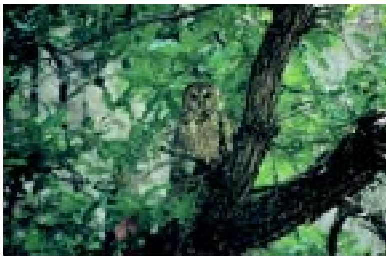
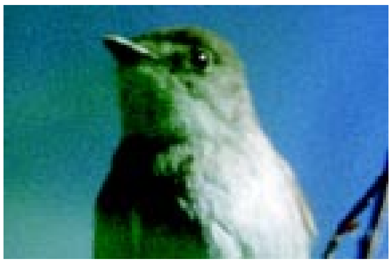
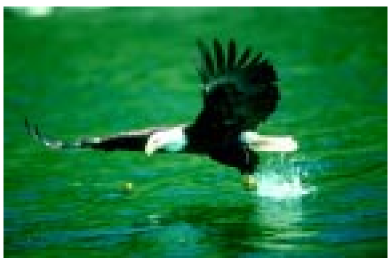

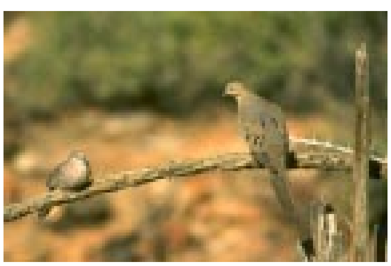


# 1998

# Annual Monitoring Report

# on the

# Status of Threatened, Endangered

# and

# Sensitive Species

# at

# Los Alamos National Laboratory

David C. Keller
Terrell H. Johnson
Steven W. Koch
Timothy K. Haarmann
Teralene S. Foxx

LA-UR-98-4698

# Threatened and Endangered Bird Surveys at Los Alamos National Laboratory: Mexican Spotted Owl

*David C. Keller**

*Ecology Group, Los Alamos National Laboratory

**Abstract**

During the 1994, 1995, 1996, 1997, and 1998 field seasons, five primary areas at Los Alamos National Laboratory were surveyed for the Mexican spotted owl (*Strix occidentalis lucida*). The surveys revealed a nesting pair of owls that subsequently fledged a pair of young during four years.

## 1.0 Introduction

Mexican spotted owls (*Strix occidentalis lucida*) are between 41 to 48 cm (16 to 19 in.) in length with white spots on the head and back, white horizontal stripes on the chest, and no ear tuffs. This owl is also only one of two species, the other being the flammulated owl (*Otus flammeolus*), in the southwest that has completely dark eyes (NGS 1983). The Mexican spotted owl inhabits mixed-conifer and ponderosa pine-Gambel oak forests in mountains and canyons in the southwestern United States and northern Mexico. High canopy closure, high stand diversity, multilayered canopy resulting from an uneven-aged stand, large, mature trees, downed logs, snags, and stand decadence as indicated by the presence of mistletoe are characteristic of Mexican spotted owl habitat. The Mexican spotted owl requires approximately 800 ha (2,000 ac) of suitable habitat to ensure reproductive success. In addition, spotted owls favor narrow, steep canyons where there is little light penetration and cool temperatures. They tend to prefer north-facing slopes and to nest in trees, crevices, or small caves (USDI FWS 1995, Travis 1992).

During the 1994, 1995, 1996, 1997, and 1998 breeding seasons, I was surveying the canyons in the western and central portion of Los Alamos National Laboratory (LANL). Also, as part of the mitigation measures for the construction of the Dual Axis Radiographic Hydrodynamic Test facility, this site was also monitored during the 1995, 1996, 1997, and 1998 breeding seasons. During the course of these surveys, a pair of Mexican spotted owls was located in 1995, 1996, 1997, and 1998. In subsequent monitoring of these locations, nests were found all four years, each with two young that ultimately fledged. Based on the proximity of each nest location, it is reasonable to assume that this is the same pair of owls and continue to be the only pair utilizing LANL lands for breeding.

A topographic model (Johnson 1994) of potential spotted owl habitat in New Mexico and LANL has been completed as a result of the habitat management plan. In addition to modeled habitat, all slopes greater than 40 degrees with mixed-conifer or pine-oak habitat (USDI FWS 1995) were analyzed for habitat. Results from modeling and other factors indicate five areas within Laboratory boundaries and three areas directly adjacent to Lab lands that have potential owl habitat. The areas on LANL lands have been monitored for at least one year, and any occupied habitat will continue to be monitored on a yearly basis. All identified habitats on LANL lands are scheduled for an initial two years of surveys prior to further evaluation of their potential as habitat.

## 2.0 Methodology

Surveying for the Mexican spotted owl follows the US Department of Interior Fish and Wildlife Service protocol. Once an area of potential habitat is identified based on habitat type, a survey route is planned. A route is designed to cover all of the available habitat within 0.8 km (0.5 mi) of the calling route. From approximately 2 AM until sunrise or from dusk until 12 AM, surveys are performed by broadcasting the call of the spotted owl and waiting for an owl to respond. The surveyor will walk a canyon edge or bottom and play the call to cover the habitat in the area of the survey. The area is covered completely in one survey outing. Once an owl is found, the preliminary surveys can be discontinued and more intensive nest location surveys can begin. All owl species detected during the survey are recorded. Table 1 shows the results of the surveys conducted in 1994, 1995, 1996, 1997, and 1998. The biologist records the time, species, and the location of each owl detected.

Once a Mexican spotted owl is located, the next step is to discover if there is a pair of owls and if they have a nest in the location of interest. The owl, after detected during a night survey, is usually followed until dawn, and a physical description of the area where the owl quit calling and the location are recorded. The area where the owl is near dawn is the most likely roost location. If a pair has young, the owl is usually near the nest location. Once a roost location is suspected, the next day the biologist searches the area for any evidence of nests or a pair of owls. Droppings, pellets, and the remains of dead prey can be a clue to the nest location. The next step is for the biologist to give the owl under surveillance a mouse. In the mousing process one or both owls are given a mouse and the biologist follows an owl to determine the fate of the mouse. Only male mice are used to ensure that a non-native mouse species is not introduced to the study area. When the female owl is given a mouse, she will then usually take this mouse to a nest, revealing its location. The male owl will often give the mouse to the female and the nest can be located. If the mouse is consumed or stored by the owl, nesting might not be taking place but further mousing is conducted to confirm that the pair is not nesting. Once several mousing attempts, noting male and female owl behavior, result in no nest being located, it is reasonable to assume that a pair is not nesting. If an area is surveyed and no owls are found, a series of four or more surveys per breeding season is required for two years before a site can be cleared for disturbance activities during the spotted owl breeding season. In addition, potential habitat is surveyed in any given year if disturbance activities are planned.

## 3.0 Results

During the 1994, 1995, 1996, 1997, and 1998 field seasons, 43 regular call broadcast surveys were conducted at LANL (Table 1). Of these surveys, 13 resulted in the detection of a Mexican spotted owl. All of these located endangered owls were in or near the same canyon complex. During the course of this summer’s surveys, no owls were found to be nesting in Los Alamos Canyon for the fourth year of surveys.

Following the identification of the roosting locations from owls detected during surveys, seven additional field outings were required to locate the owl pair and the nestlings. During the first four surveys only the male was located. During the fifth survey both birds were found. The sixth trip to the nest area revealed a pair of adult owls and chicks on the nest. The seventh visit revealed the adult owl pair and two chicks out on a tree away from the nest. The chicks were not fledged until the first week in August 1998.

Once the nest location is confirmed, physical measurements are established as to the makeup of the nest locations. Castings, owl pellets, are collected at the site to determine the prey abundance (Table 2) and characteristics of the owls diet.

