

# Overview of NPWRC's recent Piping Plover survival and dispersal research



Rose J. Swift, Michael J. Anteau, Mark H. Sherfy, Kristen S. Ellis, Megan M. Ring, and Dustin L. Toy  
U.S. Geological Survey – Northern Prairie Wildlife Research Center



# Piping Plover (*Charadrius melodus*)

- Federally listed as Threatened in the Northern Great Plains (USFWS 1985)





# History of Piping Plover research at NPWRC

2006 – 2021 data were collected somewhere in NGP

Location	Years	# of PIPL nests	# of HY PIPL banded	# of AHY PIPL banded
U.S. Alkali Wetlands	2014-2021	1,540	787	491
Lake Sakakawea	2006-2009; 2012-2019	1,759	1,343	753
Garrison Reach	2006-2008; 2012-2019	3,698	1,819	757
Lake Oahe	2014-2019	642	236	255
Lewis and Clark Lake	2007-2008	281	53	-
Gavins Point Reach	2006-2009	1,217	715	-
Central Platte River	2009-2016	962	236	147
John Martin Reservoir, CO	2017-2021	-	37	24



# Survival and dispersal within Northern Rivers and U.S. Alkali Wetlands

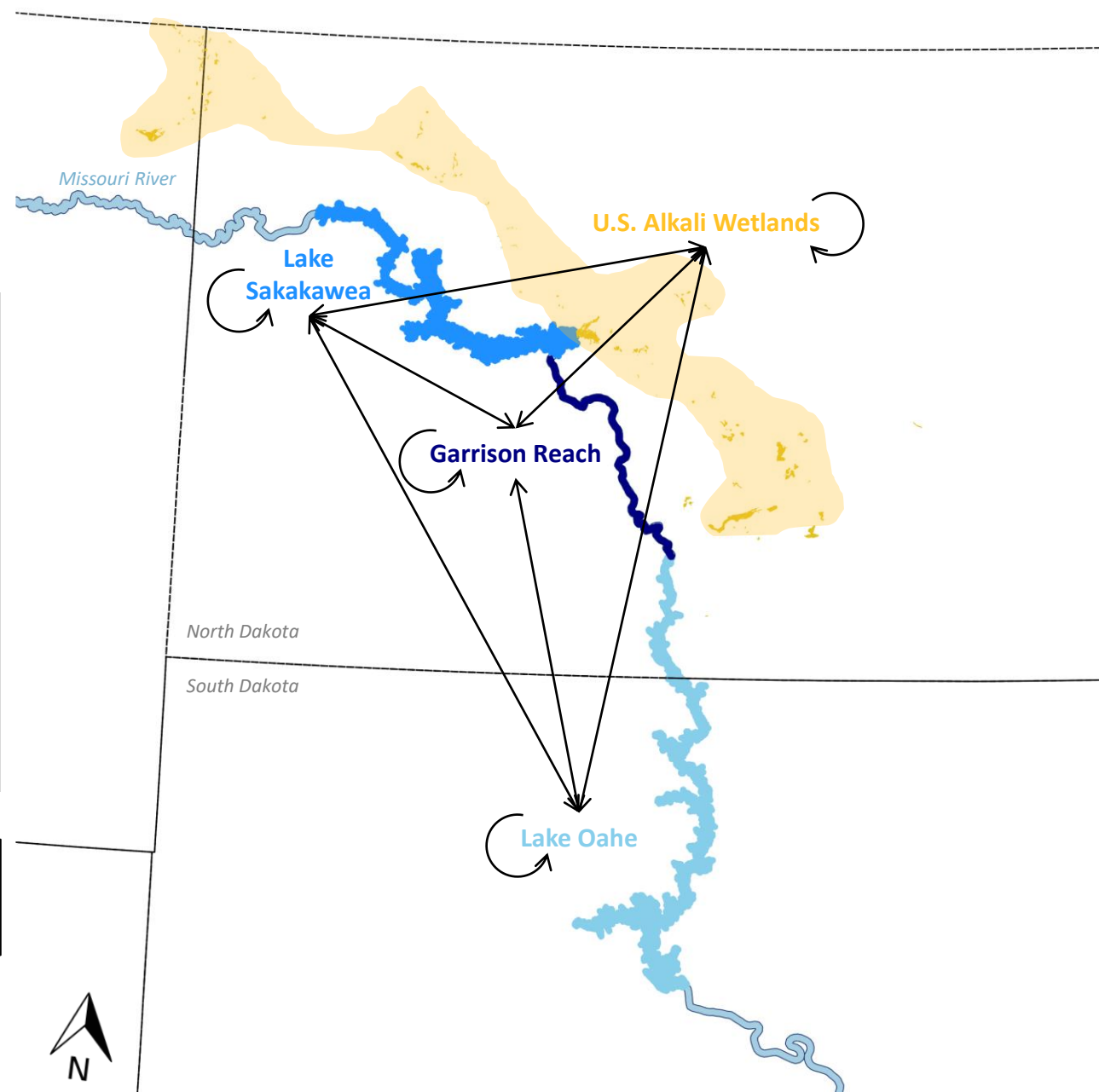
“Metapopulation Study”

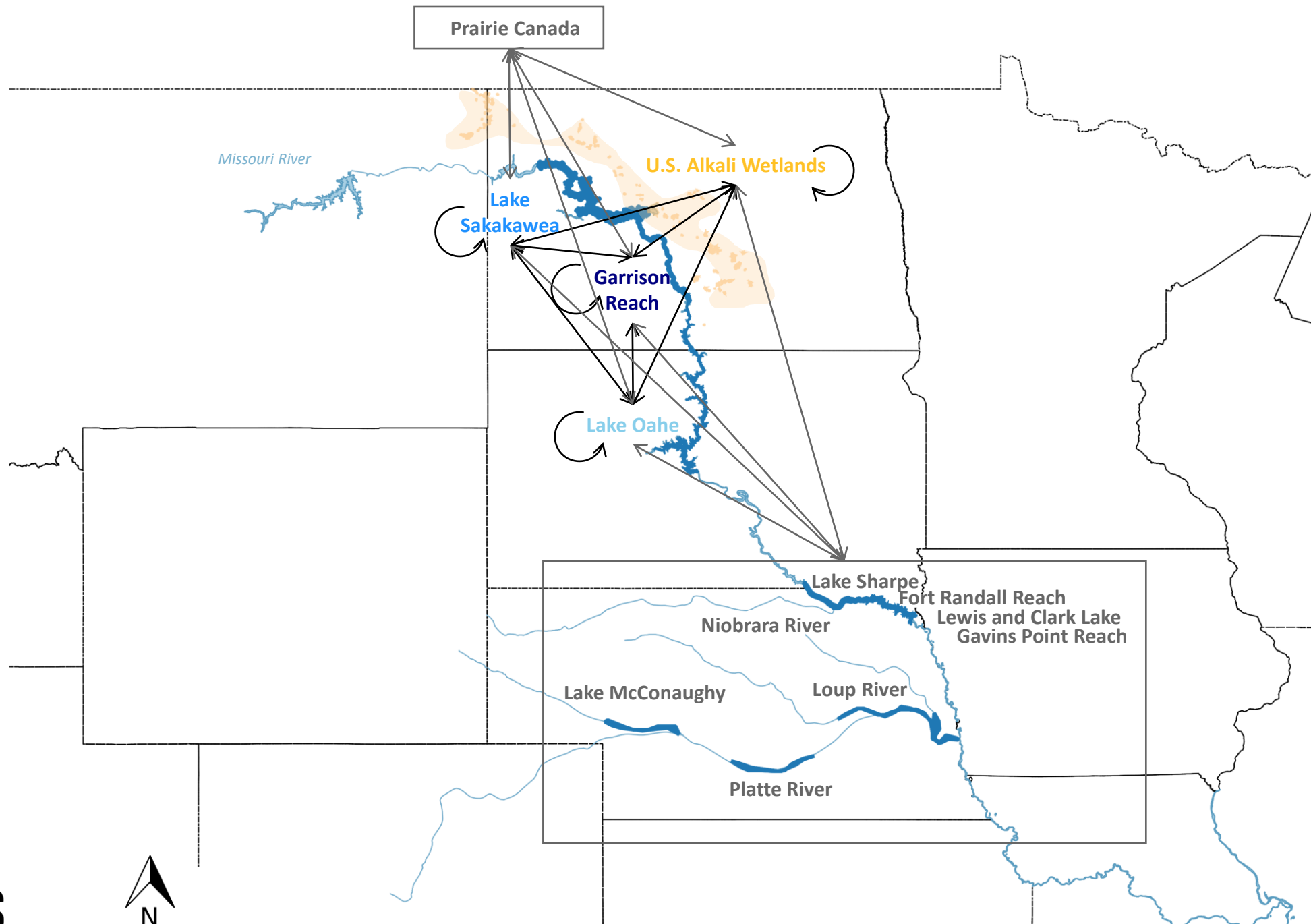
2014 – 2019

2,669 chicks banded

2,594 unique adults resighted

Swift, R.J., Anteau, M.J., Ellis, K.S., Ring, M.M., Sherfy, M.H., Toy, D.L. and Koons, D.N., 2021. Spatial variation in population dynamics of northern Great Plains piping plovers. US Geological Survey 2020-1152.



