

EVALUACIÓN DE LA EFECTIVIDAD DE DISTINTAS PRÁCTICAS AGRÍCOLAS PARA LA REDACCIÓN DE UN PLAN INTEGRAL DE GESTIÓN AMBIENTAL EN EL EMBALSE DE CEDAR CREEK (TEXAS, EEUU)

Durante las últimas décadas, la tendencia a escala mundial hacia una agricultura más intensiva e industrializada ha traído consigo diversos problemas medioambientales, entre los cuales destacan las emisiones de diferentes compuestos a la atmósfera y agua, el impacto sobre la calidad y cantidad de aguas superficiales y subterráneas, la erosión del suelo, la deforestación, la contribución al efecto invernadero, la contaminación por pesticidas y la pérdida de biodiversidad. Con objeto de dar solución a este problema, se están desarrollando estrategias de mejora que integren medidas de protección del medio ambiente, de manera que puedan mantenerse los recursos que nos ofrece la naturaleza y garantizar con ello la propia producción agrícola para las generaciones futuras.

Para la correcta implantación y evaluación de la eficacia de dichas medidas resulta de gran interés el desarrollo de modelos que permitan evaluar la eficacia de las medidas propuestas en cuanto a la reducción de contaminantes de acuerdo con criterios económicos y sociales. Concretamente, la conferencia propuesta muestra un análisis de los impactos de las prácticas agrícolas sobre la calidad de las aguas del embalse de Cedar Creek (Texas) mediante una modelización numérica que considere los principales procesos a escala de cuenca. Así, los procesos simulados son aquellos relacionados con la hidrología, las prácticas agrícolas y la transformación de nutrientes.

Para la realización de estas simulaciones se utilizó el modelo SWAT (Soil and Water Assessment Tool), el cual se puede definir como un software para el modelado integral de grandes cuencas que permite conocer la dinámica hídrica de las mismas bajo diversos escenarios actuales y futuros, permitiendo una visión holística de éstas. De hecho, SWAT permite caracterizar los procesos físicos que controlan la transformación de la precipitación en escorrentía, a la vez que modela la erosión del suelo y el transporte de sedimentos, así como la movilización de nutrientes y la dispersión de contaminantes, en el conjunto de la cuenca. SWAT es una herramienta que permite evaluar el impacto de las actividades humanas y/o del cambio climático sobre la cantidad y régimen de la producción de agua y sedimentos a nivel de cuenca hidrográfica, de subcuenca o de Unidades Hidrológicas de Respuesta (HRU), entendiéndose por HRU a aquellas superficies que poseen una combinación única de uso del suelo, suelo y pendiente. El modelo SWAT también se puede utilizar como una herramienta de planificación, puesto que permite valorar los efectos de los cambios de uso del suelo, de las actividades de restauración y de las distintas prácticas de conservación del suelo sobre el conjunto de la cuenca, optimizando la toma de decisiones del gestor. Además de la eficiencia en la simulación de escenarios que brinda esta herramienta, SWAT se caracteriza por ser un modelo con base física eficaz a nivel computacional que emplea registros de entrada reales y sencillos, con un amplio desarrollo dentro de la comunidad científica.

El embalse de Cedar Creek recoge el agua generada en una cuenca de 2.600 km², y está situado al sureste de la ciudad de Dallas. Dicho embalse abastece de agua a alrededor de 1,6 millones de personas y se estima que en 2050 abastecerá a 2,66 millones de personas. En los últimos años, la calidad del agua de este embalse ha empeorado de manera notable, tal y como certifican los altos niveles de clorofila detectados. Con objeto de redactar un plan de gestión que mitigara los problemas asociados a la calidad de las aguas, se realizó con carácter previo a la redacción del plan, un estudio que evaluaba tanto la ubicación de aquellas superficies de la cuenca que generaban una mayor cantidad de contaminantes como la simulación de la eficiencia de distintas prácticas agrícolas. Las prácticas agrícolas evaluadas no solamente incluían aquellas relacionadas con los cultivos agrícolas asociados al sector privado (como por ejemplo cultivo en terrazas, rotación de cultivos, barreras vegetales, control en el uso de fertilizantes,...), sino también otras medidas a ejecutar en zonas de

secano, erial, o en dominio público, como por ejemplo la construcción de diques de retención o la implantación de barreras vegetales en las laderas de los cauces.

La metodología que se presenta en esta conferencia puede ser replicada en numerosos casos de estudio de la Región de Murcia. Los resultados obtenidos en este caso de estudio resultarán de gran interés, tanto para los agricultores al evaluar qué medidas son las que suponen una mayor sostenibilidad ambiental a un menor coste, como para la administración, al suponer una herramienta imprescindible para la redacción de futuros planes de mejora de la calidad de las aguas.

Nota de Prensa Universidad (UCAM): <https://bit.ly/2QKFjXI>

Página Fanpage de Facebook: <https://bit.ly/2EijA7V>

Blog de la Cátedra: <https://bit.ly/2CL7B1o>

La Verdad de Murcia: <https://bit.ly/2zwrsAq>

MurciaDiario: <https://bit.ly/2NK6Kpm>

NewsEuropa: <https://bit.ly/2NoFhmD>

Murcia.com: <https://bit.ly/2EITmBy>

Retema: <https://bit.ly/2IZ5Opu>

Novaciencia: <https://bit.ly/2QSHiZX>

CUMULATIVE VITA

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I. Previous Education, Experience, and Awards

Educational Training

Ph.D. Agricultural Engineering, Purdue University, May 1992.
M.S. Agricultural Engineering, Asian Institute of Technology (Bangkok), 1989.
B.E. Agricultural Engineering, TNAU (India), 1984.

Work Experience

2016 – present: Regents Fellow
2014 – present: Texas A&M AgriLife Research Fellow
September 2011 – present: Senior Scientist of Borlaug Institute
September 2004 – present: Professor, Texas A&M University (TAMU) and Texas AgriLife Research (TALR)
August 2000 – present: Director of Spatial Sciences Laboratory, TAMU, College Station, TX
September 1999 – August 2004: Associate Professor, TAMU and Texas Agricultural Experiment Station (TAES)
April 1999 – July 2000: Assistant Director of Mapping Science Laboratory, TAMU, College Station, TX
1998 – 2005: Adjunct Professor, School of Rural Public Health, Health Science Center, TAMU
1996 – 1999: Assistant Professor, TAES, Temple, TX
1992 – 1996: Agricultural Engineer and Associate Research Scientist, TAES, Temple, TX
1989 – 1992: Graduate Research Assistant, Purdue University, W. Lafayette, IN
1988 – 1989: Graduate Research Assistant, AIT, Bangkok

Honors and Awards

- 2016: 2014-2015 Regents Fellow Service Award
- 2016: SGGW Medal of Honor for the scientific contribution and cooperation with University of Life Sciences, Warsaw University, Poland
- 2015: College of Agriculture Distinguished Agriculture Alumni Award, Purdue University
- 2014: Vice Chancellor's Award in Excellence for International Involvement

- 2014: Texas A&M AgriLife Research Faculty Fellow Award
- 2014: College of Agriculture and Life Sciences Dean Outstanding Achievement Award in the category of Interdisciplinary Research Team – “Bacterial Source Tracking Team”
- 2013: Awarded Docteur Honoria Causa (Honorary Doctorate Award) by Paul Sabatier University – Toulouse III in 2013 in recognition of outstanding scientific accomplishments
- 2012: 2011 Norman Hudson Memorial Award from the World Association of Soil and Water Conservation for outstanding contribution to soil and water conservation and the successful development and worldwide application of the Soil and Water Assessment Tool (SWAT) model, received on July 18, 2012, during the International SWAT conference at IIT, Delhi, India
- 2011: Honorary appointment as Senior Scientist of Borlaug Institute for a five-year period from 2011
- 2010: Awarded Scientist of the Year by the Biological and Agricultural Engineering Department, Texas A&M University
- 2009: Texas AgriLife Extension Superior Service Team Award for the Plum Creek Watershed Protection Plan. With R. Bauer, M. Berg, B. Davis, N. Dictson, M. McFarland, R. Karthikeyan, D. Magin, T.J. Helton, B. Koch, and A. Wendt
- 2008: American Society of Agronomy Extension Educational Materials Award for the Southern Region Water Quality Regional Website (<http://srwqis.tamu.edu>). With J. Tech, M. McFarland, and the Southern Region Water Quality Planning Committee
- 2004: AWRA Boggess Award for the paper “Simulated Impacts of El Niño/Southern Oscillation on United States Water Resources” published in February 2003
- 2001: Vice Chancellor’s Award in Excellence in recognition of outstanding contributions and performance as a member of a research team (Soil and Water Assessment Tool Team)
- 1998: Awarded Scientist of the Year at Blackland Research Center
- 1997: Nominated for the U.S. EPA Region VI Environmental Excellence Award by Governor George W. Bush for efforts in managing nonpoint source pollution
- 1994: Selected for the summer program in Global Climate Change by the Jet Propulsion Lab, California Institute of Technology, CA
- 1991: Recipient of the Ismail Interdisciplinary Program Doctoral Research Award, Purdue University, 1991
- 1988 – 1989: President, ALWDP (Agricultural Land and Water Development Program) Club, Asian Institute of Technology
- 1988 – 1989: New Zealand Government Scholarship, AIT, Bangkok

Society Memberships

American Society of Agricultural and Biological Engineers (ASABE).
American Water Resource Association (AWRA).

II. Position Description

35% teaching and 55% research, with 10% of research as Director of Spatial Sciences Laboratory in an administrator role

Teaching Responsibilities (35%)

- Teach undergraduate and graduate courses in spatial sciences as applicable to natural resources and solving environmental issues
- Direct graduate student research and participate on graduate advisory committees
- Advise undergraduate students

Research Responsibilities (55%)

- Director of Spatial Sciences Laboratory: Administer, provide leadership in spatial sciences research areas for the agricultural program of TAMU, and coordinate projects. In addition, maintain contacts and relationships with existing and new clientele as warranted. Oversee the operation of the daily lab activities in technical, financial, personnel, infrastructure, and other related matters. (More details are provided in the service section of this document, page (Section V))
- Research fundamental principles and the application of spatial sciences to natural resource settings including forestry, agricultural, and rangeland environments.
- Develop models to address hydrology and nonpoint source pollution using spatial sciences tools such as Geographical Information System (GIS), Global Positioning System (GPS), and Remote Sensing (RS) technologies.
- Direct the design of GIS linkages to large natural resource databases.
- Direct development of GIS output reports and maps designed for national and regional policy analysis.
- Direct the development of hypertext and other visual/analytical tools for managing the implementation and execution of large watershed projects.
- Direct technical supervision of post-doctoral research associates, research associates, graduate students, systems analysts, and computer programmers involved in research and development.
- Solicit research support from federal, state, and private clientele in a competitive and cooperative manner.

III. Teaching Activities

To me, teaching is the most essential component of one's professional responsibilities. Teaching challenges one to be current in all related topics in order to disseminate relevant knowledge to students in this constantly changing world.

List of courses taught for graduate and undergraduate classes

Term	Courses	Credit Hours and Sections	Total Enrollment	Responsibility and Course Evaluation (Y/N)	Notes
Fall 1999	FRSC 461/651 Introduction of GIS to Natural Resource Managers	2 hours lecture and lab 3 sections – FRSC 461 2 sections – FRSC 651	32 28 (grad)	100% and Yes mean score – 3.64 mean score – 3.68 (evaluation)	The course was totally revamped with new topics and was revised from previous years.
Fall 1999	FRSC 691 Graduate Research Hours	18 hours	2	100% and No	
Spring 2000	FRSC 652 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	11	100% and Yes mean score – 4.38 (evaluation)	The course was redesigned, and new software programs and modeling with GIS were introduced.
Spring 2000	FRSC 485 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	3	100% and Yes mean score – 4.37 (evaluation)	The course was redesigned, and new software programs and modeling with GIS were introduced.
Spring 2000	FRSC 691 Graduate Research Hours	20 hours	5	100% and No	
Summer 2000	FRSC 691 Graduate Research Hours	9 hours	2	100% and No	
Fall 2000	FRSC 691 Graduate Research Hours	8 hours	1	100% and No	
Fall 2000	FRSC 461/651 Introduction of GIS to Natural Resource Managers	2 hours lecture and lab 3 sections – FRSC 461 2 sections – FRSC 651	32 19 (grad.)	100% and Yes mean score – 4.47 mean score – 4.26 (evaluation)	
Spring 2001	FRSC 652 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	9	100% and Yes mean score – 4.51 (evaluation)	
Spring 2001	FRSC 485 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	3	100% and Yes mean score – 4.72 (evaluation)	
Spring 2001	FRSC 691 Graduate Research Hours	11 hours	2	100% and No	
Term	Courses	Credit Hours and Sections	Total Enrollment	Responsibility and Course Evaluation (Y/N)	Notes

Summer 2001	FRSC 691 Graduate Research Hours	16 hours	4	100% and No	
Fall 2001	FRSC 691 Graduate Research Hours	11 hours	5	100% and No	
Fall 2001	FRSC 461/651 Introduction of GIS to Natural Resource Managers	2 hours lecture and lab 3 sections – FRSC 461 2 sections – FRSC 651	60 18 (grad)	100% and Yes mean score – 4.30 mean score – 4.39 (evaluation)	
Spring 2002	FRSC 652 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	8	100% and Yes mean score – 4.71 (evaluation)	
Spring 2002	FRSC 691 Graduate Research Hours	29 hours	5	100% and No	
Summer 2002	FRSC 691 Graduate Research Hours	16 hours	5	100% and No	
Fall 2002	FRSC 461/651 Introduction of GIS to Natural Resource Managers	2 hours lecture and lab 3 sections – FRSC 461 2 sections – FRSC 651	63 25(grad)	100% and Yes mean score – 4.38 mean score – 4.67 (evaluation)	A new ArcGIS software program and a lab manual were prepared for the class.
Fall 2002	FRSC 691 Graduate Research Hours	26 hours	5	100% and No	
Spring 2003	FRSC 461/651 Introduction of GIS to Natural Resource Managers	2 hours lecture and lab 1 section – FRSC 461/651	12 10 (grad)	100% and Yes mean score – 4.39 mean score – 4.77 (evaluation)	
Spring 2003	FRSC 652 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	19	100% and Yes mean score – 4.61 (evaluation)	
Spring 2003	FRSC 485 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	3	100% and Yes mean score – 3.94 (evaluation)	
Fall 2003	FRSC 461/651 Introduction of GIS to Natural Resource Managers	2 hours lecture and lab 3 sections – FRSC 461 2 sections – FRSC 651	52 22 (grad)	100% and Yes mean score – 4.29 mean score – 4.73 (evaluation)	
Term	Courses	Credit Hours and Sections	Total Enrollment	Responsibility and Course Evaluation (Y/N)	Notes

Spring 2004	FRSC 652 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	19	100% and Yes mean score – 4.79 (evaluation)	
Spring 2005	FRSC 652 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	23	100% and Yes mean score – 4.05 (evaluation)	
Fall 2005	FRSC 489/102 Introduction to Spatial Sciences	1 hour lecture	9	100% and Yes Mean score – 4.65 (evaluation)	A new course was offered for students to explore the new Spatial Sciences Degree program
Spring 2006	FRSC 652 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	24	100% and Yes mean score – 4.05 (evaluation)	Additional lectures and lab sections were added to improve the contents
Summer 2006	FRSC 461/651 Introduction of GIS to Natural Resource Managers	2 hours lecture and lab 1 section – FRSC 461 1 section – FRSC 651	10 11	100% and Yes mean score – 4.47 mean score – 4.76 (evaluation)	To keep up with the demand and interest, taught the summer course. Also helped the university WCSH for legislative budgeting.
Fall 2006	FRSC 102/SPSC 101 Introduction to Spatial Sciences	1 hour lecture	30	100%	
Spring 2007	FRSC 652 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	24	100% and Yes mean score – 4.52 (evaluation)	Additional lectures and lab sections were added to improve the contents
Fall 2007	FRSC 102/SPSC 101 Introduction to Spatial Sciences	1 hour lecture	xx	100%	
Spring 2008	FRSC 652 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	24	100%	
Fall 2008	FRSC 102/SPSC 101 Introduction to Spatial Sciences	1 hour lecture	12	100%	
Spring 2009	FRSC 652 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	24	100%	
Term	Courses	Credit Hours and Sections	Total Enrollment	Responsibility and Course Evaluation (Y/N)	Notes

Fall 2009	FRSC 102/SPSC 101 Introduction to Spatial Sciences	1 hour lecture	10	100%	
Spring 2010	FRSC 652 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	24	100%	
Fall 2010	FRSC 102/SPSC 101 Introduction to Spatial Sciences	1 hour lecture	10	100%	
Spring 2011	FRSC 652 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	26	100%	
Spring 2012	FRSC 652 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	26	100% and Yes mean score – 4.57 (evaluation)	
Spring 2013	ESSM/BAEN 652 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	24	100%	
Spring 2014	ESSM/BAEN 652 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	21	100% and Yes mean score – 4.47 (evaluation)	
Spring 2015	ESSM/BAEN 652 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	25	100% and Yes mean score – 4.54 (evaluation)	
Spring 2016	ESSM/BAEN 652 Advanced GIS and Its Application to Natural Resource Managers	2 hours lecture and 1 section lab	25	100% and Yes mean score – x.xx (evaluation)	

Significant Contributions

Major Revision of FRSC 461/651 Introduction of GIS to Natural Resource Managers

Since the assumption of my responsibilities as Director of the Spatial Sciences Laboratory, a complete revision of the FRSC 461/651 course has been implemented. This course now has the latest updated text materials on GIS principles and its application to natural resources. This course was completely revamped to cover newer topics and software as industry standards have changed. I was the first educator within

TAMU to adopt the new ArcGIS software to prepare students for tomorrow's job market. FRSC 461 was approved to cross-list with AGSM 461 (Agricultural System Majors, which is in the Biological and Agricultural Engineering Department) starting fall 2003. This would further enhance the opportunity for engineering students to take this introductory GIS course. In addition, FRSC 651 was approved and cross-listed with BAEN 651 from spring 2003.

The students were encouraged to participate in classroom and lab settings and to formulate how GIS can be used in their own major field. Several examples of GIS applications were examined during class. All class materials/presentations were made available online for the students a day or two before the class. This was very successful, and students welcomed the idea of having the material beforehand and the chance to review the information.

Graduate students in the class were asked to submit a term paper as part of their evaluation. The entire class was given an opportunity to submit a term paper for 10 points of extra credit. Students had five topics to choose from for the term paper. Topics ranged from application of GIS in an individual student's discipline to legal issues of using public domain spatial data. Most of the undergraduate students made use of this chance to improve their grades. In addition, attempts were made to bring in various private, state, and federal users of GIS applications to present case studies of how GIS is used in their workplace. Due to the time limit, only a U.S. COE engineer from Galveston and a Schaumburg Inc. Oil industry geophysicist were invited to present case studies for the class.

Major Revision of FRSC 652 Advanced GIS and its application to Natural Resource Managers

The ESSM 652 course was completely redesigned to focus on building from the ESSM 351/651 foundation courses. As a result, enrollment more than doubled, and the course has achieved its maximum capacity of 24 students without expanding the number of sections. The FRSC 652 course was newly designed to teach the most current GIS modeling techniques using raster, 3-D, and Geostatistical and Internet mapping server extensions of ArcGIS. In addition, ESSM 652 was approved and cross-listed as BAEN 652 starting in spring 2003. ESSM 652 was taught as a TTVN-distance education course for the first time in the spring of 2003. During this class, several modeling techniques from simple index and rule-based approaches to more complex spatial simulation models were taught to students. In addition, the grid/raster GIS modeling framework, which is more suitable for the natural resources area, was discussed and taught in the laboratory. The course had a heavy emphasis on individual projects that students designed while developing methods, and implementing and documenting procedures. Several research papers from recent literature were made available to students. Journal articles from various disciplines catered to the diversity of the students.

ESSM 652 followed the example of ESSM 351/651 by presenting class materials using a PowerPoint presentation with the materials available online for the class before the lecture. External speakers were invited from the modeling and application arena to

present case studies, which was quite successful and informative for students. The GIS software used for this class is always kept current so that the graduating students can step into the real world and be effective immediately. Maintaining the state-of-the-art computing environment, along with the latest software, is very important for the success of students about to enter the job market.

In both courses, students were evaluated for their understanding of the spatial technologies by means of quizzes during the lab sessions and three formal one-hour exams. In addition, students were encouraged to read the latest research articles and synthesize current research by means of term paper reports. In labs, students worked in pairs in FRSC 461/651 and individually in FRSC 652 to solve real-world problems through the methods and tools they learned throughout the semester. The class project contained report writing and a computer-aided class presentation to the entire class, where all students interacted actively through a question and answer session after each presentation.

GIS and Remote Sensing Graduate Certificate Program

I was instrumental in developing two graduate certificate programs in cooperation with the Department of Geography. Students are expected to take 12 graduate credit hours in the GIS and remote sensing areas in order to earn the certificate. Both the certificate programs require all the courses (ESSM 351/651, ESSM 652 and ESSM 608) that are taught through the Spatial Sciences Laboratory. Detailed descriptions of these certificate programs are attached as Appendix 10.

Professional Development

Teaching Workshop: Attended a teaching portfolio and strategy workshop conducted by the Texas A&M Center for Teaching Excellence on December 1 and 2, 2000, at Conroe, Texas.

Continuing Education (Short Courses)

Since 1999, have conducted hundreds of workshops related to watershed and water quality modeling. The U.S. Environmental Protection Agency's (USEPA) water programs, their counterparts in each state, and other pollution control agencies are increasingly emphasizing development of watershed and water quality-based assessment for integrated point and nonpoint sources pollution. Better Assessment Science Integrating Point and Nonpoint Sources (BASINS) is a system developed to meet the needs of such agencies. It integrates a geographic information system (GIS), national watershed data, and state-of-the-art environmental assessment and modeling tools into one convenient package. I was instrumental in designing and developing BASINS package for USEPA and successfully developed detailed continuing education materials to teach the BASINS course in cooperation with the University of Texas at Austin. As part of this education materials, I was responsible for two days out of the five-day course. I presented a real-world application of the Soil and Water Assessment Tool (SWAT), a watershed and water quality model that was applied to the Bosque watershed in Texas. I also

taught the class from start to end on formulating the TMDL (Total Maximum Daily Load) program as per USEPA's guidelines. In addition, I prepared and conducted a hands-on session for the use of the BASINS tools. Detailed listings of dates of these courses are listed under the services section of this document.

