CONFERENCE PROCEEDINGS

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RESEARCH SESSION

SPATIOTEMPORAL RELATIONSHIPS BETWEEN CLIMATE AND WHITEBARK PINE MORTALITY IN THE GREATER YELLOWSTONE ECOSYSTEM

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Whitebark pine (*Pinus albicaulis*) serves as a subalpine keystone species by regulating snowmelt runoff, reducing soil erosion, facilitating the growth of other plants, and providing food for wildlife, particularly grizzly bears (*Ursus arctos horribilis*). Mountain pine beetle (*Dendroctonus ponderosae*) is an ideal bio-indicator of climate change, as its life cycle is entirely temperature dependent. Western North America is currently experiencing the largest outbreak of mountain pine beetle on record, and evidence suggests that a changing climate has accelerated the life-cycle of this bark beetle, allowing it to expand into new habitat. This study explored the relationships between climate, mountain pine beetles, and whitebark pine mortality in the Greater Yellowstone Ecosystem (GYE). A time-series of Landsat satellite imagery was used to monitor whitebark pine mortality in the GYE from 1999 to 2008. The patterns of mortality were analyzed with respect to monthly climate (temperature and precipitation) variations over the 9-year period. The impacts of topography and autocorrelation (both spatial and temporal) were also analyzed with respect to whitebark pine mortality. Whitebark pine mortality was assessed using the Enhanced Wetness Difference Index (EWDI), a Landsat-derived measure of canopy moisture. Regression tree models were built to predict yearly changes in EWDI. Thirty-eight percent of the deviance in whitebark pine was explained by a regression tree with 10 predictor variables. The most important predictor variables were autocorrelation terms, indicating a strong host-tree depletion effect, where mountain pine beetles were much less likely to attack recently attacked areas. Topographic variables (elevation, slope, aspect) were not useful in predicting whitebark pine mortality. Climate variables alone were used to construct a regression tree with 14 predictor variables which predicted 15% of the dataset deviance in whitebark pine mortality. Drier climatic conditions favored increased whitebark pine mortality, likely due to the decreased ability of whitebark pine to repel beetle attacks. Warmer climatic conditions also favored increased whitebark pine mortality, likely due to a decrease in winter mortality of mountain pine beetle. These results show for the first time a statistical link between climate variability and whitebark pine mortality, likely mediated by mountain pine beetles.

ASSESSING LAND COVER STATUS AND CHANGE USING HISTORICAL LANDSAT DATA

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The Earth's landscapes are constantly changing. Many of the changes, such as those related to logging, agricultural expansion, urbanization, and fire are relatively straightforward to detect, map, and monitor using current remote sensing technology. In contrast to these events, other less noticeable changes are also occurring within various ecosystems, including those related to insect damage, wind, pollution, climate, and forest succession. These latter types of "within-state" changes may be very subtle and can occur very gradually. Similar to land conversion and fire events, the cumulative impacts of "within-state" changes can have substantial impacts on various ecosystem processes and result in changes in carbon balance and biogeochemical cycling, microclimate, and patterns of biodiversity.

We are currently employing a number of different yet related approaches for characterizing the different types of landscape change taking place. As part of our work, we are seeking to provide information on rates, types, magnitudes, geographic locations and directions of changes taking place across large regions in the United States. For much of this work, we are relying heavily on analyses of Landsat time series data from the USGS EROS archive. This work is possible in large part because the USGS has recently made all Landsat data available over the Web to users at no charge. Such assessments using large numbers of multi-temporal scenes were cost prohibitive until this change was implemented. We are also using MODIS data to provide much broader (although less spatially detailed) overviews of changes taking place. The types of changes that we are focusing on include those related to fire, insects, drought, and forest harvesting.

MAPPING TERRESTRIAL HABITATS IN THE BOSTON MOUNTAIN AND ARKANSAS RIVER VALLEY ECOREGIONS: A MULTI-SCALE APPROACH

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The intent of this project was to categorically map Terrestrial Habitats within the Boston Mountains and northern Arkansas River Valley. Two Terrestrial Habitat map sets were produced, at different scales, for the project area. The first map set was based on 30-meter resolution datasets encompassing the Boston Mountain and northern Arkansas River Valley ecoregions. The second map set, mapped at 5-meter resolution, depict Terrestrial Habitats for seven Arkansas Natural Heritage Commission "National Areas" within the Boston Mountain and northern Arkansas River Valley ecoregions.

A given terrestrial habitat is an ecological system defined as a group of plant community types that tend to co-occur within landscapes with similar ecological processes, climate regimes, hydrogeomorphic structure such as slope and aspect, and surface features such as soil characteristics. Healthy terrestrial habitats can support a broader range of animal species, and a good understanding of the geographic location and distribution of habitat types is useful for planning and restoration.

A variety of spatial datasets were employed in the mapping process including aerial photography and derived products, satellite imagery and derived products, datasets derived from elevation models, products derived from stream data, seasonal sun azimuth and altitude data, and EPA ecoregion delineation data. Additionally, field samples for each habitat category were collected in April 2008 and April 2009. The overall methodology included three main tasks: data preprocessing, model rule-set development, and accuracy assessment/ model revision.

The final Terrestrial Habitat (TH) map, including categories not sampled such as urban, water, and agricultural lands, had an overall accuracy of 91%. The average accuracy for sampled terrestrial habitat categories was 76%. With some modifications in input data and input data rules criteria, the resulting "rules-based" model can be adapted to map other ecoregions. Discussion and revision of this model by the scientific community is encouraged.

Ecogreions are not contained by state boundaries, and this approach to mapping land-cover is well-suited for multi-stateview collaboration.

