



**RESEARCH AND
EDUCATION**
2022 STATUS UPDATE



Delta Science Leads the Way

DNA sampling, radio telemetry and drone surveying highlight 2022 research roster

Delta Waterfowl has always believed that waterfowl management decisions should be based on sound science. It's a philosophy Delta has followed since Dr. Albert Hochbaum began his work as the organization's first science director in 1938 at the Delta Marsh.

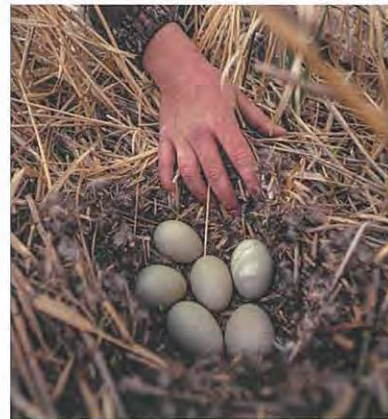


**DELTA HAS TRAINED MORE
THAN 600 MASTER'S AND
DOCTORAL STUDENTS,
INCLUDING SOME OF TODAY'S
FOREMOST WATERFOWL
BIOLOGISTS**

Delta has continually focused research on ducks and duck hunting issues in North America. This strategy allows The Duck Hunters Organization to study important, long-term issues, as well as new concerns impacting ducks and duck hunters.

Delta's research informs our duck production, habitat conservation and Hunter3 programs, as well as waterfowl management decisions throughout North America. Ultimately, all of our research supports Delta's mission to produce ducks and ensure the future of duck hunting.

This special report highlights our



2022 research program. Although the descriptions of each project are brief, more information is always available. Please feel free to contact me to discuss any of Delta's research.

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Hot Spot Trapping to Improve Dabbling Production
 Evaluating dabbling nest success with a new trapping technique

MATT DAVIS, M.S. STUDENT, AND DR. CHRISTOPHER MALCOM, BRANDON UNIVERSITY, HUNTER VELTKAMP, M.S. STUDENT, AND DR. TODD ARNOLD, UNIVERSITY OF MINNESOTA, AND DR. CHRIS NICOLAI, DELTA WATERFOWL

Delta is exploring whether focusing Predator Management on highly productive patches of grassland habitats could efficiently boost production of mallards, pintails and other puddle ducks. This project is different from past studies, as we are assessing how many ducks are attempting to nest rather than simply measuring nest success.

Predator trapping has typically focused on township-sized blocks. Recent Delta research projects have identified “hot spot” trapping as a potentially more effective approach and a more efficient use of management dollars in some portions of the PPR. This project will assess the full impact that hot spot trapping has on increasing duck production.

Raccoon Satellite Telemetry
 Studying movements and habitat use of raccoons to improve effectiveness of Predator Management

DR. CHARLOTTE MILLING, POST-DOCTORAL RESEARCHER, DR. STANLEY GEHRT AND MR. SHANE MCKENZIE, MAX MCGRAW WILDLIFE FOUNDATION

In 2018, 2019 and again in 2021, Delta fitted raccoons with GPS transmitting collars on the Delta canvasback study block in Manitoba. The transmitters collected incredible amounts of data on each raccoon’s daily movements. It was discovered that raccoons spent a



DELTA WATERFOWL'S RESEARCH AND EDUCATION PROGRAM HAS RESULTED IN MORE THAN 950 PEER-REVIEWED STUDIES

lot of time in wetland edges. All of the field work from this study has been completed, and stable isotope samples

are being processed in the lab. The goal of this work is to understand raccoon habits to improve management of these predators and increase production of canvasbacks, redheads, ring-necked ducks and other over-water nesters.

