EARTHWATCH INSTITUTE

WILDLIFE OF THE MONGOLIAN STEPPE

2015
FIELD
REPORT

EARTHWATCH INSTITUTE

Wildlife of the Mongolian Steppe

2015 FIELD REPORT

Background Information

LEAD PI: Gana Wingard

REPORT COMPLETED BY: Gana Wingard, Melinda Arnold

PERIOD COVERED BY THIS REPORT: Summer 2015

CHANGES TO:

PROJECT SCIENTISTS: In August 2015, Richard Reading, Ph.D., Director of Field Conservation left Denver Zoo to pursue other opportunities.

RESEARCH SITE: No

RESEARCH SITE LATITUDE / LONGITUDE: No

PROTECTED AREA STATUS: No

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Dear Earthwatch Volunteers,

We are writing on behalf of our Mongolian and American team members to express our gratitude to you for all of your hard work on behalf of Mongolian wildlife! Our 2015 fieldwork went exceedingly well in almost every aspect of our work. We captured and radio tagged a large number of animals (4 argali, 1 ibex, 10 Mongolian gazelles and 6 Goitered gazelles); we monitored, wing tagged, and leg banded 57 cinereous vultures fledglings; we leg banded and measured 12 lesser kestrels and 1 Eurasian eagle owl; we monitored nests of 6 raptor species; we captured and wing tagged 40 bats; we collected data on over 100 vegetation plots; we conducted 9 small mammal, insect, and lizard surveys; and we gathered telemetry data on argali, ibex and gazelles. It was a lot of work, but also a lot of fun!

A few highlights from the season:

- Based on data collected from the Earthwatch project, for the first time ever, Zoo staff identified lesser kestrel migrations.
- For the first time ever, staff fitted 21 ungulates with satellite telemetry units with the Earthwatch project. Now the Zoo is tracking movements of four argali sheep; one Siberian ibex; ten Mongolian gazelles and six Goitered gazelles.
- The Zoo's Mongolian Researcher Onolragchaa was enrolled in PhD program in South Korea thanks to his previous research experiences at Ikh Nart with Earthwatch support. Onolragchaa also received a Distinguished Graduate Researcher Award from the Mongolian State University of Education.

Many of you have decided to help with our work even more with donations of money, equipment, training materials, or other useful items. Thank you very much! Your hard work is already paying dividends. Without you, none of this would be possible! We were thrilled by all the energy, hard work, and wonderful goodwill you all provided. We hope that our many new friendships will last! We look forward to continuing our work with Earthwatch and hope to see many of you in the future.

Also, for those of you who want to receive updates, if you have not already done so, please send us an e-mail (**gwingard@denverzoo.org**) with your e-mail address and request that I add your name to our distribution list. I periodically send out updates to volunteers who wish to be included on this list.

Please keep in touch!

With best,
Gana Wingard and the team

SECTION ONE: Scientific research achievements

TOP HIGHLIGHT FROM THE PAST SEASON

Based on data collected from the Earthwatch project, for the first time ever, Zoo staff identified lesser kestrel migrations. In early June, two kestrels were observed with geolocators. One bird was caught and a geolocator was recovered. A second kestrel was captured during EW Team 3 with another geolocator. Thus, two geolocators have been recovered from a total of 24 deployed geolocators in the summer of 2015. The maximum distance covered by the kestrels is about 12,000 kilometers when measured from northeastern-most to southwestern-most points. The distance from the central part of their summering grounds in Mongolia and their wintering grounds in Africa is roughly 10-11,000 kilometers for both birds. For the first time ever, staff fitted 21 ungulates with satellite telemetry units with the EW project. Now the Zoo is tracking movements of four argali sheep; one Siberian ibex; ten Mongolian gazelles and six Goitered gazelles. Denver Zoo is collecting movement and behavioral data on the collared animals. The organization is very proud to continue to build capacity in Mongolia and conduct hands-on trainings to young Mongolian scientists and veterinarians. Denver Zoo's Mongolian graduate student Rentsen Oyunbat is applying for the Graduate school at the University of New Mexico. Given rapidly changing environmental conditions, this is a critical time in Mongolia for biodiversity studies. The Zoo's Mongolian Researcher Onolragchaa was enrolled in PhD program in South Korea thanks to his previous research experiences at Ikh Nart with EW support. Onolragchaa also received a Distinguished Graduate Researcher Award from the Mongolian State University of Education.

REPORTING AGAINST RESEARCH OBJECTIVES

Objective 1: Understand the ecology of target species well enough to develop long-term conservation management plans for the species and for the Ikh Nart Nature Reserve that ensure their long-term health and enjoys enduring public support.

Progress towards/against objective 1: Zoo staff continue to collect substantial data on a wide number of wildlife species and archaeological sites within Ikh Nart. More recently, the management plan called for an innovative method to manage Ikh Nart Nature Reserve. The determined method was to use a Mongolian non-governmental organization, Argail Wildlife Research Center, managed by Dr. Amgalanbaatar. This center is the first Mongolian non-governmental organization to run a protected area and the Zoo is optimistic and to date it has been highly successful.

Objective 2: Animal Capture and Marking

Progress towards/against objective 2:

Research Goal 1: Each year capture and radio collar:

• *5 - 10 adult and 8 - 10 young argali sheep (Ovis ommon) and Siberian ibex (Capra sibirica)*
We captured 4 adult argali (1♂: 3♀); 1 ibex (1♂); 10 Mongolian gazelles and 6 Goitered gazelles in drive nets in 2015. All 21 animals received satellite collars (Figure 1, 2,3,4,5,6,7,8 and 9).

• *3-5 hedgehogs*
We did not capture and radio tag any hedgehogs in 2015 as Zoo staff believe sufficient data on hedgehogs has been collected.

Research Goal 2: Permanently leg band and wing tag 10-20 cinereous vulture *(Aegypius monachus)* fledglings and place satellite telemetry units on 2 adult cinereous vultures.

We wing tagged and leg banded a record number of 57 Eurasian black vulture fledglings in Ikh Nart in 2015 (Figure 10).

Research Goal 3: Permanently leg band 5-10 lesser kestrel *(Falco naumanni)* fledglings and capture and place tail mounted telemetry units on 5 lesser kestrel adults.

We leg banded 11 adults (5♂:6♀). We also leg banded and measured 1 Upland buzzard *(Buteo hemiliasis)*; 1 saker falcon *(Falco cherrug)* pre-fledging juveniles; 1 Golden eagle *(Aquila chrysaetos)* and 6 common ravens *(Corvus corax)*.

In 2015, we applied 11 light sensitive geolocators (to track long distance movements) on 6 male and 5 female lesser kestrels. (Figure 11)

Research Goal 4: Survey small mammals and invertebrates monthly using live traps for mammals. Ear tag all small mammals captured.

We sampled small mammals at each of 6 habitats (9 surveys total), including sandy drainage, shrub, rocky, short grass, and long grass. For small mammals, we logged a total 220 captures of 441 individuals. All animals received ear tags.

Research Goal 5: Collect biological samples (blood, hair, parasites, etc.) as necessary and morphological measurements from captured animals for future genetic, disease, and other analyses.

We collected blood from 40 fledgling cinereous vultures.

We collected tail feathers from 57 vulture fledglings for later analyses of nutrition and stress by an Israeli colleague.

We collected blood samples from 4 argali and 1 ibex to test for hoof-and-mouth disease, the West Nile virus, Maedi, blue tongue, and brucellosis.

We collected fecal samples from 43 argali; 10 ibex, and 9 domestic sheep and goats to assess their parasites.

Objective 3: Fecundity, Survivorship, Development, & Mortality

Progress towards/against objective 3:

Research Goal 6: Gather data on fecundity of marked individuals and survivorship of their young.

We gathered data on Eurasian black vulture and lesser kestrel nestlings to monitor nesting success in 2015 (see below). We also tracked the nesting success and survivorship of tagged adults of both species.

We maintain data on survivorship of all animals we radio telemeter, including argali, ibex, vultures, and kestrels (Figure 12).

Research Goal 7: Evaluate survival of 20-40 Eurasian black vulture fledglings and 8-16 young argali and ibex.
We monitored 77 active nests of cinereous vultures, of which 57 produced vulture fledglings in 2015. We tagged those vultures for a total of 396 wing tagged fledglings since 2005.

We did not collar any neonatal lambs and neonatal ibex in 2015, as we believe have sufficient data on these young animals now.

Research Goal 8: Assess the influence of nest and nest site characteristics on nest failure for 50-70 nests.
We now have nest site characteristics on over 500 Eurasian black vulture nest sites and are beginning to analyze these data to examine factors influencing site selection and nesting success (Figure 13).

We monitored 56 lesser kestrel, 1 common kestrel *(Falco tinnunculus),* 1 saker falcon; 1 golden eagle and 6 common ravens nest sites in 2015 (Figure 14).

Research Goal 9: Determine sources of mortality for as many marked and radio collared animals as possible.
We did not record any deaths of neonatal lambs in 2015.

