The Alaskan Wildlifer

Newsletter of the Alaska Chapter of the Wildlife Society

Fall Issue - November 2015

Message from President Grant Hilderbrand

Hello everyone!!! I hope you all had, or are wrapping up successful and safe fall field seasons. I know for many of you, this is one of the best times of year.

It seems that, along with the seasons, this has been a period of transition for many of our peers. I may be a bit myopic. I've changed jobs, talked to a great group of applicants about my old position, and had several dear colleagues retire. I've also seen past members of our board and close friends and collaborators move out of state. It seems to be a time of musical chairs with old faces in new places taking on new challenges, and new faces in old places as we collectively recruit to fill the vacancies created. I've had a chance to do a bit of travel this summer and fall and, without explicit thought, I always find myself raving about our wildlife community here in Alaska…great people doing great things.

I realize that more often than not, I'm not really speaking about a particular agency, or species, or project…I'm thinking about our Alaska TWS community. As I talk to people from outside, I look for folks that would "fit" here…that would thrive as part of our community. When I see someone outstanding, I want them here…regardless of the agency or organization, because outstanding is what we do.

As folks move from one chair to another, as they move on to retirement, and as they return or arrive new to the state, they already have a network, a group of peers and collaborators and mentors. They have a professional family. One of the great benefits of being a member of the Chapter is that it exposes us to the array of work being done across the state on a vast range of topics and questions.

Always remind your peers, new and old, about the Alaska Chapter. Encourage them to join and engage. We are here to serve you and connect you to those that share your passions. Further, as you meet colleagues from outside, encourage them to conduct work here, base students here, and become part of our community.

I'm continually awestruck by the work you collectively do and I'm proud to be a part of your community.

Issue Highlights

Regional News

Northern

Todd Brinkman, Northern Representative

Personnel Changes

Steve Arthur left the National Park Service and accepted a position with the Arctic National Wildlife Refuge as the Supervisory Ecologist.

Matt Cameron was hired as a new biological technician with the National Park Service, Fairbanks office, and is also a new Wildlife M.S. student at UAF with Dr. Knut Kielland. Details on the objectives of his research are being organized.

In September, **Ryan Klimstra** transitioned from his poisition as a Wildlife Biologist with the North Slope Borough Department of Wildlife Management, and accepted the ADF&G Area Biologist position in Barrow, replacing **Geoff Carroll**.

After 15 years as Assistant Unit Leader of the Alaska Cooperative Fish and Wildlife Research Unit at University of Alaska, Fairbanks, **Dr. Abby Powell** recently left Alaska to become the Unit Leader of the Florida Cooperative Fish and Wildlife Research Unit at the University of Florida. Dr. Powell's research on avian ecology included full life cycle biology of king and spectacled eiders, use of the Beaufort Sea by shorebirds, and breeding ecology of Smith's Longspurs in the Brooks Range. During her time in Alaska, Abby served as an advisor to 15 M.S. and 6 Ph.D. students at UAF. These students have gone on to pursue additional graduate education, work for federal agencies within Alaska including the National Park Service and U.S. Fish & Wildlife Service, work for non-profit conservation organizations (WCS, TNC), and one is currently a faculty member at University of Alaska, Anchorage. To date, Dr. Powell and her students have contributed 44 peer-reviewed publications based on their research conducted in Alaska.

Dr. Laura Prugh, Assistant Professor of Wildlife Biology, left the University of Alaska Fairbanks (UAF) during summer 2015. Dr. Prugh has accepted an Asst. Professor position with University of Washington. Dr. Prugh was productive during her three years at UAF, producing multiple publications and mentoring several graduate students to completion. Dr. Prugh will continue to be involved in research in Alaska. More specifically, she is serving as the PI on a 4-year project assessing alpine ecosystem vulnerability to environmental change using Dall sheep as an iconic indicator species (http://above.nasa.gov/cgi-bin/above/inv_pgp.pl?pgid=3379).

TWS-Alaska Chapter Regions: Northern, Southcentral, and Southeast.

Brad Wendling accepted a position with ADF&G as the Dall sheep Research Biologist. Brad's initial efforts will be to identify data gaps and identify research priorities.

Graduate Student Transitions

Janelle Badger (supervised by Greg Breed) and **Joseph Eisaguirre** (supervised by Greg Breed and Travis Booms) began their M.S. research at UAF this fall. Janelle is studying the effect of individual heterogeneity in female reproductive rates on offspring survival in the Sable Island, Nova Scotia grey seal colony. Joe will be investigating movements of Alaska's migratory population of Golden Eagles. He is particularly interested in the way various environmental, intrinsic, and anthropogenic (e.g., renewable energy developments) factors interact to influence the movements of this soaring raptor.

Ross Dorendorf completed his M.S. degree with UAF (Thesis: Motivations and Drivers of Interior Alaskan Trappers) and accepted a position with Wildlife Conservation Society—Arctic Beringia. Ross will be devoting much of his efforts to a wolverine project.

Kelly Sivy recently completed her thesis "Direct and Indirect Effects of Wolves on Interior Alaska's Mesopredator Community," and will receive her M.S. in Wildlife Biology and Conservation from UAF in December 2015. She plans on pursuing research opportunities in Alaska related to carnivore ecology and management.

Taylor Stinchcomb is a new Wildlife M.S. student at UAF with Dr. Todd Brinkman. Taylor will be using a soundscape-ecology approach to explore spatial relationships among caribou, caribou hunters, aircraft traffic, and oil and gas activity around the community of Nuiqsut, Alaska.

Other News

Jeff Wells, ADF&G Tok Office, reports that ADF&G has started a cooperative habitat project with the Ruffed Grouse Society and Forestry Division. They will be rollerchopping aspen-dominated areas in a 25-year-old burn to create forest stand diversity and aspen-willow regeneration. This is a 4-5 year project with funding from ADF&G and the Ruffed Grouse Society (see pages 22-25).

Southcentral

Nathan Svoboda, Southcentral Representative

Personnel Changes

Darren Bruning is the new Region III Regional Supervisor for ADF&G and the Department is currently recruiting for Regional Supervisors for Regions II and IV.

Casey Burns, is the new Bureau of Land Management Alaska State Wildlife Program Lead, replacing **Cara Staab**. Casey previously was the State Biologist for NRCS in Utah and Cara is now a Wildlife Biologist in the Missoula, Montana Regional Office of the U.S. Forest Service.

After investing over 43 years of exemplary dedication and professional excellence to better ensure the conservation of migratory birds in Alaska, **Christian (Chris) Dau** will retire from the U.S. Fish & Wildlife Service Migratory Bird Management Program in December 2015. Chris obtained a B.S. degree in Biology from Fresno State and went on to the University of Alaska Fairbanks for an M.S. degree in Wildlife and Fisheries addressing nesting biology of spectacled eiders. Chris then began his career as a Wildlife Biologist in 1971 on the Clarence Rhode National Wildlife Range which in 1980 became the Yukon Delta NWR. He was drawn to the Yukon-Kuskokwim Delta because of the >1 million ducks, 0.5 million geese, and the nearly 40,000 loons, 40,000 grebes, 100,000 swans, and 30,000 cranes that return to the Refuge each spring to nest. After 10 years on the Delta, Chris moved to Izembek NWR in 1981 where he served as the Refuge's Wildlife Biologist until 1997 when he moved to Anchorage to begin work with the Migratory Bird Management Program. Chris is recognized by his peers as the consummate wildlife biologist with the rare capacity to blend natural history, ecology, and social science to address just about any question on migratory birds. Chris plans to stay in Alaska with his family (Carla, Jens, Niels, and Karin) to enjoy art, reading, hunting, and fellowship.

Dr. Charles (Chuck) Frost will begin work as a Wildlife Biologist (Biometrician) in the U.S. Fish and Wildlife Service Migratory Bird Management Program in November 2015. Chuck most recently worked as the National Wildlife Refuge Biometrician for the U.S. Fish and Wildlife Service in the Northeast Region linking refuge objectives and management of coastal systems for migratory waterfowl, shorebirds, and landbirds. Prior to his work with Service, Chuck spent three years as the Biometrician for the Alaska SeaLife Center in Seward, Alaska, working on population

viability analyses for a variety of species vulnerable to the effects of the warming Arctic, including Steller's and spectacled eiders, Steller sea lions, and harbor seals. Chuck attended the University of Nebraska where he received his B.S. degree in Agricultural Economics (2003) and Ph.D. in Wildlife Ecology and Mathematics and Statistics (2009). Chuck's interests are linkages between social, economic, political, and biological processes and their inclusion in a structured decision making cycle. When he is not running R or leading an SDM discussion, Chuck enjoys fishing, hunting, and strategically placing a softball over the outfield fence. Chuck returns to Alaska with his wife January, son Asher (10), daughters Evangeline (5) and Callista (3), and the newest Frost arrivals Drake (2 months) and Ember (2 months).

Maria Gladziszewski has been appointed Deputy Director of the Alaska Department of Fish and Game and **Lem Butler** is the new Assistant Director for the Alaska Department of Fish and Game. Both positions are located in the Juneau office.

Dr. Michael Guttery is the new Alaska Department of Fish and Game Region IV Biometrician in the Region IV Palmer office. Dr. Guttery received his Ph.D. in Wildlife Biology from Utah State University. From there he acquired three years of consulting experience in post-doctorate positions at both Utah State University and University of Wisconsin-Madison. Over the years he has served as a biometric consultant for dozens of fellow researchers and graduate students. We expect Michael's blend of biological knowledge, quantitative skills, and personable consulting skills will serve him well in this position.

Dr. David Irons, Supervisory Wildlife Biologist and Seabird Coordinator for the U.S. Fish & Wildlife Service Migratory Bird Management Program retired May 2015 after 36 years with the Service. David was recognized as a national and international leader in seabird ecology holding leadership positions with the Pacific Seabird Group and the World Seabird Union; mentoring graduate students; and supporting academic and research institutions, conservation organizations, and natural resource agencies, councils, and foundations. David advocated for science and the scientific process, especially graduate education and publishing. Despite supervisory responsibilities and an aggressive field work schedule, David found time to author and co-author peer-reviewed papers, presentations, and grants and serve in leadership positions with the Pacific Seabird Group and World Seabird Union. David was extraordinarily creative and resourceful relative to research work orders, grant agreements, purchase orders, and any other administrative tasks in the way of getting the job done.

Dr. Erik Osnas was hired as a Supervisory Wildlife Biologist (Biometrician) in the U.S. Fish & Wildlife Service Migratory Bird Management Program in April 2015. Erik is an evolutionary and population ecologist with research interests in wildlife disease, wildlife conservation, decision analysis for natural resource management, and applying quantitative methods to wildlife population problems. In his most recent position, Erik was a Wildlife Biologist with the USGS Patuxent Wildlife Research Center where he used mathematical and statistical models to understand waterfowl population dynamics and developed expertise in structured decision making. He worked collaboratively with multiple Landscape Conservation Cooperatives, Joint Ventures, and Ducks Unlimited Canada to develop a framework for decision-making by relating habitat change to demographic rates using northern pintail as a model. He completed his Ph.D. at Indiana University in Ecology, Evolution, and Behavior, an M.S. in Zoology at the University of Western Ontario, and a B.S. in Wildlife Biology at the University of California, Davis. Erik is married and has two young daughters and enjoys the outdoors, fly-fishing, hunting, sea kayaking, hiking, and gardening.

Cory Stantorf accepted the Assistant Area Biologist position (WBII) with ADF&G based in Anchorage, starting in July 2015. Cory received both his Bachelor's and Master's degrees from the University of Alaska, Anchorage. He worked under Dr. Don Spalinger on his Master's thesis, investigating the mechanistic connection between nutrition, body condition, and reproduction to explain variation in Alaskan moose productivity rates. Cory worked as a wildlife technician from 2010 - 2014, first at the Palmer Moose Research Center, then at the Anchorage Wildlife Information Center. He then moved to the Assistant Area Biologist position in Glennallen. His experience with wildlife surveys, captures, research projects, and dealing with the public on everything from routine regulatory questions to responding to wildlife conflicts, makes him the ideal candidate for this position. We are excited to get him back to his hometown.

Michael Swaim joined the U.S. Fish & Wildlife Service Migratory Bird Management Program in July 2015 as a Wildlife Biologist (GIS) in the Waterfowl Section. Michael comes to the Migratory Bird Management program most recently from Dillingham where he was responsible for implementing complex biological studies involving numerous taxa and habitats for the Togiak National Wildlife Refuge. Prior to Togiak, Michael served as the Wildlife Biologist/GIS specialist for the Yukon Delta National Wildlife Refuge focusing on migratory birds and their habitats. These positions together with past appointments with National Park Service in Alaska and National Forest Service in the Southwest equipped Michael with a diverse biological and technical background that he will apply towards the Service's mission to conserve migratory birds. Michael completed his B.S. degree in Biological Sciences at the University of Colorado and post-baccalaureate courses in mammalogy and statistics at the University of Alaska. Michael will be designing aerial and ground-based surveys, conducting geospatial analyses and field studies, and managing long-term spatially explicit data sets that are used to assess changes in distribution, abundance and trend for harvest management, determine recovery status of listed species and to assess potential effects of proposed development projects. The Migratory Bird Program is thrilled that Michael, Dianna, and Katelynn migrated from rural Alaska to call Anchorage home.

Southeast

Kevin White, Southeast Representative

Personnel Changes

Alaska Department of Fish and Game

ADF&G Wildlife Education Specialist, **Tennie Bentz**, has recently transitioned into a position with the Juneau school district. Tennie had previously worked on several wide-ranging wildlife education programs for ADF&G throughout the southeast Alaska region.

UAF graduate student, **Sophie Gilbert**, recently completed her PhD focused on Sitka black-tailed deer population ecology and habitat selection on Prince of Wales Island. Sophie collaborated with recently retired ADF&G research biologist, Dave Person, and UAF advisor, Kris Hundertmark, on the project. Sophie was also recently involved in an independent project focused on conducting population viability analyses for the Alexander Archipelago wolf (*Canis lupus ligoni*) as part of the ongoing ESA petition evaluation process (see below). Sophie is currently doing a post-doc at the University of Alberta and studying population ecology of endangered woodland caribou using long-term data sets collected from multiple populations.

Juneau-based ADF&G mountain goat and moose research technician, **Jeff Jemison**, has recently transitioned into a new position with ADF&G focused on hunter education and management of the Juneau shooting complex. Jeff enjoys his new position but sometimes misses those sunny days in the alpine working with Alaska's most iconic mountain ungulate species.

