Kentucky Water Resources Research Institute
Annual Technical Report
FY 2001

Introduction

The FY 2001 Annual Technical Report for Kentucky consolidates reporting requirements of the Section 104(b) base grant award in a single technical report that includes: 1) a synopsis of each research project supported during the period, 2) a list of related reports, 3) a description of information transfer activities, 4) a summary of student support during the reporting period, and 5) notable achievements and awards during the year.

Research Program

The activities supported by Section 104(b) and the required matching are interwoven into the Kentucky Water Resources Research Institute's total program. Other elements of the program during FY2001 included: 1) the Environmental Systems Certificate graduate program, 2) the Environmental Protection Scholarship Program, and 3) Research and sevice activities funded by other sources.

Memorandum of Agreement projects with the Kentucky Division of Water included: 1) Continued development of a watershed-based water quality assessment and management methodology for the Kentucky River, 2) Kentucky TMDL development, 3) Evaluation of the impacts of gravel dredging on Buck Creek, and 4) Graphic design and production of a poster for public education to protect ground water in karst areas of Kentucky.

Several additional projects were funded by the Kentucky Cabinet for Health Services (CHS), the Kentucky Department of Military Affairs (DMA), the Kentucky River Authority (KRA), the National Institute of Environmental Health (NIEH), and east Kenucky PRIDE (Personal Responsibility in a Desirable Environment): 1) Technical support for the Maxey Flats Nuclear Disposal Site (CHS), 2) Technical support for the Paducah Gaseous Diffusion Plant (CHS), 3) Technical Support for Environmental Construction (DMA), 4) Kentucky River Basin management coordination (KRA), 5) Superfund outreach program for Kentucky (NIEH), and 6) Kentukcy PRIDE water quality assessment.

Retirement and restoration of forest roads in steep terrain: Influence on nonpoint source pollution and hillslope hydrology

Basic Information

Title:	Retirement and restoration of forest roads in steep terrain: Influence on nonpoint source pollution and hillslope hydrology
Project Number:	2001KY1982B
Start Date:	3/1/2001
End Date:	2/28/2002
Funding Source:	104B
Congressional District:	Sixth
Research Category:	Water Quality
Focus Category:	Hydrology, Non Point Pollution, Nutrients
Descriptors:	forest hydrology, road restoration, nutrient cycling, sediment transport
Principal Investigators:	Randall Karl Kolka

Publication

1. Smidt, M.F., and R.K. Kolka, 2001, Alternative Skid Trail Retirement Options in Steep Terrain, in Proceedings Council on Forest Engineering Conference, Showshoe, WV.
2. Kolka, R.K. and M.F. Smidt, 2001, Revisiting Forest Road Restoration, American Water Resources Association, Water Resources IMPACT, 3, 15-18.

Problem and Research Objectives

Forest roads constructed as a result of harvesting operations severely disturb soil which leads to enhanced nonpoint source pollution, altered hillslope hydrology and lower productivity. Current best management practices (BMPs) for forest road retirement in Kentucky and many other states are effective at *reducing* nonpoint source pollution but sediment fluxes can still be on the order of 10 to 40 times those in unharvested systems the first few years after harvest. Also, none of the current forest road BMPs specifically address the recovery of soil properties, normal hillslope hydrology, and site productivity. It is critical that we develop new road closure techniques to lessen the transport of sediment and nutrients and minimize the altering of hillslope hydrology while still leading to more productive ecosystems. The overall objective of this project is to examine the effects of restoration (i.e. recontouring the hillslope) and a new subsoiling retirement technique on forest roads on steep side slopes. Specific objectives include the following:

1) Examine how hillslope restoration and deep subsoiling affect the transport of sediment and nutrients from forest roads;
2) Examine how hillslope restoration and deep subsoiling affect hillslope hydrology and soil moisture;
3) Identify amelioration techniques that efficiently and effectively improve soil properties and seedling growth on severely disturbed areas.

