The Weather Vane

The Newsletter of the Heartland Inventory and Monitoring Network

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News in Brief

Park abbreviations are given on page 2

Aquatic Monitoring

Progress continues on data analyses and reports for PIPE, GWCA, WICR, BUFF and OZAR.

Invertebrates — Sampling at TAPR was cancelled due to drought conditions. Staff will sample invertebrates at OZAR in November. We continue to process samples.

Fish — Fish monitoring at OZAR began in late September. Staff continue to analyze data and write reports. We published the HEHO fish report at the end of October.

Data Management

Staff are exploring new information tools for managing HTLN references stored on the IRMA Data Store web portal. Staff are working with the HTLN aquatic program to store water quality data in the NPStoret data system. The database provides a standardized template, which allows the data to be integrated into the national STORET database in Ft. Collins.

Staff have now completed three standard operating procedures that in data management for the Exotic Plant Management Team.

Exotic Plant Management Team

The EPMT completed simultaneous stints at LIBO and OZAR, using combined teams from CUVA-based staff and Conservation Corps of Iowa (CCI) at LIBO, and using WICR-based staff, OZAR fire team, and an additional CCI crew at OZAR. The combined effort involved 20 people working from September 10 to 17, 2012.

Fire Ecology

Fire Ecology continues with completing reports and data entry. In December and January, we will make our annual calls to discuss fire management plans and goals in parks for 2013.

Great Plains Fire Science Exchange — We gave introductory presentations to several

(Continued on page 4)

Monitoring Seasonal Change, Remotely

Park managers must consider seasonal change in landscape-scale conservation efforts. We call the study of seasonal patterns phenology. Annual life-cycle events initiated by environmental factors, called phenological events, occur at predictable times every year. Phenological events, such as leaf color change in autumn, first flowering in spring, and for those with allergies, start of the pollen season, capture public attention. These events can impact our daily lives, but they also provide scientists with evidence of how climate change can impact the natural cycles of plants and animals.

Scientists gather phenological observations at various scales, from plots smaller than an acre to landscapes of hundreds to thousands of acres in size. Linking these observations to evolutionary biology or climate sciences can help us to understand species and ecosystem responses to climate change.

A cooperative study between the National Park Service (NPS), the U.S. Geological Survey (USGS) and the National Aeronautics and Space Administration (NASA) has been exploring how satellite information can summarize phenological patterns observed at park or landscape scales. Affective presentation of those summaries to both park managers and visitors has become a focal point of the project.

The cooperative study specifically addressed seasonal changes in plants, including the onset of growth, photosynthesis in the spring, and autumn leaf-drop. The primary objective of the work is to demonstrate how seasonal events, even in protected places like parks, changed across years.

A major challenge is to differentiate natural variability from possible trends in ecosystem condition. Trends consist of the directional changes that can lead to a permanent and a radically different ecosystem character. Parsing the difference between background variability and trends resembles comparing weather and climate. Weather is the day-to-day variability in atmospheric conditions, while climate change is the long-term trend in weather patterns over decades or centuries.

At Tallgrass Prairie National Preserve, areas of upland prairie differ in their growing season according to the application of prescribed fire, grazing, and annual variability in precipitation.

Landscape condition trends can take the form of gradual degradation or steady improvement in conditions. We often attribute degradation in park conditions to outside stressors, while we usually attribute improvement in conditions to implementation of long-term conservation plans. In either case, we must first grasp the magnitude of natural variation so that we recognize actual trends.

