Saving the Eastern Loggerhead Shrike

Fifteen Years of Recovery Success

Elaine Williams and Jessica Steiner

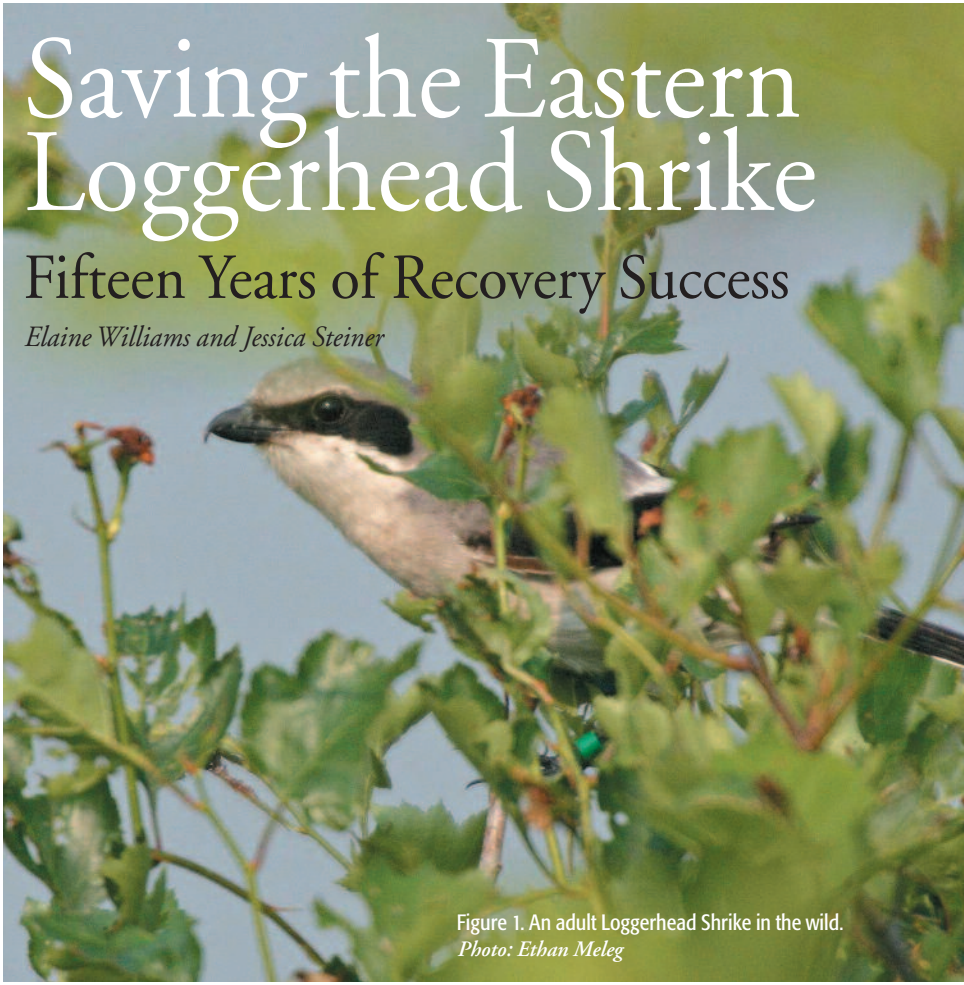


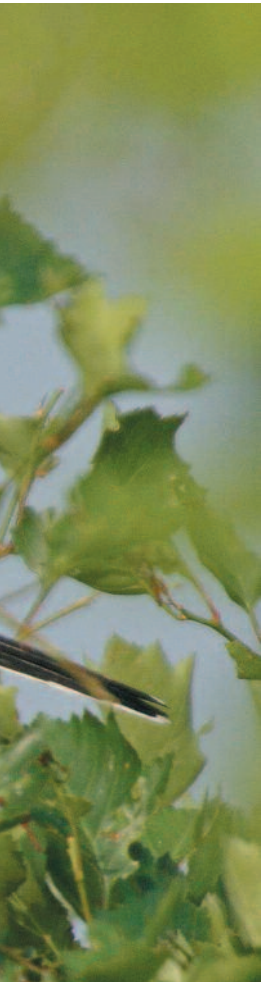
Figure 1. An adult Loggerhead Shrike in the wild. *Photo: Ethan Meleg*

Introduction

The Loggerhead Shrike *Lanius ludovicianus* (Figure 1) is both a songbird and a bird of prey, a combination unique to shrikes. Because it lacks strong talons to grasp its prey, the black-masked bird impales its meals on thorns and barbed wire, earning the nickname of "butcher bird" (Figure 2).