## 4.0 Conclusions

For the fourth year in a row, a pair of Mexican spotted owls at LANL have successfully reared and fledged a pair of chicks. The habitat surrounding the nest location is cur-

Table 1. Results of the five years of Mexican spotted owl surveys.

| Date of Survey | Location of Survey | Result of Survey |
|---|---|---|
| 6/30/94 | Site 1 | None |
| 7/18/94 | Site 1 | None |
| 8/3/94 | Site 1 | None |
| 8/23/94 | Site 1 | None |
| 5/10/95 | Site 2 | Great Horned Owl *(Bubo virginianas)* (4)<br>Flammulated Owl (1) |
| 5/16/95 | Site 2 | Mexican Spotted Owl (1)<br>Great Horned Owl (1) |
| 5/18/95 | Site 3 | Mexican Spotted Owl (2)<br>Great Horned Owl (2)<br>Flammulated Owl (1) |
| 5/23/95 | Site 2 | Flammulated Owl (1) |
| 5/25/95 | Site 3 | Flammulated Owl (1)<br>Great Horned Owl (1) |
| 6/2/95 | Site 2 | Great Horned Owl (2)<br>Flammulated Owl (1) |
| 6/8/95 | Site 3 | Mexican Spotted Owl (2) |
| 6/15/95 | Site 3 | Northern Pygmy-Owl *(Glaucidium gnoma)* (1)<br>Mexican Spotted Owl (1)<br>Great Horned Owl (1) |
| 6/22/95 | Site 1 | Great Horned Owl (1) |
| 7/6/95 | Site 1 | None |
| 7/27/95 | Site 1 | None |
| 8/9/95 | Site 1 | None |

Table 1 (cont.)

| | | |
|---|---|---|
| 4/26/96 | Site 3 | Great Horned Owl (2)<br>Mexican Spotted Owl (1) |
| 5/1/96 | Site 2 | Northern Pygmy-Owl (1) |
| 5/7/96 | Site 3 | Great Horned Owl (1)<br>Mexican Spotted Owl (1)<br>Northern Pygmy-Owl (1) |
| 5/17/96 | Site 2 | None |
| 6/5/96 | Site 2 | Northern Pygmy-Owl (1) |
| 6/25/96 | Site 2 | Mexican Spotted Owl (1) |
| 4/18/97 | Site 3 | Great Horned Owl (3)<br>Mexican Spotted Owl (1) |
| 4/30/97 | Site 3 | Mexican Spotted Owl (1) |
| 5/1/97 | Site 1 | None |
| 5/16/97 | Site 1 | Flammulated Owl (1) |
| 5/30/97 | Site 1 | Flammulated Owl (1)<br>Great Horned Owl (1) |
| 6/13/97 | Site 1 | Flammulated Owl (1) |
| 6/26/97 | Site 4 | Great Horned Owl (3) |
| 7/11/97 | Site 4 | Great Horned Owl (1) |
| 7/25/97 | Site 4 | Great Horned Owl (2)<br>Western Screech-Owl (*Otus kennicottii*)(1)<br>Mexican Spotted Owl (1) |
| 4/14/98 | Site 3 | Mexican Spotted Owl (1) |
| 4/21/98 | Site 3 | Mexican Spotted Owl (2)<br>Great Horned Owl (1) |
| 5/6/98 | Site 3 | Mexican Spotted Owl (1) |
| 5/12/98 | Site 1 | None |
| 5/28/98 | Site 1 | None |
| 6/3/98 | Site 1 | None |
| 6/11/98 | Site 1 | Flammulated Owl (2) |
| 4/24/98 | Site 5 | None |
| 5/7/98 | Site 5 | None |
| 5/27/98 | Site 5 | None |
| 6/4/98 | Site 6* | Great Horned Owl (2)<br>Northern Pygmy-Owl (2) |

*Site 6 surveys were not completed in 1998 due to the Oso fire restricting access to the area.

rently protected from major disturbance, and continued protection of this area will ensure that LANL will play a role in the conservation and recovery of the Mexican spotted owl. The lands of LANL are capable of supporting more than one pair of Mexican spotted owls, and an aggressive monitoring program will ensure that biologists know the location of nesting birds and are able to assist in the planning of projects that could be impacted by the location of these birds. The continued monitoring of owl nest locations will be a valuable tool to planners to ensure that owls and the mission of the Laboratory can coexist.

**Acknowledgment**

I wanted to thank Rhonda Robinson, Martin MacRoberts, Doug Cram, Eric Pacheco, Steve Koch, Hillary Clay, Megan Mee, and Kathy Bennett for getting up early and staying up late to stumble around in the dark to see if we could hear some owls.

**Literature Cited**

Johnson 1994: T.H. Johnson, "Status of the Spotted Owl in the Jemez Mountains—1993," unpublished report (1994).

NGS 1983: National Geographic Society, *Field Guide to the Birds of North America*, 2nd edition, (National Geographic Society, Washington DC).

Travis 1992: J. Travis, "Atlas of the Breeding Birds of Los Alamos County, New Mexico," Los Alamos National Laboratory report LA-12206.

USDI FWS 1995: USDI Fish and Wildlife Service, "Recovery Plan for the Mexican Spotted Owl (*Strix occidentalis lucida*)," Vol. 1, Albuquerque, NM.

Table 2. Results of the two years of Mexican spotted owl dietary analysis.

| **Species Found** | **Relative Abundance** | |
|---|---|---|
| | **1995*** | **1996** |
| Wood Rats | 24.69 % | 30.16 % |
| Peromyscus Mice | 9.88 % | 11.11 % |
| Voles | 4.94 % | 3.17 % |
| Gophers | 4.94 % | 4.76 % |
| Bats | 7.41 % | 1.59 % |
| Chipmunks | 1.23 % | 0.00 % |
| Rabbits | 12.35 % | 14.29 % |
| Shrews | 0.62 % | 3.17 % |
| Unknown Small Mammal | 1.23 % | 1.59 % |
| Unknown Medium Mammal | 2.47 % | 0.00 % |
| Medium Bird | 9.26 % | 4.76 % |
| Small Bird | 5.56 % | 3.17 % |
| Nocturnal Birds | 1.23 % | 0.00 % |
| Reptiles | 5.56 % | 3.17 % |
| Arthropods | 8.64 % | 19.05 % |

* 1995 includes contents of nest and may represent more than one year of prey captures.

# Threatened and Endangered Bird Surveys at Los Alamos National Laboratory: Southwestern Willow Flycatcher

*David C. Keller**

*Ecology Group, Los Alamos National Laboratory

**Abstract**

During the 1995, 1996, 1997, and 1998 field seasons, two primary areas were surveyed for the southwestern willow flycatcher (*Empidonax traillii extimus*). The areas searched were Pajarito Canyon and the Rio Grande near Buckman Crossing. The southwestern willow flycatcher was found during the 1998 spring migration.

## 1.0 Introduction

The southwestern willow flycatcher (*Empidonax traillii extimus*) is a small insectivorous bird approximately 15 cm (5.75 in.) long. It has a grayish-green back and wings, whitish throat, light gray-olive breast, and light yellowish belly. Two wingbars are visible and an eye ring is faint or absent. The upper beak is dark and the lower is light. The song is a wheezy "fitz-bew" or "fit-za-bew," the call a repeated "whitt." The southwestern willow flycatcher has experienced extensive loss and modification of its habitat and is also endangered by nest parasitism by the brown-headed cowbird (*Molothrus ater*). The breeding range of the southwestern willow flycatcher includes southern California, southern Nevada, southern Utah, Arizona, New Mexico, western Texas, and northern Mexico. The southwestern willow flycatcher winters in Mexico, Central America, and northern South America.

Southwestern willow flycatchers inhabit areas near water with 4- to 7-m- (13- to 23-ft-) high thickets of willow (*Salix* spp.), buttonbush (*Cephalanthus occidentalis* var. *pubescens*), seepwillow (*Baccharis glutinosa*), and tamarisk (*Tamarix pentandra*) (Tibbitts et al. 1994). There is occasionally a sparse overstory of cottonwoods (*Populus* spp.) associated with this species. At some nest sites surface water may be present early in the breeding season but only damp soil is present by late June or early July. Habitat patches as small as 0.5 ha (1.2 ac) can support one or two nesting pairs. This species has previously been found on Los Alamos National Laboratory (LANL) property but only during migration. Areas in lower Pajarito Canyon near the Pajarito wetlands contain marginal southwestern willow flycatcher habitat.

The nest is a compact cup of bark and grass with feathers on the rim lined with a layer of grass or silky plant material. It is located in a fork or on a horizontal tree branch 1 to 4.5 m (3.2 to 15 ft) above ground in a medium-sized bush or small tree, with dense vegetation all around the nest.

The southwestern willow flycatcher is present and singing on breeding territories by mid-May. This flycatcher builds nests and lays eggs in late May and early June and fledges young in early to mid-July.

During the 1995, 1996, 1997, and 1998 breeding seasons, monitoring of the potential southwestern willow flycatcher habitat did reveal the presence of this federally endangered species. To date, in four consecutive years of surveys, this flycatcher has been found on LANL or surrounding lands in 1997 and 1998. However, this flycatcher is only using LANL lands during migration and has not been found to be nesting.

## 2.0 Methodology

Once an area of potential habitat is identified, based on habitat type, a survey route is planned. A route is designed to cover all of the available habitat. Surveying for the southwestern willow flycatcher is conducted from approximately dawn until the survey area is completed. Surveys are performed by broadcasting the call of this flycatcher and waiting for it to respond. The surveyor will walk a wetland area and play the call enough to cover the habitat in the area of the survey. Once a flycatcher is found, the preliminary surveys can be discontinued and more intensive nest location surveys can begin. The physical description of the site and the nest location are recorded but the nest site is not disturbed.

If an area is surveyed and no flycatchers are found, a series of three or more surveys per breeding season is required each year before a site can be cleared for disturbance activities during the breeding season.