This study used existing and freely available remote-sensing data, specifically the NASA-funded 250 meter spatial-resolution land-surface phenology product for North America. This product is calculated from an annual record of vegetation health observed by NASA's Moderate Resolution Im-

(Continued on page 2)

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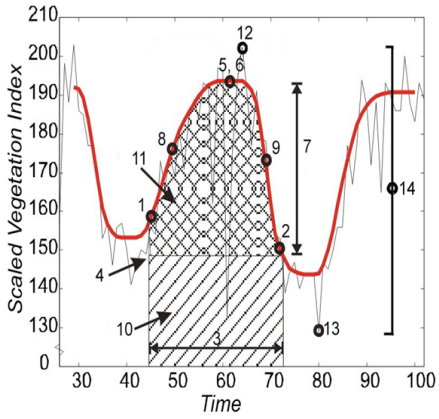
Heartland Network
Natural Resource Monitoring

(Continued from page 1)

aging Spectroradiometer (MODIS) instrument. The land surface phenology product serves as a method to summarize all the observations throughout a year into a few, key, ecologically relevant "metrics", such as the following satellite vegetation data example.

Example of time series summaries from a year of satellite vegetation data.



1. Beginning of season
2. End of season
3. Length of season
4. Base value
5. Peak time
6. Peak value
7. Amplitude
8. Left derivative
9. Right derivative
10. Integral over season - absolute
11. Integral over season - scaled
12. Maximum value
13. Minimum value
14. Mean value

Based on Jonsson and Eklund, 2004. "TIMESAT - a program for analyzing time-series of satellite sensor data", Computers & Geosciences 30:833-845, 2004.

Even though NASA produces the MODIS phenology product for all of North America, in order for park managers to use information or incorporate it into interpretive material they must summarize it graphically. The USGS Fort Collins Science Center have prepared data and graphics for several parks within the Great Plains. All three agencies are working on a formal agreement to expand work beyond these pilot parks.

Ecologists and park natural resource managers interested in linking phenology and climate will have access to products through the NPScape program website. The NPScape software uses landscape-dynamics monitoring to provide landscape-level data, tools, and evaluations for resource management, planning, and interpretation. Parks could associate GIS (Geographical Information System) data products with datasets to analyze seasonal changes, such as length of growing season. Park interpretive staff could use phenology maps to support discussions of seasonal changes in plant communities with visitors.

The NPScape site will provide links to metrics, products, and methods from this study. The land-surface phenology methods remain consistent with I&M protocols, and will permit managers to use data visualization tools (The Weather Vane, volume 8, number 5) to efficiently generate new customized products.

Visual inspection of the composite data (see bar graph, below) can assess variability in the vegetation growing season within and among park units. Each horizontal bar in the graphic represents a single year, arranged by reporting year (2000 - 2008). The graph presents six different phenological metrics for two park units, Tallgrass Prairie National Preserve in Kansas (TAPR) and Lake Meredith National Recreation Area in Texas (LAMR). The composite graphics characterize individual growing seasons and allow comparisons of multiple years for a single park unit and growing season or of variability among park units.

Phenology metrics can be displayed for a single year, an average across multiple years, or departures from average for the park unit. The map on the next page displays the average length of the growing season over a nine year period in and around Wind Cave National Park, South Dakota (WICA). Instead of comparing the temporal variability in growing season, this type of map is used to display the spatial variability of the growing season within a park.

We can only imagine the uses for these methods that combine various metrics to display trends and variability. If a picture is worth a thousand words, then phenological products will go a long way towards showing scientists, park managers, and the public the effects of climate change on our public resources.