Graduate Student Direction

Chair (*) or Co-chair (**) for graduate students:

Degree Program	Name of Student	Department	University	Dates
M.S.*	Xiaohan Mei	WHMS	Texas A&M	2016-present
M.S.**	Sintayehu Teshome	ESSM	Texas A&M	2016-present
Ph.D.**	Danielle Bressiani	Civil Engineering	University of Sao Paulo	2013-2016
Ph.D.**	Xiaoling Sun	Sciences de L'Univers, de L'Environnement et de 'Espace (SDU2E)	Paul Sabatier University	2013-2015
Ph.D.*	Elizabeth Haney	Ecosystem Science and Management	Texas A&M	2014 - present
Ph.D.**	Mijin Seo	Biological and Agricultural Engineering	Texas A&M	2012 - 2014
Ph.D.**	Dhanesh Yeganantham	Civil Engineering	Texas A&M	2012 - present
Ph.D.*	Nina Omani	Biological and Agricultural Eng.	Texas A&M	2009 - 2014
M.S.**	Ceema Feizollahi	Range Science and Management	Texas A&M	2010 - 2014
M.S.*	Jace Don Stukey	Forest Science	Texas A&M	2011 – 2012
M.S.*	John Kretzchmar	Range Science and Management	Texas A&M	2011 - 2012
Ph.D.**	DeEtra Young	Forest Science	Texas A&M	2006 - 2010
M.S.*	David Shoemate	Range Science and Management	Texas A&M	2009 - 2011
M.S.*	David Reeves	Water Management and Hydrological Science (WHMS)	Texas A&M	2007-2009
M.S.*	Drew Miller Gholson	Water Management and Hydrological Science	Texas A&M	2007-2009
M.S.*	Sivarajah Mylevaganam	Biological and Agricultural Engg	Texas A&M	2006 - 2009
M.S.*	Martin Gibson	Forest Science	Texas A&M	2006 - 2008

M.S.*	Zach Vernon	Forest Science	Texas A&M	2006 - 2008
Ph.D.*	Xuesong Zhang	Forest Science	Texas A&M	2004 - 2008
M.S.*	Detra Young	Forest Science	Texas A&M	2006 – 2006
M.S.*	Elizabeth Poprik	Forest Science	Texas A&M	2003 – 2005
Ph.D.**	Mathias Tobler	Wildlife and Fisheries Science	Texas A&M	2003 - 2008
M.S.*	Greg Michalak	Forest Science	Texas A&M	2003 - discontinued
M.S.*	Bakkiyalakshmi Palanisamy	Biological & Agricultural Engineering	Texas A&M	2002 – 2006
M.S.*	Kim Hart	Forest Science	Texas A&M	2002 – 2006
Ph.D.	Chen Jing	Forest Science	Texas A&M	2002 – 2004 (transferred to BAEN)
Ph.D.*	Hakan Oguz	Forest Science	Texas A&M	2001 – 2004
M.S.*	Jennifer Hadley	Forest Science	Texas A&M	2001- 2003
M.S.*	Todd Snelgrove	Forest Science	Texas A&M	2000 – 2002
Ph.D.*	Balaji Narashiman	Agricultural Engineering	Texas A&M	1999 – 2004
Ph.D.*	Ramesh Sivanpillai	Forest Science	Texas A&M	1999 – 2002
Ph.D.*	Pei-Yu Chen	Forest Science	Texas A&M	1999 – 2001
Ph.D.**	Moh'd Al-Rabab'ah	Forest Science	Texas A&M	1999 – 2003
Ph.D.*	Rajaraman Jayakrishnan	Agricultural Engineering	Texas A&M	1996 – 2001
M.S.*	Balasubramaniam Raju	Agricultural Engineering	Texas A&M	1997 – 1999

Committee Member for graduate students:

Degree Program	Name of Student	Department	University	Dates
M.S	Sai Praneeth Kalakuntla	Urban Planning	Texas A&M	2016-present
M.S	Meaghan Owens	WHMS	Texas A&M	2016-present
M.S	Brandon Burks	WHMS	Texas A&M	2016-present
M.S	Di Chen	WHMS	Texas A&M	2016-present
Ph.D.	Cherish C. Vance	BAEN	Texas A&M	2015-present
Ph.D.	Yiwen Zhang	WHMS	Texas A&M	2015-present
M.S.	Jason Devaney	WFSC	Texas A&M	2014 - present
M.S.	Afreen S. Virani	WHMS	Texas A&M	2013 - 2015
M.S.	Kushal Gurung	Range Science and Management	Texas A&M	2011 - 2012
M.S.	Jeremiah Bowling	WHMS	Texas A&M	2011 - 2012
Ph.D.	Chih-Hung Hsu	Civil Engineering	Texas A&M	2011 - present
M.S.	Chase Jennings	Geography	Texas A&M	2012 - present

M.S.	Zhongxia Li	Geography	Texas A&M	2012 - present
M.S.	Brent A. Henry	ESSM	Texas A&M	2012 - 2013
M.S.	Michael Bevilacqua	Civil Engineering	Texas A&M	2011 - present
Ph.D.	Young-jae Yi	Landscape Architecture and Urban Planning	Texas A&M	2010 - 2012
Ph.D.	Mi Ae Ha	Biological and Agricultural Engineering	Texas A&M	2010 - 2012
M.S.	Vallirie Miller	Watershed Hydrology & Management Science	Texas A&M	2008-2009
M.S.	Uttara Nilawar	Urban Planning	Texas A&M	2008-2010
M.S.	Martin Eugene Siwek	Urban Planning	Texas A&M	2008-2010
Ph.D.	Yue Ge	Landscape Architecture and Urban Planning	Texas A&M	2008 - 2012
Ph.D.	Faramarzi Monireh	Environmental Sciences	ETH/EAWQG, Switzerland	2008-2010
Ph.D.	Gao Shan	Urban Planning	Texas A&M	2008-2010
Ph.D.	Youngho Ko	Landscape Architecture and Urban Planning	Texas A&M	2009 - 2012
M.S.	Spencer Thomas Schnier	Civil Engineering	Texas A&M	2008-2010
M.S.	Indumathi Srinath	Geography	Texas A&M	2007-2009
Ph.D.	Yongxia Cai	Agricultural Economics	Texas A&M	2007-2009
M.S.	Ching-yu Chou	Urban Planning	Texas A&M	2006-2008
Ph.D.	Jey Angerer	Range Science and Management	Texas A&M	2005-2008
M.S.	Courtney Wittich	Veterinary and Epidemiology	Texas A&M	2006-2007
Ph.D.	Huidae Cho	Civil Engineering	Texas A&M	2006 - 2008
Ph.D.	Praveen Kumar Maghela	Urban Planning	Texas A&M	2005 - 2007
Ph.D.	Shan Guo	Urban Planning	Texas A&M	2006 - 2010
M.S.	Aarin Teague	Biological and Agricultural Engineering	Texas A&M	2005-2007
Ph.D.	Hesham Farouk El- Sobky	Geology	Texas A&M	2005-2007
Ph.D.	Laban Adero Macopiyo	Rangeland and Ecology	Texas A&M	2003-2005

		Management		
M.S.	Narendra Das	Biological and Agricultural Engineering	Texas A&M	2003-2006
M.S.	Julie Villeneuve	Biological and Agricultural Engineering	Texas A&M	2003-2006
M.S.	Tarun Deep Gill	Civil Engineering (Water Resources)	Texas A&M	2004 – 2005
Ph.D.	Comfort Manyame	Soil Science	Texas A&M	2004 – 2006
M.S.	Marcelo De Castro Chaves Stable	Agronomy	Texas A&M	2004 – 2005
Ph.D.	Seongha Hwang	Civil Engineering (Water Resources)	Texas A&M	2004 - 2008
M.S.	Wes Highfield	Urban Planning	Texas A&M	2003 – 2004
M.S.	David W. Geiger	Biological and Agricultural Engineering	Texas A&M	2003 – 2004
M.S.	Gaurav Garg	Civil Engineering (Water Resources)	Texas A&M	2003 – 2004
M.S.	Colin Shackelford	Range Land Ecology and Management	Texas A&M	2003 – 2004
M.S.	Ashish Agarwal	Civil Engineering (Water Resources)	Texas A&M	2003 – 2005
M.S.	Ganesh Krishnamurthy	Civil Engineering (Water Resources)	Texas A&M	2002 – 2005
M.S.	Adan G. Gandaria	Wildlife and Fisheries	Texas A&M	2002 - 2004
M.S.	Milver A. Valenzuela Zapata	Civil Engineering (Water Resources)	Texas A&M	2002 – 2003
M.S.	Zubin Sukheswalla	Civil Engineering	Texas A&M	2001 – 2003
M.S.	Sophie De Beukelaer	Oceanography	Texas A&M	2001 – 2003
M.S.	Tiffany Bloxom	Geography	Texas A&M	2001 – 2002
M.S.	Jaeyong Lee	Urban Planning	Texas A&M	2001 – 2002
M.S.	Anne Barnett	Geography	Texas A&M	2001 – 2002
Ph.D.	Sabu Paul	Agricultural Engineering	Texas A&M	2001 – 2003
M.S.	Juchul Jung	Urban Planning	Texas A&M	2000 – 2001
M.S.	Kim Camilli	Plant Pathology	Texas A&M	1999 – 2001
M.S.	Brad Daugherty	Forest Science	Texas A&M	1999 – 2000
M.S.	Gretchen Riley	Forest Science	Texas A&M	1999 – 2000
Ph.D.	Xinweng Chen	Agricultural Engineering	Purdue University	1997 – 2000
Ph.D.	Marty Sponberg	Civil Engineering	Texas A&M	1997 – 2000

Ph.D.	Sudhakar Mamillapalli	Agricultural Engineering	Purdue University	1995 – 1998
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IV. Research Activities

I have developed a broad and relevant research program. The application areas have ranged from hydrologic water quality modeling to cutting-edge information technologies. The thread that connects these efforts is the foundation in spatial technologies. I emphasize relevancy, creativity, technology transfer, and teamwork in developing the research program.

Texas A&M AgriLife Research projects

H-8623, Integrated analytical framework for agricultural and rural health - May 1998. Duration: 1998-2003. A new hatch proposal was written and approved with the title “NATURAL RESOURCES MODELING USING THE SPATIAL SCIENCES” for the duration of 2004-2009. The hatch proposal was further extended until 2014. Support personnel: four Ph.D. - post-doctoral research associates, three M.S. - level research associate, two – system and software administrators, and three B.S level technicians.

H-6932, “Computer analysis of agricultural systems”– Co-PI Duration: 1992-1998. Support personnel: Four - Ph.D. - level post-doctoral research associate, one M.S. - level research associate, and two B.S. level technicians.

Principle and/or Co-PI on the following cooperative and competitive agreements:

Yearly breakdown of the various research resources for which Dr. Srinivasan had primary responsibility

Year	Internal Funds		External Funds		Total Funds
	P.I	Co-P.I	P.I	Co-P.I	
2016	\$10,000	\$21,000	\$590,732	\$449,874	\$1,071,606
2015			\$361,719		\$361,719
2014			\$612,655	\$259,693	\$872,348
2013			\$713,501	\$325,064	\$1,038,565
2012			\$766,680	\$613,219	\$1,379,909
2011			\$902,075	\$1,076,365	\$1,978,440
2010			\$480,000	\$204,375	\$684,375
2009			\$388,168	\$367,100	\$755,268
2008			\$161,671	\$567,505	\$729,176
2007			\$84,000	\$575,839	\$659,839
2006	30,000	25,000	\$343,406	\$451,000	\$849,406
2005			\$759,065	\$399,032	\$1,158,097
2004			\$212,510	\$241,200	\$453,710
2003	\$1,900		\$364,903	\$340,002	\$706,805
2002	\$36,000		\$574,119	\$215,640	\$825,759
2001	\$51,280		\$456,002	\$345,817	\$853,099
2000	\$70,000	\$42,000	\$270,000	\$149,489	\$533,489
1999	\$105,000	\$54,000	\$239,767	\$415,179	\$813,946
1998			\$350,657	\$125,685	\$476,342

1997			\$16,900	\$167,455	\$184,355
1996			\$28,500	\$561,415	\$589,915
1995			\$101,400	\$715,124	\$816,524
1994			\$45,000	\$37,000	\$82,000
1993			\$5,500		\$5,500
1992				\$817,000	\$817,000
Total	\$304,180	\$142,000	\$8,828,930	\$9,420,072	\$18,695,182
				Yearly Average	\$747,807

1. **Title:** Developing an online graduate advanced GIS course for natural resource majors.
Co-PI: Dr. Sasa
Total Grant: \$10,000
Sponsor: COALS-TAMU
Sponsor Funding: \$10,000
Funding for which I had Primary Responsibility: \$10,000
Duration: 11-1-16 to 7-31-17
Project Summary: Convert existing ESSM 652 to an online course for future offering.
2. **Title:** Diversifying the Water Portfolio for Agriculture in the Rio Grande Basin
Co-PI: Dr. John Tracy et. al.
Total Grant: \$4,997,257
Sponsor: USDA-NIFA
Sponsor Funding: \$4,997,257
Funding for which I had Primary Responsibility: \$407,760
Duration: 12-1-16 to 9-30-20
Project Summary: Develop a framework for sustainable water portfolio for agriculture including reuse of waste water for the Rio Grande Basin.
3. **Title:** Water Management to Sustain the Economic Activity from the Ogallala Aquifer on the Southern High Plains-TAMU
Co-PI:
Total Grant: \$80,000
Sponsor: USDA-ARS
Sponsor Funding: \$80,000
Funding for which I had Primary Responsibility: \$80,000
Duration: 10-1-16 to 2-28-18
Project Summary: Develop automated and manual irrigation enhancement algorithms for SWAT and SWAT+ using field data collected in Panhandle Texas.
4. **Title:** A Grid-Based Modular Watershed Model for the Landscape-River Continuum
Co-PI:
Total Grant: \$60,000
Sponsor: USDA-ARS
Sponsor Funding: \$60,000
Funding for which I had Primary Responsibility: \$60,000

- Duration:** 6-1-16 to 9-30-17
Project Summary: Develop a methodology in GIS for developing landscape delineation algorithm for SWAT+.
5. **Title:** A Modeling Framework to Couple Food, Energy, and Water in the Teleconnected Corn and Cotton Belts
Co-PI: Dr. Bruce McCarl
Total Grant: \$674,375
Sponsor: NSF/University of Maryland
Sponsor Funding: \$674,375
Funding for which I had Primary Responsibility: \$0
Duration: 9-1-16 to 10-31-17
Project Summary: Develop a modeling framework with feedback from climate change on coupled food, energy and water for two teleconnected regions (Midwest and Panhandle Texas).
 6. **Title:** Data Collection and Development of Essential Components to Support the Development of a Watershed Protection Plan for Lake Lavon
Co-PI: Dr. R. Karthikeyan
Total Grant: \$117,992
Sponsor: TSSWCB/EPA
Sponsor Funding: \$117,992
Funding for which I had Primary Responsibility: \$42,114
Duration: 5-1-16 to 12-31-17
Project Summary: Develop detailed landuse map and help with SELECT modeling to support the development of watershed protection plan for Lake Lavon.
 7. **Title:** A hierarchical evaluation framework for assessing climate simulations relevant to the energy-water-land nexus.
Co-PI:
Total Grant: \$150,000
Sponsor: Iowa State University/DOE-Office of Science
Sponsor Funding: \$150,000
Funding for which I had Primary Responsibility: \$150,000
Duration: 10-1-16 to 9-30-19
Project Summary: The goal of this project is to evaluate at national level of energy, water and land nexus due to climate as the main driver.
 8. **Title:** Determination of Impact of Great Lakes Restoration Initiative Funded Agricultural Best Management Practices through SWAT Modeling
Co-PI:
Total Grant: \$10,000
Sponsor: USGS/USEPA
Sponsor Funding: \$10,000
Funding for which I had Primary Responsibility: \$10,000
Duration: 06-1-16 to 12-31-16
Project Summary: Develop a calibrated SWAT model for an intensively monitored tile drained and non-tile drained watersheds in OH. In addition, continue to assist USGS in their other watersheds to parametrize and help with calibration and scenario analysis.

9. **Title:** HAWQS (Hydrologic Water Quality System) Project
Co-PI:
Total Grant: \$290,732
Sponsor: Indus Corporation and USEPA
Sponsor Funding: \$290,732
Funding for which I had Primary Responsibility: \$290,732
Duration: 4-30-2016 to 10-31-2016
Project Summary: Develop HAWQS modeling system for the entire US at three spatial and temporal resolutions. Develop web-based modeling system for water quality analysis for policy analysis framework.
10. **Title:** Modeling Surface Water Quality Impacts of Shale Oil and Gas Development in Texas
Co-PI: Dr. Reid Stevens
Total Grant: \$42,000
Sponsor: Texas A&M Energy Institute
Sponsor Funding: \$42,000
Funding for which I had Primary Responsibility: \$21,000
Duration: 7-1-16 to 6-30-17
Project Summary: The goal of this project is to combine cutting-edge econometric, hydrologic, and surface water quality models to estimate the impact of hydraulic fracturing on surface water in Texas.
11. **Title:** Evaluation of the Relationship Between Sustainably Intensified Production Systems and Farm Family Nutrition
Co-PI: Drs. Neville Clarke, Tom Gerik, James Richardson
Total Grant: \$999,197
Sponsor: USAID
Sponsor Funding: \$999,197
Funding for which I had Primary Responsibility: \$60,000
Duration: 12-1-15 to 9-30-19
Project Summary: Develop integrated modeling system of field, farm, watershed and economic analysis for small-scale farmers in irrigation technologies at Ethiopia, along with nutritional outcomes at the farm/family level. Also develop capacity building in cooperation with IWMI, ILRI, IFPRI CG systems for various local stakeholders.
12. **Title:** Determination of Impact of Great Lakes Restoration Initiative Funded Agricultural Best Management Practices through SWAT Modeling
Co-PI:
Total Grant: \$25,000
Sponsor: USGS/USEPA
Sponsor Funding: \$25,000
Funding for which I had Primary Responsibility: \$25,000
Duration: 09-1-15 to 12-31-16
Project Summary: Develop a calibrated SWAT model for an intensively monitored tile drained and non-tile drained watersheds in OH. In addition, continue to assist USGS in their other watersheds to parametrize and help with calibration and scenario analysis.
13. **Title:** HAWQS (Hydrologic Water Quality System) Project

Co-PI:

Total Grant: \$229,812

Sponsor: Indus Corporation and USEPA

Sponsor Funding: \$229,812

Funding for which I had Primary Responsibility: \$229,812

Duration: 5-1-2015 to 4-30-2016

Project Summary: Develop HAWQS modeling system for the entire US at three spatial and temporal resolutions. Develop web-based modeling system for water quality analysis for policy analysis framework.

14. **Title:** Database Development and Maintenance for TSSWCB

Co-PI:

Total Grant: \$112,487

Sponsor: TSSWCB

Sponsor Funding: \$112,487

Funding for which I had Primary Responsibility: \$112,487

Duration: 12-1-2015 to 8-31-2017

Project Summary: Develop water quality databases and online tools to query, access, modify and create reports by watershed, county, congressional districts etc.

15. **Title:** Data Collection and Development of Essential Components for the Mill Creek Watershed Protection Plan

Co-PI: Mark McFarland

Total Grant: \$299,955

Sponsor: Texas State Soil and Water Conservation Board

Sponsor Funding: \$299,955

Funding for which I had Primary Responsibility: \$39,804

Duration: 9-1-14 to 5-31-16

Project Summary: Develop Millcreek River watershed landuse map using satellite and GPS surveys for ground trothing.

16. **Title:** HAWQS (Hydrologic Water Quality System) project

Co-PI:

Total Grant: \$300,000

Sponsor: Indus Corporation and USEPA

Sponsor Funding: \$300,000

Funding for which I had Primary Responsibility: \$300,000

Duration: 5-1-2014 to 4-30-2015

Project Summary: Develop HAWQS modeling system for the entire US at three spatial and temporal resolutions. Develop web-based modeling system for water quality analysis for policy analysis framework.

