Impacts of Hunting on Duck Populations

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Abstract: The wood duck and other species of waterfowl were spared by reducing overharvest caused by unregulated hunting. The comparison of scientific investigations to duck hunter and law enforcement agent questionnaires revealed considerable controversy over the impacts of hunting and hunting regulations on duck populations and harvests. More reliable data on legal and illegal harvest, cripping loss, and non-hunting mortality are necessary for the orderly management of all species of ducks. The literature agreed with hunter/agent questionnaires—illegal kill and hunting ethics are significant issues. They indicated that violating duck laws had been socially accepted. Suggested solutions were: increased field law enforcement, stiffer innovative sentences, and more hunter involvement in ethics education. A video presentation titled, "Changing Traditions" was edited from selected hunter interviews.

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Leopold (1933:315) discussed human characteristics that have historically separated the management of migratory waterfowl from resident game. He said, "The fact that seasons and bag limits on migratory birds have remained so much more liberal than seasons on resident game strongly substantiates the assertion that people can be induced to conserve what stays on their own land, but only the exceptional individual will voluntarily conserve what he shares with the community at large." Brant (1937:1) adds, "Sportsmen discuss the disappearance of waterfowl as they did 6 years, 10 years, 20 years ago, blaming everything and everybody but themselves. Ducks, they say, are killed by drainage, drought, botulism, alkali, oil pollution, crows, seagulls, foxes, Indians, Mexicans, and muskrats." But is ever a word said about the deadly barrage of shotguns—a 3,000 mile gauntlet of shot and shell, ablaze from September to Christmas along every lake and stream from Canada to the Gulf of Mexico? Not a syllable. The subject is "tabu" (Brant 1937).

Fifty years later all of the above mentioned by Brant (1937) continue to destroy ducks, including shotguns. The loss of habitat is unquestionably the most critical issue, but not the only one (Hall 1986). Scientific investigations of duck hunting mortality, especially illegal kill, are lacking (Gascoyne 1947, Nieman et al. 1987, Trost 1987).

Since the enactment of the Migratory Bird Treaty Act in 1918, agents observing waterfowl hunters in the field have consistently reported that the illegal killing of ducks was a major management problem. The response has been "you law enforcement guys are biased." Managing fish and wildlife resources depends greatly upon the success or failure of controlling ourselves. While considerable information is available about the biology of waterfowl, there is limited knowledge about man/take issues.

The purpose of this paper is to evaluate duck hunting issues from hunter and law enforcement agent questionnaires and published literature, and to identify agreement and/or disagreement about (1) who, when, where, how, and how much illegal harvest occurs, (2) impacts of legal harvest and other hunting, (3) improving hunter ethics by altering sociological behavior and duck hunting traditions, (4) establishing a cooperative spirit that will represent the best interest of ducks while continuing to maintain huntable populations, (5) human dimensional waterfowl research needs, and (6) the role of law enforcement.

Methods

During the 1977–78 waterfowl season, U.S. Fish and Wildlife Service (USFWS) Special Agents assigned to Louisiana, Arkansas, and Mississippi completed a questionnaire on (1) duck hunters contacted, (2) hunters cited for violations, (3) illegal ducks seized, and (4) hours expended on Migratory Bird Treaty Act enforcement (Hall, unpubl. rep., 1979). An illegal kill estimate was projected from a one-time contact by multiplying:

—the average number of ducks seized per violation by

—the hunter violation rate by

—the number of duck hunters in the three states.

The March 1985 issue of *Waterfowler's World* invited their subscribers to complete an evaluation of the 1984–85 waterfowl hunting season. An analysis was made of 100 randomly selected responses.

Following the 1986–87 season, Richard L. Hall, executive director of the Louisiana Waterfowl Association, published a random waterfowl hunter attitude questionnaire in the *Louisiana Sportsman*. Although the sample was too small to be statistically significant (only 40 questionnaires were completed and returned), it indicates the opinions of waterfowlers who cared enough to respond.

A duck hunting questionnaire was completed by the 30 U.S. Fish and Wildlife Service agents assigned to the southeastern region. The questionnaire consisted of 28 statements about duck hunting that reflect the agent's individual opinion based on his or her observations and conversations with duck hunters.

