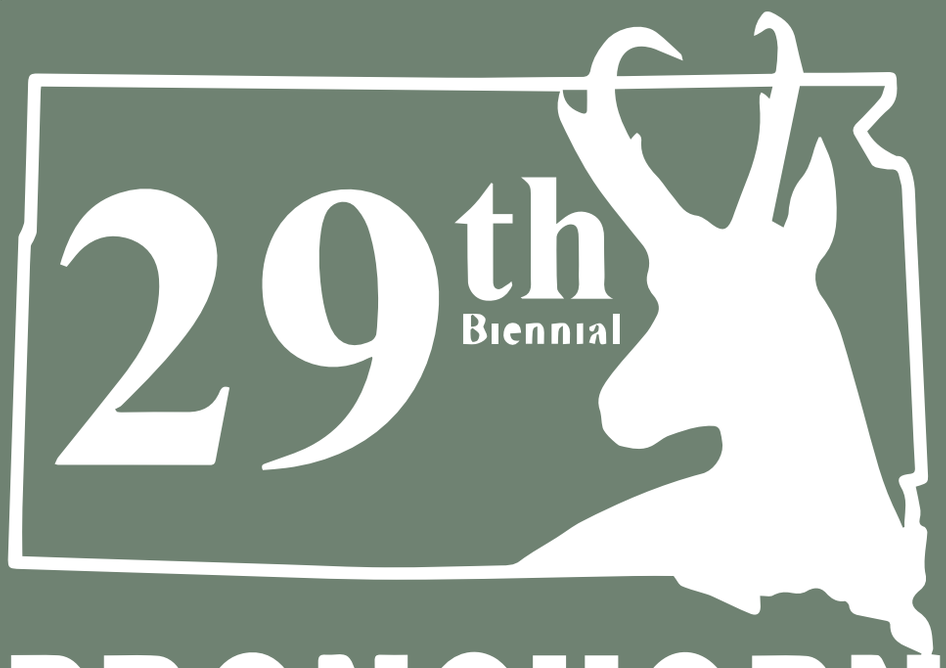

PRONGHORN
workshop 2022

22-25 AUGUST 2022

HOLIDAY INN RESORT DEADWOOD MOUNTAIN GRAND

DEADWOOD, SOUTH DAKOTA

Sanctioned by the Western Association of Fish and Wildlife Agencies
Hosted by the South Dakota Department of Game, Fish and Parks

WORKSHOP PLANNING COMMITTEE:

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MEETING AGENDA

MONDAY - 22 AUGUST

4:00 – 7:00 PM Registration / Social

Poster Presentations

Endangered Peninsular Pronghorn
**Mason Kleist and Melodi Tayles*

Pronghorn movement and resource selection in Nebraska's agriculturally dominated landscape
**Katie M. Piecora, Andrew R. Little and Dustin H. Ranglack*

TUESDAY - 23 AUGUST

6:30 – 8:00 AM Breakfast provided – *Mountain Grand Event Center*

7:00 – 8:30 Registration

TUESDAY MORNING SESSION

8:30 – 8:40 AM **Opening remarks and logistics**

8:40 – 9:00 **Welcome to Deadwood, South Dakota**
Kevin Robling, SDGFP Secretary

Population Demographics and Evaluation I
Moderator: Andy Lindbloom

9:00 – 9:20 **A comparison of density and detectability of pronghorn in Wyoming from aerial surveys**
**Lee Knox, Jason D. Carlisle and L. Embere Hall*

9:20 – 9:40 **Population models aid defensible decision making and guide monitoring of the world's largest pronghorn population**
**Hans W. Martin, L. Embere Hall, Will Shultz, Lee Knox, Paul M. Lukacs and J. Joshua Nowak*

9:40 – 10:00 **Can hunters track trends in pronghorn populations?**
**Paul F. Jones, Susan H. Peters, Vic Adamowicz and Jay Anderson*

10:00 AM Break

10:15 Raffle drawing

TUESDAY MORNING SESSION

Movement/Migration I

10:20 – 10:40 **Migratory strategies and integrated step selection analysis of pronghorn on the Modoc Plateau**
**Colton J. Wise, Clinton W. Epps, Brian R. Hudgens and Robert S. Spaan*

10:40 – 11:00 **Wind-energy development alters pronghorn migration at multiple scales**
*Megan C. Milligan, *Aaron N. Johnston, Jeffrey L. Beck, Kaitlyn L. Taylor, Embere Hall, Lee Knox, Teal Cufaude, Cody Wallace, Geneva Chong and Matthew J. Kauffman*

11:00 – 11:20 **Pronghorn exhibit diverse array of seasonal use behaviors on the Modoc Plateau, California**
Brian Hudgens

11:20 – 11:40 **Seasonal resource selection by pronghorn in central Oregon**
**Andrew J. Walch, Corey Heath, Seth Harju and Donald J. Whittaker*

11:40 – 12:00 **Pronghorn resource selection and migration through a high-elevation forest in northern New Mexico**
**Joanna R. Ennis and James W. Cain III*

Noon Lunch provided

TUESDAY AFTERNOON SESSION

Population Demographics and Evaluation II
Moderator: Andrew Norton

1:00 – 1:20 PM **Investigating sources and seasonality of acute, fatal pneumonia in free-ranging pronghorn (Antilocapra americana)**
**Marguerite Johnson, Madison Blaeser, Erin Schwalbe, Amy K. Wray, Christopher MacGlover, Hank Edwards, Samantha E. Allen, Erika Peckham, Kerry S. Sondgeroth and Jennifer L. Malmberg*

1:20 – 1:40 **Assessing genetic susceptibility of pronghorn to prion disease through PRNP gene sequencing**
**Angela M. Grogan, Matthew J. Buchholz, Courtney L. Ramsey, Emily A. Wright, Robert D. Bradley and Warren C. Conway*

1:40 – 2:00 **Variation in survival rates across pronghorn northern populations**
**Molly C. McDevitt, Andy Lindbloom, Kelly Proffitt, Joshua Millspaugh and Paul Lukacs*

TUESDAY AFTERNOON SESSION

2:00 – 2:20 **Spatiotemporal risk factors predict landscape-scale survivorship for a northern ungulate**
*Daniel R. Eacker, *Andrew F. Jakes and Paul F. Jones*

2:20 – 2:40 **Divergent population parameters signal losses in resilience driven by global change drivers in pronghorn, an iconic rangeland species**
*Victoria M. Donovan, *Jeffrey L. Beck, Carissa L. Wonkka, Caleb P. Roberts, Craig R. Allen and Dirac Twidwell*

2:40 – 3:00 **Pronghorn Range-wide Status Report**
**Andrew Norton and Andy Lindbloom*

3:00 PM Break

3:15 Raffle drawing

Movement/Migration II

3:20 – 3:40 **Advancing fence datasets: Comparing approaches to identify fence locations and specifications in southwest MT**
**Simon A. Buzzard, Andrew F. Jakes, Amy J. Pearson and Len Broberg*

3:40 – 4:00 **Modeling behavior and space-use: Acclimation of translocated pronghorn on the Edwards Plateau**
**Erin C. O'Connell, Justin T. French, Carlos E. Gonzalez, Louis A. Harveson and Shawn S. Gray*

4:00 – 4:20 **Activity dynamics of resident and translocated pronghorn in the Edwards Plateau, Texas**
**Justin T. French, Erin C. O'Connell, L. Cody Webb, Carlos E. Gonzalez, Louis A. Harveson and Shawn S. Gray*

4:20 – 4:40 **Using citizen scientists to connect science and road mitigation**
*Tracy S. Lee, Paul F. Jones, Andrew F. Jakes, Megan Jensen, Ken Sanderson, Danah Duke and *Amanda MacDonald*

6:00 PM Awards Banquet – *Mountain Grand Event Center*

WEDNESDAY - 24 AUGUST

6:30 – 8:00 AM Breakfast provided – *Mountain Grand Event Center*

WEDNESDAY MORNING SESSION

8:15 – 10:00 AM **Business Meeting**

10:00 AM Break

10:15 Raffle Drawing

Movement/Migration III
Moderator: Chad Switzer

10:20 – 10:40 **Deciphering Idaho's pronghorn antelope seasonal movements; modifying migration mapping methods for migration route estimation, seasonal range analysis and conservation**
**Scott Bergen, Jodi Berg, Mark Hurley and Shane Roberts*

10:40 – 11:00 **Pronghorn migration in eastern Oregon**
**Jerrod L. Merrell, Kelley M. Stewart and Don Whittaker*

