National Wildlife Research Center

FY 2019

Reducing Bird Damage to Agriculture

Contact Information:

Dr. Page Klug
Research Wildlife Biologist
North Dakota Field Station
c/o North Dakota State University
Stevens Hall 233
Fargo, ND 58102

Phone: (701) 231-5190
E-mail: page.e.klug@usda.gov
Website: www.aphis.usda.gov/wildlifedamage/nwrc/

Groups Affected:

- Consumers and producers of sunflower, rice, corn, fruit, dairy, meat and other products
- Feedlot Owners Association
- National and State Fruit Grower Associations
- National Sunflower Association
- North Dakota Department of Agriculture
- North Dakota Game and Fish Department
- Processors, manufacturers, suppliers, and sellers of sunflower, rice, corn, fruit, diary and meat
- South Dakota Department of Agriculture
- South Dakota Game, Fish and Parks
- South Dakota Oilseed Council

Major Cooperators:

- Arkion Life Sciences, LLC
- Michigan State University
- National Sunflower Association
- North Dakota State University
- North Dakota Department of Agriculture
- Purdue University
- Red River Zoo
- USDA-APHIS-WS NWRC Ohio Field Station
- USDA-APHIS-WS NWRC Repellents Project

National Wildlife Research Center Scientists Investigate a Variety of Tools to Address Bird Damage

Wildlife Services' (WS) National Wildlife Research Center (NWRC) is the only Federal research organization devoted exclusively to resolving conflicts between people and wildlife through the development of effective, selective, and socially responsible methods, tools, and techniques. NWRC's field station in Fargo, North Dakota, evaluates and develops methods for managing bird damage to agricultural crops.

European starlings, blackbirds and crows are abundant and widely distributed in the United States, with their winter populations estimated between 750 million and 1 billion birds. The estimated annual damage to grain, fruit and berry crops from these birds exceeds $150 million in direct costs. Blackbirds annually damage more than $15 million in sunflower, $15-25 million in ripening corn, $20-50 million in seeded corn, $6 million in sorghum, and more than $20 million in rice. Thus, the development of bird-damage management methods and acquisition of baseline knowledge on impacts of management actions on ecology and biology of these birds in relation to agriculture is needed at national, regional, and local scales. Current approaches to reduce avian depredation of agricultural crops include 1) chemical repellents, 2) physical frightening devices, 3) decoy crops, 4) habitat management, and 5) altered agricultural practices. NWRC scientists are studying ways to refine current damage abatement methods and develop new methods for reducing damage. As part of their efforts to develop new methods and tools, NWRC scientists conduct multifaceted behavioral and physiological studies involving the use of both captive and free-ranging birds; estimate the economic impacts of bird damage; evaluate and develop application strategies for nonlethal repellents to deter birds; and develop best practices for using unmanned aircraft systems (UAS) as nonlethal scare devices to disperse birds.

Applying Science and Expertise to Wildlife Challenges

Frightening Devices to Prevent Bird Damage. One promising new technology in wildlife damage management is small unmanned aircraft systems (sUAS), which have been deployed by producers to protect agricultural fields from birds and are being evaluated for use in wildlife and agricultural monitoring. A main benefit of sUAS is their ability to reduce bird habituation and sensitization through their dynamic flight paths and movements. With support from the National Sunflower Association, NWRC North Dakota field station and researchers from North Dakota State University conducted a study to evaluate the response of blackbirds to a multi-rotor sUAS flown at decreasing altitudes. Both captive and free-ranging flocks of red-winged blackbirds showed alert or escape responses to the multi-rotor sUAS when it was flown within 98 feet/30 meters above ground level (AGL) and at lower altitude approaches. Results suggest that the sUAS' altitude is important to increase risk perception when used as a hazing device (low altitude) or to minimize disturbance when monitoring populations (high altitude). In similar studies supported by the Federal Aviation Administration, NWRC, North Dakota State University, and Purdue University researchers tested the effectiveness of three different sUAS designs: 1) multi-rotor, 2) fixed-wing, and 3) raptor-shaped for dispersing birds. Each sUAS design was flown towards foraging blackbird flocks in commercial sunflower fields, as well as captive birds. Results suggest that sUAS designed to look like raptors (predators) are more effective at flushing individual birds than fixed-wing or multi-rotor models. However, flock size and landscape features, including the size of the sunflower field and adjacent roosting habitats, also influence the effectiveness of the sUAS for hazing free-ranging blackbird flocks.

