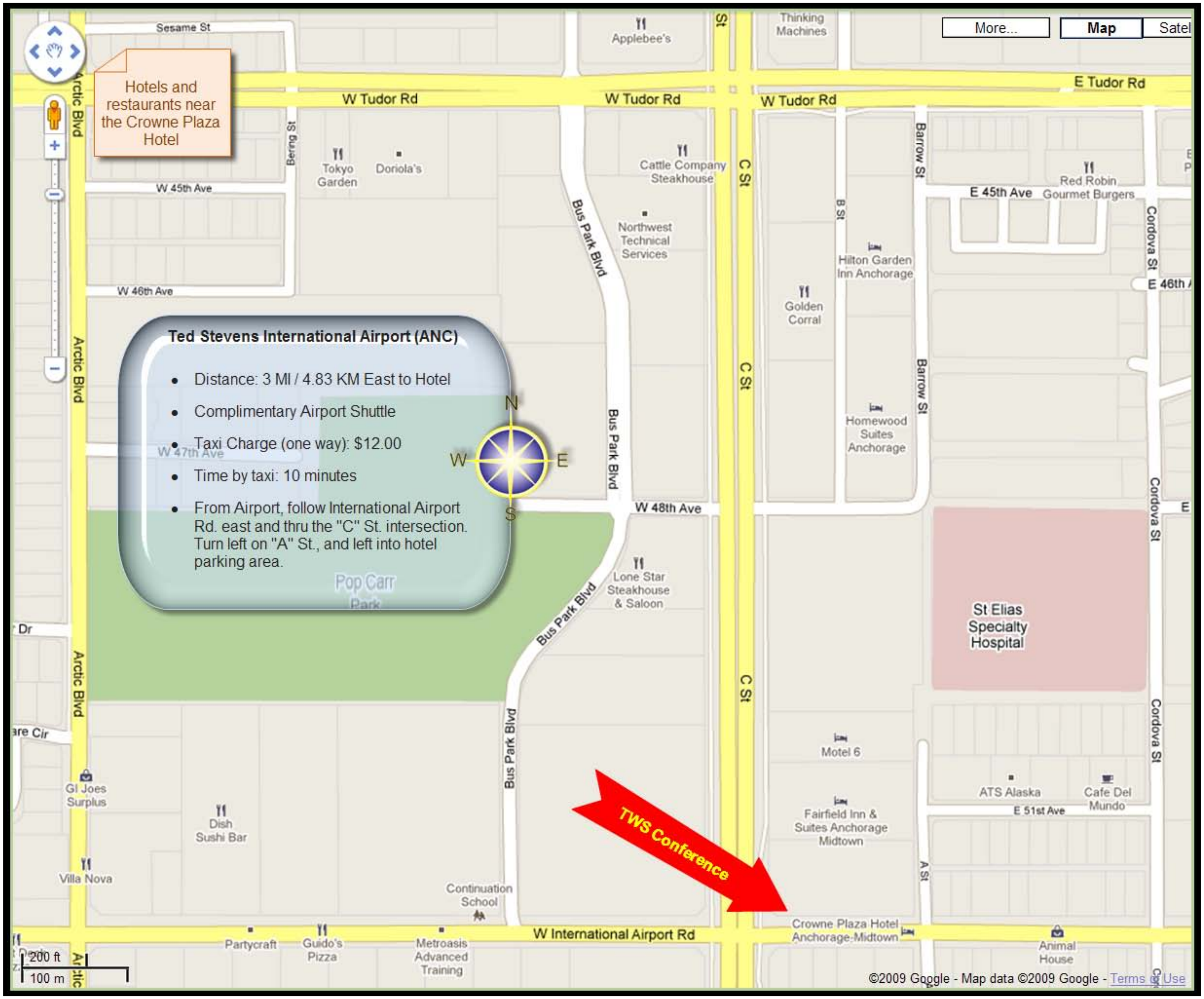
ANNUAL MEETING OF THE ALASKA CHAPTER OF THE WILDLIFE SOCIETY

CROWNE PLAZA HOTEL
Anchorage, Alaska

February 9 & 10, 2010



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ANNUAL MEETING OF THE ALASKA CHAPTER OF THE WILDLIFE SOCIETY

CROWNE PLAZA HOTEL
ANCHORAGE, ALASKA

February 9 & 10, 2010

Conference Committee:

Kevin White, Kris Hundertmark, Howard Golden, Liz Solomon, Tom Lohuis, Thomas McDonough, Nancy Fresco, Todd Rinaldi

Special Thanks

ADF&G Administrative Staff

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IN MEMORIAM

Margaret “Meg” Hahr

Former Alaska biologist, Margaret "Meg" Hahr, 41, died suddenly June 21, 2009 from injuries sustained in a mountain biking accident near her home in Munising, Michigan.

Meg recently moved to Munising to accept the position as Chief for the Division of Science and Natural Resources at Pictured Rocks National Lakeshore. She transferred from Kenai Fjords National Park in Seward, Alaska, where she served as a wildlife ecologist since 2006. She had been an active member of the Alaska Chapter of The Wildlife Society, running as a candidate for Secretary-Treasurer in 2008.

Meg was born November 19, 1967 in Plainfield, New Jersey. She earned a B.A. in English with a minor in Biology from Rutgers University and a M.S. in Environmental Studies from the University of Montana. Following a Student Conservation Association internship for the Bureau of Land Management in western Oregon, Meg spent two years as an Agroforestry Specialist with the U.S. Peace Corps in sub-Saharan West Africa. While there, she provided technical assistance to rural, subsistence farmers and herders in the areas of rangeland management, soil conservation, reforestation, wildlife conservation, watershed management, and sustainable agriculture.

Meg’s employment with the National Park Service began in 1998 as a wildlife technician at Glacier National Park. She conducted a winter distribution and habitat use study of lynx, fisher, and wolverine in Glacier National Park for her Master’s thesis through the University of Montana. Meg moved to Alaska in 2002 to manage the wildlife and natural resources program at Klondike Gold Rush National Historical Park in Skagway, Alaska. Her efforts there focused on bear management, habitat restoration, and inventory and monitoring of landbirds, waterbirds, western toads, and forest owls. As the wildlife ecologist for Kenai Fjords National Park, Meg was responsible for designing, implementing, and managing the park's wildlife program. Her efforts focused on seabird monitoring, black oystercatcher research, and brown and black bear management.

Meg had spent only four months in her position at Pictured Rocks National Lakeshore, but she quickly conveyed her skills and abilities not only as a top-notch resource manager but as a communicator and supervisor. "The entire Lakeshore staff and the town of Munising are devastated at this loss of such a young, vibrant, capable, and dedicated person," said Superintendent Jim Northup. "The National Park Service has truly lost a leader in her field. We will miss her greatly."

Despite their short time in Munising, Meg and her husband, Sidney Shaw, who is a mental health professional, had become quickly engaged in the social fabric of the community and endeared themselves to many. "Meg was always one to fully engage in the act of living life, and to participate at all levels, at all times," her family recalled. "Her kindness was infectious, and her energy and spirit inspirational. Meg was an accomplished outdoors woman who loved to hike, sea kayak, ski, and snowshoe. She also completed a yoga instructor's course in Costa Rica, and was constantly exploring the outdoors and the world with her husband and friends. She was an amazingly balanced and centered individual who knew how to find and celebrate the joys in life, and who touched all our lives for the better."

Meg is survived by her husband, Sidney Shaw of Munising; her parents, Arthur and Barbara Hahr of Plainfield, N.J.; and her sister and brother-in-law, Nancy and Neil Weidner and their family. Since Meg felt most at home outdoors and believed in the preservation of wilderness areas, a fund has been established with the Nature Conservancy. Donations may be made to this fund in Meg's name at: Nature Conservancy, PO Box 6020, Albert Lea, MN 56007-9824; 1-800-628-6860; account #12005888. — *Gregg Bruff, family, and friends; Photo courtesy of Gregg Bruff*

CONFERENCE SCHEDULE

Tuesday, February 9

All Events in the Aurora Ballroom

8:00–8:30 **REGISTRATION** (Pre-Function Corridor outside Aurora Ballroom)

8:30–8:40 **OPENING REMARKS**
Howard Golden

PLENARY SESSION: ECOLOGICAL EFFECTS OF CLIMATE CHANGE ON WILDLIFE POPULATIONS IN ALASKA
Session Chair: Nancy Fresco

8:40–9:05 **USING SNAP MODELS TO PREDICT SPECIES SHIFTS AND BIOME CHANGE**
Nancy Fresco, Karen Murphy, Falk Huettmann, and John Morton

9:05–9:30 **THE FUTURE OF ALASKA'S WILDLIFE: RESOURCE NEEDS BEYOND THE CRYSTAL BALL**
Falk Huettmann and Karen Murphy.

