

**Black Hills Area Botany & Ecology Workshop
(BHABEW XII)
March 13, 2014**

8:00 – 8:30 Coffee's On!

Session 1

- 8:30 Symstad – **Welcome**
- 8:35 Guffey – **South Dakota Invasive Species Management Association (SISMA)**
- 8:55 Ohms – **Exotic plants in a vertical world: The climbing biotech project at Devils Tower National Monument**
- 9:15 Ohrtman, Clay, and Smart – **Minimizing *Tamarix* invasion in South Dakota**
- 9:30 Butler and Wacker – **Pre- and post-timber harvest analysis of forest structure and herbaceous composition**

9:50 – 10:00 Break

Session 2

- 10:00 Chowanski and Gates – **Developing ecosite potential productivity in the Black Hills, SD**
- 10:15 Ashton – **Are plant conservatism scores a useful tool for evaluating condition of plant communities in the Black Hills?**
- 10:35 Van Ee and Gabel – **Progress on a revision of the Flora of South Dakota**

10:40 – 10:55 Break/World Café Setup

Session 3: World Café

- 10:55 Paintner-Green – **World Café goals and logistics**
- 11:05 Café session 1
- 11:30 Café session 2
- 11:55 Café session 3
- 12:15 Café wrap-up

12:20 – 1:30 Lunch (on your own)

Session 4

- 1:30 Nelson and Zimmerman – **Lichens and bryophytes of the Black Hills: Research, education and outreach**
- 1:50 Ott and Hartnett – **Vegetative reproduction of the perennial grass *Andropogon gerardii* (big bluestem) at the center and periphery of its range**
- 2:10 Higa, Uresk and Quinn – **Overview of the South Dakota box turtle ecology project with emphasis on habitat selection**
- 3:00 Tinant – **Resilience or tipping point: What can we infer from two decades of stream health monitoring?**

2:50 – 3:00 Break

Session 5

3:00 Café table hosts – **World Café topic summaries**

Poster Session (3:45-4:45)

- Bolka – **Invasive species and integrated pest management**
- Burkhart and Kovacs – **Tracking residual forage in Wind Cave National Park 2010-2013 using Robel pole protocol calibrated for the southern Black Hills**
- Drozda, Mayer, Monks, Sprague, and Warnke – **Black Hills National Forest botanical resources update**
- Gould – **Inventory and characterization of fens in the Black Hills**
- Myer – **Mob grazing as a possible method of weed control in South Dakota grazing lands**
- Rolfsmeier – **A preliminary survey of the bryophytes of the Nebraska Pine Ridge region**
- Symstad – **Choosing specific climate change projections for climate change planning**
- Symstad, Swanson and Newton – **Strategies to quickly find invasive plant outbreaks after prescribed fire in Black Hills ponderosa pine forest**

Abstracts

(Alphabetical by first author's last name)

Isabel Ashton (National Park Service, Northern Great Plains Inventory & Monitoring Network) – **Are plant conservatism scores a useful tool for evaluating condition of plant communities in the Black Hills?** Plant conservatism scores, or coefficients of conservatism, are used to describe the tolerance of a plant to disturbance and human impact. Plants of high conservation value are typically the first plants to disappear from a habitat impacted by humans. After four years of monitoring vegetation in national park units in the Black Hills, I explore how average plant conservatism values vary across parks, years, and habitats. For these analyses, plants were assigned scores based on data from neighboring states. Future work is needed to refine these analyses, when and if conservatism scores are developed for the Black Hills.

Eugene Bolka (USDA Forest Service, Black Hills National Forest, Mystic Ranger District) – **Invasive Species and Integrated Pest Management.** Examples of invasives (new and old) in the State of South Dakota and some of the treatments used to help control them. (*Poster*)

Beth Burkhart and Kevin Kovacs (National Park Service, Wind Cave National Park) – **Tracking residual forage in Wind Cave National Park 2010-2013 using Robel pole protocol calibrated for the southern Black Hills.** The Wind Cave National Park (WICA) Robel project used a simple, precise, and economical tool to characterize WICA forage over four years from 2010 through 2013. Project results indicate that the forage areas of the park grazed by bison and other wildlife were above the target level in every year from 2010-2013, although this target was nearly missed in the dry year of 2012. Project results also indicate that vegetation height/density was not likely a factor in the decrease of prairie dog acres that occurred during this time period. These results, in combination with other WICA vegetation monitoring projects, suggest that water rather than forage is a limiting factor for WICA ecological health. (*Poster*)

Jack Butler and Stefanie Wacker (USDA Forest Service, Rocky Mountain Research Station) – **Pre-and post-timber harvest analysis of forest structure and herbaceous composition.** We used a pre-timber harvest classification of forest structure and herbaceous composition to evaluate changes in vegetation composition 1 to 2 years post-harvest. As predicted, pre-harvest tree density served as a general predictor of total herbaceous cover and species richness for both native and non-native species. The greatest response of the understory vegetation to timber harvest occurred primarily in plots that had the highest pre-harvest tree density. Composition, richness, and cover of non-native plants were concentrated in a few localized plots that had high abundance of non-native plants prior to timber harvest.

