

Alligators in Natural Areas: Choosing Conservation Policies Consistent with Local Objectives

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ABSTRACT

In parks and reserves, the conservation and management of large animals, particularly dangerous ones, has always been of concern with respect to human safety. In some areas, protective management for crocodilians, some species of which are known to attack humans, is appropriate despite prevailing national or regional management trends emphasising commercial utilisation. Management of problem alligators in Everglades National Park provides an example of protection management. We found that incidents involving conflict between visitors and alligators were not frequent in the Park despite a large resident alligator population and the annual passage of 400 000 people through the area. Furthermore, responses to alligator incidents were not time-consuming, requiring an average of four personnel-days per year. Visitor management was an effective tool in this park, emphasising a balance between visitor safety and alligator protection by focusing on reducing the potential for conflict. Because objectives differ in various reserves, there is a need for locally sensitive planning for crocodilian management. Three criteria to be evaluated at a local level are potential threats to human safety, economic necessity, and the ecological values of the species. Although ethical and philosophical arguments can be raised, in the United States nonconsumptive management appears to be most effectively argued on the value of crocodilians to the ecosystems they inhabit.

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INTRODUCTION

The literature on human-wildlife interactions in natural area parks and reserves records many examples of the effects of disturbances created by the visiting public with regard to natural resources (Boyle & Samson, 1983). Limiting the number of visitors to a reserve, however, may not in itself control visitor impacts (White & Bratton, 1980) and is a difficult policy to promulgate. To ensure the quality of a visitor's experience in a reserve (Hendee & Potter, 1971) while still protecting the ecological values of the resident species (Buell, 1967), it is important to consider the socio-economic and cultural factors motivating a visitor's expectations and interests. Expectations depend largely on past experience, the general opinion of society, and on the influence of media (Chanter & Owen, 1976; Everett, 1978), whereas interests may centre on seeing a variety of species (Chanter & Owen, 1976), especially the so-called 'conspicuous species' (Everett, 1978) that are large, colourful, noisy or attractive and are likely to be readily noticed and observed (Helliwell, 1973). The incorporation of these concepts in planning for the management of natural area reserves may be critical to the future success of land preservation efforts.

In the Florida Everglades, USA, the American alligator *Alligator mississippiensis* is a conspicuous species having a high impact (both positive and negative) on public perception (Adamus & Clough, 1978). Alligators are locally valuable attractions because they are large, easily identifiable animals that are encountered with ease during the day at several visitor use areas. Because alligators inhabit swamps they attract visitor attention and inspire the imagination of swamps as valuable and interesting habitats. Many visitors travel to the Everglades specifically to view alligators, and thus alligators should be considered an appreciative and aesthetic resource (Cobus, 1972) to be used nonconsumptively by the visiting public.

Public perception of the potential danger presented by wild alligators is probably an important influence on visitor expectations on entering the Everglades. In 1977, a public opinion survey showed that 73% of the public harbours some fear of alligators, and that while 27% of the public believed that alligators were rarely or never dangerous, 14% believed that they were usually dangerous without provocation (Hines & Schaeffer, 1977). In general, people react with interest and fear toward crocodilians, and such a reaction is justified because large crocodilians

have a capacity to injure people. The incidence of injury from alligators is small (Hines & Keenlyne, 1977), although, like attacks by grizzly bears, such incidents provide exciting news, generate exaggerated public response (Craighead & Craighead, 1971), and perpetuate a myth of excitement and adventure. It is in the manifestation of the visitor's curiosity and lack of understanding that problems are created in providing for human safety and yet ensuring the quality of their visits to natural areas. Visitors accept some risk when entering natural areas, although in the case of federal lands the United States is 'bound to use ordinary and reasonable care' in providing for the safety of park visitors (Giles, 1963).

In this paper we discuss the importance of local management of dangerous animals, emphasising as an example options available in the management of alligators that threaten human safety or require some action on the part of managers of natural areas. We base our discussion on experience managing alligators in Everglades National Park, Florida, a natural-area biosphere reserve. The need for locally sensitive planning is stressed in presenting criteria by which local interests, rather than national trends, can be used to develop management policies for crocodilians.