A little smaller than an American Robin (*Turdus migratorius*), the Eastern Loggerhead Shrike (*L.l.migrans*) is one of 11 subspecies of Loggerhead Shrike found in North America (Miller 1931).

Figure 2. Shrike prey impaled on a hawthorn. *Photo: Mark Wiercinski*



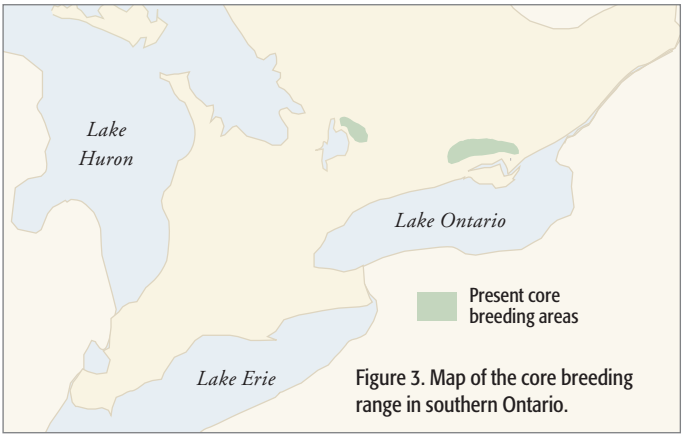


Figure 3. Map of the core breeding range in southern Ontario.

However, recent work recognizes only 9 subspecies (Yosef 1996). It was once a common sight across large areas of Manitoba, Ontario, Quebec, and the eastern United States, inhabiting cattle pastures and shortgrass prairies, where it could easily find the mice, crickets, and snakes that form its diet.

Like most North American grassland bird populations, however, shrike numbers have been declining steadily. Over the past 40 years, Loggerhead Shrike populations shrunk by 70% (Butcher and Niven 2007), with the eastern subspecies showing the steepest drop. Since 1970, breeding populations in Canada and the northeastern States have been nearly extirpated (Pruitt 2000).

As a result, Eastern Loggerhead Shrikes have been listed as endangered both federally (Migratory Birds Convention Act 1994, Species at Risk Act 2003) and in several provinces, including Ontario (Endangered Species Act 2008). According to 2008 estimates, there are currently fewer than 40 known breeding pairs across the country (K. De Smet pers. comm., Wildlife Preservation Canada unpublished data). Most are concentrated on the limestone alvars of Carden and Napanee in southern Ontario (Figure 3), with a few elsewhere in Ontario and Manitoba.

What lies behind the dramatic drop? A number of factors have been suggested, including habitat fragmentation, pesticides, predation, availability of prey, climate change, and collisions with vehicles (Pruitt 2000, Environment Canada 2006). To date, no "smoking gun" has been identified, although more research is required into mortality factors on the as yet unknown migration routes and overwintering grounds (Smith 2001).

A Strategy for Recovery

In the face of plummeting shrike numbers, a National Recovery Plan for Loggerhead Shrike was published by Johns *et al.* (1994). Its goal was to maintain or enhance wild populations of Loggerhead Shrike nesting in Canada to the point they could be removed from COSEWIC's list of threatened or endangered species (Smith 2001).

Despite very limited funding between 1994 and 2000, the multi-agency Recovery Team charged with implementing the Plan succeeded in achieving an impressive number of the measures it called for. These included: monitoring the remaining wild population, establishing a captive breeding program, assessing the genetic make-up of the wild and captive birds, and launching a habitat stewardship and restoration program to protect disappearing cattle pasture (Smith 2001).

The financial picture brightened in 2000/01 when the program secured significant funding from the newly established federal Habitat Stewardship Program, as well as additional funding for other recovery activities. Then, in 2003, Wildlife Preservation Canada (WPC) signed a five-year Conservation Agreement with Environment Canada-Ontario Region, under Section 11 of the Species at Risk Act, making WPC the lead non-governmental agency responsible for coordinating all aspects of the recovery effort in Ontario on behalf of Environment Canada.

