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TRACING THE HISTORY OF BLACKBIRD RESEARCH THROUGH AN INDUSTRY'S LOOKING GLASS: THE SUNFLOWER MAGAZINE

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ABSTRACT: The Sunflower magazine, the voice of the National Sunflower Organization, featured articles in January 1978 and December 1996 that began with these words, "If Old King Cole was a merry old soul, it was probably because he had only four and twenty blackbirds to contend with, and they were all out of commission!" This quotation captures the sentiments of sunflower growers, who have identified blackbirds as a major production problem since the 1960s. The National (formerly Denver) Wildlife Research Center, a unit within the U.S. Department of Agriculture's Animal and Plant Health Inspection Service Wildlife Services, is charged with both improving and developing new methods for managing blackbird damage to sunflower. The Sunflower has chronicled these research efforts championing studies with clear objectives and opposing studies, sometimes vehemently, that use resources for seemingly esoteric research. In this paper, the history of blackbird research in the northern Great Plains is traced through The Sunflower.

KEY WORDS: avicides, blackbirds, cattails, cattail management, crop damage, DRC-1339, National Sunflower Association, pyrotechnics, repellents, sunflower, The Sunflower, *Typha* spp., wetlands.

THIS PAPER HAS BEEN PEER REVIEWED.

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INTRODUCTION

Hordes of marauding blackbirds rise from the sunflower field as a well-known South Dakota sunflower grower ignites a salvo of Class B pyrotechnics and quickly follows this barrage with several bursts from a .223 caliber semiautomatic rifle. A scene from the early 1970s, when the fledgling sunflower industry is just beginning to compete in the world oil markets? Amazingly, this event was witnessed by the senior author in the 1990s, at a time when other pest problems associated with cultivating sunflower, such as weeds and insects, had been mitigated by well-researched, economically viable management tools.

Despite millions of dollars spent on research and operational programs over 25 years, the "blackbird problem" remains to be solved. In 1994, 37% of sunflower growers still considered blackbird damage one of the three worst production problems in South Dakota, while 36% and 17% felt the same in North Dakota and Minnesota, respectively (Lamey et al. 1995). Further, as articulated through The Sunflower, the U.S. Department of Agriculture's (USDA), Wildlife Services unit (formerly Animal Damage Control) has yet to establish a reliable integrated pest management program. Nevertheless, the authors believe the National (formerly Denver) Wildlife Research Center (NWRC) and its cooperative research entities have made progress, perhaps significant progress, toward developing methods for managing blackbird damage to sunflower. In this paper, the authors support their thesis with information published in The Sunflower magazine.

The Sunflower, published by the National Sunflower Association (NSA), has a circulation of approximately 22,000 (Lilleboe 1995a). The magazine serves as an information outlet for about 18,500 sunflower growers, with 13,300 of these growers in the northern Great Plains (National Sunflower Association, unpublished data). Since its inception in 1975, The Sunflower has published 27 issues containing 31 articles on the prevention of

sunflower damage by blackbirds. Many articles were penned by Don Lilleboe, who was editor of the magazine until 1987, and is now a contributing writer and editor. Larry Kleingartner, the Executive Director of the NSA, has taken over the editorial chores since 1987 and authors many articles for the magazine.

ARTICLES

Anonymous, 1978a, Growers, Research Personnel Seek Blackbird Solution

This article begins with "If Old King Cole was a merry old soul, it was probably because he had only four and twenty blackbirds to contend with, and they were all out of commission!" Sunflower growers are investing an average of \$5.00/acre (\$12.35/ha) to control blackbird damage, but to no avail, as birds took an average of 8 to 10% of the crop, with some growers suffering heavier losses. Against this backdrop, the most prominent question from sunflower growers is how to dramatically reduce blackbird populations. However, the U.S. Fish and Wildlife Service (USFWS), in charge of developing damage abatement methods, is focusing on: 1) improving methods for putting repellents on plants; 2) developing bird-resistant hybrids; 3) conducting taste aversion studies; 4) recommending land management practices; and 5) developing lure cropping strategies. Additionally, the basic feeding, breeding, and migratory behaviors of blackbirds are being studied.