## 3.0 Results

During the 1998 field season, five regular call broadcast surveys were conducted at LANL and adjacent lands. Of these surveys one of them resulted in the location of a southwestern willow flycatcher. Table 1 shows the results of the surveys conducted in 1995, 1996, 1997, and 1998.

## 4.0 Conclusions

As of the 1998 field season, the southwestern willow flycatcher is only using LANL wetland habitat during migration. The existing habitat at LANL is suitable for this flycatcher and I believe it should be periodically monitored for future colonization by this species. The mapping and designation of potential habitat will provide a tool for any projects building near this habitat. This potential nesting habitat has been established in the geographical information system, and any potential conflicts between LANL activities and endangered species are dealt with very early in the planning stages of a habitat disturbing activity.

## Acknowledgment

I wanted to thank Rhonda Robinson, Steve Koch, Hillary Clay, and Eric Pacheco for getting up early and battling the mosquitoes to find this shy bird.

## Literature Cited

Tibbitts 1994: T.J. Tibbitts, M.K. Sogge, and S.J. Sferra, “A Survey Protocol for the Southwestern Willow Flycatcher (*Empidonax traillii extimus*),” National Park Service, Technical Report NPS/NAUCPRS/NRTR-94/04 (1994).

Table 1. Results of 1995, 1996, 1997, and 1998 southwestern willow flycatcher surveys.

| Date of Survey | Location of Survey | Result of Survey |
|---|---|---|
| 6/14/95 | Pajarito Canyon | None |
| 6/22/95 | Rio Grande | None |
| 7/13/95 | Pajarito Canyon | None |
| 7/19/95 | Rio Grande | None |
| 5/30/96 | Pajarito Canyon | None |
| 5/31/96 | Rio Grande | None |
| 6/13/96 | Rio Grande | None |
| 6/14/96 | Pajarito Canyon | None |
| 7/17/96 | Pajarito Canyon | None |
| 7/18/96 | Rio Grande | None |
| 5/23/97 | Pajarito Canyon | Male Heard Singing |
| 5/28/97 | Rio Grande | Male Heard Singing |
| 6/5/97 | Rio Grande | None |
| 6/6/97 | Pajarito Canyon | None |
| 6/19/97 | Rio Grande | None |
| 6/20/97 | Pajarito Canyon | None |
| 5/27/98 | Pajarito Canyon | None |
| 5/29/98 | Rio Grande | Male Singing, second Willow Flycatcher in the same area. |
| 6/10/98 | Pajarito Canyon | None |
| 6/11/98 | Rio Grande | Possible Willow Flycatcher at location but did not sing or defend territory. |
| 6/30/98 | Pajarito Canyon | None |

# Bald Eagle Habitat Management at Los Alamos National Laboratory

*Terrell H. Johnson* and David C. Keller***

*Consultant, **Ecology Group, Los Alamos National Laboratory

**Abstract**

Bald eagles (*Haliaeetus leucocephalus*) winter along the Rio Grande, but are not known to nest in the area. Most wintering bald eagles congregate downstream from Los Alamos National Laboratory (LANL), but LANL contains winter foraging and roosting habitat and potential nesting habitat. Numbers of wintering bald eagles in White Rock Canyon have generally increased, but were notably lower in 1997 and 1998. As bald eagles become more numerous and the river delta above Cochiti Lake expands, bald eagle use of LANL is expected to increase. Interagency coordination will increase the effectiveness of bald eagle habitat management in the area. Potential nest and roost trees in White Rock Canyon and sensitive zones around them have been mapped to trigger review of potentially disturbing activities. Potential nest trees, roost trees, and foraging perches in LANL are monitored annually for signs of use, and most bald eagle use in 1998 occurred near foraging perches.

## 1.0 Introduction

The bald eagle (*Haliaeetus leucocephalus*) is federally listed as threatened throughout the lower 48 states and state listed as threatened in New Mexico. Bald eagles winter along the Rio Grande, including Department of Energy (DOE) land in and around White Rock Canyon, and several dozen often congregate downstream near Cochiti Lake. Some are resident from November through March, but others move about, and peak numbers usually occur in January or early February. Bald eagles forage for fish and waterfowl along the river and lake, and for carrion and rabbits over land. While they forage most often in the vicinity of Cochiti Lake, they use all of White Rock Canyon regularly, and the entire Pajarito Plateau occasionally. Bald eagles roost overnight in canyons that offer weather protection, security, and convenience to foraging areas, usually in tall ponderosa pines in lower portions of tributary canyons. Bald eagles around Cochiti Lake behave as if they are hunted, weaving and dodging in flight to avoid people. Evacuation of foraging and roosting areas in response to human presence within 200 to 800 m (220 to 880 yd) is typical behavior. Because few bald eagles nest in New Mexico, their nesting habitat is not well characterized, but a secure tree or cliff nest site near suitable aquatic habitat is probably required.

Several agencies have funded or conducted studies of bald eagles in this area. Johnson (1993) has monitored bald eagle winter population and diet near Cochiti Lake since 1979, funded by the National Park Service, the US Army Corps of Engineers (COE), the US Forest Service (USFS), and the US Bureau of Reclamation. The USFS funded a study of bald eagles by Dodd (1979) in White Rock Canyon, and Public Service Company of New Mexico funded a study by Stahlecker (EES 1986) in the upper portion of White Rock Canyon. The New Mexico Department of Game and Fish (NMDGF) has performed midwinter fixed-wing aerial counts of bald eagles almost every year since 1978, and the COE has performed helicopter counts most years since 1984. LANL funded a survey for roosting and potential nesting habitat at LANL in 1992, and has begun annual surveys for signs of winter use of suitable trees.

## 2.0 Methodology

Roosting counts provide the most effective way to census wintering bald eagles, which tend to congregate at regular roosts (Johnson 1993). Late afternoon and early morning counts along flyways to and from roosts are more effective than counts of eagles at roosts, where growing darkness and the distance required to avoid disturbance limit visibility. Aerial counts cover more ground and sample aquatic foraging areas, but tend to detect relatively fewer immature eagles. Collection of castings and other prey remains under roost trees provide the most comprehensive picture of diet, but underrepresent the absolute proportion of fish in the diet. Late winter surveys of suitable roost trees for accumulated castings, feathers, and droppings have proven to be the most efficient method of documenting occasional use of trees for roosting and perching.

## 3.0 Results

Winter roosting counts of bald eagles in the Cochiti area have generally increased over the years (Johnson 1993), as have statewide aerial counts (S.O. Williams III, pers. comm.). Since 1979, average winter counts near Cochiti have generally doubled (Figure 1). As total counts have increased, the number of bald eagles using areas farther upstream has also increased. However, bald eagle use of the Cochiti headwaters was markedly lower in 1997 and only slightly higher in 1998 (Figure 1). It is not known whether this decrease was widespread or local, as neither the NMDGF nor the COE performed aerial surveys in 1998.

Since 1979, the wetland habitat of the delta above Cochiti Lake has expanded to about 12 km (7 mi) of delta between Frijoles Canyon and the lake. This delta provides diverse aquatic and wetland habitat for fish, wintering waterfowl, and bald eagles (Allen 1993). Castings indicate that wintering bald eagles consume fish, waterfowl, and significant amounts of carrion, especially deer and elk. Water management may affect bald eagle habitat (Johnson 1988), especially that of the delta wetlands.

A survey of potential roost trees near the mouths of Water, Ancho, and Chaquehui Canyons in March 1992, indicated occasional bald eagle use of trees near the mouth of Water and Chaquehui Canyons, as droppings but no castings or feathers were found. The same habitat has potential for nesting. A survey on March 12, 1997, found similar evidence of use, with definite sign under foraging perches, possible sign under roost trees, and no sign of nesting. During 1998 the peak count of eagles was eight juveniles and four adults counted above Cochiti Lake. Bald eagle use of the Pajarito Plateau is too sparse to study or to attract much attention. A detailed report of an immature bald eagle in Los Alamos Canyon above the Omega reactor (A. Kron, pers. comm.) and a number of reports of bald eagles seen along State Highway 4 west of the Bandelier National Monument entrance illustrate that the bald eagle does occur on the Pajarito Plateau.

Fifteen suitable roost and five potential nest trees in the lower tributary canyons and sensitive zones extending up to 1700 m (1870 yd) from roost and 900 m (990 yd) from potential nest trees were mapped in 1992 (Johnson 1992). Sensitive zones indicate an area in which LANL activities should be reviewed for potential impact on roosting (November 1 to March 31) or nesting (January 1 to July 31) bald eagles, and outside of which no effect is anticipated.