Kurt Chowanski and Roger Gates (South Dakota State University, West River Ag Center) – **Developing ecosite potential productivity in the Black Hills, SD.** The relationship between current livestock use and ecosite potential may provide a context to compare management practices and stocking rates on forested grazing lands in the Black Hills. Major Land Resource Area (MLRA) 62 encompasses the Black Hills, where potential productivity is not currently available. I developed a spatially explicit model of ecosite potential productivity based on soil type and canopy cover classes, and compared potential production to current livestock use for 5 USFS range management units.

Nick Drozda, Cheryl Mayer, Chelsea Monks*, Rylan Sprague*, and Kelly Warnke* (USDA Forest Service, Black Hills National Forest, Supervisor's Office and All Districts) – **Black Hills National**

Forest Botanical Resources Update. The Black Hills National Forest botany program was active in 2013 and we want to share! The plant Species of Local Concern (SOLC) list was updated in 2011 and we have learned much about the newly added species as well as other rare and ecologically important species. In addition we have been engaging local high school science classes in some environmental monitoring projects. (*Poster. *will be available for questions at the poster.*)

Jessica J. Gould (USDA Forest Service, Black Hills National Forest) – **Inventory and characterization of fens in the Black Hills: Update and status of our knowledge.** Arthur McIntosh is credited with the discovery and documentation of the first Black Hills fen – the McIntosh Fen adjacent to Castle Creek, near Deerfield Reservoir. Until recently, it was believed that this was the only fen on the Black Hills. Preliminary investigations through 2009 had identified over thirty confirmed fens, generally located along the geologic contact between the Limestone Plateau and the underlying Precambrian metamorphics. Since 2009, fens have been documented within the Harney Peak granite as well. Both calcareous (calcium rich) fens and “iron fens” with a ranging composition of peat and plant assemblages continue to be documented throughout the Black Hills. To date, over 400 wetlands of varying size have been identified as potential fens.

Jessica J. Gould (USDA Forest Service, Black Hills National Forest) – **Inventory and characterization of fens in the Black Hills.** Fens are rare, geographically restricted wetlands where perennial groundwater discharge occurs on the time scale of millennia, creating permanently saturated, anaerobic conditions which promote the deposition of peat. Fens often support unique and rare plant and animal communities. Black Hills fens differ from other fens worldwide, largely because they: occur in a region that is outside the limits of past periods of glaciation; occur at lower elevations which do not support winter-long snow packs that prevent partial freezing; and represent a broad range of characteristics due to the inherent variety of the underlying geology in the Black Hills region. Both calcareous (calcium rich) fens and “iron fens” are found in the Black Hills. As fens continue to be identified across the Black Hills region, their geomorphic position, vegetation, and unique groundwater chemistry will serve to identify their groundwater source areas and thus will help land managers to protect not only the fen ecosystems, but their source areas as well. (*Poster*)

Scott Guffey (SISMA Board of Directors) – **South Dakota Invasive Species Management Association (SISMA).** This presentation will describe SISMA and the activities we have planned in the upcoming year.

Alessandra Higa (Oglala Lakota College), Daniel Uresk (USDA Forest Service), and H. Quinn (Oglala Lakota College) – **Overview of the South Dakota box turtle ecology project with emphasis on habitat selection.** Ornate box turtle (*Terrapene ornata*) is a “*Species of Greatest Conservation Need*” in South Dakota. Habitat loss through agricultural development and fragmentation is the main threat to the species throughout its range, which extends from Wisconsin and northern Indiana through the central Great Plains from southern South Dakota to Arizona, northern Mexico, and the Gulf Coast in Texas. We studied box turtle habitat characteristics on the Pine Ridge Reservation, documenting macro- and microhabitat use during 2010-2011. For both years, based on a modified Robel pole, turtles selected habitats with greater visual obstruction readings (height density of vegetation) than at a stratified random distance of 10m from the turtle. Canopy cover results reveal a preference for sand sagebrush (*Artemisia filifolia*) coverage to grasses and forbs. Shrubs are an important component of box turtle microhabitat selection, as they facilitate thermoregulation by providing cool areas during the summer and favorable hibernation sites during the winter.