Michael Kohen, ADF&G Wildlife Diversity Program Biologist, has recently moved into a position as the Fisheries Technical Director for the Alaska Seafood Marketing Institute. Michael had previously worked on bat research and citizen science projects (among other things) throughout southeast Alaska.

Yasaman Shakeri was recently hired as the new ADF&G mountain goat and moose research technician. Yasaman had most recently been working on a graduate research project in the Haines area, focused on the indirect effects of brown bears on small mammal community dynamics (see below).

Tom Schumacher was recently hired as the Wildlife Management Coordinator for the southeast Alaska region for ADF&G. Tom had previously been involved with carnivore research in southeast Alaska and, more recently, policy and permitting based in the ADF&G headquarters office. Tom is currently settling into his new, well-lit office in the re-designed ADF&G regional office in Douglas.

U.S. Forest Service

Mary Friberg, Planner for the Tongass National Forest, has recently retired and moved to Tanzania! Mary had previously been involved in a collaborative effort with Tom Hanley to develop a GIS application of the nutrition-based deer habitat carrying capacity model (FRESH) for southeast Alaska.

Tom Hanley, Research Biologist and program leader for the Juneau-based Forestry Science Lab, retired last spring following a long and distinguished career. Tom primarily focused on fundamental and applied research focused on ungulate nutritional ecology (primarily Sitka black-tailed deer).

Brian Logan, Wildlife Program Coordinator for the Tongass National Forest, has recently taken a position at the U. S. Forest Service national headquarters in Washington D. C. Brian is now responsible for managing U. S. Forest Service wildlife programs nationwide, including providing technical advice and expertise relative to many high profile wildlife conservation issues including Mexican and red wolf population recovery, sage grouse conservation, and of course, potential ESA listing of the Alexander Archipelago wolf.

U.S. Fish & Wildlife Service

Deborah Rudis retired in March 2014 from the U.S. Fish & Wildlife Service Ecological Services office in Juneau where she was the Contaminants Biologist for the past 25 years. Deb's first work in Alaska was on the Exxon Valdez oil spill and included numerous other oil spills over the years, including the BP spill in the Gulf of Mexico. Much of her work focused on mining issues in southeast Alaska, and contaminants on National Wildlife Refuge lands, particularly in the Aleutians. Deb will be staying in Juneau and doing some part-time consulting work when she is not enjoying hiking, skiing, running, sea kayaking, or traveling.

Alexander Archipelago Wolf Update

Wildlife and land managers are awaiting the upcoming decision by the U.S. Fish & Wildlife Service (USFWS) regarding a potential endangered species listing of the Alexander Archipelago wolf in Southeast, Alaska. Through a court approved agreement, the USFWS will announce their listing decision on or before, December 31, 2015. The petition, submitted in August 2011 by Greenpeace and the Center for Biological Diversity has wide ranging implications for wildlife, land, and forest management, particularly on Prince of Wales Island. Multiple regulatory agencies contributed data, analyses, and comments to the USFWS species status assessment and population modeling efforts completed in August 2015. ADF&G and the Federal Subsistence Board recently denied requests by the petitioners and several other organizations to suspend the fall 2015 hunting and trapping seasons in Game Management Unit (GMU) 2. These groups subsequently submitted a request to emergency list the Alexander Archipelago wolf in Game Management GMU 2. A decision on the emergency petition is pending. ADF&G and the U.S. Forest Service are moving forward with a combined GMU 2 harvest quota of 9 wolves during state and

federal hunting and trapping seasons.

Bear Community Ecology Research

Yasaman Shakeri and **Laurie Forrest**, two M.S. students working with **Dr. Taal Levi** in the Department of Fisheries and Wildlife at Oregon State University, completed a second year of field work studying the community ecology of bears in the upper Chilkat Valley, nears Haines in southeast Alaska. Yasaman is quantifying seed abundance in black and brown bear scats and exploring the fate of these seeds. Small mammals forage for seeds in bear scats and may act as secondary seed dispersers by caching seeds. Yasaman is quantifying the visitation rate of small mammals to bear scats, and testing the hypothesis that small mammal populations benefit from bears using a scat addition experiment on four small mammal trapping grids. Laurie is monitoring fruiting plants to determine the proportion of fruit consumed by mammalian and avian seed dispersers and seed predators. She has focused on monitoring Devil's Club fruit and has found, surprisingly, that red squirrels are by far the most important seed predator, removing entire infructescences and carefully extracting seeds from each fruit. In contrast, avian seed predation by crossbills is quite rare. Bears consumed far more fruit than birds in 2014, when southeast Alaska experienced a rainy summer, but not during the sunny summer of 2015.

Dispatch from the Southern Ocean

Jamie Womble recently returned from Australia where she was an Endeavour Post-Doctoral Research Fellow working with **Dr. Mary-Anne Lea** at the Institute for Marine & Antarctic Studies (IMAS) at the University of Tasmania (http://www.imas.utas.edu.au/) in Hobart, Tasmania. IMAS pursues interdisciplinary research to advance the understanding of temperate marine, Southern Ocean, and Antarctic environments. Jamie's research with Dr. Lea focused on a synthesis of the influence of marine prey pulses on the behavioral ecology of sea lions and fur seals at a global scale. While in Tasmania, Jamie participated in several research projects with graduate students and faculty

(Left to right) Dr. Mary-Anne Lea (IMAS-UTAS), Natalie Bool (PhD Student IMAS-UTAS), Reny Tyson (Endeavour Fellow-Duke University), and Jamie Womble (Endeavour Fellow) exploring the Tasman Peninsula in southeastern Tasmania (Photo: Phil Trathan-British Antarctic Survey)

from IMAS that were focused on Little Blue penguins, Short-tailed Shearwaters, Australian fur seals, and New Zealand fur seals in the Tasman Sea and Southern Ocean.

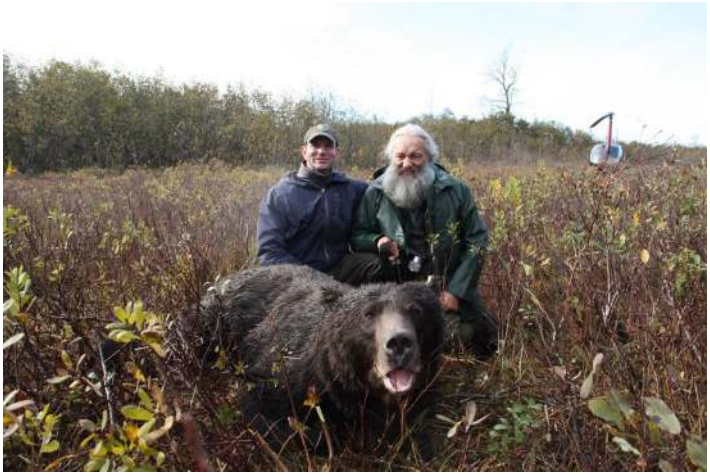
The Endeavour Research Fellowships are internationally competitive and are provided by the Australian Government to support scientists to undertake research and professional development programs in Australia and to build international and professional links and institutional collaborations between Australia and the world. Jamie and Dr. Lea are continuing to work together to develop collaborative research projects and to create exchange opportunities for undergraduate and graduate students from Australia and the United States.

Yakutat Brown Bear Research

Since 2009, ADF&G biologists **Anthony Crupi**, **Rod Flynn**, and **LaVern Beier** have been studying brown bears in southeast Alaska along the Yakutat Forelands in GMU 5A. The objectives of the study are to determine seasonal spatial relationships of brown bears, including resource selection, home range size, den site selection, and movement patterns,

and to investigate population density, abundance, productivity, survival, and mortality. To achieve these objectives they have captured and GPS radiocollared (GPS) 36 female and 34 male brown bears throughout the Yakutat Forelands study area, and 7 female and 15 male brown bears at the Yakutat landfill.

In 2013, the research team examined brown bear population abundance and density across 1,700 km^2 of the Yakutat Forelands. They systematically collected 850 hair samples using single-catch hair snares, scent baited barbed wire corrals, and rub trees. DNA was extracted from 440 samples and 152 individuals were identified, with 1¬ 11 detections per individual. With the expertise of biometrician **Jason Waite**, they are currently estimating density and abundance using spatially-explicit capture recapture models that account for trap type, sex, behavioral changes, and site-specific capture probability. During the final phase of field work in 2015, the crew recovered released collars and recaptured bears to remove collars which failed to release. They also investigated den site selection, visiting more than 50 of 100 identified den sites. One third of the den sites were found at low elevations (< 75 m) across the forelands and on small islands in Yakutat Bay. The majority of these low elevation dens were found under root structures of live, dead, and logged trees. The mean elevation of the remaining den sites was 525 m, and the majority of high elevation dens were excavated in the ground on south to west facing aspects with 35% slope. With the completion of field work the team now has the necessary biological information to sustainably manage the brown bear population along the northern mainland coast of southeast Alaska.



ADF&G staff, Anthony Crupi and LaVern Beier, recapture an 11-year old female brown bear on the Yakutat Forelands to remove a GPS radiocollar

Join or renew memberships

New memberships and renewals are available on-line at The Wildlife Society (www.wildlife.org/alaska/). Click on membership to obtain membership forms.

Look for us on Facebook!

You can now "like" us on Facebook. On our new Facebook page, we are posting information on scientific publications relevant to Alaska's wildlife, announcements of upcoming meetings, and job openings. If you have ideas on how we can most effectively use our Facebook page, contact the Executive Board through the Chapter email: twsalaska@gmail.com

Habitat Guidelines for Boreal Forest Management

By Tom Paragi, Julie Hagelin and Scott Brainerd - ADF&G Division of Wildlife Conservation, Fairbanks

Proposals in recent years for increased logging of wood biomass for heat and power production in interior Alaska have prompted the Alaska Department of Fish and Game (ADF&G) to summarize key knowledge of forest-wildlife interactions and recommend habitat guidelines for maintaining wildlife abundance and diversity in managed boreal forest. Last year, we began a literature review and description of data on forest composition and structure germane to logging in boreal forests. Our goal is to collaborate with forestry professionals to design long-term monitoring protocols for timber sales in Alaska boreal forest that will inform adaptive management of both wood and wildlife objectives. The protocols would also evaluate the efficacy of proposed forestry and wildlife guidelines.

The first year has focused on ways in which wildlife influence forest regeneration. Tom and Julie have served on a Science and Technical Committee to review reforestation standards on state, municipal, and private lands in southcentral and interior Alaska. This committee was convened by the Alaska Departments of Natural Resources (DNR) and ADF&G under the auspices of the Alaska Board of Forestry.

Tree regeneration is affected by design of timber harvest practices (e.g., size, shape, and timing of cuts) and post-logging site treatments (e.g., scarification to prepare seed beds or planting sites). Such activities can influence wildlife habitat and associated ecosystem services that wildlife provide. Forest-wildlife interactions can therefore impact regeneration objectives that the DNR Division of Forestry seeks to optimize. For example, predators can help reduce herbivore damage to seedlings, whereas small mammals disperse key mycorrhizal spores. Wildlife interactions are just one of several topics covered by the Committee. All findings will be transmitted later this fall to the Board of Forestry. If endorsed by the Board, information will next be reviewed by an Implementation Committee composed of managers, industry, and various public interests. A draft bibliography, technical presentations, and associated meeting minutes can be found at: Reforestation Standards Review - Regions II and III (http://forestry.alaska.gov/forestpractices#reforestation).

The overriding intent for the committee work was to identify the benefits of maintaining wildlife diversity in boreal forests. We believe the benefits fall into two broad categories. First, as a general principle, diverse species linkages within ecosystems provide greater resilience against natural or anthropogenic change when compared to more simplified systems which are prone to instability. Second, specific wildlife interactions can be managed to provide desired ecosystem services within boreal forests. Preliminary findings indicate reforestation practices can influence habitat to enhance wildlife outcomes that positively affect both tree regeneration and wildlife diversity in important ways. For example, timber sales could be designed to retain habitat features beneficial to key predators of snowshoe hares (e.g., raptors and furbearers), the principle herbivore of seedling trees. On harvested sites, providing woody debris for small mammals such as red-backed voles and denning trees for flying squirrels would facilitate the obligate fungal dispersing relationship that these species have, which is linked with seedling establishment, nutrient uptake, and tree resilience in the Pacific Northwest and European boreal forests.

With regard to harvest planning, determining the size, location, and timing of timber sales can also help mitigate or reduce risk of herbivory due to wildlife. For example, creating relatively small patches of regenerating seedlings in a matrix of mature forest predisposes the patch to browsing, especially during years of high hare or moose density. Many wildlife professionals collect data that can inform forestry planning decisions (e.g., when to plant seedling trees), given the cyclical nature of some key herbivore populations, such as hares. Managing for reduced vegetative cover near young crop trees may further

reduce vertebrate herbivory risk.

Our effort on the Science and Technical Committee is one aspect of a larger project focusing on forest-wildlife interactions. A second component includes a broader literature review to synthesize existing literature on boreal forest (at landscape and stand scales) to identify wildlife-forest outcomes germane to forest planning and management in interior Alaska. The work will assess, for example, the efficacy of forest harvest practices aimed at emulating natural disturbances such as fire. It may be that retaining "islands" of uncut timber within larger timber sale boundaries can mimic a wildland fire mosaic, particularly if the islands retain late-seral features critical to wildlife diversity (e.g., snags that provide predator denning sites, cover for prey species, etc.). It will be important to evaluate whether such efforts, which can act as testable hypotheses, successfully achieve stated forestry and wildlife objectives.

Finally, in a separate process, the project aims to identify existing habitat gradients within the Tanana Valley using recent spatial data (e.g., timber inventory, logging sites, wildland fires, and vegetation diversity). Linkages between forest attributes and wildlife presence or abundance can form the basis for guidelines that are further testable as hypotheses in adaptive management.

Recent drops in oil prices on the world market have reduced the potential for wood energy projects compared to a few years ago. Harvest presently involves relatively small scale timber sales in or near the Tanana Valley State Forest, and the Alaska Division of Forestry estimates that harvests are <10% of the annual allowable cut. Substantial portions of the current harvest include timber salvage after wildland fires, windstorms, or insect-caused mortality events. Although demand for large-scale biofuel operations is currently low, boreal forests in Alaska still provide wood for heating, residential construction, and subsistence food resources derived from wildlife, fish and plants.

