

PROFILE

Impending Recovery of Kirtland's Warbler: Case Study in the Effectiveness of the Endangered Species Act

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ABSTRACT / The Endangered Species Act (ESA) has received a large amount of criticism in recent years by conservative landowners and others who believe that it has infringed on property rights. It also has been criticized by those who think it has been costly and ineffective in reaching its goal of preventing extinction and recovering species. Recent evidence, however, shows that the ESA has stabilized or increased the populations of over a third of the listed species. In addition, its chief administrator, the US Fish and Wildlife Service, has been increasingly flexible in implementing the ESA. After reviewing the administrative machinery of

the ESA, this paper provides a case study of one endangered species, the Kirtland's warbler (*Dendroica kirtlandii*). This particular recovery program actually began before passage of the federal ESA, when biologists alerted the Michigan Department of Natural Resources of the perilously low population of this bird, which only breeds under jack pine (*Pinus banksiana*) trees in Michigan. By the time an ESA Recovery Team was formed for this bird in 1975 (the first such team created under the ESA), a legacy of consensus and interagency cooperation was well established. This has led to successful efforts at habitat management and control of its nest parasite, the brown-headed cowbird (*Molothrus ater*). While the Kirtland's warbler is not yet recovered, its population is near an all-time high, and its recovery is possible within the next decade. When (and if) this happens, it will be clearly attributable to this successful model of federalism for natural resources management.

Of all the major environmental laws in the United States, the one that has received the most emotionally charged criticism is the Endangered Species Act (ESA). Signed into law by President Richard Nixon in 1973 with bipartisan support, the ESA has been the target of conservative landowners and their congressional supporters who believe that government intrusion on private property has gone too far, and others who believe that the ESA has been costly and ineffective in reaching its goal of preventing extinction and recovering species (Smith 1994, Gordon 1994). Does this government program give rodents greater rights than people, as some have charged? First, there have been very few cases of land-use conflicts. The evidence also indicates that the ESA has been successful in stabilizing or increasing the populations for over a third of the target species, and that only 2% of the listed species of flora and fauna have become extinct (NRC 1995, p. 197). Finally, its chief administrator, the US Fish and Wildlife Service, has been increasingly flexible in its implementation precisely to avoid additional land-use conflicts (Stone 1995).

The success rate of the ESA is all the more impressive

when one considers the modest budget of the US Department of the Interior's Fish and Wildlife Service (the lead agency) for this program, at under \$100 million a year, and that most species do not get listed for ESA protection until they reach critically low population levels. Fortunately, this budget is supplemented by the spending of several other federal and state agencies in different parts of the country. While the improved status of the national symbol, the bald eagle (*Haliaeetus leucocephalus*), is well known, other species have hovered at more dangerously low numbers before they have rebounded. For instance, the whooping crane (*Grus americana*) population that winters near the gulf of Texas sank to less than 20 birds, the lemon lily (*Lilium parryi*) of southern Arizona dropped to just two plants, and the black-footed ferret (*Mustela nigripes*) of the Great Plains also declined to less than 20 individuals (Clark and Westrum 1987), before they began their respective recoveries from the brink.

The focus of this paper is on the management and recovery of another highly endangered bird species, which breeds only in Michigan, the Kirtland's warbler (*Dendroica kirtlandii*), hereafter the KW. The KW is an unusual bird in many ways and makes for a timely case study on the effectiveness of the ESA. First, it is a relict species, which was possibly much more numerous a few

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thousand years ago when its breeding habitat, the jack pine barrens, was more widespread in the North Central states (Mayfield 1960, p. 2). Partly because its breeding range has been restricted to primarily a few counties in the northern third of Michigan's Lower Peninsula, it was the first songbird species in the world to have a complete population census done, in 1951 (Mayfield 1953). The population of the KW has been dangerously low since that first census, stabilizing at 400–500 birds in the 1970s and 1980s. Then from 1990 to 1995 the breeding bird count showed a large growth in population, at a yearly average rate of 24% (although it declined by 9.5% in 1996), more than tripling the population (Probst and Weinrich 1993, Weinrich 1996 and personal communication). In this case the partial recovery cannot be attributed to the banning of DDT or other pesticides, which greatly assisted the recovery of the bald eagle, osprey (*Pandion haliaetus*), brown pelican (*Pelecanus occidentalis*), peregrine falcon (*Falco peregrinus*), and other bird species, but rather to successful interagency cooperation in the management of habitat. Management predated the ESA, but it has been greatly facilitated by its enactment.