REMOTE SENSING FOR ESTIMATING REGIONAL EVAPOTRANSPIRATION AND MODELING BASIN WATER BALANCE

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Monitoring vegetation water use is important for early detection of droughts, assessing agricultural productivity and for conducting hydrologic water balance studies. The use of remotely sensed data has become increasingly important in monitoring large areas around the world where ground-based monitoring is not available. Even in well-instrumented regions, the high precision of remotely-sensed data and its ease of manipulation for quick processing and interpretation has increased its use in conjunction with field-based monitoring products. Researchers at the Earth Resources Observation and Science (EROS) center have developed two largely independent methods to monitor vegetation water use. The first method is based on a water-balance approach that uses remotely- sensed land surface phenology (LSP) to parameterize commonly-used vegetation water balance algorithms. This method is operational for the conterminous use on a daily time step (http://earlywarning.usgs.gov/usewem/swi.php) with a focus on monitoring rain-fed systems. The second method applies energy balance principles where land surface temperature (LST) derived from satellite data is used as the main input to develop a Simplified Evapotranspiration Index (SETI) model to estimate actual landscape ET for both rain-fed and irrigated systems. Application examples for both methods are presented for specific regions and the conterminous US in terms of drought monitoring and water balance assessment.

FEATURE PRESENTATIONS

ASSESSING THE ACCURACY OF REMOTELY SENSED DATA: DOING IT RIGHT!

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Assessing the accuracy of maps derived from remotely sensed data has become commonplace to the point that many have stopped citing any papers referencing the accuracy assessment procedures that they have used. However, a large portion of these assessments are either wrong or do not document the process used in enough detail to evaluate if the process was conducted correctly. My presentation for AmericaView members will help them to understand fully the accuracy assessment process so that: (1) all AV members perform accuracy assessment correctly, and (2) all AV members can help train others to do it right.

ENGAGING REMOTE SENSING & HIGH PERFORMANCE COMPUTING TECHNOLOGIES FOR SUSTAINABLE DEVELOPMENT, PUBLIC HEALTH & DISASTER MITIGATION IN AFRICAN COUNTRIES

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The authors address the advances made in remote sensing and high performance computing (HPC) within the African continent and their application to environmental sustainability, infectious disease vector habitat monitoring and the mitigation of man-made and natural disasters. Specifically, the authors review Purdue University's involvement with South Africa's Center for High Performance Computing in Cape Town and the North Atlantic Treaty Organization (NATO) Science for Peace initiative in Cairo, Egypt. Data distribution methods, developed under the AmericaView program, are being adapted to the Egyptian spatial data infrastructure context. The implications of deploying HPC assets in combination with real-time remote sensing for time-critical environmental and epidemiological events in developing nations and within highly industrialized countries are examined.

TECHNOLOGY SESSION

IMAGERY SOLUTIONS FOR FUTURE PROJECTS

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The presentation will focus on the array of solutions that SPOT Image has to offer AmericaView members. We will present our current offerings to AmericaView members, including our web-based solution that allows AmericaView members to search archive data over North America and purchase online. In addition, this presentation will educate members about the wide range of services we offer outside the program, such as Google Earth Enterprise, Archive Management, Monitoring Services (change detection), etc. Participants will also learn the latest information on Pleiades, our upcoming very-high-resolution satellite, and discuss how AmericaView members might benefit from these upcoming products and solutions.

PRESTIGE: WEB-BASED NEAR REAL-TIME ACCESS TO SATELLITE IMAGE DATA

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PRESTIGE is a web-based system for near-real-time access to the Purdue Terrestrial Observatory (PTO) satellite image data. The focus of the PRESTIGE system is to enable interactive PTO data and information access, including subscription, and dissemination. Different from a traditional remote sensing data system, PRESTIGE uses Web 2.0 and service-oriented distributed workflow technologies to create an efficient, user-oriented web based environment for processing, management, and delivery of customized remote sensing data in near real time. It gives users the ability to specify the data products they want and have the back-end data production system dynamically generate and deliver the products. This system serves users from research and education communities, ranging from K-12, college, to technical training. Products are currently provided from the NASA MODIS Terra/Aqua and NOAA GOES-12 satellite sensor systems. The geographical coverage areas for Aqua and Terra MODIS are: 1) State of Indiana; 2) Region around Indiana including Indiana, Michigan, Ohio, Kentucky, Illinois and Wisconsin; and 3) the Entire Pass. The coverage areas for GOES GVAR are: 1) Region around Indiana including 22 other states; 2) the Continental U.S. and 3) the earth disk centered on 75 degrees West longitude. The current projections for the image data are Transverse Mercator for Indiana and Orthographic for the Indiana Region and for the entire pass coverage areas. Data formats (depending on the respective product): can be hdf, jpeg, geotiff or png. Users can request that a notification email be sent to them when a product is ready.

MODIS TODAY IMAGES

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The direct readout aspect of the MODIS sensor system on the Aqua and Terra satellites provides opportunities for the near real-time development of custom products. At WisconsinView, we are working with the direct reception facility of the Space Science & Engineering Center at UW-Madison to produce daily imagery for Wisconsin and all AmericaView states. In this presentation I describe the underlying systems that produce daily GeoTIFF and JPEG imagery with three different band combinations at four different spatial resolutions for both Aqua and Terra, available by FTP-pull for the 36 AmericaView States. I show how WisconsinView archives and publishes the Wisconsin imagery with WMS, GoogleMaps, and metadata enhancements.

REDDnet FOR EMERGENCY RESPONSE

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Over the past several years, geospatial technology, including remote sensing applications, have revolutionized the way we respond to natural and man-made disasters. However, the combination of large files sizes typical of remotely sensed datasets and the size and distribution of the community of users needing access to these datasets, creates serious impediments to their timely and effective use. Today, the prevalence of aerial ortho-imagery and high-resolution satellite data exacerbates the problem. It is now common practice to follow any major emergency event with an aerial imagery acquisition as quickly as possible. Other remotely sensed datasets are collected as well, resulting in many terabytes of data. The challenge is getting these datasets processed and distributed to researchers and responders as quickly as possible. Despite the fact that all the data is on line, and many of the users have good network connectivity, USB drives are still commonly required in order to expedite delivery. Clearly, a better way to distribute emergency response data is needed.

Data Logistics is about the efficient management of data in distributed environments. The goal is to provide disparate users fast access to data when needed. The Research and Education Data Depot Network (REDDnet) is an NSF funded initiative to build and operate a network of WAN-aware storage nodes for improved data logistics. TexasView has been working with the REDDnet team to adapt this technology for the distribution of remotely sensed data. This presentation unveils the latest phase of this work – a data distribution system for delivering large geospatial data sets in response to emergency events. The prototype system employs simultaneous, multi-stream data transport to move data quickly from the source to the REDDnet network where the data is distributed between depots located across the country. Download

occurs very quickly and can scale to dozens of users without impacting performance. The system is designed to minimize demands on the data producers and data users.