Trailing Hounds to Find Raccoons
 Using trailing dogs to search wetland and other prairie habitats to detect raccoons

MIKE BUXTON, DELTA WATERFOWL

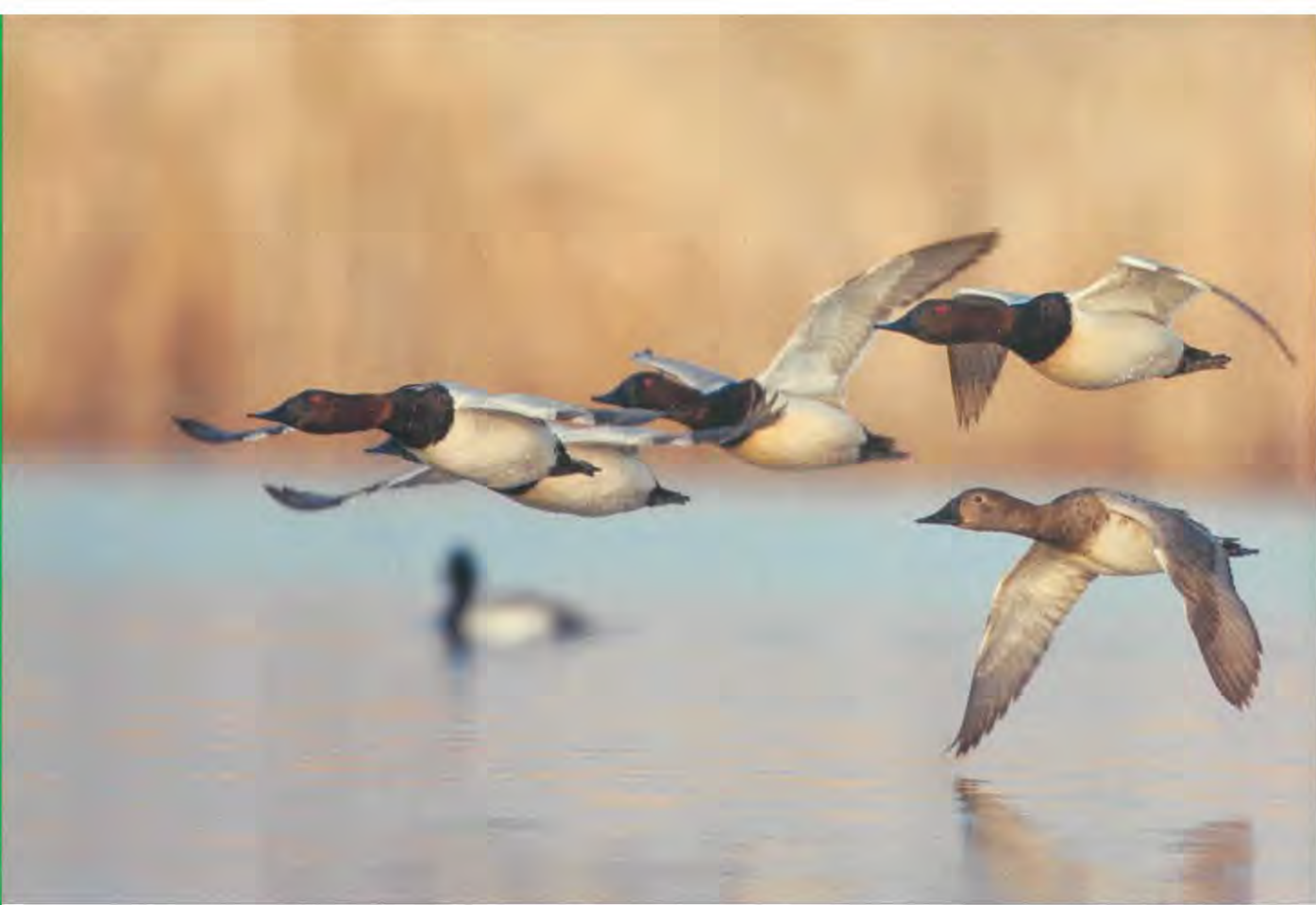
Dogs have long been used to hunt raccoons with great success; however, traditional hunting seasons for furbearers are fall and early winter. This study will explore the effectiveness of trailing hounds to detect raccoons in wetlands and other prairie habitats during summer conditions, when Predator Management is impactful on waterfowl nesting success and brood survival.

