article by DAVID R. ZIMMERMAN
painting by Peter Parnall
Champions of Kirtland’s warbler have run out of moves and possibly time, and there is 

Panic in the pines

Few birds have attracted such passionately dedicated friends as Kirtland’s warbler. This tiny, rare gem of a songbird has called forth the best efforts of an unusual band of skilled and distinguished champions. Today, however, they are grief-stricken and panicked. Despite their best efforts, they appear to be losing the battle for the bird’s survival. Last June, in their annual census, they found only 167 singing adult males, indicating there remained only that many active breeding pairs of Kirtland’s warblers. This was a 23 percent drop from the previous June; a 66 percent drop in just 13 years.

Only a year ago, before the 1974 count, the warbler’s friends believed they had identified and corrected the major threat to its existence. They were hopeful that its numbers were rising. Now, with no clear notion where their energies and the not inconsiderable funds available might best be spent, they are trying to decide what to do next. They are hoping, perhaps praying, that they can luck onto something to forestall the bird’s extinction. They are driven by the knowledge that there is not much time left.

Kirtland’s warbler (Dendroica kirtlandii) is a bird of entrancing beauty. Its colors—blue flecked with black above, pale lemon-yellow below—are of breathtaking purity when seen close-up on its breeding ground in the sharp light of the summer sun. It is a perky, jaunty bird, a persistent tail-jerker that is remarkably unconcerned by or unafraid of man.
Since its discovery 125 years ago its numbers always have been incredibly few—in the hundreds or low thousands, rather than in the tens or hundreds of thousands in which some species of the wood warbler family (Parulidae) may be reckoned. While it is a large bird as warblers go, the average breeding adult weighs less than half an ounce. Thus its current chief admirer and champion, Harold Mayfield of Waterville, Ohio, could remark last May that “all the Kirtland’s warblers in existence would fit into one large shopping bag.”

Clearly, Mayfield said, the species is not of concern because of its biomass, which is inconsequential. Or its environmental impact, which is slight.

It is valued rather for other reasons. Its beauty. Its rarity. Its elusiveness. The frustrating challenges that it seems to impose on all who would know or assist it.

The bird is named for Dr. Jared P. Kirtland, a pioneer physician and naturalist in northern Ohio, on whose farm near Cleveland the type specimen was shot. The date: May 13, 1851. Kirtland had studied the birds of Ohio with great care. A century later, in a way that he could not have anticipated, his data would contribute importantly to efforts to save his namesake bird.

The first reported specimen had been shot on northward migration. Thirty years passed before the wintering ground whence it came—the Bahama Islands—was discovered. Only after fifty-two years, in June 1903, was the breeding ground, toward which it was bound, discovered.

An ornithologist from the University of Michigan Museum of Zoology had gone to fish the Au Sable River, in western Oscoda County in the Lower Peninsula of Michigan. When he heard an unfamiliar bird, he shot it and fetched it back to Ann Arbor, where the museum’s curator of birds, Norman A. Wood, identified it. Wood, who was a taxidermist and self-taught biologist, quickly retraced his colleague’s steps to find a Kirtland’s warbler nest.

He reached a timber tract of several hundred acres that had been burned over by a forest fire several years before. In the ashes, young jack pines (Pinus banksiana) had sprung up like Christmas trees between the charred snags. Here Wood’s search ended. His excitement is clearly revealed in jottings that he made in his pocket notebook, transcribed and published by Mayfield in his authoritative life history, The Kirtland’s Warbler. Wood wrote:

“Leaving the river bottom I climbed to the top of the first plain and walked slowly along . . . suddenly I heard a new song, so rich, loud, and clear, I knew it must be the one I was in search of . . . After a long time I saw him alight in a low bush and sing . . . Its song, the most beautiful of any warbler, is so wild and clear and has such a ringing, liquid quality, I feel well repaid for my trip by this one experience . . .

