Activities for the Changing Earth System: (291pp) This middle/high school curriculum contains some simple and some not-so-simple activities that teach important earth science concepts. Topics include biodiversity, sea-level rise, ozone depletion, volcanoes, global warming and others. Although many of the activities are effective, some of the instructions are difficult to follow and the publication design is weak. However, there is a wealth of global change education information in the appendices. For ordering information, contact: Earth Systems Education Program, Ohio State University, 29 W. Woodruff Ave., Columbus, OH 43210. ($19.95)

Always a River: (284 pp) This is a comprehensive K - 12 watershed education curriculum for the Ohio River, but it is applicable anywhere. Just introduce data and maps for your watershed and you've got a good curriculum package. Topics include: river ecosystems, living resources, watershed protection, waste and drinking water, economics and others. It has good curriculum design and provides a wide selection of activities. For ordering information, contact: US-EPA, Office of Research and Development, Cincinnati, Ohio 45202 or contact the specialist for copy information.

Bottle Biology: (127 pp) Mrill Ingram has taken the lowly plastic drink bottle to new heights with this informative and fun activity guide. It is useful for all grades, even college level instruction. There are detailed instructions on making living systems such as "Eco-columns, Predator/prey columns and Terra-Aqua Columns." Be sure to save all of those one and two liter bottles and get a copy of this book. For ordering information, contact: Acorn Naturalist, 17300 East 17th St., #J-236, Tustin, CA 92680 (800-422-8886) and ask for their catalog. ($15.95)

Clean Water for the Frog is a simple yet entertaining animated cartoon about the structure and function of wetlands. Designed for youth in grades K - 3, it contains an animated story featuring Lilly the Frog, interactive games, glossary and teacher’s guide. Flash animated and Power Point versions are contained in the CD. It is available from Barry Fox, Extension Specialist, 4-H Marine/Aquatic Education, Box 9081, Virginia State University, Petersburg, VA 23806 (804-524-5848) for $5.00 per copy.

Come Walk With Me on a Virtual Tour of the Forest: (50 pages) This is a middle/high school level virtual tour of pine and hardwood forests at different ages with multi-media CD and teacher’s guide. Information about the aging process, community structure and wildlife habitat is provided for each forest type. Details about harvesting and planting, riparian buffers, forest products, fire and water quality are also included. The guide is correlated to the Virginia Standards of Learning and Projects WET, WILD and Learning Tree. For ordering information, contact: Virginia Department of Forestry, 900 Natural Resources Dr., Suite 800, Charlottesville, VA 22903 (434-977-6555); $10 per copy.
**Conserve Water:** (306 pages) From the writers of Project WET, this curriculum investigates a variety of processes and issues dealing with water conservation. Topics include conservation methods, groundwater and irrigation issues, water history, water rights, interdependence among water users and producers and water resource management. A number of water resource case studies with activities are also included. For information about training, contact your state or local Project WET coordinator/facilitator.

**Cycling Back to Nature** is a series of activity guides produced by the Environmental Stewardship Office of the National 4-H Council. Titles include **Soils Alive** and **Food Production and Pesticides.** **Soils Alive** investigates many aspects of soils and soil organisms including soil formation, mineral and rock characteristics and soil pH. **Food Production and Pesticides** is a K - 12 curriculum that addresses habitat characteristics, diversity and the need/use/issues concerning pesticides. **Mud Muck and Other Wonderful Things** is an exploratory environmental education activity guide for youth 5 - 8 years of age. Children will investigate plant and animal relationships, food webs and other processes. **Going Places - Making Choices** is a middle school curriculum that helps students evaluate the environmental cost of transportation. Two additional K - 12 curricula are available, **Energizing Your Future** (energy, environment and economics) and **Field of Genes** (biotechnology). **Field of Genes** is downloadable. **On Common Ground** is a series of four activity/discussion guides for junior and high school students that stresses conflict resolution in dealing with environmental issues. Four topics are explored - water quality, recreational trails, endangered species, and wetlands. Students research topics, evaluate trends and discuss scenarios that center on environmental protection versus development or other situations. Hard copies are available from the National 4-H Supply (301-961-2973). Information about these curricula and other National 4-H Programs is available at the National 4-H Council WEB site: [http://www.fourhcouncil.edu](http://www.fourhcouncil.edu).

