

Evaluation of the Management of Problem Alligators in
Everglades National Park

Report SFRC-83/0

Terri Jacobsen and James A. Kushlan

National Park Service
South Florida Research Center
Everglades National Park
Homestead, Florida 33030

October 1983

TABLE OF CONTENTS

LIST OF TABLES	ii
LIST OF FIGURES	iii
LIST OF APPENDICES	iv
INTRODUCTION.	1
Nature of Nuisance Alligators	1
History of the Alligator-Human Conflict	2
Legal Status of Alligators - Federal	3
Legal Status of Alligators - State of Florida	6
Regionwide Nuisance Alligator Control Programs	6
Florida	7
Louisiana	7
South Carolina.	8
Georgia.	8
Texas	8
Alabama	9
Mississippi	9
North Carolina	9
Arkansas	9
Problem Alligator Control in Everglades National Park.	9
EVALUATION OF THE 1979 MANAGEMENT POLICY.	11
Criteria	11
Management Actions	12
Responsible personnel	12
Relocation	13
Handling Problem Alligators	14
Regional Distinctions	15
Backcountry.	16
Nest sites.	16
Unrestricted areas	17
Restricted areas	17
People Management Strategies	18
Sign system	18
Law enforcement	19
Physical barriers.	19
1983 PROBLEM ALLIGATOR MANAGEMENT RECOMMENDATIONS	20
Education	20
Enforcement	20
Reduction of Unnatural Conflicts	20
Control of Problem Alligators	21
Criteria	21
Response	21
ACKNOWLEDGEMENTS	22
LITERATURE CITED.	23

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1.	Nature and location of nuisance alligator incidents according to Case Incident Reports filed from 1972 to 1982	24
2.	Return of nuisance alligators to original capture site after relocation to L-67E	25

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1.	Number of incidents involving alligators that occurred each year in Everglades National Park from 1972 to 1982	26
2.	Personnel effort expended on eight types of alligator incidents occurring in Everglades National Park from 1972 to 1982	27
3.	Distribution of incidents involving alligators among five management areas in and around Everglades National Park from 1972 to 1982	28

LIST OF APPENDICES

<u>Appendix</u>		<u>Page</u>
I.	Alligator control incidents in Case Incident Reports	29
II.	Suppliers for alligator tagging and capturing equipment	34
III.	Alligator Removal Data Form	35

INTRODUCTION

The National Park Service strives to perpetuate the native animal life of the parks for their essential role in natural ecosystems (National Park Service 1978). In aquatic habitats, the ecological importance of crocodilians is being given increasing recognition by both scientists and wildlife managers (January 10, 1977 - 42 FR 2075). This is especially relevant in the Everglades, where the activities of the American alligator (Alligator mississippiensis) are critical to the natural functioning of the ecosystem, serving to maintain species richness and increase habitat diversity (Craighead 1968, Kushlan 1974). In recognition of their important ecological role and their popularity with the visiting public, alligators have become symbols of the wilderness of Everglades National Park.

The history of the alligator within the Everglades began with its exploitation, especially for the commercial value of its hides. Keeping a check on illegal hunting once consumed many personnel-hours of effort within Everglades National Park, and the earliest emphasis on alligator management had always been properly placed on the protection of alligators from humans. As the park became established, however, and was opened to people other than local hunters, a new range of potential problems for management developed. The realization that alligators might become nuisances arose early in the history of the park. In 1948, the first Park Superintendent, Dan Beard, inquired ". . . Can it be we shall soon be putting up signs 'Do not feed the alligators'?" His foresight proved correct. While not foreseeing that habitat changes and water management practices would replace hunting as the primary threat to Everglades alligators, early park managers began to see that conflicts between alligators and civilization were to take many forms.

The alligator, once nearly decimated by hunting in the early 1900's (Allen and Neill 1949), is now Florida's most visible nuisance wildlife species (Goodwin 1982). Today, one focus of alligator management must include human safety, particularly in areas where people and alligators are in close association. In this report, we review the nature and extent of alligator-visitor conflicts within Everglades National Park. We discuss the conditions likely to create these conflicts, and how they relate to effective management. We also examine the legal status of the alligator throughout its range and review for background how various State and Federal agencies handle similar problems. We evaluate the results of a problem alligator management policy instituted in Everglades National Park in 1979 and recommend a management scheme to provide protection for both alligators and the park visitor.

Nature of Nuisance Alligators

Alligators are dangerous because they are large, strong, predatory animals, and their bite can kill or maim humans. Even less than fatal bites can cause problems, especially because of the danger of infection by a bacteria associated with alligators, Aeromonas hydrophilam, which can cause serious and even permanent damage in an open wound (Spillan 1983).

An alligator becomes a problem of concern to park personnel when it is aggressive toward visitors, leaves the water and approaches visitors, or defends a nest near

visitor-use areas. Similarly, a visitor becomes a problem when he or she harasses, feeds, or in any way disturbs an alligator. Aggressive behavior in problem alligators results primarily, although not exclusively, from feeding, as alligators gradually become familiar with the potential rewards of close association with visitor-use areas. Although they may be most dangerous during the nesting season (Kushlan and Kushlan 1979), alligators attack without provocation only very rarely (Hines and Keenlyne 1977).

Public perception of the potential danger presented by wild alligators is variable. A public opinion survey was conducted in 1977 by the Florida Game and Fresh Water Fish Commission to measure human attitudes toward wild alligators. Results showed that most (92%) Florida residents interviewed considered the alligator a valuable species, but 73 percent felt that large alligators are dangerous in some situations. Thirty-two percent considered that danger exists only when the alligator is provoked, 14 percent felt that alligators were usually dangerous without provocation, and 27 percent felt that alligators were rarely or never dangerous (Hines and Schaeffer 1977). It is possible that these attitudes reflect a recent change in public opinion caused in part by publicity emphasizing that alligators can be dangerous.

History of the Alligator-Human Conflict

The potential threat of alligators as large predators capable of harming people, pets, and livestock must be of concern to wildlife and law enforcement officials. In order to suggest policies that will alleviate that threat, we began by examining how the potential for dangerous situations has evolved and acknowledging situations that are most likely to contribute to hazardous conditions. We base this discussion on Hines and Keenlyne (1976 and 1977), who reviewed the history of the alligator as a threat to human safety.

Early explorers and naturalists reported the alligator as a menace to life and property, while Indians apparently kept a constant guard against alligators. In the early 1790's, Bartram described attacks on his boat by three large alligators in the St. John's River, and other explorers reported equally perilous adventures involving alligators. It is possible that these accounts may be tainted by the authors' need to make their adventures appear exciting. If alligators were in fact such ferocious creatures at one time, then the depletion of the Florida population by hunting in the 1800's and early 1900's must have changed the alligator's behavior. As a result of hunting pressure, alligators may have retreated to secluded swamps and become increasingly timid toward humans. This, of course, cannot be proven. It is possible that there may have been more aggressive alligators in these early times simply because there were more large individuals capable of taking large prey.

In spite of the widespread depletion of alligators as a result of hunting, it may be that habitat destruction in Florida has impacted alligator populations to an even greater extent (Hines 1969). With urban expansion into previously secluded areas that had become the alligator's retreat, the increased potential for human-alligator contact began to manifest itself in reports of human injury and even death from alligator attacks. In Florida, sixteen documented attacks have been reported,

beginning as far back as 1948 (Carle 1948). Details of these attacks included three interesting observations - (1) fourteen of sixteen victims were between nine and sixteen years old; (2) larger alligators were usually involved in attacks on larger people; and (3) thirteen of sixteen attacks occurred while the victim was either swimming or playing in the water, although three victims were standing on land at the edge of the water. Many of these incidents occurred in urban or park areas, and newspaper accounts cited the feeding of alligators as contributory to the attacks. In addition, information had been released in the past indicating that alligators were harmless, and this may have led to a relaxed, unwary attitude on the part of some people. Nevertheless, the documentation of two attacks in 1975 showed that large alligators, even when unprovoked, may attack humans. Although no attacks on people have ever occurred within Everglades National Park, the idea that alligators in the park are naturally afraid of humans is questionable. It is clear that they learn to avoid people if harassed, and it appears that alligators can also lose that tendency and become aggressive if such behavior is positively reinforced.

Legal Status of Alligators - Federal

In 1967, the U.S. Department of the Interior determined the alligator to be an endangered species throughout its entire range in ten southeastern states (January 10, 1977 - 42 FR 2071-2077). This determination reflected concern for alligator populations that had become drastically reduced after many years of excessive exploitation and habitat loss. The alligator was legally protected as an endangered species under Federal law in 1973 with the passage of the Endangered Species Act (16 USC 1531-1543; 87 Stat. 884). The Act defines "endangered" to include "any species which is in danger of extinction throughout all, or a significant portion, of its range." The "threatened" category not only gives protection to species before they become endangered but also provides a means of gradually reducing the level of protection for previously endangered species that have been successfully "restored" to a point where extreme protective measures are no longer necessary (Busterud 1977).

Soon after Federal law officially declared all alligators endangered, it became apparent that not all alligator populations were in need of strict protection. Anticipating this situation, the Act broadly defines "species" so that distinct geographic populations can be evaluated on an individual basis. Thus, it is possible to have a particular species, such as the alligator, subject to stringent protection as an endangered species in one area, less stringent protection as a threatened species in another, and have no Federal protection elsewhere (September 26, 1975 - 40 FR 44412). Consequently, during the past ten years, legal protection for alligators has been gradually loosened in a somewhat piecemeal and time-consuming manner. This reflects both the time required for these distinct geographical populations to recover and the careful diligence of the delisting bureaucracy. In this section, we review the delisting process because it reflects the inherent diversity and the history of changing attitudes toward alligator management.

As early as 1975, alligator populations in three parishes in Louisiana were thought to be neither endangered nor threatened, and it was proposed that their status be changed (July 8, 1975 - 40 FR 44412-44429). However, it was recognized that these

alligators could not be distinguished from other still endangered alligators except when found in the wild in these three parishes. Reclassification in this area, it was determined, would cause further threats to those populations that remained listed. To address this problem, the proposal for delisting was based on provisions under Section 4(e) of the Act that allow some populations of alligators to be managed with greater flexibility and yet remain classified as threatened because of their similarity in appearance to endangered alligators. Recognizing that alligator poaching and subsequent trading in alligator hides and products was still a major factor in the threat to endangered and threatened alligators, Federal regulations were developed to control interstate trade and to prohibit international trade in these goods.

The first delisting proposal, which changed the alligator's status in three Louisiana parishes to threatened due to similarity of appearance, became final in 1975 (September 26, 1975 - 40 FR 44412-44425). The 1975 ruling documented a changing attitude in alligator management policies, citing that "available data indicate that the primary threats to alligator populations in [certain areas where there has been substantial recovery] are not biotic but rather [result from] the absence of adequate regulatory and enforcement mechanisms" to control poaching, malicious killing, unwise commercial harvesting, and illegal trade. In 1975, the alligator was believed to be making "encouraging gains in population over much of its historical range," and in many areas, populations were considered to be "ecologically secure." The 1975 rule goes on to say that:

"...increasing urbanization and development is resulting in more frequent human-alligator conflicts, and control of certain populations is needed to minimize public hostility toward the species. Even though actual numerical levels of alligators may be below the biotic carrying capacity in most habitats, socioeconomic factors must be considered in setting management goals to maximize public interest in, and acceptance of, coexistence with this potentially troublesome but ecologically important species."