Objective 4: Habitat Use & Movement Patterns

Progress towards/against objective 4:

Research Goal 10: Collect data on habitat use for radio collared animals using location data.

We collected 332 VHF telemetry locations on argali sheep, and 79 VHF telemetry locations on ibex in 2015 through November. So far in the study we have collected 15,165 VHF telemetry locations on argali and ibex at Ikh Nart since November 2000.

We also obtained GPS, satellite, and satellite/GPS location data for argali, and cinereous vultures. In 2015, we have collected 8,418 location data for cinereous vultures and 4,818 locations for argali (Figure 15).

Research Goal 11: Collect data on hedgehog foraging using fecal analyses.

We continued collecting hedgehog scats in 2015, which we hope to analyze this winter.

Research Goal 12: Determine prey (small mammal, invertebrate, and lizard) and forage availability from spring through autumn.

We ran 6 small mammal grids on sandy drainage, shrubby, rocky, short grass and tall grass habitats during 2014. We logged a total of 220 captures of 441 individuals.

We gathered vegetation data on 100 one sq meter circular plots from June through September, including data on species composition, biomass, and phenotypic stage of the plants.

Research Goal 13: Evaluate characteristics of den sites and hibernacula for hedgehogs.

We did not gather data on hedgehog den in 2015. We believe sufficient data on hedgehogs has been collected.

Research Goal 14: Compare habitat use and forage plants of target animals to assess resource partitioning and overlap.

This work has been completed and published (Wingard et al. 2011).

Research Goal 15: With help from birders throughout Asia, gather data on cinereous vulture dispersal and foraging patterns.

We recorded 6 re-sightings of vultures in 2015. Of these, 3 re-sightings occurred in South Korea and 3 re-sightings occurred in Mongolia.

Research Goal 16: Gather data on movement patterns and dispersal for 5-15 radio collared individuals/species.

We collected 332 VHF telemetry locations on argali sheep, and 79 VHF telemetry locations on ibex in 2015 through November. So far in the study we have collected 15,165 VHF telemetry locations on argali and ibex at Ikh Nart since November 2000.

Objective 5: Behavioral & Social Ecology

Progress towards/against objective 5:

Research Goal 17: Determine activity patterns for 5-15 radio collars individuals/species.

We continue collecting more data via satellite collars on 3 argali and 1 ibex.

Research Goal 18: Collect data on group sizes and composition for appropriate species.

We gathered data on 1,123 argali groups and 388 ibex groups in 2015 through November. We now have group size and composition data from 17,174 argali groups and 3,979 ibex groups at Ikh Nart since November 2000.

Research Goal 19: Determine social organization.

We continued analyzing social organization data and population vital rates.

Objective 6: Initiate an ecological study of Pallas' colubers (Elaphe dione) in 2010.

Our main goal to increase awareness and knowledge of reptile ecology in Ikh Nart.

Progress towards/against objective 6:

Research Goal 20: Capture and radio transmit 3-8 Pallas' coluber snakes.

We could not capture Pallas' colubers in 2015, because we could not find large enough colubers to fit radio transmitters.

Research Goal 21: Evaluate characteristics of den sites and hibernacula for coluber snakes.

In 2015, we revisited 2 hibernacula sites, which we found in 2013 to gather data on Pallas’ colubers and Central Asian vipers *(Gloydius halys)*. Both species occurred there in large numbers in 2015.

