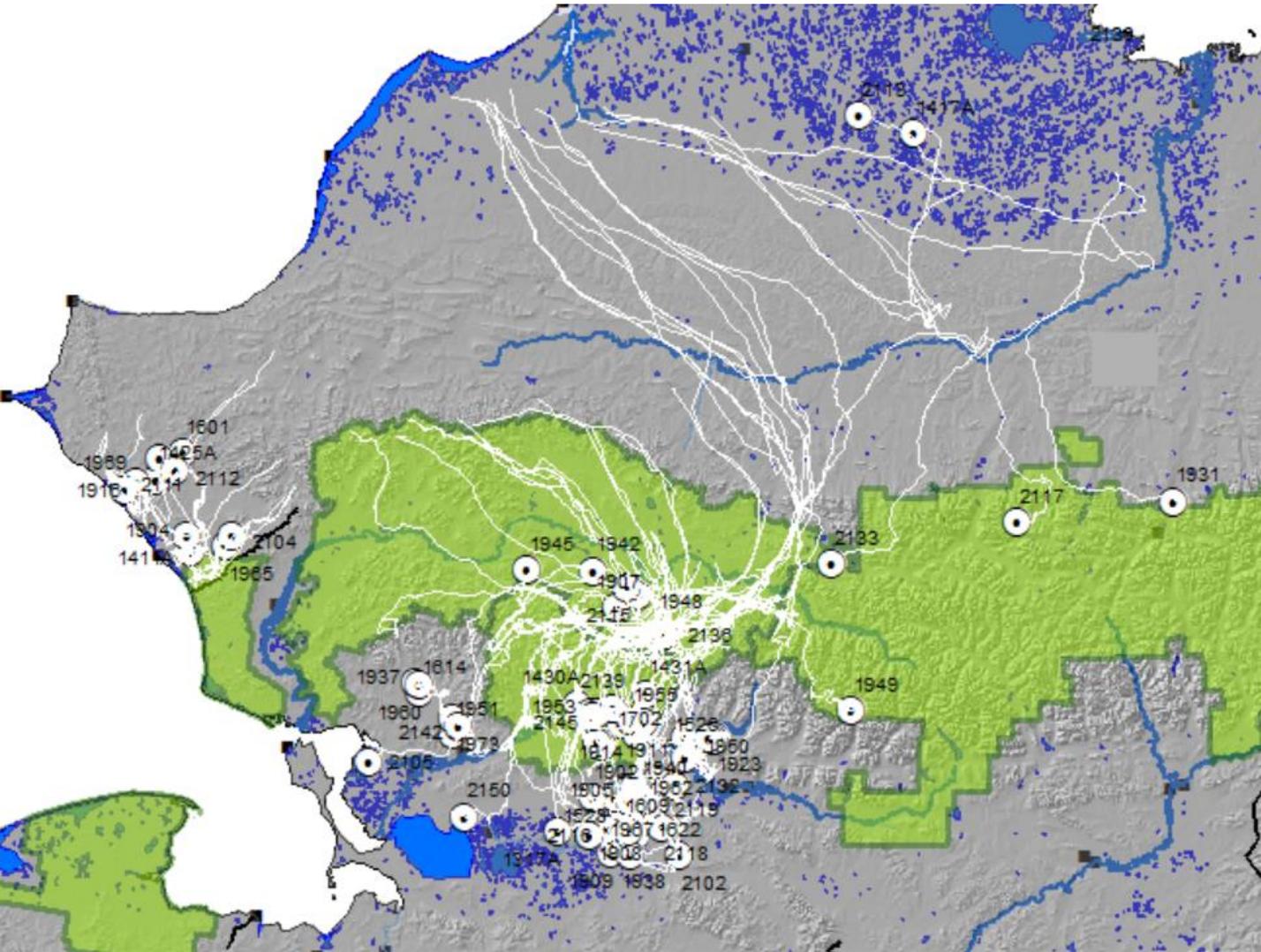




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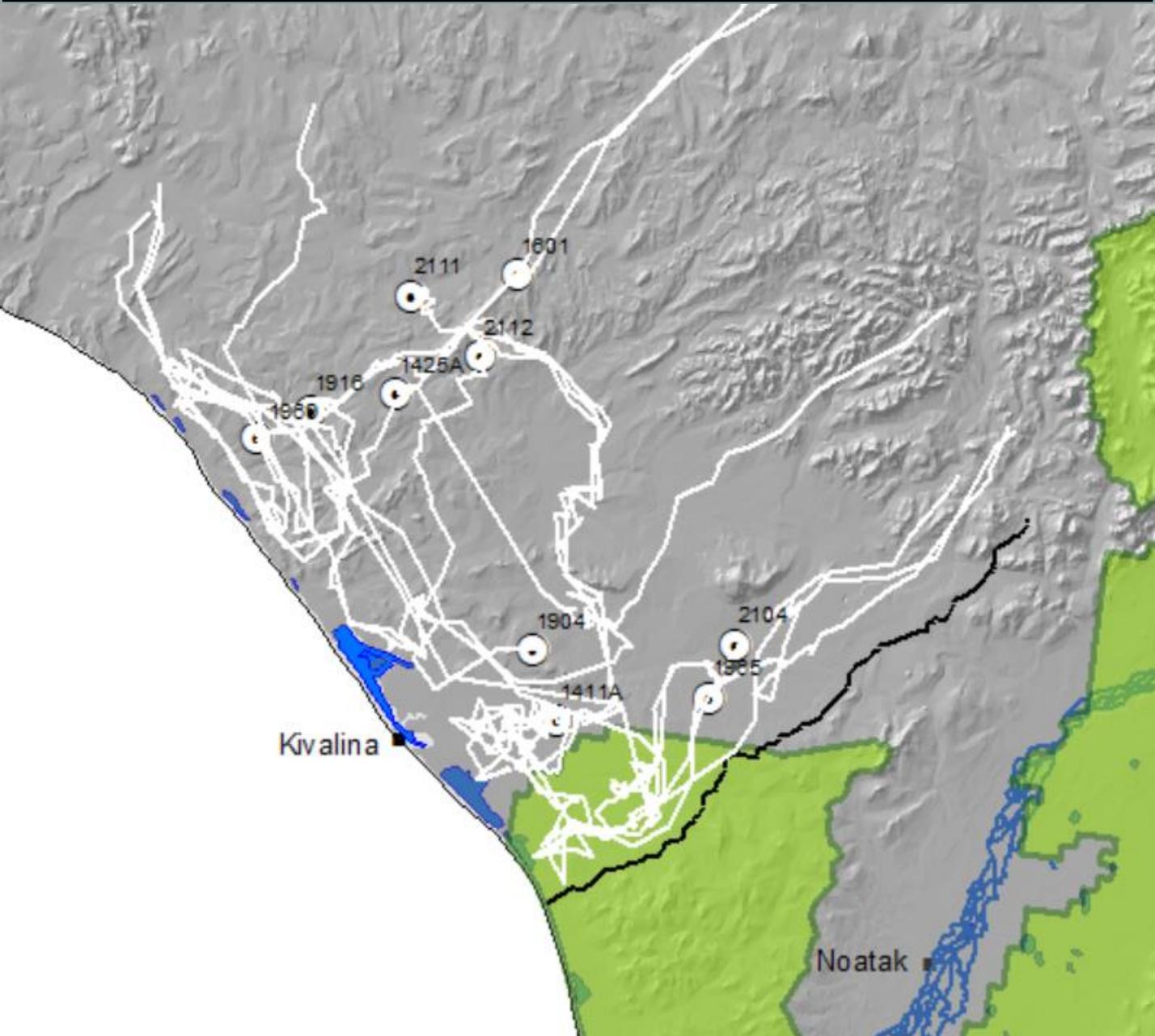
October GPS Locations