**Earth Matters:** (176 pp) This is one of the best curricula dealing with the "P" word - population. The activities do an excellent job of relating many of our environmental problems to the underlying cause - uncontrolled population growth. Topics include climate, population growth rates, water, deforestation, energy, food, economics and women's status. It is for high school students and can provide a foundation for effective classroom debate and discussion. This curriculum is a must for any environmental, economics or social science class. For more information, contact: Zero Population Growth, 1400 16th St. NW, Suite 320, Washington, D.C. 20036 (202-332-2200). ($19.95) A very effective video, "Population Growth", is also available. Two additional curricula are available from ZPG: **For Earth’s Sake**, an elementary version of **Earth Matters**; and **USA by the Numbers**, with activities based on US Census data.

**Energy and Society:** This interactive, Project Learning Tree educational program features Billy B, a nationally known environmental troubadour, complete
with video, CD and activity guide. Designed for students K – 8, Billy leads students through a variety of energy-related activities, songs and dances. The video leads kids through fun dances with sing-along for several songs. The activity guide helps students investigate energy sources and uses, renewable and non-renewable energy sources, changing forms of energy, transportation, fuels, and conservation. Colorful posters are also provided. For ordering information, contact your state or local Project Learning Tree coordinator/facilitator.

**Field Manual to Water Quality Monitoring:** (240 pp.) As the title implies, this book is a guide for student water quality projects. It is well written for the high school student and provides gobs of background information about water quality parameters. It provides instructions for the Hach test kits. However, other test kits will do fine as the sampling and descriptive information is applicable to all situations. The price is about $10.00. For more information, contact: William Stapp, 2050 Delaware Ave., Ann Arbor, MI 48103.

**Fish Banks** is a computer-based game that explores the science and social implications of fisheries management. Students must make decisions on when, where and how to fish as well as fishing fleet decisions. The consequences of their decisions are analyzed by the computer program and presented with fishery stock impacts. This is a terrific educational program involving natural resource management strategies. For more information, contact: Laboratory for Interactive Learning, Institute for Policy and Social Science Research, Hood House, UNH, Durham, NH o3824 (603-862-2186). (Cost - $110.00)

**Four-H Wildlife Habitat Evaluation Program National Manual:** (148 pages) This is a comprehensive guide to learning about wildlife habitat needs and habitat evaluation. It is designed as an instructor’s guide for training teams of youth for competitive events in wildlife management. It includes sections on management concepts, ecological regions, wildlife species requirements, and management practices for each species. There are also sections on identifying common wildlife foods, interpreting aerial photographs, and developing wildlife management plans. There is an annual training program and state and national competitions. For more information, contact your local Cooperative Extension 4-H Office.

**Give Water a Hand:** (65 pp. - youth guide, 33 pp. - leader guide) This is one of the few curricula that actually challenges youth to address water issues. The focus is water resources found around the home, community, school and farm. Students are guided through a series of activities that help them identify, research, investigate and address water issues at a level they can be successful. The curriculum has an excellent format and the leader/teacher guide is very informative. Every youth environmental club or organization should use this project. For more information, contact: Give Water a Hand c/o Barry Fox, Box 9081, Virginia State University, Petersburg, VA 23806 (804-524-5848) (single
Global Environmental Education Resource Guide: (350 pp) This middle school curriculum addresses many of the global environmental issues we face today. Acid rain, bio-diversity, deforestation, ozone depletion and other topics are included in this well written curriculum. It is highly readable and an effective teaching tool. For more information, contact: J. L. Scott Marine Education Center and Aquarium, P.O. Box 7000, Ocean Springs, MS 39564-7000 ($20.00).

Great Explorations in Math and Science (GEMS): This is a comprehensive collection of 65 instructional guides for students grades PK - 10. Each guide has multiple activities and focuses on a specific topic. Prices range from $10 - $40. Topics include animal defense, insect behavior, properties of liquids, astronomy, aquatic systems and many others. Acorn Naturalist (acornnaturalist.com) has a complete listing.

