



# HAPET

**Collaborative Conservation  
for Breeding Waterfowl**

The mission of the Habitat and Population Evaluation Team (HAPET) is clearly laid out in its name. HAPET was originally established to support waterfowl conservation in the Prairie Pothole Joint Venture (PPJV). The PPJV adopted an “all birds” strategy in the late 1990s, but waterfowl science and conservation have always been the core of HAPET activities. And, as you’ll see in this document, waterfowl conservation in the PPJV greatly benefits a host of other wetland and upland species. Whether funded by the Refuges program, Migratory Birds program, or the PPJV, multiple HAPET staff work closely with partners on a variety of projects involving conservation of waterfowl and wetlands in the Mountain-Prairie Region and beyond.

This booklet provides an overview of some of HAPET’s projects and partnerships supporting conservation of wetlands, waterfowl, and other wetland- and grassland-dependent species. Products from these projects are [available to partners](#) and HAPET encourages opportunities to refine tools to meet partners’ conservation delivery needs. For more information about HAPET, please refer to the last two pages of this document. The following contacts are available to discuss opportunities to collaborate and how HAPET can support your work.

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# THE POWER OF PARTNERSHIPS

Partners are essential to HAPET's mission and success, filling key roles with data collection, analysis, and — most importantly — conservation delivery. Partners have been critical to the widespread adoption of spatial decision-support tools in the Great Plains. The first spatial model that HAPET developed was the waterfowl Thunderstorm Map, which laid the groundwork for development and use of a host of other spatial decision-support tools in the PPJV and beyond.

Agencies and groups that adopted use of spatial models have seen the benefits of landscape-level analyses, which have become the standard for conservation planning and delivery. Individuals who might have initially resisted use of spatial models are often now strong supporters of such tools. It is not unusual for HAPET staff to receive data requests from developers and consultants who were told by state agency staff that their proposal would not be evaluated unless they used products developed by HAPET and partners. We offer a **huge thank you to our partners!**

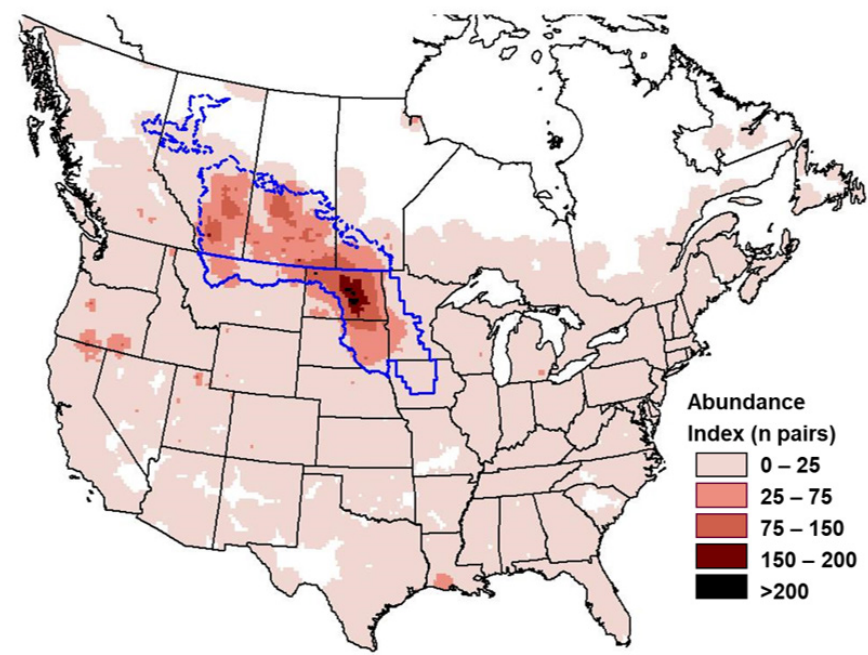
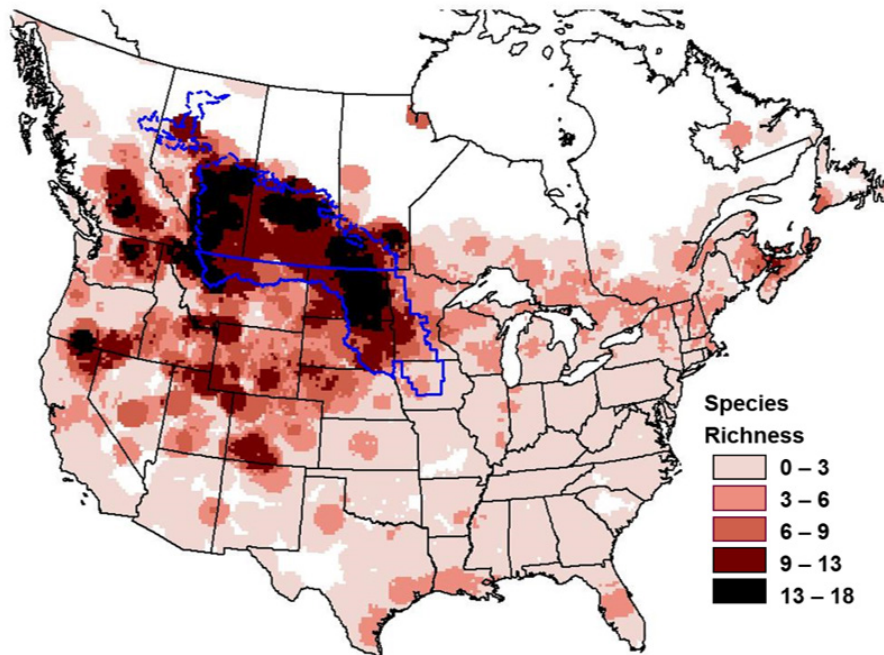


# A GLOBAL JEWEL

The Prairie Pothole Region (PPR; blue outlines) is one of the most unique wetland-grassland systems on the planet. The PPR has the highest species richness (left) and abundance (right) of breeding ducks in North America and is one of the most important waterfowl production areas on the planet. HAPET was established to help manage and conserve this resource, working primarily in the Prairie Pothole Joint Venture (PPJV), which is the part of the Prairie Pothole Region located in the United States.

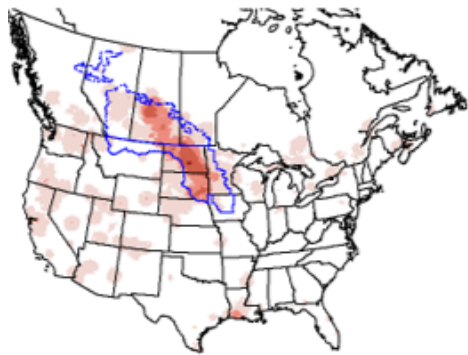
Richness: 24 species of breeding ducks

Abundance: 24 species of breeding ducks

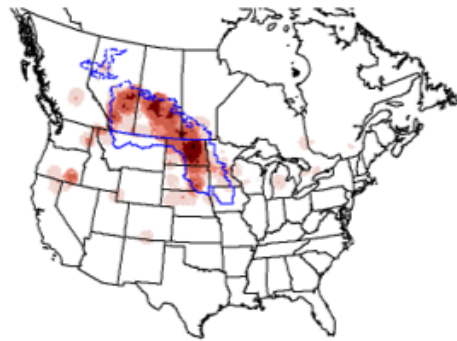


# MORE THAN DUCKS

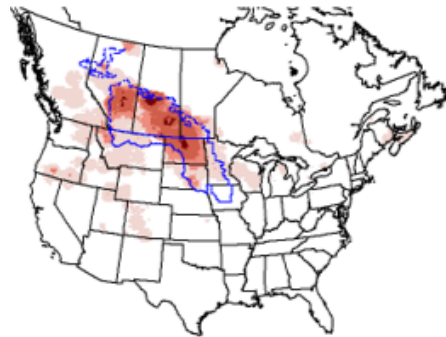
In addition to large numbers of waterfowl, the Prairie Pothole Region (blue outlines) is the most important area in North America for a multitude of other wetland-dependent species, as well as many grassland species. Since 1998, HAPET has had full-time staff conducting analyses and developing models to integrate conservation of these and other species with waterfowl conservation efforts.