Existing programs of public education and rigid enforcement were deemed "inadequate in the face of burgeoning alligator populations and increasing human-alligator conflicts," and the ruling concluded that "some populations are now at a point where the species could be best served by more flexible management programs."

The 1975 ruling paved the way for subsequent delisting proposals which were wider in scope. The next proposal in 1976 (April 8, 1976 - 41 FR 14886-14887) called for a reclassification of alligators from endangered to threatened in all of Florida and in certain coastal areas of Georgia, Louisiana, South Carolina, and Texas. The 1976 rulemaking proposed "limited, lethal removal of dangerous alligators to protect human lives and property" and authorized "controlled takings for scientific or conservation purposes in restricted areas . . . all to enhance long-range conservation objectives for the species as a renewable natural wildlife resource." This new philosophy of alligator management prevailed. In recognition of the encouraging recovery of the alligator under legal protection throughout much of its known

historical range, the status of the alligator was changed in 1977 from endangered to threatened in all or part of the five states of Florida, Georgia, Louisiana, South Carolina, and Texas (January 10, 1977 - 42 FR 2071-2077).

The newly adopted concept of the alligator as a renewable resource was not without its opposition. The "wholesale" reclassification of alligators in Florida to a threatened species drew negative responses from various conservationists, and these comments are included in the final ruling in 1977. The National Park Service submitted comments at the proposal stage questioning the effects of implementing the ruling. The Service felt that reclassification of alligators in Florida could initiate further threats to alligators and crocodiles in Everglades National Park by stimulating a market for poached hides. The response to these comments was that a diligently enforced system, where legally-taken hides are tagged, should keep poaching to "tolerably low levels." In addition, strong control of international trade would provide further protection. Other conservation-oriented groups stressed that an overemphasis on lethal control would develop when transplantation might sometimes be a better alternative. The state of Florida, in response, instituted an experimental harvest program to determine the relative effectiveness of lethal and non-lethal methods of alligator control. The results of this study showed that lethal means of dealing with problem alligators provided a more time- and cost-effective solution. Consequently, the State Nuisance Alligator Control Program (Florida Statute 39-25.03) was initiated in 1978.

In spite of these objections a Fish and Wildlife Service report supported the reclassification, stating:

"The situation [in Florida] is geographically complex and defies simple summarization except to note that, in general, Florida supports moderate to large alligator populations throughout the state either increasing or remaining stable in the face of increasing urbanization . . . Supplementary data [including input from Everglades National Park and other groups] indicate that the population levels [in Florida] are generally high . . . just how high is considered a problem for local management decisions, not for overall status review."

In 1977, data showed that "alligators in Florida [were] more numerous than in any other state, and [were] increasing in number annually, fully qualifying for reclassification to threatened status." It became apparent that it is large-scale trends and not local exceptions that form the basis for reclassification decisions.

After the major reclassification of alligators to threatened status throughout most of their range in 1977, further rulings loosened legal protection to an even greater extent. The number of parishes in Louisiana in which the alligator could be lawfully taken from the wild was increased to twelve (June 25, 1979 - 44 FR 37131 and July 20, 1979 - 44 FR 42911). Internationally, the alligator's status was changed from Appendix I to Appendix II under the CITES regulations to allow resumption of international trade in alligator products (May 1, 1979 - 44 FR 25480 and October 12, 1979 - 44 FR 59080-59083). In 1981, the alligator was reclassified in 52 parishes in Louisiana to the status of threatened by similarity of appearance in "formal recognition by the (Fish and Wildlife) Service of biological recovery of the alligator in Louisiana" (August 10, 1981 - 46 FR 40664). At present, the alligator is classified on the Federal level as threatened due to similarity of

appearance in Louisiana and in captivity wherever found. Threatened status holds in all of Florida and parts of Georgia, Texas, and South Carolina. Alligators remain endangered "wherever found in the wild except those areas listed" above (August 10, 1981 - 46 FR 40669).

Legal Status of Alligators - State of Florida

The current (1981) statewide alligator management policy in Florida establishes a goal of managing the Florida alligator population "...on an optimum sustained yield basis, that includes recognizing alligators as an ecologically, aesthetically, and economically valuable natural resource." The state legally lists the alligator as a species of special concern, a less restrictive rating than the threatened listing on the Federal register. Current regulations in Florida limit the "taking" of alligators to state employees for scientific purposes (including experimental harvest), as appropriate to the duties of their job, and to alligator trappers in accordance with the State Nuisance Alligator Control Program (Florida Statute 39-25.03). In 1978, a state law (Florida Statute 372.667) was passed prohibiting persons from "intentionally feeding or enticing with food any wild alligator or crocodile." Persons found violating the provision are guilty of a misdemeanor of the second degree which is punishable by a fine of up to \$500 and/or imprisonment in the county jail not exceeding sixty (60) days.

In recognition of the recovery of many populations of alligators in Florida, the Florida Game and Fresh Water Fish Commission developed a delisting proposal in July of 1981, which is still pending (A. Woodward, pers. comm., November 1982). The proposal requests a status change at the Federal level for the Florida alligator population to be delisted from threatened to threatened due to similarity of appearance. Although the overall state policy is not consistent with that of the National Park Service, which does not engage in the commercial utilization of wildlife species in areas it controls (National Park Service 1978), Everglades National Park has previously been included with the entire state of Florida in reclassification decisions. Alligator populations in the park would be legally covered by such a ruling. The effect of the state's delisting proposal would be to place alligator populations in Florida under state law, although any more restrictive policies of the National Park Service would prevail on the federally-protected lands within Everglades National Park. However, until we understand what factors limit or control the survival of alligators in the Everglades marsh, we suggest that this population remains threatened, especially considering the adverse effects of water management on alligator productivity (Kushlan and Jacobsen, in prep.). In this report, we show that education and enforcement programs, considered "inadequate [by the Fish and Wildlife Service] in face of burgeoning alligator populations and increasing human-alligator conflicts" (April 8, 1976 - 41 FR 14856), do in fact provide sufficient control of alligators in Everglades National Park without necessitating a lowering of the alligator's status in the park.

Regionwide Nuisance Alligator Control Programs

The need to control problem alligators has prompted the formulation of formal policies in five of the ten southeastern states within the species' range (Louisiana, Texas, South Carolina, Florida, and Georgia). The five remaining states (Mississippi, North Carolina, Arkansas, Alabama, and Oklahoma) handle problems on a

case-by-case basis using relatively little manpower. Different approaches are necessary because of local variability in alligator population size, the type of habitats to be managed, and the nature of public recreational activities. In this section we review the prevailing regionwide approaches and attitudes toward nuisance alligator control because these policies provide a useful context for understanding the nature and extent of potential nuisance alligator problems within Everglades National Park.

Florida

Populations were estimated for states in the alligator's range in 1974, Florida being credited with 407,585 animals (Joanen 1974). Although such estimates are exceptionally and unreliably crude, it does appear that Florida has more alligators than any other state (see January 10, 1977 - 42 FR 2073). Florida is one of two states, the other being Louisiana, to utilize the alligator commercially. Harvesting was instituted in Florida in 1978 when it was decided that resolution of the extensive nuisance alligator problem using relocation techniques was not economical. Some commission officers were reported to be spending over 50 percent of their time responding to complaints about alligators and relocating problem alligators. The use of wildlife reservists (volunteers) to relocate alligators failed for several reasons, including the lack of volunteers, the time-intensive nature of the removal process, and the extensive drain on state manpower needed for supervision of the program. Based on the results of a pilot study conducted in 1977, the state began using private hunters to harvest nuisance alligators with profits from the sale of the meat and hides to be partially taken by the state. This has been judged to be a practical and economical method of handling nuisance alligator complaints on a state-wide basis (Hines and Woodward 1980). Under current state regulations, designated agent trappers of the commission are authorized to take, possess, and kill only those alligators specifically designated by the state alligator coordinator, who specifies the location and size of any alligator to be taken (Florida Statute 39-25.03). The state also licenses alligator farms that can sell hides and meat (A. Woodward, pers. comm.).

Louisiana

Next to Florida, Louisiana ranks second in alligator abundance (Joanen 1974) and yet surpasses Florida in supporting the most liberal policies of controlling alligator populations. Responsibility for the control of problem alligators in Louisiana has recently transferred from the state to the local level because of its extensive and time-consuming nature. The state continues to cooperate with the local governing body (parish council) by verifying the need for alligator control within the parish and by approving the selection of a private control agent to handle complaints in that area. From then on, the state assists only occasionally and for all practical purposes budgets no manpower or funds for nuisance alligator control.

Because Louisiana alligators become dormant in the winter, nuisance complaints are received seasonally, in warmer months, from January through the end of the summer. Complaints concern typical situations of alligator-human contact.

Although Louisiana has a large population of alligators, officials stress that having a lot of alligators in an area is not a problem in itself. Rather, it is the size of some individuals that creates a serious situation both for the residents and for the wildlife officials. So, while small alligators (less than 5 ft) can be relocated, larger ones are destroyed to save time and effort. Profits from the harvest go to the contracted agent unless the local government assumes a percentage. The state has no monetary involvement with the program and maintains no formal control policy (J. Traver, pers. comm.).

South Carolina

The third largest alligator population is found in South Carolina (Joanen 1974), where dealing with nuisance alligators frequently creates a manpower problem. Local conservation officers in each district are specially trained in handling alligators and follow policies similar to those in most other states, i.e., problem alligators larger than 4 feet in length are considered nuisances and, after several attempts at relocation, the animals are killed. Destruction of problem alligators is rare, and when over 150 such alligators were caught and relocated in 1981, only five were killed. Estimates of manpower required in one district in 1981 showed that 20 personnel-hours were spent for each of 57 alligators handled (S. Phillips, pers. comm.)

Georgia

In Georgia, where the fourth highest alligator population was reported in 1974, nearly all (99%) of the alligator control is handled by personnel of the State Game and Fish Department. The problem is not an extensive one. In 1981, wildlife officials received 140 complaints. It is interesting that public attitudes toward alligators reportedly vary across the state. In the northern areas, there is a general fear of alligators, while in the more rural areas in south Georgia, people are more tolerant and complaints are fewer. In Georgia, a one-page formal policy specifies the definition of a nuisance alligator and outlines the recommended capture procedures. Nuisance alligators are relocated to suitable habitats that are isolated from inhabited areas or public recreation facilities to minimize the recurrence of complaints regarding the same animal (G. Johnson, pers. comm.)

Texas

Nuisance alligator relocation or disposal has occupied an increasing amount of personnel time each year in Texas as a result of an increase in alligator numbers since the species was afforded protection by the state in 1969. Texas was reported to have the fifth largest alligator population in 1974 (Joanen 1974). Complaints are handled by the Texas Parks and Wildlife Department, and that agency is seeking complete delisting of the alligator in Texas to allow management of alligators as a renewable wildlife resource. Texas officials report that the frequency of human-alligator confrontations has increased drastically as a result of urban and industrial expansion, and note that complaints are most frequent in and around the coastal marshes which are natural alligator habitats. Ranchers and farmers have reported that alligators are responsible for the loss of some of their livestock, and further

claim that alligator denning activities have damaged levees, canal banks, and earthen retention dams, causing a loss of valuable water supplies and resulting in a financial drain on materials and manpower that such repairs require (Potter 1981).

Alabama

No extensive problem is presented to state law enforcement personnel in Alabama concerning alligator control. They receive about ten calls annually, to which they respond on a case-by-case basis with no formal policy. Alabama has high concentrations of alligators in coastal areas, particularly in the Mobile delta, but populations in these areas are generally too remote to constitute a nuisance. Most complaints are of alligators in farm ponds and backyards, and these calls come in only after long-time resident alligators have reached a large size. Such complaints are not usually a result of aggressive behavior. All gators are relocated and no harvesting occurs (K. Guyse, pers. comm.)

