

Grants Awarded

From 10/1/05 To 10/31/05

Principal Investigator: Kenneth Currie, Manufacturing Center

Co-PI(s):

Project Title: Simulation Analysis

Activation Amount: \$24,000.00

Agency: ArvinMeritor

This project will provide computer-aided engineering support to ArvinMeritor's Simulation and Analysis group located in Cookeville, Tennessee. The work will entail typical computer aided engineering tasks such as Finite Element Analysis, HyperMesh for optimization, and Computer-Aided Drawings (CAD) of parts.

Principal Investigator: Michael Harvey, Biology

Co-PI(s):

Project Title: Bat Ecosystem Management

Activation Amount: \$10,000.00

Agency: U. S. Department of Agriculture

The primary objective of this project is to annually monitor populations of bats on the Ozark-St. Francis National Forest with emphasis on federally and state endangered bat species present (Indiana bat-Myotis sodalis; gray bat-Myotis grisescens; Ozark big-eared bat-Corynorhinus townsendii ingens). A secondary objective is to gain additional information concerning the ecology of endangered and other bat species present to aid the U.S. Forest Service in formulating management plans for the protection of bat species present. Bat populations will be monitored at caves during both summer, when bats are active, and during winter hibernation.

Grants Awarded

From 10/1/05 To 10/31/05

Principal Investigator: Marilyn Musacchio, Nursing
Co-PI(s): Glenn Binkley, Administrative Offices
Project Title: New Nursing and Health Services Building

Activation Amount: \$491,032.00
Agency: Department of Health and Human Services

Principal Investigator: Douglas Airhart, Agriculture
Co-PI(s):
Project Title: Developing Written Standards for Selecting, Transplanting and Establishing Young Trees in Urban Settings

Activation Amount: \$20,800.00
Agency: Tennessee Department of Agriculture

Specific components to be completed by this project:

- A. Review existing resources for the most current technical information currently available. Sources include but limited to Florida Standards, International Society of Arboriculture's planting practices, American Association of Nurseryman's Nursery Stock Standards, Society of Municipal Arborists guides, and others as appropriate.
- B. Develop written standards for selecting, planting, and establishing trees in urban areas in Tennessee.
- C. Print (or CD produced) 500 copies for distribution.
- D. Distribute standards to a minimum of 35 Tennessee tree boards, 25 city foresters or individuals involved with urban forestry in their community, and 140 individuals who impact tree planting in communities including but not limited to landscape architects, architects, city engineers, consultant engineering firms who consult for cities, city planners, public works directors, landscape contractors, and nursery owners and managers. Also post standard on Tennessee Urban Forestry Council and the TLC for Trees websites.
- E. Send one representative to the Morton Arboretum in Lisle, IL for a national working group meeting on tree planting practices in November 2005, and one representative to the Tennessee Urban Forestry Conference in Germantown, TN in October 2005.
- F. Print a statement on the standards booklet (and CD) acknowledging the USDA Forest Service and the Tennessee Department of Agriculture, Forestry Division as partners in this project.

Grants Awarded

From 10/1/05 To 10/31/05

Principal Investigator: James Layzer, Biology

Co-PI(s):

Project Title: Status of the Mussel Fauna in the Green River within the Mammoth Cave National Park

Activation Amount: \$4,099.00

Agency: U. S. Department of Interior

The Green River flows through the Mammoth Cave National Park (MACA), Kentucky. This river system once contained over 70 species of freshwater mussels. Presently, at least 50 species still exist in the Green River, including at least four endangered species: *Cyprogenia stegaria*, *Obovaria retusa*, *Pleurobema clava*, and *Pleurobema plenum*. While several factors are probably responsible for the decline of mussels, land-use practices and operation of the Green River Dam (GRD) are believed to have been largely responsible. Presently, both problems are being addressed. The Nature Conservancy and the Kentucky State Nature Preserves Commission have formulated and begun to implement plans to protect a 200-km-long segment of the Green River between the GRD and the upstream boundary of the MACA. The U.S. Army Corps of Engineers has developed an alternative conservation discharge regime for the GRD and implemented it in the fall 2003. A primary goal of the MACA is to protect and restore the biological integrity of the Green River. To accomplish this goal, the MACA needs to have current information on the status and trends of the mussel fauna. The objectives of this study are to: 1) Determine the composition and size structure of the mussel assemblage in the Green River within the MACA; and, 2) Determine the long-term response of the mussel assemblage to the proposed conservation flow regime.

