7. ENVIRONMENTAL EDUCATION

THE NEED of students to understand the natural world they will inherit in a time of daunting environmental challenges.

Tennessee's rich environments and biodiversity represent valuable assets for teaching students to appreciate nature while improving academic performance. The comparative advantages of using the local environment as a framework and focus for learning in all subject areas is well established.

A 1998 study by the Pew Center, for example, looked at 40 schools nationwide that had adopted a teaching model called Environment as an Integrating Concept (EIC). The study concluded:

"Evidence gathered from this study indicates that students learn more effectively within an environment-based context than within a traditional framework. By providing a comprehensive educational framework instead of traditional compartmentalized approaches, EIC appears to significantly improve student performance in reading, math, science and social studies and enriches the overall school experience."

Fourteen schools in the same study conducted comparative analyses of test data from both EIC and traditional students. These studies found that "92% of these comparisons indicate that students who have been in EIC programs academically outperform their peers in traditional programs."

That this kind of model has advantages should come as no surprise. It is a well established principle of effective teaching that students are more engaged when offered opportunities for hands-on learning, and

the level of engagement is the single most significant factor in student performance in any subject. The EIC model builds on this principle, using several interrelated components:

- **Local Context.** Following a place-based model, use local natural and community surroundings as a context for standards-based instruction.
- **Natural and Social Systems.** Develop students' understanding of natural systems, of social systems and their community's cultural characteristics, and of interrelationships and interactions among natural and social systems.
- **Hands-on Learning.** Use direct student interaction with natural and social systems to provide grater personal engagement with the learning process.
- **Integrated, Interdisciplinary Instruction.** Work across traditional disciplinary boundaries to develop comprehensive understanding of natural and social systems. The real-world interdependence of these systems makes them an ideal vehicle for integrated, cross-curricular instruction.
- **Community-based Investigations.** Provide students with opportunities to investigate real-world community problems and issues and to use higher-level thinking and creative problem-solving skills in pursuit of authentic issues of personal interest to them.
- **Service-Learning.** Create a continuum of learning and long-term engagement that crosses grade levels and allows students to conduct multi-year research and service-learning projects that contribute to their community.

EIC and other environment-related models appear to show potential for improving student performance in Tennessee, and there is strong public support for implementing the concept. The 2009 TRAB Survey found that 86% of Tennesseans somewhat or strongly support a proposition that Tennessee's teaching standards should

include the use of outdoor nature education to learn math, science, reading and writing. Likewise, 92% of respondents to this plan's online survey expressed the highest level of support for environmental education of young people.

Use of the environment in teaching could provide benefits that Tennessee's students clearly need. While standardized test scores have continued to show improvement in the state over the past nine years, in 2009 Tennessee still ranks 37th among states for overall educational performance. A spokesperson for the Tennessee Department of Education acknowledged the disparity, saying "Tennessee students need to do a lot better nationally compared to their peers." In this context, Environment as an Integrating Concept deserves serious consideration.

No Child Left Inside Legislation

As this planning process was getting underway, a new opportunity in the area of environmental education was just emerging. The U.S. House of Representatives passed the No Child Left Inside Act, which authorized a total of $500 million over five years to fund environmental education for K-12 students. While the Act did not become law in the last Congress, it has been reintroduced with strong bipartisan support, and enactment could occur by 2011. Provisions of the No Child Left Inside Act are expected to apply to Tennessee as follows:

1. Federal Grants for Environmental Education

A federal grants program will provide funding to the Tennessee Department of Education (TDOE) in the range of $2 million annually for five years to fund professional development of teachers and educators and to provide outdoor learning experiences for students. Eligible partners in these programs can include TDEC, TWRA and other state natural resource management agencies; local parks and recreation departments; and nonprofit or for-profit organizations that provide outdoor environmental education experiences, such as private nature centers and zoos.

2. State Environmental Literacy Plans

To qualify for environmental education grants, TDOE will develop a K-12 plan and submit it to the U.S. Department of Education. The purpose of this plan, called a State Environmental Literacy Plan (SELP), is to ensure environmental literacy among elementary and secondary school students. It will be prepared in consultation with TDEC, TWRA and other state natural resource management agencies, with input from the public and relevant non-profit organizations. The SELP must include:

- Relevant content standards, content areas or subjects where instruction will take place.
- Description of how the plan relates to state graduation requirements.
- Description of programs for professional development of teachers to improve their environmental content knowledge, skill in teaching about environmental issues, and field-based pedagogical skills.
- Description of how TDOE will measure the environmental literacy of students.
- Description of how TDOE will implement the plan, including securing funding and other necessary support.