— Kevin James & Sherry Middlemis-Brown

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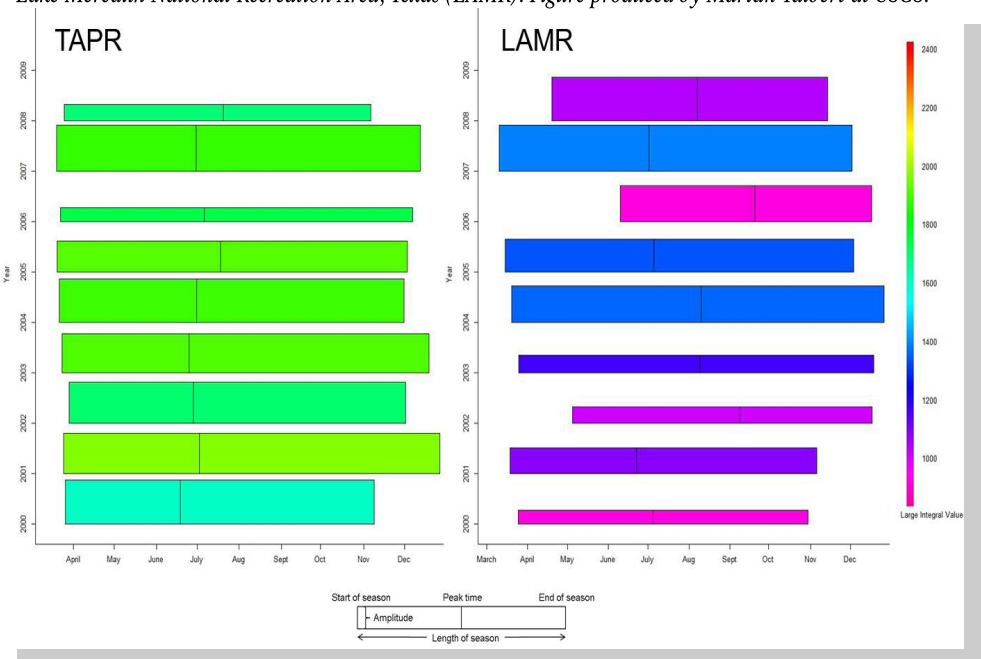
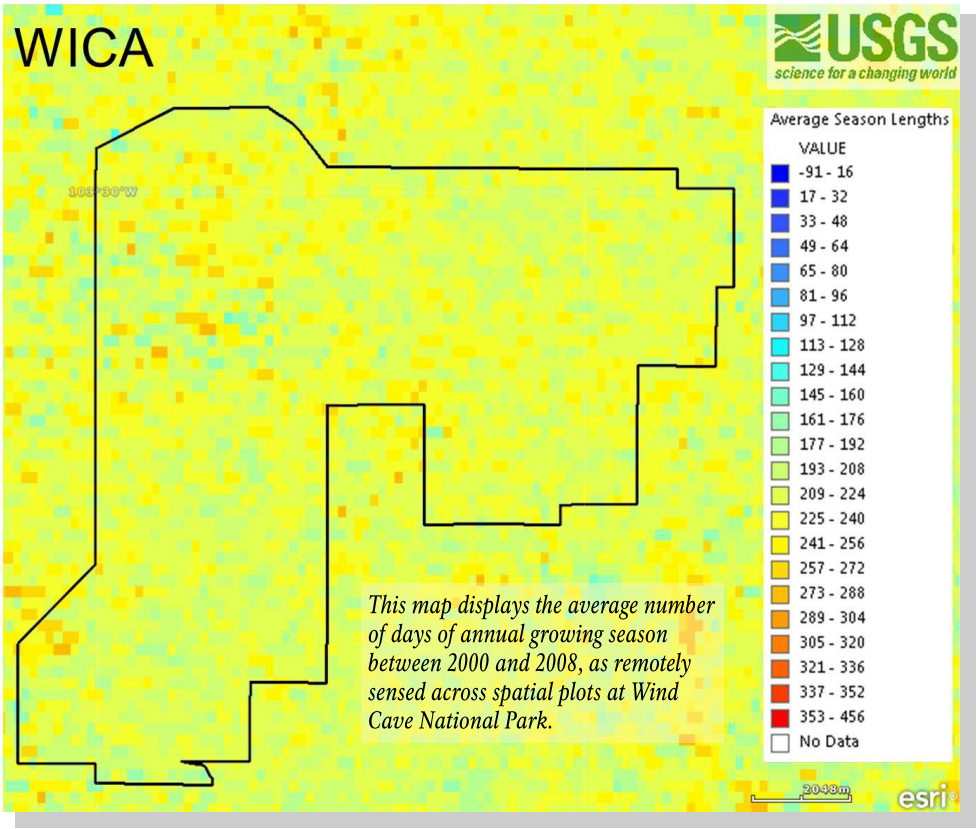
Phenological products using composite data for Tallgrass Prairie National Preserve, Kansas (TAPR) and Lake Meredith National Recreation Area, Texas (LAMR). Figure produced by Marian Talbert at USGS.