Pied-billed Grebe



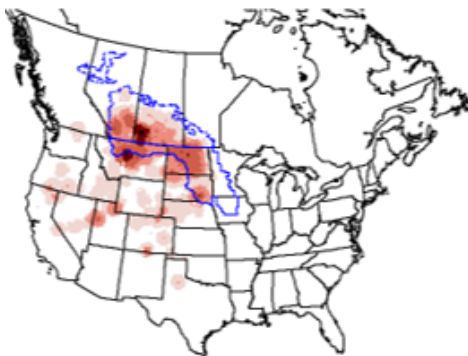
Black Tern



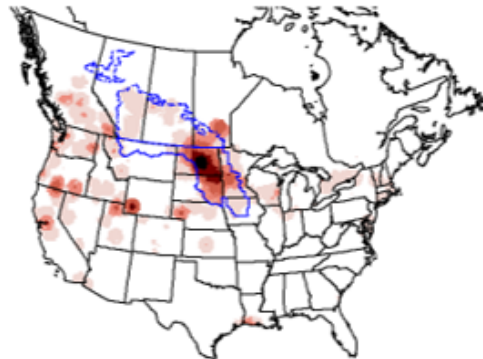
Sora



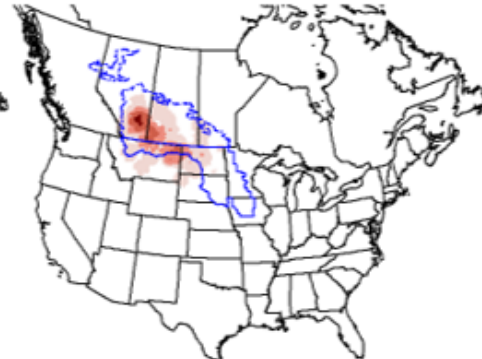
Marbled Godwit



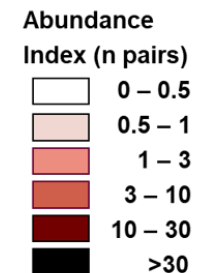
Wilson's Phalarope



Marsh Wren

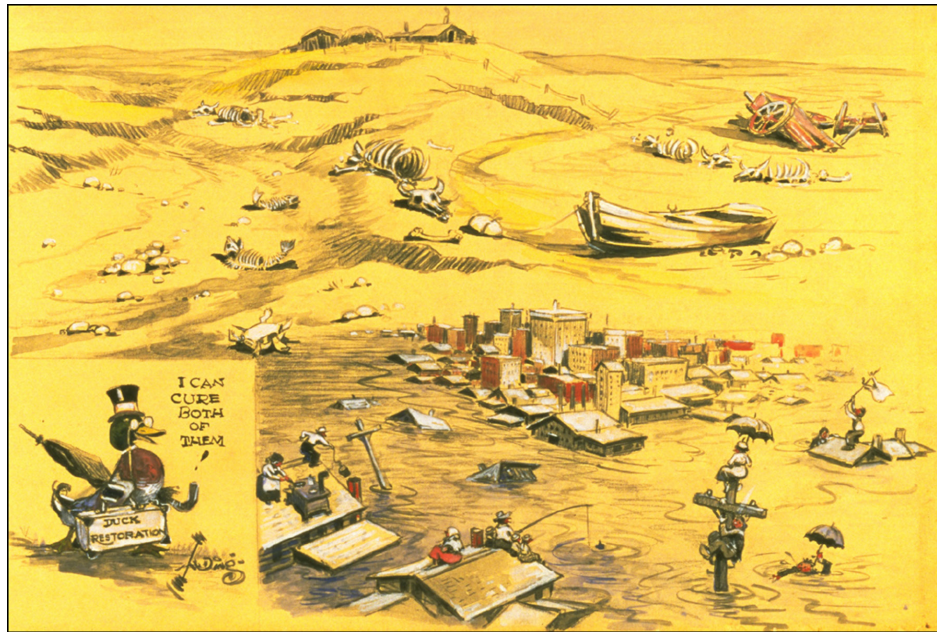


Sprague's Pipit



# BORNE FROM DIRE STRAITS

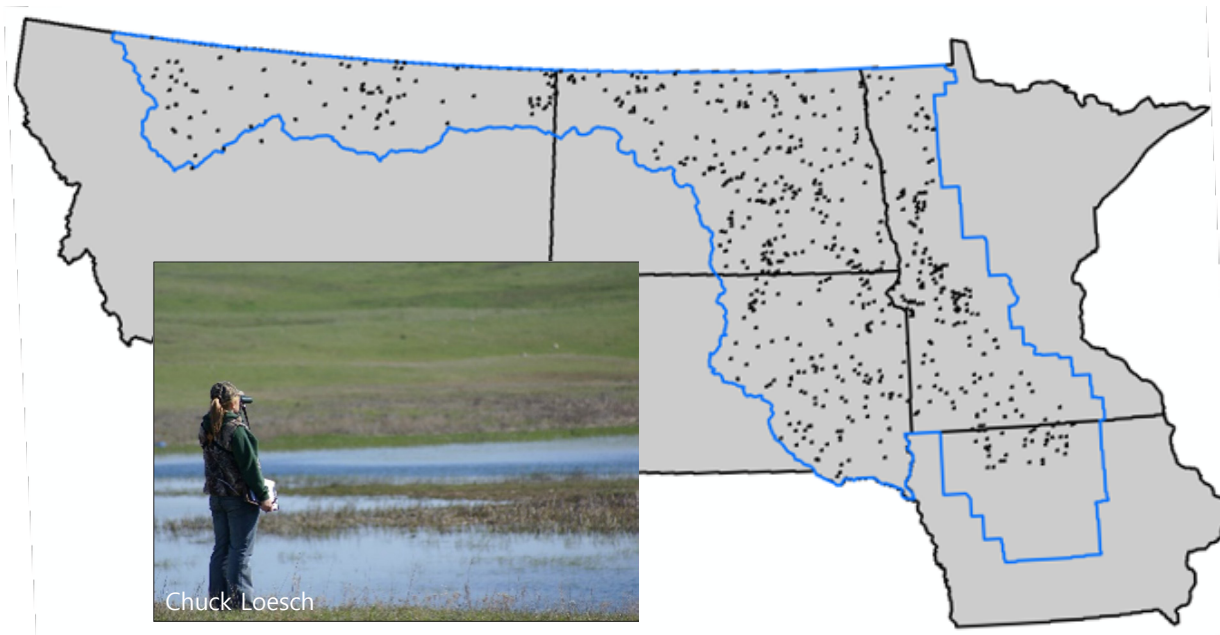
The waterfowl conservation successes of today had their origin in the Dust Bowl of the 1930s, when waterfowl populations plummeted as drought enveloped the Great Plains. Forward-thinking politicians realized that waterfowl conservation would provide multiple societal and ecological benefits and instituted a variety of programs that provided a foundation for today's efforts.



Establishment of the Duck Stamp is often considered the crowning achievement of the Dust Bowl waterfowl conservation era. However, establishment of a network of refuges in the Prairie Pothole Region laid the groundwork for authorization of fee-title and easement acquisition across the broader PPJV landscape, which enabled expenditure of Duck Stamp and other moneys and is the foundation of the largest and arguably most important waterfowl conservation program on the continent.

# SCIENTIFIC FOUNDATIONS

Sound science underpins all of HAPET's work, and good data are essential to that science and providing useful tools for management. Every May, staff from wetland management districts contact hundreds of landowners to request permission and visit ~5,500 wetlands on 651 Four-Square-Mile Survey plots spread out across portions of five states. As ground crews make field visits, pilots using planes equipped with belly cameras fly over each survey plot to collect aerial images, which are used to assess water conditions on ~63,000 wetland basins each year. The four-square-mile area of each plot was chosen to approximate the home range size of a breeding hen mallard, ensuring that analyses are consistent with the scale of habitat selection by priority species.



Data collection is just the beginning. Ground data are entered and aerial imagery is processed, then both are integrated into workflows that produce annual waterfowl population estimates, annual predicted wetness layers, and coefficients for regression models relating duck pairs to environmental predictors.