Figure 1: Objective 2 - Argali Sheep Density Map – September 2015

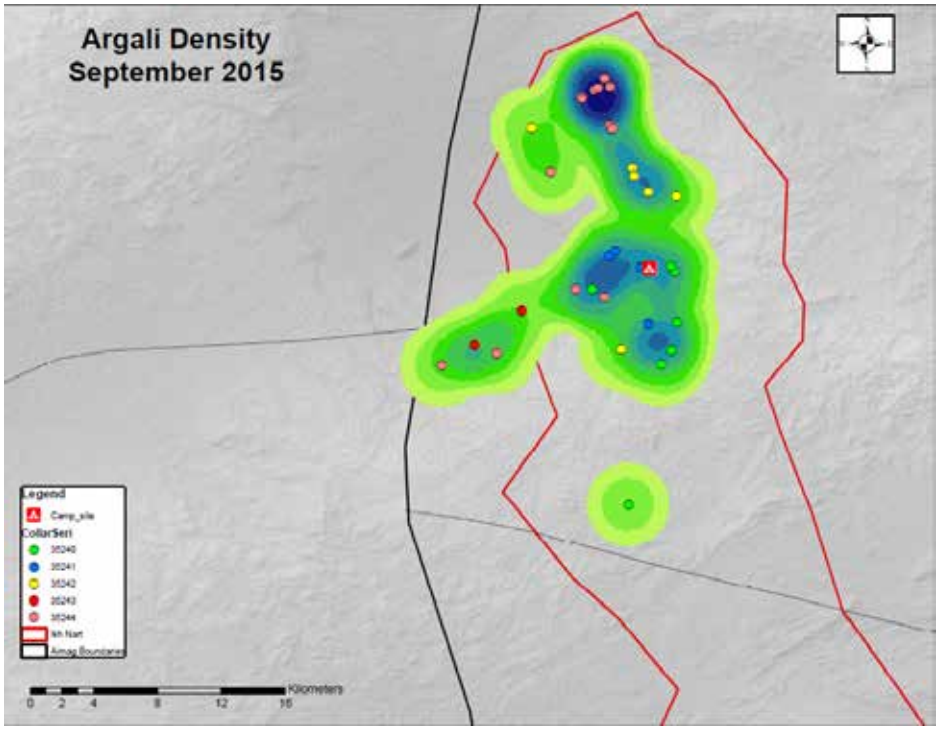


Figure 2: Objective 2 - Argali Sheep Density Map – October 2015

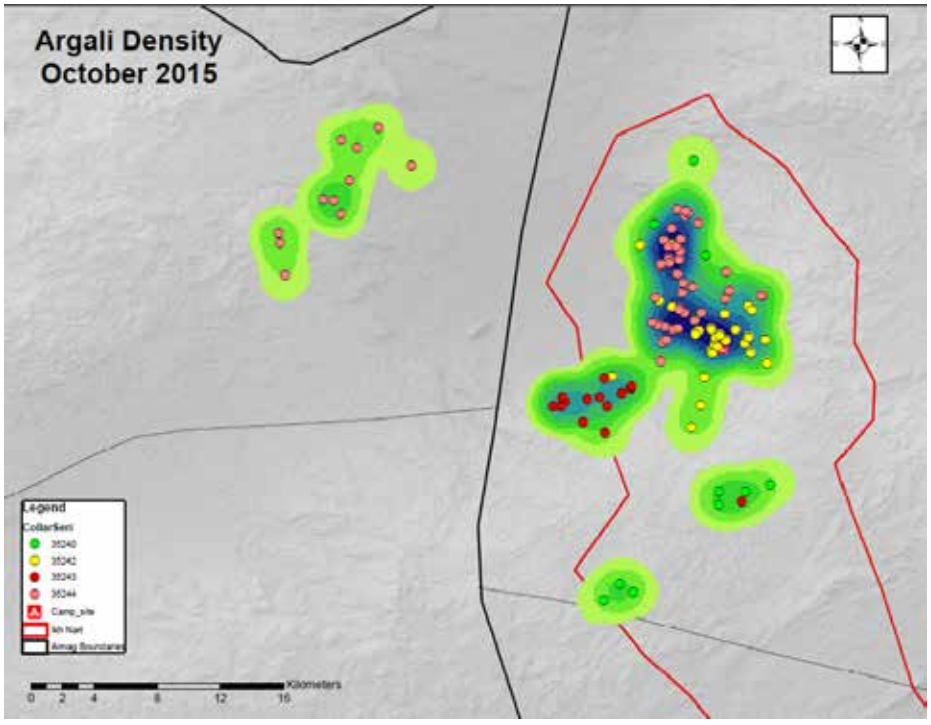


Figure 3: Objective 2 - Argali Sheep Density Map – November 2015

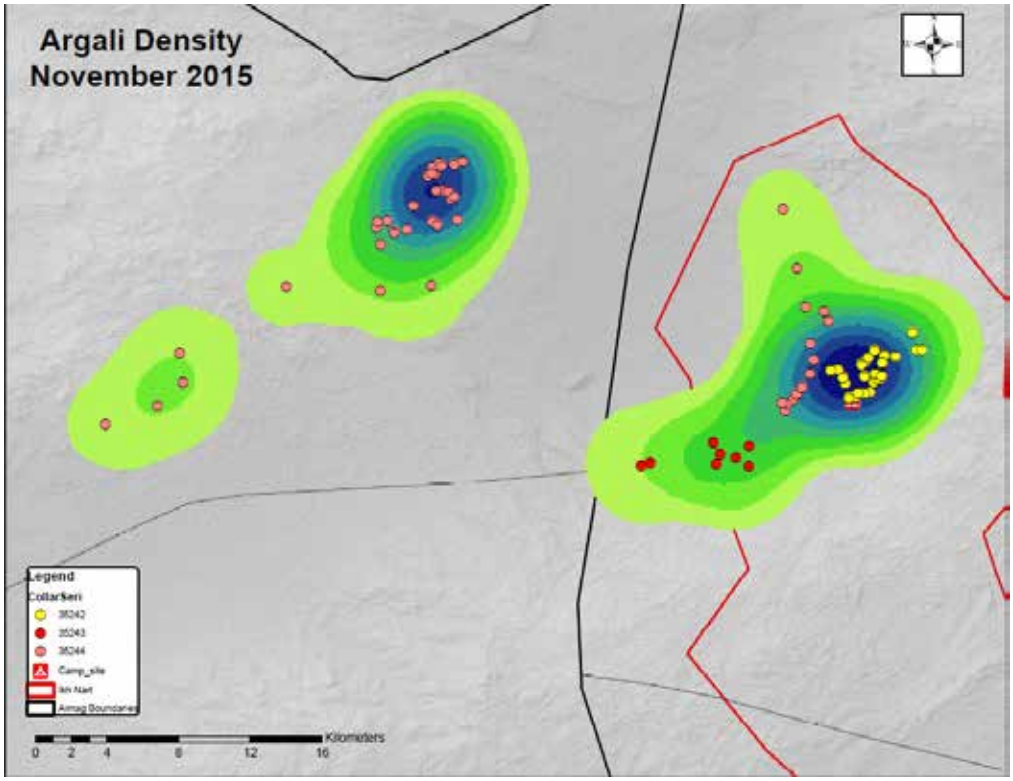


Figure 4: Objective 2 – Gazelle Density September 2015

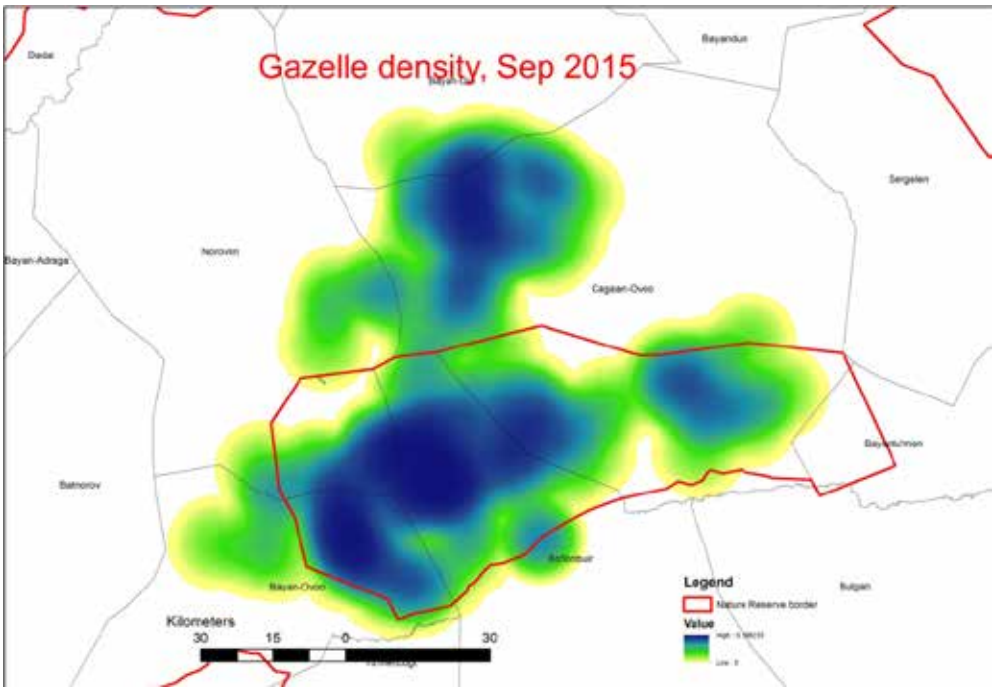


Figure 5: Objective 2 – Gazelle Density October 2015

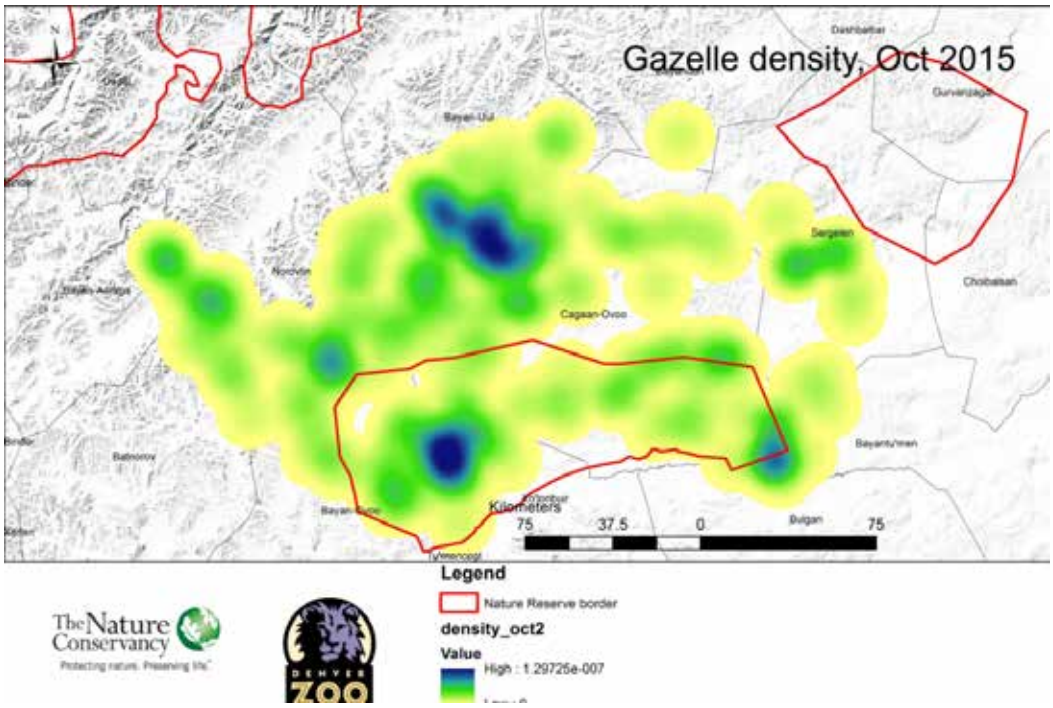


Figure 6: Objective 2 – Gazelle Density November 2015

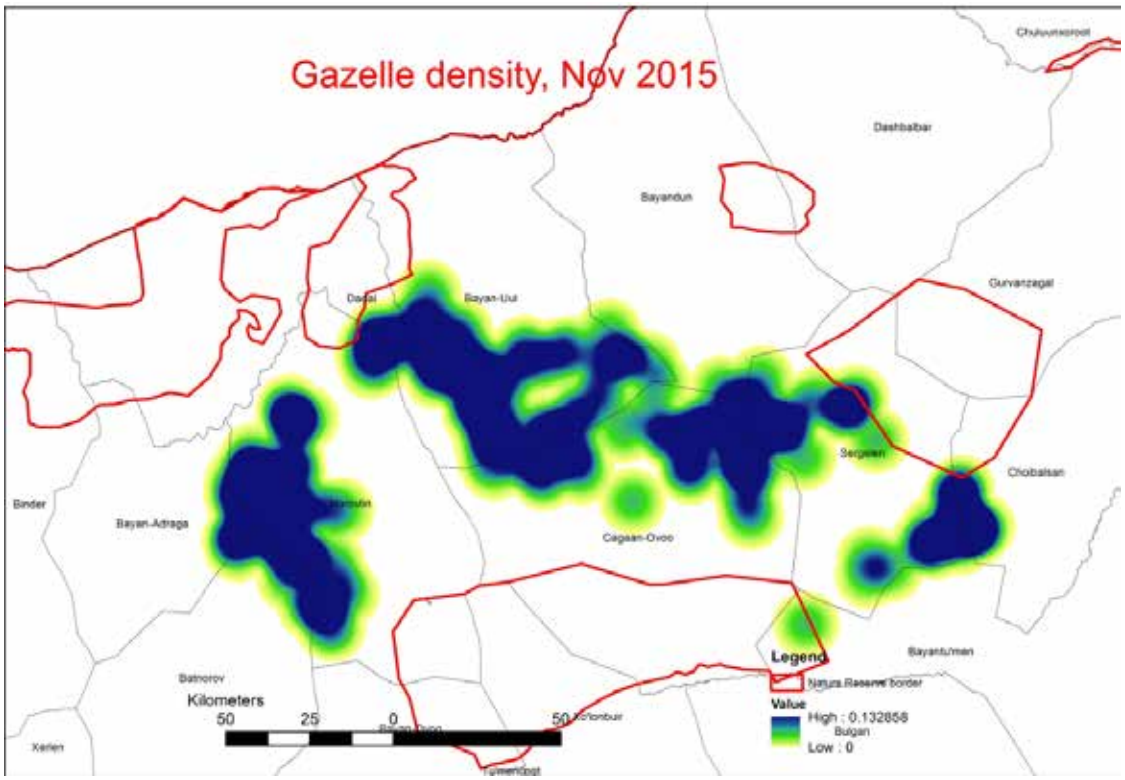


Figure 7: Objective 2 – Goitered Gazelle Density September 2015

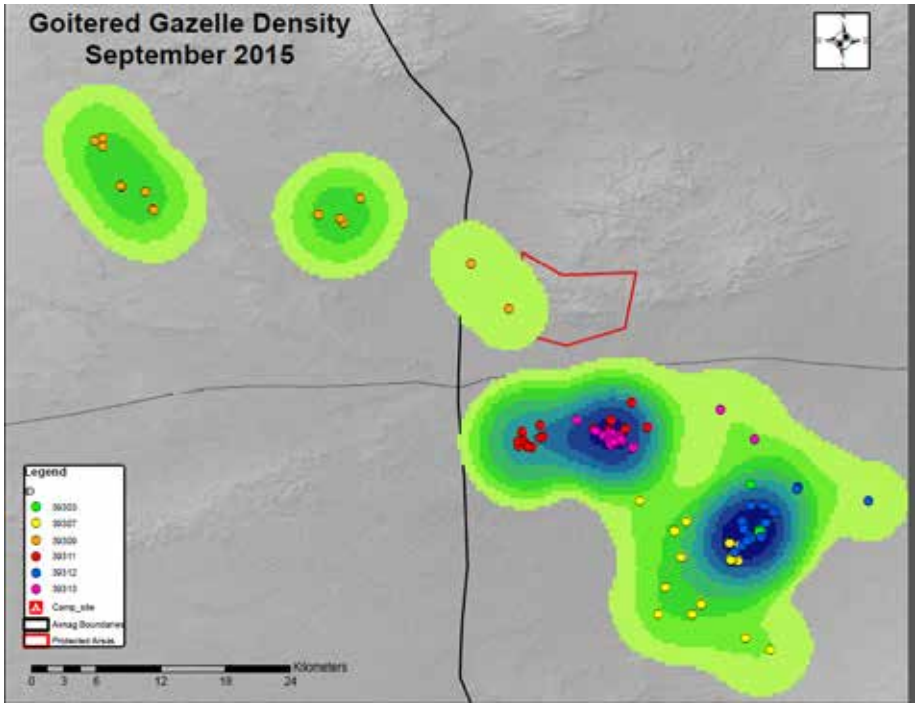


Figure 8: Objective 2 – Goitered Gazelle Density October 2015

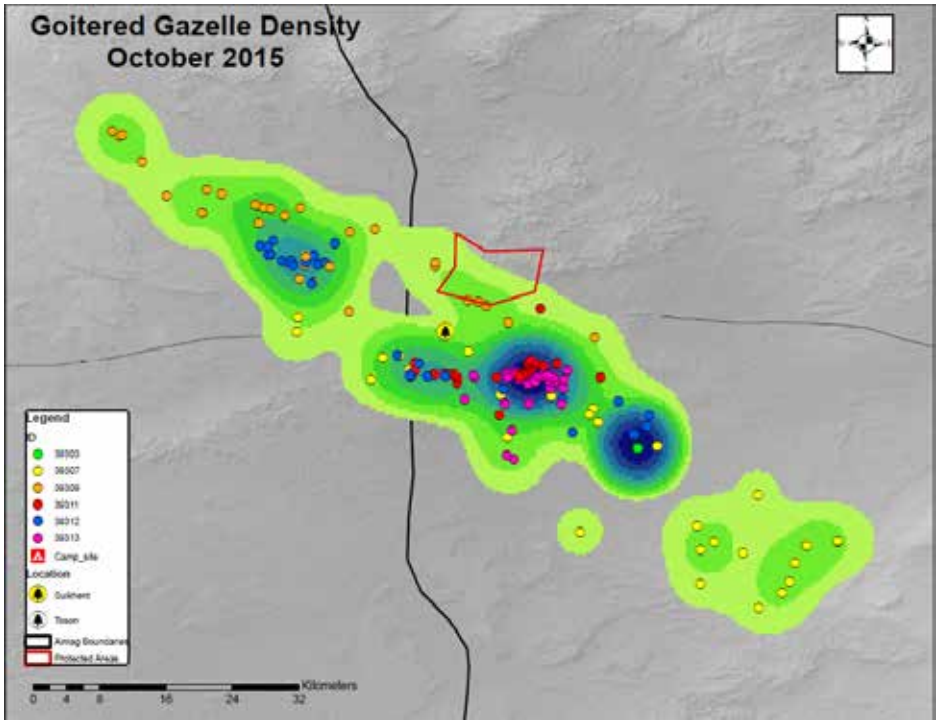


Figure 9: Objective 2 – Goitered Gazelle Density November 2015

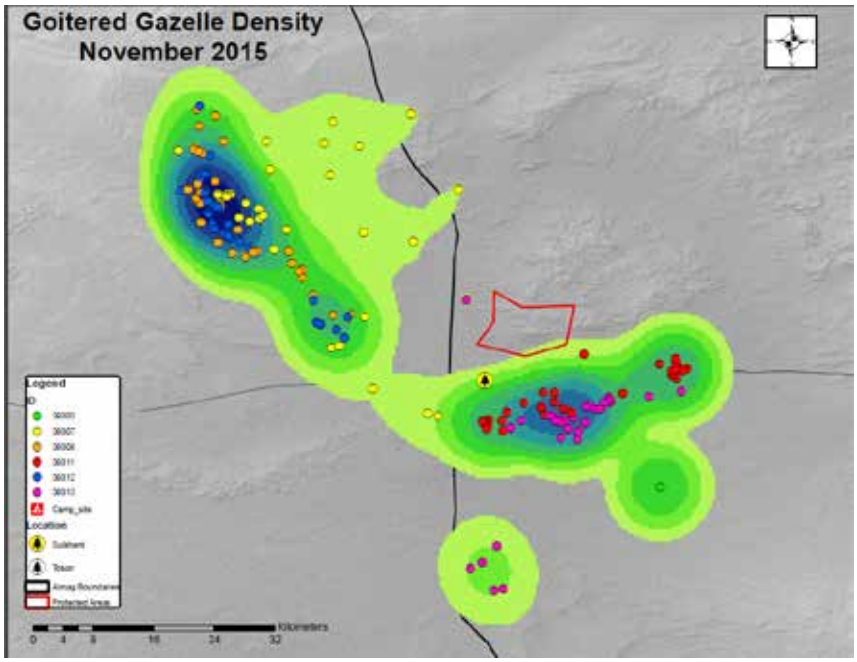


Figure 10: Objective 2 – Eurasian Black Vulture Movements

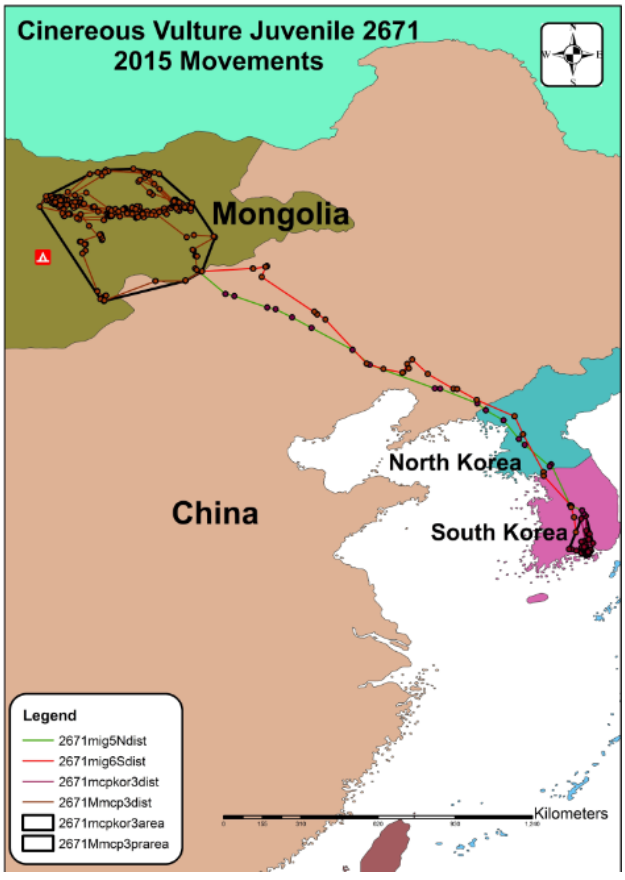


Figure 11: Objective 2 – Lesser Kestrels Migration