This map displays the average number of days of annual growing season between 2000 and 2008, as remotely sensed across spatial plots at Wind Cave National Park.

Landscape-scale Conservation, Something New?

Landscape-scale conservation has become an important concept in addressing the challenges of broad environmental threats, such as climate change, that extend over entire parks and even range beyond park boundaries. Instead of being a localized approach to conservation, landscape conservation works holistically by considering the broad expanse of the resource area, the values associated with the resources, and the benefits and costs of managing the environment. Instead of "preservation at any cost" for each constituent of the environment within parks, it considers resource integrity and values on a large-scale. Outside of parks, the term has come to equate resource values with the local economy for agriculture, tourism, recreation, and other benefits to both the environment and people.

Pea Ridge's Holistic Approach, the Right Approach to Planning and Implementation

Pea Ridge National Military Park (PERI) has embarked on a holistic approach to manage public trust resources. The park is combining all aspects of vegetation management and maintenance (fire, exotic plant, cultural landscape) into a parkwide resource program that crosses traditional barriers between divisions. This process of integrating park administration does not stop with the park's on-the-ground actions. It also breaks down park boundaries to engage public institutions in participating in planning and implementing park actions.

The first phase of the holistic approach proposes assimilating maintenance of historic resources into resource management. This sets the stage for aligning objectives for cultural and natural resources, blurring boundaries between the divisions to integrate resource management. This allows combining of resources to attain common objectives.

The next phase is to write a vegetation management plan that joins cultural landscape management with ecological stewardship. The integration of resource management is incomplete without consideration of interpretation. The park has completed a Comprehensive Interpretive Plan. The plan says that interpretation must receive the support of a landscape that reflects the views available during the historic Civil War battle. The late Dr. Robert Weih from University of Arkansas, provided the primary source of historical landscape information associated with the time of the battle (Weih and Eads 2007, unpublished) in landscape maps. With this understanding, the resource managers will propose locations for placement of fields and forest. The alternatives for the vegetation management plan use this vegetation structure and will consider three ways of managing those established areas.

In order to manage land under any alternative, the park must know what resources are located on the landscape. This is the purpose of the inventory portion of the Inventory and Monitoring Program (I&M), but investigation can go beyond I&M limitations. Therefore, the park has completed its first Bio-blitz, using University of Arkansas professors and graduate students, the public, and a dedicated group of Boys & Girls Clubs of America members to inventory visible plants and animals. This first Bio-blitz focused on the main loop road through the park, surveying different vegetation types. Kevin Eads, Nolan Moore, and Curtis Tilghman led the efforts with approximately 20 professors and graduate students heading small groups of young investigators. From slime mold, scat, and insects to

Boys & Girls Clubs of America participated in the Bio-Blitz on October 20, 2012.

Partnerships with University of Arizona, Northwest Arkansas Community College, and local organizations bring volunteers that use the park as a learning center, while providing service to conserve public-trust resources.

birds, mammals, and trees, kids had a great time discovering the outdoors.

The park has also begun an extensive small mammal study to help managers incorporate best practices in vegetation management that will conserve mammals and enhance their habitat. A two-year study of glades has already identified historic trees that stood sentry at the time of the historic battle. These trees will play an important role in reestablishing the historic landscape. These efforts, the Cultural Landscape Inventory (2012), the expected Cultural Landscape Report, and the HTLN inventory maps will guide specific actions in vegetation management.

The park will coordinate assistance from several sources in designing alternatives and in implementing actions. The HTLN Exotic Plant Management Team, the NPS fire program, and external partners, such as the University of Arkansas, have worked with the park in the past and will continue to do so for this planning process.