## 4.0 Conclusions

Bald eagle use of DOE land in White Rock Canyon should increase as the Cochiti Lake delta continues to expand upstream and numbers of wintering eagles increase. The 1997 decrease in numbers above Cochiti Lake was unprecedented, and its cause is unknown, but it could conceivably be related to unprecedented flooding after the 1996 Dome Fire that dumped ash directly into the Cochiti Lake delta. During 1998 there was a slight increase in the eagle numbers but the value continues to be low. Indications of bald eagle use on DOE land in White Rock Canyon in 1992 and 1997 were too slight to justify direct bald eagle counts, but annual survey for signs of use is an appropriate method to monitor and document bald eagle winter use there. Infrequent and scattered use of terrestrial areas does not justify direct survey for bald eagles in terrestrial areas, but management planning should recognize that it does occur at low levels, and may be associated with elk or deer carrion. Likewise, bald eagle nesting in White Rock Canyon or adjacent areas is a possibility that should not be discounted.

Sensitive zones should be used to flag review of LANL activities to prevent disturbance of roosting or nesting bald eagles. Potentially disturbing activities should be scheduled outside of the sensitive season, unless non-occupancy has been determined at that time. These zones are mainly undeveloped and should remain so. LANL land use planning should also recognize the contribution of terrestrial foraging areas, and cluster future developments to maintain large blocks of open land, especially near White Rock Canyon.

Water management agencies have increasingly involved land and wildlife management agencies in water management decisions, and an interagency group has developed an ecological framework for managing the Cochiti delta wetlands (Allen 1993). The DOE and LANL should continue to participate in the Cochiti Lake Advisory Committee, which is now being organized to provide ongoing input into river and reservoir management.

## Acknowledgment

S.O. Williams III of the New Mexico Department of Game and Fish has kindly provided summaries of midwinter counts of bald eagles throughout New Mexico. David Keller and Steve Koch participated in the March 12, 1997, survey.

**Literature Cited**

Allen 1993: C.D. Allen, B. Hanson, and C. Mullins, “Cochiti Reservoir Reregulation Interagency Biological Report,” US Bureau of Reclamation unpublished report (June 1993).

Dodd 1979: N.L. Dodd, “Wintering Bald Eagle Habitat and Ecology on the Santa Fe National Forest, New Mexico,” US Forest Service unpublished report (April 1979).

EES 1986: Eagle Ecological Services, “The Biological Assessment on Public Service Company of New Mexico’s Proposed Ojo Line Extension 345 kV Project and Three Federally Endangered Species,” US Bureau of Indian Affairs unpublished report (January 1986).

Johnson 1988: T.H. Johnson, “Effects of Reservoir Habitat Changes on Wintering Bald Eagles at Cochiti Reservoir, Northern New Mexico,” in: R. Glinski et al., eds., *Proceedings of the Southwest Raptor Management Symposium and Workshop*, National Wildlife Federation, Washington, D.C., pp. 182-87 (1988).

Johnson 1992: T.H. Johnson, “White Rock Canyon Raptor Habitat Management,” memo to Terry Foxx (March 18, 1992).

Johnson 1993: T.H. Johnson, “Bald Eagles Wintering near Cochiti Reservoir, 1979-1993,” US Forest Service, US Army Corps of Engineers, and US Bureau of Reclamation unpublished report (1993).

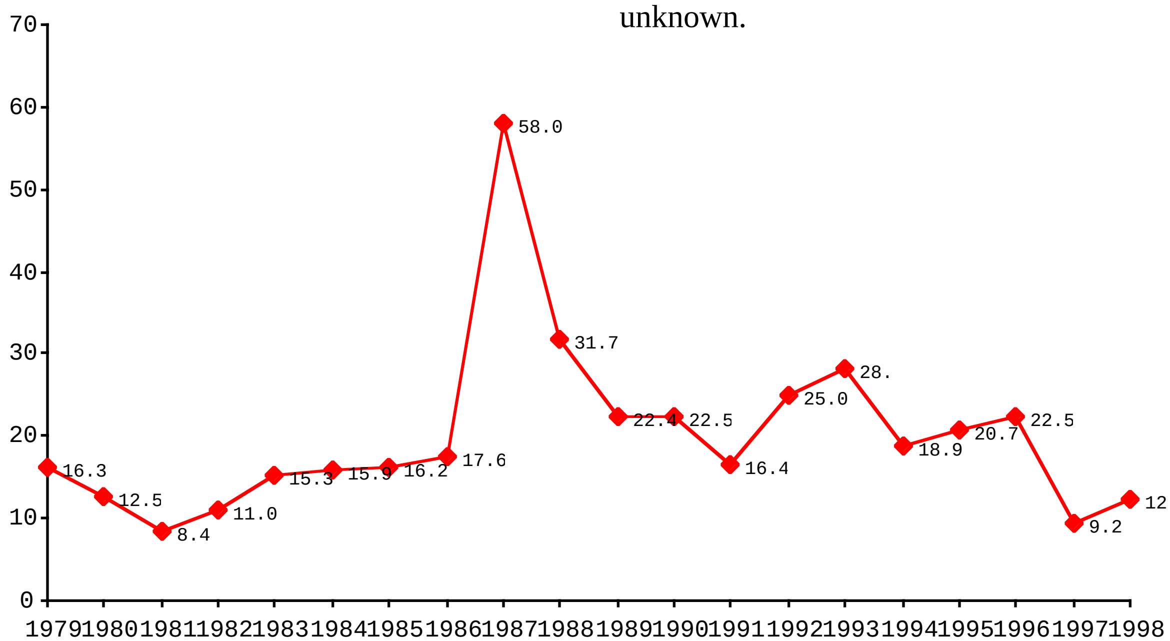


Figure 1. Average numbers of bald eagles roosting above Cochiti Lake during the winters of 1979–1998. An increasing trend underlies annual variations, which are dependent on water management and weather (Johnson 1993). The cause of the 1997 decrease is unknown.

# Peregrine Falcon Habitat Management and Monitoring in the Los Alamos National Laboratory Environmental Research Park

*Terrell H. Johnson**

*Consultant

**Abstract**

Suitable breeding habitat for the American peregrine falcon (*Falco peregrinus anatum*) is located in and around the Los Alamos National Environmental Research Park (LA/NERP), and the entire area is foraging habitat. Statewide, the peregrine population has been increasing, but reproduction has been declining for a decade, which threatens to reverse this population trend. If peregrine falcons continue to increase in New Mexico, peregrine use of the LA/NERP is expected to increase. Four suitable nesting areas in and around the LA/NERP have been identified, and sensitive zones have been mapped to trigger review of potentially disturbing activities. Site management plans will guide Los Alamos National Laboratory activities within the sensitive zones, but management of the suitable habitat involves several other entities, and will require interagency cooperation to be successful.

## 1.0 Introduction

The American peregrine falcon is federally listed as endangered and state listed as threatened. The US Fish and Wildlife Service has recently solicited public comment on a controversial proposal to remove the peregrine completely from the list of endangered and threatened species. Peregrine falcons nest on cliffs with defensible and protected nest ledges that are in good foraging habitat. Peregrine breeding habitat occurs throughout the mountains of New Mexico, including lands in and around the Los Alamos National Environmental Research Park (LA/NERP). Peregrine falcons forage up to 20 km from nesting areas, almost entirely for birds, which are attacked and caught in the air. Avian prey is vulnerable when it is without cover, which may occur in a large gulf of air, as found over a canyon, or over large grasslands or bodies of water. They are resident from early March through mid October. Breeding peregrine falcons have been increasing in New Mexico for more than a decade, but pesticides evidently continue to impair reproduction, and occupancy of breeding territories remains below recovery levels (Johnson 1997).

By agreement among the wildlife and major land management agencies in New Mexico, all suitable peregrine habitat is managed as if occupied, in the absence of a current determination of vacancy. Suitable habitat has been identified throughout much of the state, based on an objective evaluation of historic habitat. The suitable habitat approach has proven to be the most efficient and effective management strategy, because it maintains the distinction between the relative permanence of habitat and transience of habitat use by individuals of the species. It maintains habitat for population expansion, and protects peregrines wherever they may breed. At the same time, it permits coordination of other activities in a predictable manner. Attempts to coordinate activities based on occupancy in any given year have proven complicated and inefficient, and have usually disappointed expectations and resulted in more disclosure than predetermined habitat management.

Observations have shown how peregrines respond to human activity (Johnson 1988b).

Disturbance can prevent birds from occupying habitat or cause mortality of young by interrupting essential parental care. Nesting areas in New Mexico with frequent human activity are generally occupied irregularly, and peregrines in areas with occasional disturbance suffer reproductive failure more often than those in undisturbed areas (Johnson 1994). While pesticide impacts on reproduction result from national or international factors, local management of peregrine habitat focuses on minimizing disturbance and maintaining habitat quality. Preserving the confidentiality of nesting areas is essential to minimizing disturbance, because the peregrine has such notoriety that disclosure inevitably results in disturbance.