“I watched a few minutes longer and saw the female in the low jack pines. I watched her and she seemed very uneasy . . . I began looking carefully on the ground, as I had made up my mind it would be found there. Suddenly I saw the nest! . . . In [it] were two young birds a few days old and, as luck would have it, one beautiful egg, pinkish white and thinly sprinkled with chocolate brown spots gathered in a wreath at
the larger end.”

Wood saw, heard, and noted much that later would be confirmed as species traits of Kirtland’s warbler in its breeding season. Foremost was the richness of the male’s song, the territorial claim and threat, which a keen-eared listener, poet Hazen Miller, has transcribed as:

“Please, let me be—let me be, will you, please?”

The song lasts one to one and a half seconds. It may be repeated ten times a minute and over two thousand times in a day, and it is rare that a breeding male will let even five minutes of a fine June morning pass without its utterance. This bent for frequent loud singing, almost always from within the male’s several-acre territory, has been of inestimable value to conservationists: it permits them to find, map, and count all breeding pairs of a species that at other times is virtually never seen.

Jack pines cover half a million acres of Michigan’s Lower Peninsula. But the warblers have never been found outside a dozen counties in which these trees are very abundant. Norman Wood discovered the first nest near the center of this breeding ground, and no nest has been found more than 60 miles from that spot. As Kirtland’s warbler numbers dropped in recent decades, its breeding area shrank toward the center of its range. By 1973, all singing males, except for one tiny isolated group, were found in eight colonies in Crawford, Ogemaw, and Oscoda counties.

Under natural circumstances, the jack pine tracts the warblers favor—extensive growths of uniform-sized trees—occur only after a forest fire. When all vegetation in an area has burned, the jack pines regrow synchronously, and so reach proper height together.

In primeval times, forest fires were caused by lightning or set by Indians and sometimes burned vast areas before being extinguished by rain. When loggers moved north after the Civil War to strip the Michigan forests of their virgin pines, even more devastating fires, fueled by slash, occurred. Eventually, forest fires were controlled and the Smokey Bear philosophy—that all fires are bad—became holy writ. Only recently has that philosophy been challenged.

With fewer fires, there were fewer synchronous stands of young jack pines—and fewer warblers. This may have started the decline of the species. No one
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will know. What is certain is that much of the conservation effort for Kirtland’s warbler is directed toward the creation and protection of suitable breeding habitat. Forest areas are burned for it; areas that happen to burn accidentally are protected; staked stands of jack pines are planted on other cleared places, in the hope they will appeal to the warblers. State and federal forestry officials take great pride in their work for the warbler, which undoubtedly improves its chance for survival. If breeding habitat were its only need, the warbler’s problems might have been solved, its survival assured. However, a different threat—identified early but long discounted—emerged as the primary force that appeared to be pushing the songbird toward extinction.

FOR TWO DECADES after Wood found the first nest, there was little serious research on Kirtland’s warbler breeding behavior. Then, in the spring of 1922, Wood had an undergraduate student who became greatly intrigued by his accounts of the bird. The student was an extremely bright, academically precocious young man of 17. He was the scion of an extremely wealthy Chicago family and was headed for a career in law. He was an avid birdwatcher and bird collector and reportedly had a special permit to shoot birds in the Chicago parks. His name: Nathan F. Leopold Jr.

Adventurously, Leopold decided to retrace Wood’s steps of 1903 to find and study Kirtland’s warbler. He and another young man spent five days in the breeding area in 1922 but saw no sign of the bird. The next year, in mid-June, Leopold returned with several companions. Near a different stretch of the Au Sable River, an unfamiliar song was heard. All piled out of the car. Leopold recalled:

“We fought our way several hundred yards through extremely dense jack pine, when [we] simultaneously caught a view of the singer perched in a large pine tree . . . a fine adult male D. kirtlandii in full nuptial plumage.”

With much difficulty, Leopold’s party located some Kirtland’s warbler nests. In one of them, they found but one nestling warbler—not the four or five that might have been there. They also found an egg and a second, much larger hatching of a different species—the brown-headed cowbird (Molothrus ater).
As Leopold and his companions watched and photographed the birds, they could see that the young cowbird "was getting all of the food" and was crowding out the young warbler. The watchers switched roles, from observers to conservers, and committed a precedent-setting act. Leopold recounted:

"By one o'clock we decided to remove the young cowbird . . . We did this and then returned to the hotel for lunch."