Research on the KW has been conducted primarily by biologists and ecologists and has focused on the bird's natural history and habitat requirements (e.g., Mayfield 1960, Walkinshaw 1983, Zou and others 1992, Probst and Weinrich 1993). There has been no previous social science research on the KW, and modest overall work in the social sciences and humanities on endangered species. Research foci have included legislative reviews (e.g., Yaffee 1982, Houck 1993, Dwyer and Murphy 1995) and criticism (Simon and Wildavsky 1992, Mann and Plummer 1995), contributions on social science theories and applications (chapters in Clark and others 1994, Kellert 1985, 1986, Clark and Westrum 1987), federalism (Ernst 1991, Yaffee 1991), conflict resolution (Wondolleck and others 1994), and a few case studies, e.g., northern spotted owl (Yaffee 1994, 1995, Lange 1993), black-capped vireo and golden-cheeked warbler (Mann and Plummer 1995, pp. 176–211, Peterson and Horton 1995), and the grizzly bear (Sellers 1994).

The next section of this paper provides a brief review of the Endangered Species Act, focusing on administrative issues in the protection of species on both public and private lands. After that a detailed case history is provided of the KW recovery effort, which has involved several different government agencies. The focus is on interagency cooperation and consensus, and other reasons why this appears to be a successful program. Finally, the paper closes with some modest conclusions from the KW case study and their implications for the

improvement of the recovery programs for other species.

The Endangered Species Act

Recognizing the growing rate of anthropogenic species loss, Congress passed the first endangered species law, The Endangered Species Preservation Act, in 1966. The 1966 act directed the Secretary of Interior to “carry out a program in the U.S. of conserving, protecting, restoring, and propagating selected species of native fish and wildlife.” It also authorized the acquisition of endangered species habitat for inclusion in the National Wildlife Refuge System, required the preparation of an official list of endangered species, and required the Departments of Interior, Agriculture, and Defense to protect species of fish and wildlife threatened with extinction, and their habitats. The 1966 act had minimal success because protection of habitats was limited, and there were no restrictions on the “taking” of individuals from species threatened with extinction. The Endangered Species Conservation Act of 1969 repealed the 1966 act and replaced it with stronger legislation. In addition to providing for the protection of habitats and restrictions on the taking of species, it redefined fish and wildlife to include “any wild mammal, fish, bird, amphibian, reptile, mollusk, or crustacean” (US Senate 1987). The 1969 act also broadened the focus to encompass the worldwide extinction of species. It prohibited the importation into the US of any species or subspecies on the published list.

Endangered species protections were further strengthened by the passage of the landmark Endangered Species Act of 1973 (ESA), Public Law No. 93-205. “Threatened” species (ones likely to become endangered within the foreseeable future throughout all or a significant portion of their range) were protected for the first time, as were plants and previously uncovered phyla of the animal kingdom. Other important changes included Section 7 provisions for the expanded protection of “critical” habitat. The taking of listed species became prohibited and strict requirements were placed on all federal agencies to protect listed species and their habitats. “Take” was defined as “[t]o harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct” (US Department of the Interior 1973, 16 USC Sec. 1532). In short, the ESA has a full set of rather sharp teeth, although the implications of this legislation were not understood by its Congressional authors (Yaffee 1982). Endangered species are now widely recognized to be of value to the nation for medical, scientific, ecological, economic, educational, historical, recre-

ational, aesthetic, and ethical reasons. The ESA has had many additional amendments since passage of the 1973 act and is currently due for reauthorization.

Federal implementation of the ESA is divided between the Fish and Wildlife Service (FWS) and (to a lesser extent) the Biological Resources Division of the US Department of the Interior, and the Forest Service (FS) of the US Department of Agriculture, for inland and certain marine species; and the National Marine Fisheries Service (NMFS) of the US Department of Commerce for other marine life and anadromous fish. The FWS and NMFS have lead responsibility for ensuring that the government and citizens do not harm endangered or threatened species and for developing recovery plans under the 1978 amendments.