Groundwater - A Vital Resource: (61 pp) This curriculum (grades 3 - 12) does a very good job of consolidating activities and information about this important resource. Three sections address soils, water quality and community impacts. Although student/instructor sections are not separated, there is a good presentation of groundwater processes and issues. For ordering information, contact: Tennessee Valley Authority, Office of Natural Resources and Economic Development, Environmental - Energy Education Program, Knoxville, TN 37902 (615-632-4402). A companion resource is the Groundwater Flow Model available from National Project WET, Culbertson Hall, Montana State University, Bozeman, MT 59717-0057 (406-994-5392). This is an excellent educational tool that provides a visual demonstration of groundwater processes. ($700 + S&H)

Hands On Save Our Streams: (200 pp) This is a complete K - 12 curriculum on stream education and monitoring. Sections include watersheds, stream health, land use, water quality and biological monitoring. This is a must for any ecology instructor. For more information, contact: Izaak Walton League, 707 Conservation Lane, Gaithersburg, MD (800-BUG-IWLA). Also available is the Save Our Streams Water Quality Monitoring Program.


Home-A-Syst: This is a comprehensive guide to self-assessment of pollution and health risks for residential homes and properties. The guide covers home water quality, storm water management, well and septic tank management, hazardous household wastes, lead, yard and garden care, fuels, indoor air quality, energy conservation and solid waste reduction. It contains much useful information about each topic with user-friendly recommendations and improved practices. It allows the homeowner to conduct a confidential survey of their
property’s environmental condition. This publication would make an excellent reference resource for Give Water a Hand Programs. For more information, contact: NE Agricultural Engineering Service, Cooperative Extension, 152 Riley-Robb Hall, Ithaca, New York 14853-5701 (607-255-7654)

**Keepers of the Earth (Animals, Life, Night)** is an excellent series of curricula that base their contents on Native American lore. Native American stories provide the foundation for science-based education. Students gain an appreciation for Native American culture, religion and philosophy while conducting interesting investigations and activities on numerous topics. A compilation of the Native American stories is also available. These publications are available through Acorn Naturalist ([www.acorn-group.com](http://www.acorn-group.com)) for $29.95 each.

**Living in Water** is a grade 4 - 6 curriculum that addresses the physical, chemical and biological aspects of life in water. It has numerous, easy to follow activities that students will enjoy. It is well formatted and provides an excellent basis for scientific investigation. It is available through Acorn Naturalist ([www.acorn-group.com](http://www.acorn-group.com)) and the National Aquarium in Baltimore, Maryland ([www.aqua.org](http://www.aqua.org)) for $29.95.

**Living Lightly in the City** (K - 3, 4 - 6) and **Living Lightly on the Planet** (7 - 9, 10 - 12): Maura O’Conner and Kathy McGlauflin have succeeded in producing one of the few environmental stewardship awareness curricula that address tangible issues for youth. Topic selection and activity presentation are excellent. This is a must curriculum for anyone trying to help youth understand why we must all be good stewards and how to do it. For more information, contact: Schlitz Audubon Center, 1111 East Brown Deer Rd., Milwaukee, WI 53217 (414-352-2880). ($25.00 for each of four volumes)

**Museum of Solid Waste and Energy:** This is a terrific classroom guide for setting up a teaching center about solid waste issues. Recycling will never take hold until we stop making garbage a valuable commodity for the numerous private landfills. This guide presents lots of great ideas and resources for solid waste education. For more information, contact: National Energy Education Development Project, P.O. Box 2518, Reston, VA 22090 (703-860-6029).