Leopold spent only five days watching the warblers, but in that time he graphically described the cowbird as a new danger that he felt was threatening the species with extinction:

"It has long been a subject of speculation why the Kirtland's warbler, which raises as large a brood as most other warblers, and which apparently has no more natural enemies than the other warblers, should continue to be so extremely scarce. I suggest as a reason for this the fact that the bird is largely preyed upon by the cowbird. Whenever we saw a singing male Kirtland's there were a number of cowbirds perched about in the tall dead trees, apparently in quest of the same thing for which we were looking . . . It is greatly to be feared that D. kirtlandii may soon be another of the American birds on the extinct list."

Leopold submitted the report of his expedition to The Auk, journal of the American Ornithologists' Union, which published it in the issue of January 1924. Regrettably, little heed was paid to Leopold's warning. Nor was his example of destroying the cowbirds followed. Leopold himself, though he was to sustain a lifelong passion for Kirtland's warbler, was to have little subsequent influence on its fortunes. In fact, 41 years were to pass before his next visit to the breeding ground.

On May 20, 1924, a few months after his Auk report was published, while the Kirtland's were building their nests of the year, the 19-year-old Leopold and a friend, Richard Loech, lured a neighbor boy into a car, killed him, and left his body in a culvert near a swamp that Leopold had frequented as a birdwatcher. The young men were quickly arrested and charged with the murder, which came to be called "the crime of the century." Only masterful pleading for mercy by their lawyer, Clarence Darrow, spared them the gallows, and
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they were sentenced to life imprisonment in the Illinois State Penitentiary.

Unreported by Leopold in his Auk account is the fact that he shot two adult Kirtland's warblers at one nest and also took their three nestlings, a baby cowbird that was with them, the nest itself, and a three-foot-square chunk of the surrounding habitat, including a jack pine. This remained unmentioned because Leopold lacked a license to collect the species, which even then was highly protected.

The specimens were shipped by train to Chicago, where a taxidermist at the Field Museum of Natural History prepared a lifelike display. But when the habitat group was finished, Leopold was in prison.

"I wanted to give the group to the Field Museum," Leopold said later, "but I wanted awfully to see it first. Warden [John] Whitman was most gracious about granting permission, and one day Sven, the chauffeur who had been with our family since I was six months old, brought the large case down to the prison. I was called to the warden's office and permitted to admire it for half an hour."

The exhibit went back to the museum but was never displayed, contrary to Leopold's belief at the time. It remained in storage 39 years, still in its original wrappings.

Just before Leopold was paroled in 1958, a Kirtland's warbler worker, Douglas Middleton of Detroit, wrote to ask for a reprint of Leopold's Auk report. A correspondence grew up between Leopold and Middleton, and then an acquaintance, for Leopold, who had moved to Puerto Rico, was anxious to revisit Kirtland's warbler country. In 1964, Middleton took him there. "That trip, getting to know you, meeting the other K.W. enthusiasts, and, of course, renewing acquaintance with The Bird constituted a glorious experience," Leopold wrote.

Middleton had won Leopold's trust and affection, and Leopold told him about the habitat group, still stored at the Field Museum. He said he still owned the display and wished now to give it to a museum in Michigan. He had ruled out the University of Michigan because it had the other habitat group for the species, collected by Norman Wood in 1903.

Middleton recommended the Cranbrook Institute of Science in Bloomfield Hills, a suburb of Detroit. Leopold agreed, and the display arrived there in 1965. The flora was refurbished, and it may be seen in the Ecology Hall as part of an exhibit called "One Does Not Live Alone." Nathan Leopold is not identified as the donor.

FOR ALL OF the 33 years that Leopold remained in prison, the relationship of Kirtland's warbler and the brown-headed cowbird was much studied, but little was done about it. In large part this was because the warbler's next champion, intensively devoted to the bird as he was, did not agree that the cowbird was a mortal peril. Even if he had thought that it was, it is not clear, for reasons of temperament, that he would have done anything about it.