9:30–9:55 **RELATING CLIMATE CHANGE PROJECTIONS TO THE AVAILABILITY OF WILDLIFE**
Todd Brinkmann, T. Scott Rupp, Shauna Burnsilver, Gary Kofinas, and Terry Chapin

9:55–10:10 **BREAK**

10:10–10:35 **HAS CLIMATE CHANGE AFFECTED THE ABUNDANCE AND DISTRIBUTION OF TRUMPETER SWANS IN ALASKA?**
Josh Schmidt and Mark Lindberg

10:35–11:00 **ASSESSING THE IMPLICATIONS OF A GREENER NORTH FOR ARCTIC UNGULATES**
Brad Griffith, Christine Cuyler, Robert White, Layne Adams, Don Russell, Dave Douglas, Anne Gunn, and Raymond Cameron

11:00–12:00 **PLENARY SESSION PANEL DISCUSSION**

12:00–13:15 **LUNCH** (On your own)

SPECIAL SESSION: ALPINE AND ARCTIC UNGULATE ECOLOGY AND CONSERVATION
Session Chair: Kevin White

13:15–13:40 **ALASKA'S ALPINE AND ARCTIC UNGULATES IN A CHANGING CLIMATE**
David R. Klein

13:40–14:05 **DISEASES OF MUSKOX, DALL'S SHEEP AND MOUNTAIN GOATS: WHAT THEY'VE GOT, WHAT WE ARE LOOKING FOR AND HOW TO RECOGNIZE THEM**
Kimberlee B. Beckmen and Kathleen A. Burek

14:05–14:30 **CAW RIDGE'S MOUNTAIN GOATS: INSIGHTS FROM A LONG-TERM STUDY**
Aaron Shafer and Steeve Cote

14:30–14:55 **TEMPORAL AND GEOGRAPHIC PATTERNS OF GENETIC DIFFERENTIATION IN MOUNTAIN GOATS: A FOCUS ON ALASKA**
Aaron Shafer, Steeve Cote, and David Coltman

14:55–15:10 **BREAK**

15:10–15:35 **PRELIMINARY RESULTS OF MOUNTAIN GOAT HABITAT MODELING FOR THE KENAI PENINSULA, ALASKA**
Naresh Nepal, Alok Bohara, Thatcher Jennifer, Martin Bray, Aaron Poe, Grant Harris, and Thomas McDonough

15:35–16:00 **LIFE HISTORY AND CLIMATE EFFECTS ON MOUNTAIN GOAT SURVIVAL IN COASTAL ALASKA**
Kevin White, Grey Pendleton, Dave Crowley, Herman Griese, Kris Hundertmark, Thomas McDonough, Lyman Nichols, Matt Robus, Christian Smith, and John Schoen

16:00–16:25 **DALL'S SHEEP PRODUCTIVITY AND SURVIVAL IN THE CHUGACH RANGE, ALASKA**
Tom Lohuis

16:25–16:50 **EFFECTS OF A SNOWSHOE HARE DECLINE ON SURVIVAL OF DALL'S SHEEP IN ALASKA**
Steve Arthur and Laura Prugh

Tuesday, February 9

18:00–19:00 **POSTER SESSION AND SOCIAL MIXER** (Hors d'oeuvres & cash bar)

NANNIES IN THE CROSSHAIRS: EFFECTIVENESS OF USING A SEX IDENTIFICATION QUIZ TO REDUCE HARVEST OF FEMALE MOUNTAIN GOATS IN ALASKA
Jeff Jemison, Kristen Romanoff, and Kevin White

CURRENT MUSKOXEN STATUS IN ALASKA
Letty Hughes, Patricia Reynolds, Kimberlee Beckmen, Phillip Perry, and Geoff Carroll

POPULATION STRUCTURE AND GENETIC HISTORY OF RANGIFER IN SOUTHWEST ALASKA
Kevin Colson, Karen Mager, and Kris Hundertmark

GENETIC DIFFERENTIATION OF CARIBOU HERDS AND REINDEER IN NORTHERN ALASKA
Karen Mager, Kevin Colson, and Kris Hundertmark

AGENCIES IN LIMBO: MIGRATORY BIRDS AND INCIDENTAL TAKE BY FEDERAL AGENCIES
Julie Joly

19:00–20:00 **BANQUET**
Buffet dinner with selection of chicken marsala and pork medallions, garden salad, potatoes, rice, vegetables, and dessert.

20:00–21:00 **KEYNOTE SPEAKER**
Lily Peacock
Lily recently arrived in Anchorage after spending 3½ years as Polar Bear Biologist for the Government of Nunavut (a territory in Arctic Canada). While there, she was responsible for the research and management of Nunavut's 12 populations of polar bears (65% of the world's total) as well as the potential effects of climate change on those populations. Previously, Lily studied black bear genetics, behavior, and population ecology on Kuiu Island, Southeast Alaska for her Ph.D. She is now employed by USGS Alaska Science Center as Research Wildlife Biologist in the polar bear program. Her focus will be on polar bear use of terrestrial environments. Lily will share from her extensive collection of photos and stories of her experiences studying polar bears and living in the Canadian arctic.

Wednesday, February 10

All Events in the Aurora Ballroom

ALPINE AND ARCTIC UNGULATE ECOLOGY AND CONSERVATION – Continued
Session Chair: Kevin White

8:30–8:50 **EVALUATING THE GENETIC STRUCTURE OF DALL'S SHEEP IN WRANGELL ST. ELIAS NATIONAL PARK AND PRESERVE**
Gretchen Roffler, Sandra Talbot, George Sage, Kristy Pilgrim, Layne Adams, Michael Schwartz, Rebecca Schwanke, and Gordon Luikart

8:50–9:15 **USING DISTANCE SAMPLING TO ESTIMATE DALL'S SHEEP ABUNDANCE IN GATES OF THE ARCTIC NATIONAL PARK AND PRESERVE**
Josh Schmidt and Kumi Rattenbury

9:15–9:40 **PHYSIOLOGY OF RECRUITMENT IN MUSKOX POPULATIONS**
Perry Barboza

9:40–10:05 **ISOTOPIC MONITORING OF PROTEIN STATUS IN MUSKOXEN DURING THE WINTER**
Dave Gustine, Perry Barboza, Jim Lawler, Steve Arthur, Brad Shults, and Kate Persons

10:05–10:20 **BREAK**

10:20–10:45 **DYNAMICS OF MUSKOXEN IN AND NEAR THE ARCTIC NATIONAL WILDLIFE REFUGE, ALASKA**
Patricia Reynolds

10:45–11:10 **POPULATION STATUS AND POTENTIAL CAUSES OF A DECLINE IN MUSKOXEN IN NORTHEASTERN ALASKA**
Steve M. Arthur, Kimberlee Beckmen, and Patricia A. Del Vecchio

11:10–11:35 **COMPARATIVE DYNAMICS OF MUSKOX POPULATIONS IN NORTHWEST ALASKA**
Layne Adams, Joel Berger, Marci Johnson, Brad Shults, Jim Lawler, and Gretchen Roffler

11:35–12:00 **MUSKOX HUNTING TRADITIONS AND PRACTICES ACROSS THE ARCTIC**
Claudia Ihl

12:00–14:00 **ALASKA CHAPTER TWS BUSINESS MEETING – Free Lunch**

Wednesday, February 10

TECHNICAL SESSION: WILDLIFE ECOLOGY AND CONSERVATION
Session Chair: Todd Rinaldi

14:00–14:20 **FINE SCALE POPULATION STRUCTURE OF SITKA BLACK-TAILED DEER ON PRINCE OF WALES ISLAND**
Kevin Colson, Todd Brinkmann, David Person, and Kris Hundertmark