ALLIGATOR PROBLEMS IN EVERGLADES NATIONAL PARK

Based on law enforcement records, 115 situations involving alligators occurred in Everglades National Park during the eleven-year period from 1972 to 1982 (Fig. 1). On an average, then, twelve such incidents were reported each year, comprising fewer than 1% of all cases handled by law enforcement personnel. These data suggest that alligator-related situations are not frequent in Everglades National Park despite a large resident alligator population and the passage of 400 000 visitors through the area annually. Responses to these alligator incidents are not time-consuming, requiring an average of 30 personnel hours or four personnel-days per year.

Different management strategies are necessary in park areas having differing degrees of public access. We identified three situations where alligator problems develop: unrestricted areas—easily accessible places where people can approach alligators without restrictive barriers; restricted areas—where people are behind barriers; and backcountry

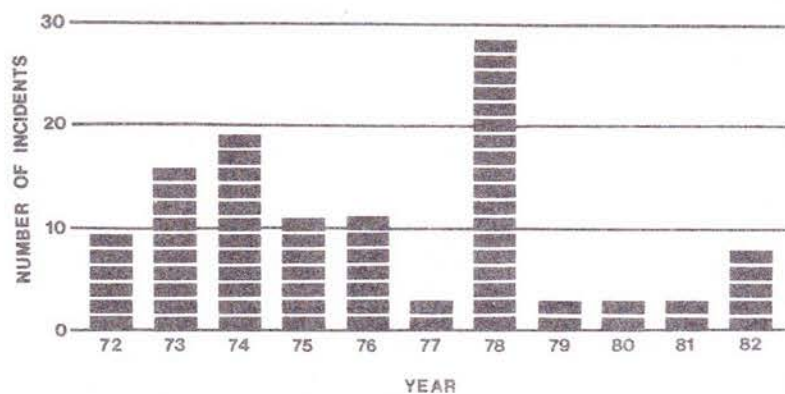


Fig. 1. Number of incidents involving alligator-visitor interactions occurring each year from 1972 to 1982 in Everglades National Park.

areas—less accessible places reached by canoe, motorboat and along foot-trails. The majority of visitors travel by car through the park and visit only restricted and unrestricted areas, with visits to these two types of areas occurring with equal frequency. As might be expected, most situations (81 of 115 incidents or 70%) arose in unrestricted areas (Fig. 2). In ten years only seven alligator-related situations have occurred

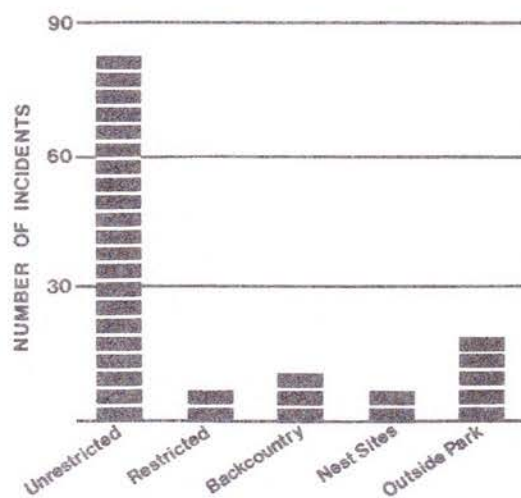


Fig. 2. Number and location of alligator-visitor incidents in Everglades National Park from 1972 to 1982. Areas are classified on the basis of degree of access to the visiting public.

in restricted areas and only nine in the backcountry. Nonadventurous visitors in the restricted areas and backcountry visitors, then, are apparently not particularly faced with a nuisance alligator problem. Rather, problems develop most frequently in easily accessible, unrestricted areas. Thus management of visitor interactions with alligators needed to focus on only 10 locations inside the park.

