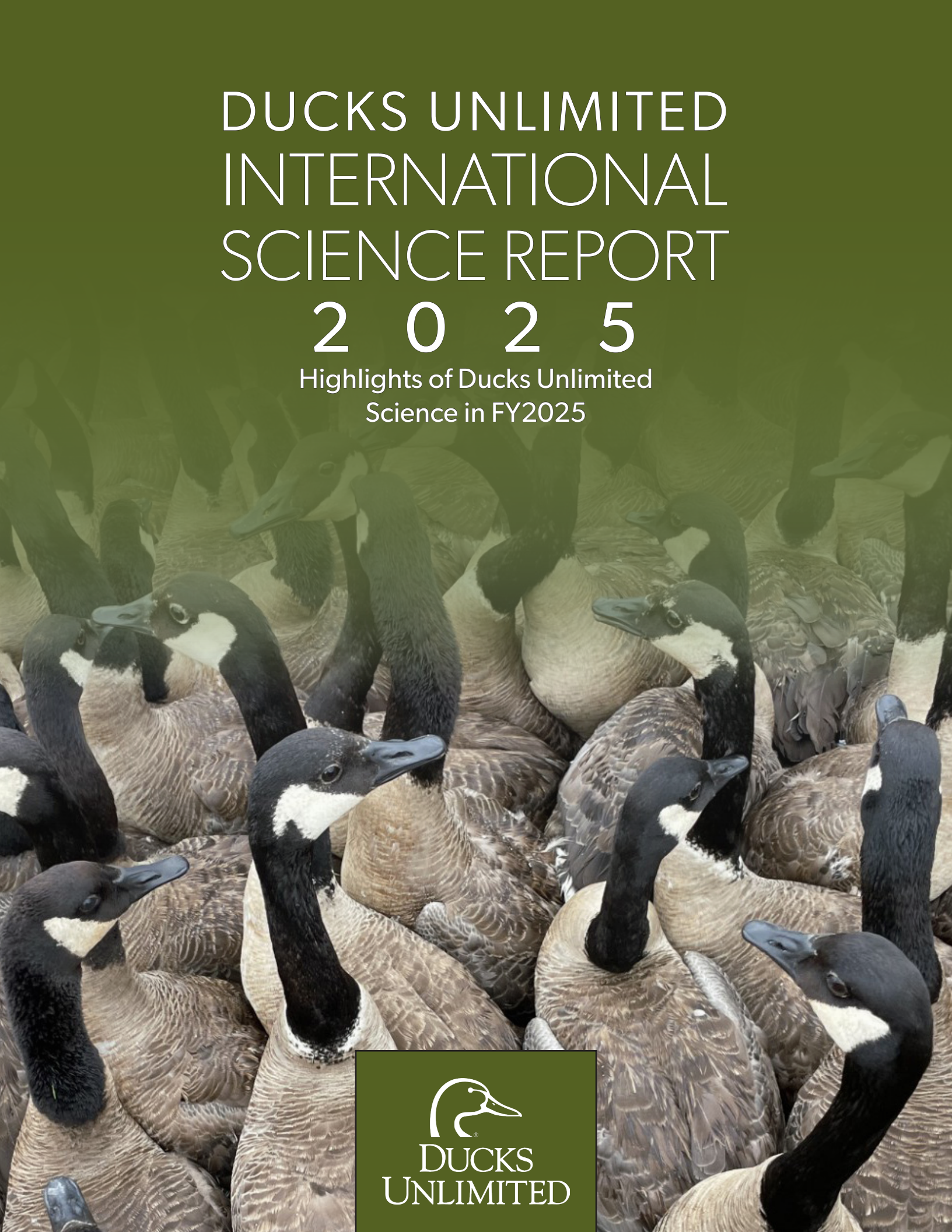
DUCKS UNLIMITED INTERNATIONAL SCIENCE REPORT 2025

Highlights of Ducks Unlimited Science in FY2025



DUCKS UNLIMITED

WHAT SCIENCE MEANS TO DU

Since its founding, Ducks Unlimited has embraced a scientific approach to conserving wetlands and associated uplands that support North America's waterfowl. More recently, DU's application of science has expanded to increase understanding of how habitat conservation affects ecosystem services (e.g., water quality, flood mitigation) that directly improve human health and livelihoods. This approach ensures DU's conservation actions continue to sustain waterfowl populations while increasing their relevance and benefits to broader society.

DU'S SCIENCE VISION STATEMENT

To strengthen Ducks Unlimited's vital science foundation through a robust internal science team and innovative partnerships that integrate data-based decision making to effectively and efficiently advance the conservation of waterfowl and their habitats in North America, as well as to recruit, retain, and engage a dedicated and diverse group of conservation professionals and supporters.

DU'S SCIENCE PRIORITIES AND APPROACH

Ducks Unlimited has a choice of where we invest our science capacity. Activities that address our greatest uncertainties, in our most important geographies, and provide the greatest opportunities to achieve our conservation mission receive highest priority. Across our 3 organizations, DU's science activities can be classified into 6 thematic areas: 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.

This annual International Science Report highlights the involvement and partnership of DU Inc., DU Canada, and DU de México in scientific efforts during FY2025, reflecting a combination of university-led research, projects conducted internally by DU staff, and other activities in which DU staff are otherwise involved. Just as conservation delivery relies on diverse partnerships and cross-border collaboration for maximum efficiency, so too do our scientific efforts. Paramount among our list of science partners are numerous federal and state agencies, university researchers, non-governmental organizations, foundations, NAWMP Joint Ventures, corporations, private landowners, and our volunteers and donors. The results of DU's science investments will strengthen our continental conservation efforts while contributing to the education and development of our next generation of scientists and conservationists.

DU – INTERNATIONAL

WATER QUALITY IMPROVEMENT CO-BENEFITS OF PRIORITY MALLARD HABITAT RESTORATION

Dr. Pascal Badiou & Dr. Lauren Bortolotti, DUC-IWWR; Dr. Nandita Basu & Dr. Emily Uri (Post-doctoral researcher), Univ. of Waterloo; Cathleen Sampselle & Dr. Ellen Herbert, DU-NHQ; Ed Verhamme & Doug Bradley, Limnotech

Harmful algal blooms fueled by phosphorus in Lake Erie have threatened wildlife habitat, economic livelihoods, and jeopardized clean and reliable drinking water supplies for communities. This study will collect data on the local and landscape factors influencing wetland phosphorus retention efficiency and parameterize a model of phosphorus retention and restoration cost across the U.S. and Canadian Great Lakes region. An ultimate goal is to generate a spatial model of potentially restorable wetlands and associated return on investment for the dual objectives of improving water quality and enhancing mallard habitat.

BEE-FRIENDLY WINE GRAPE PROJECT

Dr. Samuel Robinson, DUC-IWWR; Dr. Andony Melathopolous & Lincoln Best, Oregon State Univ.

Land managers are often asked to add pollinator-friendly plants to restoration projects, but there are typically very few plant-pollinator datasets to support these decisions, interpreting existing datasets is technically complicated, and collecting new pollinator data is prohibitively expensive. This pilot study uses an existing large plant-pollinator interaction dataset collected by the Oregon Bee Atlas and pairs this data with iNaturalist flower datasets collected by vineyard owners, with the goal of a) predicting on-farm bee diversity from the regional interaction datasets, and b) generating a list of candidate restoration plants that will enhance bee diversity and abundance of rare bee species. This study will contribute to developing a tool that can be used by land managers to assess pollinator biodiversity in their area, choose flowering plant species that are both regionally appropriate and beneficial to pollinators, and ultimately increase biodiversity at farms and restored sites.

DU INC. – NATIONAL

IDENTIFYING EFFECTS OF WEATHER AND LAND USE ON AUTUMN AND WINTER WATERFOWL DISTRIBUTION DYNAMICS IN THE 21ST CENTURY

Dr. Bram Verheijen (Post-doctoral researcher) & Dr. Lisa Webb, USGS Cooperative Research Unit, Univ. of Missouri; Dr. Heath Hagy, USFWS; Mike Mitchell & Dr. Dale James, DU-SR; Dr. Mike Brasher, DU-NHQ

Migration and winter distribution of waterfowl have implications for harvest opportunities, conservation planning, and stakeholder support for wetland and waterfowl conservation. Some evidence suggests the timing of migration and terminal distribution of several common waterfowl species may have shifted. This research used band recovery and harvest data to quantify changes in waterfowl distribution during fall and winter in the Mississippi and Central flyways over the past 60 years. The final stage of this project is examining how these shifts are influenced by weather (temperature, snow cover, precipitation), land use, or landscape changes throughout the flyways.

*ASSESSING THE CLIMATE CHANGE MITIGATION POTENTIAL OF WETLAND RESTORATION IN THE CONSERVATION RESERVE PROGRAM: MEASUREMENTS, MODELING, AND SCALING CHANGES IN SOIL CARBON AND GREENHOUSE GAS FLUXES

Dr. Sheel Bansal, USGS; Dr. Shannon Osborne, USDA Agricultural Research Service; Dr. Chenhui Li, Univ. of Missouri; Dr. Jessica O'Connell & Megan Podolinsky (PhD student), Univ. of Texas Marine Science Institute; Dr. Siobhan Fennessy, Kenyon College; Dr. Thomas O'Halloran, Clemson Univ.; Dr. Kimberly Van Meter, Pennsylvania State Univ.; Dr. Emily Biggane, United Tribes Technical College; Dr. Ellen Herbert & Cathleen Sampselle, DU-NHQ; Kaylan Kemink & Kyle Kuechle, DU-GPRO

This project will explore how wetland restoration through the Conservation Reserve Program (CRP) in the Agricultural Midwest and Great Plains (~81% of wetland CRP) contributes to climate mitigation by measuring and modeling soil and vegetation carbon stocks and greenhouse gas fluxes in restored wetlands. This study will explore how climate, surrounding land-use, soils, and hydrology impact wetland carbon cycling. Additionally, the team will model other ecosystem functions of restored wetlands including surface water storage, nutrient retention, and waterfowl habitat value.

APPLICATION OF eBIRD DATA TO ENHANCE INTERREGIONAL PLANNING FOR MIGRATORY WATERFOWL DURING THE NONBREEDING PERIOD

Dr. Nick Masto (Post-doctoral researcher) & Dr. Orin Robinson, Cornell Lab of Ornithology; Dr. Kevin Ringelman, Louisiana State Univ.; Dr. Auriel Fournier & Aaron Yetter, Illinois Natural History Survey; Dr. Mike Brasher, DU-NHQ

Mobile technology and citizen participation in scientific data collection are revolutionizing the type and quantity of information available for natural resource conservation and management. One such data collection and analytical platform relevant to waterfowl conservation is eBird, yet its utility for waterfowl conservation planning remains uncertain. This project compared eBird data metrics to those obtained from independently collected waterfowl surveys to help identify under what circumstances eBird data are useful in waterfowl conservation and management.

NATURAL INFRASTRUCTURE RESEARCH AND TRAINING

Dr. Brian Bledsoe, Univ. of Georgia; Dr. Ellen Herbert & Dr. Jerad Henson, DU-NHQ; Sara Burns, DU-GLAR; Dr. Sara Phelps, DU-SR; Thomas Parker, DU-GPR

Natural infrastructure uses, restores, or emulates natural ecological processes to achieve engineering objectives and provide multiple conservation benefits. The UGA–DU partnership will educate a graduate workforce through practical research experience aimed at evaluating existing and planned conservation projects. The partnership will co-develop a research agenda that focuses on (1) enumerating the role wetland loss and conservation have played in regulating past floods and droughts and (2) exploring the biophysical and economic outcomes of future wetland conservation. DU and UGA will also co-develop a curriculum and internship program to further develop the engineering workforce.

TRANSMITTER EFFECTS ON SPRING MIGRATORY STEP-LENGTHS AND LATITUDINAL POSITIONING OF WINTER-MARKED FEMALE MALLARDS

Dr. Doug Osborne, Univ. of Arkansas-Monticello; Dr. Ryan Askren, Five Oaks Ag Research & Education Center; Brett Leach & Luke Naylor, Arkansas Game & Fish Comm.; Dr. Andy Raedeke (retired), Missouri Dept. of Cons.; Dr. Mike Brasher, DU-NHQ

Advances in transmitter technology have made fine-scale movement data much more accessible, but the potential effects of transmitters on movement and behavior remain uncertain. This study will compare step length and migration latitude of female mallards across 3 different transmitter types to inform the utility of standardizing methodologies to understand avian movements. Comparisons will be made among dorsal backpack units attached with single-loop harnesses, double-loop harnesses, and implantable transmitters.

duckDNA: ENGAGING WATERFOWL HUNTERS IN THE SCIENCE OF CONSERVATION GENETICS

Dr. Mike Brasher, Kayci Messerly, Katie Tucker, Ty Sharrow, & Rae Moore, DU-NHQ; Dr. Philip Lavretsky & Vergie Musni, Univ. of Texas at El Paso

Genetic research is a critical component of wildlife management, providing researchers with information on a wide variety of behavioral, physiological, and ecological variables. This project, termed duckDNA, is engaging waterfowl hunters in providing tissue samples from harvested ducks across the U.S. to enable expanded studies of genetic processes in waterfowl and their implications for population management.

