

SCIENCE STORIES

SERIES NO. 11

SCIENCE-BASED ADVANCES FOR TARGETED, IMPACTFUL CONSERVATION

THE PRAIRIE POTHOLE REGION (PPR), COVERING A VAST PORTION OF THE CANADIAN PRAIRIES AND THE UNITED STATES GREAT PLAINS, IS THE MOST IMPORTANT LANDSCAPE FOR BREEDING DUCKS IN NORTH AMERICA. SCIENTISTS AT [DUCKS UNLIMITED CANADA \(DUC\)](#) ARE LEADING A PROJECT TO HELP ENSURE THAT WETLAND AND WATERFOWL CONSERVATION ACTIVITIES IN THE CANADIAN PPR CAN CONTINUE TO BE TARGETED, EFFICIENT, EFFECTIVE, AND ACCOUNTABLE TO FUNDERS AND SUPPORTERS.

The project was spurred by recent advances related to the Waterfowl Decision Support System (DSS). This DSS is used by DUC and its partners in the [Prairie Habitat Joint Venture \(PHJV\)](#) in planning, implementing and evaluating their conservation activities in the Canadian PPR. It plays a foundational part in the PHJV's long tradition of taking a scientifically informed approach to conservation.

"The DSS uses information about where ducks are observed [during aerial surveys], and the environmental features in those locations, to help us predict where ducks will be in areas that aren't surveyed," explains Vanessa Harriman, a research scientist with DUC's [Institute for Wetland and Waterfowl Research \(IWWR\)](#).

Using the survey data, the DSS generates a map identifying areas with the highest waterfowl densities in Canada's prairie and parkland ecoregions. And that helps the PHJV partners, including its provincial partners like the Alberta NAWMP Partnership, to focus their efforts.

Harriman notes that the DSS and its underlying datasets have seen significant steps forward in recent years. "For example, there have been some fantastic advancements in the waterfowl surveying methods, particularly by the Canadian Wildlife Service in partnership with the U.S. Fish and Wildlife Service." For many decades, these two organizations have been flying annual waterfowl population [surveys](#) across the most important waterfowl landscapes in Canada and the U.S.

"Since 2000, they have been taking exact locations of each waterfowl breeding pair seen during these aerial surveys. This has allowed us to use that more fine-scale, higher quality information on where ducks were to understand the relationship between breeding pair location and the underlying habitat." As well, there have been exciting improvements in the GIS-based habitat information, especially in the ability to accurately map smaller wetlands.

Furthermore, the DSS itself has gone through several improvements since

Version 1 was produced in 1999. Version 2, released in 2012, used better landscape data and more waterfowl data. Now Version 3, released in 2024, is even better.

DSS Version 3 is a collection of statistical models that incorporate several advances including the georeferenced duck pair locations, higher resolution and more recent landscape data, and additional environmental factors. Version 3 also has individual waterfowl density models for each of the PHJV's seven priority species – mallard, blue-winged teal, northern shoveler, gadwall, northern pintail, canvasback and redhead – as well as a composite model for all seven species (like the Version 2 model). So, Version 3 produces maps of the predicted distributions and abundances for each of the seven species and a composite map, for the Canadian Prairies at the quarter section level.

The DSS has an essential role in two of the PHJV's key planning and evaluation tools:

- **Waterfowl Target Landscapes:** The DSS is used in delineating these Target Landscapes, which guide conservation resources toward areas with the highest densities of breeding waterfowl in the Canadian PPR.
- **Waterfowl Productivity Model:** The DSS is a component in this model,

Pictured above: A blue-winged teal pair, a priority species for the PHJV.
credit: Ducks Unlimited Canada

which estimates the impact of conservation investments on duck production and is used to set PHJV habitat objectives.

To help make sure the PHJV's conservation work will continue to be relevant, credible and scientifically robust, scientists at IWWR launched a project in 2023 to update these two models to reflect the recent improvements in the DSS and the underlying datasets.

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Harriman says, "We knew it would be a massive undertaking to update these two models, but we felt that the new information really warranted it."

UPDATING THE TARGET LANDSCAPES

Under this project, in collaboration with PHJV partners, Harriman and her team have recently completed the process to develop, review and refine the updated Waterfowl Target Landscapes.

"The identification of the Target Landscapes is a data-driven process

designed to optimize conservation efforts across the Canadian Prairie Pothole Region. The foundation of the Target Landscapes is DSS Version 3, which models the predicted breeding pair distributions for the seven priority duck species. These are then analyzed using a spatial prioritization tool called Zonation," she explains.

"The Zonation evaluation of the landscape is done in two parallel steps: one that considers the stacked abundance of all duck species, and another that evaluates each species individually... This dual approach ensures that the most valuable areas are identified – not only the areas with the highest overall duck densities but also the areas that are uniquely important to individual species."