The TRAC committee, which guided this planning process, placed a high priority on making the most of this anticipated opportunity. It was agreed that Tennessee should adopt the EIC learning model in its Environmental Literacy Plan and that the curriculum should be place-based, with a focus on Tennessee's environment. Recognizing that the anticipated NCLI federal funding will be limited, the committee set a goal of developing an innovative approach that could serve as a national model, qualifying it for supplemental funding from private foundations and federal agencies.

The framework proposed in this plan is designed to incorporate best practices while making use of Tennessee's natural and cultural systems itself to provide an optimal learning environment.

Climate Change Legislation

As of the summer of 2009, climate change "cap and trade" bills introduced in Congress contain provisions for a percentage of auction proceeds to be applied to climate change education. This additional funding source is certainly appropriate, as climate change is an exceptionally complex, long-term problem that calls for an educated electorate. This is an issue that will confront the entire adult lives of today's students, as well as their descendants, and the more they understand its causes, the better chance they will have to reach effective solutions.

The general themes of environmental education complement the goals of climate change education, because both stress the interconnections between human and natural systems and point out the results of imbalance between the two. Thus, implementation under this second source of funding for environmental education can be easily integrated into and leveraged by the NCLI program. Congress should be encouraged to include climate change education funding in the final cap and trade legislation.

Watersheds as Teaching Tools

Tennesseans love to celebrate their relationship with the land, especially the rural countryside. They sing about it, tell stories about it, and have built a global entertainment industry around the vicissitudes of rural life. This cultural asset can serve to boost environmental learning in Tennessee by tapping into our innate sense of our state as a collection of unique places.

A strategy of environmental education content focused on Tennessee places will mesh well with TDEC's transition toward the Watershed Manage-

Watershed-based School Programs in Tennessee

Some of Tennessee's schools have already embraced the concept of integrating watershed-based service learning into their curriculum.

- **Del Rio Elementary School.** Students test local waters for dissolved oxygen and pH weekly, as well as studying stream quality through organisms present. Students have been involved in the clean-up and development of an eight-acre plot of land belonging to the school district, located across from the school. The community is working to develop this into a Nature Center.
- **Elizabethton High School Ecology Club.** The club's efforts have been concentrated on adopted watersheds of two streams: Buffalo Creek and the Doe River. Each May the club participates in the Annual Watauga River Clean-up sponsored by Trout Unlimited. After the Doe River flood in 1998, the Ecology Club helped with the clean-up. They also helped with stream bank restoration by planting trees. Club members utilize digital test kits to test for chemical parameters on a monthly basis.
- **Wolf River/WET.** Wolf River/WET Program at Germantown High School monitors the Wolf River and works with East High School (Shelby County) and Fayette-Ware High School (Fayette County) on test sites spread miles apart. The group shares data with the local rangers, conservation groups, university faculty and the public through various presentations.

ment Approach, described in this plan's initiative on **Recreational Waters**. As the department shifts its regulatory framework to the watershed as the basic unit of reference and compiles new online GIS data for each watershed, educators will have access to the same watershed data to help students in conducting local investigations. Hands-on field studies of local streams coupled with service-learning projects will help foster a sense of stewardship of the local watershed.

An excellent model for such an approach is the innovative **Meaningful Watershed Experiences** program developed by the multi-state Chesapeake Bay Compact. In this program, students use natural and social systems of their local watershed as an integrating concept for multidisciplinary learning. They choose their own issues and questions, conduct hands-on field research to answer these questions, upload their field data to an online database, follow up with student action to restore stream resources, and communicate to the public what they have learned about water quality impacts of human activities.

The Educators

Responsibility for implementing a State Environmental Literacy Plan will fall on the school districts and, ultimately, on the classroom teachers themselves. To be successful, the teachers will need to receive outside assistance in several areas:

- **Integration.** Since the environmental education approach recommended in this plan would be integrated into all subjects, teachers in disciplines not traditionally associated with nature studies will need materials and training to integrate the environmental framework into their subject areas.
- **Field Studies.** The experiential approach recommended here stresses the importance of learning environments that provide hands-on engagement. Students will need opportunities to learn from nature, not just about nature. Each school will need assistance in identifying appropriate outdoor classroom sites, ideally within walking distance, and in connecting with learning resources and interpretive specialists at nature centers and parks.
- **Interpretive Specialists.** Tennessee's existing corps

of professional interpretive specialists will be needed as partners to provide critical expert resources both to teach students and to train classroom teachers. These professionals are trained in integration of environmental subject matter into many disciplines.