11:00 – 11:20 **Migration and management of pronghorn in the Madison Valley, southwest Montana**
**Julie A. Cunningham, Kelly Proffitt and Jesse Devoe*

11:20 – 11:40 **Pronghorn demography and movement on the Modoc Plateau, California**
**Brian Hudgens, Colton Wise and David Garcelon*

Noon Lunch provided

WEDNESDAY AFTERNOON SESSION

12:55 Raffle drawing

History, Management, and Conservation
Moderator: Trenton Haffley

1:00 – 1:20 PM **Habitat and Access priority in South Dakota**
John Kanta

1:20 – 1:40 **Private lands habitat and landowner tolerance in western South Dakota**
Bill Eastman

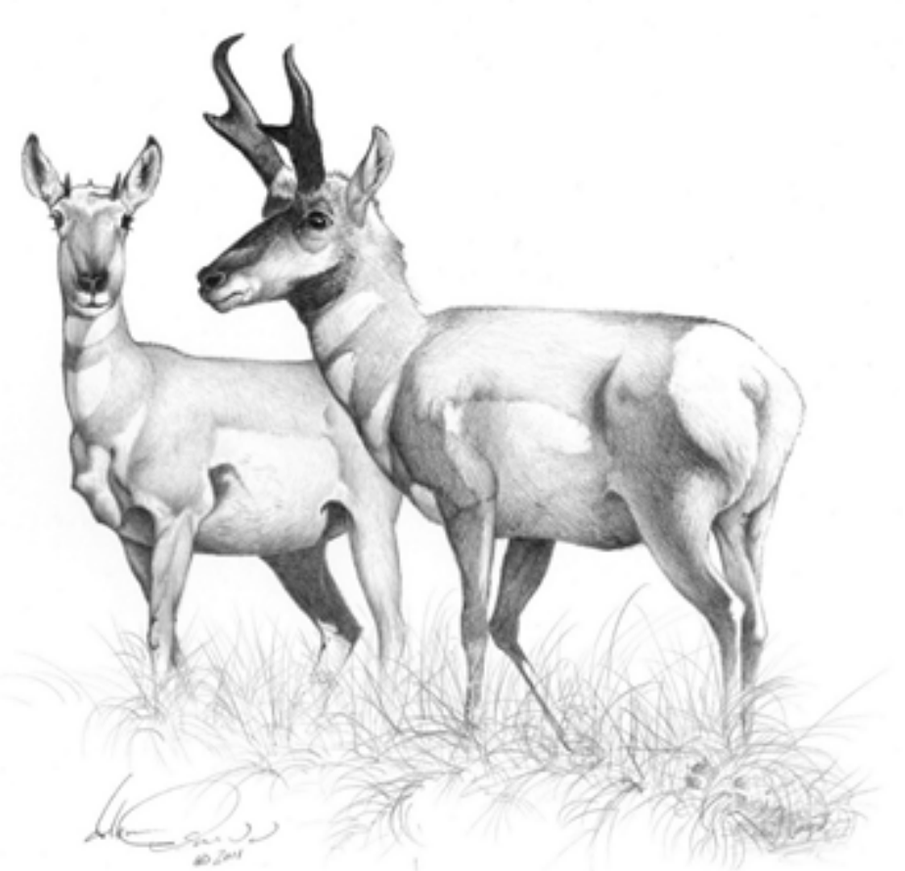
1:40 – 2:00 **Evaluating a landowner-controlled harvest strategy for pronghorn bucks in the northern Texas Panhandle**
**Shawn S. Gray, Calvin L. Richardson, James D. Hoskins and Jonathan C. Malone*

WEDNESDAY AFTERNOON SESSION

2:00 – 2:20	**Collaborative wildlife-snow science: Integrating wildlife and snow expertise to improve research and management** **Adele K. Reinking, Stine Hojlund Pedersen, Kelly Edler and Glen E. Liston*
2:20 – 2:40	**Observations on various pronghorn populations in Mexico and the southwestern United States** *Raymond M. Lee*
2:40 – 3:00	**Ice-Age pronghorn in North America** *Richard S. White*
3:00 PM	Break
3:20 – 3:40	**Pronghorn habitat suitability in the flint hills of east-central Kansas** **Jeff W. Rue and Dustin Ranglack*
3:40 – 4:00	**Southeastern Arizona grasslands pronghorn initiative 2010-2019** **Glen Dickens, John Millican and Rana Murphy*
4:00	**GRAND PRIZE RAFFLE DRAWING**
6:00 PM	Dinner on the town, on your own

THURSDAY - 25 AUGUST

Return Travel



Artwork by Adam Oswald

Alphabetical by Lead Author

DECIPHERING IDAHO'S PRONGHORN ANTELOPE SEASONAL MOVEMENTS; MODIFYING MIGRATION MAPPING METHODS FOR MIGRATION ROUTE ESTIMATION, SEASONAL RANGE ANALYSIS AND CONSERVATION

Presenting Author: SCOTT BERGEN, *Idaho Dept. of Fish and Game, 1345 Barton Road, Pocatello, ID 83201, USA, (208) 236-1263, scott.bergen@idfg.idaho.gov*

JODI BERG, *Alta Science and Engineering Inc., 220 E 5th St Suite 325, Moscow, ID 83843, USA, (208) 882-7858, jodi.berg@alta-se.com*

MARK HURLEY, *Idaho Dept. of Fish and Game, 2885 W. Kathleen Ave. Coeur d'Alene, ID 83815, USA, (208) 769-1414, mark.hurley@idfg.idaho.gov*

SHANE ROBERTS, *Idaho Dept. of Fish and Game, 600 South Walnut St., Boise, ID 83712, USA, (208)334-3700, shane.roberts@idfg.idaho.gov*

ABSTRACT: It is recognized that ungulate seasonal migrations are amongst the most endangered phenomena globally. Subsequent and current US DOI initiatives have recognized that seasonal migrations are worth conserving in the western continental US and provide mechanisms and methodologies for estimating these migration routes and two other cervids. Unfortunately, methodologies used to delineate migration routes and migration stopover locations have not worked for some populations in the continental US. In Idaho, we have found that winter range variability is a major factor that can obscure determining when and where pronghorn seasonal migrations begin using net-squared displacement protocols. When we modified 'anchor' locations to peak fawning date provides for a more accurate and easier NSD graph to interpret. Further, when using this 'anchor' location, we are able to identify winter movement corridors that are recognized as being critical for pronghorn herds where winter conditions can influence and change population trajectories (aka, winter kill). We have found that estimates of stopover locations based on population level utilized distributions are not consistent with results based on parsimonious methods based on rate and duration. These methodological adaptations have allowed IDFG to estimate six migration routes for winter herds occurring in Idaho. In this talk, I talk about the management implications of these results for the identification of migration routes, migration stopover locations, and range analysis and how Idaho has incorporated these findings into its statewide pronghorn management.

NOTES

OBSERVATIONS OF A REMNANT POPULATION OF TRANSLOCATED PRONGHORN NEAR HILLSIDE, ARIZONA

DAVID E. BROWN *(Deceased), Arizona State University, P.O. Box 35141, Tempe, AZ 85069, (602) 471-2872, debrown@asu.edu*

Presenting Author: *RAYMOND M. LEE, *P.O. Box 130, Cody, WY 82414, (602) 315-0604, rlee@morgenson.com*

MATTHEW PEIRCE, *P.O. Box 1736, Wickenburg, AZ 85356, (928) 684-3774, mcpeirce@gmail.com*

ABSTRACT: We monitored the persistence of a remnant population of 4 to 9 pronghorn near Hillside, AZ over a 10-year period from May 2008 through February 23, 2019. Originally consisting of 3 bucks, 2 does and 1 female yearling, the last pregnant doe was seen 3/13/2014 and the last fawn was seen on 11/10/2014. Only 1 buck was seen after 6/17/2014 and no males after 7/7/2018. The last pronghorn was seen on 12/15/2018. Although the possibility exists of animals immigrating or emigrating from the 78 km² study area, we did not document such behavior during our study. With no overt management the population doubled before losing 4 animals following a May 2014 Palmer Drought Severity Index of -4.09. The persistence of this population through 2018 is attributed to low adult mortality and a greater recruitment of females than males. The disappearance of this population is attributed to inbreeding depression and low recruitment as a result of genetic bottle-necking. The Hillside population was too small and too isolated to survive without periodic translocations and predator control would not have helped.

* No formal presentation for this abstract. Raymond M. Lee will be presenting some of this material in abstract titled Observations on various pronghorn populations in Mexico and the southwestern United States.