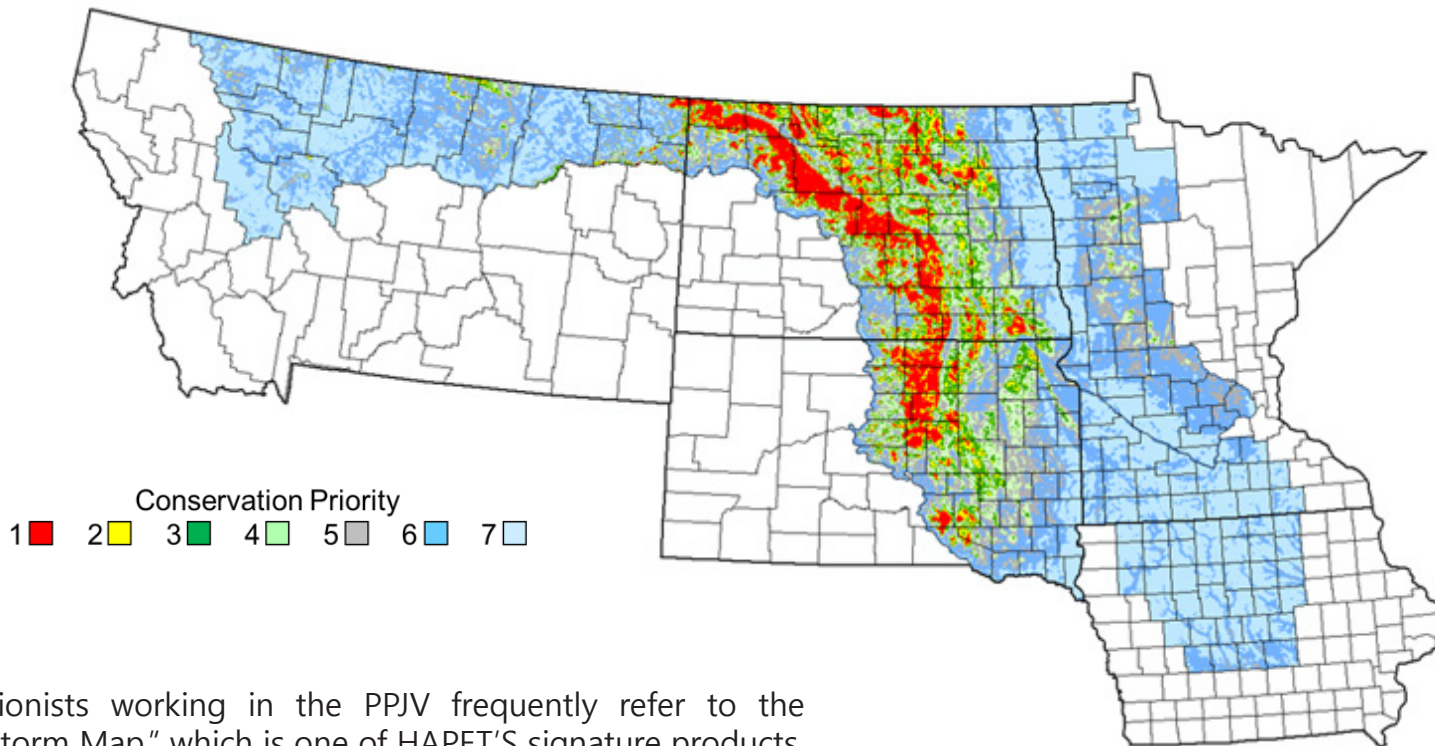
Regression coefficients are applied to the universe of predictor variables in GIS, creating a layer showing the number of duck pairs, by species, estimated to be present on each of >2 million wetland basins across the PPJV. This layer is used for multiple planning and conservation purposes and would not exist without the help of dedicated staff throughout the PPJV!

## Pertinent HAPET Publications

- Niemuth, N.D., B. Wangler, & R.E. Reynolds. 2010. Spatial and temporal variation in wet area of wetland basins in the Prairie Pothole Region of North Dakota and South Dakota. *Wetlands* 30:1053-1064.
- Loesch, C.R., R.E. Reynolds, & L.T. Hansen. 2012. An assessment of re-directing breeding waterfowl conservation relative to predictions of climate change. *Journal of Fish and Wildlife Management* 3:1-22.



# THUNDER ON THE PRAIRIES



Conservationists working in the PPJV frequently refer to the "Thunderstorm Map," which is one of HAPET'S signature products. Named for its resemblance to a radar image of a thunderstorm crossing the region, the Thunderstorm Map depicts numbers of duck pairs accessible to upland parcels and is used to target grassland and wetland conservation practices. Used in a multitude of programs, the Thunderstorm Map is frequently updated using data collected each year on the Four-Square-Mile Survey.

HAPET's waterfowl Thunderstorm Map prompted the USDA to create a Duck Nesting Habitat conservation practice as part of the Conservation Reserve Program, which restored more than 450,000 acres of grasslands (>700 square miles!) across five states.

## Pertinent HAPET Publications

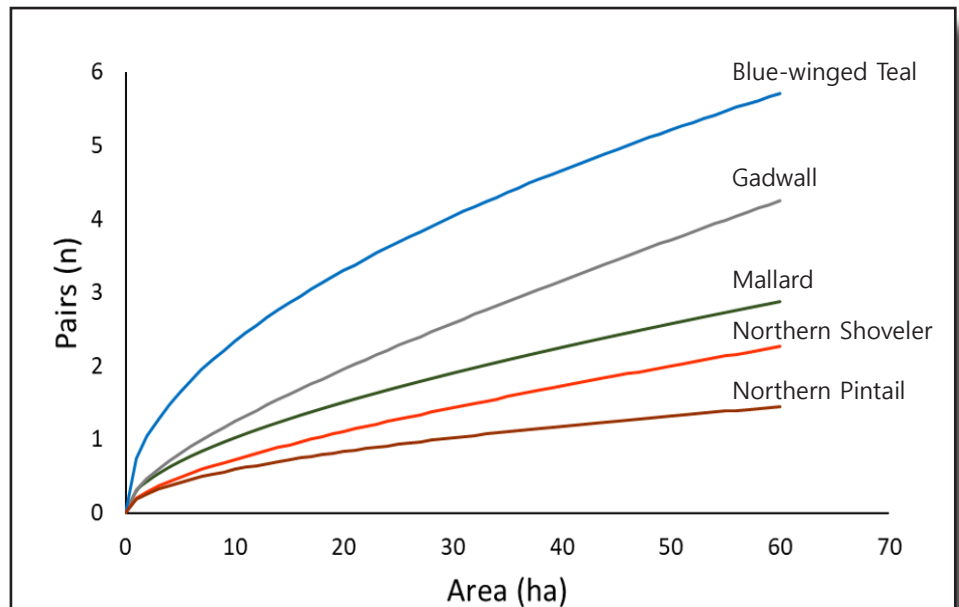
- Reynolds, R.E., T.L. Shaffer, R.W. Renner, W.E. Newton, & B.D.J. Batt. 2001. [Impact of the Conservation Reserve Program on duck recruitment in the U.S. Prairie Pothole Region](#). *The Journal of Wildlife Management* 65:765-780.
- Reynolds, R.E., T.L. Shaffer, C.R. Loesch, & R.R. Cox, Jr. 2006. The Farm Bill and duck production in the Prairie Pothole Region: Increasing the benefits. *Wildlife Society Bulletin* 34:963-974.
- Reynolds, R.E., C.R. Loesch, & B. Wangler. 2007. [Waterfowl response to the Conservation Reserve Program and the Swampbuster provision in the Prairie Pothole Region, 1992-2004](#). Department of Agriculture Farm Service Agency RFA05-IA-04000000-N34.



# THE IMPORTANCE OF SMALL WETLANDS

The US Fish and Wildlife Service's Small Wetlands Acquisition Program (SWAP) is aptly named. Large wetlands harbor many waterfowl during fall, when people are hunting them and birds are highly visible, leading to the belief that large wetlands should be prioritized for conservation. But small wetlands have much more conservation value for breeding waterfowl in the PPR.

Small, shallow wetlands warm up earlier in spring than large wetlands, providing food and open water for migrant waterfowl. Small, shallow wetlands often dry out in late summer, which facilitates nutrient cycling. This leads to higher primary and secondary productivity, which helps soon-to-be breeding hens gain energy reserves for egg production and incubation. Small wetlands generally lack minnows, which forage on invertebrates and reduce invertebrate numbers, leading to reduced growth rates and survival of ducklings. Finally, small shallow wetlands are generally higher in the local watershed than large wetlands and are therefore easier to drain or consolidate than large wetlands, which places them at higher risk for drainage.



As this example using Four-Square-Mile Survey data shows, the number of duck pairs on wetlands increases non-linearly with wetland area. Therefore, **ten 1-hectare wetlands have approximately three times as many pairs of ducks as one 10-hectare wetland.**

## Pertinent HAPET Publications

- Niemuth, N.D., M.E. Estey, R.E. Reynolds, C.R. Loesch, & W.A. Meeks. 2006. Use of wetlands by spring-migrant shorebirds in agricultural landscapes of North Dakota's Drift Prairie. *Wetlands* 26:30-39.
- Fields, S.P., J.S. Brice, K.M. Carrlson, C.R. Loesch, R.J.D. Murano, & J.A Walker. 2017. [Waterfowl Plan](#). Prairie Pothole Joint Venture Implementation Plan, Pages 2.1-5.35. Prairie Pothole Joint Venture, Denver, Colorado.
- Vest, J.L., D.A. Haukos, N.D. Niemuth, C.M. Setash, J.H. Gammonley, J.H. Devries, & D.K. Dahlgren. In press. Wetland birds of rangelands. Chapter in *Rangeland Wildlife Ecology and Conservation*, L.B. McNew, D.K. Dahlgren, & J.L. Beck, editors. Springer.



