Monk Parakeet Management at Electric Utility Facilities in South Florida

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Abstract: The monk parakeet (*Myiopsitta monachus*) is native to South America but has become established in several locations throughout the United States through purposeful and accidental releases. The species is unique among parrots in that it is not a cavity-nester, but instead it builds a bulky nest structure of sticks. Often, in its native range and in the United States, the parakeet selects a electric utility structure as a nest site. Material from the nest then can cause short-circuits that result in damage to the utility structure and a subsequent power outage. In south Florida, monk parakeet damage and associated outages have increased substantially in recent years. Although the full costs associated with the damage and the outages are not known, it is evident that current methods to manage the problem are inadequate. In 2001, to address the need for more effective management methods, Florida Power and Light Company initiated a project to identify and investigate new, potentially useful management alternatives. In this paper, we review what is currently known regarding the impacts of monk parakeets to electric utilities and we discuss the status of research to develop new methods to reduce these impacts.

Key Words: biocontrol, deterrent, economic impact, effigy, electric utility, Florida, laser, monk parakeet, *Myiopsitta monachus*, nest removal, *Sarcocystis falcatula*

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INTRODUCTION

Damage to utility structures has been reported from a number of the states in which monk parakeets *Myiopsitta monachus* occur. The nesting of monk parakeets on utility structures in the Florida Power & Light (FPL) service area in south Florida has increased dramatically in the last 10 years, causing significant amounts of damage to the utility structures and substantial subsequent power outages. Increasing amounts of time and money are being spent by FPL to repair damage and remove nests from substations, transmission lines, and distribution lines in south Florida. The increase in the amount of utility damages, outages, and costs for controlling monk parakeets has been associated with the dramatic increase in monk parakeet populations during this period.

MONK PARAKEET BIOLOGY

The monk parakeet is native to South America, occurring from central Bolivia and southern Brazil south to central Argentina. The species has been introduced and become established as a naturalized species to the mainland of the United States, Puerto Rico, Bahamas, West Indies, England, Belgium, Italy, Spain, and the Canary Islands. Purposeful or accidental releases of the species have occurred in Canada, and it has been recorded as breeding there, but the species does not appear to have yet established itself in Canada.

The species first became established in the United States during the 1960s through accidental and purposeful releases by individuals or pet shops. The releases across the U.S., whether purposeful or accidental, were ultimately the result of the fact that thousands of monk parakeets have been imported for the pet trade. For example, in the 4-year period 1968 - 1972, 64,225 monk parakeets were imported into the United States for the pet trade (Spreyer and Bucher 1998). Currently, the largest populations are in Florida, Illinois, New York, Rhode Island, and Texas.

In Florida, the species was first recording breeding in Miami in 1969 (Stevenson and Anderson 1994), and since the early 1970s the species has been firmly established in Florida. It has been recorded in at least 24 of 67 counties, with the largest populations occurring in west coast and southeast coast counties.

In the early 1970s, the U.S. Fish and Wildlife Service initiated a control and removal program based on the species' reputation as an agricultural pest in South

America. This program ended in 1975 and reduced the existing population at that time by approximately 50%. Since 1975, however, the species has dramatically increased its population size and distribution in the U.S. Both population size and number of localities where the species occurs are currently growing exponentially.

A review of Christmas Bird Count (CBC) data for the last 30 years shows that monk parakeet populations have increased significantly, especially since the mid-1980s (Figure 1). Using CBC data for Florida, population increase projections can be made. Population growth can be estimated from the CBC data by developing an intrinsic rate of increase, *r*. This intrinsic rate of increase can be calculated from census data over any time period using the formula:

$r = \ln N(t+1) - \ln N(t)$.

In other words, *r* = natural logarithm of the population size at time t + 1 minus the natural logarithm of the population size at time t. For the past 5 years, *r* was calculated for each year, then averaged (for FPL counties, for all of Florida, and for all of the U.S.) for a 5-year period. With *r* determined, future population size can be calculated as follows:

$N(t) = N(0)e^{rt}$

In other words, the population size at time t = the initial population size times e raised to the power of *r* times t.