The five-year agreement ensured a predictable flow of cash that allowed us to plan our work strategically. This paid off with strong results, particularly from the captive breeding and release program.

Captive Breeding: Breaking New Ground

One of the priorities of the National Recovery Plan was to establish a captive population of the eastern subspecies, but the cost for such a program made it controversial. However, when the wild population hit a low of only 18 pairs in 1997, the recovery team decided it couldn't simply stand by and watch a species disappear without taking steps to save it (J. McCracken, pers.comm.).

Thus, in 1997 and 1998, a total of 43 wild nestlings was collected to create a captive breeding program with the goal of protecting the genetic diversity of the population and, if possible, augmenting the wild population by releasing captive-bred birds.

At the time, little was known about how to raise shrikes in captivity, and no captive breeding and release program had been attempted at this scale for a migratory songbird. Not surprisingly, perhaps, the number of fledglings hatched in captivity at McGill University and the Toronto Zoo during the first five years was equaled by the number of deaths.

A switch in Ontario to field breeding in 2001 proved much more successful. This approach allowed captive shrikes to raise their young in large wood and wire

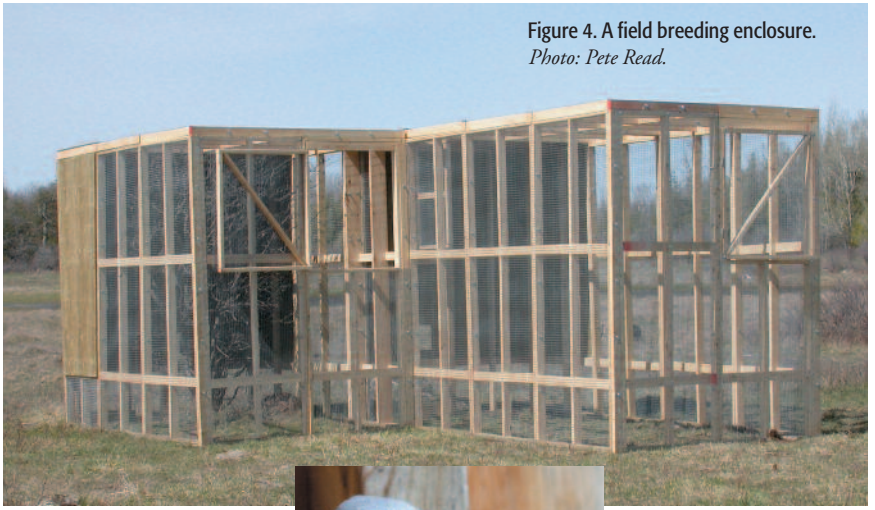


Figure 4. A field breeding enclosure.
Photo: Pete Read.

mesh enclosures (Figure 4) sited in traditional shrike habitat: cattle-grazed fields separated by patches of mixed forest and native short grassland.

The fledglings produced by field breeding are extremely fit (Figure 5). The young shrikes develop strong flight skills and predator avoidance skills. They are also good hunters: as well as feeding on the live crickets and mealworms and thawed mice provided twice a day, they are frequently seen hawking insects in midair and catching frogs and snakes that make their way into the enclosure.

Figure 5. Captive-bred young birds.
Photo: Andrew Smart.

Currently we have 24 field-breeding/release enclosures at two field sites in southern Ontario: 10 in Dyer's Bay on the Bruce Peninsula, where shrikes have been recently extirpated; 14 on the Carden Alvar, where a breeding population continues to exist in the wild. Five additional field-breeding enclosures are at an Ingersoll facility.

We also built a new overwintering facility in 2003 to improve the fitness of our captive birds, which were suffering from cramped winter quarters at the Toronto Zoo. The new Ingersoll facility provides large indoor/outdoor flights for 47 birds, and freed up space at the Zoo for more large enclosures with outdoor access, reducing stress and improving muscle tone and body condition for the birds housed there.