For a species to receive protection under the ESA, it must first be put either on the endangered or threatened species list. As of 31 March, 1997, the FWS listed 1080 species in the United States in both categories, 59% of which are plants. Defining what a species is has not been a major source of controversy in implementing the ESA, although greater problems have arisen in distinguishing subspecies and distinct population segments (NRC 1995, p. 47). Once a plant or animal species is listed as endangered or threatened, it receives protection from any adverse effects of federal activities. The FWS and NMFS have developed and carried out recovery plans and purchased critical habitat for less than half the listed species, although typically in cooperation with state natural resources officials. Finally, once a species is improved or recovered it can be upgraded or delisted from protection under the ESA.

The ESA is jointly enforced by federal and state governments, although citizen suits are also possible. Criminal violators, upon conviction, can be fined up to \$50,000 and/or sentenced to a year in jail for each violation. Each violation is considered a separate offense. Furthermore, any illegally held wildlife or plant specimens and products can be seized by the US government. The Secretary of the Interior also has the power to suspend for up to one year any federal hunting or fishing permits or stamps issued to any person who is convicted of a criminal violation of the ESA. Rewards may be offered to citizens who furnish information that leads to an arrest.

In 1974, Michigan became one of the first of many states to pass their own ESA (cf. Dwyer and Murphy 1995). Since the initial listing of threatened and endangered species on 11 March, 1967, Michigan has become a leader in the endangered species program. The Michigan law allows additional legal protections for species that are only regionally threatened or endangered. This approach is consistent with the partial

preemption policy that generally exists for environmental protection programs in the United States (Wells 1996, pp. 28–29, Ernst 1991). The Michigan ESA also provides for a cooperative relationship between the FWS and the Michigan Department of Natural Resources (MDNR), e.g., in the establishment and use of a recovery team for the KW, among other species.

Endangered species that exist partially or exclusively on private lands raise some vexing issues for government. It has been argued, for example, that private landowners lack sufficient positive incentive to voluntarily conserve species and their habitat (Keystone Center 1995). To encourage private landowners to conserve species, Section 10(a) of the ESA provides for habitat conservation plans (HCP). Under this program, a private landowner can obtain a permit that allows an "incidental (unintentional) take" of a listed species in the course of development and other activities, as long as the landowner follows certain other steps to provide for conservation of the species. While the use of HCPs has increased dramatically in the 1990s, critics have charged that the process is time-consuming and burdensome, especially for small landowners (Mann and Plummer 1995).

Complaints by private landowners against the ESA and its administration peaked with the 6–3 vote by the US Supreme Court in *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon et al.* (1995). This case was originally brought by timber interests that had to curtail logging to protect habitat for the northern spotted owl (*Strix occidentalis caurina*); the lawsuit was joined by similar interests in Washington and also in Georgia, where land use was restricted to protect the red-cockaded woodpecker (*Picoides borealis*). In essence, the Supreme Court majority ruled that the meaning of harm in the federal definition of take "naturally encompasses habitat modification that results in actual injury or death to members of an endangered or threatened species." While this decision may have minimal application to endangered species programs such as for the KW that focus on habitat management on public lands, the ruling validates the scientific arguments linking habitat modification with species loss (NRC 1995).

ESA Implementation History: The Case of the KW

Concern about the survivability of the KW species began in the 1940s and 1950s, when nest observations showed very low production of young birds. The census of singing male KWs done in 1951 was repeated in 1961, indicating a total population of about 850–1000 birds. Population ecologists have argued that a harmonic

mean population of more than 1000 reproductive adult birds is needed to ensure even the short-term survival of a species (Lynch 1996, Lande 1995). The third decennial census of KWs, however, taken in 1971, showed a 60% drop in population. This increased the importance of efforts already under way by resource managers to address the two primary threats to the survival of the KW: insufficient suitable habitat and the high rate of nest parasitism by brown-headed cowbirds (Byelich and others 1985, Terborgh 1989, pp. 52–58). These two issues will be discussed in turn.