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Movements Near the Red Dog Road



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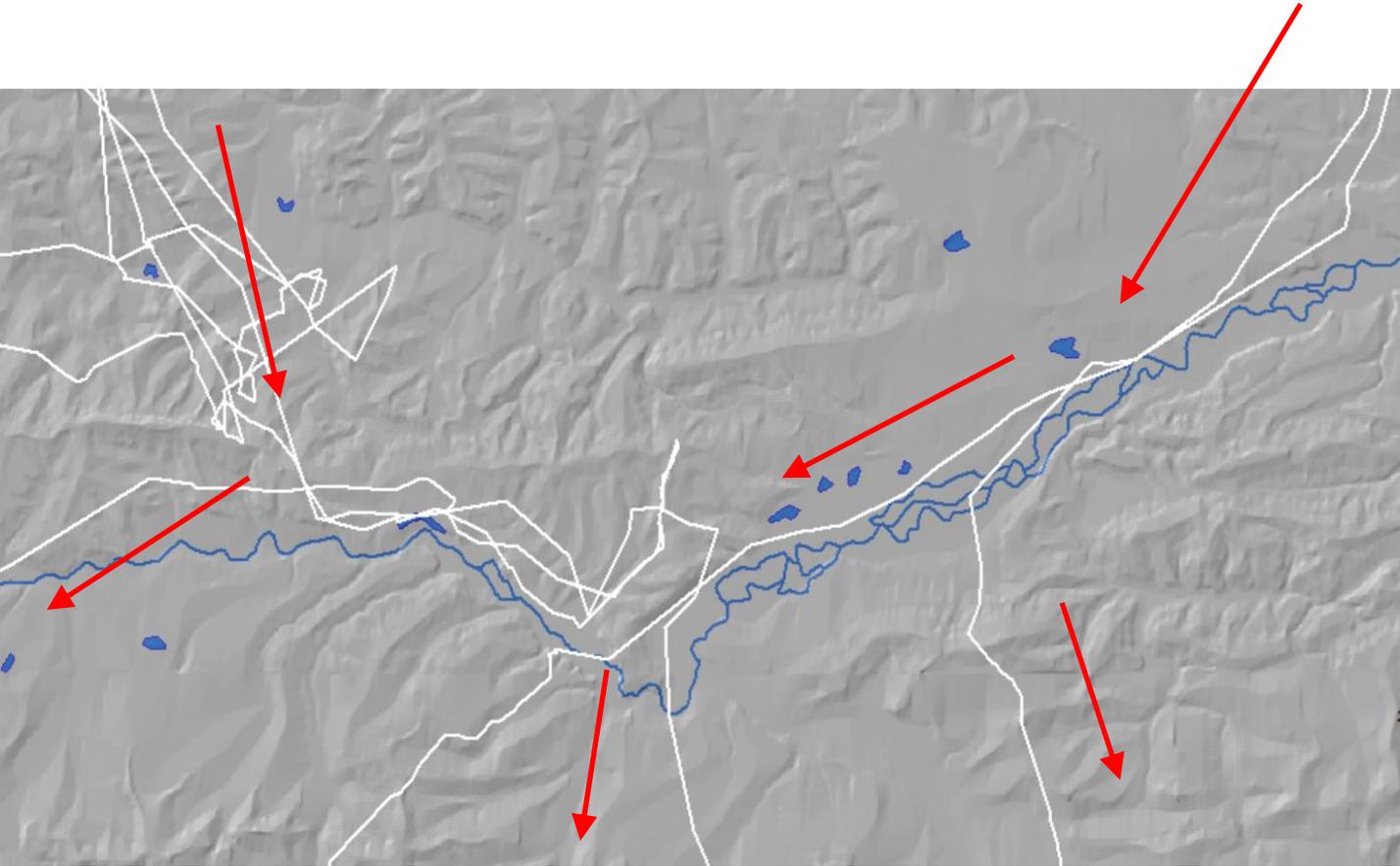
Movements Near Kiana



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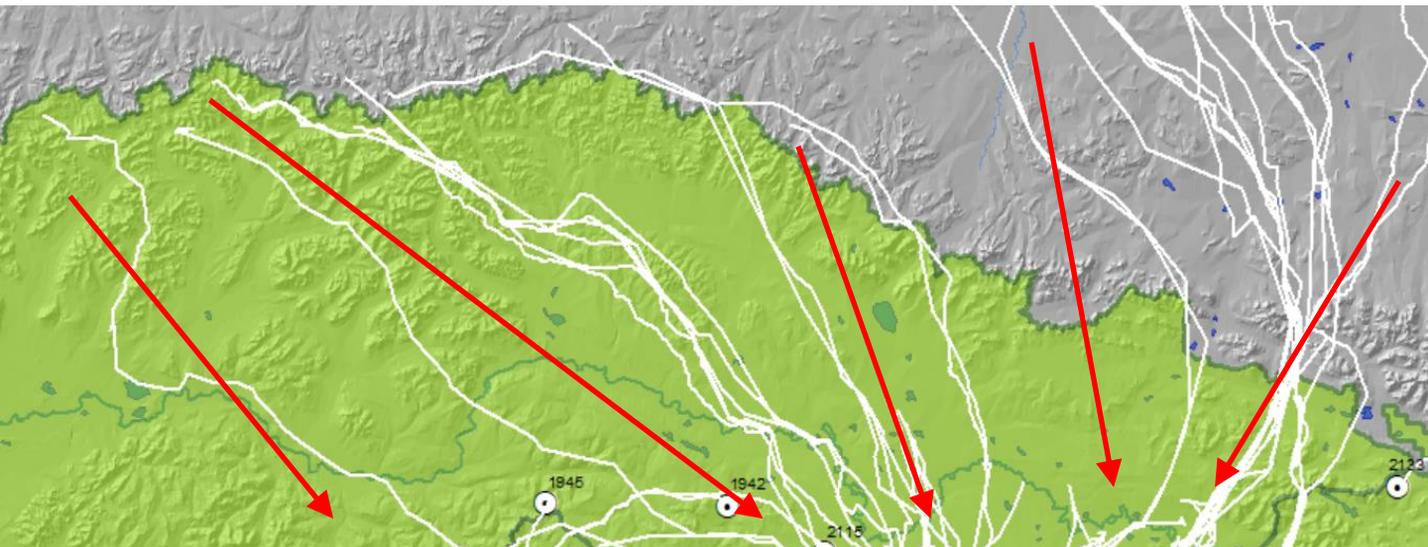
Movements Near the Colville River