LARGE AOI EXTRACTS FROM WEB MAPPING SERVICE

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AlaskaView has been trying to centralize the imagery datasets being made accessible via the OGC Web Mapping Service. This allows the data to be used by a variety of clients over the Internet but does not remove need for special formats/projections stored locally.
This talk will discuss a project created at AlaskaView for doing large AOI extracts from WMS services. The tool provides a simple web application that can submit map extract requests to a back-end that will pull a tile set out of a WMS and merge it together into the target projection and format requested by the user. The talk will cover a brief overview of how to use the application, what is required on the back-end to setup/deploy this software, and where you can go to get the source code. Future development plans include supporting large AOI extracts from WCS services (gridded datasets, such as elevation).

USGS / EROS DATA MANAGEMENT AND DIGITAL DELIVERY OF ANALOG DATA

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The U.S. Geological Survey's (USGS) historical remote sensing archive at the Earth Resources Observation and Science (EROS) Center is a comprehensive and impartial record of the Earth's changing land surface. The USGS/EROS/LTA is responsible for over 8.6 million frames of aerial photographs and 4 million images of satellite film that cover a majority of the Earth's surface.

USGS/EROS has been archiving, managing, and preserving these data for over 37 years. As a world leader in preserving land remote sensing data, USGS/EROS has a reputation as a technological innovator in its efforts to preserve, protect, and update the data to ensure that access is available in the future.

The LTA film archive, access, and distribution systems face the challenge of meeting rising demands and user expectations. In response to these challenges, The LTA strives to advance its expertise in managing and maintaining archive storage facilities and information/access systems. To improve access to all the USGS/EROS film archive, each frame on every roll of film are being captured by automated high performance digital camera systems. The system robotically captures a digital image from each frame for the creation of browse, medium and high resolution image files. Single frame metadata records are also created for these collections to improve access that otherwise involves interpreting flight indexes.

Access to the USGS/EROS film archive is available through Earth Explorer (http://earthexplorer.usgs.gov). GloVis also provides access to the National Aerial Photography Program (NAPP) and National High Altitude Photography (NHAP) collections (http://glovis.usgs.gov). Work performed under USGS contract 08HQCN0005.

EDUCATION SESSION

AMERICAVIEW UNIVERSITY: A FRAMEWORK FOR ONLINE REMOTE SENSING COURSES

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WWW.AVUNIV.ORG was developed with Moodle CMS (Course Management System) in order to facilitate online teaching of remote sensing courses. Moodle, an acronym for Modular Object-Oriented Dynamic Learning Environment, is an open source software package that is used in 38,889 sites delivering about 2.7 million courses world-wide. A course, *Introduction to Remote Sensing*, was developed and deployed in the Moodle framework in 2008. This research presents the administrative and managerial aspects of the online course. Important topics discussed are how to start an online course in AVUNIV, how to branch out to develop your own course, how to modify course contents, and how to manage student's progress. Educators who want to develop online remote sensing courses will benefit from this Moodle framework and its contents. In addition, the teaching material in AVUNIV will help off-line remote sensing instructors.

AMERICAVIEW UNIVERSITY – A REMOTE SENSING CERTIFICATE PROGRAM FOPR JUNIOR COLLEGES AND WORKFORCE TRAINING

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CaliforniaView is developing an online remote sensing baseline certificate for remote sensing entry-level positions as well as for workforce training and retraining. To develop an intermediate as well as an advanced certificate are planned for the future.
The certificate program is composed of several online modules. The Baseline Remote Sensing Certificate or entry level course is offered at no cost, and its goal is to provide students with basic knowledge about remote sensing and a fundamental skill set with which to launch a career in remote sensing. Additional certificates at the intermediate and advanced levels will further develop skills, and enhance the ability to build up expertise in various areas of remote sensing. To be competitive on the job market students need experience

applying their remote sensing skills in the workforce environment. Together with our partners we will offer internship opportunities that will be a critical connection between remote sensing employers and high quality personnel. The course lab work will incorporate different software tools including: ArcGIS, Multispec and ENVI. The baseline online remote sensing certificate will be available free of charge to any StateView member of AmericaView.

AMERICAVIEW'S EARTH OBSERVATION DAY PROJECT

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Earth Observation Day is a coordinated outreach event supported by the AmericaView Board of Directors and organized by the AmericaView Education Committee. In the past, AmericaView offered a state-wide Landsat mosaic poster and supporting geospatial science and technology lessons to interested teachers in participating states. In 2010, AmericaView plans to partner with the Geospatial Revolution Project at Penn State Public Broadcasting. The Geospatial Revolution Project, described as "an integrated public media and outreach initiative about the world of digital mapping and how it is changing the way we think, behave, and interact." AmericaView will support the project by developing, distributing, and supporting geospatial lessons and activities that are tied to national science and geography standards. Each participating StateView will use the Project's web-based media, consisting of eight short episodes that tell an intriguing geospatial story and highlight the power of geospatial technology. Teachers will show the episodes followed by an integrated lesson or set of lessons involving geospatial science and technology developed by the StateViews. In this way, both AmericaView consortium members and the Geospatial Revolution Project team will benefit from leveraged outreach, reaching more teachers and students than either organization could on its own.

USGS EROS OUTREACH AND EDUCATION

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The USGS EROS Data Center supports an active outreach program organized around several themes, including Earth system science, geography, geospatial science and technology, and mathematics. Outreach personnel support theses themes by designing, developing, and implementing specific projects and activities. Examples of these include participating in several USGS supported conferences around the Nation, including the National Science Teachers Association Conference, participation at an annual venue entitled Women In Science that caters to 8th grade girls, attending and participating in various career fairs, South Dakota Space Days, and offering local community and school presentations. Our group recently produced a PPT presentation that highlights careers in the USGS mainly focusing on the role of math and science, to support recruitment of K-12 students in the STEM disciplines. These projects will be discussed, with examples from each.