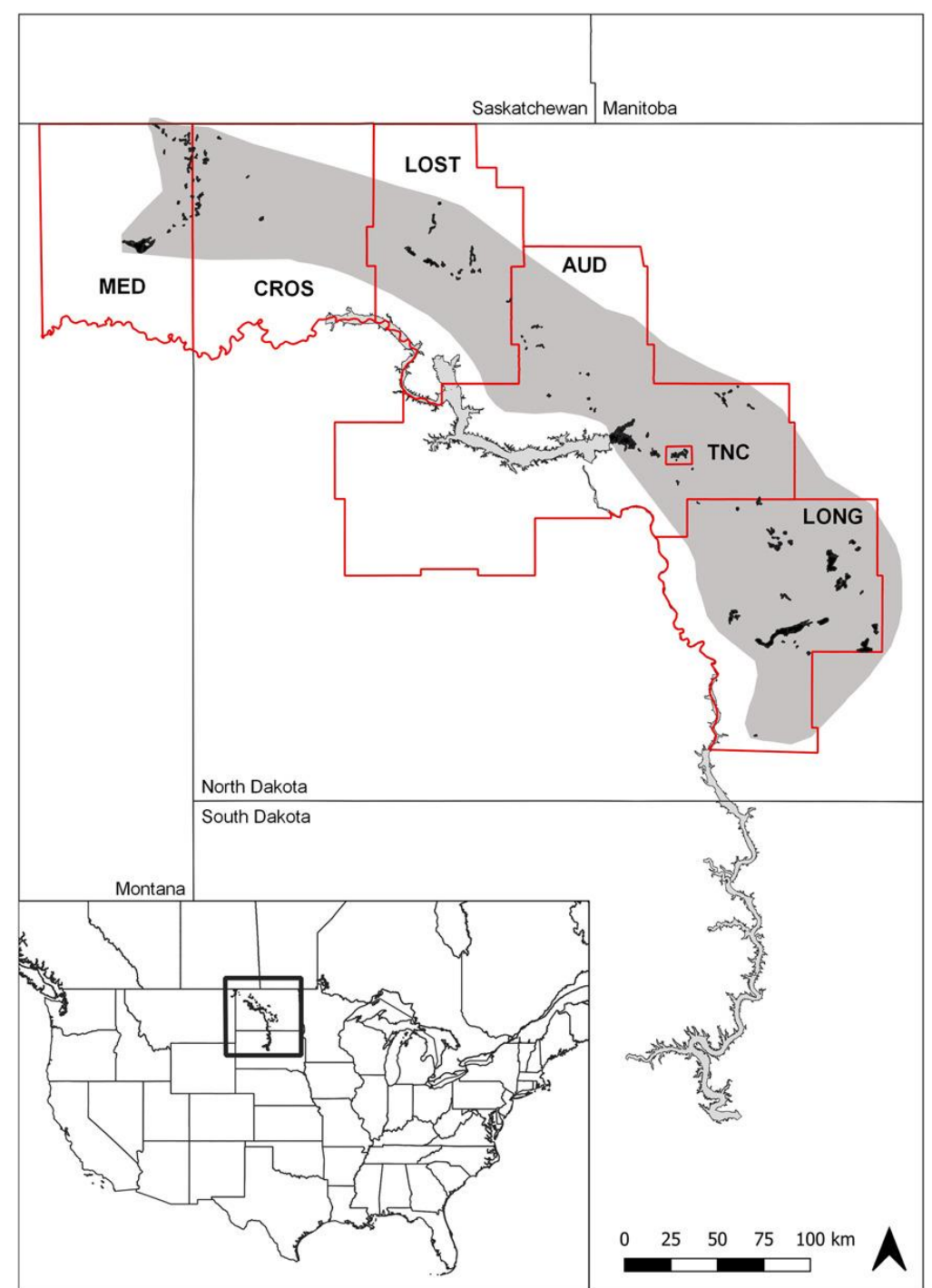


# Effect of predator exclosures on demography

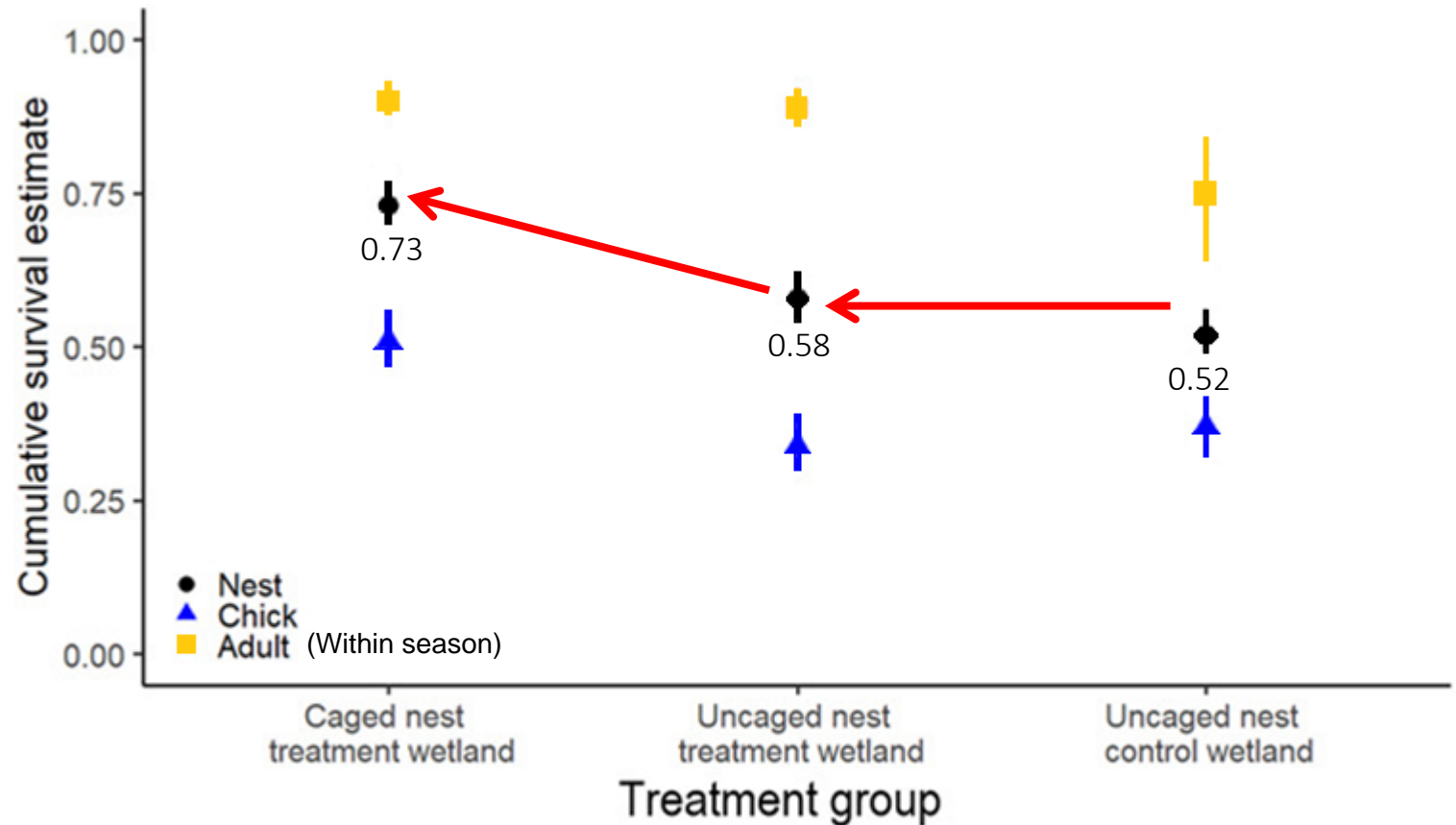
Do predator exclosures around nests affect nest, chick, within-season adult, or annual adult survival?

Experimental design where half of the wetlands had half of nests caged and the other half did not receive a cage.

Anteau, M.J., Swift, R.J., Sherfy, M.H., Koons, D.N., Ellis, K.S., Shaffer, T.L., Toy, D.L. and Ring, M.M., 2022. Experimental evaluation of predator exclosures on nest, chick, and adult survival of piping plovers. *The Journal of Wildlife Management* 86:e22139.



# Effect of predator exclosures on demography



Nest cages provide a meaningful increase in nest survival across a large study area with no side effects of reduced chick or adult survival.

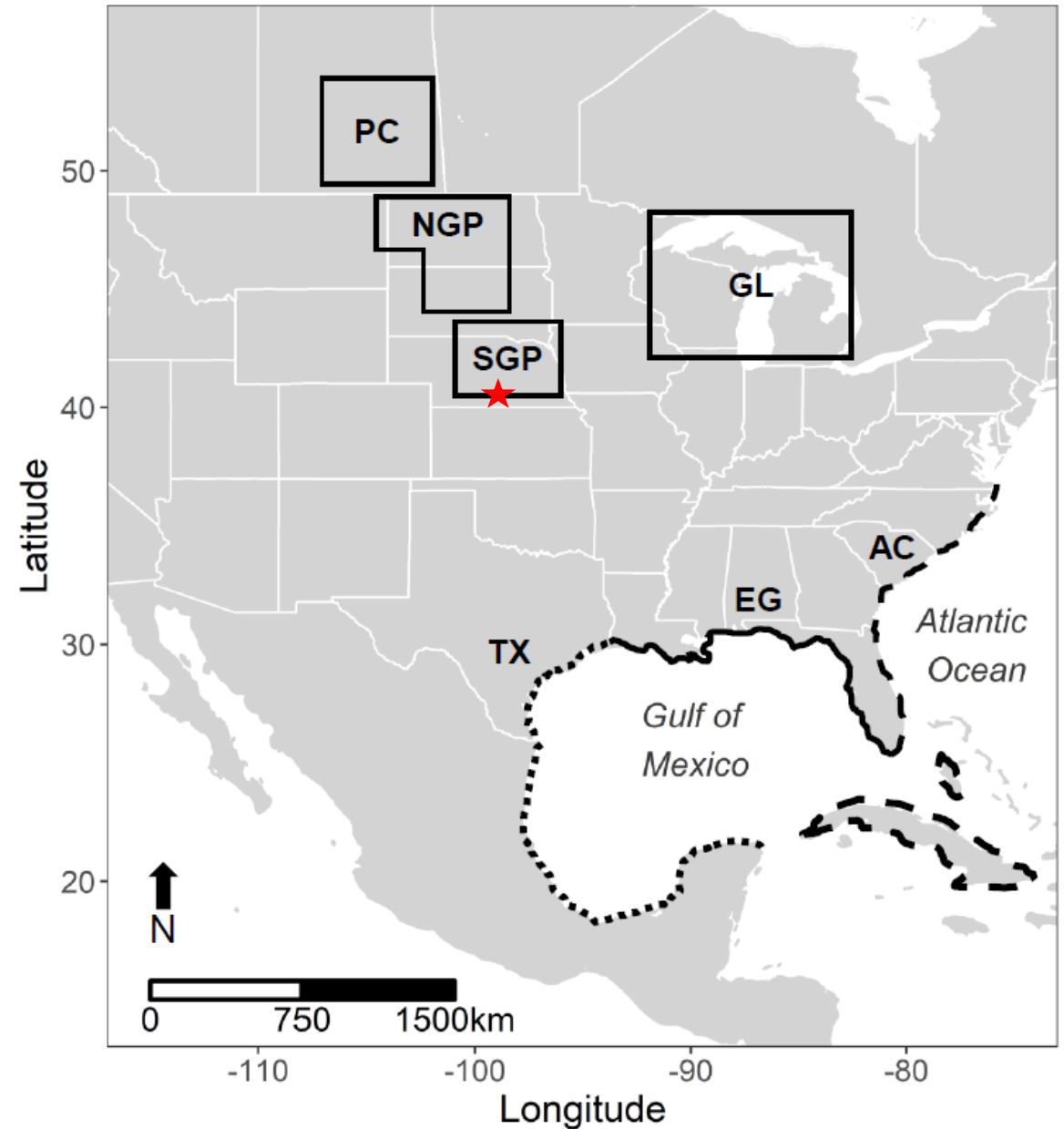


# Seasonal survival of interior piping plovers

Do extreme environmental events impact nonbreeding season survival?