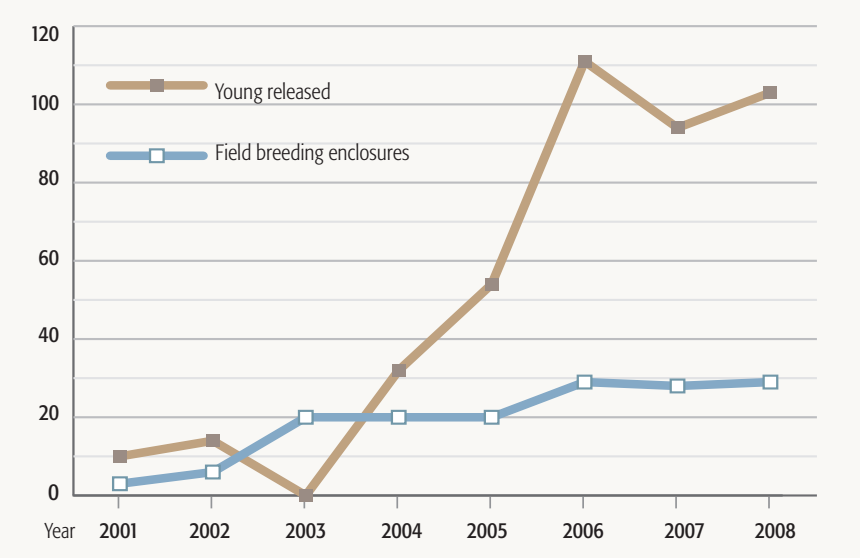


Figure 6. Productivity of field propagated pairs and number of fledglings produced between 2001 and 2008.

Releases: Achieving Precedent-Setting Results

The combination of field breeding and better winter accommodation greatly increased the number of fledglings produced annually (Figure 6). In some years the captive-bred pairs were more productive than wild pairs, and double clutches were frequent. In 2001, the captive population reached approximately 100 birds — large enough to begin releasing captive-bred shrikes — and by 2006, productivity was high enough that we could release approximately 100 fledglings each season.

Because mortality rates are high for migratory songbirds, releasing these kinds of numbers is essential if we are to boost the size of the wild population. Band results for juvenile Loggerhead Shrikes in North America reveal return rates between 0 and 4.7%, depending on the population (Okines and McCracken 2003).

To make the transition to the wild as smooth as possible, we use a soft-release technique that starts with separating fledglings from their parents between the ages of 37 and 49 days and transferring them to larger groups of mixed broods in a release enclosure. This mimics shrike behaviour in the wild, where young from different nests travel together (Pruitt 2000, Chabot *et al.* 2001a).

Once we have ensured the young shrikes are successfully hunting the live mice we provide, they are ready to be released. Post-release, we provide supplemental food until the birds are self-sufficient.

To maintain a captive population of 120 adults, we keep back the most genetically important young each year. Using a detailed studbook that tracks kinship coefficients, inbreeding coefficients, and previous breeding history, the best pairings are determined to maximize both productivity and genetic diversity. To date, we succeeded in maintaining 97.1% of the genetic diversity of the wild founders, well over the program's goal of 90% (Carnio 2007).

The real test of the success of our captive breeding and release program is producing young that could survive in the wild, migrate, and return to breed. Our big breakthrough came in 2005 when a captive-bred shrike was spotted on the Carden Alvar, where it subsequently bred with wild a male and successfully fledged five young (Nichols and Steiner 2006).

Since then, we have seen more returns each year (Figure 7). In the 2008 season, eight captive-bred birds were sighted in the wild, including two released in 2006 — the first time we have had release birds return to breed in consecutive years. At 6.4%, this year's return rate was significantly higher than that of wild juveniles. In total, almost a quarter (22.2%) of wild pairs confirmed in Ontario this year contained a release bird.

Home on the Range: Habitat Stewardship Efforts

Ontario's shrike habitat is shrinking; nearly all of the original grassland and savannahs in the province have been plowed under or paved over. At the same time, much of the cattle pasture that provided a substitute has been abandoned in recent years. Meanwhile, increasing development is fragmenting much of the remaining habitat. Thus, habitat stewardship was identified as an important component of the shrike recovery effort.

Early work focused on documenting current and past nesting sites in Ontario, Quebec, and Manitoba (Smith 2001). Criteria for "suitable" and "restorable" habitat were developed, traditional core nesting areas were mapped in Ontario and Quebec, and the information was recorded in GIS-based mapping systems (Smith 2001).