OUTREACH SESSION

REMOTE SENSING ENDEAVORS IN EAST™

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As a partner in the EAST™ (Environmental and Spatial Technology) Initiative since 1996, CAST staff (aka EAST Support Team) are growing remote sensing and geospatial endeavors reaching over 215 schools in 8 states. CAST provides geospatial support to nearly 17,000 K-12 students a year using ESRI ArcGIS and Trimble hardware and software. This combination of software and support from CAST staff allows EAST™ students to apply learning cooperatives with multiple agencies developing community projects. EAST™ students use GIS/GPS to assess land use impacts, create bus routing improvements, and provide raw critical data for emergency management, cultural and environmental issues. These nationally recognized students are therefore raising-the-bar to enable an upcoming and capable remote sensing workforce. There are potential EAST™ collaboration possibilities for the remote sensing community across eight AmericaView states.

PARTNERING WITH GOVERNMENT AGENCIES: CHALLENGES AND OPPORTUNITIES

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WyomingView has been working with federal, state and tribal government agencies to promote remote sensing applications. Through targeted outreach we have been addressing the needs of these agencies and provided technical support in the areas of data acquisition and processing and software related questions. We have trained several personnel in remote sensing concepts and freeware data viewers (ERDAS ViewFinder™). Working with governmental agencies poses challenges and this presentation will focus on outlining the approaches we adapted in Wyoming for promoting remote sensing applications.

OUTREACH RESOURCES THAT WORK: EXAMPLES AND EXHORTATIONS

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AmericaView performs outreach to inform potential partners about our accomplishments as well as about our needs. Partners may be institutions, companies, government agencies, funding sources, or governmental bodies. When tasked with providing information to such entities, AmericaView has relied on outreach materials provided by StateViews, primarily through StateView semi-annual and annual reports, annual proposals, and oral or poster presentations at semi-annual meetings. When the AV national office requests a formal outreach resource such as a PowerPoint slide set, fact sheet or mini-poster, someone at the StateView level must tell a story *again*, in a new form, that they have already told somewhere else. The extra effort to condense a report, poster, or PowerPoint into a practical outreach "unit" can of course be done at the national level, but valuable perspectives may be lost in translation. This presentation will share various outreach "units" that have been successfully applied for outreach over the past several years, and emphasize the importance of producing such materials to support AmericaView's outreach efforts.

POSTER SESSION – AMERICAVIEW

OBJECT-BASED IMAGE ANALYSIS FOR HIGH-RESOLUTION LAND COVER MAPPING

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Over the past decade there has been a marked increase in the availability of high-quality, high-resolution remotely sensed data. These datasets offer enormous potential for increasing our understanding of heterogeneous landscapes, particularly in urbanized areas where the vast majority of the world's population resides. Object-based image analysis (OBIA) techniques are paradigm shift in automated feature extraction. Numerous studies have demonstrated the superiority of OBIA methods, yet little discussion has been devoted to understanding the key components of an effective OBIA system. Drawing on our experience deriving over 30 billion pixels worth of land cover data from high-resolution imagery and LiDAR, we outline these components and present examples to illustrate their importance. First, we recognize that OBIA is rooted in human cognition, and is thus fundamentally different than the pixel-based approaches to automated feature extraction. In many respects, OBIA more closely resembles the photointerpretation methods that have successfully been employed to exploit high-resolution imagery for seven decades. Second, we do not believe it is realistic to expect any automated system to approach the human image analyst using imagery alone. The integration of passive and active sensor data with preexisting GIS datasets

offers numerous benefits. Finally, we acknowledge that in order for OBIA technology to be considered worthwhile, it is not enough to simply replicate the human. An OBIA system must provide an economic advantage by rapidly exploiting large amounts of data. To this end, an OBIA system can only be considered effective if it: a) can replicate human cognition, b) provides the capability incorporates multiple remotely sensed datasets and GIS vector layers, and c) leverages enterprise computing power to process datasets in the billions of pixels.

THE WILDLAND FIRE EMISSIONS INFORMATION SYSTEM: PROVIDING INFORMATION FOR SCIENTISTS AND MANAGERS WITH OPEN SOURCE GIS TOOLS

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MONITORING THE ONGOING ERUPTION OF KĪLAUEA VOLCANO, HAWAI′I, USING LOW SPATIAL BUT HIGH TEMPORAL RESOLUTION INFRARED SATELLITE DATA

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The current eruption of Kīlauea began in 1983. Since then the volcano has exhibited a wide range of eruptive behaviors including explosive fire fountaining, the development of transient lava ponds and, for more than a decade, the more of less continuous eruption of an extensive lava flow-field. Challenges arise in monitoring and documenting these processes given the relatively large geographic area over which the activity takes place, the temporally dynamic nature of the phenomena, and the hazard inherent in studying active volcanic processes. The USGS Hawai'i Volcano Observatory (USGS-HVO) is responsible for monitoring the volcano and maintains a comprehensive in-situ monitoring network which includes, amongst other things, seismometers, a network of continuously recording GPS instruments, and spectrometers for measuring sulfur dioxide fluxes from the volcano. As such, satellite remote sensing is peripheral to the USGS-HVO monitoring effort. Nevertheless, we have recently begun to explore with scientists at the HVO how products derived from remote sensing data, specifically from the GOES Imager and MODIS instruments, can be incorporated into this monitoring system. Products of interest include maps of the location of the active lava flows and how this varies over time, and estimates of the amount of energy radiated by these flows over time, which has been shown at other volcanoes to act as a proxy for a) the volumetric rate of lava effusion, b) seismic energy released.

This presentation describes the background to the problem, the techniques used to analyze the remote sensing data and some of the benefits and limitations that are encountered when studying active volcanoes using remote sensing data acquired at low spatial, but high temporal, resolution.

