“Behavioral ecology and conservation of American bison”

For the 5th consecutive summer, our research team spent 10 weeks studying the bison herd at Fort Niobrara National Wildlife Refuge in the Sandhills of Nebraska. Our team this year was multi-institutional, consisting of undergraduate students from PLNU (Daniel, Stefanie), Southern Nazarene University (Rachel), and University of California, Davis (Heather), plus graduate student Megan Wyman from UC Davis. Our research involves documenting the reproductive success of bulls during the breeding season (rut) by means of behavioral observations and genetic parentage analysis. With this information, we can calculate the effective population size of the herd, and thus compute the minimum viable population size needed to maintain genetic diversity into the future. During the July-August rut, our field observations were conducted from dawn-to-dusk by monitoring all breeding bulls and cows in the herd. A complementary microsatellite study in collaboration with the UC Davis Veterinary Genetic Lab has now assigned dams and sires for calves born from 2004-2007. Tissue samples for the parentage study were collected during the summer by biopsy darting, while blood and tail hair samples were collected during the annual roundup in late September.

We successfully completed our 4th year of the bison acoustical communication study in collaboration with graduate student Megan Wyman of UC Davis. By recording the acoustical structure of the male “bellow” vocalization and conducting playback experiments, we will determine the acoustical parameters (call rate, fundamental frequency, amplitude, formants, etc.) that signal the competitive ability of males to other bison. Bulls must assess the competitive ability of their rivals prior to making strategic decisions to attack or retreat, while cows may evaluate the bellows so as to choose the best mate. This summer was our second full season of playback experiments. Playbacks in 2006 examined formants (harmonics produced by the filtering of sound through the vocal tract), while the 2007 playback experiments examined bellow duration. Playbacks must be conducted at night, and involve finding a tending pair, identifying both male and female, setting up all the equipment (speaker, recorder, camcorder, night vision), and completing the experimental protocol before a disturbance sends them running off. Some nights are more challenging than others! We also continued to collect fecal samples to study the behavioral endocrinology of bulls and cows.

Perhaps the most prominent aspect of the 2007 research season was the absence of any major natural disasters. We had no droughts, floods, wildfires, tornados, or microbursts...just normal weather! When not working, we enjoyed the flora and fauna of the Sandhills, canoed and kayaked on the river, and enjoyed fellowship with our church families in Valentine. The team met weekly for Bible study, journal discussions, and community meals.
Students Involved in CRES Endocrinology Research and Directed by Kerry Fulcher
Niccole Schultz (San Diego, CA), Kensey Stansberry-Perkins (Rancho Murieta, CA).

“Reproductive endocrinology of female bison before, during, and after the rut”

Nicolle and Kensey worked together on a project analyzing progesterone levels in fecal samples collected from female bison before, during, and after the rut. This work was done both at PLNU and the Reproductive Endocrinology lab at Zoological Society of San Diego’s Conservation and Research for Endangered Species (CRES) at the San Diego Wild Animal Park. Samples were collected by the PLNU bison research team directed by Dr. Mike Mooring at the Fort Niobrara refuge in Nebraska and sent to CRES on dry ice. Once at CRES, the samples were lyophilized to remove moisture. These dried samples were processed at PLNU and made ready for hormone extraction and analysis at CRES. Progesterone levels were assayed from ether extracts using radiomnunosay techniques perfected at CRES. These assays were performed using a strict set of controls and the results of each assay had to be validated to ensure that comparisons could be made from assay to assay and from year to year. Once the assays were validated, the results were connected back to individual cows and associated with the behavioral observations in the field in order to draw conclusions concerning the effects of reproductive hormones on behavior.

Faculty Presentations, Publications, and Grants

Journal Articles


Grants


Research and Special Projects Grant, “Space use of bison in relation to the rut at Fort Niobrara NWR”, $1900.

Student Presentations

Climate Change Presentations

Since January of 2007, I have delivered 21 PowerPoint presentations on climate change to over 1500 people in a variety of venues, including classrooms, churches, schools, conferences, and workshops. Those attending have included PLNU faculty, staff and administrators (including President Brower and the Cabinet), students at PLNU, Mesa College, and Chula Vista High School, church members, pastors, and community people. Early in January, I spent several days in Nashville receiving technical training by The Climate Project (including Al Gore and Dr. Michael McCracken) plus the use of ‘An Inconvenient Truth’ slide resources. Customizing the presentation with my own slides of local impacts of climate change and verses reflecting the Biblical mandate to care for creation, I developed a slideshow that I entitle “A Christian perspective on climate change”. Although I have presented for all sorts of audiences, my primary interest is in educating the Christian community about the threat of climate change and what I believe to be the obligation of believers to take action in obedience to God’s commands to “tend and care for the garden” (Genesis 2:15) and “love your neighbor as yourself” (Mark 12:31). The slideshow presents the compelling scientific evidence that climate change is real and is caused by human actions, and makes the argument that this is a moral, ethical, and spiritual issue. In October, I partnered with the Center for Pastoral Leadership to organize a Creation Care Workshop for Pastors, which included a presentation on climate change. Future plans include working together with Floresta to bring more presentations to area churches, and the ‘Science and Faith Symposium’ at First United Methodist Church in April. Although I am not a climate specialist, I have an appropriate background for giving these presentations because I am trained as an ecologist, have a special interest in creation care, and am current Co-Chair of the President’s Resource Stewardship Task Force. I have read a number of books on climate change, keep abreast of the latest news and technical reports on this topic, and regularly attend 2 lectures series on climate change at the Birch Aquarium at Scripps and the San Diego Natural History Museum.

Peer Reviews

“Fitness increases with partner and neighbour cooperation” by Lewis, Sue et al.

“Programmed versus stimulus-driven anti-parasite grooming in a rodent: efficiency, time allocation and age dependence” by Hawlena et al.

“Timing of mating and group dynamics in American bison (Bison bison): effects of large males” by Bowyer RT, Bleich VC, Manteca X, Whiting JC, Stewart KM.

Revision of “Fitness increases with partner and neighbour cooperation” by Lewis, Sue et al.

“Reconciling competing ecological explanations for sexual segregation in ungulates” by Martin Main.

“Age and social rank affect mating tactics and mate choice in male mountain goats” by Julien Mainguy et al.

Review for National Science Foundation, 1 September 2007.

“Sexual segregation as a consequence of sex differences in the patterning of some activities, but not others: evidence from feral goats” by Dunbar RIM, Shi J.