Our project goal is to provide pragmatic habitat guidelines for future timber harvest. There is significant opportunity now for forestry and wildlife professionals to focus efforts and learn how trees and wildlife can be optimized within managed forests. Reliable information on forest-wildlife interactions can help us enhance future forest

Upcoming Meetings

8th Annual Mat-Su Salmon Science & Conservation Symposium – Palmer, Alaska
November 18-19, 2015
http://www.matsusalmon.org/what-we-do/science-symposium/2015-symposium/

Co-Management Symposium – UAF, Fairbanks
November 18-19, 2015
http://tribalmgmt.uaf.edu/co-mgmt

Northwest Fish Culture Concept 66th Annual Meeting – Wilsonville, Oregon
December 1-3, 2015
http://www.pnamp.org/event/5219

21st Biennial Conference on the Biology of Marine Mammals – San Francisco, CA
December 13-18, 2015
https://www.marinemammalscience.org/conference/

7th North American Duck Symposium and Workshop – Annapolis, Maryland
February 1-5, 2016
http://www.northamericanducksymposium.org/

Pacific Seabird Group's 43rd Annual Meeting – Oahu, Hawaii
February 10-13, 2016
http://www.pacificseabirdgroup.org/index.php?f=meeting&t=Annual%20Meeting&s

Nesting Bears - Bear Dens on Prince of Wales Island

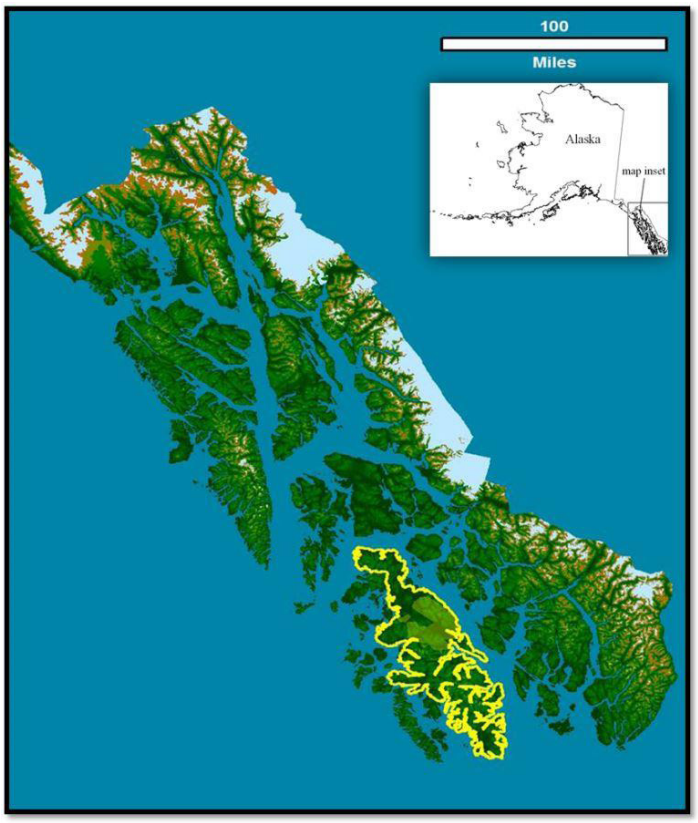
By Riley Woodford, ADF&G

Say "bear den" and for many, the cartoonish image of a cave comes to mind, the entrance littered with bones. Boyd Porter and his colleagues spent the past four years studying black bear dens on Prince of Wales Island in southern Southeast Alaska, and for him the word that comes to mind is "nest."

"They're nesters, although people wouldn't necessarily put them on a list of nesting animals in Alaska," said Porter, a state wildlife biologist based in Ketchikan. "They bring in nesting materials as a buffer between them and the cold ground." Evergreen boughs (hemlock and cedar) are the preferred material, although salmonberry stalks and other vegetation are also used. Porter described bears gathering mouthfuls of material and making multiple trips to the den to prepare for hibernation. These winter bedrooms are not year-round homes for bears, but they are used year after year and are an important resource.

"It looks like they add to the nesting material each year, and some of the structures have been around a long time and could be pretty ancient, there is obvious historic use of many dens," Porter said. Porter and his crew handled 65 black bears and documented 52 bear dens. All the dens were associated with trees and "woody material," hollow tree trunks, root wads and cavities. Prince of Wales is famous for its limestone caves, but none of the 65 bears Porter tracked hibernated in natural caves.

A bear den at the base of a tree.



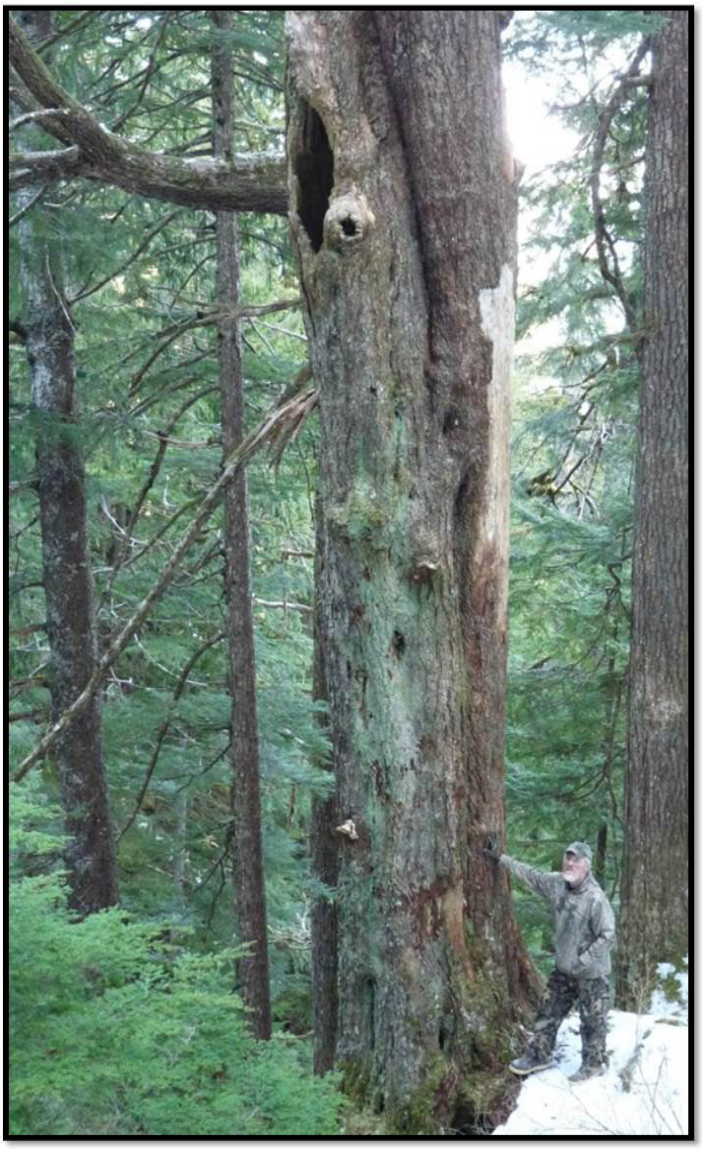
Prince of Wales Island (yellow boundary) in southeast Alaska.

"There was also very little use of excavated dens," he said. "That's different than the majority of dens in the Interior and in South-central Alaska, where the majority of dens (for both black and brown bears) are excavated and carved into side hills."

Although the Prince of Wales bears were not digging dens, there was evidence that bears modified the entrance of tree dens to make it easier to move in and out. "It looked like there were multiple years of use at many sites," he said. "Like for example, a 400 or 500-year-old cedar tree, which could've been used for a bear den for 200 or 300 years."

Some of the most remarkable "nests" were up high in trees. Some of these "elevated dens" had nesting material that represented multiple trips by the bear, probably climbing the tree with mouthfuls of vegetation to make the winter bed.

Nesting Bears - Continued



An elevated bear den.

Bears were initially captured in summer using foot snares and equipped with radio tracking collars that enabled the researchers to find them at all times of year including in winter. In one case, Porter had a strong signal coming from inside a nearby tree, with no obvious way into the tree. The trunk where the signal was coming from was 40 inches in diameter and very clean on the outside. It became apparent the tree was hollow and the hidden entrance was at the very top where the last 20 feet of the tree had sheared off, maybe during a winter storm. "The bear had climbed up the tree and then down into the deep cavity and was resting peacefully just above our heads," Porter said.

But how would a bear ever find such a den?
"Bears are good at finding those sorts of things," Porter said. "It makes you wonder if during their daily routines and summer explorations they make a mental note of potential sites and come back later. They probably identify multiple sites, as we had some bears that moved from one den to another in the same winter." A wet or flooded den is a likely scenario for a bear relocating during mid-winter, but there may also be other factors that influence a mid-winter move.

Another time a strong collar signal indicated a bear was in a jumble of windfall trees, all lying horizontal in a big pile. "We were climbing under these windfall trees, thinking it was in some cavity under the brush pile," Porter said. Standing on the horizontal tree trunk with the collar signal blasting, they realized the bear was directly beneath them, inside the hollow tree under their feet. "He was 20 feet straight in the tree and it was very tight quarters inside. We didn't (re) capture that particular bear because of safety concerns for the bear and for the researchers. It was just too tight to wiggle inside and even if we were able to tranquilize the bear there was no way to handle her or remove her collar."

Because this portion of the study focused on den site descriptions, researchers did not spend a lot time "processing" bears, as is often done in bear research, where samples of blood, hair, and tissue are taken, a small premolar tooth is pulled to determine the bear's age, and where bears are often tagged and marked. This work had already been accomplished during the summer capture. Researchers conducted a quick health assessment of the animal, noted if any cubs had been born and counted them, and swapped out the bear's radio collar for one with fresh batteries. The GPS collar also had valuable location data stored onboard the small computer - a location point recorded every six hours, documenting where the bear had been.

Nesting Bears - Continued

At the 52 dens located during 2010-2013, the following details were measured and recorded: entrance and cavity size, elevation, slope and aspect, distance above or below ground level, nest material type, tree diameter at breast height, tree species, surrounding timber stand type, and den structure (e.g., standing, downed, dead, logged, roots). Trail cameras were also placed at den sites to document when the bears emerged in the spring, and how many cubs might be present.

One interesting detail is that males denned at higher elevation than females: the average den elevation was 313 m for males and 193 m for females. Bears also preferred den sites in timbered habitat on steeper slopes.

Crawling into a bear den mid-winter to examine a hibernating bear required precautions to insure the safety of the researchers and the bears. Bears were sedated using a CO_2 powered dart gun, or a "jab stick" style hypodermic needle, which delivered the sedative. "We soon realized, after seeing how tight these cavities were, we didn't want to pull bears out of the den," Porter aid. "We did most of the work in the den so we didn't have to push and jam them back in – like pushing a 200-pound sack of beans back into a small cupboard. We were concerned for the bears' safety, and our safety, we talked about a lot of different scenarios with the drugs and bears in the planning process, and took a lot of latitude so that everyone was safe. We also had an animal care plan that insured the bears were treated well and both adults and cubs were safe."

Part of the issue is that black bears are not true hibernators, like marmots or ground squirrels, which reduce their body temperature to near freezing and their heartrate and respiration to just a few beats and breaths per minute. Bears are in torpor - they are metabolically processing stored fat, although they don't urinate or defecate. Instead they reabsorb the urine and feces in the form of proteins. This is an amazing evolutionary process that allows bears to live on stored fat reserves and maintain themselves, even give birth to young, during a time when most bear food is not available. They don't hibernate because it is cold outside but rather because there is no food available during winter months. They reduce their body temperature by 7 or 8 degrees and heartrate is reduced somewhat, but they can wake up fast. They still burn about 4,000 calories per day while in hibernation, which is why they need to put on so much fat during summer and fall. Bears lose 25-40 percent of their body weight during hibernation burning fat for fuel.

Some days as the researchers approached a den, the tracking signal indicated the bear was up, awake and aware of their presence from a long distance away. "Most bears met us with eyes wide open and fully alert at the den entrance," said Porter. Other times they left the den and moved away before the researchers arrived.

A black bear in a den.

"We tried to go in as stealthy as we could, but on some of the cold, crunchy, icy days the noise of our approach was just too much for them," he said. "That might be a strategy they use for predators such as wolves, not sitting tight in a den if a pack of wolves is moving in. The majority of the dens were not fortified or protected, and several had multiple entrances — not good if you were going to be dealing with a pack of wolves that could kill you and or your small cubs."

Nesting Bears - Continued

That could make the elevated dens, or standing hollow tree dens, pretty appealing to a black bear. Porter said a bear could be very safe and more relaxed in a really good elevated den.

So if bears spend the summer identifying potential den sites, who gets the best ones?
"Who knows, maybe it's first come first served for available den sites. If a pregnant sow or a sow with last year's cubs comes to a den and somebody is already there, does she go to the second choice – right on down the list of identified dens that she knows of, or maybe the one she was born in with her mother? A longer-term study would tell you, but this project was concluded after four years."

In nearby British Columbia during a similar black bear study, radio-collared bears reused dens in seven out of 25 potential occasions. During this long-term study in coastal British Columbia they found 71 percent of the identified dens were reused at least once over a ten year period.

As a wildlife biologist managing a population of black bears, Porter said the take home lesson is that dens are a valuable resource that should be protected if possible. That's especially important in areas that are logged. Not only are dens removed (the trees that create dens) in the logging process, but other old trees that could potentially become den sites over time are also removed.

He paraphrased a statement from a research project in British Columbia, where bears were using root wads and other woody structure as dens, year after year. "If you're interested in managing black bears responsibly, you should be making special allocation for woody structures and insure there are plenty of potential sites available into the future," he said.

"This could help us in terms of comments on timber sale designs and locations," Porter said. "We went to the Forest Service with 50-some recent den locations, and suggested they provide some sort of individual tree protection, or a small buffer around these known bear den sites. We discussed den sites with the Forest Service several times and were encouraged by some positive comments from Forest Service staff initially. However, in the end they did not incorporate our den site protection suggestions for some upcoming large timber sales in the same area. There's nothing in the Forest Plan that says they have to make any allocations for black bear dens."

Porter and his colleagues are still working with the data they gathered and plan to compare their findings to other work done across North America. Collars provided telemetry information that can be used to create maps of the bears' movements over the course of the year. Researchers will be looking at average times bears entered dens in fall and den emergence times in spring, habitat selection (and whether that changes over time), food resource preferences at different times of the year, and the bears' activities and movement patterns.

Dave Gregovich, a research analyst working with Porter, said he's lucky to have such a wealth of data to work with. He participated in initial radio-collaring efforts and he visited dens with Porter and others in winter, and was struck by the cleanliness of the dens. He speculated that may simply be healthier for the inhabitant. A messy den could breed parasites, but a bear nesting in a pile of fresh cedar boughs could be in pretty good shape for the long dry and warm winter. "The dens that I went to didn't smell at all, they're as clean as a whistle," he said. "For a bear being in a small space all winter, it was cleaner than my apartment."