He began his doctoral work in zoology at the University of Michigan in 1925. Like Leopold, his schoolmate, he became an associate of Norman Wood, whom he later was to succeed as the university museum's curator of birds. His name: Josselyn Van Tyne.

Van Tyne was one of the pillars of American ornithology in this century. Judged by his tight-lipped countenance and the accounts of his field companion, friend, and disciple, Harold Mayfield, he was an exemplar of upright living, a true practitioner of the Protestant ethic. "To the end," Mayfield says, "his work was his life."

In Van Tyne's severe self-regimen, Kirtland's warbler, whose breeding ground he first visited in 1930, seems to have been the moment of light, joy, and inspiration. Mayfield says the few spring weeks Van Tyne spent each year in warbler country was "half work and recreation, the one time of the year just to get away and have some fun."

For years, Van Tyne had said and perhaps believed that his life history of Kirtland's warbler would be his magnum opus. Yet when Van Tyne died in 1957 at the tragically early age of 54, no manuscript could be found, not even a draft. He left only a stack of 3-by 5-inch cards and a few scattered notes, cryptically written and difficult to decipher.

In his lifetime, Van Tyne published only two dozen pages on Kirtland's warbler. His most popular contribution certainly is his shortest: his signed 300-word
entry for the species that has appeared in most of the 1,400,000 copies of Roger Tory Peterson’s A FIELD GUIDE TO THE BIRDS.

Fortunately, Van Tyne’s labors were not wholly lost. While it had been his preference, Mayfield says, “to work silently on his own independent investigations” with “little effort to coordinate his efforts closely with others,” one person had grown quite close to him—Mayfield himself.

Mayfield retired early from his job to spend more time on nature, birds, and particularly Kirtland’s warbler conservation. He leads, shapes, and coordinates the efforts of the several government agencies and private groups that protect the bird, and it is his diplomacy, perhaps more than any other single factor, that has sustained their unity of purpose. The bitter rifts and conflicts that have hindered other conservation efforts seem not to have paralyzed the warbler’s champions.

Now in his mid-sixties, Mayfield is a tall, courtly man, a gracious leader, but one who brooks no challenge to his authority. He is a man who knows his mind, knows what he wants, and also knows how to work effectively with others to get it. In short, Mayfield is a consummate politician.

His achievements in the bird world reflect these abilities. Like Van Tyne he was president of two of the principal North American ornithological organizations, the American Ornithologists’ Union and Wilson Ornithological Society, and last year he added a third, becoming president of the Cooper Ornithological Society. That he is the first person ever to achieve this is all the more remarkable in light of the fact that he is not by training or by profession an ornithologist.

Mayfield is not even a biologist. He says he preferred the physical sciences, and he took his master’s degree in mathematics. Much of his working life was spent with Owens-Illinois, the world’s largest container manufacturing company, and he became the firm’s personnel director.

Judged by his own account, Mayfield is an achiever who has not hesitated to abort one promising course in order to pick up and succeed at another. He says he has always enjoyed the out-of-doors, and identified his first bird from a guidebook when he was six. He was an

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accomplished athlete, played tennis and semiprofessional basketball, and then, in his late twenties, asked himself which of his hobbies would provide the most fun in the years ahead. He put down his tennis racket and returned to bird study.

This led Mayfield to Van Tyne. He submitted several notes to the ornithologist, who was editor of The Wilson Bulletin, and they exchanged letters. When Mayfield needed to do library research, he would drive the 50 miles from his home near Toledo to the University of Michigan Museum.

Mayfield genuinely liked “Van,” and Van Tyne reciprocated, in part because of what Mayfield was not—a professional ornithologist. “Van was an intolerant man in some ways,” Mayfield says. “His standards were so high that he didn’t find many ornithologists who had his full respect. He thought a lot of them were scoundrels. But I wasn’t a professional. He didn’t judge me in that context. There was no jealousy on either side. That made it very feasible for me to be a nonornithologist whom he could be close to.”