NOTES:

ADVANCING FENCE DATASETS: COMPARING APPROACHES TO IDENTIFY FENCE LOCATIONS AND SPECIFICAITONS IN SOUTHWEST MONTANA

Presenting Author: SIMON A. BUZZARD, *National Wildlife Federation, 240 North Higgins Ave., Suite 2, Missoula, MT 59802, USA, (406) 529-2409, BuzzardS@nwf.org; Environmental Studies Program, University of Montana, Jeannette Rankin Hall 106A, Missoula, MT 59812, USA.*

ANDREW F. JAKES, *Smithsonian Conservation Biology Institute, 1500 Remount Road, Front Royal, VA 22630, USA, (406) 439-7583 JakesAF@si.edu; National Wildlife Federation, 240 North Higgins Ave., Suite 2; Missoula, MT 59802, USA*

AMY J. PEARSON, *The Nature Conservancy, 32 South Ewing St, Helena, MT 59601, USA, (406) 443-0303, APearson@tnc.org*

LEN BROBERG, *Environmental Studies Program, University of Montana, Jeannette Rankin Hall 106A, Missoula, MT 59812, USA, (406) 243-6273, Len.Broberg@mso.umt.edu*

ABSTRACT: Fencing is a major anthropogenic feature but its ecological impacts are difficult to quantify due to a widespread lack of spatial data. We created a fence model and compared outputs to a fence mapping approach using satellite imagery in two counties in southwest Montana, USA to advance fence data development for use in research and management. The model incorporated road, land cover, ownership, and grazing boundary spatial layers to predict fence locations. The model predicted 34,706.4 km of fences with a mean fence density of 0.93 km/km2 and a maximum density of 14.9 km/km2. We also digitized fences using Google Earth Pro in random 93.2 km2 areas (n = 50). We validated both approaches using fence data collected on random road transects (n = 330). The Google Earth approach showed greater agreement (K = 0.76) with known samples than the fence model (K = 0.56) yet was unable to map fences in forests and was significantly more time intensive. We overlaid GPS vector data from collared female pronghorn (Antilocapra americana) (n = 45) from January 30th – August 16th, 2022 to visually assess where turn angles increased near mapped fences, potentially indicating reduced fence permeability. We also evaluated fence attributes more broadly and found that private lands were more likely to have fences with lower bottom wires ($t(366.4) = -4.73$, $p = 0.001$) and higher top wires ($t(367.76) = 5.22$, $p < 0.0001$) than those on public lands with sample means at 22 cm and 26.4 cm, and 115.2 cm and 110.97, respectively. Both bottom wire means were well below recommended heights for ungulates navigating underneath fencing (≥ 46 cm), while top wire means were closer to the 107 cm maximum fence height recommendation. Our novel fence type data can help inform policy while our tools for estimating fence locations can help identify potential areas for conservation actions when paired with wildlife movement data.

NOTES:

MIGRATION AND MANAGEMENT OF PRONGHORN IN THE MADISON VALLEY, SOUTHWEST MONTANA

Presenting Author: JULIE A CUNNINGHAM, *Montana Fish, Wildlife and Parks. 1400 S. 19th Ave, Bozeman MT 59718, USA. (406) 577-7865, juliecunningham@mt.gov*

KELLY PROFFITT, *Montana Fish, Wildlife and Parks. 1400 S. 19th Ave, Bozeman MT 59718, USA. (406) 577-7884, kproffitt@mt.gov*

JESSE DEVOE, *Montana Fish, Wildlife and Parks. 1400 S. 19th Ave, Bozeman MT 59718, USA. jesse.devoe@mt.gov*

ABSTRACT: The Madison Valley is a high-elevation grassland valley surrounded by the Gravelly and Madison mountain ranges north and west of Yellowstone National Park. The study area is bisected east to west by the Madison River and US Route 287. Pronghorn were native to this valley but were thought to have been extirpated by the 1920s. A series of transplants 1951-1952 restored pronghorn to the Valley and their population expanded to more than 2,000 individuals, but little was known about their movement habits or herd structure. Secretarial Order 3362, designed/implemented to improve habitat quality, winter range, and migration corridors for western big game, provided an opportunity to study Madison Valley pronghorn as part of the statewide Montana Migration Initiative. Montana Fish, Wildlife and Parks captured and fitted with GPS collars 82 adult female pronghorn over three years (2019-2021) to evaluate seasonal ranges, herd structures, migratory routes, as well as identify problematic and non-problematic natural and human-made barriers. We found a clear herd structure, with two nonmigratory herds on the west side of the Valley and one partially migratory herd on the east side. Individuals on the east side had a variety of movement strategies including residency, short-distance migrations, and long-distance migrations as far as 100km. Migratory pathways followed a narrow route between forested hills, highways, rivers, and human development. Pronghorn crossed the Continental Divide at a low-elevation saddle and continued south to Island Park, Idaho. These research findings have been used to develop partnerships between other agencies, NGOs, and private landowners and collaboratively improve fences and protect pronghorn pathways.

NOTES:

DIVERGENT POPULATION PARAMETERS SIGNAL LOSSES IN RESILIENCE DRIVEN BY GLOBAL CHANGE DRIVERS IN PRONGHORN, AN ICONIC RANGELAND SPECIES

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Presenting Author: JEFFREY L. BECK, *Department of Ecosystem Science and Management, University of Wyoming, Dept 3354, 1000 East University Avenue, Laramie, WY 82071, USA. (307) 766-6683; jlbeck@uwyo.edu*

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CRAIG R. ALLEN, *Center for Resilience in Agricultural Working Landscapes, University of Nebraska-Lincoln, 203K Keim Hall 1825 North 38th Street, Lincoln, NE, 68583, USA. (402) 472-0421; callen3@unl.edu*

DIRAC TWIDWELL, *Department of Agronomy & Horticulture, University of Nebraska, 512 North 12th Street, Lincoln, NE 68583, USA. (402) 580-8832; dirac.twidwell@unl.edu*

ABSTRACT: Conservation is increasingly focused on preventing species' population losses before they occur. This requires understanding changes in the resilience (the amount of disturbance a population can endure while continuing to persist within its current state) of populations in response to global change drivers before drastic population declines occur. We used population productivity (late summer juveniles per 100 females) as an indicator of population resilience to global change drivers in 40 pronghorn (Antilocapra americana) populations across sagebrush (Artemisia spp.) steppe in Wyoming, which includes one of the globe's most intact rangeland ecosystems. Pronghorn are an iconic rangeland species that have been exposed to increasing levels of anthropogenic, climatic, and land-use change. Using data collected across the state of Wyoming, we (1) assessed long-term signals of population resilience and compared these to changes in population size, (2) identified patterns in large-scale global change drivers (i.e., climate, land cover change) across pronghorn habitat, and (3) determined the relationship between global change drivers and population resilience over a 35-year (1984–2019) period. We found that while Wyoming hosts some of the most abundant populations of pronghorn in North America, many herds are experiencing long-term declines in productivity, signaling losses in population resilience. These declines were not limited to smaller populations, but rather occurred in some of the largest and most productive populations in the region. Long-term declines in productivity were associated with increases in oil and gas development and woody encroachment. Although increasing across almost all herds, woody vegetation cover remains at low levels, suggesting that pre-emptive management may help to prevent drastic losses in pronghorn populations. Our findings highlight the value of utilizing trends in population demographics as an indicator of changing population resilience to support preventative conservation efforts in the face of rapid global change.

Donovan, V. M., J. L. Beck, C. L. Wonkka, C. P. Roberts, C. R. Allen, and D. Twidwell. In review. Divergent population parameters signal losses in resilience driven by global change drivers in pronghorn, an iconic rangeland species. Global Change Biology.

