half of the survey points were situated in riparian habitats. Species assigned to other habitats were often detected in patches of other habitat types adjacent to points situated in riparian habitats. We detected no striking differences in species richness among transects or between the two years, but we detected many more individual birds in 2009 (904) than in 2008 (671). Larger numbers of individuals in 2009 could be due in part to opportunistic detection of large groups of social species such as Common Ravens, Brewer's Blackbirds, and American Goldfinches. Some other species such as Mountain Bluebirds seemed to breed in the area in greater numbers in 2009. Some birds may have been less detectable in late 2008 because the last few 2008 surveys were conducted about a week later than in 2009, when singing rates would be expected to be declining.

Piñon-Juniper

The badland habitat west of the railroad tracks in the Cañoncito Subunit is unsuitable for GRVI, mainly due to absence of ground cover and rough, varied topography. The piñon-juniper habitat at the base of the mesa appeared to be marginal for GRVIs, lacking sufficient area for a breeding territory and sloping too sharply up the mesa side. Auditory surveys did not confirm GRVI in that subunit. Piñon-juniper habitat on the mesa top did not appear highly suitable for GRVI. However, if the park acquires that parcel in the future, we recommend that the habitat on the mesa top be thoroughly evaluated and any suitable habitat be surveyed for GRVI.

There is apparently little or no suitable habitat for GRVI at the Pigeon's Ranch Subunit. The terrain is too steep in most wooded areas, elevation is too high, and areas of favored piñon-juniper woodland and juniper savannah are insufficient.

Piñon-juniper habitat is abundant on the main PECO unit. Juniper savannah habitat there may have been the most suitable GRVI habitat at the park, but most of this vegetation type has been destroyed by recent juniper removal projects in the main PECO unit. We recommend that potential GRVI habitat on the main unit be assessed and surveys be conducted in any suitable habitat.

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