The updating process included review of the draft Target Landscapes by the Alberta, Saskatchewan and Manitoba provincial NAWMP teams, as well as by the PHJV's Science Committee and Advisory Board. Input from the provincial teams ensured that local ecological knowledge was incorporated into the final Target Landscapes.

Harriman summarizes the main changes introduced in the 2026 Target Landscapes:

- **Enhanced data inputs:** The new Target Landscapes are based on DSS Version 3, which incorporates more recent and higher-resolution environmental data.

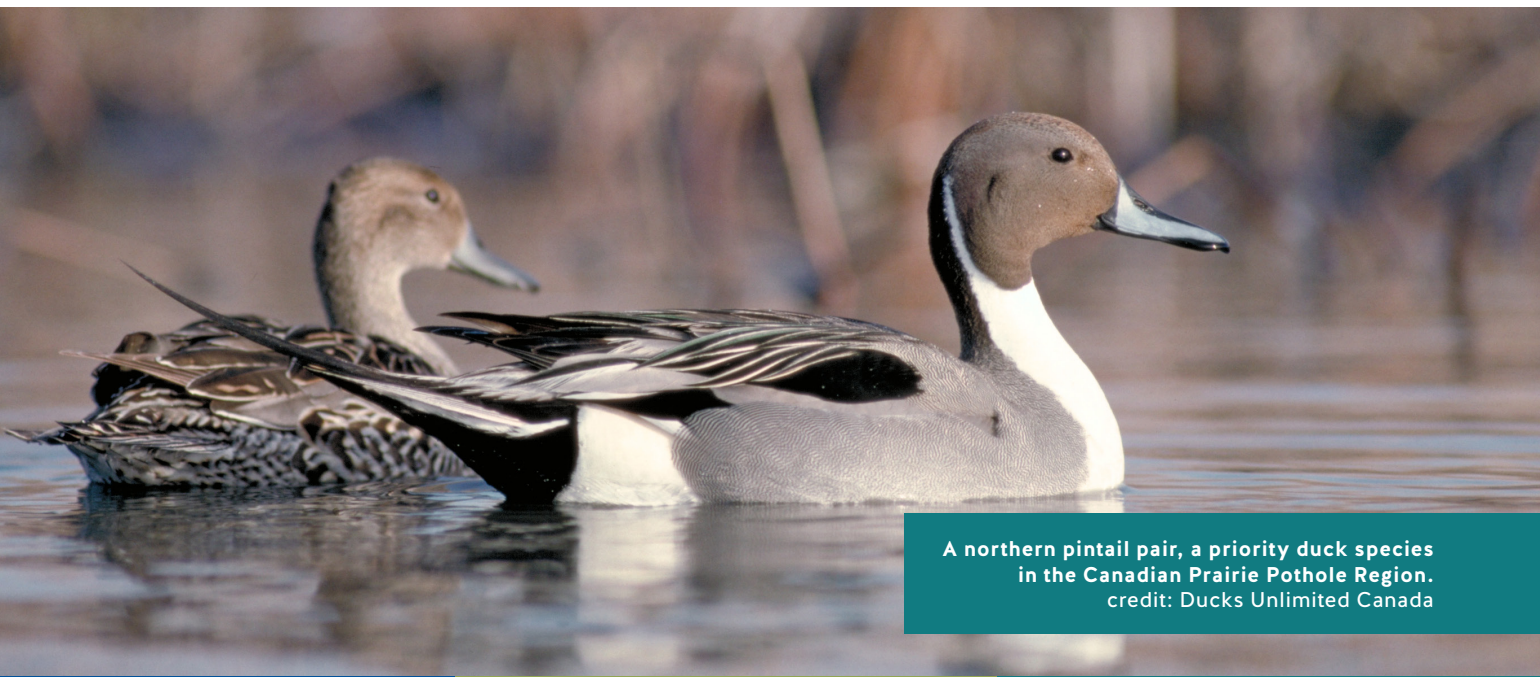
- **Species-specific modeling:** The 2026 Target Landscapes integrate the new density models for each of the seven priority duck species, along with the composite layer.
- **Refined targeting:** Some Target Landscape boundaries have shifted, new Target Landscapes have been added, and others have been removed. These changes do not necessarily indicate a change in the ecological value of areas; rather they reflect improved data and modeling techniques that provide a more accurate representation of waterfowl distributions.

She adds, "When we took the draft Target Landscapes out to the field staff, they said, 'These new models really better represent those areas that are important for waterfowl based on our observations on the ground.'... This felt like validation that updating these models was the right thing to do."