Principal Investigator: Dennis George, Water Center

Co-PI(s):

Project Title: Center for the Management, Utilization and Protection of Water Resources

Activation Amount: \$26,700.00

Agency: State of Tennessee

Grants Awarded

From 10/1/05 To 10/31/05

Principal Investigator: Sastry Munukutla, Energy Systems Research

Co-PI(s):

Project Title: Center for Energy Systems Research

Activation Amount: \$20,100.00

Agency: Tennessee Higher Education Commission

Grants Awarded

From 10/1/05 To 10/31/05

Principal Investigator: Steven Hayslette, Biology

Co-PI(s):

Project Title: Effects of Eurasian Collared-Doves on Populations of Mourning Doves and Other Species in the Southeastern U.S.

Activation Amount: \$11,855.00

Agency: U. S. Fish and Wildlife Service

Eurasian collared doves are recent invaders of North America. Native to India and the surrounding region, collared doves were introduced to the Bahamas in the mid-1970s. Since then, the species has spread across much of the continent, assisted by additional releases and escapes from captivity. Concern has been raised about the potential effects of the collared-dove invasion of North America on indigenous species, particularly other species of doves and pigeons. Ecological similarity between collared doves and other columbids may lead to competition between the exotic invaders and their native relatives. Additionally, anecdotal evidence suggests that collared-doves are behaviorally dominant to many native species. Anecdotal reports of declines in mourning dove numbers in locations with large collared-dove populations in Florida suggest that competition with collared doves may, in fact, lead to displacement of less aggressive native species. Effective and cost-efficient management of collared-dove populations to benefit mourning doves and other native species requires an understanding of the population-level effects of collared-doves on these native species. The objectives of this study are to test the hypothesis that arrival and expansion of collared-dove populations in the southeastern U.S. have been associated with declines of mourning doves, and other potential collared-dove competitors, identify site-specific geographic or other variables affecting the relationship between collared-doves and native species, and assess the usefulness of existing databases for evaluating the ecological, population-level effects of the Eurasian collared dove invasion of North America. This study will use annual census data from Breeding Bird Surveys and Christmas Bird Counts to estimate and compare trends in local populations of mourning doves in Florida and other southeastern states prior to, and following, the arrival of collared-doves. It also will investigate the influence of local land uses and other variables on the relationship between mourning doves and collared-dove populations. This study should yield important information regarding the need for active collared-dove management (e.g., control measures, including liberalized harvest), and the expected effects of the collared-dove invasion on populations of mourning doves and other native species in other areas of the U.S.

Grants Awarded

From 10/1/05 To 10/31/05

Principal Investigator: Satish Mahajan, Electrical and Computer Engineering

Co-PI(s):

Project Title: Explosive Vapor Detection Using Microcantilevers

Activation Amount: \$27,600.00

Agency: Oak Ridge National Laboratory

A small amount of explosive vapor will be deposited on a coated microcantilever. Heating of cantilever will lead to deflagration thereby giving a unique bending signature of the explosive. In the present work, the role of moisture in the vapor will be analyzed carefully. A system utilizing pulsed corona will be explored for trapping moisture.

Principal Investigator: Ken Currie, Manufacturing Center

Co-PI(s):

Project Title: Center for Manufacturing Research

Activation Amount: \$33,900.00

Agency: Tennessee Higher Education Commission

Grants Awarded

From 10/1/05 To 10/31/05

Principal Investigator: Michael Harvey, Biology

Co-PI(s):

Project Title: Monitor the Populations of Three Species of Endangered Bats Found in Northern Arkansas

Activation Amount: \$15,000.00

Agency: Arkansas Game and Fish Commission

The primary objective of this project is to annually monitor populations of endangered and other bats in Arkansas. A secondary objective is to obtain additional information concerning various aspects of the ecology of these species. Bat populations will be monitored primarily at caves where bats hibernate during winter and/or where they roost during summer. Standard bat population monitoring techniques will be used, including direct counts and trapping or netting techniques. Information gained will add to the database for these species and will be used to formulate management plans for the species involved.