In December 1977, a meeting is held at North Dakota State University (NDSU) among representatives of NDSU, North Dakota Sunflower Council, and USFWS. Biologists from the USFWS testify that heavy damage occurs under flightlines between roosts and loafing areas. They speculate that heavy losses occurred in 1977 because of: 1) an abnormally long damage season (75 compared to 45 days); 2) an early small grain harvest that resulted in waste grains being buried by fall plowing; and 3) more fields planted near wetlands. Industry representatives express doubt that current methods of scaring birds such

as propane boomers, guns, and chemical repellents are effective and that reducing the blackbird populations would be more appropriate. USFWS biologists explain that numerical reductions are not always accompanied by an equal reduction in depredation. Nevertheless, they suggest poisoning blackbirds in the roosts, placing avicides at bait stations, and developing chemosterilants as three possible avenues of research. Meeting attendees recommend: 1) research on chemosterilants for male blackbirds be expedited; 2) development of more effective approaches for distributing damage abatement information; and 3) funding from Congress be sought to enhance the blackbird-research effort.

Anonymous, 1978b, Australians Have Bird Problems Too

The Sunflower consoles U.S. sunflower growers, just beginning their annual battle with blackbirds by relating the hardships endured by growers in northern Australia. Apparently, cockatoos, white over-sized parrot-like birds, were observed harvesting sunflower at a rapid rate; however, damage statistics are not available.

Pfeifer, 1979, Plan Ahead For Blackbird Control

Pfeifer, State Director for the North Dakota Animal Damage Control program, suggests that to maximize sunflower yields growers should plan on controlling all pests, including blackbirds. He advises growers to: 1) avoid planting fields near cattail (*Typha* spp.) marshes; 2) synchronize sunflower plantings because early and late fields suffer the most damage; 3) provide lanes planted with an early maturing crop for easy access to blackbirds feeding in large fields; and 4) provide alternate foods on conservation set-aside land where the birds can feed undisturbed.

Anonymous, 1979, Researchers Seek Long-Term Answers to Blackbird Problems

Sunflower growers near cattail marshes along major flyways know about blackbird damage. In 1978, blackbirds destroyed more than 1% of the sunflower crop, valued at \$2.75 million. Yet, the only agricultural solutions are to plant early-maturing hybrids and to avoid planting near cattail marshes. Chemical repellents and scare devices, such as propane boomers, guns, and electronic alarm calls may help rid one sunflower producer of birds, but passes the problem along to another grower.

NDSU researchers are looking for solutions to blackbird damage with funding administered through the U.S. Department of Interior. Most of the funding is designated for bird-resistant hybrid development, but developing these hybrids is predicted to take several years. Studies on food aversion, food habits, migratory behavior, alternative food sources, cultural practices, and associated environmental factors consume the remainder of available funds.

Sandvik, July 1980a, Season For Blackbirds Approaches - Millions \$\$\$ Damage in '79

Sandvik interviews three USFWS biologists on their views concerning blackbird damage to sunflower. The USFWS is testing variations of old methods such as hawk

kites, jump-up scarecrows with distress calls, and trying to improve the efficacy of the avian repellent Avitrol® (active ingredient - 4-Aminopyridine). The USFWS determines sunflower damage in North Dakota, Minnesota, and South Dakota to be 0.88%, 0.69% and 0.58%, respectively. Of the 575 fields surveyed by the USFWS, 95% have estimated damage less than 3%. At a seed value of \$0.09/lb (\$0.20/kg), about \$5.0 million of sunflower is lost to birds. Counties in North Dakota with the most damage are Benson, Bottineau, McHenry, Pierce, Grant, and Emmons; whereas, Mahnommen and Traverse counties in Minnesota, and Moody, McCook, and Hanson Counties in South Dakota suffer the highest losses in these states. The USFWS reports that these counties have an abundance of cattail marshes, the preferred habitat of roosting blackbirds. Moreover, increased sunflower acreage in western North Dakota may have drawn blackbirds to an area that normally does not have significant damage.

The USFWS believes that increased sunflower acreage does dilute the overall blackbird damage but blames the drought in the northern Great Plains for high damage in localized areas. Drought, which effectively reduces the number of prime roosting sites for blackbirds, ironically concentrates the birds and creates situations where heavy local damage occurs. Referring to blackbirds, one biologist is quoted as saying "They don't live to eat; they eat to live. And in the process, they're going to take those foods that rate best in taste, nutrition, and availability." He concludes by saying that if you plant near prime roosting and loafing habitat, you can expect problems, especially during dry years.

Sandvik, 1980b, Three Methods of Battling the Birds

Sandvik interviews three people familiar with the blackbird-sunflower problem to find out what they are doing to control damage. An owner of a flying service believes Avitrol®, which causes birds ingesting the 1-in-100 treated corn particles to emit distress calls, is effective if applied early in the damage season. He adds that birds have difficulty finding the baits in weedy fields. A grower from Westhope, North Dakota plants sunflower in the same field three years in a row knowing he would have bird problems. In 1977, he uses a .22 rifle and propane boomers; in 1978, a helicopter is used to chase birds, and in 1979, he purchases six hawk kites attached to helium-filled balloons. This grower concludes that one hawk kite controls birds as well as a propane boomer, but hawk kites are more work.

