ATTACHMENT 1

Application Form
FY 2003 (Cycle 7) Section 6217 Request For Proposals:

Program Implementation Projects

1. TITLE AND LOCATION OF PROPOSED PROJECT
Texas Coastal Watershed Center – Linking Landuse to Water Quality

2. APPLICANT(S)		
Name: Raghavan Srinivasan and John Jacob		
Agency Texas Agricultural Experiment Station		
Address: Texas Agricultural Experiment Station Room 5, Jack K. Williams Administration Building 2147 TAMU		
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3. CONTACT PERSON (IF DIFFERENT FROM APPLICANT)		
Name: Diane M. Gilliland		
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4. FUNDING
A. Amount of grant funds requested $118,000
B. Amount of match funds provided $121,310
C. Source of matching funds Texas Agricultural Experiment Station

5. COASTAL NONPOINT SOURCE POLLUTION MANAGEMENT PROGRAM IMPLEMENTATION

Which Management Measure does the project implement? (Provide Measure and justification.) (www.glo.state.tx.us/coastal/nps.html, Chapter 5 for list of measures.)

Urban and Developed Areas

5.2.5.1 New Development
5.2.5.2 Watershed Protection from Urban Runoff
5.2.5.3 Site Development
5.2.5.7 On-Site Disposal Systems

Wetland and Riparian Areas

5.4.5.1 Protection of Wetlands and Riparian Areas
5.4.5.2 Restoration of Wetlands and Riparian Areas

6. Project Description/Scope of Work

Please provide a 2-3 paragraph project description with sufficient detail. (Use additional pages as necessary.)

Fully one-third of the population of the State of Texas lives within 100 miles of the Gulf Coast shoreline. Several of the state's fastest growing cities are within this region. The impact of this growing urban population on coastal waters has not been quantified, but urban runoff is now generally recognized as the fastest growing source of contamination in coastal waters.

Coastal waters are directly impacted by urban expansion because of the increase in impervious surfaces along with unsound practices such as landscape over-fertilization. But the indiscriminate loss of important natural areas such as wetlands and riparian forests also contributes to water impairment over and above the simple loss of pervious land because of the additional purification associated with ecosystem processes (e.g., denitrification in wetlands).
While the linkage between land use and water quality is well established in the scientific literature, few public citizens, including public officials, recognize the connection. But even if they did, would they be able to do anything about it? Land use planning is not a popular political subject in Texas

We propose to establish the Texas Coastal Watershed Center (TCWC) as an avenue of information dissemination and technical assistance for local governments and citizen groups along the Texas Gulf Coast. As part of both Texas Sea Grant and Texas Cooperative Extension, the TCWC will pull together the resources of the Texas A&M University System and other universities and institutions in the state to provide a full range of geospatial and planning information and science to enable local use planners to make informed decisions about land uses that impact coastal water quality

The TCWC will be a full partner in the National NEMO (nonpoint education for municipal officials) Network (www.nemo.uconn.edu). NEMO provides educational information that illuminates landuse and water quality linkages. This project will develop geospatial data that allows landuse planners to visualized the impacts of future development on water quality as well as formulate plans for mitigating any potentially negative impacts.

Current land use maps and adjusted impervious coefficients for specific land uses will be a major product developed by the SSL. The SSL will also develop the GIS interfaces that will enable users to interact with the geospatial data and make informed resource management decisions.

A basic set of tools can be provided including:

- Application of the NEMO framework to the Texas coast
- Impervious surface maps (current and projected).
- Landuse/Landcover maps.
- Visualization tools – hands on tools allowing the user to see the effects current development will have on future water quality.
- Water quality impact models based on the published values from the USGS National Water Quality Assessment (NAQWA) Program. http://water.usgs.gov/nawqa/nawqa_home.html
- Event mean pollutant concentration levels by landuse will be assigned using the NAQWA values to gauge impacts on water quality. The impact on water quality of different development scenarios can be assessed using theses values in a geospatial environment.

7. APPLICATION SUBMITTAL

Mail 2 copies to:
Blake Traudt
Coastal Management Division
P.O. Box 12873
Austin, TX 78711-2873

Please do NOT submit applications in spiral bindings, nor plastic/ hard covers. Questions should be directed to Blake Traudt at (512) 475-1745 (phone), (512) 475-0680 (fax), or at blake.traudt@glo.state.tx.us.

Please note: All applications must be received by 5:00 p.m. on February 21, 2002

A Proposal to establish the

TEXAS COASTAL WATERSHED CENTER

Linking Land Use to Water Quality

A NEMO-partnership project

Fully one-third of the population of the State of Texas lives within 100 miles of the Gulf Coast shoreline. Several of the state's fastest growing cities are within this region. The impact of this growing urban population on coastal waters has not been quantified, but urban runoff is now generally recognized as the fastest growing source of contamination in coastal waters (NRC, 2000).