Mississippi

Alligator control in Mississippi is not an extensive problem. Alligators are not destroyed, and there have been no recorded attacks on humans. About 150-200 alligators are relocated each year to natural rivers and beaver dams by state district biologists in cooperation with the Fish and Wildlife Service. Restocking of some formerly occupied habitats with approximately 5,000 alligators from Louisiana in 1977 and 1978 has, unfortunately, only reestablished the problem of nuisance alligators in these areas (E. Cliburn, pers. comm.)

North Carolina

State personnel lend assistance to the Fish and Wildlife Service in handling nuisance alligator complaints in North Carolina. The problem is not extensive, occurring once or twice a year, and there is no formal control policy. The state estimates an average expenditure of 15-20 personnel-days per year in alligator-related work (R. Hamilton, pers. comm.)

Arkansas

Until recently, Arkansas claimed to have few if any alligators remaining in the state and had received no complaints from the public. Recent restocking of certain natural areas with 2-3,000 Louisiana alligators is expected to establish the problem in the near future. Although restocking is supposed to aid in beaver control, it is disputed by sportsmen as detrimental to waterfowl hunting and recreation in certain areas. No control policy exists and no personnel time is spent on alligator control except in the recent restocking program (H. Alexander, pers. comm.)

Problem Alligator Control in Everglades National Park

A primary concern of Everglades National Park is to achieve a balance between visitor safety and legal and biological responsibilities that accompany the management of a protected and valuable species. Within Everglades National Park,

control of alligators in relation to public safety falls under the jurisdiction of the Resources Management and Visitor Protection Division. This division handles all types of alligator incidents ranging from road-kills to complaints about aggressive individuals. Consistent documentation of personnel effort in relation to alligator control began in 1972 with the institution of the Case Incident Report system. Under this system, incidents involving alligators fall under two categories: (1) Animals and Wildlife, and (2) Hazardous Conditions. We have categorized incidents involving alligators as detailed in these reports into eight types of situations based on the actions taken by park personnel. We calculated the effort involved in each incident by including both field time and paperwork and defined a minimum effort as one personnel-hour. Alligator-related incidents generally are of the following types:

Aggressive: Alligators behaving in an aggressive manner toward visitors either in an unprovoked incident or as a result of familiarity induced through feeding. Response by law enforcement calls for relocation and/or destruction of the problem alligator. A special potential for aggressive behavior occurs during the nesting season (June-September) when female alligators may vigorously defend a nest site often in close proximity to public areas. Response to situations involving nest defense includes the posting of warning signs and barricades around the nest site.

Hunting: Violation of laws prohibiting the hunting of alligators. Involvement of law enforcement personnel includes investigating reports of suspicious activity, prosecuting violations, or documenting the discovery of a shot or tail-less alligator.

Injured: The handling of an alligator injured through either natural (combat or disease) or unnatural (road accident) events. Typical response involves relocation or destruction.

Road-kill: Alligators struck and killed by cars along roads within and adjacent to the park. Response is removal from traffic.

Feeding: Public feeding of alligators. Typical response is an explanation of park policy and the issuance of a warning, although such activity is illegal in Florida and citations could be given.

Harassment: Typically, alligators pelted with rocks and other debris to elicit movement or other response. In some incidents, injuries may be severe enough to kill the animal. Such activity is usually discouraged with a verbal warning, although this activity is a violation of Federal regulations and could be enforced as such.

Translocation: Alligators brought to the park from outside areas for relocation inside the park. Action involves evaluation of the case and selection of a release site.

Other Contact: Incidents falling into no category and involving little personnel-effort, i.e., encouraging quicker travel across a road or encountering an alligator dead of natural causes. Response is on a case-by-case basis.

A review of case incident reports from 1972 to 1982 (Appendix I) shows that alligator management action is not required frequently. Fewer than 1 percent of the reports filed concerned alligator control, and the responses are generally not time consuming, requiring an average of 30 personnel-hours each year park-wide. Only 115 incidents were documented over 11 years (Table 1) for a mean of about 11 alligator-related incidents per year. The number of incidents has, on the average, declined in recent years (Fig. 1). A peak in 1978 coincides with the writing and discussions of the original management policy and may have resulted from heightened awareness of the policy at that time.

Aggressive incidents are the most numerous type of alligator cases, although totaling only 27 in the past 11 years. Incidents involving aggressive alligators also require the greatest investment of personnel (Fig. 2) because such situations generally require the aid of several persons. The evaluation of a situation and a subsequent capture and removal of an aggressive alligator required an average of 5.7 hours per incident, contributing to the total of 154 personnel-hours from 1972 to 1982. No injuries have been reported to personnel involved in the program. Thus, despite views to the contrary, participation in alligator handling is not a dangerous activity. However, because most situations involve aggressive animals, trained personnel need to be on hand to respond appropriately to such incidents.

Eleven translocations were made into the park from 1972 to 1982, requiring a total of 57 man-hours or 5.2 hours per incident. The remaining 77 problem alligator incidents recorded of all other types (67% of all incidents) required a mean effort of 1.5 personnel-hours per incident. This suggests that in the majority of cases, a verbal warning and the filing of necessary paperwork is all that is required of park personnel in problem alligator situations.

EVALUATION OF THE 1979 MANAGEMENT POLICY

The first initiation of a formal management policy for problem alligators in Everglades National Park was made in 1979. Information and analysis presented in this report suggest that a review and evaluation of the current policy is now possible. In this section, we discuss the effectiveness of each aspect of the 1979 policy before making recommendations for an updated management plan.

Criteria

The 1979 policy defined a problem alligator as one that would act aggressively toward visitors, leave the water and approach visitors, or defend a nest near visitor-use areas. The policy specified that the presence of an alligator becomes a problem when its activities pose a demonstrable threat to visitor safety. Visitor complaints and observations by park personnel made over a long period of time would be considered in determining the existence of a problem situation. These criteria remain useful, and we might add that a problem visitor is one that disrupts the natural behavior of an alligator in any way.

Management Actions

Responsible personnel

The 1979 plan specified that the decision on how to handle a problem alligator was to be made by the district ranger, and this procedure seems to have worked well. The district ranger was also called upon to train a team of alligator handlers, and this has proven to be less effective. As few alligator incidents developed each year, experienced personnel left and new personnel arrived, and the training necessary for the capture and handling of alligators was not passed on. We have suggested that one or more long-term staff members of the Visitor Protection and Resources Management Division should be designated to actually handle alligators on-site under the supervision of the district ranger. It might be considered that periodic training sessions for all staff by alligator researchers would be more appropriate. However, such expertise may not always reside in the Research Division and suitable training situations, when alligator incidents occur and when all personnel are available, are rare. Over the past several years, each incident tends to become a training session using many more personnel than necessary. It is essential that the responsible employees be trained and that this expertise be maintained with the responsible division.

Suitable equipment for handling alligators must be available in each district, and the cost should be borne by the responsible division. The necessary equipment and suggested suppliers are listed in Appendix II. The capture equipment and procedures that we recommend are based on what has proven successful in capturing over 5,000 alligators for research purposes. Other procedures may also prove useful in the future. We strongly recommend duct tape to secure the alligator's snout, although other materials such as rubber bands or rope are also suitable. Duct tape does not break or slip and eventually comes off by itself if the alligator were to escape before the tape is removed. It would be useful to assemble an "alligator capture procedures notebook," including photographs and detailed explanation of safety measures.

The 1979 management policy called for the wildlife biologist to certify alligator handlers and contact the Fish and Wildlife Service as required by Federal regulations. Certification by the Research Division is no longer necessary since these duties can be handled by the district ranger. Recommendations for addressing the reporting requirement have been made in a later discussion on handling nuisance alligators, and this should be dealt with as soon as possible. Staff wildlife biologists should remain responsible for analyzing results of actions taken to handle any nuisance alligator situation and for evolving more effective procedures.

All staff should be alert for potentially dangerous situations of alligator-visitor conflict, especially in high-risk areas of unrestricted visitor access. Information and observations of these types of situations should be relayed to the Ranger Division and documented as a Case Incident Report. This will help monitor the effectiveness of current policies and will serve to maintain consistent internal

records. Should a situation require a barricade or temporary sign, an on-site investigation should be made by law enforcement to determine appropriate action. Research and Interpretation Divisions should be available for consultation and should be notified of any action taken.

Relocation

When necessary, initial relocations of problem alligators were to be made to areas of Everglades National Park where return was least likely, specifically to the south end of the L-67E or to the Shark Valley borrow pits. A subsequent problem by the same alligator in the same location was to necessitate its second removal to a more distant location, namely the Everglades City area. Double removals were thought to be necessary until effective removal distances were known. As a general policy, further management action was to be determined by the results of previous removals and was not to include lethal methods unless all other reasonable methods had failed. Killing an alligator not posing an immediate threat to life required justification (with respect to 50 CFR § 17.42 (B)(4)) and was to be approved by the Superintendent.

Our examination of the effectiveness of the relocation procedure suggests a modification of the initial policy. Thirty-four relocations were made in Everglades National Park from 1972 to 1982. Of six relocations to L-67E, three alligators returned to the original capture site (Table 2). In one case, an animal relocated a second time to Turner River Park has, at this writing, not returned. In two cases, a second relocation was not necessary because on their return the behavior of these alligators no longer posed a threat to visitor safety, and they eventually moved away from visitor-use areas.

We suggest that the relocation of nuisance alligators should be made not only to places where return is least likely, but to areas where continued aggressive behavior is unlikely, and where little impact on resident alligators is anticipated. Such conditions suggest the first release site to be L-67E. This canal harbors primarily transient alligators, and the introduction of another alligator should be of little consequence to the population. Relocations to L-67E have been successful in half of six attempts, and returns have been documented for straight-line distances of over 58 km. Nevertheless, these alligators are not posing a problem while they are away, and relocation seems to alter the behavior of problem alligators in the event that they return to visitor-use areas. Monitoring the original capture area for return and behavior of the tagged individual is a critical follow-up of the relocation procedure.

The use of Shark Valley borrow pits for relocation should be discontinued for two reasons. First, these areas harbor resident and possibly territorial alligators. Here, the introduction of a new individual could upset the prevailing population structure. Second, visitor access along the Shark Valley Canal near the borrow pits is unrestricted and the potential for aggressive behavior continues to threaten visitor safety. A similar situation exists at Turner River Park in the Big Cypress, where relocations have been made in the past. It is suggested that all second relocations be made off the Loop Road at Roberts Lake Strand to increase the probability of a permanent move.

Regarding translocations, we feel that the release of problem alligators from elsewhere into the park should be discouraged because such animals are of no biological value and may be detrimental to the resident alligator population. These alligators present an unnecessary burden to park personnel and pose the potential to become nuisances in the park just as they were outside. Introductions also threaten the genetic purity of the park population and may introduce disease. As a result, no alligators should be translocated into the park. Animals outside the park fall under the jurisdiction of the Florida Game and Fresh Water Fish Commission in West Palm Beach, which should be notified regarding these animals.