The last interview showcases an innovative farmer who uses Avitrol® but has mixed results. So he equips his helicopter with a cassette tape deck, speakers, and amplifier and plays "Willie Nelson Live in Concert." At times, he augments this method with a couple of riflemen on the ground. After dark, this grower and some of his friends canoe into the roosts and throw pest bombs and shoot into the birds. He feels that all methods of blackbird control are partially effective, but methods of harassment must change periodically. He is quoted as saying, "An explosion every 15 minutes just doesn't do it."

Besser and Otis, 1980, Dakota Drought Speeds Blackbird Decline

Besser and Otis of the USFWS's Denver Wildlife Research Center report that red-winged blackbird (*Agelaius phoeniceus*) numbers dropped from 2.2 million in 1965 to 1.1 million in 1980 in a 30,000 square mile (77,694 km²) area centered on the James and Souris Rivers from Canada to central South Dakota. They speculate that modern large machinery has enabled growers to plow the drier parts of wetlands normally used by nesting redwings. Besser and Otis say that a decline in blackbird numbers during drought years may not necessarily result in lower damage, because nonbreeding blackbirds may congregate earlier, and with fewer suitable roosting locations available, damage in some areas may be abnormally high.

Anonymous, 1980, Bird Research Project Continues

NDSU scientists report that bird damage may be highest in tall plants with head diameters of 4 to 8 inches (10.2 to 20.3 cm). Heads outside this range, with long bracts and down-turned, flat, or concave heads have the most promise for bird resistance. Finally, these scientists propose that certain naturally occurring chemicals may avert blackbirds from eating sunflower seeds and that further investigation is warranted.

These investigators show that blackbirds will feed in all directions from the roost, usually traveling up to five miles (8 km) from the roost; however, some birds may travel up to seven miles (11.3 km) to feed. Birds appear to cause more damage in weedy fields; weeds make it harder for the birds to find treated grain baits, such as Avitrol®. Taste aversion studies show that developing a delivery system to educate blackbirds not to eat sunflower will be difficult. Investigators were hoping that birds would retain an aversion for sunflower when feeding in other locations.

Fairaizl, 1982, Springtime Blackbird Control Measures

Fairaizl, a Wildlife Biologist with the USFWS's ADC, advises farmers to: 1) avoid planting near cattail marshes and shelterbelts; 2) synchronize planting in a given area because the first and last fields to mature tend to suffer the most damage; and 3) leave lanes in the fields for Avitrol® baiting and easy access for placing scare devices. The loss of field production from providing access lanes, he continues, is partially negated by plants with bigger heads and more seeds. Finally, Fairaizl suggests planting alternate foods on conservation set-aside acres to serve as lure crops.

Kleingartner, 1982, Blackbird Population Control Essential

Kleingartner, Executive Director for the NSA, provides a litany of blackbird transgressions: Blackbirds annually damage \$5 to 12 million in sunflower, \$15 to 25 million in ripening corn, \$20 to 50 million in seeded corn, \$10 million in ripening cherries, \$6 million in sorghum, \$2 to 5 million in rice, \$4 million in grapes, \$1 to 2 million in blueberries, \$1 million in lettuce, and unknown dollars of cereal grains, peanuts, and pecans. Moreover, blackbirds are attracted to feedlots where they eat and contaminate feed and water. Finally, blackbirds cause

health hazards, such as histoplasmosis, and are a nuisance in southern cities during the winter. Kleingartner concedes that blackbirds do have some value because they eat weed seeds and insects.

The Denver Wildlife Research Center (DWRC) reports that research is progressing on baits and repellents, scaring devices, lure-crop plantings, and bird-resistant hybrids; however, the NSA counters that dispersing blackbirds only transfers the problem from one farmer to another. Researchers believe that data on migration patterns and roosting habits may be a key aspect in identifying the blackbird's vulnerabilities, which could then lead to a more effective population control effort. DWRC's development of a new paint-tagging method leads to a clarification of migration patterns, showing that redwings funnel from northwestern Missouri to sunflower growing areas in the Dakotas, Minnesota, and Canada.

Kleingartner maintains that population control can be accomplished in Missouri with chemical sterilants and toxicants. He reports that growers do not want to eradicate the blackbird, but want some form of population control. Sterilization of males and lethal control of females seem like promising methods to the NSA. While Missouri may be the vulnerable staging area, population suppressants will require intensive testing of safety hazards to humans and nontarget species, a long and costly process. Regardless, Kleingartner believes the time to start is now, because the political climate is right, and the NSA has allies in other commodity groups who have similar goals. He concludes that growers feel the USFWS will not pursue population control as a matter of agency philosophy; moreover, the blackbird problem is directly related to inaction by the USFWS. An aggressive and sincere effort by the USFWS to reduce blackbird numbers would improve their image with growers, and to quote the Executive Director, "would also be a big step in reducing the problems growers have with blackbird damage."