UPDATING THE WATERFOWL PRODUCTIVITY MODEL

Harriman and her team are currently in the process of updating the Waterfowl Productivity Model (WPM). They will also be using the updated model to provide a consistent, quantitative measure of the conservation impact attributable to habitat investments by the PHJV partners.

The WPM estimates the conservation outcomes of the PHJV's habitat investments in the PPR by predicting the



A northern pintail pair, a priority duck species in the Canadian Prairie Pothole Region.
credit: Ducks Unlimited Canada

number of ‘incremental hatched nests’ for five priority duck species: mallard, blue-winged teal, gadwall, northern shoveler and northern pintail.

Incremental hatched nests represent the difference between the actual number of hatched nests on the landscape with PHJV conservation delivery (the ‘with PHJV’ reality), and what the number of hatched nests would have been without PHJV delivery (the ‘without PHJV’ hypothetical scenario). The difference between the ‘with PHJV’ and ‘without PHJV’ scenarios represents the hatched nests in the landscape that can be attributed to PHJV habitat restoration and retention accomplishments.

This estimate of the PHJV’s biological return on investment is very useful, for example, as the PHJV assesses its accomplishments under its 2021-25 Implementation Plan for the Prairie Parklands in its five-year planning cycle, and as it reports to funders and supporters on conservation progress.

Modelling the incremental hatched nests requires multiple inputs. First, the breeding waterfowl density models are used in estimating the breeding population densities by municipality, and these estimates are adjusted to account for wetland loss on the landscape. Then these local population estimates are joined with local species composition, habitat cover (derived from the Census of Agriculture) and the reported acre accomplishments from the PHJV partners. Once all this information is incorporated, the WPM provides estimates of hatched nests by municipality, which can then be rolled up to individual Target Landscapes.

Harriman and her team have already integrated the updated waterfowl density models and the latest land use data from the Census of Agriculture into the WPM. The next steps in the updating the WPM will be completed in the coming months.

“THE [WATERFOWL PRODUCTIVITY MODEL] LINKS ON-THE-GROUND CONSERVATION ACTIONS THAT EVERYONE IS OUT THERE WORKING SO HARD TO DO, WITH THE POPULATION RESPONSE BY WATERFOWL.”

Those steps include: updating the PHJV database with the habitat acres restored or protected by each PHJV partner during 2021-25; determining the number of nests that would have been hatched in the ‘without PHJV’ scenario; and calculating the difference between hatched nests in the ‘with PHJV’ and ‘without PHJV’ scenarios to estimate incremental hatched nests. Another next step is to update the wetland loss rates in the WPM using the PPR wetland loss rates for 2011 to 2021 recently calculated by the Canadian Wildlife Service.

Then the team will run the WPM for 2021-25, with the updated data and using the old Target Landscape boundaries. That will produce a clear, objective picture of the PHJV’s conservation achievements in the PPR over the past five-year cycle.

“When you run the Waterfowl Productivity Model, you see the impact that the PHJV’s conservation work has had on the ground for ducks. The model links on-the-ground conservation actions that everyone is out there working so hard to do, with the population response by waterfowl. It’s pretty awesome!” says Harriman. “It is invigorating and inspiring to see this tangible benefit of all of the partners’ conservation work in Alberta and across the PHJV delivery area.”

Along with looking back at the 2021-25 accomplishments, Harriman’s team will also be using the WPM with the new Target Landscape boundaries to help in setting the PHJV’s habitat goals for 2026-30.

“We’ll be working with Alberta NAWMP and the other provincial NAWMP teams to understand what they think they can accomplish over the next five years. Then we can translate that into duck benefits using the WPM,” she explains. “Essentially, we will be doing a version of the same thing we’ve done back-casting with the model but now projecting forward.”

SCIENCE-BASED, EFFECTIVE, COLLABORATIVE

The project’s updates to the Waterfowl Target Landscapes and Waterfowl Productivity Model are vital for effective, scientifically sound conservation targeting, and relevant, reliable estimates of the PHJV’s conservation impacts over the past five years and setting goals for the next five years.