Handling Problem Alligators

When a species becomes "listed," it is subject to very stringent protection. One of the most significant restrictions is that no person may "take" that species anywhere in the United States, its territorial sea, or in the high seas (16 USC -1538 (a)(1)(b)). "Taking," under Federal law, is defined very broadly, meaning to "harass, harm, pursue, hunt, shoot, capture, collect, or to attempt to engage in any such conduct" (16 USC - 1532 (14)). With few exceptions, no person may take American alligators except (1) in defense of his own life or the lives of others, or (2) as an employee or agent of the Fish and Wildlife Service, any other Federal land management agency, or a state conservation agency. Such an employee, when designated by the agency for such purposes, may, during the course of official duties, take alligators without a permit if such action is necessary to: (1) aid a sick, injured, or orphaned specimen; (2) dispose of a dead specimen; (3) salvage a dead specimen which may be useful for scientific study; or, (4) remove specimens which constitute a demonstrable threat to human safety. The removal process calls for destruction of the alligator only if live-capture and relocation has been shown to be not reasonably possible.

Discussion has been extensive regarding the proper and most practical means and justification for disposing of either severely injured or persistently aggressive alligators within the park. As for justification, Federal regulations clearly allow the handling and destruction of alligators by designated Federal employees without a permit during the course of duty if the above conditions are met. As for the means of handling alligators, the rules are clear regarding the initial requirement for live-capture. Subsequently, the destruction of an alligator may be necessary if it presents a persistent and recurring threat to visitor safety, a threat that has not been alleviated by less drastic action. Under any condition, killing needs to be justified and approved in advance by the Superintendent.

While alligators could be killed by shooting or by severing the spinal cord at the neck using an ax, such procedures may raise public objections for being inhumane. The recognized humane method for euthanizing an animal involves injection of the drug atropine. This is the standard veterinary procedure which has proven effective with alligators (E. Jacobson, School of Veterinary Medicine, University of Florida, Gainesville, pers. comm.). Use of atropine in the park would require its proper storage and handling. However, this could be the sole responsibility of one individual, the trained alligator control specialist. Use of the drug in the field should cause no great inconvenience if standard procedures for handling problem alligators are developed and followed. In each case when an animal is to be destroyed, after approval by the Superintendent, the animal would in any event

need to be captured. With this occurring under the direction of the specialist, administration of atropine could then be accomplished by an individual trained and prepared for such a duty.

Destroying an injured alligator that poses no threat to human safety is a different matter and is permitted only if the taking in fact "aids a sick, injured, or orphaned specimen." It is difficult to justify how killing an alligator could aid it. Permission should be obtained from the Superintendent prior to any such action taken.

Disposal of an alligator that has been destroyed is best done by incineration because this prevents the subsequent recovery of any parts of the alligator carcass for personal possession, and we note that such collection is illegal (January 10, 1977 - 42 FR 2076). This may cause inconvenience compared to the alternative of allowing the carcass to degrade naturally in a convenient marshy or woody area. However, any carcass disposed of in such a manner would not be deposited from natural causes and responsibility for it would continue to reside with the park. Federal regulations specify that "the specimen may only be retained, disposed of, or salvaged in accordance with directions from the [Fish and Wildlife] Service" (January 10, 1977 - 42 FR 2076). Thus, if incineration is not done, the Superintendent should consult with the Fish and Wildlife Service on a case-by-case basis for instructions.

Federal regulations require that any action taken involving alligators, including their capture, must be reported in writing to the U.S. Fish and Wildlife Service, Division of Law Enforcement, P. O. Box 19183, Washington, D. C. 20036, within five days after the taking occurs (January 10, 1977 - 42 FR 2076). We have found that both State and Federal wildlife agencies seem satisfied that Everglades National Park keeps its own internal records (A. Woodward, FGFWFC, pers. comm.; M. Moynihan, USFWS, pers. comm.). As a result, the maintenance of written documentation of all such actions is essential. Official permission could be sought from the Fish and Wildlife Service to maintain this documentation in lieu of written reports, based on an approved management plan. A similar memorandum of understanding could be sought with the State of Florida. Until such agreements are in force, written reports should be made to the Fish and Wildlife Service.

Regional Distinctions

The 1979 management policy identified four types of areas within Everglades National Park where alligator problems generally develop: (1) backcountry areas; (2) nest sites; (3) unrestricted areas, where people can approach alligators without restrictive barriers, including West Lake, Nine Mile Pond, Eco Pond, Paurotis Pond, Long Pine Key Lake, and the Shark Valley Loop Road; and (4) restricted areas, where visitors are behind barriers, including Royal Palm, the Shark Valley Tower, Pa-Hay-Okee, and Mahogany Hammock. These distinctions seem useful, and as the following discussion indicates, different types of problems have arisen in each area, suggesting that a variety of measures is necessary to handle the problem alligator situation on a park-wide basis.

Backcountry

The 1979 policy specified that problem alligators in backcountry areas were to be dealt with on a case-by-case basis. If necessary, alligators were to be removed according to the same criteria and methods established for other areas. Information about the risks of going into the backcountry and reminders not to feed alligators were to be made available to visitors, and instituting such a program was to be the responsibility of the Interpretation Division.

Our analysis shows that nine incidents involving backcountry areas were reported from 1972 to 1982. Of these, one involved illegal hunting, five were observations of alligator behavior during dry-season conditions, one involved harassment and subsequent death of an alligator in Florida Bay, and two involved aggressive behavior by alligators in Tarpon Bay. This suggests that backcountry users are apparently not faced with an extensive nuisance alligator situation, although we realize that not all incidents in the backcountry are reported to park personnel. We note, however, that a formal policy on warning backcountry users about the danger and illegality of feeding or harassing alligators has not been developed. Placement of small signs, which are already on hand, in appropriate backcountry areas and access points may be useful. This is especially important for people boating out of Flamingo. Although the elimination of the houseboat concession will ease the situation considerably, a similar situation may develop in any regularly-used area.

Nest sites

The 1979 policy noted, and our research has shown, that alligators guarding nests use obvious threat behavior before an attack (Kushlan and Kushlan 1980). Despite such threats, alligators are considered to be dangerous only when people approach the nest site too closely. Alligator nests near visitor-use areas were to be barricaded from visitors and signs were to be erected that warned of danger.

On at least four occasions, barricades were required at nest sites in Shark Valley and Anhinga Trail, although Case Incident Reports were not always filed. In one case, an area was roped off and an "Area Closed" sign was used. In three cases, orange cones were used as a barricade without signs. An experiment in 1982 using an ambiguous sign stating "Wildlife Nesting Area - Keep Out" showed that visitor curiosity was aroused and the barricade was frequently ignored. The danger involved in such situations cannot be underestimated (Kushlan and Kushlan 1980), and a consistent policy is needed regarding nest-site barricades. There have been differences of opinion as to whether aggressive alligators and other alligator situations should be barricaded, thereby attracting attention to the site, or left alone hoping that few visitors would notice the problem. We see no question here, such situations should be signed simply "Area Closed" and, perhaps "Danger," and should be barricaded with orange cones secured by ropes. To achieve consistency, signs and cones must be readily available, and we suggest that the Maintenance Division make this a priority for future nesting seasons. District naturalists could instruct personnel to "actively interpret" the reasons for closure of any area. Although we realize that some visitors will always defy both barriers and signs, we

feel that the park has the responsibility to make every reasonable effort to protect the visitor and the alligator in such situations.

Unrestricted areas

The geographic distribution of incidents involving alligators in the park from 1972 to 1982 shows that most incidents of all types combined have occurred in unrestricted areas, where people can approach alligators without restrictive barriers (Fig. 3). Such areas include the main park road, Nine Mile Pond, West Lake, Long Pine Key, Tamiami Trail, Paurotis Pond, Flamingo, and two canals bordering the park, L-67E and L-30. The main park road shows the highest frequency of all types of incidents (Table 1). Manpower-intensive incidents, which include aggressive, feeding, and harassment situations, have occurred primarily at Nine Mile Pond where visitor approach to alligators is among the most extensive in the park. West Lake follows close behind as a problem area. In unrestricted areas, problem alligator situations require prompt management action to insure visitor safety. It is in these areas where relocation policies most frequently apply.

Restricted areas

Eleven case incident reports were filed from 1972 to 1982 regarding alligators in restricted areas. Of these, one dealt with illegal hunting, two were of naturally injured alligators, two were observations of alligators, two were of harassment, and four dealt with aggressive behavior. One of these aggressive alligators at Anhinga Trail was relocated to Long Pine Key in 1972. Thus, in 11 years, only four aggressive alligators were reported from restricted areas and only one relocation was required. The major problem in restricted areas was recognized in the 1979 policy to be one of physically preventing people from getting too near alligators. Consequently, the situation here is seen more as one that requires people management rather than alligator management, and this is detailed in the next section.

Unlike in unrestricted areas, the 1979 policy suggested that problem alligators in restricted areas, such as Anhinga Trail, Mahogany Hammock, Pa-Hay-Okee, and the Shark Valley Tower, were to be removed only if they posed an immediate threat, and aversion training was to be attempted if the problem was not considered to be immediate. The concept of aversion training is an attempt to modify the behavior of nuisance alligators so that capture and removal is not necessary. We have heard of the use of firecrackers and prodding with sticks or poles to discourage the presence of an alligator in a conspicuous area. Each technique has met with relatively low success because a lot of repeated personnel effort is required and because alligators frequently return when the aversion training stops. We note, however, that in Flamingo, blasts of water from a firetruck were used to disperse alligators from the boat ramp. Good success with this method is reported and the sight of the firetruck itself is now sufficient to rid the area of problem alligators at least temporarily. It is clear though that alligators learn to avoid the firetruck or persons in uniform and not the visiting public, which may still be at risk from an aggressive individual. If such methods prove effective, park personnel should be encouraged to try them in lieu of viewing

relocation as the only option available for control. However, we note that if aversion training proves unsuccessful as a long-term deterrent, the subsequent capture of an alligator that has learned to avoid park personnel may be made more difficult.

People Management Strategies

The 1979 policy noted that people management concerning problem alligators required three approaches: (1) a sign system, (2) increased law enforcement, and (3) erecting physical barriers.

Sign system

The 1979 policy noted that visitors come to the Everglades unaware of reasons for not feeding or approaching alligators. To the contrary, visitors are reinforced into feeding and approaching dangerous wildlife by their experiences in zoos and similar areas. Because of this, the need for strategically placed and strongly worded signs in Everglades National Park was suggested. A sign, standardized in size and message, was to be placed in all problem areas. Some signs were to be permanently installed while others would be portable and moved as needed. The district ranger was to be responsible for obtaining permission from the Park Sign Committee, for erecting permanent signs, and for using the option to erect temporary signs in an emergency situation. The signs were to read as follows:

"It is illegal to feed or harass alligators:
It is dangerous for you and harmful to them.
Maximum fine \$500"

The Interpretation Division was responsible for developing other interpretive devices for educating visitors on the alligator.

Although these signs have been likened to reading "like the Dead Sea Scrolls," they seem to have been very successful. Maintenance reports providing 12 such signs (24" x 26") for distribution throughout the park. Four permanent signs have been erected in the Flamingo District at Nine Mile Pond, West Lake, Coot Bay Pond, and near Eco-Pond. In the Pine Island District, signs were placed at Paurotis Pond, at Royal Palm, and at the lake in the Long Pine Key campground. One sign was erected at the entrance to Shark Valley, and no signs were requested by the Everglades City district. Four signs remain on hand at Pine Island. In addition, several dozen small signs (4" square) carrying the same message were ordered for mounting on railings in hopes of providing a less intrusive warning to visitors.

Comments from some districts suggested that more signs should be made available in the districts. In addition, it was suggested that the smaller signs could be installed in backcountry areas to educate and remind campers of the danger involving feeding and harassing alligators.