Van Tyne invited Mayfield to share in his Kirtland’s warbler research, and for many springs the two of them visited the breeding ground together. Their studies on the warbler and on the cowbird’s impact are carefully reported in The Kirtland’s Warbler, which Mayfield published three years after Van Tyne’s death. For the reluctant author that he said he was, Mayfield has more than done justice to his friends, to himself, and to his subject; the book surely is a model of its genre, the species monograph. It won the AOU’s coveted William Brewster Award for research, an honor that pleases and amuses Mayfield. “Although most of my professional colleagues in ornithology—indeed nearly all—are more than cordial to me,” he says, “I should think a few find it a little galling that an amateur should win the highest award for a scientific work in American ornithology.” Van Tyne might gleefully have agreed.

Cowbirds Intrude on Kirtland’s warblers in various ways. Unlike some hosts, which throw them out, the warblers incubate the cowbird eggs as their own. The cowbird eggs are larger, and in brooding them the female warbler tends to leave her own eggs out to the side, uncovered. They get less warmth and so the hatching rate is lower than in unparasitized nests.

Greater damage is done after hatching. The cowbird eggs usually hatch about two days before the warbler eggs. The two-day-old cowbird weighs eight times as much as a hatching warbler, and by the third day its weight is equal to that of an adult warbler, whose own nestlings the cowbird steps upon and may kill.

Mayfield has no record of a warbler hatching having survived in a nest with two older cowbirds. In nests containing only one older cowbird, he knows of none that has fledged more than two warblers.

What did their extensive field observations and data mean? Here Van Tyne and Mayfield part company. Van Tyne scoffed at those who said the cowbird was pushing the warbler to oblivion. “There seems to be no reason to share Leopold’s fear that the cowbird ‘may soon’ exterminate this warbler,” he said.

Van Tyne and Mayfield left cowbird eggs where they found them in Kirtland’s warbler nests on the grounds they were studying the problem. One person who was less scientifically fastidious was Michigan conservation officer Verne Dockham, who lived nearby. One field worker who knew them all says: “Dockham used to puncture the cowbird eggs, and that got Van Tyne very upset!”

Mayfield changed only slowly from observer to conserver. Van Tyne, he says, never calculated any survival data. Mayfield did, and as he used his mathematical expertise to analyze their field data, the threat became strikingly clear:

Of every 100 warbler eggs in parasitized nests, 41 are removed by cowbirds and an additional six fail to hatch because the presence of cowbird eggs hinders their incubation. Of the 53 warblers that hatch, 31 will die from competition with the cowbird chicks, leaving only 22 warblers to fledge.

“As a direct result of the cowbird,” Mayfield says, “78 percent of warbler eggs in parasitized nests fail to produce fledglings.”

In the period that Mayfield and Van Tyne worked together, 55 percent of warbler nests were parasitized. The cowbird’s inroads continued to rise in the next fifteen years, until 70 percent of nests were parasitized in some
These losses are far greater than the cowbird inflicts on any other host species. Rarely, among other hosts, are more than one or two percent of nests parasitized. Many species, moreover, have ways to protect themselves. They throw out the cowbird eggs, cover them with a new nest floor, or abandon the nest and start over. Other birds regularly produce second or third clutches after the cowbirds have finished laying their eggs. Kirtland’s warbler practices none of these defenses. “For Kirtland’s warbler,” Mayfield says, “the cowbird is the man who came to dinner!”

The cowbird, Mayfield explains, came only recently to Kirtland’s warbler country. It is believed to be native to the shortgrass prairies west of the Mississippi River, where it foraged behind the bison. It moved eastward, experts believe, when the forests were cleared and farmers brought in grazing animals, which the cowbirds follow as they did the buffalo.