17. **Title:** Continued Coordinating Implementation of the Lampasas River Watershed Protection Plan

Co-PI:

Total Grant: \$312,655

Sponsor: TSSWCB

Sponsor Funding: \$312,655

Funding for which I had Primary Responsibility: \$312,655

- Duration:** 10-1-2014 to 9-30-2017
Project Summary: To develop a water quality implementation plan for the Lampasas River Watershed.
18. **Title:** Global Hunger and Food Security Research Strategy: Program Area 4. Small-Scale Irrigation Technologies and Agricultural Water Management
Co-PI: Drs. Neville Clarke, Tom Gerik, James Richardson
Total Grant: \$5,267,075
Sponsor: USAID
Sponsor Funding: \$5,267,075
Funding for which I had Primary Responsibility: \$439,778
Duration: 8-12-13 to 8-11-18
Project Summary: Develop integrated modeling system of field, farm, watershed and economic analysis for small-scale farmers in irrigation technologies at Ethiopia, Tanzania and Ghana. Also develop capacity building in cooperation with IWMI, ILRI, IFPRI CG systems for various local stakeholders.
19. **Title:** Demonstration of the Global Decision Support System
Co-PI: Drs. Neville Clarke, Tom Gerik, James Richardson
Total Grant: \$152,702
Sponsor: Bill and Melinda Gates Foundation
Sponsor Funding: \$152,702
Funding for which I had Primary Responsibility: \$30,000
Duration: 4-11-13 to 3-31-14
Project Summary: Develop GDSS modeling frame work and demonstrate it for couple of watersheds in Ethiopia.
20. **Title:** To Implement the STAR Resource Inventory Tool Utilizing the APEX Model in Navarro and Ellis Counties
Co-PI:
Total Grant: \$88,213
Sponsor: USDA-NRCS
Sponsor Funding: \$88,213
Funding for which I had Primary Responsibility: \$88,213
Duration: 9-17-13 to 9-16-14
Project Summary: Test and deploy a web-based interface for the APEX model for any fields in Texas for the USDA-NRCS field office tool for evaluate the resource assessment tool and develop conservation plans for Navarro and Ellis Counties.
21. **Title:** Impacts of Decadal Droughts on the Agricultural Economy of the Missouri River Basin
Co-PI: Bruce Mccarl
Total Grant: \$150,758
Sponsor: Center of research for changing earth systems and NOAA
Sponsor Funding: \$150,758
Funding for which I had Primary Responsibility: \$75,379
Duration: 8-1-2012 to 7-31-2014
Project Summary: Analyze the impact of decadal drought impacts on agricultural production in Missouri River Basin. Develop high resolution SWAT model for Missouri

- River Basin and apply the decadal climate variability to study how the agricultural production are impacted.
22. **Title:** HAWQS (Hydrologic Water Quality System) Project
Co-PI:
Total Grant: \$242,587
Sponsor: Indus Corporation and USEPA
Sponsor Funding: \$242,587
Funding for which I had Primary Responsibility: \$242,587
Duration: 2-6-2013 to 4-30-2014
Project Summary: Develop HAWQS modeling system for the entire US at three spatial and temporal resolutions. Develop web-based modeling system for water quality analysis for policy analysis framework.
 23. **Title:** Hydrology Modeling of Al-Hawezih Marsh, Iraq
Co-PI:
Total Grant: \$40,000
Sponsor: ISWEEP LLC
Sponsor Funding: \$40,000
Funding for which I had Primary Responsibility: \$40,000
Duration: 8-1-2013 to 4-30-2014
Project Summary: Develop detailed model of Tigris and Euphrates River basins and assess the impact of Al-Hawezih marsh land in Iraq.
 24. **Title:** Surface Water Quality Monitoring to Support the Implementation of the Lampasas River Watershed Protection Plan
Co-PI:
Total Grant: \$206,109
Sponsor: TSSWCB
Sponsor Funding: \$206,109
Funding for which I had Primary Responsibility: \$206,109
Duration: 10-1-2013 to 9-30-2016
Project Summary: To develop water quality implementation plan for the Lampasas River Watershed.
 25. **Title:** Database development and maintenance for TSSWCB
Co-PI:
Total Grant: \$136,592
Sponsor: TSSWCB
Sponsor Funding: \$136,592
Funding for which I had Primary Responsibility: \$136,592
Duration: 8-1-2013 to 5-31-2015
Project Summary: Develop water quality databases and online tools to query, access, modify and create reports by watershed, county, congressional districts etc.
 26. **Title:** Resource Conservation Assessment: A Tool for Natural Resource Impact and Assessment In Conservation Planning
Co-PI:
Total Grant: \$150,000
Sponsor: USDA-NRCS

- Sponsor Funding:** \$150,000
Funding for which I had Primary Responsibility: \$150,000
Duration: 9-30-12 to 9-30-13
Project Summary: Test and deploy a web-based interface for the APEX model for any fields in Texas for the USDA-NRCS field office tool for evaluate the resource assessment tool
27. **Title:** Water Intensity and Footprint of Advance Feedstock
Co-PI:
Total Grant: \$100,000
Sponsor: Shell Oil Inc.
Sponsor Funding: \$100,000
Funding for which I had Primary Responsibility: \$100,000
Duration: 1-05-12 to 9-30-12
Project Summary: Develop methods to assess water availability for the Midwestern and southern regions for a biofuel plant.
28. **Title:** Citywide Water Quality Modeling Project
Co-PI:
Total Grant: \$100,000
Sponsor: City of Austin
Sponsor Funding: \$100,000
Funding for which I had Primary Responsibility: \$100,000
Duration: 5-21-2012 to 5-22-2013
Project Summary: Develop LID (Low Impact Development) conservation practices algorithms and implement in the SWAT model for sub-daily and daily simulations.
29. **Title:** Database Development and Maintenance for TSSWCB
Co-PI:
Total Grant: \$46,000
Sponsor: TSSWCB
Sponsor Funding: \$46,000
Funding for which I had Primary Responsibility: \$46,000
Duration: 12-1-2012 to 8-31-2013
Project Summary: Develop water quality databases and online tools to query, access, modify and create reports by watershed, county, congressional districts etc.
30. **Title:** The Southern Region Water Quality Coordination Project Phase II
Co-PI: Dr. Mark McFarland
Total Grant: \$21,000
Sponsor: USDA-CSREES, Texas AgriLIFE Extension Service
Sponsor Funding: \$21,000
Funding for which I had Primary Responsibility: \$21,000
Duration: 8-30-2012 to 8-30-2013
Project Summary: This is a multi-state and institutional project where TAMU is the leading agency to develop comprehensive web-based water quality information delivery for the 13 Southeastern states
31. **Title:** Development of Watershed Protection Plan for Attoyoun Bayou
Co-PI:

- Total Grant:** \$617,829
Sponsor: TSSWCB and EPA
Sponsor Funding: \$370,697
Funding for which I had Primary Responsibility: \$7,575
Duration: 1-1-2012 to 10-31-2013
Project Summary: Assist with landuse /land cover development for the Attoyau Bayou watershed to develop a watershed protection plan using remotely sensed data sources.
32. **Title:** Hydrologic Water Quality System II (HAWQS II)
Co-PI: Jeff Arnold
Total Grant: \$60,000
Sponsor: US EPA and USDA ARS
Sponsor Funding: \$60,000
Funding for which I had Primary Responsibility: \$60,000
Duration: 5-1-2010 to 3-31-2013
Project Summary: Develop online national level database system at three watershed resolutions (NhdPlus, 10-digit and 8-digit) for the SWAT and SPARROW models so that USEPA and their contractors can use to assess the national water quality system.
33. **Title:** Application of the SWAT Model to Determine the Environmental Sustainability of Feedstock Product of Biofuels in Hawaii
Co-PI: Jeff Arnold, USDA-ARS
Total Grant: \$431,225
Sponsor: USDA-ARS and Naval Academy
Sponsor Funding: \$431,225
Funding for which I had Primary Responsibility: \$391,225
Duration: 1-1-2012 to 9-30-2014
Project Summary: Apply real-time SWAT model for the Hawaii sugarcane plantation to estimate the hydrological budget and feedstock production in a sustainable manner.
34. **Title:** National Watershed Protection Program - Modeling Impact of Hydraulic Fracturing
Co-PI:
Total Grant: \$105,375
Sponsor: Cadmus Inc. and USEPA
Sponsor Funding: \$105,375
Funding for which I had Primary Responsibility: \$105,375
Duration: 12-16-2011 to 12-31-2012
Project Summary: Study the impact of hydraulic fracturing on the water supply in the Upper Colorado River basin.
35. **Title:** Coordinating the Implementation of the Lampasas Watershed Protection Plan
Co-PI:
Total Grant: \$205,305
Sponsor: TSSWCB and USEPA
Sponsor Funding: \$205,305
Funding for which I had Primary Responsibility: \$205,305
Duration: 11-1-2012 to 10-31-2014
Project Summary: Coordinate the implementation of the Lampasas watershed protection plan that was developed using the previously funded project.

36. **Title:** Predictability and Prediction of Decadal Climate and Its Impacts in the Missouri River Basin with Climate, Hydrologic, and Crop
Co-PI: Bruce Mccarl
Total Grant: \$386,858
Sponsor: Center of research for changing earth systems and USDA-AFRI
Sponsor Funding: \$386,858
Funding for which I had Primary Responsibility: \$193,429
Duration: 5-15-2011 to 5-14-2014
Project Summary: Develop methodology and automate the calibration and validation of hydrology and water quality for non-pilot 5-4 digit watersheds around the USA to evaluate the SWAT model for studying 14 climate change impact scenarios on agriculture, water and environment.
12. **Title:** Resource Conservation Assessment: A Tool for Natural Resource Impact and Assessment in Conservation Planning
Co-PI:
Total Grant: \$500,000
Sponsor: USDA-NRCS
Sponsor Funding: \$500,000
Funding for which I had Primary Responsibility: \$500,000
Duration: 9-22-10 to 9-30-12
Project Summary: Develop a web-based interface for the APEX model for any fields in Texas for the USDA-NRCS field office tool for evaluate the resource assessment tool
13. **Title:** Collaborative Research: Northern Gulf of Mexico Hypoxia and Land Use in the Watershed: Feedback and Scale Interactions
Co-PI: Jeff Arnold and Iowa State University, CARD and various other universities
Total Grant: \$1.5M
Sponsor: NSF
Sponsor Funding: \$315,990
Funding for which I had Primary Responsibility: \$315,990
Duration: 10-1-10 to 9-30-13
Project Summary: Develop high resolution SWAT model for watershed region 05, 06 and 07 (Ohio, Tennessee, Upper Mississippi basins) to estimate the nutrient loadings to Gul of Mexico and correlate with dead zone estimation. Further develop various socio, economic, and environmental indicators and scenarios to reduce the overall load to Gulf of Mexico.
14. **Title:** Development of Landuse for Leona Creek Watershed
Co-PI:
Total Grant: \$34,500
Sponsor: TAIER and TSSWCB
Sponsor Funding: \$34,500
Funding for which I had Primary Responsibility: \$34,500
Duration: 2-1-2011 to 12-31-12
Project Summary: Develop high resolution landuse/landcover map using remotely sensing techniques to use within SELECT model to estimate potential bacterial loading to the streams from various landuse for Leona Creek watershed.
15. **Title:** Water Intensity and Footprint of Advance Feedstock

- Co-PI:**
Total Grant: \$200,000
Sponsor: Shell Oil Inc.
Sponsor Funding: \$200,000
Funding for which I had Primary Responsibility: \$200,000
Duration: 11-05-10 to 11-30-11
Project Summary: Develop methods to assess water footprint for biofuel stock production in Upper Mississippi River Basin under various climatic and management scenarios.
16. **Title:** Estimation of irrigated agricultural land using time-integrated remotely sensed images for Texas
Co-PI: Drs. Taesoo Lee and Pushpa Tuppada
Total Grant: \$275,000
Sponsor: TWDB
Sponsor Funding: \$275,000
Funding for which I had Primary Responsibility: \$275,000
Duration: 9-01-09 to 8-31-14
Project Summary: Develop a detailed methodology to identify irrigated agriculture by county using time-integrated remotely sensed images and automate the procedure for the entire Texas.
17. **Title:** Modeling Support for Little Brazos River Tributaries Bacteria Assessment
Co-PI:
Total Grant: \$51,534
Sponsor: TSSWCB
Sponsor Funding: \$51,534
Funding for which I had Primary Responsibility: \$7,575
Duration: 6-1-2008 to 9-30-2011
Project Summary: Develop high resolution landuse/landcover map using remotely sensing techniques to use within SELECT model to estimate potential bacterial loading to the streams from various landuses
18. **Title:** Assist in developing SWAT model for biofuel application for the entire USA.
Co-PI:
Total Grant: \$10,000
Sponsor: UT-Battle and Oakridge National Laboratory
Sponsor Funding: \$10,000
Funding for which I had Primary Responsibility: \$10,000
Duration: 1-6-2010 to 9-30-2011
Project Summary: As Oakridge national lab develops national biofuel application using the SWAT model, the model applicability, setup, calibration and validation will be assisted as needed basis.
19. **Title:** Applicability of SWAT model in Texas Coastal Watersheds: phase II.
Co-PI: Dr. Taesoo Lee
Total Grant: \$35,000
Sponsor: TWDB
Sponsor Funding: \$35,000
Funding for which I had Primary Responsibility: \$35,000

- Duration:** 9-1-2010 to 9-30-2011
Project Summary: Develop the SWAT model for the coastal watersheds to assess the natural flow in to estuaries, both water quantity and quality.
20. **Title:** Comprehensive assessment of climate and emission changes on US water quality: an integrated approach.
Co-PI: Drs. Liang and Jeff Arnold
Total Grant: \$100,375
Sponsor: US EPA STAR grants
Sponsor Funding: \$1,000,000
Funding for which I had Primary Responsibility: \$100,375
Duration: 8-1-2009 to 7-31-2012
Project Summary: Develop an integrated model of surface water quality and atmospheric model and assess the impact of climate and emission changes on both air and watersheds for the entire USA
21. **Title:** Hydrologic Water Quality System II (HAWQS II)
Co-PI: Jeff Arnold
Total Grant: \$350,000
Sponsor: US EPA and USDA ARS
Sponsor Funding: \$430,000
Funding for which I had Primary Responsibility: \$350,000
Duration: 5-1-2010 to 9-30-2012
Project Summary: Develop online national level database system at three watershed resolutions (NhdPlus, 10-digit and 8-digit) for the SWAT and SPARROW models so that USEPA and their contractors can use to assess the national water quality system.
22. **Title:** Watershed modeling to evaluate potential impacts of climate and environment.
Co-PI:
Total Grant: \$150,000
Sponsor: US EPA and Tetra Tech Inc.
Sponsor Funding: \$150,000
Funding for which I had Primary Responsibility: \$150,000
Duration: 8-1-2010 to 9-30-2011
Project Summary: Develop methodology and automate the calibration and validation of hydrology and water quality for non pilot 5-4digit watersheds around the USA to evaluate the SWAT model for studying 14 climate change impact scenarios on agriculture, water and environment.
23. **Title:** Assist in developing SWAT model for biofuel application for the entire USA.
Co-PI:
Total Grant: \$10,000
Sponsor: UT-Battle and Oakridge National Laboratory
Sponsor Funding: \$10,000
Funding for which I had Primary Responsibility: \$10,000
Duration: 1-6-2010 to 9-30-2011
Project Summary: As Oakridge national lab develops national biofuel application using the SWAT model, the model applicability, setup, calibration and validation will be assisted as needed basis.

24. **Title:** Applicability of SWAT model in Texas Coastal Watersheds: phase II.
Co-PI: Dr. Taesoo Lee
Total Grant: \$35,000
Sponsor: TWDB
Sponsor Funding: \$35,000
Funding for which I had Primary Responsibility: \$35,000
Duration: 9-1-2010 to 9-30-2011
Project Summary: Develop the SWAT model for the coastal watersheds to assess the natural flow in to estuaries, both water quantity and quality.
25. **Title:** The Southern Region Water Quality Coordination Project Phase II
Co-PI: Dr. Mark McFarland
Total Grant: \$51,000
Sponsor: USDA-CSREES, Texas AgriLIFE Extension Service
Sponsor Funding: \$51,000
Funding for which I had Primary Responsibility: \$51,000
Duration: 9-01-09 to 8-31-10
Project Summary: This is a multi-state and institutional project where TAMU is the leading agency to develop comprehensive web-based water quality information delivery for the 13 Southeastern states
26. **Title:** Comprehensive assessment of climate and emission changes on US water quality: an integrated approach.
Co-PI: Drs. Liang and Jeff Arnold
Total Grant: \$100,375
Sponsor: US EPA STAR grants
Sponsor Funding: \$1,000,000
Funding for which I had Primary Responsibility: \$100,375
Duration: 8-1-2009 to 7-31-2012
Project Summary: Develop an integrated model of surface water quality and atmospheric model and assess the impact of climate and emission changes on both air and watersheds for the entire USA
27. **Title:** Develop a watershed protection plan for Geronimo Creek watershed
Co-PI: R. Karthikeyan, Mark McFarland
Total Grant: \$xxxxx
Sponsor: US EPA and TSSWCB
Sponsor Funding: \$162,157
Funding for which I had Primary Responsibility: \$53,000
Duration: 5-1-2009 to 8-31-2011
Project Summary: Develop landuse land cover map using 2008 NAIP and help to apply the SELECT model to assess the bacteria loading the watershed. A SWAT model need to be developed for estimating the flow at various locations to develop load duration curves that will be used to target pollution reduction in the watershed.
28. **Title:** Hydrologic Water Quality System II (HAWQS II)
Co-PI: Jeff Arnold
Total Grant: \$350,000
Sponsor: US EPA and USDA ARS

- Sponsor Funding:** \$430,000
Funding for which I had Primary Responsibility: \$350,000
Duration: 5-1-2010 to 9-30-2011
Project Summary: Develop online national level database system at three watershed resolutions (NhdPlus, 10-digit and 8-digit) for the SWAT and SPARROW models so that USEPA and their contractors can use to assess the national water quality system.
29. **Title:** Web-based hunting permitting program for Lake Levon, Texas
Co-PI:
Total Grant: \$35,000
Sponsor: US COE
Sponsor Funding: \$35,000
Funding for which I had Primary Responsibility: \$35,000
Duration: 8-1-2010 to 9-30-2011
Project Summary: Develop a web based hunting permit program for gaming industry to not only issue permit and but also gather hunting experiences that will be provided as feedback to successive year hunting program.
30. **Title:** Watershed modeling to evaluate potential impacts of climate and environment.
Co-PI:
Total Grant: \$50,000
Sponsor: US EPA and Tetra Tech Inc.
Sponsor Funding: \$50,000
Funding for which I had Primary Responsibility: \$50,000
Duration: 8-1-2010 to 9-30-2011
Project Summary: Develop methodology and automate the calibration and validation of hydrology and water quality for non pilot 5-4digit watersheds around the USA to evaluate the SWAT model for studying 14 climate change impact scenarios on agriculture, water and environment.
31. **Title:** Estimation of irrigated agricultural land using time-integrated remotely sensed images for Texas
Co-PI: Drs. Taesoo Lee and Pushpa Tuppada
Total Grant: \$275,000
Sponsor: TWDB
Sponsor Funding: \$275,000
Funding for which I had Primary Responsibility: \$275,000
Duration: 9-01-09 to 8-31-12
Project Summary: Develop a detailed methodology to identify irrigated agriculture by county using time-integrated remotely sensed images and automate the procedure for the entire Texas.
32. **Title:** Statewide implementation of watershed stewards program in Texas
Co-PI: Dr. Mark McFarland
Total Grant: \$34,500
Sponsor: USDA-CSREES, Texas AgriLife Extension Service
Sponsor Funding: \$34,500
Funding for which I had Primary Responsibility: \$34,500
Duration: 4-01-09 to 9-30-10

- Project Summary:** This is a multi-state and institutional project where TAMU is the leading agency to develop comprehensive web-based water quality information delivery for the 13 Southeastern states
33. **Title:** Development of a National Air Quality Self-Assessment Tool
Co-PI:
Total Grant: \$83,968
Sponsor: USDA-NRCS and Michigan State University
Sponsor Funding: \$83,968
Funding for which I had Primary Responsibility: \$83,968
Duration: 2-10-2009 to 9-30-2009
Project Summary: Develop and implement an expert system for six air pollutants from five different animal operations/stalls and assist the extension specialists and producers to improve the air quality of their operations.
34. **Title:** Watershed modeling: Improving water management in rainfed agriculture
Co-PI:
Total Grant: \$30,000
Sponsor: World Bank
Sponsor Funding: \$30,000
Funding for which I had Primary Responsibility: \$30,000
Duration: 2-2-2009 to 9-30-2009
Project Summary: Develop a detailed report on state of the art about improving water management in rainfed agriculture and develop model to test various typical water management scenarios of economical and environmental impact for insurance purpose.
35. **Title:** Construction of a computer model of the St. Croix River watershed.
Co-PI:
Total Grant: \$110,500
Sponsor: USFWS and Science museum of Minnesota
Sponsor Funding: \$110,500
Funding for which I had Primary Responsibility: \$110,500
Duration: 1-12-2009 to 1-11-2011
Project Summary: Calibrate and validate the hydrology for the St. Croix watershed.
36. **Title:** Assist in developing SWAT model for biofuel application for the entire USA.
Co-PI:
Total Grant: \$20,000
Sponsor: UT-Battle and Oakridge National Laboratory
Sponsor Funding: \$20,000
Funding for which I had Primary Responsibility: \$20,000
Duration: 1-6-2009 to 9-30-2010
Project Summary: As Oakridge national lab develops national biofuel application using the SWAT model, the model applicability, setup, calibration and validation will be assisted as needed basis.
37. **Title:** Applicability of SWAT model in Texas Coastal Watersheds.
Co-PI: Dr. Taesoo Lee
Total Grant: \$35,000
Sponsor: TWDB

- Sponsor Funding:** \$35,000
Funding for which I had Primary Responsibility: \$35,000
Duration: 9-1-2008 to 3-31-2010
Project Summary: Develop the SWAT model for the coastal watersheds and test its applicability for the TWDB application.
38. **Title:** The Southern Region Water Quality Coordination Project Phase II
Co-PI: Dr. Mark McFarland
Total Grant: \$22,600
Sponsor: USDA-CSREES, Texas AgriLIFE Extension Service
Sponsor Funding: \$22,600
Funding for which I had Primary Responsibility: \$22,600
Duration: 9-01-08 to 8-31-09
Project Summary: This is a multi-state and institutional project where TAMU is the leading agency to develop comprehensive web-based water quality information delivery for the 13 Southeastern states
39. **Title:** Watershed modeling to evaluate potential impacts of climate and environment.
Co-PI:
Total Grant: \$107,700
Sponsor: US EPA and Tetra Tech Inc.
Sponsor Funding: \$107,700
Funding for which I had Primary Responsibility: \$107,700
Duration: 8-21-2008 to 8-31-2010
Project Summary: Develop an methodology and automate the calibration and validation of hydrology and water quality for 5-4digit watersheds around the USA to evaluate the SWAT model applicability for studying climate change impact on agriculture, water and environment.
40. **Title:** Linking SWAT and WRAP model for Lake Whitney
Co-PI:
Total Grant: \$36,000
Sponsor: US DOE and Baylor University
Sponsor Funding: \$36,000
Funding for which I had Primary Responsibility: \$36,000
Duration: 4-1-2008 to 3-31-2009
Project Summary: Develop an automated tool to link SWAT model with WRAP model for the lake Whitney watershed.
41. **Title:** Evaluation of BMPs in two subwatersheds of Bosque Watershed
Co-PI: TWRI
Total Grant: \$108,000
Sponsor: US COE
Sponsor Funding: \$108,000
Funding for which I had Primary Responsibility: \$33,499
Duration: 5-1-2008 to 12-31-2008
Project Summary: Setup SWAT model for two subwatersheds and assess the various BMPs impact on the Bosque Watershed.
42. **Title:** Environmental Impact Assessment of Biofuel crops on Upper Mississippi River Basin

