



RESEARCH AND EDUCATION 2026 STATUS UPDATE



Innovating to Produce More Ducks

Delta's ambitious slate of research aims to answer key questions about waterfowl production, movement, and survival

Delta Waterfowl remains steadfast in its belief that waterfowl management decisions must be rooted in the sound science. Delta continues to lead the way in research focused on ducks and duck hunting issues across North America.

Our strategic emphasis enables The Duck Hunters Organization™ to investigate both long-term challenges and emerging concerns that affect waterfowl populations, wetland habitat, and waterfowl hunters. The insights gained from Delta's research projects are integral to our Duck Production efforts, Habitat Conservation initiatives, and HunteR3 programs. Moreover, our

work informs waterfowl management decisions continent-wide.

Led by Dr. Frank Rowher, Dr. Jay VonBank, Dr. Todd Arnold, and Jacob Bushaw, Delta is working with graduate students from across the country to undertake an impressive 43 research projects in 2026. Together, our biologists, technicians, and young scientists work each year to provide innovative data and analysis.

We proudly present Delta Waterfowl's 2026 Research and Education Status Update as an overview of several key studies. As always, please reach out to your Delta representative for more information.

**DELTA CONTINUES TO
LEAD THE WAY
IN RESEARCH FOCUSED
ON DUCKS AND
DUCK HUNTING
ISSUES ACROSS
NORTH AMERICA**



Meta Analysis of Trapping Data

Dr. Todd Arnold, Delta Waterfowl Senior Scientist

Over the past three decades, Delta has evaluated predator trapping at more than 150 trapped and untrapped nesting sites across a range of landscapes. This data will provide senior scientist Dr. Todd Arnold with an unparalleled opportunity to conduct a large-scale assessment of trapping effectiveness to identify the underlying factors driving large increases in nest success rates. Dr. Arnold will combine data from more than a dozen student- and staff-led assessments to identify key factors such as landscape composition and trapping methods that maximize duck production. Nest success is the most important driver of mallard populations, and understanding variability will help Delta improve targeted Predator Management to strategically bolster duck production.

Does Hot-Spot Trapping Create Nesting Supersites?

Dr. Todd Arnold, Dr. Jay VonBank, Dr. Frank Rohwer, Delta Waterfowl

Nest predation is the greatest drag on duck production in the prairie pot-hole region. To help ducks, Delta pioneered hot-spot trapping, which focuses predator removal on grasslands where nesting hens concentrate in higher-than-average numbers across the prairies. Predator Management increases nest success, with certain sites becoming “superfields” that host hundreds of duck nests in a small area. To identify the drivers, Delta researchers will monitor at least 40 hot-spot trapping sites, evaluating wetland densities, water levels, and how seasonality and surrounding cover impact nest success. Understanding what creates superfields will allow Delta to deliberately identify and prioritize those landscapes for Predator Management.

Using GPS/GSM Transmitters to Validate Geolocator Data and Assess Canvasback Movements

Master's student Jake Pannell and Dr. Benjamin Sedinger, University of Wisconsin Stevens Point; Dr. Jay VonBank, Delta Waterfowl

Waterfowl ecology has greatly benefited from the increased availability, miniaturization, and greatly expanded data-collection capabilities of GPS/GSM transmitters in recent years. However, questions remain about potential influences on bird movement and behavior, in addition to transmitters still being relatively expensive. By contrast, small tracking devices attached to leg bands called geolocators are far less costly and have fewer perceived impacts, but the data they collect is on a much coarser scale and less precise than that from GPS/GSM transmitters. At Delta's Minnedosa Research Station in



Manitoba, M.Sc. student Jake Pannell and Dr. Ben Sedinger of UW-Stevens Point, along with Delta's Dr. Jay VonBank, aim to increase the precision of geolocators by validating them with a GPS transmitter. Pannell will dual-mark nesting female canvasbacks with geolocators and surgically implanted GPS/GSM transmitters to compare the two data streams. Researchers will measure geocator accuracy against known exact locations from the GPS/GSM transmitters and develop models to reduce location error, with the goal of identifying a more cost-effective tool for tracking duck movements at large scales.

