SCIENCE SPOTLIGHT 2020

DUCKS UNLIMITED

WHAT SCIENCE MEANS TO DU

Since its founding, Ducks Unlimited has embraced a scientific approach to inform planning and programs to conserve waterfowl populations and their habitats. More recently, DU's application of science has expanded to increase understanding of how our habitat conservation affects ecosystem services (e.g., water quality enhancement, flood mitigation). This approach helps ensure that conservation plans and actions effectively and efficiently sustain waterfowl populations and simultaneously provide other benefits to broader segments of society.

DU'S SCIENCE PRIORITIES AND APPROACH

Ducks Unlimited has a choice of where and in what we invest our science capacity. Activities that address our greatest uncertainties, in our most important geographies, and provide the most significant opportunities to advance our conservation mission invariably receive highest priority. Across our 3 organizations, 6 themes have been identified into which DU science activities are assigned: 1) conservation program planning, delivery and adaptation, 2) ecosystem services and human dimensions, 3) sustainable agriculture, 4) implications of climate change for conservation, 5) species of concern, and 6) development and refinement of the International Conservation Plan.

Intended to complement the International Science Report, this Science Spotlight details a subset of the more than 100 ongoing and new projects in which DU Inc., DU Canada, and DU de Mexico were collectively engaged or supported during Fiscal Year 2020. Also highlighted in this report are some of the students and researchers leading these projects, a list of the DU Fellowship recipients in 2020, and other science insights from across the DU organizations. Ducks Unlimited is proud to collaborate with these outstanding students, researchers, and conservation partners, and we look forward to their continued and future leadership for science in support of waterfowl and wetlands conservation.

PROJECTS NEAR COMPLETION

*HOW CONSERVATION PROGRAMS FOR RICE PRODUCERS CAN HELP WINTERING WATERFOWL HABITAT

Taylor Linder (MS student), Dr. Doug Osborne, & Dr. Kenneth Wallen, Univ. of Arkansas-Monticello; Dr. Scott Manley & Dr. Dale James, DU-SRO

"What's good for rice, is good for ducks" ... "What's good for ducks, is good for rice." Either way you say it, the fate of rice and waterfowl are inextricably linked along the migration corridors and wintering habitat in the Lower Mississippi Alluvial Valley.

That is why the Rice Stewardship Partnership (RSP), a collaboration between DU, USA Rice, and the Natural Resource Conservation Service (with financial contributions from many corporate partners) included wildlife habitat management into this conservation program. The RSP helps rice producers in six major rice-growing states—Arkansas, California, Louisiana, Mississippi, Missouri, and Texas—with financial and technical resources to address conservation issues in water, nutrient, and wildlife habitat management. Despite the resources available to a producer during the program, it remained unknown what happens to water, nutrient, and wildlife habitat conservation practices when the program ends.

To find out, DU teamed up with researchers at the University of Arkansas Division of Agriculture and rice producers enrolled in the RSP from Arkansas, Louisiana, and Mississippi to understand how on-farm operations are influenced during and after the program. Led by Master's student Taylor Linder and Principle Investigators, Dr. Douglas Osborne and Dr. Kenneth Wallen, researchers conducted interviews with rice producers enrolled in the RSP to uncover which principles, beliefs, and experiences underlay their decision to continue (or not) irrigation water management, nutrient management, or flooding their rice fields as habitat for migrating and wintering waterfowl after their enrollment in RSP expired. Forty-seven of fifty (94%) producers indicated that they would continue practices in water management; forty out of forty-four (91%) producers indicated that they would continue practices in nutrient management, and thirty-eight of forty (95%) producers indicated they would continue practices associated with winter water habitat management.

The main components of winter flooded rice fields in the RSP are installing flashboard risers and plugging rice field drains in the winter months (November – February). Winter flooding protects much of the post-harvest rice grain from germination, decomposition, and exploitation from mice and blackbirds, but more importantly it makes these resources readily available for waterfowl and other wetland-dependent species.

Many rice producers in the RSP welcome the idea of incorporating habitat back into farming regimes. One producer from the program noted, "I imagine over the years, a lot of farming has taken away from habitat, so when you see that coming through, it's kind of nice."

* DENOTES A STUDENT-LED PROJECT

For other producers, integrating wildlife habitat is commonplace on their farm, especially for ducks in Arkansas, Louisiana, and Mississippi. One Arkansas producer remarked, "We've got a few hunters in the family, so we're going to continue to do it on some basis anyway. I'd say the program encourages you to do it on more acres." This quote, in particular, demonstrates the importance of RSP in maximizing potential habitat on the landscape for waterfowl while simultaneously keeping an eye on the business of rice.

Most of all, the RSP provides foundational incentives for many producers that otherwise may not winter flood rice fields. "The wildlife flooding, it's hard to do that. It's hard to go out and flood thousands and thousands of acres without a monetary incentive." Without programs like RSP, rice producers are often limited in the amount of waterfowl habitat they can contribute.

By understanding the preferences and motivations of those working with the land, we can design better conservation programs to mutually benefit the producer, the farm, and our natural resources. Wildlife conservation and agriculture do not have to be opponents. By working with private landowners, rice producers in this case, DU and our partners have a great opportunity to make large-scale impacts through local investments that are backed by scientific evidence.

STUDENT SPOTLIGHT

TAYLOR LINDER

Taylor Linder is a native of Ames, Iowa. After graduating from Ames High School, he went on to graduate from South Dakota State University with a BS in Wildlife and Fisheries Sciences. While at the University of Arkansas at Monticello for his Master's Degree, Taylor studied the human dimensions of private land conservation, specifically identifying how we can work with rice producers to incorporate wetland bird habitat on winter rice fields while addressing on-farm efficiency needs of the producer. Taylor is an avid waterfowler and a dedicated Ducks Unlimited volunteer, having served as the President of his SD State Collegiate Chapter for three years, as well as other local chapters in Iowa, South Dakota, and Arkansas. In the future, Taylor hopes to continue to work with Ducks Unlimited to help solve habitat issues by working with private landowners to bridge the gap between agricultural production and waterfowl habitat. Taylor was recently accepted into the PhD program at the University of North Dakota where he will be studying how grazing practices affect grassland nesting birds.