Recommendations of the U.S. Fish and Wildlife Service Law Enforcement Evaluation Report (USFWS, unpubl. rep., 1976) and the Law Enforcement Issue Paper (USFWS, unpubl. rep., 1983) were incorporated into the discussion of law enforcement manpower and funding needs. A search was conducted of the literature

on duck hunter ethics and hunting mortality. A comparison of views was made from published research data, opinions of duck hunters and law enforcement agents, and interviews with selected experienced and knowledgeable hunters and guides. These interviews were videotaped and edited into a presentation titled, "Changing Traditions."

Discussion

Historical Hunting Impacts

The history of the wood duck during the past century is one of the most exciting success stories in the annals of wildlife management (Reeves 1966). According to Phillips (1925:65), "Older writers, notably Audubon, testify to the extreme abundance of this species in all the eastern part of the United States." Early writers attributed the rapid decline of wood ducks at the end of the 19th century to overharvesting from being shot at all seasons (Grinnell 1901); spring shooting (Palmer 1912); shooting for the flank feathers sought by makers of artificial flies (Elliot 1898); and traditional summer shooting of flapper ducks (Phillips and Lincoln 1930). In 1904, Louisiana was the first state to close the wood duck season (Palmer 1912). Green (1963) found the wood duck 3 times more vulnerable to hunting than mallards. There is a direct relationship between shooting pressure and the survival of immature wood ducks (Smith et al. 1963). Enforcement of hunting regulations contributed to sparing the wood duck from extermination throughout its eastern region (Reeves 1966).

The long-term closure of the shooting seasons for greater snow geese and tundra swans has definitely helped put these 2 formerly endangered species back on the game list. These 2 species are particularly significant examples because their nesting grounds have never been in jeopardy. Their decline was a result of unregulated shooting pressure, and their recovery has been framed by strict limitations on the number of birds that can be shot annually (Reiger 1985).

Harvest and Survival Rates

The role of hunting mortality on duck populations has been estimated by several investigators since 1952 (Trost 1987). Hickey (1952) and others (Crissey 1963, 1969, 1970, 1973; Geis 1959, 1963, 1972*a*, 1972*b*) all imply that hunting was a form of additive mortality. Additive mortality means that birds dying due to hunting are birds that would have otherwise survived that year.

Beginning in the 1970s, new techniques were developed by Seber (1970), Robson and Youngs (1971), Nichols et al. (1984), Anderson and Burnham (1976), Roger et al. (1979), and Nichols and Hines (1983) that rejected the additive mortality hypothesis. Anderson and Burnham (1976) stated that previous investigators used invalid analytical procedures and that additive hunting mortalities in waterfowl is unsubstantiated. All of these data were reexamined by Trost (1987). Trost noted bias in determining harvest rates from harvest and breeding population estimates by Roger et al. (1979). Because these rates did not account for nonhunting mortality,

crippling loss, or illegal kill, Trost (1987) concluded that this measure of harvest rate is not an accurate depiction of the annual harvest rate of mallards.

Anderson and Burnham's (1976) conclusion that mallards cannot be "stockpiled" contradicts both the recovery of the wood duck and other species by reducing hunting mortality and waterfowl's natural longevity. Reiger (1985) said that, unlike generally short-lived nonmigratory game birds such as quail and grouse, duck can be "stockpiled." Many diving species do not begin nesting until their third spring, and many individuals of all species are known to live for more than 10 years in the wild.

Conner (1985) concluded that the stabilized regulations were undertaken to prove sport hunting did not effect waterfowl populations. If Anderson and Burnham (1976) and other investigators were correct in concluding that (1) survival rate was not increased in years when restrictive hunting regulations were enacted, (2) hunting mortality is not additive, and (3) ducks cannot be stockpiled, why did Sparrowe and Patterson (1987:323) conclude, "We believe that the capability of hunters to kill ducks at the same rate, when numbers of ducks are low, support the need for conservative regulations during population declines. . . ." Conner (1985:19) stated that "the U.S. Fish and Wildlife Service said the decline in duck populations during stabilized regulation is attributed to poor nesting habitat conditions. There is no mention of hunting contributing to the population decline by shooting prime breeding stock. Now regulating the waterfowl hunter is the only solution suggested by the Service." Conner's concern was supported by Sparrowe and Patterson's (1987:324) conclusions of the stabilized hunting regulations: ". . . improving the capacity of duck populations to recover from low levels is a primary consideration in duck management. We understand that habitat preservation and habitat management to increase duck production is the central issue. On the other hand, we cannot disregard possible overharvest of hens when breeding stocks are at low levels." Trauger and Stoudt (1978) found that while habitat quality and quantity have declined in the Canadian prairie-parkland area, it has not progressed to the extent where it could be responsible for the present declines in breeding dabbling duck populations. These populations are being overharvested in North America. Trauger and Stoudt (1978:202) said "Results of our long-term study have pointed to other factors, including hunting pressure, that have held waterfowl populations below levels which could be supported by the existing waterfowl breeding habitat." Hochbaum (1947) and Dzubin (1969) found that hunting mortality may decimate a population homing to a relatively large breeding area, resulting in an underpopulation even though optimum habitat conditions exist. Trauger and Stoudt (1978:202) concluded: "These findings also suggest that to allow heavily harvested species to recover their numbers after an extended drought and to allow these populations to take full advantage of improved habitat conditions, it would be prudent to retain fairly restrictive harvest regulations for a few years after the drought has ended. Immediate liberalization of hunting regulations, following severe population depressions, such as in time of drought, apparently retards expected population recovery rates for these species. This is not a new idea. Hochbaum (1946) expressed this view