Of relatively minor concern to alligator management in Everglades National Park are three types of situations that together totalled 10% of all incidents (Fig. 3). One such situation involved the introduction of foreign alligators into the park. Eleven introductions were made into the park between 1972 and 1982. These required a total of 57 personnel-hours, or 5.2 h for each alligator moved. The transport and release of foreign crocodylians into such a park or reserve is neither necessary nor desirable unless it is necessary to restore depleted populations as part of a carefully controlled recovery programme. Introduction of animals into natural populations carries the risk of introducing disease, upsetting naturally established territories, and threatening the genetic purity of

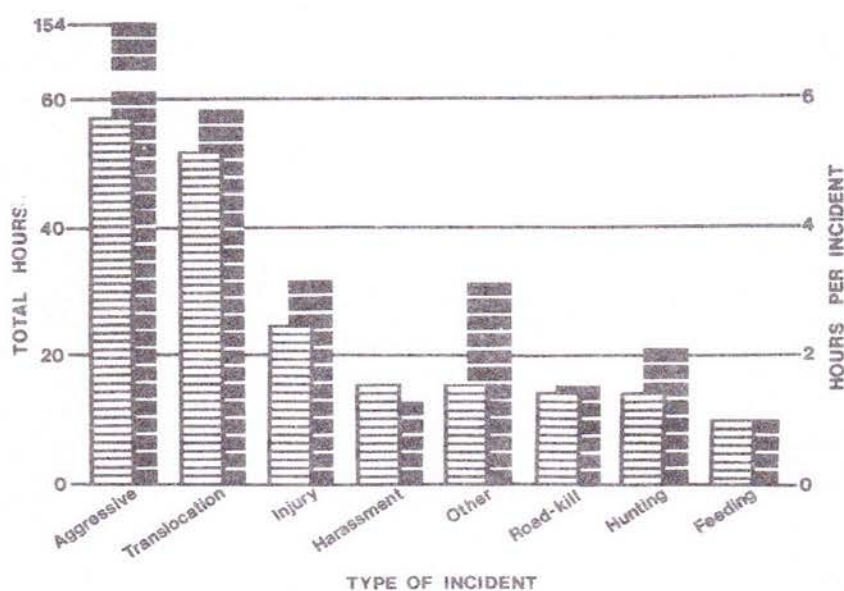


Fig. 3. Total hours (solid bars) and hours per incident (open bars) required by park personnel in handling eight types of situation involving alligator-visitor interactions in Everglades National Park from 1972 to 1982.

the resident population (Kushlan, 1980). Many such animals brought to reserves are captives or have been nuisances elsewhere and as such pose the threat of becoming nuisances in the reserve as well. A second minor concern arose when alligators were struck and killed by cars on roadways open to public automobile traffic. The handling of an injured or dead alligator was sometimes necessary if only to destroy or move the animal away from public areas. Thirteen such situations were recorded from 1972 to 1982, and these required a total of 31 personnel-hours, or 2.3 h for each incident. Also requiring only a minimum of personnel effort were other minor problems such as encouraging an alligator to cross a road more quickly and encountering an alligator dead of natural causes. Thus in the majority of cases (54%) a minor amount of field time and paperwork was all that was required in situations involving alligators in Everglades National Park. Our discussion of alligator management centres on the remaining alligator-related incidents (53 of 115 incidents or 46%), most of which involve aggressive behaviour on the part of alligators, or on the part of visitors.

An alligator by our definition becomes a nuisance when it poses a demonstrable threat to human safety, and situations such as these were the most numerous type of aggressive situation. Even so only 27 incidents occurred in eleven years. Response to these situations generally required the assistance of several persons and an average of 5.7 personnel-hours per incident or 15.4 h per year. No injuries have been reported by personnel involved in the programme, and it has not been necessary to kill an aggressive alligator in Everglades National Park. From 1972 to 1982, 34 relocations were made, primarily to areas within the park where the animal would be unlikely to come back into contact with visitors and where little impact on resident alligators was expected. A standardised release site was a relatively little-visited canal bordering the park that harbours primarily transient, male alligators. Here the addition of another alligator was expected to be of little consequence to the resident population, and the isolation and distance of the canal from visitor areas discouraged further problems. In half of six attempts at relocation to this canal, alligators returned to their initial capture location. Returns usually occurred in about a year, and the alligators travelled straight-line distances of over 58 km, covering habitats such as pinelands, rocky glades and roadways. During the time these alligators were away, the animals were not posing a problem to visitors, and once these alligators returned to heavily used visitor areas, in only one case

was a repeated nuisance situation serious enough to require a second relocation. In other cases, the animals eventually moved away from their previous capture site on their own. Their relocation may have served as aversion training, discouraging further aggressive behaviour. Similar homing behaviour necessitating more than one removal has occurred in other areas (Jacobsen, 1983; Murphy & Coker, 1985). Despite homing, relocation appears to be a successful method of alleviating problem situations in natural reserves and can serve as an effective management tool. Such relocations, although time-consuming, occur rarely and seem to present no special burden to responsible personnel.