Common Raven Movement Ecology in Relation to Waterfowl Nest Success

Master's student Annika Fridberg, Dr. Adam Janke and Dr. Gunnar Kramer of Iowa State University; Dr. Jay VonBank, Delta Waterfowl

There's a new nest predator in the parkland region of Saskatchewan. Ravens have dramatically expanded their range and their population across much of the Canadi-

an PPR. They pose a serious threat to diving duck nests as well as grassland-nesting dabblers such as mallards, gadwalls, pintails, and blue-wing teal. Due to their rapid population growth, waterfowl managers know very little about the habits of ravens. That's about to change. Researchers are conducting a two-year study in Saskatchewan to understand raven movements and their reliance on duck eggs as a source of food. Fridberg's work will focus on how ravens utilize the waterfowl nesting landscape, how ravens depredate nests, and how they use human infrastructure to do so, with the ultimate goal of determining raven predation risk at a landscape level to increase duck nest success rates.

Development of a Rapid Duckling Production Assessment Tool for Upland-Nesting Ducks

Ph.D. candidate Grant Rhodes and Dr. Kevin Ringelman, University of California Davis; Dr. Todd Arnold, Delta Waterfowl

Delta has expanded its Predator Management research into all of prai-

rie Canada, and we are now measuring its effectiveness using some new, cutting-edge tools. This project will expand beyond monitoring nest success to simultaneously measure brood survival and the total number of ducklings produced across three trapped and three non-trapped study blocks. The use of drones, VHF radios/receivers, and nasal saddles attached to incubating hens are allowing us to explore new techniques to measure demographic rates that have traditionally been very difficult to measure. The hope is to use new technology to provide new methods to monitor brood production following management actions.

Development of Effective Moist Soil Management in Prairie Canada

Master's student Braden Bodin and Dr. Drew Fowler of Louisiana State University; Dr. Todd Arnold, Dr. Jay VonBank, Dr. Frank Rohwer, Delta Waterfowl

Managing moist soil habitats to promote vegetation growth transformed wintering habitats for ducks across the Gulf Coast and Midwest. How-



ever, in the prairie pothole region, the practice remains largely untested. Graduate student Braden Bodin and Dr. Drew Fowler of Louisiana State University are working with Delta on a moist soil management research project at the Delta Marsh in Manitoba, testing water drawdown timing, soil manipulation and chemistry, and direct seeding across leveed impoundments. The goal is to uncover a replicable process to establish robust stands of moist-soil plants in northern wetlands, which extends to high-quality fall forage for staging ducks and ample plants for breeding ducks in the spring.

Evaluation of Hot-Spot Trapping Across a Grass Gradient for Predator Management and Nest Success

Master's student Jack Johnson and Dr. Ben Sedinger of University of Wisconsin Stevens Point; Dr. Todd Arnold, Delta Waterfowl

Delta Waterfowl uses hot-spot trapping to focus on predator removal in grasslands where nesting hens concentrate, strategically removing

animals such as skunks and raccoons that raid nests for eggs. Through nest searching and subsequent monitoring, this strategy has been proven to increase nest success. Jack Johnson has been working to better understand the efficacy of this practice across breeding sites in South Dakota. Johnson has divided his field sites into areas where surrounding grassland densities are low, medium, and high. Half of these sites were managed for predators, and the other half were not. Johnson compares nest success across managed and unmanaged areas with varying amounts of surrounding grassland. Johnson is testing drones equipped with thermal cameras for surveying broods. To further test this method's efficacy, Johnson has pilots survey an area twice and record broods each time. He also equipped some nesting hens with nasal saddles — a colored, plastic tag attached over a duck's bill — that clearly distinguishes specific hens and their broods during drone flights. Johnson's research is helping to refine the impact of Delta's Predator Management efforts. With more effective hot-spot trapping

across the PPR and more informed brood counts available to researchers, Delta can better work toward our mission of putting more ducks in the fall flight.

Predator Management on the Western Edge of the Prairie Pothole Region in Alberta

Jacob Bushaw, Dr. Todd Arnold, Dr. Jay VonBank, Dr. Frank Rohwer, Delta Waterfowl

Beginning in 2027, Delta's science team will conduct full-scale testing of intensive Predator Management in Alberta. Although the western stretches of the prairie pothole region have historically recorded high hatch rates, as raccoons and ravens have colonized or reestablished their presence there, nest success estimates have fallen. Researchers will monitor both trapped and non-trapped sites while also evaluating drone technology to monitor pairs and broods as an alternative to traditional ways to search for nests. These efforts will help Delta refine the efficiency of Predator Management in a historically productive region.