**Nature Scope** is a series of eighteen, excellent curricula on a variety of wildlife and natural resource topics. For grades K - 7, the guides are informative and provide lots of interactive and hands-on activities. Effective "copycat" pages provide great classroom handouts. Insects, birds, weather, astronomy, wetlands, oceans, mammals and many more topics are included. For more information, contact: National Wildlife Federation, 1400 sixteenth St., N.W., Washington, D.C. 20036-2266. (approximately $100.00 for the set)

**Planning Guide for Field Study Programs:** (100 pp) Planning for school or club trips can be a real bear. There is always something you forget or don't think
This guide provides all of the necessary information to help make your planning easier. Sections include pre-planning, committee organization, transportation, food and housing, program and schedule planning, health and safety, and budget. Working forms are provided. In addition, eighteen water-related field study activities are provided. A companion video is also available. For more information, contact: Barry Fox, Extension Specialist, Box 9081, Virginia State University, Petersburg, VA 23806 (804-524-5848). (out-of-state $10.00 for guide and video)

**Pond and Stream Safari:** This little booklet is a terrific introduction to the world of aquatic insects. Adaptations, ecology and identification are covered with interesting activities and excellent insect drawings. It is designed for upper elementary and middle school grades but can also be useful in the biology classroom. For more information, contact: Resource Center-GP, 7 Business & Technology Park, Cornell University, Ithaca, NY 14850. (Publication 147L24, $15.00)

**Project Learning Tree** Secondary Modules provide high school students a wide variety of EE activities that are both challenging and interesting. The three modules are *Focus on Forests*, *Municipal Solid Waste* and *Forest Ecology*. There are numerous field activities and opportunities for in-depth research. Contact your state Project Learning Tree Coordinator for more information.

**Project Underground:** (120 pp) This is one of the very few general curricula concerning cave and karst education. Topics include cave biology, geology, hydrology and historical significance. The activities are easy to conduct and the text is well formatted. Whether your teach earth science, ecology or general biology, this text will made a valuable addition to your resource files. For more information, contact: Project Underground, P.O. Box 13079, Richmond, VA 23225 (804-288-4226).

**Schoolyard Habitat Project Guide:** (133 pp) This is a teacher/student guide in assessing, planning and implementing a wildlife habitat improvement project. Students conduct habitat and wildlife surveys, research their selected habitat, create an improvement plan, complete the project and monitor its success. Project designs are included for forest, scrub, meadow and wetland habitats. Copies are available from the U.S. Fish and Wildlife Service (410-573-4593) at www.fws.gov/r5cbfo/.

**Sharing Nature With Children** (172 pp) and **The Joy of Sharing Nature** (164 pp), by Joseph Cornell, are excellent activity guides for anyone who enjoys teaching children about nature - but doesn't know a tree from a telephone pole. A number of wonderful sensory activities are provided with meaningful text. These booklets introduced "new age", experiential education. They are commercially available at most bookstores or through distributors such as Acorn Naturalist.
**Science and Civics: Sustaining Wildlife:** (351 pages) Following in the footsteps of Project WILD, this curriculum the needs of wildlife populations to the legislative and legal processes we use to protect their habitats. This is a comprehensive activity guide for grades 9 – 12 with investigations into habitat types and changes, legislative processes, environmental features of habitats and citizen action. Contact your state or local Project WIL facilitator/Coordinator for information on training opportunities.

**Silver Bullets** (186pp) and The **Bottomless Bag** (366 pp), by Karl Rohnke, are excellent resources for environmental and outdoor educators. If you need a game to teach a concept or to get a group pulled together, you'll find it here. Ever play "Wordles?" - Well, Rohnke has hundreds of them. These references are a must for any serious, outdoor or experiential education program. To order, contact American Camping Association, 5000 State Rd. 67 North, Martinsville, IN 46151-7902 (800-428-CAMP).

**Stream Keeper’s Field Guide:** If you ever wanted to know about streams and how to protect and repair them, this is the book. Topics include: watershed structure, function and topography, monitoring and stream survey, water quality, how to collect/manage/report data and stream case histories. There is a lot to this excellent, easy to read manual. There is also a companion video. The manual and video are $25.00 each available from Adopt-A-Stream Foundation. 600-128th Street SE, Everett, WA 98208 (206-316-8592).