Principal Investigator: James Layzer, Biology

Co-PI(s):

Project Title: Propagate and Restore Endangered Mussels in the Green River

Activation Amount: \$27,323.00

Agency: U. S. Department of the Interior

One of the most diverse mussel faunas in North America occurred in the Green River system. About 70 of the 104 species found in Kentucky are known from the Green River drainage. Although some species have been extirpated as a result of human alteration of the aquatic habitat, > 50 species, including the endangered *Cyrogenia stegaria*, *Lampsilis abrupta*, *Obovaria retusa*, *Pleurobema clava*, and *Pleurobema plenum* are still present. Mussel diversity within the Mammoth Cave National Park (MCNP) section of the Green River remains relatively high; however, recruitment of mussels is limited. The Tennessee Cooperative Fishery Research Unit and the Mammoth Cave National Park have jointly initiated a major long-term project to enhance populations of the most critically endangered mussels within the Green River. Juveniles propagated and initially cultured by the Unit are transferred to the MCNP culture facility for grow-out. The overall goal of this project is to establish self-sustaining populations of endangered species in the Green River.

Grants Awarded

From 10/1/05 To 10/31/05

Principal Investigator: Dennis George, Water Center

Co-PI(s): Glenn Cunningham,

Project Title: Franke Co. Innovative Food Processing Exhaust Emission Treatment System-Research Program

Activation Amount: \$99,992.00

Agency: Franke Company

The project is to characterize the chemical composition of food processing exhaust emissions treated by Franke Foodservice UVC Systems and potential corrosivity. In addition, the affects of UVC-light, ozone and other physical parameters on kitchen exhaust quality will be determined along with kinetic oxidation rates of the major constituents through the UVC process.

Principal Investigator: Donald Visco, Chemical Engineering

Co-PI(s):

Project Title: Developing Novel Scaffolds for Biological Molecules by Solving the I-QSAR Problem Using the Signature Molecular Descriptor

Activation Amount: \$50,000.00

Agency: Sandia National Laboratories

The broad field of quantitative structure-property relationships (QSAR) allows researchers in many areas to use such dependencies to correlate properties with particular features of the compounds examined. After this information is gleaned, the next step is the use of the results on the relative importance of some features to predict information about compounds that have not been examined in this way. The hope is, of course, that better compounds can be developed in this manner that have optimal desired properties. Unfortunately, the limiting step in the procedure is how to best quantify the particular features of compound's structure. Work by Professor Visco, in collaboration with Sandia National Laboratories, have made great strides in this problem through the introduction of a molecular descriptor, called Signature, which quantifies a molecule's 2D structure. Previous work has focused on using Signature to assess the biodiversity of a small database (~100 HIV-1 protease inhibitors) and a large database (~30,000 AIDS anti-viral drugs) as well as study the degeneracy/information content of Signature relative to dozens of other popular descriptors. As this technique matures, certain algorithmic bottlenecks have become apparent as we fine-tune this methodology against a variety of different problems. Since the longer term goal of this work is to develop an approach that goes from "data set" to "focused library", it is important to flesh out all of these areas in the earlier stages of the research. To this end, current work will focus on these issues as generated by several concurrent studies. Ultimately, once focused libraries are generated, experimentation will occur (as available) to provide a feedback mechanism to the algorithm.

Grants Awarded

From 10/1/05 To 10/31/05

Principal Investigator: Gay Shepherd, Administrative Offices
Co-PI(s): Francis Otuonye, Administrative Offices
Project Title: Comprehensive/Multi-Faceted Meth Response Project (SMART)

Activation Amount: \$493,322.00

Agency: U. S. Department of Justice

Tennessee Technological University (TTU) in collaboration with the 6th Congressional District counties and the 13th Judicial District Drug Task Force Stop Methamphetamine Abuse in Rural Tennessee (SMART) Unit Project have established a positive momentum in dealing with the problem of clandestine lab-produced methamphetamine in the Upper Cumberland region of Tennessee. With the funding for this project we will refine our attack on the methamphetamine problem in middle Tennessee and expand the successes of this project across the 15 counties of the 6th Congressional District.