Habitat Management

Research on the KW has confirmed its preference for building its nests on the ground below jack pines, and occasionally red pines (*Pinus resinosa*), in the northern Lower Peninsula of Michigan, in the so-called jack pine plains or barrens (Mayfield 1960). The jack pines must be 5–20 ft tall to be suitable. Additionally, the jack pine soil must be dry, deep sand, and very pervious to water, and able to drain quickly to prevent summer flooding (Byelich and others 1985). In the Lower Peninsula of Michigan, this jack pine and soil combination is found in 29 counties, but the KW currently nests in only 10 of these.

The MDNR first established KW management units on state forest lands in 1957, well before passage of the ESA. Parts of these lands were planted with jack pines. Ironically, jack pines had to be planted because fire control efforts prevented the natural cycle of jack pine regeneration from occurring; the forest was virtually devoid of young jack pines of the appropriate size and density. The natural way of regenerating jack pine trees is through wildfires, which historically occurred in this region of Michigan about every 30–40 years (Mayfield 1993). Without fire, jack pine stands became overmature and were often replaced by hardwoods. The amount of suitable habitat and thus number of KWs may have been largest from 1880 to 1910, when lumbering and forest fires were at their peak. During this same period, however, the KW may have begun to encounter significant nest parasitism by cowbirds (Mayfield 1960, pp. 32, 145). This problem is explored in the next section.

In the late 1950s, a KW task force was formed that included members of the MDNR, FS, and notable researchers such as Walkinshaw and Mayfield. This task force set a lasting precedent for interagency cooperation (Trauger and Bocetti 1993). The FS also began to manage some of its federal lands in Michigan for the KW in the 1960s and early 1970s, which continued its cooperation with the MDNR. Importantly, habitat management for the KW at this early stage began to integrate the needs of the bird with commercial logging

rotations, a practice that has strongly contributed to the current rebound of the population. Currently about 15,000 ha of productive nesting habitat are maintained at all times.

Land management for the KW has been facilitated by the location of its breeding grounds on mostly state and federal lands. Some public opposition has occurred, however, to the need for prescribed burns and the clear-cutting of jack pines when they reach sufficient maturity. For example, a prescribed burn at Mack Lake, Michigan, in 1980 got out of control and burned almost 10,000 ha of forest, including 100 ha of warbler habitat (Probst 1986, p. 98). This burn area was about twice the previous extent of suitable habitat for the KW, and clearly has been a factor in its recovery as new jack pines grow.

For many years government scientists, among others, have searched for the KW in other regions with ample jack pines, such as Wisconsin, Minnesota, southern Ontario and Quebec. In 1988 there were eight singing males sited in Wisconsin. Another eight and then 14 males were located in four counties in the Upper Peninsula of Michigan in 1995 and 1996, respectively (Weinrich personal communication). As the KW population recovers, it is thus possible that it could expand its breeding range, which could trigger expanded protections under the ESA. Fortunately, most of the suitable habitat in the Upper Peninsula is also in the public domain.

Cowbird Trapping

The brown-headed cowbird was originally a bird of the short-grass Great Plains, where it followed the bison. It apparently followed farmers into the forested part of the continent and has developed the parasitic habit of leaving its eggs in the nest of up to 200 bird species and often destroying the host's eggs, while the cowbird follows the livestock for its own food sources. It is believed that the KW has been especially vulnerable to nest parasitism from the cowbird since the 1880s and has not developed any effective defense mechanisms (Mayfield 1960, pp. 144–145). In the late 1960s, the cowbird was parasitizing approximately 70% of the KW nests, and very few young adult KWs were being fledged. Other less significant predators include squirrels, blue jays, and garter snakes. In the jack pine habitat cowbirds were laying over 90% of their eggs in KW nests (Walkinshaw 1983, pp. 158, 180). Consequently, the KW is the most convincing case that has been made for a decline in population of a bird species because of the cowbird, and some biologists assumed that for all intents and purposes the KW had essentially been eliminated (e.g., Terborgh 1989, p. 52). Thus, control of cowbirds may