A priority in developing a state environmental education program must be to streamline the process as much as possible. Already overburdened schools and teachers will not have time to evaluate individual interpretive programs or determine which potential field trip sites are appropriate for their students. Implementation of a state ELP will therefore require that all schools will have access to a well-organized, certified network of interpretive specialists with consistent, high-quality programming that directly addresses the needs of teachers and students. All the State Parks in East Tennessee have developed interpretive programs that are fully integrated with the state's curriculum frameworks in all subjects and at all grade levels. This effort will need to be expanded to include all of Tennessee's State Parks, local nature centers, and other environmental education providers.

The Tennessee Environmental Education Association (TEEA), which represents the state's network of environmental education providers, is ideally suited to assist the state in developing a high-quality SELP. The organization is a well-established resource for best practices in environmental education and interpretive program implementation. It will be critical for the SELP to be fully integrated with the TEEA network, which includes 70 parks and nature centers located in 43 counties. This is a good beginning for a statewide network but 52 counties currently lack an organized environmental education facility. One solution for filling this gap could be the Tennessee Citizen Naturalist program now being organized with support from TDEC and TWRA. Volunteers in this program could be trained to assist schools in implementing environmental education programs using locally available outdoor classroom sites.

As a first step toward implementing the State ELP, the TEEA can facilitate organizing these and other environmental education providers into an integrated network readily accessible to every school in every county of the state. These efforts, coupled with online access to teacher resources at the Tennessee Recreation One-Stop website, can result in a user-friendly turnkey solution with a simplified cost structure for Tennessee's schools.

2015 Action Plan

TDEC, TWRA, TDOE and the TEEA should form a partnership to develop a State Environmental Literacy Plan designed to:

- Use Tennessee's environment as an integrating concept for all academic disciplines at all grade levels.
- Provide hands-on experiential learning at outdoor classroom sites on each school's nearby streams and creeks and at nearby parks and nature centers.
- Use each school's local watershed and the interdependence of human and natural systems within it as the framework for a Tennessee place-based curriculum.

The TEEA, TWRA and TDEC should organize Tennessee's professional interpretive specialists into a well-organized network with a consistent, statewide program specifically designed to meet the needs of teachers in implementing the state's Environmental Literacy Plan.

Steps to implement this initiative include the following:

- TDEC and its partners will organize an Environmental Education Summit of all environmental education providers in the state. The objective will be to generate interagency collaboration, establish a formal provider network partnership, and begin work on a standardized environmental education framework based on Tennessee watersheds. The Tennessee Citizen Naturalist program should be included in this effort.
- The TEEA will seek supplemental private and government grant funding, based on Tennessee's goal of developing a national model of best practices for NCLI implementation.
- The partners will develop a Tennessee-specific watershed-based learning model that coordinates directly with the state's standards in all subjects at all grade levels and leverages TDEC's Watershed Management Approach to provide a template that can be adapted for any location or watershed in the state.
- TDOE will establish a policy that Tennessee's NCLI fund distributions shall have a local, place-based focus with a priority of contracting with Tennessee providers teaching the standardized Tennessee-specific model.
- The Tennessee Recreation One-Stop website will post geospatial and descriptive information about the state's environmental education provider network and local outdoor classroom sites to make it easy for schools, teachers, parents, and others to find these resources close to home.
- The TEEA members will train teachers to integrate the Tennessee watersheds model into their classroom teaching and to make use of nearby outdoor classroom opportunities. An online resource library at the Tennessee Recreation One-Stop will facilitate this training.

The Department of Education should seek federal funds for climate change education, if such funding becomes available under legislation currently under consideration, and should integrate this program into the State environmental Literacy Plan.

2020 Vision

Tennessee's schools will be a national model for using the interaction of local natural and human systems as an integrating concept in all subjects and all grades, with the assistance of a well-organized statewide network of professional interpretive specialists and a

comprehensive online information delivery system. This well-integrated program will increase student engagement and achieve measurable improvements in performance.

Coordination Links

Every Child Outdoors. Naturalizing local parks, play grounds, and school grounds with native plants to provide wildlife micro-habitats will increase the availability of outdoor classrooms and give students more opportunities to interact with nature on a regular basis.

Tennessee Recreation One-Stop. The website will include information on Tennessee's organized network of environmental education providers and resources, consolidated on a geospatial platform to enable schools to find nearby providers and outdoor classroom locations.

Quality Growth. Communities will be encouraged to pursue connectivity of greenways and trails, which will facilitate the ability of teachers and students to walk to local outdoor classroom sites.

Recreational Waters. Improved access to creeks and streams at local greenways and bridge crossings will provide outdoor classrooms for hands-on study of local watersheds.