Understanding Driving Mechanisms for Skewed Sex Ratios in Mallards, Pintails, and Blue-winged Teal

Master's student Liv Lundin and Dr. Thomas Riecke of the University of Montana; Dr. Todd Arnold, Delta Waterfowl

Studies conducted nearly a century ago by Aldo Leopold described a sex ratio in ducks that favored males, and more recent research has indicated that this disparity has continued and increased. Although hunters often specifically target males during the hunting season, females face substantially greater natural risks than males during the breeding season due to the costs of egg production and the risks of incubating a nest and raising a brood. This causes lower overall survival rates for females relative to males, and over the past 20 years, hen survival seems to have further decreased. This has led to sex ratios of even more drakes per hen in several dabbling duck populations breeding in the prairie pothole region. This project will explore the mechanisms behind these changes, which promises to better inform the monitoring and management of key PPR-nesting species.

Goose Harvest in the Central Flyway: Developing a New Web-based Database Platform

Dr. Jay VonBank, Delta Waterfowl; Central Flyway Council; Arctic Goose Joint Venture

Estimating the annual harvest of waterfowl species open to hunting in North America is complex. Managers in all four flyways rely on voluntary, hunter-supplied data from the Harvest Information Program, Migratory Bird Hunter Survey, and Parts Collection Survey — hunters mail in wings and tail feathers to the U.S. Fish and Wildlife Service — to arrive at a result. Delta's Dr. Jay VonBank set out to simplify the process and improve goose harvest estimates by using an online/mobile application that combines HIP, MBHS, and PCS. The project focuses on Central Flyway geese, including Canada geese, cacklers, white-fronted geese, snow geese, and Ross's geese. During the 2025 waterfowl season, hunters from all 10 Central Flyway states were invited to report their goose harvests through the online portal. In the first year of the project, 467 hunters submitted their harvests from 1,708 hunts. A major benefit of logging data online is hunters can submit their harvests at

any time during the season on their phones in the field or at home. Hunters submitted three and a half times the previous samples, including many more snow geese. The online survey was achieved at about 10% of the cost of traditional methods.

The goal is to obtain one or two more years of data as further proof of concept and hopefully continue to bolster hunter participation.

Evaluating Four Transmitter Attachment Techniques for Effects on Survival, Movements, and Behavior of Mallards

Ph.D candidate Kelsie Huss, Dr. Karen Machin, Dr. Mitch Weegman, University of Saskatchewan; Dr. Jay VonBank, Delta Waterfowl

Radios have been used for decades to understand the movements, harvest rates, survival, and a number of other demographic rates for ducks. An underlying assumption is that the attachment of radios does not bias these demographic rates. Several studies have shown subtle or detrimental effects of different attachment methods. Delta attached hundreds of radios on female mallards caught in Manitoba, North Dakota, and South





Dakota. The goal is to use 100 radios for each of the four following attachment methods: 1-strap backpacks, 2-strap backpacks, implants, and sub-dermal. We will also compare these data to standard leg-mounted geolocators and standard leg-banded ducks in an overall contemporary assessment of attachment style.

Evaluating the Impact of Predator Management on Canvasback Brood Survival Using Marked Hens and Drone Technology

Master's student Rich Cain and Dr. Kevin Ringelman, University of California Davis; Dr. Todd Arnold, and Dr. Jay VonBank, Delta Waterfowl

Canvasback populations are being limited by lagging production. Therefore, improving nest success and brood survival is of paramount importance to waterfowl managers and duck hunters. However, multiple years of Predator Management research in the Minnedosa, Manitoba, region — a prime location for breeding canvasbacks — have netted mixed results for canvasback nest success. Promisingly, however, the number of canvasback broods have proven consistently higher in areas where Predator Management techniques are applied, suggesting a latent effect not captured by traditional nest monitoring. This is encouraging because the abundance and survival of broods are ultimately the determinants of how many juvenile canvasbacks fly south in the fall. Until recently, studying brood abundance and survival was difficult, because broods are hard to detect and identify across surveys. However, Delta's third-generation drones equipped with thermal and visual cameras have made the research of brood ecology feasible at scale. Drones will be used to study canvasback brood abundance when Predator Management is applied on active and control sites. We will mark individual, brood-attending hens

with nasal saddles, which will allow broods to be tracked and identified, while also enhancing our understanding of detection rates across different periods during the breeding season.