Eastern Mallard Banding and Isotopes
 Using isotopes to determine whether mallards are moving between the US and Canada during banding operations

KAYLA HARVEY, M.S. STUDENT, DR. MIKE SCHUMMER, STATE UNIVERSITY OF NEW YORK COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY

Mallards in the Atlantic Flyway have declined by 40 percent in recent years. The reasons are not well understood. Banding data, specifically pre-hunting season banding, is an important tool to monitor mallard populations. Production and survival estimates for Atlantic Flyway mallards have not changed significantly during the decline, suggesting a possible bias in banding data. An important assumption used for past estimates is that birds do not move between survey units, but recent research suggests the potential for an early migration of mallards before the banding period. This study will use stable isotope analysis to determine whether this is the case.





**📍 Lower Mississippi Flyway
Dabbling Tracking**
Determining duck locations during
hunting seasons and migration

DANIEL ODIN, M.S. STUDENT,
STARLA PHELPS, M.S. STUDENT,
DR. DOUGLAS OSBORNE,
UNIVERSITY OF ARKANSAS
DIVISION OF AGRICULTURE, DR.
CHRIS NICOLAI, DELTA WATERFOWL

Delta seeks to better understand the migration and wintering ground habits of dabbling ducks in the Mississippi Flyway. Employing backpack transmitters powered by miniature solar panels, Delta installed radios on mallards, green-winged teal and American wigeon to record movements for the past two years. Ducks were caught during or after the 2019-2020 and 2020-2021 hunting seasons in Arkansas and in September 2021 in South Dakota.

The goal is to understand when and where these ducks migrate and how they respond to hunting pressure and weather events. Odin is focusing on describing preferred habitats each species uses during the winter. Phelps is assessing fine-scale movements of the ducks in the Mississippi Alluvial Valley.

**📍 Predator Trapping
in Wetlands**
Extending trapping efforts into
wetlands to focus on overwater
nesting ducks

MIKE BUXTON, DELTA WATERFOWL

Based on recent Predator Management and nest monitoring programs, over-water nesting ducks are experiencing lower nest success than upland-nesting ducks, even on the same managed blocks. It may be that expanding trapping into the wetlands could result in improved production. With Delta's guidance, Predator Management contractors will undertake and monitor deployment of new trap styles within the perimeters of wetlands in southwest Manitoba.

**📍 Strategic Placement
of Hen Houses**
Using a suite of already collected
variables that predict Hen House use
to optimize hen house placement