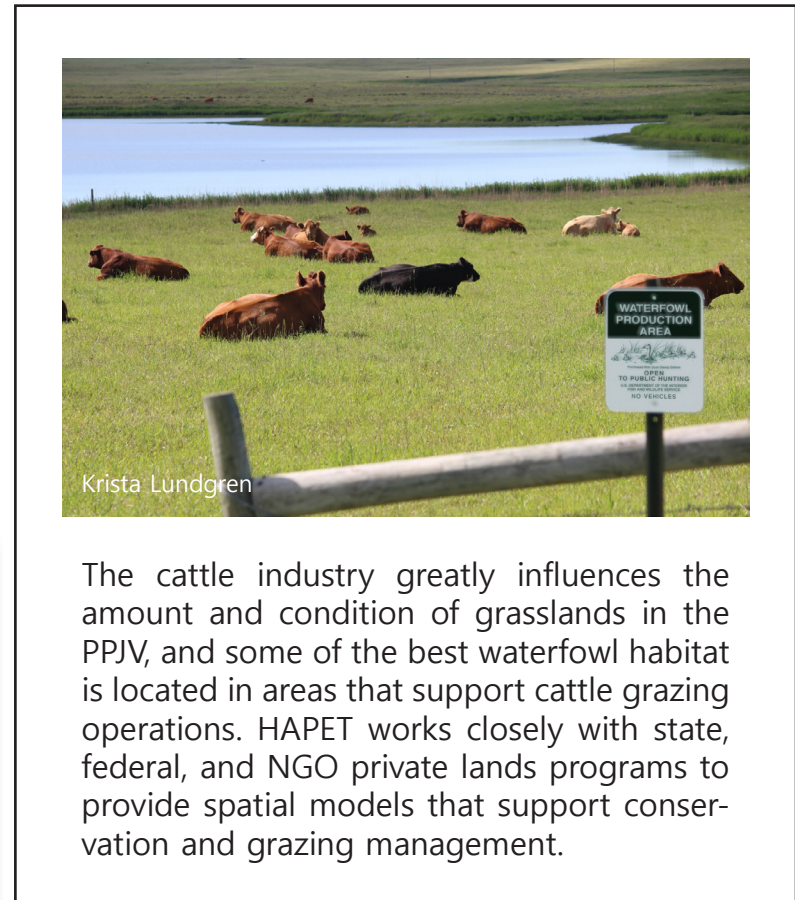
# DUCKS ARE GRASSLAND BIRDS

Ducks are necessarily associated with water, but grasslands are extremely important to waterfowl populations. Survey data indicate that **more than 90% of breeding waterfowl in the PPJV nest in uplands**. In addition, nesting success is higher where there is more grass, and wetlands embedded in grasslands have higher invertebrate numbers than wetlands in croplands, which benefits egg-laying hens and ducklings by providing protein and energy.

Consequently, conservationists spend considerable time and effort protecting and restoring grasslands. Easements prevent grasslands from being converted, restoration projects help replace grass that was converted, and grazing systems and other management practices help maintain structure and health of grasslands to benefit wildlife.



Ryan Moehring



Krista Lundgren

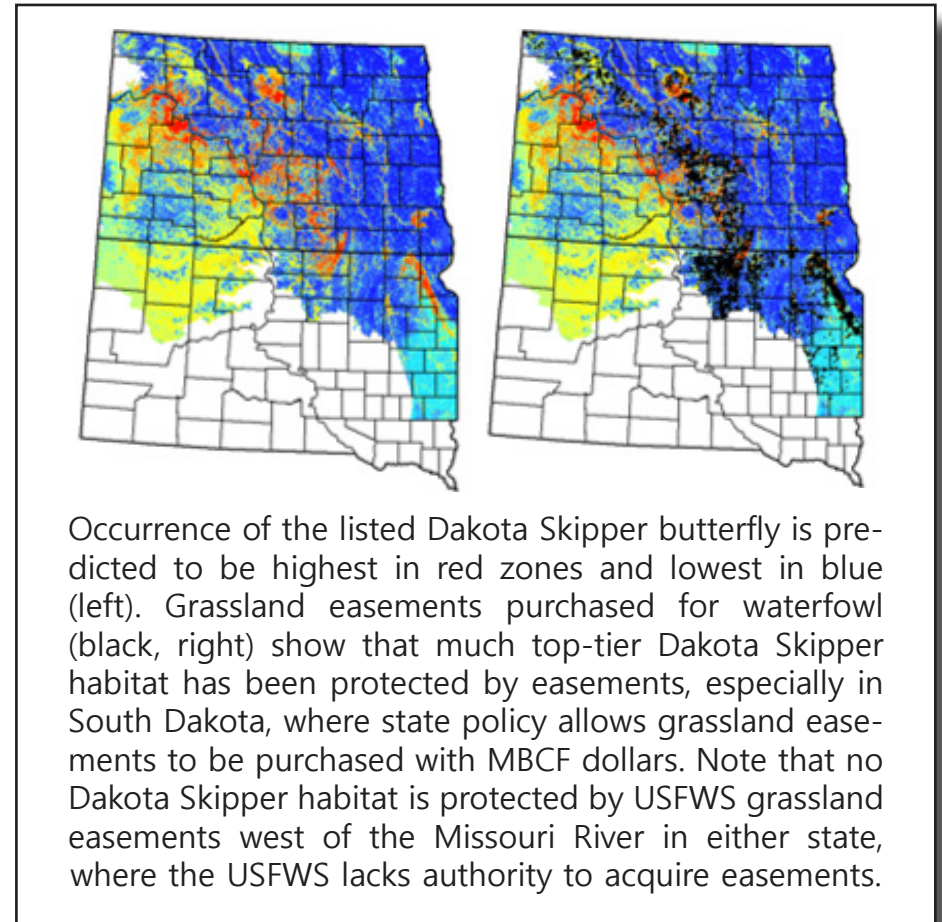
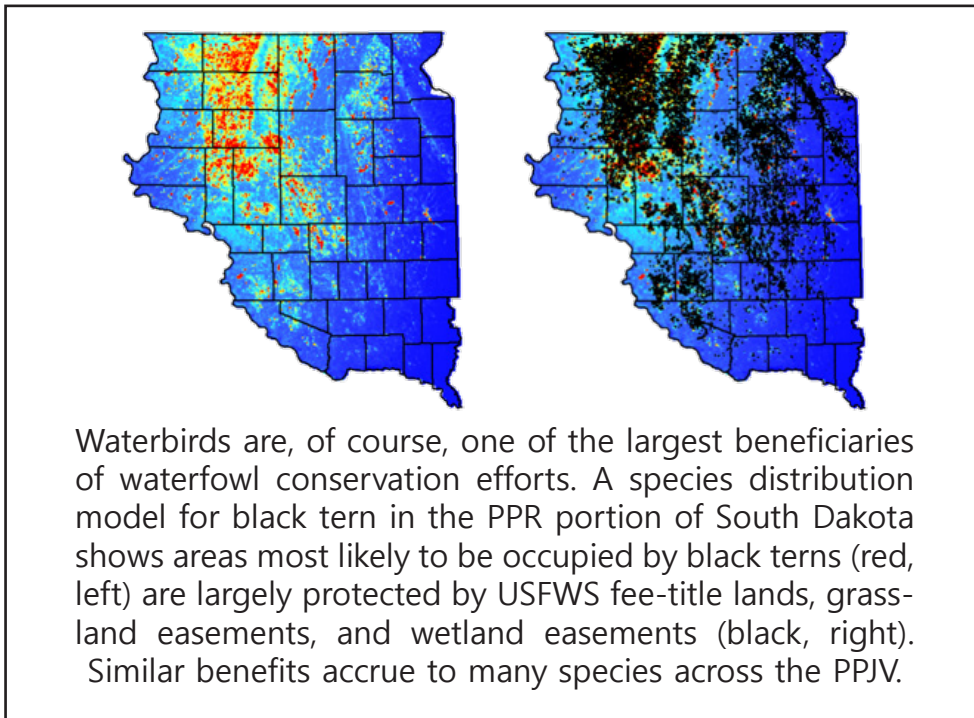
The cattle industry greatly influences the amount and condition of grasslands in the PPJV, and some of the best waterfowl habitat is located in areas that support cattle grazing operations. HAPET works closely with state, federal, and NGO private lands programs to provide spatial models that support conservation and grazing management.

## Pertinent HAPET Publications

- Reynolds, R.E., T.L. Shaffer, R.W. Renner, W.E. Newton, & B.D.J. Batt. 2001. [Impact of the Conservation Reserve Program on duck recruitment in the U.S. Prairie Pothole Region](#). The Journal of Wildlife Management 65:765–780.
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- Drum, R., C.R. Loesch, K.M. Carrlson, K.E. Doherty, & B.C. Fedy. 2015. Assessing the biological benefits of the USDA Conservation Reserve Program (CRP) for waterfowl and grassland passerines in the Prairie Pothole Region of the United States: Spatial Analysis for targeting CRP to maximize benefits for migratory birds. Final report for USDA-FSA Agreement: 12-IA-MRE-CRP-TA.