14:20–14:40 **KILL RATE OF WOLVES ON MOOSE IN A LOW DENSITY PREY POPULATION: RESULTS FROM EASTERN INTERIOR ALASKA**
Bryce C. Lake, Mark R. Bertram, Nikki Guldager, and Jason Caikoski

14:40–15:00 **QUANTIFYING POTENTIAL BIASES IN DEMOGRAPHIC PARAMETERS CALCULATED FROM TELEMETRY COLLAR DATA**
Alex Pritchard and Kyle Joly

15:00–15:20 **BREAK**

15:20–15:40 **RESEARCH ADVANTAGES USING SHORT-TERM WILDLIFE BEHAVIOR DATA: A DOMINANCE HIERARCHY EXAMPLE RELEVANT FOR WILDLIFE MANAGEMENT**
Kim Anke Jochum, Falk Huettmann, Lilian Alessa, and Andrew Kliskey

15:40–16:00 **ALASKA GAP UPDATE: PUBLIC TERRESTRIAL VERTEBRATE DISTRIBUTION MODELING AND BIODIVERSITY CONSERVATION FOR THE FUTURE**
Tracey Gotthardt, Falk Huettmann, Sanjay Pyare, Andy Baltensperger, Tamara Fields, and Julie Neilsen

16:00–16:20 **LANDSCAPE CONSERVATION COOPERATIVES: PUTTING THE POWER OF COLLABORATION TO WORK FOR CONSERVATION IN ALASKA**
Phillip Martin, Karen Murphy, and Charla Sterne

16:20–16:30 **CLOSING REMARKS**
Howard Golden

PLENARY SESSION ABSTRACTS

RELATING CLIMATE CHANGE PROJECTIONS TO THE AVAILABILITY OF WILDLIFE

Brinkman, Todd J, T. Scott Rupp, Shauna Burnsilver, Gary Kofinas, and Terry Chapin

Management of wildlife often functions under the assumption that interactions between hunters, game species, and the landscape will be similar to recent past experience. However, there is considerable evidence that future climatic and ecological conditions will be quite different. Currently, Alaska is undergoing rapid social and ecological changes, many of which are related to climate trends that are amplified at high latitudes. Information is lacking on how those changes could affect the availability of wildlife resources that hunters depend on. We present a series climate projections (e.g., temperature, precipitation) for communities across Alaska and speculate how future (1-2 human generations) scenarios may impact availability of important game species. Climate projections suggest warmer temperatures, increased precipitation, and changing freeze up and thaw dates which likely will alter vegetation composition, forest succession, and fire regimes. In turn, those changes are likely to influence opportunities to harvest wildlife by changing the abundance of wildlife populations, the distribution of wildlife, and the ability of hunters to get to wildlife. Although uncertainty surrounds projections, consideration of future scenarios will help wildlife biologists anticipate potential effects of climate change, prepare strategies to respond to changes, and create opportunities for proactive management of wildlife.

USING SNAP CLIMATE MODELS TO PROJECT SPECIES SHIFTS AND BIOME CHANGE

Fresco, Nancy[1*], Karen Murphy[2], Falk Huettman[3], and John Morton[2]

[1]Scenarios Network for Alaska Planning, University of Alaska, 3352 College Road, Fairbanks AK, nlfresco@alaska.edu; [2]US Fish and Wildlife Service; [3]University of Alaska Fairbanks

Wildlife ranges and population viability are strongly influenced by climate, either directly (e.g. through heat stress, cold intolerance, or metabolic requirements) or indirectly, via the impacts of climate on vegetation, water availability, snow cover, predation, interspecific competition, pests, and diseases. The Scenarios Network for Alaska Planning (SNAP) has created monthly temperature and precipitation projections out to 2100, based on IPCC global models downscaled to 2km resolution. We are using these projections to estimate impacts to key species, species assemblages, and ecosystems. In a multi-agency project co-led by Karen Murphy and John Morton (USFWS) and Falk Huettman (UAF), we linked biomes and species ranges to their current summer and winter temperature and precipitation, and then projected potential shifts as a function of climate change. This method is simple and powerful. However, it does not account for the lag times in landscape-level change that

will occur based on variables such as seed dispersal rates, reproductive rates, and topological bottlenecks. Nor does it account for changes such as permafrost thaw or fire that are linked to threshold values rather than being continuous. Species with highly plastic habitat requirements are likewise difficult to model. SNAP and our partners are expanding the above project as well as pursuing other avenues for assessing wildlife. We plan to incorporate existing models of permafrost dynamics and fire dynamics, and to tap the knowledge of our partners, particularly traditional users, to refine and validate models and to incorporate hunting and other human uses and impacts.

ASSESSING THE IMPLICATIONS OF A GREENER NORTH FOR ARCTIC UNGULATES

Griffith, Brad[1]*, Christine Cuyler[2], Robert G. White[3], Layne G. Adams[4], Donald E. Russell[5], David C. Douglas[6], Anne Gunn[7], and Raymond D. Cameron[8]

[1]U.S. Geological Survey, Alaska Cooperative Fish and Wildlife Research Unit, P.O. Box 757020, University of Alaska Fairbanks, Fairbanks, AK 99775, USA; [2]Greenland Institute of Natural Resources, Postboks 570, DK–3900 Nuuk, Greenland; [3]Office of Research and Graduate Studies, University of Alaska Anchorage, Anchorage, AK 99508, USA; [4]U.S. Geological Survey, Alaska Science Center, 4210 University Drive, Anchorage, AK 99508, USA; [5]Yukon College, Box 10038, Whitehorse, YT Y1A 7A1, Canada; [6]U.S. Geological Survey, Alaska Science Center, 3100 National Park Rd., Juneau, AK 99801, USA; [7]368 Roland Road, Salt Spring Island, BC V8K 1V1, Canada; [8]Institute of Arctic Biology, P.O. Box 757000, University of Alaska Fairbanks, Fairbanks, AK 99775, USA.

Confidence is increasing that rapid warming over the past 100 years has anthropogenic origins. Assessments of the potential responses of natural populations have proliferated, and most reports postulate negative effects on wildlife. For free-ranging vertebrates, estimating effects of climate change is limited to correlation analyses because the timing or magnitude of treatment cannot be controlled. Such field studies must adhere to rigorous protocols by 1) using conservative levels of significance and power in statistical tests; 2) identifying and dismissing alternative explanations for individual and population performance, where possible; 3) offering plausible mechanisms that might lead to the observed relationships between climate change and animal performance; and 4) assessing any additive or compensatory effects on animal performance within and among years. Failure to adhere to these standards can result in spurious correlations and premature conclusions that misdirect research, management, and policy. We will review 1) the effects of warming trends on temporal changes in the quantity and quality of summer forage available to arctic herbivores; 2) the effects of forage quantity and quality on herbivore performance; and, 3) the mechanisms integrating habitat and animal performance. Recent reports and empirical data will be evaluated in the context of these documented relationships.

THE FUTURE OF ALASKA'S WILDLIFE AND HABITAT? RESOURCE NEEDS BEYOND THE CRYSTAL BALL!

Huettmann, Falk[1*], and Karen Murphy[2]

[1]EWHALE lab, Institute of Arctic Biology, Biology and Wildlife Department, University of Alaska Fairbanks, 419 IRVING I, University of Alaska Fairbanks AK 99775, fhuettmann@alaska.edu; [2]National Wildlife Refuge System, Anchorage AK 99503

In times of IPCC (Intergovernmental Panel on Climate Change) models, Future Predictions are *en vogue*, but often criticized, too. So far, only few models have been truly assessed even, and they still await their 'test of time'. From the perspective of a modeler and wildlife & landscape ecologist working in Alaska and elsewhere, here we present how to achieve certainty and minimum estimates for a sustainable management. Relevant methods and data used by the global community and IPCC are presented to provide scientific transparency and repeatability for Alaskan applications, e.g. game and non-game species. This work makes reference to the intergovernmental multi-authored project '*Connecting Alaska Landscapes into the Future*', but the wider, multi-species cumulative picture gets presented by considering over 400 Alaska's species, taxonomy/genetics, diseases and the interactions across scales, summarized as a Meta-Analysis for general trends.

