

Webmapping for the *Special Habitats of Tennessee* NGSEF project

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Carson-Newman College, the Southern Appalachian Information Node of the National Biological Information Infrastructure, the Tennessee Environmental Education Association, the Tennessee Geographic Alliance, and other partners are developing Tennessee's first statewide K-12 program to integrate social study and science standards. Students will engage in age-appropriate, cross-curricular, standards-based activities to promote appreciation, enhancement, and stewardship of special habitats. These may include backyard and schoolyard habitats, parks and natural areas, and other terrestrial and aquatic ecosystems within the state. The activities will be facilitated by teachers who have received special training through the project. Students will share and display local data, access and interactively explore local and regional data from a variety of sources, and apply geographic inquiry skills to search for patterns in data related to real-world questions. The project is supported by a Grosvenor Grant of the National Geographic Society Education Foundation.

Using Geography to Integrate Science and Technology Education

The Special Habitats project creates professional development opportunities, tools, and support for teachers to increase their "skills for teaching about the interdependence of society and the biosphere," as called for by the Biodiversity and Ecosystems Panel of the President's Committee of Advisors on Science and Technology (PCAST 1998).

By making local habitats the focal points for teaching scientific observation and inquiry, the project will raise the students' and community's awareness and understanding of the workings of the ecosystems within which they live. We hope that the project will lay a foundation for future generations to be responsible stewards of their community's biodiversity and ecosystem services.

Initially, the project focuses on grades 4-6 in Tennessee, but we expect to include additional grades and other states in the coming years. The Special Habitats project leverages the existing data discovery capabilities of the National Biological Information Infrastructure (NBII). And, it contributes to the further development of the Sustainable Communities Participation Toolkit of the Southern Appalachian Information Node (NBII-SAIN).

The Special Habitats project

- emphasizes the organization and presentation of content most appropriate for its target audiences,
- engages students in activities that foster the development of a strong sense of place and a good understanding of basic geographic concepts
- develops tools that improve the efficiency and effectiveness of the users' interaction with biological data and information, and
- seeks a better understanding of educator and student needs through interactive feedback mechanisms and careful evaluation of outcomes.

The project also will

- test data collection, mapping and information synthesis technologies appropriate for student environmental monitoring projects
- explore the usefulness of collaboration services and visualization tools in geography, biology, and social sciences education

- engage educators in participatory analysis, design, and evaluation of the toolkit
- encourage the adoption of new technologies and methodologies in science education, and evaluate their impact on student achievement.

First-Year Objectives

1. Create a Special Habitats of Tennessee website that is highly interactive and innovative.
2. Use age-appropriate map-making and map-use activities and monthly activities involving online collaboration to promote sharing of information among participating schools across the state and provide a basis (at higher grade levels) for decision-making regarding local and regional issues.
3. Address and better integrate standards for science education in geography, biology, and other disciplines with the development of computer skills.
4. Create a network of trained Key Leader teachers and facilitators.
5. Get several hundred classes to adopt and register a habitat by the end of the 2nd semester.
6. Establish species diversity, habitat diversity, interactions, interdependence, and sustainability as recurring themes at all grade levels.
7. Document toolkit modules and their effective use. Prepare them for technology transfer to similar projects in other states and regions.
8. Evaluate the effectiveness of the tools and of the project overall in improving student test scores.

Approach and Methods

To support innovation in professional development of K-12 geography teachers, Carson-Newman organized a series of workshops to train at least 72 educators, including classroom teachers as well as environmental educators (formal and non-formal), by the end of the second semester of the project. A facilitator training workshop was held for 18 regional facilitators, each of whom is assigned to mentor four Key Leader teachers, each of whom will mentor three colleagues. The trained facilitators and Key Leaders provide a basis for expanded involvement of additional teachers, schools, and grade levels in subsequent years. All curriculum materials developed in support of the project will be available for download from SAIN's Special Habitats website <http://specialhabitats.net/>.

SAIN's primary role in the project is to provide the students and teachers with Web-based tools to explore how real-world biological and geographic issues in their communities relate to each other and to their regional, national, and global context. These tools are based on SAIN's existing portfolio of toolkit capabilities and implementation examples. They will include easy-to-use applications for interactive entry and automated partial validation of biological and ecological monitoring data; user-and-task-centric map interfaces; and mapviewers enhanced for geospatial data mining and analysis.

Although an important component of this pilot project is provision of Tennessee-specific information for teachers and students, the inquiry protocols and the data access methodology will be replicable in other states. Because the Sustainable Communities Participation Toolkit is based on OpenGIS and other platform-independent interoperability standards, it will be easy to transfer and implement for similar projects in other areas. Most of the toolkit modules to be developed for this project also will be reusable and/or adaptable to a variety of future projects.

Distinguishing Characteristics

Our project will combine a set of characteristics that will make it uniquely suitable for place-based biodiversity education with a strong stewardship component. We will

- promote the adoption of natural habitats in local communities
- facilitate data sharing and collaborative data analysis
- demonstrate the value of standardized protocols for data collection and sharing
- make all data contributed by participating classes accessible through online GIS tools and database querying capabilities

- provide tools targeted specifically for direct use by students
- allow younger students to use a simplified interface to access the power of GIS technology, while older students will have more sophisticated access options
- encourage exploration of biogeographic and other spatial patterns related to habitat suitability and sustainability
- exemplify the importance of good documentation (metadata) to enhance the discoverability, usability, and value of datasets
- focus on regional data, including data not accessible through other educational websites, such as Surf Your Watershed or GLOBE
- promote application of environmental and spatial information to problem-solving and long-term planning for locally important issues
- emphasize the development of a geographic perspective on conservation issues
- include a skills assessment that will provide feedback to both teachers and project directors on students' progress toward mastery of geographic skills
- use a statewide network of teachers trained to gather evaluation data
- assess whether the project improves student scores on state-mandated tests

Project Infrastructure

In 2000, the Southern Appalachian Man and the Biosphere (SAMAB) program partnered with the University of Tennessee SunSITE to build the South East Regional Information System (SERIS). In 2002 the National Biological Information Infrastructure chose SERIS as the platform for its Southern Appalachian Information Node. SERIS/SAIN is hosted by the University of Tennessee SunSITE on a cluster of SunFire servers. Major software used by SERIS includes Apache 2, Tomcat 5.5, ArcIMS 9, ArcSDE 9, Oracle 9i, and Oracle 10g.

SAIN started the Sustainable Communities Participation Toolkit project in 2003 with the goal of developing a flexible, extensible, and scalable set of software modules for building highly interactive, geospatially enabled Internet services and websites.

An interesting and challenging opportunity to codevelop, prototype, and demonstrate the first modules of the toolkit arose when RiverLink issued an RFP to build a French Broad River Watershed educational website and webmap. See <http://seris.info/RiverLink/>.

Limited funding in 2004 allowed several enhancements to the toolkit and the use of a some modules in the construction of the *Oriental Bittersweet Distribution in Western North Carolina* mapviewer <http://seris.info/ArcIMS/OBWNC/>. Toolkit modules also were used to create the *Southern Appalachian Volunteer Environmental Monitoring* mapviewer <http://seris.info/ArcIMS/SAVEM/> and interactive map-maker applications for several NBII projects.

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