THE CASE FOR BEST MANAGEMENT PRACTICES TO IMPROVE WATER QUALITY IN A RAPIDLY URBANIZING ALABAMA WATERSHED

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Saugahatchee Creek Watershed is located in the Lower Tallapoosa River Basin in east-central Alabama and encompasses a 220 square mile area. Although a majority of the watershed remains forested, the upper watershed is undergoing rapid rates of suburban development. Saugahatchee Creek has two segments, the Pepperell Branch and the Saugahatchee Creek Embayment currently on the Alabama Department of Environmental Management's 303(d) list of impaired streams for receiving excess nutrients, primarily phosphorus. The Phase 1 Implementation of the Saugahatchee Watershed Management Plan (SWaMP) began in 2007. Analysis of historical water quality data indicates that urban nonpoint source pollution should be a priority of SWaMP, since runoff from urban subwatersheds was about three times higher in phosphorus than rural (primarily forested) subwatersheds. SWaMP has partnered with the Auburn University Geography Department to map the historical land use/land cover (LULC) change. Landsat imagery is used to determine LULC for the period from the early 1990's through the present. Changes in LULC over this period are analyzed relative to changes in water quality of Saugahatchee Creek measured at its confluence with the Tallapoosa River (the Saugahatchee Embayment) at Yates Lake. Analyses suggest that there is a strong positive correlation between urban/suburban expansion and increasing amounts of phosphorus flushing into Saugahatchee Embayment. SWaMP is actively supporting the strategic installation of BMPs to intercept/minimize pollution runoff and reduce phosphorus loading into the 303(d)-listed Saugahatchee Embayment, and ultimately restore the creek's waters so that they fully support all designated uses (Public Water Supply, Swimming, Fish and Wildlife).

DETECTION OF URBAN HEAT ISLANDS USING STUDENT OBSERVATIONS AND MY WORLD GIS

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Students have been taking surface temperature measurements through the SATELLITES Program during intensive field campaigns in 2006, 2007 and 2008. An Earth Exploration Toolbox lesson (http://serc.carleton.edu/eet/) is being developed to assist students in analyzing the urban heat island effect utilizing data from the GLOBE Surface Temperature field campaigns within the My World GIS. The SATELLITES Program was established in 1999 at the University of Toledo to engage students in "real science" and introduce Earth System Science and geospatial technologies into the K-12 environment. The SATELLITES Program has held trainings in Ohio, West Virginia and Pennsylvania with the AmericaView Remote Sensing Consortium. The GLOBE database contains thousands of surface temperature observations per field campaign. My World GIS was designed by the Geode Initiative at Northwestern University.

Teachers have found it easier to learn than other GIS software. My World GIS comes preloaded with many data sets including demographic information, digital elevation models, and aerial photographs to name a few. The lesson shows students how to download data from the GLOBE website and import the data into My World GIS. Due to the schools that are currently involved with the GLOBE Surface Temperature field campaign, the lesson works best in Ohio, Michigan and West Virginia. The range of the applicability of the lesson should increase as the number of trained teachers increases. Students then use the threshold function to find large cities in a region. The students separate the data by rural and urban schools using a buffer around the cities. Other complicating factors that students can check are the cover type, cloud cover, time of day the observation was taken, day of year, etc. The lesson was field tested this past summer in Ohio with eleven teachers.

TEACHING GIS AND REMOTE SENSING THROUGH COMMUNITY-BASED PROJECTS

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The University of Mississippi Enterprise for Innovative Geospatial Solutions program and its affiliated members in the MississippiView program have been developing and conducting educational outreach activities involving local schools. Closely aligned with AmericaView's goals of supporting remote sensing education and professional development, the focus of the program has been to engage students and teachers in community-based projects using GIS and Remote Sensing activities which serve the dual purpose of educating students in potential career paths and informing local communities about the use and applications of geospatial technologies.

The MississippiView program started with five schools, recently expanded to eight schools, including a pilot summer camp program. The program partners local schools with a mentoring Institutions of Higher Learning (IHL) that support, through teacher professional development and scientist engagement with students, a student-lead project beneficial to the local community. This has the effect of 1) informing and educating students on the use and application of GIS and Remote Sensing technologies; 2) informing and educating local officials, helping to identify needs which can be filled by these technologies; 3) encouraging and educating students in potential career choices as well as fostering higher education aspirations; and 4) providing a sense of "giving back" or contributing to the respective local communities.

This past June, a pilot summer camp was conducted in partnership with Youth Opportunities Unlimited (Y.O.U). Y.O.U. is an "at-risk" youth program with several chapters across the county. The summer camp was conducted in the small community of Marks, Mississippi which is in one of the most economically depressed areas of the state. Students and teachers from four regional counties participated in the four week camp during which projects were identified and completed in each of the four counties.

REMOTE SENSING ENDEAVORS IN EAST™

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As a partner in the EAST™ (Environmental and Spatial Technology) Initiative since 1996, CAST staff (aka EAST Support Team) are growing remote sensing and geospatial endeavors reaching over 215 schools in 8 states. CAST provides geospatial support to nearly 17,000 K-12 students a year using ESRI ArcGIS and Trimble hardware and software. This combination of software and support from CAST staff allows EAST™ students to apply learning cooperatives with multiple agencies developing community projects. EAST™ students use GIS/GPS to assess land use impacts, create bus routing improvements, and provide raw critical data for emergency management, cultural and environmental issues. These nationally recognized students are therefore raising-the-bar to enable an upcoming and capable remote sensing workforce. There are potential EAST™ collaboration possibilities for the remote sensing community across eight AmericaView states.

WEST VIRGINIA WATERSHED DYNAMICS: A COOPERATIVE WEST VIRGINIA VIEW - NATIONAL SCIENCE FOUNDATION GEOSCIENCE EDUCATION PROJECT IN WEST VIRGINIA

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To understand how watersheds function, it is necessary to understand spatial and temporal variability, requiring spatial thinking and the technical skills necessary to frame, explore, and understand interactions. Fortunately, it is becoming easier to teach spatial thinking using technology because GIS, GPS, and remote sensing have become more user-friendly and accessible. Using these technologies, teachers are now able to engage their students in exciting, relevant, inquiry-based lessons and activities in the classroom, lab, and field while strengthening their skills in math and science. By visualizing, exploring, and analyzing watersheds using geospatial technology, teachers and students will better understand connections between land use - land cover and local hydrology, and thus will be able to better understand how their local watersheds function. Through a key partnership at WVU, we are currently teaching an integrated, two course sequence in science education called 'Geospatial Elements of the Water Cycle' for in-service K-12 West Virginia science teachers. The project is a cooperative effort between West Virginia View, the WVU College of Human Resources and Education, the WVU Department of Geology and Geography, and the NASA Independent Verification and Validation Facility in Fairmont, WV.