Male Birds in Michigan

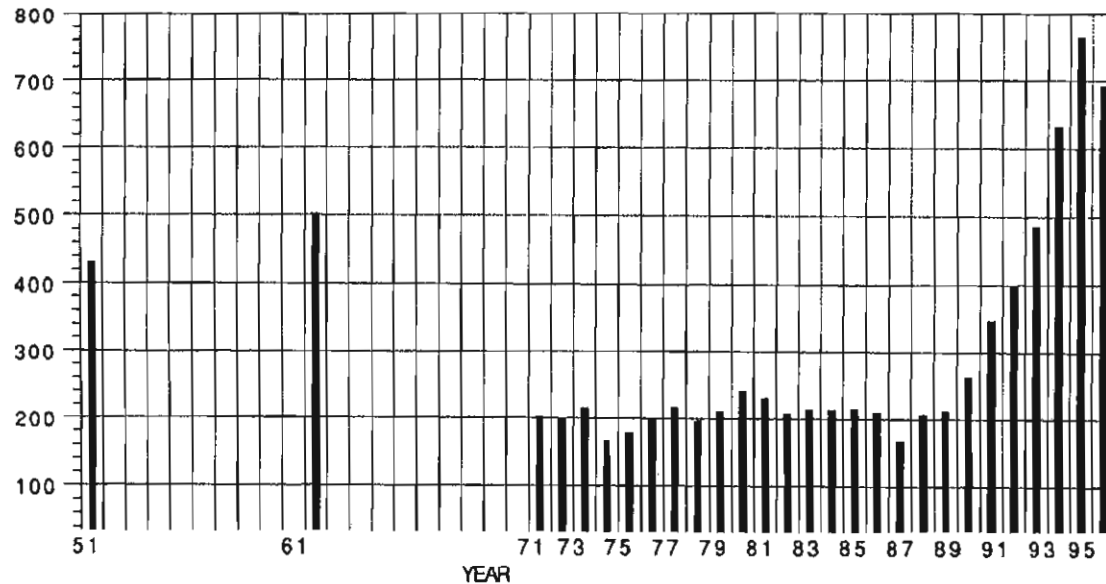


Figure 1. Results of census of Kirtland's warbler in Michigan. Source: Weinrich (1996a, and personal communication).

have been even more urgent than provision of suitable habitat for the survival of the KW.

A program to trap and remove the cowbird from KW breeding grounds began in 1972, following the sharp drop in the KW population to 201 singing males in 1971 (Figure 1). This program resulted from a joint meeting of the FS and the MDNR. The KW task force was continued as a government advisory committee. In addition to the cowbird trapping program, new restrictions were placed on human activities in the nesting areas. The FWS led this massive trapping effort and has been assisted by the FS, MDNR, and the Michigan Audubon Society. The cowbird trapping program was expanded in 1973 and 1974 and has been continued ever since. Similar cowbird control programs exist for the protection of many other bird species.

The cowbird control program has generally been considered a success for the KW (Walkinshaw 1983, Byelich and others 1985). Trapping was even extended to Michigan's Upper Peninsula in 1996 (DeCapita personal communication). The rate of nest parasitism has been reduced from an average of 70% to under 10% (MDNR 1992, p. 5). It took 20 years, however, before the reduction in the rate of cowbird parasitism combined with the provision of suitable KW habitat by state and federal officials resulted in a steady population increase. In 1995, the KW population reached an all time recorded high of 765 singing males (Figure 1). Thus, the cowbird control program may have prevented the KW from going extinct, but only slowly, in combination with habitat management and perhaps other un-

known factors, is recovery of this species now seen as possible, including eventual removal from the Endangered Species list.

The ESA Recovery Team: Interagency Cooperation and Consensus

After the ESA was passed by Congress in 1973, FWS regulations called for the establishment of recovery teams for threatened or endangered species. These requirements were strengthened by the 1978 amendments. The first such team created by the FWS was for the KW in early 1975. It included many members of the original KW task force. The KW recovery team prepared the first KW recovery plan in 1976. It was last updated in 1985. This recovery plan has been an exception under the ESA in that it has been implemented fairly quickly. It also has served as the guidepost and yardstick for the recovery effort discussed earlier. The plan's main objective "is to reestablish a self-sustaining Kirtland's warbler population throughout its known range at a minimum level of 1,000 pairs" (Byelich and others 1985, p. 14). Importantly, membership on the recovery team has been fairly divided between the FWS, FS, and MDNR, with the team leadership alternating over time as well. This has led to a reasonably equitable contribution of labor, financial resources, and research support among the agencies. The creation of the National Biological Service in the US Department of Interior (now called the Biological Resources Division of the US Geological Survey) has added to this cooperative effort.