We calculated three estimates of *r* for the past 5 years:

- for FPL service area counties, $r = 0.30$, population doubling time = 2.31 years,
- for all Florida counties, $r = 0.205$, population doubling time = 3.4 years, and
- for the entire U.S., $r = 0.135$, population doubling time = 5.1 years.

The projected parakeet population increase in south Florida varies considerably based on these three rates of increase (Figure 2). Assuming $r = 0.135$ (based on the entire U.S. monk parakeet population), it can be conservatively estimated that in 10 years the monk parakeet outage problem will be more than 3 times greater than it is now. If the $r = 0.30$ (based on the parakeet population in the FPL service area), then a

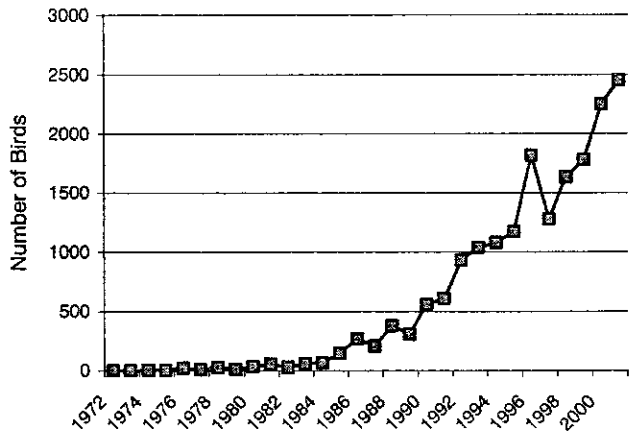

Figure 1. Number of monk parakeets recorded on annual Christmas Bird Counts in Florida, 1972-2001.

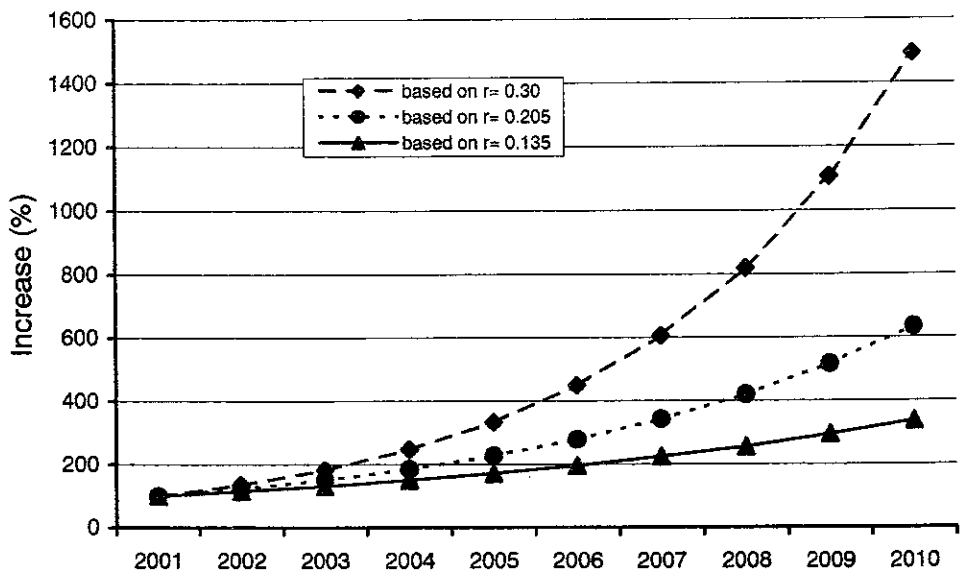

Figure 2. Projected population growth of Florida monk parakeet population based on three estimated rates of increase (*r*).

1400% increase can be expected. Without having biological information specific for Florida populations, it is uncertain which intrinsic rate of increase is appropriate.