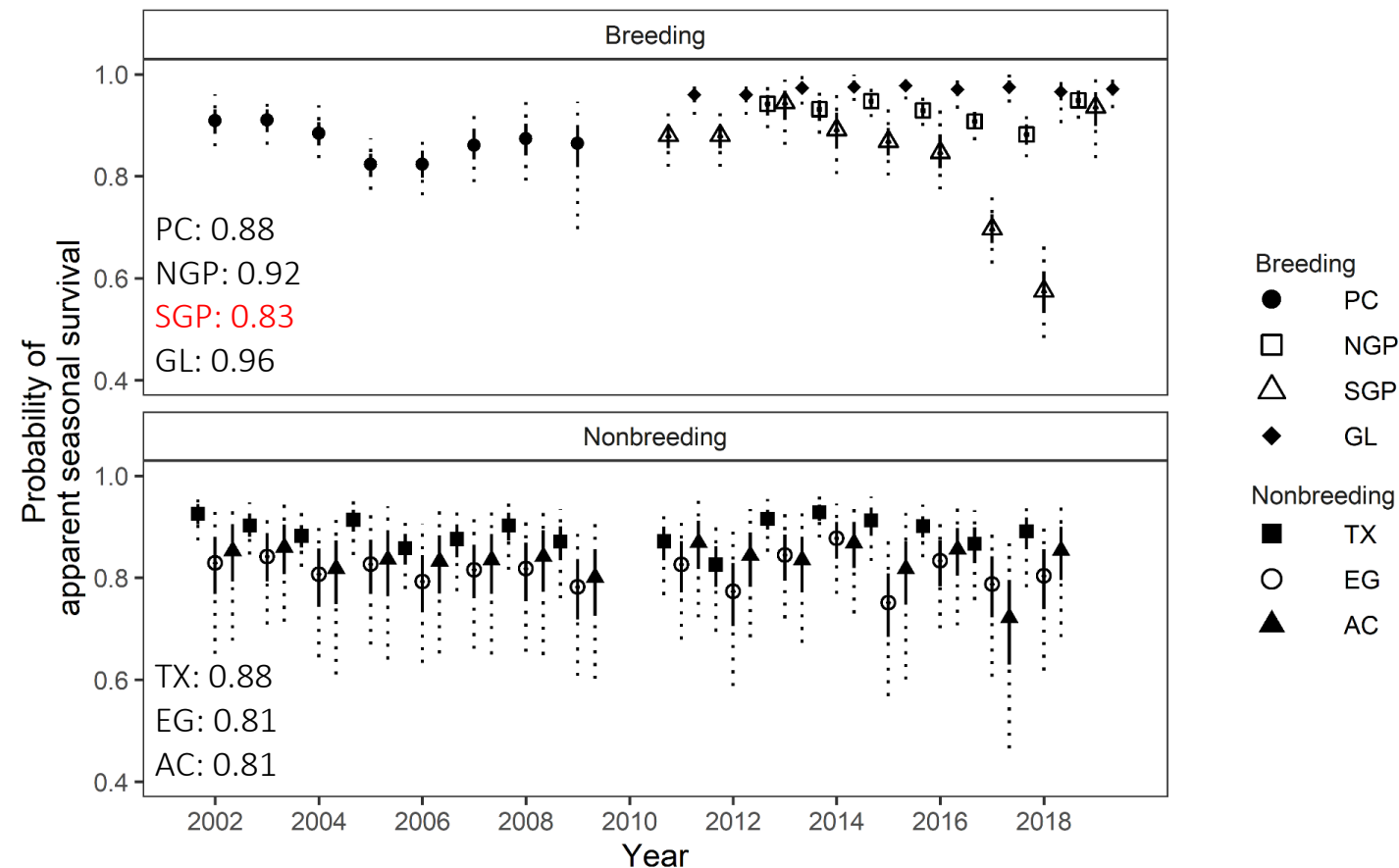
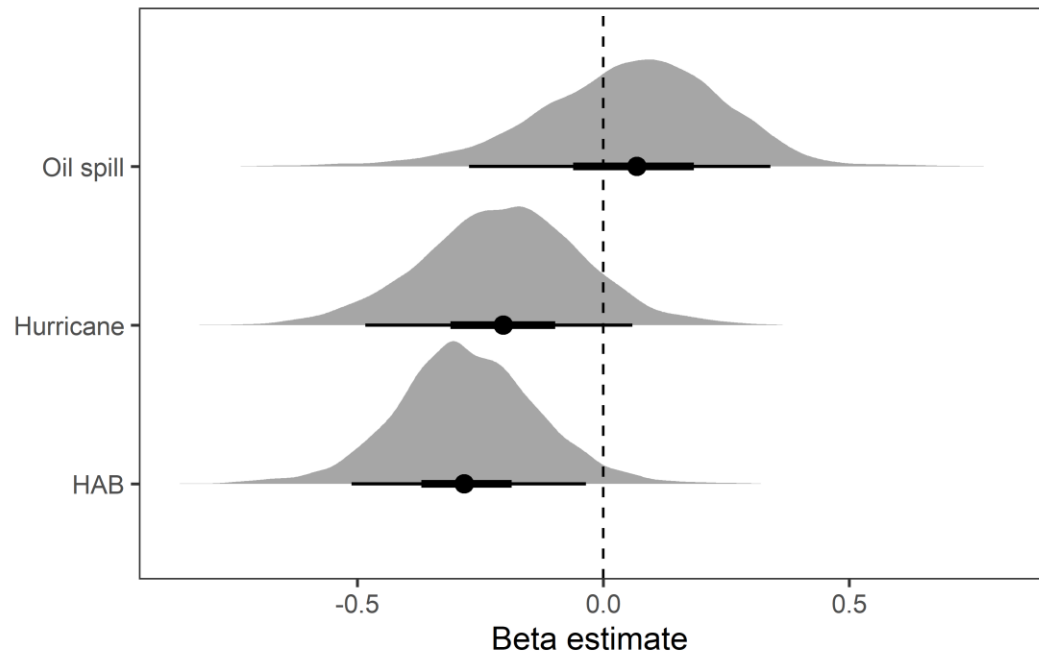
Are individuals from separate breeding areas mixing during the nonbreeding season?

Ellis, K.S., Anteau, M.J., Cuthbert, F.J., Gratto-Trevor, C.L., Jorgensen, J.G., Newstead, D.J., Powell, L.A., Ring, M.M., Sherfy, M.H., Swift, R.J., Toy, D.L., and Koons, D.N. 2021. Impacts of extreme environmental disturbances on piping plover survival are partially moderated by migratory connectivity. *Biological Conservation*, 264, 109371.





# Seasonal survival of interior piping plovers



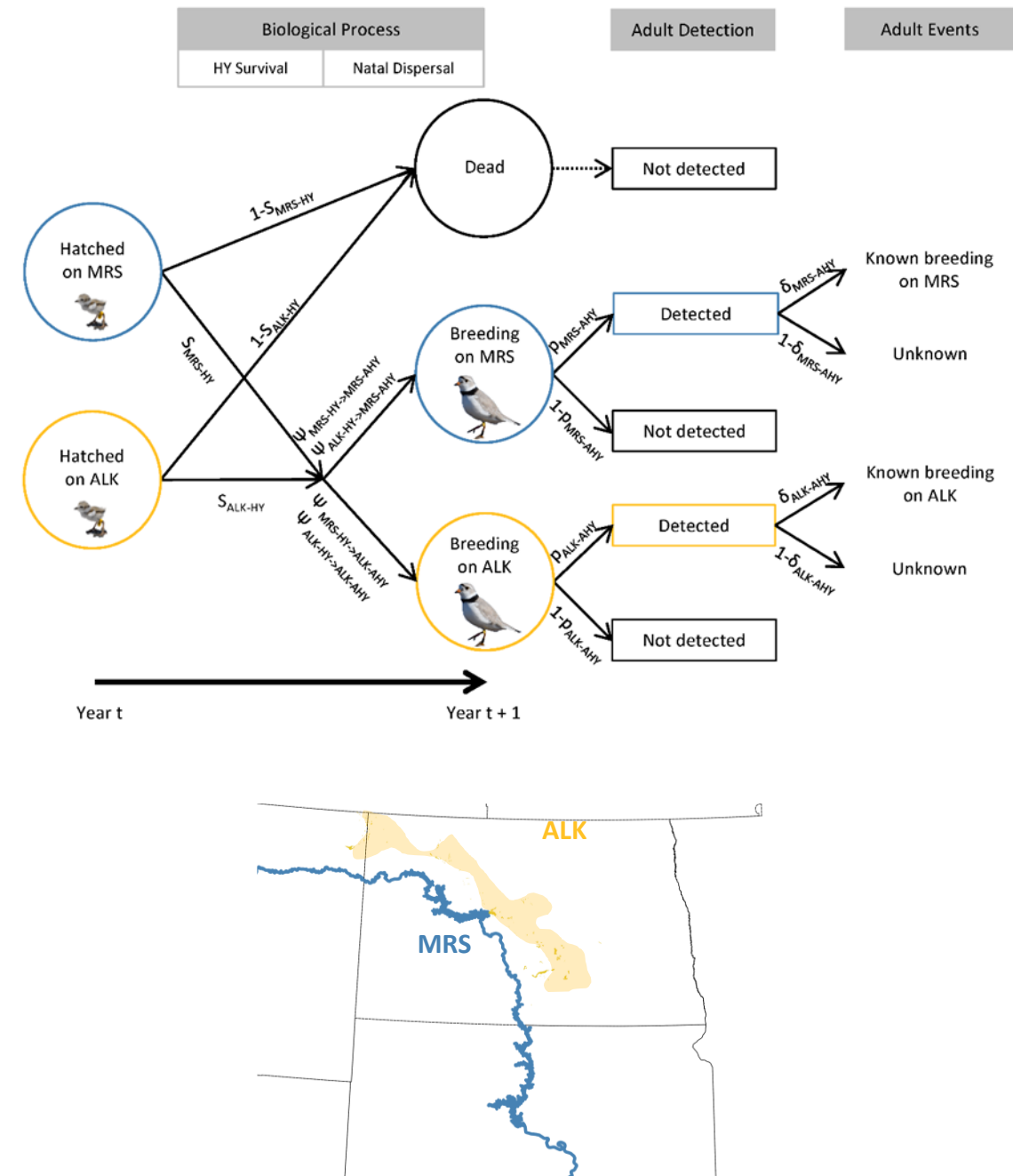
Migratory connectivity among breeding regions in the nonbreeding season was low, potentially providing a buffering effect against extreme events.

# Natal survival and dispersal

How do intrinsic and extrinsic factors influence hatch-year survival and natal dispersal probabilities?

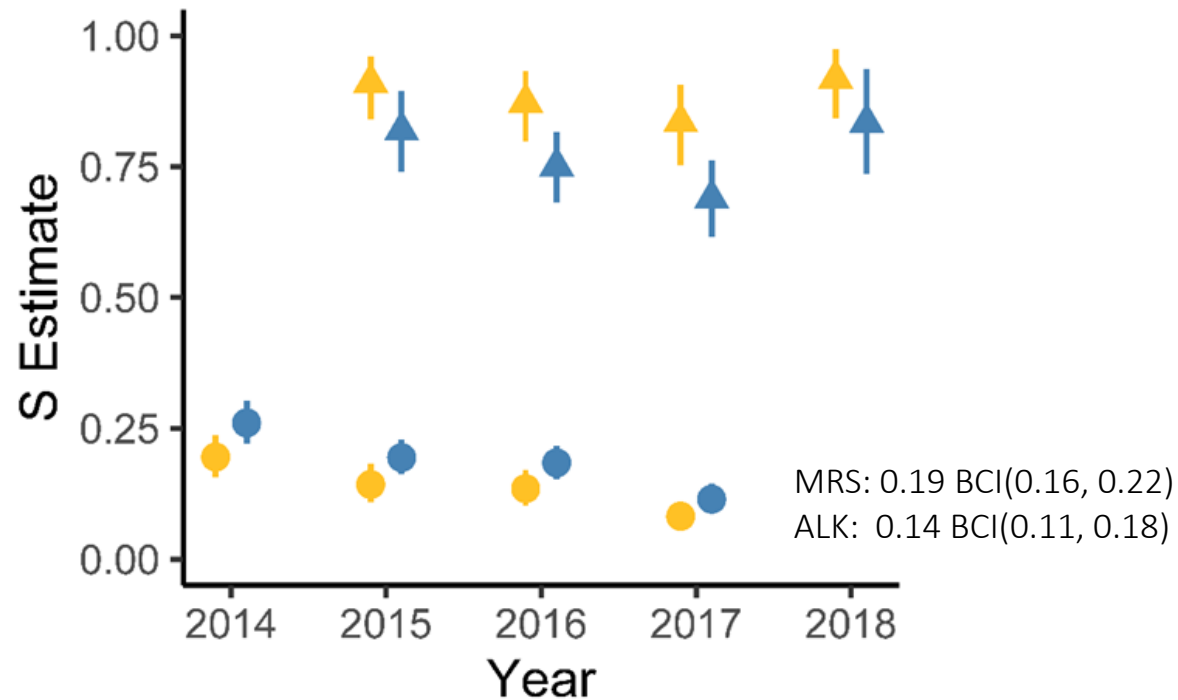
Implications for recruitment within Northern Rivers and U.S. Alkali Wetlands.

Swift, R.J., Anteau, M.J., Ellis, K.S., Ring, M.M., Sherfy, M.H., Toy, D.L., and Koons, D.N. Implications of habitat-driven survival and dispersal on recruitment in a spatially structured piping plover population. *In review*.