EXAMINING THE UTILITY OF TRAIL CAMERAS FOR ESTIMATING SEX RATIOS IN MALLARD POPULATIONS

Katie Tucker, Ty Sharrow, & Dr. Mike Brasher, DU-NHQ; Chase Hardage, WiseEye

Wild bird populations are typically male-biased, especially ducks, as males do not participate in parental care. New research suggests increasingly male-biased sex ratios, potentially as high as 3:1 in Mallards, although there remains some uncertainty about these emerging findings. Because excess males may harass females and skew breeding population estimates, confidence in the magnitude and trend in sex ratios is paramount. This project is using artificial intelligence (AI) to evaluate the utility of trail cameras for large-scale monitoring of Mallard sex ratios.

DU INC. – SOUTHERN REGION

MISSISSIPPI ALLUVIAL VALLEY WINTER MALLARD BANDING PROGRAM-ARKANSAS

Dr. Doug Osborne, Univ. of Arkansas-Monticello; Dr. Aaron Pierce, DU-SR

DU is supporting this winter banding project to help understand harvest distribution patterns, winter homing rates, and enable estimation of seasonal survival rates of mallards in the Mississippi Alluvial Valley. This work also provides outreach and education opportunities by involving local students and volunteers in banding efforts.

*EVALUATING MOTTLED DUCK NEST PREDATOR COMMUNITY IN SOUTHWESTERN LOUISIANA USING CAMERA TRAPS AND ARTIFICIAL NESTS

Alexandre Dopkin (MSc student) & Dr. Kevin Ringelman, Louisiana State Univ.; Dr. Aaron Pierce, DU-SR

Mottled duck nest success averaged only 21% during a 2018–2020 study in southwestern Louisiana, largely due to nest predation. Researchers at Louisiana State University used trail cameras and artificial nests across a diversity of habitats to identify the primary nest predators of mottled duck nests and provide information on nest predation risk as it varies by habitat type (e.g., pasture, cordgrass meadow, fallow rice, overwater marsh, marsh terrace, etc.). This study will provide a more holistic understanding of how predators are affecting mottled duck nest success in southwestern Louisiana.

*EVALUATING UNCREWED AERIAL VEHICLES TO MONITOR WATERFOWL RESPONSE TO WETLAND RESTORATION IN THE MISSISSIPPI ALLUVIAL VALLEY

Zack Loken (MSc student) & Dr. Kevin Ringelman, Louisiana State Univ.; Dr. Aaron Pierce, DU-SR; Dr. Anne Mini, Lower Mississippi Valley Joint Venture

This project will explore novel methods of monitoring duck use within forested and shallow water habitats on Wetland Reserve Easement sites in the Mississippi Alluvial Valley. Uncrewed aerial vehicles were deployed in 2021 and 2022 to investigate their utility to monitor site use by waterfowl. Image analysis and machine learning were used to establish protocols for estimating duck abundance and behavior at a project level scale. The final model achieved a total mean average precision and recall of 99.1% and 82.9%, respectively, after 45 training epochs. The artificial intelligence waterfowl identification application (DuckNet) is now available for other researchers.

A REGIONAL ASSESSMENT OF ECOSYSTEM SERVICES PROVISIONING IN RESTORED COASTAL WETLANDS

Dr. Anna R. Armitage, Texas A&M Univ. at Galveston; Dr. Jessica O'Connell, Colorado State Univ.; Dr. Ellen Herbert, DU-NHQ; Dr. Aaron Pierce, DU-SR

Wetland restoration is a critical component of a multi-faceted coastal management strategy to compensate for impacts from disturbance, development, and climate change. An important restoration goal is to support local economies by reestablishing essential ecosystem services such as erosion protection, fishery support, and carbon sequestration. This project will evaluate the provision of ecosystem services in older restoration sites, through a fusion of field and remote sensing assessments. Research will be conducted to understand links between coastal wetland restoration design and the provision of ecosystem services.

***LINKING WETLAND INUNDATION AND HABITAT SELECTION TO BLUE-WINGED TEAL SURVIVAL THROUGHOUT THE FULL ANNUAL CYCLE**

Jeffrey Edwards (MSc student) & Dr. Lisa Webb, Missouri Cooperative Fish and Wildlife Research Unit; Dr. Drew Fowler, Louisiana Cooperative Fish and Wildlife Research Unit; Paul Link, Louisiana Dept. of Wildlife and Fisheries; Chad Courville, Louisiana Waterfowl Working Group; Dr. Aaron Pierce, DU-SR

Wetland habitat conditions at migratory stopover and wintering sites can influence body condition and breeding success of waterfowl. Recognition of this importance has led to increased research on dabbling duck habitat use during the non-breeding period. Using GPS tracking devices and remotely sensed landcover data, this project will quantify spatial and temporal variation in habitat availability for blue-winged teal during the non-breeding season, assess how inundation and land ownership influence habitat selection, and evaluate relationships between movements and habitat selection on survival. This study will help inform wetland management to improve dabbling duck survival and productivity in support of NAWMP goals.

****UNDERSTANDING HOW WATERFOWL REST AREAS AFFECT WINTERING WATERFOWL DISTRIBUTIONS, LANDSCAPE CONNECTIVITY, AND HUNTER OPPORTUNITY**

Cory Highway (PhD student) & Dr. Bradley Cohen, Tennessee Technological Univ.; Jamie Feddersen, Tennessee Wildlife Resources Agency; Dr. Aaron Pierce, DU-SR

This study attempts to understand how disturbance-free rest areas influence waterfowl behaviors and hunter opportunity across western Tennessee. Previous telemetry work in this region suggests that mallards have high winter site fidelity coupled with limited movements and small home ranges, which may increase survival during the hunting season. This study will examine how rest areas influence mallard movements, habitat selection, survival, and hunter opportunities. Study results will help inform wetland management decisions that account for conservation needs and hunter opportunities.

***DEVELOPMENT OF A DECISION SUPPORT TOOL FOR MANAGING ANTEBELLUM RICE FIELDS**

Akshit Suthar (PhD student), Oluwatobi Olaniyi (PhD student), & Dr. James Anderson, Clemson Univ.; Dr. Aaron Pierce, DU-SR; Andy Quattlebaum and Blackwell Family Foundation

South Carolina's Antebellum rice fields provide critical resources for waterfowl and waterbirds. However, sea-level rise and other environmental changes have created challenges for their restoration, maintenance, and management. This project (2024–2029) will use waterfowl abundance and occupancy in Antebellum rice fields combined with relationships between impoundment characteristics and hydrologic conditions to create a comprehensive risk-benefit matrix and decision-support tool for management of coastal rice impoundments.

* DENOTES A STUDENT-LED PROJECT
** DENOTES A DU FELLOWSHIP STUDENT-LED PROJECT

Photo by Jared Clarke

***INVESTIGATING CHANGES IN WATERFOWL HARVEST DISTRIBUTION IN THE ATLANTIC & PACIFIC FLYWAYS, 1960–2020.**

Rasheed Pongon (MSc student) & Dr. Chris Williams, Univ. Of Delaware; Dr. Aaron Pierce, DU-SR; Dr. Mike Brasher, DU-NHQ; Dr. John Coluccy, DU-GLAR; Dr. Mark Petrie & Dr. Dan Smith, DU-WR.

Changes in climate, wetland conditions, and broader land use have the potential to cause persistent shifts in waterfowl distributions. These shifts may lead to mismatches between prevailing conservation plans and the resource needs of waterfowl. This study will quantify annual harvest distribution for up to 16 species of ducks and geese in the Atlantic and Pacific flyways, 1960–2020. We will also examine temporal and spatial trends in waterfowl harvest distributions. Quantifying patterns of historical change is a necessary first step to understanding variation in waterfowl distributions across space and time. This information is vital for informing Ducks Unlimited's landscape-scale conservation efforts and enabling science-based communication to core constituencies regarding ongoing changes and their implications for recreational engagements.

MONITORING AND EVALUATION OF PORT FOURCHON TERRACES AND LIVING SHORELINE, EAST BARATARIA BASIN MARSH TERRACING AND COMMUNITY RESILIENCE, AND DULARGE MARSH ENHANCEMENT AND COMMUNITY RESILIENCE CONSERVATION PROJECTS.

Dr. Jonathan Willis, Dr. Allyse Ferrara, & Rissa Inselmman, Nicholls State Univ.; Dr. Aaron Pierce, DU-SR

The project will provide baseline vegetation, elevation, and shoreline position assessments for the three conservation projects completed by Ducks Unlimited. Additionally, the work will determine oyster recruitment assessments for the living shoreline features at the Port Fourchon project site. The study will help quantify benefits from these restoration efforts and help inform future restoration work.

BARRIERS AND OPPORTUNITIES FOR LANDWARD MIGRATION OF COASTAL WETLANDS ALONG THE TEXAS UPPER AND MIDDLE COAST

Dr. Jena Moon & Colt Sanspree, USFWS; Dr. Nicholas Enwright, Dr. Michael Osland, & Dr. Camille Stagg, USGS; Barry Wilson, Gulf Coast JV/USFWS; Dr. Joe Lancaster, Gulf Coast JV/DU-SR

Coastal wetlands can adapt to changes related to sea level rise by compensating for seaward wetland loss with movement inland where elevation allows. This project will use contemporary elevation data for the middle and upper Texas coast to quantify the spatial probability of wetland hydroperiod (e.g., regularly or irregularly flooded) and make predictions about future conditions using alternative sea level rise scenarios. Additionally, this project will quantify current landcover types and identify areas where wetlands can move upslope. Moreover, on USFWS lands in the region, the project will identify barriers to wetland migration.

FIRE EFFECTS IN GULF OF MEXICO MARSHES: HISTORICAL PERSPECTIVES, MANAGEMENT, AND MONITORING OF MOTTLED DUCKS AND BLACK AND YELLOW RAILS

Dr. Auriel Fournier, Univ. of Illinois; Dr. Mark Woodrey & Dr. Kristine Evans, Mississippi State Univ.; Dr. Andy Nyman & Dr. Robert Rohli, Louisiana State Univ.; Dr. Warren Conway, Texas Tech Univ.; Dr. Nicholas Enwright, Dr. Michelle Stantial, & Dr. Jim Lyons, USGS; Erik Johnson, Audubon Delta; Jim Cox, Tall Timbers Research Station; Dr. Chris Butler, Univ. of Central Oklahoma; William Vermillion, Gulf Coast JV/USFWS; Dr. Joe Lancaster, Gulf Coast JV/DU-SR; Amy Schwarzer, Florida Fish and Wildlife Cons. Commission; Eric Soehren, Alabama Dept. Cons. and Nat. Res.; Jennifer Wilson & Dr. Jena Moon, USFWS

Prescribed fire is an important tool for managing grasslands but there has been little research into its use in coastal wetlands and bird response in these ecosystems. This project will investigate the value of fire as a management tool of irregularly flooded high marsh wetlands along the U.S. Gulf Coast. Goals of the project are to determine the distribution and abundance of black rails, yellow rails and mottled ducks during selected time periods (e.g., breeding vs. non-breeding). This study will also assess changes in the frequency of frontal passages and their effect on prescribed fire management. Remote sensing and landcover classification will identify high marsh wetlands across the landscape, and collectively this project will help managers evaluate tradeoffs in using prescribed fire to manage habitats for priority bird species.

DU INC. – GREAT LAKES & ATLANTIC REGION

UPDATING THE GREAT LAKES/ATLANTIC REGION'S INITIATIVE PLANS

In 2019, GLAR developed conservation plans for each of our four initiative areas (Big Rivers, Completing the Cycle, Great Lakes & Living Lakes). The goal of these plans was to focus our conservation programs on the highest priority landscapes and actions to efficiently move towards achieving migratory bird habitat joint venture habitat goals for the region established to support waterfowl populations at North American Waterfowl Management Plan objectives. We are currently in the process of updating these plans and creating short executive summaries to support initiative fundraising efforts for our regional conservation programs.

COMPARING INVASIVE CATTAIL TREATMENTS TO MAXIMIZE CONSERVATION DOLLAR IMPACTS FOR WATERFOWL HABITAT

Dr. Megan Fitzpatrick, Ed Zlonis, John Maile, Adam Kleinschmidt, Sarah Kvidt, & Jacob Rambow, Minnesota DNR; Sara Vacek & Stacy Salvevold, U.S. Fish & Wildlife Service; Dr. Daniel Larkin & Dr. Todd Arnold, Univ. Minnesota; Dr. Susan Ellis-Felege, Univ. of North Dakota; Dr. John Coluccy, DU-GLAR

This project will experimentally compare the effectiveness and longevity of four different treatments for invasive cattail in seasonal prairie pothole wetlands in Minnesota using a "before-after/control-impact" experiment. Ten cattail-choked seasonal prairie pothole wetlands will be treated with each of 4 study treatments (40 total wetlands): 1) herbicide treatment, 2) herbicide with roller-chopping (crushing), 3) herbicide with disking, and 4) scraping to remove cattail rhizomes and accumulated sediment. One year before and 3 years after treatment, we will survey vegetation, breeding waterfowl pair use, and secretive marsh bird (e.g. rails, grebes, bitterns) use of these wetlands and 10 untreated "control" wetlands (50 wetlands total). To assess treatment effectiveness, contemporary technology will be used to count wildlife hidden among cattail, including a drone with infrared cameras to survey waterfowl and passive acoustic recorders to detect secretive marsh birds. Results from this study will provide managers with the most cost-effective invasive cattail management approaches that will benefit native vegetation, breeding ducks, and secretive marsh birds.