Monk parakeets can build their nests virtually anywhere they can find a flat surface to begin construction. In Florida, electric utility structures and palm trees are the most common substrates for nesting. Nests can be built quickly. A pair of birds can build a nest in less than 2 weeks, and pairs rebuild destroyed nests equally as fast. All individuals in a colony, including young birds, participate in building and maintenance of nests. The nests of monk parakeets serve both as a site to reproduce as well as a year-round roosting site. The nest appears to be a vital part of the life of an individual monk parakeet. If nests are destroyed, monk parakeets will rebuild them even during the non-breeding season

The monk parakeet is a highly social species and can either nest singly or in groups of varying sizes. Colonies can include groups of single nests, compound nest structures, aggregations, or single or compound nests. Nesting structures can get very large, with dozens of pairs nesting within a single nesting structure. Nests usually start out as a single nest, and with passing years get larger as the original pair builds onto the nest, and other pairs build their nests on top of or surrounding the original nest. Single nests are smaller, approximately 1 meter in diameter, and compound nests are larger, sometimes many meters in diameter. Single nests may have just one chamber or several chambers in them. Compound nests are much larger, and in Argentina have up to 20 chambers.

THE PROBLEM FOR ELECTRIC UTILITIES

For reasons that are not clear, monk parakeets often build their bulky stick nests in electric utility substations and on support structures for distribution and transmission lines. The birds' tendency to use electric utility facilities occurs both in the parakeets' native range in South America (Bucher and Martin 1987) and in the U.S. (e.g., Simpson and Ruiz 1974, van Doorn 1997). Nest material can result in arcing of current that causes damage to the facility and subsequent power outage. The full extent of damage to electrical utility structures and resulting outages is not known, but direct economic damage caused by monk parakeets may include:

1) Lost electric power sales revenue during outages,
2) Costs for restoration of power after outages and repair of equipment damaged during outages,
3) Costs for removal of nests and other control and mitigation measures,
4) Indirect costs for utility management time and effort in attending to the problem, and
5) Costs to electric customers for loss of service or reduced electrical system reliability.

Even though a full accounting of the economic impact of parakeets is not available, some preliminary information is illustrative of the problem. During the first 5 months of 2001, FPL logged 498 outages, which affected over 21,000 customers. This projects to an annual rate of 1,027 outages, or 2.81/day. The total lost revenue estimated for 2001 was $19,000. The cost for repair of outages was estimated at $566,000 annually or $551 per incident, including $136 for system resetting/ repair and $415 for nest removal. Total estimated costs associated with outages in 2001 were $585,000, or $570 per outage (A. Hodges and C. Newman, unpubl. data).

The cost of removing monk parakeet nests on distribution and substations was estimated by FPL at $415 per nest. The cost is likely higher on transmission lines where additional time and equipment are needed. In 2001, about 90 nests were removed preemptively, giving a total cost of $37,000. A survey of monk parakeet nests throughout the FPL system found a total of 1,110 nests, including 534 at substations, 400 on distribution structures, and 176 on transmission towers. Based on current rates for nest removal, a conservative cost for removal of all existing nests would be $460,650 (A. Hodges and C. Newman, unpubl. data).

Because birds will readily rebuild their nest, an effective nest removal program requires that the birds be removed with the nest. The estimated cost to capture monk parakeets from a nest is $1,000. The cost to remove both a nest and the birds inhabiting it is estimated at $1,500/nest. At this rate, the conservative cost to remove all 1,110 nests and the birds would be $1,665,000.

DEVELOPING A SOLUTION

For managing the parakeet nesting problem, the only effective technique used to date is nest removal. Unfortunately, this short-term solution is labor intensive and can compound the nesting problem if the birds are not captured, because individual pairs of a colony will disperse to start new nesting colonies.

There presently are no policies or laws in Florida to manage the monk parakeet. Statewide control of monk parakeets will ultimately be necessary because of their widespread distribution and their ability to use both vegetative and man-made structures for nesting. Any strategy needs to account for pubic acceptance of the control methods. Since the monk parakeet is also a pet species, it will be important to understand various stakeholders' interests when developing a public communications program. Public communications should emphasize the economic impacts and utility reliability problems associated with the monk parakeet.

Because of increasing utility damages and reliability problems associated with the monk parakeet, FPL has initiated a program to evaluate the extent of the problem and to develop potential control strategies for monk parakeets nesting on utility structures. At this time, 4 management options are under investigation or development:

- Visual deterrence
- Trapping and Removal
- Right of Way (ROW) and Substation Habitat Management
- Biological Control

Visual Deterrence

We recently conducted limited trials at south Florida substations to evaluate the usefulness of a taxidermic monk parakeet effigy, a commercial scare device, and a low-power laser. These trials were conducted initially with no nest removal and then with the nests removed from the substation. Recent research has demonstrated that vulture roosts can be dispersed from cellular and broadcast towers by installing vulture carcasses or taxidermic effigies on the structure (Avery et al. 2002). Here we evaluated whether the use of a monk parakeet effigy can be similarly used to prevent parakeets from nesting in substations.