For more on Prince of Wales black bears and bear research, see "Bear research on Prince of Wales Island from AFWN, 2012. http://www.adfg.alaska.gov/index.cfm?adfg=wildlifenews.view_article&articles_id=568

A series of trail camera images of a black bear investigating a bucket snare (and evading capture) can be found at http://www.adfg.alaska.gov/index.cfm?adfg=viewing.trailcams&gallery=13

State and Federal Agencies Collaborate on New Marine Mammal Disentanglement Technique

By Julie Speegle, Lauri Jemison, and Riley Woodford

Steller sea lions are curious by nature. They will play with trash they encounter in the ocean, and a sea lion swimming through marine debris can become entangled. Loops of synthetic material are especially hazardous to marine animals.

Imagine a young sea lion playing with a plastic packing band floating in the ocean. The band slips over the animal's head and lodges around its neck. Initially there isn't a problem, but plastics are durable and outlive sea lions, so as the animal grows, the band becomes tighter around its neck, eventually cutting into its flesh. Lacerations, respiratory distress, and infection can follow, and eventually the animal may strangle or starve to death. The Alaska Department of Fish and Game's (ADF&G) Steller Sea Lion Research Program documented more than 300 sea lions with neck entanglements in Southeast Alaska during the past 15 years.

A team of scientists from ADF&G and NOAA Fisheries recently sighted an adult male sea lion with a packing band around its neck at the Inian Islands, a sea lion haulout in Icy Strait southwest of Glacier Bay National Park in Southeast Alaska. "In the past, there was nothing we could do to alleviate the suffering of such a large animal," said veterinarian Kate Savage, of NOAA Fisheries Alaska Region Protected Resources. "Drugs used to immobilize terrestrial mammals are dangerous when applied to marine mammals. If the animal enters the water, they are at risk of drowning."

"We've documented hundreds of sea lions that have plastic material partially or completely embedded in their neck," said Lauri Jemison, a wildlife biologist with ADF&G. "We've tracked some of these animals over multiple years, and have watched the injuries get worse over time. The animals are clearly suffering from these deep, open wounds."

In 2010, after a team of scientists successfully used a new drug combination to chemically immobilize

Lauri Jemison and Kim Raum-Suryan discuss feasibility of disentangling a sub-adult male SSL. This animal was successfully darted and disentangled two days later. Photographer John Skinner

adult female Steller sea lions, Jemison and biologist Kim Raum-Suryan decided it would be worth developing the skills to attempt disentanglements of sea lions in Alaska. The logical and efficient approach was to piggy-back this work along with ADF&G's annual Steller sea lion research trip in Southeast Alaska, where the scientists already had extensive experience working with sea lions. The first step, however, was to obtain necessary permits. Michael Rehberg, ADF&G's Steller Sea Lion Research Program leader, worked with NOAA's Marine Mammal Health and Stranding Response Program to pave the way

Disentanglement - Continued

for this work. Thanks to these efforts, and the financial support of World Animal Protection for 2015 disentanglement field work, state and federal scientists are now using a new drug combination for helping animals such as the 1,400 pound, 7-year old male sea lion found at the Inian Islands. The new drug combination, pioneered by veterinarian Martin Haulena and others, allows the animal to maintain its breathing, even when the animal enters the water. This is the third year biologists from ADF&G and NOAA Fisheries Alaska Region collaborated to put the new technique to work disentangling Steller sea lions in Southeast Alaska.

"We can dart the animal with the newly devised cocktail, which includes a sedative as well as components to alleviate pain and stress, that subdues the animal quite quickly," said Savage. "Once we have disentangled the animal, we can also reverse the effects so the animal is up and about very quickly."

The Rescue Operation

July 7 was a lucky day for an entangled Steller sea lion. There were low clouds, gusty winds, and a steady blowing rain. The six team members were divided into pairs, two each in the skiffs, and two on shore. They spotted their target high on a beach, tucked against a rock with about a dozen other sea lions nearby. ADF&G's Greg Snedgen and NOAA's Kate Savage were dropped off on the north side of the beach where there were no animals, and skirted the back edge of the beach until they were in the woods behind the target animal. From there they were able to crawl around the boulders to within three yards of the entangled animal.

After carefully filling the dart with drugs and placing it in a Dan-Inject dart gun, Savage set the pressure and when the animal was perfectly in sight, slowly squeezed the trigger. The dart struck the sea lion in the right flank, a perfect shot. The animal alerted, looked around, moved a short distance down the beach, and then lay down again. Once he stopped, he rested his head against a rock and fell

Greg Snedgen and Kate Savage slowly crawl toward the target animal, a sub-adult male Steller sea lion that has a packing band around its neck. Photographer Kim Raum-Suryan.

asleep. The capture team waited about 15 minutes before approaching the animal. While Savage began monitoring vital rates, Snedgen quickly cut free a thin plastic packing band that was embedded about two inches into the animal's neck. Thickened scar tissue on each side of the plastic strap indicated it had been in place for quite some time. The sea lion was given a dose of antibiotic to help him heal from the infection.

The biologists took hair and skin samples, measurements, and glued a satellite tag to the animal's upper back to track his movements. They also applied a small white plastic tag to each fore-flipper for long-term identification, and used hair dye to mark the number "761" on each side of the animal's body to provide easy visual identification from a distance. The

Veterinarian Kate Savage (NMFS) monitors the sedated Steller sea lion while the ADF&G crew applies tags and collects samples after removing a packing band from around the animals neck. Photographer John Skinner

Disentanglement - Continued

hair dye and the satellite tag will only last until the animal molts in the fall.

After Savage administered the reversal dose, it took about two minutes for the animal to begin moving his head. Soon he was up and swaying back and forth, then sluggishly moved towards the water, lying down and resting several times as he continued to the water's edge. Within 10 minutes after waking, the animal entered the water. After one shallow dive, he appeared fully awake and alert, and swam away along the coast.

The state and federal team has used the same method to successfully remove fishing flashers (lures) from the throat and mouths of three other Steller sea lions as well as removing another packing band from a fifth animal.

"Other marine mammal groups across the country are now interested in using this remote sedation technique to disentangle seals and sea lions," Rehberg said. "We are providing those groups with expertise and insights from our experiences." In addition to disentangling sea lions as opportunity allows, the ADF&G team is gaining important experience in handling chemically-immobilized sub-adult and adult sea lions; a technique that had been put on hold for about 15 years until the safe drug cocktail was developed.

The capture crew watches SSL #761 leave the beach after removing a packing band from his neck, applying tags, and collecting biological samples. Photographer John Skinner

Preventing Entanglements - Lose the Loop!

Although marine mammal biologists are pleased with the new process, the best way to reduce marine mammal entanglements is to "Lose the Loop!" "We can all be a part of the solution by being responsible with our trash," said Raum-Suryan. "The simple act of cutting any loop of synthetic material before discarding it in the trash could prevent neck entanglements if that trash ends up in the ocean." Use of biodegradable products or those with less packaging can also reduce entangling marine debris.

As for #762, biologists resighted the animal at the Graves Rock rookery (about 12 miles west of the Inian Islands) during both morning and afternoon surveys on July 9 and 10; he appeared to be doing well.

More than 200 marine species have been documented eating or becoming tangled in marine debris, including 26 species of marine mammals - and entanglement is a leading cause of death. ADF&G's Steller Sea Lion Research Program began systematically documenting entanglements in 2000. Plastic packing bands or straps account for about half of all Steller sea lion entanglements in Southeast Alaska. Large rubber bands cause about a third of the entanglements and the rest are caught in nets, ropes, and monofilament lines.

Packing bands are commonly used to secure boxes of fishing bait. All too often they wind up in the ocean. To address the problem some commercial fishermen are going bandless, switching to bait that doesn't come packaged in boxes with loops or bands. Others simply cut all loops. Cutting loops and disposing of them responsibly keeps potentially lethal marine debris out of the ocean.

NOAA Fisheries Alaska Region and the Alaska Department of Fish and Game are partners in the Lose the Loop initiative, along with other members of the Pinniped Entanglement Group. For more information on how you can help, visit: www.entangledsealions.adfg.alaska.gov For more on World Animal Protection, see: http://www.worldanimalprotection.

Grizzly Bear Denning in the North Slope Oilfield Region

By Dick Shidel

In the early 1990s when Alaska Department of Fish and Game (ADF&G) Wildlife Biologist Dick Shideler began research on grizzly bears living in the North Slope oilfield region, he wondered where the bears denned. Looking around at the relatively flat terrain, with a scattering of features rising only a few meters above mostly wet Arctic tundra, it was easy to believe the "conventional wisdom" that grizzly bears only inhabited this area in the summer and moved back to the foothills and mountains of the Brooks Range to den. Some knowledgeable biologists even speculated that lack of suitable denning habitat limited the number of bears that could live out on the coast. For someone whose concept of denning habitat was framed by grizzly bears denning in alpine areas like the Rocky Mountains or Alaska Range, or bears "nesting" in the big tree country of Southeast Alaska, Shideler considered the pickings for den sites on the Beaufort Sea coastal plain pretty slim.

But now, some 20-plus years later, after inspecting more than 300 dens of 78 radio-collared bears, he has a strong appreciation for the adaptability of grizzly bears to all sorts of habitats. Along the way he has acquired some insights into the features they pick for denning. These insights are important because grizzly bears in his study area share the region with the largest oil and gas development area in North America. Most off-road activities, such as ice road and drill pad construction and seismic exploration, take place in winter, when snow cover and frozen ground limit the damage that heavy equipment can do to the tundra. To avoid disrupting grizzly and polar bear denning, land management agencies prohibit industrial work around active dens. Understanding the denning behavior of bears, including where and when they den, is important in fine-tuning this mitigation.

Dates of denning and emergence vary from year to year depending on weather. Pregnant females den up earlier than males, and that's true of bears in general. Shideler said September 21 is the earliest he's seen for a pregnant female. By mid-October all the females are

ADF&G biologist Torsten Bentzen inspecting a den in a sand dune near Prudhoe Bay. Photo by Dick Shideler

in dens where they may remain up to eight months. About 80 percent of the males have denned up by November 1st. "Males spend less time in the den, and they come out earlier," he said. "Females also tend to hang around the den longer once they pop out. They stay around for a few weeks with the cubs, using the den as a refuge. They may still be around the den by the first of June."

The Arctic Landscape

To fully appreciate how grizzly bears have adapted their denning to this ecosystem, it's important to understand a bit about the processes that govern it and how they influence denning habitat. Foremost is permafrost, the permanently frozen ground that dominates the landscape and extends from hundreds of meters deep to within a meter of the surface in most of the area. As long as its thick insulating cover of short tundra vegetation remains undisturbed, permafrost forms an impermeable barrier that traps rain and melting snow at the surface, creating the extensive wetland landscape. Underneath this inhospitable landscape, however, are more forgiving soils. Because this coastal region was not glaciated, much of the surface soils are mixtures of sand and silt deposited by ancient oceans and large rivers that carried fine sediment from the melting glaciers of

North Slope Grizzly Dens - Continued

the Brooks Range. Large areas of underlying sand dunes were created by ancient winds that blew the sediments around, especially near the deltas of the large rivers.

Multiple dens in a pingo south of Prudhoe Bay. Photo by Dick Shideler

Looking down on the landscape from the air, it would appear that the "conventional wisdom" was right. More than 80 percent of the area is flooded or moist tundra unsuitable for denning. But from the perspective of a bear, the terrain has lots of small-scale elevated areas where the permafrost has melted enough to allow the soil to dry several meters deep. Bears can easily excavate their dens in these sandy soils. Stream and river banks, sand dunes, and certain terrain breaks on low rolling hills all provide den habitat, along with such features as drained lakes and pingos that are unique to permafrost environments.

Drained lakes are pretty much what they sound like: the permafrost in the bank surrounding the lake suddenly melts and, like pulling the plug in a bathtub, the basin drains. This leaves a partially thawed bank a few meters high that eventually dries out allowing bears to dig into it. These areas of potential denning habitat are actually quite plentiful but are scattered around the country sometimes in very small but still useable bits.

"They are using places we never would have expected, which makes it exceptionally hard to map denning habitat," he said. "We're looking at some features that are the size of my office."

The pingo, another permafrost-generated landform, is especially interesting. This ice-cored, conical-shaped mound rises from a few to tens of meters above surrounding wetlands. Although eye-catching, pingos are not plentiful but bears, foxes, Arctic ground squirrels, and wolves all den in them and ancient and modern hunters used them as vantage points for spotting game. Botanists and biologists recognize the importance of pingos. "They sometimes have different vegetation characteristics than the surroundings," Shideler said. "Archeologists want to preserve them, they have evidence of human use going back hundreds and even thousands of years. We want to save them for denning."

Shideler said that suitable locations get repeated use, and when they began the study they found a number of den sites in pingos and in terraces. "There are clusters," he said. "But the dens erode and they're not really available for the bears to use again. They collapse, basically the spot caves in and you are left with the outline of the den."

North Slope Grizzly Dens - Continued

Shideler described most dens as, "The classic picture of a bear den, a short tunnel and a larger nest chamber. The entrances are actually pretty small, you'd think some of the bigger bears would have a hard time getting in. Although there was one in a sandy terrace up from a stream bank that was big enough we could sit up in it. They do substantial digging, I think it's easy digging for them." He knows of one animal that excavated a den in a matter of hours. "I followed one bear in the oil field; he left one night and when I caught up with him the next day he'd already dug his den and was bedded down."

Location, location, location

The next question that Shideler and his colleagues addressed was, why do bears prefer certain places as den sites—for example, why did bears select one short stretch of stream bank or spot on a drained lake bank over another? To get at that answer means considering two processes that strongly affect the Arctic coastal plain: snow and wind. Interestingly enough, this area would be defined as a desert if total precipitation was the measure. Most precipitation falls as snow, but the average annual snowfall is less than half a meter. If this thin snow cover blanketed the ground smoothly, it would not provide much insulation from the severe winter temperatures, but fortunately strong winter winds move the snow around and deposit it in deep drifts that provide good insulation for a denning bear. These drifted areas correspond to the places where bears dig their dens. Drifts that form in early winter are especially important because they seal the open entrance to the den with a plug of snow that keeps the den temperatures well above those on the surface. As these drifts accumulate over winter they provide even more insulation, reducing the loss of stored fat the bears underneath are using to maintain their body temperature. By mid-winter, some dens are covered by several meters of dense insulating snow. By late winter, some den sites on small streams appear as flat ground because the entire drainage is filled with drifted snow. Someone driving a snowmobile or heavy equipment over that location would be hard pressed to know that there was a den below, or indeed that it was even a stream. But not all areas drift at the right time and place. Shideler has found that a significant proportion of bears select places where the slope faces in roughly a south-southwest direction — downwind from the prevailing north-northeast winds — where you would expect the largest drifts to form. Furthermore, much of the winter snowpack develops in fall and early winter, so locations where drifts collect early in the season due to the topography provide longer and better protection. In locations a bit farther inland, low-growing shrubs help catch and hold wind-driven snow, adding to the accumulation in the drift.