***UNDERSTANDING LANDOWNER ATTITUDES AND BEHAVIORAL INTENTIONS TOWARDS WETLANDS RESTORATION & PRIVATE LANDS CONSERVATION PRACTICES**

Dr. Emily Pomeranz & Meghan Vona (MSc student), Michigan State Univ.; Dr. Barbara Avers, Dr. Randall Knapik, & Steven Chadwick, Michigan DNR; Dr. John Coluccy, DU-GLAR

This study uses a mixed-methods social science approach to examine landowner attitudes and perceptions of wetlands, water quality, and conservation practices and compare pre- and post- a large-scale wetland restoration project, the Western Lake Erie Basin (WLEB) pilot project. The pilot project is within a new Michigan DNR state game area in southeast Michigan, designed to realize water quality benefits within the WLEB. Approach includes a mail survey of a sample of residents within pilot project-adjacent townships as well as a series outreach events with a selection of adjacent landowners to understand which communication channels and messengers are more effective at delivering conservation messaging. Results are intended to be scalable to the Western Lake Erie Basin, and knowledge gained from this project will be used to develop targeted approaches for landowner participation in conservation practices within the basin.

ECOLOGICAL FUNCTIONS AND SERVICES OF MANAGED WETLANDS

Dr. Rod Lammers, Dr. Amanda Suchy, & Dr. Don Uzarski, Central Michigan Univ.; Dr. Ben Luukkonen & Randy Knapik, Michigan DNR; Sara Burns, DU-GLAR

This project will quantify ecosystem services and disservices under different management strategies at Shiawassee and Pointe Mouillee State Game Areas in Michigan. Data on water quality, greenhouse gas production, soils, plant and waterfowl abundance, and hydrology will be collected to provide a holistic understanding of the nutrient retention capacity, carbon storage, water storage, flood mitigation, and habitat services provided by study wetlands. Results will be used to inform management recommendations while accounting for tradeoffs between ecosystem services and disservices.

***EVALUATING THE IMPACTS OF SUB-LETHAL EXOTIC TREMATODE INFECTIONS ON LESSER SCAUP MIGRATORY AND REPRODUCTIVE EFFORTS**

Scott Herman (PhD student) & Dr. Auriel Fournier, Univ. Illinois; Dr. Jennifer Koop, Northern Illinois Univ.

This study will implant 150 female lesser scaup with GPS accelerometer tracking devices to examine the impacts of sub-lethal trematode infections on migration and reproduction. A subset of hens will be marked in Pools 7 and 8 of the Mississippi River where the trematode is present, while another subset will be marked on staging areas west of Pool 7 and 8 where the trematode is absent. Results will improve our understanding of the potential role that exotic trematodes play in the long-term scaup population decline.

***IDENTIFYING AND ANALYZING BROOD-REARING BEHAVIOR FOR MALLARDS AND AMERICAN BLACK DUCKS WITH GPS-ACCELERATION TRANSMITTERS**

Abbey Butler (MSc student) & Dr. Jake Straub, State Univ. of New York, Brockport; Josh Stiller, New York State Dept. of Environ. Cons.; Dr. John Coluccy, DU-GLAR

This project will leverage two large-scale American black duck and mallard movement ecology studies deploying more than 1,700 GPS accelerometer tracking devices to develop post-hatch behavior classifications. Using location and accelerometer data, we will identify incubating hens, field verify successful hens with broods, use accelerometer data to classify brood-rearing behavior, and use accelerometer signatures to retroactively assign brood-rearing status for all hens in the marked sample. Results will inform analyses evaluating which environmental and landscape variables best explain mallard and black duck reproduction.

****MIGRATION ECOLOGY AND DEMOGRAPHICS OF EASTERN MALLARDS THROUGHOUT THE FULL ANNUAL CYCLE**

Cassidy Waldrep (PhD student) & Dr. Mitch Weegman, Univ. of Saskatchewan; Daria Sparks (MSc student) & Dr. Jacob Straub, State Univ. of New York, Brockport; Josh Stiller, New York State Dept. of Environ. Cons.; Nate Huck, Pennsylvania Game Commission; Dr. John Coluccy, DU-GLAR

This project will deploy 1,200 GPS-acceleration transmitters on hen mallards in the eastern U.S. and Canada to quantify and compare reproductive metrics, estimate seasonal survival rates, quantify and compare movements, habitat use, and selection throughout the annual cycle. This study will fill important gaps in our understanding of eastern mallard population ecology and provide additional insights into potential causes of population declines.

REFINING WETLAND HABITAT CLASSIFICATION FOR WETLANDS WITHIN THE NON-BREEDING RANGE OF AMERICAN BLACK DUCKS WITHIN THE EASTERN HABITAT JOINT VENTURE

Jes Skillman, Evelyn Magner, Alek Kreiger, & Dr. John Coluccy, DU-GLAR

DUI and DUC scientists are collaborating to refine wetland data for the Canadian Wetland Inventory in southeastern Canada and create a crosswalk to more closely align with the US National Wetlands Inventory. These refinements will improve the energetics model and output of the American Black Duck Decision Support Tool.

REFINING TECHNIQUES FOR SEMI-AUTOMATED NATIONAL WETLANDS INVENTORY MAPPING IN PENNSYLVANIA, WASHINGTON, TAMPA BAY, AND TEXAS

Alek Kreiger, Evelyn Magner, Heidi Marshall, Maddie Holm, & Jes Skillman, DU GLAR; Megan Lang, FWS; Nate Herold, NOAA; Katie Walker, Chesapeake Conservancy

DU is collaborating with partners to improve wetland mapping efficiency for the National Wetland Inventory. Wetlands are the most difficult biome to map due to the temporal changes and diversity of conditions. Despite repeated attempts to automate wetland mapping, updates are still performed via heads-up manual digitization. This study will assess effort required to convert C-CAP wetlands data from NOAA, 3D Hydrography Program riverine and waterbodies data from USGS, and automated wetland mapping data from the Chesapeake Conservancy into NWI standard compliant wetlands.

MICHIGAN'S DOMESTIC ACTION PLAN—LAKE ERIE WATER QUALITY, WILDLIFE HABITAT AND PUBLIC RECREATION IMPROVEMENT PILOT PROJECT

Jason Hill, Rob Paige, Cathleen Sampselle, & Sara Burns, DU-GLAR; Michigan DNR, Michigan EGLE; Dr. Ellen Herbert, DU-NHQ; Ed Verhamme, Limnotech

Wetlands in the western basin of Lake Erie have the potential to contribute significantly to the reduction of nitrogen and phosphorus runoff into Lake Erie. DU is developing a site prioritization tool in ArcGIS to select optimal sites to restore drained agricultural lands to wetlands that intercept agricultural drainage. In collaboration with Limnotech this study will monitor water quality of wetland inflows and outflows both before and after the restoration project.

DU INC. – WESTERN REGION

POPULATION ECOLOGY OF WRANGEL ISLAND AND WESTERN ARCTIC LESSER SNOW GEESE

Dr. Mitch Weegman & Dr. Antti Piironen (Post-doctoral Fellow), Univ. of Saskatchewan

Growing populations of white geese in the Pacific flyway continue to be a conservation concern, especially as it relates to competition for food with dabbling ducks. Key objectives for this study include the development of a population model for Wrangel Island and Western Arctic lesser snow geese that includes banding, productivity, and population survey information for all colonies, 1970–present, and a better understanding of the influence of hunting and other environmental factors on population growth.

THE ROLE OF PUBLICLY MANAGED HABITATS IN SUPPORTING WATERFOWL POPULATIONS IN WASHINGTON'S NORTH PUGET SOUND

Dr. Mark Petrie, Dr. Dan Smith, DU-WR; Kyle Spragens, Washington Dept. of Fish & Wildlife

North Puget Sound supports the highest density of wintering waterfowl on the U.S. Pacific Coast, but birds are overwhelmingly dependent on agricultural foods in this region, even while the agricultural landscape is rapidly changing. This study is assessing the effects of these changes on landscape carrying capacity and the future role of public lands in offsetting effects on waterfowl.

CONSERVATION PLANNING FOR WATERFOWL AND PEOPLE IN THE CENTRAL VALLEY OF CALIFORNIA

Dr. Mark Petrie, DU-WR; Luke Matthews, California Dept. of Fish & Game

Waterfowl hunters and rice farmers are critical supporters of waterfowl conservation in the Central Valley of California. This study examines how we can integrate objectives for both waterfowl populations and conservation supporters by identifying actions that can simultaneously meet the needs of waterfowl, waterfowl hunters, and rice producers in the Central Valley.

PACIFIC FLYWAY WATER ANALYSIS

Dr. Mark Petrie, DU-WR; Greg Yarris, Central Valley JV; Dave Smith, Intermountain West JV

The California Central Valley, Great Salt Lake, and Southern Oregon/Northeastern California (SONEC) collectively support 70% of all ducks in the Pacific Flyway. Each of these areas is facing long-term water shortages, and because they share birds throughout autumn–winter, the effects on waterfowl habitats and populations may be compounded. This study will examine the potential consequences of regional water shortages for Pacific Flyway waterfowl and identify conservation strategies to mitigate them.

GREENHOUSE GAS FLUX RESPONSE TO TIDAL REINTRODUCTION AT HILL SLOUGH

Dr. Patty Oikawa, CSU Easte Bay; Dr. Dennis Baldocchi, UC Berkeley; Aaron Will, DU-WR

The Hill Slough Restoration Project will restore 603 acres of managed seasonal wetlands and 46 acres of upland habitat to tidal wetland by improving existing public infrastructure, breaching interior levees, and lowering and breaching exterior levees. DU has partnered with researchers at UC Berkeley. Upon Dr. Dennis Baldocchi's retirement, DU is adding California State University East Bay, Dr. Patty Oikawa as the research lead, and her staff to the Team to measure pre- and post-construction greenhouse gas emissions using an eddy-flux covariance tower. The project team is adapting to ecological response and adding a second eddy covariance flux tower to capture carbon flux for different developing habitat types. Data collected at the site will be used to verify the calculated quantification of emissions. The project provides a unique opportunity to investigate carbon dynamics in a restored brackish wetland.

CANADA GOOSE BOOK

Dr. Mark Petrie, DU-WR; Katie Burke, Tom Fulgham (retired), DU-NHQ

This book tells the story of all the Canada goose and cackling goose populations now recognized in North America, including their basic biology, population status, and management challenges they pose.

CALIFORNIA BREEDING MALLARDS

Mike Casazza, USGS Dixon Field Station, CA; Dr. Mark Petrie, DU-WR

This study will capture hen mallards in northeastern California and the Sacramento and San Joaquin Valleys and fit them with transmitters during 2023 and 2024. These marked birds will be used to better understand nest locations, nest fate, and nesting efforts, as well as post-breeding movements and distribution throughout the Central Valley.

EFFECTS OF THE CALIFORNIA DROUGHT ON WATERFOWL DISTRIBUTION AND HABITAT USE

Mike Casazza, USGS Dixon Field Station, CA; Dr. Mark Petrie, DU-WR

During fall of 2022, waterfowl in the Central Valley of California experienced record drought. This study marked four species of waterfowl (mallards, pintails, white-fronted geese and snow geese) with satellite transmitters to determine the effects of drought on habitat use, movements, and distribution compared to normal water years.

KLAMATH RIVER GROUNDWATER DISCHARGE EVALUATION

Jonathan Traum, USGS; Dr. Dan Smith, DU-WR

Water within the Klamath Basin is needed to support fish and wildlife, while also being critical to agricultural irrigation. To better understand surface and groundwater connections within the basin, USGS will utilize a regional groundwater flow model, calibrated to represent seasonal hydrology conditions over a 40-year period (1980-2020). This model will be used to estimate how water deliveries to wildlife refuges impacts groundwater levels, and groundwater discharge into adjacent stream systems under a variety of management scenarios.

DIRECT EVALUTATION OF WETLANDS AS JUVENILE C'WAAM AND KOPTU HABITAT

Dr. Robert Lusardi, University of California, Davis; Dr. Dan Smith, DU-WR

The c'waam (Lost River sucker, *Deltistes luxatus*) and koptu (shortnose sucker, *Chasmistes brevirostris*) once had large populations across lakes and rivers throughout the Klamath Basin, but significant population declines ultimately leading to the two species being listed as federally endangered in 1988. One possible factor contributing to low juvenile recruitment rates is limited juvenile rearing habitat; specifically, shallow-water wetland habitats which have been lost due to landscape conversion. We plan to monitor hatchery reared juvenile sucker growth and survival in wetland areas using open bottom enclosures within the Klamath Basin. We will stratify enclosures within wetland areas by vegetation types (non-vegetated, emergent vegetation, and submerged aquatic vegetation) and monitor key covariates, such as water quality and food abundance, which may influence survival and growth of juvenile suckers. This study will provide critical information as to the potential value of wetlands as juvenile sucker habitat.

BALANCE WINTERING AND BREEDING WATERFOWL NEEDS IN THE SAN JOAQUIN VALLEY

Ric Ortega, Grasslands Irrigation District; Dr. Dan Smith, DU-WR

California's Central Valley provides critical wintering habitat for millions of migratory waterfowl; however, the Central Valley also supports approximately 30% of the Pacific Flyway's breeding mallard population. Declines in the estimated abundance of breeding mallards has prompted efforts to improve breeding waterfowl habitat. We will use bioenergetic models and predictive nesting equations to test a variety of possible management scenarios and estimate their impact on wintering and breeding waterfowl within the region. The results of these models will aid in the identification of key management actions that will contribute to the regions ability support both wintering and breeding waterfowl populations.