Anonymous, 1982, Mesuro® To Be Tested On Birds

South Dakota State University (SDSU) researchers obtain a Section 18 EPA label for testing Mesuro® for blackbird control. Mesuro®, an effective bird deterrent for other crops, will be formulated on cracked corn at 0.5 lb (0.23 kg) per 100 lb (45.4 kg) corn and applied by air on 3,000 acres (1214.1 ha). Mesuro® has already been tested on sunflower as a foliage and head spray but is not effective because the downward-facing head position keeps the spray from contacting the achenes.

Lilleboe, 1983, Bird-Resistant 'Flowers Now Being Field Tested

Lilleboe leads this article with "Will the day ever come when hungry blackbirds fly past maturing sunflower fields rather than diving in for a hearty meal?" NDSU scientists plan to plant bird-resistant sunflower on 20 farms in North Dakota, Manitoba, and Ohio to answer that question. They are convinced that plants with long head-to-stem distances, flat or slightly concave downward-facing heads with long bracts, and tightly-held achenes may provide substantial bird resistance. Theoretically, bird-resistant sunflower are too expensive

energetically for birds to pursue, forcing them to seek alternate sources of food, such as weed seeds and waste grains. However, current genetic lines of bird-resistant sunflower, with 10 to 20% lower yields and 5 to 10% lower oil than commercial hybrid sunflower, are not competitive in the seed market and need improvement. Purple-hulled sunflower also are being tested for bird-resistance because they contain high levels of anthocyanins that seem to impart a bad taste. NDSU scientists conclude that sunflower may never be totally immune to blackbirds, but theorize if birds are moved from susceptible locations near wetlands, the damage will be dispersed over a larger area.

Anonymous, 1984a, NSA Proposes Blackbird Program

The NSA proposes that Congress appropriate \$25 million over a 10-year period to develop methods for reducing blackbird populations. Funded projects would lead to the development of chemosterilants and avicides that would be implemented by the USFWS on an operational basis. Progress and direction of the program would be monitored by a citizen advisory board.

The legislation, sponsored by the NSA, notes a 500-million blackbird population in North America, with the majority wintering in the southeastern U.S. The USFWS estimates that direct damage to food crops and feed grains is about \$80 million; indirect costs incurred from controlling damage are unknown. The NSA maintains the most probable solution to blackbird depredation is to reduce their population, either by chemosterilants or lethal methods. From an environmental and moral position, chemosterilants appear to offer the best potential.

Arnett, 1984a, Blackbird Control in Sunflower

Arnett, Assistant Secretary for Fish, Wildlife, and Parks, U.S. Department of Interior, spoke to attendees of NSA's national meeting and provided comments to The Sunflower. A quote from Arnett sums up the USFWS' position on blackbirds, "The picture seems clear: if possible, do not plant sunflower near shelterbelts, marshes and other places where blackbirds roost." Arnett acknowledges there is no single panacea for controlling blackbird damage, and that a combination of methods are being developed to reduce blackbird problems to a tolerable level. Other USFWS research is focusing on the timing of blackbird damage. Arnett reports that sunflowers are most vulnerable when 10% of the yellow petals start to wilt; 41% of the damage occurs between the third and ninth day following this time. Bird harassment efforts, therefore, should be done early, before flocks develop a feeding pattern.

The USFWS is well aware that farmers have tried and are disappointed with the efficacy of Avitrol®. Scientists think Avitrol® failed because the chemical is lost during handling and is vaporized during hot weather; the manufacturer agrees to correct these problems. Arnett promises further research on increasing the efficacy of this repellent by finding baits that are more acceptable to blackbirds than cracked corn, such as sunflower. He then addresses the question of direct control at winter roosts in the southern U.S. by stipulating that, although it seems simple to growers, it is not a feasible approach for solving

blackbird depredation to sunflower. The USFWS intends to focus its damage-reduction efforts closer to the time and place of occurrence. Arnett concludes, rather cryptically, the USFWS will take into consideration both the positive and negative values of blackbirds as viewed by the nation's citizens.