Results show that (i) '*Business as Usual*' and single-species management is not an option anymore for Alaskans and their natural resources and biodiversity, (ii) that '*being conservative*' today may lead to serious environmental losses in the future, (iii) that relying on an protected area strategy alone is insufficient, (iv) and that relevant changes are required to keep us at least the *status quo*. These changes involve innovative solutions, a new economy, great science efforts, and changes from current policies, structures and values even. For instance, the continued subsidization of remote parcel development should be re-considered, and likely abandoned, unless sustainable solutions are found soon. I end with an average 2050 outlook for Alaska, based on spatial computations of simple resource consumption and for a world inhabitated by c. 9 billion people.

HAS CLIMATE CHANGE AFFECTED THE ABUNDANCE AND DISTRIBUTION OF TRUMPETER SWANS IN ALASKA?

Schmidt, Josh[1*], and Mark S. Lindberg[2]*

[1]Central Alaska Network, National Park Service, 4175 Geist Road, Fairbanks, AK 99709, Joshua_schmidt@nps.gov; [2]Institute of Arctic Biology and Department of Biology and Wildlife, University of Alaska, Fairbanks, AK 99775, mslindberg@alaska.edu

Survey data for trumpeter swans (*Cygnus buccinator*) were collected throughout Alaska since 1968 providing an opportunity to examine questions about how long-term factors, such as climate change, may be affecting this population. We examined the relationship between

climate related factors (e.g., temperature and latitude) and swan abundance, growth rates, and distribution. During the study period, the adult population of swans grew at a rate of 5.9% (95% credible interval = 5.2% to 6.6%) and production of cygnets increased at 5.3% (95% credible interval = 2.2% to 8.0%) annually. We also found evidence that cygnet production exhibited higher rates of increase at higher latitudes in later years, which may be a response to warmer spring temperatures and occupancy of novel habitats. Habitat occupancy was positively related to number of days >0ºC and negatively related to latitude in a non-linear manner, with the later relationship perhaps indicating that swans are approaching the current limits of their range expansion. We found no evidence that wetland shrinkage was affecting swan occupancy in the Cordova area. Habitat occupancy was dependent on wetland type and increased with wetland size, history of fire in surrounding habitat, and warm spring conditions. Increased elevation and the presence of transportation infrastructure negatively affected occupancy. To examine these date we developed Bayesian hierarchical models that: account for missing data, provide estimates of goodness-of-fit, and utilize multiple random effects to help explain heterogeneity in the data.

ALPINE AND ARCTIC UNGULATE SESSION ABSTRACTS

COMPARATIVE DYNAMICS OF MUSKOX POPULATIONS IN NORTHWEST ALASKA

Adams, Layne[1]*, Joel Berger[2], Marci Johnson[3], Brad Shults[3], Jim Lawler[4], and Gretchen Roffler[1]

[1]US Geological Survey-Alaska Science Center, 4210 University Drive, Anchorage, AK 99508, ladams@usgs.gov; [2]Division of Biological Sciences, University of Montana, Missoula, MT 59801 and Wildlife Conservation Society, Bozeman, MT 59715; [3]National Park Service-Western Arctic National Parklands, PO Box 1029, Kotzebue, AK 99752; [4]National Park Service-Arctic Inventory and Monitoring Network, 4175 Geist Road, Fairbanks, AK 99709

The Seward Peninsula and Cape Thompson muskox populations both originated from transplants in 1970, and while muskoxen on the Seward Peninsula continue to exhibit marked population growth, the Cape Thompson population has been relatively stationary over the last decade. The lack of continued growth of the Cape Thompson population has been hypothesized to result from density-dependent nutritional restriction. Following a limited pilot effort in March-April 2008, we initiated a research project in March 2009 to compare and contrast vital rates and nutritional status of these 2 populations with work centered at Bering Land Bridge National Preserve (Seward Peninsula population) and at Cape Krusenstern National Monument (Cape Thompson population). The goal of our research is to compare calf production/recruitment, adult female survival, and mass-age relationships between our study populations. Our studies include particular emphasis on the growth and reproductive performance of young females (≤ 4 years old), the age-classes most likely to exhibit differences if the divergence in trends of the Seward Peninsula and Cape

Thompson populations has a nutritional basis. Given that we are just completing the first year of a 4-year research program, we will present an overview of our research design and some preliminary results.

POPULATION STATUS AND POTENTIAL CAUSES OF A DECLINE IN MUSKOXEN IN NORTHEASTERN ALASKA

Arthur, Stephen M.*, Kimberlee Beckmen, and Patricia A. Del Vecchio

Alaska Department of Fish and Game, 1300 College Road, Fairbanks, AK 99701, steve.arthur@alaska.gov

We monitored movements, survival, and reproductive success of radiocollared muskox cows in northeastern Alaska during 2007-2009 to assess population status and the relative importance of predation, nutrition, disease, and parasites as potential causes of a recent population decline. Estimated population size was approximately 200 muskoxen during all 3 years. Minimum estimated birth rates ranged from 51% in 2007 to 84% during 2008. Survival of calves from birth until October increased from 52% in 2007 to 77% in 2009. Predation by grizzly bears was the most common proximate cause of death. However, muskoxen killed by bears commonly showed signs of disease or other conditions that might increase susceptibility to predators. Muskox blood and tissue samples indicated exposure to a variety of infectious diseases, including *Chlamydiophila, Pasteurella trehalosi* (pneumonia), *Brucella suis* serovar 4, leptospirosis, and contagious ecthyma. Liver and serum concentrations of copper were low compared to levels considered adequate for domestic livestock or captive muskoxen, and tissue concentrations of iron, molybdenum, and zinc were higher than levels found in muskoxen on the Seward Peninsula. Elevated concentrations of these minerals would further reduce the availability of copper. These results suggest that immune function of many muskoxen in northeastern Alaska is compromised. Thus, the population decline was likely the result of interactions among nutrition, disease, and predation. Additional work is needed to clarify the relative contributions of these factors and potential effects of changes in vegetation and weather patterns due to the warming climate.

EFFECTS OF A SNOWSHOE HARE DECLINE ON SURVIVAL OF DALL'S SHEEP IN ALASKA

Arthur, Stephen M.[1]*, and Laura R. Prugh[2]

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We estimated survival of Dall's sheep (*Ovis dalli*) in the central Alaska Range during years of differing snowshoe hare (*Lepus americanus*) abundance to test whether indirect interactions with a cyclic hare population affect Dall's sheep either negatively, by subsidizing predators (apparent competition), or positively, by diverting predation (apparent commensalism). Annual survival of adult ewes was consistently high (= 0.85); whereas, lamb survival was low and ranged from 0.15-0.63. The main predators of lambs were coyotes (*Canis latrans*) and golden eagles (*Aquila chrysaetos)*, which rely on hares as their primary food and prey on lambs secondarily. Coyotes and eagles killed 78% of 65 radiocollared lambs for which cause of death was known. Lamb survival was negatively related to hare abundance during the previous year, and lamb survival rates more than doubled when hare abundance declined, supporting the hypothesis of predator-mediated apparent competition between hares and sheep. However, stage-specific predation and delays in predator responses to changes in hare numbers led to a positive relationship between abundance indices of adult Dall's sheep and hares. Lacking reliable estimates of survival, a manager might erroneously conclude that the relationship was apparent commensalism. Thus, support for different indirect effects can be obtained from differing types of data, demonstrating the need to determine the mechanisms that create indirect interactions. Long-term survey data suggest that predation by coyotes is limiting this sheep population below levels typical when coyotes were rare or absent. Understanding the nature of indirect interactions is necessary to effectively manage complex predator-prey communities.