MATT CHOUINARD AND MIKE
BUXTON, DELTA WATERFOWL

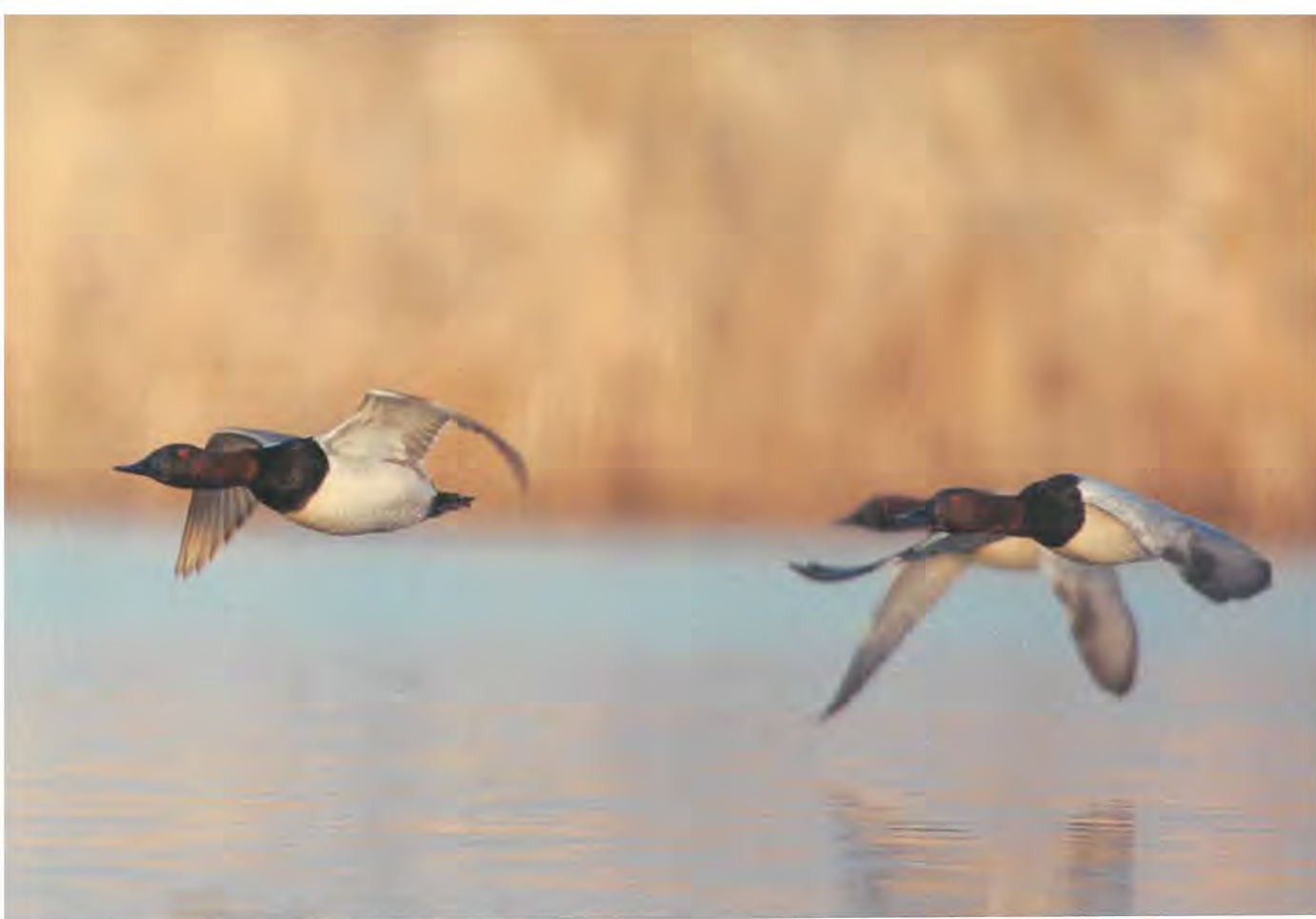
In more than 30 years of study and

refinement of Hen House nesting structures, Delta has gathered a multitude of data about the placement and use-rates of thousands of Hen Houses. A retrospective analysis will use these extensive long-term data to help inform the optimal placement of hen houses that maximize occupancy and success of Hen Houses. The results will be used to maximize the efficacy of the successful Hen House program by installing future hen houses in the best locations.

**📍 Accurizing Mid-winter
Hen House Checks**
How representative are the
mid-winter Hen House checks
to determine prior use?

MATT CHOUINARD,
DELTA WATERFOWL

Annual mid-winter maintenance provides upkeep of Hen Houses, but also seeks to collect data on usage of the structures. During annual maintenance checks, Hen House contents are examined after the breeding season for nest bowls and egg remnants.



These signs provide information on how many nests were attempted and hatched in the prior nesting season.

A team of Delta technicians will monitor approximately 200 hen houses in southwestern Manitoba during the spring and summer to provide known nesting histories of these specific structures. These data will be compared to use data collected during traditional mid-winter maintenance checks.

♀ Pintail Harvest and Survival
How does hunting harvest impact duck populations?

THOMAS RIECKE, POST-DOCTORAL RESEARCHER, UNIVERSITY OF NEVADA RENO

One of the big unanswered questions in waterfowl management is: “What influence does hunting harvest have on populations?” By using new scientific approaches, Delta can more accurately answer this question for a number of important species, including mallards, pintails and blue-winged teal. This look at population cohorts (male/female and juvenile/adult) hopes to deliver understanding of how differing survival

rates may help inform the relationship between harvest and population sizes. In addition, the study revisits the understanding of how density dependence (how many breeding pairs of ducks wetlands can accommodate) works in duck populations.

♀ Spatiotemporal Variation in Duck Demographic Rates
How environmental change influences duck population dynamics

MADELEINE LOHMAN, PHD STUDENT, AND DR. PERRY WILLIAMS, UNIVERSITY OF NEVADA RENO

Waterfowl monitoring efforts have created one of the largest data sets in the world. Using these data, the



researchers will investigate how demographic rates can differ across years and areas for dabbling ducks in the prairie pothole region to shed new light on basic biology and the conservation needs of widely distributed waterfowl populations. This work will focus on mallard demographic rates, including survival, age ratios, and natural versus harvest mortality. We will then use these methods to further explore among other species.