Shideler says researchers can't say with any scientific certainty whether bears purposefully select these locations or if they just randomly dig wherever they happen to be when the mood to hibernate strikes them. "They'll dig test dens, scratch around and try different places," he said. "They do a lot of digging in the fall anyway because they're eating ground squirrels and roots." However, pingos provide a pretty good and very suggestive example that bears are selecting locations where drifts will form. On pingos, bears can pick slopes facing all 360° directions. Yet bears denning in pingos select the slope facing generally south-southwest, similar to the dens in other terrain features.

Aspect

the term scientists use for the direction the slope faces—appears to be an important determinant in where bears pick their den sites, and there may be other factors as well. For example, over 60 percent of the dens were located in or adjacent to Arctic ground squirrel colony burrows. While it is tempting to speculate that bears like a mid-winter snack, Shideler has found no evidence that the bears eat the squirrels while denning. Their proximity may simply be a correlation between the denning needs of bears and the burrow needs of ground squirrels. It's also possible that bears recognize that the location has the kind of well-drained soil they need by the unique vegetation that surrounds a ground squirrel's burrow.

North Slope Grizzly Dens - Continued

A den in a stream bank. Notice the site is covered by grass, which is typical of a den excavated in a long-time Arctic ground squirrel burrow system

Individual experience also appears to affect site selection. Several bears—mostly relatives—have denned for many years in pingos. For example, two sisters have denned for more than 10 years exclusively in pingos. They change pingos every year, occasionally returning to a previously used one. Most of their offspring have also used pingos. Other bears seem to prefer dunes, and still others seem to have no preference all. This variability is an interesting feature of den site selection but certainly makes predicting where the bears will den very difficult.

While site preferences vary, most bears do make a bed in the den. "About three-quarters bring in bedding material, and that's an interesting thing in itself," Shideler said. "There is a short, low growing heather, Cassiope, bell heather, and they'll go out of their way to drag that in, even when there's grass that's closer. I don't know why they do this, there's something about it that's very comfortable. I've looked at homeopathic textbooks, older textbooks about Natives using different plants, and I can't find anything about it."

"In other places, like dunes where that (heather) doesn't grow, they'll bring in grass, wild rye. Sometimes they'll bring in willows, chew them up and put grass on top of that. One adult, we had to laugh about it, he brought in a bunch of willow sticks about an inch in diameter, and I thought that had to be less comfortable than just lying on bare ground."

Mapping dens

While identified dens have been mapped and prime locations like pingos are known, ideally biologists would be able to identify and map good denning habitat. The project will wrap up this year, Shideler has about 30 bears radiocollared now and he expects to collect those collars this summer.

The goal now is to develop a method of predictably identifying denning habitat so that industry will be able to avoid such areas, even without the aid of radio collars. Every year at least a handful of dens have been located within seismic projects or near ice roads or pads. This winter, of the 25 known den locations, seven were located within proposed seismic programs.

To date, the dens have been located by research staff radio-tracking in the early winter and apprizing industry of the dens within their area of interest. One of the recent objectives of Shideler and his colleagues has been to develop a map of likely denning habitat in the oilfield region so that industry can then focus den detection techniques such as Forward Looking infrared (FLIR) or trained Wildlife Service Dogs (visit http://www.adfg.alaska.gov/index.cfm?adfg=wildliferesearch.polarden for an example) to locate dens near proposed winter projects. In the oilfield region, this objective has been frustrated by the lack of fine-scale digital mapping that captures the terrain features where bears den. However, new and more advanced mapping techniques should improve industry's ability to detect where bears are denning and thus leave them to hibernate undisturbed.

Enhancing Habitat for Moose and Grouse

By Riley Woodford, ADF&G

Smashing trees and burning forests may not seem like habitat enhancement. But nature rebounds in the aftermath of what might look like carnage, and that's often good for wildlife.

Wildland fires are a natural part of the Interior Alaska ecosystem, and plants and animals have adapted to periodic wildfires. Willow, aspen, and birch are nutritious, high-quality forage for moose. They can regenerate and thrive after certain kinds of physical trauma, such as fire or crushing. Lush sprouts emerge from the ground level – gardeners call them root suckers – and quickly grow. Importantly, this new growth is accessible to moose. Plants like fireweed also thrive after fire – and provide good moose food.

Regenerating growth isn't the only benefit of fire. Standing dead trees provide roosts for raptors and homes for cavity nesters such as woodpeckers. Fallen trees provide cover for voles, hares and marten, shelter that's especially valuable in winter.

Wildlife managers and foresters use prescribed fires as a habitat-enhancement tool to stimulate plant growth. But another natural phenomenon in Alaska also stimulates these plants. During spring break-up, massive chunks of ice are rafted down rivers, scouring riverbanks and gravel bars. Mechanical crushing mimics this process.

Sue Rodman explains how the aptly named roller chopper works. "The chopper is a big drum that has teeth on it, it's drug behind the D-9 (tractor). This is done in winter because the cold helps – the bulldozer snaps the trees off at the base, then the roller chopper cuts it up into smaller chunks. So what happens, because of the physiology of aspen, when we cut them all down, their hormone balance changes and they send up root suckers – aspen is all connected underground, like one big organism."

Rodman has a forestry background and works on habitat enhancement and fire-related projects for the Alaska Department of Fish and Game (ADF&G). She's helping coordinate a number of projects to improve

A roller chopper: 140 acres of land near Tok was treated with the roller chopper in the summer of 2015. Fish and Game, the Alaska Division of Forestry, and the Ruffed Grouse Society are working together to use this technique to enhance habitat on as much as 2,000 acres in the Tok area over the next four years

forage quality and quantity, aimed at increasing numbers of moose and ruffed grouse to provide food and hunting opportunities.

Moose and ruffed grouse have similar habitat requirements

Ruffed grouse rely on aspen stands that are a mixture of age classes. The diversity of age classes provides different things to grouse throughout the year. Younger, denser stands of aspen provide excellent cover for broods of chicks in summer, hiding them from predators. Older aged aspens provide breeding and wintering habitat. Like fire, mechanical crushing can create the diversity of habitat that grouse and moose thrive in.

"In winter they're eating primarily buds and catkins," said Cameron Carroll, a state wildlife biologist focusing on grouse and small game. "In the fall they eat berries, forbs and such; then in the spring during the breeding season male ruffed grouse are drumming and they need drumming logs and overhead cover from avian predators. Young grouse rely heavily on arthropods in their first few weeks, grasshoppers, good sources of protein. They need good cover as well as food. Cover is huge for these birds, especially in the summer."

Moose and Grouse Habitat - Continued

Plans are underway for several habitat enhancement projects, and three in particular are noteworthy: A Tok area project benefitting moose and grouse, a project near Sutton in Southcentral to benefit moose, and a project on the Kenai near Sterling to benefit moose – and provide benefits to area residents in this fire-prone region.

Kenai

Areas are chosen based on input from biologists, primarily because of moose population declines or potential declines. The Kenai Peninsula is a good example. Big fires on the Kenai in 1947 and 1969 (on what is now the Kenai National Wildlife Refuge, and Game Management Unit 15A) burned thousands of acres and led to high numbers of moose.

"Then over time, the regenerating forests grew out of reach of moose and there was less for them to eat," Rodman said. "In 1982, the population was estimated at 3,000 moose, and over subsequent years, declined to about 1,500 moose in the 2013 census. The population objective is 3,000 to 3,500, and we're not even close to that."

Fire could be an appropriate and effective tool to enhance the habitat to benefit moose, especially since the northern portion of the Kenai is particularly susceptible to burning. In the spring of 2014, the Funny River Fire burned an area encompassing about 200,000 acres. ADF&G is studying moose in the area, and biologists are looking at the productivity of the moose population in the area. More than 130 moose have been equipped with tracking collars and researchers are learning about their health, birth rates, and survival relative to the habitat conditions.

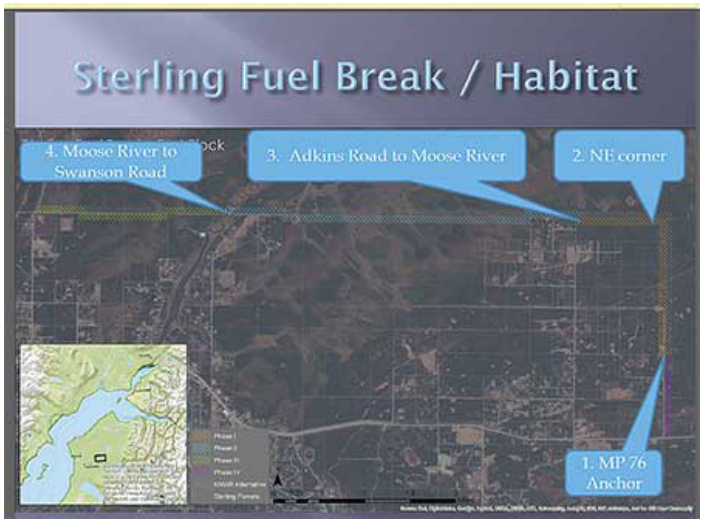
It's important to note that the fire did not burn 200,000 acres – it created a mosaic of burned, unburned, lightly scorched and completely untouched areas. That mosaic is good for wildlife. Another wildland fire encompassing 8,876 acres occurred in the summer of 2015, the Card Street Fire, in an area adjacent to the Funny River Fire burn area near the town of Sterling. While that may benefit moose in the long term, it's a cause for alarm for local residents – no one wants to see homes, life, or property threatened by fire.

Sterling fuel break project - protecting the urban and wild interface

"If we want more moose habitat there, we need to figure out a way to let fire burn when it occurs naturally," said Rodman. "By building a fuel break with the cooperation of other agencies, we could have fire on the landscape in the future. If we build a fuel break around Sterling we could maybe do some prescribed fires in that area in the future."

Plans are underway to build a fuel break along the northern and eastern edge of the community. The break is not intended to stop a fire, but to change fire behavior. Rodman said the construction of a fuel break depends on the forest; fire burns very different in different forest types.

"In some cases you might have a shaded fuel break, where some hardwoods remain and shade the forest floor. That keeps the humidity higher, keeps the moisture content of the material on the forest floor higher, so they don't burn as easily. It helps reduce the effect of wind drying out the forest floor."



Sterling area map showing proposed fuel break. The Kenai National Wildlife Refuge and the Alaska State Division of Forestry are partners in the project, and adjacent landowners including Cook Inlet Regional, Inc. (CIRI) are involved. Community meetings will be held in the winter of 2015-16 to include the public in the process.

Moose and Grouse Habitat - Continued

In the Sterling area, with lots of flammable black spruce, the break would be more dramatic. A fire in that area could rage through the crown, she said. "We want to change the fire behavior to something we can deal with. In the case of black spruce, we'd mow it down in a swath 200-feet-wide, and mulch it up. So if a raging fire hit that line, the fire intensity would change. You'd still have some spot fires and fire movement across the line, but we'd have a chance to keep it there. Hit it with retardant and water and fire fighters."

Matanuska and Little Granite Creek Prescribed Fires
A prescribed fire was planned for the spring of 2015 in the Little Granite Creek area near the community of Sutton in the Matanuska Valley. In anticipation of the fire, Fish and Game informed area residents about the plans and what to expect, and met with the Sutton Community Council. The Alaska Division of Forestry staff prepped the line. The burn, planned for April or May of 2015, was postponed due to early green up and high humidity.

The fire is desired because the leaves and potential forage on many of the birch and aspen trees in the area are out of reach of moose. "There are stands of mature aspen there, 50 feet tall and nine inches in diameter, and they're not providing moose browse," Rodman said. "If we kill them through fire, you get the sucker response of the shoots coming up. And those shoots are really nutritious to moose. "

Another issue is overgrazed, stunted trees. "These are 25 years old and have not grown more than about 5 feet tall," Rodman said. "Moose keep browsing them every spring and that prevents the tree from growing. And over time, the nutritional quality of the woody stem decreases."

Rodman said foresters and wildlife managers are hoping the burn can happen in the spring of 2016. "There is a very specific window when you can ignite a burn," she said. "We had warm enough temperatures but the humidity wasn't decreasing, so our fuels weren't going to be dry enough. It's a balance of a number of variables. We'd try if we had some of the right conditions, but if the fuels on ground weren't dry enough to get hot enough, we'd burn up all up all the available fuel without killing the trees, and we'd have nothing to burn next year.

The right conditions for a planned burn
What is the specific window for a burn? Rodman referred to the State Forestry burn plan for the Little Granite Creek Fire. "Our low (temperature) would be 40, the high would be 70, and the desired temperature is 55 degrees. That affects humidity – the range is 55 to 22 percent, 35 percent humidity is desired. We have a couple things on wind – we want the wind speed at the top of the forest canopy to be between zero and 12 mph, and the desired is seven – we do want some wind."

Fire managers also account for the wind speed right at the flames. In a raging wildland fire, flames can be 100 to 200 feet high. In a controlled fire flames may be just a few feet high. But flame height is different at the front or head of the fire than it is at the flank. Fire managers planning a burn take a number of parameters into account, including weather, and use a fire behavior model to analyze fire behavior.

The expected flame length for Little Granite Creek controlled fire is 4.1 feet at the head of the fire and 2.3 feet at the flank of fire. Mid flame wind speed is between zero and six mph, with three and a half desired. "The estimates and values are not exact, but they characterize what can be expected in how the fire moves and how fire managers can control it," Rodman said.

Tok
Fish and Game is partnering with the Ruffed Grouse Society and the Alaska Division of Forestry to enhance habitat for moose and grouse in the Tok area. This spring, a roller chopper "treated" about 140 acres.

2015 is the first of five years of treatment for the area. Rodman said they planned to treat 200 acres each year, and while they didn't meet that goal this year, they may make it up. "We're learning as we go and getting better

Moose and Grouse Habitat - Continued

as we go," she said. "We expected do to over 200 acres this year, so more than a thousand acres total over five years. Hopefully closer to 2,000 acres, because we're able to match some Fish and Game money with funds from the Ruffed Grouse Society, so we can expand our acreages."