In cooperation with the US Fish and Wildlife Service and federal land management agencies, the New Mexico Department of Game and Fish takes the lead in monitoring and compiling information on peregrine falcons in New Mexico. Los Alamos National Laboratory (LANL) has been coordinating peregrine habitat management with state and federal wildlife agencies for two decades, supporting habitat monitoring at two suitable nesting areas and ensuring that activities do not impact habitat, individuals, or the species.

## 2.0 Methodology

Suitable nesting areas are monitored for occupancy and nesting activity by observing with binoculars and spotting scope from a distance of typically 450 meters. This allows complete aural and visual observation of nesting activity and resolution of individual plumage characteristics with minimal disturbance (Johnson 1988a). Nesting areas are visited at least twice every year, but as often as necessary to determine occupancy and reproduction. Results have been standardized by having four highly experienced observers do nearly all the peregrine monitoring in the state. Individual plumages can be used to determine identity, and are recorded whenever possible.

Habitat identification is based on analysis of foraging and nesting topography, and cliff characteristics associated with peregrine falcon nesting areas (Johnson 1993). Factors of elevation and slope model prey abundance, diversity, and vulnerability to index the suitability of breeding territories, and factors of cliff size, structure, position, and temperature index the suitability of nesting cliffs. Four sensitive zones around each suitable nesting area have been defined relative to peregrine responses to disturbance (Johnson 1983) and extend from 900 m up to 3400 m from suitable nesting cliffs. These four zones have been incorporated into LANL's Areas of Environmental Interest for the peregrine falcon, and are used to evaluate and schedule activities occurring in the zones to prevent disturbance (Johnson 1994).

## 3.0 Results

Sensitivity of the information precludes disclosure of annual monitoring data for the LA/NERP area, which are not statistically significant by themselves, but trends in the LA/NERP area have reflected statewide trends. Occupancy of breeding habitat in New Mexico has increased since 1980, but reproduction has declined since 1988 (Figure 1). Although reproduction has been satisfactory the last few years, the trend line has fallen close to the level required to maintain the population, and if the trend continues downward, the population will soon begin to decrease (Johnson 1997).

During the last decade, both occupancy and productivity in the LA/NERP area have been below statewide averages. Occupancy of historic sites and productivity of adult pairs averaged 52% and 1.20 young per pair, respectively, in the LA/NERP area during 1989-98, compared to 79% and 1.73 young per pair statewide. Due to small sample sizes, these differences are not statistically significant, but they are consistent with the tendency noted above for sites with more human activity and disturbance to experience lower occupancy and productivity than undisturbed sites. In particular, loss of nestlings in the LA/NERP area has been unusually high.

Identification of breeding habitat in and around the LA/NERP began in 1979, and has continued as habitat criteria have been refined since. Four suitable nesting areas have been identified in and around the LA/NERP, all of which involve shared responsibility with other land management agencies. The DOE has primary federal responsibility for two of these suitable nesting areas, but needs only to ensure that LANL activities do not impact the other two areas. A habitat management plan was drafted for one suitable nesting area, and sensitive zones were delineated for another area in 1992. Sensitive zones were delineated for all four suitable nesting areas in 1997, and site management plans have been finalized to guide LANL activities within the sensitive zones. The entire LA/NERP is peregrine foraging habitat.

## 4.0 Conclusions

Peregrine falcon breeding activity in and around the LA/NERP should increase if the peregrine population continues to increase. Annual monitoring of the two suitable nesting areas for which the DOE has primary federal responsibility provides important management information and has been incorporated into monitoring plans. Site plans will guide LANL activities within the sensitive zones and terrestrial foraging areas. Cooperation with adjacent land managers and wildlife agencies at the county, state, and federal level is essential to successful habitat management for this species.


## Acknowledgments

S.O. Williams III of the New Mexico Department of Game and Fish has kindly provided data summarizing the status of the peregrine falcon throughout New Mexico.


## References


Johnson 1983: T.H. Johnson, “Response Thresholds of Breeding Peregrines,” US Forest Service unpublished report (1983).

Johnson 1988a: T.H. Johnson, “Turnover and Movement of New Mexico Peregrine Falcons Identified by Plumage,” in R. Glinski et al., eds., Proceedings of the Southwest Raptor Management Symposium and Workshop, National Wildlife Federation, Washington, D.C., pp. 153–56 (1988).

Johnson 1988b: T.H. Johnson, “Responses of Breeding Peregrine Falcons to Human Stimuli,” in R. Glinski et al., eds., Proceedings of the Southwest Raptor Management Symposium and Workshop, National Wildlife Federation, Washington, D.C., pp. 301–05 (1988).

Johnson 1992: T.H. Johnson, “Topographic Model of Potential Peregrine Falcon Breeding Habitat,” US Forest Service unpublished report (1992).

Johnson 1994: T.H. Johnson, “Peregrine Falcon Habitat Management in National Forests of New Mexico,” US Forest Service unpublished report (1994).

Johnson 1997: T.H. Johnson, “The Peregrine Falcon in New Mexico—1997,” New Mexico Department of Game and Fish unpublished report (1997).

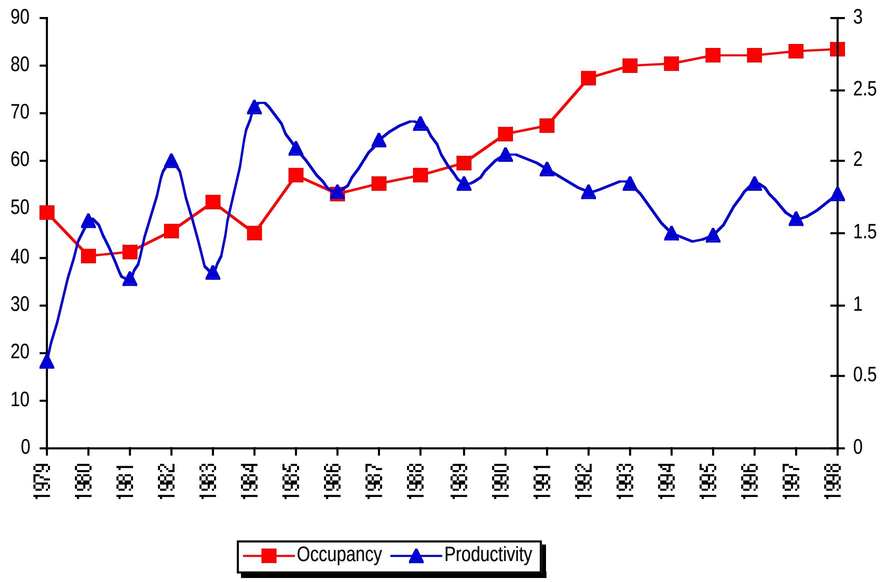


Figure 1. Occupancy of historic breeding territories by any peregrine (line) and reproduction by adult pairs (bars) in New Mexico during 1979–1998. Occupancy represents population, and has been increasing, but that trend depends on prior reproduction, which has declined since 1988 to near the minimum maintenance level (Johnson 1997).

The following data were used to generate the line/bar graph of occupancy and reproduction vs. year:

| Year | Occupancy (% of territories) | Productivity (young/adult pair) |
|---|---|---|
| 1979 | 49.5 | 0.61 |
| 1980 | 40.4 | 1.58 |
| 1981 | 41.1 | 1.18 |
| 1982 | 45.4 | 2.00 |
| 1983 | 51.4 | 1.23 |
| 1984 | 44.8 | 2.38 |
| 1985 | 56.9 | 2.09 |
| 1986 | 53.3 | 1.79 |
| 1987 | 55.3 | 2.15 |
| 1988 | 57.2 | 2.27 |
| 1989 | 59.8 | 1.85 |
| 1990 | 65.9 | 2.05 |
| 1991 | 67.6 | 1.95 |
| 1992 | 77.4 | 1.79 |
| 1993 | 80.2 | 1.85 |
| 1994 | 80.4 | 1.50 |
| 1995 | 82.0 | 1.49 |
| 1996 | 82.3 | 1.85 |
| 1997 | 82.9 | 1.60 |
| 1998 | 83.5 | 1.77 |

# The 1998 Songbird Survey at Los Alamos National Laboratory:

*Steven W. Koch**

*Ecology Group, Los Alamos National Laboratory

**Abstract**

In 1997, a roadside songbird survey was initiated on Department of Energy land in Los Alamos County in order to provide data about bird species that are not listed as threatened or endangered. This type of survey provides an opportunity to detect 1) Laboratory impacts on local populations over time and 2) the presence of species listed as 'sensitive' or as 'species of concern.' Our objectives in this study were (1) to determine what species are present, (2) to determine if any species of concern are on Laboratory property, and (3) to monitor trends in populations. Piñon-juniper woodland and ponderosa pine forest were the most often surveyed cover types with 23 stations and 20 stations in each type, respectively.