- Co-PI:** Tony Donigean, Aqua Terra Consultants.
Total Grant: \$237,331
Sponsor: US EPA
Sponsor Funding: \$237,331
Funding for which I had Primary Responsibility: \$237,331
Duration: 9-1-2008 to 3-31-2009
Project Summary: Develop the baseline and scenarios for the Upper Mississippi River Basin using the SWAT model for evaluating various biofuel scenario crop production and its environmental impacts.
43. **Title:** Acquiring Processed NEXRAD Weather Radar Data for its Testing and Use of Hydrology Modeling for Texas Coastal Regions
Co-PI: Dr. Balaji Narashimhan
Total Grant: \$30,000
Sponsor: TWDB
Sponsor Funding: \$30,000
Funding for which I had Primary Responsibility: \$30,000
Duration: 9-1-2007 to 3-31-2009
Project Summary: Process statewide NEXRAD weather data for year 2007 and acquire and test its validity to use for hydrologic modeling along the coastal basins in Texas.
44. **Title:** Develop detailed landuse/land cover for Bacteria TMDL studies
Co-PI: None
Total Grant: \$161,671
Sponsor: TSSWCB
Sponsor Funding: \$161,671
Funding for which I had Primary Responsibility: \$161,671
Duration: 9-07 to 9-09
Project Summary: Develop detailed landuse/land cover from remotely sensed data for five river basins for bacteria TMDL studies.
45. **Title:** The Southern Region Water Quality Coordination Project Phase II
Co-PI: Dr. Mark McFarland
Total Grant: \$44,000
Sponsor: USDA-CSREES, Texas Agricultural Extension Service
Sponsor Funding: \$44,000.00
Funding for which I had Primary Responsibility: \$44,000.00
Duration: 9-04 to 9-08
Project Summary: This is a multi-state and institutional project where TAMU is the leading agency to develop comprehensive web-based water quality information delivery for the 13 Southeastern states
46. **Title:** Development of Urban BMPs and interface for the SWAT model
Co-PI: N. Kannan and C. Santhi
Total Grant: \$150,000
Sponsor: City of Austin
Sponsor Funding: \$150,000
Funding for which I had Primary Responsibility: \$150,000
Duration: 11-07 to 08-09

- Project Summary:** Design and develop set of BMPs for urban environment within the SWAT model and test the algorithms of sub-daily routing algorithms.
47. **Title:** Hydrologic Water Quality Modeling System Design and Development
Co-PI: Dr. Jeff Arnold, USDA-ARS
Total Grant: \$72,675
Sponsor: USEPA
Sponsor Funding: \$72,675
Funding for which I had Primary Responsibility: \$72,675
Duration: 11-06 to 5-09
Project Summary: Design and develop a national modeling system for water quality policy analysis using NHDPlus watersheds using SWAT and SPARROW models.
48. **Title:** Hydrologic modeling of Indus River basin
Co-PI: Dr. Jeff Arnold, USDA-ARS
Total Grant: \$29,000
Sponsor: USAID
Sponsor Funding: \$29,000
Funding for which I had Primary Responsibility: \$29,000
Duration: 6-07 to 6-09
Project Summary: Assist scientists in India and Pakistan including train them in using the SWAT models to develop Indus River basin hydrologic system.
49. **Title:** Hydrologic Water Quality Modeling System Design and Development
Co-PI: Dr. Jeff Arnold, USDA-ARS
Total Grant: \$281,488
Sponsor: USEPA
Sponsor Funding: \$281,488
Funding for which I had Primary Responsibility: \$281,488
Duration: 11-06 to 5-09
Project Summary: Design and develop a national modeling system for water quality policy analysis using NHDPlus watersheds using SWAT and SPARROW models.
50. **Title:** Effect of landuse changes impact on sediment and nutrients to reservoirs in around Dallas-Fort Worth metroplex area.
Co-PI: Dallas research center and TRWD
Total Grant: \$150,000
Sponsor: TWDB
Sponsor Funding: \$150,000.00
Funding for which I had Primary Responsibility: \$95,760.00
Duration: 11-06 to 11-08
Project Summary: Develop SWAT model for the 10 lakes surrounding Dallas and Fort Worth metroplex area to assess the urbanization impact on the lakes using three decadal landuse information (1980, 2000, 2025)
51. **Title:** Development of Plumcreek watershed protection plan
Co-PI: Drs. Mark McFarland and Raghupathy Karthikeyan
Total Grant: \$80,000
Sponsor: TSSWCB
Sponsor Funding: \$80,000.00

- Funding for which I had Primary Responsibility:** \$40,000.00
Duration: 9-06 to 8-08
Project Summary: Assist in developing watershed protection plans for bacteria TMDL in Plumcreek watershed using LDC, SELECT and SWAT models analysis
52. **Title:** The Southern Region Water Quality Coordination Project Phase II
Co-PI: Dr. Mark McFarland
Total Grant: \$181,840
Sponsor: USDA-CSREES, Texas Agricultural Extension Service
Sponsor Funding: \$44,000.00
Funding for which I had Primary Responsibility: \$44,000.00
Duration: 9-04 to 9-08
Project Summary: This is a multi-state and institutional project where TAMU is the leading agency to develop comprehensive web-based water quality information delivery for the 13 Southeastern states
53. **Title:** Sulphur River Basin feasibility study
Co-PI: none
Total Grant: \$84,000
Sponsor: Surphur River basin authority
Sponsor Funding: \$84,000
Funding for which I had Primary Responsibility: \$84,000
Duration: 12-29-2006 to 12-30-2007
Project Summary: Develop landuse and landcover map using satellite images, lidar data, arial photos and intensive ground survey to be used for the bottom land hardwoods and wetland losses for environmental mitigation study
54. **Title:** Arroyo Colorado agricultural nonpoint source pollution assessment
Co-PI: TWRI
Total Grant: \$430,650
Sponsor: TSSWCB
Sponsor Funding: \$430,650
Funding for which I had Primary Responsibility: \$34,591
Duration: 10-1-2006 to 9-30-2009
Project Summary: Process landuse landcover map using satellite images and intensive ground survey to be used for the SWAT model to assess the nonpoint source pollution..
55. **Title:** Acquiring Processed NEXRAD Weather Radar Data for its Testing and Use of Hydrology Modeling for Texas Coastal Regions
Co-PI: Dr. Balaji Narashimhan
Total Grant: \$27,000
Sponsor: TWDB
Sponsor Funding: \$27,000
Funding for which I had Primary Responsibility: \$27,000
Duration: 9-1-2006 to 12-31-2007
Project Summary: Process statewide NEXRAD weather data for year 2005 and acquire and test its validity to use for hydrologic modeling along the coastal basins in Texas.
56. **Title:** Southern critical forest land assessment
Co-PI: Drs. Mike Messina and Gan

- Total Grant:** \$121,927
Sponsor: TFS
Sponsor Funding: \$121,927
Funding for which I had Primary Responsibility: \$24,000
Duration: 6-12-2006 to 6-11-2008
Project Summary: Develop 20 GIS spatial datasets for the 13 Southeastern US states to assess the forest ecosystem health by developing a spatial model using model builder within ArcGIS platform.
57. **Title:** Digital Climatic Atlas of Texas
Co-PI: Drs. Balaji Narashimhan, John Niel Gamman, Steve Quiring, and Travis Miller
Total Grant: \$60,000
Sponsor: TWDB
Sponsor Funding: \$60,000
Funding for which I had Primary Responsibility: \$38,000
Duration: 7-19-2005 to 12-31-2006
Project Summary: Develop and process over century worth of climate data for all over Texas and produce 60 different decadal climatic atlas products for TWDB, that are used for water resources planning for the state.
58. **Title:** Analysis of the current state of various drought indices for the state of Texas
Co-PI: Drs. Balaji Narashimhan, John Niel Gamman, Steve Quiring, and Travis Miller
Total Grant: \$100,000
Sponsor: TWDB
Sponsor Funding: \$100,000
Funding for which I had Primary Responsibility: \$27,000
Duration: 7-19-2005 to 12-31-2006
Project Summary: Evaluate the various existing drought indices from the literatures as they apply to the state of Texas. The drought extends from agricultural, water supply, reservoir, hydrological and meteorological drought systems. After reviewing all the existing literature in a comprehensive manner, each of the indices were discussed within the context of its applicability to the State of Texas and the pros and cons are enumerated in the final report.
59. **Title:** Acquiring Processed NEXRAD Weather Radar Data for its Testing and Use of Hydrology Modeling for Texas Coastal Regions
Co-PI: Dr. Balaji Narashimhan
Total Grant: \$11,130
Sponsor: TWDB
Sponsor Funding: \$11,130
Funding for which I had Primary Responsibility: \$11,130
Duration: 9-1-2005 to 12-31-2006
Project Summary: Process statewide NEXRAD weather data for year 2005 and acquire and test its validity to use for hydrologic modeling along the coastal basins in Texas.
60. **Title:** Bosque River Environmental Improvement Plan Development
Co-PI: Drs. Allan Jones, Paul Dyke and Larry Hauck
Total Grant: \$108,000
Sponsor: US-COE

Sponsor Funding: \$108,000

Funding for which I had Primary Responsibility: \$54,000

Duration: 2-28-2006 to 12-31-2006

Project Summary: Develop a detailed ecological improvement of Bosque River based on detailed GIS analysis and expert opinions and inputs from stakeholders so as to develop a detailed plan to implement the recommendation from this plan.

61. **Title:** Shoreline Management Tool Update

Co-PI: None

Total Grant: \$2,000

Sponsor: US-COE

Sponsor Funding: \$2,000

Funding for which I had Primary Responsibility: \$2,000

Duration: 3-30-2006 to 5-1-2006

Project Summary: Update the shoreline management tool developed for the park rangers in most of the lakes in central Texas to inventory and keep up to date records of the COE properties around the lakes.

62. **Title:** Watershed assistance to improve water quality in North Central Texas reservoirs

Co-PI: Allan Jones, Allan Plummer and Associates, Bill Espey Associates and Tarrant Regional Water District

Total Grant: \$1,500,000

Sponsor: USDA-NRCS

Sponsor Funding: \$1,500,000

Funding for which I had Primary Responsibility: \$666,000

Duration: 7-03 to 09-06

Project Summary: Develop water quality frame work to develop watershed rules using SWAT and WASP models for landscape and lakes. The lakes under consideration are cedar creek, richland chamber, benbrook, and eagle mountain.

63. **Title:** Efficient Irrigation for Water Conservation in the Rio Grande Basin Phase I

Co-PI: Bruce Lesikar, Seiichi Miyamoto, Raul Cabrera, Ronald Lacewell, Zhuping Sheng, Giovanni Piccinni, Charles Jones, Ari Michelsen, MK Owens, Robert Wiedenfeld, Richard White, Naomi Weissman

Total Grant: \$1,388,981.00

Sponsor: USDA - CSREES

Sponsor Funding: \$1,283,981.00

Funding for which I had Primary Responsibility: \$36,000.00

Duration: 7-06 to 6-07

Project Summary: Develop an interactive websites with socio, economic and natural resources geo-spatial databases for the 22 counties along the Texas and Mexico border to educate the stakeholders about water conservation and its impact.

64. **Title:** Southern Critical Forest Assessment

Co-PI: Drs. Mike Messina and Janbing Gan

Total Grant: \$97,000

Sponsor: TFS and USFS

Sponsor Funding: \$97,000

Funding for which I had Primary Responsibility: \$97,000

- Duration:** 6-12-2006 to 6-11-2007
Project Summary: Create a forest assessment model using 20 layers of information for the 13 states of the southeastern U.S states. The procedure and model should be programmed in ArcGIS and able to repeat in an automated manner for use with future datasets.
65. **Title:** Digitize and Update the Water and Sewer Utility Permits (CCN) for Texas
Co-PI: None
Total Grant: \$233,276
Sponsor: TCEQ
Sponsor Funding: \$233,276
Funding for which I had Primary Responsibility: \$233,276
Duration: 7-6-2006 to 8-31-2007
Project Summary: 120 Texas counties need to be updated with CCN water and sewer permits electronically by georeferencing and digitizing all their records. This will help TCEQ staffs and clients to have updated information and easy to add new permits and check for any overlap or interference with each other.
66. **Title:** Best Practices and Guidelines to Dispose of Mass Animal Carcasses
Co-PI: Drs. Neville Clarke, Saqib Mukthar, Bruce McCarl
Total Grant: \$267,939
Sponsor: U.S Department of Homeland Security
Sponsor Funding: \$267,939
Funding for which I had Primary Responsibility: \$150,000
Duration: 7-6-2005 to 8-31-2007
Project Summary: Develop a detailed handbook of best practices to dispose mass animal carcasses resulting from the accidental or intentional introduction of any disease organisms. Further develop an expert system based decision support system to document the procedures outlined in the handbook into software to help the first responders to decide the best options available during the emergency situation.
67. **Title:** Upgrade teaching facility
Co-PI: None
Total Grant: \$10,000
Sponsor: Texas A&M Agriculture - COALS
Sponsor Funding: \$10,000
Funding for which I had Primary Responsibility: \$10,000
Duration: 2-1-2006 to 8-31-2006
Project Summary: COALS Dean office provided bridge funding to supplement the Computer Access Funds project funded by the TAMU to upgrade the teaching computer lab with 13 new computers to meet the ever increasing demand of high performance computing environment to teach Spatial Sciences courses.
68. **Title:** Competitive proposals for computer access fee (CAF) funds FY 2006
Co-PI: Sorin Popescu and Rusty Feagin
Total Grant: \$44,000
Sponsor: TAMU
Sponsor Funding: \$25,000
Funding for which I had Primary Responsibility: \$25,000

- Duration:** 10-01-2005 to 8-31-2006
Project Summary: Through a competitive program, the SSL was awarded funds from the student's computer access fee account to modernize the teaching facility of the SSL.
69. **Title:** John Deere Gift to do spatial modeling research – unrestricted gift
Co-PI: None
Total Grant: \$20,000
Sponsor: John Deere
Sponsor Funding: \$20,000
Funding for which I had Primary Responsibility: \$20,000
Duration: 1-01-2006 to 8-31-2006
Project Summary: John Deere Company provided unrestricted gift to perform spatial research in ground water quality research in Western state of the U.S.
70. **Title:** Coastal Management Program Cycle: Linking landuse to water quality through Geo-spatial technology: A case study of Houston-Galveston Area
Co-PI: Dr. John Jacob
Total Grant: \$118,000.00
Sponsor: Texas General Land Office
Sponsor Funding: \$118,000.00
Funding for which I had Primary Responsibility: \$118,000.00
Duration: 2-03 to 3-05
Project Summary: Develop a Geo-spatial protocol to test the popular NEMO programs for Texas conditions and incorporate local knowledge to improve the linkages of landuse impacts on water quality for the study area.
71. **Title:** Analyze landuse data from various sources for its validity to watershed scale modeling
Co-PI: None
Total Grant: \$13,946.00
Sponsor: University of Iowa
Sponsor Funding: \$13,946.00
Funding for which I had Primary Responsibility: \$13,946.00
Duration: 3-03 to 5-03
Project Summary: In this project landuse GIS coverage from USGS, USDA-NRI, AgCensus and other sources to compare and contrast at the watershed level aggregation and evaluate its validity for modeling water quality impacts.
72. **Title:** Development of a GIS-Referenced Structure Inventory for the Addicks & Barker Reservoirs Water Control Manual on Buffalo Bayou in Harris
Co-PI: None
Total Grant: \$121,616.76
Sponsor: U.S. COE - Galveston
Sponsor Funding: \$121,616.76
Funding for which I had Primary Responsibility: \$121,616.76
Duration: 10-03 to 9-04
Project Summary: Develop a method to attribute and link the real estate segment inventory databases of various lakes with U.S. COE economic databases and assist in property inventory and management of information, including training the U.S. COE personnel in the use of the information developed in this project.

73. **Title:** PHASE I TWAA Model Comparison Study Part I
Co-PI: Dr. Ralph Wurbes
Total Grant: \$42,838.00
Sponsor: U.S COE – Fort worth
Sponsor Funding: \$42,838.00
Funding for which I had Primary Responsibility: \$8,200
Duration: 3-04 to 12-05
Project Summary: Compare and contrast four different models and recommend their strengths and weakness for use by U.S COE operation of lakes. Dr. Ralph Wurbes is the primary contract for this project.
74. **Title:** PHASE I TWAA Model Comparison Study Part II
Co-PI: None
Total Grant: \$47,162.00
Sponsor: U.S COE – Fort worth
Sponsor Funding: \$47,162.00
Funding for which I had Primary Responsibility: \$10,000
Duration: 3-04 to 12-05
Project Summary: Compare and contrast four different models and recommend their strengths and weakness for use by U.S COE operation of lakes. Dr. Ralph Wurbes is the primary contract for this project.
75. **Title:** Watershed assistance to improve water quality in North Central Texas reservoirs
Co-PI: Allan Jones, Allan Plummer and Associates, Bill Espey Associates and Tarrant Regional Water District
Total Grant: \$1,000,000
Sponsor: USDA-NRCS
Sponsor Funding: \$1,000,000
Funding for which I had Primary Responsibility: \$466,000
Duration: 7-03 to 09-05
Project Summary: Develop water quality frame work to develop watershed rules using SWAT and WASP models for landscape and lakes. The lakes under consideration are cedar creek, richland chamber, benbrook, and eagle mountain.
76. **Title:** Fort Hood Off-Site Conservation Program Phase III
Co-PI: Wesley Rosenthal, William Fox
Total Grant: \$425,000.00
Sponsor: DOD - Army
Sponsor Funding: \$80,387.00
Funding for which I had Primary Responsibility: \$20,992.00
Duration: 10-04 to 9-09
Project Summary: Analyze the water quality data collected from the watershed draining through the Fort Hood military base and develop a project to mitigate erosion issues from the base to near by lakes.
77. **Title:** The Southern Region Water Quality Coordination Project Phase I
Co-PI: Mark McFarland
Total Grant: \$93,840.00
Sponsor: USDA-CSREES, Texas Agricultural Extension Service

- Sponsor Funding:** \$47,840.00
Funding for which I had Primary Responsibility: \$47,840.00
Duration: 9-04 to 9-06
Project Summary: This is a multi-state and institutional project where TAMU is the leading agency to develop comprehensive web-based water quality information delivery for the 13 Southeastern states.
78. **Title:** The Southern Region Water Quality Coordination Project Phase II
Co-PI: Mark McFarland
Total Grant: \$93,840.00
Sponsor: USDA-CSREES, Texas Agricultural Extension Service
Sponsor Funding: \$46,000.00
Funding for which I had Primary Responsibility: \$46,000.00
Duration: 9-04 to 9-06
Project Summary: This is a multi-state and institutional project where TAMU is the leading agency to develop comprehensive web-based water quality information delivery for the 13 Southeastern states.
79. **Title:** Whitney Lake Web Based Hunting Management Program
Co-PI: None
Total Grant: \$22,500.00
Sponsor: U.S COE
Sponsor Funding: \$22,500.00
Funding for which I had Primary Responsibility: \$22,500.00
Duration: 5-05 to 9-06
Project Summary: Develop a web based hunting management program for the lake Whitney to manage the U.S. COE customers base in an automated system to issue permits for hunting and gather statistics about their hunting experience for on going operation and management of the property.
80. **Title:** Efficient Irrigation for Water Conservation in the Rio Grande Basin Phase I
Co-PI: Bruce Lesikar, Seiichi Miyamoto, Raul Cabrera, Ronald Lacewell, Zhuping Sheng, Giovanni Piccinni, Charles Jones, Ari Michelsen, MK Owens, Robert Wiedenfeld, Richard White, Naomi Waissman
Total Grant: \$1,388,981.00
Sponsor: USDA - CSREES
Sponsor Funding: \$1,283,981.00
Funding for which I had Primary Responsibility: \$33,000.00
Duration: 7-05 to 6-06
Project Summary: Develop an interactive websites with socio, economic and natural resources geo-spatial databases for the 22 counties along the Texas and Mexico border to educate the stakeholders about water conservation and its impact.
81. **Title:** Utilities and Districts Mapping Assessment
Co-PI: None
Total Grant: \$25,041.00
Sponsor: Texas Natural Resource Conservation Commission
Sponsor Funding: \$25,041.00
Funding for which I had Primary Responsibility: \$25,041.00

- Duration:** 6-05 to 8-05
Project Summary: Develop a need assessment report for TCEQ to convert all the mandated CCN data into digital world and help to maintain the records for future use and provide prompt services within a reasonable time to their customers. This is a project mandated by the Texas congress to address the user need immediately.
82. **Title:** Tools and Technology for Bio-diversity of Southern Peruvian Amazon
Co-PI: John Jhonvec
Total Grant: \$2.3M
Sponsor: Moore Foundation
Sponsor Funding: \$199,248.00
Funding for which I had Primary Responsibility: \$199248.00
Duration: 10-04 to 9-07
Project Summary: Develop an interactive web-based GIS services to query, analyze, display, search, download bio-diversity information system for the Southern Peruvian Amazon project.
83. **Title:** Best Management Practice (BMP) Verification Using Observed Water Quality Data and watershed Planning for Implementation of BMPS
Co-PI: C. Santhi and Balaji Narasimhan
Total Grant: \$237,722.00
Sponsor: Texas State Soil and water Conservation Board
Sponsor Funding: \$237,722.00
Funding for which I had Primary Responsibility: \$237,722.00
Duration: 8-05 to 7-08
Project Summary: Develop a methodology to quantify the effects of various BMP that may have been implemented at local, regional and watershed scale. There is no program currently available to assess the impacts of various land management programs and investments to improve the water quality. Through field, farm and watershed scale models along with measured water quality data, a protocol will be developed to address the efficiencies of multiple BMPs in a watershed and quantify their effect.
84. **Title:** Development of a GIS referenced structure inventory for Baker-Reservoir in support of the update of Addicks & Barker Reservoirs.
Co-PI: Todd Snelgrove
Total Grant: \$79,614.16
Sponsor: U.S. COE - Galveston
Sponsor Funding: \$79,614.16
Funding for which I had Primary Responsibility: \$79,614.16
Duration: 7-04 to 09-05
Project Summary: Develop a method to attribute and link the real estate segment inventory databases of various lakes with U.S. COE economic databases and assist in property inventory and management of information, including training the U.S. COE personnel in the use of the information developed in this project.
85. **Title:** Modify Swat2000 to incorporate snow-17 snowmelt algorithm.
Co-PI: None
Total Grant: \$26,532
Sponsor: Montana department of Environmental Quality

Sponsor Funding: \$26,532

Funding for which I had Primary Responsibility: \$26,532

Duration: 06-04 to 06-05

Project Summary: Montana department of Environmental Quality is using the SWAT model for their TMDL assessment program. Though this project Montana DEQ wants to incorporate the snow-17 snowmelt algorithms into SWAT 2000 version and modify the interface to take advantage of the new capabilities. This work will be done with cooperation of IIT-Delhi through existing MOU, as they have already done and examined various snow melting algorithms with SWAT.

86. **Title:** Landuse/land cover classification for the Lake Waco watershed

Co-PI: None

Total Grant: \$30,000

Sponsor: Texas Institute for Applied Environmental Research.

Sponsor Funding: \$30,000

Funding for which I had Primary Responsibility: \$30,000

Duration: 05-04 to 08-05

Project Summary: Develop a landuse and land cover map classification from landsat VII satellite images for both Lake Waco Bosque River and Leon River. This project uses 3 different images over 2003 and early 2004 to classify more detailed landuse and land cover maps for SWAT model development as part of TMDL assessment.