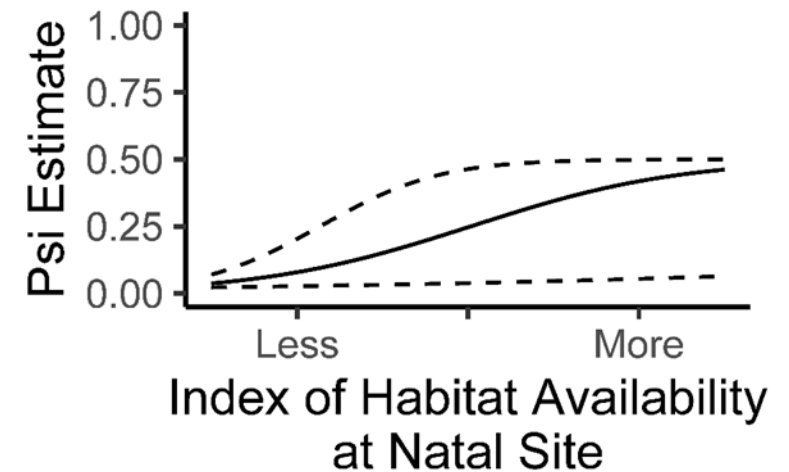
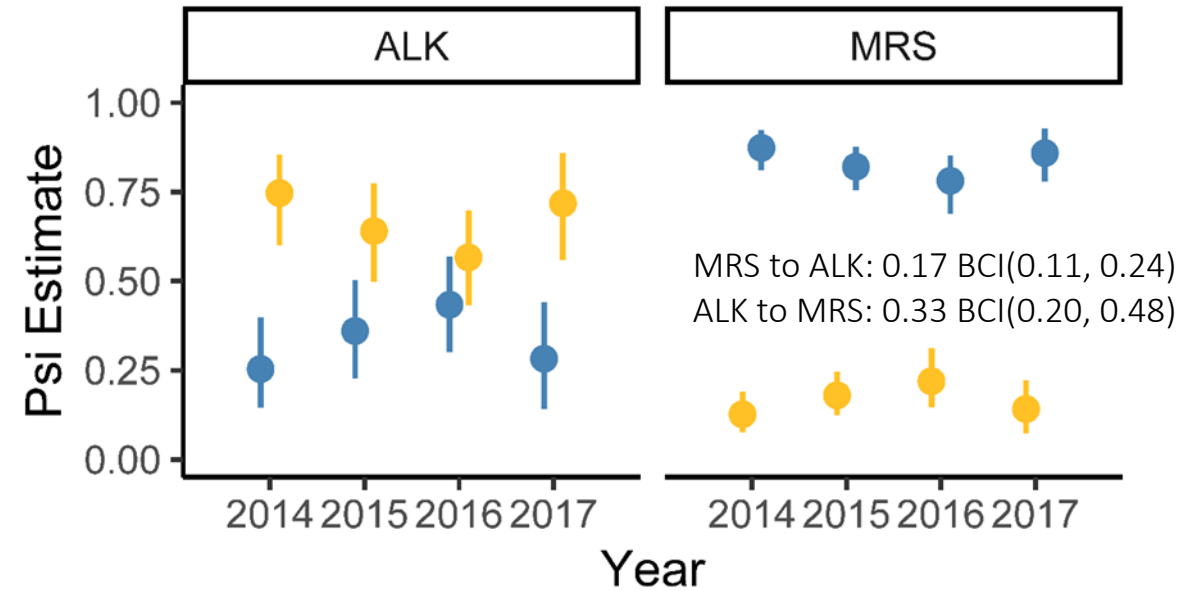




# Natal survival and dispersal



▲ ALK-AHY ▲ MRS-AHY  
● ALK-HY ● MRS-HY



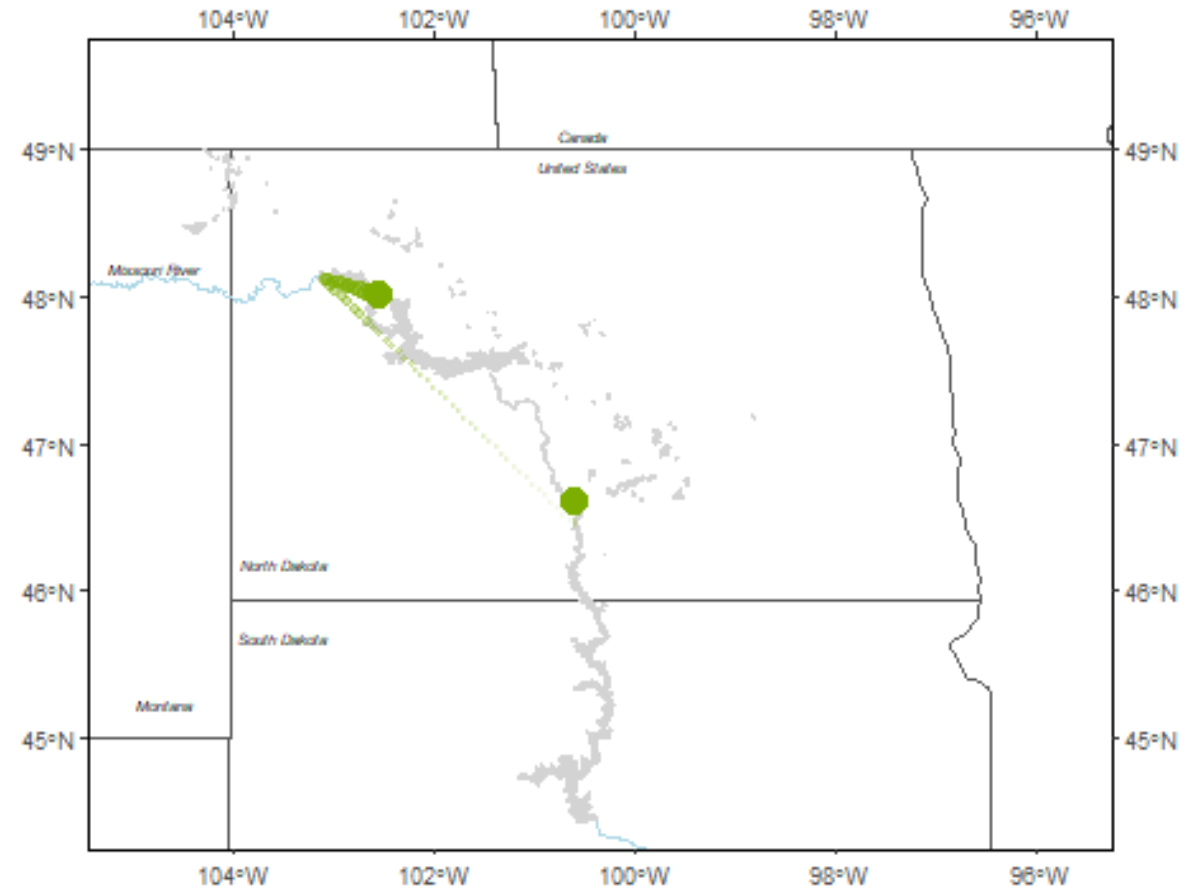
When more habitat was available than in the year prior at the natal site, individuals were slightly more likely to survive and were more likely to disperse.

# Adult annual survival

How do habitat, reproductive success, and individual characteristics affect survival?

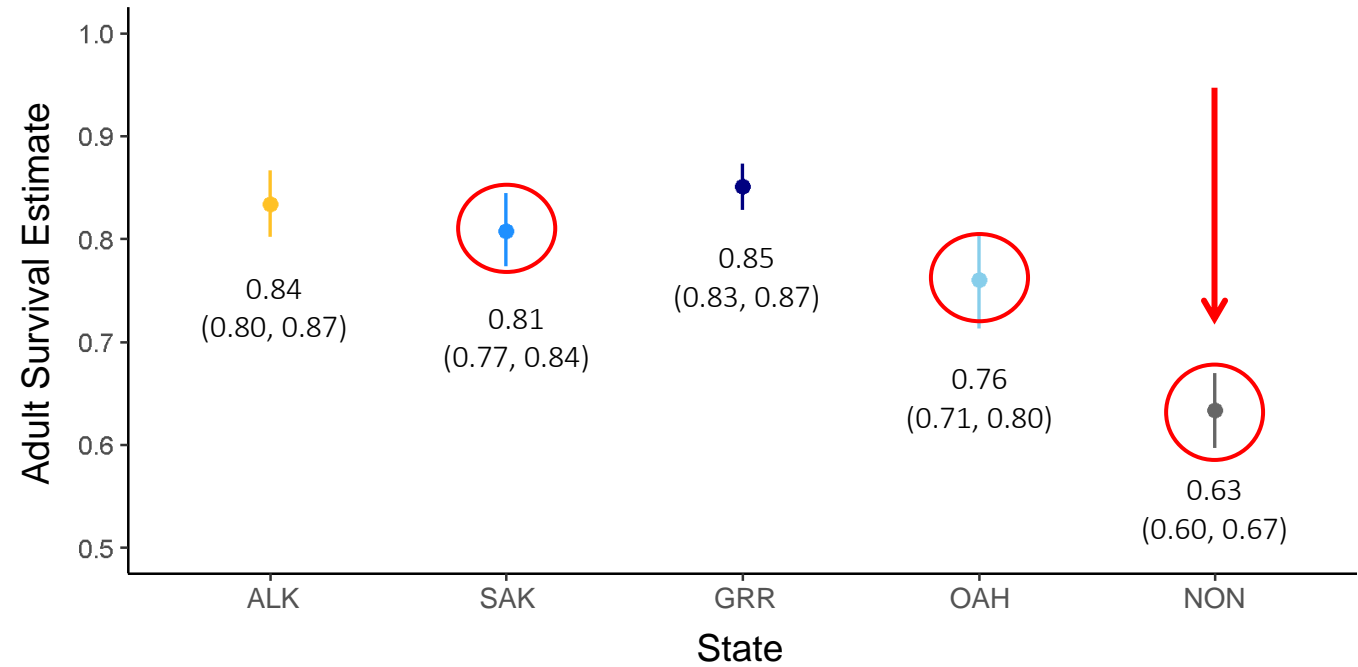
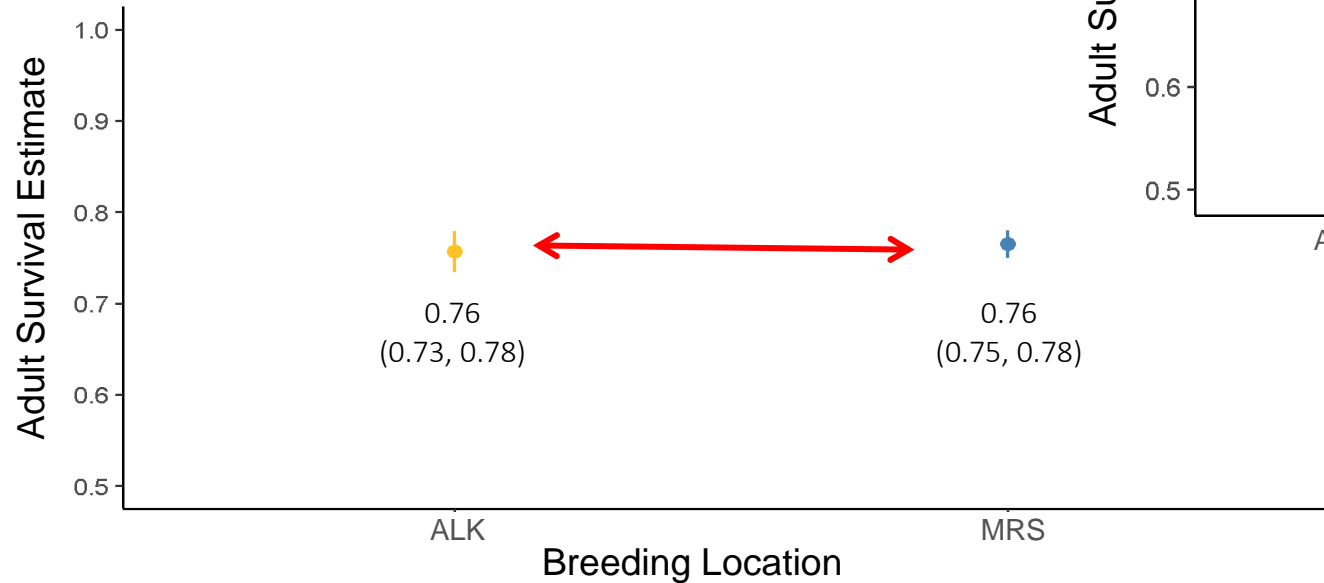
What is the effect of incorporating transient individuals?

Swift, R.J., Anteau, M.J., Ellis, K.S., Ring, M.M., Sherfy, M.H., Toy, D.L. and Koons, D.N., 2021. Spatial variation in population dynamics of northern Great Plains piping plovers. US Geological Survey 2020-1152.