Repellent Application Strategies. Anthraquinone (AQ) is a naturally occurring chemical defense found in animals, plants, and bacteria. AQ is also synthesized for industrial use as an avian repellent. The patent holder, Arkion Life Sciences LLC, holds a national registration (EPA FIFRA Section 3) to use AQ at the seeding stage and is currently working on foliar applications at plant maturity in a variety of crops. Although AQ has shown greater than 80 percent repellency in the lab field, studies in ripening sunflower have been inconclusive. Application strategies in the field need to be optimized for the specific crop

being protected in order to transfer the efficacy found in the laboratory to the field. As cultivated sunflower matures, the head faces down making the producer-preferred, aerial application of repellent problematic given that blackbirds must ingest the repellent to be effective. Thus, the main obstacle to using AQ in ripening sunflower is applying sufficient repellent directly on the face of the sunflower to repel birds while minimizing AQ residues on harvested seed. NWRC research is developing application strategies, such as drop-nozzle equipped ground rigs, to apply AQ and other chemicals directly to the sunflower face.

Review of Management Methods for Invasive Cattail. *Typha* (commonly referred to as "cattail") is an wetland plant found worldwide. Hybridization and human disturbances have resulted in large increases in *Typha* abundance in wetland ecosystems throughout North America at a cost to native plant and animal biodiversity. *Typha* is capable of rapidly colonizing habitats and forming monodominant vegetation stands because of its large size, rapid growth rate, and root expansion. Numerous physical, chemical, and hydrologic control methods are used to manage invasive *Typha*, but results are inconsistent and multiple methods and repeated treatments often are required. NWRC researchers and numerous partners contributed to a literature review and summary on *Typha* biology, regional problems, impacts, ecosystem services and management.

Selected Publications:

Bansal, S., S.C. Lishawa, S. Newman, B.A. Tangen, D. Wilcox, D. Albert, M.J. Anteau, M.J. Chimney, R.L. Cressey, E. DeKeyser, K.J. Elgersma, S.A. Finkelstein, J. Freeland, R.Grosshans, P.E. Klug, D.J. Larkin, B.A. Lawrence, G. Linz, J. Marburger, G. Noe, C. Otto, N. Reo, J. Richards, C. Richardson, A.J. Schrank, D. Svedarsky, S. Travis, N. Tuchman, and L. Windham-Myers. 2019. *Typha* (cattail) invasion in North American wetlands: biology, regional problems, impacts, ecosystem services, and management. Wetlands 39(4):645-684. doi: 10.1007/s13157-019-01174-7

Egan, C.C., L. Wandrie, B.F. Blackwell, E. Fernandez-Juricic, and P.E. Klug. 2018. Evaluating blackbird behavioral response toward unmanned aircraft systems(UASs): Exploiting antipredator behavior to enhance avoidance. In: Proceedings of the 17th Wildlife Damage Management Conference 17:71-73.

Kaiser, B.A., M. Ostillie, and P.E. Klug. 2018. Foraging behavior of red-winged blackbirds (*Agelaius phoeniceus*) on sunflower (*Helianthus annuus*) with varying coverage of anthraquinone-based repellent. In: Proceedings of the 17th Wildlife Damage Management Conference 17:85-88.

Klug, P.E. 2017. The future of blackbird management research. In: G.M. Linz, M.L. Avery, and R.A. Dolbeer, editors. Ecology and management of blackbirds (Icteridae) in North America. CRC Press, Boca Raton, FL. Pgs. 217-234.

Wandrie, L.J., P.E. Klug, and M.E. Clark. 2019. Evaluation of two unmanned aircraft systems as tools for protecting crops from blackbird damage. Crop Protection 117:15-19. doi: 10.1016/j.cropro.2018.11.008

Major Research Accomplishments:

- WS research is evaluating the use of unmanned aircraft systems (UAS) and developing best management practices to haze blackbirds from agricultural crops.
- WS research is developing application strategies, such as drop-nozzle equipped ground rigs, to apply an anthraquinone-based repellent and other chemicals directly to the sunflower face.
- WS researchers contributed to a comprehensive review on the status, impacts, and management of invasive cattail in North America.