*ECOLOGICAL ASSESSMENT OF WETLAND MANAGEMENT TECHNIQUES ON RESTORED WETLANDS IN THE MONTEZUMA WETLANDS COMPLEX

Ed Farley (MS student and DU-GLAR) & Dr. Mike Schummer, State Univ. of New York, ESF

Throughout New York state, thousands of acres of wetland habitat have been restored through the efforts of various organizations and government agencies. On these wetlands, it is common to manage water levels to mimic natural disturbance that once existed in the system. However, the ecological returns of restored wetlands are often poorly understood, especially in relation to water level management. By varying water level management regimes on several wetlands in the Montezuma Wetlands Complex (MWC) in central New York, and then studying resulting changes in the plant and animal community, we sought to develop a set of guidelines to optimize management of these restored wetlands.

One of three wetland management techniques was assigned to each of thirty randomly selected wetlands in the MWC: full draw down, where all water was removed from the wetland during the growing season; passively managed, where no water control was conducted; and partial draw down, where 20-50% of the wetland was dewatered. Over the course of the year, several biological surveys were conducted on these wetlands. These included breeding marshbird surveys, summer and fall vegetation surveys, summer and fall bird surveys, submerged aquatic vegetation sampling, invertebrate sampling, fall soil core sampling, and waterfowl surveys during spring migration. Results of these surveys were compared between the three water level management regimes to evaluate differences in biological outcomes.

Notable results illustrated the differences between the management techniques. Although the plant community was similar across the three management regimes, seed and tuber production was noticeably different. Based on data from soil cores, seed and tuber densities in full drawdown wetlands were over 2× greater than in passively managed wetlands but were similar to that in partial draw down wetlands. These findings are particularly important to waterfowl managers because seeds and tubers are valuable food sources for waterfowl.

But did greater amounts of food result in greater waterfowl use? Data from this study indicated that it depends on the time of year. During summer bird surveys, when waterfowl are raising broods, passively managed wetlands had greater waterfowl use than either partial or full drawdowns, and partial drawdowns had greater waterfowl use than in full drawdowns. Similarly, during early autumn, passively managed wetlands had greater waterfowl use than full drawdowns, but partial drawdowns had the lowest waterfowl use. During these times of year, water is more limiting than food, and not surprisingly, areas with more water had more waterfowl. During spring migration, when food is more scarce, full drawdown wetlands had greater waterfowl use than passively managed wetlands, and this difference was particularly strong for dabbling ducks. Full drawdown wetlands had on average nearly 3 times as many dabbling ducks as passively managed wetlands.

Other wildlife also exhibited a range of responses to the different management regimes. This project demonstrated that no single management regime was universally best across the entire year. Each wetland management regime produced valuable habitat, but its availability and importance varied throughout the year.

As seasons change, so do the needs of waterfowl other wetland-dependent animals. Each management technique is important, and thus the need to use them in combination to satisfy diverse needs across the year. These results give wetland managers important insights and additional tools to more effectively manage wetlands to provide sufficient habitat for waterfowl and other wildlife.

* DENOTES A STUDENT-LED PROJECT

STUDENT SPOTLIGHT

ED FARLEY

Ed Farley was a Master's Degree student at the State University of New York-College of Environmental Science and Forestry where he was studying the effects of different wetland management regimes. While conducting his research, Ed also worked as a mitigation specialist for Ducks Unlimited out of the North Atlantic Field Office. Before that, Ed started his career with DU as a conservation intern in Ann Arbor, Michigan. Working for DU has always been a dream of Ed's and he considers himself incredibly lucky to live that dream while pursuing his graduate degree. Ed is a lifelong duck hunter, dating to his early days as a kid in eastern North Carolina. He credits his time spent hunting and fishing with family for instilling in him a love of the outdoors that led him to where he is today. Ed is incredibly excited to be part of DU, restoring wetlands and expanding our knowledge at the same time.

*COVER CROPS AND UPLAND NESTING WATERFOWL IN THE PRAIRIE POTHOLE REGION OF SOUTH DAKOTA

Will Gallman (MS student) & Dr. Joshua Stafford, South Dakota State University and U.S. Geological Survey, South Dakota Cooperative Fish and Wildlife Research Unit

The Prairie Pothole Region is a critically important ecoregion for North American waterfowl, serving as a major breeding ground and accounting for a large portion of continental duck production. Over the past century, this region has seen a shift in land use from a grassland dominated to an agriculturally dominated landscape. Waterfowl rely on quality nesting cover to produce successful nests, but with continued declines in traditional grassland nesting cover it is important to quantify nest survival in alternative nesting cover types, especially in agricultural settings. Our research evaluated the use of fall-seeded cover crops by nesting waterfowl in eastern South Dakota.

In the agriculture community there is a movement known as regenerative agriculture, which promotes the importance of soil health, water quality, and other ecosystem services. The concept is not new, but in recent decades has fallen out of favor. Among the practices associated with regenerative agriculture, cover cropping has experienced the greatest increase in the last decade. There are many types of cover crops and management techniques; however, our study focused on fall-seeded cover crops. These cover crops consist of plants such as cereal rye that are not harvested; rather, they are planted in the fall to minimize soil surface exposure and build soil biota and nutrients. In the spring, cash crops are planted directly into the living or terminated cover crop using no-till methods, which may benefit from improved soil health and result in higher crop yields. Cover crops can have similar vegetation structures to winter wheat, which is known to provide quality duck nesting cover; however, cover crops receive more mechanical disturbance throughout the nesting season (e.g., due to spraying and planting) which may adversely impact nest survival compared to other agricultural cover types. The agronomic benefits of cover crops are well documented, but there is little known about their contribution to wildlife, especially grassland nesting waterfowl.