Fox, 1984, Bird Resistance Update

Fox, a sunflower breeder with NDSU, writes that although damage may be only 1 to 4%, the damage is localized and farmers planting close to wetlands receive more damage than other growers. Some of these farmers have been forced to abandon sunflower because the blackbirds severely damage an otherwise profitable crop. At this time, Fox has settled on studying morphological and chemical modes of bird resistance. He reports that morphological traits include flat or concave heads, long bracts that wrap around the head, horizontally-oriented heads, head-to-stem distance greater than 6 inches (15.2 cm), and tightly-packed achenes. These bird-resistant traits are maintained until a killing frost, after which the heads dry and the seeds loosen. Fox continues by touting purple-hulled sunflower, which contains high levels of anthocyanins that may advert birds from eating seeds. The anthocyanins levels are highest near maturity, and bird-resistance is greatest at this time.

In 1983, field tests show that poor growing conditions produced under-developed morphological traits for resisting bird depredation; this, combined with heavy bird pressure, resulted in severe damage in the test plots. Bird-resistant sunflower seeds still are 8% below normal in oil content and yields remain low. However, Fox still believes that a commercially acceptable bird-resistant variety can be developed.

Anonymous, 1984b, Blackbird Monies Being Voted On

The Sunflower notes that a \$2.5 million request for chemosterilant and toxicant research on blackbirds has passed the U.S. Senate Appropriations Committee with support from sunflower-, corn-, and rice-producing states. The money will be directed to the USFWS. A citizen advisory committee will oversee the funding.

Anonymous, 1984c, Update on Blackbird Funding

A \$2.5 million request for funding of chemosterilant and toxicant research fails in Congress. As a compromise, an additional \$200,000 is added to NDSU's current research program on developing bird-resistant sunflower.

Anonymous, 1986, USDA Gets Blackbird Program

This article announces the transfer of the ADC program from the USFWS to the Animal and Plant Health Inspection Service (APHIS) of the USDA. The NSA supports the transfer and believes more progress will be made on controlling blackbirds with the USDA leading the research effort. Additionally, Congress at the behest of the NSA appropriates \$500,000 for research on lethal and nonlethal methods of controlling blackbird damage to crops. Finally, the USDA begins developing a citizen advisory committee on blackbird control; the NSA will be represented on this committee.

Kleingartner, 1988, Progress Being Made on Blackbird Front

Kleingartner touts the development of a new toxicant for reducing blackbird populations. He reports the USDA is committed to evaluating CPT (3-Chloro-4-methylbenzenamine), a new avian toxicant. If research finds CPT to be effective and safe, the USDA will commit to gaining registration approval by the Environmental Protection Agency (EPA). Growers want an avicide, because there are too many blackbirds to control with just harassment techniques. Apparently, the USDA's ADC leadership agrees. Kleingartner recounts that CPT is closely related to DRC-1339, a chemical registered for controlling blackbirds and starlings in feedlots under the trade name of Starlicide®. A DWRC official relays to the NSA that CPT will be tested at two sites in the sunflower-growing region and at two winter roosts sites in the southeast. These tests will determine efficacy and gain necessary information for proceeding with obtaining a full EPA registration. However, this official warns that EPA clearance of CPT is not certain, and the most optimistic predictions of time-line and costs are several years and millions of dollars.

A North Dakota ADC spokesperson assures the NSA that an avian toxicant will make ADC's job of protecting sunflower from blackbirds easier, and he anticipates a substantial reduction in damage if a roost toxicant is registered. Aerial hazing of blackbirds is not the best solution but is ADC's only option at this time. He reports that flocks of resident birds congregating in August are impossible to move out of the sunflower production area. The President of the NSA, expresses optimism the USDA is a real partner at the federal level.

Anonymous, 1989, EPA Nixes Testing of CPT in the North

The USDA wants to field test CPT to determine its effectiveness before spending several million on research required for an Experimental Use Permit (EUP). The EPA will not allow testing of CPT on wetlands without an EUP but will allow testing on two terrestrial sites in the South in winter.

Kleingartner, 1989, Blackbird Controls Still On Front Burner

Kleingartner brings good news and bad news. The good news is the EPA allowed testing of CPT in a southern roost, and preliminary test results indicated the avicide was very effective. The bad news is the USDA cannot test CPT in a northern wetland without more data. Ongoing discussion with EPA regarding testing in the sunflower-producing region may result in some limited CPT testing in the North. Upon transfer of blackbird damage control from the USFWS to USDA, the ADC unit decides that a blackbird toxicant will be the number one research priority for controlling damage to crops and minimizing human health and safety concerns related to blackbirds. CPT offers the best potential as a toxicant because the chemical is highly toxic to blackbirds but only low to moderately toxic to mammals and predatory birds.