# CONSERVATION BENEFITS FOR OTHER SPECIES

Most conservation delivery in the PPJV is focused on ducks, with funding coming primarily from MBCF, NAWCA, and LWCF, as well as state, NGO, and private partners. Even though these efforts target ducks, they provide tremendous benefits for non-waterfowl species.

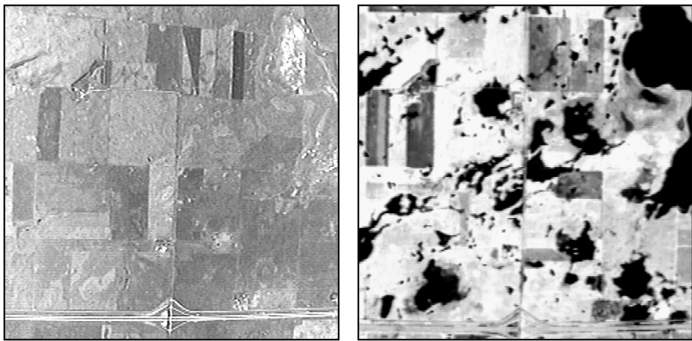


## Pertinent HAPET Publications

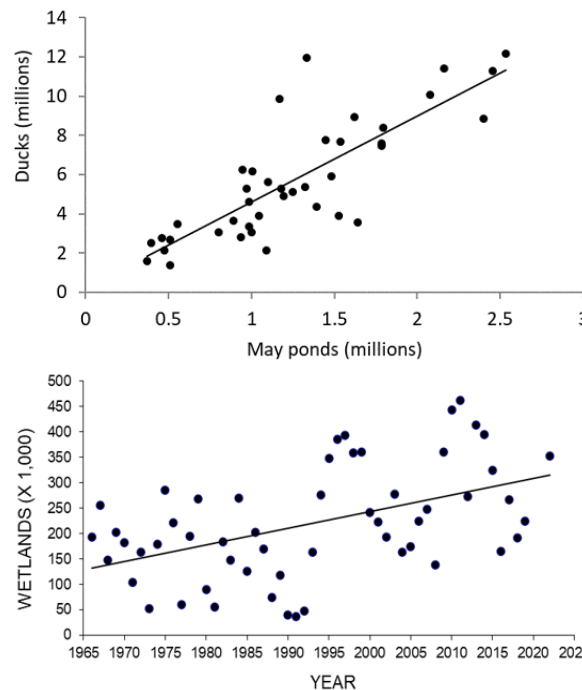
- Beyersbergen, G.W., N.D. Niemuth, & M.R. Norton. 2004. Northern Prairie & Parkland Waterbird Conservation Plan. Prairie Pothole Joint Venture, Denver, Colorado. 183 pp.
- Niemuth, N.D., G.W. Beyersbergen, & M.R. Norton. 2005. Waterbird conservation planning in the Northern Prairie & Parkland Region: integration across borders and with other bird initiatives. Pages 184-189 in Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference 2002, C.J. Ralph & T.D. Rich, eds. USDA Forest Service PSW-GTR-191, Albany, CA.
- Niemuth, N.D., R.E. Reynolds, D.A. Granfors, R.R. Johnson, B. Wangler, & M.E. Estey. 2008. Landscape-level Planning for Conservation of Wetland Birds in the U.S. Prairie Pothole Region. Pages 533-560 in Models for Planning Wildlife Conservation in Large Landscapes, J.J. Millsbaugh & F.R. Thompson, III, eds. Elsevier Science.

# THE WEATHER IS JUST DUCKY

A duck's world revolves around water. Water conditions affect duck habitat selection, settling patterns, nesting propensity, survival, and – ultimately – population size. That's why HAPET uses aerial photos, satellite imagery, statistical algorithms, and spatial analyses to track annual and long-term water conditions across the PPJV. Our analyses allow managers to better understand variation in duck population size, assess trends in water conditions, and identify areas most suitable for waterfowl conservation over the long term.



These aerial photographs of a Four-Square-Mile Survey plot were taken five years apart and demonstrate the extreme inter-annual variation in water conditions that exists in the PPJV. HAPET collects imagery on 651 plots each year, providing the most comprehensive and long-term assessment of spring water conditions on individual basins in the region.



Regional waterfowl populations are strongly correlated with numbers of May ponds (upper), which can vary dramatically among years (lower).

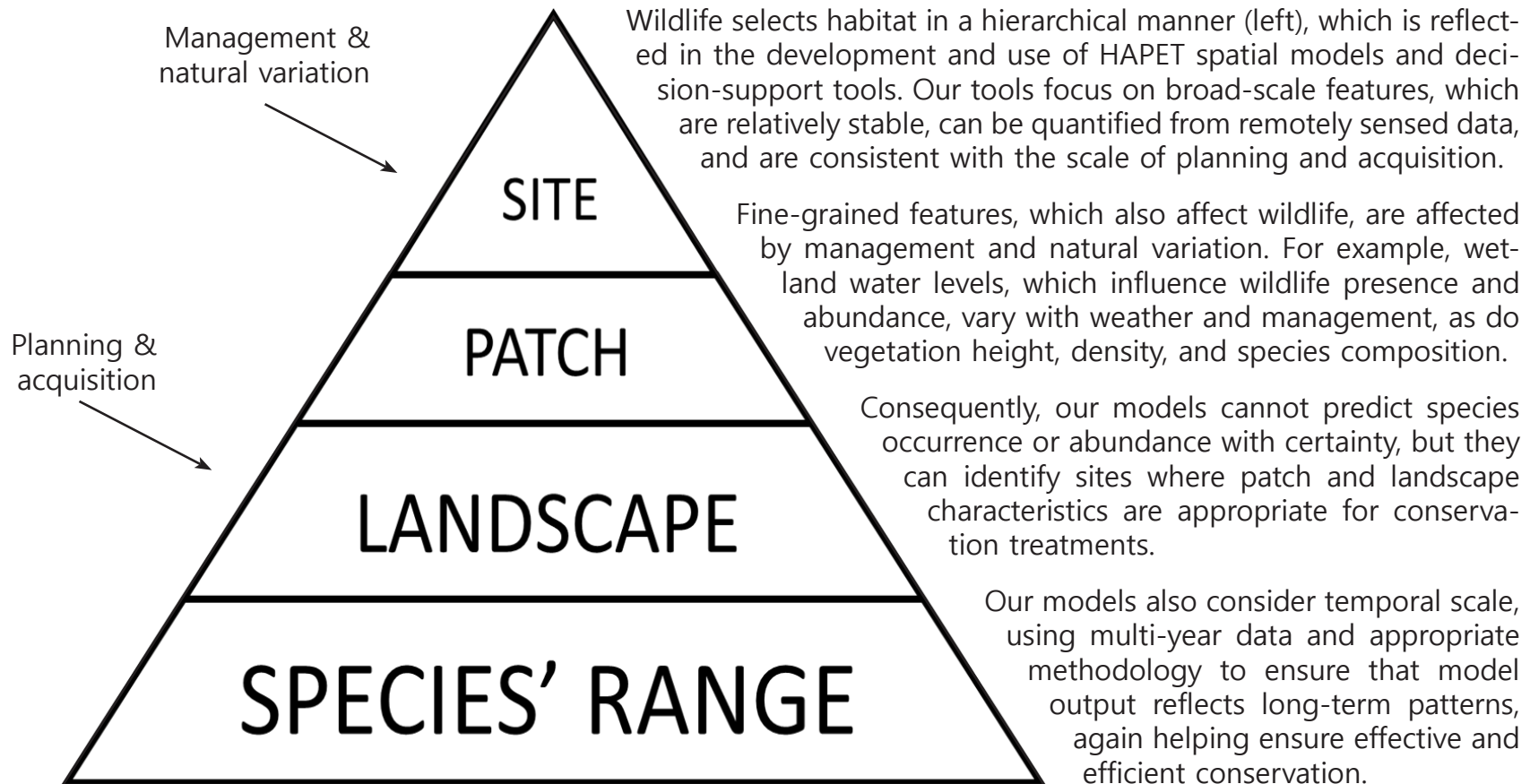
Because most prairie potholes are small and shallow, their water levels are acutely sensitive to changes in temperature and precipitation. Current understanding of climate change effects suggest that indirect factors such as land-use change will likely have a greater effect on waterfowl populations than direct effects such as wetland drying.

## Pertinent HAPET Publications

Niemuth, N.D., K.L. Fleming, & R.R. Reynolds. 2014. [Waterfowl conservation in the US Prairie Pothole Region: confronting the complexities of climate change](#). Public Library of Science One 9(6):e100034.

Czech, B., S. Covington, T.M. Crimmins, et al. 2014. Planning for Climate Change on the National Wildlife Refuge System, Washington, DC. 132 pp.