# Adult annual survival



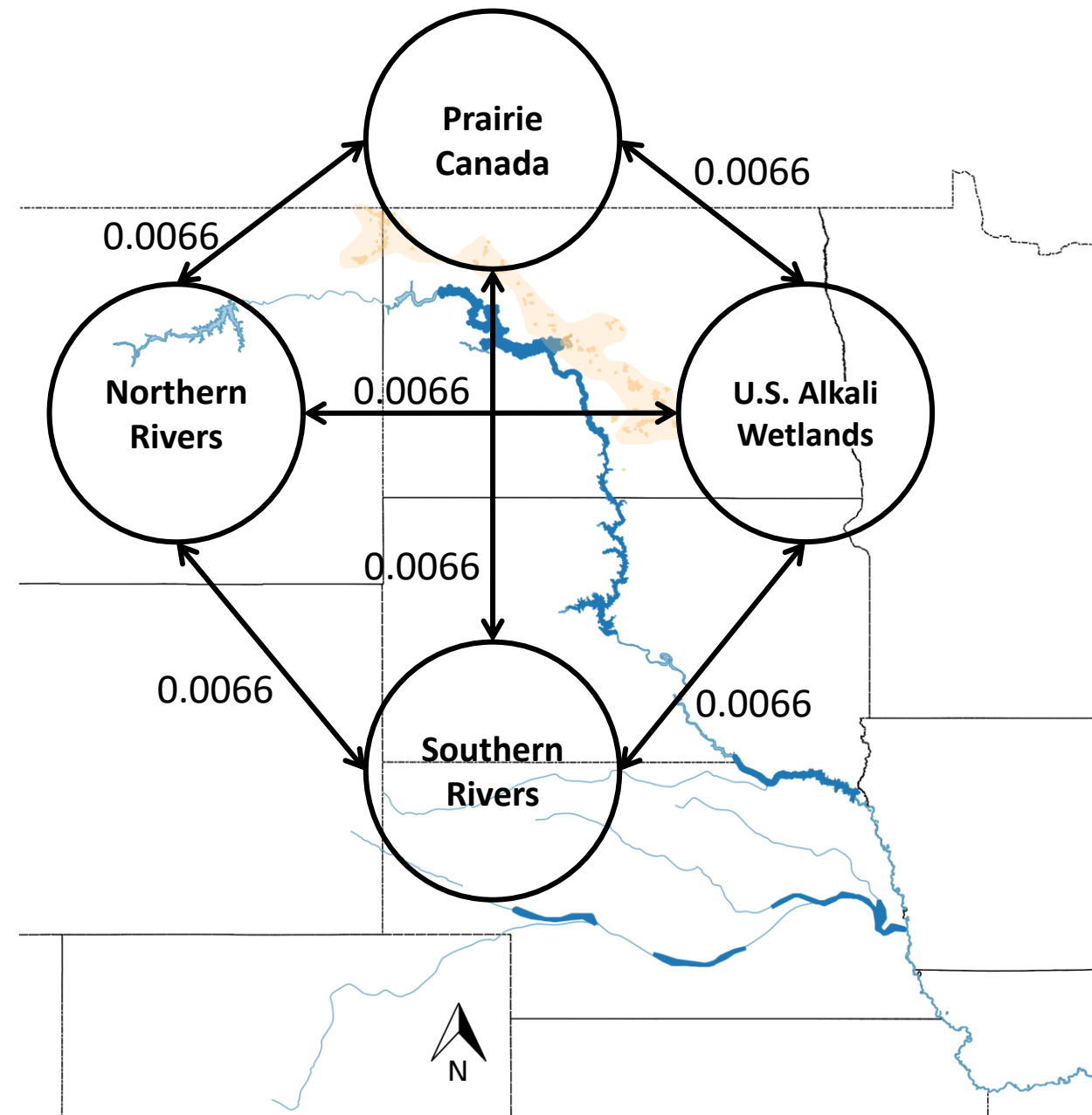
Our understanding of transients and breeding propensity may have important effects on vital rate estimation.

# Adult dispersal probabilities

How do habitat, reproductive success, and individual characteristics affect dispersal?

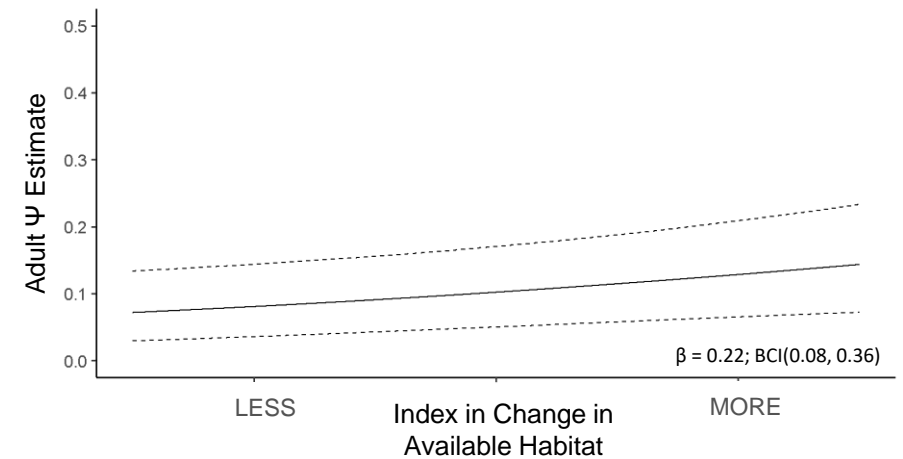
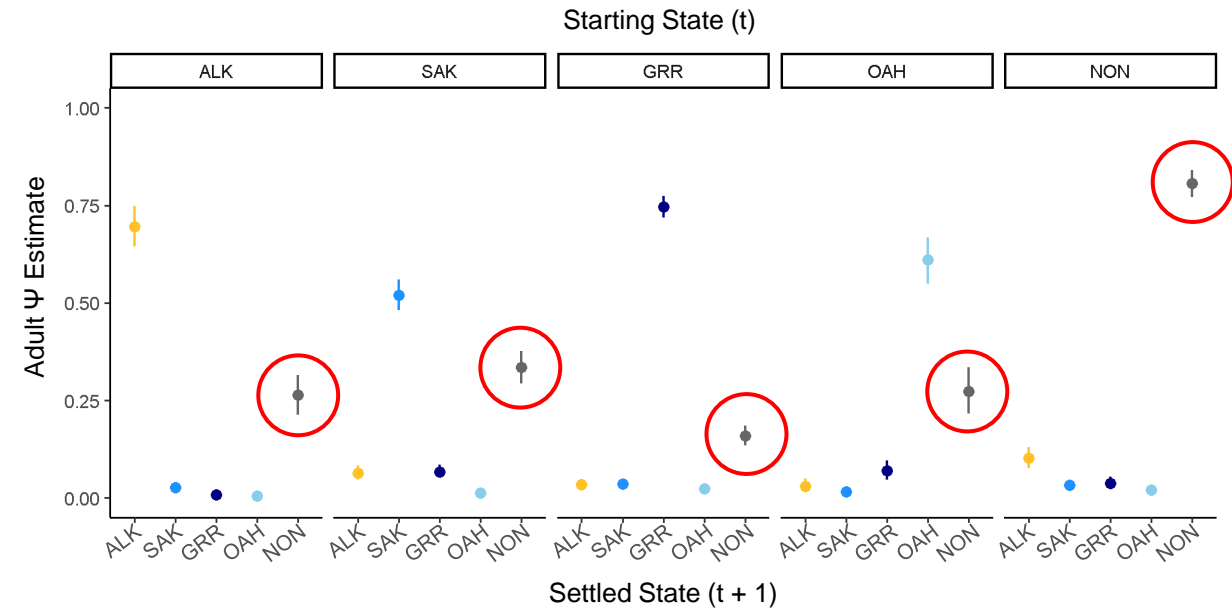
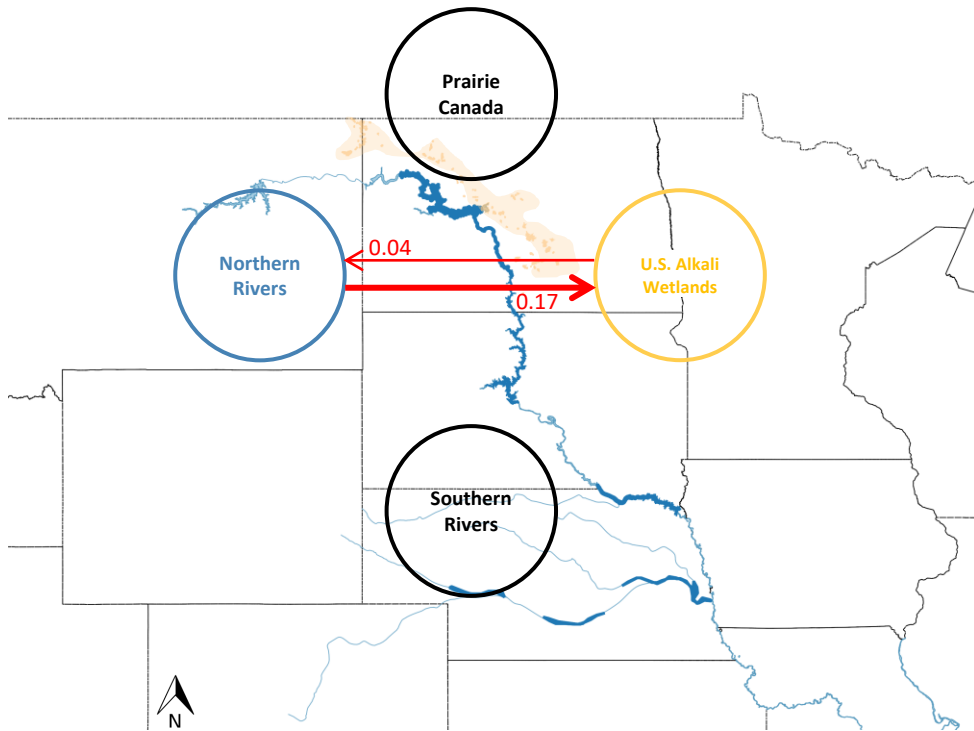
Provide empirical estimates and compare to McGowan et al. 2014 assumptions.

Swift, R.J., Anteau, M.J., Ellis, K.S., Ring, M.M., Sherfy, M.H., Toy, D.L. and Koons, D.N., 2021. Spatial variation in population dynamics of northern Great Plains piping plovers. US Geological Survey 2020-1152.