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Movements Through Noatak National Preserve



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WAH Collar Results Sep 2020 – Aug 2021



- **48 GPS Collars deployed**
 - all netting, Apr 2021
 - None at OP 2020, 2021
- **Overwinter Park Usage**
 - 0 % in BELA
 - 71 % in GAAR
- **Distance traveled**
 - Mean = 1691 miles
 - Higher than last year, but still low
- **Fall Park Usage**
 - Mixed

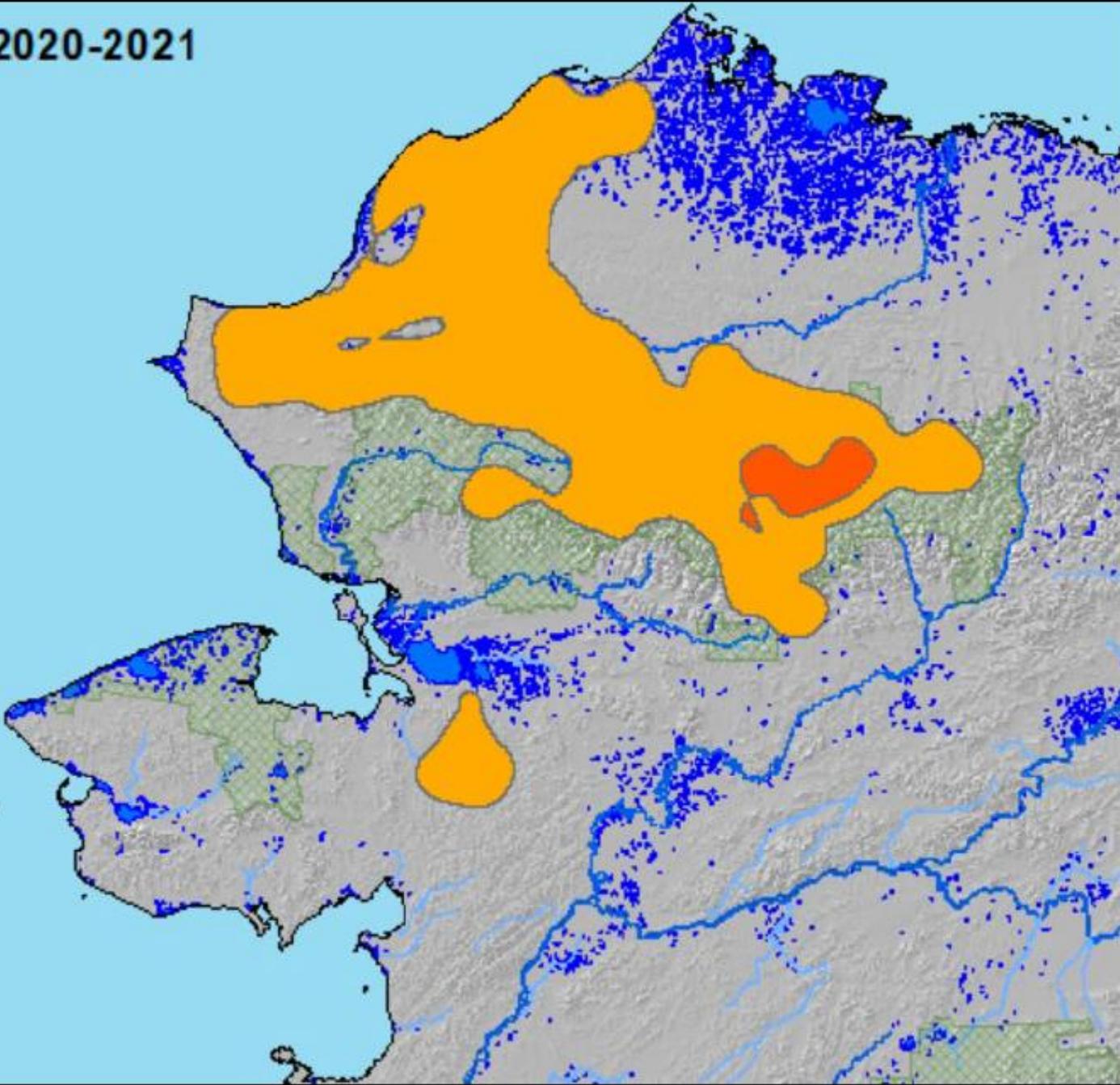