PHYSIOLOGY OF RECRUITMENT IN MUSKOX POPULATIONS (OVIBOS MOSCHATUS)

Barboza, Perry Stephen

Muskox herds are often small and vulnerable to low recruitment of young. Small calves (4.6% of maternal mass) are born before spring “green-up” and grow quickly as the rumen and small intestine develop to allow a shift from milk to forage within 60 days. Growth and resistance to infections are related to the transfer of copper from mother to young during gestation. Liver stores of wild female muskoxen are typically low in copper, which may ultimately affect the viability of their calves. Muskoxen gain lean mass in the first summer and enter winter with small stores of body fat. Food intakes for maintenance of body mass in winter are proportionately higher for calves than for adult females (106 vs. 61 g.kg$^{-0.75}$.d^{-1}). Calves (96 kg) attain the same digestive efficiency as adults (228 kg) during winter. Adults increase food intakes by 79% between spring and autumn as they gain body fat by digesting fiber in abundant graminoids of low quality. Protein requirements are low and minimized by recycling 34% of waste urea-N to body protein. The ruminal fermentation can tolerate cold food and snow in winter but is sensitive to over-heating. Food intake in summer may be limited by increasing air temperatures and decreasing water availability. Subsequent restrictions in food intake due to deep snow or icing events can increase the loss of body fat and protein during winter, which would decrease survival of calves and compromise maternal stores for the production of more calves in spring.

DISEASES OF MUSKOX, DALL'S SHEEP, AND MTN GOATS, WHAT THEY'VE GOT, WHAT WE ARE LOOKING OUT FOR AND HOW TO RECOGNIZE THEM

Beckmen, Kimberlee B.[1], and Burek, Kathleen A.[2]

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Serosurveillance for antibodies, fecal parasite examination and swabs of various mucosal surfaces for pathogen detection from live captured-released have been employed to determine that diversity and prevalence of selected infectious diseases in Alaskan muskox, Dall's sheep and mountain goats. Necropsy of research collected, capture mortalities, hunter-killed submissions and found dead individuals, with parasitological, pathological and extensive pathogen surveys has enhanced the detection of new disease agents and conditions. Recently, concerns about population declines of some muskox and Dall's sheep has intensified the sampling efforts leading to the identification of emerging disease and parasite concerns. We will introduce the typical or important disease lesions and how to recognize endemic as well as potential emerging diseases of concern, especially those that may be introduced by domestic animals or expanding range through climate change. Historic as well as current and suggested disease research and surveillance results will be presented. Potential impacts on individuals as well as populations and implications will be discussed.

ISOTOPIC MONITORING OF PROTEIN STATUS IN MUSKOXEN DURING THE WINTER

Gustine, Dave, Perry Barboza, Jim Lawler, Steve Arthur, Brad Shults, and Kate Persons

Muskoxen (*Ovibos moschatus*) populations have declined in northern Alaska while growth rates are decreasing in western Alaska. We examined protein status and diets of muskoxen in winter by using an isotopic approach based on excreta. We measured the diets and protein status of 3 populations of muskoxen during winter in Alaska [Seward (SEW), Central Arctic (CA), and Cape Thompson (THO)], 2005-2008. We examined the effect of herd on diet composition, diet diversity, and protein status. Multiple regression and the information-theoretic approach was used to evaluate the influence of site characteristics on protein status among herds and years. Seward muskoxen had the most diverse diets (SEW, 1.89 ± 0.03; CA, 1.57 ± 0.19; THO, 1.59 ± 0.14; $P = 0.006$) with the least amount of sedges and graminoids (SEW, 40 ± 2.1%; CA, 66 ± 9.1%; THO, 78 ± 6.2%; $P < 0.001$). Furthermore, protein status was poorest for the herd with recently declining growth rates (SEW, 0.51 ± 0.04; CA, 0.27 ± 0.14; THO, 0.23 ± 0.06; all $P = 0.022$). However, large variance in protein status among sites, herds, and years was related to local foraging conditions that affected forage availability. Indeed, protein status improved for groups of

muskoxen as the amount of sedges and graminoids in the diet increased (-0.430 ± 0.31, $\beta \pm$ 95CI) and elevation of foraging sites decreased (0.824 ± 0.67). Resources available for reproduction in muskoxen, therefore, are highly dependent upon demographic, environmental, and physiographic constraints that affect forage availability in winter.

MUSKOX HUNTING TRADITIONS AND PRACTICES ACROSS THE ARCTIC

Claudia Ihl

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I will present preliminary findings of a project on the subsistence use of muskoxen and the status of muskoxen in Native tradition and hunting lore in northwestern Alaska and across the Arctic. In many western Alaskan villages muskox hunting has only been possible for a decade or less. This presents a unique opportunity to document the newly emerging traditions among Native people regarding the ecology, hunting and use of muskoxen. This project aims to document and compare attitudes toward muskoxen, muskox hunting practices and meat processing habits in villages that have only recently begun to hunt muskoxen with those in villages which have a more long-term hunting tradition as well as draw comparisons to ancient, now extinct muskox hunting practices documented in archaeological records and/or Native stories or legends.

ALASKA'S ALPINE AND ARCTIC UNGULATES IN A CHANGING CLIMATE

David R Klein

Climate change influences alpine and arctic ungulates primarily through its effects on lower trophic level components of the ecosystems in which they dwell. Thus, the seasonality of climate and the associated heat and moisture regimes as well as the latitudinal, topographic, and local climatic control over solar insolation determine vegetative primary production and its availability as food for these herbivores. Questions to be asked if we are to assess the effects of climate change on alpine and arctic ungulates for the purposes of their management and conservation are:

1) Which plant species are favored by climate change and which disadvantaged by climate change, eg. shrubs vs graminoids vs forbs? And how will this influence the foraging dynamics of the target species? How will this play out for the target species?

2) How will changes in plant community structure as a consequence of climate warming, especially changes in precipitation, wind, and seasonality, affect competitor use of alpine and arctic habitats, eg. deer, caribou, moose, and sheep vs goats etc.

3) Climate change will affect parasites and diseases of alpine and arctic ungulates indirectly via their host species. Perhaps more pertinent questions are how will climate change influence the free-living stages of parasites, harassing or blood sucking insects, and their

alternate host species? Will invading species bring parasites and diseases to the native ungulates?

4) Can modeling ecosystem relationships of specific alpine and arctic ungulates species be a useful tool in species management and conservation?

DALL'S SHEEP PRODUCTIVITY AND SURVIVAL IN THE CHUGACH RANGE, GMU 13D, ALASKA

Tom Lohuis

Dall's sheep populations in some areas of southcentral Alaska have declined markedly over the last 20-30 years. This study was designed to 1) obtain baseline demographic information on Dall's sheep in this region, and to 2) attempt to identify the cause(s) of these declines. I radiocollared 37 adult ewes in March and April, and 24 lambs in May and June of 2009. Measures of pregnancy and parturition rates, and causes and rates of adult and lamb mortality, as well as the presence of bacterial and viral diseases were obtained. Preliminary results from the first year of research show 65% of ewes were pregnant, and 86% of those pregnant gave birth to viable lambs. As of January 15, 2010, 92% of ewes and 55% of lambs were alive. Avalanche, wolverine predation, and an unknown cause accounted for deaths of adult sheep. 15% of the lambs were killed by predators, including eagles, brown bears, and an unknown predator, while 18% died from disease, malnutrition, or accident. Serum from 34 ewes was tested for viral diseases including PI-3, MCF, BVD, OPP, and bluetongue. Nasal and pharyngeal swabs from 36 ewes were cultured for bacteria associated with respiratory disease. 7/34 ewes showed positive titers for PI3, all lower than 1:64. Mannheimia hemolytica was cultured from 9/36, and Pasturella trehalosi from 7/36. Other variants of Pasturella were cultured from an additional 12/36. Work is ongoing to determine pathogenicity of Mannheimia and Pasturella cultures.