Further suggestions regarding signs can be made. To our knowledge, no signs were placed at the Shark Valley Tower where a prominent feeding problem was determined to exist. More temporary signs should be on hand in each district. A

sign noting "I will bite the hand that feeds me", although cute, seems to instruct visitors to be careful in feeding alligators. One such sign at Shark Valley should be removed, and its future use should be discontinued. No interpretive program currently exists to educate all visitors on potential dangers of the alligator. Although alligators are part of nearly every talk given by Interpretation personnel, it seems that a specific message should be sent to visitors to make them aware of the issues discussed in this report. Perhaps such information could be included in pamphlets and maps.

Law enforcement

The 1979 policy recognized that a higher law enforcement profile was needed than currently existed. When the sign system was implemented and a visitor incident occurred, a citation or a courtesy citation was to be issued along with an interpretive message on the seriousness of the offense. The Ranger Division was responsible for developing a greater law enforcement presence in areas of potential alligator-visitor conflict. Since interpretive personnel often witness offenses, training was to be provided on how to handle such situations. All staff were to be advised that they have the responsibility and obligation to contact the rangers and inform visitors about the hazards of alligators when a violation or a hazardous situation was observed.

The Ranger Division has taken an active concern in alligator management. However, we know of no records of citations being issued. Such matters seem best left to the discretion of the district ranger, but it is important that all personnel assist in this aspect of visitor safety. It has been suggested that the Interpretation Division could issue public information statements and press releases to notify the public that more active law enforcement is taking place.

Physical barriers

At Royal Palm, the 1979 policy noted a problem by the wall area in front of the visitor center where an unattended child might fall into the water. In fact, such an incident occurred in 1979. A natural wood railing, similar to that currently existing along the first section of the Anhinga Trail, was recommended for construction on top of this wall to a height of 36" from the ground to the top of the railing. The Maintenance Division was responsible for the design, programming, and construction of this railing. After a cost-evaluation of the project, the Maintenance Division decided against its installation. We continue to feel that the potential for a serious incident exists here, and that such a railing should be installed. Although a permanent sign installed in this area would be helpful, we remain convinced that a higher railing is a necessary and appropriate remedy in this case.

The 1979 policy noted that at Royal Palm there were two specific areas where a floating alligator can touch the front wall. In these areas, a child would be in greater danger falling into the water than falling on solid ground. These areas were to be filled with clean fill or large rocks so that alligators, while remaining afloat, would remain three to four feet away from visitors. The Maintenance Division was responsible for evaluation, programming, and construction of this project. No action has been taken on this matter.

It was noted that at the Shark Valley Tower area, a modification of the fence was called for to prevent visitors from climbing into the area where alligators commonly bask. Signing was called for to inform park visitors who do not come on trams. No action has been taken on these matters.

1983 PROBLEM ALLIGATOR MANAGEMENT RECOMMENDATIONS

The objectives of the alligator management program in Everglades National Park are to provide for visitor safety while preserving the alligator population for its ecological, aesthetic, educational, and scientific values. These goals are attained through an integrated program of education, preventative measures, enforcement, and control requiring the cooperation of all divisions within the park.

Education

Visitors come to the Everglades unaware of reasons for not feeding or approaching alligators. To the contrary, visitor curiosity and boldness are encouraged by the deceptively lethargic behavior of large alligators during the day. Making visitors aware that alligators present a danger for physical harm should be the responsibility of the Interpretation Division. Since interpretive personnel often witness offenses, training should be provided on how to handle such situations. All staff should be advised that they have the responsibility and obligation to contact the rangers and inform visitors about the hazards of alligators when they see hazardous situations.

Enforcement

Feeding alligators is a violation of state law (Florida Statute 372.667) and should be enforced as such through issuance of citations, warnings, and interpretive messages. Federal regulations forbid any "taking" of a listed wildlife species, which includes any act which harasses or harms wildlife (16 USC § 1532 (14)). In this sense, "harm" is defined to include any acts which "annoy . . . to such an extent as to . . . disrupt essential behavior patterns, which include . . . feeding" (50 CFR § 17.3).

The Ranger Division should be responsible for prioritizing a law enforcement presence in areas of potential alligator-visitor conflict. A Case Incident Report (Form 10-343) should be filed in every alligator-related situation under the category "Animals and Wildlife." Such incidents include cases of visitor complaints, observations, official visits to the scene, and violations of feeding or harassment regulations. Such documentation allows monitoring the nature and extent of the alligator control problem and facilitates evaluation of the effectiveness of the management program.

Reduction of Unnatural Conflicts

Both education and enforcement help prevent potentially dangerous alligator-visitor interactions. A critical aspect of an integrated program includes the use of appropriate signs and physical barriers. All areas of potential alligator-visitor

contact should contain permanent signs in a conspicuous position which carry the following message:

"It is illegal to feed or harass alligators:
It is dangerous for you and harmful to them.
Maximum fine \$500."

The district rangers should be responsible for the installation of permanent signs in all such areas within their districts. The Maintenance Division should be responsible for making these signs. Signs carrying the same message should be constructed of a temporary nature and should be available in each district for use under appropriate conditions.

An especially relevant temporary situation occurs during the nesting season (June-September) when alligators may exhibit aggressive behavior in defense of a nest site located near visitor-use areas. In such cases, and in other problem areas where visitor passage should be restricted, the area should be roped off, barricaded with warning cones, and carry a large sign with the following message:

"AREA CLOSED
DANGER"

As the responsibility of the Maintenance Division, these signs should be designed in this manner, printed in bulk, distributed to each district, and should be made readily available upon request. All park personnel should be alert for the development of dangerous nesting situations and should inform the Law Enforcement Division, who will erect the barricades. The Research Division should be available for consultation in matters of alligator behavior. Strict enforcement and interpretation of the messages carried by both signs and barricades is critical to their success.

Control of Problem Alligators

Criteria

The presence of an alligator becomes a problem when the activities of the alligator pose a demonstrable threat to human safety. Visitor complaints, observations by park personnel over a period of time, and the existence of previous relevant Case Incident Reports contribute to the determination of a problem situation. The decision as to when an alligator is to be considered a nuisance and whether to remove or otherwise deal with an alligator is to be made by the district ranger.

Response

The translocation of alligators from outside the park into the park should be prohibited. Such actions are of no benefit to the park alligator population, because such alligators are usually either sick or are already a nuisance, and their introduction may disrupt resident individuals. Requests made for assistance with problem alligators outside the park should not be responded to by park personnel but should be referred to the Florida Game and Fresh Water Fish Commission, Everglades Region, West Palm Beach.

The handling of alligators that have been determined to meet criteria for classification of a problem animal shall include live-capturing and releasing the specimen unharmed in an appropriate remote area of Everglades National Park. Problem alligators should be relocated first to L-67E and, if necessary, to the Loop Road at Roberts Lake Strand. If an alligator returns from relocation a second time and becomes a problem a third time, or, if a severely injured alligator is involved, then a written evaluation of the situation should be made by the district ranger to the Superintendent requesting permission to destroy the alligator and specifying the means of destruction and disposal to be used. Any action requires approval by the Superintendent in accordance with Federal regulations (50 CRF § 17.42). This procedure should be agreed to by the U. S. Fish and Wildlife Service through formal agreement of policies proposed by Everglades National Park. Until such agreement is obtained, notification of the U. S. Fish and Wildlife Service is required by Federal regulations. The entire evaluation, removal, and relocation process including notifications of proper authorities is the responsibility of the district ranger.

A long-term, trained, permanent employee of the Visitor Protection Division should be responsible for actually handling problem alligators. This employee should be responsible for maintaining proper capture and tagging equipment in an appropriate manner. Suggested equipment suppliers are listed in Appendix II. Captures are to be made through use of a pole snare or noose trap (Murphy and Fendley 1973), whichever method proves to be most effective. All alligators should be tagged and measured. Two types of tags are to be used on each problem alligator. A visible numbered tag should be attached to scutes on the tail for rapid identification of return alligators. A metal toe tag, inserted in the center web of the left rear foot, provides a more permanent mark. Other important data include the total length of the alligator and the weight, with units clearly specified (i.e., inches, pounds, etc.). The district ranger should be responsible for properly tagging and recording data on each animal captured, including information on the form shown in Appendix III. Copies should be forwarded to the wildlife research biologist.

ACKNOWLEDGEMENTS

We appreciate the creative and supportive assistance of the many rangers, interpreters, resource managers, and researchers that reviewed and contributed to this report. We especially acknowledge the help of Jason Houck, Park Safety Officer, for distributing an earlier draft to field personnel and subsequently receiving, translating, and collating all of the responses. We received helpful and thoughtful comments from all reviewers, including Hank Blatt, Mike Castro-Shrader, Dave Dahlen, Dennis Daraghy, Rick Dawson, Pat Deason, Tom Goldbin, Jerry Hammond, Bob Howard, Galen Marr, Al Mebane, and Cherry Payne. We have attempted to consider all of their comments. We also appreciate the generosity of various personnel of State and Federal wildlife offices throughout the southeastern United States for sharing information on alligator control programs in their respective states, including K. Guyse (Alabama), H. Alexander (Arkansas), G. Johnson (Georgia), A. Ensinger and J. Tarver (Louisiana), E. Cliburn (Mississippi), R. Hamilton (North Carolina), S. Phillips (South Carolina), and B. Thompson (Texas). We especially thank A. Woodward and T. Hines of the Florida Game and Fresh Water Fish Commission for their continuing assistance. We also thank Dee Childs, Dottie Anderson, and Jessie Brundige for typing the manuscript.

LITERATURE CITED

- Allen, E. R., and W. T. Neill. 1949. Increasing abundance of the alligator in the eastern portion of its range. *Herpetologica* 5(6):109-112.
- Busterud, J. A. 1977. The evolution of national wildlife law. Report prepared for the Council on Environmental Quality. Washington, D. C.: U. S. Government Printing Office.
- Carle, W. 1948. Alligators do attack? *Fla. Wildlife* 2(4): 10-11.
- Craighead, F. D. 1968. The role of the alligator in shaping plant communities and maintaining wildlife in the southern Everglades. *The Florida Naturalist* 41:2-7, 69-71.
- Goodwin, T. M. 1982. Nuisance Wildlife. *Fla. Wildlife* 35(6): 4-12.
- Hines, T. C. 1969. The past and present status of the alligator in Florida. *Proc. Southeast Assoc. Game and Fish Comm.* 33:224-232.
- Hines, T. C., and K. D. Keenlyne. 1976. Alligator attacks on humans in Florida. *Proc. Southeast Assoc. Game and Fish Comm.* 30:358-361.
- Hines, T. C. and K. D. Keenlyne. 1977. Two incidents of alligator attacks on humans in Florida. *Copeia* 1977:735-738.
- Hines, T. C. and R. Schaeffer. 1977. Public opinion about alligators in Florida. *Proc. Southeast Assoc. Game and Fish Comm.* 31:84-89.
- Hines, T. C., and A. R. Woodward. 1980. Nuisance alligator control in Florida. *Wildl. Soc. Bull.* 8(3):234-241.
- Joanen, T. 1974. Population status and distribution of alligators in the southeastern United States. Paper presented at S.E. Regional Endangered Species Workshop, Tallahassee, Fl.
- Kushlan, J. A. 1974. Observations on the role of the American alligator (*Alligator mississippiensis*) in the southern Florida wetlands. *Copeia* 1974(4):993-996.
- Kushlan, J. A., and M. S. Kushlan. 1980. Function of nest attendance in the American alligator. *Herpetologica* 36(1):27-32.
- Murphy, T. M., and T. T. Fendley. 1973. A new technique for live trapping of nuisance alligators. *Proc. Southeast Game and Fish Comm.* 27: 308-310.
- Potter, F. E. 1981. Status of the American alligator in Texas. Special report of the wildlife division of the Texas Parks and Wildlife Department, Austin, Texas. 49 p.
- Spillan, T. 1983. Gator Bite. *Fla. Wildlife* 37(2): 41-42.