This hypothesis was difficult to prove, since the cowbirds arrived in most settled areas ahead of ornithologists. Nevertheless, Mayfield did find some compelling evidence that the cowbird and Kirtland’s warbler were recently met. The best proof came from none other than Dr. Jared Kirtland, who had prepared the first checklist of Ohio’s birds in 1838. The state already was heavily farmed, but the cowbird seemed hardly to have arrived. It “is admitted into our catalogue on rather doubtful authority,” Kirtland wrote. A similar checklist for Michigan listed the cowbird as present, but an ornithologist working in southern Ontario failed to find it before 1840. “It would appear,” Mayfield says, “that the cowbird began to move into the settled lands of Ohio and Michigan from the southwest just prior to 1840.”

Because Kirtland’s warbler was a marginal species and unprepared, its population soon was devastated by the cowbird. How devastated no one knew. No one had counted them. No one had ever tried to count the population of any small songbird. Mayfield proposed to try.

Van Tyne, the solo scientist who could not delegate authority, said that such a count could not be done. Harold Mayfield, the businessman who was at ease
with delegated responsibility and teamwork, believed that a warbler census was feasible, and he set about to do it.

In 1951, Mayfield and 32 other census-takers went afield. They exploited the fact that singing males sing frequently each day but rarely leave their nesting territories. They counted singing males, found 432, and doubled this number to reach a total of 864 breeding adults.

The second census was conducted ten years later, in 1961. Mayfield was certain it would show a marked decline, for cowbird parasitism clearly was getting worse. But to his surprise the 49 census-takers found 502 singing males, suggesting that the warbler was holding its own and might even be increasing in numbers. Mayfield says these statistics did not seem wholly believable, but they were the best data available. He lived uneasily with them for a decade.

In 1971, 48 census-takers were afield. Their findings, Mayfield says, “confirmed my worst predictions.” Only 201 singing males were found, a decrease of 60 percent in ten years.

Mayfield and the warbler’s other friends panicked. Clearly, something had to be done.

The initiative came from biologists G. William Irvine of the U.S. Forest Service and John Byelich of the Michigan Department of Natural Resources. A strategy meeting was convened at the University of Michigan Museum on October 30, 1971. Mayfield reported: “The bird has collapsed down into the center of its entire historical breeding range, leaving the periphery virtually empty.”

The focus of Mayfield’s report and the discussion was the cowbird. The minutes say: “Mayfield did not have confidence in the hypothesis that the trouble is in the Bahamas. The warblers are not limited to pine habitat on their wintering grounds, and are found in both deciduous and pine habitats. Development of the islands has occurred on the shores, while the interiors have gone back to scrub. [Mayfield] would not recommend spending research funds there until someone learns how to find the birds.”

Despite Mayfield’s doubts, there was a recommendation that a new effort be made to find and study the warblers in the Bahamas. Naturalist Bruce Rada-baugh of Hillsdale agreed to go.

The urgent recommendation of the day was that cowbirds be killed. The idea was not new. Mayfield had broached it in his monograph a decade before but had not pursued it.

The first experimental efforts to control cowbirds in a systematic way had been made in the mid-1960s. The tool used was the shotgun, and the first person to attempt it was biologist Nicholas Cuthbert of Central Michigan University in Mount Pleasant. “This is not very enjoyable work,” Cuthbert said. “I am not a hunter.”

The central question was: Would it help? Even in its greatly reduced range of 1971, Kirtland’s warbler bred in 27 different mile-square surveyors’ sections. Assuming that each section attracted cowbirds from only one other section, more than 50 square miles would have to be secured against a stealthy, cunning, wholly mobile interloper who customarily strikes by the dawn’s earliest light, between four and six o’clock in the morning.

In their first attempt to control cowbirds in 1965, Cuthbert and Radabaugh hid in a Kirtland’s warbler colony at various times of day. They used a portable tape recorder to play cowbird calls, and when cowbirds flew near to investigate, they shot them. This method yielded some dead cowbirds—and some sore shoulders—and they decided a better method was needed. The obvious solution was a trap. Mayfield found the design for a suitable one in an agricultural journal. It was a trap used on grain farms to control blackbirds.