Using Stable Isotopes to Derive Breeding Sites of Atlantic Flyway Ducks

Master's student Izzy Eagen and Dr. Michael Schummer, State University of New York College of Environmental Science and Forestry; Dr. Jay VonBank, Delta Waterfowl

Breeding densities of waterfowl in eastern Canada are low but may contribute to Atlantic Flyway harvest more than detected by annual surveys or banding. Portions of northern Quebec are potentially under-represented in breeding population surveys. Breeding waterfowl from eastern Canada may contribute to waterfowl harvest in the Atlantic Flyway, however current methodologies provide little information on abundances that may originate from

these areas. Additionally, population estimates and variances in abundance for gadwalls and wigeon are not reported for eastern North America in the annual U.S. Fish and Wildlife Service Waterfowl Population Status Report. Banding data also are limited for these species in eastern Canada because it is logistically infeasible to capture and mark individuals across such a vast, inaccessible region. We aim to use stable isotope analysis informed by winter banding data to estimate relative origins of green-winged teal, gadwalls, and wigeon across their breeding range, including the PPR. Previously, Fleming et al. (2022) used this methodology to estimate percentages and origins of lesser and greater scaup that winter along the Atlantic coast. Our analysis will provide novel information not otherwise available through traditional survey and banding methods and reflect the relative contributions of the PPR vs. eastern Canada to harvest of these species by Atlantic Flyway state hunters.

Survival and Harvest Rates of Mallard Hens in Relation to Molt Status at Time of Banding

Jacob Bushaw, Dr. Todd Arnold, Dr. Jay VonBank, Dr. Frank Rohwer, Delta Waterfowl

Delta Waterfowl has established its own banding station at the Delta Marsh in Manitoba to contribute to the vital data streams that underpin waterfowl management. As more hens reneest multiple times to hatch ducklings, wing molts that follow brood-rearing are occurring later in the season. Although millions of ducks have been banded over the last several decades, mallard hen molt status has rarely been recorded, and we still don't know how it impacts survival. Delta will evaluate whether late molting affects hen survival rates, providing a clearer picture of the costs associated with declining nest success.



DELTA'S PARTNERS IN RESEARCH

Delta Waterfowl collaborates through an extensive network of national and international partnerships spanning federal and state agencies, universities, NGOs, and private donors, with invaluable partners supporting our research and education efforts. The following list highlights the key partners directly engaged in the projects featured in this report.

- | | |
|---|--|
| Arctic Goose Joint Venture | State University of New York
College of Environmental Science
and Forestry |
| Atlantic Flyway Council | Texas Parks and Wildlife
Department |
| Canadian Wildlife Service | University of California Davis |
| Central Flyway Council | University of Montana |
| Ducks Unlimited Canada | University of Saskatchewan |
| Iowa State University | University of Wisconsin
Steven's Point |
| Louisiana Department of Wildlife
and Fisheries | U.S. Fish and Wildlife Service |
| Louisiana State University | U.S. Geological Survey –
Fort Collins Science Center |
| Manitoba Habitat Conservancy | U.S. Geological Survey – Northern
Prairie Wildlife Research Center |
| Mathwig Family Foundation | |
| Mississippi Flyway Council | |
| North Dakota Game and Fish
Department | |
| Pacific Flyway Council | |



SCHOLARSHIPS

DAVE ANKNEY AND SANDI JOHNSON WATERFOWL AND WETLANDS GRADUATE RESEARCH SCHOLARSHIP

2025

Hannah Sabatier, Ph.D candidate, with Dr. Mitch Weegman, University of Saskatchewan