Heidi Myer, Sharon Clay, and Alexander Smart (South Dakota State University) – **Mob grazing as a possible method of weed control in South Dakota grazing lands.** Mob grazing is a grazing system

that uses very high stocking densities for short durations in small paddocks. Mob grazing mimics the grazing duration and pressure of the bison herds that once roamed the Great Plains, and its effect on prairie vegetation. This method has resulted in increased vegetation usage and less selective grazing behavior than rotational systems with lower stocking densities. Decreased selectivity increases grazing pressure on plants typically avoided by herbivores, increasing weed control. This creates niches for native forbs and grasses, and may help reduce or augment chemical control. This project will demonstrate mob grazing's effect on selected invasive weeds in South Dakota. (*Poster*)

Peter R. Nelson (Oregon State University, Department of Botany and Plant Pathology) and Mary Zimmerman (Independent) – **Lichens and bryophytes of the Black Hills: Research, education and outreach.** Lichens (fungus/algae and/or cyanobacterial symbioses) and bryophytes (mosses and liverworts) are diverse yet overlooked components of the Black Hills flora. They are important for their contribution to biodiversity in the area, as tools for monitoring air quality, as hydrobuffers in rocky areas or around fens and even as winter food for ungulates or nest material for flying squirrels. We summarize our educational, outreach and research activities with lichens and bryophytes in western South Dakota over the last 2 years, demonstrate tools for researchers and educators and outline future plans for lichen and bryophyte research, education and outreach.

Rene Ohms (National Park Service, Devils Tower National Monument) – **Exotic plants in a vertical world: The climbing biotech project at Devils Tower National Monument.** At Devils Tower, common mullein, houndstongue, cheatgrass, and other exotics are found on the Tower's summit, climbing routes, approach trails, and the "Meadows" ledge. This is the final year of a three-year project aimed at reducing exotic plants on the Tower and educating the public on ways to prevent their spread. The work is performed by biological science technicians with a unique combination of exotic plant control experience and climbing skills. In 2013, nearly 10,000 plants were pulled, 65 acres were sprayed, and innovative climber educational materials were developed. Work is scheduled to continue in 2014, from July to October.

Michelle Ohrtman (Plant Science Department, South Dakota State University), Sharon Clay (Plant Science Department, South Dakota State University), and Alexander Smart (Natural Resource Management Department, South Dakota State University) – **Minimizing *Tamarix* invasion in South Dakota.** Millions of dollars have been spent in South Dakota to control the noxious weed *Tamarix* spp. (a.k.a. saltcedar). The best way to manage these plants is to minimize initial invasion. We have performed a series of studies that (1) document the specific conditions associated with *Tamarix* invasion in South Dakota, and (2) demonstrate successful control techniques for newly established individuals. Results can be used to educate land managers, weed professionals, college students in agriculture, range, and biological sciences, and the public about how to identify areas at risk of invasion and control *Tamarix* before plants become well-established and problematic.

Jacqueline P. Ott* and David C. Hartnett (Division of Biology, Kansas State University) – **Vegetative reproduction of the perennial grass *Andropogon gerardii* (big bluestem) at the center and periphery of its range.** Sexual reproduction of a species declines near its range limit. Therefore, vegetative reproduction can play a significant role in determining its distributional range. The vegetative reproduction of *Andropogon gerardii*, a C₄ grass of the Great Plains, was compared between its tallgrass prairie range center in eastern KS and its range edge in the C₃-dominated mixed grass prairie of western SD. Despite declines in individual performance of both sexual reproduction and vegetative reproductive capacity (i.e. bud production) in peripheral populations, vegetative reproduction via the belowground bud bank enabled population persistence of *A. gerardii* at both its range center and periphery. (*current affiliation is South Dakota State University and USDA Forest Service, Rocky Mountain Research Station)

James M. Robertson and Mark Dixon (University of South Dakota) – **Assessment and management of aspen in the Niobrara River valley: Canopy composition and herbaceous plant diversity.** At Smith Falls State Park in northwestern Nebraska, managers have implemented extensive clearing of invasive eastern redcedar to support native quaking aspen recruitment. This program has also had effects on herbaceous plant diversity in the stands. I compare herbaceous plant diversity in areas with aspen-dominant canopies to that which is found in areas that still feature redcedar. (Poster)