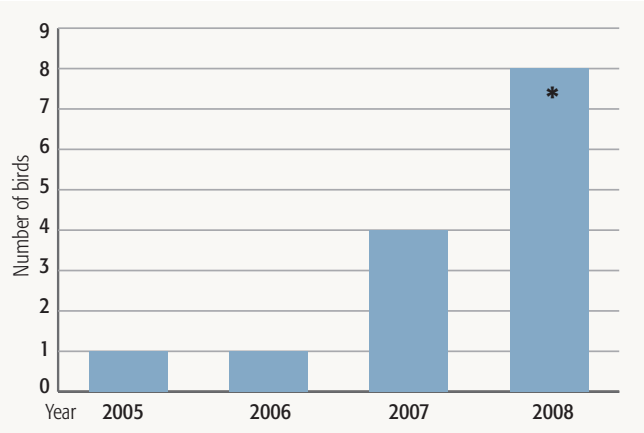


Figure 7. Number of captive-bred release birds returning to breeding grounds

* 2 birds returning in 2008 had been released in 2006

Figure 8. Fencing constructed to allow cows to pasture. *Photo: Kyra Howes*

One of the key challenges of shrike habitat stewardship is the fact that much of the habitat lies on private land. Thanks to personal contact, media coverage and public outreach (see "Community Outreach"), we have developed a solid base of landowner support for the recovery effort. In 2008, more than 80% of the landowners we contacted were supportive and allowed staff on their land for shrike monitoring and site evaluation. Between 2001 and 2008, more than 50 voluntary stewardship agreements and conservation agreements were signed with landowners in core shrike areas to protect, restore, or improve shrike habitat.

Under the federally funded Habitat Stewardship Program, launched in 2000/01, many landowners have received advice and grants to make their property more attractive to shrikes. In many cases this involved installing fencing so that abandoned pastures could be grazed (Figure 8) — a winning situation for both farmers and shrikes.

Where needed, we removed encroaching cedars, thined overgrown grasslands, planted nest/perch trees and shrubs, enhanced water sources for livestock, and installed cattle oilers. In total, since 2001, we have worked with landowners and volunteers to restore or improve more than 4,600 hectares of key shrike habitat (Table 1).

Shrike numbers are shrinking faster than would be expected based on habitat availability on the summer range (Smith 2001), implying other factors are causing the population decline. However, it is clear that habitat restoration work is making an impact. Today, more than half the wild population is nesting on properties that were enhanced or restored through the stewardship program.

Table 1. Hectares of shrike habitat restored or improved 2001-2007

Year	Area (ha)
2001	862
2002	350
2003	115
2004	680
2005	900
2006	207
2007	1575
TOTAL	**4689**

Wild Population: Mixed Trends

To measure the success of the recovery effort, tracking wild numbers is essential — no easy task with such a small population, where overlooking only a few pairs means missing a substantial percentage of the breeding population (Smith 2001). Since 1994, we have also monitored productivity, mortality, and survivorship, although variations in the sampling effort in different years make it difficult to compare figures.

Between 1999 and 2006, more than 1,000 adults and nestlings were colour-banded, thus identifying each bird, the year of banding, and whether captive- or wild-bred birds. This gave us important information on return rates for juveniles and adults, immigration and dispersal, demographic make-up, and population estimates of the wild shrike population.

This year, nearly all the wild adults in Ontario were captured for assessment, revealing that some returning birds had lost their colour bands. Not only does this make individual identification nearly impossible in the field, it means that captive return rates in previous years were likely underestimated.

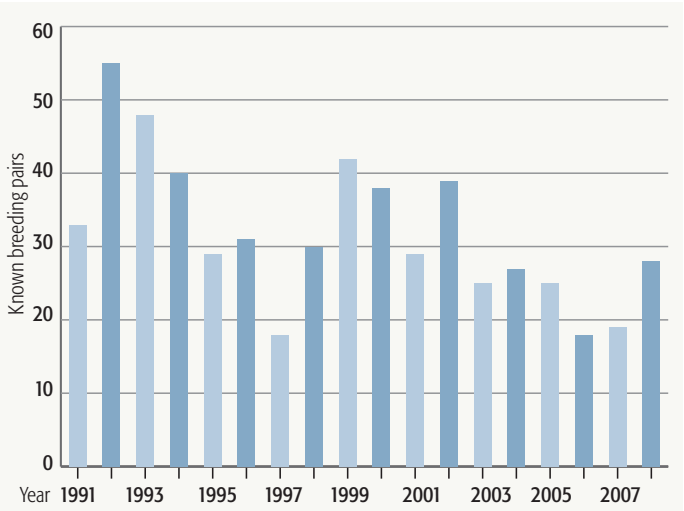


Figure 9. Number of wild breeding pairs of Eastern Loggerhead Shrike in Ontario, 1991-2008.