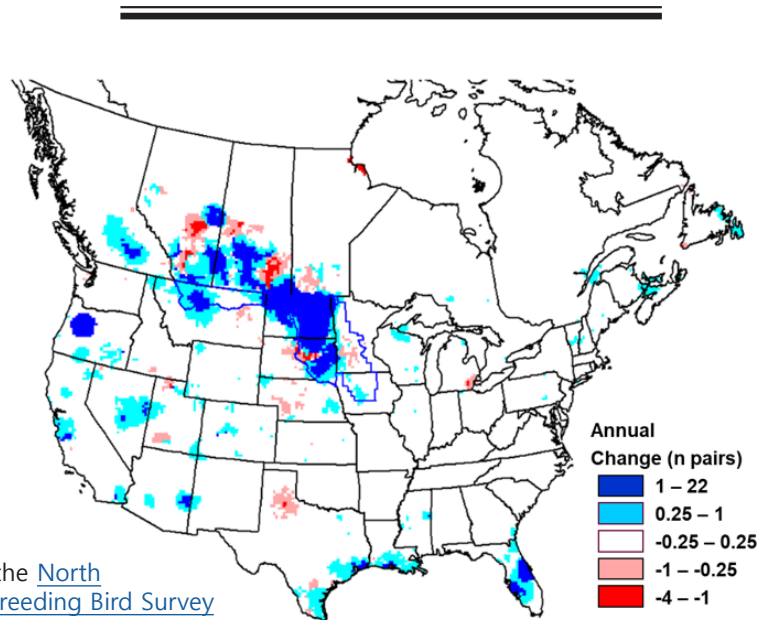
# WORKING WITH NATURE'S HIERARCHIES



HAPET staff and products benefit greatly from being stationed in field offices rather than at a regional office or research facility. By being in the field and interacting with state, NGO, private, and federal partners who actually deliver conservation, HAPET staff are engaged in a feedback loop that keeps them apprised of issues, conditions, and needs, which helps ensure improvement of existing products and development of new products that address identified needs at all scales.

# INFORMING A WELL-OILED MACHINE

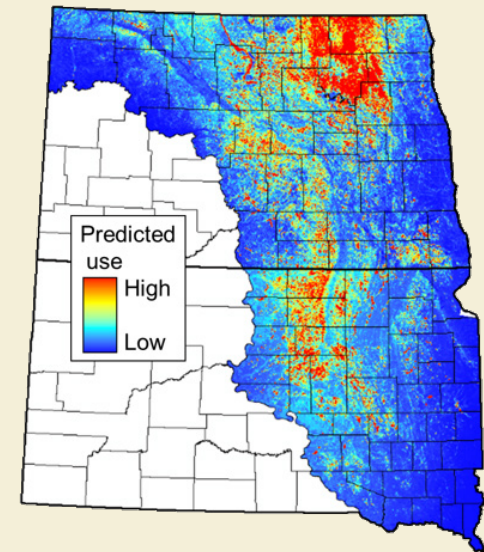
HAPET tools are of limited value unless they are used to improve conservation delivery. Fortunately, the FWS Realty and Partners for Fish and Wildlife programs, along with many state and NGO partners, have great people and processes in place to protect, enhance, and restore habitat for waterfowl and other species. HAPET works closely with these groups, often tailoring tools to meet partner objectives. Partner resources and relationships are critical to quickly and efficiently turning funding into effective on-the-ground conservation.



Data from the [North American Breeding Bird Survey](#)

Partners in the PPJV deliver a wide range of conservation treatments, with many partners and programs using HAPET tools to guide delivery. Most of these tools were developed following HAPET's modular or "toolbox" approach to conservation planning, where base tools or data layers are adapted to specific needs. The end result is that the PPJV shows the largest annual increase in abundance of 24 species of waterfowl in North America from 1966-2015 (above). The area in central South Dakota showing declining numbers is centered around Hyde and Hand counties, which have the highest levels of grassland and wetland loss in the region.

An example of the flexibility provided by HAPET's "toolbox" approach to conservation planning is the acquisition of >3,600 acres of wetland easements and 2,457 acres of grassland easements to offset loss of black terns killed in the 2010 Deepwater Horizon oil spill.

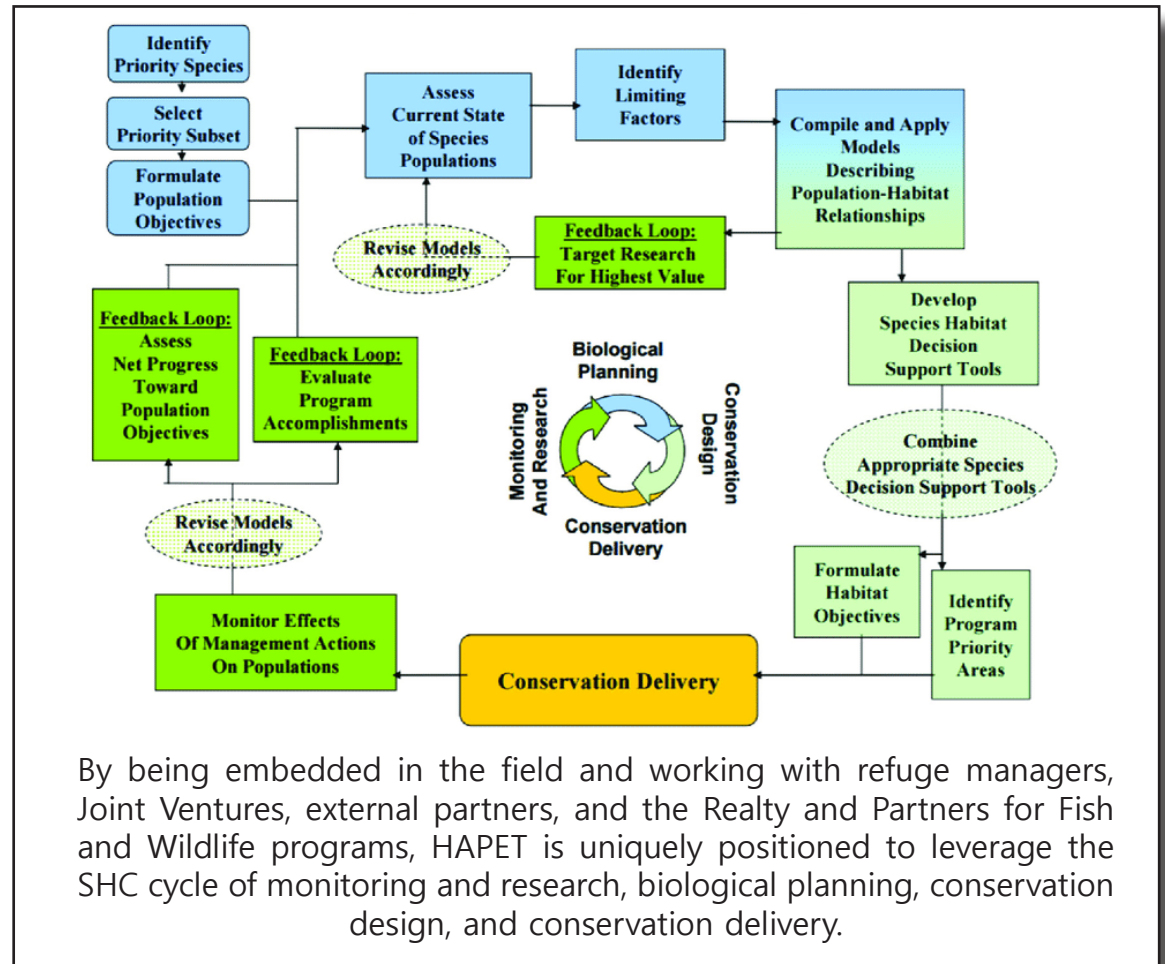


The FWS Refuges Realty program used a HAPET model (above) showing predicted use of landscapes by black tern to target areas for acquisition of easements. Acquisition was designed for optimal black tern benefits, but complements waterfowl conservation efforts in the region.

# STRATEGIC HABITAT CONSERVATION

The SHC framework remains core to everything HAPET does. The foundations of SHC and landscape-scale conservation planning used by the U.S. Fish and Wildlife Service are greatly informed by HAPET. For example, HAPET staff assisted with development of the National Ecological Assessment Team report and the final SHC report. Numerous HAPET products were used to inform and illustrate concepts for Service publications about SHC.

HAPET's extensive experience and application of SHC through partnerships enables HAPET to guide conservation actions within and beyond the U.S. Fish and Wildlife Service. Strategic planning and analysis are at the core of all HAPET efforts to inform programs and conservation delivery. HAPET continually strives to produce science and tools with partners that increase efficiency by enabling surgical placement of conservation treatments, ensuring efficient, transparent, and defensible use of conservation dollars through federal, state, and partner programs.