more than 30 years ago at the threshold of modern waterfowl management. The tragedy is not so much that his recommendation was not heeded, but rather that the mallard, the species with the greatest recovery potential, has not responded to over 15 years of generally favorable conditions. . . ." Harvest rates for the wigeon and the green-winged teal have risen sharply in recent years, with a coincident decline in prairie-parkland breeding populations (Patterson 1979). Boyd et al. (1978) said sport hunting in North America is taking a greater percentage of the fall flight of both wigeon and gadwall. Cooch (1979) concluded that consideration must be given to the minor duck species or they may disappear whilst we still have mallards. Patterson (1979) said the focus of waterfowl management primarily on the mallard is wrong. Concern about methodology used to determine harvest rates was expressed by Trost (1987:275), who recommended "an investigation into the accuracy of our harvest surveys."

Reinecke et al. (1987) in Mississippi and Arkansas found that hunting was the principal cause of mortality for mallards—6 of 10 (60%) deaths among immature females and 16 of 22 (73%) among adult females. Hunting could not be ruled out of the 10 nonhunting deaths because of the proximity of recovery and adjacent hunting sites.

Hunting Pressure

Since 1950, 600 square miles of Louisiana coastal marshland have vanished. Waterfowl hunters have almost doubled in the state during the period. The compaction of more hunters on a drastically shrinking habitat has significantly increased hunting pressure (Hall 1986). The Louisiana Land and Exploration Company, in the 1960s, issued 4 leases on 125,000 acres. Now there are 250 leases on the same property, with 200 names on a list waiting for a lease. Comparing 1945–46 to 1982–83 the continental duck population declined 45%; the daily bag limits were similar: Louisiana duck hunters more than doubled, the season length decreased 38%. Yet the 1982–83 harvest increased 10% from 1945–46. Decreasing the population by half and increasing the kill by 10% could be compounding population problems (Hall 1986).

Crippling Loss

Crippling loss of ducks was reported by Bellrose (1953) at 22.5%. Estimates by Kaczynski (1967) of 22.2% and Anderson and Burnham (1976) of 20% agree. In Canada, Nieman et al. (1987) observed losses from 20% to 45%; but hunters reported crippling to be only 6% to 18%. Nieman et al. (1987) concluded that hunter estimates are not accurate enough to be used in assessing waterfowl hunting mortality and crippling represents an important component of hunting.

Bag Limits

The data consistently indicate that violation rates are associated with opportunity. In most areas of the United States, duck hunters do not experience frequent opportunity to exceed the daily bag limit. In Wisconsin, Jackson et al. (1979) found

that 25% of the nonviolators failed to fire even 1 shot, averaged only 0.53 ducks per hunting trip, and 73% did not bag any ducks. Nieman et al. (1987), during a "spy blind" study in Canada, found that nearly 50% of Manitoba duck hunters and over 70% of Saskatchewan and Alberta hunters were unsuccessful in taking even 1 bird a day. Less than 6% attained the daily bag limit and 1% exceeded the limit. Hunter performance studies have generally been conducted under situations that have offered hunters very limited opportunity to take over the bag limit. When questioned, 83.3% of the USFWS agents strongly agreed with the statement, "Taking over the daily bag limit of ducks when opportunity arises is a serious problem"; 13.3% agreed; and 4.4% were undecided.

More realistic evaluations of hunter violation rates by spy blind observations should be conducted in high mortality areas on isolated private property where the majority of both legal and illegal ducks are harvested.