“Although DUC is leading this project, we couldn’t do it without all the



The project’s core research team (L to R): Vanessa Harriman, Rose Lacombe, Brandon Edwards and Paige Kowal. credit: Ducks Unlimited Canada

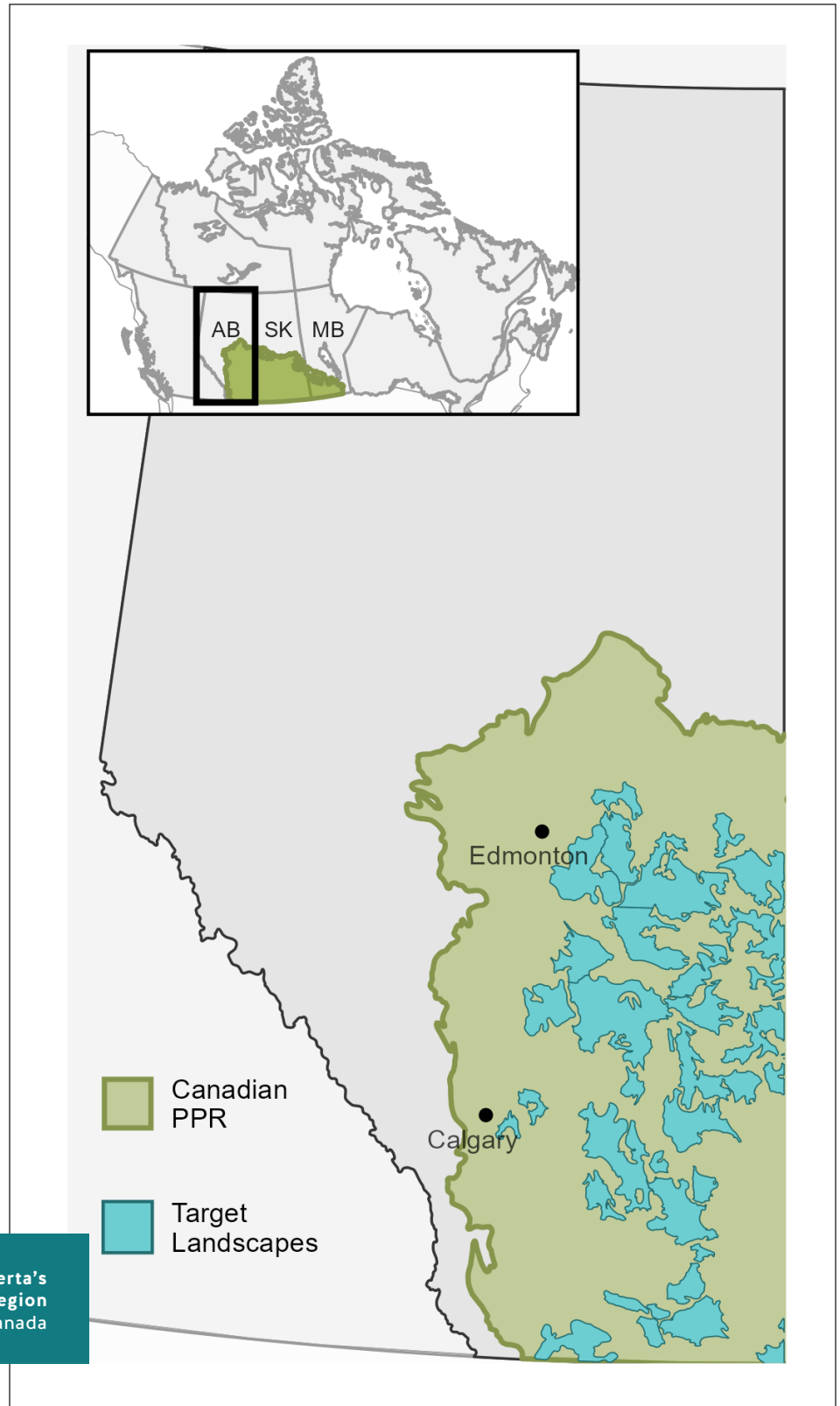
effort and commitment from all of the partners in the joint venture,” emphasizes Harriman. “It is a whole PHJV collaboration. They spend time in the working group dedicated to this, in Science Committee meetings, through the provincial NAWMP teams. And then there are partners like: the Canadian Wildlife Service and the U.S. Fish and Wildlife Service annually collecting the waterfowl survey data; the Canadian Wildlife Service providing the wetland loss data; and various partners contributing to wetland mapping over the years.”

“ALTHOUGH DUC IS LEADING THIS PROJECT, WE COULDN’T DO IT WITHOUT ALL THE EFFORT AND COMMITMENT FROM ALL OF THE PARTNERS IN THE JOINT VENTURE,”

Ducks Unlimited (including DUC and Ducks Unlimited Inc. in the U.S.) is the major funder of this work. The Alberta NAWMP Partnership’s Science Fund has helped with some funding support. Other funders have helped support this work in the past including the U.S. [North American Wetlands Conservation Act](#) (NAWCA).

Everyone involved in this effort has contributed to its success, helping to ensure that the PHJV’s conservation activities in the Prairie Pothole Region will continue to be science-based, effective, transparent, and accountable.

2026 Waterfowl Target Landscapes in Alberta’s portion of the Canadian Prairie Pothole Region
credit: Ducks Unlimited Canada



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