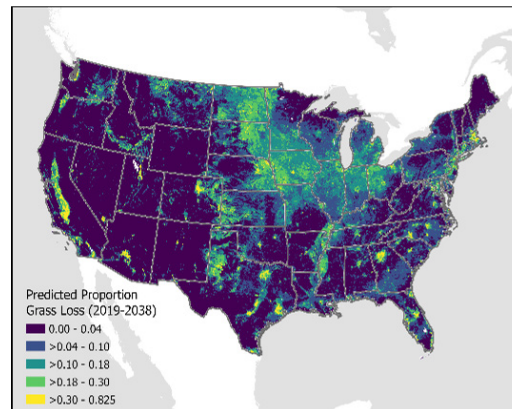
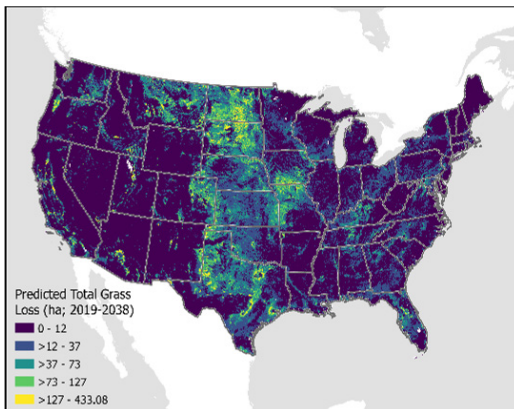
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- Niemuth, N.D., R.E. Reynolds, D.A. Granfors, R.R. Johnson, B. Wangler, & M.E. Estey. 2008. Landscape-level planning for conservation of wetland birds in the U.S. Prairie Pothole Region. Pages 533-560 in *Models for Planning Wildlife Conservation in Large Landscapes*, J.J. Millspaugh & F.R. Thompson, III, eds. Elsevier Science
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- Hagy, H.M., S.C. Yaich, J.W. Simpson, et al. 2014. Wetland issues affecting waterfowl conservation in North America. *Wildfowl Special Issue* 4:343-367.

# MAKING SHC MORE STRATEGIC

Many people think Strategic Habitat Conservation (SHC) is a simple matter of using spatial models to identify areas of high density (the “core” or “best” places), then implementing conservation in those areas. In reality, SHC considers many additional factors, including conservation treatments, population status, risk of habitat loss, cost of conservation treatments, and opportunity for implementing conservation.

HAPET is working on multiple projects to optimize conservation actions to increase the effectiveness and efficiency of conservation efforts. Although there are many good reasons for focusing high-density areas, consideration of cost, risk, and options for implementation can dramatically change areas identified as priorities for conservation, better inform conservation decisions, and improve conservation efficiency.



HAPET’S mechanistic model of grassland conversion uses a suite of economic and environmental predictors to characterize total and proportion grass loss for past and future time frames across the contiguous United States. This model helps ensure efficient and effective use of limited conservation funds by incorporating risk of grassland conversion in conservation planning efforts.

Wetland drainage continues, resulting in the ongoing loss of waterfowl habitat. HAPET’s hierarchical easement evaluation strategy prioritizes wetlands at higher risk of drainage for acquisition.

## Pertinent HAPET Publications

- Carrlson, K.M. T.T. Gue, C.R. Loesch, & J.A. Walker. 2019. Assessment of repeat-visit surveys as a viable method for estimating brood abundance at the 10.4-km<sup>2</sup> scale. *Wildlife Society Bulletin* 42:72-77.
- Niemuth, N.D., M.E. Estey, & R.D. Pritchert. 2021. [Developing useful spatially explicit habitat models and decision-support tools for wildlife management](#). Pages 173-193 in *Wildlife management and landscapes: principles and applications*, W.F. Porter, C.J. Parent, R.A. Stewart, & D.M. Williams, editors. Johns Hopkins University Press in affiliation with The Wildlife Society, Baltimore, MD, USA.
- Shaffer, J.A., N.D. Niemuth, C.R. Loesch, et al. 2022. Limited land base and competing land uses force societal tradeoffs when siting energy development. *Journal of Fish and Wildlife Management* 13:106–123.



# EVALUATING STRESSORS

Wind farms and oil & gas facilities are being developed across much of North America, including the PPJV region. However, effects of these facilities on wetland-dependent birds are poorly known. HAPET has conducted or participated in numerous studies evaluating effects of energy development on ducks and other species; results of this research help inform conservation planning, including placement of facilities and offsets for negative effects.

Results indicate that response to stressors varies among species, geographic location, stressor type, and life-cycle seasons. This information and more is included in HAPET decision-support tools.

Wind turbines, wetland drainage, and grassland conversion all negatively affect waterfowl populations; cumulative effects are likely substantial. Understanding and offsetting effects of stressors is critical to maintaining abundant populations of waterfowl and other migratory birds.



Krista Lundgren

## Pertinent HAPET Publications

- Kiesecker, J.M., J.S. Evans, J. Fargione, et al. 2011. [Win-win for wind and wildlife: a vision to facilitate sustainable development](#). PLoS ONE 6(4):e17566.
- Loesch, C.R., J.A. Walker, R.E. Reynolds, J.S. Gleason, N.D. Niemuth, S.E. Stephens, & M.E. Erickson. 2013. Effects of wind energy development on breeding duck settling in the Prairie Pothole Region of North Dakota and South Dakota. *Journal of Wildlife Management* 77:587-598.
- Kemink, K.M., C.T. Gue, C.R. Loesch, R.L. Cressey, M.L. Sieges, & M.L. Szymanski. 2019. Impacts of oil and gas development on duck brood abundance. *Journal of Wildlife Management* 83:1485-1494.
- Shaffer, J.A., C.R. Loesch, & D.A. Buhl. 2019. [Estimating offsets for avian displacement effects of anthropogenic impacts](#). *Ecological Applications* 29(8):e01983.
- Skaggs, C.G., K.M. Ringelman, C.R. Loesch, M.L. Szymanski, F.C. Rohwer, & K.M. Kemink. 2020. Proximity to oil wells in North Dakota does not impact nest success of ducks but lowers nest densities. *The Condor* 122:1-15.
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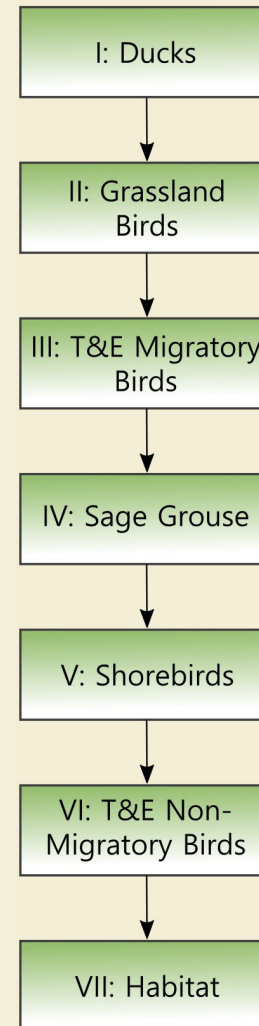
# PUTTING THE PIECES TOGETHER

HAPET is justifiably associated with GIS analyses and development of spatial models, but also offers many additional tools to support conservation strategies adopted by partners. HAPET staff work with partners and others to design studies, collect and analyze data, develop proposals, provide technical support, and contribute to various teams and committees. By being stationed in the field, working on projects from conception to application, and receiving continuous feedback from conservation delivery personnel, HAPET is uniquely positioned to develop useful and comprehensive decision-support tools to inform conservation.

HAPET recognizes that conservation actions vary depending on species, available treatments, funding, landowner desires, cost, risk, and landscape context. Consequently, there is no single map or “best place” for conservation. HAPET has adopted a modular or “tool box” approach to conservation planning, where foundational models and decision-support tools can easily be modified to best meet the needs of specific situations, whether at local, regional, national, or international scales.

Of course, sorting through multiple conservation options can be confusing. To address these concerns, HAPET has developed a hierarchical prioritization process (right) that provides a structured framework for using spatial decision-support tools that is flexible, transparent, and avoids the problems associated with point-based scoring systems. HAPET models and decision-support tools help ensure that conservation practitioners can identify the best place for each treatment and the best treatment for each place in a strategic and comprehensive manner.

## An Adaptable Conservation Framework



In this example of land parcel prioritization for acquisition of perpetual grassland easements using Migratory Bird Conservation Fund money in the western PPJV, waterfowl are assigned top priority because Duck Stamps are the primary source of funding.

These priorities were developed in consultation with conservation delivery partners and can easily be re-ordered to reflect different funding sources, changes in species status, or priorities of different partners.