Table 1. Nature and location of nuisance alligator incidents according to Case Incident Reports filed from 1972 to 1982.

Location	<u>Type of Incident</u>								Total
	Aggressive	Hunting	Injured	Road kill	Feeding	Harassment	Translocation	Other	
Main Park Rd		1	3	8		1		7	20
Nine Mile Pond	6		1		4	1		1	13
West Lake	4				3	2			9
Long Pine Key	4		3	1					8
Tamiami Trail		6	1	1				1	9
Royal Palm/Anhinga Trail	2		2			2		1	7
L-67E		4							4
L-31W		4						1	5
Paurotis Pond	2				1				3
Shark Valley	2	1						1	4
Flamingo	1	1	2			1		1	6
Backcountry	2	1				1		5	9
Other in park			1					1	2
Assist outside park	4						11	1	16
Total	27	18	13	10	8	8	11	20	115

Table 2. Return of nuisance alligators to original capture site after relocation to L-67E. NCN = no case number.

Case Number	Location	Date of Relocation	Date of First Observed Return	Maximum Travel Time (days)	Approximate Mileage (km)	Tag #	Action taken on return
771310	Long Pine Key	11/30/77	5/9/78	160	34	tail #265 metal toe tag MN 450, total length 7'3"	Resighted and reported as aggressive 10/24/78 (Case #781671) and 2/24/80 (Case #800304). Relocated a second time to Turner River Park, approximate distance 80 km. No return reported.
781243	West Lake	7/5/78	7/9/80	734	58	tail #414 metal toe tag MN 802, total length 9'1", male	Resighted and reported as aggressive 7/9/80 (NCN) and 9/30/80 (Case #801966) at which time signs were posted at West Lake. No second relocation attempted.
791243	West Lake	9/18/79	7/9/80	321	58	tail #479 metal toe tag MN 661, total length 10'9"	Resighted and reported as aggressive 7/9/80 (NCN) at which time signs were posted at West Lake. No second relocation attempted.

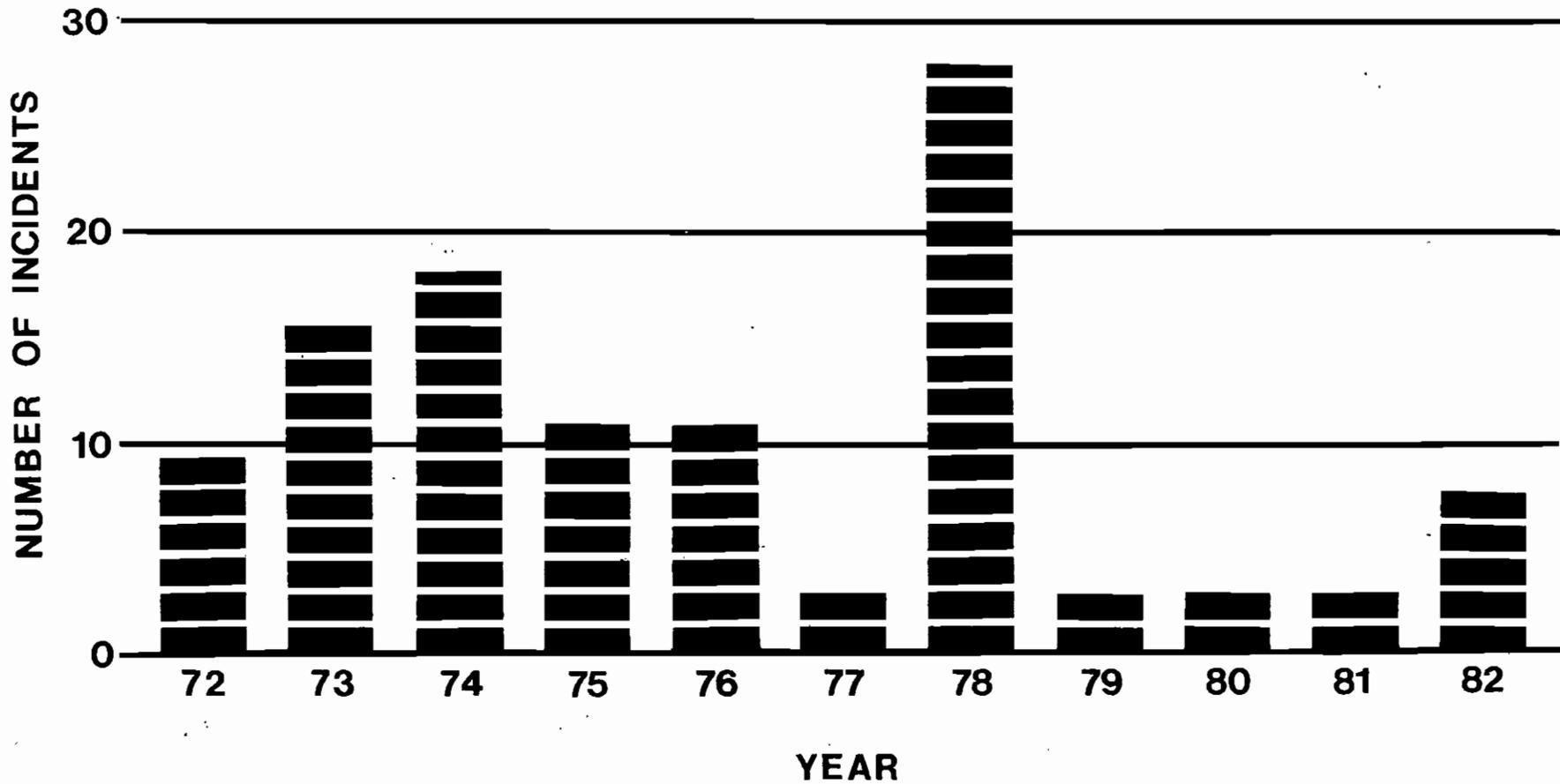


Figure 1. Number of incidents involving alligators that occurred each year in Everglades National Park from 1972 to 1982.

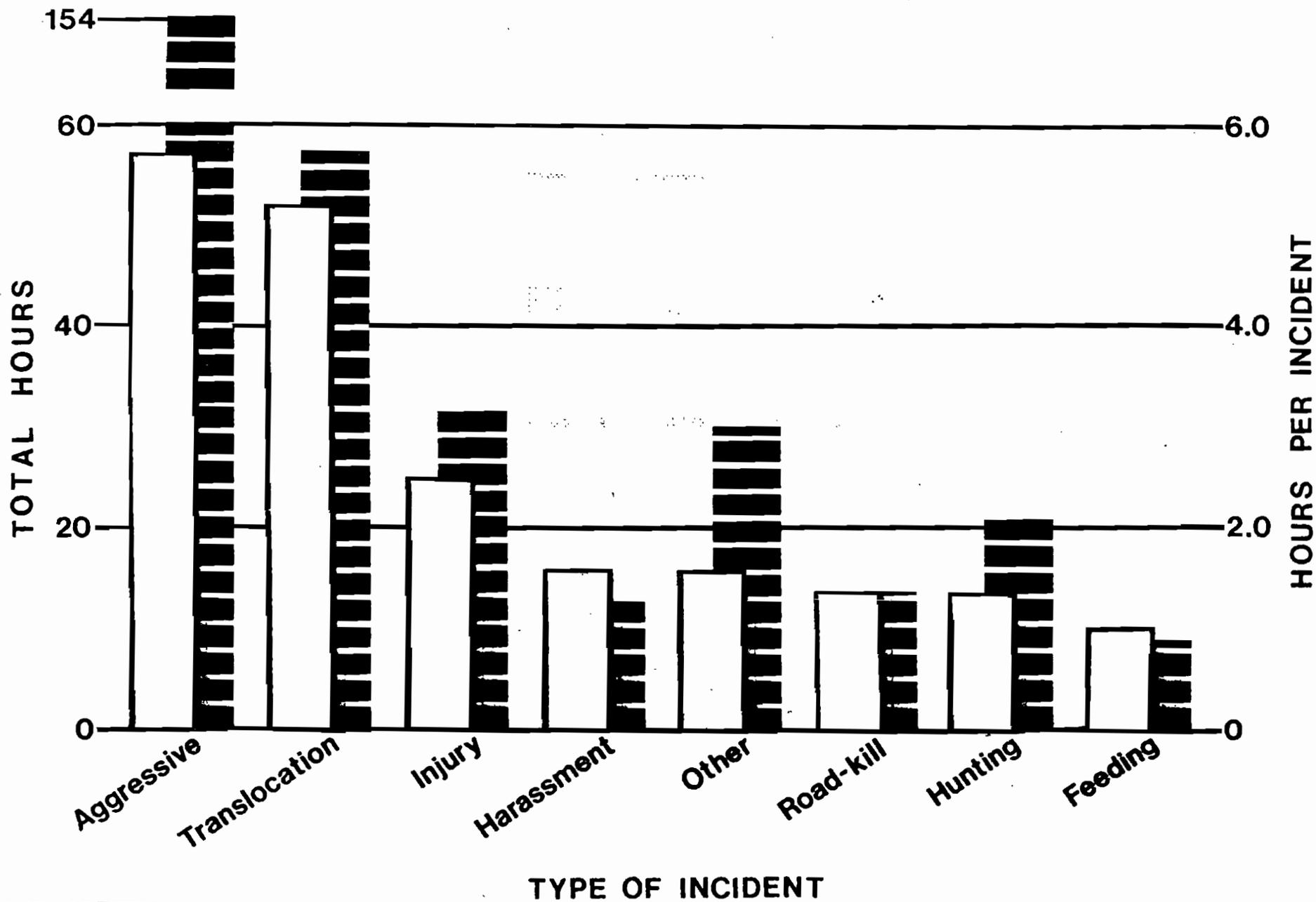


Figure 2. Personnel effort expended on eight types of alligator incidents occurring in Everglades National Park from 1972 to 1982.