Methodology

Three sections of forest roads in NE Kentucky were chosen that have approximately a 10% grade on hillslopes ranging from 30-50%. Each road section has three duplicated, randomly placed experimental treatments including (1) cover crops only (KY BMP), (2) deep tillage and cover crops, and (3) re-contouring and cover crops. An undisturbed hillslope site at a similar landscape position as the road section was also instrumented at each site and is considered as a reference. Road sections are 200 m long with six 25 m treatment plots (duplicate of treatments 1-3) with treatment plots separated by 5 m buffers. Time and cost data was collected during the installation of the treatments. TDR probes at 15 and 25 cm soil depth were installed 3 m above, 3 m below and in the center of road treatments and on the reference hillslope. Soil moisture is measured (with TDR) on a biweekly schedule and after precipitation events greater than ~1.25 cm (1/2 inch). Surface runoff diversion plots (~ 8 m^2) were constructed and graded to collect road surface runoff that was measured for volume and analyzed for sediment and nutrient concentration. Surface runoff collected with the diversion plots was analyzed for pH, conductivity, alkalinity, TSS, TDS, NO_3, NH_4, PO_4, Ca, Mg, K, Na and TOC. Soil physical properties (bulk density, particle size and soil resistance measured with a cone penetrometer) and soil chemistry (pH, plant available nutrients, organic carbon and cation exchange capacity) measurements were made within the road surface prior to plot installation. Subsequent measurements of soil physical and chemical properties were conducted to characterize recovery. Twenty tulip poplar (*Liriodendron tulipifera* L.) and eastern white pine (*Pinus strobus* L.) seedlings were planted in each plot during the spring of 2000. Seedling dimensions were measured at the end of each growing season for the duration of the study.

Principal Findings and Significance

The recontour treatment had significantly lower bulk densities than either the subsoiling or control treatments. The control and subsoil treatments had similar runoff percentages with the recontour treatment having significantly lower runoff than the control treatment. The control and subsoil treatments had similar sediment production with the recontour treatment having significantly lower sediment production. The relatively undisturbed reference sites had very little runoff and hence, very low sediment production. Reference sites had significantly lower soil moisture than treated sites. Across sites and treatments, soil moisture at 15-25 cm was significantly higher than soil moisture at 0-15 cm. Few differences were found among treatment:landscape position combinations. No differences were found at 15-25 cm soil depth when comparing similar positions in relation to the road. At 0-15 cm soil depth soil moisture below recontoured plots was significantly greater than those below reference plots. Soil moisture at 0-15 cm soil depth tended to be greater within the road on control and subsoiled plots whereas on recontoured and reference plots soil moisture tended to increase from the road to the below road locations. Recontour and subsoil treatments had significantly greater white pine diameter growth than control plots. No treatment effects were seen for white pine height growth. Yellow poplar diameter and height growth was greatest for recontoured plots followed by the subsoiled plots and the control plots. The combination of data indicates that recontouring the hillslope leads to lower bulk densities, less surface runoff and sediment production and greater seedling growth than both traditional and subsoiling road retirement methods.

Where have all the yellow perch (Perca flavescens) gone: Are endocrine disruptors (Xenoestrogens) involved?

Basic Information

Title:	Where have all the yellow perch (Perca flavescens) gone: Are endocrine disruptors (Xenoestrogens) involved?
Project Number:	2001KY2341B
Start Date:	3/1/2001
End Date:	8/31/2002
Funding Source:	104B
Congressional District:	Sixth
Research Category:	Biological Sciences
Focus Category:	Conservation, Methods, Models
Descriptors:	reproduction, endocrinology, physiology, teleost
Principal Investigators:	Brian S. Shepherd

Publication

1. Lynn, Scott G. and Brian S. Shepherd, 2002, Herbicide Body Burdens and Endocrine Correlates in Yellow Perch (Perca flavescens) from Old Woman Creek (OWC) National Estuarine Research Reserve and Lake Erie, in Proceedings of the Ohio Valley Chapter of the Society of Environmental Toxicology and Chemistry (SETAC) Symposium entitled "Molecular Approaches to Toxicological Questions", University of Louisville, Louisville, KY, May 16-17, 2002.