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December 2021

2020-2021



Annual Range - Sep 2020 –Aug 2021

Slide 7

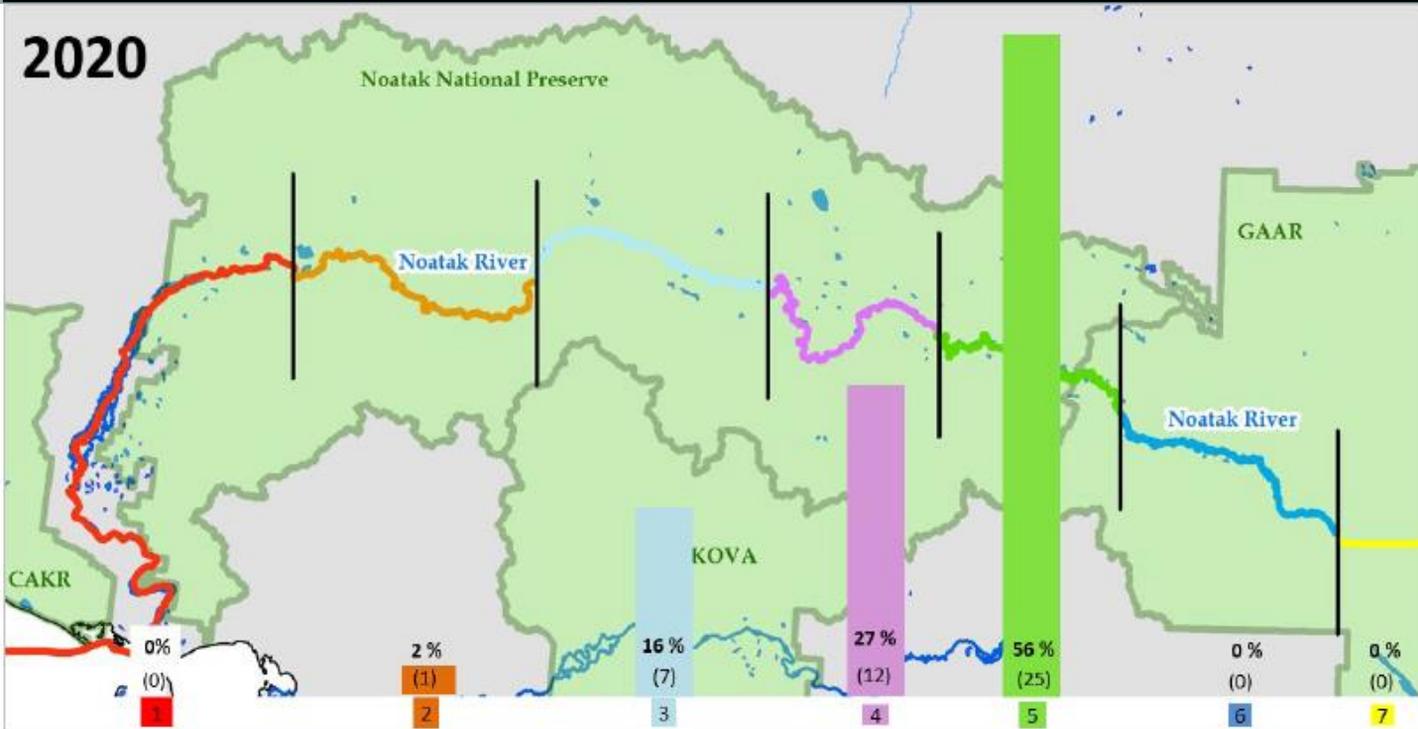


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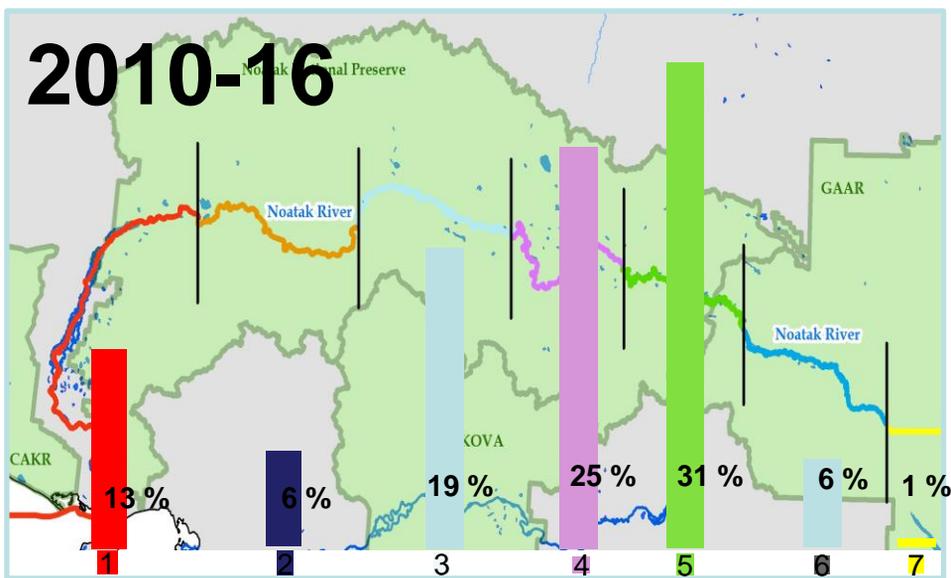
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2020



2010-16



DISTRIBUTION OF CARIBOU CROSSING THE NOATAK RIVER

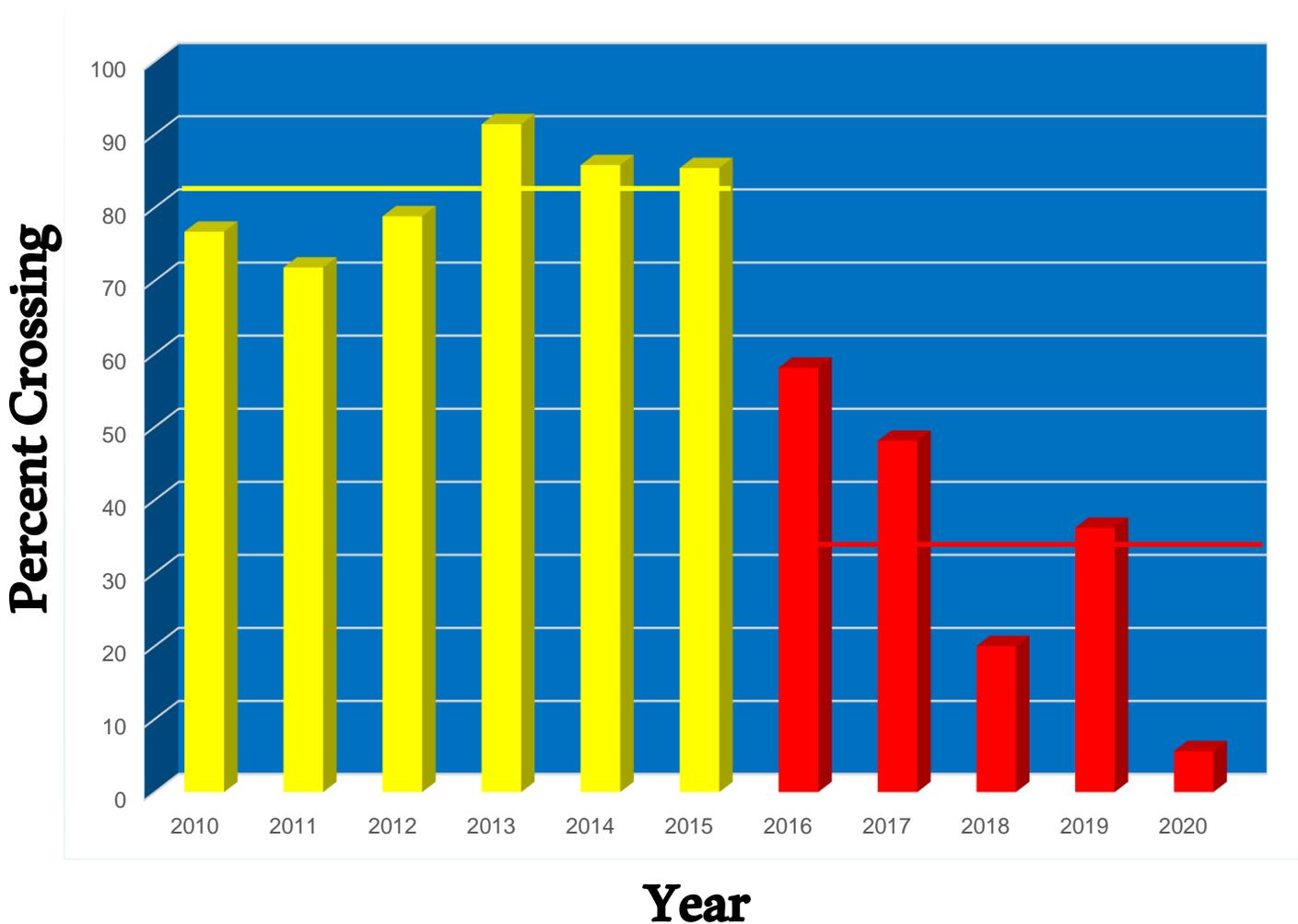
Slide 8



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Fall Migration - Kobuk Crossing