♀ Canvasback/Redhead Integrated Population Models
Determining needs for management of key diver species

DR. DAN GIBSON, POST-DOCTORAL RESEARCHER AND DR. DAVID KOONS, COLORADO STATE UNIVERSITY

Redheads and canvasbacks use the same breeding habitat in the PPR, and Delta has collected extensive data on pairs, nests and broods for both species. The goal of this research is to develop a model of the annual life cycles for canvasbacks and redheads to determine what factors drive their

populations. The resulting models will benefit management efforts by characterizing the relative importance of nest success, survival of nesting hens, brood survival, winter survival and hunting mortality.

🔍 Analyzing Canvasback Production in Relation to Predators, Parasitism and Landscapes

Quantifying impacts of varied influences on localized canvasback production

MICHAEL JOHNSON, PHD STUDENT AND DR. DAVID KOONS, COLORADO STATE UNIVERSITY

Based on experience during multiple seasons in field research in Manitoba, it is understood the recipe to improve canvasback production is not as straightforward as once thought. This project will use multiple seasons of canvasback nesting data to assess the impacts of predation and parasitism, simultaneously, on production for two time periods (1983-1990 and 2016-2021) in a local breeding population of canvasbacks. Additionally, it seeks to link the influence of these mechanisms to local habitat variables. This could help target efforts to benefit canvasback production in wetland conservation programs.

🔍 Mercury Loading in Nevada Wood Ducks

Demographics of a wood duck population in a mercury super fund site

MORGAN BYRNE, M.S. STUDENT, DR. PERRY WILLIAMS, DR. MAE GUSTIN, UNIVERSITY OF NEVADA RENO, AND DR. CHRIS NICOLAI, DELTA WATERFOWL

Delta's Dr. Chris Nicolai has maintained an 18-year project monitoring an isolated population of wood ducks in western Nevada. During the project, feather samples were collected from all banded birds and repeated feather sampling occurred for all nesting hens. Master's student Morgan Byrne collected liver, breast tissue and feather samples from 100 hunter-killed wood

ducks. Importantly, she found mercury levels as high as 40,000 ppb and found a correlation between feather and tissue samples. The levels of mercury found in this population of wood ducks is among the highest levels ever recorded in a bird species, exceeding levels for survival and reproduction. The continued research will compare mother and offspring levels of mercury to determine whether offspring directly or indirectly inherit mercury loadings. The levels of mercury found in this population of wood ducks is among the highest levels ever recorded in a bird species, exceeding levels for survival and reproduction. We will use this data to gain understanding of the trade-offs these ducks are making to maintain a stable population.

🔍 Banding Ducks at Delta Marsh

Collaboration with the Canadian Wildlife Service for Mallard Banding Goals

FRANK BALDWIN, CANADIAN WILDLIFE SERVICE AND DR. CHRIS NICOLAI, DELTA WATERFOWL

Waterfowl banding provides essential information for duck management. The Canadian Wildlife Service and the Mississippi Flyway technical session have partnered with Delta Waterfowl to re-establish duck banding at the Delta Marsh. This program will provide operational data, training opportunities for students and allow researchers to address long-standing research questions about banding across the prairies.

🔍 Genetic Identification of Redhead and Canvasback Eggs

Using genetics to confirm identity of eggs from canvasback nests

MIKE JOHNSON, PHD STUDENT, AND DR. DAVID KOONS, COLORADO STATE UNIVERSITY

Redheads and canvasback eggs are difficult to distinguish from each other. This is additionally problematic as redheads frequently lay their eggs

in canvasback nests, resulting in a mixed-species nest of eggs. Biologists have used a number of characteristics, like egg color and texture, to assign eggs to either species. However, this method has never been tested. Delta supported research will collect a number of unhatched eggs and use these methods to assign them to either species. They will then use genetic testing to confirm the accuracy of these methods.