Our research objectives were to: (1) evaluate the utility of fall-seeded cover crops to breeding waterfowl compared to perennial cover; (2) determine if cover crops in rotation with row crops can successfully support grassland nesting waterfowl, and; (3) assess landscape scale, agricultural practice, and vegetation structure factors that may influence nest survival. Using the results from these objectives, we are working to develop recommendations for best management practices to increase nest survival in fall-seeded cover crops.

* DENOTES A STUDENT-LED PROJECT

Thus far, it is clear that a few variables seem to influence nest survival in cover crops. The amount of cover crop growth may influence attractiveness to nesting waterfowl and overall cover for nest concealment. Nests initiated in cover crops that are subsequently planted to row crops tend to have reduced nest survival due to mechanical disturbances. Additionally, the timing of the mechanical disturbance (i.e., planting, spraying, etc.) may influence nest survival, which themselves are dependent on weather conditions. Spring of 2018 was relatively dry throughout much of the nesting season, whereas 2019 was abnormally wet, resulting in many cover crops not getting planted to row crops at all. Estimated nest survival at the individual field level was similar between cover types, but average nest survival was higher in perennial cover. Estimated nest survival in cover cropped fields was significantly reduced when planted to row crops and fell below the minimum threshold assumed to maintain waterfowl populations; however, survival in perennial cover was above this threshold.

Our early results suggest that nest survival may be highly variable between years in cover crops due to local conditions, compared to the relative stability of perennial cover. In an average year, cover crops that are planted to row crops are unlikely to offer highly successful nesting cover, largely due to the planting process and destruction or abandonment of nests. However, there are many different cover crop management techniques, and our conclusions reflect only the techniques evaluated in this study. To our knowledge, this is the first study investigating factors influencing waterfowl nest survival in cover cropped systems. Other techniques may be more successful in providing quality nesting cover and should be a focus of future investigations.

STUDENT SPOTLIGHT
WILL GALLMAN

Will Gallman is a Master's Degree student at South Dakota State University in Brookings, South Dakota, where he is advised by Dr. Joshua Stafford. Will is a native of Gastonia, North Carolina. He earned his Bachelor's Degree in Wildlife and Fisheries Biology from Clemson University in 2017. After completing undergraduate research through the James C. Kennedy Waterfowl and Wetlands endowment with Dr. Rick Kaminski and holding an internship managing coastal wetlands for wintering waterfowl, Will sought to expand his experience to the Prairie Pothole Region. During summer 2017, he moved to South Dakota to enroll at South Dakota State University and begin working on his current research evaluating the use of fall-seeded cover crops by nesting waterfowl. Outside of school Will enjoys hunting, fishing, golfing, cooking, and training his yellow lab, "Pearl".

RESEARCHER SPOTLIGHT

DR. JAMES (JIM) DEVRIES

Originally from Calgary, Alberta, Jim received a BSc in Wildlife Biology from the University of Montana in 1986, a MSc in Wildlife Science from Oregon State University in 1993, and a PhD from the University of Saskatchewan in 2014. Since joining DUC-IWWR in 1991, much of his work involved field research to understand the interaction of breeding waterfowl, their nesting habitats, and factors that affect population trajectory. This includes translating the results of these field investigations into planning tools that inform cost-efficient delivery of conservation programs. A specific area of interest in his work has been understanding factors affecting the population trajectory of northern pintail and how conservation actions can contribute to their recovery.

PRAIRIE CONSERVATION PLANNING "COST TOOL" DEVELOPMENT

Dr. James Devries, Llwellyn Armstrong & Susan Witherly, DUC-IWWR; Dr. David Howerter, DUC-HO; Paul Thoroughgood, DUC-SK; Cynthia Edwards, DUC; various other DUC staff

In the world of wildlife conservation, knowledge of the interaction between species and their habitats is a critical foundation for understanding responses to conservation actions. Of specific interest are linkages between habitat and population processes like reproduction and survival. Additionally, when conservation is delivered across broad geographies, conservation costs and delivery options vary widely, necessitating tools to inform the cost-benefit of habitat conservation actions. Ultimately, we are interested in the question, "Where can we get the greatest impact per conservation dollar?"

To address this question for DU Canada's (DUC) prairie conservation programs, this project combined data from long-term waterfowl nesting studies and extensive information of the costs of conservations operations. The result was the DUC "Cost Tool," a spatially explicit decision support system quantifying the biological return on investment for major conservation activities in prairie Canada.

On the waterfowl side, the Cost Tool draws on information from three long-term DUC nesting studies to analyze two interacting factors with the strongest influence on waterfowl population growth; selection of nest habitat and associated nest survival. Conducted on over 188 study sites across prairie Canada, these studies provided information on the location and survival of over 23,000 duck nests. Analyses focused on identifying the local and landscape-scale factors that affect the number of hatched nests produced (hereafter "productivity") given the local population of ducks present and habitats available. Specifically, the Cost Tool estimates the productivity of mallard, blue-winged teal, northern shoveler, gadwall and northern pintail depending on local population density of each species and the types and amounts of nesting habitat available. Thus, the Cost Tool allows us to estimate how landscape change, both through ongoing habitat loss (e.g., wetland drainage, grassland loss) and conservation actions (e.g., wetland and grassland restoration and retention), affects waterfowl productivity.

On the cost side, the tool incorporates regionally varying land values and tax rates and operational costs for wetland and upland conservation delivery, including staff costs, long-term maintenance costs, and risks of habitat loss in the absence of conservation. The Cost Tool incorporates economic principles such as opportunity cost and time-value-of-money (TVM) to make annualized return-on-investment calculations (ROIs) that are comparable across diverse conservation programs. Return on investment is expressed as cost per hatched nest (CHN).