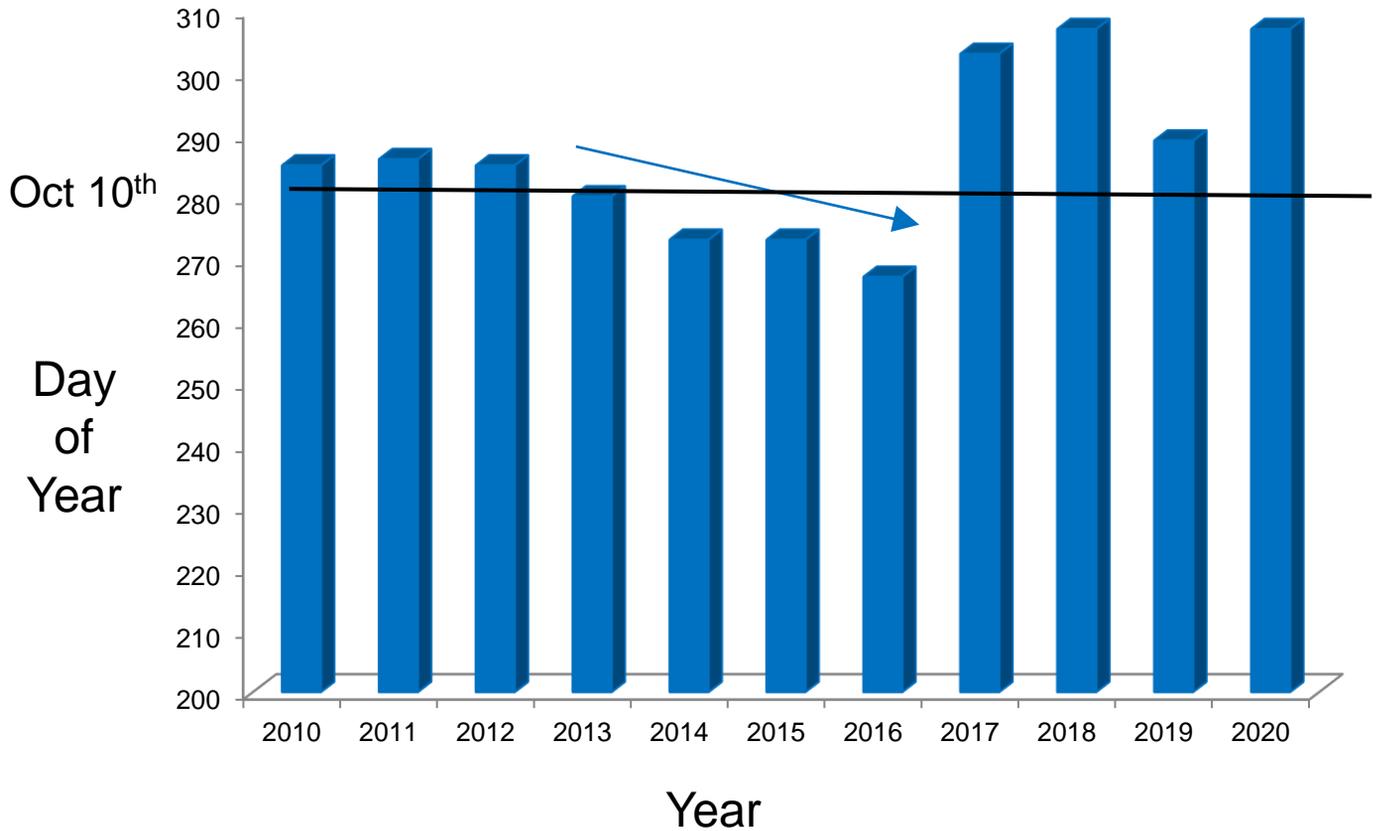
- ~ 34% crossed in last 5 years (2016-2020)
- ~ 82% crossed in previous 6 years (2010-2015)



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December 2021



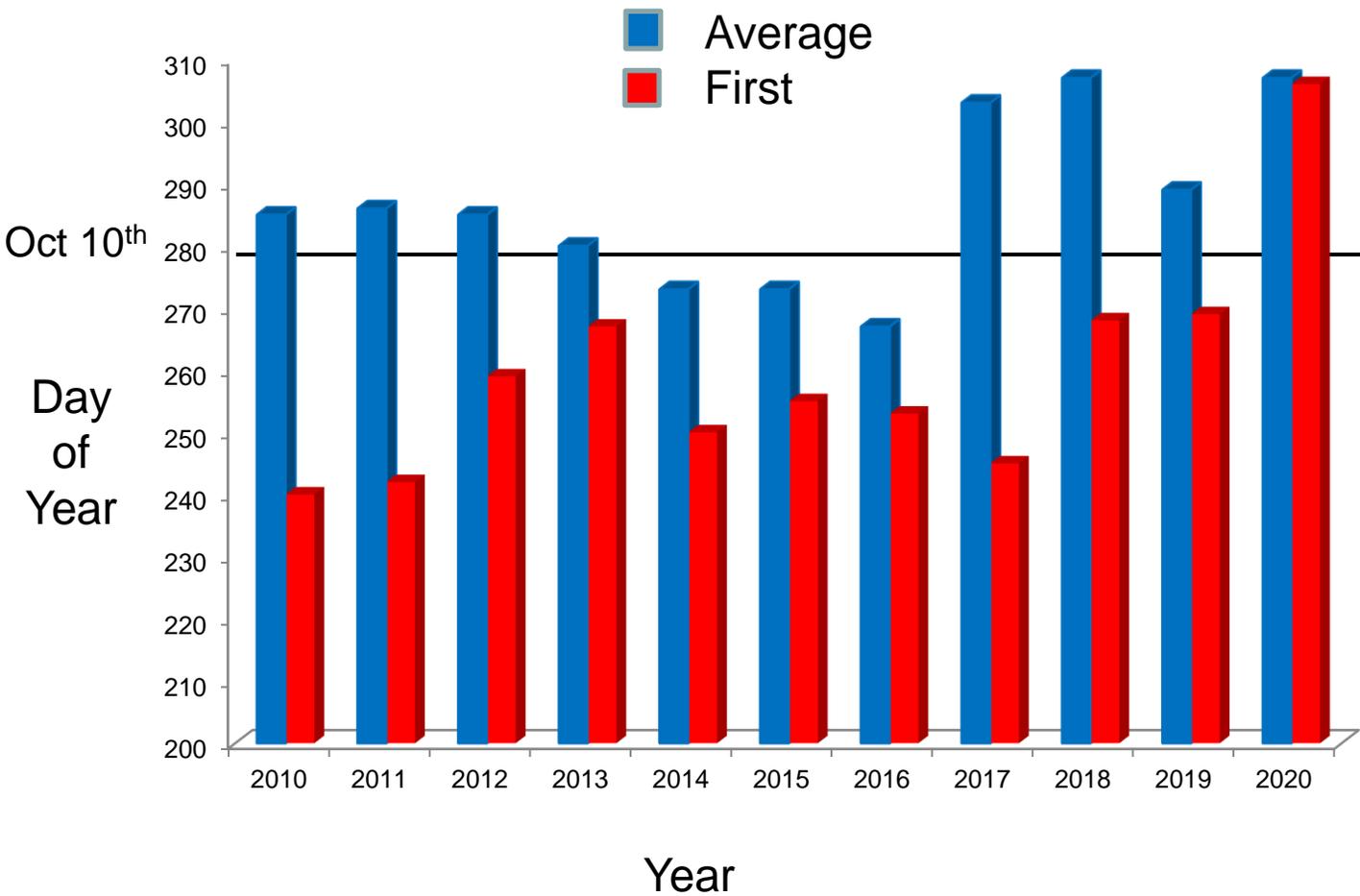
Fall Migration – Timing of Kobuk Crossing