As used for cowbirds, the trap is made almost wholly of chicken wire. It is square, 16 feet on a side, and 6 feet high. In the center of the top panel, like an inverted smokestack, is a recess 4 feet square and 4 feet deep, the bottom of which is made of a slightly wider mesh than the rest of the structure. Cowbirds land on the baited trap and then, wings tucked, drop through the wider mesh. Usually they try to escape by flying at the sides of the cages, where the smaller mesh defeats them. Even if they fly upward, toward the larger openings through which they entered, their flapping wings make them too wide to pass. The traps are baited with sunflower seeds, and several cowbirds are kept inside to decoy others.

At the 1971 strategy meeting, Cuth-
bert and Radabaugh reported promising success. In 1966, in one warbler area where there had been no cowbird control, 25 out of 29 warbler nests had been parasitized, or 86 percent. The following year, with cowbird control, parasitism fell to 9 nests out of 19, or 47 percent. From 1965 to 1971, Radabaugh added, 21 percent of nests in control areas were parasitized, less than one-third the rate in uncontrolled areas.

Cuthbert said that in one of his traps he caught 800 cowbirds in a single season. Clearly there were a lot around. And each female cowbird lays a lot of eggs, a dozen or more a year. Thus as few as 20 female cowbirds could put one egg in every nest of the 200 breeding pairs of remaining Kirtland’s warblers.

While traps were being built for an all-out assault on the cowbird, Radabaugh spent a frustrating and disturbing winter in the Bahamas, looking for Kirtland’s warblers. He investigated five of the larger islands on which the species previously had been seen or collected. He found none.

What he did find was that four of these islands—Grand Bahama, New Providence, Great Abaco, and Andros—have supported extensive stands of Caribbean pine (Pinus caribaea), on which a pine-land breeder like Kirtland’s warbler might feel particularly at home in winter. Starting in 1956, Radabaugh learned, intensive timbering had been introduced in all of these islands except New Providence. While earlier logging operations had left trees under eight inches in diameter, every tree down to four inches in diameter was now being harvested, essentially clearing the land. In many areas, forest fires finished the job. Whole islands, Radabaugh reported, were denuded of pines.

Radabaugh noted that the timbering coincided closely with the warbler’s decline, and could explain it. “Such a hypothesis,” he said, “rests on the point of whether the species relies on pine-land in winter. It is Mayfield’s contention that they [rather] rely on scrub.”

The major and most destructive timber operator on these islands, Radabaugh added, was Owens-Illinois, the company for which Harold Mayfield formerly worked. This, of course, leads to suggestions that it has been difficult for Mayfield to objectively evaluate the harm that may have been done to Kirtland’s warbler by Owens-Illinois.

Mayfield concedes that he may be biased but nevertheless stands by his belief that timbering is not the problem. He notes that pines covered 18 percent of the Bahamian land surface, but says that no more than one-third of the forest area was cut in any seven-year period. Moreover, the 16 square miles of pines on New Providence were not cut.

In all, by Mayfield’s own analysis, 645 square miles of Bahamian pineyards were cut in the last two decades. Only 121 square miles, much of it in small stands, remains uncut.

 Destruction of wintering habitat is only one hypothesis, and perhaps not the strongest one, to explain the warbler’s decline, Radabaugh conceded. But, he insisted: “If the population continues to decline in the face of new breeding habitat now coming in, and a successful and expanded cowbird control program, then we might return to the Bahama pineland hypothesis. By then,” he added with bitter anger, “it would only be to seek an explanation for the warbler’s passing, however, because the damage has been done already.”

Trapping of cowbirds at all Kirtland’s warbler breeding colonies began in the spring of 1972. Last June Mayfield and several other warbler workers presented a symposium before a couple of hundred birdwatchers and ornithologists at the Wilson Ornithological Society’s annual meeting held at the University of Michigan’s Biological Station at Pellston, not far from the warbler’s breeding area. One speaker was the chief cowbird trapper, biologist William Shake of the U.S. Fish and Wildlife Service, a specialist in the control of nuisance animals in agriculture.

The trapping program, Shake reported, had been enormously successful. In the first year, he had operated 15 traps from mid-May to mid-July. Including a few hundred birds that had been shot, a staggering total of 2,200 cowbirds had been removed from the nesting area.