Cameron Carroll, the small game biologist based in Fairbanks, said they are targeting aspen stands with this project. Project managers, including Tok-based biologist Jeff Wells, used a drone to take aerial photographs of the landscape, and will overlay them with maps to help select the most appropriate spots.

"You really want to target aspen, not spruce or willow stands," she said. "We are planning to do the work later this fall or during early winter. You want to do it when the trees are dormant, when all the nutrients are in the root system, that way they can put it all back into the new growth the next growing season. Aspen regeneration is much more productive if you do the roller chopping in the dormant season. But it's tricky, coordinating with State Forestry, making sure personnel are available and the conditions are appropriate for roller chopping. We plan to get more done this fall, before there's too much snow, or in late winter before it warms up."

One summers' growth in an area near Tok treated in the spring of 2015

She said aspen stands are coming back in really well following a fire in the area in 1990, and the treatment areas are within those stands of 25-year-old trees. "The crushed areas are within those areas, it creates the mosaic of habitat for what grouse need in the different seasons," she said. "Things are looking really good in Tok."

State biologist Jeff Wells said the habitat work will benefit the local moose population by creating new browse in an area that is important as wintering habitat. Telemetry work during the late 1980's found that both migratory and non-migratory moose wintered in the lower Tok River valley, with the migratory portion typically traveling 100-plus miles to areas south of the Alaska Range to calve and to areas within the upper Tok River to rut. In addition, this project is likely to benefit moose hunters both by helping to maintain the current moose population as the 1990 burn ages and also by potentially attracting local moose into areas accessible by highway vehicles or ATVs during the fall hunting season.

For more on fire, moose and habitat enhancement:

- Wild Wonders: Fire (PDF of eight page color magazine for kids) http://www.adfg.alaska.gov/index.cfm?adfg=educators.wildwonders
- Kenai Moose and the Funny River Fire http://www.adfg.alaska.gov/index.cfm?adfg=wildlifenews.view_article&articles_id=689
- Quest for Fire: Planning a Prescribed Burn http://www.adfg.alaska.gov/index.cfm?adfg=wildlifenews.view_article&articles_id=460
- Regeneration Following Fire Creates Fertile Habitat for Wildlife http://www.adfg.alaska.gov/index.cfm?adfg=wildlifenews.view_article&articles_id=60
- The Alphabet Hills Prescribed Burn http://www.adfg.alaska.gov/index.cfm?adfg=wildlifenews.view_article&articles_id=231
- Firewise Alaska: http://forestry.alaska.gov/pdfs/firewise09.pdf

Detecting Grizzly and Polar Bear Dens on Alaska's North Slope

By Dick Shideler, ADF&G - Fairbanks

Karelian Bear Dog "Kavik" alerts on a grizzly bear den on Alaska's North Slope. Photo by C. Perham

U.S. Fish & Wildlife Service (USFWS) biologist Craig Perham was sitting on his snowmachine taking notes when he was surprised by Karelian Bear Dog "Kavik" trotting resolutely by, heading up the nearby slope. Kavik's owner, Alaska Department of Fish and Game (ADF&G) biologist Dick Shideler, had just unloaded him from the Hagglunds tracked vehicle and was preparing Kavik's work vest when the dog took off upwind toward the nearby ridge 300 meters away.

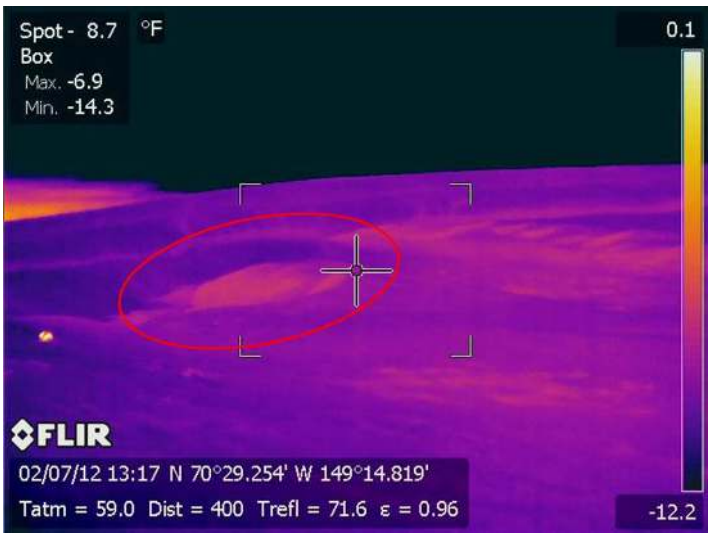
Shideler and Perham were searching for polar bear dens along Alaska's Beaufort Sea coast. They were also accompanied by Karelian Bear Dog "Baloo," an apprentice den detection dog from the Wind River Bear Institute in Montana and her handler Trent Roussin. Kavik continued upwind and began digging at the top of a hard snowdrift near the crest of the ridge. This was his indicator that a female polar bear and her new cubs were buried deep under the drift in their snow den. Shortly after, Baloo joined Kavik and indicated that she, too, smelled the bears. Shideler marked the location so that he and Perham could return the following summer to inspect the site, and the crew continued on with their den survey.

The incident occurred during a cooperative project between ADF&G and USFWS to investigate methods to detect denning polar bears. A companion study, funded by the National Fish & Wildlife Foundation as part of Shideler's North Slope oilfield grizzly bear project, investigated methods to detect denning grizzly bears. Both projects were in the region around the North Slope oilfields and were initiated in response to requirements from management agencies that industry avoid denning bears when conducting off-road exploration and transportation activities. Off-road activities are, for the most part, restricted to winter after the ground is frozen and there is sufficient snow cover to prevent damage from heavy equipment on the tundra. Although exploring for oil and gas during winter reduces tundra damage, it also coincides with both grizzly and polar bear denning. The potential for disturbing denning bears, which could affect their winter survival as well as the safety of workers operating near an occupied den, has prompted agencies to require that winter activities avoid dens.

There is currently no way to predict where dens will be, and you can't avoid a den if you don't know where it is. Especially with polar bears, which excavate maternal dens in snowdrifts along the coast and barrier islands, detection of dens is a high priority because only the pregnant female polar bears excavate dens, and very few of them are radio-collared. The situation is a bit better with grizzly bears because Shideler has had 30-40 bears radiocollared each winter and can usually find about 20-25 dens. However, at some point the grizzly bear study will end and industry will have to rely on other methods to locate dens. This is where the den detection studies come in.

Den Detection - Continued

Airborne FLIR image of a polar bear den (bright spot to the right of the bullseye) along the Beaufort Sea coast. Photo: USFWS-Marine Mammals Management



Handheld IR camera image of a polar bear den (red circle) on the North Slope. The bright spot in the left foreground is a resting red fox. Photo by C. Perham

To date, three methods have been tested to detect bear dens: (1) Forward-Looking Infrared (FLIR) imagers mounted on a helicopter or fixed-wing aircraft; (2) a handheld IR camera that takes still images, and (3) trained Wildlife Service dogs like Kavik and Baloo. The two imagers detect wavelengths on the surface of the snow that are in the infrared ("heat") spectrum invisible to the human eye. However, the sensor mechanisms differ. The airborne imager detects wavelengths within a certain predefined spectral range and displays those as video output in black, white, and shades of gray. We look for bright white objects ("lightbulbs") indicative of a warm object in a thick band of black indicating a deep drift (above left). The handheld camera imager detects different wavelengths of IR, and converts them via a computer to display temperature as a shade of color on a digital picture (above right). Unlike the airborne FLIR imager, the handheld thermal camera allows considerable manipulation of the picture after it's taken in order to enhance the contrast between background and the "hotspot." Think "photo-shopping" to improve the contrast. The dog's "imager" is its trained nose where the stimulation of the millions of sensory cells by airborne molecules given off by the bear allows it to detect faint scent percolating through the snow drift to the surface where it can be carried by the wind.

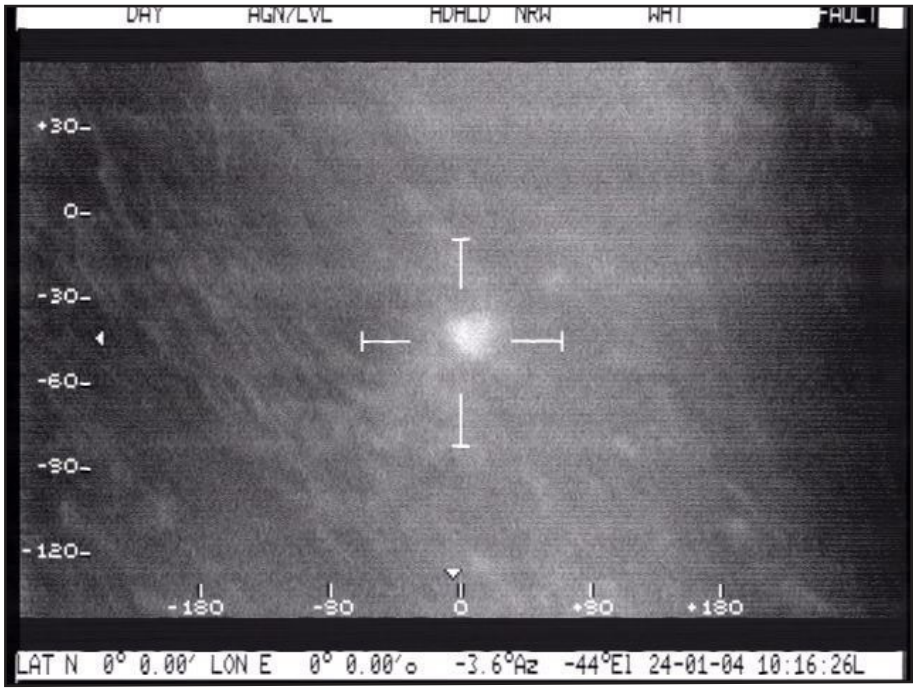
The dog's handler merely ensures that the dog is in the right position for its "imager" to go to work. It is somewhat ironic that ultramodern technologies borne of sophisticated engineering and computer science are complemented by an ancient technique that still requires partnership between dog and man.

Airborne FLIR was first tested over a decade ago on denned female polar bears by Geoff York and his colleagues from the U.S. Geological Survey's (USGS) Alaska Science Center. The initial results were promising in that most (83 percent) of known females were detected by the end of the study, but it took up to seven flights to detect some of them. Only 39 percent were detected on the first flight. Nevertheless, the USGS group was able to demonstrate that under certain conditions there was a better than average chance of finding a den. Those conditions included no blowing snow on the surface and no moisture (e.g., fog, ice crystals, or suspended snow) in the air that would interfere with the IR signal. Timing of the surveys was also important because the IR sensors are so sensitive that even the pitiful bit of sunlight during the short days in the early Arctic winter can warm the surface enough to fool the sensor and "wash out" the image. Therefore, to be reasonably certain that denning bears would be detected, the flights had to

Den Detection - Continued

occur on a cold clear "night" during darkness or civil twilight, which on the North Slope occurs for a couple of months straight, and fortuitously coincides with the timing of polar bear den construction. USGS also found that if they surveyed within a day or two after a significant storm event they had trouble detecting a denned bear. Again due to sensor sensitivity, the tiny bit of friction created by wind and warmer new snow generated enough residual surface heat to confuse the detector until the snow surface cooled down enough to provide contrast between the slightly heated snow surface over the den and its colder surroundings.

Someone familiar with the North Slope might look at these criteria and think that all these conditions are not in perfect alignment very often, and they would be right! Using the criteria developed by USGS, Shideler calculated that in winter 2009-10, a particularly stormy year, there were only nine days in December and January when conditions were optimal for airborne FLIR. From a practical standpoint this means that some if not all FLIR flights will take place when conditions are sub-optimal, and the probability of detecting a denned bear is far from 100 percent. Furthermore, even with perfect conditions there can be errors in interpreting the FLIR image. For one thing, the FLIR sensor doesn't discriminate between a hotspot that could be a chunk of buried tundra slumped off the bank, a barrel buried under the snow, or a bear tucked away in its den. On any flight there are numerous such hotspots that need to be weeded out by experienced interpreters who must decide which one is the denning bear. Occasionally there are hotspots that are white "lightbulbs" that even inexperienced viewers would identify as a den. However, the value of the interpreter's skill comes with an image that catches one's eye as a light gray anomaly in the right position in the drift for a den. Advances in FLIR technology have taken some of the guesswork out of it, but a skilled interpreter is still a big determinant of success even if the atmospheric conditions are suitable for acquiring a good image. The current FLIR system that industry uses to survey for polar bear dens is state-of-the-art, yet some occupied dens have been missed (called "false negatives") and some hotspots have been incorrectly identified as dens (called "false positives"). This is no reflection on the FLIR crew at all but suggests that further refinements in den detection methods are needed.



A "lightbulb" or bright object detected by a forward-looking infrared imager, indicative of a warm object under the snow

Although airborne FLIR technology has improved, it is expensive, the hardware is somewhat temperamental, and successful application relies on the combination of aircraft and FLIR components to be available during the optimal time for surveying. In an attempt to find a more portable and user-friendly system, Shideler, Perham, and USGS colleagues began to test handheld thermal IR cameras. The thermal cameras are the size of

Den Detection - Continued

old-style camcorders and can be transported on a snowmachine or in a tracked vehicle. There were some spectacular early successes with polar bear dens, but false negatives. During ADFG's "proof of concept" test of the thermal cameras to detect denned grizzly bears, only about 40 percent of the dens were detected even when the radio-collared bear's den location was known. Part of the problem is that the handheld IR camera is subject to the same atmospheric restrictions as the airborne FLIR, perhaps even more so in the case of blowing surface snow. If there is a small amount of blowing snow on the surface, the airborne FLIR is looking through a thin band from above, but the handheld IR is at ground level and looking through a much wider expanse. Like eyeballing a stream for fish from a bridge versus looking from stream level where waves and reflection can obscure a lurking lunker. Then too, the maximum distance that an image has been acquired with the IR camera is around 60 m, so you have to be pretty close to the den to detect it. Handheld IR cameras do have some advantages: they are portable so they can be deployed quickly as soon as conditions improve, and do not rely on a large amount of infrastructure support. As we learn more about their effectiveness under varying conditions and as technology advances, we will likely be able to improve the success of handheld IR cameras, especially for follow-up ground-truthing hotspots that the airborne FLIR detected.