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December 2021



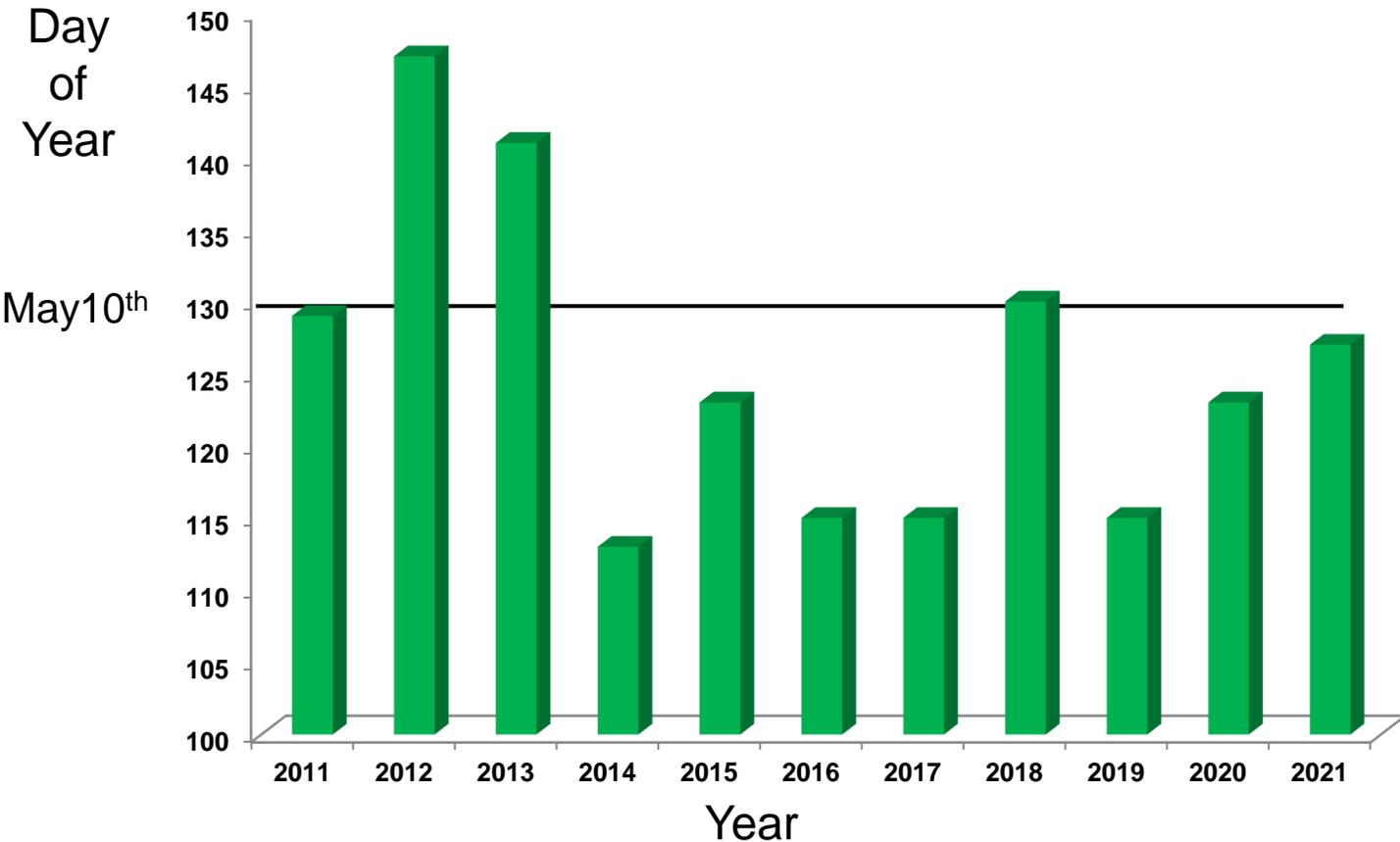
Fall Migration – Timing of Kobuk Crossing



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Spring Migration Selawik Crossing



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“Pronounced Fidelity and Selection for Average Conditions of Calving Area Suggestive of Spatial Memory in a Highly Migratory Ungulate”