An attempt had been made to move some cowbirds, rather than kill them, Shake said. These birds had been banded and released as far as 50 miles away, but they soon returned and reentered the traps. So, he said, most cowbirds now are killed. They first are shooed into a

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smaller cage, then into a plastic bag, the mouth of which is attached to the exhaust pipe of a car. When the motor is started, carbon monoxide kills them almost instantly.

In 1972, Shake reported, cowbird parasitism occurred in only two out of 31 warbler nests in one closely watched study area. In 1973, he operated 18 traps and removed 3,305 cowbirds. Of 33 warbler nests that were closely watched, not one was parasitized by cowbirds. Each nest, on the average, yielded 2.79 fledglings—two to three times the rate of years when cowbirds were not controlled.

Meanwhile, Mayfield had organized annual censuses. The 1973 count was not too discouraging: In 25 mile-square sections of four counties, the enumerators found 216 singing males, up 15 from 1971. The “gloomiest view,” Mayfield said, was that this rise was no rise at all, and might only represent a fault in the censusing method. The most optimistic view was that “a good many warblers may not breed the first year, and so wouldn’t be reflected in our count.”

And so the stage was set: 1974 was to be a critical test.

The warbler workers held their symposium just before their 1974 census, so the most important question remained unanswered. The indirect indices, however, looked better than ever. Bill Shake had increased his traps to 22, and they were proving to be extraordinarily effective. By June 3rd, he had caught over 3,000 cowbirds and so was running ahead of previous years.

A mile-square stand of jack pines is a surprisingly large area when one beats his way through it, looking for birdlife. Mayfield remarked that it had seemed simplistic to believe that two traps, one at each end of a warbler colony, could make great inroads against the many cowbirds that might be in between, or in adjacent areas. Yet the traps seemed to be doing just that. “It’s like a vacuum cleaner!” Mayfield exclaimed. “It sucks the cowbirds out of a whole area.”

Freed of their yoke, the warblers were producing more young. One of the oldest and most respected warbler field workers, Dr. Lawrence Walkinshaw, a retired dentist, said that cowbird parasitism in his study area had fallen from 75 percent of nests to zero. Most warblers, he said, now were incubating full five-egg clutches. Over several study
areas, he added, the number of young had risen from 1.31 per nest in 1966–71, to 3.38 per nest in 1972–73. In other words, each Kirtland’s warbler nest now was producing two more warbler young per year than it had just three or four years before! Said Walkinshaw: “There is no reason why Kirtland’s shouldn’t increase if we continue this program!”

But three months later, when the 1974 census was complete and the results tallied, there was dismay. Only 167 singing males, representing 334 breeding adult birds, had been found. This was a 23 percent decrease from 1973.

More certainly now than ever before, Kirtland’s warbler stood at the brink of extinction. More frustratingly than heretofore, its many dedicated friends seemingly had run out of moves. There was not one new gambit that promised to stem the fatal decline, and perhaps there was no time left anyway.

One thing was clear: Cowbird control was proving to be enormously successful. Without it, Mayfield said, Kirtland’s warbler already would be virtually extinct. Why, then, did the warblers continue to drop in numbers?

There is only speculation, and quite speculative speculation at that:

✓ Some warblers were missed in the census.
✓ Cool rainy weather in June 1974 depressed breeding and/or discouraged singing males.
✓ The present breeding habitat is qualitatively or quantitatively inadequate.
✓ Something is killing warblers on migration, storms perhaps.
✓ A new factor is taking a toll, pesticides perhaps.
✓ Something is wrong on the wintering ground, lumbering, or competition with other species, or perhaps deaths owing to abnormally dry winters that have been recorded recently in the Bahamas.

None of these hypotheses offers the champions of Kirtland’s warbler much to grab on to.

Erratum
As a large number of herpetologically inclined readers have pointed out, the snake shown on page 21 of the March issue of Audubon was misidentified. It is a nonvenomous and harmless diamond-backed water snake (Natrix rhombifera), rather than a cottonmouth.