During a 3-day pretreatment period, counts were made during 1-h periods each morning as the birds left their nests. If it was not possible to record the birds as they left their nests, then counts were made later in the morning after they returned from foraging. At one substation (Homestead), after the pretreatment a taxidermic monk parakeet effigy was installed by FPL personnel. The effigy was suspended upside down from the end of a 2.9-m PVC (schedule 40, 1-inch diameter) crosspiece glued to a 1.8-m vertical PVC piece. A FPL 2-man crew in a bucket truck secured the unit with cable ties to a lightning rod atop the northwest corner of the substation. The same procedure was followed at the second substation (Princeton) except that a Prowler Owl™ was installed. Numbers of parakeets were counted for the next 6 days as during the pretreatment period.

Birds at the Homestead site did not seem overly concerned by the monk parakeet effigy, and by 1720 hrs on the day of installation, 63 birds had settled into their nests. The numbers of birds at the Homestead site remained relatively constant at 60-65 throughout the trial (Figure 3). There was no difference between pretreatment and treatment numbers. The effigy was removed after 9 days.

On the afternoon of installation, the parakeets at the Princeton site were very agitated by the presence of the fake owl, and throughout the afternoon they mostly avoided going to their nests in the facility. Instead, they perched on adjacent utility wires and only occasionally flew into and out of the substation. There were up to 40 parakeets perched on the utility wires during the afternoon. By around 1715 hrs, however, the birds became bolder and within several minutes, 32 entered their nests.

The apparent failure of the fake owl to deter parakeets from their nests at the Princeton facility provided an opportunity to evaluate another potential parakeet management tool. At 1730 hrs on the first

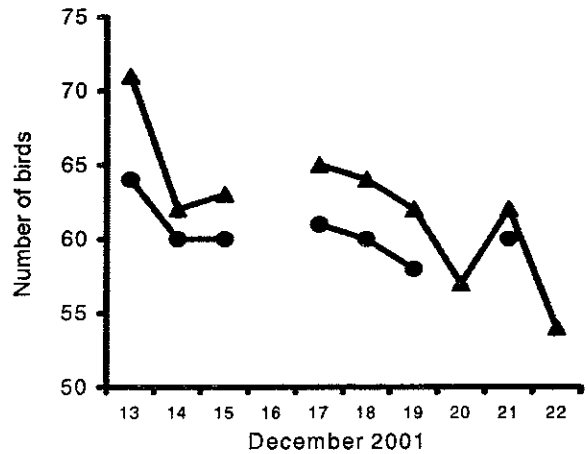

Figure 3. Number of monk parakeets at Homestead substation emerging from nests in the morning (circles) and the total number using the substation during the day (triangles). A taxidermic parakeet effigy was installed at the facility on the afternoon of Dec. 17. The effigy was removed on Dec. 26.

treatment day, we shined a red beam of light from a low-powered handheld laser (Dissuader™) on 2 parakeets that had not entered their nest. The birds immediately flew off with a squawk and perched on a utility pole approximately 30 m away. We shined the laser on them again and they flew out of sight. We then directed the beam on other nests within the substation and several other birds flew out and left the site. Repeated attempts using the laser to induce other parakeets to leave their nests were not successful. At the substation, the number of birds exiting their nests the next morning was reduced considerably (Figure 4). Continued use of the laser on each of the next 4 evenings further reduced the number of birds that spent the night there. Despite the reduced number of parakeets in the nests at night, the total number at the site during the day appeared unchanged (Figure 4).

Four weeks later, we returned to the Homestead substation to evaluate the parakeet effigy as a deterrent to nesting following removal of the existing nests. We conducted one pretreatment count and on the following day FPL personnel removed all nests from the substation and installed a parakeet effigy as in the previous trial. Parakeet activity was monitored throughout the day. Although the birds displayed no nest-building activity, they did return to the substation and appeared to reoccupy positions on the structure where their nests used to be. Given this lack of response to the parakeet effigy, we applied the laser to the parakeets and readily dispersed them from the substation. For the next 7 days, we continued to harass the parakeets with the laser each morning and evening. Although the number of birds diminished somewhat, there appeared to be a core group of 30-35 that persisted at the site despite the daily laser harassment.