# Adult dispersal probabilities



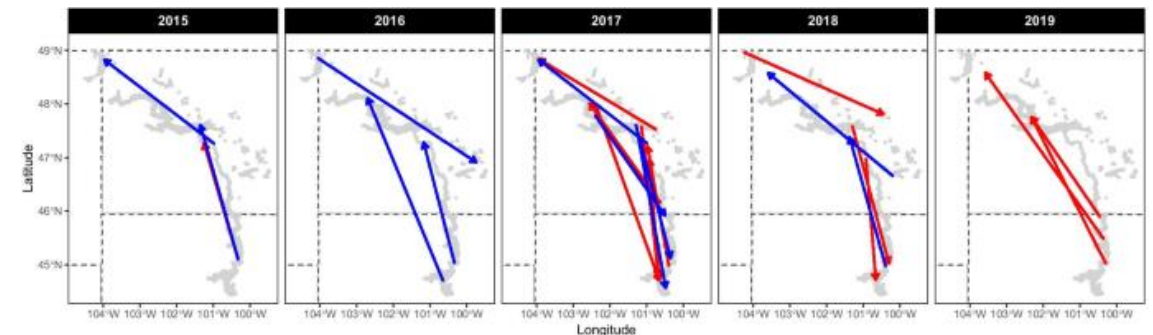
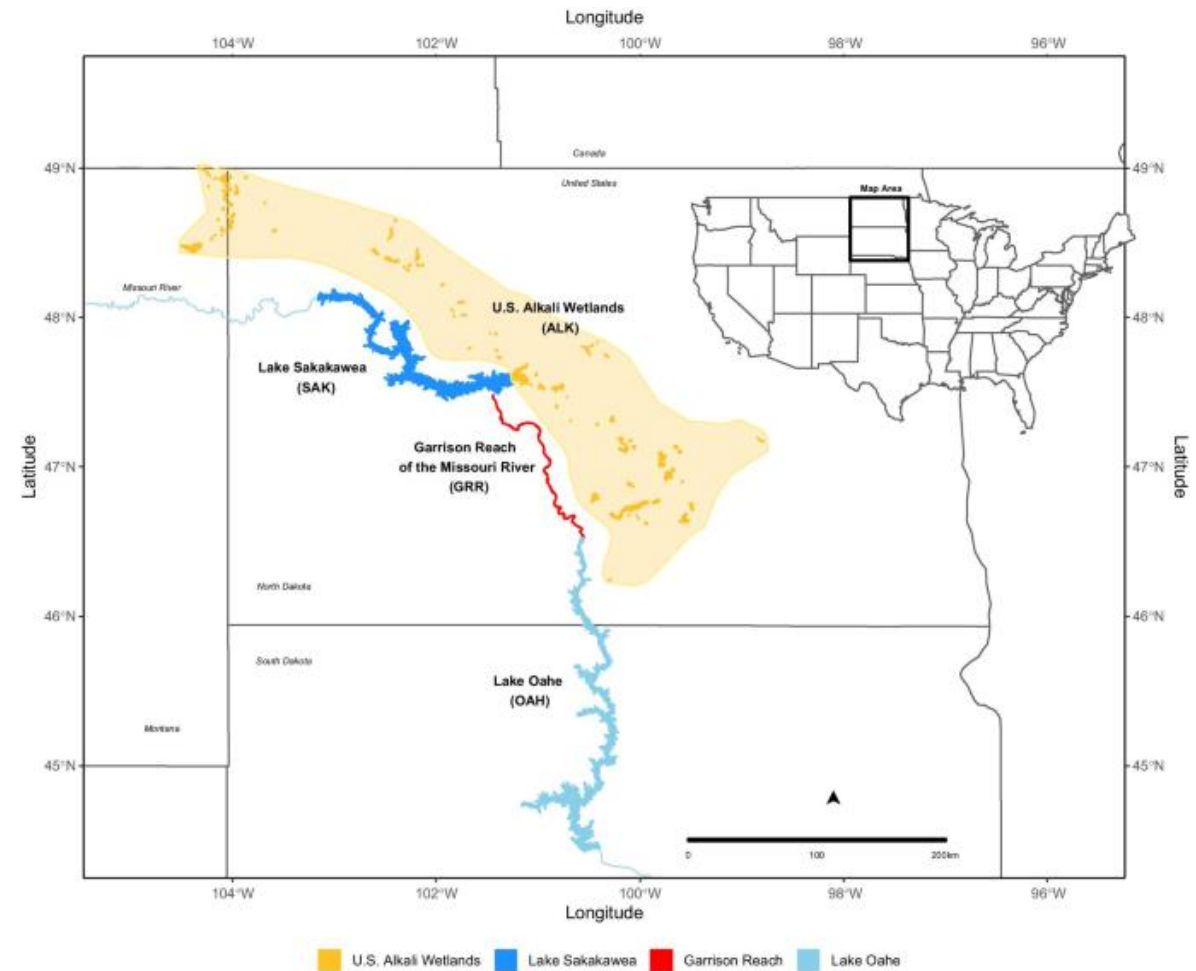
Connectivity among regions was higher than previously assumed with adults commonly moving to breed on the U.S. Alkali Wetlands.

# Variation in dispersal distances

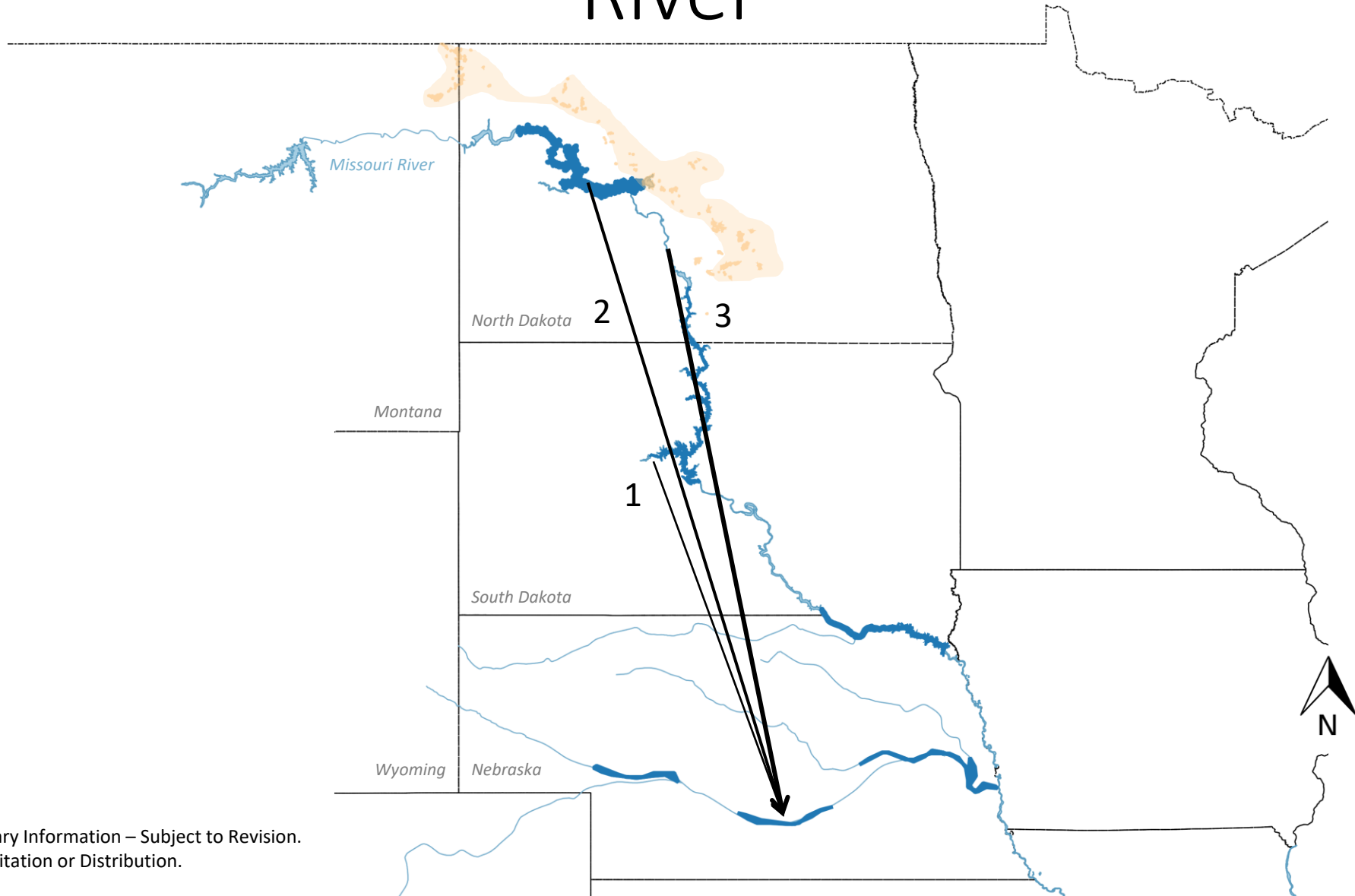
Do habitat availability, local conspecific density, or reproductive success affect interannual adult breeding dispersal distances?

Do habitat availability, local conspecific density, or hatch date affect interannual natal dispersal distances?

Swift, R.J., Anteau, M.J., Ellis, K.S., Ring, M.M., Sherfy, M.H. and Toy, D.L., 2021. Dispersal distance is driven by habitat availability and reproductive success in Northern Great Plains piping plovers. *Movement Ecology* 9:1-14.

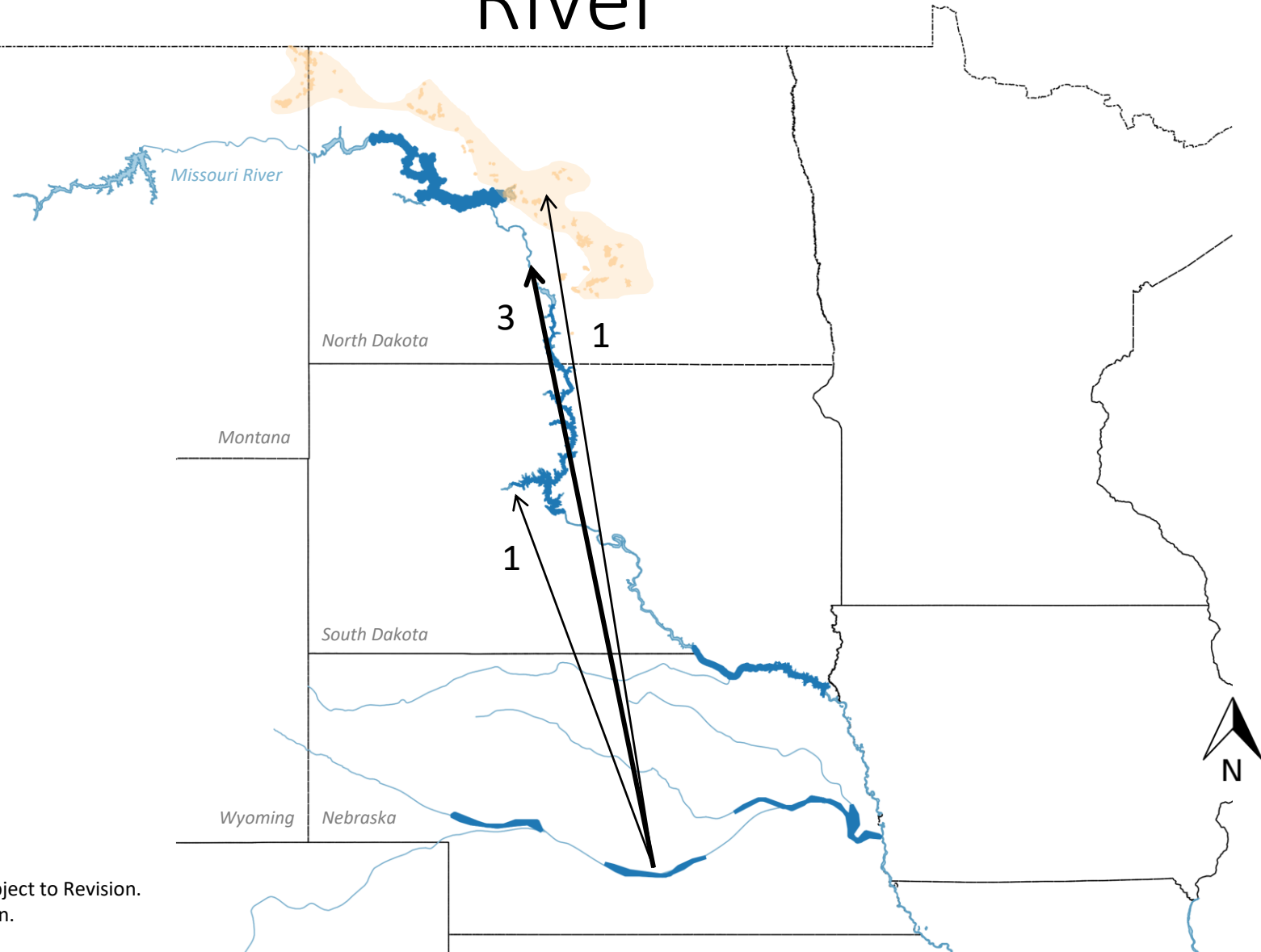


# 6 individuals **emigrated** to the central Platte River





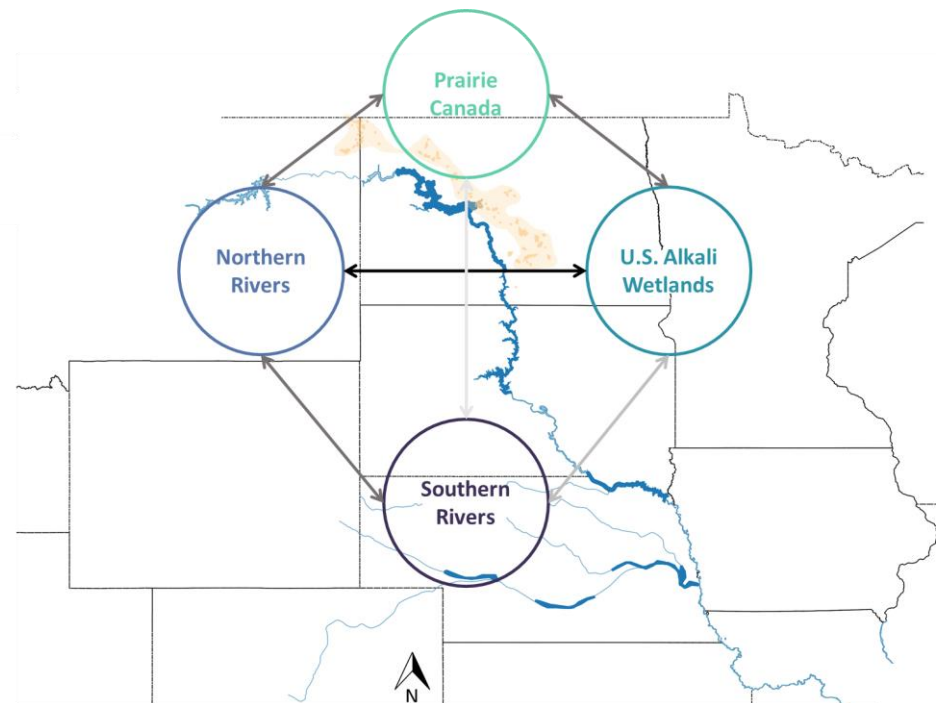
# 5 individuals immigrated from the central Platte River



# Population viability assessment for Northern Great Plains

Update McGowan et al. 2014 PVA with the current state of knowledge for survival, fecundity, and connectivity.