87. **Title:** Develop geo-referenced aerial photographs for the Southern Peruvian Amazon forests.

Co-PI: None

Total Grant: \$14,400

Sponsor: Winrock International Institute.

Sponsor Funding: \$14,400

Funding for which I had Primary Responsibility: \$14,400

Duration: 04-04 to 08-04

Project Summary: Developed geo-referenced aerial photographs of very high resolution of 10cm pixel size on the ground for very large areas for bio-diversity study.

88. **Title:** Phase 1 TWAA Model Comparison Study

Co-PI: Ralph Wurbes

Total Grant: \$42,838

Sponsor: U.S COE – Fort worth

Sponsor Funding: \$42,838

Funding for which I had Primary Responsibility: \$8,200

Duration: 03-04 to 03-05

Project Summary: Compare and contrast four different models and recommend their strengths and weakness for use by U.S COE operation of lakes. Dr. Ralph Wurbes is the primary contract for this project.

89. **Title:** CESWF'S Operations Vegetation Classification at OC Fisher Lake.

Co-PI: None

Total Grant: \$7,693.05

Sponsor: U.S. COE - Fort worth

Sponsor Funding: \$7,693.05

- Funding for which I had Primary Responsibility:** \$7,693.05
Duration: 12-03 to 09-04
Project Summary: Developed vegetation classification for salt cedar trees using high resolution remotely sensed data as per COE's specifications.
90. **Title:** Development of a GIS referenced structure inventory for the on- going Raymondville drain general reevaluation study in Willacy County.
Co-PI: Todd Snelgrove
Total Grant: \$29,292.46
Sponsor: U.S. COE - Galveston
Sponsor Funding: \$29,292.46
Funding for which I had Primary Responsibility: \$29,292.46
Duration: 10-03 to 09-04
Project Summary: Develop a method to attribute and link the real estate segment inventory databases of various lakes with U.S. COE economic databases and assist in property inventory and management of information, including training the U.S. COE personnel in the use of the information developed in this project.
91. **Title:** Conduct a reconnaissance survey and need assessment for development of a GIS-referenced structure inventory for the Raymondville drain.
Co-PI: Todd Snelgove
Total Grant: \$3,489.50
Sponsor: U.S. COE - Galveston
Sponsor Funding: \$3,489.50
Funding for which I had Primary Responsibility: \$3,489.50
Duration: 10-03 to 09-04
Project Summary: A need assessment was conducted along with a reconnaissance survey to develop a plan for the second phase of the study about GIS-referenced structures inventory for the Raymondville drain.
92. **Title:** BVCOG Hazard Mitigation
Co-PI: None
Total Grant: \$15,000
Sponsor: Brazos Valley Council of Governments
Sponsor Funding: \$15,000
Funding for which I had Primary Responsibility: \$15,000
Duration: 09-03 to 09-04
Project Summary: Assist Brazos Valley Council of Governments, to prepare and manage hazard mitigation programs using spatially explicit analysis. This first phase project addressed assembling and producing various maps of strategic interest to the county judges and mayors' office using readily available data. This project is part of the national security to develop plans to address security threat locally.
93. **Title:** Watershed assistance to improve water quality in North Central Texas reservoirs
Co-PI: Allan Jones, Allan Plummer and Associates, Bill Espey Associates and Tarrant Regional Water District
Total Grant: \$500,000
Sponsor: USDA-NRCS
Sponsor Funding: \$500,000

- Funding for which I had Primary Responsibility:** \$233,000
Duration: 7-03 to 09-04
Project Summary: Develop water quality frame work to develop watershed rules using SWAT and WASP models for landscape and lakes. The lakes under consideration are cedar creek, richland chamber, benbrook, and eagle mountain.
94. **Title:** Collection, compilation, spatial analysis and map production of data pertaining to the locations of oil wells & drilling depths
Co-PI: None
Total Grant: \$6,489.30
Sponsor: Texas Engineering Extension Service (TEES)
Sponsor Funding: \$6,489.30
Funding for which I had Primary Responsibility: \$6,489.30
Duration: 06-03 to 06-04
Project Summary: Analyzed the oil wells and its drilling depths for parts of Canada from the data provided by TEES. In addition to mapping the location of wells by various types and depths, various visualization layouts were created for easy understanding and preliminary spatial analysis was done in consultation with TEES.
95. **Title:** International Research Travel Assistance Grant (IRTAG)
Co-PI: None
Total Grant: \$1,900
Sponsor: TAMU – Vice president Office of research
Sponsor Funding: \$1,900
Funding for which I had Primary Responsibility: \$1,900
Duration: 4-03 to 8-04
Project Summary: Through a competitive program administered by the vice president for the TAMU office of research, international research travel assistance of \$1,900 was obtained to spend 45 days in Germany to develop new methods of chemical transport of pollutants through rivers.
96. **Title:** Comparison of various land use databases for developing inputs for regional watershed scale study
Co-PI: None
Total Grant: \$13,946
Sponsor: US.EPA and Iowa State University
Sponsor Funding: \$13,946
Funding for which I had Primary Responsibility: \$13,946
Duration: 3-03 to 5-03
Project Summary: Compare land use information developed by USGS, USDA-NRCS and USDA-Ag. Census and develop a procedure to adapt the data to be used in a regional watershed scale study for nonpoint source pollution for the Upper Mississippi River Basin.
97. **Title:** Adaptation of NEMO technology in Texas
Co-PI: John Jacob, Texas Cooperative Extension, Houston
Total Grant: \$118,000
Sponsor: GLO – Texas General Land Office
Sponsor Funding: \$118,000
Funding for which I had Primary Responsibility: \$118,000

- Duration:** 2-03 to 3-04
Project Summary: Test and evaluate the adaptation of NEMO technology in Texas. The study area selected for this project is the Houston-Galveston area. In this project, the impact of land use planning and management on water quality will be studied using the NEMO approach.
98. **Title:** Geo-Temporal estimation and visualization of nitrogen in a mixed land use watershed
Co-PI: Sabine Grunwald, University of Florida
Total Grant: \$71,938
Sponsor: USDA-CSREES and the University of Florida
Sponsor Funding: \$71,938
Funding for which I had Primary Responsibility: \$71,938
Duration: 9-02 to 8-04
Project Summary: Develop several land use and land cover information using latest remote sensing satellite data to identify Anderson level III classification including identifying various crops on the ground for Santa Fe watershed in Florida. This is part of a big project funded by USDA-CSREES with University of Florida.
99. **Title:** Development of a GIS-referenced structure inventory of six tributaries of Clear Creek, Harris, Brazoria, and Galveston Counties
Co-PI: None
Total Grant: \$90,253
Sponsor: U.S. COE - Galveston
Sponsor Funding: \$90,253
Funding for which I had Primary Responsibility: \$90,253
Duration: 9-02 to 2-03
Project Summary: Develop a method to attribute and field verify the floor correction elevation using spatial algorithms, and develop a comprehensive database for a flood damage assessment project for COE. It is a continuation of a previous project.
100. **Title:** Develop a watershed characterization method to classify stream segments affected by bacterial pollution for five river basins in Texas
Co-PI: None
Total Grant: \$184,925
Sponsor: TCEQ (Texas Commission for Environmental Quality)
Sponsor Funding: \$184,925
Funding for which I had Primary Responsibility: \$184,925
Duration: 5-01 to 8-03
Project Summary: Develop a spatial framework to analyze and classify the cause for the various sources of bacterial pollution in major river basins in Texas using updated readily available information, including modeling the watersheds.
101. **Title:** Development of GIS-referenced real estate segment inventory for U.S. Army Corp of Engineering division.
Co-PI: None
Total Grant: \$75,779
Sponsor: U.S. COE - Galveston
Sponsor Funding: \$75,779

- Funding for which I had Primary Responsibility:** \$75,779
Duration: 4-02 to 4-03
Project Summary: Develop a method to attribute and link the real estate segment inventory databases of various lakes with U.S. COE economic databases and assist in property inventory and management of information, including training the U.S. COE personnel in the use of the information developed in this project.
102. **Title:** Southern region watershed resource management
Co-PI: Mark McFarland, Soil and Crop Science, TAMU
Total Grant: \$2,000,000
Sponsor: USDA, CSREES, and TAEX
Sponsor Funding: \$2,000,000
Funding for which I had Primary Responsibility: \$150,064
Duration: 9-02 to 9-03
Project Summary: This is a multi-state and institutional project where TAMU is the leading agency to develop comprehensive web-based water quality information delivery for the 13 Southeastern states.
103. **Title:** Competitive proposals for computer access fee (CAF) funds FY 2002
Co-PI: None
Total Grant: \$36,000
Sponsor: TAMU
Sponsor Funding: \$20,000
Funding for which I had Primary Responsibility: \$36,000
Duration: 10-02 to 8-03
Project Summary: Through a competitive program, the SSL was awarded funds from the student's computer access fee account to modernize the teaching facility of the SSL.
104. **Title:** Cedar creek watershed study using NEXRAD radar
Co-PI: None
Total Grant: \$116,581
Sponsor: TRWD (Tarrant Regional Water District)
Sponsor Funding: \$116,581
Funding for which I had Primary Responsibility: \$116,581
Duration: 5-02 to 12-03
Project Summary: Assess the water quality impact due to point and nonpoint sources using long-term weather and NEXRAD radar-based weather data in the Cedar Creek watershed.
105. **Title:** Spatial decision support system for water quality management
Co-PIs: Ann Kenimer (TAMU), B. A. Engel (Purdue), John Lee (Purdue), and Kent Mitchell (University of Illinois).
Total Grant: \$71,637
Sponsor: USDA-CSREES
Sponsor Funding: \$71,637
Funding for which I had Primary Responsibility: \$71,637
Duration: 9-99 to 8-02
Project Summary: Develop a scaleable Spatial Decision Support System (SDSS), which can be used to assess the water quality and economic benefits of emerging agricultural

- management strategies, such as variable rate application technology, use of vegetative filter strips, wetlands, or changes in crop tillage at the field, watershed, and river basin level. This is a continuation of a previous project supported by USDA-CSREES from 1994-99.
106. **Title:** Strengthening water resource program for Texas: Development and application of a decision support system for water resources
Co-PI: C. A. Jones, Ralph Wurbes (TAMU), Francisco Olivera (TAMU), and David Maidment, (UT)
Total Grant: \$400,000
Sponsor: U.S. COE - Fort Worth
Sponsor Funding: \$400,000
Funding for which I had Primary Responsibility: \$150,000
Duration: 9-01 to 8-03
Project Summary: Develop a decision support system in ArcGIS framework using the ArcHydro model for SWAT, and TAMU-WRAP models.
107. **Title:** Development of GIS-referenced structural inventory for clear creek watershed
Co-PI: None
Total Grant: \$73,215
Sponsor: U.S. COE - Galveston
Sponsor Funding: \$73,215
Funding for which I had Primary Responsibility: \$73,215
Duration: 3-02 to 6-02
Project Summary: Develop a method to attribute and field verify the floor correction elevation using spatial algorithms, and develop a comprehensive database for flood damage assessment project for COE. It is a continuation of a previous project.
108. **Title:** Formula Animal Health Funds
Co-PI: James Thompson, College of Veterinary Medicine, TAMU
Total Grant: \$311,244
Sponsor: TDH (Texas Department of Health)
Sponsor Funding: \$311,244
Funding for which I had Primary Responsibility: \$3,461
Duration: 10-01 to 9-02
Project Summary: Perform spatial analysis of cattle movement.
109. **Title:** A computerized decision aid for the Internet to predict erosion for construction sites
Co-PI: Wyatte Harman, Blackland Research Center, TAMUS
Total Grant: \$130,000
Sponsor: U.S. EPA
Sponsor Funding: \$130,000
Funding for which I had Primary Responsibility: \$65,640
Duration: 9-01 to 8-03
Project Summary: Develop a web-based erosion prediction system for users to estimate the erosion index from a construction site given the location and duration of the construction.
110. **Title:** Development of GIS-referenced structural inventory for clear creek watershed.
Co-PI: None

- Total Grant:** \$18,498.23
Sponsor: U.S. COE - Galveston
Sponsor Funding: \$18,498.23
Funding for which I had Primary Responsibility: \$18,498.23
Duration: 10-01 to 2-02
Project Summary: Develop a method to attribute and field verify the floor correction elevation using spatial algorithms, and develop a comprehensive database for the flood damage assessment project for COE.
111. **Title:** Establish and record permanent sample plot locations within eight Houston metropolitan area.
Co-PI: None
Total Grant: \$30,000
Sponsor: Texas Forest Service (TFS)
Sponsor Funding: \$30,000
Funding for which I had Primary Responsibility: \$30,000
Duration: 11-01 to 5-02
Project Summary: To study air pollution and the use of trees to preserve the green space within Houston metropolitan areas. Sample plots need to be established and recorded for permanent monitoring of vegetation for future studies.
112. **Title:** BASINS system support and development
Co-PI: None
Total Grant: \$114,268
Sponsor: Aqua Terra Consultants/U.S. EPA
Sponsor Funding: \$114,268
Funding for which I had Primary Responsibility: \$114,268
Duration: 4-02 to 3-03
Project Summary: To support the EPA BASINS 3.0 modeling framework as and when users need help, and further develop and maintain the BASINS 3.0 modules for which TAMUS is responsible.
113. **Title:** A real-time drought assessment and forecasting for Texas using GIS and Remote Sensing
Co-PI: None
Total Grant: \$149,920
Sponsor: ATP/State of Texas
Sponsor Funding: \$149,920
Funding for which I had Primary Responsibility: \$149,920
Duration: 1-02 to 12-03
Project Summary: To develop a real-time drought index and forecasting system for entire Texas at 4Km resolution using NEXRAD weather radar and the AVHRR remote sensing system.
114. **Title:** Competitive proposals for computer access fee (CAF) funds FY 2001
Co-PI: None
Total Grant: \$51,280
Sponsor: TAMU
Sponsor Funding: \$51,280

- Funding for which I had Primary Responsibility:** \$51,280
Duration: 5-01 to 8-02
Project Summary: Through a competitive program, the SSL was awarded funds from the student's computer access fee account to modernize the teaching facility of the SSL.
115. **Title:** Computing facilities request for TNRCC-TMDL projects in FY2002
Co-PI: None
Total Grant: \$75,000
Sponsor: TIAER - Tarleton State University and TNRCC
Sponsor Funding: \$75,000
Funding for which I had Primary Responsibility: \$75,000
Duration: 7-01 to 8-01
Project Summary: Procure and assess the computing infrastructure requirement for future TNRCC-TMDL projects in Texas.
116. **Title:** Structure data inventory for Lower Colorado River Basin, Texas using spatial data infrastructure system
Co-PI: None
Total Grant: \$168,455.68
Sponsor: DOD- Army Corps of Engineering
Sponsor Funding: \$168,455.68
Funding for which I had Primary Responsibility: \$168,455.68
Duration: 6-01 to 9-01
Project Summary: Develop a method to attribute and field verify the floor correction elevation using spatial algorithms, and develop a comprehensive database for the flood damage assessment project for COE.
117. **Title:** Development of GIS for environmental water quality modeling
Co-PI: None
Total Grant: \$102,546.90
Sponsor: USDA-ARS and US. EPA
Sponsor Funding: \$102,546.90
Funding for which I had Primary Responsibility: \$102,546.90
Duration: 5-01 to 4-06
Project Summary: Develop spatial model for various water quality models, and provide technical assistance to ARS and EPA programs.
118. **Title:** Southern region watershed resource management
Co-PI: Mark McFarland, Soil and Crop Science, TAMU
Total Grant: \$2,000,000
Sponsor: USDA, CSREES and TAEX
Sponsor Funding: \$2,000,000
Funding for which I had Primary Responsibility: \$279,617
Duration: 9-00 to 9-02
Project Summary: This is a multi-state and institutional project where TAMU is the leading agency to develop comprehensive web-based water quality information delivery for the 13 Southeastern states.
119. **Title:** Tree inventory and assessment using remote sensing techniques
Co-PI: None

- Total Grant:** \$10,000
Sponsor: City of San Antonio and Texas Forest Service
Sponsor Funding: \$10,000
Funding for which I had Primary Responsibility: \$10,000
Duration: 4-01 to 6-01
Project Summary: Develop a DBH relationship from aerial photos and ground truth data, and help in managing urban-forest interface.
120. **Title:** Mary's Creek and Sycamore Creek hydrologic study using SWAT model
Co-PI: None
Total Grant: \$100,000
Sponsor: Tarrant regional water district
Sponsor Funding: \$100,000
Funding for which I had Primary Responsibility: \$100,000
Duration: 2-01 to 1-02
Project Summary: Assess the sediment loading into the Trinity River from the two creeks, along with subbasin delineation for the two creek watersheds.
121. **Title:** Efficient irrigation for water conservation in the Rio-Grande River Basin
Co-PI: R. Muttiah, Blackland Research Center, TAMUS
Total Grant: \$100,000
Sponsor: USDA, CSREES
Sponsor Funding: \$100,000
Funding for which I had Primary Responsibility: \$66,200
Duration: 6-01 to 5-02
Project Summary: Develop procedure to estimate PET using remotely-sensed data, and develop hydrologic water balance model for the Rio-Grande Basin.
122. **Title:** Development of a land cover map and REEGIS database population for the St. Francis Basin
Co-PI: None
Total Grant: \$235,000
Sponsor: G.E.C., Inc. and U.S. COE
Sponsor Funding: \$235,000
Funding for which I had Primary Responsibility: \$235,000
Duration: 8-00 to 11-01
Project Summary: Develop land cover map from about 2,100 aerial color infrared photographs based on the U.S. COE classification schemes.
123. **Title:** Flood plain inventory and agricultural analysis of Arkansas River and tributaries of Oklahoma
Co-PI: John Ellis, Agricultural Economics, TAMU
Total Grant: \$89,489
Sponsor: U.S. COE
Sponsor Funding: \$89,489
Funding for which I had Primary Responsibility: \$89,489
Duration: 7-00 to 12-00
Project Summary: Develop method to analyze the flood plain inventory, and assign property values and associated information through spatial data infrastructure.

124. **Title:** Technical assistance and implementation of the west fork of the Trinity River watershed
Co-PI: None
Total Grant: \$10,000
Sponsor: Texas Soil and Water Conservation Board
Sponsor Funding: \$10,000
Funding for which I had Primary Responsibility: \$10,000
Duration: 7-00 to 12-02
Project Summary: Develop scenarios for various BMP and their impact on water quality through SWAT modeling
125. **Title:** Development of a state-of-the-art Teaching and Spatial Science Laboratory research facility for Global Positioning System
Co-PI: None
Total Grant: \$70,000
Sponsor: TAES
Sponsor Funding: \$70,000
Funding for which I had Primary Responsibility: \$70,000
Duration: 9-00 to 8-01
Project Summary: Upgrade SSL's global positioning system and implement the most recent technology. Negotiate with PCI Geomatics Inc. for unlimited licenses of their remote sensing software for the next five years at a much-reduced price.
126. **Title:** Develop methods and products of EPA's BASINS-3 for TMDL assessment for nationwide utilization
Co-PI: J. G. Arnold, USDA-ARS, Temple, TX
Total Grant: \$43,000
Sponsor: US-EPA and USDA-ARS
Sponsor Funding: \$43,000
Funding for which I had Primary Responsibility: \$43,000
Duration: 9-00 to 8-01
Project Summary: Incorporate SWAT model into the current BASINS-2 toolbox along with developing new watershed delineation techniques that will be used nationwide by state and federal agencies, as well as private consultants, to develop TMDL in the coming years.
127. **Title:** Development of statewide water and drought information system using remotely sensed data
Co-PI: W. A. Dugas, Blackland Research Center, TAMUS
Total Grant: \$250,000
Sponsor: TAES and TAEX
Sponsor Funding: \$115,000
Funding for which I had Primary Responsibility: \$42,000
Duration: 9-00 to 8-01
Project Summary: Develop methods to process and analyze daily gathered AVHRR satellite and NEXRAD information, and develop methods to produce suitable statewide drought indices.
128. **Title:** WQMP implementation assistance in the Big Cypress Creek watershed
Co-PI: None

- Total Grant:** \$25,000
Sponsor: Texas Soil and Water Conservation Board
Sponsor Funding: \$25,000
Funding for which I had Primary Responsibility: \$25,000
Duration: 7-00 to 12-02
Project Summary: Develop scenarios for various BMP and their impact on water quality through SWAT modeling for Big Cypress Creek watershed.
129. **Title:** SWAT model evaluation for pesticides
Co-PI: J. G. Arnold, USDA-ARS, Temple, TX
Total Grant: \$17,000
Sponsor: DOE at Oak Ridge
Sponsor Funding: \$17,000
Funding for which I had Primary Responsibility: \$17,000
Duration: 3-00 to 9-00
Project Summary: Evaluate the SWAT model for atrazine and metaclor pesticides for Sugar Creek watershed in Indiana.
130. **Title:** Implementation of GIS data preparation phase at the Fort Worth district reservoirs
Co-PI: None
Total Grant: \$93,500
Sponsor: U.S. COE
Sponsor Funding: \$93,500
Funding for which I had Primary Responsibility: \$93,500
Duration: 12-99 to 9-01
Project Summary: Develop a GIS lake inventory system and implement it for several lakes within the Fort Worth COE district. This project includes installation and training on the use of the developed system for the COE personnel.
131. **Title:** Development of a state-of-the-art Teaching and Spatial Science Laboratory research facility
Co-PI: None
Total Grant: \$105,000
Sponsor: TAES
Sponsor Funding: \$105,000
Funding for which I had Primary Responsibility: \$105,000
Duration: 10-99 to 8-00
Project Summary: Update the SSL with the most recent equipment for teaching and research facilities. This includes new computers, hard disk spaces, backup solutions, E size plotters, tabloid size color laser printers, and upgrading of the entire lab from 10 mbs to 100 mbs for faster network communications between clients to server machines.
132. **Title:** Development of digital databases for environmental and agricultural management modeling use
Co-PI: None
Total Grant: \$18,701
Sponsor: Tarrant Region Water District
Sponsor Funding: \$18,701

- Funding for which I had Primary Responsibility:** \$18,701
Duration: 10-99 to 4-00
Project Summary: Develop digital natural resource databases required for environmental modeling using GIS and SWAT.
133. **Title:** Mapping of the counties along the U.S.- Mexico border
Co-PI: None
Total Grant: \$14,700
Sponsor: U.S. COE
Sponsor Funding: \$14,700
Funding for which I had Primary Responsibility: \$14,700
Duration: 9-99 to 8-00
Project Summary: Develop and train digital coverage of all the layers for the entire 14 counties along the U.S.-Mexico border.
134. **Title:** Brush management/Water yield feasibility studies for eight watersheds in Texas
Co-PI: W. A. Dugas, Blackland Research Center, TAMUS
Total Grant: \$600,000
Sponsor: Texas Soil and Water Conservation Board
Sponsor Funding: \$55,179
Funding for which I had Primary Responsibility: \$55,179
Duration: 9-99 to 6-01
Project Summary: Assist in image processing of various 2000-2001 images of Landsat 7 using the classification required for the brush study. These data were then used in SWAT modeling as input for water quantity estimation.
135. **Title:** Development of statewide water and drought information system using remotely sensed data
Co-PI: W. A. Dugas, Blackland Research Center, TAMUS
Total Grant: \$250,000
Sponsor: TAES and TAEX
Sponsor Funding: \$125,000
Funding for which I had Primary Responsibility: \$54,000
Duration: 8-99 to 7-00
Project Summary: Develop methods to process and analyze daily gathered AVHRR satellite and NEXRAD information, and develop methods to produce suitable statewide drought indices.
136. **Title:** FBC digital map system design and development to monitor economic development
Co-PI: None
Total Grant: \$36,731
Sponsor: Greater Ft. Bend Economic Development Council
Sponsor Funding: \$36,731
Funding for which I had Primary Responsibility: \$36,731
Duration: 6-99 to 9-99
Project Summary: Develop mosaic of patched high-resolution 105 aerial photographs and georeference it. In addition, develop all the natural, cultural, utility, and political GIS data layers for Ft. Bend County for use of the economic development program.