In application, the Cost Tool is embedded in a GIS-based planning environment that integrates spatially varying data layers for waterfowl distribution, habitat availability, and cost inputs, to generate predicted CHN values for each of our major conservation activities across prairie Canada. The Cost Tool makes it clear that the ROI of conservation programs are highly dependent on not only the number of ducks available to take advantage of them, but also the species composition of ducks present, the nesting habitat available, and the surrounding land use. Further, geographic location is important to ROI for two main reasons: 1) nest survival varies from west to east and north to south (i.e., hatch rates are greater in Alberta versus Manitoba, and greater in the southern prairies versus the parklands) and 2) land values and associated costs vary greatly between provinces and along urban to rural gradients.

While only recently released, the Cost Tool is already making an impact on how conservation delivery is occurring in prairie Canada. Relative CHN values, based on estimates available for all locations in prairie Canada, are used regularly by DUC staff in reviewing potential projects. Further, mapping of CHN values has highlighted some previously overlooked regions where ROI values suggest DUC conservation programs may be worthwhile. In summary, the Cost Tool provides a powerful bio-economic decision support tool informing waterfowl conservation in prairie Canada.

RESEARCHER SPOTLIGHT

THE DELTA TEAM

A project of this size and complexity requires a team to ensure efficient coordination of field activities and the production of final reports. Three Institute for Wetland and Waterfowl Research (IWWR) staff managed the project and coordinated activities with other researchers. Dale Wrubleski, lead investigator, has been with IWWR for 25 years and was involved with the project since its inception. Dale worked on the marsh for over 30 years, studying its aquatic invertebrates, vegetation and fish. Bob Emery brought to the project 30 years of experience managing several long-term waterfowl research projects. Bob managed all aspects of the project, from the field to final reporting. Paige Kowal started on the project as a field assistant, later rejoining to manage summer field activities. She has continued working with IWWR, all while successfully completing her MSc, bringing her skills to finalizing project reports and publications.

RESTORING THE TRADITION AT DELTA MARSH: MANAGING AN INVASIVE FISH SPECIES TO IMPROVE WATERFOWL HABITAT

Dr. Dale Wrubleski, Bob Emery, Paige Kowal, Dr. Lauren Bortolotti, & Llwellyn Armstrong, DUC-IWWR; Dr. Vanessa Harriman, DUC- IWWR/BOR; Dr. Michael Anteau, USGS; Frank Baldwin, ECCC; Cameron Meuckon, Government of Manitoba; Doug Watkinson, Dr. Amanda Caskenette, Dr. Eva Enders, Ricky Di Rocco, & Doug Watkinson, DFO

In south-central Manitoba, in the heart of North America, sits one of the continent's largest and most well-known marshes. Located at the south end of Lake Manitoba, Delta Marsh was known to hunting enthusiasts as a premier waterfowl hunting spot. For over 100 years, the rich and famous from around the world flocked to Delta to hunt the abundant waterfowl that passed through the marsh each fall. But that all changed several decades ago when the waterfowl stopped coming and the marsh grew silent.

An invasive fish species, the common carp, had become abundant at the marsh. This large bottom-feeding fish, native to Asia, was introduced to North America as a food fish in the 1870s. It never caught on as table fare, but it has since spread across the continent, causing tremendous damage to our wetlands. Carp root through bottom sediments like vacuum cleaners in search of food. This results in murky water, increased algal blooms, and thereby limits sunlight to submersed aquatic plants. These plants provide food for ducks and support the aquatic invertebrates that ducks eat as well. With no food to fuel their migration south, the ducks stopped coming to the marsh.

To fix the problem, DU Canada, the Province of Manitoba and other partners came together to develop a plan, with the primary objective of reducing the number of carp in the marsh. The plan, Restoring the Tradition at Delta Marsh, was intended to restore the rich waterfowl hunting heritage of the marsh. But how does one reduce numbers of one fish species without negatively affecting other fish that also use the marsh? The marsh is not only important to continental waterfowl, it is also important to regional fisheries. Delta Marsh supports over 30 species of fish, several of which are important to recreational and commercial fishers. Based on a four-year research project from 2009 to 2012, researchers came up with a way to limit carp access to the marsh, while still allowing other fish to use the marsh for spawning and feeding.

During the winter of 2012-2013, exclusion structures were constructed on channels connecting the marsh to Lake Manitoba. The purpose of these structures was to hold exclusion screens that are dropped in the spring when carp are trying to enter the marsh. All large fish species that use the marsh, including carp, overwinter in Lake Manitoba and migrate into the marsh each spring. Research found that carp tend to migrate into the marsh later than many of the native fish species, and they are also among the largest of the fish that return to the marsh. Using a combination of screen placement timing (dropped when the carp start to migrate in large numbers) and the size of the openings (70 mm [2.75 in]) in the screens, we significantly reduced the number of large carp within in the marsh.

Since the start of carp exclusion, we have monitored the marsh and been surprised by how quickly the marsh recovered. In survey transects in the eastern part of the marsh, the area of submersed aquatic plants increased sevenfold between 2009 and 2018. Northern watermilfoil dominated plant growth, but sago pondweed has also increased. To the delight of both researchers and hunters, waterfowl numbers have also increased dramatically. Late migration dabbling duck densities increased 442%, and diving duck densities increased 392% after carp exclusion. Fall staging canvasback and scaup densities have increased by 20 and 4 times, respectively, from the decade prior to carp exclusion, and are the highest numbers recorded since the 1960s-1980s. The improvements to the marsh ecosystem are encouraging signs to all partners involved with this project and inspires hope that conditions will continue to improve, and Delta Marsh will be restored to its previous glory.