On another front, the USFWS stresses that while cattails are perfect for blackbird nesting and roosting, they are not conducive for propagating ducks. The USFWS

advocates spring burning as the best method for controlling cattails but acknowledges that forced cattle grazing may also work to control cattail. As an example of how effective cattail management can be, a USFWS manager points to a wetland near Alice, North Dakota that contained 1,000 acres (404.7 ha) of cattail and harbored 5 million blackbirds before the cattails were managed. It now contains few blackbirds and numerous ducks. The USFWS is looking at purchasing a sickle bar mounted on an air boat for cutting cattail below the water line. Farmers can burn leased wetlands with prior approval from the appropriate USFWS district office.

Meanwhile, the aerial hazing program continues in 1989, despite many detractors. Hazing is not intended as a final answer says the incumbent NSA President. He continues by saying the NSA wants a federal commitment to deal with the problem.

Kleingartner, 1990, Blackbird Control Front Update

Kleingartner begins this article with, "Ever wonder how to get rid of some house guests who stayed too long? Get rid of the house." Blackbirds stay too long and eat too much, he continues, because they have cattails as an excellent habitat for nesting in spring and roosting in fall. Cattails make a comfortable home by protecting blackbirds from predators, bullets, airplanes, and inclement weather. Kleingartner informs his readers that controlling cattails may not eliminate blackbird problems, but it is a significant tool.

The promising addition to cattail management will be a toxicant that can be applied either by air or by ground application. The USDA is testing CPT, but the product is five years away from EPA registration because of a battery of expensive and time-consuming research requirements. USDA officials hope the reregistration of DRC-1339, currently underway, may provide some data for CPT registration. Meanwhile, NDSU continues working on a bird-resistant variety of sunflower and hopes to release the germplasm to private companies in 24 months. Kleingartner reiterates that a bird-resistant hybrid, while considered an important tool for reducing damage, is not the total answer.

The aerial-hazing program continues in 1990, though most participants agree it is just a band-aid. However, a survey of growers shows the hazing program is preferred over putting money into scare devices and cattail management. A North Dakota ADC manager decides to concentrate aerial hazing in high-damage areas. The same manager wants to test DRC-1339 grain baits in sunflower fields but needs a state emergency label.

Kleingartner declares that destroying cattails is the best answer for reducing sunflower damage. The USFWS is agreeable, stating they want to reduce blackbird numbers and increase duck abundance by managing cattails. Finally, the NSA is requesting federal funding for 1991 for cattail management. Farmers are urged to reduce cattail growth wherever possible.

Lilleboe, 1991, Cattail Management Helping Both Waterfowl & Sunflower

Lilleboe begins this feature article with "Other than the now-famous Patriot missiles, is there any weapon not used against feathered foes?" None of the myriad of

techniques in use by growers, has yet to provide the protection from blackbirds they need. Bird-resistant sunflower does have promise as a management tool, but commercially viable hybrids are still years away. Growers are urged to use the best method available; at this time, it is cattail control. The consensus by all parties involved is that some cattails are good, but too many cattails will both destroy the wetlands for waterfowl and create blackbird roosting habitat. The USFWS is actively using cultural and mechanical means to manage cattails, declaring that they are not trying to eradicate blackbirds, just trying to move them south faster. The USFWS is aspiring for a 50:50 emergent vegetation to water ratio but initially will accept a 70% reduction in cattail. In 1990, the USFWS managed cattails on 1,700 acres (688 ha) in 63 wetland basins in North Dakota.

DWRC tested aerial applications of 3 qt/acre (7.0 l/ha) of Rodeo® herbicide in 1989 and 2.5 qt/acre (5.8 l/ha) in 1991 to control 70% of the cattails. DWRC, NDSU, and SDSU are conducting cooperative studies designed to test the effects of the herbicide applications on invertebrates, waterfowl, and water quality. The cost of aerially applying Rodeo® is about \$64.00/acre (\$158.00/ha). The lead researcher for DWRC emphasizes that blackbirds are a management problem that each farmer must solve. The article concludes that cattail control is not a panacea but should be a part of an integrated management program used in combination with other management tools.

Lilleboe, 1992, NDSU Develops Bird-Resistant Lines

Lilleboe reports that NDSU scientists produced a bird-resistant sunflower and have now released two inbred genetic lines to commercial breeders. Sunflower varieties with horizontally-oriented concave heads and long head-to-stem distance are predicted to be the most effective against foraging blackbirds. Unfortunately, the released bird-resistant lines are susceptible to rust and downy mildews, and one line has higher yields and lower oil while the other line has the opposite attributes. The futures of these genetic lines depend on how big the potential commercial market will be for bird-resistant hybrids. Scientists did not believe that bird-resistant hybrids are the solution, but a component of an integrated pest management system.

