More and more today, ecologists are collecting environmental data at multiple spatial and temporal scales, exponentially increasing the amount and diversity of collected data. This trend now requires researchers to become experts not only in their chosen field, but also in GIS, database management and statistical analysis. In response to these demands, a new field of study has emerged centered on the acquisition, management and manipulation of ecological data. The term ‘Ecoinformatics’ often elicits the proverbial ‘double-take’, followed by questions of, “What does that mean?” One definition, provided by ecoinformatics.org, states that ecoinformatics is a field of research which, “...aims to produce software, systems, publications, and services that are beneficial to the ecological and environmental sciences.” As specialists in both data management and the domain science of ecology, an ecoinformaticist can be viewed as a facilitator; a person bridging the boundaries between multiple disciplines, including ecology, statistics, computer science and GIScience, to produce novel tools, approaches and workflows that maximize efficiency and efficacy in the analysis and sharing of ecological data.

To facilitate and increase the research capabilities in the environmental sciences, WyGISC, in partnership with the Program in Ecology (PIE), has expanded its research and service capabilities in ecoinformatics with establishment of a new Ecoinformatics Specialist research scientist (Continued on page 2)

**Ecoinformatics Initiative Helps Lead WyGISC into the Data Future**

**WyGISC & Conservation Districts Partner to Create SuiteWater Portal**

WyGISC and the Wyoming Association of Conservation Districts (WACD) have partnered to create the SuiteWater Portal (http://suitewater.wygisc.org) (Figure 1). The long-term goal of this collaborative effort is to create a web-based interface to integrate GIS, spatial data, textual information, photography, documents, user generated content, and other information for incorporation into the WACD watershed planning process and document development. Year one of this project focused on the creation of a public and private-side web portal, and associated data and application development.

The public site provides users with the ability to gather information on the watershed planning process from various state and federal agencies while also providing the ability to explore Wyoming watersheds spatially through an on-line mapping application. The private site was created for use exclusively by conservation district (Continued on page 3)
In fall 2010, WyGISC partnered with UW’s College of Agriculture and Natural Resource’s Agricultural Experiment Station to enable access to existing GIS data collected for the Sustainable Agricultural Research Extension Center (SAREC) with the purpose of facilitating science and management activities at the facility. Access to existing data is provided to SAREC researchers and administrators via a secure data portal on the Web. This application can aid in answering questions regarding current and historical field data as well as facilitate future field planning. The GIS database implementation and data access provided to SAREC researchers serves as a demonstration project that can be applied to other UW Research and Extension Centers in the future. Additionally, this project helps meet the goals of UP3 and WyGISC to foster and support collaborative science across a wide range of disciplinary domains. WyGISC personnel Wendy Berelson, GIS Research Scientist, (project lead); Shawn Lanning, GIS Research Scientist; and Phil Polzer, Application Developer, served as the core team for this project.

There were two primary goals for the SAREC project: 1) develop a database of all current SAREC GIS Data; and 2) develop a web application for SAREC researchers and administrators to access, explore, and perform basic query analyses of the data. The first part of the project was a multi-step process that included obtaining all the data collected over

Information about soil characteristics and past crop yield data for each field in SAREC can be queried. This information is useful for planning future studies.

There is a need to generate spatially derived metrics for use in statistical models (e.g. linear regression, logistic regression, kriging, home range analysis, etc.) aimed at answering natural resource management questions. The premise of this course is to simulate the processes and approaches commonly used by environmental researchers, beginning with data manipulation, then statistical modeling, and finishing with a written and graphical (i.e. maps) interpretation of the results. Using technology to more effectively and efficiently answer the pressing questions of our time is essential for creating a sustainable future. WyGISC is confident that by increasing the accessibility to these new techniques, tools, and software, the University of Wyoming and the associated environmental researchers will stay on the leading edge of environmental research.

Please visit http://www.uwyo.edu/wygisc/ecoinformatics_initiative/ or via any SmartPhone by scanning the QRC (right) to find out how WyGISC can help you reach your ‘data potential’.
SuiteWater gives users the ability to perform complex spatial analysis online, using built-in tools.

The application was developed using Adobe Flex and the ArcGIS API. Additionally, WyGISC developed a comprehensive help document for the application and has provided a secure login page to ensure the application is being used in accordance with SAREC's goals. Additional tasks included developing a complete metadata administration and WyGISC are underway to add further functionality to the current application, develop similar web-based applications for the other research centers in the state, and establish a maintenance agreement to ensure that the SAREC application always has current data.

Future work will build on the foundation created in the first phase of this project. Discussions between the Agriculture Experiment Station and WyGISC are underway to add further functionality to the current application, develop similar web-based applications for the other research centers in the state, and establish a maintenance agreement to ensure that the SAREC application always has current data.