This interagency cooperation for the recovery of the

KW has resulted in a consistent management effort over time, with a high degree of consensus among the agencies (cf. Yaffee 1991). The FWS has spent about \$3 million in habitat management and cowbird control since the early 1970s; the FS and MDNR have coordinated changes in land management on over 50,000 ha of public lands in Michigan. Even the Michigan National Guard has cooperated at its Camp Grayling property. New silviculture techniques have been developed by the FS and MDNR to improve the management of KW habitat (Trauger and Bocetti 1993), and since the first cowbird trapping program began in Michigan in 1972, this interagency effort has resulted in the capture of over 100,000 cowbirds, an amazing feat. Finally, the agencies have cooperated to conduct the annual KW breeding bird census for over 25 years, with the help of many volunteer birders.

The interagency cooperation and consensus has been made easier by the active support of several nongovernmental interest groups (Clark and others 1989) and the location of most KW breeding grounds on public property. The state and local chapters of the Michigan Audubon Society, for example, have been very active in the annual cowbird trapping program and breeding bird censuses. Some environmentalists, however, are opposed to the clear-cutting that follows the protection of jack pines for KW nesting. This opposition has been somewhat muted out of concern for survival of the KW. In addition, there are still hard feelings among some local residents because of the Mack Lake fire of 1980 (there was property damage and one fatality). The issue has become less prominent over time, largely because prescribed burns have been used infrequently in this region since then. In the private sector, the Chamber of Commerce of Oscoda County, Michigan has supported four consecutive annual KW Festivals. Sportsmen and sportswomen also have been supportive. Trout Unlimited, in particular, is managing suitable private properties for the KW along the Au Sable River.

While consensus in the KW case is not absolute, it stands in stark contrast with several high-profile instances of ESA implementation. These include efforts to protect the snail darter (*Percina tanasi*), sockeye salmon (*Oncorhynchus nerka*), gray wolf (*Canis lupus*), red wolf (*Canis rufus*), grizzly bear (*Ursus arctos horribilis*), and northern spotted owl (Houck 1993). In these and many other cases, local public support for species conservation has been tempered or undermined out of concerns for economic livelihood. This has created administrative and policy dilemmas for government agencies and has led to classic federalism battles. The threatened grizzly bear, for example, like the endangered KW, was among the earliest species listed under the ESA. State

officials in the West and property owners have called for state primacy in managing the grizzly bear population, especially with regard to takings (Sellers 1994). No case exemplifies the shortcomings of the ESA any better than the threatened northern spotted owl (Yaffee 1994, 1995). As with the grizzly bear, the spotted owl requires much more extensive habitat for its survival than does the KW. Opponents of the spotted owl have characterized the policy choice as jobs versus the environment, even if those jobs are not sustainable. The protection of jobs and the environment, in contrast, has become a critical feature of the KW recovery program.

Political Culture and Local Socioeconomic Benefits

The political culture of a region can be expected to have significant influence on the support for protecting an endangered species (Clark 1992). In the case of Michigan, many hunters and fishermen are found in the region where the KW nest. Generally speaking, these sportsmen and -women support habitat protection for endangered species, as long as it does not infringe on their right to hunt and fish. This assumption is underscored by Trout Unlimited's cooperation in protecting some private lands for KW habitat.

Perhaps more importantly, several of the communities near the KW habitat have increasingly recognized the local socioeconomic benefits that can accompany the protection of an endangered species (cf. Kellert 1985, Loomis and White 1996). These benefits began with tourism. The FS and FWS have conducted tours through a limited number of KW breeding grounds annually since 1974, between mid-May and early July. These tourists come from up to 40 US states and seven foreign nations, and generate revenue for hotels, restaurants, and other businesses. Table 1 shows the total birding tour participation since 1982 (data before then are uncertain). The annual number of participants has averaged about 1300 this decade, a significant number considering the two largest nearby communities (Mio and Grayling) have only 12,500 residents. Local officials have begun to recognize the benefits of ecotourism on employment, although there are still many residents who do not understand why such protection is required for a 5½-in. bird.