ARIZONA ANTELOPE FOUNDATION-ARIZONA GAME & FISH DEPARTMENT & NATIONAL FISH & WILDLIFE FOUNDATION'S "SOUTHEASTERN ARIZONA GRASSLANDS PRONGHORN INITIATIVE" 2010-2019

Presenting Author: GLEN DICKENS-CWB, *Vice President/Projects/Grants Manager Arizona Antelope Foundation, P.O. Box 1191, Mesa, Arizona 85211. (520-247-4907), gbdickens@comcast.net*

JOHN MILLICAN, *Southeastern Arizona Field Manager Arizona Antelope Foundation, P.O. Box 1191, Mesa , Arizona 85211. (520-508-4272), j2dbmill@msn.com*

RANA MURPHY, *Terrestrial Wildlife Specialist Region V Arizona Game & Fish Department, 555 North Greasewood Road Tucson, Arizona 85745. (520-388-4448), rmurphy@azgfd.gov*

ABSTRACT: A "Southeast Arizona Collaborative Grassland Workgroup" was created in February 2010 by the Tucson office of the Arizona Game and Fish Department and collaboratively drafted a southeastern Arizona Regional Pronghorn Strategy to increase pronghorn population numbers, distribution and connectiveness. Partners in this working group included: AAF, AGFD, BLM, USFS, ASLD, USDA, USFWS, NRCS, TNC, Altar Valley Conservation Alliance, Pima County, Arizona Wildlife Federation, AZ Land Trust, Audubon Society, Tombstone High school, Range Riders, Southern Arizona Conservation Corps and local ranchers/landowners. Long-term goals for this 9-year grant period 2011-19 were to; 1) establish a region-wide dynamic geodatabase with integrated multi-species layers to prioritize grasslands restoration/maintenance activities for pronghorn and other sensitive grassland species, 2) permanently record pronghorn travel corridors and remove or modify barriers, including fences, shrubs and trees, 3) target/plan grassland treatments/burns in priority habitat locations on an annual and long-term basis to benefit the highest number of keystone grassland species, 4) supplement at least one pronghorn population and increase numbers in two subpopulations and 5) improve grassland habitat in five pronghorn subpopulation zones. In 2011, 2013 and 2014 the Arizona Antelope Foundation (AAF) was awarded 3 different grants through the National Fish and Wildlife Foundation's (NFWF) Sky Islands Initiative totaling $510,000 to support the Arizona Game and Fish Department (AGFD) and AAF's 10-year Southeastern Arizona Grasslands Pronghorn Initiative initiated in April 2010. These funds were matched in-kind by 1) $245K - Rancher/landowner labor, equipment, and materials. 2) $337K - AAF labor, travel, food, equipment, and materials. 3) $569K - Habitat Partnership Funds and other project cash match and 4) $80K - Pima County Open Space Conservation land-acquisition funds for a total of $1.231M In-kind match. Final combined project financial total was $1.741M. AAF and partners accomplished the following results between 2012 and 2019: Pronghorn connectivity was improved on 191,800 acres in 6 herd zones through 27 fence projects, modifying 105 miles of fencing. The majority of that work was accomplished by 769 volunteers who drove 185,517 miles and donated 13,270 hours of labor. University and high school students, as well as Boy Scouts participated in 14 of the 27 fence modification projects. Eleven grasslands projects completed in 4 herd zones restored 7,874 acres of grasslands through burning, mesquite grubbing, and spot treatments with herbicides. Thirteen water projects were completed to provide year-around water distribution and security in 4 herd zones. Ninety-five (95) pronghorn were transplanted to supplement 6 subpopulations. The pronghorn population was increased in those subpopulations by a minimum of 548 animals as of August 2019, meeting the minimum viable population objective of 125 animals in 3 of the 6 subpopulations. A long-term GIS data base, including 658 total layers for each of the 6 herd zones, was established to monitor the pronghorn and habitat changes. Long-term landowner/rancher relations were improved on 21 separate properties. The projects efforts continue today with operating funds provided by the AAF and miscellaneous available AGFD habitat partnership, grant and federal funds.

NOTES:

SPATIOTEMPORAL RISK FACTORS PREDICT LANDSCAPE-SCALE SURVIVORSHIP FOR A NORTHERN UNGULATE

DANIEL R. EACKER, *Taurus Wildlife Consulting, 1017 Edwin Pl, Juneau, AK 99801, USA, 406-291-9169 daniel.eacker@tauruswildlifeconsulting.com*

Presenting Author: ANDREW F. JAKES, *Smithsonian Conservation Biology Institute, 1500 Remount Road, Front Royal, VA 22630, USA, 406-439-7583 JakesAF@si.edu; National Wildlife Federation, 240 North Higgins Ave., Suite 2; Missoula, MT 59802, USA*

PAUL F. JONES, *Alberta Conservation Association, #400 817 4th Ave South, Lethbridge, AB T1J 0P6, Canada, 403-382-4357 Paul.Jones@ab-conservation.com*

ABSTRACT: Effective wildlife conservation and habitat restoration necessitates unraveling the drivers of population dynamics for species affected by anthropogenic habitat alterations. Pronghorn (Antilocapra americana) can serve as a focus for management actions to restore habitat and maintain connectivity as they are known to annually move long distances and are sensitive to landscape disturbances. We used Bayesian proportional hazards models to assess anthropogenic risk factors that could potentially predict landscape-scale survivorship for pronghorn in the Northern Sagebrush Steppe ecosystem, where extensive habitat loss and fragmentation has occurred from the conversion of native sagebrush grasslands to agricultural lands, natural resource extraction and transportation infrastructure. We used relocations from 170 GPS-collared adult female pronghorn from 2003–2011 to test the importance of linear features (road and fence densities) and forage productivity (maximum decadal NDVI) for spatiotemporal pronghorn mortality risk, while accounting for seasonally fluctuating snow depth. As predicted, we found considerable support for the effects of average snow water equivalent (SWE), within pronghorn seasonal ranges, with mortality risk increasing by 45.7% with every 10 kg/m2 increase in SWE (range = 0–53.7 kg/m2). We also found support that greater densities of linear features increased mortality risk. Our models predicted that survivorship would decline by 27.1% over the observed range of road densities (range = 0–1.4 km/km2) and 11.8% over the range of fence densities (0–6.1 km/km2) encountered by pronghorn. Our results also suggested that agricultural areas could act as ecological traps for pronghorn based on mortality risk increasing by a factor of 14.3% with every 0.1 increase in maximum decadal NDVI (range = 0.38–0.73) on summer range. Using these results, we developed the first broad-scale, spatially explicit map of predicted annual pronghorn survivorship, which included both anthropogenic features and environmental gradients, to identify areas for conservation and habitat restoration efforts. Our efforts to highlight anthropogenic risk factors across the Northern Sagebrush Steppe can support conservation and habitat restoration for pronghorn populations at the northern periphery of their range.

NOTES:

PRONGHORN RESOURCE SELECTION AND MIGRATION THROUGH HIGH-ELEVATION FORESTS IN NORTHERN NEW MEXICO

Presenting Author: JOANNA R. ENNIS, *Department of Fish, Wildlife and Conservation Ecology, New Mexico State University, Box 30003, MSC 4901, Las Cruces, New Mexico 88003, 850-982-1281, jennis@nmsu.edu*

JAMES W. CAIN III, *U.S. Geological Survey, New Mexico Cooperative Fish and Wildlife Research Unit, Box 30003, MSC 4901, Las Cruces, New Mexico 88003, 575-646-3382, jwcain@nmsu.edu*

ABSTRACT: Few studies have documented pronghorn (Antilocapra americana) herds that migrate to higher elevations through forested landscapes. New Mexico's North Central pronghorn herd migrates from winter ranges on the Taos Plateau to high elevation (2255 to 3292 m) montane grasslands in the San Juan Mountains. We examined how forested landscapes influenced habitat selection during spring migration and when tree or woody encroachment could influence migrations in the future. Using a hypothesis-driven approach we selected landscape variables that could influence pronghorn migration and habitat selection during spring migration. We developed integrated step-selection functions (iSSF) with models parameterized based on landscape variables calculated at the end of each step. Patterns of selection during spring migration showed avoidance of high tree canopy cover and unpaved roads, while selecting for higher elevations and south facing slopes. Pronghorn avoided forests over herbaceous, shrubland, and riparian habitats. Our results demonstrate that pronghorn selectively moved to open patches through this forested landscape to reach summer range. We showed that unpaved roads reduce pronghorn habitat use. Management implications include finding a threshold density where pronghorn can migrate through this forested landscape. Mitigating the effects of roads on pronghorn could be considered for future land-use plans.

NOTES:

ACTIVITY DYNAMICS OF RESIDENT AND TRANSLOCATED PRONGHORN IN THE EDWARDS PLATEAU, TEXAS

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ABSTRACT: Diel activity cycles are partly driven by their behavioral response to predation risk. Prey species can adjust diel activity, as well as space use, to maximize foraging and breeding opportunities while minimizing predation risk, leading to the idea of a dynamic Landscape of Fear (LoF). While predation is often cited as a partial cause of pronghorn decline, little is understood about how their diel activity, much less how that influences their response to a LoF or, ultimately, their demography. This could impact the outcomes of translocation efforts, as relocated animals may be behaviorally adapted to different predators than they encounter in their new environment. As an exploratory step, we compared the activity dynamics of 6 resident and 23 translocated pronghorn following a large-scale restoration using autocorrelation surfaces. Diel activity cycles were, in fact, cyclic; pronghorn alternated between diurnal activity in the winter and crepuscular activity in spring and summer. While we found some evidence of distinct groups in diel activity dynamics, we found little evidence of differences between resident and translocated pronghorn. However, we found differences in the degree of crepuscular activity by pronghorn between the fawning seasons of 2020 and 2021. These years also differed in fawn recruitment, suggesting doe diel activity during this period and fawn success could be related. Additional data and analyses with more specificity are needed to evaluate this hypothesis. Importantly, the translocation process did not appear to disrupt pronghorn circadian rhythm. Finally, cyclic patterns were strong across all pronghorn, suggesting diel movement cycles should be considered in movement-based habitat selection models, such as integrated Step Selection Analysis.