Point System

In Michigan, Mikula et al. (1972) found from the opinions of 2,727 hunters that 69% preferred the point system. In Louisiana, Hall (1987) found 53% of the hunters preferred the point system. Mikula et al. (1972:457) said, ". . . the low percentage of reordering [the bag] observed in the experiment does not present a real threat to the orderly management of the resources. . . . It provided reasonable hunting opportunity, maximum hunter satisfaction, and acceptable hunter behavior." The agent questionnaire and hunter surveys disagreed with Mikula et al. (1972) that reordering and hunter behavior were acceptable. Jackson et al. (1979: 317) said, "Good sportsmen, as observed in this study, were significantly more likely to call for revision of the point system, because they felt that aspects of those regulations encouraged violation." Agents also expressed this concern. The point system is appealing to hunters because they can kill more ducks.

Illegal Kill

The magnitude of the illegal duck kill is presently unknown (Trost 1987). Gascoyne (1947) said that one of waterfowl management's greatest problems is the lack of understanding by hunters and game managers and wildlife specialists' reluctance to consider law enforcement in research and management studies. The issue Brant (1937) labeled "tabu" has generally continued to be sidestepped by most waterfowl researchers. Illegal harvest is a problem man alone could solve. The subject ironically was not mentioned in the North American Waterfowl Management Plan.

The Louisiana Waterfowl Association Questionnaire revealed that 18% of the hunters ranked illegal kill as the greatest threat to waterfowl and 39% believed it was the number two threat below habitat (Hall 1987).

USFWS agents responded to statements on illegal duck harvest as follows:

—The illegal duck harvest by sport hunters will equal or exceed the legal harvest: 60.0% strongly agreed; 26.6% agreed; 13.4% were undecided.

—Violations of wildlife laws, especially migratory birds, are socially acceptable: 66.7% strongly agreed; 30.0% agreed; and 3.3% were undecided.

The results of a questionnaire completed by 16 USFWS agents in Arkansas, Louisiana, and Mississippi in 1978 indicated: (1) agents contacted 2,697 duck hunters in the field; (2) 20% of the hunters contacted were cited for waterfowl hunting violations; (3) an average of 3.5 illegal ducks were seized from each hunter found in violation; (4) agents inspected 1.3% of the possible duck hunters in Arkansas, Louisiana, and Mississippi (duck stamp sales in the 3 states). Assuming that harvest and violation rates were representative of hunter performance, a one-time inspection of the stamp purchasers, 141,064 ducks would have been illegally taken. As discussed by Cowles et al. (1979), bias with these data is acknowledged. Nevertheless, the survey indicated that illegal harvest is a significant problem.

Nieman et al. (1987) found that hunter observation revealed a much higher violation rate than post-hunt bag checks (12% compared to 2%). They also concluded that the greatest number of infractions and those most detrimental to the resource will often only be detected by hunt observations. A 20% violation rate from USFWS Agent Questionnaire is similar to that found in other studies; e.g., 16% (Mikula et al. 1972) in Michigan; 18% (Hopper et al. 1975) in Colorado; 18% in Saskatchewan; and 15% in Alberta (Nieman et al. 1987). The average birds killed per violator were fewer in those states compared to the average 3.5 birds taken in Arkansas, Louisiana, and Mississippi. This would be expected, because the data consistently show that violations of hunting laws and regulations are associated with opportunity to violate (Jackson et al. 1979). Louisiana's hunter harvest rates are 2 to 4 times greater than states in other Flyways (Byrd and Smith 1984) because opportunity begins with birds available to the gun (Jackson et al. 1979).

Jackson et al. (1979) found that about 25% of the nonviolators failed to even fire a shot, but did not indicate if nonviolators had opportunities to violate. Hunters should not be classified nonviolators unless they had the opportunity to violate. When ducks are scarce and hunters are concentrated on public hunting areas, a true assessment of hunter behavior from violation rate is difficult.

Who Are the Violators?

Jackson et al. (1979) found that violators averaged 27.75 years of age, compared to 33.33 for nonviolators. They were more apt to shoot trap and skeet, belong to organizations, read technical waterfowl magazines, use retrievers, duck calls, and camouflaged boats, prepare blinds, score higher on waterfowl identification tests, and were more skilled in bagging waterfowl. Violating waterfowlers are goal-oriented individuals who may reflect many of the economic, educational, or recreational practices of our society. Conditions that created the greatest likelihood of violation were low probability of getting caught, security, and knowledge of the hunting territory, self-control of the land or knowing the landowner.