DU INC. – GREAT PLAINS REGION

UNIVERSITY DUCK HUNT AND PROFESSIONAL DEVELOPMENT FOR NATURAL RESOURCE STUDENTS

Catrina Terry, Katherine Graham, & Dr. Kaylan Kemink, DU-GPR; Dr. Sarah Cavanah, Univ. of Kansas; North Dakota Game and Fish Department; Prairie Pothole Joint Venture

The number of waterfowl hunters in the United States has been declining for over 50 years. Mentored hunt programs and educational workshops are some of the tactics being used to help recruit new hunters. This project will examine how participation in an annual hunting and professional development workshop affects students' perceptions of hunting and their perceived likelihood of persisting as a hunter.

MAKE A DUCK DEAL: ASSESSING EFFICACY OF ZOO SIGNAGE

Abby Rokosch, Katherine Graham, & Dr. Kaylan Kemink, DU-GPR; Dr. Elena Rubino, Univ. of Arkansas; Jeff Ewalt & Pete Bolenbaugh, Zoo Montana

Few studies have been conducted to assess long-term changes in environmentally responsible behaviors after visits to wildlife tourism settings. This project will examine how signage at a wetland and waterfowl exhibits at Zoo Montana, Billings, influences the adoption of everyday behaviors to benefit the environment.

INVESTIGATING MOTIVES FOR PARTICIPATION IN AND SATISFACTION WITH FARM BILL WETLAND EASEMENT PROGRAMS

Abby Rokosch, Katherine Graham, & Dr. Kaylan Kemink, DU-GPR; Dr. Elena Rubino, Univ. of Arkansas; Natural Resources Conservation Service (NRCS)

Financial and technical support throughout the life of a Wetland Reserve Easement might increase landowner satisfaction. This is of particular concern for perpetual easements, as landowner satisfaction decreases with successor landowners, often leading to legal disagreements. This study will survey three groups of landowners to 1) assess whether non-financial motives influence participation in conservation programs and 2) determine relative satisfaction of each landowner group with the easement process.

EXTENDING BROOD SURVEYS TO THE ENTIRE PRAIRIE POTHOLE REGION: METHODS FOR DEVELOPING ANNUAL PRODUCTIVITY INDICES

Catrina Terry& Dr. Kaylan Kemink, DU-GPR; Dr. Adam Janke, Dr. Anna Tucker, & Katie Mahlmeister, Iowa State Univ.; Prairie Pothole Joint Venture; North Dakota Game and Fish Department; USFWS Habitat and Population Evaluation Team

Recent research suggests conservation targeting in the Prairie Pothole Region would benefit from data on brood distribution in addition to breeding pair distribution. This project will provide the framework from which state agencies can acquire these data. We will develop a scalable brood survey methodology using both roadside and drone surveys.

ASSESSING LANDOWNER SATISFACTION WITH ENVIRONMENTAL QUALITIES INCENTIVE PROGRAM

Katherine Graham, DU-GPR; Catherine Wightman & Krista Erdman, Northern Great Plains Joint Venture

This pilot study will interview producers in Western South Dakota to learn about outcomes associated with participation in climate-smart EQIP practices and their relationship to producer satisfaction and resilience. The objectives of this work are to 1) describe producer perceptions of the ecological, social, cognitive, and economic outcomes of participating in climate-smart EQIP practices, 2) investigate the role of perceived outcomes in driving producer satisfaction with EQIP participation, and 3) explore the role of perceived outcomes in landowner resilience to a range of stressors. These results will inform recommendations for enhancing program outcomes, marketing, and new practices.

EVALUATING TEN YEARS OF WATERFOWL NESTING ECOLOGY DATA

Catrina Terry, Dr. Kaylan Kemink, C. Tanner Gue, Kyle Kuechle, DU-GPR; Dr. Susan Ellis-Felege, University of North Dakota; Dr. Thomas Riecke, University of Montana, Mason Sieges, United States Forest Service; Ryann Cressey-Smith, Wisconsin Department of Natural Resources, United States Geological Service- Northern Prairie Wildlife Research Center, The Nature Conservancy.

Since 2015, DU has worked closely with the University of North Dakota to collect a longitudinal dataset on nesting waterfowl in Sheridan County, North Dakota. Research focused on monitoring nest success with the use of small video surveillance cameras. DU research scientists are now working with university partners to analyze the dataset and publish results in peer-reviewed journals.

EFFECTIVENESS OF THE COVER CROP AND LIVESTOCK INTEGRATION PROGRAM FOR IMPROVING WETLAND WATER QUALITY

Kyle Kuechle, Catrina Terry, Macayla Greider, Emily Schwartz, & Tanner Gue, DU-GPR; Greg Sandness, North Dakota Dept. of Environmental Quality; Dr. Mark Kaemingk & Page Arsenault, Univ. of North Dakota

DU and conservation partners developed the Cover Crop and Livestock Integration Program (CCLIP) to help producers adopt sustainable agricultural practices that integrate seasonal cover crops and cattle ranching with traditional grain production to improve soil health and generate broader environmental benefits. This study will ascertain benefits of CCLIP to water quality by monitoring wetland nutrient concentrations and hydrology in seasonal and temporary wetlands embedded in CCLIP fields, conventional agriculture, and pastureland.

PERSISTENCE AND RESILIENCE THROUGH CRP

Katherine Graham, Dr. Kaylan Kemink, & Greg Brinkman, DU-GPR; Dr. Ellen Herbert & Cathleen Sampselle, DU-NHQ; Megan Podolinsky, Dr. Lauren Gifford, & Dr. Jessica O'Connell, Colorado State Univ.; USDA Farm Service Agency

Programs like WRE and CRP not only restore and protect wetlands but may also provide important social, economic, and cognitive benefits for landowners—supporting livelihood resilience and potentially encouraging continued participation in conservation. However, these broader outcomes are rarely measured, and little is known about how landowners perceive them, whether benefits are equitably distributed, or how they influence long-term engagement. To address these gaps, our project will: (1) Identify landowners' perceived economic, ecological, and social outcomes from enrolling in wetland CRP; (2) explore how these outcomes affect livelihood resilience and sustained conservation practices; and (3) assess whether sharing ecological data with landowners influences perceptions and persistence. Results will inform policy strategies to boost conservation participation, resilience, and rural economic stability.

HOW GRAZING INTENSITY, TIMING, AND DURATION IMPACT UPLAND NESTING DUCK ABUNDANCE AND SUCCESS – A REVIEW

Macayla Greider, Catrina Terry, & Dr. Kaylan Kemink, DU-GPR

Grasslands are vital for duck production, especially across the Northern Great Plains. To support the maintenance of this critical habitat, conservation organizations like Ducks Unlimited Inc. often provide technical and financial assistance for grazing practices. Although various grazing strategies—defined by their timing, duration, and intensity—have been studied individually, there is currently no comprehensive review of how these approaches influence duck nest success or abundance. This review will synthesize existing research on the relationship between grazing and upland duck nesting success, identify key knowledge gaps, and offer practical guidance to DU biologists and land managers to enhance conservation outcomes.

MULTI-SCALE REMOTE SENSING MODELS TO IMPROVE DECISION MAKING AROUND WATERBIRD AND WETLAND DIVERSITY

Dr. Kaylan Kemink, DU-GPR; Dr. Jessica O'Connell & Maggie Church, Colorado State Univ.; Dr. Thomas Riecke, Univ. of Montana; NASA; USFWS Habitat and Population Evaluation Team; Ducks Unlimited Canada; Canadian Wildlife Service; CYVERSE

Thanks to a grant from the NASA ROSES program, the Ducks Unlimited Great Plains Region has teamed up with scientists from Colorado State University and the University of Montana to develop an open-science tool. This tool will provide estimates of breeding waterbird diversity and abundance in the Prairie Pothole Region (PPR) using multi-scale models of wetland habitat derived from remote sensing. The project will produce high-resolution estimates of habitat heterogeneity, hydroperiods, and ponded water across both the U.S. and Canadian portions of the PPR. These data will enhance conservation decision-making by linking dynamic habitat information with waterbird population models across thousands of wetland basins. The goal is to help update and improve existing conservation tools like the thunderstorm map. Preliminary research that aided in the development of this project was supported by the Prairie Pothole Joint Venture and the USFWS Habitat and Population Evaluation Team and is described at this website: https://www.landscapemodeling.net/water.html.

PEOPLE IN THE PRAIRIES – HOW MUCH PROGRESS HAVE WE MADE TOWARDS THE THIRD NAWMP OBJECTIVE?

Katherine Graham & Dr. Kaylan Kemink, DU-GPR; Prairie Pothole Joint Venture

This project seeks to assess the Prairie Pothole Joint Venture's progress toward the North American Waterfowl Management Plan's third goal by (1) describing the region's social-ecological context from 2015–2025, (2) evaluating progress toward explicit social goals, (3) describing current efforts and challenges, and (4) developing recommendations for revising and/or developing, and measuring social objectives. Work is being conducted in close collaboration with the joint venture implementation plan update, the technical committee, and state wildlife departments.

DU CANADA – NATIONAL

WETLANDS AS NATURE-BASED CLIMATE CHANGE SOLUTIONS: QUANTIFYING CARBON-CAPTURE POTENTIAL WHILE BUILDING A STRONGER GREEN ECONOMY

Dr. Irena Creed & Dr. George Arhonditsis, Univ. of Toronto, Scarborough Campus; Dr. Pascal Badiou, Dr. Lauren Bortolotti, Paige Kowal, Bryan Page, & Lee van Ardenne, DUC-IWWR; Dr. Matt Bogard & Dr. Larry Flanagan, Univ. of Lethbridge; Dr. Gail Chmura, Dr. Sara Knox, & Dr. Christian von Sperber, McGill Univ.; Dr. David Lobb, Univ. of Manitoba; Dr. Ali Ameli, Univ. of British Columbia

Freshwater mineral wetlands are integral features of Canada's agricultural landscapes and have the potential to become a key component of Canada's nature-based climate solution (NbS) strategy while supporting a thriving agricultural sector. A barrier to accurately assessing their contribution to climate goals stems from a lack of coverage, carbon stock and greenhouse gas data from these specific types of wetlands. This project will advance science and inform policy by measuring the potential of these wetlands to store carbon in agricultural landscapes. Results will be used to support DUC and decision-makers with the data, tools, and models to incentivize the use of wetlands as NbS.

RESNET: PROMOTING SUSTAINABLE AND RESILIENT ECOSYSTEMS THROUGHOUT CANADA

Dr. Elena Bennett, McGill Univ.; Adam Campbell, DUC-ATL; Dr. Lauren Bortolotti & Dr. Vanessa Harriman, DUC-IWWR; numerous academic, government, non-profit, and industry partners

ResNet is a national research network to improve Canada's capacity to monitor, model, and manage working landscapes and the benefits they provide. DUC is involved in multiple sub-projects that combine scientific quantifications of these benefits with human dimensions of management issues. In Atlantic Canada, this project will improve our understanding of the trade-offs between the reinforcement of dykelands and restoration of tidal marshes in the Bay of Fundy. In the Prairies, this project will help us understand how to reduce conflict around wetland management through collaborative decision making.

DU CANADA – BRITISH COLUMBIA

PREDICTING HABITAT DISTRIBUTION FOR SEA DUCKS IN BRITISH COLUMBIA

Bruce Harrison, Kyla Bas, Paul Yeung, & Fiona Tse, DUC-BC; Danielle Morrison, Nature Trust BC; Kathleen Moore, CWS; Llwellyn Armstrong (retired) & Dr. James Devries (retired), DUC-IWWR

The coastal waters of British Columbia (BC) support significant populations of sea ducks, though habitat requirements of these species are poorly understood. The Pacific Birds Habitat Joint Venture (PBHJV) lacks the ability to inventory and assess waterfowl habitat along much of the entire 25,000 km BC coastline making it difficult to prioritize conservation actions for these species. This project is developing predictive models to identify key nearshore marine areas for important sea ducks. This product will aid in the assessment and targeting of conservation activity along the BC coast by PBHJV partners.

EVALUATING PERFORMANCE OF HABITAT PROJECTS IN BRITISH COLUMBIA

Kyla Bas, Jayden Andrada, Sarah Nathan, & Bruce Harrison, DUC-BC

DUC has constructed hundreds of habitat projects in British Columbia (BC) since the late 1960s but had not conducted a comprehensive biological performance review since the 1990s. Since 2019, we have been evaluating project performance in terms of bird use and habitat structure across BC projects. Coastal projects include evaluation of the effects of new floodplain restoration techniques.

JOINT VENTURE RESTORATION, MANAGEMENT AND STEWARDSHIP (RMS) DATABASE

Andrew Huang, Kathleen Moore, & Lili Simon, CWS; Bruce Harrison, Fiona Tse, & Alexandra (Ola) Kepczynska, DUC-BC; Danielle Morrison & Leanna Warman, NTBC; Trevor Reid & Cindy McCallum, NCC

The Pacific Birds Habitat Joint Venture and Canadian Intermountain Joint Venture Technical Team has used its ENGO Conservation Areas Database for over a decade to track long- and medium-term securement activities among the partners in both Joint Ventures (JV). Though instrumental in measuring JV accomplishments, it lacks the ability to spatially track outcomes from other habitat initiatives across habitat types and ENGO partners. The JV team began developing this new database in FY23 to enable partners including DUC to better assess, evaluate and track their RMS activities within priority habitat types.