NOTES:

CASE STUDY: EVALUATING A LANDOWNER-CONTROLLED HARVEST STRATEGY FOR PRONGHORN BUCKS IN THE NORTHERN TEXAS PANHANDLE

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ABSTRACT: Texas Parks and Wildlife Department (TPWD) initiated an experimental buck-only landowner-controlled harvest strategy during the 2013 hunting season in 3 herd units in the northern Texas Panhandle in an attempt to decrease the administrative burden of issuing pronghorn permits on TPWD staff and to provide more hunting opportunity and flexibility to hunters and landowners. This new harvest concept relied on landowners to control the harvest of buck pronghorn on their properties as an alternative to TPWD setting quotas through survey-based permit issuance. During the 2017 hunting season 3 more herd units were added to increase the contiguous size of the experimental areas. The resulting experimental sites consisted of 3 herd units located near Dalhart, TX in the northwest Panhandle and 3 herd units near Pampa, TX in the northeast Panhandle. Hunters in the experimental units were required to take their harvested buck to a mandatory check station within 24 hours of harvest. All bucks brought to the check stations were aged using the cementum annuli technique, and basic horn measurements were collected. Annual pre-season fixed-wing surveys were also conducted within the experimental areas. During most years of the experiment, harvest intensity exceeded TPWD's recommended harvest rate (permit issuance rate of 35% of the estimated buck population). Data suggest that the landowner-controlled harvest strategy did not have negative impacts to pronghorn population sustainability, but showed undesirable effects on buck age structure and sex ratios. Age structure of harvested bucks during the 2012 hunting season (1 year prior to the experiment) was 4.0 and 4.4 years of age in the Dalhart and Pampa areas, respectively. During the 8 hunting seasons of the experiment the average age of harvested bucks declined to 3.0 years for the Dalhart area and 3.7 years for the Pampa area. The last 3 hunting seasons (2018–2020) showed a more drastic change with average ages of 2.5 in the Dalhart area and 3.4 in the Pampa area. Sex ratios were also negatively impacted by the landowner-controlled harvest strategy. Prior to the experiment, does per buck ratios were 2.5 in the Dalhart area and 2.7 in the Pampa area. The average sex ratios during the experiment (2013–2020) became more skewed toward does at 2.9 and 4.1 does per buck in the Dalhart and Pampa areas, respectively. Similar to buck age structure, the sex ratios became even more skewed during the last 3 hunting seasons, averaging 3.3 in the Dalhart area and 4.3 in the Pampa area. In addition, hunter and landowner opinion surveys conducted in 2016 and 2020 indicated that support and satisfaction for the landowner-controlled harvest strategy waned. Therefore, based upon biological data, opinion surveys, and public comments; the landowner-controlled harvest strategy was terminated indefinitely beginning with the 2021 hunting season.

NOTES:

ASSESSING GENETIC SUSCEPTIBILITY OF PRONGHORN (ANTILOCAPRA AMERICANA) TO PRION DISEASES THROUGH PRNP GENE SEQUENCING

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ABSTRACT: Chronic wasting disease (CWD) affects both native and non-native North American Cervids and has become a major conservation issue for wildlife managers worldwide. As CWD expands geographically, concerns about management and species susceptibility continue to be part of a larger narrative of wildlife management, conservation, and human health. Given how CWD is transmitted, and the history of spontaneous generation of novel prion diseases, the possibility of interfamilial transmission also raises concerns. Historically, pronghorn (Antilocapra americana) have utilized much of the same habitat as susceptible cervids and occur within the endemic CWD area of Colorado and Wyoming. However, to date, there has been no research on pronghorn susceptibility to prion diseases like CWD, as they have been assumed to be resistant and not susceptible. In Texas, pronghorn occur in portions of both the Texas Panhandle and the Trans-Pecos, where currently both regions contain Texas Parks and Wildlife Department CWD containment and surveillance zones. Our goal is to sequence the prion protein gene, PRNP, exon 3 (the coding region of the prion protein, PrPC) in pronghorn from Texas and New Mexico to compare to amino acid sequences of known susceptible Cervids and assess if pronghorn may be susceptible to prion diseases. Currently, we are amplifying and sequencing PRNP from individuals from Texas (including translocated individuals) and New Mexico. Preliminary results indicated that pronghorn have one additional octapeptide repeat, for a total of 6 repeats, rather than the 5 octapeptide repeats seen in Cervids. Additionally, pronghorn seem to align with Cervids for codons 95,96,116,132, and 225, which might confer susceptibility to CWD. This research will be useful for evaluating the potential risks associated with sympatric coexistence of pronghorn with Cervids in CWD containment zones in Texas, and to assess if pronghorn are susceptible to prion diseases.

NOTES:

PRONGHORN EXHIBIT DIVERSE ARRAY OF SEASONAL USE BEHAVIORS ON THE MODOC PLATEAU, CALIFORNIA

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ABSTRACT: Considerable attention has been given in recent years to the variety of migratory behaviors that ungulates employ. However, the focus on migration ignores many other of seasonal use behaviors animals may exhibit to cope with seasonal changes in resource availability and mortality risk. We document that pronghorn inhabiting the Modoc Plateau exhibit a varied repertoire of seasonal use behaviors. Animals responded to changing seasonal conditions by expanding, shrinking, or shifting their home ranges, migrating up to 61 km, or not changing their home ranges at all. Individuals mix strategies throughout the year and exhibit different annual patterns across years, while neighboring individuals may exhibit different behavioral strategies in the same year. This variety of behaviors implicates a large number of interacting environmental and internal cues influencing the size, shape, and location of seasonal home ranges.

NOTES:

PRONGHORN DEMOGRAPHY AND MOVEMENT ON THE MODOC PLATEAU, CALIFORNIA

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ABSTRACT: Pronghorn (Antilocapra americana) residing in northeastern California and southern Oregon make up the western-most populations connected to the Great Basin ecoregion. Relatively little work has been conducted on the California population, but aerial surveys indicate that the population has declined by over 85% since 1992. We studied pronghorn movements and survival of adults and fawns to better understand factors that might be contributing to the population decline. We placed satellite GPS collars on 100 adults (99 females, 1 male) and tracked their movements for up to 7 years. Annual adult survival from 2014-2022 was 0.78 (+/- 0.032 SE). Causes of mortality varied from year to year, with mountain lions (Puma concolor) being an important predator in some years and coyotes (Canis latrans) in others. We found evidence that increased cover is associated with mortality risk. We tracked 114 radio-collared fawns for up to 200 days. Fawn survival through 200 days was higher during the first three years of the study 2015-2018 (s=0.45 +/- 0.071 SE) than during the last three years (s=0.17 +/- 0.058 SE). We used adult movement data to identify fences with the greatest impact on pronghorn movement. We found that modification of these fences can increase their permeability. Landscape level changes leading to greater cover for predators, such as woodlands expanding into sage steppe areas, and fences that are not wildlife friendly may be increasing mortality risk and reducing access to quality habitat.

NOTES:

INVESTIGATING SOURCE AND SEASONALITY OF ACUTE, FATAL PNEUMONIA IN FREE-RANGING PRONGHORN (ANTILOCAPRA AMERICANA) IN WYOMING

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ABSTRACT: The bacterium Mycoplasma bovis (M. bovis) is a globally distributed, economically important bacterial pathogen of cattle (Bos taurus) and American bison (Bison bison). Pneumonia, polyarthritis and mastitis are among the most common clinical signs. Reports of M. bovis in free-ranging wildlife are rare, consisting of a few isolated cases in mule deer (Odocoileus hemionus) and white-tailed deer (Odocoileus virginianus). In early 2019 near Gillette, Wyoming, we documented M. bovis as the cause of acute, fatal pneumonia in free-ranging pronghorn antelope (Antilocapra americana), a previously unreported finding. Here we report on additional pronghorn mortalities due to M. bovis occurring in the same geographic region one year later. Mortalities occurred between February and April in 2019 and 2020 with over 500 documented mortalities in total. To evaluate whether pronghorn develop chronic, subclinical infections and begin assessing M. bovis status in other sympatric species, we used PCR testing of nasal swabs to opportunistically survey select free-ranging ungulates. We found no evidence of subclinical infections in 230 pronghorn sampled from nine counties in Wyoming and ten in Montana, USA. All mule deer (Odocoileus hemionus) (n=231) sampled from 11 counties in Wyoming also were PCR negative. To estimate the potential for environmental transmission, we examined persistence of M. bovis in various substrates and conditions. Controlled experiments revealed that M. bovis can remain viable for 6 hours following inoculation of shaded water, and up to 3 hours in shaded hay and topsoil. Our results indicate transmission of M. bovis from livestock to pronghorn through the environment is possible, and that seasonality of infection could be due to shared resources during late winter. Further investigations to

better understand transmission dynamics, to assess population level impacts to pronghorn, and to determine disease risks among pronghorn and other ungulate taxa appear warranted.