Anonymous, 1992a, Is a Cattail Herbicide For You?

This article discusses the economics of using the aquatic herbicide Rodeo® for dispersing roosting blackbirds. A DWRC scientist maintains it is cost-effective to manage cattails. For example, if a 25-acre (10.1 ha) wetland harbors 20,000 birds and each bird consumes a half ounce (14.2 g) of sunflower/day, that flock will eat 617 lb (280 kg) of seed/day. Assuming a seed price of \$0.10/lb (\$0.22/kg), this flock consumes \$61.70 worth of sunflower/day. Over a month's time, the dollar loss will be about \$1,850. The cost of treating from 70 to 100% of the wetland is between \$1,050 to 1,500; thus, the cost of treatment is recouped in one year.

In 1992, DWRC and NDSU researchers are gathering data on the efficacy of cattail management. Additionally, they are assessing the effects of Rodeo® on water quality, aquatic invertebrate populations, breeding

bird populations, and winter cover for pheasants. Researchers continue evaluating the response of cattails to various application rates of Rodeo® herbicide.

Anonymous, 1992b, Hazing Help Available for Blackbird-Plagued Dakota Producers

In this article, sunflower producers with blackbird problems are urged to call North or South Dakota ADC for assistance. The aerial hazing program, developed by the NSA and ADC, is still in place to harass birds in sunflower fields. Growers are given telephone numbers to call if they have at least 1,000 blackbirds in a given field and are told to initiate their own scare tactics when birds are observed in sunflower. Growers are asked to provide legal descriptions of field locations, mark fields with white material, and give ground support with 22-caliber rifles, racket bombs, screamers, etc. Growers are urged to be careful not to shoot the airplane and report any wetland with more than 5,000 blackbirds to schedule for cattail-control measures.

Lilleboe, 1992, South Dakotan Fires Back at The Blackbirds

In this article, a Clark County, South Dakota sunflower grower explains how he disperses blackbirds from sunflower fields. He describes the development and use of Class B explosives that contain more than 55 grams of powder. These pyrotechnics were legalized by the "Boomer Bill" which was passed by the South Dakota legislature in 1992. This grower is convinced that explosives work when used in combination with propane cannons, taped distress calls, and a .223 caliber semiautomatic rifle. His annual costs for chasing blackbirds from mid-August to early October are about \$2,500, including the use of at least four Class B explosives per day at \$6 to 8 each. He is thinking about developing a radio-controlled airplane with an on board ignition system to detonate explosives within the flocks. Another idea is to connect a series of bombs throughout the field.

Lilleboe, 1993, No Vacancy Sign Out For Blackbirds

Lilleboe begins this article with "Bearing ill will toward the innocent cattail is like nurturing a grudge against motherhood and the flag." A USDA scientist says cattail management is a valuable ally for dispersing blackbirds. In cooperation with NDSU, the USDA is studying the impacts of cattail management on ring-necked pheasants (*Phasianus colchicus*), invertebrates, and water quality.

Scientists recommend that cattail management be used if 5,000 or more birds are using the wetland. Between August and the first frost, about 70% of the marsh should be aerially sprayed with Rodeo®, leaving strips of living cattail as cover for other wetland animals. To ensure a good control, an application rate of 2.25 qt/acre (5.3 l/ha) of Rodeo® at a cost \$55.00/acre (\$136/ha) is recommended. Growers are urged to only treat areas of the marsh that contain water because that is the preferred roosting location for blackbirds. Under these conditions, one treatment may last four years or longer.

Scientists point out that cattail management disperses birds but does not reduce the overall population. Each

producer is urged to manage bird problems by dispersing the birds, and therefore the damage, over a wide-area. The article concludes the battle will be won if the 10% of the growers who suffer 10% or greater damage can reduce their damage to 1 to 2%.

Anonymous, 1995, So, What Was Bugging Your Crop Last Year

In 1994, a mail survey is conducted to discover the sunflower growers' most prevalent production problems in Kansas, Minnesota, North Dakota, and Minnesota. Of the 1,079 respondents, nearly 25% estimated losses of 5 to 10% to blackbirds; whereas, about 10% of the growers reported losses greater than 10%.

Lilleboe, 1995, Cattail Management Now Focus Of Blackbird Battle

Lilliboe chronicles the end of the blackbird-hazing program by ADC, the rise of cattail management, and offers hope for the development of an avicide. Besides boomers and other scare devices, cattail management is now the only game in town. With several years of research in hand, the NSA board recommends that ADC switch its funding from aerial hazing to cattail management. This is not a universally popular decision, as 50% of growers are against the change and 33% are in support; and the remaining 17% have no opinion. Moreover, only 50% of the growers will cost-share a cattail management program. While cattail management is designed to disperse roosting blackbirds in the short-term, this technique also reduces habitat for breeding blackbirds in the long-term, a fact not well advertised.