137. **Title:** Implementation of a Geographical Information System at the pilot study lake, Lake O'the Pines
Co-PI: None
Total Grant: \$24,330
Sponsor: U.S. COE
Sponsor Funding: \$24,330
Funding for which I had Primary Responsibility: \$24,330
Duration: 5-99 to 9-99
Project Summary: Develop a prototype GIS lake inventory system and write implementation report for a lake.
138. **Title:** Develop methods and products of EPA's BASINS-3 for TMDL assessment for nationwide utilization
Co-PI: J. G. Arnold, USDA-ARS, Temple, TX
Total Grant: \$360,000
Sponsor: US-EPA and USDA-ARS
Sponsor Funding: \$360,000
Funding for which I had Primary Responsibility: \$360,000
Duration: 4-99 to 8-2000
Project Summary: Incorporate SWAT model into the current BASINS-2 toolbox along with developing new watershed delineation techniques that will be used nationwide by state and federal agencies, as well as by private consultants, to develop TMDL in the coming years.
139. **Title:** Identify and map hardwood species groups using large scale, color-infrared aerial photographs
Co-PI: None
Total Grant: \$12,814
Sponsor: Temple-Inland Forest Products Corporation
Sponsor Funding: \$12,814
Funding for which I had Primary Responsibility: \$12,814
Duration: 2-99 to 8-99
Project Summary: Identification and mapping of hardwood species groups using large scale, color-infrared aerial photographs, and training the Temple-Inland staff about use of these data.
140. **Title:** Implementation of a Geospatial Data System for the U.S. COE
Co-PI: None
Total Grant: \$38,991
Sponsor: U.S. COE
Sponsor Funding: \$38,991
Funding for which I had Primary Responsibility: \$38,991
Duration: 2-99 to 8-99
Project Summary: Develop a prototype GIS lake inventory system and write implementation report for a lake.
141. **Title:** APEX model to simulate hydrologic and crop growth for various fields
Co-PI: None
Total Grant: \$24,725

- Sponsor:** Monsanto Agricultural Products Company
Sponsor Funding: \$24,725
Funding for which I had Primary Responsibility: \$24,725
Duration: 12-98 to 6-99
Project summary: Simulate various Monsanto fields using GIS and APEX models for precision farming.
142. **Title:** Land use/land cover for nine county regions in northeast Texas
Co-PI: None
Total Grant: \$82,000
Sponsor: NTMWD (North Texas Water District)
Sponsor Funding: \$82,000
Funding for which I had Primary Responsibility: \$82,000
Duration: 10-98 to 4-00
Project summary: Collect, project, and geo-reference existing digital data in a GIS format that is compatible to either ArcView or GRASS format for nine counties in the northeast region of Texas. In addition, develop techniques to create historical land use/land cover using satellite images (70s, 80s, and 90s).
143. **Title:** A spatial decision support system for water quality management
Co-PIs: Ann Kenimer (TAMU), B. A. Engel (Purdue), John Lee (Purdue), and Kent Mitchell (University of Illinois).
Total Grant: \$95,685
Sponsor: USDA-CSREES
Sponsor Funding: \$95,685
Funding for which I had Primary Responsibility: \$95,685
Duration: 9-98 to 9-00
Project Summary: Develop a scaleable Spatial Decision Support System (SDSS), which can be used to assess the water quality and economic benefits of emerging agricultural management strategies, such as variable rate application technology, use of vegetative filter strips, wetlands, or changes in crop tillage at the field, watershed, and river basin level.
144. **Title:** Determination of Land Use for 303(d) List Watersheds
Co-PI: None
Total Grant: \$243,932
Sponsor: Texas Natural Resource Conservation Commission
Sponsor Funding: \$243,932
Funding for which I had Primary Responsibility: \$243,932
Duration: 7-98 to 8-99
Project Summary: Estimate percentages for each impaired segment using currently available land use data and drainage areas based on USGS 8-digit HCUs.
145. **Title:** Red River chloride control project
Co-PIs: Clive Walker and Ron Lacewell, Agricultural Economics, TAMU
Total Grant: \$400,000
Sponsor: U.S. COE
Sponsor Funding: \$360,000
Funding for which I had Primary Responsibility: \$30,000
Duration: 3-98 to 9-98

- Project Summary:** Analyze the Wichita portion of the Red River chloride control project and implications to the Red River, including an integrated effort that includes economics, hydrologic simulation models, Geographical Information Systems (GIS), and environmental factors.
146. **Title:** Methods and models – global change model assessment and its impact on agriculture
Co-PI: Robbie Brown of Pacific Northwest Labs
Total Grant: \$16,900
Sponsor: NSF
Sponsor Funding: \$16,900
Funding for which I had Primary Responsibility: \$16,900
Duration: 6-97 to 6-98
Project Summary: Update EPIC and SWAT models for simulating agricultural and water resource sensitivity to climate change and interannual/interdecadal climate variability. Update the HUMUS hydrology/Geographical Information System to support analyses of water resource sensitivity to climatic change and interannual/interdecadal climate variability at the scale of the U.S. Geological Survey 8-digit basin.
147. **Title:** Utilizing simulation models/geo-referenced databases to sustain economic viability and environmental quality of agriculture
Co-PI: W. A. Dugas, Blackland Research Center, TAMUS
Total Grant: \$534,911
Sponsor: Anonymous
Sponsor Funding: \$481,419
Funding for which I had Primary Responsibility: \$167,455.50
Duration: 6-97 to 5-98
Project Summary: Design and develop natural resource databases in a format compatible to be used with simulation models for all Terra sites and surrounding counties. In addition, develop methods to access these databases over the World Wide Web network.
148. **Title:** A grass interface for pesticide modeling for the Soil and Water Analysis Tool (SWAT)
Co-PI: None
Total Grant: \$10,000
Sponsor: USDA/ERS/NRED
Sponsoring funding: \$10,000
Funding for which I had Primary Responsibility: \$10,000
Duration: 7-96 to 2-98
Project Summary: Create a grass interface for pesticide modeling for the Soil and Water Analysis Tool (SWAT).
149. **Title:** Institutional adjustments for coping with prolonged and severe drought in the Rio Grande Basin
Co-PI: John Ellis, Agricultural Economics, Texas A&M; Agricultural Economics Department of NMSU
Total Grant: \$40,300
Sponsor: New Mexico Water Resources Research Institute WRI.
Sponsor Funding: \$40,300

- Funding for which I had Primary Responsibility:** \$40,300
Duration: 9-96 to 8-98
Project Summary: Study the Rio Grande Basin from the Colorado headwaters to the Gulf of Mexico to define the existing engineering-institutional-economic system, structure drought scenarios that are credible in light of occurrences during the period for which recorded data exist, assess their hydrological and economic impacts, and evaluate selected management strategies for reducing economic damages when such droughts occur.
150. **Title:** Sensitivities of North America agriculture to ENSO-based climate scenarios and their socio-economic consequences
Co-PI: None
Total Grant: \$18,500
Sponsor: Battelle
Sponsor Funding: \$18,500
Funding for which I had Primary Responsibility: \$18,500
Duration: 6-96 to 9-96
Project summary: Collect EPIC data for farm locations in Mexico, assist in aggregating the climatic data for Mexican locations, train scientists on the use of EPIC models, work with Mexican scientists on developing EPIC input data sets and making EPIC runs, and other ENSO scenarios.
151. **Title:** Utilizing simulation models/geo referenced databases to sustain economic viability and environmental quality of agriculture
Co-PI: Wyatte Harman, Blackland Research Center, TAMUS
Total Grant: \$738,527
Sponsor: Anonymous
Sponsor Funding: \$664,674
Funding for which I had Primary Responsibility: \$279,550.00
Duration: 6-96 to 5-97
Project Summary: Design and develop natural resource databases in a format compatible to be used with simulation models for all Terra sites and surrounding counties. In addition, develop methods to access these databases over the World Wide Web network.
152. **Title:** Delineate agro ecozones for the conterminous U.S.
Co-PIs: Jeff Arnold, ARS, and Ron Follet of ARS (Fort Collins, CO).
Total Grant: \$10,000
Sponsor: USDA-ARS
Sponsor Funding: \$10,000
Funding for which I had Primary Responsibility: \$10,000
Duration: 5-96 to 9-97
Project Summary: Develop methods and databases to delineate agro ecozones for the conterminous U.S.
153. **Title:** Assessment of DDT pesticide impact in the Yakama River Basin
Co-PI: Jeff Arnold, EPA/ARS
Total Grant: \$140,000
Sponsor Funding: \$140,000
Funding for which I had Primary Responsibility: \$140,000
Duration: 5-96 to 4-98

- Project Summary:** Prepare, in consultation with ARS, plan, and outline the project. Assemble DDT application data in the Yakama River Basin to model the effect of DDT using the SWAT model, and calibrate the model with available monitoring data.
154. **Title:** Design development of GIS databases for the Rio Grande region and assist in a border health survey data analysis
Co-PI: PPRI (Public Policy Research Institute, Texas A&M University).
Total Grant: \$102,500
Sponsor: Texas Department of Health (TDH)
Sponsor Funding: \$91,565
Funding for which I had Primary Responsibility: \$91,565
Duration: 4-96 to 7-96
Project summary: Design and develop a Geographic Information System (GIS) database including environmental data and available health data for the six most populous border counties. These counties include El Paso, Val Verde, Maverick, Webb, Hidalgo, and Cameron.
155. **Title:** Environmental information management in Central American watersheds
Co-PI: None
Total Grant: \$20,000
Sponsor: United Nations (UNEP)
Sponsor Funding: \$20,000
Funding for which I had Primary Responsibility: \$20,000
Duration: 12-95 to 3-96
Project summary: Train Mexican scientists on environmental modeling, soil productivity assessment, and sustainable development.
156. **Title:** Analysis in support of the 1995 sediment-coring project in Amistad, Falcon, and Elephant Butte reservoirs using Geographic Information Systems (GIS) in conjunction with selected Mexican institutes
Co-PI: None
Total Grant: \$31,400
Sponsor: TNRCC (Texas Natural Resources Conservation Commission).
Sponsor Funding: \$31,400
Funding for which I had Primary Responsibility: \$31,400
Duration: 11-95 to 8-96
Project summary: Contract between TNRCC and TAES to perform an analysis using a Geographic Information System (GIS) in support of an ongoing investigation of sedimentation reservoirs in the Rio Grande watershed. Initiate training on watershed hydrology and Geographic Information System (GIS) techniques to four INIFAP and IMTA research scientists. The Mexican scientists brought their data for the Rio Bravo, including the Rio Conchos, to model the watersheds.
157. **Title:** School of Rural Public Health Informatics Lab
Co-PI: R. S. Muttiah, Blackland Research Center, TAMUS
Total Grant: \$570,600
Sponsor: Texas A&M Health Science Center, State of Texas.
Sponsor Funding: \$570,600
Funding for which I had Primary Responsibility: \$520,000

- Duration:** 9-95 to 9-97
Project summary: Establish an informatics lab for the School of Rural Public Health. The major activity in this lab is to acquire, analyze, and develop methods for public/cooperator access to socio-economic, environmental, public health, and natural resources information using the World Wide Web and other recent technology.
158. **Title:** A spatial decision support system for water quality management
Co-PIs: Ann Kenimer (TAMU), B. A. Engel (Purdue), John Lee (Purdue), and Kent Mitchell (University of Illinois).
Total Grant: \$1,930,000
Sponsor: USDA-CSREES
Sponsor Funding: \$218,950
Funding for which I had Primary Responsibility: \$195,124
Duration: 9-95 to 8-97
Project Summary: Develop a scaleable Spatial Decision Support System (SDSS) which can be used to assess the water quality and economic benefits of emerging agricultural management strategies such as variable rate application technology, use of vegetative filter strips, wetlands, or changes in crop tillage at the field, watershed, and river basin level.
159. **Title:** Integrating SWAT with an in-stream water quality component using the kinetic routines of QUAL2E. (Enhanced stream water quality model.)
Co-PI: None
Total Grant: \$50,000
Sponsor: Oklahoma Conservation Commission
Sponsor Funding: \$50,000
Funding for which I had Primary Responsibility: \$50,000
Duration: 2-95 to 12-95
Project Summary: Integrate the SWAT and QUAL2E into one model, which will enable the simulation of point and non-point source pollutants at an in-stream scale. The model is then calibrated and verified using collected in-stream data from two basins in eastern Oklahoma.
160. **Title:** Modeling of water quality and quantity for SANREM CRSP Philippines sites
Co-PI: P. T. Dyke, Blackland Research Center, TAMUS
Total Grant: \$43,613
Sponsor: USAID
Sponsor Funding: \$37,000
Funding for which I had Primary Responsibility: \$37,000
Duration: 1-94 to 7-97
Project Summary: Provide technical assistance and technology transfer of watershed modeling to a watershed in the Philippines for erosion control.
161. **Title:** Developing Global Change Assessment Model (GCAM)
Co-PI: None
Total Grant: \$45,000
Sponsor: Battelle Institute (Pacific Northwest Lab)
Sponsor Funding: \$45,000
Funding for which I had Primary Responsibility: \$45,000
Duration: 10-93 to 3-94

Project Summary: Assist in development of land surface hydrology model interactions with global climate change models for the U.S.

162. **Title:** Demonstration of procedures for creating a world natural resources database.

Co-PI: None

Total Grant: \$5,500

Sponsor: USDA – OICD – Foreign Agriculture Service

Sponsor Funding: \$5,500

Funding for which I had Primary Responsibility: \$5,500

Duration: 6-93 to 9-93

Project Summary: Study the relationship between FAO soils databases to U.S. taxonomy and other relative information.

163. **Title:** General concepts and guidelines for the HUMUS project

Co-PIs: P. T. Dyke, R. S. Muttiah, Blackland Research Center, TAMUS

Total Grant: \$1,051,700

Sponsor: Soil Conservation Services

Sponsor Funding: \$957,000

Funding for which I had Primary Responsibility: \$897,000

Duration: 10-92 to 9-96

Project Summary: Design Hydrologic Unit Modeling for the U.S. (HUMUS) project to provide a modern tool for making national generalized assessments of the availability, quality, and uses of freshwater resources in the nation under current and projected alternative conditions of the use and management, or mismanagement, of those resources.

Research and scholarly activity documentation:

(Samples of recent publications are enclosed in Appendix 6.)

Year	Referred	TALR Pub	Book Chap	Proceeding	Prof. Meeting
2016	22		2	1	9
2015	28	1			19
2014	15	2		4	11
2013	14			7	11
2012	9	1		5	3
2011	13	2		13	3
2010	9	1		6	4
2009	17	2		23	5
2008	12	3		6	1
2007	7	3		8	1
2006	10		2	2	5

2005	19		1	5	4
2004	4	2	2	4	5
2003	5	1		1	1
2002	5	4		1	4
2001	1	1	1	1	7
2000	2			2	2
1999	4	2		4	
1998	2	1	2	2	7
1997	2			1	3
1996	1		2	7	1
1995	2			1	
1994	4			4	2
1993	2			7	1

Referred Journal Articles

Asterisk (*) indicates graduate students, (**) post docs or (***) employees whom I have supervised.

1. Nina Omani*, Raghavan Srinivasan, Raghupathy Karthikeyan, Venkat Reddy K., Patricia K. Smith. 2016. Impact of climate change on glacier melt from five river basins. *Transactions of the ASABE*. 59(4): 829-848. doi: 10.13031/trans.59.11320. (IF=0.913)
2. Bieger, Katrin**, Jeffrey G. Arnold, Hendrik Rathjens**, Michael J. White, David D. Bosch, Peter M. Allen, Martin Volk, and Raghavan Srinivasan, 2016. Introduction to SWAT+, a completely restructured version of the Soil and Water Assessment Tool. *Journal of the American Water Resources Association (JAWRA)* 1–16. DOI: 10.1111/1752-1688.12482. (IF=1.659)
3. Rajaei, F.*, Sari, A.E., Salmanmahiny, A., Majid Delavar, Ali Reza Massah Bavani, R. Srinivasan. 2016. Surface drainage nitrate loading estimate from agriculture fields and its relationship with landscape metrics in Tajan watershed. *Paddy Water Environment* (2016). doi:10.1007/s10333-016-0570-y. (IF=0.871)
4. Hojat Ahmadzadeh, Saeed Morid, Majid Delavar, Raghavan Srinivasan. 2016. Using the SWAT model to assess the impacts of changing irrigation from surface to pressurized systems on water productivity and watersaving in the Zarrineh Rud catchment. *Agricultural Water Management*. 175 (2016) 15–28. <http://dx.doi.org/10.1016/j.agwat.2015.10.026> (IF=2.603)
5. Rathjens, H.***, Bieger, K., Chaubey, I., Arnold, J. G., Allen, P. M., Srinivasan, R., Bosch, D. D., and Volk, M. (2016) Delineating floodplain and upland areas for hydrologic models: a comparison of methods. *Hydrol. Process.*, 30: 4367–4383. doi: 10.1002/hyp.10918. (IF=2.768)
6. Elizabeth Brooke Haney*, Richard Lee Haney, Jeffrey George Arnold, Michael James White, Raghavan Srinivasan and Scott Allen Senseman. 2016. Spatial Analysis and Modeling the Nitrogen Flush after Rainfall Events at the Field Scale in SWAT. *American Journal of Environmental Sciences 2016*, 12 (2): 102.121 DOI: 10.3844/ajessp.2016.102.121. (IF=0.56)

7. Yen, H.***, M. J. White, J.G. Arnold, S. C. Keitzer, M. V. Johnson, J. D. Atwood, P. Daggupati, M. E. Herbert, S. p. Sowa, S. A. Ludsin, D. M. Roberson, R. Srinivasan, C. A. Rewa. (2016). Western Lake Erie Basin: Soft-data-constrained, NHDPlus resolution watershed modeling and exploration of applicable conservation scenarios. *Science of Total Environment*. 569(570):1265-1281. doi: <http://dx.doi.org/10.1016/j.scitotenv.2016.06.202>. (IF=3.976)
8. Daggupati, P.***, M. Ahmadi, R. Srinivasan, D. Verma. (2016). Spatial and temporal patterns of annual and monthly precipitation and streamflow variations in Tigris-Euphrates river basin. *Environmental Monitoring and Assessment*. doi: <http://dx.doi.org/10.1007/s10661-016-5752-y>. (IF=1.633)
9. Daggupati, P.***, R. Srinivasan, Y. Dile, D. Verma. (2016). Reconstructing the historical water regime of the contributing basins to the Hawizeh marsh: Implications of water control structures. *Science of Total Environment*. doi: <http://dx.doi.org/10.1016/j.scitotenv.2016.12.029>. (IF=3.976)
10. Marek, G.W., Gowda, P., Evett, S.R., Baumhardt, R.L., Brauer, D.K., Howell, T.A., Marek, T.H., Srinivasan, R. 2016. Calibration and validation of the SWAT model for predicting daily ET over irrigated crops in the Texas High Plains using lysimetric data. *Transactions of the ASABE*. 59(2):611-622 doi:10.1303/trans.59.10926. (IF=0.913)
11. Monteiro, J. A. F.***, Strauch, M., Srinivasan, R., Abbaspour, K., and Gücker, B. (2016). Accuracy of grid precipitation data for Brazil: application in river discharge modelling of the Tocantins catchment. *Hydrol. Process.*, 30: 1419–1430. doi: 10.1002/hyp.10708. (IF=2.768)
12. Marek, Gary W., Prasanna H. Gowda, Steven R. Evett, R. Louis Baumhardt, David K. Brauer, Terry A. Howell, Thomas H. Marek, and R. Srinivasan, 2016. Estimating Evapotranspiration for Dryland Cropping Systems in the Semiarid Texas High Plains Using SWAT. *Journal of the American Water Resources Association (JAWRA)* 52(2): 298-314. DOI: 10.1111/1752-1688.12383 (IF=1.659)
13. Yihun T. Dile**, Prasad Daggupati***, Chris George, Raghavan Srinivasan, and Jeff Arnold. 2016. Introducing a new open source GIS user interface for the SWAT model. *Environmental Modelling & Software* 85 (2016) 129-138. <http://dx.doi.org/10.1016/j.envsoft.2016.08.004> (IF=4.207)
14. Daggupati, P.***, D. Deb***, R. Srinivasan, D. Yeganantham*, V. M. Mehta, and N. J. Rosenbert (2016). Large scale-fine resolution hydrological modeling using parameter regionalization in the Missouri River Basin. *Journal of American Water Resource Association* DOI: 10.1111/1752-1688.12413 (IF=1.659)
15. Yen. H.***, P. Daggupati***, M. J. White, R. Srinivasan, J. Arnold (2016). Application of Large-scale, Multi-resolution Watershed Modeling Framework using the Hydrologic and Water Quality System (HAWQS). *Water* 8(4), 164. doi:10.3390/w8040164 (IF=1.687)
16. Nina Omani*, Raghavan Srinivasan, Patricia K. Smith & Raghupathy Karthikeyan (2016). Glacier mass balance simulation using SWAT distributed snow algorithm, *Hydrological Sciences Journal* DOI: 10.1080/02626667.2016.1162907 (IF=2.182)
17. Clarke, N., Bizimana, J., Dile, Y., Worqlul, A., Osoriod, J., Herbst, B., Richardson, J. W., Srinivasan, R., Gerik, T. J., Williams, J., Jones, C. A., Jeong, J. 2016. Evaluation of new farming technologies in Ethiopia using the Integrated Decision Support System