Johnson, M., C. MacGlover, J. L. Malmberg, K. S. Sondgeroth, T. K. Bragg, A. K. Wray, E. Schwalbe, M. K. Davison, M. Blaeser, W. H. Edwards, T. Creekmore, S. E. Allen, H. Killion, and E. Peckham. 2022. Source and Seasonality of Epizootic Mycoplasmosis in Free-Ranging Pronghorn (Antilocapra americana). Journal of Wildlife Diseases 58.

NOTES:

CAN HUNTERS HELP TRACK TRENDS IN PRONGHORN POPULATIONS?

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ABSTRACT: Data used to manage wildlife populations effectively require survey methods that provide accurate and precise population estimates that are also efficient and economical. In Alberta, aerial surveys have historically been the primary method used to estimate population size, trend, distribution, and herd composition for ungulates, including pronghorn. As such, aerial surveys have been an important source of data for setting hunting allocations; however, these surveys are intermittent and are prohibitively expensive, prompting the need for additional strategies for monitoring populations. Hunter observations of moose in Scandinavia have proven to be a valuable data source for monitoring population trends. Using hunter observations of pronghorn and other harvestable species could provide an alternative cost-effective method of collecting large-scale data on population trends and demographics. In 2021, Alberta Conservation Association partnered with the University of Alberta and Inside Outside Studios to launch ABHuntLog; a mobile phone survey that uses the iHunter smartphone app as a platform to allow hunters to voluntarily report species observations and harvest records at a Wildlife Management Unit level. The survey also allows for the tracking of hunter activity to evaluate the economic importance of hunting to Alberta's economy. Here we demonstrate the utility of the data collected from a conservation and hunter's perspective using pronghorn (and where needed, other ungulates) as the case study.

NOTES:

ENDANGERED PENINSULAR PRONGHORN

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ABSTRACT: Peninsular pronghorn (Antilocapra americana peninsularis) are an endangered subspecies of pronghorn in Baja California, Mexico. Zoological institutions are actively working to recovery the peninsular pronghorn. There are five zoos in America that breed peninsular pronghorn and they work together to keep the gene pool strong. Some zoos are strictly holding facilities for males if there are ever a surplus of males in the captive populations. The Peninsular Pronghorn Recovery Project is a conservation program that works specifically on maintaining sustainable populations of peninsular pronghorn in Baja California and in captivity.

NOTES:

A COMPARISON OF DENSITY AND DETECTABILITY OF PRONGHORN IN WYOMING FROM AERIAL SURVEYS

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ABSTRACT: Accurate estimates of population size are foundational to appropriate management and conservation of wildlife species. Estimating the abundance of free-ranging wildlife over large areas and through time poses a significant challenge to wildlife managers. Wyoming is home to approximately 50% of pronghorn (Antilocapra americana) rangewide, and pronghorn are a species of particular interest to wildlife stakeholders. Wyoming uses an aerial line transect survey following a distance-sampling protocol to estimate the population size in distinct herd units. A 200-m wide strip along line transects is surveyed by one observer on one side of the plane, with the strip beginning 65 m from the transect to omit the unviewable area directly below the plane. Surveys are conducted from fixed-wing aircraft at a nominal 91 m (300 ft) above ground level and speeds of 80 to 120mph, and observers use strut markers to assign pronghorn detections to one of five distance ranges. Data are analyzed using distance-sampling statistical models, and abundance estimates feed into integrated population models and inform subsequent management decisions. Herd-specific analyses sometimes suffer from relatively small sample sizes and often have less precision than desired. In an effort to improve the precision of estimates and draw comparisons of density and detectability among herd units, we undertook a comprehensive analysis of data from multiple surveys. Preliminary herd-level estimates of probability of detection ranged from approximately 40 – 80%, and estimates of pronghorn density ranged from approximately 2 – 10 pronghorn/km2 (5 – 25 pronghorn/mile2). Preliminary results suggest that pooling data can produce estimates with higher precision, and that accounting for herd-level differences in pronghorn density and detectability remains important to accurate population monitoring.

NOTES:

OBSERVATIONS ON VARIOUS PRONGHORN POPULATIONS IN MEXICO AND THE SOUTHWESTERN UNITED STATES

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ABSTRACT: Various pronghorn populations in Baja California Sur, Chihuahua, Sonora, Arizona, and New Mexico have been surveyed to determine demographics, population estimates, and sustainability. Aerial surveys in some areas have occurred annually since 1994. These surveys, designed in accordance with the Pronghorn Management Guides, have been conducted to help identify appropriate management opportunities and to evaluate the success of prior and ongoing management actions. Some populations have been reduced by adverse climatic conditions, limited genetic variability, small initial population size, lack of community support, habitat interference caused by human made structures, and inter-specific competition. Other populations have increased due to aggressive management actions. Examples of both results are discussed.

NOTES:

USING CITIZEN SCIENTISTS TO CONNECT SCIENCE AND ROAD MITIGATION

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ABSTRACT: Roads, their infrastructure, and associated traffic have significant impacts on wildlife, from direct mortality caused by collisions with vehicles to more indirect effects when wildlife avoid a road reducing access to important resources. Historically, transportation departments identified road mitigation sites based on hotspots of wildlife vehicle collisions (WVC) to ensure human safety. Often wildlife crossing needs are not accounted for in determining road mitigation sites. As an alternative, wildlife professionals have used landscape connectivity models derived from GPS collar data to identify linkage areas along roads that allow animal movement. However, these landscape models can be coarse and only provide general areas of where animals will likely traverse roads. We aimed to identify finer-scale locales to inform where road mitigation would best benefit pronghorn connectivity across the TransCanada Highway (TCH) in Alberta and Saskatchewan, Canada using three data sources: 1) pronghorn observations reported by citizen scientists via a smartphone application (Pronghorn Xing), 2) a pre-existing spring and fall pronghorn connectivity model, and 3) WVC data reported to RCMP or provincial government transportation agencies. Using these three data sets, we documented 16 potential crossing areas where pronghorn are more expected to cross the highway and therefore are candidate sites for mitigation. We then refined the potential mitigation sites using expert opinion from a steering committee. We also determined that WVC clusters derived from government agencies road carcass data do not align well with potential pronghorn crossing areas. To effectively reduce the impact of roads on wildlife, transportation planners need to consider multiple species, collision and crossing areas, and the type of mitigation required to facilitate safe movement. Additionally, by harnessing the competency of citizen scientist to fill in data gaps, planners will increase local awareness and support for mitigation plans and projects.

NOTES:

POPULATION MODELS AID DEFENSIBLE DECISION MAKING AND GUIDE MONITORING OF THE WORLD'S LARGEST PRONGHORN POPULATION

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ABSTRACT: Agencies across western North America are faced with the unique challenge of monitoring and managing pronghorn (Antilocapra americana), a species with a unique life history, a penchant for migration, and a limited range. In collaboration with Wyoming Game and Fish, we developed an integrated population model (IPM) to help inform and defend pronghorn management in the state. The WDGF monitoring program provides a useful test-case for the application of IPMs to a species with a life history strategy that varies significantly from mule deer and elk. We used harvest surveys, abundance estimates, and composition surveys to inform an integrated population model which incorporates statistical population reconstruction within the typical IPM framework. We found the IPM worked well to describe Wyoming pronghorn populations while providing defensible inputs to management decisions. However, we also discovered some key takeaways that need to be considered when implementing these models for pronghorn. These include the incorporation of effort covariates that track changes in harvest rates, population definitions that respect spatial closure assumptions necessary for any population model, and structuring models to reflect the relatively fast life history strategy of pronghorn.