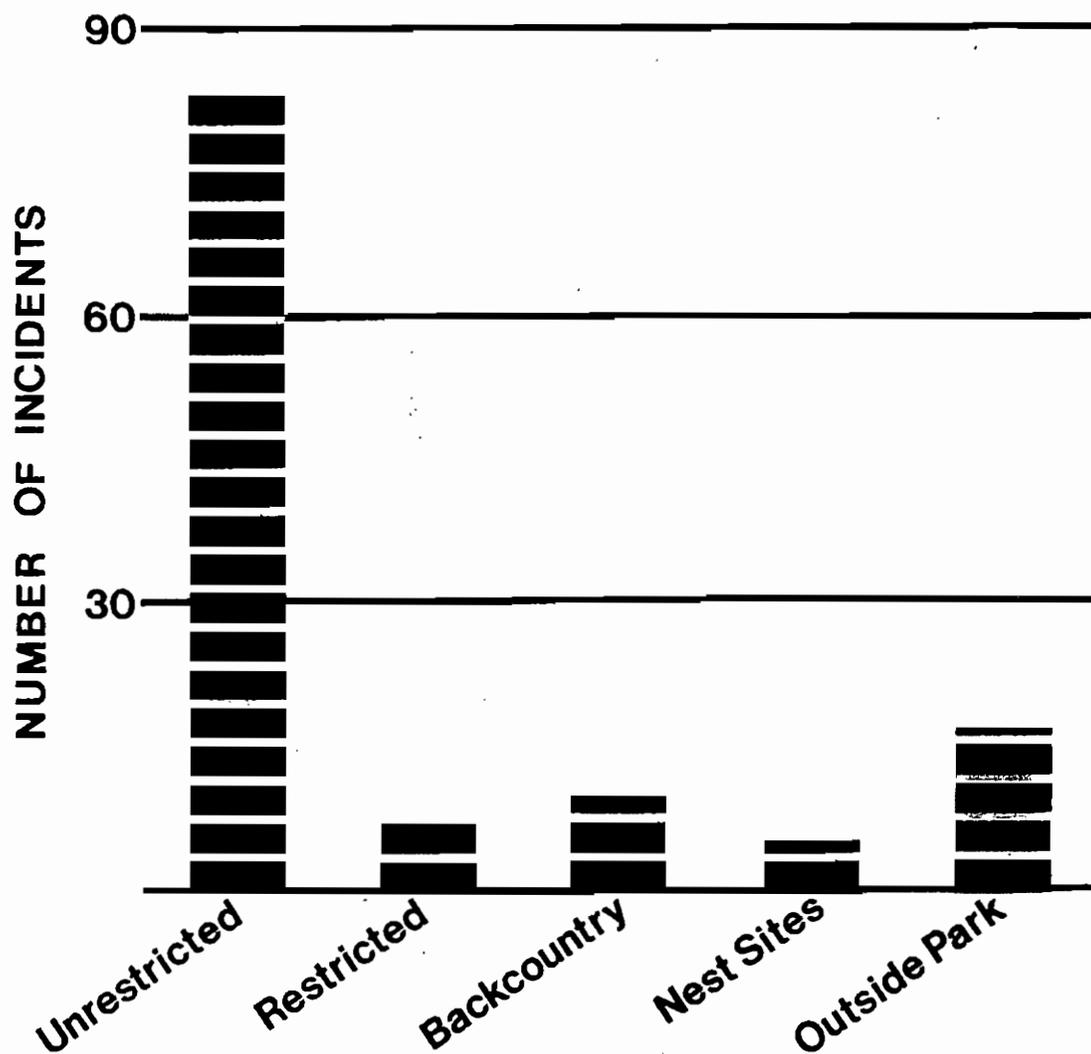


Figure 3. Distribution of incidents involving alligators among five management areas in and around Everglades National Park from 1972 to 1982.

Appendix I. Alligator control incidents in Case Incident Reports. NCN = no case number.

1972-1982

Case Number	Date	Incident Location	Nature of Problem	Action Taken	Relocation Site	Size and Tag No. of Alligator	Estimated Man-hours per Incident
23	7/3/72	Main Park Rd	Road kill	None		3'	1
83	7/14/72	Anhinga Trail	Unspecified	Relocated	Sisal Pond	7'	1
236	7/27/72	Anhinga Trail	Aggressive	Relocated	Long Pine Key	10' 7"	12
250	7/28/72	Outside Park	Translocation	Relocated	Royal Palm	3'	1
492	8/27/72	L-67	Hunting	None			1
591	9/4/72	Outside Park	Translocation	Relocated	Royal Palm	2'6"	1
682	9/28/72	Anhinga Trail	Other	None			1
961	11/11/72	Outside Park	Translocation	Relocated	Royal Palm	2'6"	1
1018	11/19/72	L-31W	Hunting	None			1
1709	1/24/73	Main Park Rd	Other	None			1
2197	2/5/73	Chekika	Translocation	Relocated	Visitor's Center	5'	1
2292	3/15/73	Long Pine Key	Injured	Destroyed			1
2463	3/30/73	Long Pine Key	Injured	Relocated	Hole-in-Donut Lake		1
2507	4/4/73	Tamiami Trail	Hunting	None			1
2522	4/5/73	West Boundary	Hunting	None		5'	1
2527	4/4/73	Main Park Rd	Road kill	None		5'	1
2748	4/24/73	Jimmy Tiger	Translocation	Relocated	Shark Valley	9'	10
2852	5/11/73	Anhinga Trail	Harassment	None			1
2969	5/28/73	Long Pine Key	Injured	None			1
3430	8/25/73	Tamiami Trail	Hunting	None			1
3438	8/31/73	Main Park Rd	Road kill	None			1
3451	9/1/72	Nine Mile Pond	Other	None			2
3648	10/8/73	Pete Osceola's	Aggressive	None			2
3650	10/6/73	Catfish Farm	Translocation	Relocated	Hole-in-Donut Lake	6'6"	4
3651	10/8/73	Coot Bay Pond	Aggressive	None			1
3655	10/9/73	Pete Osceola's	Aggressive	None			2
3702	10/22/73	Buttonwood Canal	Injured	Relocated	Dragover Lake	8'	4
4487	2/16/74	Long Pine Key	Unspecified	Relocated	L-31W		1

Appendix I continued.

Case Number	Date	Incident Location	Nature of Problem	Action Taken	Relocation Site	Size and Tag No. of Alligator	Estimated Man-hours per Incident
4667	3/30/74	Tamiami Trail	Road kill	None		9'	1
6678	3/31/74	Tamiami Trail	Hunting	None			1
4764	4/15/74	West Boundary	Other	Relocated	Shark Valley	4'	1
4773	4/16/74	Flamingo	Hunting	None			1
4810	4/25/74	Long Pine Key	Road kill	None		10'	1
4816	4/27/74	Shark Slough	Other	None			1
4825	4/28/74	West Boundary	Other	None			1
4849	5/11/74	Rookery Branch	Other	None			1
4877	5/11/74	L-67	Hunting	Arrest		9'	1
4888	5/13/74	Tamiami Trail	Injured	Relocated	Unknown	8'	1
4984	6/27/74	Tarpon Bay	Aggressive	None			1
4988	6/29/74	Nine Mile Pond	Feeding	None			1
5102	8/9/74	Paurotis Pond	Feeding	None			1
5181	9/11/74	Shark Valley	Aggressive	None			1
5191	9/13/74	Miccosukee School	Other	Relocated	Shark Valley		2
5203	9/16/74	Royal Palm	Injured	Destroyed			2
5245	10/4/74	L-31W	Hunting	None			2
5298	10/27/74	Shark Valley	Hunting	None			1
750136	2/9/75	Main Park Rd	Injured	Destroyed			1
750142	2/11/75	L-67	Other	None			1
750218	2/24/75	Mine Mile Pond	Feeding	None			1
750337	3/23/75	Nine Mile Pond	Injured	None			1
750363	3/27/75	Outside Park	Translocation	Relocated	Antenna Camp		6
750435	4/14/75	Tamiami Trail	Hunting	None		10-13'	1
750484	5/8/75	Tamiami Trail	Hunting	None			1
750563	6/8/75	Main Park Rd	Road kill	None			2
750635	7/12/75	Nine Mile Pond	Aggressive	Relocated	Shark Slough	9'5"	4
750852	9/26/75	Miami	Translocation	Relocated	Shark Slough	9'	2
750863	9/30/75	Main Park Rd	Road kill	None		3-4'	1
760107	1/21/76	Anhinga Trail	Harassment	None			1
760545	4/11/76	Nine Mile Pond	Feeding	None			1
760565	5/5/76	Catfish Farm	Translocation	Relocated	Shark Valley	8'11"	24

Appendix I continued.

Case Number	Date	Incident Location	Nature of Problem	Action Taken	Relocation Site	Size and Tag No. of Alligator	Estimated Man-hours per Incident
760642	4/23/76	Rookery Branch	Other	None		7'	1
760740	5/30/76	Main Park Rd	Injured	Destroyed		4'11"	2
760818	6/20/76	US 27	Translocation	Relocated	Visitor's Center		4
760834	6/27/76	Main Park Rd	Hunting	None			2
760835	6/28/76	Main Park Rd	Road kill	None		4'	2
761071	9/9/76	West Lake	Feeding	None			1
761154	10/16/76	Main Park Rd	Road kill	None		1'	1
761182	10/29/76	L-31W	Hunting	None			1
770971	8/21/77	L-67	Hunting	None			1
771149	10/26/77	L-67	Hunting	None		4'	1
*771310	11/30/77	Long Pine Key	Aggressive	Relocated	L-67	7'3", MN450 Tag #265	20
780106	1/14/78	Eco Pond	Harassment	Relocated	East River	3-4'	4
780637	3/19/78	Nine Mile Pond	Feeding	None		12'	1
780684	3/19/78	West Lake	Feeding	None			1
780730	3/27/78	Main Park Rd	Harassment	None		11'	1
780801	4/8/78	Main Park Rd	Other	None		4'6"	1
780853	4/18/78	Hays Barn Rd	Other	Relocated	Unspecified	4'	2
780914	4/28/78	Tamiami Trail	Other	None		6'6"	1
780971	5/7/78	Research Rd	Injured	Destroyed		4'	1
780995	5/8/78	Nine Mile Pond	Aggressive	None		5'	1
781000	5/9/78	Eco Pond	Other	Relocated	Nearby	4'	2
781090	5/29/78	L-31W	Hunting	None			2
781191	6/28/78	Nine Mile Pond	Aggressive	None		7'	2
*NCN	5/9/78	Long Pine Key	Resighted	None		T265, MN450	
*NCN	10/10/78	Long Pine Key	Resighted	None		T265, MN450	
*see 800304							
*see 781671							

Appendix I continued.

Case Number	Date	Incident Location	Nature of Problem	Action Taken	Relocation Site	Size and Tag No. of Alligator	Estimated Man-hours per Incident
781243	7/5/78	Paurotis Pond	Aggressive	Relocated	L-67E	MN900, Y412 TL 182.1 cm, SV 91.5 cm, Wt 17 kg male	58
781243	7/5/78	Nine Mile Pond	Aggressive	Relocated	L-67E	MN 897, Y413 TL 245 cm, SV 129 cm, Wt 45 kg male	
*781243	7/5/78	West Lake	Aggressive	Relocated	L-67E	MN802, Y414 TL 9'1", Wt 210 lbs male	
781243	7/7/78	Nine Mile Pond	Aggressive	Relocated	L-67E	MN 813, T415 TL 239.6 cm SV 124.0 cm, Wt 41 kg male	
781265	7/12/78	Buttonwood Canal	Injured	Relocated	Nearby	4'	1
781382	8/6/78	Nine Mile Pond	Harassment	None			1
781512	9/10/78	West Lake	Harassment	None			1
781612	10/7/78	West Lake	Harassment	None			1
781671	10/24/78	Long Pine Key	Aggressive	None		T 265	2
781815	11/22/78	West Lake	Feeding	None			1
781914	12/11/78	Main Park Rd	Injured	Relocated	Unknown		6
781961	12/16/78	Main Park Rd	Other	None			2
*NCN	7/9/80	West Lake	Resighted- Aggressive			Y 414	
*see 801966							

Appendix I continued.