A special potential for aggressive behaviour occurs during the nesting season (June to September) when female alligators may vigorously defend a nest site in public areas. Alligators guarding nests use obvious threat behaviour before an attack (Kushlan & Kushlan, 1980). Despite such threats, alligators are dangerous only when people approach the nest site too closely and do not retreat. On at least four occasions, the barricading of nest sites in visitor use areas in Everglades National Park was required, and each was successful in maintaining visitor safety and allowing natural hatching of the nests.

VISITOR PROBLEMS IN EVERGLADES NATIONAL PARK

Many reserves are established with an inherent contradiction—they are designed both to protect and preserve the diversity of natural and largely human-free systems (Duffey, 1974) and yet at the same time provide for public enjoyment of natural areas (White & Bratton, 1980). The greatest source of conflict in such natural areas are the changes imposed by humans, including visitors (Budowski, 1976; White & Bratton, 1980). In Everglades National Park, however, we have found that conflicts between visitors and alligators require little time, money, or effort to control. Visits to the Everglades are generally short (averaging 5.6 h) and are highly seasonal. Reduced visitation during the summer is one reason for a lack of conflicts during the alligator nesting season. Visitor pressure, however, results from both the number of visitors and from visitor behaviour inside the park. Effective management of problem alligators can be directed toward the management of visitors, rather than alligators, by anticipation and prevention of potential conflicts.

Such programmes have included signs, barriers, educational programmes, increased law enforcement, and research studies, and together these have proved to be largely successful.

Only so much can be done to enhance visitor safety in many areas because visitor behaviour continues to be a potential source of conflict that may often reach beyond the attempts of management to redirect it (Bell, 1963). The form and consequences of visitor pressure on alligators are varied and often subtle. Visitors respond to the 'Jekyll-Hyde image' of crocodylians (Graham & Beard, 1973) which contrasts the calm, quiet, unmoving behaviour of basking alligators with the popularised view of their potential aggressiveness. Visitor expectations centre on the 'Hyde-side' of alligators; feeding, harassment, or other soliciting behaviours tend to successfully elicit some kind of response. Visitors to the Everglades, as in many other parks (Bryan & Jansson, 1973), seem unaware of reasons for not feeding or approaching dangerous wildlife. This probably arises from experiences in zoos and similar areas where animals are observed 'out of context' with respect to their natural environment. In Florida, feeding of wild alligators is both illegal (Florida Statute 371.667) and dangerous. Feeding encourages the close approach of alligators to visitors and to visitor use areas so that such approaches may in time become aggressive. The idea that alligators naturally avoid humans is questionable (Hines & Keenlyne, 1977), and alligators may easily lose whatever avoidance tendency they have learned. When this happens, alligators become problems that may require some action on the part of park management. Transplanting nuisance alligators can be an effective management tool, although it fails to address situations that can cause nuisance behaviour (McArthur, 1981). With a high visitor turnover rate, the increased issuance of legal penalties for feeding would probably have a limited effect. Short visits, in fact, probably contribute to the promotion of feeding. Unnatural feeding is a primary contributor in the nuisance behaviour of other dangerous wildlife as well (Beeman & Pelton, 1976; Cole, 1976).

Aggressive behaviour by visitors can take several forms, largely harassment or hunting. Harassment typically occurs when alligators are pelted with rocks or other debris to elicit some response. Other studies have shown that chronic harassment takes a toll on wildlife, resulting in reduced reproductive rates and increased mortality (Giest, 1971). In at least one recent incident in Everglades National Park, injuries from harassment were severe enough to kill an alligator. Eight incidents of

harassment were officially recorded from 1972 to 1982, and when observed many such incidents undoubtedly go undocumented. The need to educate visitors on the danger and illegality of aggressive or soliciting behaviours has prompted the use of strategically-placed and strongly-worded signs in all problem areas.