(IDSS). *Agricultural Water Management* doi:
<http://dx.doi.org/10.1016/j.agwat.2016.07.023> (IF= 2.603)

18. Dile, Y. T.*, Karlberg, L., Srinivasan, R., and Rockstrom, J. 2016. Investigation of the curve number method for surface runoff estimation in tropical regions. *Journal of the American Water Resources Association* 1-15. doi: 10.1111/1752-1688.12446 (IF = 1.659)
19. Sun, X.*, Bernard-Jannin, L., Garneau, C., Volk, M., Arnold, J. G., Srinivasan, R., Sauvage, S., and Sánchez-Pérez, J. M. 2016. Improved simulation of river water and groundwater exchange in an alluvial plain using the SWAT model. *Hydrological Processes* 30: 187–202. doi: 10.1002/hyp.10575.
20. Monteiro, J. A. F.***, Kamali, B., Srinivasan, R., Abbaspour, K., and Gücker, B. 2016. Modelling the effect of riparian vegetation restoration on sediment transport in a human-impacted Brazilian catchment. *Ecohydrology* doi: 10.1002/eco.1726. (IF=2.138)
21. Francesconi, W., Srinivasan, R., Pérez-Miñana, E., Willcock, S. P., Quintero, M. 2016. Using the Soil and Water Assessment Tool (SWAT) to model ecosystem services: A systematic review. *Journal of Hydrology* 535: 625–636. doi: 10.1016/j.jhydrol.2016.01.034 (IF=3.043)
22. Dile, Y.*, Karlberg, L., Daggupati, P., Srinivasan, R., Wiberg, D., Rockström, J. 2016. Assessing the implications of water harvesting intensification on upstream–downstream ecosystem services: A case study in the Lake Tana basin. *Science of the Total Environment* 542: 22–35. doi: 10.1016/j.scitotenv.2015.10.065. (IF=3.976)
23. Deb, D.***, Butcher, J., Srinivasan, R. 2015. Projected hydrologic changes under mid-21st century climatic conditions in a sub-arctic watershed. *Water Resources Management* 29: 1467-1487. (IF – 2.6)
24. Faramarzi, M., Srinivasan, R., Iravani, M., Bladon, K. D., Abbaspour, K. C., Zehnder, A. J. B., and Goss, G. G. 2015. Setting up a hydrological model of Alberta: Data discrimination analyses prior to calibration. *Environmental Modelling & Software* 74: 48–65. (IF - 4.42)
25. Mehta V. M., Mendoza, K., Daggupati, P., Srinivasan, R., Rosenberg, N. J., Deb, D. 2015. High-resolution simulations of decadal climate variability impacts on water yield in the Missouri River Basin with the Soil and Water Assessment Tool (SWAT). *Journal of Hydrometeorology* doi: <http://dx.doi.org/10.1175/JHM-D-15-0039.1> (IF - 3.645)
26. Panagopoulos, Y. **, Gassman, P. W., Jha, M. K., Kling, C. L., Campbell, T., Srinivasan, R., White, M., Arnold, J. G. 2015. A refined regional modeling approach for the Corn Belt – Experiences and recommendations for large-scale integrated modeling. *Journal of Hydrology* 524: 348–366. doi: 10.1016/j.jhydrol.2015.02.039. (IF - 3.053)
27. Meaurio, M. *, Zabaleta, A., Uriarte, J. A., Srinivasan, R., Antigüedad, I. 2015. Evaluation of SWAT models performance to simulate streamflow spatial origin. The case of a small forested watershed. *Journal of Hydrology* 525: 326–334. (IF – 3.053)
28. Panagopoulos, Y. **, Gassman, P. W., Arritt, R. W., Herzmann, D. E., Campbell, T. D., Valcu, A., Jha, M. K., Kling, C. L., Srinivasan, R., White, M., Arnold, J. G. 2015. Impacts of climate change on hydrology, water quality and crop productivity in the Ohio-Tennessee River Basin. *International Journal of Agricultural & Biological Engineering* 8(3). doi: 10.3965/j.ijabe.20150803.1497.
29. Abbaspour, K.C., Rouholahnejad, E., Vaghefi, S., Srinivasan, R., Yang, H., Kløve, B. 2015. A continental-scale hydrology and water quality model for Europe: Calibration

- and uncertainty of a high-resolution large-scale SWAT model. *Journal of Hydrology* 524: 733-752. doi: 10.1016/j.jhydrol.2015.03.027 (IF - 3.053)
30. Daggupati, P***, Yen, H., White, M. J., Srinivasan, R., Arnold, J. G., Connor, C. S., Sowa, S. P. 2015. Impact of model development decision on hydrological processes and streamflow. *Hydrological Processes* 29: 5307-5320. doi: 10.1002/hyp.10536 (IF-2.677)
 31. Ahmadzadeh, H., Morid, S., Delavar, M., Srinivasan, R. 2015. Using the SWAT model to assess the impacts of changing irrigation from surface to pressurized systems on water productivity and water saving in the Zarrineh Rud catchment. *Agricultural Water Management* doi: 10.1016/j.agwat.2015.10.026 (IF – 2.286)
 32. Bressiani, D. A.*, Gassman, P. W., Fernandes, J. G., Garbossa, L. H. P., Srinivasan, R., Bonumá, N. B., et al. 2015. Review of Soil and Water Assessment Tool (SWAT) applications in Brazil: Challenges and prospects. *International Journal of Agricultural & Biological Engineering* 8(3): 9-35. doi: 10.3965/j.ijabe.20150803.1765.
 33. Daggupati, P.***, Yen, H., White, M. J., Srinivasan, R., Arnold, J. G., Keitzer, C. S., and Sowa, S. P. 2015. Impact of model development, calibration and validation decisions on hydrological simulations in West Lake Erie Basin. *Hydrological Processes* doi: 10.1002/hyp.10536. (IF – 2.677)
 34. Deb, D.***, Tuppad, P., Daggupati, P., Srinivasan, R., Varma, D. 2015. Spatio-temporal impacts of biofuel production and climate variability on water quantity and quality in Upper Mississippi River Basin. *Water* 7: 3283-3305. (IF – 1.428)
 35. Grusson, Y.*, Sun, X., Gascoin, S., Sauvage, S., Srinivasan, R., Anctil, F., Sánchez-Pérez, J. M. 2015. Assessing the capability of the SWAT model to simulate snow, snow melt and streamflow dynamics over an alpine watershed. *Journal of Hydrology* doi: 10.1016/j.jhydrol.2015.10.070 (IF – 3.053)
 36. Guo, T.*, Engel, B. A., Shao, G., Arnold, J. G., Srinivasan, R., Kiniry, J. R. 2015. Functional approach to simulating short-rotation woody crops in process-based models. *Bioenergy Research* 8: 1598–1613. doi: 10.1007/s12155-015-9615-0 (IF – 3.541)
 37. Guzman, J. A., Moriasi, D. N., Gowda, P. H., Steiner, J. L., Starks, P. J., Arnold, J. G., Srinivasan, R. 2015. A model integration framework for linking SWAT and MODFLOW. *Environmental Modelling & Software* 73: 103-116. doi: 10.1016/j.envsoft.2015.08.011 (IF-4.42)
 38. Epelde, A. M., Cerro, I., Sánchez-Pérez, J. M., Sauvage, S., Srinivasan, R., Antigüedad, I. 2015. Application of the SWAT model to assess the impact of changes in agricultural management practices on water quality. *Hydrological Sciences Journal* 60(5): 825-843. (IF – 2.182)
 39. Havrylenko, S.B.*, Bodoque, J. M., Srinivasan, R., Zucarelli, G. V., Mercuri, P. 2015. Assessment of the soil water content in the Pampas region using SWAT. *Catena* doi: 10.1016/j.catena.2015.10.001 (IF – 2.82)
 40. Her, Y. **, Frankenberger, J., Chaubey, I., Srinivasan, R. 2015. Threshold effects in HRU definition of the Soil and Water Assessment Tool. *Transactions of the ASABE* 58(2): 367-378. doi: 10.13031/trans.58.10805 (IF – 0.895)
 41. Johnson, T., Butcher, J., Deb, D., Faizullabhoj, M., Hummel, P., Kittle, J., McGinnis, S., Mearns, L. O., Nover, D., Parker, A., Sarkar, S., Srinivasan, R., Tuppad, P., Warren, M., Weaver, C., Witt, J., 2015. Modeling streamflow and water quality sensitivity to climate change and urban development in 20 U.S. watersheds. *Journal of the American Water Resources Association* 1–21. doi: 10.1111/1752-1688.12308 (IF – 1.348)

42. Krysanova, V., Srinivasan, R. 2015. Assessment of climate and land use change impacts with SWAT. *Regional Environmental Change* 15: 431-434. doi: 10.1007/s10113-014-0742-5. (IF – 2.628)
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1. Andrade, CWL.*, Montenegro, SMGL., Lima, JRS., Magalhaes, AG., R. Srinivasan. 2016. Modelagem hidrológica de uma sub-bacia do Alto Mundaú utilizando o modelo SWAT. In: XIII Simpósio de Recursos Hídricos do Nordeste, 2016, Aracajú - SE. Anais do XIII Simpósio de Recursos Hídricos do Nordeste, 2016.
2. Hong, J.*, Ahiablame, L., Lim, K. J., Srinivasan, R.(2016). Impacts of Grassland Conversion on Hydrology and Water Quality in the Bad River Watershed, South Dakota. Poster presented at The 2016 Western South Dakota Hydrology Conference, April 7th – 8th, Rapid City, SD.
3. Rathjens, H.**, Bieger, K.**, Chaubey, I., Arnold, J., Srinivasan, R., Bosch, D., Allen, P., and Volk, M. (2016): Evaluation of upland-floodplain delineation methods across

- scales and DEM resolutions. ASABE 2016 Annual International Meeting, July 17-20, Orlando (USA).
4. Rathjens, H.**, Bieger, K.**, Chaubey, I., Arnold, J., Srinivasan, R., Bosch, D., Allen, P., and Volk, M. (2016): Development of a Landscape Unit Delineation Framework to assess Water Transfers across Landscape Units using SWAT. 10th International Symposium on Agriculture and the Environment, May 23-27, West Lafayette (USA)
 5. Mosase, E.*, Ahiablame, L., Srinivasan, R. (2016) Blue and Green water modeling in the Limpopo River Basin. Oral presentation at UCOWR 2016 Annual meeting, June 21-23, Pensacola, FL
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 7. Gassman, P.W., J.G. Arnold and R. Srinivasan. 2016. SWAT Global Impacts. Presented at the 2016 International SWAT Conference, July 27-29, Beijing Normal University, Beijing, China.
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 10. Monteiro J.A.F.**, Kamali B., Srinivasan R., Abbaspour K., Gücker B., Modelling the effect of riparian vegetation restoration on sediment transport in a human-impacted Brazilian catchment, 2015 International SWAT Conference, Pula, Italy. <http://dx.doi.org/10.13140/RG.2.1.1037.9368>.
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Research Software Developed

1. Developed an Intel-PC based 32-bit GIS software called BLACKLAND GRASS with GRASS GIS as a basis. This tool is copyrighted as a TALR product, and has been distributed at cost to various national and international users. So far, about 500 licenses have been sold. In addition, there are two more components that will be released with this tool. The Texas A&M University Agricultural Engineering department and numerous other universities use this tool as a teaching aid for GIS courses in undergraduate and graduate classes.
2. Developed interface software between GRASS GIS and the AGNPS (Agricultural Non-Point Source Pollution) model. This interface helps the AGNPS model user community to more quickly and easily develop input datasets for a distributed watershed model. This interface has been widely distributed over the internet from various anonymous FTP sites including the U.S.-ARMY CORE-CERL lab.
3. Developed several spatial processing tools and import/export tools between various GIS systems and various platforms such as various flavors of UNIX and PC. Some of the tools include extraction of stream and watershed attributes from elevation maps within GRASS GIS.
4. Developed interface software between the GRASS GIS and the SWAT (Soil and Water Assessment Tool) model. SWAT is a spatially distributed, continuous time water quantity and quality assessment tool. The interface reduces the time for input data gathering and is the critical element of the HUMUS project funded by USDA-NRCS, U.S. EPA, NOAA, USDA-NRCS, TNRCC and TWDB. Several state, local, and private organizations are currently using this tool. This tool is being distributed, and an active user's mailing group is also maintained. In addition, this tool is being adapted in several international institutions in Korea, India, Nepal, Germany, France, Italy, Mexico, and Canada.

5. In recent years, several web-based tools have been developed as part of research programs and are available for public use. Integration of web-based technologies, such as HTML, CGI, Perl, Java, and client-server models, is being used to link to several point and spatial scale biophysical models. Some of the web links are:
<http://srph.brc.tamus.edu/humus>, <http://srph.brc.tamus.edu/epic>, and <http://srph.brc.tamus.edu/swat>.
6. Developed several remote database access tools over the internet or from intranet tools as part of various funded projects. These tools are generic in nature, can be used to query spatial, temporal, or tabular databases, and can create customized outputs in chart, map, or table formats.
7. Developed the Keetch-Byram Drought Index (KBDI) for determining forest fire potential. This work was developed jointly with the Texas Forest Service (TFS). The drought index is based on a daily water balance where a drought factor is balanced with precipitation and soil moisture, and which is expressed in hundredths of an inch of soil moisture depletion. The drought index ranges from 0 to 800, where a drought index of 0 represents no moisture depletion, and an index of 800 represents absolutely dry conditions. Presently, this index is derived from ground-based estimates of temperature and precipitation derived from weather stations and interpolated manually by experts at the TFS for counties across the state. Currently, the index is developed from AVHRR satellite and NEXRAD radar. The new KBDI product will have a spatial resolution of 4 km, and the process will be automated within a GIS. <http://webgis.tamu.edu/kbdi.asp>.

International Impact of the Research

The SWAT model and GIS interfaces developed through the research program over the years had significant impact on international research groups. International research institutions from Germany, Switzerland, Italy, India, China, and Mexico are using the tools developed for advancement of their science and research findings to address nonpoint source pollution movement and ways to control these pollutants through best management plans. In appendix 7, letters of support from scientists from Germany, Switzerland and India are attached along with their curriculum vita for additional information. In the next section, information about the various collaborative international activities including seminars, workshops and conferences conducted are provided that support this effort.

V. Service Activities

Short Courses Conducted (1999-present)

1999-present: Short courses/continuing education is important in the technology transfer service function of the university to enable graduates and other professionals to keep their skills current. The spatial sciences lab traditionally has been teaching three per year two-day courses. However, the number and frequency of courses have declined in recent years. Short courses

trend has been revamped with new additional courses in all the spatial technologies with introductory and advanced level GIS, GPS, and Remote Sensing principle and applications varying from two-day to five-day courses.

Continuing education program since most recent appointment:

Course Title	Year	Dates	# of Participants
Introductory to GIS	1999	3/2-3, 5/5-6, 11/10-11	47 (total of 3 courses)
	2000	1/18-19, 5/31-6/1, 9/27-28, 10/11-12	60 (total of 4 courses)
	2001	2/21-22, 4/20-21, 6/19-6/20, 11/30-12/1	46 (total of 4 courses)
	2002	1/15-1/16, 5/29-5/30, 7/1-7/2, 8/7-8/8	76 (total of 4 courses)
Advanced GIS	1999	1/20-21, 3/9-10, 9/8-9	27 (total of 3 courses)
	2000	7/12-13, 11/1-2	20 (total of 2 courses)
Introductory to GPS	2000	5/24-25, 8/30-31	18 (total of 2 courses)
Remote Sensing	2000	8/9-11	6 (total of 1 course)
SWAT Model and Arcview Workshop	1999	3/16-3/18,	12
		8/17-8/19	9
	2000	9/26-9/28	13
	2001	6/26-6/28	15
	2002	1/10-1/11	6
		1/15	6
		3/5-3/7	9
		3/10	48
		4/23-4/25	15
	2003	5/13-5/16	17
2/4-2/6		15	
2004	10/29-10/31	9	
	1/14-1/16	6	
	5/11-5/13	17	
	5/15	24	
	8/24-8/26	22	
	10/1-10/9	8	
12/15-12/18	8		
2005	5/17-5/19	12	
	7/11-7/12	20	
	12/6-12/8	12	
	12/13-12/15 (at ND)	41	

	2006	5/7 5/9-5/11 9/25-9/27	18 14 27
	2007	3/20-3/22 5/1-5/3 7/15-7/18 11/12-11/14	9 13 12 17
	2008	2/11-2/13 4/21-4/23 9/1-9/3 11/3 – 11/4	8 9 6 14
	2009	2/23-2/24 6/8 – 6/9 8/3 – 8/4 11/2 – 11/3 11/16 – 11/17	19 10 12 10 25
	2010	1/26-1/28 5/3 – 5/5 5/10 -5/11 5/24-5/26 6/1-6/4 6/7-6/8 6/14-6/16 7/19-7/21 8/31 – 9/1 9/13 – 9/15 10/11-10/12	25 22 20 10 22 6 18 22 12 35 25
	2011	2/7-2/8 4/4-4/5 6/13-6/14 10/17-10/18	15 15 17 16
	2012	5/1 – 5/3 5/7 – 5/9 6/7 – 6/15 7/16 – 7/17 7/23 – 7/24 9/14 – 9/15	42 16 10 35 12 12
	2013	2/4 – 2/5 2/12 – 2/14 5/6 – 5/7 8/19 – 8/21 10/21-10/22 12/30 – 12/31	14 11 11 3 13 40 (IITM, India)

	2014	1/5 – 1/6 1/27 – 1/29 2/9 – 2/11 5/19-5/21 6/10-6/12 9/29-10/1 10/6-10/10 12/15-12/16	25 (Amman, Jordan) 11 12 21 (Warsaw, Poland) 45 (ILSSI, Ethiopia) 20 (Sardinia, Italy) 7 (Almaty, Kazakhstan) 10 (Almaty, Kazakhstan)
	2015	1/26-1/28 3/31-4/1 5/25-5/27 6/22-6/23 8/6-8/7 8/10-8/12	15 25 (Purdue University) 19 (Warsaw Poland) 15 (Sardinia, Italy) 12 (Recife, Brazil) 28 (Recife, Brazil)
	2016	2/22-2/24 4/27-4/28 7/25-7/26 8/1/-8/2	12 55 (University of Guelph) 70 (Beijing Normal Univ) 7 (Purdue University)
Advanced SWAT Training	2006	3/7-3/9 9/28-9/29 10/17-10/19	6 40 12
	2007	4/17-4/19 7/19-7/20 11/15-11/16	14 13 11
	2008	2/14-2/15 4/24-4/25 9/4-9/5 11/6-11/7	3 9 6 12
	2009	2/26-2/27 6/10-6/11 11/5 – 11/6 11/19-11/20	12 9 10 25
	2010	5/5 – 5/7 5/12- 5/13 5/26-5/28 6/16-6/18 7/22-7/23 8/2-8/3 9/3 – 9/4 10/13 – 10/14	25 14 13 24 20 50 6 25
	2011	2/10-2/11 4/7-4/8 10/20-10/21	11 10 12

	2012	4/25 – 4/26 5/11 – 5/12 6/18 – 6/21 6/22 – 6/27 7/24 - 7/25 9/17 – 9/18	25 17 4 8 12 13
	2013	2/7 – 2/8 5/9 – 5/10 8/21 – 8/23 10/23	8 15 4 12
	2014	1/2 – 1/3 1/13-1/17 1/29 – 1/31 2/12 - 2/13 5/22-5/23 10/2-10/3 12/26-12/27	40 (IITM, India) 60 (MRC, Vietnam) 14 12 21 (Warsaw, Poland) 20 (Sardinia, Italy) 30 (IIT Hyderabad)
	2015	1/28-1/30 4/2-4/3 5/28-5/29 8/13-8/14 10/12-10/13	14 30 (Purdue University) 19 (Warsaw, Poland) 28 (Recife, Brazil) 25 (Purdue University)
	2016	2/24-2/26 6/2-6/3 8/3-8/4	6 18 (Warsaw Life Sciences University, Poland) 13 (Purdue University)
Advanced Data Processing	2009	2/25 6/10 11/4	11 3 9
	2010	9/2	6
	2011	2/9 4/6 10/19	9 9 16
	2012	5/10 9/16	18 13
	2013	2/6 5/8 10/24-10/25	12 12 12
APEX Model Workshops	2009	11/18	25
Extreme Climate Impacts on Land Sustainability	2014	1/7-1/9	20 (Amman, Jordan)

Climate Change Downscaling and Landuse Sustainability	2014	6/16-6/20	20 (Tashkent, Uzbekistan)
	2015	5/5-5/8	8 (Amman, Jordan)
QSWAT (QGIS-SWAT Interface)	2015	8/26-8/27	23 (Sao Paulo, Brazil)
	2016	1/13-1/15 5/31-6/1	8 (Lisbon, Portugal) 12 (Warsaw Life Sciences University, Poland)

2000-present: Taught 30% of the U.S. EPA's BASINS course through the University of Texas Continuing Education program. This was a five-day training course on the use of BASINS tools for TMDL (Total Maximum Daily Load) assessment for state, federal, and local river authorities and private consultants. The dates of these training courses were 2/28/00 – 3/3/00, 6/5/00 – 6/9/00, 12/4/00 – 12/8/00, 4/2/01-4/6/01, 6/4/01-6/8/01, 11/12/01-11/16/01, 3/4/02-3/8/02, 4/29/02-5/3/02 with 28, 17, 18, 16, 13, 14, 6 and 17 participants, respectively. Appendix 5 gives a detailed sample evaluation of BASINS course.