Sensing a growing economic opportunity, local businesses have worked with government officials and in 1994 developed an Annual Kirtland's Warbler Festival over a few days in spring (Miller 1995), and the Jack Pine Wildlife Viewing Tour, a 48-mile self-guided car tour. Many areas around the country now have birding festivals, but the KW Festival is the only one held for an endangered species. It is probably too early to judge the

Table 1. Kirtland's warbler public tour participants, Grayling and Mio, Michigan

Year	Number of participants
1982	955
1983	931
1984	1058
1985	985
1986	1024
1987	1000
1988	1122
1989	1216
1990	1223
1991	1096
1992	1217
1993	1331
1994	1596
1995	1317
1996	1268

Source: Data from US Fish and Wildlife Service and US Forest Service.

success of the KW Festival, although early indications are very positive (Babbitt 1994).

To fully understand how the region surrounding the KW breeding grounds has begun to embrace the potential benefits of having the KW for almost half the year, the *Oscoda County Travel Guide* produced by the Chamber of Commerce is instructive. This 80-page guide begins with a scenic picture of the Au Sable River valley on the cover, which describes the area as the "Kirtland's Warbler Capital of Michigan." Inside the document one learns of the KW monument that was built in 1963 and still stands in front of the county courthouse in Mio, Michigan, "the World's first monument to a songbird." There is a listing for Kirtland Community College, the host and coorganizer of the 1996 and 1997 KW festivals, located south of Mio in Roscommon. There are advertisements for several lodging spots that mention birding or the KW, including some package deals; several detailed articles on the KW, the Jack Pine Wildlife Viewing Tour, related plants and animals; an article on "Forestry saving the Kirtland's warbler"; an ad for obtaining postage stamp cancellations honoring the KW Festival; and numerous other sketches of the KW.

Conclusions

The ultimate measure of success for an endangered species program has to be whether or not a species is recovered. In the case of the Kirtland's warbler the species is still endangered, but is no longer on the brink of extinction as was commonly believed as recently as the late 1980s. Indeed, its population trends indicate that the recovery plan goal of a self-sustaining popula-

tion of 1000 pairs of birds may be achievable before the turn of the century, or soon thereafter, if sufficient resources are devoted to its recovery. If this species recovers it will be no accident and clearly will be attributable to three things: the control of the parasitic brown-headed cowbird, a large reestablishment of suitable jack pine habitat, and the interagency cooperation and consensus among the three agencies that jointly administer the program under Section 7 of the Endangered Species Act, i.e., the Michigan Department of Natural Resources, US Forest Service, and US Fish and Wildlife Service.

The cowbird control program in the critical jack pine habitats of Michigan has to be considered a big success. It has been continued for 25 years and has drastically reduced the rate of nest parasitism of the Kirtland's warbler. Importantly, this program has been a partnership among the agencies and nongovernmental organizations. Without the program, many ecologists believe that the Kirtland's warbler would have become extinct in the late 1970s. Yet it was not until suitable jack pine habitat was reestablished by the late 1980s that the bird began its upswing in population in the 1990s. Since habitat management efforts for the Kirtland's warbler have been underway for 40 years and primarily on public lands, the payoff has been slow in coming, but well worth the wait for conservationists. The 40-year history of the Kirtland's warbler task force, which evolved into the recovery team, is truly amazing in the annals of endangered species programs for both its longevity and its success in the face of very difficult odds.

Just as every endangered species has unique habitat and food requirements, every endangered species program has some unique characteristics and time frames for achieving recovery. Nonetheless, there are some lessons from the Kirtland's warbler case for other endangered species. For example, in cases where there are many and diverse interests (including those of the general public) in the recovery program, consensus on a recovery plan is critical at the earliest possible date. In addition, it is important to be realistic about what can be accomplished in any time frame and to be patient and persistent in recovery efforts given the factors limiting the population size of an endangered or threatened species. Irrespective of the exact size of the future KW population, these lessons undoubtedly will be the greatest legacy of the KW recovery program.

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