UTILISATION, PRESERVATION, AND CROCODILIAN MANAGEMENT

The nature and success of crocodilian management policies, especially in developing countries, depends largely on local economic, social, ethical, and cultural factors (National Research Council, 1983; Magnusson, 1984). It is not surprising that different political units find different management practices appropriate based on their own political and socio-economic policies. On a smaller but still relevant scale, variation in land-use purposes and cultural and economic factors within national boundaries may render a range of local management options for crocodilians appropriate. However, prevailing regional management practices are extended to areas where such practices are unsuitable, as typified by current management of the alligator. In recent years, the prevalent trend in alligator management has moved from complete protection of an endangered species to the commercial harvest of a renewable resource, based on the view that the alligator is best managed for its utilisation as a huntable species (Hines & Woodward, 1980). The concept of 'value-added conservation' has recently been used in support of this approach (Hines *et al.*, in press) although this concept has yet to be tested in practice. The philosophy of utilisation has led to experimental and operational harvest programmes in Louisiana and Texas, as well as Florida (Nichols *et al.*, 1976; Magnusson, 1984; Hines *et al.*, in press).

The increasingly accepted tendency of seeing all crocodilians as harvestable resources may in some cases compromise, *a priori*, an unbiased evaluation of alternative programmes for managing them in specific areas. This presents a dilemma to managers of parks, sanctuaries, reserves, and other natural areas where management policies stress preservation rather than the commercial utilisation of wildlife populations. Despite the evolution of more relaxed attitudes towards the status of alligators in the United States, a spectrum of alligator

management strategies that accommodate the diversity of local values and management needs may still be appropriate. Because of the potential for dangerous interactions, managers of natural areas in the United States are faced with maintaining a balance between the economic and recreational aspects of human activity in parks, and the survival of alligators for their ecological, educational, aesthetic, and scientific values. As in any compromise, choices must be made. The ethical basis for these choices involves local management philosophy, local economic constraints, and priorities of local decision-makers. We stress the importance of maintaining flexibility in developing alligator management policies by making choices at a local level, and suggest that natural park areas can be managed to provide a balance between visitor safety and alligator protection without resorting to harvest or other practices that may be inconsistent with a preservationist mandate. Management that accommodates local interests, including those of preservation, can be appropriate despite a prevailing trend which conflicts with a philosophy of non-exploitation.

We can suggest three issues to be evaluated at a local level by managers of crocodilians and their habitats. The first regards human safety. Most species of crocodilians rarely if ever attack humans unless provoked or attracted (Hines & Keenlyne, 1976; Webb *et al.*, 1978; Kar & Bustard, 1983) although unsolicited attacks, possibly attributed to territorial defence (Webb *et al.*, 1978), have also been reported (Jackson, 1962; Richard & Livingstone, 1962; Burrage, 1963). Even the most dangerous species of crocodilian from a human standpoint, *Crocodylus porosus* (Neill, 1971), has recently been reported in some areas to be of little serious threat to humans (Kar & Bustard, 1983). Severe reduction in the sizes of crocodilian populations (which reduces the number of encounters with humans) may, of course, be the reason that some species of crocodilians no longer threaten human safety. Nevertheless, while the danger and legal responsibilities may exist, it seems that the need to protect visitors in some parks and reserves could reasonably be directed less toward crocodilians than toward the actions of the visitors themselves.