While the level of the wild population has fluctuated considerably over the past decade, the last few years have seen an upswing (Figure 9). This year, 27 pairs were confirmed in Ontario — the highest number since 2004, and significantly higher than the 18 pairs found in 1997. Other positive developments include the sighting of pairs in the historic breeding areas of Renfrew and Smiths Falls this year (three fledglings were also observed in Renfrew later in the season), and the occupation of new territories in Carden.

Preliminary genetic, stable isotope, and banding data from across North America, indicate that individuals from other shrike populations join the Ontario population each year (Chabot and Lougheed 2005), increasing genetic diversity and helping to maintain shrike numbers here.

In turn, the Ontario populations may feed more southerly populations, although the extent of gene flow is unknown (A.A. Chabot pers. comm.). Further research is being done to determine how important dispersal is for the sustainability of the Ontario population.

The Mystery of Migration

The evidence that a considerable amount of breeding habitat is unoccupied (Chabot *et al.* 2001b, Jobin *et al.* 2005) and that wild pairs generally have high fledgling success (Chabot *et al.* 2001a) suggests the main causes of decline may lie outside Ontario. However, the migratory routes and location of the overwintering grounds for Ontario shrikes remain unclear. To date, two of our captive-bred shrikes have been sighted at Long Point during fall migration (J. McCracken and C. Wood pers. comm.), while one was sighted in Ohio in March 2007 (P. Whan pers. comm.)— the first winter band recovery for this subspecies.

Preliminary results from stable isotope analysis of tail feathers from shrikes across North America suggest that Ontario shrikes may not have a specific overwintering ground. Instead, they likely overwinter throughout the wintering range for this subspecies, as far south as Florida (Chabot *et al.* 2006).

We hope to learn more about migration patterns from a radio-tracking program where captive-bred shrikes are fitted with tiny radio-transmitters, with a signal radius of a few kilometres, that allow researchers to track the birds by car or airplane. The transmitters, which weigh only 1.4 grams, are attached to the back of the bird using a figure-8 leg-loop harness (Rappole and Tipton 1991), leaving visible only a fine, thread-like antenna extending from the bird's tail (Figure 10).

Trials were conducted on captive shrikes in 2006/07 to test different harness designs (Steiner 2006). In a pilot study in 2007, 18 juvenile birds were released in Carden with live radio-transmitters, after first being tested with a "dummy" tag to ensure they had no physical or behavioural effects on the birds. This proved it was feasible to track shrikes using a combination of ground and aerial telemetry.

Figure 10. Shrike with radio-telemetery harness. *Photo: Joe Crowley*

This winter we are exploring the use of geolocators, which have just recently been made light enough to put on small songbirds.

Attached in the same manner as radiotags, they continuously measure light levels. Because day length on a particular date varies with latitude, and timing of sunrise or sunset varies with longitude, this information will let us determine the timing and routes of migration and location of wintering grounds. In order to collect these logged data, the birds will need to be recaptured, but the impressive return rates seen with our captive juveniles in the last few years make this a real possibility.

Our 2008 study, involving 20 radiotagged birds showed that most stayed near the Carden site for several days before dispersing. Individual shrikes were tracked to Beaverton, Duclos Point (near the south end of Lake Simcoe), Virginia Corners (about half-way to Toronto) and near Hamilton. Through the telemetry studies we learned that the post-release survival rate for the captive bred/ released shrikes, prior to leaving Canada on migration, was between 75%-77%.