For more information on this project, please contact Teal Wyckoff (wyckoff@uwyo.edu) and Jim Oakleaf (joakleaf@uwyo.edu) at WyGISC; Cathy Rosenthal (crosenthal@tribcsp.com) at WACD; or Nephi Cole (nephi.cole@wy.usda.gov) at the Natural Resource Conservation Service. The public is also encouraged to contact their local conservation district to learn more about how this technology will be implemented within their district.
Development and Stewardship of the National Hydrography Dataset

In 2001, WyGISC initiated a collaborative effort between the Bureau of Land Management (BLM), United States Geological Survey (USGS), and the United States Forest Service (USFS), to create a high-resolution, 1:24,000-scale National Hydrography Dataset (NHD) for the state of Wyoming. The NHD is the national standard in spatial hydrography – points, lines, and polygons representing streams, rivers, lakes, reservoirs, and other water features in a GIS database. The high-resolution NHD for all subbasins affecting Wyoming was completed in March, 2007.

The NHD provides a nationally consistent framework assigning “reach” (stream) addresses to any water-related information such as industrial discharges, drinking water supplies, fish habitat areas, etc. NHD can be linked to reach addresses by one organization (national, state, local) and shared with other organizations.

Benefits of State NHD Stewardship / Maintenance:

Error Correction for:
- missing, nonexistent, and misnamed features
- disconnected linear features
- network flow and routing (streams & canals)
- Watershed Boundary Dataset (WBD)/NHD alignment

Addition of features, including:
- gaging stations, water quality sampling sites
- ditches/canals/dams/diversion structures
- associated attributes

Revisions:
- refined accuracy of streams, water bodies, and point features using the most current National Agriculture Imagery Program (NAIP) imagery and Light Detection and Ranging (LIDAR) imagery

Both the 1:24,000 scale NHD and WBD were delineated using the older Digital Raster Graphic (DRG) maps (on left). When overlaid onto the more accurate and current National Agriculture Imagery Program (NAIP) (shown below) the NHD and WBD is very usable but these data can also be enhanced as source data improves.

Picture credits: Pat Madsen
The National Hydrography Dataset is a seamless, multi-scale (1:100,000 & 1:24,000) set of spatial data containing all surface water features that appear on USGS 7.5 minute topographic maps with associated attribute information for as many as 52 hydrographic feature types. NHD surface water features such as lakes, ponds, streams, rivers, springs and wells can be easily linked with other water-related data. These linkages can facilitate the analysis and display of these water-related data throughout the NHD water drainage network. Other applications, such as map making, geocoding, up and down stream flow modeling, and data maintenance for future enhancements, are supported by the NHD. The three-dimensional representation of the NHD within the Lower Laramie sub basin (10180011) and the Grayrocks Reservoir above depicts the cartographic usefulness and complexity of the NHD.

WyGISC has had a Memorandum of Understanding (MOU) with USGS to undertake the primary role as the state steward for the NHD since 2000. The success of the Wyoming NHD stewardship will depend on the establishment and support of local, state, and federal partnerships that work with geospatial hydrographic data. Under funding provided by the USGS and the BLM, WyGISC has been working to enhance our state’s NHD by correcting major Geographic Names Information System (GNIS) naming errors for Wyoming’s streams, lakes and reservoirs and by adding local and state-level point events for dams, gaging stations and major diversion structures to the dataset.

More recently, WyGISC has been creating pour (drainage) point events at the outlets of all Wyoming Watershed Boundary Dataset (WBD) hydrologic units which will be used for additional modeling applications. The pour point features will be created using the most current color aerial imagery available to help account for any natural or man-made changes to stream direction and drainage. The pour point creation process will also involve analyses used to help WyGISC determine the extent of any vertical alignment issues between the NHD and WBD; the results of which will greatly benefit future stewardship efforts for both the NHD and the WBD, and will help to improve the recent integration of the two highly important datasets.
WyGISC participates in Pathfinder Wind Community Ranches Conservation

Pathfinder Wind Community Ranches is a privately held association of five ranches totaling 290,000 acres of deeded and leased lands in Carbon and Natrona counties. Major activities on the properties include wind energy development and mitigation sites on partner ranches. In 2010, the Pathfinder group established a conservation team to assist the landowners with habitat, wildlife, livestock, and cultural resources management of the partner ranches in the light of proposed wind energy development activities. As part of this team, WyGISC performed an Inventory Assistance and Suitability Mapping Project for the Pathfinder ranches.