Problem and Research Objectives

Growth, development and reproduction, in all vertebrates, are regulated through the orderly, but complex release of the pituitary hormones, growth hormone (GH) and prolactin (PRL). Adding to this complexity are pollutants that mimic/alter the actions of endogenous hormones. These hormonal mimetics are called "endocrine disrupting chemicals" (EDCs) or “xenoestrogens”, because they possess estrogenic activities that can affect endogenous hormones in inappropriate ways. To date, studies have mainly focused on the effects of EDCs on physiological end-points, with little emphasis on the impacted endocrine pathways themselves. To understand the sub-lethal impacts of EDC exposure in aquatic vertebrates, an approach focused on determining the mechanism(s) of endocrine disruption is required. The study of an ecologically- and economically-important organism that responds uniquely to estrogen would facilitate our understanding in many ways. In this regard, our aim is to develop the yellow perch (*Perca flavescens*) as a model to study the effects of estrogenic EDCs on teleost endocrine physiology. An understanding of the endocrine physiology of this teleost will aid in future studies to improve the environmental monitoring and management practices of this important species in areas where endocrine disruption is suspected. To accomplish this, our immediate objective is to develop the molecular endocrine tools needed to investigate the endocrine mechanisms of development/growth in this teleost. Once characterized, the sub-lethal effects of EDCs on teleost physiology can then be explored.

Methods

Molecular tools are being developed to characterize the hormonal pathways responsible for growth and development in yellow perch. We have obtained partial cDNA clones for PRL, GH (Courtesy of F. Goetz, Univ. of Notre Dame) and the estrogen receptor genes. RT-PCR procedures (5'-RACE) and automated DNA sequencing have been employed to clone and verify cDNA sequences. We also have partial cDNA clones for the pituitary hormone somatolactin (SL) and the insulin-like growth factors (IGFs I & II). Once full-length cDNAs are obtained, the sex-, tissue- and developmental-specific expression of these genes will be examined in yellow perch. In addition to our molecular studies, we are also working to purify native perch GH and PRL and to generate primary antibodies to these hormones. This will permit the development of assays to measure blood GH & PRL levels and receptor abundance, distribution and affinity in perch throughout the life-cycle and in those exposed to EDCs.

Principal Findings and Significance

We have a full-length cDNA clone for perch GH (courtesy of F. Goetz, Univ. of Notre Dame), and partial clones for PRL and estrogen receptors- α & -β. We have also cloned the hormones, somatolactin (SL: pituitary hormone), IGF-I & -II and will clone perch P-450 aromatase. We continue to obtain the full-length cDNAs for these clones and expect to have a paper describing expression patterns of GH, PRL and SL by the end of summer 2002. We have also collected pituitaries from approximately 6,000 animals for purification of native perch GH and PRL. Efforts to purify these hormones will be

well underway during summer 2002. This work was to be completed in collaboration with another lab, but this has not worked out. As a result, we have obtained a no-cost extension to set our laboratory up for this work. Also, in collaboration with Geoff Wall at (Ohio State Extension, Piketon, OH), we have begun rearing larval perch in order to examine developmental-specific patterns of gene expression. An understanding of the underlying endocrine physiology of yellow perch growth and reproduction will aid in future studies to improve the environmental monitoring, management practices and even the aquaculture and restoration of this important species.

Developmental stability as an indicator of amphibian population health and environmental degradation

Basic Information

Title:	Developmental stability as an indicator of amphibian population health and environmental degradation
Project Number:	2001KY2441B
Start Date:	3/1/2001
End Date:	5/31/2002
Funding Source:	104B
Congressional District:	First
Research Category:	Biological Sciences
Focus Category:	Water Quality, Conservation, Toxic Substances
Descriptors:	bioindicators, conservation biology, pollutants, monitoring
Principal Investigators:	Howard H. Whiteman

Publication

1. Meredith, Christy and Howard Whiteman, 2002, Lethal and sublethal effects of increasing nitrate concentration on Ambystoma mexicanum embryos and larvae. Annual Sigma Xi Poster Competition, Murray State University.

Problem and Research Objectives

One of the most important, yet most difficult, tasks associated with conservation of any organism is the identification of populations subject to stress before such stress has a detrimental effect (Clarke 1995). This is particularly true of amphibians; the global decline of amphibians is considered a disturbing indicator of environmental degradation because it may forebode of cascading ecological effects, as well as raising health concerns about human populations (Wyman 1990, Wake 1998). Amphibians are ideal biological indicators, because their semi-permeable epidermis and complex life cycle expose them to multiple stressors in both aquatic and terrestrial environments (Wyman 1990). Because of this, amphibians should be among the first vertebrates affected by anthropogenic stressors in either of these environments (Stebbins and Cohen 1995). Furthermore, some of the same stressors affecting amphibians are known to have negative effects on other species, including humans (e.g., PCBs, UV light, etc.; Wake 1998, Carey 2000). Biologists thus need an early-warning system that could identify environmentally-stressed animals before the stressor causes population and/or regional harm. Such an indicator should be able to measure stress-induced effects before drastic changes in morphology take place which would subsequently decrease the organism's survival and reproductive abilities. One such indicator is obtained by measuring developmental stability (DS), the ability of an organism to develop normally under a range of environmental conditions (Waddington 1942, Clarke 1995). The objective of the current project was to utilize developmental stability as an indicator of amphibian stress and habitat quality from temporary ponds in Kentucky that vary in land use, water quality and other anthropogenic disturbance.