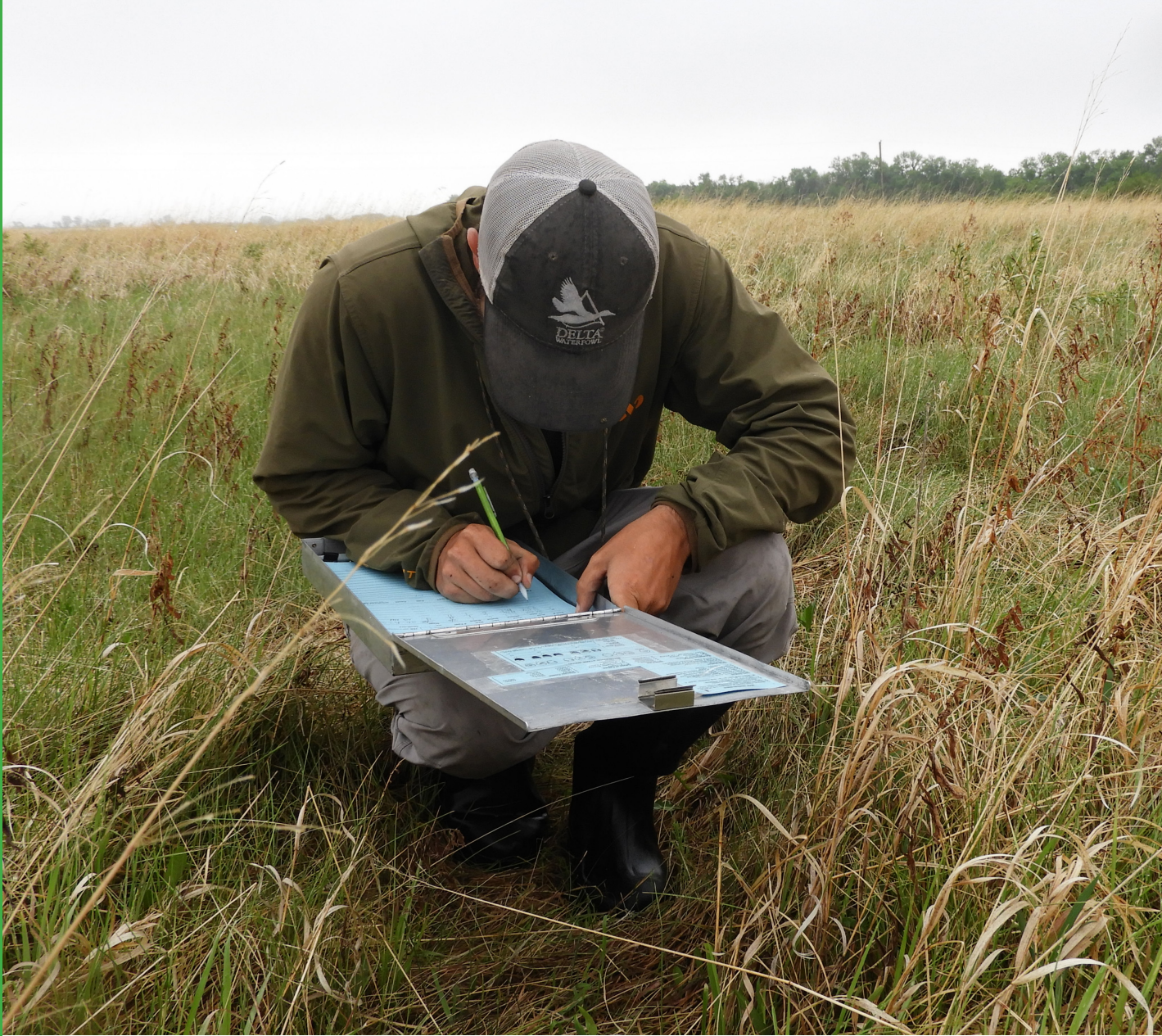
Sabatier, a native of Manitoba, Canada, recently completed her master's degree at the University of Wisconsin–Stevens Point, where she led Delta-funded research to refine waterfowl survey methods using drone technology. She began her doctorate work at the University of Saskatchewan in fall 2025, where her work will involve a comprehensive desktop analysis to assess how representative common datasets are for managing North American waterfowl populations.



Katie Miranda, master's student, with Dr. Kevin Ringelman, University of California Davis

Miranda, an M.S. student at Louisiana State University, is building on her undergraduate honors thesis to examine the broader movement ecology of black-bellied whistling ducks. Using light-logging geolocators attached to plastic leg bands, she is tracking migratory movements that may span multiple continents — providing insight into the expansion of the species to aid in refining future management.





RESEARCH LEADERS

Throughout the organization's storied history, Delta Waterfowl has amassed an impressive body of research that includes supporting more than 600 graduate students and publishing more than 950 peer-reviewed scientific papers.

Delta's research has profoundly influenced how waterfowl, wetlands,

and annual harvest are managed. It has also provided biologists, technicians, and young scientists with the opportunity to gain hands-on experience and guidance to become leaders in waterfowl and wetland conservation. We are proud that many of Delta's former students are working for government and

non-government agencies, as well as universities.

Delta Waterfowl's important waterfowl and wetland research is made possible by you — our generous donors, members, and volunteers. We deeply appreciate your support. Thank you!



DELTAWATERFOWL.ORG

U.S. Office
 1412 Basin Avenue
 Bismarck, ND 58504
 OFFICE 701.222.8857
 TOLL FREE 1.888.987.3695
 usa@deltawaterfowl.org

Canada Office
 RR1 Site 2 Box 2
 Portage la Prairie, MB R1N 3A1
 canada@deltawaterfowl.org