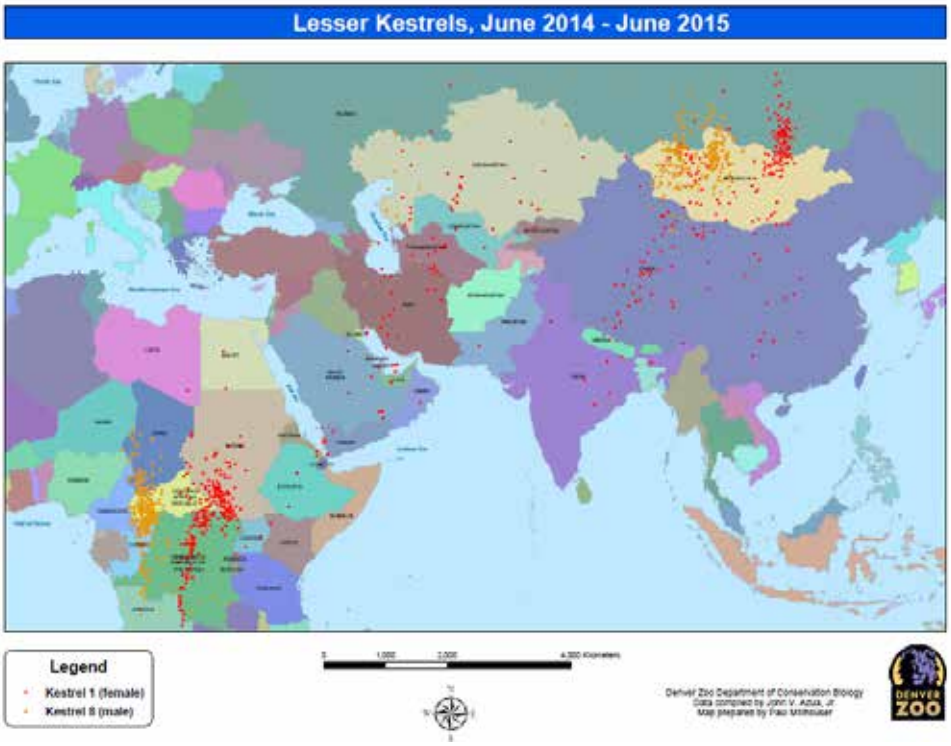


Figure 12: Objective 3 – Argali Survival

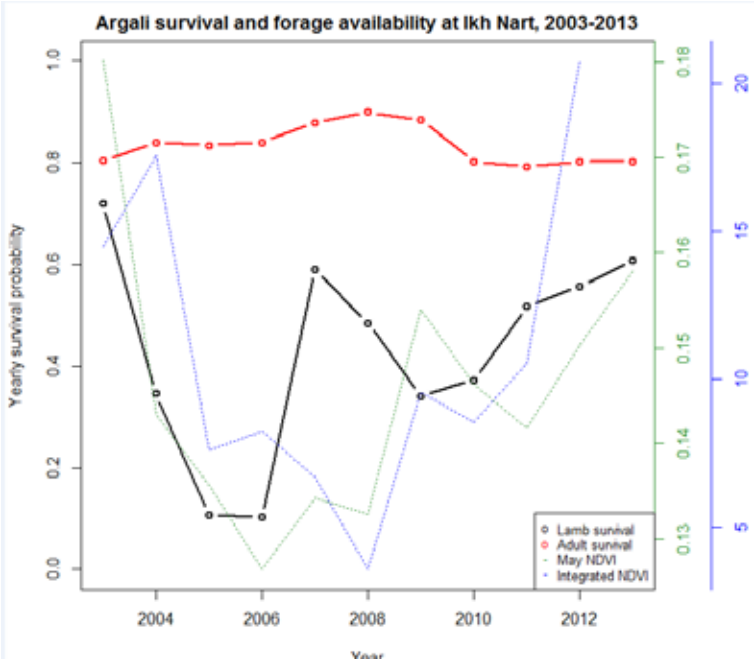


Figure 13: Objective 3 – Eurasian Black Vulture nest 2015

Figure 14: Objective 3 – Nest numbers of Lesser Kestrel colonies

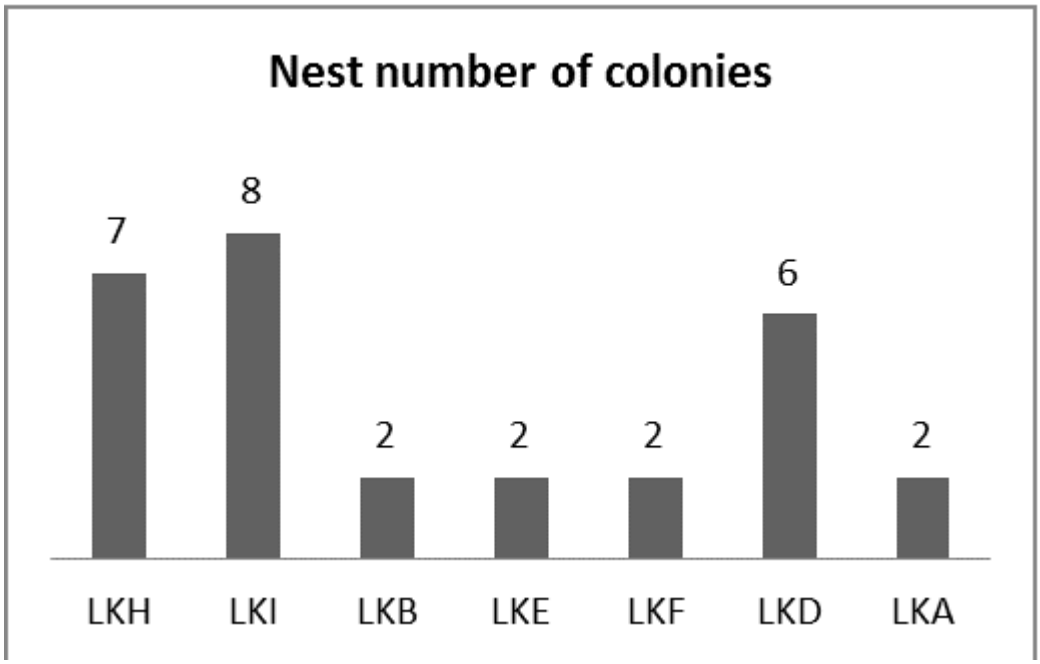
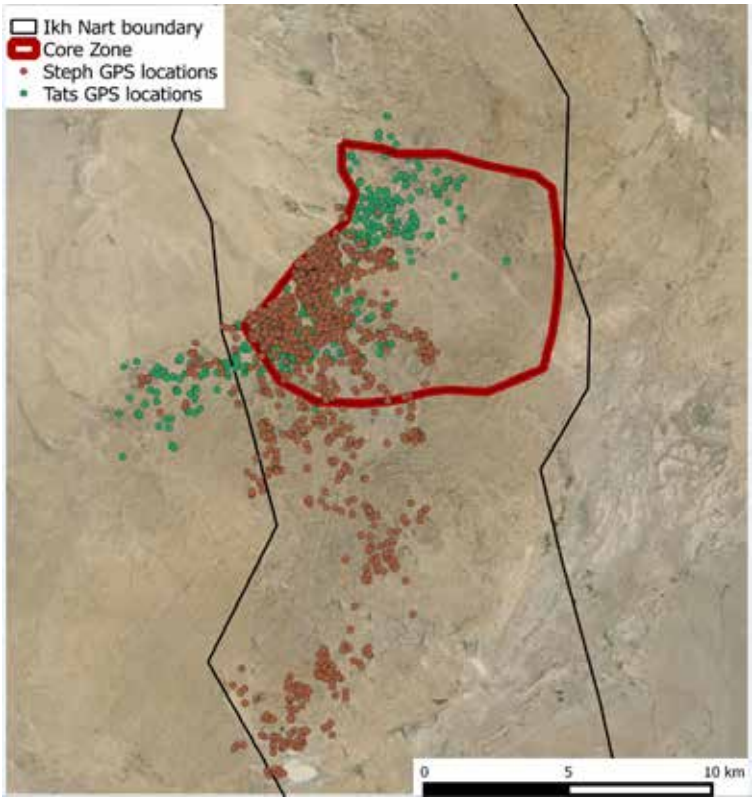


Figure 15: Objective 4 – Argali sheep (GPS locations)



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SECTION TWO: Impacts

1.INCREASING SCIENTIFIC KNOWLEDGE

MoS 1.2 Peer Reviewed Publications

- Ekernas, L.S., Sarmento, W.S., Davie, H.S., Reading, R.P., Amgalanbaatar, S., Wingard, G.J., Murdoch, J., and Berger, J. *In review*. "The dark clouds and silver lining of human-wildlife conflict in Mongolia's Gobi-steppe: indirect effects of pastoralists help and hurt rare wildlife." *Conservation Biology*.
- Ekernas, L.**S.**, Reading, R.P., Wingard, G., Amgalanbaatar, S., Kenny, D., and Berger, J. *In review*. "Evaluating core zones in arid protected areas: argali *Ovis ammon* in the Gobi desert-steppe." *Biological Conservation*.