Coastal waters are directly impacted by urban expansion because of the increase in impervious surfaces along with unsound practices such as landscape over-fertilization. But the indiscriminate loss of important natural areas such as wetlands and riparian forests also contributes to water impairment over and above the simple loss of pervious land because of the additional purification associated with ecosystem processes (e.g., denitrification in wetlands).

While the linkage between land use and water quality is well established in the scientific literature, few public citizens, including public officials, recognize the connection. But even if they did, would they be able to do anything about it? Land use planning is not a popular political subject in Texas.

Land use planning may not often be discussed outright, but the issues associated with it are being looked at with increasing frequency in areas of intense urban growth. Many communities struggle to maintain something of their character in the face of urban sprawl. And stormwater permitting issues increasingly force municipalities to face the water quality issues of new development. While Texas may not have the strong land use laws associated with the Northeast, the planning authority of most Texas municipalities is not insignificant.

We propose to establish the Texas Coastal Watershed Center (TCWC) as an avenue of information dissemination and technical assistance for local governments and citizen groups along the Texas Gulf Coast. As part of both Texas Sea Grant and Texas Cooperative Extension, the TCWC will pull together the resources of the Texas A&M University System and other universities and institutions in the state to provide a full range of geospatial and planning information and science to enable local use planners to make informed decisions about land uses that impact coastal water quality.

Education that makes the link between water quality and land use will be the fundamental mission of the Texas Coastal Watershed Center. We will help planners, policy makers, and citizens understand the water quality impacts of specific land uses and practices through visualizations and case studies. We will deliver this information through seminars and workshops, most held on-site with local governmental officials. Through the Spatial Sciences Laboratory at Texas A&M University, we will develop the geospatial tools that will enable linkages to be made in at least a semi-quantitative fashion.

The TCWC will also deliver information on the planning and preservation options that are available to Texas local governments. In addition to basic education on land use and water quality linkages, the TCWC will also provide education about practices that mitigate the water quality impacts (e.g., watersmart landscaping and other best management practices).

In addition to education and outreach, the TCWC will also provide a linkage to academic research facilities. The fundamental processes are well understood, but many details remain to be worked out for our own region. Just one example is the need for localized coefficients of imperviousness for specific land uses on the soils of the Gulf Coast. The classic Extension-Research linkage will be robust in the TCWC because of the multiple relationships established through the Spatial Sciences Laboratory.

Because of recent advances in geospatial information science and technology, tools are available that can enable local officials to make planning decisions with a much greater awareness of the environmental consequences. Most of these tools, however are still beyond the reach of all but the largest planning offices. And very few have the information and expertise to collect and transform the needed data.

The Texas Coastal Watershed Center will replicate the successful extension pattern of outreach backed up by professional specialists. The two areas of specialization pertinent to this proposal are geospatial information and urban planning. The combination of high powered geospatial inventory and visualization tools with in-depth knowledge of planning and development law at both the local and state level will enable the delivery of immediately usable information. The outreach delivery vehicle will be through traditional Extension means (county agents, V.G. Young Institute) as well as through partnerships with local council of governments such as the Houston-Galveston Area Council.

The Texas Coastal Watershed Center will be a full partner in the National NEMO (nonpoint education for municipal officials) Network (www.nemo.uconn.edu). NEMO provides educational information that illuminates land use and water quality linkages. By partnering with NEMO, the TCWC will have access to NEMO materials developed around the country, as well as a network for access to experienced professionals nationwide. TCWC would of course share any materials developed in the state with the national NEMO partners.

This proposal will support the Geospatial component of the TCWC. A separate proposal to NOAA will support the planning side.

This proposal supports the following Coastal Nonpoint Source Pollution Management Program Management Measures:

Urban and Developed Areas

5.2.5.1 New Development

5.2.5.2 Watershed Protection from Urban Runoff

5.2.5.3 Site Development

5.2.5.7 On-Site Disposal Systems

Wetland and Riparian Areas

5.4.5.1 Protection of Wetlands and Riparian Areas

5.4.5.2 Restoration of Wetlands and Riparian Areas

Geospatial Support

The Spatial Sciences Laboratory (SSL) at Texas A&M University will be the clearinghouse for geospatial information useful for the Texas Gulf Coast. The SSL has a team experienced in a wide range of geospatial applications from watershed modeling to landuse/landcover data development. The SSL will develop GIS layers such as impervious surfaces, soils, landuse, and hydrography for regional use. The purpose of the materials developed by SSL will be to enable decision makers to evaluate a range of land use decisions in terms of water quality and habitat, e.g., the cost to replace water quality functions of specific wetlands or forests destroyed by development. These tools will not make the decisions; rather they will allow planners or policy makers to be fully aware of the environmental implications and costs of their decisions,

Current land use maps and adjusted impervious coefficients for specific land uses will be a major product developed by the SSL. The SSL will also develop the GIS interfaces that will enable users to interact with the geospatial data and make informed resource management decisions.