MONTANAVIEW OUTREACH

Christine Sommers-Austin[2] and Van Shelhamer[2]

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MontanaView's outreach goal is to support remote sensing in Montana through resources and activities that increase the organization's visibility and brings services to our community. One of MontanaView's outreach objectives include expanding the consortium membership through making contacts and presenting MontanaView and its resources to laymen and professionals in agriculture, range, forest, wild lands, urban landscapes, and all levels of academia in Montana. Recent outreach efforts are given to higher-educational institutions such as tribal collages in meeting their geospatial needs and course offerings. Another outreach objective is to advance the availability and timely distribution of remotely sensed data. A final outreach objective is to advance remote sensing through education and research in the public and private sectors. This objective encompasses three types of activities, (1) training for local, state, or federal agencies and for farmers and ranchers, (2) K-12 education training sessions for students and teachers, and (3) remote sensing research opportunities and the use of data for students and professionals in their research.

U.S. DEPARTMENT OF AGRICULTURE UV-B MONITORING AND RESEARCH PROGRAM AND INTEGRATED CROP MODELING ACTIVITY

Wei Gao[1], John M. Davisa, Xin-Zhong Liang[2], and Roger Tree[1]

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ColoradoView is administrated by Dr. Wei Gao, Director of the USDA UV-B Monitoring and Research Program. This national program has been in operation since 1992, and is housed in the Natural Resource Ecology Laboratory, which is within the Warner College of Natural Resources at Colorado State University. This poster introduces the UV-B Monitoring and Research Program and summarizes its three major components: 1) A nationwide network of surface solar irradiance stations, 2) UV Crop Effects Studies, and 3) an Integrated Agricultural Impact Assessment System.

ACQUISITION, ORTHORECTIFICATION, AND OBJECT-BASED CLASSIFICATION OF UNMANNED AERIAL VEHICLE (UAV) IMAGERY FOR RANGELAND MONITORING

Scott Schrader, A.S. Laliberte, J.E. Herrick, A. Rango, C. Winters, A. Slaughter, and C. Maxwell

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We examine the potential of using a small unmanned aerial vehicle (UAV) for rangeland inventory, assessment and monitoring. Imagery with 8-cm resolution was acquired over 290 ha in southwestern Idaho. We developed a semi-automated orthorectification procedure suitable for handling large numbers of small-footprint UAV images. The orthorectified image mosaics had a geometric accuracy ranging from 1.5 m to 2 m. Object-based hierarchical image analysis was used to classify imagery of plots measured concurrently on the ground using standard rangeland monitoring procedures. Correlations between image- and ground-based estimates of percent cover resulted in r-squared values ranging from 0.86 to 0.98. Time estimates indicated a greater efficiency for the image-based method compared to ground measurements. Overall classification accuracies for the image mosaics were in the 83-88% range. Even under the current limitations of operating a UAV in the National Airspace, the results of this study show that UAVs can be used successfully to obtain imagery for rangeland monitoring, and that the remote sensing approach can either complement or replace some ground-based measurements. Details of the UAV mission, image processing and analysis, and accuracy assessment are discussed.

OBJECT-BASED CLASSIFICATION OF ULTRA-HIGH RESOLUTION AERIAL PHOTOGRAPHY FOR POTENTIAL INTEGRATION INTO NRI CEAP FOR GRAZING LANDS

Scott Schrader, A.S. Laliberte, J.E. Herrick, D.M. Browning, and P. Gronemeyer

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Ultra high resolution digital aerial photography has great potential to complement or replace ground measurements of vegetation cover for rangeland monitoring and assessment. We investigated object-based image analysis (OBIA) techniques for classifying vegetation in southwestern U.S. arid rangelands with 4 cm resolution digital aerial photography. The objectives were 1) to compare image-based and ground-based measures of cover, and 2) to assess the viability and efficiency of applying the image-based method to a wide variety of vegetation communities. We obtained high r-square values for image- and ground-based measures of percent cover (r-square values: 0.82-0.92). OBIA enabled us to automate the classification process and demonstrated potential for quantifying fine-scale land cover attributes with ultra high resolution imagery. This approach exhibits promise for nationwide application for monitoring grazing lands. We are currently implementing the same methods for a nationwide study in a wide range of vegetation communities. Tools and techniques for potential integration into the National Resource Inventory (NRI) in support of the Conservation Effects Assessment Program (CEAP) for Grazing Lands are being developed.

ASPRS UPPER MIDWEST CHAPTER ORAL PRESENTATIONS

USING REMOTE SENSING TO ESTIMATE BURN SEVERITY AND MONITOR VEGETATION RECOVERY

Xuexia Chen[1], James Vogelmann[2], Matt Rollins[2], Donald Ohlen[3], Carl H. Key[4], Limin Yang[5], Chengquan Huang[6], and Hua Shi[1]

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In this study, multi-temporal remote sensing data were used to examine the correlations between spectral indices and burn severity in the Jasper Fire burned areas in 2000. Practical methods were also developed to estimate burn severity and monitor vegetation recovery. We calculated the Normalized Difference Vegetation Index (NDVI), Enhanced Vegetation Index (EVI), Normalized Burn Ratio (NBR), and Integrated Forest Index (IFI) from six Landsat images acquired in June 2000 and 2001, May 2002, July 2003 and 2005, and June 2007. Spectral index difference values between the pre-fire and post-fire years were calculated and analyzed with 66 field-based Composite Burn Index (CBI) plots collected in May 2002. Among these plots, there were 38 dense forest plots, 20 open canopy forest plots, and 8 grass plots based on their pre-fire vegetation cover types. Results from this study showed that differences of NDVI and differences of EVI between the pre-fire year and the first two years post-fire were highly correlated with the CBI field scores. The correlations were significantly reduced in the later post-fire years. Differences of NBR had good correlations with CBI scores in all five years post-fire. Differences of IFI had low correlation with CBI in the first year post-fire and had good correlation in the following years. Regression tree models were developed to simulate CBI scores using all spectral indices from the multi-temporal images. The regression tree model of dense forest plots exhibited a higher accuracy (R^2=0.95) than the model of all cover type plots (R^2=0.85). The dynamics of spectral indices from 2000 to 2007 indicated that both NBR and IFI were valuable indices for monitoring long-term recovery. The high burn severity areas had the slowest recovery and their spectral index values were greatly different from the values of moderate and low burn areas.