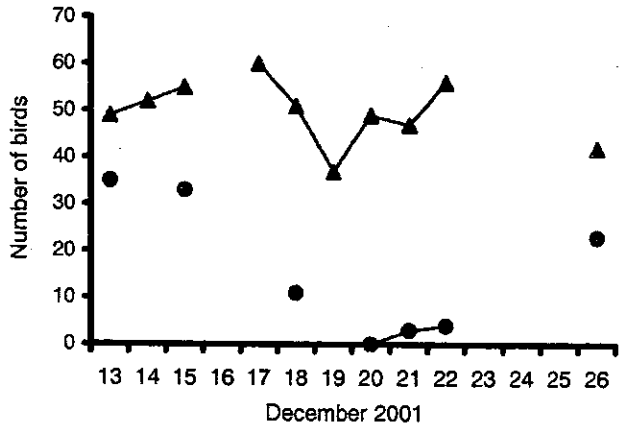

Figure 4. Number of monk parakeets at Princeton substation emerging from nests in the morning (circles) and the total number using the substation during the day (triangles). A commercial scare device was installed at the facility on the afternoon of Dec. 17. Laser harassment in the evening commenced on Dec. 17 and ended on Dec. 22.

Trapping and Removal

Nest removal by FPL personnel is an ongoing activity at substations and on distribution and transmission line structures. This provides only short-term relief, however, as the birds readily rebuild their nests. A more long-lasting remedy would be to remove the nest and the birds as well. Such action would not only keep the nest occupants from rebuilding but would contribute to a lowering of the overall monk parakeet population.

For the initial evaluation, we adopted a drop-in decoy trap designed by Bashir (1979) and used successfully to trap rose-ringed parakeets (*Psittacula krameri*), a gregarious species similar in size to the monk parakeet. We erected one trap at a substation (Florida City) frequented by about 15 monk parakeets. The trap was provisioned with water and food and shaded perches, and 4 decoy parakeets were placed inside. An electrical fence around the trap discouraged mammalian predators. The trap measured 3.1 × 3.1 × 1.8-m. The 4 side panels were aluminum frame with plastic-coated poultry wire. The top panels were wood and poultry wire. The trap was monitored daily and food and water replenished as needed. After 7 days, the trap was moved to a power plant (Cutler Ridge) to take advantage of a larger resident parakeet population.

Although free-flying parakeets visited the trap at each site, no birds entered it. We observed interactions between decoy birds and parakeets outside the trap, which raised the possibility that the decoy birds were in some way inhibiting others from entering. To examine this, we removed the decoy birds but kept the trap baited with food and water. Birds did not enter the trap under these conditions, either. The results of this initial trial cast doubts on the usefulness of this type of trap for monk parakeet management, but further evaluation is needed.

Right of Way (ROW) and Substation Habitat Management

An initial review of the distribution of monk parakeet nests on the utility structures in south Florida suggests that monk parakeets exhibit preferences in nesting sites. In some areas, it appears that monk parakeets nest on transmissions lines more than they nest on substations, whereas in other areas the reverse seems to hold. Preliminary observations suggest that monk parakeets may prefer to nest on transmission line towers in ROWs that are park-like or mowed rather than unmowed or overgrown. In addition, CBC data suggest the relative abundance of monk parakeets in west Florida exceeds that in south Florida, but the reported frequency of nesting on utility structures is noticeably less in west Florida. Thus, there could be different nesting preferences between the two populations.

Understanding and being able to modify the nesting habitat preference could reduce or eliminate nesting of monk parakeets by making the utility structures less suitable. If habitat preferences exist, ROW maintenance activities can be modified to reduce the frequency of nesting. If nesting preference is a learned behavior, then the focus of proposed parakeet management should be at the edge of the range where monk parakeets are nesting on utility structures, to prevent these birds or their offspring from spreading the behavior. Finally, more effective physical deterrents, e.g., modifying certain structural components of substations, transmission lines or distribution lines, might reduce nesting once nesting preferences of monk parakeets are better understood.