NOTES:

VARIATION IN SURVIVAL RATES ACROSS PRONGHORN NORTHERN POPULATIONS

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ABSTRACT: Estimating demographic parameters (i.e., survival and recruitment) is critical for tracking and predicting trends in wildlife populations. Identifying how demographic parameters change in response to dynamic landscape and climatic conditions can provide insight into how wildlife populations will respond under future environmental changes. Further, in understanding demographic responses across spatiotemporal factors, ecologists can better guide management actions aimed to maximize conservation efforts in wildlife populations. In this project, we study how pronghorn population survival rates vary across space and time. Leveraging GPS location and survival data from nearly 1,000 GPS collared pronghorn across Montana and South Dakota, we estimate annual survival from over 10 pronghorn populations. With over 500 juvenile and adult pronghorn collared in northwestern and central South Dakota and an additional 500 adult pronghorn collared in eastern, central, and southwestern Montana we can compare survival rates from mountain valley populations to mixed grass prairie ecosystems. To analyze these GPS collar data, we used a hierarchical Bayesian survival model to estimate annual survival rates across 2 years. Our results found that survival greatly varies across populations. Mean parameter estimates ranged from 0.66 (CRI 0.55 - 0.77) to 0.90 (CRI 0.85 – 0.94). Such variation offers insight into mechanisms driving survival across space and time and brings ecologists a step closer to effectively adapting conservation actions that best meet management objectives in a changing landscape.

NOTES:

PRONGHORN MIGRATION IN EASTERN OREGON

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ABSTRACT: Migration maximizes accessibility of high-quality forage in variable ecosystems. This ubiquitous behavior is found in taxa worldwide. Large herbivores use long distance migrations to obtain seasonally productive forage. Mule deer (Odocoileus hemiones) and elk (Cervus canadensis) of the western US migrate to lower elevations when snow makes forage at high elevation inaccessible. Pronghorn (Antilocapra americana) in the western US also move between distinct seasonal ranges to obtain higher quality forage. Our objectives were to identify migration corridors and stopover locations used by a population of pronghorn in southeast Oregon. We deployed 154 GPS collars on adult female pronghorn between 2019 and 2021 by means of helicopter capture. We used a Brownian Bridge Movement Model to identify movement corridors, seasonal home ranges, and stopover locations using location data from 107 different pronghorn. Additionally, we identified individual movements between home ranges as well as migration corridors. Additionally, we identified substantial variation among individuals in timing of movements and locations of seasonal ranges. Our observations indicate that pronghorn movement southeast Oregon is influenced by shifting forage quality and not predicted by calendar dates.

NOTES:

WIND-ENERGY DEVELOPMENT ALTERS PRONGHORN MIGRATION AT MULTIPLE SCALES

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ABSTRACT: Migration is a widespread behavioral strategy that facilitates population persistence and ecosystem functioning, but migration routes have been increasingly disrupted by anthropogenic activities, including energy development. Wind energy is the world's fastest growing source of electricity and represents an important alternative to hydrocarbon extraction, but its effects on migratory species beyond birds and bats are not well understood. We evaluated the effects of wind-energy development on pronghorn migration, including behavior and habitat selection, to assess potential effects on connectivity and other functional benefits including stopovers. We monitored GPS-collared female pronghorn from 2010–2012 and 2018–2020 in south-central Wyoming, USA, an area with multiple wind-energy facilities in various stages of development and operation, and collected 286 migration sequences from 117 individuals, including 121 spring migrations, 123 fall migrations, and 42 facultative winter migrations. While individuals continued to migrate through wind-energy facilities, pronghorn made important behavioral adjustments relative to turbines during migration. These included avoiding turbines when selecting stopover sites, selecting areas farther from turbines at a small scale, moving more quickly near turbines in spring, and reducing fidelity to migration routes relative to wind turbines under construction. While much remains to be learned, the behavioral adjustments pronghorn made relative to wind turbines could affect the functional benefits of migration, such as foraging success or the availability of specific routes, over the long-term.

WESTERN STATE AND PROVINCE PRONGHORN STATUS REPORT, 2022

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ABSTRACT: A range wide pronghorn summary is provided during each biennial western state and province pronghorn workshop. Because of the coronavirus pandemic, the 29th workshop was delayed 2 years. For the 2022 pronghorn workshop, hosted by the South Dakota Game, Fish and Parks, we administered a questionnaire survey to 23 states and provinces spanning pronghorn range from Canada, Mexico, and the United States. The 6-page questionnaire included 91 questions and was designed to standardize information among jurisdictions. We received responses from all 23 jurisdictions providing comprehensive coverage of all pronghorn subspecies from Canada to Mexico. The total 2021 pre-hunting season population estimate was 929,016 across 801,007 square miles of pronghorn range. Of the 8 states or provinces that reported numerical population goals, 5 were below the population objective. Pronghorn population density in Wyoming was nearly 3 times the next highest density reported in Colorado. All pronghorn in Mexico continue to be under objective despite no hunting seasons. Pronghorn densities in Mexico were about 1/6th of the average pronghorn density across the entire range. Adult buck to adult doe ratios averaged 41 bucks to 100 does in 2021, comparable to long-term averages. Except for Arizona Sonoran pronghorn, buck to doe ratios were highest in the northcentral part of the range in Montana and Saskatchewan. Concerningly, fawn to adult doe ratios that averaged 38 fawns per 100 does in 2021 were >5% below long-term averages in 85% of states and provinces. The southwestern region of pronghorn range reported the lowest fawn to doe ratios. Total pronghorn harvest in 2021, excluding Saskatchewan, was 75,400 (11.3 pronghorn harvested per 100 square miles of identified pronghorn range) and accounted for 8% of the range wide estimated population. In addition to the highest population, pronghorn harvest was highest in Wyoming. Below objective populations and below average recruitment rates may be cause for concern if the pattern persists.

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MODELING PRONGHORN BEHAVIOR AND SPACE-USE: ACCLIMATION OF TRANSLOCATED PRONGHORN IN THE EDWARDS PLATEAU

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ABSTRACT: Translocation is the most widely used tool to combat megafauna population declines to prevent extinction. However, despite widespread use, there are no explicit measures for translocation success. To alleviate this challenge, it is first essential to define appropriate timescales to assess translocation success. To address this, we estimated the post-translocation acclimation period for translocated pronghorn (Antilocapra americana) based on patterns of animal space use. The acclimation period is a critical time scale indicative of translocated individuals changing their space use and becoming familiar with their novel environment. Familiarity with the environment is associated with a lower mortality risk. We postulated that residents would maintain a static range size over time, whereas translocated pronghorn would initially have large range sizes that declined as they acclimated. In February 2019, Texas Parks and Wildlife Department (TPWD) collared 20 resident pronghorn on Rocker b Ranch, near Big Lake, Texas. In January 2020, TPWD translocated 115 pronghorn from Pampa, Texas, to the Rocker b Ranch, 45 of which were fitted with Global Positioning Systems collars. We fit weekly utilization distributions (UD) using a kernel density estimator for each resident and translocated pronghorn, following the translocation event. We took the area of the 75% isopleth of each UD to collate a time series of each individual's weekly range size. We then fit generalized linear mixed models to quantify differences between resident and translocated pronghorn behavior through time. We found that the acclimation period for translocated pronghorn is approximately 6 months post-release, much longer than previously thought (R2 = 0.30). In addition, translocated pronghorn settled into smaller ranges than residents (β = 5.87 km2, 95% CI = $\pm$ 1.05), supporting the notion memory is a primary factor in pronghorn space use, and suggesting translocated may have fitness advantages over residents. These results also suggest the success of both fence modification efforts and translocations should be evaluated over longer time scales than previously thought. Further, translocation may expedite the colonization of reconnected habitat following fence modification, conferring a previously unrecognized advantage of this practice.

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PRONGHORN MOVEMENT AND RESOURCE SELECTION IN NEBRASKA'S AGRICULTURALLY DOMINATED LANDSCAPE

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ABSTRACT: Grasslands are globally recognized as one of the most ecologically and economically valuable biomes on earth, yet 50% of North America's temperate grasslands have been converted to crop production and rangeland for livestock. Pronghorn (Antilocapra americana) are an endemic species to these imperiled temperate grasslands and are capable of some of the longest migrations of all North American ungulates. With the conversion of these critically important temperate grasslands, landscape fragmentation may pose significant challenges to movements and resource selection of pronghorn and may significantly alter their use compared to historical populations. Currently, a knowledge gap exists in our understanding of pronghorn resource selection in Nebraska. We seek to understand how landscape structure influences pronghorn movement and resource selection across a fragmented agricultural system in the panhandle of western Nebraska and the Sandhills. We captured and fit 110 adult pronghorn in western Nebraska with GPS collars and collected locations every 2.5 hours. Using step selection functions, we will compare habitat features and environmental conditions at used versus available locations to identify selection preferences. We hypothesize that large-scale crop production artificially increases access to forage, improving fitness of year-round residents and lessening the need for long-distance seasonal movement. This analysis is in progress and results will be finalized by July 2022. With pressure mounting on farmers to feed an ever-growing human population, results from this study will build a foundation to guide management for long-term persistence of pronghorn in a human-dominated landscape.