**Students and Research:** (279 pages) Getting students to conduct effective science research projects is always a challenge. This comprehensive guide to research will help make the challenge easier. There are sections on basic research concepts with numerous examples, generating experimental ideas, describing procedures, constructing graphs and tables and writing simple reports. For more involved research, thorough discussions of literature research, data analysis and statistics, designing complex experiments and preparing formal research papers. This publication is a must for the die-hard science instructor. Contact Kendall/Hunt Publishing Company, 4050 Westmark Dr., Dubuque, IA 52002, (800-228-0810), $29.95 to order.

**Teaching About Garbage:** This is one of the best general curricula on waste management education available. It is divided into three grade levels: K-3, 4-6, and 7-9. The text format, layout and curriculum design are excellent. Every important waste education topic is covered, including consumer issues and economics. Although most of the data and resource contacts are Canadian, it is a valuable resource for US educators. For more information, contact: Public Affairs, Ministry of the Environment, 135 St. Clair Ave. West, Toronto, Ontario M4V 1P5 (800-565-4943) or contact the specialist for copy information.
Teaching Environmental Economics is one of the few curricula that addresses the economic issues involved in natural resource use and management. It is a K-12 curriculum and presents a wide range of economic topics including paper production, protecting endangered species, clean water, forest harvesting, international trade and many others. This is a must for social studies classes and special topics in the life sciences. Contact Mike Ellerbrock, Center for Economic Education, Virginia Tech, Blacksburg, VA 24061-0401 for ordering information.

Waste, A Hidden Resource: (224 pp) This is an excellent "consumer education" curriculum dealing with waste education. Developed for students, grades 6 - 12, it does a terrific job of helping students relate to solid waste issues. A companion publication, Waste in Place, is available for elementary students. For more information, contact: Keep America Beautiful, Inc., Mill Run Plaza, 9 West Broad Street, Stamford, CT 06902 (203-323-8987).

Water Source Book: (300 pp) This is an excellent series of four (grades K-2, 3-5, 6-9, 10-12) activity guides for water education. They are quite comprehensive and probably more than the average educator would need. However, the series is a good resource, providing hands-on activities for a wide range of water topics. Prices range from $22- $30. For more information, contact: Georgia Water Wise Council, 1033 Franklin Rd., Suite 9-187, Marietta, GA 30067-8004.

What is Water? (multi-media CD) This is an interactive, educational program designed to help students in grades 4 – 6 to understand the structure and properties of water. It allows students to investigate several aspects of water including: necessity, molecular structure, hydrogen bonding, solubility, density and surface tension. It has animated graphics, review quizzes with feedback and voice narrative. This is a pilot project and evaluation is requested with use. For ordering information, contact Barry Fox, Extension Specialist, 4-H Marine/Aquatic Education, Box 9081, Virginia State University, Petersburg, VA 23806 (804-524-5848, bfox@vsu.edu), $10.00.

Wonders of Wetlands: (330 pp) This is an excellent wetlands education curriculum created by Environmental Concern, Inc. and adopted by The Watercourse of Project WET fame. The original WOW publication has been revised with better layout, graphics, text and curriculum design. Wetland function, structure, process and management are the primary topics of the curriculum. This is a valuable resource for anyone teaching about wetlands. For more information, contact: Environmental Concern, Inc., P.O. Box P, St. Michaels, MD 21663-0480 (406-994-1919).

Competitive Programs

Envirothon is a competitive program sponsored by the American Association of Soil and Water Conservation Districts. High school teams compete in forestry,
wildlife, soils, aquatic resources and a special topic. They also must make a presentation on this special topic. Teams receive training and study materials from their state Association of Soil and Water Conservation Districts. Youth compete at local, area and state events to win a trip to the national competition. Contact your local Soil and Water Conservation District or go to http://www.envirothon.org/.

**National Ocean Sciences Bowl** is a competitive event for students interested in ocean science. Topics include biology, chemistry, physics, geology and other aspects of oceanography. Teams register with their state contact and are provided contest guidelines and study aides. State winners compete at the national level. For more information, contact your state Sea Grant Marine Advisory Office or go to http://core.cast.msstate.edu/nosb.html.