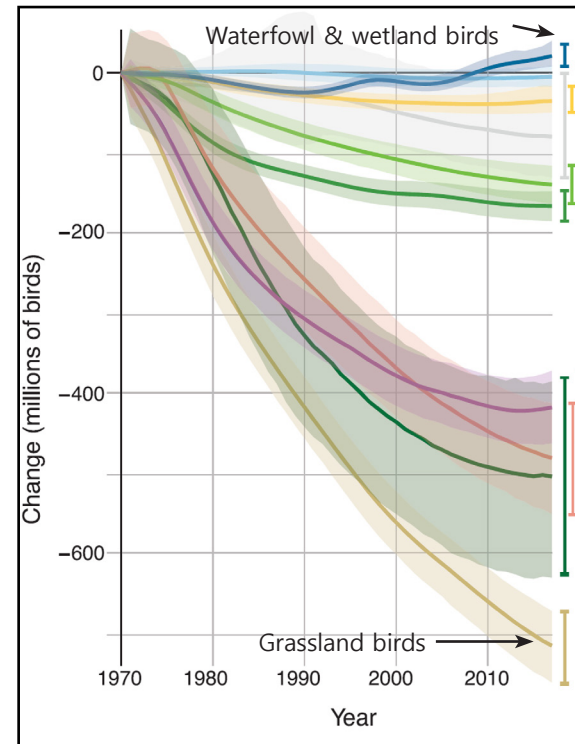
The categories used in this example are just one portion of the hierarchy; other factors include (but are not limited to) treatment type, funding source, program support, cost, risk, state priorities, management practices, and grassland type (native prairie, reconstructed prairie, or other).

# A WINNING FORMULA



A recent publication dubbed the “Billion Birds Report” indicates that North America has lost 2.9 billion birds since 1970. Of the ten bird habitat groups considered in the analysis, only one – waterfowl – showed an increase in numbers since 1970. Numerous publications and leaders of conservation organizations have noted the “winning formula” of waterfowl conservation efforts and have urged that waterfowl conservation be adopted as a model for conservation of other species, especially grassland birds.

Efforts by PPJV partners and tools provided by HAPET have been instrumental in maintaining waterfowl populations. HAPET has a suite of spatial decision-support tools available to support conservation of grassland birds, which have shown greater declines than species from any other habitat group. HAPET tools are designed to help target the on-the-ground delivery that is essential to conservation success.

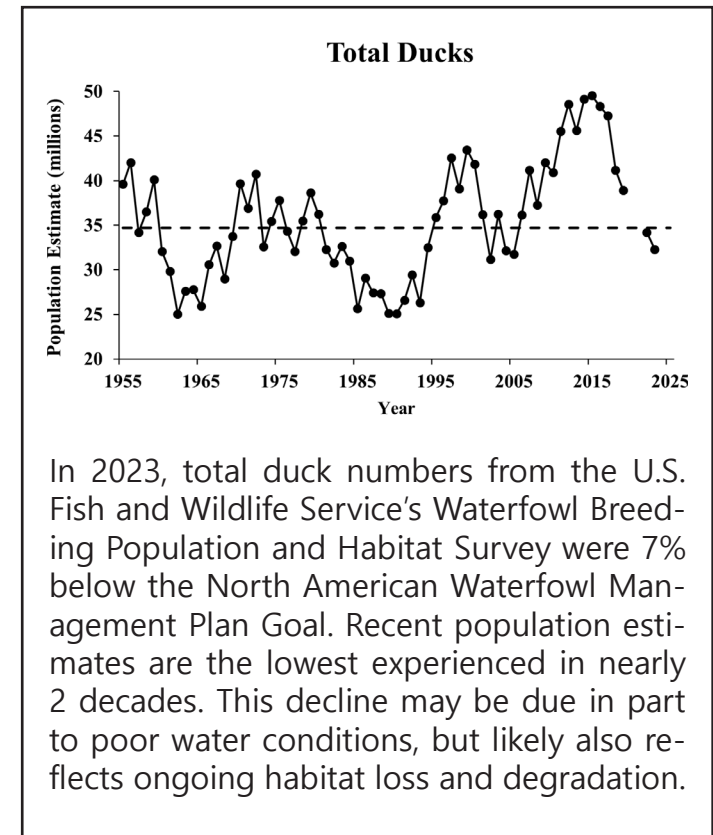


# PADDLING INTO TROUBLED WATERS?



Ongoing grassland conversion and wetland drainage along with climate change and increasing human demands for natural resources will continue to stress and reduce wildlife populations. HAPET is committed to working with long-term partners such as the PPJV to provide comprehensive, integrated strategies for conservation of waterfowl and other species.

**Grasslands in the PPR are among the most at risk for conversion and loss in the U.S.** Conversion of grasslands destroys or degrades nesting habitat for the >90% of ducks in the PPJV that are upland nesters. In addition, grassland conversion often results in wetland drainage as well as degradation of wetlands that remain, which are more susceptible to siltation, invasion by hybrid cattails, and contamination by pesticides.



In 2023, total duck numbers from the U.S. Fish and Wildlife Service's Waterfowl Breeding Population and Habitat Survey were 7% below the North American Waterfowl Management Plan Goal. Recent population estimates are the lowest experienced in nearly 2 decades. This decline may be due in part to poor water conditions, but likely also reflects ongoing habitat loss and degradation.

## Pertinent HAPET Publications

- Prairie Pothole Joint Venture. 2005. [Prairie Pothole Joint Venture 2005 Implementation Plan](#). Prairie Pothole Joint Venture, Denver, Colorado.
- Doherty, K.E., A.J. Ryba, C.L. Stemler, N.D. Niemuth, & W.A. Meeks. 2013. [Conservation planning in an era of change: state of the U.S. Prairie Pothole Region](#). Wildlife Society Bulletin 37:546-563.
- Walker, J.J., R. Dell, R.W. Renner, J.K. Ringelman, J.J. Rotella, C.R. Loesch, K.E. Doherty, & M.S. Lindberg. 2013. An integrated strategy for grassland easement acquisition in the Prairie Pothole Region, USA. *Journal of Fish and Wildlife Management* 2:267-279.
- Gue, C.T., J.A. Walker, K.R. Mehl, J.S. Gleason, S.E. Stephens, C.R. Loesch, R.E. Reynolds, & B.J. Goodwin. 2013. The effects of a large-scale wind farm on breeding season survival of female mallards and blue-winged teal in the Prairie Pothole Region. *Journal of Wildlife Management* 77:1360-1371.

# HAPET - PAST & PRESENT

## PROGRAM & IMPACTS

HAPET's chief activity is the development of tools to guide the USFWS Refuges program's expenditure of Migratory Bird Conservation Fund ("Duck Stamp") dollars to acquire perpetual wetland and grassland easements in the Prairie Pothole Joint Venture. In FY2022, the Region 6 and Region 3 Refuges Realty programs acquired ~154,000 acres (>240 square miles!) of perpetual wetland and grassland easements in the five PPJV states and expect to acquire an equal or larger number of acres in FY2023.

Similarly, the USFWS Partners for Fish and Wildlife program restores habitat and implements term conservation agreements with private landowners across millions of acres in the Great Plains. Whether easements, restoration projects, or grazing systems, none of these acts of conservation are random, but rely on strategic goals and tactics along with HAPET models and decision-support tools to increase efficiency and effectiveness of conservation actions.

## STRATEGIC PLANNING & DELIVERY

As with conservation delivery, HAPET actions are not random, but are part of a comprehensive process that includes communication, strategic planning, identification and evaluation of assumptions and uncertainties, and filling of information gaps. This provides a coordinated strategy for understanding waterfowl populations and how to best conserve them using available conservation treatments.

HAPET conservation planning products reflect a commitment to strategic habitat conservation (SHC), where monitoring and research, biological planning, conservation design, and conservation delivery follow an iterative and adaptive cycle. In fact, HAPET was one of the models for development of SHC and the adoption of landscape-level conservation planning within the USFWS

## SCIENCE & ORGANIZATION

Even though our primary focus is conservation delivery, HAPET products are generally published in the peer-reviewed literature. Review provides useful insights that improve our products, while publication increases awareness of HAPET efforts and frequently leads to collaboration with conservation professionals across North America. Most sections in this document are followed by a chronological list of pertinent publications involving HAPET staff, including some that represent current projects and are still in preparation. Each publication is listed once, in the section most relevant to its content, but most publications are pertinent to multiple topics related to waterfowl and wetland conservation.

HAPET is funded by the USFWS Region 6 and Region 3 Refuges and Migratory Bird programs and the Prairie Pothole Joint Venture. HAPET staff are located in Fergus Falls, Minnesota; Bismarck, North Dakota; Missoula, Montana; and Hadley, Massachusetts. HAPET also receives support from refuge and wetland management district staff, as well as staff from other Service and external programs.

# LEARN MORE



Staff from HAPET and the PPJV are always happy to discuss conservation planning and delivery. If you or your group would like to learn more about the work described in this document or other projects that HAPET is involved with, please contact any of the people listed to the right or visit the [HAPET web page](#) or [PPJV website](#). USFWS personnel can also visit the HAPET Sharepoint site.

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