- Kenny, D., Y. J. Kim, H. Lee, and R. P. Reading. 2015. Blood lead levels for Eurasian Black Vultures (*Aegypius monachus*) migrating between Mongolia and the Republic of Korea. Journal of Asian-Pacific Biodiversity 8(3): 199-202.
- Kenny, D., R. P. Reading, and H. Lee. 2015. Blood-gas analysis from free-ranging Eurasian Black Vultures (*Aegypius monachus*) in Mongolia and the Republic of Korea. Research & Reviews: Journal of Veterinary Sciences 1(1): 1-9.
- Murdoch, J. D., H. S. Davie, M. Galbadrakh, and R. P. Reading. In press. Factors influencing red fox occupancy probability in central Mongolia. Mammalian Biology.
- Reading, R. P., G. Wingard, T. Selenge, and S. Amgalanbaatar. 2015. The crucial importance of protected areas to conserving Mongolia's natural heritage. Pp. 257-265, in: Protecting the wild: Parks and wilderness, the foundation for conservation, Wuerthner, G., E. Crist, and T. Butler (eds.). Island Press, Washington, D.C.
- Zapletal, M., Batdorj S., J. Atwood, J. D. Murdoch, and R. P. Reading. 2015. Fine-scale habitat use by Daurian hedgehogs in the Gobi-steppe of Mongolia. Journal of Arid Environments 114:100-103.