A field geospatial support specialist will be based in the TCWC in Houston to provide direct logistical support to the initial service area. In addition, a research associate and graduate

research assistant will be stationed at the SSL to develop GIS datasets, end-user interfaces, and provide geospatial technical support. A basic set of tools can be provided including:

- Application of the NEMO framework to the Texas coast
- Impervious surface maps (current and projected).
- Landuse/Landcover maps.
- Visualization tools – hands on tools allowing the user to see the effects current development will have on future water quality.
- Water quality impact models based on the published values from the USGS National Water Quality Assessment (NAQWA) Program. http://water.usgs.gov/nawqa/nawqa_home.html
- Event mean pollutant concentration levels by landuse will be assigned using the NAQWA values to gauge impacts on water quality. The impact on water quality of different development scenarios can be assessed using theses values in a geospatial environment.

Planning Specialist

A planning specialist with in depth knowledge of Texas planning and land use law will be hired for this project (under a separate proposal to NOAA). While Texas has few of the land-use ordinances available to Connecticut townships, it has granted counties and cities some fairly substantial planning authority. In addition, a wide variety of voluntary and incentive tools are also available (e.g., transfer of development rights).

Research

The TCWC will coordinate research needs on the effects of impervious surfaces and development on coastal watersheds. We will do that by serving as a information gateway between the university community and coastal officials and citizens.

Project Deliverables

There will be two basic types of deliverables, extension/outreach and geospatial information for the initial service region (Houston/Galveston coastal areas).

Extension/Outreach Deliverables:

Seminars (2)

Audience: County/city commissioners and other land use decision makers.

We will develop seminars based on existing NEMO seminars (adapted to Texas conditions):

Linking Land Use to Water Quality.* Provides basic concepts of land use practices and their effects on water quality.

National NEMO Network Programs.* Introduces the idea of NEMO and gives examples of NEMO programs already in practice.

How to do a Community Resource Inventory.* Teaches land use planners how to recognize all of the resources in a community.

Plans of Conservation and Development.* Incorporates conservation goals with development plans.

*NEMO Programs (will be adapted to Texas conditions)

Small Group Presentations (2)

Audience: County/city commissioners and other land use decision makers, private and governmental agencies, and the public..

Presentations will cover topics of:

Water quality in the area of concern.

Linkage between land use and water quality.

Status and trends of watersheds in the area of concern.

Land use planning.

Establishment and purpose of the Texas Coastal Watershed Center (TCWC).

NEMO; National NEMO Network

Geospatial Information Deliverables:

Compilation of existing GIS datasets into a consistent format for end use for the lower Galveston Bay area.

- digital elevation models(DEM)
- hydrography (streams, rivers, lakes, bays, other waterbodies)
- roads (TXDOT)
- urban areas
- soils (SSURGO where available, STATSGO otherwise)
- watershed boundaries
- digital ortho quarter quads (DOQQ)

Development of current landuse/landcover data (USGS National Land Cover Data (NLCD)).

Determination of imperviousness coefficients for landuse/landcover classes

Municipal Zoning Data (includes committed opens space)

Unbuildable areas including floodplains (FEMA), federally regulated wetlands, etc.

Scenario modeling

- GIS interface for planners to gauge impact of future development on existing resources and water quality using the data developed above
- Based on the NEMO framework for impervious surface buildout analysis (*i.e.* what impact do current levels of development have on water quality and what impact will proposed future development have?)
- Water quality impact models using the values developed by the USGS NAQWA program to gauge surface runoff pollution loads based on cover type

<u>Project Timeline</u>

Compilation of existing GIS datasets (6 months from contract execution)

- DEM, hydrography, roads, urban areas, soils, watershed boundaries

- Landuse/landcover data development
- Municipal zoning data
- Unbuildable areas

Determination of impervious surface coefficients (9 months from contract execution)

Scenario modeling (12-15months from contract execution)

- Development of GIS interface for resource planners
- Adaptation of NEMO framework to Texas
- NAQWA water quality impact models

Small group presentation (12 months from contract execution)

Seminars (15 months from contract execution)

Appendix A.

Existing Texas Sea Grant / Texas Cooperative Extension Programs that fit under the Texas Coastal Watershed Banner

Armand Bayou/ Clear Creek Watershed Working Group

> Out growth of the Clean Water for Armand Bayou project. Funding in place for 1 FTE for ~18 months for a "watershed coordinator." The WC will work with local governments, NGOs, and citizens to develop a watershed action plan. Prospects for continued funding are good.