USFWS agents agreed with the results of Jackson et al. (1979) that habitual violators are normally most knowledgeable about waterfowl, are middle-class or

above, use state-of-the-art equipment, and hunt on private property with security. USFWS agents also think habitual violators are likely to bait waterfowl. When questioned, 60% of agents strongly agreed with the statement: "Individuals who otherwise would not violate laws will regularly take migratory birds illegally"; 33.3% agreed; and 6.7% were undecided.

Perhaps the most potentially resource-damaging illegal duck hunting has not previously been addressed by investigators. The profit motive encourages flagrant violations. Corporations use duck hunting to entertain business clients and commercial operators provide accommodations and guide services. Considerable cost outlay is required by both corporate and commercial clubs. Their success depends largely upon a continuous population of ducks to satisfy hunters throughout the season.

Agents have apprehended clubs using tons of bait. One case involved guests who participated in a duck shooting contest while hunting with state licenses issued to aliases. Two confirmed outlaw guides were interviewed. One guide acknowledged that he and his guests shot over 100 cases of shells from his duck blind in 1971. The other guide, who once supervised 40 assistant guides, said, "For years (1970s) we killed from 40 to 100 mallards a day. Tons of bait were poured out from airplanes."

What Are the Most Serious Violations?

Baiting is a tragedy for waterfowl, for the "little hunter," and for the integrity of the sport itself. The longer we postpone solving our dilemma, the more we play into the hands of anti-hunters (Reiger 1975).

Waterfowl baiting is increasing. It is a problem now where it was not practiced over 50 years ago (1935) when it was prohibited. Baiting is a symptom of the real problem. Declining resources have stimulated frantic competition between hunters. Baiting makes the shooting of ducks and geese more predictable, more profitable for commercial operators, and more successful for those who judge a hunt by the number of birds bagged (Hall 1985).

Guides, hunters, and agents agree that baiting and the associated violations, particularly overbagging, that accompany the practice are the most serious waterfowl violations. USFWS agents responded to 2 statements on baiting:

Baiting waterfowl is common, contributing significantly to the illegal kill: 90% strongly agreed; 10% agreed.

Increased baiting is an indicator of hunting pressure, decreased population, competition for a declining resource, and it contributes significantly to the illegal taking of waterfowl: 80% strongly agreed; 20% agreed.

Law Enforcement

Crouch (1944) said that beyond any doubt, law enforcement is a vitally important part of the waterfowl conservation program. Since the beginning of federal migratory bird protection in 1918, statements similar to Crouch (1944) are found

throughout the literature. Wildlife administrators frequently ask, "How much law enforcement is enough law enforcement?" The lack of law enforcement research and knowledge was discussed by Beattie et al. (1977). Roughly 60% of state fish and/or wildlife enforcement divisions are not currently conducting law enforcement research and do not anticipate any research. Beattie et al. (1977) encouraged agencies to allocate funds to this important area of research.

Federal migratory bird protection has generally lacked adequate manpower and funding necessary for protecting waterfowl resources (Hall 1972). USFWS (1976) said it is doubtful that the existing staffing level of 176 agents is adequate to accomplish objectives. Since 1969, increased responsibilities for federal wildlife law enforcement have emanated from Congressional enactment or amendment of 10 public wildlife laws (USFWS 1976).

In 1976, the Director of the U.S. Fish and Wildlife Service appointed a team to evaluate the Service's law enforcement function. A questionnaire was sent to all State game and fish department directors. All but 4 states considered the most important problem to be "lack of sufficient manpower to get the job done." Forty-six percent of the states said that USFWS agents were of greatest value to their agency in the enforcement of the Migratory Bird Treaty Act. In response to the question, does USFWS enforcement have a positive effect in reducing the migratory birds lost to illegal kill by hunters—76% of the states said yes and 24% said no. The states recommended that 340 USFWS agents be stationed in the field to maintain a "minimum presence level" (USFWS 1976).

In 1977 the agent force was increased to 220 field and supervisory personnel. This was the largest agent force to date. By 1983 budgetary restraints again reduced the force to 200. A law enforcement issue paper addressed the situation (USFWS 1983).

The Louisiana Waterfowl Association questionnaire (Hall 1987) asked: How would you rate federal enforcement efforts? Hunters responded: good, 20%; adequate, 32%; poor, 35%; and don't know, 12%. USFWS agents responded to law enforcement statements as follows:

—The protection of migratory waterfowl should be a FWS priority: 90% strongly agreed; 10% agreed.