## 1.0 Introduction

The Los Alamos National Laboratory roadside songbird survey, begun in 1997, was continued in 1998. This type of survey provides an opportunity to detect 1) Laboratory impacts on local populations over time and 2) the presence of species listed as 'sensitive' or as 'species-of-concern.' Since such species could become listed as 'threatened,' it behooves us to monitor the presence of these species on Laboratory property. Two such species are the gray vireo (*Vireo vicinior*) and the loggerhead shrike (*Lanius ludovicianus*).

Our objectives in this study were (1) to determine what species are present, (2) to determine if any species of concern are on Laboratory property, and (3) to monitor trends in populations.

The survey technique that most efficiently meets the study objectives is on-road point counts (Ralph et al. 1993, Ralph et al. 1995).

## 2.0 Methods

Point counts involve an observer standing in one spot (the station) and recording all birds seen or heard. Point count stations are placed one-half mile apart on secondary and tertiary roads with the observer driving between stations. Traffic noise on each road must not interfere with birdsong detection. Counts begin at sunrise and end four hours later with each count lasting for six minutes. Bird distance from the observer is estimated and placed into one of five categories: 0-25 m; 25-50 m; 50-75 m; 75-100m; >100 m. The habitat is assessed at each station in order to link bird populations and habitat. Each habitat, or cover type, is described in Balice et al. (1997).

## 3.0 Results

In 1998 five canyons and three mesas were censused. The canyons surveyed were Cañada del Buey, Water Canyon, Los Alamos Canyon, Mortandad Canyon, and Potrillo Canyon. The mesas surveyed were in Technical Areas (TAs) 70, 33, and 67. From 5 to 15 stations were censused on each route, depending on the route length. Six land cover types were represented in the survey (Table 1). Piñon-juniper woodland and ponderosa pine forest were the most often surveyed cover types with 20 stations and 30 stations in each type, respectively.

Table 1. Cover types encountered on routes and the number of stations.

| | |
|---|---|
| Pinon-Juniper Woodland | 30 |
| Ponderosa Pine Forest | 20 |
| Wetland/Riparian Zone | 5 |
| Shrubland | 4 |
| Grassland | 1 |
| Mixed Conifer | 1 |
| Total | 61 |

The most commonly detected bird was the spotted towhee (*Psaltriparus maculatus*) with 60 detections, followed by the broad-tailed hummingbird (*Selasphorus platycercu*) with 25 counts. The complete list of birds detected is listed in Table 2.

Table 3 to Table 8 list species detected in each cover type.

No gray vireos or loggerhead shrikes were detected in 1998.

## 4.0 Conclusions

Songbirds detected in 1998 were similar to those detected in 1997. Birds missing from the 1998 survey which were found in 1997 include the Cassin's kingbird (*Tyrannus vociferans*) and the cordelleran flycatcher (*Empidonax occidentalis*). Analysis for trends in populations can begin after a third year of surveys.

## Acknowledgment

Thanks to Esther Nelson, Jill Podalsky, and John Sigler for assistance in conducting surveys.

## References

Balice 1997: R.G. Balice, S.G. Ferran, and T.S. Foxx. "Preliminary Vegetation and Land Cover Classification for the Los Alamos Region," Los Alamos National Laboratory report LA-UR-97-4627.

Ralph 1995: C.J. Ralph, S. Droege, and J.R. Sauer, "Managing and Monitoring Birds Using Point Counts: Standards and Applications." In: Ralph, C.J, J.R. Sauer, and S. Droege (eds.) "Monitoring Bird Populations by Point Counts," US Dept. of Agriculture, Forest Service, Pacific Southwest Research Station general technical report PSW-GTR-149.

Ralph 1993: C.J. Ralph, G.R. Geupel, P. Pyle, T.E. Martin, and D.F. DeSante, "Handbook of Field Methods for Monitoring Landbirds," US Dept. of Agriculture, Forest Service, Pacific Southwest Research Station general technical report PSW-GTR-144.

Table 2. Species detected, ranked by total detections.

| COMMON NAME | SCIENTIFIC NAME | TOTALS |
|---|---|---|
| Spotted towhee | *Psaltriparus maculatus* | 60 |
| Broad-tailed hummingbird | *Selasphorus platycercus* | 25 |
| Mountain chickadee | *Parus gambeli* | 21 |
| Ash-throated flycatcher | *Myiarchus cinerascens* | 18 |
| Steller’s jay | *Cyanocitta stelleri* | 18 |
| Northern flicker | *Colaptes auritus* | 14 |
| White-breasted nuthatch | *Sitta carolinensis* | 14 |
| Canyon wren | *Catherpes mexicanus* | 13 |
| Yellow-rumped warbler | *Dendroica coronata* | 13 |
| Common raven | *Corvus corax* | 12 |
| Chipping sparrow | *Spizella passerina* | 10 |
| Mourning dove | *Zenaida macroura* | 10 |
| Scrub jay | *Aphelocoma coerulescens* | 9 |
| Western bluebird | *Sialia mexicana* | 9 |
| Black-headed grosbeak | *Pheucticus melanocephalus* | 8 |
| American robin | *Turdus migratorius* | 7 |
| Western wood-pewee | *Contopus sordidulus* | 7 |
| Solitary vireo | *Vireo solitarius* | 6 |
| Virginia’s warbler | *Vermivora virginiae* | 6 |
| Brown-headed cowbird | *Molothrus ater* | 5 |
| Pygmy nuthatch | *Sitta pygmaea* | 5 |
| Say’s phoebe | *Sayornis saya* | 4 |
| Grace’s warbler | *Dendroica graciae* | 3 |
| Mountain bluebird | *Sialia currucoides* | 3 |
| Summer tanager | *Piranga rubra* | 3 |
| Green-tailed towhee | *Pipilo chlorurus* | 2 |
| Hermit thrush | *Catharus guttatus* | 2 |
| House finch | *Carpodacus mexicanus* | 2 |
| Pine siskin | *Carduelis pinus* | 2 |
| Townsend’s solitaire | *Myadestes townsendi* | 2 |
| Western tanager | *Piranga ludoviciana* | 2 |
| Dark-eyed junco | *Junco hyemalis* | 1 |
| Gray flycatcher | *Empidonax wrightii* | 1 |
| Hammond’s flycatcher | *Empidonax hammondii* | 1 |
| Hepatic tanager | *Piranga flava* | 1 |
| Red-breasted nuthatch | *Sitta canadensis* | 1 |
| Yellow Warbler | *Dendroica petechia* | 1 |
| **Totals** | | 321 |

Table 3. Counts in Ponderosa Pine Forest Cover Type.

| SPECIES | COUNTS |
|---|---|
| Spotted towhee | 21 |
| Steller's jay | 9 |
| White-breasted nuthatch | 9 |
| Broad-tailed hummingbird | 7 |
| Mountain chickadee | 7 |
| Mourning dove | 6 |
| Ash-throated flycatcher | 5 |
| Canyon wren | 5 |
| Western bluebird | 5 |
| Black-headed grosbeak | 4 |
| Chipping sparrow | 4 |
| Yellow-rumped warbler | 4 |
| Grace's warbler | 3 |
| Solitary vireo | 3 |
| Summer tanager | 3 |
| Virginia's warbler | 3 |
| Western wood-pewee | 3 |
| Brown-headed cowbird | 2 |
| House finch | 2 |
| Mountain bluebird | 2 |
| Northern flicker | 2 |
| Say's phoebe | 2 |
| Townsend's solitaire | 2 |
| American robin | 1 |
| Common raven | 1 |
| Dark-eyed junco | 1 |
| Hammond's flycatcher | 1 |
| Hepatic tanager | 1 |
| Hermit thrush | 1 |
| Pine siskin | 1 |
| Red-breasted nuthatch | 1 |
| Scrub jay | 1 |
| Western tanager | 1 |
| Totals | 123 |

Table 4. Counts in Pinon-Juniper Woodland Cover Type.

| SPECIES | COUNT |
|---|---|
| Spotted towhee | 31 |
| Mountain chickadee | 11 |
| Ash-throated flycatcher | 10 |
| Broad-tailed hummingbird | 10 |
| Northern flicker | 8 |
| Scrub jay | 6 |
| Steller's jay | 6 |
| Yellow-rumped warbler | 6 |
| Chipping sparrow | 5 |
| Pygmy nuthatch | 5 |
| Canyon wren | 4 |
| Common raven | 4 |
| Western bluebird | 4 |
| American robin | 3 |
| Mourning dove | 3 |
| White-breasted nuthatch | 3 |
| Brown-headed cowbird | 2 |
| Green-tailed towhee | 2 |
| Solitary vireo | 2 |
| Virginia's warbler | 2 |
| Black-headed grosbeak | 1 |
| Gray flycatcher | 1 |
| Mountain bluebird | 1 |
| Say's phoebe | 1 |
| Western wood-pewee | 1 |
| Yellow Warbler | 1 |
| Total | 133 |