MoS 1.3 Grey Literature and Other Dissemination of Your Results

- Altangerel T. Dursahinhan, A. T., R. P. Reading, B. Nyamsuren, K. J. Thomas, G. Wingard and S. L. Gardner. 2015 Occidian (Apicomplexa: Eimeriidae) parasites from ibex (Capra sibirica) and domestic goat (Capra hircus) from Ikh Nart Nature Reserve, Dornogobi Province, Mongolia. 46th Annual Meeting of the Rocky Mountain Conference of Parasitologists, Cedar Point Biological Station, University of Nebraska, Nebraska, 10-12 Sept. 2015.
- Bragin, N., D. Kenny, O. Ganbold, G. Wingard, H. Lee, M. J. Willis, J. Azua, T. Garrett, and R. P. Reading. 2015. Long distance migration by Cinereous Vultures (Aegypius monachus). Zoos and Aquariums Committing to Conservation Conference, 12-16 October 2015, Denver Zoo, Denver, CO. (Poster).
- Ekernas, L.S., Reading, R.P., Wingard, G., Amgalanbaatar, S., Kenny, D., and Berger, J. 2015. "Core zones for conservation? Argali in Mongolia's desert-steppe". Zoos & Aquariums Committing to Conservation (ZACC) Conference, Denver, CO. (Poster)
- Ekernas, L.S. August 2015. "Human wildlife conflict at Ikh Nart: what does 15 years of research tell us?" Denver Zoological Foundation, Denver, CO.
- Reading, R. P. 2015. From "Paper Park" to model protected area: Transforming Ikh Nart Nature Reserve. Center for Great Plains Studies. University of Nebraska, Lincoln, NE, 6 May 2015.
- Reading, R. P. 2015. From "Paper Park" to model protected area: Conserving the Desert Grasslands of Mongolia. South Dakota State University, Brookings, SD, 16 Sept. 2015.
- Reading, R. P. 2015. From "Paper Park" to model protected area: Ikh Nart Nature Reserve, Mongolia. Department of Zoology and Physiology, University of Wyoming, Laramie, WY, 2 October 2015
- Reading, R. P. 2015. A One Health Approach to Protected Areas Management: Examples from Mongolia & the USA. Third Global Risk Forum One Health Summit: Fostering interdisciplinary collaboration for global public and animal health, 4 – 6 October 2015, Davos, Switzerland.
- Wingard, G., R. P. Reading, D. Kenny, and S. Amgalanbaatar. 2015. Expansion of Ikh Nart Nature Reserve in Dornogobi Province, Mongolia. Zoos and Aquariums Committing to Conservation Conference, 12-16 October 2015, Denver Zoo, Denver, CO. (Poster).
- Wingard, G., R. P. Reading, D. Kenny, and S. Amgalanbaatar. 2015. Building and Running a Conservation Program, Ikh Nart Nature Reserve, Mongolia. Conservation Medicine Group, Universidad Peruana Cayetano Heredia. Lima, Peru

- Wingard, G., R. P. Reading, D. Kenny, and S. Amgalanbaatar. 2015. Building and Running a Conservation Program, Ikh Nart Nature Reserve, Mongolia. Lake Titicaca National Reserve, Puno, Peru
- Wingard, G., R. P. Reading, D. Kenny, and S. Amgalanbaatar. 2015. Building and Running a Conservation Program, Ikh Nart Nature Reserve, Mongolia. Annual Eco-brigades Conference, Taraco, Peru
- Wingard, G., R. P. Reading, D. Kenny, and S. Amgalanbaatar. 2015. Building and Running a Conservation Program, Ikh Nart Nature Reserve, Mongolia. Puno School Teachers Workshop, Puno, Peru
- Wingard, G., R. P. Reading, D. Kenny, and S. Amgalanbaatar. 2015. Building and Running a Conservation Program, Ikh Nart Nature Reserve, Mongolia. Mongolian Community Association of Colorado, Denver, Colorado

2.DEVELOPING ENVIRONMENTAL LEADERS

MoS 2.1 Education

There is a tremendous need to train Mongolian students so that they can then lead research programs and training efforts in Mongolia. In 2015, Denver Zoo started an application process for partnering student (Rentsen Oyunbat) to attend graduate school at the University of New Mexico, USA. In 2015, the application process began for two rangers and one park official to attend the World Ranger Conference in Estes Park, Colorado. Ikh Nart students: Batdorj (PhD on hedgehogs); Onoloo (PhD on kestrels), Stefan Ekernas (University of Montana – argali sheep); Remo (Master's on small mammals); Byambaa (Master's on bats); Chimidbat (undergraduate on kestrels); Mendee (Master's on argali/ibex); Dandar (Master's on argali/ibex); Tuvshin (undergraduate on plants); Javhaa (undergraduate on reptiles) and Anuun (undergraduate on insects) are enrolled at various universities in Mongolia and elsewhere. The Zoo provided tuition support to three doctorate and three Master's students. In 2015, two Master's students were hired as part-time biologists and one PhD student as a part time biologist. During the year, the organization continued to employ the first Cultural Resources Ranger, Choi, who helped to protect the cultural resources of Ikh Nart and provide outreach activities. Ikh Nart ranger Dandar enrolled in his 2nd year at the university in 2015 to pursue a Master's degree in ecology.

3.PARTERNSHIPS

MoS 3.1 Organizations Actively Engaged

Denver Zoo continues to work in productive partnerships with biologists, veterinarians and students from several organizations, including the ***National University of Mongolia (NUM)***; ***Mongolian Central Veterinary Laboratory***; ***Archaeology of Mongolian Academy of Sciences (MAS)***; ***Mongolian State University of Education (MSUE)***; ***University of Vermont***; ***University of Montana***; ***Nomadic Nature Trunks***; ***Mongolian Conservation Coalition***; ***Argali Wildlife Research Center***; ***Anza-Borrego Desert State Park*** and ***Anza-Borrego Foundation and Institute***; and the ***local governments of Dalanjargalan and Airag Soums and Dornogobi Aimag***.

Zoo staff work with two national institutions of Mongolia; ***Mongolian National Central Veterinary Laboratory*** and ***MAS's Institute of Archaeology***. We worked with Dr. Zorigoo, Dr. Tugsuu, and Dr. Bat- Amgalan from ***Mongolian National Central Veterinary Laboratory***. Dr. Bat-Amgalan visited the United States in 2015 with support from Trust of Mutual Understanding. He spent time with Dr. Scott Larsen (Vice President of Veterinary Medicine, Denver Zoo) and Dr. Kevin Fitzgerald (Staff Veterinarian of the East Alameda Animal Hospital) to learn different approaches and aspects to veterinary medicine. Dr. Bat-Amgalan also visited the Veterinary Diagnostic Laboratory of the Colorado State University in Fort Collins to learn about animal disease diagnostic services and disease surveillance including bacteriology, virology, parasitology, chemistry/toxicology and pathology services for all species.

Serving as lead counterpart, the Zoo also continued to work with Dr. Y. Tserendagva of the MAS's Institute of Archaeology and fellow researcher, Dalantai. Mr. Olzbayar continued to participate in Ikh Nart Archaeology research during the summer of 2015 and now he is enrolled in the second year of his Master's degree program at NUM. Emma Fowler (Stanford University, USA) is pursuing her bachelor's degree on wildlife biology and she came to explore field work opportunities at Ikh Nart.

The organization continues to work with local Mongolian non-governmental organizations (NGOs) to improve their capacity. The strongest partners are **Mongolian Conservation Coalition (MCC), Nomadic Nature Trunks (NNT),** and **Argali Wildlife Research Center**. The Zoo works closest with MCC, who hires staff and manages our finances. In 2015, we continued to employ the director of NNT to assist us with implementing our conservation and outreach activities in Mongolia. Staff and resources from Anza-Borrego Desert State Park and the Anza-Borrego Foundation (ABF) and Institute continue to provide support in the form of financial contributions, equipment, and, most importantly, training. In 2015, ABF substantially contributed to Ikh Nart ranger salaries. Every year, including 2015, staff from these organizations come to Mongolia to help with capacity development.

