Cheatgrass Dieoff in the Great Basin: Quantifying Spatial Extents and Potential Causal Mechanisms of Cheatgrass Die-off
Date: 10:00 - 12:00 (MST) – Tuesday March 6, 2012

Cheatgrass (*Bromus tectorum*) invasion and expansion in sagebrush ecosystems of the Great Basin has been well documented. Currently, cheatgrass dominated rangelands cover approximately 10 million acres in the Great Basin, USA. Since 2003, the Winnemucca District (BLM NV) has been experiencing landscape scale vegetation changes resulting from the "die-off" (i.e, partial/complete stand failure) of cheatgrass within Wyoming Big Sagebrush ecological sites. A similar phenomenon has also been reported in the Salt Desert shrub systems of central/southern Utah. Initial estimates of "die-off" areas are greater than a half million acres. Once void of cheatgrass, these sites are exposed to accelerated soil erosion, invasion by new weed species, loss of spring livestock and wildlife forage, and further degradation requiring additional management attention. In late 2010, members of BLM's Great Basin Restoration Initiative identified the need to develop a more formalized strategy to inform BLM managers on the magnitude of the die-off phenomena and engage the science community to examine potential causal mechanisms. The combined result was the development of the Integrated Cheatgrass Die-off Project. *The primary objectives of this project are to (1) to characterize current CGDO occurrence and spatial extent with remotely sensed imagery, and (2) development/implement an integrated science research project to examine the potential causal factor(s) responsible for these die-offs. We will highlight the various collaborator efforts and associated project accomplishments in 2011.*

Presentation 1:
Mapping interannual cheatgrass production and dieoff in the Great Basin using remote sensing data and ecological models.
Stephen Boyte, Stinger Ghaffarian Technologies, Inc.
Bruce K Wylie, USGS Earth Resources Observation and Science Center

Since January 2011, the EROS team studying cheatgrass in the Great Basin has made significant strides developing datasets that identify cheatgrass extents and abundances and cheatgrass dieoff in and around the Winnemucca, Nevada area. Additionally, the team, in partnership with the BLM, received money from the USGS' Northwest Climate Science Center to expand our cheatgrass dieoff study area to most of the northern Great Basin. In the Winnemucca area, we developed a regression-tree model, trained on Peterson's cheatgrass maps, that generated a time series (2000 – 2010) of cheatgrass extents and abundances and then analyzed the relationships between this cheatgrass time series and spatially explicit site-specific variables like elevation, slope, aspect, and a dynamic variable, annual precipitation. We used the cheatgrass time-series dataset to build a time series (2000 – 2010) of weather-based ecosystem performance anomaly models that identified cheatgrass dieoff areas. In the expanded study area covering the northern Great Basin, we are currently developing the time series of cheatgrass extents and abundances. Future plans include developing a time series of weather-based ecosystem performance anomalies to identify areas of cheatgrass dieoff across most of the northern Great Basin. Our final objective is develop cheatgrass dieoff probability models that will use regression-tree techniques along with future climate data to predict areas of *future* cheatgrass extents and abundances and potential areas of *future* cheatgrass dieoff.

Presentation 2:
Are cheatgrass die-offs in the Great Basin an opportunity for long-term control?
Susan Meyer - USFS RMRS Shrub Laboratory (Integrated Science Team Lead)

Cheatgrass (Bromus tectorum) is an invasive annual grass that forms extensive monocultures on tens of millions of hectares of western rangeland. A poorly studied phenomenon in cheatgrass monocultures is the sporadic but widespread occurrence of 'die-off' or stand failure, where for at least one year there is a complete absence of plants and seed production in an area that was previously dominated by cheatgrass. How quickly cheatgrass reestablishes in the years following a die-off depends on the size of the carryover seed bank, the status of the seed bed microenvironment, and possible persistent effects of the die-off causal agent. These factors also influence whether die-offs represent opportunities for restoration seeding. While die-offs are known to have multiple causes, we are testing the hypothesis that cheatgrass stand failure is caused by soilborne pathogens. We have preliminary evidence that pathogenic Fusarium species found in cheatgrass-dominated soils can kill germinating cheatgrass seeds. These pathogens appear to cause higher mortality under conditions of water stress that slow seed germination. This suggests that the 'perfect storm' for complete stand failure may happen only in years with specific patterns of early season precipitation that set up the conditions for epidemic disease. If these pathogens are endemic to rangeland soils and only become epidemic in years with unusual precipitation patterns, it may be possible to seed native species the year following a die-off with low risk of pathogen-caused negative effects. Reestablishing diverse native communities in formerly cheatgrass-dominated areas is the best hope for long-term cheatgrass control.