Community Outreach

Because so much shrike habitat lies on private land, local landowner participation is crucial to the success of the shrike recovery effort. To build strong levels of support and avoid the conflicts that can arise between property rights and the needs of endangered species, we have put a strong emphasis on community outreach over the past 15 years. Some of our efforts have directly targeted landowners, including personal contact, a landowner

handbook, factsheets, and a series of videos providing an overview of shrikes and the recovery effort, habitat restoration, and the captive breeding and release program.

We have also created Recovery Action Groups in core shrike areas to coordinate community actions, working with landowners and often bringing in volunteers to help with habitat stewardship and other activities. A newsletter keeps supporters updated on recovery efforts, while annual landowner appreciation dinners in Carden, Napanee, and Dyer's Bay acknowledge the vital contribution of landowners, volunteers, and donors to shrike recovery.

To heighten public awareness, we regularly have displays at local events, while media releases have garnered significant press coverage. We have also created public service announcements for radio and TV, asking the public to report shrike sightings, while road signs warning motorists to slow down have been erected in nesting areas.

Most recently, we have helped to launch the Integrated Carden Conservation Strategy (ICCS), a multi-stakeholder initiative aimed to benefit a number of species at risk, integrate recovery actions with habitat conservation and stewardship programs, and guide broader ecosystem-based land stewardship. Through a process that has earned kudos from participants, the ICCS has brought together naturalists, government representatives, farmers and ranchers, aggregate producers, and private landowners to resolve mistrust and conflict and develop a workable conservation strategy for the Carden Alvar.

Summary: A Pioneering Model for Recovery

When the field breeding and release program was launched in 2001, it was envisioned as an experiment that would produce new knowledge and insights (Smith 2001). We have achieved that and more. While most captive breeding and release programs typically take more than 10 years to achieve their first successes, our first captive-bred birds returned to breed just 4 years after the first releases. Comparisons with other captive breeding programs for endangered birds also reveal our program is extremely cost-effective — less than one-tenth the per-bird costs of the San Clemente Loggerhead Shrike program in California, for example (Kleiman and Lynch 2008).

It takes a minimum of 15 years before most captive breeding and release programs have impact on wild populations (Kleiman and Lynch 2008). While it is still too early for our program to create sustained increases in wild population levels, it has generated many positive effects. We have restored grassland habitat that will benefit other species in decline, including Bobolinks (*Dolichonyx oryzivorus*), Upland Sandpipers (*Bartramia longicauda*), and Henslow's Sparrows (*Ammodramus henslowii*). We have raised awareness about endangered species through extensive public outreach. Most

importantly, we have pioneered an approach to captive breeding and release that generates fit, healthy young; a model that can be used by other recovery programs for migratory passerines around the world.

In May of 2007, WPC was told that due to severe budget cuts, Environment Canada would not be able to fulfill its funding commitments under the conservation Agreement, and it would not be renewing the Agreement in March 2008. WPC managed to patch together enough funding from private donors and provincial and federal government sources to maintain the captive population and other recovery activities in both 2007 and 2008 . It is thanks to the contributions from Boisset Family Estates (makers of French Rabbit wines) that WPC was able to launch the successful 2008 field season, since federal and provincial funding commitments were made only very late into the field season.

However, with no Conservation Agreement in place, and no multi-year commitments from either the federal or provincial governments, funding for the recovery effort will again be uncertain and piecemeal, making it difficult to plan or work in any strategic fashion. Despite the success of the program, and the money and time spent on recovery, the whole program faced the prospect of being shut down when funding was cut in 2007/2008. That is still a possibility if funding cannot be found in the coming year.

Acknowledgements

Environment Canada, through the Habitat Stewardship Program and grants and contributions, has been the lead funder of the shrike recovery efforts. In 2007 and 2008 the Ontario Species at Risk Stewardship Fund also provided significant funding support. Boisset Family Estates is the single largest private sector supporter of recovery effort. In addition to Environment Canada and the provinces of Ontario, Manitoba and Quebec, we would like to acknowledge our other recovery partners: Avian Science and Conservation Centre of McGill University, Bird Studies Canada, Canadian Cattlemen's Association, Canadian Association of Zoos and Aquariums, Canadian Cooperative Wildlife Health Centre, Toronto Zoo, Queen's University, and many landowners. A big thank you as well to the many landowners, volunteers, interns, researchers, and field staff who have contributed to the recovery effort over the years. We also thank free-lance writer, Julie Staffer, for pulling this article together.