Methodology

During 2001 we continued our collection and imaging analysis of bullfrog (*Rana catesbiana*) larvae and 12 eastern newt (*Notophthalmus viridescens*) adult males. After transporting amphibians to MSU, each individual was anesthetized using tricaine methylchloride (MS-222), and measured for snout-vent length (mm) and mass (g). Each individual was then photographed with a Pixera Professional digital camera connected to a PC. After imaging was complete, animals were submerged in aged water to revive them and released back to their pond of capture. Measurements of DS concentrated on morphological structures directly related to amphibian fitness. Each individual was measured three separate times in order to statistically analyze measurement error (Palmer 1994). Temperature, pH, conductivity, dissolved oxygen, and alkalinity was measured at each pond with portable meters and orthophosphates and nitrate/nitrite were measured using a Lachet Nutrient Analyzer at MSU's Hancock Biological Station (HBS). Currently statistical analyses are being conducted to correlate habitat variables with levels of asymmetry in each species.

Experiments were modified slightly from the grant proposal. We reared *Ambystoma mexicanum* embryos and larvae under various nitrate concentrations. We used this species, an endangered Mexican salamander, because we were concerned that utilizing embryos from spotted salamanders, *A. maculatum*, would have been unwieldy and might lead to spurious results. The latter species has large, gelatinous egg masses in which cutting single embryos for experiments is difficult and can lead to increased mortality. *A. mexicanum* is closely related to *A. maculatum* as well as other Kentucky congeners (*A. tigrinum, A. opacum, A. talpoideum*) and thus provides an indicator of potential native species response. In addition, *A. mexicanum* is utilized extensively by developmental biologists and can be readily reared in the laboratory, allowing for its potential future use in toxicology labs in university, government (EPA) and corporate settings. We reared embryos

in various levels of nitrate, a common agricultural pollutant, and assessed mortality as well as sublethal effects. Surviving larvae were then moved to the same or different nitrate treatment to determine the effects of increasing, decreasing, or constant levels of nitrate on larval growth and development . After rearing for three weeks, larvae were photographed as above and currently await analysis for asymmetry.

Principal Findings and Significance

All field images have now been measured, and we are currently analyzing the results statistically. Our preliminary analyes of bullfrog tadpoles showed significant correlations with anthropogenic stress, as described in last year's report, and our updated data thus far do not refute this result. Our experimental results showed that salamander eggs are fairly robust against increasing concentrations of nitrate, whereas larvae are highly susceptible at nitrate levels commonly experienced in natural farm ponds. Mortality rate was much higher in larvae than eggs at the same nitrate concentrations, perhaps because nitrate affects metabolic processes that are not yet functioning in developing embryos. In addition, both embryos and larvae showed significant sublethal effects, in terms of time to hatching, size at hatching, and larval growth rate. We will be analyzing the images of larvae from this experiment for asymmetry this summer, and may conduct a short-term experiment with *A. maculatum* larvae to confirm the effects of nitrates on native species of salamanders.

Bacterial ratios and neural networks for modeling Kentucky River water quality

Basic Information

Title:	Bacterial ratios and neural networks for modeling Kentucky River water quality
Project Number:	2001KY2781B
Start Date:	3/1/2001
End Date:	5/31/2002
Funding Source:	104B
Congressional District:	Sixth
Research Category:	Water Quality
Focus Category:	Water Quality, Models, Surface Water
Descriptors:	bacteria, ratios, indicators
Principal Investigators:	Gail Montgomery Brion, Srinivasa Lingireddy