Eli Rodemaker, Remote Sensing Scientist at WyGISC lead the vegetation habitat mapping for the conservation team, which included conducting extensive vegetation sampling surveys of the ranches. Members of the Pathfinder Wind Community Ranches Conservation Team (right) toured the ranches with the Wyoming Game and Fish Department’s regional habitat biologist and a grazing management specialist from Colorado State University. From left to right are Dr. Ed Vasquez (Wyoming Wildlife Consultants, LLC), Raymond Ansotegui (KC Harvey Environmental, LLC), Dave Lockman (Wildlife Management Services of the Rockies, LLC), Carrie Dobie (Lander Region Terrestrial Habitat Biologist for the Wyoming Game and Fish Department), Dusty Lockman (KC Harvey Environmental, LLC), and Dr. Roy Roath (Extension Range Specialist, Cooperative Extension Colorado State University).

Using the field data, WyGISC completed an initial habitat or land cover map of the Pathfinder ranches. Map production involved the development of a predictive, spatially explicit model using statistical analyses of explanatory environmental and remotely sensed variables.

Inventory and mapping efforts resulting from this study provide land managers with baseline data quantifying the current ecological conditions on Pathfinder Ranches. Classified field data and map products describe the floristic composition of plant communities, contribute to an assessment of the status and viability of native vegetation, and delineate corresponding patch sizes and locations. The land cover map may be used to inform and guide management efforts geared towards maintaining rangeland productivity and the quality of wildlife habitat, and will provide quantitative baseline data for the evaluation of future ecosystem changes attributed to land use, restoration prescriptions, or climate variation. Photographs and map courtesy: Eli Rodemaker.

Arne Buechling (WyGISC Staff Vegetation Ecologist) collects cover type sample information early in the growing season.

Survey results showing relevé plot locations within the Pathfinder study area.
ESRI Virtual Campus offers **FREE GIS** courses for **UW students, staff and faculty**. There are more than 25 online courses that you can complete at your pace. Courses cover introductory materials to advanced database management. At the end of successful completion of each course, users can print an ESRI course completion certificate, which is recognized in the geospatial industry. Non-UW users can enroll in these courses through www.esri.com. For further details about Virtual Campus courses call (307) 766-2770, email wygisc-education@uwyo.edu or visit the Education & Outreach section in http://vc.wygisc.org/

**Spring 2011 All Things Geography Speaker Series**

WyGISC and the UW Department of Geography jointly hosted the spring 2011 All Things Geography speaker series. Talks covered topics such as spatial visualization and planning tools, human impact on the environment, advanced spatial analyses, and historical perspectives. Two talks were held at the Agriculture Auditorium in order to accommodate the large audience.

01/21/11: “Who Murdered the Gorillas?” Mark Jenkins, National Geographic Correspondent.

01/28/11: “The Aral Sea Catastrophe: Is the Disaster Irreversible?” Dr. Alexandre Latchininsky, RENEWABLE RESOURCES

02/04/11: “Laramie’s Railroad Legacy” Dr. Larry Ostresh, Professor Emeritus, GEOGRAPHY


02/18/11: “Reko Diq Geoarcheological Reconnaissance Chagai District, West Pakistan.” Michael McFaul, Principal Geoarcheologist & President, LARAMIE SOILS SERVICE INC.

02/25/11: “The Case for Adaptive Interaction for 3D Visualizations.” Dr. Amy Ulinski, Assistant Professor, COMPUTER SCIENCE


04/01/11: “The cultural ecology of the “Trueque Chilote”, potato-wood barter trade routes, in the Chiloé Region of Chile.” Richard Vercoe, Graduate Student, GEOGRAPHY

04/29/11: “Holocene records of climate from lake carbonate d18O in the Central Rocky Mountains.” Lesleigh Anderson, U.S. GEOLOGICAL SURVEY, Denver
Mission Statement

WyGISC’s mission is to advance geographic information science (GisCi) at the University of Wyoming and its application across the State of Wyoming, Rocky Mountain Region and beyond. We accomplish this through research and application development in place-based decision-making and Web-based access to geospatial data and mapping applications. The Center’s education, training, and information and technology transfer activities support the adoption and use of geospatial data and information technologies among a variety of users in academia, government, business, and our local communities.

Giving to WyGISC

Gifts to WyGISC enhance our programs by providing support for outreach and educational materials, scholarships, and student and academic staff development. If interested, please contact us at wygisc@uwyo.edu. You can also make a contribution online through the UW Foundation at https://uwsecureweb.uwyo.edu/GIVEONLINE/. Be sure to indicate that your gift is to be made to the Wyoming Geographic Information Science Center under further instructions about your gift of giving online form. Thank you for your valuable support.