Steven Rolfsmeier (High Plains Herbarium, Chadron State College) – **A preliminary survey of the bryophytes of the Nebraska Pine Ridge region.** Though the flora of the Nebraska Pine Ridge region is reasonably well studied, its bryophyte flora has received relatively little attention. Prior to 2012, a total of 56 moss and 6 liverwort species were documented from the region (as compared with 307 and 45, respectively, reported from the Black Hills). In 2012 and 2013 approximately 300 bryophyte specimens were collected from sites in Dawes, Sheridan and Sioux Counties. At least 17 mosses and three liverworts new to the region were found, including two mosses (*Hypnum revolutum* and *Timmia austriaca*) and two liverworts (*Preissia quadrata* and *Ptilidium pulcherrimum*) not previously collected in Nebraska. Three species not collected in the region since 1890 (*Bryoerythrophyllum recurvirostrum*, *Dicranum tauricum*, and *Moerckia flotoviana*) were relocated. (Poster)

Susan Rolfsmeier (Chadron State College) – **Systematics of North American *Lappula*.** (Poster)

Amy Symstad (U.S. Geological Survey, Northern Prairie Wildlife Research Center) – **Choosing specific climate change projections for climate change planning.** Quantitative climate change planning, including ecosystem or species vulnerability assessment, requires selecting one or more quantitative climate projections for a specific location. Given the large and ever-growing selection of climate projections available, how do you choose which projections to use in your climate change planning? This poster (1) gives an overview of some of the decisions that must be made when choosing climate projection data and a resource being developed to aid in that decision-making, and (2) illustrates one method for exploring the range of climate projections available for use.

Amy Symstad (U.S. Geological Survey, Northern Prairie Wildlife Research Center), Daniel Swanson (National Park Service, Northern Great Plains Fire Ecology Program), and Wesley Newton (U.S. Geological Survey, Northern Prairie Wildlife Research Center) – **Strategies to quickly find invasive plant outbreaks after prescribed fire in Black Hills ponderosa pine forest.** We assessed the relative importance of environmental characteristics and prescribed fire severity in explaining invasive plant cover in Black Hills ponderosa pine forest. A combination of surface fire severity and either pre-fire forest structure or distance from roads explained 24-30% of the variation in post-fire cover of two common invasives and all invasives together. Pre-fire invasive cover explained the most variation (40-83%) in post-fire invasive cover, suggesting the best strategy for reducing post-fire invasive outbreaks may be to eliminate invasives before the fire. This may be difficult, since pre-fire environmental characteristics explained < 30% of variation in pre-fire total invasive cover. (Poster)

Charles Jason Tinant (Oglala Lakota College) – **Resilience or tipping point: What can we infer from two decades of stream health monitoring on the Pine Ridge Reservation?** Water is an essential resource, yet freshwater ecosystems are directly threatened by human activities. There is a need to improve water quality monitoring beyond measuring water chemistry in order to evaluate trends in ecosystem structure. Stream health metrics were calculated from macroinvertebrate samples collected 1993 – 1996 and 2008 – 2011 for Pine Ridge Reservation streams. I evaluated these data using two-way MANOVA to determine if significant differences exist across ecoregions, land use intensities and/or time. Three levels of land use intensity were distinguished by the life history of the dominant

taxon in each sample. Results indicate statistically significant differences between ecoregions, land use intensity, and a land use x ecoregion interaction. ANOVA and Tukey's Honestly Significant Difference tests were conducted as post-hoc analyses. The results indicate: 1) %EPT, %Dipteran and Non-Insect, and %Collector Gatherer metrics significantly differ by ecoregion, 2) EPT Index, %EPT, Family Biotic Index (FBI), Dipteran and Non-Insect, and Collector Gatherer metrics significantly differ by land use, 3) taxa richness and % dominance metrics could not detect land use changes, 4) FBI and %Collector Gather values have significantly increased over time, and 5) the Badlands ecoregion has significantly higher %EPT and Collector Gather values at moderate and high land use intensities. In conclusion that stream macroinvertebrate community changes on the Pine Ridge reservation are consistent with moderate nutrient loadings from non-point sources. However, it is unclear to what extent the macroinvertebrate community changes are also a response to climate variability or changes in the assimilative capacity of the watershed and/or stream.

Benjamin Van Ee and Mark Gabel (Black Hills State University) – **Progress on a revision of the Flora of South Dakota.** Modern studies of the flora of the state include three editions of the Vascular Plants of South Dakota by Ted Van Bruggen in 1976, 1985 and 1996. In his most recent edition Van Bruggen included 126 families and 1628 species within the state. Over the last 18 years many changes have been noted due to the advances in plant systematics, additional botanical exploration of the state, and more botanists looking at plants. We are currently working on a revision of the flora with 15 co-authors. To date, 63 families have been completed and are undergoing review. We anticipate adding at least 200 species to the previous edition. We are hoping for completion of the work in 12 months, depending upon contributions by collaborators, both in revising treatments and in reviewing completed treatments. The end product is proposed to be a field-sized manual with keys that are more user-friendly, about 100 line drawings and current species names.