Publication

1. Neiman, Jonathan , 2002, Novel Bacterial Ratio for Predicting Fecal Age, MS Thesis, Department of Civil Engineering, University of Kentucky, Lexington, KY.
2. Brion, G.M. and S. Lingireddy, 2002, Artificial Neural Network Modeling: A Summary of Successful Applications Relative to Microbial Water Quality, in Proceedings Joint CSCE/EWRI Environmental Conference, Niagara Falls, Canada, July 2002.
3. Nieman, J. and G.M. Brion, 2002, Novel Bacterial Ratio to Predict Fecal Age, In Proceedings Joint CSCE/EWRI Environmental Conference, Niagara Falls, Canada, July 2002.
4. Brion, G.M., T.R. Neelakantan, and S. Lingireddy, 2001, New Tools to Define the Impact of Stormwater on Receiving Surface Waters, in Proceedings ASCE Environmental Water Resources Institute Congress, Orlando, Forida, May 2001.
5. Brion, G.M., and S. Lingireddy, 2002, Artificial Neural Network Modeling: A Summary of Successful Applications Relative to Microbial Water Quality, in Proceedings 3rd World Congress of the International Water Association, Health-Related Water Microbiology Symposium, Melbourne, Australia, April.
6. Neiman, J. and G.M. Brion, 2002, Novel Bacterial Ratio for Predicting Fecal Age, in Proceedings 3rd World Congress of the International Water Association, Health-Related Water Microbiology Symposium, Melbourne, Australia, April.

Problem and Research Objectives

Our nation's rivers as well as our local water supply the Kentucky River are overburdened with pathogen indicators, and presumably pathogens. Existing indicator systems fail to identify the source and age of fecal contamination thereby limiting their usefulness as risk assessment tools. Watershed managers, water utilities, public health microbiologists, and regulators need new indicator systems; systems that provide more specific information about fecal contamination to assess the pathogen risk in source water and implement changes to management practices and/or treatment methods when required. The Kentucky American Water (KAW) Company is one of the few facilities that has monitored their intake for a range of bacterial indicators. The database KAW has kept is incomplete, with the peak numbers of bacteria often missing due to inadequate dilution. Published research by the PIs has proven using multi-parameter databases and advanced neural network programming can predict peak microbial concentrations. The main objective of this research is to backfill the missing data in the KAW database, which is crucial for developing reliable indicator systems.

Methodology

A feed-forward neural network will be trained on historical but complete (those with no missing/incomplete records) observations from KAW database to predict a range classification for a single parameter from the other available parameters. Once trained, the model will be asked to predict the range of concentration of bacteria for the missing observations based upon the pattern and interrelationships it has learned between other water quality parameters (pH, alkalinity, turbidity, etc.) The neural network model predictions for bacterial concentrations will be checked against the results of the simultaneous laboratory survival studies and new data from KAW collected during spring, summer, and early fall peak events.

Principal Findings and Significance

In addition to providing further insight into the abilities of neural network models in classifying fecal contaminant sources and in backfilling missing data, the research is expected to strengthen the previous findings on bacterial ratio (Atypical Coliforms/ Total Coliforms or AC/TC) as a reliable indicator of age of fecal source. Principal findings reported at conferences triggered interest in this research and have resulted in collaboration with two International groups: 1. Department of Microbiology, University of Barcelona, and 2. Institute of Environmental Science & Research Limited, Christchurch Science Center, NEW ZEALAND, of which the second group has already confirmed our research findings on AC/TC ratios on one of their databases.

Does waste amendment affect abiotic N cycling in soils by naturally occurring reactive Fe(II)?

Basic Information

Title:	Does waste amendment affect abiotic N cycling in soils by naturally occurring reactive Fe(II)?
Project Number:	2001KY2801B
Start Date:	3/1/2001
End Date:	2/28/2002
Funding Source:	104B
Congressional District:	Sixth
Research Category:	Water Quality
Focus Category:	Hydrogeochemistry, Acid Deposition, Nitrate Contamination
Descriptors:	denitrification, chemodenitrification, water quality
Principal Investigators:	Christopher J. Matocha, Mark S. Coyne

Publication

1. Matocha, Christopher, Gerald Haszler, Mark Coyne, and Ravi Kukkadapu, 2001, Abiotic Nitrogen Cycling in Kentucky, In 93rd Annual Meetings of Soil Science Society of America, American Society of Agronomy, Charlotte, NC.
2. Matocha, Christopher, and Gerald Haszler, 2001, Characteristics of Reactive Ferrous Iron, In 93rd Annual Meetings of Soil Science Society of America, American Society of Agronomy, Charlotte, NC.