Further details of the recovery program are available from Wildlife Preservation Canada at www.wildlifepreservation.ca or 1-800-956-6608, and contributions to the recovery program would be welcomed.

Literature Cited

Butcher G.S. and **D.K. Niven**. 2007. Combining data from the Christmas Bird Count and the Breeding Bird Survey to determine the continental status and trends of North American birds. Audubon Society technical report.

Carnio, J. 2007. Eastern Loggerhead Shrike studbook report 2006/2007. Unpublished report to Eastern Loggerhead Shrike Recovery Team, Ken Tuininga (Canadian Wildlife Service – Ontario), Chair. Toronto, Ontario. 7 pp.

Chabot, A.A. and **S.C. Lougheed**. 2005. Historic and present day apportionment of genetic diversity in the eastern subspecies of Loggerhead Shrike (*Lanius ludovicianus migrans*): interdepartmental recovery fund final report 2005. Unpublished report for Canadian Wildlife Service, Ontario Region. Kingston, Ontario. 37 pp.

Chabot, A.A., **D.M. Bird** and **R.D. Titman**. 2001a. Breeding biology and nest success of Loggerhead Shrikes in Ontario. Wilson Bulletin 113:285-289.

Chabot, A.A., **R.D. Titman** and **D.M. Bird**. 2001b. Habitat use by Loggerhead Shrikes in Ontario and Quebec. Canadian Journal of Zoology 79:916-925.

Chabot, A., K. Hobson and **S.C. Lougheed**. 2006. Wintering movements of Loggerhead Shrikes from Ontario: results from stable isotope analysis of feather samples 2001-2005. Unpublished report prepared for the Endangered Species Research Fund. Kingston, Ontario.

Environment Canada. 2006. Recovery strategy for the Loggerhead Shrike, migrans subspecies (*Lanius ludovicianus migrans*), in Canada [proposed]. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. vi + 25 pp.

Jobin, B., M. Grenier and **P. Laporte**. 2005. Using satellite imagery to assess breeding habitat availability of the endangered Loggerhead Shrike in Quebec. Biodiversity and Conservation 14:81-95.

Johns, B., E. Tefler, **M. Cadman**, **D. Bird, R. Bjorge, K. DeSmet, W. Harris, D. Hjertas, P. Laporte** and **R. Pittaway.** 1994. National recovery plan for the Loggerhead Shrike. Recovery of Nationally Endangered Wildlife Committee Report number 7, Ottawa, Ontario. 32pp.

Kleiman, D.G. and **C. Lynch**. 2008. Final report: Results and recommendations for the captive breeding/release program for the eastern loggerhead shrike. Zoo-Logic, Limited Liability Company. Chevy Chase, Maryland, U.S.A.

Miller, A.H. 1931. Systematic revision and natural history of the American shrikes (*Lanius*). University of California Publications in Zoology. 38:11-242.

Nichols, R. and **J. Steiner**. 2006. Eastern Loggerhead Shrike in Ontario end of season report 2005: field monitoring and experimental captive breeding and release programs. Unpublished report to Canadian Wildlife Service, Ontario Region. Guelph, Ontario. 162 pp.

Okines, D. and **J. McCracken**. 2003. Loggerhead Shrike banding in Ontario: report on the 2003 field season. Unpublished report to Canadian Wildlife Service and Wildlife Preservation Trust Canada. Port Rowan, Ontario.

Pruitt, L. 2000. Loggerhead Shrike status assessment. U.S. Fish and Wildlife Service. Bloomington, Indiana. 169 pp.

Rappole J.H. and **A.R. Tipton**. 1991. New harness design for attachment of radio transmitters to small passerines. Journal of Field Ornithology 62:335-337.

Smith, M.C. 2001. Eastern Loggerhead Shrike program review 1994 to March 31, 2000. Environment Canada, Canadian Wildlife Service. Acton, Ontario. 54 pp.

Steiner, J. 2006. A trial of "dummy" radiotransmitters on juvenile captive-born Eastern Loggerhead Shrike. Wildlife Preservation Canada, Guelph, Ontario. 13 pp.

Yosef, R. 1996. Loggerhead Shrike (*Lanius ludovicianus*). *In* The Birds of North America, No. 231 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.

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