Table 5. Counts in Grassland cover type.

| SPECIES | COUNT |
|---|---|
| Common raven | 1 |
| Northern flicker | 1 |
| Say's phoebe | 1 |
| Steller's jay | 1 |
| White-breasted nuthatch | 1 |
| Totals | 5 |

Table 6. Counts in Wetland/Riparian cover type.

| SPECIES | COUNT |
|---|---|
| Common raven | 6 |
| Broad-tailed hummingbird | 3 |
| Mountain chickadee | 3 |
| Spotted towhee | 3 |
| Yellow-rumped warbler | 3 |
| Black-headed grosbeak | 2 |
| American robin | 1 |
| Ash-throated flycatcher | 1 |
| Canyon wren | 1 |
| Hermit thrush | 1 |
| Northern flicker | 1 |
| Steller's jay | 1 |
| Virginia's warbler | 1 |
| Western tanager | 1 |
| Western wood-pewee | 1 |
| White-breasted nuthatch | 1 |
| Totals | 30 |

Table 7. Counts in Shrubland cover type.

| SPECIES | COUNT |
|---|---|
| Broad-tailed hummingbird | 4 |
| Spotted towhee | 3 |
| Ash-throated flycatcher | 2 |
| Northern flicker | 2 |
| Scrub jay | 2 |
| Western wood-pewee | 2 |
| American robin | 1 |
| Black-headed grosbeak | 1 |
| Chipping sparrow | 1 |
| Mourning dove | 1 |
| Solitary vireo | 1 |
| Steller's jay | 1 |
| Totals | 21 |

Table 8. Counts in Mixed Conifer Forest cover type.

| SPECIES | COUNT |
|---|---|
| Canyon wren | 3 |
| Spotted towhee | 2 |
| American robin | 1 |
| Broad-tailed hummingbird | 1 |
| Brown-headed cowbird | 1 |
| Pine siskin | 1 |
| Totals | 9 |

# Monitoring Reptiles and Amphibians at Los Alamos National Laboratory

*Tim Haarmann*, David Keller*, and Teralene Foxx**

*Ecology Group, Los Alamos National Laboratory

**Abstract**

Baseline studies of reptiles and amphibians of the Pajarito wetlands at Los Alamos National Laboratory have been conducted by the Ecology Group (ESH-20) since 1990. ESH-20 continued a pioneer mark-recapture study in 1998, using a passive integrated transponder (PIT) and toe clipping. When animals are over eight grams in mass, PIT tagging is utilized, and when less than eight grams, toe clipping is used. The pioneer study is to investigate the feasibility for using permanent marking methods in the future. With the gathered data, we will develop a monitoring plan and use the information to interpret population dynamics over time.

## 1.0 Introduction

Research has demonstrated the importance of these animals in natural ecosystems. Reptiles and amphibians are indicators of general environmental health while aquatic amphibians and snakes are good indicators of the health of aquatic systems. These animals are especially sensitive to pollution and loss of aquatic habitat (Hall 1980). Amphibians and reptiles are also important in food chains, and they make up large proportions of vertebrates in certain ecosystems (Bury and Raphael 1983). Because of recent concern for non-game wildlife, biologists and land managers find themselves faced with studies and management needs for a group of animals they know little about (Jones 1986).

The Ecology Group (ESH-20) at Los Alamos National Laboratory (LANL) has been monitoring reptiles and amphibians since 1990. This will allow the Biology Team of ESH-20 to provide pertinent information for LANL management decisions as they pertain to reptiles and amphibians.

## 2.0 Study Area

The traps are located within LANL's Technical Area 36, known as the Pajarito wetlands. The wetlands are located 804 m (2655 ft) west of White Rock on Pajarito Road (Figure 1). The study site is 127 m (419 ft) wide by 356 m (1175 ft) long.

This area is classified as both a riparian association (Degenhart et al. 1996) and a dry upland. The major vegetation in the upland area is Apache plume (*Fallugia paradoxa*), rabbitbrush (*Chrysothamnus nauseosus*), big sage (*Artemisia tridentata*), white sweet clover (*Melilotus albus*), one-seed juniper (*Juniperus monosperma*), blue grama (*Bouteloua gracilis*), mutton grass (*Poa fendleriana*), and mullein (*Verbascum thapsus*). Vegetation in the wetland area is rush (*Juncus* spp), willows (*Salix* spp.), broad-leaved cattail (*Typha latifolia*), redtop (*Agrostis gigantea*), and mutton grass (*Poa fendleriana*). Pitfall traps are located by both upland and riparian vegetation types. Approximately 16 pitfall trap arrays are located within the study site. The study site is divided into two areas—denoted as north and south—by an ephemeral stream. Seven ponds are located adjacent to the north side of the stream.

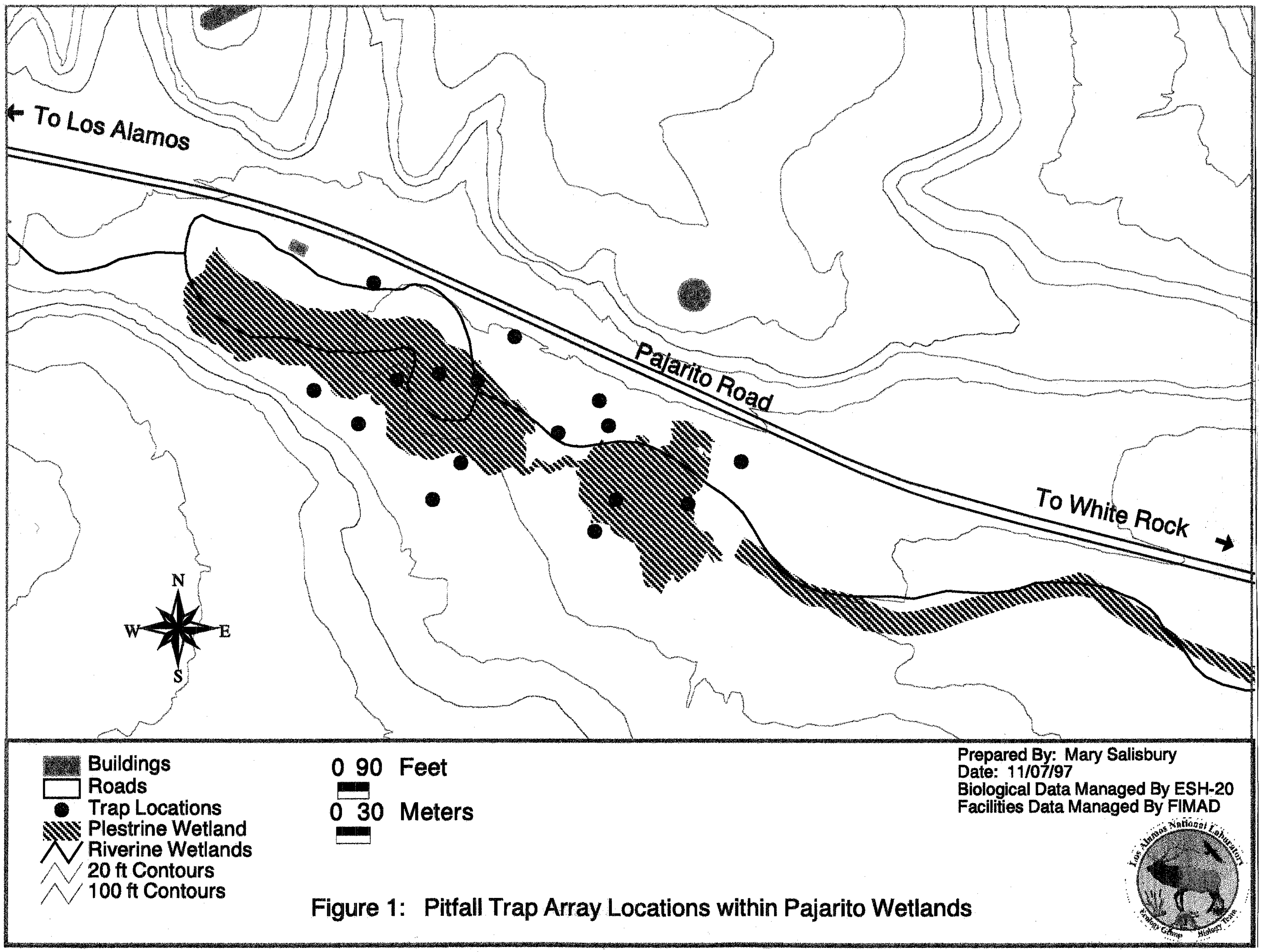


Figure 1: Pitfall Trap Array Locations within Pajarito Wetlands

## 3.0 Materials and Methods

Studies of reptiles and amphibians have been conducted via pitfall trapping at LANL since 1990. Drift fences (aluminum flashing) with pitfall traps (large buckets) are used commonly to inventory and monitor populations of amphibians and reptiles (Heyer et al. 1994). Aluminum flashing is placed in the ground and used to intercept and direct animals into pitfall traps. Lids are elevated above the traps to provide overhead protection by attaching uniformly shaped wooden blocks underneath the corners. The entire trap system, including the aluminum flashing and buckets, will be referred to as a pitfall trap array. Nine pitfall trap arrays were placed in the wetland area in 1990. In 1993, seven pitfall trap arrays were added to the study site at the wetland area. The total number of pitfall traps (one-gal. buckets) in the arrays was 72. The 72 1-gal. buckets were placed side by side with the drift fence intersecting the very edge of the buckets. In 1997, all pitfall traps were replaced with 5-gal. buckets to reduce the potential for escape by larger animals. The total number of traps was also reduced from 72 to 40. Although the number has changed, the actual traps are in the same location and encompass the previously occupied space.