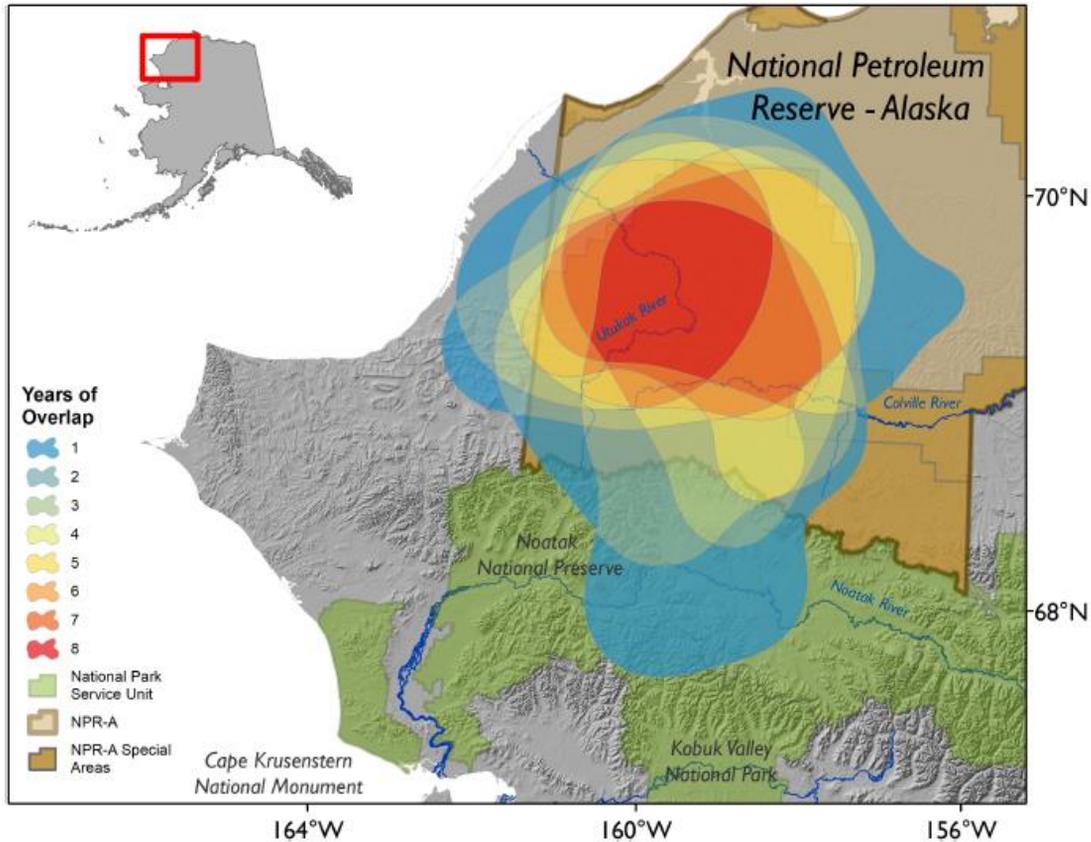


FIGURE 4 | Overlap of all observed annual calving areas for caribou of the Western Arctic Herd, 2010–2017, Alaska. Calving areas were delineated using the 95% contour of a kernel utilization distribution generated from parturition locations, which were inferred from GPS data. Special Areas of the National Petroleum Reserve – Alaska (NPR-A; brown) include the Utukok River Uplands and Colville River Special Areas, as defined in the 2013 Integrated Activity Plan (BLM, 2012).

- Identified calving areas from 2010-2017 for the WAH
- Females migrate to the general calving ground each spring, a place that typically has high-quality forage
- Differences in calving areas each year are because they seek out the best conditions that year
- The WAH has been using the same general calving ground for > 100 years
- Publicly-accessible version:

<https://www.nps.gov/articles/000/cariboucalvinglocales.htm>

Arctic I & M Network

Slide 13



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December 2021

“Seasonal patterns of spatial fidelity and temporal consistency in the distribution and movements of a migratory ungulate”

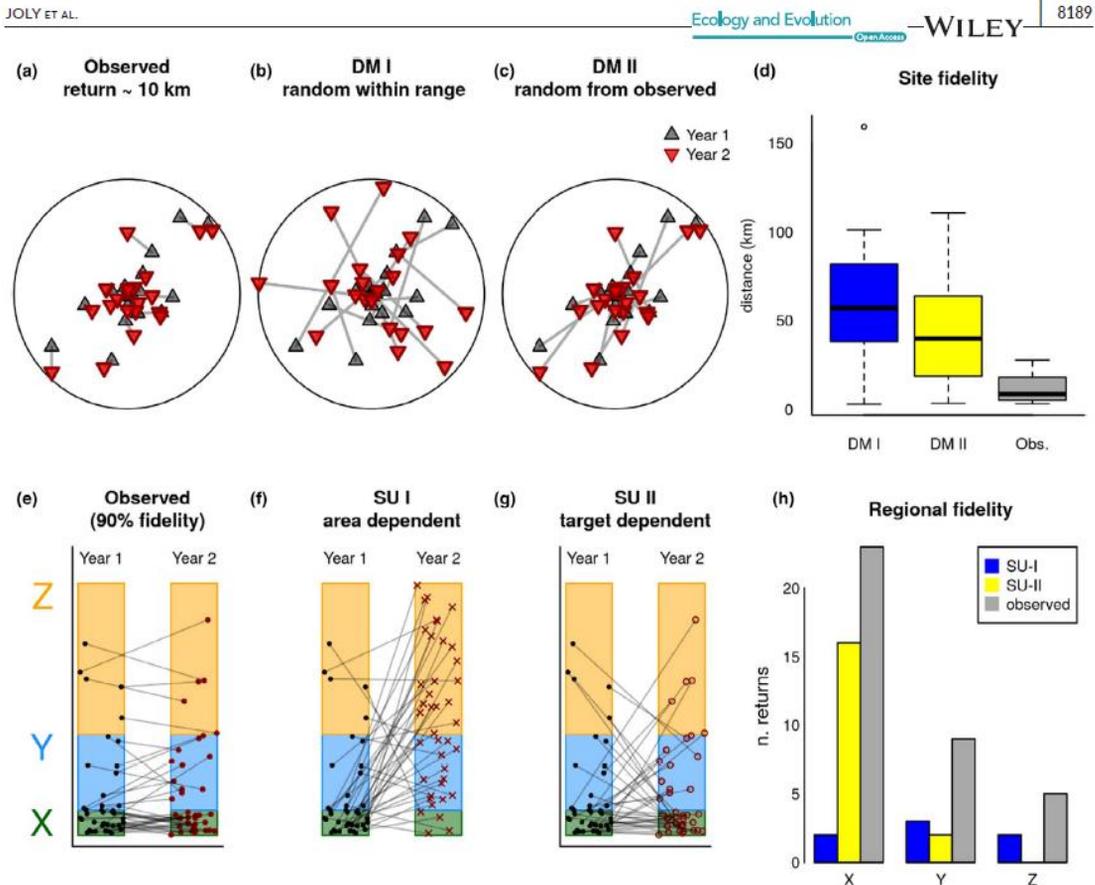


FIGURE 4 Illustration of distance metric (DM) fidelity analyses at the site scale and space use (SU) fidelity at the regional scale. Both

- Analyzed if WAH caribou re-used seasonal ranges and migration routes
- Fidelity was greatest to insect relief and calving areas
- Calving locations of an individual were, on average, 35 miles apart from one year to the next
- 90% of females calved within 1 week from previous year
- Fall migration was more variable than spring migration
- Publicly-accessible version: <https://www.nps.gov/articles/000/bouseasonalfidelity.htm>



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December 2021

“Mapping potential effects of proposed roads on migratory connectivity for a highly mobile herbivore using circuit theory”