PRELIMINARY RESULTS OF MOUNTAIN GOAT HABITAT MODELING FOR THE KENAI PENINSULA, ALASKA

Nepal, Naresh, Alok K. Bohara, Thacher Jennifer, Martin Bray, Aaron J. Poe, Grant Harris, and Thomas J. McDonough

Mountain goats (Oreamnos americanus) are highly valued by Alaskans and visitors for both consumptive and non-consumptive purposes. The Chugach National Forest (CNF) in Alaska manages mountain goat habitats and works with the Alaska Department of Fish and Game to monitor goat numbers. In addition, these agencies developed a collaborative research project to collect information for the purpose of meeting their mountain goat management objectives of maintaining suitable habitat and sustaining healthy populations. In order to develop a mountain goat habitat model for the Kenai Peninsula, ten mountain goats were captured and fitted with GPS collars. These data were downloaded and incorporated into resource selection function (RSF) model that identified available mountain goat on the

Kenai Peninsula. We also employed logistic regression model to estimate the coefficients and predicted probabilities for various landscape variables. Preliminary results classified mountain goat habitat as occurring mostly at an intermediate elevations (1375 – 2750 feet) for the area and areas with steep slopes (>38 degrees). During diurnal periods, these ungulates preferred cliffs with south aspects. We also used the distance from nearest road and trail as a proxy to capture the human impact on the habitat of mountain goats. We tested the validity of the model by comparing the estimates with the results from negative binomial count data model, where we found the similar results from both models.

DYNAMICS OF MUSKOXEN IN AND NEAR THE ARCTIC NATIONAL WILDLIFE REFUGE, ALASKA

Reynolds, Patricia E.

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Muskoxen from Nunivak Island were released near the Arctic National Wildlife Refuge in 1969 and 1970. In the refuge, numbers increased until1986 and were relatively stable for over a decade. After 1986, the population range expanded east and westward. Abundance of muskoxen in northeastern Alaska peaked in 1995 at 650 and then declined. Most losses occurred in the Arctic Refuge. In 2006, a population-wide census in northeastern Alaska counted 217 muskoxen. Only one animal was in the Arctic Refuge. Between 2007-2009, abundance in northeastern Alaska was relatively stable (196-247 muskoxen). Muskoxen disappeared from the Arctic Refuge because adult mortalities and the movement of mixed groups out of the refuge exceeded calf recruitment. Factors that affect recruitment, survival, and shifts in distribution include winter weather, access to forage, predation and disease. In northeastern Alaska, winter lasts for 8-9 months. Calves are born in late April when winter conditions prevail. Lactating females do not have access to green forage for several weeks and must maintain body reserves throughout winter to successfully reproduce. Muskoxen are adapted to conserve heat and to survive on small amounts of low quality forage. They reduce activity and movements in winter as an energy-conserving strategy. But winters with rain-on-snow events, and/or deep snow increase energetic costs, decrease access to forage and could affect rates of predation and disease.. Changes in climate exacerbate these conditions, suggesting that muskoxen in northeastern Alaska, like other arctic-adapted species, could be on the brink of additional shifts in abundance and distribution.

EVALUATING THE GENETIC STRUCTURE OF DALL'S SHEEP POPULATIONS IN WRANGELL ST. ELIAS NATIONAL PARK AND PRESERVE

Roffler, Gretchen H.[1*], Sandra L. Talbot[1], George K. Sage[1], Kristy Pilgrim[3], Layne G. Adams[1], Michael K. Schwartz[3], Rebecca Schwanke[4], and Gordon Luikart[2]

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Currently little is known of the genetic structure of Dall's sheep (*Ovis dalli dalli*) populations within contiguous mountain ranges. We used DNA extracted from tissue samples from 30 hunter-killed rams to test a set of 15 microsatellite loci used in bighorn sheep (*O. canadensis*), and to screen and develop markers to access sequence data from 3 mitochondrial DNA genes. We obtained DNA from fresh feces collected in late summer 2007-2009 (*n* = 236) and additional tissue samples from hunter-killed rams (*n* = 56) to genotype sheep throughout Wrangell-St. Elias National Park and Preserve (WRST). Using the previously developed markers, we assessed levels of genetic diversity and gene flow of WRST sheep, and evaluated the genetic structure to determine the level and spatial scale of population differentiation. We initially assigned samples *a priori* to 4 geographical groups: the Southern Wrangell Mountains, Northern Wrangell Mountains, the St. Elias Mountains, and the Chugach Mountains. Preliminary analyses of microsatellite allele frequencies and mtDNA haplotype frequencies uncovered significant substructuring overall, and pairwise comparisons among geographical groups indicated all were significantly differentiated from each other. There was however evidence of admixture between some groups based on Bayesian clustering where groups were not defined *a priori*. We are completing DNA extractions and genotyping of additional samples which will be included in further analyses of genetic structure and individual-based landscape genetics of Dall's sheep in WRST.

USING DISTANCE SAMPLING TO ESTIMATE DALL'S SHEEP ABUNDANCE IN GATES OF THE ARCTIC NATIONAL PARK AND PRESERVE

Schmidt, Joshua, and Kumi Rattenbury

Historically, management of Dall's sheep in Alaska has depended on minimum count surveys for population assessment. High levels of movement and differences in survey coverage between years can result in high levels of variability in counts, making interpretation of counts difficult. Additionally, these techniques can require an input of time and money that may be unrealistically high, especially when estimates for large areas, such as national parks, are necessary. Dall's sheep were selected by the Arctic Network for long-term monitoring in Gates of the Arctic National Park and Preserve (GAAR), Noatak National Preserve, and Kobuk Valley National Preserve. The sheer size of the area occupied by sheep in this region (41,000 km^2) precludes minimum counts as an effective monitoring tool. In 2009, we tested distance sampling as an alternative approach for estimating Dall's sheep abundance within GAAR. A set of 20km transects (n=316) was generated systematically throughout all potential sheep habitat in GAAR (27,934 km^2) to ensure good spatial coverage. Our preliminary estimate of abundance indicated that there were 8723 (95% CI: 6021 to 12637) sheep in GAAR in 2009. This is the first viable park-wide estimate of Dall's sheep abundance for GAAR since the early 1980's, and we intend to refine methods in 2010 to improve survey efficiency and precision of estimates. Our preliminary findings suggest that distance sampling is a practical and efficient alternative to minimum counts for monitoring Dall's sheep populations and can provide precise estimates of abundance over large areas.

CAW RIDGE'S MOUNTAIN GOATS: INSIGHTS FROM A LONG-TERM STUDY

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Caw Ridge is located in the foothills of the Rocky Mountains. It is an ideal place to study mountain goats because it harbors the largest population in Alberta and is relatively easy to access by ATV. The study officially began in 1989, and more than 99% of goats >1 year old have been uniquely marked. The initial objectives of our research were to determine which factors affected population dynamics and what selective pressures shaped female reproductive strategies. Recently, research has expanded to address questions related to male reproductive success, inbreeding, and phylogenetics of mountain goats. A review of the major findings will be presented.

TEMPORAL AND GEOGRAPHIC PATTERNS OF GENETIC DIFFERENTIATION IN MOUNTAIN GOATS: A FOCUS ON ALASKA

Shafer, Aaron B.A.[1*], Steeve D. Côté[2], and David W. Coltman[1]

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The mountain goat (*Oreamnos americanus*) is an alpine specialist endemic to the mountains of western North America. We examined the spatial genetic structure and phylogeographic patterns of mountain goats spanning their entire native range using microsatellite and DNA sequence data. Fossil evidence suggests a single southern refugia existed for mountain goats during the last glacial maxima; however, we observed a historical north - south split, indicative a second, northerly refugia in Alaska/Yukon. Phylogeographic analysis also revealed a cryptic refugium on the Alexander Archipelago of Alaska. This latter finding is important, as historical translocations may have impacted the genetic integrity of this relict population. Relative to the entire range of mountain goats, southeast Alaska's mountain goats were quite diverse and appeared to be randomly mating; however, goats from the Kenai Peninsula displayed lower levels of diversity. We also found that connectivity among

mountain ranges facilitated gene flow, while valleys and fiords impeded it. This study is the first to assess the temporal and spatial genetic structure of mountain goats, and has provided important new evolutionary and ecological insights.