DEVELOPING WORKFLOWS TO ASSESS WETLAND TRENDS AND CLIMATE RESILIENCE

Kristina Deenik & Evan Lavine, Geodesic Solutions; Kathleen Moore, CWS; Bruce Harrison & Kyla Bas, DUC-BC

Advances in remote sensing enable detailed and long-term monitoring of wetland changes. This project evaluates historic and recent wetland trends in priority habitat areas in the Canadian Intermountain Joint Venture (CIJV), by analyzing changes in open water extent using a combination of existing datasets and newly developed workflows. These workflows are designed to explore how wetlands respond to historic drought, quantify variability in open water extent, and assess the potential influence of climate change.

FACTORS INFLUENCING THE PERSISTENCE OF CREATED TIDAL MARSHES IN THE FRASER RIVER ESTUARY

Daniel Stewart, Asarum Ecological Consulting; Megan Lievesley, British Columbia Institute of Technology; Dr. James Paterson, DUC-IWWR; Daniel Hennigar, Robyn Inham, & Eric Balke, DUC-BC; Rob Knight & Brad Mason, Community Mapping Network

More than 100 tidal marshes have been constructed in the Fraser River Estuary over the last 40 years, but the factors behind project success have not been investigated. The site is an important waterfowl overwintering area, as well as a stopover site for millions of shorebirds. This project analyzed vegetation survey data from 78 marsh creation sites and 16 reference marshes to determine what factors influence (1) the persistence of created tidal marshes and (2) the resilience of created marsh plant communities. This project provides the most comprehensive analysis of tidal marsh creation efforts in the Fraser River Estuary to date and will support improved outcomes with future tidal marsh creation and restoration efforts.

CLIMATE-INFORMED ESTUARY CONSERVATION PRIORITIZATION ALONG THE PACIFIC FLYWAY

Rekha Marcus (MSc student), Dr. Gerald Singh & Dr. Nancy Shackelford, Univ of Victoria; Monica Iglecia & Laura Farwell, PBHJV; Andrew Huang, CWS; Bruce Harrison, DUC-BC

Estuaries in the Pacific Northwest are critical habitats for over 190 species of birds that will all be affected by climate change in different ways. However, incorporating climate change into conservation planning is often challenging and complex. This research seeks to understand how changes in temperature and precipitation will occur across estuaries of the Pacific Northwest, with the goal of informing conservation prioritization in collaboration with the Pacific Birds Habitat Joint Venture to support bird habitat conservation.

DU CANADA – BOREAL

EFFECTS OF NATURAL AND ANTHROPOGENIC LINEAR FEATURES ON SETTLING AND PRODUCTIVITY OF DUCKS IN THE WESTERN BOREAL FOREST

Dr. Stuart Slattery, Howie Singer, Llwellyn Armstrong (retired), Dr. Matt Dyson, & Dr. Vanessa Harriman, DUC-IWWR

The Western Boreal Forest is changing rapidly due to industrial development. Implications of these changes for waterfowl nesting guilds (e.g., ground, overwater, cavity) are unknown. This study is assessing the potential effects of roads, pipelines, and seismic lines on waterfowl settling and productivity at the guild level in the Boreal Plains using aerial surveys. This information will be used to guide and refine DUC conservation in the boreal forest.

SPECIES-HABITAT RELATIONSHIPS OF DUCKS IN THE WESTERN BOREAL FOREST

Dr. Matt Dyson, Dr. Stuart Slattery, Howie Singer, Dr. Vanessa Harriman, & Llwellyn Armstrong (retired), DUC-IWWR

Knowledge of species-specific responses to land use and landcover change informs our ability to deliver conservation programs and anticipate conservation needs. The Western Boreal Forest has rapidly changed in recent decades due to industrial development, and there remains uncertainty about the varying effects of these changes among different species of ducks. This study is assessing effects of roads, pipelines, and seismic lines on settling and productivity for American wigeon, blue-winged teal, green-winged teal, lesser scaup, mallard, northern shoveler, ring-necked duck, bufflehead, and common goldeneye across the Boreal Plains.

INFORMING WETLAND POLICY AND MANAGEMENT FOR WATERFOWL HABITAT AND OTHER ECOSYSTEM SERVICES USING MULTI-FREQUENCY SYNTHETIC APERTURE RADAR

Becky Edwards, & Sonny Lenoir, DUC-BOR; Michael Battaglia, Dr. Laura Bourgeau-Chavez, & Dr. Nancy French, Michigan Tech Research Institute; Dr. Jennifer Baltzer, Wilfrid Laurier Univ.; Dr. Bruce Chapman, NASA; Dr. Chris Spence, ECCC

This collaboration is a Phase III project under the auspices of NASA's Arctic Boreal Vulnerability Experiment. In Phase II we focused on improving methods to map wetland status, dynamics, and change for waterfowl habitat assessment. In the next phase, we are focusing on using these methods to assess wetland ecosystem services where land stewardship activities lack sufficient information for informed management. This project will identify key species, areas of concern, and ecosystem services vital to stakeholder needs by initiating discussions with regional Indigenous communities and provincial and national governments.

WETLANDS AND WATERFOWL IN DENE K'ÉH KUSĀN STORYMAP

Becky Edwards, Darrell Kovacz, & Raina Mithrush, DUC-BOR; Howie Singer, DUC-IWWR

Dene K'éh Kusān is a proposed Indigenous Protected and Conserved Area (IPCA) in northern British Columbia and provides important nesting habitat for migratory birds and waterfowl. DUC has partnered with Dene Keyah Institute and Dane nan yé dāh Kaska Land Guardian Program to create a storymap amplifying Indigenous stories, knowledge, and science regarding wetland and waterfowl in the region.

INTERLAKE AND INTERLAKE EXTENSTION WETLAND INVENTORY

Becky Edwards & Aaron Sneep, DUC-BOR

The Interlake region in Manitoba's Boreal Plains ecozone has been identified as a high-priority wetland and waterfowl conservation region in Canada's Western Boreal Forest. This area lacks Canadian National Wetland Inventory (CNWI) compliant data for baseline analysis and conservation initiatives. DUC produced a wetland inventory that meets CNWI standards, by mapping five CNWI classes and further differentiating into DUC's Enhanced Wetland Classification system. Wetland location, extent, and distribution were determined using satellite-collected data sets via cloud-based software and predictive machine learning methods. The current phase of the project adds 0.5 million hectares to the inventory. While producing the wetland inventory for the extension area, new remote sensing methodologies using google earth engine and python scripting will be tested. The performance of these new methods will be compared to the processes employed to create the Interlake wetland inventory, which will help to inform the workflows used for future wetland inventories in the boreal.

WAHKOHTOWIN WETLAND INVENTORY

Becky Edwards, Aaron Sneep, Darrell Kovacz, & Lindsay McBlane, DUC-BOR

Wahkohtowin Development GP Inc. is a social enterprise of three First Nations communities - Chapleau Cree First Nation, Missanabie Cree First Nation and Brunswick House First Nation. The study area within Treaty 9 Territory in Ontario extends over approximately 9.5 million hectares and is rich in boreal wetlands, including various peatland types. This project will produce a desktop-based wetland inventory that meets Canadian National Wetland Inventory (CNWI) standards and will support the enterprise with various goals such as land stewardship, protecting culturally significant ecosystems, and informing decision-making grounded in Indigenous rights and knowledge.

CONSERVATION AREAS NETWORK ANALYSIS PROJECT

Lindsay McBlane, Darrell Kovacz, Mark Kornder, & Alain Richard (retired), DUC-BOR; Elston Dzus (retired), Tom Habib, Kiera Steward-Shepherd, & Sandra Cardinal, Alberta-Pacific Forest Industries Inc.; Kevin Gillis, Mistik Management Ltd.; Kecia Kerr, Ryan Cheng, Stew Coles, & Gord Vaadeland (retired), CPAWS

This project uses GIS modeling (Marxan) to assess how well the current protected areas network in northeast Alberta and northwest Saskatchewan represents features of conservation interest, including waterfowl abundance. The goal is to recommend an expanded network of conservation areas, meet forestry certification goals, and contribute to the Canadian Federal Government's protected areas goals. DUC is leading the technical portion of this project to leverage waterfowl and wetlands conservation, engage with Indigenous communities, and build opportunities for conservation.

QUANTIFYING EFFECTS OF OIL SANDS DEVELOPMENT ON WETLAND FUNCTION: MANAGING TO MITIGATE IMPACT AND OPTIMIZE RECLAMATION OUTCOMES

Dr. Scott Ketcheson, Athabasca Univ.; Dr. Maria Strack, Univ. of Waterloo; Dr. Greg McDermid, Univ. of Calgary; Dr. Bin Xu, NAIT Centre for Boreal Research; Lindsay McBlane & Kylie McLeod, DUC-BOR

This project examines the effect of resource-access roads and well pads on hydrological processes and wetlands. Changes in water movement can impact the type and amount of vegetation growth. This project will determine if these changes are occurring and how it affects ecological suitability of Boreal habitats. This research is being conducted in partnership with Imperial Oil Ltd. and will directly inform their operations. DUC extend the reach and application of project findings.

CAN-PEAT: CANADA'S PEATLANDS AS NATURE-BASED CLIMATE SOLUTIONS

Dr. Maria Strack, Univ. of Waterloo; Dr. Elyn Humphreys, Carleton Univ.; Dr. Jianghua Wu, Memorial Univ.; Dr. David Olefeldt, Univ. of Alberta; Dr. Oliver Sonnentag & Dr. Michelle Garneau, Univ. de Montréal; Dr. Mary Kang, McGill Univ. The Can-Peat network includes many other collaborators with DUC represented by Lindsay McBlane & Kylie McLeod, DUC-BOR; Dr. Pascal Badiou, DUC-IWWR

Peatlands are the world's largest terrestrial organic carbon (C) stock, with Canada home to the largest portion. The Can-Peat project assembles a diverse team of researchers and partners to quantify the potential of peatland management to reduce Canada's greenhouse-gas emissions and mobilize this information to support peatland research, management, and policy. Can-Peat's focus is to create an open access database of peatland distribution, condition, and vulnerability; delivering innovative modelling of peatland response to disturbance; and developing decision-support tools for peatland management.

NATURE-BASED SOLUTIONS: RESTORATION OF PEATLANDS FOR BIODIVERSITY RECOVERY AND CLIMATE CHANGE MITIGATION

Dr. Line Rochefort & Dr. Marc-Andre Bourgault, Laval Univ.; Dr. Ian Strachan, Queen's Univ.; Dr. Maria Strack, Univ. of Waterloo; Alexandre Brisson; Frederic Caron, Premier Tech; Lee Fedorchuk, Government of Manitoba; Asha Hingorani, Canadian Sphagnum Peat Moss Association; Jerome Lambert, Lambert Peat Moss; Warren Walker, Sungro; Lindsay McBlane & Kylie McLeod, DUC-BOR

Canada has almost a third of the world's peatland area and is one of the world's largest producers and exporters of horticultural peat. While horticultural peat extraction represents 1.2% of all peatland disturbances, there is interest from the industry in restoring and reclaiming disturbed peatlands. This project will develop natural solutions through peatland restoration to re-establish biodiversity and restore peatland carbon sink potential. The project will test new approaches to fen restoration, improve understanding of the drivers of post-restoration greenhouse gas exchange, and use adaptive management and knowledge exchange to support peatland restoration. Project activities will be conducted across Quebec, Alberta, Manitoba, and New Brunswick.

IMPACTS OF CLIMATE CHANGE ON BOREAL WETLANDS

Dr. Vanessa Harriman & Dr. Lauren Bortolotti, DUC-IWWR; Kylie McLeod, DUC-BOR; Dr. Yanping Li & Dr. Danqiong Dai, Western Univ.; Dr. Zhe Zhang, National Center for Atmospheric Research; Dr. Scott Ketcheson, Athabasca Univ.; Dr. Oliver Sonnentag, Univ. de Montréal

Boreal wetlands are expected to be sensitive to climate change with consequences for the communities, industries, forests, and wildlife that depend on them. This study will produce predictions of future wetland abundance and distribution in the Western Boreal Forest (WBF) and will respectfully engage and learn from communities that may be affected by wetland change. Results from this study will support DUC's conservation planning for waterfowl, migratory landbirds, and other natural resources in the WBF.

fRI RESEARCH HEALTHY LANDSCAPES PROGRAM: A WHOLE LANDSCAPE APPROACH TO ECOSYSTEM BASED MANAGEMENT

Kylie McLeod, DUC-BOR; Dr. David Andison, fRI; Courtney Miller, Alberta-Pacific Forest Industries Inc.; Paul LeBlanc, Louisiana-Pacific Canada Ltd.; Chris Watson, Parks Canada; others from the HLP Activity Team (consisting primarily of forest industry and provincial government)

fRI Research's Healthy Landscapes Program (HLP) is a forest management research partnership among industry, government, academia, and others. With DUC as its lead, this project will growour understanding of the role of wetlands, particularly peatlands, on the landscape, including how drying peatlands contribute to catastrophic wildfire). The purpose of this project is to (1) define the "whole landscape" for the HLP bringing together forest and wetland classifications and (2) assess HLP's current gaps in wetland knowledge, identify past and current research, and create a road map for future research.

SPATIAL ESTIMATES OF WETLAND SOIL ORGANIC CARBON IN THE BOREAL PLAINS ECOZONE, CANADA

Heather Peacock, Darrell Kovacz, & Lindsay McBlane, DUC-BOR; Dr. Vanessa Harriman, Dr. Pascal Badiou, & Llwellyn Armstrong (retired), DUC-IWWR

Carbon accounting is increasingly important in land management and the forestry sector, particularly in the context of Canada's carbon-rich ecosystems. Current spatial mapping products at the national scale do not allow for accurate estimates of carbon stocks at local scales. This project is estimating wetland soil organic carbon across the Boreal Plains ecozone using DUC's Enhanced Wetland Classification. Understanding the quantity and distribution of soil organic carbon holds pivotal significance for climate change mitigation. This fine-grained map product can assist carbon accounting and conservation by highlighting where and which wetland classes store large amounts of carbon.