**Wildlife Habitat Evaluation Program** is a competition guide that leads to the national contest. It includes wildlife management concepts and terms, description of ecological zones and important associated species and a thorough description of wildlife management practices. This is a valuable guide for any wildlife education program. Teams compete in various aspects of wildlife management including foods, habitat assessment, aerial photos, urban planning and others. State winners are eligible to go to the national competition. For more information, contact your state Cooperative Extension 4-H, wildlife agency or go to http://www.aces.edu/dept/WHEP/.

**Bibliographies and Resource Guides**

**Great Lakes Collaborative - Science Activities, k-12 Resources** is a CD packed full of educational resource information including elementary lesson plans, papers on global change, bibliography of instructional resources, digital images of insects and conifers and more. It is available from: Wayne County Regional Educational Service Agency, 33500 Van Born Rd., Wayne, MI 48184-2497 (313-467-1436).

**Environmental Education Resources Directory** is a listing of resource personnel, programs, curricula and educational facilities found across Virginia. This guide and additional information is available at Governor Gilmore’s Virginia Naturally WEB site: http://www.vanaturally.com.

**Educating Young People about Water - A Guide to goals and Resources** is an annotated bibliography of water education resources from across the country. Revised in 1995, it reviews more than 90 curricula and provides a comprehensive content matrix. It is part of a series of publications on water education including: A Guide to Unique Program Strategies and A Guide to Program Planning and Evaluation. The three guides are available for $5 each or
the entire set with companion video for $22.95 from Distribution Office, ERIC/CSMEE, 1929 Kenny Rd., Columbus, Ohio 43210-1080 (800-276-0462).


**BRIDGE - Ocean Sciences Education Teacher Resource Center:** [http://www.marine-ed.org](http://www.marine-ed.org) - A comprehensive link to other WEB sites that are related to marine and fresh water education.

**Chesapeake Bay Program:** [http://www.chesapeakebay.net/](http://www.chesapeakebay.net/) - The official site for information, programs, data and current news concerning restoration efforts for the Chesapeake Bay.


**Bibliography: Environmental Change and its Impact on Species/Ecosystems:** [http://www.pacinst.org/wildlife.html](http://www.pacinst.org/wildlife.html) - A listing of research and technical books and articles.

**Climate Network of Europe:** [http://www.climnet.org/library/library.htm](http://www.climnet.org/library/library.htm) - The CNE library has over 3000 documents on climate change and is regularly updated.

**Volunteer Water Quality Monitors’ Site:** [http://www.science.widener.edu/~grant/crc/crc_biol.html](http://www.science.widener.edu/~grant/crc/crc_biol.html) - This has dozens of links to aquatic invertebrate sites.

**Forest Biology and Dendrology:** [http://www.cnr.vt.edu/dendro/wwwmain.html](http://www.cnr.vt.edu/dendro/wwwmain.html) - Virginia Tech’s comprehensive WEB site on forests issues and tree identification.

**EE Link:** [http://eelink.net/eeorganizationsandprojects_general.html](http://eelink.net/eeorganizationsandprojects_general.html) - Links on this page include organizations and projects primarily concerned with the profession of environmental education and/or with EE on a wide range of topics.

**North American Association for Environmental Education:** [http://naaee.org/](http://naaee.org/) - Official WEB site with links to other affiliates and resources.

**Global Change and Environmental Education Resources:** [http://gcrio.org/edu/educl.html](http://gcrio.org/edu/educl.html) - this collection of resources was selected for its relevance to global change and environmental education. Included is a wide range of resources in a variety of formats for educators and students at all levels (K_12 and higher education), librarians, citizens and community groups.
Environmental Education Programs and Resources:  
http://www.cnie.org/Education/ - A comprehensive directory of EE WEB sites.

Center for Great Lakes Environmental Education:  
http://www.greatlakesed.org/

Environmental Education Center: http://www.epa.gov/teachers/ - EPA’s teacher resource site.

Environmental Protection Agency (EPA) Office of Water and Wetlands:  
http://www.epa.gov/owow/nps/whatis.html

Natural Resources Conservation Service:  

Virginia Environmental Quality Index: http://www.veqi.org/

U.S. Geological Survey - Water Resources of the United States:  
http://water.usgs.gov/

Virginia Water Resources Research Center: http://www.vwrrc.vt.edu/