To examine habitat relationships, we will randomly select monk parakeet nest sites at substations, transmission lines, and distribution lines. Within each facility type, we will pair each nest site with a site having no nests. A boundary based on the estimated home range of the monk parakeets will be established around each test site. An analysis will be conducted on how land cover, land use (e.g., residential, commercial, industrial, agriculture) and roads influence nesting site presence. Based on recent aerial photography and ground truthing, we will determine if there are any correlations between surrounding land uses and nest site locations. Field personnel will also count the number and identify the locations of nests and birds at each affected site.

Using the information generated by the GIS evaluation and field verification, comparisons will be made to determine whether there are any land use factors that might be used to predict monk parakeet nesting on utility structures. Statistical analysis will be conducted to look at various factors surrounding the nests, such as acreage of open space/pasture/open urban lands, proximity to food sources and ratio of natural - unnatural ground surface (residential lawns/urban landscaping - asphalt/cement). A product of this study will be a GIS database of monk parakeet distribution and facility habitat characteristics for use in evaluating monk parakeet distribution and expansion as additional data are collected.

Biological Control

Population reduction is one approach to lessening the impacts of monk parakeets to utility structures and agricultural resources. One possible approach to lethal control is the selective application of an endemic protozoan parasite.

Sarcocystis falcatula is a protozoan parasite that cycles between Virginia opossums (*Didelphis virginiana*) and brown-headed cowbirds (*Molothrus ater*) and grackles (*Quiscalus* spp.). It is endemic wherever opossums occur, including South Florida. The stages passed in the feces of the opossum (sporocysts containing sporozoites) are eaten by the avian intermediate hosts. Once the sporozoites enter the bird, they develop in the endothelial lining of blood vessels where they multiply by schizogony. The resultant merozoites then move into muscle cells and undergo further asexual reproduction in sarcocysts. The mature sarcocyst is the stage infective to the definitive host (opossum). The parasite gains access to the definitive host when the opossum eats an infected bird and the intermediate host (the bird) is infected orally through contact with feces from infected opossums. Damage occurs to the intermediate host (the bird) due to the schizogony by the parasite. Laboratory trials have revealed no signs of disease in experimentally infected opossums, cowbirds, or grackles (E. Greiner, University of Florida, College of Veterinary Medicine, unpubl. data).

A number of studies suggest that this parasite causes morbidity and mortality in psittacine birds. For example, in a study at a major zoo, 37 psittacine birds died (Hillyer et al. 1991). The most common signs were pulmonary edema and hemorrhage. Half of these birds died without any clinical signs. Infected birds sometimes go off feed and lose weight, but most die before any signs are evident.

Because this endemic parasite is apparently lethal to psittacines and is apparently not harmful to native bird species, it is worth investigating whether selective application of the parasite can be used as a component of a monk parakeet population management plan. This study will be the first step in that process. Once an effective dose is identified in trials with captive birds, then it will become necessary to develop and evaluate a selective delivery procedure so that only monk parakeets will be affected by field application of this control method.

FUTURE CONSIDERATIONS

The goal of this project is not to eliminate the monk parakeet population, but rather to protect facilities from nesting to ensure reliable delivery of electricity. It is unlikely that a single method will suffice. Based on the widespread nature of the problem in the FLP service area in south Florida, the projected future increase in monk parakeet populations in Florida, the different types of utility structures involved, and the differential effectiveness of various control techniques, an overall control strategy consisting of a variety of flexible approaches will have to be developed. We have outlined in this paper a starting point in this effort.

Additional research is needed in other areas as well. In particular, more comprehensive information is needed on the economic damage caused by monk parakeet outages. This information will be used to develop a cost - benefit analysis for the different control options. The economic analysis will include basic types of damages such as: lost electric power sales revenue during outages; repair of damaged towers, lines, and transformers; cost for control and mitigation measures by the utility; reduced overall electrical system reliability; and cost to customers for loss of electric power during unscheduled outages and possible mitigation measures taken. In addition, there is very little basic biological information on the monk parakeet from Florida. It is important to conduct appropriate field studies to obtain life history and ecological information to refine the population model as a means to developing, evaluating, and selecting an appropriate population management strategy.

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