The third technique that Shideler and Perham have tested came about as a happy coincidence. Shideler had been using his Karelian Bear Dogs, Riley and Kavik, for bear conflict work in the oilfields. Mostly as an informal experiment, he began taking them out to dens of radio-collared grizzly bears to see if the dogs could find them. He continued to do this on an informal basis when grizzly bears denned near the oilfield road system so he could reach them on foot or with a borrowed snowmachine. One day Perham and Shideler, as dog aficionados often do, started discussing their experiences with dogs on the North Slope. Earlier in his career Perham had worked with trained Labrador Retrievers to find seal lairs and breathing holes as part of a project to reduce impacts of offshore ice roads on seals. He and his colleagues had also conducted a pilot study to find out if the same dogs could find polar bear dens. Based on their joint experience, Shideler and Perham developed a collaborative study funded by a USFWS State Wildlife Grant to ADF&G to investigate methods to detect polar bear dens. Concurrently, Shideler expanded the grizzly bear study to more formally investigate methods, including dogs, to detect grizzly bear dens. They developed a set of procedures for using the dogs that would maximize human and dog safety and minimize bear disturbance. Using Shideler's Karelian

Craig Perham (left) and Dick Shideler (right) prepare Karelian Bear Dog "Riley" for a polar bear den survey while "Kavik" waits for his turn. Each vest pocket contains a GPS unit. Photo by C. Putnam, USFWS

Den Detection - Continued

Bear Dogs and, later, apprentice dogs like Baloo from the Wind River Bear Institute, they found that dogs not only confirmed that hotspots detected by the airborne FLIR were indeed dens (i.e., true positives), but also detected dens the airborne FLIR had missed. Not that the dogs were perfect, but they successfully detected about 95 percent of the grizzly bear dens and 75 percent of the polar bear dens in weather that would have grounded either IR method. The dogs missed a couple of the polar bear dens on the same day when temperatures were -35° to -40°. Humidity at those temperatures is very low and Shideler speculates that the low humidity interfered with the dogs' ability to scent. Dogs need to keep their nasal sensory receptor cells moist in order for them to be stimulated by the molecules of scent that are dissolved in moisture in the air. There may be a lower humidity threshold at which dogs cannot detect dens. Although dogs are not perfect "imagers" either, one advantage of dogs is that they did not alert on anything that was not a den, i.e., they did not produce false positives. Although not as important as a false negative (i.e., missing a den), eliminating false positives is important because it is expensive for industry to reroute an ice road or a seismic line around a potential den, and if no den is actually there then the reroute has cost a great deal with no conservation benefit.

There appears to be no "silver bullet" that will provide the perfect method to detect bear dens on the North Slope. Each method tested so far comes with its own list of advantages and disadvantages. Airborne FLIR can survey long distances over a short period of time; however, limitations on availability and rapid response to optimal conditions suggest that the technique may need to be supplemented with other methods. Furthermore, more testing has to be done on grizzly bear dens to flesh out ways to optimize surveys for their dens. The future of airborne FLIR may lie with Unmanned Aerial Vehicles (UAV's—"drones"). If FLIR sensors on UAV's prove successful in detecting denned bears, their relatively low cost, portability, and potential for rapid deployment may make UAV's the "next big thing" for aerial operations. The University of Alaska-Fairbanks is beginning to investigate that, and both Shideler and Perham are advising on the project. Handheld IR imagers will continue to have a niche, especially since the industry airborne FLIR system is not currently available to all companies operating in the oilfields. However, the short range at which IR imagers are effective will probably limit their use to spot-checking or short-distance surveys. Trained scent dogs have proven their effectiveness for detecting both grizzly and polar bear dens. Although Shideler and Perham have surveyed tens of kilometers of polar bear habitat in a day, dogs can become fatigued or injured and their effectiveness reduced. Their utility for surveying a 100-km long ice road or seismic line is possible but would take several days as opposed to a few hours of airborne FLIR. However, dogs have the highest success rate in finding dens and are worth considering, especially to ground-truth potential hotspots detected by FLIR. And most notably, they will not alert on a non-existent den. An integrated approach to bear den detection will probably yield the best success in locating dens and reducing encroachment by winter activities.

And what about the polar bear den that Kavik and Baloo found? Colleagues from Brigham Young University (BYU) had set up a remote camera to capture den emergence behavior on the west side of the same mound because polar bears had previously denned there. Although an airborne FLIR survey had not found any bears denned on either side, after the dogs alerted on the east side BYU moved their camera there. A few weeks later they were rewarded with footage of the family group exiting the den and the cubs playing around it. Unfortunately, they also captured footage of a large nose on their lens followed by black as the bear trashed their camera setup. Nevertheless, the dogs alert had been confirmed—a true positive.

SAVE THE DATE

Annual Meeting of The

Alaska Chapter of The Wildlife Society

March 30-31

Anchorage, Alaska

Mark your calendars for the annual TWS Alaska Chapter meeting, to be held on the 30th and 31st of March at the BP Energy Center in Anchorage. In addition, a workshop focusing on Human Dimensions in Wildlife Management will be held on Tuesday the 29th, and another workshop on Monitoring Moose in Alaska will be held on Friday, the 1st of April. If you have ideas for special sessions or wish to volunteer for the meeting, please contact Scott Brainerd (scott.brainerd@alaska.gov) or Grant Hilderbrand (ghilderbrand@usgs.gov). Our conference registration and abstract submission website will be online starting December 1st. You will find the link to it on our conference website: http://twsalaskameeting.com/

OUR PROFESSION NEEDS YOUR INPUT!

Most of you are probably familiar with the Wildlife Techniques Manual that serves as a key textbook in many wildlife techniques courses across the country. The manual includes a variety of important wildlife management topics ranging from human dimensions to wildlife capture and immobilization to experimental design and analysis. This manual is widely accepted as one of the "go to" resources for many topics and themes related to wildlife management; however (until now) the manual has not included a chapter addressing the issues and topics related to wildlife management on Tribal/Native lands. In an effort to incorporate this important theme into the upcoming version of the manual, we are soliciting ideas for important concepts and topics related to Tribal/Native wildlife management. Please spread the word as we are seeking input from all corners of Alaska. Please send your thoughts, ideas, comments, and questions on this important addition to the manual to Nate Svoboda at **Nathan.svoboda@alaska.gov.**

Integrated Invasive Species Strategy Across International and Domestic Boundaries: National Strategy for the Arctic Region and Conservation of Arctic Flora and Fauna

By John Martin, Gilbert Castellanos, Phillip Andreozzi, and David M. Lodge

Each year all those agencies, academia, entities, and interested individuals engaged in Alaska invasive species issues gather at the Alaska Invasive Species Workshop to discuss lessons learned from successes, failures, and insights gleaned during the field season and previous years. It should be no surprise for anyone present to state climate change is, and will, substantially alter the short- or long-term distribution and population dynamics of flora and fauna at high latitudes. Population responses for adapting to new environmental conditions may include:

(1) alteration of species biology and ecology translated into new distributions that may lead to new zones of contact between species, or isolation, thereby;

(2) altering stochastic stability(s) and ecosystem resilience;

(3) alteration of species-species and species-habitat relationships; and,

(4) the real possibility of local to regional distribution expansions and/or local extirpations or species extinctions.

Because high latitude environments are generally difficult to access, there is limited information available about many of these essential factors for many species, only compounded by limited existing inventories and other baseline data – regardless of native or invasive species.

Additive to future climate change scenarios, the general lack of biological information, is increasing and imminent anthropogenic stressors that may compound invasive species mobility, e.g., principally related to linear rights-of-way, mineral extraction, hydrocarbon development, associated infrastructure, and transportation.

Fortunately, the current Alaska landscape remains relatively pristine with regard to invasive species, with those species present localized or limited to the few existing road systems or waterways. However, Alaska is vulnerable to pioneering by invasive species.

Potential impacts of invasive species may include or may affect:

(1) *Biodiversity* – at genetic, population, species, community, and ecosystem scales, including ecological services (functions and processes), including conservation of trust species and encumbering agency capacity to meet State or Federal legislative mandates;

(2) *Sustainable development*, specifically energy development, rare earth, and precious metals industries, local villages socioeconomics, and other infrastructure and transportation;

(3) *Food security for subsistence lifestyles*, particularly human health and safety; and,

(4) *Safe commerce*, not only within local villages but among villages and larger population centers, but international across the entire circumpolar region and beyond it.

I wish to present a vision of the future that may greatly aid in getting ahead of potential invasive species incursions that may be facilitated by ongoing climate change and be further mobilized through pending development within Arctic and boreal ecosystems. For those familiar with the *Partners in Flight* (PIF) or *Partners for Amphibian and Reptile Conservation* (PARC), the domestic and international efforts now in place may ultimately look and work in a similar manner.

Looming Alaska Crisis

The spring of 2015 was a milestone for invasive species issues when elodea (Canadian waterweed *Elodea*

canadensis) was discovered in Lake Hood, located in Anchorage, Alaska. This was no big deal as this aquatic invasive species had been expanding in the Kenai Peninsula since its inadvertent discovery in 2012. Problematic was the vectoring of elodea via floatplanes arriving and departing Lake Hood in a nearly endless, albeit seasonal, procession as Alaska hosts the largest collection of privately-operated planes in the world. This airborne flotilla travels to every waterbody large enough to accommodate landing and takeoff for a wide variety of business, personal, and recreational purposes. The inference was clear, if elodea was in Lake Hood – the major hub for incoming-outgoing flights including those from-to the lower-48 states, elodea could be anywhere in the State.

With heightened public awareness, thus ensued a multiagency effort to identify, at a minimum, floatplane hubs for monitoring, concurrently with rapid control actions, some of which combined with already planned control efforts. Eradication is a worthy stated-goal but use of this term may be a bit ambitious and maybe unrealistic. Vectoring pathways remain unmanageable for floatplanes as potential controls remain unresolved, such as a proxy for boat cleaning stations at boat ramps common to recreational sites of the lower-48 states for zebra mussel (*Dreissena polymorpha*), quagga mussel (*D. rostriformis*), or other aquatic invasive species. Control efforts will continue, most likely indefinitely and in perpetuity for this species. Presently the most notable successes have been through public outreach and education.

If nothing else, the elodea situation highlighted a far larger mounting issue for Alaska, and concurrently the Arctic and subarctic regions, of the increasing threat of pioneering by invasive species (vascular and nonvascular plants, vertebrate and invertebrate animals, and pathogens) whether a "natural" event or human-subsidized accidentally or intentionally. Compounding this factor is the increasing accessibility of the Arctic and subarctic as the region increasingly warms. As the majority of the Alaskan Arctic and subarctic regions are relatively pristine, the impacts of invasive species could have significant negative effects on biodiversity, sustainable development, food security for subsistence lifestyles, and safe commerce at not only landscape-scales, but also internationally across the entire circumpolar region.

Background: Domestic and International Mirrored Approaches

An opportunity has been presented for Interior Department agencies to engage with other planning or conservation entities to consolidate and coordinate invasive species prevention and management control into a single seamless effort through the Executive Order entitled *National Strategy for the Arctic Region* (NSAR) signed in May 2013. The *Implementation Plan for the National Strategy for the Arctic Region* was signed in January 2014, and identified action goals for the Executive Order.

The goals as set forth in NSAR Implementation Plan are:

- Explore becoming a party to the *International Convention for the Control and Management of Ships' Ballast Water and Sediments* in consideration of existing domestic regulations and standards: deadline was 2014 - achieved during 2015.

- Identify and assess invasive species **pathways**, risks, and ecosystem and economic impacts to the Arctic region: deadline December 2015.

- Establish baseline conditions, prepare an **early detection and rapid response** (EDRR) plan to reduce the threat of invasive species, and gather information regarding effective management options: deadline December 2015.

- Develop a comprehensive invasive species prevention, control, and **management plan** in accordance with existing requirements: deadline April 2017.

- Initiate implementation of invasive species prevention and **management plans** through extensive consultation with stakeholders – management plan: deadline April 2019.

Parallel with NSAR are the ongoing multifaceted efforts under *Conservation of Arctic Flora and Fauna* (CAFF), an international forum of common interests within participating nations as opposed to an international treaty venue. Relevant to invasive species are the *Circumpolar Biodiversity Monitoring Program* (CAFF-CBMP) and *Arctic Biodiversity Assessment* (CAFF-ABA), specifically the *Report to Policy Makers* released in 2013 with goals and objectives.

- Recommendation 9: Reduce the threat of invasive alien/non-native species to the Arctic by developing and implementing common measures for early detection and reporting, identifying and blocking pathways of introduction, and sharing best practices and techniques of monitoring, eradicating and control. This includes supporting international efforts currently underway, for example, those of the international maritime organization to effectively treat ballast water, clean and treat ship hulls, and drilling rigs.
- 9.1. Develop a strategy for the prevention and management of invasive species across the Arctic, including the identification and mitigation of **pathways** of invasions. Include involvement of indigenous observing networks, which include invasive and new species reporting, to assist with early detection.
- 9.2. Incorporate **common protocols** for early detection and reporting of non-native invasive species in the Arctic into the CBMP.

As can be seen here, the common elements between the domestic and international efforts with regard to invasive species are (1) pathway identification; and (2) early detection and rapid response through consistent protocols developed through all participants.

The deadline for implementation of these goals and objectives is April 2017.

The 8-nation Arctic Council Chair is presently the U.S., and the CAFF Chair is Norway, with a scheduled change in April 2017 with the U.S. assuming the CAFF Chair and Norway assuming the Arctic Council Chair. The U.S. has proposed an action plan for the CAFF-ABA goals and objectives for approval by Norway, in March 2016.

This proposal seeks to accomplish the task through a risk-based assessment and management of potential and ongoing invasive plants, animals, their parasites, and pathogens, including epizootics that may directly or indirectly affect human health. The successful achievement of this goal will also successfully achieve the goals under NSAR.

Future Vision

The implementation of a risk-based assessment of invasive species pathways along with protocols for EDRR may largely have been developed already within the practitioners of Alaska Invasive Species Workshop. For the NSAR elements, this includes Alaska Department of Interior land-administering agencies (e.g., Bureau of Land Management, National Park Service, Fish and Wildlife Service) and their counterparts in Alaska Natives, academia, NGOs, private industry, and other interested parties. For the Arctic Council nations, this includes country-specific natural resource departments or equivalent (Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and U.S.), indigenous peoples and cultural entities, private industry, and interested parties.