CLIMATOLOGICAL APPLICATIONS OF LAND COVER CONVERSION IN THE UNITED STATES

Kevin Gallo[1] and Robert Hale[2]

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Climatological applications are presented that utilize the land cover conversion results of the USGS Land Cover Trends Project. Current climatological applications include assessment of the influence of land cover changes documented by the Trends Project on long-term temperature records observed at climate observation stations. The differences in temperature trends before and after nearby land cover changes observed as a result of this analysis will be discussed.

MASS PROCESSING LANDSAT FOR FOREST COVER CHANGE ESTIMATION

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MAKE GEOSPATIAL DATA USEFUL

Paul Harwig
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Fugro Horizons, Inc. has been in the aerial mapping business since 1968, resulting in a collection of massive amounts of geospatial data. Early collection consisted of classic 9 x 9 inch roll film (still ongoing today). Technology has evolved our library into the addition of digital volumes of LiDAR and imagery. Yet with all this data at our fingertips, a dilemma exists as to how best to access it. Film in rolls on shelves is only useful if it is properly cataloged and you have access to a film viewer that can easily locate the right frame for display. In the digital world, one usually can only access the data we collect with high end software and hardware. So we sought to find a method or methods to be able to access and view our geospatial data in an easy to use, low cost manner. We wanted to make geospatial data useful.

The solution we arrive at was to use the ubiquitous Adobe Reader as our free viewer platform. By one estimate, Adobe claims that well over 90% of PC users have access to this software. TerraGo Technologies, Inc., a software company out of Atlanta, Georgia developed a free plug in to Adobe Reader called the TerraGo Toolbar. Their technology allows the free Adobe Reader software to read and manipulate "geo-enabled" pdf files (called "GeoPdfs"). Two interns at our company this summer developed work processes that produce GeoPdfs to index, display and manipulate the common pdf file format and make our geospatial data useful. This presentation will display and describe some creative products that make use of multispectral data, map data and imagery.

Future Development: Our company is continuing to partner with TerraGo Technologies in their ongoing work to use the 3D feature in Adobe Reader. With this capability, a user will be able to geo-reference three dimensional information (LiDAR, DEMs, DSMs, etc) in the pdf format.

ASSESSING THE DATA: NEW SOURCES AND HOW THEY ARE EVALUATED AT THE USGS EROS

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More and more new sources of remotely sensed data are becoming available each year. How do the data from these new systems measure up? How accurate are they? Can I use them in my applications? These and other questions are answered by the Remote Sensing Technologies Program at the USGS EROS. This presentation will discuss how data are evaluated, how the results are made known, and opportunities for partnering in these evaluations.

COMMERCIAL REMOTELY SENSED DATA AVAILABLE FOR FEDERAL USERS AND PARTNERS: SUPPORTING THE COMMERCIAL REMOTE SENSING SPACE POLICY (CRSSP)

Linda Jonescheit

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The USGS, in support of the president's Commercial Remote Sensing Space Policy, works to make commercial remotely sensed data available to Federal users and partners. These data include commercial imagery sources such as SPOT, IKONOS, GeoEye, QuickBird, WorldView and more. This presentation will discuss this USGS program and how to access existing data and request additional data collections.

AN EVENT-DRIVEN PHENOLOGY MODEL

Valeriy Kovalskyy
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Phenology of vegetated land surface has been increasingly used for diagnosis and prognosis of climate change consequences. At this point in time prescriptive and descriptive phenology models stand far apart in their approaches to the subject. We report on exploratory attempt to build phenology model based on new event driven approach that has both diagnostic and prognostic capabilities in the same framework. The new Event-Driven Phenology Model (EDPM) is capable of simulating land surface phenology and seasonal vegetation dynamics based on assimilation of weather data and operational land surface observations. The model enables phenologies to unfold in response to changing environmental conditions and disturbance events. It also has the ability to ingest contemporaneous discrete external records of land surface dynamics to adjust its output to achieve a better representation of the observed process. We describe the model and report results of initial testing of the EDPM using level 1 flux tower records from the Mead, Nebraska and Bondville, Illinois. In relation to ground records, the predictions by the EDPM show good agreement

(RMSE <0.08, r2>0.8) for two crop types during several growing seasons on different locations. The talk discusses prospects for future use of descriptive and prescriptive EDPM capabilities in the work of climate models, production of continuous remote sensing records, and other scientific applications.

ENTERING A NEW LANDSAT ERA: ENABLING GLOBAL STUDIES OF ENVIRONMENTAL CHANGE

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Landsat data have been acquired continuously over the global land surface since July 1972 creating an unprecedented comprehensive record of landscape dynamics. The Landsat data policy was recently revolutionized by a U.S. Geological Survey (USGS) decision to distribute Landsat digital images at no cost to those requesting data from its Landsat archive. The USGS has since distributed over a million Landsat scenes in less than a year in comparison to a previous annual distribution record of 25,000 scenes. This data policy has initiated a revolution that is enabling larger-scale and longer-term studies of land cover and land use change.

LIDAR RESEARCH AND APPLICATIONS

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This presentation will provide an introduction and overview to Light Detection and Ranging (LIDAR) technology. We will explore the system components, differences between small footprint discrete return lidar and continuous waveform large footprint systems. We will overview how the system operates, how systems can vary, what LIDAR data looks like, and how we go about processing small footprint LIDAR data. Focus will be on specific technical issues and lessons learned by users processing, analyzing, visualizing and distributing lidar data sets. New tools and techniques being used specifically at the U.S. Geologic Survey EROS will be discussed in detail. We will discuss not only how LIDAR is being used for bare earth DEM generation, but how we can extract vertical vegetation and structural information from the resultant LIDAR returns.

SOLAR AND WIND ENERGY RESOURCES ASSESSMENT (SWERA) PROJECT

Eric Wood

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The talk will highlight improved access to, and understanding of, information relevant to solar and wind energy project development through high-resolution maps of solar and wind energy resources.