LIFE HISTORY AND CLIMATE EFFECTS ON MOUNTAIN GOAT SURVIVAL IN COASTAL ALASKA

White, Kevin, Grey Pendleton, Dave Crowley, Herman Griese, Kris Hundertmark, Thomas McDonough, Lyman Nichols, Matt Robus, Christian Smith, and John Schoen

Life-history theory predicts that individual survival should vary between sex and age categories due to differences in allocation of nutritional resources for growth and reproductive activities. During periods of environmental stress (i.e. severe winters, hot summers) such relationships may be exacerbated, due to heightened selection pressure, and affect sex and age classes differently. In this study, we test hypotheses about the relative roles of sex, age and winter and summer climate on the probability of mountain goat survival in coastal Alaska. Specifically, we used known-fates analyses to model the effects of life-history and climatic variation on survival using data collected from 279 radio-marked mountain goats (118 males, 161 females) in 9 separate study areas during 1977-2008. Overall, results of our analyses indicated that models including age, sex, winter severity (mean monthly snow depth) and summer growing conditions (growing degree days) best explained variation in survival probability of mountain goats. Specifically, our findings reveal that old animals (9+ years) have lower survival than prime-aged (5-8 years) and young animals (1-4 years). In addition, males tended to have lower survival than females, at least for prime-aged and old animals. Further, survival was also strongly influenced by winter and summer climate such that survival was negatively related to snow depth and growing degree days. Overall, these findings detail how climate interacts with basic life-history features to affect mountain goat survival. Such results will assist conservation and management of mountain goats by enabling detailed, model-based demographic forecasting of human and/or climate-based population impacts.

TECHNICAL SESSION ABSTRACTS

FINE SCALE POPULATION STRUCTURE OF SITKA BLACK-TAILED DEER ON PRINCE OF WALES ISLAND

Colson, Kevin E.[1], Todd J. Brinkman[1], David K. Person[2], and Kris J. Hundertmark[1]

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Previous studies have shown interisland structure among Sitka black-tailed deer (*Odocoileus hemionus sitkensis*), but research at finer spatial scales is absent. We investigated population structure within 3 different drainages separated by 30 km on Prince of Wales Island, Alaska. We extracted DNA from fecal-pellet samples (n = 376) and used 8 microsatellites to identify unique individuals (n = 221 PI = 0.0002). We estimated moderately low diversity among the population ($H_o = 0.492$). An exact G-Test revealed significant over-all structure ($P = 0.006$), albeit at a low level ($\theta = 0.009$). Further analyses reveal two population pairs with significant structure. Analyzing the data for effective migrants, we estimated between 0.2 and 3.2 effective migrants per generation. Our results suggest demographically isolated deer populations may exist, despite relatively short distances between populations. We recommend consideration of these data during discussions on management unit boundaries of deer in Southeast Alaska.

ALASKA GAP UPDATE: PUBLIC TERRESTRIAL VERTEBRATE DISTRIBUTION MODELING AND BIODIVERSITY CONSERVATION FOR THE FUTURE

Gotthardt, Tracey[1], Falk Huettmann[2], Sanjay Pyare[3], Andy Baltensperger[2]*,Tamara Fields[1], and Julie Nielsen[3]

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In 2006, Alaska became the final state in the country to begin work on a USGS-funded Gap Analysis Project (GAP). Designed to identify lands of special conservation importance but lacking in protection, GAP aims to inventory the extent to which native plant and animal species are being conserved at a regional level. In line with these goals, Alaska GAP has undertaken efforts to map known species occurrences, to model and validate projected distributions and geographic ranges for 451 terrestrial vertebrate species across Alaska, and to make these data publicly available. Thus far, we have gathered 1.5 million locations from 640 unique data sources for 348 species for use in these analyses. Geo-referenced wildlife locations and occupied major hydrologic drainage unit (HUC) polygons can serve as the inputs for both inductive and deductive modeling processes, in an effort to create predictive spatial distribution models for each species in the state. Deductive modeling will use expert-derived range maps, occurrence points, and wildlife/habitat relationships to extrapolate species distributions across their ranges. Inductive modeling will incorporate wildlife occurrences and their relationships to a variety of environmental layers into machine-learning based decision-tree models, in order to predict species distributions explicit in space and time. The compilation of individual species distribution maps and their intersections will ultimately yield the first species distribution atlas and biodiversity hotspot map for the state. These spatially explicit results will serve as powerful conservation tools, representing the 'best available science' for managers seeking to maximize biodiversity protection on lands throughout Alaska.

RESEARCH ADVANTAGES USING SHORT-TERM WILDLIFE BEHAVIOR DATA - A DOMINANCE HIERARCHY EXAMPLE RELEVANT FOR WILDLIFE MANAGEMENT

Jochum, Kim Anke, Falk Huettmann, Lilian Alessa, and Andrew Kliskey

This study presents a new approach to collecting, handling and examining wildlife behavior data across mammal species. Sophisticated dominance hierarchy patterns and the ability of individual recognition are well described in many large mammals such as monkeys and cetaceans through the effort of detailed long-term field studies. Their implications are of known importance for wildlife management strategies. However, for other large mammals, e.g. bears, few detailed long-term behavior studies are available; knowledge about their hierarchy systems and their ability to differentiate between individuals for instance is still inadequate. Using short-term sampling, here we present a new approach for gaining better knowledge about species behavior when long-term data are lacking. Such data becomes quite accessible, is fairly easy to collect, cheaper and can be highly efficient when tracing broad social pattern and analysed in a non-traditional way using data mining techniques.

To test the methodology, short-term behavior data was collected on Howling monkeys (*Alouatta palliata*) in Nicaragua during winter 2005/06, Humpback whales (*Megaptera novaeangliae*) in Canada during spring, Brown bears (*Ursus arctos*) in Alaska during summer, and Polar bears (*Ursus maritimus*) in Canada during fall 2006. Data mining tools proved invaluable for finding signals in coarse data, and helped to describe the overall and specific trends. When compared with long-term studies, quite identical patterns can be found in our ‘simple’ data. As hypothesized, Brown and Polar bears show distinct signs of social behavior and recognition. These results suggest a need for rapid implementation of new methodological approaches into management decision making.

KILL RATE OF WOLVES ON MOOSE IN A LOW DENSITY PREY POPULATION: RESULTS FROM EASTERN INTERIOR ALASKA

Lake, Bryce C.[1]*, Mark R. Bertram[1], Nikki Guldager[1], and Jason R. Caikoski[2]

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A study to estimate the kill rate of wolves on moose was initiated in eastern interior Alaska in 2008. This study is the first to examine kill rates in a system with a single ungulate prey species that occurs at a low density (0.08-0.13 moose/km^2). Information from this study will address public concerns over low moose numbers and provide managers with the ability to make more informed decisions. To locate kills, wolves from six packs were radio tracked daily during early February and March, 2009. The estimated kill rate was 0.019

moose/wolf/day (95% CI: 0.011-0.028). This estimate was similar to previous research that estimated kill rates of wolves on moose. In November 2009, GPS collars were attached to ten wolves in seven packs in order to gain information on kill rates from across the winter, to address issues of detectability of kills, and to estimate wolf density. Preliminary results from the GPS collars will also be presented.

LANDSCAPE CONSERVATION COOPERATIVES – PUTTING THE POWER OF COLLABORATION TO WORK FOR CONSERVATION IN ALASKA

Martin, Philip[1]*, Karen A. Murphy[2], and Charla M. Sterne[3]

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Major climatic changes have occurred with visible and measurable consequences to biological systems in Alaska. Recognizing that conservation of species, habitats and ecological processes in the face of climate change and other stressors must occur on large spatial scales, the Service is spearheading the development of a national network of conservation partnerships called Landscape Conservation Cooperatives. Landscape Conservation Cooperatives are self-directed conservation partnerships among federal, state, and local government agencies, Tribes, nongovernmental organizations, academic institutions and other entities that address the challenges of climate change and other stressors in an integrated fashion across a defined geographic area. The principal function of an LCC will be to provide scientific and technical expertise to support conservation agencies' and organizations' missions to sustain abundant, diverse and healthy populations of fish, wildlife and plants. Because the Arctic is projected to experience the most pronounced warming in North America, and the natural resources of the region are intricately tied to the area's economy and culture, the Arctic has been identified as priority for development of Alaska's first landscape conservation cooperative. The Arctic Landscape Conservation Cooperative will build on a solid foundation of collaboration already in place in Alaska.