These significant and singular opportunities are afforded natural resource conservation efforts in Alaska with the combination of climate change, pending developments in a warming Arctic region, and the domestic and international efforts to implement a meaningful strategy for management of invasive species. To be sure, the future Arctic region

will not be free of invasive species whether their arrival is natural, accidental, and (hopefully not) intentional. Regardless, such an approach will permit a uniform and consistent approach across all administrative and political boundaries for information sharing, control actions, mitigation, and enforcement. Private industry should welcome consistent approaches as it would provide front-end knowledge for best management practices for project or site developments, including aspects of mitigation. For invasive species practitioners, such a network would provide access to species databases with regard to monitoring surveys applicable to species or suites of species related to pathway identification, and EDRR methods and techniques that may not be available locally upon discovery of a new invasive species. For subsistence lifestyles, new knowledge and awareness of risks or vulnerabilities would aid to ensure health and safety of local residents and visitors to the region. For the latter this may entail use of the internet via an invasive species information clearinghouse, and/or mapping of known or potential invasive species locations.

Presently, the NSAR and CAFF-ABA have no allocation for new staffing or funding. As a result the collaboration and coordination needed to achieve the goals and objectives will need to come from each participating agency or organization within the context of their own purview similar to the PIF and PARC efforts noted earlier. Certainly there already exist partnership platforms to implement the NSAR and CAFF-ABA strategies, for example:

(1) Landscape conservation cooperatives (Arctic LCC; Northwest Boreal LCC, Western Alaska LCC among others);

(2) Other landscape-level planning efforts such as the BLM Resource Management Plans (ongoing Central Yukon RMP and Bering Sea Western Interior RMP);

(3) Conservation system unit (CSU – international usage), i.e., National Parks and Preserves, National Wildlife Refuges management plans;

(4) State or borough weed management plans; and,

(5) Other local management plans that may have wider applications, such as the *Alaska Exotic Plants Information Clearinghouse*; 1999 *Field Manual of Wildlife Diseases: General Field Procedures and Diseases of Birds*; 2008 *Invasiveness Ranking System for Non-native Plants in Alaska*; 2010 *Integrated Pest Management of Invasive Species on Kodiak NWR and Vicinity*; 2012 *Response Protocols for Biofouled Debris and Invasive Species Generated by the 2011 Japan Tsunami*; 2012 *Dalton Management Area Integrated Invasive Plant Strategic Plan*; and the 2015 FWS *Avian Mortality Event Response Plan*, among many others local management plans.

In addition to existing partnering mechanisms for successful achievement of NSAR and CAFF-ABA goals and objectives, is the state-of-the-science for species and ecosystem predictive modeling through the Statewide Network for Alaska Planning (SNAP) and Alaska Frame-based Ecosystem Code (ALRESCO) which could be adapted to include invasive species mobility based upon known distributions and habitat preferences contrasted with future scenarios. This would greatly facilitate ranking risks associated with human activities, including subsistence lifestyles, with pathways likely to deliver invasive species into the Arctic region. Such predictions would further facilitate monitoring of known or suspected locations in addition to narrowing types of surveys, including staffing and logistic costs.

Pending Actions

The U.S. proposal to CAFF-ABA identified the following salient actions:

Employ to best the advantage, existing data and expert knowledge to map areas that are of high biodiversity value to enable better-informed prioritization of invasive species prevention and management measures. These most likely will include biotic community refugia within existing CSUs, less likely to change as identified through SNAP scenario modeling.

Continued on page 38

Recent Publications by TWS - AK Chapter Members

We would like to highlight the contributions of Chapter members to wildlife science. If you or your colleagues have recently published articles in peer-reviewed journals, please send the citation to Jerry Hupp (jhupp@usgs.gov). The following are some papers that were recently published by Chapter members.

Baltensperger, A. P., F. Huettmann, J. C. Hagelin, and J. M. Welker. 2015. Quantifying trophic niche spaces of small mammals using stable isotopes (δ15N and δ13C) at two scales across Alaska. Canadian Journal of Zoology 93: 579-588.

Boertje, R. D., M. M. Ellis, and K. A. Kellie. 2015. Accuracy of moose age determinations from canine and incisor cementum annuli. Wildlife Society Bulletin 39:383-389.

Brooks, J. J., R. G. Dvorak, M. Spindler, and S. Miller. 2015. Relationship-scale conservation. Wildlife Society Bulletin 39:147-158.

Brown, C., K. A. Seaton, T. J. Brinkman, E. S. Euskirchen, and K. Kielland. 2015. Applications of resilience theory in management of a moose-hunter system in Alaska. Ecology and Society 20(1):16.

Brown, D. N., M. T. Jorgenson, T. A. Douglas, V. E. Romanovsky, K. Kielland, C. Hiemstra, E. Euskirchen, and R. W. Ruess. 2015. Interactive effects of wildfire and climate on permafrost degradation in Alaskan lowland forests. Journal of Geophysical Research: Biogeosciences DOI:10.1002/2015JG003033.

Hagelin, J. C., S. Busby, A. Harding-Scurr, and A. R. Brinkman. 2015. Observations on fecal sac consumption and near-ground foraging behavior in the olive-sided flycatcher (Contopus cooperi). Wilson Journal of Ornithology 127:332-336.

Hansen, C. M., B. W. Meixell, C. Van Hemert, R. F. Hare, and K. Hueffer. 2015. Microbial infections are associated with embryo mortality in Arctic-nesting geese. Applied and Environmental Microbiology 81:5583-5592.

Haynes, T., J. Schmutz, J. Bromaghin, S. Iverson, V. Padula, and A. Rosenberger. 2015. Diet of yellow-billed loons (Gavia adamsii) in Arctic lakes during the nesting season inferred from fatty acid analysis. Polar Biology 38: 1239-1247.

Hupp, J. W., S. Kharitonov, N. M. Yamaguchi, K. Ozaki, P. L. Flint, J. M. Pearce, K. Tokita, T. Shimada, and H. Higuchi. 2015. Evidence that dorsally mounted satellite transmitters affect migration chronology of northern pintails. Journal of Ornithology 156:977-990.

Hupp, J., M. Brubaker, K. Wilkenson, and J. Williamson. 2015. How are your berries? Perspectives of Alaska's environmental managers on trends in wild berry abundance. International Journal of Circumpolar Health 74:28704.

Joly, K., T. Craig, M. S. Sorum, J. S. McMillan, and M. A. Spindler. 2015. Variation in fine-scale movements of moose (Alces alces) in the upper Koyukuk river drainage, northcentral Alaska. Alces 51: 97-105.

Joly, K., T. Craig, M. S. Sorum, J. S. McMillan, and M. A. Spindler. 2015. Moose (Alces alces) movement patterns in the upper Koyukuk river drainage, northcentral Alaska. Alces 51: 87-96.

Joly, K., S. K. Wasser, and R. Booth. 2015. Non-invasive assessment of the interrelationships of diet, pregnancy rate, group composition, and physiological and nutritional stress of barren-ground caribou in late winter. PLoS One 10 (6): e0127586. doi:10.1371/journalpone.0127586.

Joly, K., S. P. Rabinowitch and J. L. Joly. 2015. Dual management of wildlife in Alaska: making federal practice align with federal mandates. George Wright Forum 32: 18-2.

Jones, C. E., K. Kielland, L. D. Hinzman, and W. S. Schneider. 2015. Integrating local knowledge and science: economic consequences of driftwood harvest in a changing climate. Ecology & Society 20: 503-516

Publications - Continued

Kissling, M. L., S. M. Gende, S. B. Lewis, and P. M. Lukas. 2015. Reproductive performance of Kittlitz's murrelet in a glaciated landscape, Icy Bay, Alaska, USA. Condor: Ornithological Applications 117:237-248.

Lake, B. C., J. R. Caikoski, and M. R. Bertram. 2015. Wolf (Canis lupus) winter density and territory size in a low biomass moose (Alces alces) system. Arctic 68: 62-68.

Lewis, T. L., M. S. Lindberg, J. A. Schmutz, M. R. Bertram, and A. J. Dubour. 2015. Species richness and distributions of boreal waterbird broods in relation to nesting and brood-rearing habitats. Journal of Wildlife Management 79: 296-310.

Lewis, T. L., M. S. Lindberg, J. A. Schmutz, P. J. Heglund, J. Rover, J. C. Koch, and M. R. Bertram. 2015. Pronounced chemical response of subarctic lakes to climate-driven losses in surface area. Global Change Biology 21: 1140-1152.

Lewis, T. M., S. Pyare, and K. Hundertmark. 2015. Contemporary genetic structure of brown bears (Ursus arctos) in a recently deglaciated landscape. Journal of Biogeography 42:1701-1713.

Lord, R., and K. Kielland. 2015. Effects of variable fire severity on forage production and foraging behavior of moose in winter. Alces 51:23-34.

Macander, M. J., C. S. Swingley, K. Joly, and M. K. Raynolds. 2015. Landsat-based snow persistence map for northwest Alaska. Remote Sensing of Environment 163:23-31.

Marcot, B., M. Jorgenson, J. S Lawler, C. Handel, and A. DeGange. 2015. Projected changes in wildlife habitats in Arctic natural areas of northwest Alaska. Climatic Change 130:145-154.

McIntyre, C. L., and M. D. Paulson. 2015. What came first, the nest or the egg? An unusual golden eagle nest observed in Denali National Park and Preserve, Alaska. Journal of Raptor Research 49:98-101.

Newsome, S., M. Tinker, V. Gill, Z. Hoyt, A. Doroff, L. Nichol, and J. Bodkin. 2015. The interaction of intraspecific competition and habitat on individual diet specialization: a near range-wide examination of sea otters. Oecologia 178:45-59.

Paragi, T., C. T. Seaton, K. A. Kellie, R. D. Boertje, K. Kielland, D. D. Young, M. A. Keech, S. D. DuBois. 2015. Browse removal, plant condition, and moose twinning rates before and after short-term changes in moose densities. Alces 51:1-21.

Petersen, M. R., G. V. Byrd, S. A. Sonsthagen, and M. G. Sexson. 2015. Re-colonization by common eiders Somateria mollissima in the Aleutian Archipelago following removal of introduced arctic foxes Vulpes lagopus. Journal of Avian Biology 46:538-549.

Prugh, L. R., and S. M. Arthur. 2015. Optimal predator management for mountain sheep conservation depends on the strength of mesopredator release. Oikos 124:1241-1251.

Reeves, A. B., M. M. Smith, B. W. Meixell, J. P. Fleskes, and A. M. Ramey. 2015. Genetic diversity and host specificity varies across three genera of blood parasites in ducks of the Pacific Americas flyway. PLoSONE 10(2):e0116661.

Roach, J., and B. Griffith. 2015. Climate-induced lake drying causes heterogeneous reductions in waterfowl species richness. Landscape Ecology 30:1005-1022.

Rode, K. D., C. T. Robbins, L. Nelson, and S. C. Amstrup. 2015. Can polar bears use terrestrial foods to offset lost ice-based hunting opportunities? Frontiers in Ecology and Environment 13:138-145.

Schmidt, J. H., D. S. Johnson, M. S. Lindberg, and L. G. Adams. 2015. Estimating demographic parameters using a combination of known-fate and open N-mixture models. Ecology 96:2583-2589.

Stillfried, M., J. L. Belant, N. Svoboda, D. E. Beyer, and S. Kramer-Schadt. 2015. When top predators become prey: Black bears alter movement behaviour in response to hunting pressure. Behavioural Processes 120:30-40.

Publications - Continued

Smith, M. M., J. Schmutz, C. Apelgren, and A. M. Ramey. 2015. A real-time quantitative PCR protocol for assessing the relative parasitemia of Leucocytozoon in waterfowl. Journal of Microbiological Methods. 111:72-77.

Stillman, R. A., K. A. Wood, W. Gilkerson, E. Elkington, J. M. Black, D. Ward, and M. Petrie. 2015. Predicting effects of environmental change on a migratory herbivore. Ecosphere 6:114.

Van Hemert, C., P. L. Flint, M. S. Udevitz, J. C. Koch, T. C. Attwod, K. L. Oakley, and J. M. Pearce. 2015. Forecasting wildlife response to rapid warming in the Alaskan Arctic. BioScience 65:718-728.

Ward, D. H., J. Helmericks, J. W. Hupp, L. McManus, M. Budde, D. C. Douglas, and K. D. Tape. 2015. Multi-decadal trends in spring arrival of avian migrants to the central Arctic coast of Alaska: effects of environmental and ecological factors. Journal of Avian Biology DOI: 10.1111/jav.00774

Wild, T. C., S. J. Kendall, N.i Guldager, and A. N. Powell. 2015. Breeding habitat associations and predicted distribution of an obligate tundra-breeding bird, Smith's longspur. Condor: Ornithological Applications 117: 3-17

Wilson, R. E., T. J. McDonough, P. S. Barboza, S. L. Talbot, and S. D. Farley. Population genetic structure of moose (Alces alces) of South-central Alaska. Alces 51:1-16.

Wilson, R. E., S. D. Farley, T. J. McDonough, S. L. Talbot, and P. S. Barboza. 2015. A genetic discontinuity in moose (Alces alces) in Alaska corresponds with fenced transportation infrastructure. Conservation Genetics. DOI: 10.1007/s10592-015-0700-x.

Worker, S.B., K. Kielland, and P.S. Barboza. 2015. Effects of geophagy on food intake, body mass, and nutrient dynamics of snowshoe hares (Lepus americanus). Canadian Journal Of Zoology 93:323-329

Invasive Species - Continued

Complete a thorough literature review, expert knowledge, and where possible existing data, to make recommendations on best management practices and techniques for EDRR and monitoring (including CBMP), as well as eradication and control efforts for highly vulnerable areas.

Create a spatially explicit risk atlas of the Arctic region through expert knowledge and output from the efforts described above to elicit ranking scores for ecological, economic and health risks (considering the probability of invasion and the probability of impact given invasion). The value of the resource should also be assessed in conjunction with each risk.

Recommend best management practices to preclude or limit invasions from prioritized pathways into prioritized areas of terrestrial, freshwater, and marine ecosystems.

Integrate risk atlas results and information on high-probability species and pathways to inform monitoring and other management activities that can contribute to early detection and rapid response activities.

Conclusion

From the foregoing it may be seen that the invasive species elements for the domestic and international, (1) pathway identification, and (2) early detection and rapid response through consistent protocols, will prove beneficial cross-programmatically and across multiple boundaries. This is a singular opportunity afforded State, Federal, and local governments, Alaska Natives, invasive species practitioners, private industry and interested parties. For Alaska Interior Department agencies, there are substantial benefits to participation in these strategies, along with their peer agencies and partners.

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