Problem and Research Objectives

Nitrate loss from soil is typically attributed to leaching or biological denitrification as default pathways. Field conditions at the surface and subsoil conducive for biological denitrification are also environments where other potential reductants are known to accumulate such as ferrous (Fe(II)) iron. An alternative abiotic pathway of NO_3^- reduction could involve oxidation of Fe(II) species, but the mechanisms are complex because of the heterogeneous nature of soil and multiple oxidation state changes of nitrogen that lead to either its conservation or loss. However, this reaction could play a significant role in coupling the redox cycles of N and Fe in soil environments, yet there is very little information available in this regard. The objectives were modified from the original proposal in that we wanted to first establish whether abiotic nitrate reduction was occurring prior to studying the effect of animal waste amendment.

Methodology

The stirred-batch kinetic experiments and field soil characterizations had to be conducted in an anaerobic chamber due to the sensitivity of solid Fe(II) minerals and adsorbed Fe(II) species. Therefore, the number of reference minerals and soils employed during the reactivity studies was reduced.

Principal Findings and Significance

The initial screening of minerals representative of Kentucky soils revealed that Fe(II)-bearing phyllosilicates showed very little reactivity towards NO_3^- due to repulsion effects. Dissolved Fe(II) alone reduced NO_3^- slowly, but when catalyzed with dissolved Cu^{2+} to simulate manure addition, NO_3^- was reduced to N_2O and ammonium (NH_4^+) in a complex, multistep reaction mechanism. Current experiments are evaluating the role of adsorbed Fe(II) as a possible reductant of nitrate. A method has been calibrated to determine the native Fe speciation on field soil samples. Solid phase Fe(II) and Fe(III) were distinguished only by quick freezing samples in the field immediately during sampling with liquid N_2 in a Dewar. All sample manipulation was conducted in an anaerobic glovebox or else Fe(II) concentrations decreased markedly. It is noteworthy that there was an inverse correlation between solid Fe(II) concentrations determined using this procedure and exchangeable NO_3^- concentrations, with a concomitant increase in exchangeable NH_4^+. It is not known how reactive the extractable Fe(II) in the surface and subsurface is with respect to NO_3^- removal and ongoing studies are investigating this system.

Information Transfer Program

The Institute’s information transfer program has numerous components:

The Environmental Systems Seminar Series is managed with assistance from the Insitute. Graduate students working toward the certificate are required to participate in the weekly seminar for two semesters, but the presentations are also open to the general public. The theme of the series for the 2001-2002 academic year was "The Many Lives of the Kentucky River." Presentations included:

The Kentucky River Basin: A river flows through it, Eric Christianson, UK History Department

Physical landscapes of the Kentucky River Basin: Our geologic inheritance, James Dinger, Kentucky Geological Survey

Aquatic organisms in the Kentucky River Basin: Habitats, ecology, and indicator species, Greg Pond, Kentucky Division of Water

Man-made impacts on the Kentucky River Basin: Our management responsibility, Lindell Ormsbee, UK Civil Engineering Department

The Clean Water Act: How it’s supposed to work, Hank Graddy, Kentucky Watershed Watch

The Clean Water Act: The role of state government, Kentucky Division of Water

TMDL’s: A scientific perspective, Ken Reckhow, North Carolina Water Resources Research Institute

TMDL’s: An agricultural perspective, Rebeckah Freeman, Kentucky Farm Bureau

The impact of water quality on regional water supply: The central Kentucky experience, Lindell Ormsbee, UK Civil Engineering Department

Urban water quality: The Lexington experience, David Gabbard, Lexington-Fayette Urban County Government

Rural water quality, Dave Harmon, Kentucky Division of Water

Making sense of weather data, Tom Priddy, UK Agricultural Weather Center

Public health and the environment: Real life examples, Rice Leach, Kentucky Commissioner for Public Health

The role of the press in water issues, The Lexington Herald-Leader

New tools for the 21st Century, Sylvia Daunert, UK Department of Chemistry

Watershed action, Greg Epp, KWRRI and Ken Cooke, Kentucky Division of Water

Eastern Kentucky PRIDE, Karen Engle, Executive Director Eastern Kentucky PRIDE

Town Branch: The forgotten heart of Lexington, Zina Merkin, Town Branch Trail

Aqua-farming in Kentucky, J. Tidwell, President of the World Aquaculture Society

Water works wonders: Recreational fisheries in Kentucky, Benjy Kinman, Kentucky Department of Fish and Wildlife Resources

Water in Kentucky: Challenges and solutions for the future, James Kipp, Acting Director KWRRI

The Kentucky Water Resources Annual Symposium was held on February 20, 2002. This one-day symposium allowed individuals from universities, government, and the private sector to present information on completed and ongoing research and management activities. Twenty-nine platform presentations and three poster presentations were included in the program and the abstracts were printed as a proceedings volume and distributed to participants. There were 130 registrants for the symposium.