How does increased connectivity affect population viability?



Biological Conservation 177 (2014) 220–229



Contents lists available at [ScienceDirect](#)

Biological Conservation

journal homepage: [www.elsevier.com/locate/biocon](http://www.elsevier.com/locate/biocon)



Establishing endangered species recovery criteria using predictive simulation modeling



Conor P. McGowan<sup>a,\*</sup>, Daniel H. Catlin<sup>b</sup>, Terry L. Shaffer<sup>c</sup>, Cheri L. Gratto-Trevor<sup>d</sup>, Carol Aron<sup>e</sup>

<sup>a</sup> U.S. Geological Survey, Alabama Cooperative Fish and Wildlife Research Unit, Auburn University, Auburn, AL 36849, United States

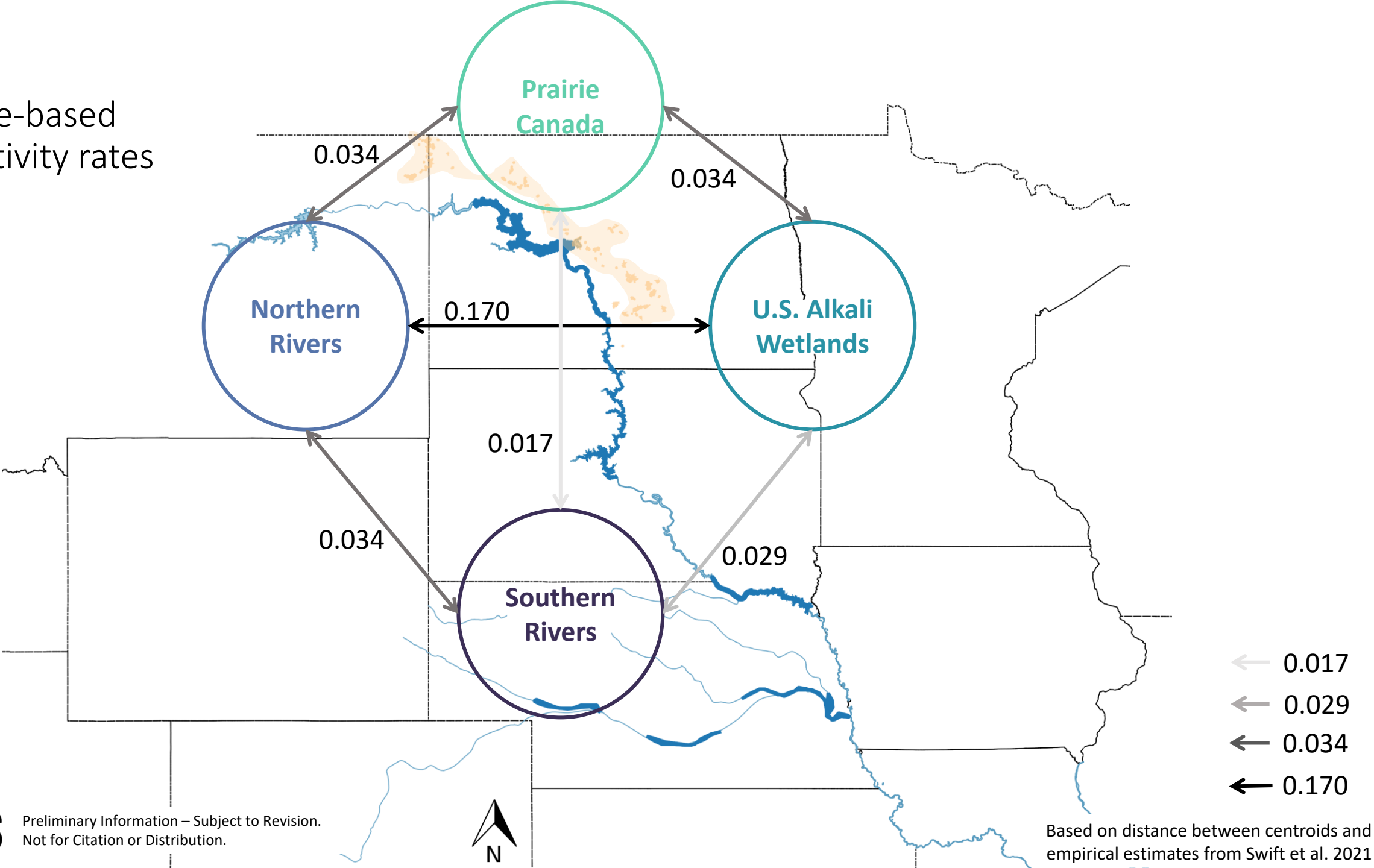
<sup>b</sup> Department of Fish and Wildlife Conservation, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061, United States

<sup>c</sup> U.S. Geological Survey, Northern Prairie Wildlife Research Center, Jamestown, ND 58401, United States

<sup>d</sup> Environment Canada, Prairie and Northern Wildlife Research Centre, Saskatoon, SK, Canada

<sup>e</sup> U.S. Fish and Wildlife Service, North Dakota Field Office, Bismarck, ND 58501, United States

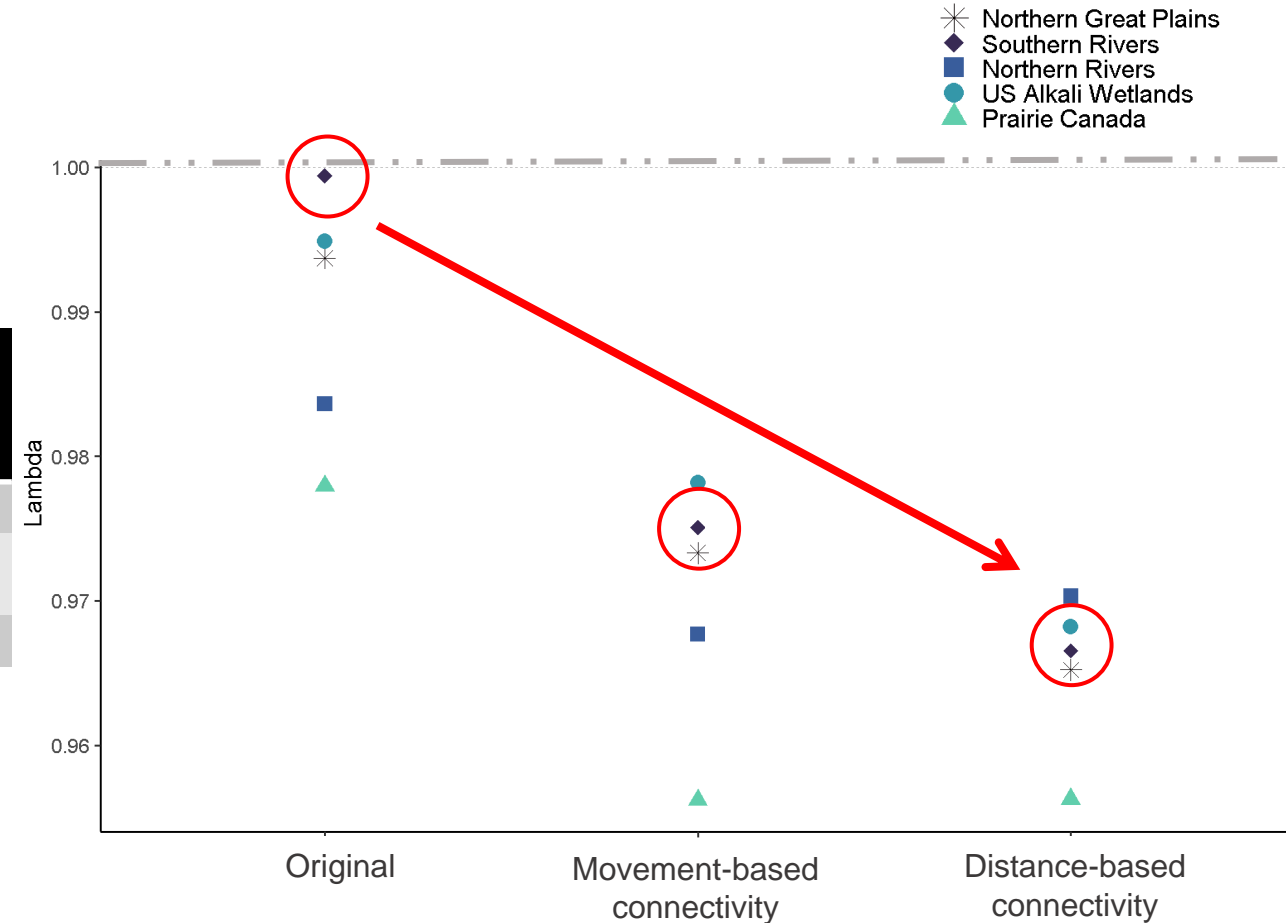
Distance-based  
connectivity rates





# Population viability assessment for Northern Great Plains

Simulation	Overall Extinction Probability	Overall Rate of Population Growth	Median Abundance after 50 years
Original	0.054	0.994	9,503
Movement-based connectivity rates	0.164	0.973	6,468
Distance-based connectivity rates	0.217	0.965	3,922



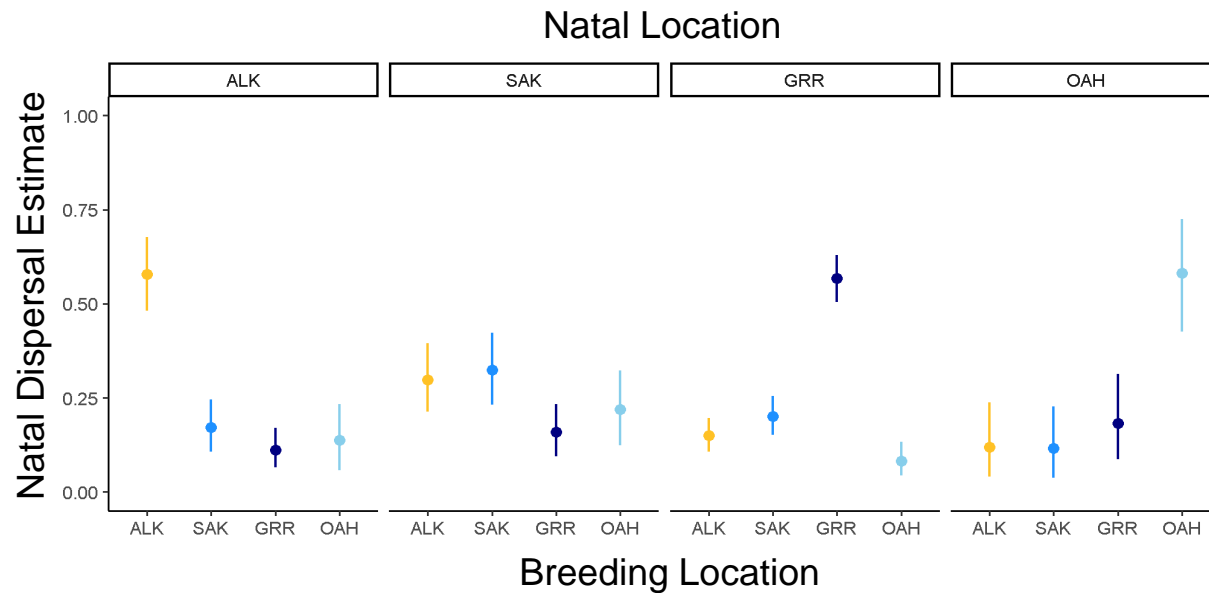
Both scenarios with increased rates of connectivity increased extinction probability for the entire Northern Great Plains Piping Plover population.