DU CANADA – PRAIRIES

ASPECTS OF BUFFLEHEAD BREEDING BIOLOGY IN SOUTHWESTERN MANITOBA: AN AREA OF RECENT POPULATION GROWTH

Gord Hammel, Erickson-MB; Howie Singer & Llwellyn Armstrong (retired), DUC-IWWR

Understanding species-specific breeding information is important for conservation and harvest management decisions. This project collected data on a relatively understudied duck species, Bufflehead, in southwestern Manitoba from 2008–2018. Data were collected on population size, duckling age and size, hatch date, and productivity to investigate the potential range expansion and population growth of this species. This information will inform future conservation plans.

PRAIRIE CONSERVATION PLANNING "COST TOOL" DEVELOPMENT

Dr. Vanessa Harriman, Dr. James Devries (retired), & Llwellyn Armstrong (retired), DUC-IWWR; Dr. David Howerter (retired) & Paul Thoroughgood, DUC-HO; Cynthia Edwards, DU-NHQ; other DUC staff

Developed from years of field research, the "Cost Tool" incorporates data on waterfowl nest habitat selection and success with costs of habitat conservation to provide a decision support tool predicting return on investment (cost per hatched nest) across prairie Canada. This planning product provides a powerful tool for mapping the relative value of conservation actions across prairie Canada and is being used by DUC to guide conservation decisions.

QUANTIFYING THE DEMOGRAPHY OF NORTH AMERICAN DABBLING DUCKS USING INTEGRATED ANALYSES AND SCENARIO-PLAYING TO GUIDE CONSERVATION PLANNING

Dr. Dan Gibson (Post-doctoral researcher) & Dr. Todd Arnold, Univ. of Minnesota; Dr. Mitch Weegman, Univ. of Saskatchewan; Dr. James Devries (retired) & Dr. Matt Dyson, DUC-IWWR; Dr. David Howerter (retired), DUC-HO; Dr. Bob Clark (retired), ECCC

This project uses 55 years of breeding survey data in the Prairie Pothole Region (1961–2022) to develop Bayesian hierarchical models of land use and climate change effects on productivity (i.e., age ratios at banding) for seven dabbling duck species. These models will be used to predict responses of the dabbling duck community to climate and land use change scenarios, thereby providing a more holistic view of conservation measures that differentially or uniformly benefit waterfowl.

BEE COMMUNITY COMPOSITION IN PRAIRIE POTHOLE LANDSCAPES: EFFECTS OF CLIMATE, WEATHER AND LANDSCAPE COMPOSITION

Dr. Abigail Cohen (Post-doctoral researcher) & Dr. Paul Galpern, Univ. of Calgary; Dr. James Devries (retired), DUC-IWWR

This project is quantifying the variation in wild bee occurrence that may provide value to farmers through improved crop pollination and pest control. Researchers are measuring and modeling the diversity of wild bees in prairie agroecosystems of southern Alberta related to local weather, longer-term climate, and local landscape composition. Understanding variation in bee diversity provides valuable information supporting pollination ecosystem services and the retention of natural and semi-natural habitat in prairie agroecosystems.

EVALUATING BENEFITS OF DIVERSE CONSERVATION PROGRAMMING

Dr. Tim Alamenciak (Post-doctoral researcher) & Dr. Joseph Bennett, Carleton Univ.; Dr. Lauren Bortolotti, DUC-IWWR

In working landscapes like the Canadian Prairies, it is difficult to protect enough land through conservation easements and land purchases alone, so DUC supplements land securement with term conservation agreements and agricultural extension work. This study is evaluating the outcomes for habitat protected by 10-year agreements and examining how diverse conservation programs may complement each other in building participation in conservation programming in this landscape.

*DIVERSITY AND ABUNDANCE OF GROUND-DWELLING ARTHROPODS IN CANADIAN PRAIRIE AGROECOSYSTEMS: UNDERSTANDING THE ROLE OF REMNANT AND RESTORED HABITATS

Georgiana Antochi-Crihan (MSc student) & Dr. Sean Prager, Univ. of Saskatchewan; Dr. James Devries (retired) & Dr. James Paterson, DUC-IWWR

This project is examining the diversity and abundance of ground-dwelling arthropods associated with wetlands and field edges in croplands and grasslands of central Saskatchewan. Quantifying the abundance and diversity of these species provides valuable information on the potential of remnant semi-natural habitats to provide pest control services in prairie agroecosystems. Quantifying ecosystem services provided by wetlands and other habitats supports DUC communication and policy efforts to promote conservation.

PRAIRIE BIODIVERSITY MAPPING AND ASSESSMENT TOOL

Dr. James Paterson, Dr. Lauren Bortolotti, Paige Kowal, Ashley Pidwerbesky, & Dr. James Devries (retired), DUC-IWWR

This project is using prairie-wide observations for amphibians, birds, mammals, and reptiles to develop probability of occurrence layers for each species as a function of habitat and climate variables at multiple scales. These layers will be used to map biodiversity potential across prairie Canada as a function of land cover at fine spatial scales. This effort will enhance DUC conservation planning by highlighting areas of potential high biodiversity and allowing prediction of the effects of conservation actions (e.g., restoration) and land cover change (e.g., wetland and grassland loss) on biodiversity potential.

QUANTIFYING PRAIRIE WETLAND ECOSYSTEM SERVICES—THE WETLAND ECOSYSTEM SERVICES TOOL

Dr. Lauren Bortolotti, Llwellyn Armstrong (retired), Paige Kowal, Lee van Ardenne, Dr. Pascal Badiou, Bryan Page, Dr. James Paterson, & Dr. James Devries (retired), DUC-IWWR; Dr. Henry Wilson, AAFC

Wetlands provide many ecosystem services, and quantification and communication of these values can garner support for DU's continental conservation objectives. This study is developing spatially explicit models of prairie wetland ecosystem services including water storage, nutrient retention, carbon storage, and biodiversity. The resulting product, the Wetland Ecosystem Services Tool, will have numerous applications, including communicating wetland values to the public and informing efforts to maximize ecosystem services from waterfowl conservation delivery.

Photo by USFWS

IMPACTS OF CLIMATE CHANGE IN PRAIRIE CANADA—WATERFOWL PRODUCTIVITY

Dr. Lauren Bortolotti, Dr. James Devries (retired), & Llwellyn Armstrong (retired), DUC-IWWR; Dr. Zhe Zhang, National Center for Atmospheric Research; Dr. Yanping Li, Western Univ.; Dr. Benjamin Rashford, Univ. of Wyoming

Future improvements in conservation planning for waterfowl will require enhanced understanding of the effects of climate change on prairie wetlands, agricultural land use, and population demographics. In the second part of a multi-stage project, this study is incorporating direct impacts of climate change on wetlands and indirect (economically driven) effects on land use into models of prairie waterfowl productivity.

EVALUATING DITCH PLUG WETLAND RESTORATIONS IN THE PRAIRIE POTHOLE REGION

Dr. James Paterson, Dr. Matt Dyson, Howie Singer, Ashley Pidwerbesky, & Dr. Stuart Slattery, DUC-IWWR

This study is evaluating the success of ditch plug wetland restorations in supporting ducks and other wildlife by sampling restored wetlands of various ages and comparing waterfowl and other biodiversity to undrained wetlands in similar landscapes. Results from this study will improve wetland restoration decisions (e.g., value of restoring wetlands in different landscapes) and build support for the value of restored wetlands supporting ducks and other biodiversity.

LINKAGES BETWEEN BIODIVERSITY AND GREENHOUSE GAS FLUXES IN PRAIRIE WETLANDS

Dr. Sam Woodman & Dr. Matt Bogard, Univ. of Lethbridge; Dr. Lauren Bortolotti, Dr. James Paterson, Ashley Pidwerbesky, & Dr. Pascal Badiou, DUC-IWWR

Wetlands provide numerous benefits including storing carbon and supporting biodiversity, but there may be trade-offs between the provisioning of different services. This study will analyse greenhouse gas flux and wetland bird biodiversity data collected from wetlands across the prairie provinces. These data will be used to evaluate hypotheses about linkages between carbon and biodiversity functions and inform the management of wetlands systems to provide multiple benefits in both grazing lands and annual crops.

WETLANDS IN WORKING LANDSCAPES: MAINTAINING WETLAND RESILIENCE IN THE CONTEXT OF AGROECOSYSTEMS AND CLIMATE CHANGE

Dr. Matt Dyson, Dr. James Devries (retired), Andrew Collard, Ashley Pidwerbesky, & Dr. James Paterson, DUC-IWWR; Dr. Tyler Cobb & Dr. Rob Hinchcliffe, Alberta Biodiversity Monitoring Institute-Univ. of Alberta; Dr. Brian Eaton, Dr. Jim Davies, Dr. Sue Koziel, & Dr. Emily Herdman, Innotech Alberta; Dr. Mitch Weegman, Univ. of Saskatchewan

The Prairie Pothole Region (PPR) is the most productive waterfowl breeding habitat on the continent, but over the past century wetlands have been extensively drained and converted for agricultural production. This study is evaluating PPR wetlands across an agricultural gradient to understand how agricultural land use affects wetland water quality, invertebrate communities, abundance, and their ability to support waterfowl pairs and broods. Results will clarify the influence of agricultural land use and water quality on wetlands and their ability to support sustainable populations of waterfowl and other wetland dependent species in the PPR.

***COMPARING MOVEMENTS, BEHAVIOUR, SURVIVAL AND REPRODUCTIVE SUCCESS IN DABBLING DUCKS FITTED WITH TRACKING DEVICES USING DIFFERENT ATTACHMENT TECHNIQUES**

Kelsie Huss (MSc student), Dr. Mitch Weegman, & Dr. Karen Machin, Univ. of Saskatchewan; Dr. Frank Rohwer & Dr. Chris Nicolai, Delta Waterfowl Foundation; Paul Link, Louisiana Dept. of Wildlife and Fisheries; Dr. James Devries (retired) & Dr. Matt Dyson, DUC-IWWR

This project is deploying state-of-the-art GPS-acceleration tracking devices on midcontinent mallards using four attachment techniques to compare movements, behaviour, survival, and reproductive success throughout the full annual cycle. Geolocators also are being deployed to collect movement, survival, and reproductive data as a control for comparison to GPS tracking devices. The project anticipates deploying 300 GPS-acceleration tracking devices and 300 geolocators from 2022 to 2025. We also will develop simulations to understand optimal sample sizes of tracking devices to support future research on movement ecology.

QUANTIFYING ENVIRONMENTAL DRIVERS OF CONTINENTAL-SCALE PINTAIL POPULATION DYNAMICS

Dr. Dan Gibson (Post-doctoral researcher) & Dr. Mitch Weegman, Univ. of Saskatchewan; Dr. Todd Arnold, Univ. of Minnesota; Dr. James Devries (retired) & Dr. Matt Dyson, DUC-IWWR

This project will test hypotheses about environmental drivers of pintail populations across North America by linking three breeding regions and two wintering regions, via movement and seasonal survival estimates, calculated in one integrated population model. This unique approach will allow simultaneous assessment of mechanisms of population change and consider the full annual cycle to guide conservation planning in space and time. Results will also enable scenario-playing to guide financial investments given anticipated land use and climate change.

TEMPORAL VARIATION IN PRAIRIE WATERFOWL PRODUCTIVITY: LINKING LOCAL NESTING DATA TO POPULATION SURVEYS AND BANDING DATA TO INFORM CONSERVATION DELIVERY

Dr. Matt Dyson & Dr. James Devries (retired), DUC-IWWR; Dr. Mitch Weegman, Univ. of Saskatchewan

Nest success contributes strongly to explaining variation in waterfowl population change, and this information has influenced conservation programs at a continental scale. However, there have been few studies linking local nest success to measures of productivity at larger scales (e.g., banding age ratios or hunter-submitted wings). This study will compare measures of waterfowl productivity at local and population scales to assess their representativeness relative to other commonly estimated parameters. These comparisons will enhance our understanding of the effectiveness of habitat conservation programs to benefit waterfowl.

MAPPING RISK OF GRASSLANDS CONVERSION ACROSS THE CANADIAN PRAIRIES

Dr. Samuel Robinson, Dr. James Devries (retired), & Llwellyn Armstrong (retired), DUC-IWWR

Grasslands provide crucial habitat to a variety of songbirds and waterfowl, and are one of the most at-risk ecosystems worldwide. This risk is especially high in the Prairie Pothole Region of Canada, where roughly 75% of grasslands have been converted to annual crops. Using machine-learning techniques and remotely sensed imagery, this project aims to a) identify where grassland loss is occurring most quickly, and b) determine landscape-level predictors of grassland loss. This project will identify high-risk areas for conservation, support policy to reduce grassland loss, and ultimately help preserve the habitat and ecosystem services provided by grasslands.

GRASSLAND LEARNING AND KNOWLEDGE HUB

Dr. John Pattison-Williams, Univ. of Alberta; Dr. Lauren Bortolotti & Dr. Samuel Robinson, DUC-IWWR; Gia Paola, DUC-IGR; Canadian Forage and Grassland Association; RAD Network; numerous academic partners and other DUC staff

Natural climate solutions hold potential for helping Canada meet its international greenhouse gas reduction commitments, but there are barriers to the implementation and scaling up of these solutions. The Grassland Learning and Knowledge Hub will analyze barriers and propose solutions to reducing grasslands conversion and increasing restoration, with an emphasis on policy, the social sciences and Indigenous engagement.