Our emphasis will continue in the crucial arena of prevention and public awareness. We have followed a strategy that a problem of this magnitude can only be successfully eradicated with the participation of a coalition of dedicated professionals from all related fields and the public at large. In the first year of operation we have seen this strategy prove to be successful. Our prevention methodology is to educate the larger population on the details of what methamphetamine is; how it works; and things they, as concerned citizens, can do to protect themselves and to join the fight. The 13th Judicial District Drug Task Force has also trained teachers, counselors, relapse prevention therapists, and other professionals on the latest and most useful techniques to address prevention and rehabilitation.

In the area of enforcement we have unified the approach across the initial project area by individualized on site trainings for the local agencies dealing with methamphetamine and how to make good cases. This training was accomplished by a local full time methamphetamine prosecutor. We have sponsored national methamphetamine clandestine lab certification and recertification courses, certifying 40 officers representing every law enforcement agency in the initial project area. These officers were supplied with field protective equipment, and evidence and intelligence gathering equipment including laptop computers and digital cameras. A web-based intelligence network was developed and made available with accompanying training so that methamphetamine cooks could be tracked across traditional jurisdictional boundaries.

The complexion of methamphetamine continues to evolve and change. It is necessary to monitor these changes as they come and to maintain the flexibility to address the problem in its most current state. In the coming grant year we propose to develop new tools and refine and expand the use of the proven successful tools of the initial project. We propose to take this unified approach and its successes into an expanded area of the 15 county 6th Congressional district.

Grants Awarded

From 10/1/05 To 10/31/05

Principal Investigator: Dennis George, Biology

Co-PI(s): Brad Cook, Biology

Project Title: A Comparative Study of the Historical and Present Ecological State of the Emory River Watershed

Activation Amount: \$11,250.00

Agency: U.S. Fish and Wildlife Service

Introduction: During the 1960s through 1980 the US Fish and Wildlife Service (USFWS) and other federal and state agencies surveyed fish and mussel population at various locations throughout the Emory River watershed, HUC TN06010208. Within the watershed several streams support federally listed endangered and threatened species, including the spotfin chub (*Cyrinella monacha*) and the purple bean mussel (*Villosa perpurpurea*). In addition, the turgid blossom (*Epioblasma turgidula*), Alabama lamp mussel (*Lampsilis virescens*) and fine-rayed pigtoe (*Fusconaia cuneolus*) have not been reported in the streams since 1923. Associated critical habitat area for the spotfin chub in the Emory River watershed are

- Emory and Obed Rivers and Clear and Daddy's Creeks in Morgan County,
- Clear Creak in Fentress County, and
- Obed River upstream to U.S. Interstate Highway 40, Clear Creek upstream to U.S. Interstate 40, and Daddy's Creek upstream to U.S. Highway 127 in Cumberland County.

In addition, the USFWS is currently accessing if the Obed River, with its population of purple bean mussels, should be designated as critical habitat.

During the following 30 plus years Cumberland County has experienced a large increase in population and industrial growth that have altered landuse in the watersheds. Several of the streams are listed as impaired by the Tennessee Department of Environment and Conservation (TDEC) as shown in Figure 1 and listed on the 2002, 305b list for HUC TN06010208. Landuse changes can have impacts on habitat and water quality of the adjacent streams.

Scope: The proposed project will determine the current diversity and habitat condition of fish, mussels and macroinvertebrates within the Emory River Watershed. The project will determine the state of endangered and threatened fish and mussels and associated critical habitat. Also water quality in the Emory River watershed at biological monitoring sites will be determined. A GIS will be used to assess georeferenced data and information with associated landuse. Historical ecological and associated landuse data will be statistically compared current data to assess significant differences in the aquatic ecology within the watershed and associated landuse impacts. The findings from this project will be used to plan for mitigation processes that can reduce the impact of landuse alterations on aquatic ecology.

Grants Awarded

From 10/1/05 To 10/31/05

Principal Investigator: Dennis George, Water Center

Co-PI(s): Martha Wells, Water Center

Project Title: Franke Co. Innovative Food Processing Exhaust Emission Treatment System-Research Program

Activation Amount: \$99,992.00

Agency: Franke Company

The project is to characterize the chemical composition of food processing exhaust emissions treated by Franke Foodservice UVC Systems and potential corrosivity. In addition, the affects of UVC-light, ozone and other physical parameters on kitchen exhaust quality will be determined along with kinetic oxidation rates of the major constituents through the UVC process.