# Questions?



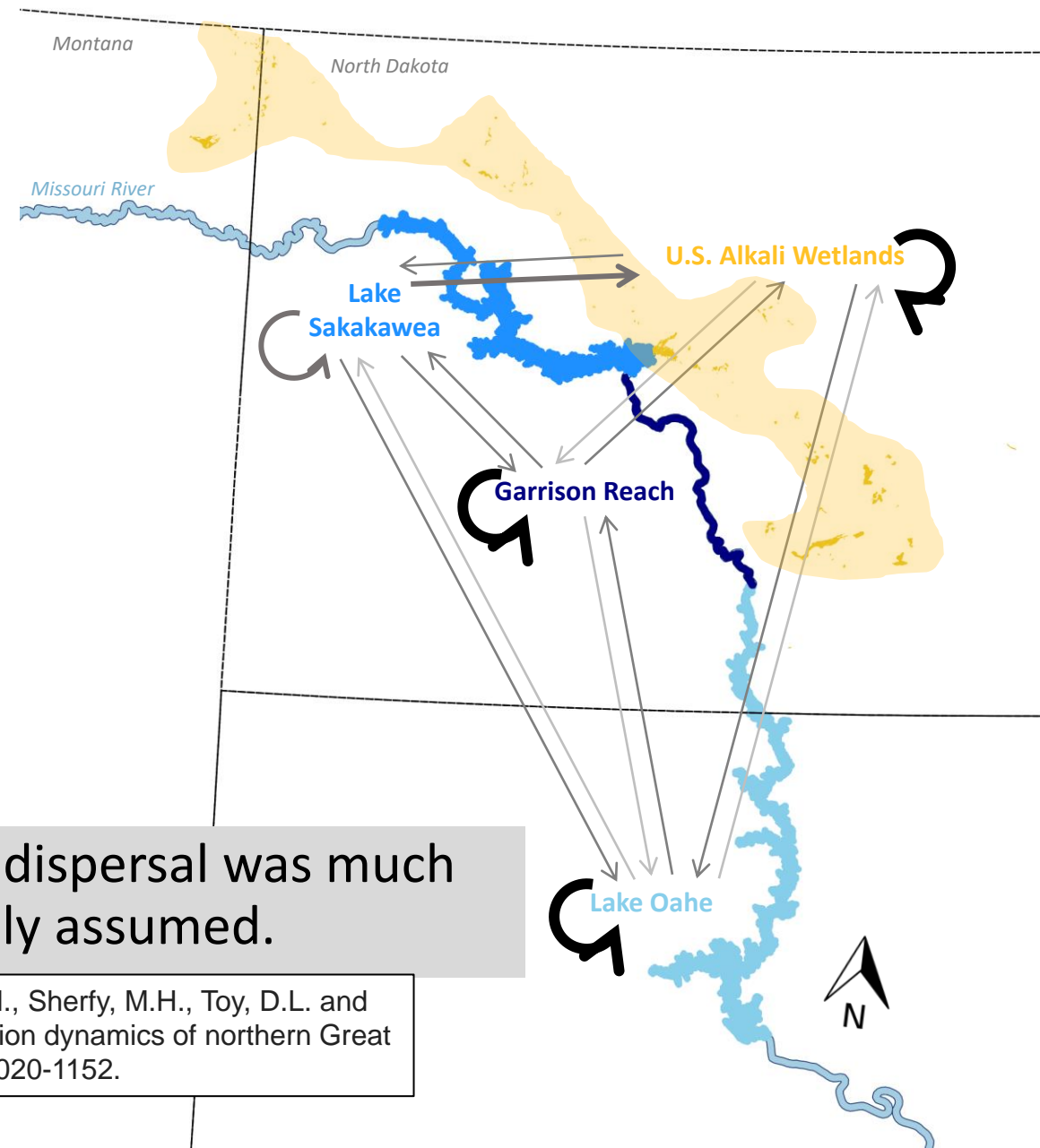
[rswift@usgs.gov](mailto:rswift@usgs.gov)

# Natal dispersal between management units



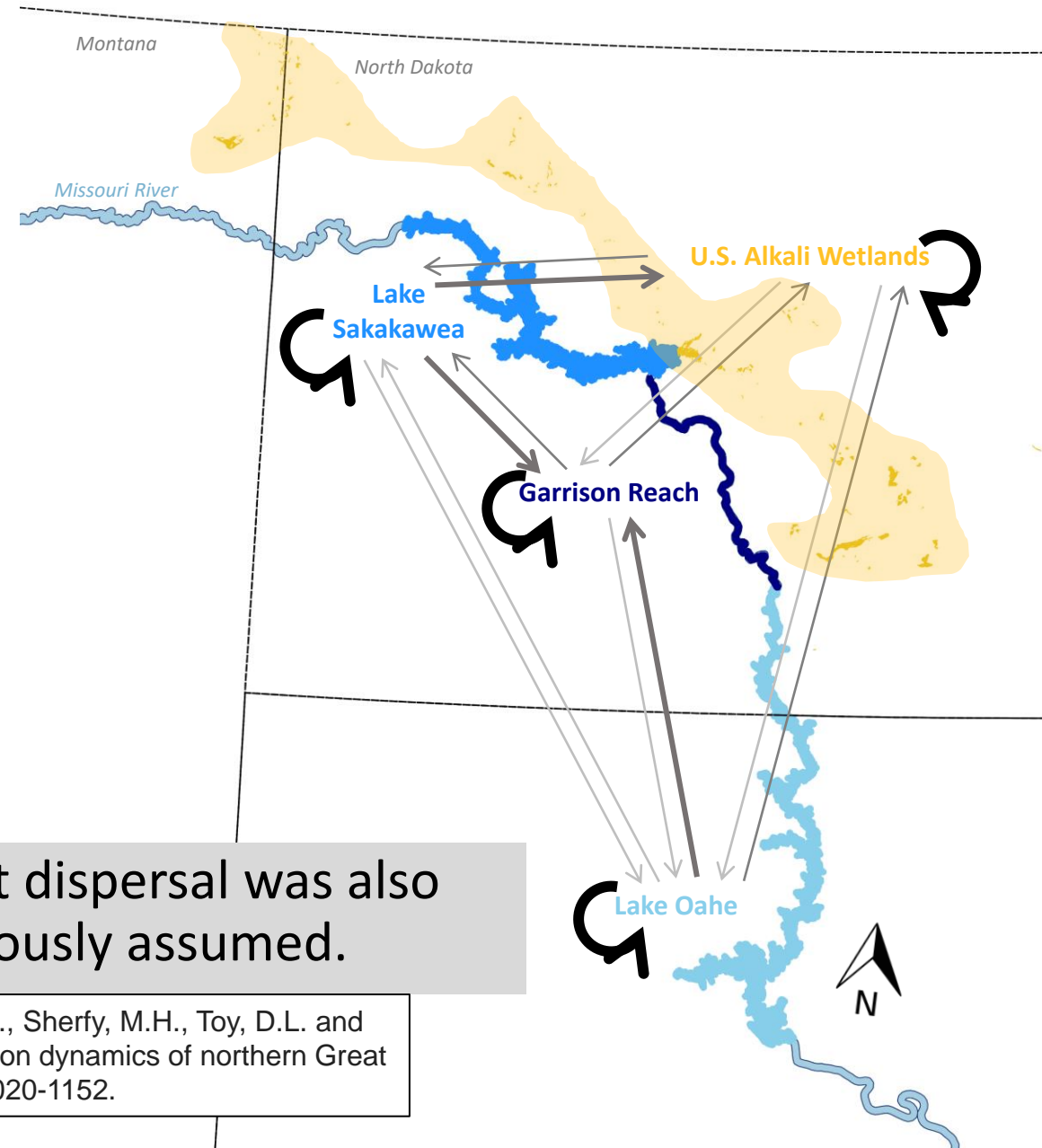
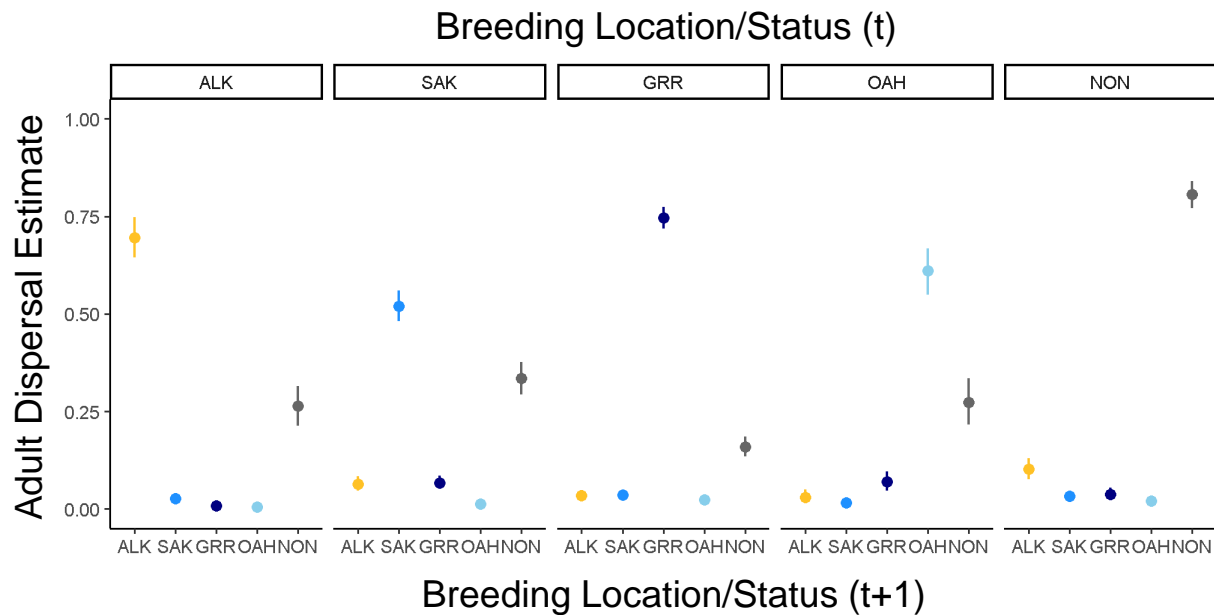
Within our study area, natal dispersal was much higher than previously assumed.

Swift, R.J., Anteau, M.J., Ellis, K.S., Ring, M.M., Sherfy, M.H., Toy, D.L. and Koons, D.N., 2021. Spatial variation in population dynamics of northern Great Plains piping plovers. US Geological Survey 2020-1152.





# Adult dispersal between management units



Within our study area, adult dispersal was also much higher than previously assumed.

Swift, R.J., Anteau, M.J., Ellis, K.S., Ring, M.M., Sherfy, M.H., Toy, D.L. and Koons, D.N., 2021. Spatial variation in population dynamics of northern Great Plains piping plovers. US Geological Survey 2020-1152.