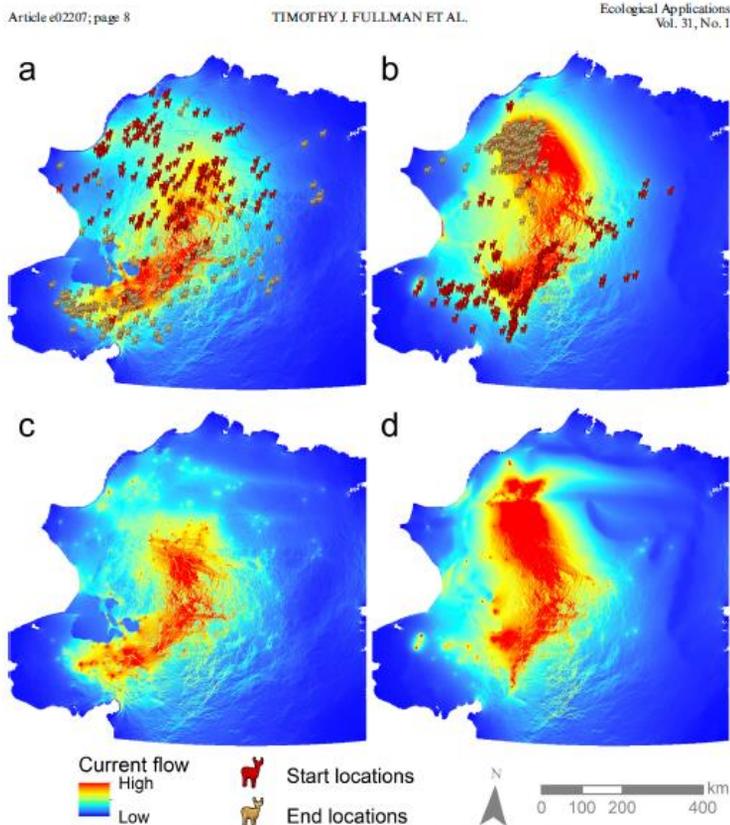


FIG. 4. Population-level migratory connectivity for the Western Arctic Herd in (a) fall with existing roads, (b) spring with existing roads, (c) fall with possible roads added, and (d) spring with possible roads added. Maps display summed current flow values under each individual's top-ranked model for the given season. Start and end locations are the same within seasons.

- Collaboration with TWS and FWS, led by Tim Fullman
- Analyzed flow of caribou spring and fall migrations
- Assess impact of proposed ASTAR roads
- Caribou avoided dense vegetation, rugged terrain, major rivers, and existing roads in both spring and fall.
- Proposed road system could impact migrations and subsistence
- Publicly-accessible version: <https://www.nps.gov/articles/000/toolstoassessimpacts.htm>



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“Simulation modeling accounts for uncertainty while quantifying ecological effects of development alternatives”

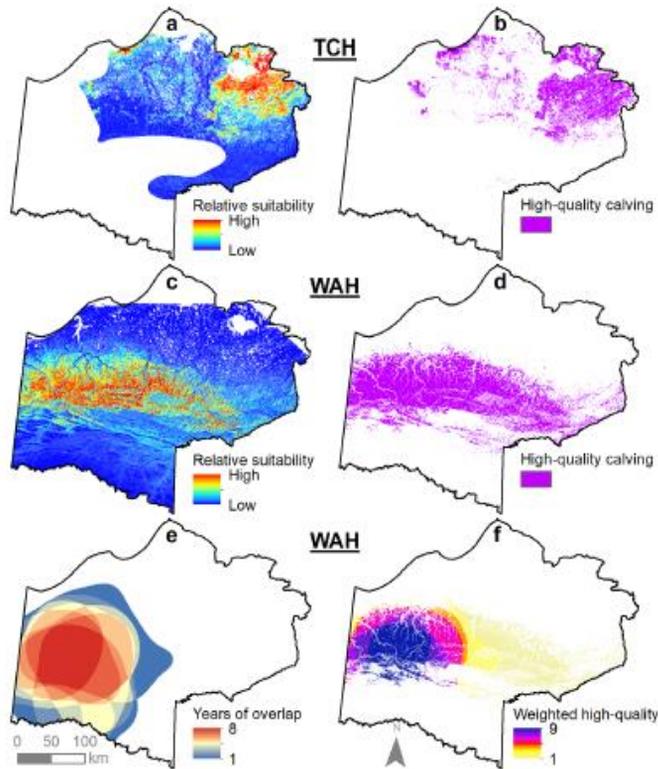


Fig. 3. Caribou input data for the Development Impacts Analysis model. Relative habitat suitability data from resource selection functions for the (a) Teshekpuk Caribou Herd (TCH) and (c) Western Arctic Herd (WAH) were used to identify high-quality calving habitat areas for the (b) TCH and (d) WAH, which we considered the upper quartile of RSF values. For the WAH, we used additional information on (e) calving area overlap between 2010 and 2017 to produce (f) a weighted set of high-quality pixels where high-quality pixels that had been used more frequently received increased weight.

- Collaboration with TWS and Audubon Alaska, led by Tim Fullman
- Analyzed potential impacts of NPRA development on caribou and birds
- Identified areas where develop could impact wildlife
- Models suggest alternatives that could result in less impacts
- Publicly-accessible version: <https://www.nps.gov/articles/000/toolstoassessimpacts.htm>



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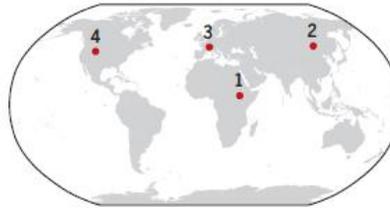
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“Mapping out a future for ungulate migrations”

Ungulate migrations around the world

Animal tracking studies are being conducted around the world, facilitating discovery of previously unknown movements and making it possible to map migrations and identify threats with precision.

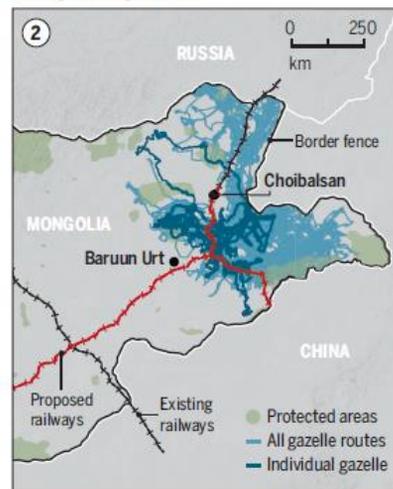


White-eared kob



In 2018, white-eared kob were discovered to make an 860-km migratory circuit between Ethiopia and South Sudan, extending the known migratory range. The herds traverse working landscapes consisting of oil and gas concessions, hotspots of armed conflict, and commercial agricultural developments in the Boma-Gambella landscape.

Mongolian gazelle



On the Eastern Steppe, the nomadic movements of Mongolian gazelle are an order of magnitude larger than the region's protected areas despite being bound by impermeable border fences with Russia and China. A proposed railroad threatens to further constrain their wide-ranging movements.

- Long-distance, terrestrial migrations are imperiled globally
- The Global Initiative on Ungulate Migration is a new group of scientists, conservationists, and other stakeholders working to preserve these migrations
- One main goal is to map out existing migration routes so that they can be conserved
- Publicly-accessible version: <https://www.nps.gov/articles/000/migrationmapping.htm>