NATIONAL WETLANDS INVENTORY AND CLASSIFICATION IN MEXICO

Eduardo Carrera, Gabriela de la Fuente, Norma Rangel, & Diana Sánchez, DUMAC-NHQ

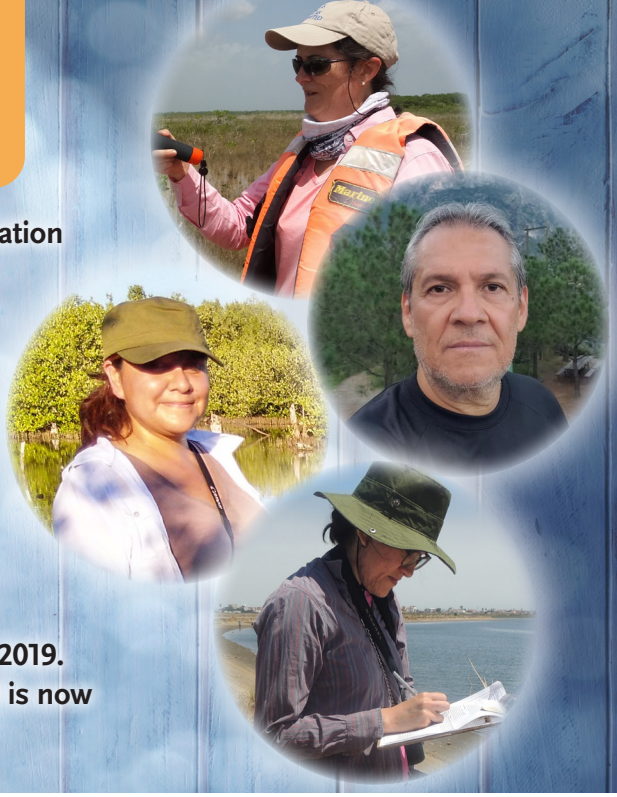
Historically, limited information existed on the abundance, diversity, or distribution of wetlands in Mexico, thus greatly hindering the creation of effective wetland conservation programs to offset the effects of human activities or protect remaining high quality wetlands. In Mexico, by law the National Water Commission (CONAGUA) is responsible for generating the national wetlands inventory, but the information they have produced is at very coarse spatial scale (1:250000) and only reaches system levels. Moreover, it has not included marine or coastal areas such as bays, estuaries, or lagoons, which limited its utility for management and conservation of Mexico's wetlands. Recognizing the importance of comprehensive wetland data for effective conservation, DUMAC led a multi-year effort to develop the Mexico Wetlands Inventory and Classification database, which contains the most detailed wetland information available in Mexico under a common classification system. Of additional significance is the development of this database using a system that is compatible with other international wetland information (e.g., U.S. National Wetlands Inventory).

The effective management of wetlands requires complete knowledge of their general characteristics such as location, size, and identification of the different wetland types that are used as feeding, resting, and shelter areas for all wildlife that depend on them. DUMAC, through the Wetlands Inventory and Classification Program, collected the necessary information at a finer scale (1:100000) than was previously available to support and implement conservation programs for priority wetlands of importance to wintering waterfowl in Mexico. This inventory also provides land managers, federal, state and municipal government agencies and private organizations with basic information necessary for conservation, planning, and zoning activities.

DUMAC initiated this effort in Mexico in late 1991 and completed the entire country in 2020, a truly monumental undertaking. DUMAC scientists used Landsat satellite imagery as the basis for wetland classification because of its comprehensive spatial coverage and spectral characteristics that lends itself to effective classification of wetland and terrestrial landscapes. Remote sensing and classification analyses developed by DUMAC scientists reflected their experience and training gained over the 29 years of this project. These analyses resulted in an effective standardized nomenclature for defining wetland types in Mexico.

Wetland classification data were integrated into a geographic database intended for use by governmental and non-governmental organizations to assist their decision-making for conservation and management of wetlands in Mexico. This database is available through an online map server, which also enables its availability to the general public. The Mexico National Wetlands Inventory and Classification provides a foundational dataset from which to advance wetland conservation and has already played important roles for DUMAC in identifying wetland areas of importance to migratory waterfowl.

RESEARCHER SPOTLIGHT
DUMAC WETLANDS INVENTORY TEAM



A nation-wide project of this scope and duration required close cooperation and persistent dedication of a multi-talented team of biologists, geographers, and analysts. Four DUMAC staff managed the project and coordinated activities with other partners across the many different states where this work was conducted. Gabriela de la Fuente, lead investigator and DUMAC Assistant Director, has been with the organization for 28 years and was involved with the project since its start. More than 34 years of experience and leadership was brought to the project by Eduardo Carrera, DUMAC CEO. Norma Rangel joined the team in 2016 and has since managed all aspects of the project, from field trips to final reporting. Diana Sanchez is the newest member of the team, having joined DUMAC in 2019. Diana completed the remote sensing analysis for the south region and is now helping with the final report.

NEW PROJECTS IN FY20

*COMPARING SPRING MIGRATION STRATEGIES OF NORTHERN PINTAILS FROM WINTERING AREAS ACROSS NORTH AMERICA

Georgina Eccles (PhD student) & Dr. Bart Ballard (Texas A&M-Kingsville)

Understanding factors that impact pintail populations is a crucial first step to inform ongoing conservation and management activities to improve population status. Current information suggests poor body condition of wintering females in the Gulf Coast region, poor nest success in prairie breeding areas, and their possible interaction through "cross-seasonal" connections, may be contributing factors. Prior research has revealed substantial differences among individual ducks in their timing, duration, and path of migration from wintering to breeding grounds, but little is known about the benefits or costs of these different strategies. The primary objective of this research is to better understand the consequences of wintering and migration staging site selection to the survival and breeding success of female pintails across the continent. This study will also enable insights into pintail settling patterns and large-scale habitat selection. Over the course of three years, 480 female pintails will be captured at multiple wintering sites from California, Texas, Louisiana, Arkansas, and potentially other locations. By tracking and examining decisions and behaviors of individual female pintails through their entire annual cycle (nonbreeding and breeding), the study aims to better understand the factors affecting population growth of this important North American species.