In 2015, at the request of **The Nature Conservancy Mongolia** office, Denver Zoo helped their research team capture ten Mongolian gazelles at the **Toson Hulstai Nature Reserve**. Based on the results of monitoring the movements of gazelles and vultures, we hope to be the first to conclusively prove that gazelle calving sites overlap with vulture feeding sites for their summer range. We suspect the vultures are scavenging on the gazelles. Thus, we hope this collaboration with The Nature Conservancy office in Mongolia helps us to understand the landscape-scale movements of the globally declining cinereous vultures captured at Ikh Nart and their important relationship to Mongolian gazelles in Toson Hulstai. This partnership with The Nature Conservancy Mongolia office is one of the mutually beneficial partnerships established since 2010 when the United Nations named Ikh Nart Nature Reserve as a model protected area in Mongolia.

4.CONTRIBUTIONS TO POLICIES OR MANAGEMENT PLANS

MoS 4.1 Informing Policies or Management Plans

- **International Policies or Management Plans:**
  Denver Zoo continues to work with the Asian Raptor Research and Conservation Network to provide a review of the status of cinereous vultures.
- **National or Regional Policies or Management Plans:**
  In 2015, Ikh Nart continued to be a model park and Zoo staff disseminated ideas and practices to other parks. Last September, staff visited the Toson Hulstai Nature Reserve in Eastern Mongolia, managed by the Nature Conservancy Mongolia office. Zoo staff helped the Reserve capture ten Mongolian Gazelles during EW Team 5. Denver Zoo also cooperated with the Governor of the Mandakh Soum and helped with Suikhent Nature Reserve management and research. In Suikhent, five globally declining Goitered gazelles were captured.
- **Local Policies or Management Plans:**
  In 2015, Zoo staff continued to help with Ikh Nart Management Plan implementation and collaborated with Ikh Nart Nature Reserve administration in creating an Ikh Nart research database and publications in their information center. A book containing over 150 research papers from research based at Ikh Nart is in process and will be published.

MoS 4.2 Actions or activities that enhance natural and/or social capital

In 2015, Zoo staff continued to conduct activities to enhance natural capital in the project area. The organization helped protect and maintain clean, open water sources at Burgas and Red Rock Valleys. Because there were few winters without snow recently, this work was essential for wildlife. Recently, 20 local people helped clean and improve the flow of the natural spring source at the research camp, and the camp manager continues to maintain the water source every day. Denver Zoo conducted a Conservation Day at Ikh Nart. Attended by 100 people, Conservation Day helped to maintain and strengthen local support for the nature reserve.

5.ENHANCING NATURAL AND SOCIO-CULTURAL CAPITAL

MoS 5.1 Conservation of Taxa

n/a

Are you enhancing, restoring, or maintaining populations of any species of conservation significance as part of your project?

Argali sheep *(Ovis ammon)*. The argali sheep is listed as Threatened in the Mongolian Red Book of Threatened and Endangered Species. The Convention on International Trade of Endangered Species of Wild Flora and Fauna includes argali on Appendix II. The IUCN Red List Status for argali sheep is Near Threatened because this species is believed to be in significant decline (but probably at a rate of less than 30% over three generations, taken at 24 years) due to poaching and competition with livestock. These factors make the species close to qualifying for Vulnerable under criterion A2de. Since 2000, Denver Zoo have radio collared 236 argali in Mongolia. Based on locations from tracked collared animals, the project analyzes argali home ranges. Also, Zoo staff believe that Ikh Nart's population of Argali sheep has expanded and continues to expand as the argali sheep numbers are two to three times higher than when the Zoo actively began researching the species. The argali populations are expanding to the areas around the reserve, and the results of this work helped expand crucial argali habitats by creating local protected areas around Ikh Nart.

Siberian ibex *(Capra sibirica)*. The species is listed as Near Threatened in the most recent Mongolian Red List. This represents an upgrade in status from the last two Mongolian Red Books, in which the species was listed as Threatened. The IUCN Red List Status is Least Concern because of its wide distribution, presumed large population, and because, although some populations are likely to be in decline, overall this is probably much less than the rate required to qualify for listing in a more threatened category. Since 2003, researchers have captured and radio collared 68 ibex. Now, there are higher populations of ibex around the reserve, and the results of work helped expand the Ikh Nart official boundary. Ikh Nart doubled in size to provide protection to these critical ibex habitats.

Eurasian black vulture – *(Aegypius monachus)*. The Convention on International Trade of Endangered Species of Wild Flora and Fauna and Bonn Conventions include Eurasian black vulture on Appendix II. The IUCN Red List Status is Near Threatened, which means this species has a moderately small population that appears to be suffering an ongoing decline in most parts of Asia, despite the fact that in parts of Europe numbers are now increasing and the population in Mongolia appears stable. Zoo staff are now collecting valuable data on juvenile vulture migration routes as we have begun research into movement patterns. Recently, the Zoo learned that the spring home range of these juvenile vultures is the eastern steppes of Mongolia. The Zoo is collaborating with The Nature Conservancy, Mongolia office, to determine the exact spring home ranges of vultures and possible overlaps with Mongolian gazelles breeding sites.

Siberian Marmots *(Marmota sibirica)*. The species is listed as Near Threatened in the most recent Mongolian Red List, which represents an upgrade in status from the last two Mongolian Red Books, in which the species was listed as Threatened. IUCN Red list status is Endangered, and in Mongolia this species is experiencing an ongoing decline in population size, estimated at 70% over the past 10 years (Batbold 2002), due to exploitation and disease. Generation length has been estimated as six years based on data from Nowak (1991). This species qualifies as Endangered under Criterion A2ad, based on observed declines of greater than 50% over the past three generations due to exploitation. Most of the species' global range is in Mongolia. Zoo staff continue to collect data on marmot habitat sites using camera traps. The results of this work helped expand crucial marmot habitats by creating local protected areas around Ikh Nart.

MoS 5.2 Conservation of Habitats

Ikh Nart Nature Reserve rangers and local people continued to restore and maintain Ikh Nart Nature Reserve boundary signs in summer 2015. Denver Zoo also helped establish new local protected areas to conserve habitats research data identified as important, by doing this the protected area doubled in size.

MoS 5.3 Conservation of Ecosystem Services

Zoo staff continues to protect water sources in the area. Fences were built near the sources at Burgas and Red Rock Valleys, the only permanent water sources in the reserve. Otherwise, these natural water sources would be destroyed and damaged by the increasing numbers of livestock in the reserve.

Objective 13: Identification, Protection, and Preservation of Archaeological Resources in Ikh Nart Nature Reserve

Progress toward/against objective 13:

Archaeology Goal 1: Develop a project to record, assess the condition of, and map known cultural resources within Ikh Nart.
In 2015, Zoo staff used the results of the completed random sample survey to focus on areas of the Ikh Nart landscape where our statistical results predicted there would be additional cultural heritage sites.

(1) We surveyed the entirety of two major drainages in northern Ikh Nart.
(2) We surveyed the area around large Neolithic-Bronze age complexes that we had previously documented near the Ikh Nart research camp. We discovered and documented 31 previously undocumented cultural heritage sites, bring our total documented site number up to 139.
(3) We incorporated three Mongolian graduate students into our work. One student has a master's degree in History and is especially prepared to document and develop a plan for management of historic-period sites at Ikh Nart. The other student is completing his Master's degree. The third is beginning his Master's thesis.
(4) The new environmental archaeology program has succeeded in determining that there were periods of time in the past when climatic regimes were much wetter than today, thus giving ancient peoples plant resources as well as animal resources to sustain themselves in this area. Plant-food residues (starch grains) have been recovered from Ikh Nart milling stones.
(5) We conducted test excavations of some stone-wall features and are in the process of analyzing our results. This was an effort to identify living floors of houses of the pre-pastoral peoples in Ikh Nart.

Archaeology Goal 2: Develop a Cultural Resources monitoring/stewardship program for Ikh Nart.

In 2015, the Zoo was able to evaluate the first complete year of work of the first Cultural Heritage Ranger in Mongolia, established through a grant from the Ambassador's Cultural Heritage Preservation program of the U.S. Embassy in Ulaanbaatar. Results of his work were found to be excellent and the team has applied for additional funds for him to continue his work for the next several years until the local government, itself, can pay his salary. Denver Zoo has also received grant funds in order to send the Cultural Heritage Ranger to the World Ranger Congress in Colorado in spring of 2016. While in the U.S., the ranger will also visit Anza-Borrego Desert State Park (sister park to Ikh Nart) and learn management methods from rangers in that park.

Archaeology Goal 3: Identify a lead person or persons in Mongolia to receive training by American archaeological specialists.