DU CANADA – CENTRAL CANADA

IMPLEMENTING BIOLOGICAL CONTROL OF INTRODUCED *Phragmites australis* IN ONTARIO

Dr. Michael McTavish (Post-doctoral researcher) & Dr. Ian Jones (Post-doctoral researcher), Smith Forest Health Lab and AAFC; Dr. Rob Bouchier, AAFC; Dr. Sandy Smith, Univ. of Toronto; Matt Bolding, DUC-ON

Introduced common reed (*Phragmites australis*) is one of the most invasive plants in North America, displacing native species and threatening wetland biodiversity. Mechanical and chemical management have proved costly and ineffective for larger populations. As an alternative, nearly 20 years of research has identified the stem-boring noctuid moths as suitable biocontrol agents, and a petition for their release in Canada has recently been approved. This project is part of a larger initiative that will determine the impact of the stem-boring noctuid moths on introduced and native Phragmites and survival of the moths at all life stages.

ADVANCING DETECTION AND SURVEILLANCE OF AQUATIC INVASIVE SPECIES

Dr. Peyman Saidi & Dr. Medhi Sanjari, saiwa inc; Matt Bolding & Mallory Carpenter, DUC-ON

saiwa inc. and DUC are integrating image processing and artificial intelligence techniques for invasive species surveillance. The main objective is to automate the detection of European water chestnut (EWC), and water soldier (WS) in RGB and IR images collected by drone. Windows-based software has been developed to detect EWC in aggregation of RGB images making use of the SegDecNet model, which was trained on nearly 1,400 images collected in the Wolfe Island and Welland River areas in July 2022 & 2023. This model is being adapted to detect WS using images collected from Red Horse Lake and Lake Simcoe, collected in 2024. The ultimate goal is to develop a hands-off, rapid method by which to detect EWC and WS for early detection and control.

WATERFOWL SURVEY DESIGN AND SPECIES-HABITAT RELATIONSHIPS IN THE RING OF FIRE REGION OF ONTARIO

Dr. Matt Dyson, DUC-IWWR; Dr. Shannon Badzinski, Shawn Meyer, Chris Sharpe, Ross Wood, & Brigitte Colins, CWS-ON Region

CWS-ON is undertaking surveys of migratory birds, with a focus on waterfowl within the remote regions of northern Ontario to obtain baseline information on abundance, distribution and habitat associations. Data from these surveys will inform a Regional Impact Assessment within the Ring of Fire mine claims area and the Ontario Breeding Bird Atlas. To align with current surveys, CWS-ON desires to develop a new helicopter waterfowl survey within this region that will account for relevant habitat and logistical considerations while maximizing cost efficiencies. Results of this work will improve our understanding of waterfowl distributions and species-habitat relationships in remote parts of Canada.

ADVANCING CONSERVATION DECISION SUPPORT TOOLS FOR THE EASTERN HABITAT JOINT VENTURE

Dr. Daniel Dylewsky (Post-doctoral researcher) & Dr. Joseph Bennett, Carleton Univ.; Dr. Matt Dyson & Dr. James Paterson, DUC-IWWR; Nic McLellan, DUC-ATL/IWWR; Dr. Richard Schuster, NCC

The Eastern Habitat Joint Venture (EHJV) requires an updated decision support tool to guide strategic habitat conservation. This information will guide regional conservation to support waterfowl and social values while remaining consistent with other bird conservation goals. This project will advance the EHJV decision support tools to provide a common standard among partners and improve allocation of resources to maximize the return on investment for habitat conservation that benefits waterfowl, society, biodiversity, and other ecosystem services.

EASTERN CANADA BIODIVERSITY MAPPING AND ASSESSMENT TOOL

Dr. Yisa Ginath Yuh (Post-doctoral researcher) & Dr. Julie Lee-Yaw, Univ. of Ottawa; Dr. James Paterson, Ashley Pidwerbesky, Paige Kowal, & Dr. Lauren Bortolotti, DUC-IWWR

This project is building species distribution models for all amphibians, birds, mammals and reptiles in the Mixedwood Plains and Atlantic Maritime ecozones to support conservation planning and reporting. The stacked model predictions will map biodiversity potential across eastern Canada as a function of land cover and climate variables. This effort will enhance conservation planning by highlighting areas of high potential biodiversity and examine spatial variation in the benefits of conservation programs (e.g., restoration) to biodiversity.

***INFLUENCE OF PRIOR LAND USE AND SURROUNDING LAND COVER ON THE TAXONOMIC AND FUNCTIONAL DIVERSITY OF PLANT COMMUNITIES IN RESTORED MARSHES**

Kim Charron-Charbonneau (MSc student) & Monique Poulin, Université Laval; Chrystel Losier, DUC-QUE

This study examines the impact of local and landscape-level factors on plant diversity in restored marshes in Québec. It assesses how variables such as prior land use and surrounding land cover affect the taxonomic and functional composition of wetland vegetation. The hypothesis is that disturbed sites promote ruderal and invasive species. Results will help distinguish contexts where spontaneous colonization is sufficient from those requiring active revegetation, contributing to the development of evidence-based guidelines for wetland restoration in Québec.

DEVELOPING A MONITORING PROTOCOL FOR VEGETATION AND ECOLOGICAL SERVICES IN RESTORED WETLANDS

Gabriela Torchia (Post-doctoral researcher) & Monique Poulin, Université Laval; Jean-Olivier Goyette, Université du Québec en Outaouais; Chrystel Losier, DUC-QUE

This project aims to develop a standardized monitoring protocol to assess vegetation and ecological functions in restored wetlands in Québec. Grounded in a literature review and field testing, the protocol includes context-specific sub-protocols, a decision-support tool to guide their selection, and the identification of relevant ecological indicators and remote sensing tools. This science-based framework will help structure long-term monitoring under Québec's mitigation program (Programme de création et de restauration des milieux humides et hydriques) and support the definition of clearer restoration objectives.

EVALUATING NON-MARKET METHODS TO ASSESS THE TOTAL ECONOMIC VALUE OF ECOSYSTEM SERVICES IN THE PLAISANCE-TREMBLANT ECOLOGICAL CONNECTIVITY CORRIDOR

Dr. Jie He, Antoine Dumas (MSc student), Franck Banalet, & Maxence Collado (PhD students), Université de Sherbrooke; Francis Côté, DUC-QUE

Ecological connectivity is essential for biodiversity, climate resilience, and human well-being. However, its economic value — especially non-market components like indirect use and non-use values — is often overlooked. This research aims to evaluate the effectiveness, coherence, and relevance of various non-market valuation methods in the context of the Plaisance-Tremblant ecological corridor in Québec. The project will identify suitable valuation methods, develop data collection tools, and conduct comparative analyses using both revealed and stated preference techniques. By estimating the total economic value of ecosystem services—including cultural, recreational, and ecological benefits—this study will inform conservation planning and policy integration, while also addressing the unique perspectives of local stakeholders, with an intention to involve the Indigenous communities into the study.

NATURE FORCE – ONTARIO: WASHINGTON CREEK MONITORING AND MODELING STUDY

Dr. Pascal Badiou & Bryan Page, DUC-IWWR; Dr. Steven Frey, Aquanty

This study is focused on understanding the role of wetlands in regulating water flow in the Washington Creek watershed using the HydroGeoSphere (HGS) model. Stream discharge and wetland water levels were measured and used to calibrate the HGS model and scenarios of wetland loss and gain are being assessed against a 1-in-100-year design storm.

DU CANADA – ATLANTIC

*EFFECTS OF FISHWAYS ON SEX RATIOS OF SPAWNING POPULATIONS OF ALEWIFE *Alosa pseudoharengus* ON THE ISTHMUS OF CHIGNECTO, NOVA SCOTIA AND NEW BRUNSWICK

Bailey Silver (MSc student), Dr. Sarah Baldwin, & Dr. Mike Stokesbury, Acadia Univ.; Dr. Aaron Spares & Nic McLellan, DUC-ATL/IWWR

This project investigates the potential impact of fishways and other anthropogenic barriers on the sex ratios of spawning alewife. Initial investigation suggestions a skewed male to female ratio as fish traverse watercourses and approach the spawning grounds. Investigating this potential population level pressure will improve knowledge of watershed connectivity.

IDENTIFYING DEMOGRAPHIC BOTTLENECKS AND HABITAT USE TO SUPPORT THE RECOVERY AND MANAGEMENT OF AMERICAN COMMON EIDER

Scott Gilliland (retired), Dr. Greg Robertson, Dr. Al Hanson, Dr. Sarah Gutowsky, & Christine LePage, CWS/ECCC; Nic McLellan, DUC-ATL/IWWR; Dr. Matt Dyson, DUC-IWWR; Kelsey Sullivan, State of Maine; Lucas Savoy, Biological Resource Institute; Dr. Jean-François Giroux, Univ. du Québec à Montréal; Dr. Oliver Love, Univ. of Windsor; Dr. Mark Mallory, Acadia Univ.

This multi-year project will deploy satellite tracking devices on hen American common eiders across their breeding range. The project aims to develop a methodology to assess breeding status, assess breeding propensity, and identify periods in the annual cycle when female mortality occurs. It will also provide information on movement and habitat use at various spatial scales, identify linkages between breeding and wintering areas, and help identify conservation opportunities for this sub-species.

***ESTIMATING NESTING STATUS OF PTT-EQUIPPED AMERICAN COMMON EIDER (*Somateria mollisuma dresseri*) HENS TO DETERMINE BREEDING PROPENSITY**

Asha Grewal (MSc student) & Dr. Mark Mallory, Acadia Univ.; Dr. Greg Robertson, Scott Gilliland (retired), & Dr. Sarah Gutowsky, ECCC; Dr. Frances Buderman, Pennsylvania State Univ.; Nic McLellan, DUC-ATL/IWWR

This project uses telemetry data from American common eider hens across their breeding range to estimate breeding state based on movement patterns. This will be used to determine breeding propensity, an important vital rate for this sub-species that has been declining in the southern portion of its breeding range.

ASSESSING AND IMPROVING ALEWIFE FISH PASSAGE AT DUC FISHWAYS IN ATLANTIC CANADA

Dr. Aaron Spares & Nic McLellan, DUC-ATL/IWWR; Dr. Sarah Baldwin & Dr. Mike Stokesbury, Acadia Univ.; Dr. Royce Steeves, DFO Science; Jonathan Platts, DUC-ATL

This long-term project uses PIT tagging technology and other proxies, including eDNA, to assess and improve passage efficiency of migratory fish species, including alewife and American eel at DUC wetlands with fishways in coastal Atlantic Canada. This assessment has broadened to include other anthropogenic obstructions, including tide gates and culverts. Improved connectivity should increase the health and productivity of both freshwater and marine environments.

UNDERSTANDING AND MEASURING BLUE CARBON STORAGE IN SALT MARSHES OF THE MARITIME PROVINCES

Dr. Jeff Ollerhead, Mount Allison Univ.; Dr. Holly Abbandonato & Nic McLellan, DUC-ATL/IWWR; Dr. Amanda Loder, ECCC

This project aims to better understand how to measure and quantify carbon storage in natural and restored salt marshes. In addition, it will identify knowledge gaps for the region to address and facilitate the verification of carbon storage for offsetting. This project will improve our knowledge of this important function of salt marshes.

***CARBON STORAGE AND GAS FLUX IN DUC MANAGED FRESHWATER WETLANDS ON DYKELANDS IN THE MARITIME PROVINCES**

Wendy Ampuero Reyes (PhD student) & Dr. Gail Chmura, McGill Univ.; Dr. Pascal Badiou, DUC-IWWR; Nic McLellan, DUC-ATL/IWWR

In Atlantic Canada, DUC continues to restore and manage large freshwater wetlands on dykelands (lands that were formerly saltmarsh) as priority waterfowl and wildlife habitat. This project will help DUC better understand the role and value of these wetlands for carbon storage while informing future projects.

***WETLAND BIRD RESPONSE TO HISTORICAL AND CURRENT ANTHROPOGENIC HABITAT DRIVERS AND CONSERVATION IMPLICATIONS IN ATLANTIC CANADA**

Kiirsti Owen (PhD student) & Dr. Joe Nocera, Univ. of New Brunswick; Dr. Mark Mallory, Acadia Univ.; Nic McLellan, DUC-ATL/IWWR

This broad research project will assess waterfowl and wetland bird use of coastal, dykeland habitats along the Bay of Fundy, including DUC wetland projects, throughout the annual cycle. This project will also build on previous wetland senescence research and assess bird use with respect to wetland age, habitat, and management techniques.

***SUB-HABITAT USE BY FISH IN, AND PHYSICAL CHARACTERISTICS OF, RESTORED AND ESTABLISHED SALT MARSHES IN MEGA- AND MICROTIDAL REGIMES**

Kiana Endresz (PhD student), John Linihan (MSc student), & Dr. Myriam Barbeau, Univ. Of New Brunswick; Dr. Jeff Ollerhead, Mount Allison Univ.; Nic McLellan, DUC-ATL/IWWR

This project is researching how fish utilize salt marsh habitats in the Maritime Provinces and how this varies depending on location and tidal regime. In addition, it will focus on how the physical characteristics of salt marshes relate to fish usage. This project will improve our understanding of salt marsh values and how we design salt marsh restoration projects in the future to maximize biodiversity outcomes.