A second issue that needs evaluation at the local level is the desirability of potential economic gain from management of crocodilians as a harvestable resource. Conservation attempts such as farming (National Research Council, 1983) may be important where revenues are critical to local economies, and when the use of crocodilians as an economic

resource may be necessary to ensure their survival in the wild. It has been stated that 'few developing countries can afford to conserve animals and their habitat purely on the basis of sentiment . . . [and species such as] the Nile crocodile . . . [are] likely to be eliminated in areas populated by humans, unless cogent reasons are put forward for their wise management' (Blake & Loveridge, 1975). Recent studies outside the United States have documented both the depletion of crocodilian populations by hide-hunting (Rebelo & Magnusson, 1983; Glastra, 1983) and the implementation of farming and re-stocking programmes (Bolton & Laufa, 1982; Montague, 1983; Singh *et al.*, in press). Recent statistics, however, suggest that captive propagation may be economically unfeasible in many developing countries (Magnusson, 1984), particularly where socio-cultural and world economic factors overwhelm the conservationist approach (Hope & Abercrombie, in press). Furthermore, it has been estimated that 98% of the money derived from processing of crocodilian skins taken in one underdeveloped country, Belize, circulates among people in the developed world (Hope & Abercrombie, in press). This figure may not be this high in other countries such as Zimbabwe, where the crocodilian industry may be more organised and where more profits may circulate locally.

In the United States, protection of endangered wildlife is relatively well enforced and respected by the public, and strict export laws protect threatened and endangered wildlife. Both farming and recreational harvest now occur only for the benefit of a few private citizens, and no harvests occur now on federally protected lands. The economics of crocodilian management are irrelevant in most natural area reserves, where protection of an area itself generally protects the wildlife that it supports without need for using it to generate income. The idea that natural areas under private ownership can 'pay for themselves' and thus provide incentive for remaining undeveloped has yet to be conclusively demonstrated. Thus economic gain is more of an ethical and free-enterprise issue in the United States. Economic incentives with respect to hide markets are present, but these may arguably derive more from governmental encouragement than popular demand.

With economic necessity and human safety of little concern in natural area parks in the United States, a third issue becomes more relevant to crocodilian managers; that of the scientific, educational, ecological, and aesthetic value of crocodilians to the wetland systems which they inhabit (Jacobsen & Kushlan, in press). Assessing the relative value of ecological

elements in a cost/benefit structure is admittedly difficult both practically (Dearden, 1978) and philosophically (Sagoff, 1984). We suggest that value can be judged on several scales, and each should be considered at a local level. One value of the alligator, for example, lies in its contribution to the public's judgement of environmental quality by acting as a conspicuous species. In addition, the ecological value of the alligator is enormous to the Everglades (Kushlan, 1974) and has yet to be evaluated in many ecosystems. The costs of harvests, for example, include only estimates of demographic value (Hines *et al.*, in press) while failing to recognise or include ecosystem-level services. The impact of management practices with regard to each of these values should be considered in the management of alligators in natural areas.

Ensuring the continued survival of wildlife through habitat protection has been recognised as a form of land use that competes with agriculture, forestry, recreation, and urban industrial development for a diminishing supply of land resources (Margules & Usher, 1981). Wildlife tourism, while beneficial to the conservation movement, has been described as a 'modern and expanding business' (Gooders, 1975). No one policy can hold universally when it comes to the management of crocodylians and humans in areas where contact and competition are inevitable. 'Utilisationists', on the one hand, may hold the view that the wise harvest of resources is the preferred means of ensuring long-term use of renewable resources. 'Preservationists', on the other hand, may support a 'hands-off' management approach and see ecosystems as self-maintaining units needing only protection from human influence to remain as they are (White & Bratton, 1980). Extreme philosophies, of course, are rarely appropriate, but the concepts of 'utilisation' and 'preservation' provide the endpoints for a continuum of management options that can be targeted toward local situations.

When a preservationist philosophy is affordable, managers can often anticipate, recognise, and manage for the direct and indirect impacts of human activities. In this light, visitor management becomes an effective and increasingly necessary management tool. In areas that are unreserved or where utilisation philosophies predominate, conflicts of interest are destined to occur with increasing frequency (Parker & Watson, 1970; Loveridge & Blake, 1972; Hines & Keenlyne, 1977; Hines & Woodward, 1980) and harvest programmes may provide the only reasonable means of eliminating problem alligators. But in natural areas, parks, and reserves, where preservation is the mandate of management, harvest is

not a feasible solution, and as shown by the Everglades, by far not the only solution available. Management of natural areas can be sensitive to local needs and can focus successfully on a reduction of the potential for conflict while maintaining access to the qualities of the wilderness for which these areas are established.

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