—There are not sufficient USFWS agents to adequately protect migratory waterfowl: 96.6% strongly agreed; 3.4% agreed.

Hunter interviews indicated they believe that effective law enforcement and stiff sentencing by the courts are the keys to reducing the illegal duck kill.

Ethics and Traditions

Unfortunately, duck hunting ethics have not been practiced as much as they have been preached. Hine (1962) said, "To the average duck hunter esthetics makes thin soup." In his mind, quantity is inextricably linked with quality, and only a productive hunt is a good hunt.

Ethics and tradition are closely associated and both are difficult to change. Successful duck hunting techniques passed from one generation to the next eventually become established traditions. Ethics are society's judgment of individual behavior. Jackson et al. (1979) said history indicates that morality or ethics cannot be legislated. Traditions that were once right before the enactment of duck hunting regulations were not easily changed when declared wrong by society's laws. Violating waterfowl regulations and evading game wardens in some communities became part of local hunting traditions. Waterfowl resources were significantly impacted when illegal hunting tradition continued in areas where ducks historically concentrated. Psychologists generally believe that all behavior is an expression of the basic personality and values of the individual and those groups or segments of the society with which he or she identifies (Jackson et al. 1979). If baiting, roost shooting, taking over the limit, and so on, were taught and accepted hunting methods practiced by role models, then young hunters likely continued to hunt the traditional way.

Leopold (1933) said a responsible hunter is one who imposes restrictions upon himself, but as Kohlberg (1971) pointed out, to effectively raise the individual from one level of ethical behavior to a higher one requires that the person become involved with an individual (or group) already at that higher level of development. Individuals at higher ethical levels are not generally abundant or persuasive when strong tradition condones illegal hunting. Hunter and agent interviews agree that the illegal taking of waterfowl is a social problem. Hunters themselves must assume the responsibility of improving ethical standards by establishing positive peer pressure. Jackson et al. (1979) said that it is time hunters became activists in demanding ethical behavior of their peers, and in recognizing and reinforcing quality of behavior rather than quantity of bag.

Improving duck hunter ethics by reducing traditional illegal take is timely. Conner (1985) indicated that 66% of American duck hunters believe that waterfowl populations decreased during the last 5 years and Hall (1987) revealed that 94% of Louisiana duck hunters said waterfowl are in serious trouble requiring man's intervention through management techniques. Psychologists say effective behavioral change normally occurs during crisis. Jackson et al. (1979) concluded that the ultimate answer to hunting ethics will be found in education rather than by fines and sentences. Agents agree that education is the key and that fines generally created only a minimal violation deterrent. Law enforcement supported by innovative sentences, however, are integral components of education. Fifty-six percent of Louisiana hunters believe penalties for repeat offenders are too lenient and 76% support mandatory jail terms (Hall 1987). Hunter interviews indicated that some ceased violating because they were apprehended and sentenced. Other hunters feared the revocation of hunting privileges, termination of hunting leases and jail sentences. Video presentations from interviews of reformed violators representing hunters at higher ethical levels exercise positive peer pressure described by Kohlberg (1971).

Conclusions

Reacting to the rapid decline of North American waterfowl attributed to unregulated shooting, Congress enacted the Migratory Bird Treaty Act in 1918. Enforcement of hunting regulations promulgated under this Act spared the wood duck, tundra swan, greater snow goose, and other waterfowl species.

The impacts of hunting, particularly illegal kill, on duck populations have been controversial and somewhat "tabu" among waterfowl researchers. More reliable data on harvest rates, including crippling, legal and illegal hunting, survival rates, and nonhunting mortality for all species of ducks are necessary for orderly management. Investigations concerning hunter behavior and law enforcement should also be research priorities.

Duck hunters and USFWS field agents in the lower Mississippi Flyway agree on duck hunting impacts as follows: (1) Populations have drastically declined during the 1980s; (2) Violations of waterfowl laws have been common and generally socially accepted; (3) Illegal kill is significant; (4) Population distribution is affected by hunting pressure; (5) Law enforcement is crucial to protecting the resource; and (6) Revocation of hunting privileges, loss of leases and jail sentences are effective violation deterrents.

Duck hunters must become activists demanding better ethical behavior of their peers. Improving ethics is the responsibility of both hunters and organizations representing waterfowl management. Video presentations featuring positive role models have the capacity to educate large numbers of hunters about collective impacts of duck hunting.

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