***LINKAGES BETWEEN SALT MARSHES AND MUDFLATS IN MEGA-TIDAL AND MICROTIDAL REGIMES IN MARITIME CANADA**

Alexa Stack Mills (PhD student) & Dr. Myriam Barbeau, Univ. of New Brunswick; Dr. Jeff Ollerhead, Mount Allison Univ.; Dr. Holly Abbandonato & Nic McLellan, DUC-ATL/IWWR

This project will use stable isotope analyses to assess trophic linkages within and between salt marsh and mudflat habitats in different tidal environments. This project will also assess organic carbon sources in restored and established salt marshes, which is an important need for carbon verification protocols. This project will improve DUC's ecological knowledge of coastal habitats and ability to quantify carbon storage.

***SALT MARSH HYDROPERIODS IN MARITIME CANADA: QUANTIFYING MARSH ACCESSIBILITY TO NEKTON IN MEGATIDAL AND MICROTIDAL ENVIRONMENTS**

Johnathan Linihan (MSc student) & Dr. Myriam Barbeau, Univ. of New Brunswick; Dr. Jeff Ollerhead, Mount Allison Univ.; Nic McLellan, DUC-ATL/IWWR

This project will assess the hydroperiod and flooding conditions of salt marshes in both megatidal (Bay of Fundy) and microtidal (Northumberland Strait) environments. This includes flooding duration, depth, and frequency to determine the functional connectivity and accessibility of different marsh habitats to nekton (fish and swimming invertebrates). Understanding these physical characteristics will help inform salt marsh restoration and conservation on different coastlines.

***REMOTE SENSING FOR IDENTIFICATION AND ASSESSMENT OF INVASIVE PHRAGMITES IN WETLAND ECOSYSTEMS IN NEW BRUNSWICK**

Ram Bajgai (PhD student) & Dr. Chris Wong, Univ. of New Brunswick; Dr. Holly Abbandonato & Nic McLellan, DUC-ATL/IWWR

Invasive phragmites presents a large threat to wetland management and conservation. This project will develop drone and satellite remote sensing tools for identifying and monitoring invasive plant populations. It will investigate expansion based on local climate and geography, including the impact of soil conditions on growth. This project will include a socio-economic assessment to better understand options for, and barriers to, management.

DU de MÉXICO

COASTAL EROSION DYNAMICS IN THE TELCHAC-CELESTUN SECTION OF THE YUCATAN: DIAGNOSIS AND POSSIBLE MITIGATION MEASURES

Dr. Paulo Salles de Almeida & Dr. Alec Torres-Freyermuth, Engineering Institute of the National Univ. of Mexico; Secretary of Sustainable Development of the state of Yucatan; Eduardo Carrera & Gabriela de la Fuente, DUMAC-NHQ

Coastline erosion along Mexico's Yucatan peninsula threatens the ecological integrity of mangrove swamps and other wetlands that provide important habitat for waterfowl wintering in Mexico. This study will estimate coastline erosion and accretion rates from Telchac to Celestun, determine the effect of port infrastructure on sediment transport processes and coastline erosion, and identify possible mitigation activities to increase the resilience of coastal wetlands in this region.

SEAGRASS STUDY IN THE LAGUNA MADRE DE TAMAULIPAS

Dr. Leonardo Arellano & Dr. Arturo Mora, Tamaulipas St. Univ.

In 1996, DUMAC and the Tamaulipas State University conducted the first seagrass biomass study at Laguna Madre Tamaulipas. In 2019, the study was replicated to determine contemporary shoalgrass biomass, a critical food resource for redheads, and compare to earlier findings from the 1970s. This information will help determine trends in seagrasses and guide development of policies at state and federal levels to conserve this important habitat for migratory and resident waterfowl species.

WETLANDS INVENTORY AND CLASSIFICATION IN MEXICO

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

The lack of a wetlands inventory in Mexico and associated data related to wetland characteristics and extent motivated DUMAC to initiate in 1991 the Mexico National Wetlands Inventory and Classification. Since then, DUMAC has been working regionally to complete what represents the first wetlands inventory to include all Nearctic and Neotropical wetland types in Mexico. Completed in 2020, this information will be available through a web-based map server for all institutions and agencies to support their wetlands conservation initiatives in Mexico.

COASTAL DIGITAL CHANGE DETECTION ANALYSIS IN SINALOA AND SONORA

Gabriela de la Fuente, Eduardo Carrera, Carlos Salinas, & Norma Rangel, DUMAC-NHQ

Coastal wetlands along the upper Pacific coast (UPC) of Mexico support 38% of migratory waterfowl wintering in Mexico. Prior to 1987, the most important threats for these coastal wetlands were agricultural expansion and runoff of agrochemicals and fertilizers, causing uncontrolled growth of cattail at important intertidal areas for waterfowl and shorebirds. After 1987, intensive shrimp farming began in Sinaloa and Sonora and became the primary cause of the loss and degradation of mangrove forests in this region. This study, initiated in 2016, measured the amount and distribution of mangrove forest loss due to shrimp farm growth. This information will serve as a visual tool to show local and federal authorities the damages of the shrimp farm industry to mangrove forests within the coastal wetlands ecosystems of the UPC, and will inform public policy to guide the management, restoration, and conservation of these important habitats.

WATERFOWL SURVEYS OF MEXICO: A MULTI-ORGANIZATIONAL COLLABORATION

Metropolitan Univ.; Biopicture A.C.; Birds.mx; National Commission of Natural Protected Areas; Biodiversity Conservation of Central Mexico, A.C.; Municipality of Almoloya de Juarez; Mexico St. Univ.; Chihuahua State Government; Chihuahua Municipality Government; ITZAMNA, A.C.; Aguascalientes Environmental Movement, A.C.; Wildlife Management Unit at Chiconahuapan Lagoon and Los Golodrinos, ASOCIES, A.C.; PROFAUNA; Secretary of Urban Development and Environment of Yucatan; Secretary of Environment and Territorial Planning of the State of Guanajuato; Secretary of Environment and Natural Resources of the States of Mexico, Durango and Zacatecas; Black Forest A.C.; Secretary of Environment and Territorial Development of Durango, Society for Research and Use of Wildlife; Forest and Wildlife Services; Morelos St. Univ.; Sinaloa St. Univ.; Zacatecas St. Univ.; Queretaro St. Univ., Michoacán St. Univ.; U.S. Fish and Wildlife Service; DUMAC.

Effective conservation and management of migratory waterfowl populations requires an understanding of their ecology and distribution throughout the annual range. In recognition of this, the U.S. Fish and Wildlife Service began collaborating with Mexican biologists in 1937 to conduct aerial surveys of the distribution of wintering waterfowl across major wetland complexes in Mexico. Resource constraints and logistical considerations became increasingly challenging in the early 2000s, ultimately leading to discontinuation of the survey after 2006. DUMAC is using a diverse coalition of partners to renew the Mexico mid-winter waterfowl surveys, thus providing a critical data stream for understanding contemporary trends in waterfowl populations and guiding conservation efforts in Mexico. DUMAC has been working with current and retired USFWS biologists for the aerial surveys and train pilots and observers following the protocols used in the original mid-winter waterfowl surveys. The renewed survey was flown annually during January 2018–2020, providing a foundation from which to resume Mexico mid-winter waterfowl surveys.

SHOREBIRD SURVEYS OF MEXICO: A MULTI-ORGANIZATIONAL COLLABORATION

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After the conclusion in 2006 of the National Strategy for the Conservation and Management of Shorebirds, which followed similar documents developed for Canada and the USA, it became clear that limited data on shorebirds in Mexico hindered effective prioritization and conservation of the most important wetlands for this group of birds. In response, DUMAC collaborated with professionals from partner organizations and universities to design and conduct a national shorebird survey for Mexico between 2010 and 2017. The survey was divided into 3 regions: Gulf Coast, Pacific Coast, and Northern and Central Highlands. The data gathered was used to help update the National Strategy and identify the most important areas for shorebirds in Mexico. This information will support management decisions and help focus additional resources and conservation efforts on priority habitats shared with migratory waterfowl.

DU FELLOWSHIP SUPPORT

EDWARD D. AND SALLY M. FUTCH GRADUATE FELLOWSHIP

** INFLUENCE OF BEHAVIOUR, MOVEMENT, AND ENVIRONMENTAL DRIVERS ON MULTIPLE STAGES OF THE BREEDING PERIOD IN EASTERN MALLARDS

Cassidy Waldrep (MSc student) & Dr. Mitch Weegman, Univ. of Saskatchewan

Movement, behaviour, and weather may all impact the reproductive success of mallards in eastern North America, and there may be seasonal carry-over effects. This study will use GPS-acceleration tracking devices to characterize reproductive success and assess differences in both breeding and non-breeding periods between one stable and one declining subpopulations of eastern mallards. This project will inform conservation plans by providing insight into factors limiting eastern mallard populations.

WATERFOWL RESEARCH FOUNDATION FELLOWSHIPS

**OPTIMIZING WINTERING WATERFOWL DISTRIBUTION AND HUNTER OPPORTUNITIES THROUGH STRATEGIC WETLAND DESIGN

Cory Highway (PhD student) & Dr. Bradley Cohen, Tennessee Tech Univ.

Public properties that are not used for hunting serve as refuges for migrating and wintering waterfowl. This project investigates how the strategic addition of waterfowl rest areas in western Tennessee affects the ecology and management of mallards during the non-breeding period and will provide a framework to understand whether strategic placement of waterfowl rest areas can benefit wintering waterfowl and waterfowl hunters.

**RECONSTRUCTING THE GENOMIC HISTORY AND CONSERVATION THREAT FROM A CENTURY OF GAME-FARM MALLARD RELEASES IN NORTH AMERICA

Lauren McFarland (PhD student) & Dr. Philip Lavretsky, Univ. of Texas El Paso

Recent genetic work has demonstrated that releases of game-farm mallards along the eastern seaboard of North America have resulted in extensive hybridization with North American wild mallards, and it has been hypothesized that hybridization has introduced maladaptive traits that may partially explain declining mallard populations in eastern North America. This study will shed light on the consequences of hybridization, producing information that can guide state and federal agencies in establishing management practices to reverse the impacts of game-farm releases and educate hunters and the general public about the issues of this practice.

BONNYCASTLE FELLOWSHIP FOR WATERFOWL AND WETLAND RESEARCH

**EVALUATING TOXICITY IMPLICATIONS OF WETLAND SEDIMENT INSECTICIDE CONCENTRATIONS ON BENTHIC AQUATIC INSECTS AND TEMPORAL CHANGES IN AQUATIC INVERTEBRATE COMMUNITIES IN MISSOURI WETLAND ECOSYSTEMS

Corinne Sweeney (PhD student) & Dr. Lisa Webb, Univ. of Missouri

Because of their widespread application and chemical properties, neonicotinoid pesticides may negatively impact non-target species, including aquatic insects that form an important component of wetland food webs. This study will close knowledge gaps around sediments as a pathway of exposure for aquatic insects and improve our understanding of risks to aquatic insects in Missouri wetlands and the organisms, including ducks, that depend on them for food.

MICHAEL F.B. NESBITT FAMILY RESEARCH FELLOWSHIP

**QUANTIFYING THE INFLUENCE OF ENVIRONMENTAL CONDITIONS AND AMERICAN BLACK DUCK BEHAVIOUR AND MOVEMENTS THROUGHOUT THE FULL ANNUAL CYCLE ON SUBSEQUENT PRODUCTIVITY

Ilsa Griebel (PhD student) & Dr. Mitch Weegman, Univ. of Saskatchewan

American black duck populations decreased between the 1950s and 1980s and have not recovered to historic levels. Financial and logistical challenges of accessing the boreal region, where black ducks breed, has hindered assessment of whether black duck population growth is limited by factors during the breeding season. This study will use GPS-acceleration tracking devices to collect data on black duck movement and behaviour to identify factors which influence their productivity. This project will provide information critical for identifying landscapes most important for the management and conservation of black duck populations.

DR. BRUCE D.J. BATT FELLOWSHIP IN WATERFOWL CONSERVATION

**QUANTIFYING EFFECTS OF JAMES BAY STAGING AREA HABITAT CONDITIONS ON SUBSEQUENT PRODUCTIVITY OF ATLANTIC BRANT

Lindsay Carlson (PhD student) & Dr. Mitch Weegman, Univ. of Saskatchewan

Atlantic brant have experienced significant habitat loss on both their wintering (mid-Atlantic coast) and staging grounds (James Bay coast) over the past 100 years and, in recent decades, their population has fluctuated dramatically, likely due to variation in the number of young produced. This study will examine relationships between brant behaviour, habitat use and reproductive success and will work closely with Cree land users in data collection and research development. This work will be useful for developing targeted conservation plans for the James Bay coast.

DAVID R. LUUKKONEN WATERFOWL AND WETLAND GRADUATE STUDENT FELLOWSHIP

**ASSESSING WATERFOWL PRODUCTION ACROSS PRIOIRTY BREEDING HABITATS IN WISCONSIN USING UNCREWED AERIAL SYSTEMS DISTANCE SAMPLING METHODS

Amanda Griswold (MSc student) & Dr. Ben Sedinger, Univ. of Wisconsin-Stevens Point

The Wisconsin Waterfowl Habitat Conservation Strategy decision support tool guides waterfowl habitat restoration and retention efforts by ranking watersheds for conservation priority. This study will evaluate the accuracy of the tool using data on breeding pairs and broods collected using uncrewed aerial systems with thermal imaging.

DUCKS UNLIMITED
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