POSTER SESSION – ASPRS UPPER MIDWEST CHAPTER STUDENTS

ASSESSING CHANGES AT THE GRASSLAND DESTABILIZATION EXPERIMENT IN THE NEBRASKA SANDHILLS FROM 2006 TO 2009 USING IMAGING SPECTROSCOPY

Benjamin Helder and Geoffrey Henebry

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Over 30% of the High Plains Aquifer lies under the 58,000km^2 of the Nebraska Sandhills. The stability of this aquifer has ramifications for neighboring states. The NSF Sandhills Biocomplexity Project was initiated to study how the interactions of sand, grass, and water in the region contribute to the stability of the largest dunefield in the Western Hemisphere. The Grassland Destabilization Experiment (GDEX) is a landscape level manipulative experiment initiated in 2004 to evaluate the surface changes following
the loss of stabilizing vegetation. GDEX features five treatments allocated among ten plots of 120 m in diameter (1.13 ha). Aggressive Bare Sand protocol included chemical defoliation and subsequent shallow disking and raking in 2004 to devegetate the plot with periodic physical disturbance to maintain bare sand. Long Term Disturbance (Press) protocol includes an initial chemical defoliation in 2005 and seasonal reapplications but no physical disturbance. Short Term Disturbance (Pulse) treatment had chemical defoliation only in 2005. There are two sets of controls: Ungrazed and Grazed. Eight treatment plots located contiguously within a fence are the focus of our investigation: Ungrazed Control, Pulse, Press, and Bare Sand. Erosion pin networks were established in each plot to track net (gain-loss) sand movement. Remote sensing data were acquired using the AISA Eagle imaging spectrometer in 2004 through 2009. The 2005 image was omitted from our analysis due to data quality issues. We tracked the spread of bare sand within and outside of the treatment plots by thresholding the upper range of values in the red portion of the spectrum (662-671 nm). Red light is strongly absorbed by green vegetation for photosynthesis but strongly reflected by bare sand; thus, increasing red reflectance indicates increasingly less vegetation. The average reflectance for 662-671 nm at the erosion pin locations increased in press and bare sand treatments from 0.23 in 2006 to 0.32 in 2009; it decreased over the same period in pulse treatments from 0.13 to 0.10 and in controls from 0.11 to 0.06. Increases in the areal extent of bare sand in the neighborhood of the plots between 2006 and 2009 were an average of 6400 m^2 for press treatments and 1900 m^2 for bare sand treatments. Four years elapsed before sustained sand mobilization occurred. We expect sand in the bare sand and press treatments tocontinue to move as long as experimental treatments are maintained.

STANDARDIZING MAPPING OF GROUNDWATER VULNERABILITY FACTORS USING NATIONAL AND STATE-LEVEL GEOSPATIAL DATABASES

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Groundwater is the principal source of drinking water for nearly two billion people. Mapping groundwater vulnerability is critical for implementing programs to protect groundwater quality. GIS-based models such as DRASTIC are often used for assessing risks of groundwater pollution. Such models typically involve weighted linear combination of factor maps (e.g. depth-to-water, soils, aquifer properties, and recharge), the classes of which are subjectively "rated" before combination. Methods for standardizing the preparation of factor maps required for assessing groundwater vulnerability using the DRASTIC model are evaluated in a case study of the Elkhorn River Basin in Nebraska. The approach employs only data that are widely available from national or state sources (e.g., water-level monitoring data, geologic test holes, soils), thus ensuring that the methods can be readily extended to other sites. Data extraction is carried out using simple web and database queries. Subsequently, factor maps are generated using statistical and geostatistical techniques that reduce subjectivity in the assignment of weightings and ratings to factors. A groundwater vulnerability map generated for the Elkhorn River basin shows that the upper basin has higher vulnerability than the lower part, a trend generally reflected by observed groundwater quality data.

ASSESSING CATASTROPHIC WILDFIRE RISK IN CALIFORNIA

Brad Stricherz

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Although, there is a risk of wildfires all across the United States, no state has a greater risk than California. California's topography, vegetation, and climate increases fire risk. Wildfires spread faster through dry fuels, up slopes, and in the direction of wind. Wildfires that start in areas of these conditions spread quickly and burn intensely; they threaten lives, cause economic damage, and can have adverse ecological effects such as increase in soil erosion and flooding. As California becomes more populated, urban sprawl causes more people to live in hazardous areas. Individuals seeking peace and quiet are settling into forested areas proliferating the expansion of wildland urban interface. Climate change also adds to fire risk by increasing the intensity of natural disasters, such as drought. It is important to be able to identify areas at risk before a wildfire occurs. The geographic variables of fuels, slope, and wind speed strongly shape fire behavior, severity, and spread. Using a geographical information system to combine these variables creates a simple and easy to understand map of areas at risk After identifying areas at risk, mitigation efforts such as, prescribed burning, mechanical thinning and timber harvesting can be prioritized; planners can choose areas where mitigation will be most effective. People living in areas of high risk should be aware of the situation and educated on proper vegetation management and land use.

The following six prize-winning posters from the ASPRS-St. Louis Region Geography Awareness Week 2008 poster competition will also be displayed:

UTILIZATION OF SRTM DATA FOR FLOOD PROTECTION AND APPLYING SINMAP TO DEVELOP A LANDSLIDE POTENTIAL MAP FOR THE CANLE RIVER

Anh Nguyen
University of Missouri at Columbia, Columbia, MO

REMOTE SENSING: THE WAVE(LENGTHS) OF THE FUTURE

Diana Pope
Northwest Missouri State University, Maryville, MO

ANIMATING STATE PROGRESSIVENESS IN GAY AND LESBIAN RIGHTS, 1961-2008

Timothy Ponce
Northwest Missouri State University, Maryville, MO

EQYPT: A CULTURAL CASE STUDY

Jill Walker
Northwest Missouri State University, Maryville, MO

GEOGRAPHY AND WEATHER: THE PHENOMENA THEY CAUSE

Jacob Meuth
University of Missouri at Columbia, Columbia, MO

RIVERS OF LIFE

Dina Roze
Northwest Missouri State University, Maryville, MO