*EVALUATING WATERFOWL USE AND HABITAT QUALITY FOLLOWING WETLAND RESTORATION IN LAKE ONTARIO COASTAL WETLANDS AT BRADDOCK BAY WILDLIFE MANAGEMENT AREA

Christopher Mitchell (MS student) & Dr. Rachel Schultz, State Univ. of New York, Brockport

The deepwater and coastal wetland habitats of the Great Lakes region are important to breeding, migrating, and wintering populations of a high diversity of waterfowl species. Since 1800, we have lost approximately 50% of coastal wetland area in the Great Lakes region, and these wetlands are increasingly impacted by anthropogenic disturbance. One source of wetland degradation is the invasion of hybrid cattail and common reed (i.e., Phragmites) into Great Lakes coastal wetlands, which can form dense stands of monotypic vegetation and greatly reduce habitat values. A common target of wetland restoration is to increase the amount of open water area interspersed within marshes to improve waterfowl habitat. However, little is known about how waterfowl and other wetland characteristics are affected by these small-scale treatments, and how these habitats meet the needs of waterfowl at critical periods, such as spring migration. This research will measure waterfowl use relative to wetland characteristics to evaluate a wetland enhancement technique of dredging open water ponds amongst stands of invasive vegetation in the coastal wetlands of Braddock Bay Wildlife Management Area on the southern coast of Lake Ontario. This information is needed to understand how this management technique benefits waterfowl and their habitats.

* DENOTES A STUDENT-LED PROJECT

*MALLARDS, CLIMATE CHANGE, AND LAND USE IN THE PRAIRIES

Madeleine Lohman (PhD student) & Dr. Perry Williams, Univ of Nevada, Reno

Data from waterfowl banding and survey programs reveal that duck populations in the Prairie Pothole Region (PPR) fluctuate and their spatial distributions change through time. Some of these changes are due to natural climate cycles, but land use change, especially grassland and wetland loss have played a role too. This study will use cutting-edge statistical models to investigate how mallard survival, harvest mortality, and reproduction have changed in response to land use and climate between 1961 and 2015 and how they differ across the PPR. By identifying causes of past fluctuations in mallard populations, this research can help us better target where, when, and what type of management efforts will be most effective.

*DUCK BROOD USE AND SELECTION OF WETLANDS IN CROPLAND DOMINATED LANDSCAPES IN THE U.S. PRAIRIE POTHOLE REGION

Blake Mitchell (MS student) & Dr. Adam Janke, Iowa St. Univ

Alterations to the Prairie Pothole Region (PPR) through wetland drainage, grassland conversion, and agricultural expansion have changed the capacity of the landscape to support breeding waterfowl. Understanding these changes has been the focus of waterfowl research for decades, but few studies have examined the capacity of these landscapes to produce duck broods. This research aims to assess wetland use by duck broods in agriculturally dominated landscapes in the Iowa and Minnesota PPR where wetlands still exist through restoration or protection in a drastically altered landscape. Aerial brood surveys will be conducted with a quadcopter drone equipped with a thermal and visual camera. This technology will enable repeat-visit brood surveys at the landscape-scale with high confidence in estimates of brood abundance. In addition to surveying broods on wetlands, data will also be collected on water quality, aquatic invertebrate forage, terrestrial vegetation communities, and wetland densities. These various metrics will be combined with brood data to help understand what factors determine which wetlands duck broods use. This project is being conducted in concert with a study funded by Delta Waterfowl and Louisiana State University (LSU), which is being led by Catrina Terry (MS student) and Dr. Kevin Ringelman, both of LSU. This research will yield a better understanding of the dynamic wetland-grassland-cropland ecosystems in the PPR and help DU and partners improve strategies for restoring or acquiring productive wetlands for birds.

PRAIRIE ECOSYSTEM SERVICES: QUANTIFYING THE CONTRIBUTION OF WETLANDS IN LIVESTOCK PRODUCTION LANDSCAPES

Dr. Pascal Badiou & Dr. Lauren Bortolotti, DUC-IWWR

For the first time, researchers will be using sophisticated flux towers to quantify carbon sequestration and greenhouse gas (GHG) emissions for prairie wetlands. Flux tower technology uses high-frequency sensors to measure GHGs as they move between wetlands and the atmosphere. This technique has been widely used in other types of wetlands around the world but has not yet been applied to wetlands of the Prairie Pothole Region. This study will focus on wetlands embedded in grazing lands and cropped fields, which can help fill two important information gaps: understanding how land use affects wetland GHG emissions and quantifying the carbon benefits of the landscapes important to sustaining waterfowl. Information generated from this work will determine the degree to which wetlands in agricultural landscapes contribute to natural climate solutions and how to manage these systems to maximize these benefits.

* DENOTES A STUDENT-LED PROJECT

2020 DUCKS UNLIMITED FELLOWSHIP RECIPIENTS

Educating the next generation of conservation scientists and managers is critical to the success of Ducks Unlimited and waterfowl management in North America. In addition to including graduate studies in many staff-led research projects, DU provides dedicated support to graduate students (MSc or PhD) across the continent. This support is provided in the form of annual graduate fellowships that have the purpose of developing young professionals who are dedicated to conservation, while advancing our scientific understanding of waterfowl and wetlands. To date DU has awarded fellowships to over 56 students from 26 universities. In 2020, DU awarded 3 fellowships to new recipients and renewed fellowships for 5 continuing students.

NEW RECIPIENTS IN 2020

MADELEINE LOHMAN

BONNYCASTLE FELLOWSHIP IN WETLAND AND WATERFOWL BIOLOGY – This fellowship is awarded to graduate students throughout North America for projects focusing on an aspect of wetland or waterfowl ecology that promises to advance conservation. The 2020 recipient is Madeleine Lohman, a PhD student at the University of Nevada, Reno, for her research on mallard population dynamics in the Prairie Pothole Region.