Dr. Yadmaa Tserendagva continues to assume leadership in cultural heritage management on the Mongolian side. This year was his sixth year of learning Cultural Heritage conservation techniques. He has become quite expert and is the supervisor of our Cultural Heritage Ranger from whom he receives monthly reports. Dr. Tserendagva also fully participates in research regarding climatic changes and pre-pastoral lifeways in the Ikh Nart area. He and Drs. Schneider and Rosen have published and presented professional papers on our research results.

Archaeology Goal 4: Establish an on-going Cultural Resources Protection Program for Ikh Nart.

In 2015, Zoo staff continued to use and distribute Cultural Heritage conservation. Interpretive, and educational messages to Ikh Nart visitors, local herder communities, and Ikh Nart staff. Second, an interpretive sign was shipped and installed for the Ikh Nart Research Camp explaining the scientific endeavors of the people working at the camp. Third, in 2015 staff worked with a local eco-tourism enterprise that has an exclusive agreement with Ikh Nart to provide tourism services in order to develop financial sustainability for Ikh Nart. Together, partners have identified a number of Cultural Heritage sites that are suitable for tourists to visit and have worked closely with the eco-tourism camp to develop accurate and interesting interpretive materials for areas along a prescribed route. Denver Zoo has also worked toward educating local residents so that they can act as guides, thus sustaining the local community.

MoS 5.5 Impacting Local Livelihoods.

Several activities help enhance local livelihoods. Denver Zoo supported the Airag soum local ladies with buying a felt presser to improve the quality of products produced by the local women's collective. Staff continued to assist with sale of the handcrafts by local women's collective (called Ikh Nart is our future) to volunteers and guests. More specifically, Ikh Nart collective ladies visited the research camp and sold their crafts two times and Airag soum collective ladies visited the research camp and sold their crafts four times. This again helps build support for the reserve.

This year, 22 horsemen participated in argali sheep and ibex capture sessions and received over $1,500 as their per diem.

Anza-Borrego Foundation provided salaries (of $4,800) for rangers at Ikh Nart.

Local Community Activities Ikh Nart Education and Outreach Program.

1. School-Pairing Program: The conservation education portion of the program successfully completed the following goals in 2015; 1) the successful continuation of the school-pairing program between Dalanjargalan Secondary School in Dornogobi Aimag Mongolia, Ikh Nart and a partner school in Denver, 2) completion of a service-learning component to the education and outreach program and 3) the implementation of an annual Community Outreach day in Mongolia. Denver Zoo funds designated for conservation work in Mongolia enabled the team to provide education materials, critical training for Mongolian teachers, and participation of Mongolians in an educational exchange program; increasing the participation of both students and teachers in wildlife conservation in both Mongolia and Denver. Using a backwards design process, Denver Zoo was able to create an education logic map and strategically accomplish the following facets of the program; 1) develop two conservation clubs, 2) hold conservation exchange programs between Mongolia and Colorado that incorporated a service-learning component and 3) implement a Community Outreach day in Mongolia. The first objective was the continuation of the school-pairing program between two conservation clubs; one in Dalanjargalan and one in Denver, CO. Accomplishments include:

- One conservation club created in Dalanjargalan Primary School called Green Nature Club, with over 35 members ranging from ages 8-14;
- One conservation club created at Kent Denver named Rockies to Mongolia Wildlife Elective, with 16 students ages 12-14. The interest in the club at Kent Denver was large enough that it became an elective, meeting twice a week for the entire 2014-2015 school year. This is a positive step for the program, as in 2013-2014 it was only a club, meeting twice a month;
- Communication between the clubs was accomplished through letters, email, Facebook and a website created by the Rockies to Mongolia Wildlife Elective;
- Two Mongolian students and two Mongolia teachers traveled to Denver and participated in the conservation exchange program. During their visit, participants stayed with Kent Denver host families, toured Denver's cultural facilities, and participated in local research. By assisting in wildlife conservation and river restoration at Rio Mora National Wildlife Refuge (managed by Denver Zoo), participants experience a hands-on approach toward conservation, building on their skills and knowledge;
- In June, eight Kent Denver students, one teacher and two Denver Zoo staff members traveled to Mongolia, as part of the conservation exchange. During their visit, the students visited cultural attractions in the capital city of Ulaanbaatar.
- The students traveled by train to Ikh Nart, where they participated in wildlife research, interacted with the Mongolian researchers, learned about conservation in Mongolia, and had the opportunity to gain an understanding and appreciation for Mongolian culture. The second objective was to design and implement two service-learning projects at Dalanjargalan Primary School and Kent Denver. Accomplishments include:
- The Rockies to Mongolia Elective successfully designed and implemented one service learning project; the creation of one school campus trail sign that included information on local Colorado wildlife on the school's camp, wildlife identification and information on the elective;
- The Green Nature Club, as part of their service-learning activity, organized one "parent night out" and invited all the parents of current club students to the school for an evening filled with conservation sharing.
- Together with their parents, the eco-club students educated their parents on their club activities, Ikh Nart Nature reserve and the importance of wildlife conservation.
- The event reached over 60 parents in the community of Dalanjargalan. Community Outreach Day: Together with Mongolian wildlife researchers, the student's successfully educated the local Mongolian community on the importance of their wildlife. Community Day had three goals, to educate the community on the 1) interdependent relationships in the ecosystems, 2) ecosystem diversity and 3) human connections to the ecosystem with community members living near and within Ikh Nart Nature Reserve, Mongolia. The celebration welcomed over 100 local Mongolians living near Ikh Nart Nature Reserve. Nomadic Nature Trunk Program: In 2015, Denver Zoo program partner Tungalagtuya Khuukhenduu was awarded 2015 Disney Conservation Fund Conservation Heroes Award for her community education work in Mongolia and NNC created a nature trunk for use by our local schools.

SECTION THREE: Acknowledgements, Funding and Appendices

PROJECT FUNDING

Support from Earthwatch, in the form of both financial and human resources, continued to play a vital role in the ability to conduct work and realize the many successes that have achieved to date. Expenses exceeded the support from Earthwatch, but were covered by the Denver Zoological Foundation, donations from private donors, and foundations. The Zoo planned for these expenses, so overall expenses and income roughly matched the overall project budget.

APPENDICES

Research Figures are incorporated into the body of the proposal, though listed here for reference.

- Figure 1 Objective 2 Animal Capture and Marking - Argali Sheep Density Map for September 2015
- Figure 2 Objective 2 Animal Capture and Marking - Argali Sheep Density Map for October 2015
- Figure 3 Objective 2 Animal Capture and Marking - Argali Sheep Density Map for November 2015
- Figure 4 Objective 2 Animal Capture and Marking – Mongolian Gazelle Density Map for September 2015
- Figure 5 Objective 2 Animal Capture and Marking - Mongolian Gazelle Density Map for October 2015
- Figure 6 Objective 2 Animal Capture and Marking - Mongolian Gazelle Density Map for November 2015
- Figure 7 Objective 2 Animal Capture and Marking - Goitered Gazelle Density Map for September 2015
- Figure 8 Objective 2 Animal Capture and Marking - Goitered Gazelle Density Map for October 2015
- Figure 9 Objective 2 Animal Capture and Marking - Goitered Gazelle Density Map for November 2015
- Figure 10 Objective 2 Animal Capture and Marking Eurasian black vulture movements 2015
- Figure 11 Objective 2 Animal Capture and Marking - Lesser Kestrels Migration (June 2014- June 2015)
- Figure 12 Objective 3 Fecundity, Survivorship, Development, & Mortality -Argali survival and NDVI
- Figure 13 Objective 3 Fecundity, Survivorship, Development, & Mortality - Eurasian black vulture nest 2015
- Figure 14 Objective 3 Fecundity, Survivorship, Development, & Mortality - Nest numbers of Lesser kestrel colonies 2015
- Figure 15 Objective 4 Habitat Use & Movement Patterns for Argali sheep Tats and Steph (GPS locations)

Photos are included on Attachment 1, though listed here for reference.

- Photo 1 EW report Argali sheep at Ikh Nart Nature Reserve 2015
- Photo 2 EW report Mongolian gazelles at Toson Hulstai Nature Reserve 2015
- Photo 3 EW report Red fox at Toson Hulstai Nature Reserve 2015
- Photo 4 EW report EW volunteers helping to set nets 2015
- Photo 5 EW Report EW volunteers checking out cranes
- Photo 6 EW report local horsemen and EW volunteers helping to set nets 2015
- Photo 7 EW report EW volunteers helping out with snakes study 2015
- Photo 8 EW report EW volunteers helping with small mammals study 2015
- Photo 9 EW report Gana (PI) with EW volunteers 2015
- Photo 10 EW report local horsemen enjoying the EW research participation 2015
- Photo 11 EW report local people taking care of the water source at Ikh Nart 2015
- Photo 12 Local people taking care of the water source at Ikh Nart 2015
- Photo 13 EW report local people and EW volunteers 2015
- Photo 14 EW report - Argali sheep was named after EW volunteer (Kofi) 2015
- Photo 15 EW report - EW volunteer (Kim) 2015

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