During the 1998 season, traps were checked daily Monday through Friday and closed on the weekends. Trapping days for all years are similar. Field technicians responsible for checking the traps changed on a yearly basis. Because data collected from 1992 are incomplete, we excluded them from our analysis.

Once animals were captured, they were brought back to the laboratory to be measured. The mass of the animal was measured in grams with a Mettler electronic scale. Then the distance from the tip of the rostrum to the vent (snout-vent length) was measured in millimeters with Mitytoyo electronic calipers. Total tail length is measured from the vent to the tip of the tail. If the tail had been damaged or showed regeneration, then the regenerated portion of the tail was measured from the anterior portion of where the tail was broken off to the most posterior portion of the tail. The data were recorded with date, trap number, and comments.

ESH-20 implemented a pioneer mark-recapture study in 1996 to study the feasibility of using mark-recapture methods for future use. A permanent marking system known as the passive integrated transponder (PIT) was implemented for the purpose of gathering mark and recapture data. In 1997 another permanent marking system, toe clipping, was used in addition to PIT tagging. Both methods are used independently of one another. PIT tagging is used only for animals that are eight grams or more in mass. Toe clipping is implemented if an animal is less than eight grams in mass. PIT tags are only used when the tag is less than 10% of the body mass of the animal.

When animals are caught in a pitfall trap, it can be determined if the animal is a recapture by counting the number of toes, or scanning the individual with the PIT wand for an implanted PIT tag. This method is used in mark-recapture studies where long-term monitoring is desirable.

## 4.0 Results

All reptiles and amphibians caught at the Pajarito wetlands since 1990 (excluding 1992) have been recorded and are included in Table 1. The population dynamics of these animals are to be studied in the future. With the mark-recapture study underway, we wish to calculate survival rates and monitor populations as well. Only five animals were recaptured in 1996, where 17 were implanted with PIT tags. In 1997, 100 animals were marked with either toe clips or PIT tags. In 1998, 120 animals were marked. Animals marked and recaptured are shown in Table 2.

Table 1. Reptiles and Amphibians caught at Pajarito Wetlands.

| Species | 1998 | 1997 | 1996 | 1995 | 1994 | 1993 | 1991 | 1990 |
|---|---|---|---|---|---|---|---|---|
| Tiger salamander (*Ambystoma tigrinum*) | 3 | 1 | 7 | 1 | 0 | 5 | 29 | 5 |
| New Mexico spadefoot toad (*Spea multiplicata*) | 1 | 2 | 7 | 0 | 1 | 0 | 878 | 1 |
| Couch's spadefoot toad (*Scaphiopus couchii*) | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 0 |
| Woodhouse's toad (*Bufo woodhousii*) | 3 | 27 | 1 | 2 | 2 | 9 | 4 | 1 |
| Canyon treefrog (*Hyla arenicolor*) | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| Western chorus frog (*Psuedacris triseriata*) | 13 | 55 | 15 | 4 | 12 | 21 | 26 | 28 |
| Short-horned lizard (*Phrynosoma douglasii*) | 1 | 5 | 0 | 0 | 1 | 1 | 0 | 2 |
| Prairie lizard* (*Sceloporus undulatus*) | 11 | 5 | 12 | 3 | 6 | 13 | 2 | 9 |
| Plateau striped whiptail lizard (*Cnemidophorus velox*) | 55 | 83 | 101 | 42 | 73 | 23 | 30 | 48 |
| Many-lined skink (*Eumeces multivirgatus*) | 51 | 33 | 37 | 21 | 31 | 48 | 22 | 46 |
| Great plains skink (*Eumeces obsoletus*) | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 24 |
| Night snake (*Hypsiglina torquata*) | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Smooth green snake (*Liochlorophis vernalis*) | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Western terrestrial garter snake (*Thamnophis elegans*) | 1 | 5 | 3 | 1 | 8 | 10 | 2 | 4 |
| Prairie rattlesnake (*Crotalus viridis*) | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |

* Prairie lizard was formerly known as eastern fence lizard (Degenhart et al. 1996).

Table 2. Reptiles and Amphibians PIT Tagged or Toe Clipped. (Recaptures are in parentheses.)

| Species | PIT tagged | | Toe clipped | |
|---|---|---|---|---|
| | 1997 | 1998 | 1997 | 1998 |
| New Mexico spadefoot toad | 1 | 0 | 0 | 0 |
| Tiger salamander | 0 | 0 | 0 | 0 |
| Woodhouse's toad | 4 (1) | 2 | 0 | 0 |
| Western chorus frog | 0 | 0 | 5 | 5 |
| Short-horned lizard | 1 | 0 | 3 (1) | 3 |
| Prairie lizard* | 0 | 0 | 2 (1) | 6 |
| Plateau striped whiptail | 18 (3) | 8 (2) | 41(10) | 62 (1) |
| Many-lined skink | 0 | 0 | 21 (2) | 34 (1) |
| Western terrestrial garter snake | 3 | 0 | 0 | 0 |

*Prairie lizard was formerly known as eastern fence lizard (Degenhart et al. 1996).

## 5.0 Conclusion

Pitfall trapping has been employed widely for surveys of amphibian and reptile diversity and abundance in different habitat types. Traps can be operated continuously, so that variation in activity due to weather can be detected (Bury and Corn 1987).

Reptiles and amphibians have been trapped at the Pajarito wetlands using pitfall traps since 1990 (excluding 1992). The project was initiated to monitor these species as they are affected greatly by environmental changes. Through the years we have modified our sampling design and implemented new techniques to help us better understand the population dynamics of these animals. With the data collected, we will develop a monitoring plan to identify if any significant changes have occurred within the populations over time. Monitoring generally requires sampling over several years so that species and community health can be more accurately evaluated. This is especially needed in sampling amphibians and reptiles because populations fluctuate greatly from year to year with environmental changes, with respect to precipitation. Data collected over several years allows biologists to determine if population trends are due to naturally fluctuating environmental conditions or to other causes (Jones 1986).

With the implementation of these studies we are in the process of evaluating population dynamics such as survival rates and species composition as compared to annual and seasonal fluctuations in precipitation and temperature. In addition, issues of contamination effects on reptiles and amphibians may be evaluated.

In the future the mark-recapture methods in the pioneer study will be incorporated into our sampling methodology.

**Acknowledgements**
Special thanks to field crew members Hilary Clay, Chuck Hathcock, Brandon Finch, and Carrie Viera.

**Literature Cited**

Bury 1987: R. B. Bury and P. S. Corn, "Evaluation of Pitfall Trapping in Northwestern Forests: Trap Arrays with Drift Fences," Journal of Wildlife Management, 51:112–119.

Bury 1983: R. B. Bury and M. G. Raphael, "Inventory Methods for Amphibians and Reptiles," in: Bell, John F., and Atterbury, Toby (eds.) "Proceedings of Renewable Resource Inventories for Monitoring Changes and Trends," 1983 August 15–19, Corvalis, OR, Society of American Foresters report SAF 83-14 416–419.

Degenhart 1996: W. G. Degenhart, C. W. Painter, and A. H. Price, *The Amphibians and Reptiles of New Mexico*, University of New Mexico Press, Albuquerque, NM.

Hall 1980: R. J. Hall, "Effects of Environmental Contaminants on Reptiles: A Review," US Department of Interior, Fish and Wildlife Service special scientific report 228.

Heyer 1994: W. R. Heyer, M. A. Donnelly, R. W. McDiarmid, L. A. C. Hayek, and M. S. Foster (eds.), *Measuring and Monitoring Biological Diversity. Standard Methods for Amphibians*, Smithsonian Institute Press, Washington D. C.

Jones 1986: B. K. Jones, "Reptiles and Amphibians," in Cooperrider, A. Y., R. J. Boyd, and H. R. Stuart (eds.), *Inventory and Monitoring of Wildlife Habitat*, 267–290, US Department of Interior, Bureau of Land Management Service Center, Denver, CO.