Lilliboe suggests that an avicide, which has been discussed among growers for years, would be more effective at reducing blackbird damage than dispersal techniques. However, the mention of avicides causes concerns among wildlife groups. A USDA official reminds growers the blackbird problem will never be eliminated if the crop and birds coexist. So the key is not control but management of the problem, so that people have the option of growing sunflower. This spokesperson concludes that "Compared to where we were 10 years ago, we're finally making some real progress."

Lilleboe, 1996, Blackbird Project Focuses on Population Reduction

Lilliboe begins this article with the same words that began the 1978 article, "If Old King Cole was a merry old soul, it was probably because he had only four and twenty blackbirds to contend with and they were all out of commission." The article recounts the December 1977 meeting at NDSU and chronicles the myriad of bird-dispersal techniques tried, improved upon, and discarded over 19 years. In the late 1970s and early 1980s, growers used Avitrol®; in the 1980s, researchers looked into bird-resistant sunflower, bird sterilants, and taste-aversion; in the early 1990s, the industry saw the development of a herbicide to control cattails. All the while, ADC continued financing 22,000 hours of bird-hazing with airplanes (complete with a back-seat gunner), and farmers used propane boomers, tabasco-treated baits, scarecrow balloons, and fireworks. All of these

techniques are bird dispersal techniques that are not designed to reduce populations.

Lilliboe recounts that for the previous three years, USDA scientists have tested the use of DRC-1339-treated rice to kill up to 250,000 blackbirds during spring migration in South Dakota. Researchers are asking: 1) can killing blackbirds translate into reduced damage? and 2) is the avicide killing nontargets? Kleingartner suggests the avicide will not be a "silver bullet," and a combination of cattail control, frightening devices, and rifles must be coupled with the avicide.

A high-level official of the South Dakota Game Fish and Parks Department (SDGFP) is very concerned about the effects of DRC-1339 on pheasants, an economically important game bird in South Dakota. Although USDA scientists have not detected evidence that DRC-1339 is killing pheasants, the SDGFP funds SDSU to conduct laboratory and field trials to answer questions asked about the effects of DRC-1339 on pheasants. Larry Kleingartner, representing the industry's position, expresses frustration that a product with a Section 3 EPA label cannot be used in an operational program. He concludes by saying, "It is time to move on to the next stage in using this tool to hopefully provide some relief to growers experiencing significant dollar losses from blackbirds."

SUMMARY

As articulated through The Sunflower, the NSA insists that bird dispersal techniques are, at best, a temporary solution with questionable results, and at worst, time consuming, expensive, and ineffective. Moreover, the NSA remains steadfast in its desire to have Wildlife Services develop and use an avicide to manage the blackbird population. In stark contrast, wildlife officials consistently write and talk about how to improve and implement bird dispersal techniques, and cast doubt on the efficacy and environmental impacts of population control for reducing sunflower damage. The NSA, to their credit, have always advocated an integrated pest management approach. Undoubtedly, this impasse will be resolved in future years after much public debate.

THE FUTURE

What bird-damage abatement methods will the NSA promote through The Sunflower over the next 20 years? The answer largely depends on what methods NWRC and its cooperators develop and successfully implement in field trials. In the near term (five years), thorough testing of DRC-1339-treated grain baits for managing both spring and late-summer blackbird populations in and near the sunflower-growing region will continue. Additionally, NWRC and the North Dakota-South Dakota Wildlife Services unit have recently agreed to a joint project designed to lower costs and enhance the benefits of using aquatic herbicides to manage cattails (Leitch et al. 1997). In the mid-term (5 to 10 years), biological control of cattails may be touted as an efficacious and environmentally friendly method. We expect that new, less-expensive aquatic herbicides will be developed after the patent expires on Rodeo® early in the next millennium. In the long-term (10 to 20 years), species-specific immuno-contraceptives may be field

tested for suppressing blackbird populations. Advancements in genetic engineering may result in sophisticated methods of controlling blackbird reproduction or longevity. Finally, a bird dispersal method in the form of a new chemical bird repellent or mechanical scare device may be discovered and warrant field testing.

The authors caution the most environmentally benign damage abatement methods will be subject to much public debate through implementation of the National Environmental Policy Act. Therefore, to maintain credibility it is incumbent on scientists involved in wildlife damage management to provide unbiased data on the efficacy, costs and benefits, and environmental risks of each method.

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