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COLLABORATIVE WILDLIFE-SNOW SCIENCE: INTEGRATING WILDLIFE AND SNOW EXPERTISE TO IMPROVE RESEARCH AND MANAGEMENT

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ABSTRACT: Snow and other winter features or processes affect many aspects of wildlife ecology, ranging from movement behaviors, to forage accessibility, to community dynamics. Moreover, the relationships between wildlife and the snow properties they experience, such as snow onset date, depth, and distribution, can ultimately influence individual fitness and alter population dynamics. Therefore, researchers and managers in regions experiencing snow often seek to understand these interactions and their consequences. However, studying and monitoring wildlife-snow relationships remain challenging, because properly characterizing snow and identifying, accessing, and applying relevant snow information at appropriate spatial and temporal scales often require a detailed understanding of physical snow science and technologies that typically lie outside the expertise of wildlife professionals. To overcome these difficulties and achieve novel, more nuanced understandings of wildlife-snow relationships, we advocate for substantive, cross-disciplinary collaboration between the wildlife and snow sciences. We propose a five-step procedure to facilitate this collaboration, and we present the different types of snow information that can be used within this interdisciplinary framework. These data types and methods include field observations, remote-sensing datasets, and examples of modeling tools that simulate spatiotemporal snow property distributions and evolutions. Our procedure details how to identify relevant snow information at appropriate spatiotemporal scales, produce validated and tailored snow datasets, and apply the resulting snow information in wildlife analyses through direct collaboration between wildlife and snow professionals. We present these concepts through the lens of several real-world examples of wildlife-snow studies and focus on how this work is relevant to the ungulate ecology community, with particular emphasis on pronghorn research and management.

Reinking, A. K., S. H. Pedersen, K. Elder, N. T. Boelman, B. A. Oates, S. Bergen, M. B. Coughenour, T. W. Glass, J. A. Feltner, K. J. Barker, L. R. Prugh, T. J. Brinkman, T. W. Bentzen, Å. Ø. Pedersen, N. M. Schmidt, and G. E. Liston. In press. Collaborative wildlife-snow science: Integrating wildlife and snow expertise to improve research and management. Ecosphere: Innovative Viewpoints. DOI: : 10.1002/ecs2.4094.

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PRONGHORN HABITAT SUITABILITY IN THE FLINT HILLS OF EAST-CENTRAL KANSAS

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ABSTRACT: Pronghorn (Antilocapra americana) were translocated into the Flint Hills region of Chase County, Kansas during the late 1970s through the early 1990s as a part of statewide reintroduction efforts into portions of their historical range. Since the last translocation in 1992, the Chase County pronghorn population has stabilized at approximately 30 individuals. Several research projects conducted in the 1990s provided important information on the Chase County population and local habitat conditions during initial translocations. However, land ownership and land management have changed which may impact pronghorn habitat suitability. Habitat conditions were inventoried in 2021 to determine the current status of pronghorn habitat and potential limiting factors including bottom wire fence heights, fence density, pasture size, vegetation composition, vegetation height, and coyote occupancy. Maximum bottom wire fence height was estimated at an average of 41 cm and minimum of 30.7 cm which are below the recommended minimum bottom wire height of 46 cm. Additionally, only 27.3% of the total number of fences sampled were ≥ 46 cm which suggests a low percentage of adequate bottom wire height for pronghorn passage. Fence density and pasture size was estimated at 1.9 km/km2 and 2.6 km2 respectively. Vegetation height averaged 8.6, 10.0, and 11.1 cm for June, July, and August 2021, which falls below fawn habitat height recommendations (> 25 cm). Coyote naïve occupancy was determined to be 100% among nine camera trap sites while individual site estimated occupancies was lower (psi = 50%). Management recommendations that may be acceptable to local landowners is a minimum average bottom wire height of 46 cm to improve pronghorn passage and movement across the landscape and maintain an average vegetation height >25 cm during the months of June, July, and August to increase potential fawning habitat.

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SEASONAL RESOURCE SELECTION BY PRONGHORN IN CENTRAL OREGON

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ABSTRACT: Understanding features on the landscape that animals select for is critical information for wildlife managers in order to make population and land management decision to manage wildlife, and is important for predicting where wildlife are expected to occur across the landscape. The Oregon Department of Wildlife (ODFW) collected location data on free-ranging pronghorn (Antilocapra americana) in central Oregon from February of 2018 through March of 2021. Pronghorn were captured and fitted with Global Positioning Satellite (GPS) collars and released, with collars programmed to record locations approximately every 13 hours year-round. We used net squared displacement to estimate seasonal range migration periods and estimated mixed-model resource selection functions to understand resource selection by pronghorn. We found that this is a mixed migratory population, but that most individuals showed year-round range fidelity or sporadic non-seasonal migrations. Pronghorn avoided Pinus ponderosa and Juniperus occidentalis cover, especially during winter. Pronghorn also selected for areas with higher annual forb and grass cover, but only in fall and winter. Surprisingly, pronghorn selected for locations with higher surrounding fence density than was available within their home ranges, and from spring to winter increased the strength of their selection. Variation in selection for specific resources among individual pronghorn was highly resource and season dependent. Maps of the predicted relative probability of occurrence validated well (Spearman rho = 0.92, $p < 0.001$) and are now available for pronghorn managers across a large portion of central Oregon.

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ICE-AGE PRONGHORN IN NORTH AMERICA

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ABSTRACT: Four genera (with a total of 6 species) of pronghorn are known from North America: Capromeryx, Stockoceros, Tetrameyx, and Antilocapra. Ironically, the living pronghorn, Antilocapra americana, has a meager record in the Pleistocene, despite its abundance and wide distribution in recent times. Only 7 records of Antilocapra in the Pleistocene are recognized as valid; most of the nearly 100 other records in the literature are based on non-diagnostic fragments. Antilocapra overlaps in size with Stockoceros and Tetrameryx; Stockoceros being mainly smaller, and Tetrameryx being mainly larger than the modern species. Identification of Antilocapra in the Pleistocene has been based primarily on size; Tetrameryx being ignored in most such consideration. To complicate comparisons further, there is no known occurrence of a Tetrameryx skull being directly associated with a skeleton, so we have no known reference for its postcranial remains, and no idea of potential variation in size. I examine the distribution of Ice-Age pronghorn in time and space, discussing the occurrence of these animals in cave and karst deposits versus open sites. Finally, I highlight the interesting problem of why three genera, two of them roughly the same size as the modern species and one a dwarfed form, should have become extinct by the end of the Pleistocene, while the extant American pronghorn survived and flourished.

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MIGRATORY STRATEGIES AND INTEGRATED STEP SELECTION ANALYSIS OF PRONGHORN (ANTILOCAPRA AMERICANA) ON THE MODOC PLATEAU

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ABSTRACT: Anthropological effects have influenced habitat and organisms' ability to move across landscapes freely. For pronghorn (Antilocapra americana), barriers such as fences and roads inhibit movement. Understanding migratory strategies and how pronghorn interact with the environment during range shifts would improve management. To distinguish migratory strategies, we used location data from 173 GPS-collared pronghorn in California, Nevada, and Oregon, collected over six years. Using a mechanistic range shift analysis, we identified movements between ranges and migration strategies. We then used an integrated Step-Selection Analysis (iSSA) to determine how landscape characteristics influence these movements. We determined that 114 of 173 (65.9%) of pronghorn shifted ranges at least once. Range shifts lasted an average of 4.57 days, with individuals traveling an average distance of 22.04 km (range = 1.05–78.30 km). Migration strategy varied, with some individuals remaining as residents and others shifting up to ten times/year. Our iSSA indicated that terrain roughness, fence density, and distance to fence influenced pronghorn movements. The next step is using our iSSA to simulate pronghorn movements under different environmental conditions. We were able to identify individuals with varying strategies of migration and identified landscape features that affected these movements. This study demonstrates how migratory behavior can vary within and amongst populations and will help inform how habitat modification efforts can alter landscape connectivity.

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Artwork by Adam Oswald