QUANTIFYING POTENTIAL BIASES IN DEMOGRAPHIC PARAMETERS CALCULATED FROM TELEMETRY COLLAR DATA

Prichard, Alex, and Kyle Joly

Radiotelemetry collars are frequently used to monitor a random sample of animals over time. Observations of these animals can then be used to estimate demographic parameters such as annual survival and parturition rates for the population. These estimates can be biased by factors such as an unrepresentative age structure and individual heterogeneity in survival of collared animals if statistical adjustments are not made. In order to quantify the

effects of different factors on the magnitude of these potential biases, we created a computer simulation of the female portion of a typical arctic caribou herd and then randomly assigned collars to individuals within the simulated population. Under our default model, based on the Western Arctic Herd, caribou were collared randomly from all females aged 2 years and over and caribou remained collared for an average of 7 years. Under this default model, survival rates were underestimated by ~3% and parturition rates were overestimated by ~3%. The magnitude of these biases increased with increasing time individuals remained collared. Increasing the level of individual heterogeneity in the population only resulted in small increases in survival and parturition rates. If changes in the age structure of collared caribou are not accounted for, then there is a substantial chance of incorrectly concluding there is a significant declining trend in survival in the first 6 years after collaring begins, when the age structure of the collared sample changes most dramatically. These potential biases should be considered when interpreting demographic parameters from multi-year collaring studies.

POSTER SESSION ABSTRACTS

POPULATION STRUCTURE AND GENETIC HISTORY OF RANGIFER IN SOUTHWEST ALASKA

Colson, Kevin E., Karen H. Mager, and Kris J. Hundertmark

Institute of Arctic Biology and Department of Biology and Wildlife, University of Alaska Fairbanks, Fairbanks, AK 99775

We investigated the population structure and genetic history of *Rangifer* herds in southwest Alaska, including the Northern Alaska Peninsula herd, Southern Alaska Peninsula herd, and Mulchatna caribou (*R. tarandus*) herd. Here, we present preliminary data demonstrating that unlike free ranging *Rangifer* on the North Slope, Southwestern herds appeared to be discrete genetic demes corresponding to the herd designations. Using data from reindeer on the Seward Peninsula, we detected no sign of domestic introgression into Southwestern free ranging herds. Through the usage of the program BOTTLENECK, we identified a significant genetic bottleneck in the Southern Alaska Peninsula herd. These initial findings suggest the value of further genetic analysis on Southwestern herds.

CURRENT STATUS OF MUSKOXEN IN ALASKA

Hughes, Letty, Patricia Reynolds, Kimberlee Beckmen, Phillip Perry, and Geoff Carroll

Muskoxen (*Ovibos moschatus*) were reintroduced to Alaska after disappearing in the late 1800s. In 1936, thirty-one muskoxen from east Greenland were relocated to Nunivak Island where the seed population increased to a peak of 750 animals in 1968. Muskoxen from the Nunivak population were relocated to Nelson Island, western portions of the Seward

Peninsula, Northwestern Alaska, and Northeastern Alaska between 1967 and 1981. This effort created five populations that expanded in unoccupied ranges and increased to over 4500 muskoxen statewide. Nunivak Island, with a current population of 567, had the first hunting season in 1975 to stabilize population growth. Numbers are highest on the Seward Peninsula where range has increased eastward, and population growth increased 14% annually from 1970-2000 and then slowed to 6% annual growth from 2000-2007 where the 2007 census counted 2688 muskoxen. The Northeastern population increased to 650 by 1995, expanded east and westward, decreased to 200 animals by 2005 when areas were vacated and is currently stable (200-250). The Northwestern population grew 8% annually between1970-1998 and stabilized (324-424) in 1999-2008 while expanding their range northward. The Nelson Island population located on the Yukon-Kuskokwim Delta is currently 557 animals and experiences emigration to the mainland. Disease surveillance shows a healthy population on the Seward Peninsula with low impacts on reproduction compared to populations with low calf recruitment due to predation, vehicle collisions, trace mineral deficiencies, and disease. Continued investigations of population parameters and health assessments along with public input will enhance future management of muskoxen in Alaska.

NANNIES IN THE CROSSHAIRS: EFFECTIVENESS OF USING A SEX IDENTIFICATION QUIZ TO REDUCE HARVEST OF FEMALE MOUNTAIN GOATS IN ALASKA

Jemison, Jeff, Kristen Romanoff, and Kevin White

Mountain goats have relatively low survival and reproductive rates relative to other northern ungulates. Consequently, human harvest of mountain goat populations must be carefully managed to avoid overharvest and population declines. Unfortunately, correctly differentiating between male and female mountain goats in the field is difficult. As a result, either sex harvest is reluctantly allowed throughout most of Alaska. Fortunately, a point system (males = 1, females = 2) can be used to set harvest quotas to reduce the likelihood of overharvest. Nonetheless, reducing female harvest is desirable to increase population resilience and provide greater hunting opportunity. In an effort to reduce female mountain goat harvest we initiated an educational program intended to increase the ability of hunters to correctly identify male and female mountain goats in the field. Specifically, we developed a mountain goat identification quiz (available in both a hard copy and interactive web-based format) that was designed to highlight the subtle morphological and behavioral characteristics associated with correctly identifying male and female mountain goats. In addition, we conducted follow-up phone interviews with successful hunters in order to evaluate whether the mountain goat identification quiz influenced the likelihood of hunters harvesting male vs. female mountain goats. We also examined other factors associated with harvest of male and female mountain goats such as, hunter experience, shot distance, field conditions and hunter intent. The results of this study provide key information needed to evaluate the effectiveness of hunter education materials to meet management goals and insights into behavior and challenges mountain goat hunters face in the field.

AGENCIES IN LIMBO: MIGRATORY BIRDS AND INCIDENTAL TAKE BY FEDERAL AGENCIES

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It is a violation of the Migratory Bird Treaty Act (MBTA) to take migratory birds by any means or in any manner, except as allowed by regulation. Federal agency actions in Alaska routinely take migratory birds incidentally in the course of other activities, particularly land clearing during nesting season. Such takings are a violation of the statute but may be a necessary part of agency operations in Alaska under certain circumstances. The U.S. Fish and Wildlife Service (FWS) has not used its authority to provide regulatory guidance that would help agencies abide by the act and avert lawsuits. Therefore, while agencies may not be prosecuted by the FWS for their incidental bird-taking, those agencies are still vulnerable to citizen suits. Many courts have so far refused to recognize the likelihood of migratory bird deaths presented by land clearance activities, though an analysis of the statute and the case law demonstrates that the MBTA regulates unintentional takings and does not differentiate between direct and indirect bird deaths, as some courts have postulated. The FWS should ban land disturbance activities during nesting season in order to avoid incidentally taking migratory birds, and necessary exceptions to that rule ought to be evaluated in part using the model established by Executive Order 13186. This work has been published and can be found at: Julie Lurman, “Agencies in Limbo: Migratory Birds and Incidental Take by Federal Agencies," 23 *Journal of Land Use and Environmental Law* 39, 2007.

GENETIC DIFFERENTIATION OF CARIBOU HERDS AND REINDEER IN NORTHERN ALASKA

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Four herds of caribou on Alaska's North Slope constitute management units, yet the extent to which the herd concept approximates the genetic population structure is unknown. We analyzed DNA from North Slope caribou and Seward Peninsula's domestic reindeer to investigate caribou population structure and the potential introgression of reindeer genes into caribou herds. Using both traditional F-statistics and the individual-based program STRUCTURE, we find that reindeer and caribou can be clearly differentiated, while North Slope caribou herds cannot. Within caribou herds, levels of reindeer introgression appear to be very low, though a few individuals may be genetic migrants or hybrids. These

preliminary findings suggest that the level of gene flow among North Slope caribou herds is sufficient to homogenize them, while reindeer genes from any recent interbreeding between caribou and reindeer have largely disappeared from herds. Further research linking genetic data with satellite-collar data will increase our understanding of North Slope caribou population structure.

NOTES