Population dynamics and species distributions shift over time and space. Elucidating the mechanisms behind these changes allows us to better predict the effects of environmental change. Madeleine is developing and implementing models, from the fields of Bayesian statistics and mathematics, to assess the effects of precipitation and land use on survival, harvest mortality, and fecundity for mallards in the Prairie Pothole Region from 1961-2015. Her research will contribute to waterfowl conservation by informing how and where to best direct management efforts in light of changing climate and land use.

EDWARD D. AND SALLY M. FUTCH GRADUATE FELLOWSHIP – Thanks to the generous support of one couple with a special interest in DU's scientific work, this fellowship helps to advance our understanding of waterfowl and wetlands in North America. This fellowship in 2020 has been awarded to Cheyenne Beach, a MSc student at Western Illinois University for her research on sub-lethal effects of parasite infections in lesser scaup.

Since 1998, tens of thousands of lesser scaup have died while migrating through the Upper Midwest, owing to trematode infections. Fearing the continued spread of exotic faucet snails, which serve as intermediate host of the trematodes, Cheyenne's work seeks to address knowledge gaps in our understanding of the physiological response of scaup to sub-lethal trematode infections. She will conduct a series of experiments to evaluate:

1) How trematode infections influence scaup blood biochemical profiles and body condition.
2) The additive effects of trematode and "typical" helminth community infections on migratory lesser scaup physiology and condition.
3) How demographic factors like age and sex influence the physiological response to sub-lethal infections.

This research will improve our understanding of one of the factors potentially contributing to scaup population declines.

CHEYENNE BEACH

MORIAH TANGUAY

DUC-MBNA CANADA BANK® CONSERVATION FELLOWSHIP – Sponsored by a long-time partner of Ducks Unlimited Canada (DUC), this fellowship helps support tomorrow's conservation leaders while providing new information that DUC can apply today. The DUC-MBNA Canada Bank® Conservation Fellowship was awarded to Moriah Tanguay, a MSc student at the University of Saskatchewan for her research on habitat selection by scoters in the Northwest Territories.

The North American breeding population of scoters remains below historic levels. With more than 80% of this population in the boreal forest, habitat changes in that landscape may be important. Focusing on white-winged and surf scoters in the Ramparts River area in the Mackenzie River Valley, Moriah will identify wetland and landscape characteristics that predict breeding scoter abundance and examine the relative importance of foraging and nesting habitat for wetland selection by scoters. Her work will refine our understanding of scoter habitat needs and thus improve identification of priority scoter habitat and inform conservation planning in this important waterfowl area.

CONTINUING RECIPIENTS IN 2020

WATERFOWL RESEARCH FOUNDATION FELLOWSHIP (1 OF 2) – This relatively new fellowship is an investment in young waterfowl professionals with three primary objectives: 1) developing critical scientific information that will contribute to the future conservation of waterfowl and wetland resources, 2) contributing to the training of future professionals in the field of waterfowl and wetlands conservation, and 3) honoring the critical role that waterfowlers have played in supporting waterfowl and wetland conservation throughout North America. This fellowship is held by Cynthia Anchor, a MSc student at South Dakota State University for her research on the post-fledging movement and ecology of hatch year mallards.

During the post-fledging period, young mallards are learning new skills, exploring their environment, and preparing for migration, and some studies suggest that their behavior may be different than adults at this time. Cynthia's work will help us better understand this essentially unstudied period in the lifecycle of mallards in the Prairie Pothole Region. She will mark ducks with small transmitters integrated with GPS and cellular technologies. Data from these devices will allow her to identify the potential influence of habitat characteristics, hunting disturbance, fall territory prospecting, and local weather patterns on local, regional, and migratory movements. This work will also allow Cynthia to assess potential implications of migration patterns and wintering locations on both survival and breeding success. Gaining this insight into factors affecting habitat use, recruitment, and breeding success of hatch year mallards will help ensure effective habitat management.

CYNTHIA ANCHOR

WATERFOWL RESEARCH FOUNDATION FELLOWSHIP (2 OF 2) – The second recipient of this fellowship in 2020 is Josh Brown, PhD candidate at the University of Texas El Paso, for his work examining the long-term genetic implications of game farm mallard releases in the eastern U.S.

JOSH BROWN

Prior to the 1800s, mallards were seldom seen in Atlantic flyway states. However, by the 1950s mallards had become one of the most common waterfowl species in the region. This is partially thought to be a result of changes in management practices, specifically the introduction of nearly 500,000 game-farm mallards per year throughout the mid 1900s. The objective of Joshua's project is to test for and better understand the population structure of North American mallards, particularly focusing on eastern populations. Specifically, he will determine the extent of game-farm mallard genetics found in wild mallard populations and thus gain insight into the potential role of game farm genetics in eastern Mallard population decline.

SAMANTHA FINO

BONNYCASTLE FELLOWSHIP FOR PRAIRIE ECOSYSTEM STUDIES – This fellowship fosters research in Prairie Canada that: 1) enhances the scientific understanding of prairie wetlands, associated habitats and wetland-dependent wildlife; and 2) contributes to the protection, restoration, or wise use of this highly altered landscape. The 2020 recipient of this fellowship is Samantha Fino, a PhD student at South Dakota State University for her work evaluating predator communities and duck nest survival in eastern South Dakota.

Grasslands are an important but diminishing habitat for waterfowl. Samantha's research will examine predator movements and duck nest success as related to characteristics of grassland patches. The goal is to help identify factors that lead to reduced predator use and higher nest success. Specifically, she will (1) quantify the influence of grassland composition and patch dynamics on predator communities, occupancy and use, as well as on nest site selection and survival of ducks, (2) quantify relationships between predator community dynamics and nest success, and (3) estimate vital rates of predators and nests. She will use a unique combination of radio-marked predators, camera traps, and surveys of predators and their prey. Results of this study will provide a better understanding of how grassland characteristics influence predators and will assist conservation agencies in developing habitat-patch-size recommendations that benefit waterfowl productivity.