A very intriguing partnership has developed between the park and the Boys & Girls Clubs of America. Three-hundred youth, ages 13-18, contributed over 7,000 hours of work on nine occasions this past year, working on trails, exotic species, fences, and planting trees. They are expected to come nine more times before an early spring celebratory campout with ranger programs and activities on March 9-10. This fall and winter, the boys and girls are potting tree seedlings, which they intend to plant next fall in accordance with the historical vegetation maps. With the 2013 club theme revolving around wildlife and vegetation, the park will include the boys and girls as stakeholders in the Environmental Assessment for the vegetation management plan.

Additionally, Northwest Arkansas Community College has collaborated with the park to train students in fire science. The students receive training at the park and work with staff on preparing and executing prescribed fires. Nolan Moore from the park spearheaded this partnership with Jeff Sprout at the community college.

Holistic approaches and partnerships are the key to not only planning the park landscape, but to implementing the plan. The next decade may see many changes in the Pea Ridge battlefield landscape with the involvement of many stakeholders.

— Sherry Middlemis-Brown

WARNING, GIS Users

The HTLN currently uses ArcGIS version 10.1. Some spatial files created in this new version may not work in older GIS software versions.

Abbreviations

NPS = *National Park Service*
ARPO = *Arkansas Post National Memorial*
BUFF = *Buffalo National River*
CUVA = *Cuyahoga Valley National Park*
EFMO = *Effigy Mounds National Monument*
GWCA = *Geo. Washington Carver Nat. Mon.*
HEHO = *Herbert Hoover Nat. Historic Site*
HOME= *Homestead Nat. Mon. of America*
HOCU = *Hopewell Culture Nat. Historical Park*
HOSP = *Hot Springs National Park*
LIBO = *Lincoln Boyhood National Memorial*
OZAR = *Ozark National Scenic Riverways*
PERI = *Pea Ridge National Military Park*
PIPE = *Pipestone National Monument*
TAPR = *Tallgrass Prairie National Preserve*
WICR = *Wilson's Creek National Battlefield*

(Continued from page 1)

groups and completed a series of landowner video interviews. We are finishing up details on our website GPFireScience.org, and sent out our second newsletter (see More on the Web).

Land Cover

The land cover protocol is currently in the formal review process.

Vegetation Monitoring

Plant Community — Staff completed all data entry and verification for the 2012 field season. Data analysis is currently underway for GWCA, PERI and WICR. We prepared accuracy assessment reports on the vegetation mapping reports for GWCA, PERI and WICR.

Invasive Plant — Staff completed invasive plant monitoring reports for ARPO, EFMO, HOCU, LIBO, and OZAR. Based on these reports, crews treated several early detection species at HOCU and LIBO this year.

Wetland Monitoring

We are finishing final field work and are back to working on protocol development. We ended this field season with over 900 volunteer hours for groundwater well monitoring!

Wildlife Monitoring

Breeding Birds — Reports on this past spring's bird monitoring efforts by park staff and volunteers went out to their respective parks. Park staff and volunteers surveyed birds on 301 bird points. Our HTLN staff surveyed birds on another 203 survey points. All 11 parks in the HTLN bird monitoring efforts received some type of monitoring this past spring. Reports on HTLN bird surveying efforts at GWCA, PERI, and WICR are nearing completion.

Whitetail Deer — HTLN staff is preparing for the upcoming surveying season which will begin Jan 7 at ARPO.

More on the Web

HTLN website: http://science.nature.nps.gov/im/units/htln/index.cfm

HTLN reports: http://science.nature.nps.gov/im/units/htln/articles.cfm

Great Plains Fire Science Exchange newsletter: http://eepurl.com/poJKz

Pea Ridge National Military Park: http://www.nps.gov/peri/index.htm

Bio-blitz at PERI announcement: http://www.nps.gov/peri/parknews/bio-blitz-to-be-held-at-pea-ridge-nmp.htm