Stormwater Circuit Rider

> 1 year FTE to assist municipalities and others affected by TxPDES stormwater program to development stormwater management plans. Direct assistance and seminars. Probable continued funding for 2-5 years. New position yet to be filled.

Wetland Ecosystem Mapping, lower Galveston Bay Watershed

> Funded by Galveston Bay Estuary Program. Current funding ~.75 FTE, with prospects for continued funding. GIS mapping of wetland and riparian complexes throughout the Clear Creek Watershed. Technical prioritization of complexes accomplished. Map is web accessible. Next phase will involve stakeholder participation and prioritization. Ricardo Lopez (full time).

Watershed Event/ Network

> We raised almost $30,000 to host the one day "Watershed Event" conference which brought leading lights of smart growth/ conservation development together with members of the greater Houston development community to explore the issues of flooding, habitat, and development on the Upper Gulf Coast. A network has been formed and the conversation continues.

Watersmart Landscaping Initiative

> Current project funded by the Galveston Bay Estuary Program. Ongoing. Current funding about $30,000. Annual Watersmart Landscaping Workshop in Clear Lake area (3 years). Clean Water for Armand Bayou demonstrations. Watersmart pamphlets. Nassau Bay demonstrations. 1-3 presentations monthly. Marissa Sipocz (.2 FTE). Proposal for 300k pending with Houston Endowment.

Urban Treatment Wetlands

> We are participating in the development of an urban stormwater treatment wetland on Brays Bayou in the near-downtown Houston area. Funded by the GBEP. In 2001, we developed the basic plan for the wetland, and have developed partnerships with Austin and Chavez High Schools, 2 inner city dominantly Hispanic schools, working through Natural Legacy, a small arts and environment NGO working in low income neighborhoods in central Houston. High School students have been involved in plant collection and maintenance. (Marissa Sipocz, 0.3FTE).

Soil Landform Maps, Montgomery County

We have developed significant geospatial information technology capability by developing digital groundwater suitability maps for on-site septic systems in Montgomery County. Product is in field testing mode. If successful, we may develop similar maps for other counties in Texas.

Existing Spatial Sciences Laboratory projects that fit under the Texas Coastal Watershed Banner

Brays and Greens Bayou Flood Assessment Study--USACE-SFG (1996)

The U.S. Army Corps of Engineers (COE), Galveston District, must evaluate the potential impact of the 500 year flood in the many urbanized areas. As flood control structures are designed by the COE, economic studies to determine the potential impact on each structure in case of flooding must be done. The valuation of the impact, typically done by COE, requires numerous data sources that are typically not in digital form, requires months or even years to develop, and is very costly. Additionally, these types of studies may have to be done more than once since the local flood control agency must approve the COE plan. The Spatial Sciences Laboratory began working with the COE Galveston District to develop a methodology that would reduce the time and cost for developing the databases to conduct the economic valuations. The thrust of this activity was to develop a methodology that would take advantage of digital data that currently exists, as well as develop a methodology that can be repeated for any other flood studies similar to this one.

St. Francis Basin LULC Development--USACE, MVM and GEC, Inc. (2000)

The Spatial Sciences Laboratory is contracted to develop and furnish a land cover map of the Saint Francis Basin for the Memphis district of the U.S. Army Corps of Engineers (USACE-MVM). Studies are routinely conducted by COE to determine the impact of implemented flood control and navigation structures on vegetation. Many of the lands managed by COE along the Mississippi River have been designated as wetlands by various federal legislative actions. Because they are wetlands, they must be monitored and protected. Toward that end, the COE periodically conducts studies to establish trends in land cover changes along the river. One such study is the vegetation mapping within the St. Francis River basin. This basin consists of approximately 4.1 million acres of lands and water located in southeast Missouri and northeast Arkansas, west of the Mississippi River. The Spatial Sciences Laboratory (SSL) contracted with the LMVD to map the vegetation in the St. Francis River basin using color infrared (CIR) aerial photography. Hard-copy CIR aerial photography was converted to digital format and geo-referenced to create a photo mosaic of the entire river basin. Thirty-five vegetation classes were delineated using "heads-up" digitizing. This represents a significant improvement in efficiency from traditional methods. The end result of this mapping effort is a seamless, digital, GIS database for the entire area.

BASINS (2000)

In this project, user-friendly spatial tools for extraction of model input data are developed for USEPA's BASINS. The spatial tools are developed for automatic watershed delineation with many flexible configurations from DEMS, computing sub-watershed parameters like soil and land use definitions, and input of point sources and reservoirs. The spatial tools allow the model users to use either the available data or input their own data and do the necessary processing and simulation. As part of the effort the SWAT model is incorporated within BASINS.