SPENCER T. AND ANN W. OLIN FOUNDATION WETLANDS AND WATERFOWL RESEARCH FELLOWSHIP – This fellowship reflects the long-term commitment made by one family that has been supporting DU since 1941. Emily Tarsa is the most recent winner of this fellowship for her PhD work at Utah State University. Her research is focused on restoring native wetland plant communities after control of invasive Phragmites to improve waterfowl habitat and return critical functions and services, particularly in the wetlands surrounding the Great Salt Lake.

EMILY TARSA

One of the greatest threats to wetland conservation and waterfowl habitats across North America is the invasion of *Phragmites australis*. Recent research has highlighted effective control strategies for Phragmites. However, natural recolonization of native plants needed to support waterfowl habitat has been limited. Seeding is a financially and logistically feasible restoration option, however native plant seedling mortality is often high in restorations. Emily's research will focus on how to effectively revegetate wetlands following Phragmites removal. She will identify functional traits that drive seed and seedling life stage transitions for native species. She is focusing on native plants that provide critical waterfowl habitat, as well as Phragmites. Specifically, her research objectives are to:

- Evaluate the variation in regeneration traits that exist within and between native species sourced from different sites throughout the region
- Identify regeneration traits that are linked to plant performance in restorations under various environmental conditions
- Develop a systems model to quantitatively describe the relationship between regeneration traits and restoration outcomes under various environmental conditions

The results of Emily's research will provide important management tools that can be used to develop targeted, cost-effective wetland restoration strategies following Phragmites control.

SARAH CLEMENTS

MICHAEL F.B. NESBITT FAMILY RESEARCH FELLOWSHIP – This relatively new fellowship honors the many contributions by members of the Nesbitt family to science and conservation. This fellowship has been awarded to Sarah Clements for her PhD research at the University of Missouri. Sarah's research seeks to improve our understanding of the fitness consequences of habitat availability and quality for a declining group of birds—migratory shorebirds.

Migratory species are affected by habitat and climate over broad geographic ranges and it can be difficult to monitor individuals and populations over a full annual cycle. Sarah will harness the power of GPS-acceleration tracking devices, technology that allows researchers to make inferences about both habitat use and productivity without needing to resight or recapture birds. Tracking three wetland-dependent shorebird species (American avocet, black-bellied plover, Hudsonian godwit), ranging from short- to long-distance migrants, this project will provide information needed for effective conservation planning for migratory birds including:

- key characteristics of high-quality habitat
- factors affecting the quality of stopover sites
- relative importance of breeding season versus carry-over effects on survival

DR. BRUCE D.J. BATT FELLOWSHIP IN WATERFOWL CONSERVATION – This fellowship was established in recognition of a retired DU employee who was particularly passionate about the role of sound science in guiding conservation. This award is currently held by Casey Setash for her PhD work at Colorado State University that is examining waterfowl productivity in a flood-irrigated system in the North Platte Basin.

Effective water management is essential for both agricultural production and waterfowl habitat and is more pressing than ever due to growing human demands for water, drought, and climate change. Casey will evaluate waterfowl production before and after irrigation infrastructure improvements. Specifically, she will measure the impacts of management change on:

- Nest survival
- Nest density
- Abundance during peak stopover and breeding periods

Results from this study will be used to inform best management practices benefitting both agricultural producers and waterfowl managers.

CASEY SETASH

DU CANADA ENDOWED CHAIR IN WETLAND AND WATERFOWL CONSERVATION

Earlier this year, Ducks Unlimited Canada (DUC) and the University of Saskatchewan (USask) announced a partnership to create the Ducks Unlimited Canada Endowed Chair in Wetland and Waterfowl Conservation—the first of its kind in Canada.

The new research Chair will teach and supervise students, while coordinating education, research, and outreach to tackle the complex environmental challenges facing land, water and wildlife. The endowment will provide student support through graduate fellowships and undergraduate scholarships. DU Canada and USask have launched a $5-million fundraising initiative to support the chair and its work.

"Ducks Unlimited Canada is a visionary organization that has made outstanding contributions to the conservation and restoration of North America's wetlands and waterfowl," said USask Vice-President Research Karen Chad. "This new research partnership will open up exciting new opportunities for our faculty and student researchers, with a potentially huge impact on our environment."

Dr. Karla Guyn, CEO of Ducks Unlimited Canada and USask alumna (MSc and PhD in biology), is one of Canada's leading conservation scientists. She is pleased that this Chair will further the conservation science needed to address increasing pressures on wetlands and wildlife. This is especially important in the Prairie Pothole Region of Canada.

"We want to see the chair advance new knowledge about wetlands and waterfowl and translate that into action on the ground," said Guyn. "It's this landscape-level focus that will provide solutions to some of today's most pressing environmental issues including water quality, flood and drought mitigation and climate change."

Dr. Bob Clark, research scientist and USask adjunct professor in biology, has devoted his life to waterfowl and wetland conservation.

"Although this chair will be focused on Canadian conservation issues, you cannot ignore what is happening in other locations as these birds complete their full annual cycle of migration. Depending on the species, some birds use habitats from Northern Canada and the Arctic all the way into South America," he said.

"To me, an investment in an endowed chair is going to be really critical for ensuring there is a training environment in Canada for a whole new generation of young scientists, people who are going to carry this passion forward and ensure the natural environment is safeguarded."

Anticipated start date for this position is autumn 2020. For more information about the inspiration for and creation of the chair position, please visit: https://www.ducks.ca/our-work/science/saskatchewan-endowed-chair.

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THREE COMPANIES WITH A SHARED MISSION:

Ducks Unlimited conserves, restores and manages wetlands and associated habitats for North America's waterfowl. These habitats also benefit other wildlife and people.