The Insitute's newsletter WATERWORKS provided a forum for the dissemination of research results and water news of interest to researchers, regulators, and the general public. A 2001 Annual Report describing all of the activities of the Institute during the calendar year was also published and distributed.

The Institute also maintains a homepage on the Internet that provides electronic access to information and documents all of the programs of the Institute.

http://www.uky.edu/WaterResources/

General Information Transfer Program Publications:

Kentucky Water Resources Research Institute 2001 Annual Report, March 2002, Kentucky Water Resources Research Institute, Lexington, KY, 36 p.

Proceedings Kentucky Water Resources Annual Symposium, 2001, Kentucky Water Resources Research Institute, February 20, 2002, Lexington, KY, 66 p.

The Ohio River Basin Commission seeks to improve the water resources programs and related land programs of its member states. As an interstate body, the commission endeavors to contribute to the formulation of a comprehensive, coherent, and coordinated national water policy that recognizes interstate water issues and the primary role of the states in water resources palnning and management. June 30, 2001 marked the Commission's thirteenth year on the campus on the University of Kentucky and its association with the Kentucky Water Resources Research Institute. The ORBC cosponsors the Institute's annual symposium.

The Association of State Dam Safety Officials (ASDSO) is a national, non-profit association dedicated to the improvement of dam safety through research, education, and communications. The national office is located in Lexington, Kentucky and the unit is affiliated administratively with the Water Resources Research Institute. In addition to several regional technical seminars held throughout the country, ASDO also maintains a clearinghouse of books, videos, articles, and CD-ROMs on subjects related to dam safety. The Association web site is:

http://www.damsafety.org

The Superfund Basic Research Program at the University of Kentucky (supported by NIEHS) is collaborating with educators and outreach personnel to develop community-based programs. Educational programs and materials related to the nutritional implications of Superfund site chemicals are a major focus. The KWRRI Director served as Co-Project Leader for Core C: "Superfund Outreach Program for Kentucky." An Information Coordinator was also employed by the Institute for the project. Efforts were directed toward assisting existing community action groups in the vicinity of the Paducah Gaseous Diffusion Plant.

The theme selected for the Special Educational Exhibition at the 2001 Kentucky State Fair (August 16-26, 2001) was "2001: A Water Odyssey." The centerpiece of the exhibit was a large-scale, physical model of a watershed including a working lock and dam. Interactive aspects of the exhibit allowed participants to explore aquatic biology, water quality, and the many ways that we use water. An educational curriculum associated with the exhibition was also developed and provided to teachers throughout the state. An estimated 400,000 people visited the exhibit and over 7,000 students toured the exhibit on prearranged school field trips. The staff of the KWRRI assisted with planning and staffing the exhibit.

Student Support

Student Support					
Category	**Section 104 Base Grant**	**Section 104 RCGP Award**	**NIWR-USGS Internship**	**Supplemental Awards**	**Total**
Undergraduate	3	0	0	0	3
Masters	3	0	0	0	3
Ph.D.	1	0	0	0	1
Post-Doc.	0	0	0	0	0
Total	7	0	0	0	7

Notable Awards and Achievements

The state fair educational exhibition "2001: A Water Odyssey" received a Spirit of the Land award recognizing international excellence in Environmental Education. The award was presented at the 2002 Olympic Winter Games in Salt Lake City, Utah on February 18, 2002. Funding for the project was provided by an EPA Section 319(h) Nonpoint Source Implementation Grant administered by the Kentucky Division of Water (Water Quality Branch, Nonpoint Source Section).

Work conducted by Brian Shepherd (2001KY2341B) was featured regionally by a prominent Ohio newspaper. Kavanaugh, Molly, 2001, "A different fish tale: Scientist hopes perch glands show pollutants." The Plain Dealer, Cleveland, OH, Section B (Metro), page B3, October 23, 2001.

Publications from Prior Projects