Case Number	Date	Incident Location	Nature of Problem	Action Taken	Relocation Site	Size and Tag No. of Alligator	Estimated Man-hours per Incident
781976	11/10/78	Main Park Rd	Other	None			2
781979	12/1/78	Main Park Rd	Other	None			2
781982	11/11/78	Main Park Rd	Other	None			2
781983	11/19/78	Main Park Rd	Other	None			3
791158	9/5/79	West Lake, Nine Mile, Paurotis Ponds	Aggressive	None			1
*791243	9/18/79	West Lake	Aggressive	Relocation	L-67E	MN 661, T479 TL 10'9"	15
791267	9/30/79	Royal Palm	Injured	Relocated	Unknown		10
**800304	2/24/80	Long Pine Key	Aggressive	None		T 265	1
***801766	8/14/80	Card Sound Rd	Translocation	Relocated	Pine Glades Lake	T 500	3
801966	9/30/80	West Lake	Aggressive	Signs Posted		T 414	1
810241	2/15/81	Miccosukee	Aggressive	Relocated	Nearby	7'	3
817371	8/4/81	Jimmy Tiger's	Aggressive	Relocated	Shark Valley	5'	3
811549	8/7/81	Tarpon Bay	Aggressive	Patrol			1
820652	4/17/82	Tamiami Trail	Hunting	None		5' (two gators)	1
820692	4/25/82	Long Pine Key	Aggressive	None		5-6'	1
820748	5/9/82	L-31W	Other	None		2-3'	1
820808	5/27/82	Main Park Road	Road kill	None			2
820882	7/1/82	Backcountry	Harassment	Relocated (dead)		6'	3
820928	6/19/82	Anhinga Trail	Aggressive	Signs posted Barrier erected		6'	1
820933	7/18/82	Shark Valley	Other	None		6'	1
821018	7/1/82	Shark Valley	Aggressive	Signs posted Barrier erected		6½'	12
*NCN	7/9/80	West Lake	Resighted-aggressive			T 479	
**NCN	3/2/80	Long Pine Key	Aggressive	Relocated	Turner River Park	T 265	15
***NCN	1/22/81	Main Park Rd	Injured	Relocated	Pine Glades Lake	T 500	1

Appendix II. Suppliers for alligator tagging and capturing equipment.

Metal toe tags: Size #1 (large tags)
Self-piercing Monel metal tags
Special stamping "NPS"
Cost: \$48.90/1,000 tags

National Band and Tag Company
721 York Street
Newport, Kentucky 41072

Visible tail tags: Allflex large tags
Specify numbering sequence desired
Specify color (yellow)
Cost: \$0.50 each - Applicator cost: \$4.40 each

Allflex Tag Company
P.O. Box 3132
Santa Monica, California 90404

Nooses: Kleflock #2 Standard snare (6 ft)

Woodstream Corporation
P.O. Box 327
Litiz, Pennsylvania 17543

Appendix III.

ALLIGATOR REMOVAL DATA FORM

1. Complete form for each alligator handled.
2. Send form to Jim Kushlan, South Florida Research Center.

Date _____

Name of person completing form _____

Names of those involved with removal _____

Initial location of alligator _____

Removal techniques tried, which successful _____

Give history of situation on back of form _____

Release location _____

Comments on behavior at release _____

Date and time of release _____

Critical alligator data

Total length (cm) _____

Snout-vent length (cm) (to back of vent) _____

Weight (give units) _____

Toe tag _____ (left hind foot, center web)

Collar color _____

Tail/neck tag number _____

Distinguishing characteristics _____

Any comments (use reverse of form if necessary) _____

Appendix III.

ALLIGATOR REMOVAL DATA FORM

1. Complete form for each alligator handled.
2. Send form to Jim Kushlan, South Florida Research Center.

Date _____

Name of person completing form _____

Names of those involved with removal _____

Initial location of alligator _____

Removal techniques tried, which successful _____

Give history of situation on back of form _____

Release location _____

Comments on behavior at release _____

Date and time of release _____

Critical alligator data

Total length (cm) _____

Snout-vent length (cm) (to back of vent) _____

Weight (give units) _____

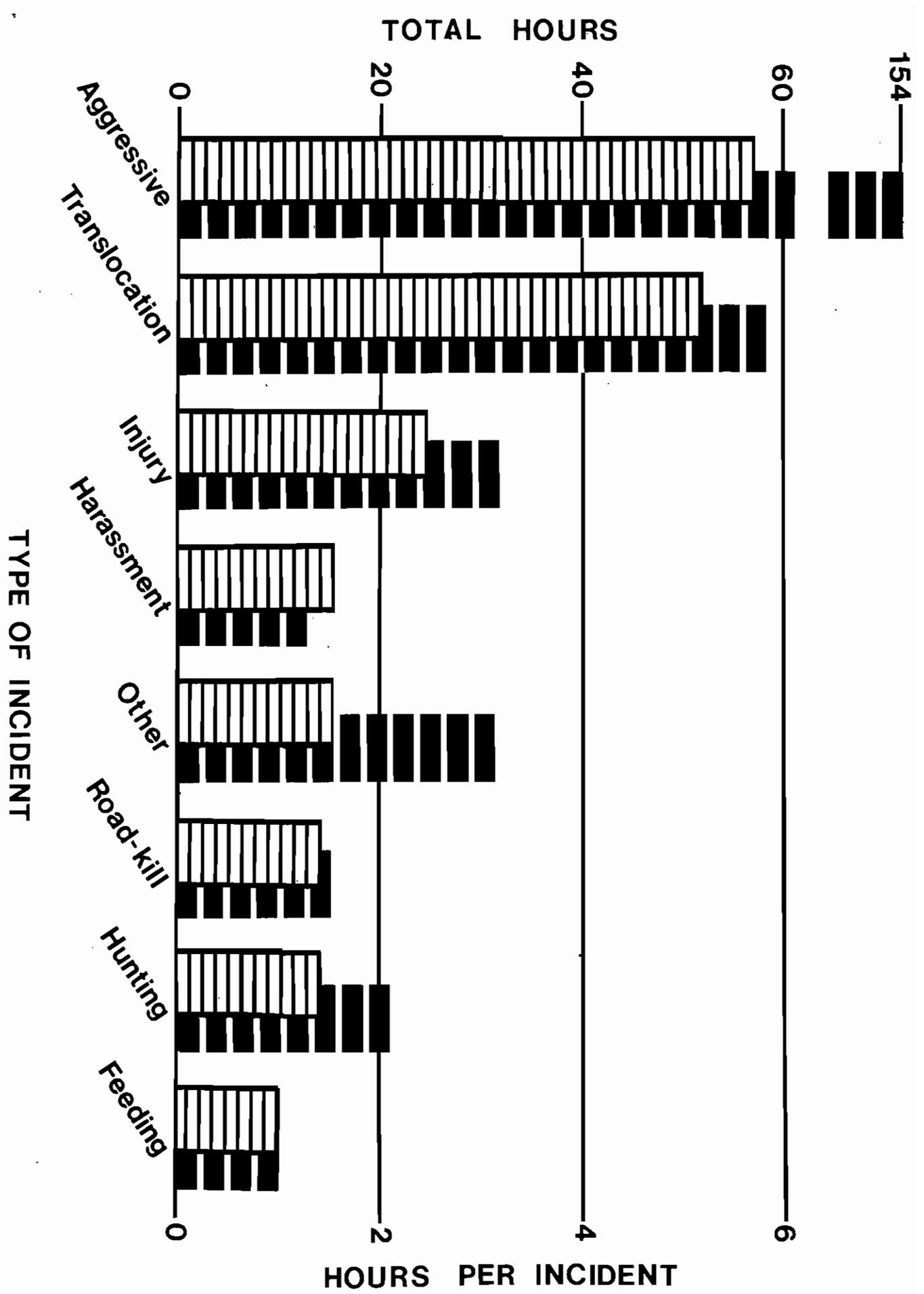
Toe tag _____ (left hind foot, center web)

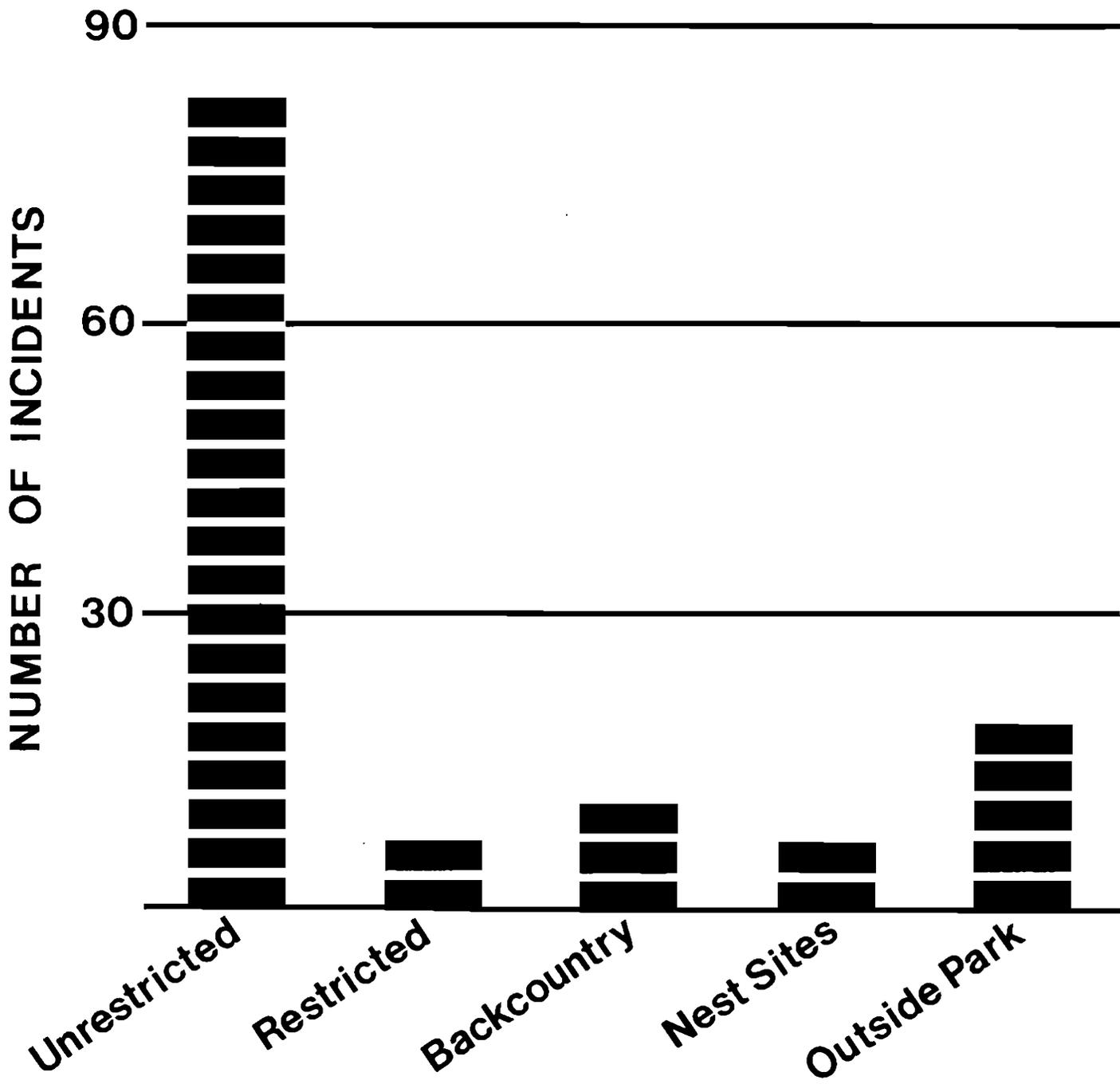
Collar color _____

Tail/neck tag number _____

Distinguishing characteristics _____

Any comments (use reverse of form if necessary) _____





NUMBER OF INCIDENTS

