ASSESSING POST-FIRE RECOVERY OF SAGEBRUSH STEPPE RANGELANDS IN SOUTHEASTERN IDAHO

Executive Summary
Significant Findings and Achievements

- Two primary objectives were addressed in this study, 1) determine the ability of geospatial technologies to reliably capture and characterize changes in the vegetation community following wildfire and 2) determine if the Big Desert study area in southeast Idaho is moving toward a state of desertification as a consequence of the 2006 Crystal fire disturbance.

- Characterizing changes in the vegetation community following a wildfire disturbance was examined using MODIS, Landsat, and SPOT satellite imagery. In each case specific abilities of each sensor were revealed including the ability of MODIS fPAR data to reliably describe changes in primary productivity within semiarid savanna ecosystems (cf. chapters 6-8).

- Semiarid savanna ecosystems are paradoxical. At first glance the untrained eye may be led to believe the sagebrush-steppe is a stagnant sea of unchanging shrubs. In reality however, these ecosystems exhibit tremendous changes throughout each year and each growing season (cf. chapter 9). Furthermore, the C3 plants found throughout the study area exhibit distinct diurnal patterns of respiration and photosynthesis (cf. chapter 10). A consequence of these research findings have direct implication for primary productivity modeling and suggest current primary productivity values may underestimate actual productivity of semiarid savanna ecosystems.

- Assessing changes in land cover over extended temporal periods requires the use of a correspondingly lengthy dataset. Making valid comparisons across time further requires the use of complimentary datasets. Based upon these statements and suppositions it becomes clear that the Landsat data archive is arguably the most important dataset available to geospatial scientists. However, current Landsat satellites are experiencing difficulties and it is uncertain whether Landsat imagery will remain continuous through the successful launch of Landsat 8 in December of 2012.

- An investigation into the complementary nature of Landsat and ResourceSat --a recommended interim alternative platform-- was conducted as part of this study. Results suggest with proper site-specific intercalibration, ResourceSat could serve adequately as an interim replacement for Landsat (cf. chapter 5).

- The development of a long-term Landsat dataset (1984-2010) was initiated as part of this project. Using data from 2000-2009 an evaluation of various primary productivity indicators was conducted to assess the status of sagebrush-steppe rangelands prior to and following the 250,000 acre Crystal fire of 2006. Specific indicators used in this study include composite-NDVI , rain-use efficiency, water-use efficiency, and local net primary productivity scaling. Results suggest that while primary productivity is *estimated* to be relatively low across the Big Desert, it is also fairly stable when viewed from a long-term, decadal perspective. Results also underscore the importance of using long-term data (10 years longer) for this and other assessments as short-term (2-4 years) snapshots of change could be misleading (cf. chapter 14).

- The detection of landscape or regional land cover change is ultimately tied to fine-scale changes in bare ground, plant community species/structure, and current phenological-status at the time of data capture. Issues related to phenology can be effectively resolved through the use of composite-NDVI, but properly scaling data from plant scale (fine-scale) to landscape scale is very difficult. To address scaling issues we examined the ability of remote sensing technologies to detect various fine-scale landscape features such as small patches of dead shrubs (cf. chapters 4 and 17) and randomly located, rare and spectrally unique targets (cf. chapter 11). Results demonstrate various limitations of current remote sensing capabilities due to mixed pixels and the signal-to-noise ratio of the sensor.

- Eight of the chapters included in this final report have been published (five) or are in review for publication (three) in a peer-reviewed professional journal.

- Five graduate students were supported in whole or in part through this grant (Bhushan Gokhale [cf. chapters 5-8, and 13], Darci Hanson [cf. chapters 3, 4, 17, and 18], Mansoor Raza [cf. chapter 13], Heather Studley [cf. chapters 2 and 15]), and Linda Tedrow [cf. chapter 9]) as well as one undergraduate student (Kerynn Davis [cf. chapters 1 and 3]). Each of these students have completed their studies at Idaho State University and have graduated.