🔍 Using Saliva to Identify Nest Predators

Can we use residual saliva on depredated eggs to determine the nest predator?

CHRIS NICOLAI, DELTA WATERFOWL

Determining the nest predator of waterfowl nests based on evidence after predation events has always been subjective. New techniques have been developed that can collect saliva samples from predated eggshells. However, it is unknown whether the moist conditions at over-water nests will yield sufficient samples. Delta technicians will swab a number of egg fragments and have them tested for viable DNA.

🔍 Drivers of Redhead and Canvasback Populations

Using May population survey data to understand changes in redhead and canvasback numbers in the prairies and parklands

DR CHRIS NICOLAI, DELTA WATERFOWL

This Delta research will use the long-term dataset provided by the USFWS' annual Breeding Population and Habitat Survey regarding the numbers of May ponds, and breeding canvasbacks and redheads, in important breeding areas across North America. Similar to the recent Delta-funded analysis on pintails by Dr. Franny Buderman, models will be developed to understand how survey variation in breeding numbers has influenced population dynamics across the expansive range of both redheads and canvasbacks. Of particular



interest is how redhead populations grew following the return of water to the prairies, yet at the same time, canvasback populations remained relatively unchanged.

🔍 Drone Brood Surveys
 Development of an operational survey to measure complete duck production

GRANT RHODES, DELTA WATERFOWL TECHNICIAN AND DR. CHRIS NICOLAI, DELTA WATERFOWL

Over many seasons, Delta has been using a combination of pair surveys, nest monitoring and brood surveys to measure productivity. However, none of these approaches are “perfect” as nests and broods can be missed. Therefore, it is likely that measures of overall duck production have been imperfect. Delta seeks to find a simpler and more accurate method to measure the ultimate measure of our management actions — duckling production. In 2022, Delta will begin testing new methods using aerial drones for these assessments.

🔍 Comparing Four Styles of Radio Attachment
 An assessment across radio attachment methods to understand transmitter impacts on mallards

DR. KAREN MACHIN, DR. MITCH WEEGMAN, DR. KIRSTY GURNEY, UNIVERSITY OF SASKATOON, BLAKE BARTZEN, CANADIAN WILDLIFE SERVICE, WALT RHODES, US FISH AND WILDLIFE SERVICE, PAUL LINK, LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES, AND DR. CHRIS NICOLAI, DELTA WATERFOWL

Radios have been used for decades to study and understand waterfowl. An underlying assumption is the attachment of radios does not impact “normal” habits. Several studies have shown subtle and detrimental effects of different attachment methods. In a wide-ranging cooperative effort, Delta will attach 75 radios and dozens of geolocators in each of the next two years in Saskatchewan on female mallards in late summer. Both years, 25 radios each will entail four attachment

methods: backpacks, implants, prong/suture, and leg-mounted geolocators. The study will also compare results to the survival rates among standard, leg-banded ducks.

🔍 Molting Locations of Ring-necked Ducks
 Providing Atlantic Flyway partners additional data from Delta’s recent ring-necked duck radio project

MORGAN BYRNE AND JAMES GOLDEN, MS STUDENTS UNIVERSITY OF NEVADA RENO AND DR. CHRIS NICOLAI, DELTA WATERFOWL

This study will summarize the four-year dataset from Delta’s efforts attaching radios to ring-necked ducks in the southern half of the Atlantic Flyway. Following on the theme of providing information for one of the four species used on the multi-stock harvest model, there is interest in banding large numbers of ring-necks that use the Atlantic Flyway. The research focuses on locations collected during



DELTA WATERFOWL'S LEGACY OF LEADING-EDGE SCIENCE DATES TO THE 1930S, WHEN ALDO LEOPOLD VISITED MANITOBA'S DELTA MARSH.

the late summer when ducks molt and are sedentary for about a month. First, it will look for these wetlands, and then it will use multiple wetland GIS layers to describe the characteristics of lakes on which ringers choose to molt. The Atlantic Flyway banding committee will be able to use this information to help focus ring-necked duck banding efforts.

Research Leaders

Throughout the organization’s storied history, Delta Waterfowl has amassed an impressive body of research that includes supporting more than 300 graduate students and publishing 600 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!



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