Invited International and Other Activities (1992-present)

- i. 2016: Conducted Quantitative and Qualitative Assessment of Water Resources Using SWAT (GIAN 2-credit Course, Dec 12 – Dec 23, 2016, NIT, Warangal, India) for 49 students.
- ii. 2016: Conducted Hydro-informatics for Integrated Water Resources Management (GIAN 2-credit Course, Nov 28 – Dec 9, 2016, IIT Madras, India) for 43 students.
- iii. 2016: Invited by Vietnam National Mekong Committee to help to setup the SWAT model for the hydrology and sediment simulation for the Red River Basin and train their modelers from Oct 19-22 and Nov 13-19, 2016.
- iv. 2016: Organized an International SWAT conference at Beijing Normal University, Beijing, China from July 27-29, 2016, where 160 participants from 19 countries presented 92 papers and posters. The papers presented were invited through three special editions of peer review journal publication (HESS, WATER and IJABE).
- v. 2016: Conducted an Introductory SWAT workshop as part of the International SWAT conference at Beijing Normal University, China on July 25-26, 2016 for 70 participants.
- vi. 2016: Invited to give a keynote speech on “Global Blue and Green water Assessment from country to continental scale” at the IEMS (International Environmental and Modeling Software) conference on 13 July, 2016.
- vii. 2016: Conducted ILSSI (Innovation Lab for small scale irrigation) stakeholder workshop on irrigation impact for small scale farmers at Accra, Ghana to government, university and NGOs. 6/22-25, 2016.
- viii. 2016: Invited to give a seminar on “Global Watershed Modeling Challenges” at Warsaw Life Sciences University, Poland. June 4, 2016.

- ix. 2016: Conducted an Advanced SWAT workshop at Warsaw Life Sciences University, Poland for 18 participants from June 2-3, 2016
- x. 2016: Conducted an Intro SWAT workshop at Warsaw Life Sciences University, Poland for 12 participants from May 31-June 1, 2016
- xi. 2016: Invited to give a seminar at PIK (Potsdam Institute of Climate Impact Research) on “Global SWAT application: climate change impacts on vegetation and water resources” in honoring Dr. Valentina Krysonova’s colloquium. May 26, 2016
- xii. 2016: Taught graduate course for two graduate classes at Warsaw Life Sciences University, Poland on “Risk Assessment and Hydrologic and Watershed Models” for 10 students from May 13-30, 2016.
- xiii. 2016: Introductory SWAT workshop at the “Canadian Great Lakes Region Workshop on Watershed Modeling” organized by the University of Guelph on April 27-28, 2016 for 55 participants.
- xiv. 2016: Invited to give a seminar at “Canadian Great Lakes Region Workshop on Watershed Modeling” organized by University of Guelph on April 26, 2016. The title of the presentation was “Why Models, What Models, How to use Models”.
- xv. 2016: Invited to be on the Advisory board member for Turkish journal of Forest Science from 2016. <http://dergipark.gov.tr/turkjforsci/page/1861>.
- xvi. 2016: Conducted QSWAT (QGIS interface to SWAT model) workshop at IST, Lisbon, Portugal for 8 participants from 1/13-1/15/16
- xvii. 2016: Invited to give a seminar on International SWAT applications at IIT, Madras on January 4, 2016
- xviii. 2015: Taught a 2-credit course at IIT, Hyderabad, titled “Hydrologic modeling using SWAT” for 53 graduate students from December 14-24, 2015.
- xix. 2015: Organized an International SWAT conference at Purdue University, West Lafayette, IN, from Oct 14-16, 2015, where 140 participants from 10 countries presented 96 papers and 22 posters. The papers presented will be invited for a special edition of peer review journal publication.
- xx. 2015: Conducted an advanced SWAT workshop as part of the International SWAT conference at Purdue University on Oct 12-13, 2015 with 25 participants.
- xxi. 2015: Conducted an introduction to QSWAT (a public domain SWAT interface for a free GIS called QGIS) at San Jose, Sao Paulo, Brazil for 23 participants from August 26-27, 2015.
- xxii. 2015: Conducted intro and advanced SWAT workshops for UFPE and UFRPE students from August 10-14, 2015 for 28 participants.
- xxiii. 2015: Conducted introductory to SWAT workshop to IPA staff at Recife, Pernambuco, Brazil on August 6-7, 2015 for 12 participants.
- xxiv. 2015: Organized the International SWAT conference at Sardinia, Italy from June 24-26, 2015, where 180+ registered with 150 papers presented from 32 countries and six continents. The papers from the conference will be published in three peer reviewed journals. Recruited a total of 12 volunteers around the world to be the guest editors of these journals to publish the papers presented at the conference. Expecting around 80 papers to be published through the three journals
- xxv. 2015: Conducted introductory SWAT workshop as part of the International SWAT Conference in Sardinia, Italy for 15 participants from June 22-23, 2015.

- xxvi. 2015: Organized SWAT model developer conference from June 18-19, 2015 for 30 SWAT model developers around the world to discuss strategies for the future of SWAT model development.
- xxvii. 2015: Taught a graduate class on SWAT modeling using a watershed in Austria at Boku University, Vienna for 12 students from June 1-12, 2015.
- xxviii. 2015: Conducted intro and advanced SWAT workshops at Warsaw Life Sciences University for 19 participants from May 25-29, 2015.
- xxix. 2015: Taught graduate course for two graduate classes at Warsaw Life Sciences University on “Watershed Models” for 20 students from May 11-22, 2015.
- xxx. 2015: Climate change and agricultural impact workshop, May 5-8, 2015 at ICARDA, Amman, Jordan for 8 participants.
- xxxi. 2015: Invited to be on grant review panel for “Water Quality Benefits” and attended the review panel from April 14-15, 2015.
- xxxii. 2014: Conducted an intro and an advanced SWAT workshop at IIT, Hyderabad, India for 55 and 30 participants, respectively, Dec 26-27, 2014. Dr. Balaji conducted intro and I taught the advanced workshop.
- xxxiii. 2014: Conducted SWAT workshop at Almaty, Kazakhstan for CAREC, Kazakhstan, on application of SWAT in Aral Sea basin. Dec 15-16, 2014.
- xxxiv. 2014: Conducted a SWAT workshop at Almaty, Kazakhstan, from Oct 6-10, 2014 for 7 persons CAREC team on ecosystem services for Aral Sea basin.
- xxxv. 2014: Conducted a SWAT workshop at Sardinia, Italy, from 29-3 Oct, 2014 for 20 participants.
- xxxvi. 2014: Conducted graduate level class on GIS and hydrological modeling and risk assessment for 15 students at Warsaw University of Life Sciences from May 5 – 27, 2014.
- xxxvii. 2014: Conducted SWAT workshop at Warsaw, Poland as part of Central Eastern European SWAT workshop organized by Warsaw University of Life Sciences from May 19-23, 2014 for 21 participants.
- xxxviii. 2014: Invited visiting scientist at University of Federal Rural of Pernambuco, Brazil from July 1 to August 6, 2014 to conduct workshop for 40 graduate students.
- xxxix. 2014: Organized an international SWAT conference at Recife, Brazil from July 30- Aug 1, 2014 with 142 participants. 100 papers and 28 posters were presented with representation from 32 countries and six continents. First Portuguese presentation session in the SWAT conference was organized.
- xl. 2014: Portuguese SWAT manual were published and made available through SWAT website.
- xli. 2014: Organized and conducted international SWAT workshops of intro and advanced levels for 33 participants as part of the International SWAT Conference on July 28-29, 2014.
- xlii. 2013: Organized introductory and advanced SWAT workshops at IIT, Madras, India from December 30 – January 3, 2014 with 40 participants each.
- xliii. 2013: Organized introductory and advanced SWAT workshops at CSR4, Sardinia, Italy from September 30 – Oct 4, 2013 with 20 participants each.
- xliv. 2013: Invited as resource person and presented seminars for a USAID project on WLI (Watershed Livelihood Initiative) titled “Regional Knowledge Exchange on Decision-support Tools and Models to Project Improved Strategies for Integrated Management of Land, Water and Livelihoods, 23-27 September, 2013, Djerba, Tunisia”

- xliv. 2013: Conducted a SWAT workshop for Ministry of Water, Environment, Forestry and Soil Sciences of Royal Bhutan of 14 participants from August 26-30, 2013.
- xlvi. 2013: Conducted two SWAT workshops at Cali, Columbia for CIAT, CG center with about 60 participants from August 5-9, 2013.
- xlvii. 2013: Organized an international SWAT conference at Paul Sabtier University, Toulouse, France from July 17-19, 2013 with 200+ participants and 170 papers presented and representation from 35 countries and six continents.
- xlviii. 2013: Organized and conducted international SWAT workshops of intro and advanced levels with 40 participants as part of the International SWAT Conference on July 15-16, 2013.
- xliv. 2013: Invited by Midwestern watershed modeling user conference to give seminar on “What is new in SWAT and online demonstration of HAWQS and STAR projects” at U. of MN, St. Paul, MN.
 - i. 2013: Invited to deliver a seminar at Biological and Agricultural Engineering, Purdue University titled “New developments in SWAT” on February 28, 2013.
 - ii. 2013: Invited by Purdue University to conduct advanced SWAT workshop for 18 graduate students and post-docs on February 26-27, 2013.
 - iii. 2012: Invited by Center for Water Resources at Anna University, Chennai, India to give a seminar on “Worldwide use of SWAT and its application” which was attended by more than 75 students and researchers.
 - iiii. 2012: Invited by CEGIS at Dhaka, Bangladesh to conduct intro and advanced SWAT workshops for 12 of their scientists and engineers during July 23-25, 2012.
 - liv. 2012: Organized an international SWAT conference at IIT, Delhi, India from July 18-20, 2012 with 200+ participants and 133 papers presented with representation from 25 countries and six continents.
 - lv. 2012: Organized and conducted international SWAT workshops of intro and advanced levels with 70 participants as part of the International SWAT Conference on July 16-17, 2012.
 - lvi. 2012: ICARDA invited to visit Jordan to teach SWAT-CUP and advanced topics in use of the SWAT model from June 22-27, 2012.
 - lvii. 2012: Invited to conduct advanced SWAT workshop for four P.hD students at CNRS, EcoLab, Toulouse during June 18-21, 2012.
 - lviii. 2012: Invited by the World Bank to provide a critical review of the SWAT model development for the Nile Basin and provide training for about 10 interns at ENTRO office of Nile Basin Initiative at Addis Ababa during June 7-15, 2012.
 - lix. 2012: Invited to conduct intro and advanced workshops at Florinapolis and Sao Carlos at Brazil with 25 and 42 participants, respectively, during April 20 - May 11, 2012.
 - lx. 2012: Invited to give a lecture on “Review of Water Quantity and Quality Applications of the SWAT Model in the USA” as part of university wide lecture series at University of NE, Lincoln on 3/2/2012
 - lxi. 2012: Invited to speak at BST conference on 28-29, February, 2012 on “Overview of WQ models for Pathogen Sources.” Conference organized by TWRI under TSSWCB sponsorship.
 - lxii. 2011: Invited to speak at UPMC - University Pierre and Marie CURIE on July 28th, 2011 to present the SWAT model and its possible integration with their river stehler model.

- lxiii. 2011: Visited as visiting professor at Universite Paul Sabatier, Toulouse from May 15th to August 3rd, 2011. During this time, I worked with 3 PhD students on their research at the Ecolab of CNRS, France.
- lxiv. 2011: Invited by ICARDA, Syria, a CGAIR center to conduct an introductory SWAT workshop for 10 participants from 6 countries to use the SWAT model for water conservation and management. The workshop was conducted in Amman, Jordan during July 9-16, 2011.
- lxv. 2011: Organized SWAT international conference in Toledo, Spain, from June 13-17, 2011.
- lxvi. 2011: Overall, 165 people participated in the Toledo SWAT conference. 120+ papers were presented and, presentations, videos and a proceeding are available online. In addition, journal articles from the conference are planned. Three workshops were conducted for SWAT beginners, advanced, and developers with 17, 20 and 19 participants, respectively, on June 13-14, 2011.
- lxvii. 2011: Invited to conduct a workshop at Warsaw Agricultural University from June 6-10, 2011 for about 22 participants on introductory and advanced topics of SWAT modeling, including field visits.
- lxviii. 2011: Invited to present climate change and water resources at University of the Basque Country on June 2-3, 2011.
- lxix. 2011: Conducted intro and advanced SWAT workshops at Ibraki University to 14 participants from March 7-11, 2011
- lxx. 2010: Conducted SWAT introduction workshop at UNESCO-IHE University, Delft, Netherlands from September 13-15, 2010 for 35 participants.
- lxxi. 2010: Conducted introductory and advanced SWAT workshops at Indian Institute of Technology, New Delhi, India for 25 participants each from Oct 11-14, 2010.
- lxxii. 2010: Organized SWAT international conference in Seoul, South Korea, from August 2-6, 2010. Overall, 130 people participated with about 100 from South Korea. 70+ papers were presented, and both presentations and videos are online. In addition, journal articles from the conference are planned. Two workshops were conducted for SWAT beginners and advanced with 70 and 50 participants, respectively, on August 2-3, 2010.
- lxxiii. 2010: Invited to participate in a government sponsored project involving all seven IITs in India to study and model the Ganges river basin. The SWAT model was selected as surface water model. Helped to set up the model and participated in the project from June 16 to July 31, 2010.
- lxxiv. 2010: Conducted introductory and advanced SWAT workshops at Indian Institute of Technology, New Delhi, India for 22 and 20 participants, respectively, from July 19-23, 2010.
- lxxv. 2010: Conducted introductory and advanced SWAT workshops at University of Castella La-Mancha, Toledo, Spain for 18 and 24 participants, respectively, from June 14-18, 2010.
- lxxvi. 2010: Conducted a SWAT beginner's workshop at Instituto Superior Técnico, in Lisbon for 6 participants from June 7-8, 2010.
- lxxvii. 2010: Conducted SWAT beginners' workshop in Toulouse, France for CNRS, a French government research group; a total of 22 people participated from June 1-4, 2010.
- lxxviii. 2010: Conducted SWAT beginner and advanced workshops at Dalaman, Turkey from May 24-28, 2010, with 10 and 13 participants, respectively.
- lxxix. 2010: Conducted SWAT beginner and advanced workshops at University of Montreal, from May 3-7, 2010, with 22 and 25 participants, respectively.

- lxxx. 2010: Developed an MOU between Texas AgriLife Research and Indian Institute of Technology, Madras for a five-year period to collaborate in research and scientific exchanges. These MOU also help to recruit good graduate students from one of the premier institutions in India.
- lxxxi. 2010: Invited to present in the U.S EPA CREAM conference in Washington DC on the topic of “Hydrologic Water Quality System Methodology,” January 20-21, 2010.
- lxxxii. 2009: Invited by Syngenta Corporation, Greenville, NC to present “Climate change impacts on agriculture, water and environment” on Nov 18, 2009.
- lxxxiii. 2009: Conducted SWAT introduction workshop at UNESCO-IHE University, Delft, Netherlands from September 23-24, 2009 for 51 participants.
- lxxxiv. 2009: Invited to give guest lecturers titled “GIS application in water and natural resources” and “Impact of climate change on agriculture” to the undergraduate and graduate students and faculty of agriculture and natural resources at Hanoi University of Agriculture on September 16, 2009.
- lxxxv. 2009: Conducted introductory SWAT workshop at Hanoi University of Agriculture, Hanoi, Vietnam, for 32 participants from September 14-15, 2009.
- lxxxvi. 2009: Conducted MWSWAT training at Land Development Department of Thailand for 42 participants from September 10-12, 2009
- lxxxvii. 2009: Invited as keynote speaker at the “Regional Technical Workshop on Application of Modeling Tools for Climate Change Impact and Vulnerability Assessment" September 8-9, 2009. Bangkok, Thailand. Title of the presentation was “Climate Change on Agriculture, Water and Environment.”
- lxxxviii. 2009: Conducted introductory SWAT workshop at University of Castella La-Mancha, Toledo, Spain for 23 participants from May 25-28, 2009.
- lxxxix. 2009: Invited to participate and provide advice on Clima-Rice and REACOCA project by Bioforsk, Oslo, Norway from May 17-21, 2009 to model watersheds in India and entire Baltic Sea draining watershed.
- xc. 2009: Conducted introductory SWAT workshop for 25 government and university participants in Cochabamba, Bolivia from May 4-8, 2009.
- xci. 2009: Conducted introductory SWAT workshop for ministry of environment, ministry of agriculture, ministry of water resources and university participants in Managua, Nicaragua from February 2-6, 2009
- xcii. 2009: Organized the First Southeast SWAT conference at Chaing Mai, Thailand from January 8-9, 2009, with more than 25 papers and 80 people participating from all over Southeast Asia
- xciii. 2009: Conducted introductory SWAT workshop at Chaing Mai University, Chaing Mai, Thailand for 45 participants from 13 Southeast Asia Countries from January 5-6, 2009.
- xciv. 2009: Established a MOA with Indian Institute of Technology (IIT), Madras with Texas AgriLife Research for long term research relationship, similar to the one established with IIT, Delhi. IITs are the premier institutions for engineering and sciences in India.
- xcv. 2009: January 2-4, 2009. Conducted introductory SWAT workshop at Nam Lam University, Hoh Chi Minh City, Vietnam for 18 participants.
- xcvi. 2008: Conducted introductory SWAT workshop at the University of Castella La-Mancha, Toledo, Spain for 30 participants from December 9-11, 2009.
- xcvii. 2008: Participated as external examiner for the UNESCO-IHE University, Delft, Netherlands for Integrated Sediment Transport Modelling Using OpenMI (SWAT and

- SOBEK-RE) for the Blue Nile River Basin. Getnet Dubale Betrie. MSc Thesis (WSE-HI, 08-20). UNESCO-IHE
- xcviii. 2008: Conducted SWAT introduction workshop at UNESCO-IHE University, Delft, Netherlands from September 15-17, 2008 for 27 participants.
 - xcix. 2008: Invited to present a seminar at IIT, Madras on 6/6/08 titled “Global fresh water estimation using hydrologic models.”
 - c. 2008: Conducted intro and advanced SWAT workshop at Institute Superior Technico, Lisbon, Portugal, for 19 participants from 5/19-5/23.
 - ci. 2008: Conducted intro and advanced SWAT workshop at Cranfield University, UK for 8 participants from 5/12-5/17.
 - cii. 2008: Conducted introduction SWAT workshop for Oak Ridge National Lab, University of Tennessee, and TN Department of Environment Quality on May 1-2, 2008 for a total of 21 participants at University of TN.
 - ciii. 2008: Presented a seminar on February 1, 2008 at the request of Department of Geography, Texas A&M University, titled “Estimation of Global Fresh Water Availability”
 - civ. 2008: Led a SWAT user group meeting of Midwestern states (IA, SD, ND, MN and WI) in Q&A session about issues with SWAT for their application on January 18 at Metro council, Minneapolis.
 - cv. 2008: Conducted SWAT intro and advanced training at MPCA, Minneapolis, January 14-17 for 23 students in each session.
 - cvi. 2007: Conducted Application of the SWAT Model for Pesticide Exposure Assessments in Montpelier, VT from Sep 17-21, 2007 for 14 participants.
 - cvii. 2007: Presented an invited seminar on Sep 6, 2007 at IIT, Madras on “use of GIS in water resource modeling” and discussed opportunities to set up an MOU between IIT, Madras and TALR
 - cviii. 2007: SWAT intro and advanced training for Indo-US Training School on SWAT, sponsored by Indo-US program and IIT, Delhi with 28 participants from August 20-30, 2007.
 - cix. 2007: Invited to Philippines from May 12-18, 2007 to train IRRI, University of Philippines, Chengmai University, and scientists from Indonesian and Vietnam on use of the SWAT model coupled with ArcGIS software for SANREM project. 12 people participated in this program.
 - cx. 2007: Conducted beginners SWAT training using ArcSWAT at University of Lafayette, LA for 8 participants from April 4-5, 2007.
 - cxii. 2007: Conducted introductory SWAT training for PCRWR (Pakistan Council of Research in Water Resources) and Agricultural University of Faisalabad. Total of 20 participants participated in the workshop funded by State Department, Jan 15-19, 2007.
 - cxiii. 2007: Invited to train Mekong River Commission staff on use of the VizSWAT to visualize the model results from Jan 1 – Jan 13, 2007.
 - cxiiii. 2006: Invited to USDA-ARS, Beltsville to present international opportunities in water resources modeling, on Dec 12, 2006.
 - cxv. 2006: Schuol, Juergen, EAWAG visited the SSL from Nov 13 to Dec 22, 2006 to model continental Africa using the SWAT model.
 - cxvi. 2006: Visited China from 11/2 to 11/12 with Dr. Jeff Arnold and Allan Jones. Conducted SWAT intro and advanced training for about 40 participants at Beijing Normal University.

- cxvi. 2006: Organized advanced SWAT model developer conference at PIK, Potsdam, Germany for 40 modelers from Oct 3-6, 2006.
- cxvii. 2006: Invited to be a panel member by VPR office for a DOD/National Lab grants writing seminar. March 29, 2006. 2-4PM at 601 Rudder tower.
- cxviii. 2005: International Research School in Water Resources, Fiva organized a PhD course on "*Distributed Hydrological Modeling for Water Resources Management at River Basin Scale*" with R. Srinivasan, Professor, Blackland Research Center, Texas A&M University; Jens Christian Refsgaard, Professor, Geological Survey of Denmark and Greenland; Karsten Høgh Jensen, Professor, University of Copenhagen, at Copenhagen, Denmark. August 22-26, 2005.
- cxix. 2005: Organized 3rd International SWAT workshops and Conference at EAWAG, Zurich, Switzerland. 110 participants from 32 countries participated to present 80 papers and posters in the conference. July 11-15, 2005.
- cxx. 2005: Two scientists from Mekong River Commission visited the SSL to learn and carry out the calibration and validation project of applying the SWAT model in Lower Mekong River Basin. May 17 – June 21, 2005.
- cxxi. 2005: Invited by Mekong River Commission to assist in their calibration and validation of the SWAT model application to the Lower Mekong River Basin. This is one of the largest river basins that the SWAT model is being applied to outside of the U.S watersheds. May 1-8, 2005.
- cxxii. 2005: Invited to participate in EPA national meeting on *Economic benefits assessment of national policy analysis through WQ models*. February 9-10, 2005.
- cxxiii. 2005: Invited to present a seminar at Shamane University, Japan and further explored mutual interest and cooperation with the University researchers. January 25 – February 1, 2005.
- cxxiv. 2004: Invited to present a seminar at Department of Agricultural Economics on *Natural resource modeling using Spatial Sciences and its linkages to Policy and Economic analysis*. November 19, 2004.
- cxxv. 2004: Invited to give a seminar by the Department of Biological and Agricultural Engineering, Cornell University on *Natural Resources Modeling using Spatial Sciences*. October 20-22, 2004.
- cxxvi. 2004: Invited for a meeting at Joint Research Center, Ispra, Italy from October 11-15, 2004 to participate in a European-wide watershed modeling project discussion using the SWAT model.
- cxxvii. 2004: Conducted advanced SWAT modeling workshop as part of *SWAT SUMMER SCHOOL*, 2004 at University of Giessen, Germany. July 26-28, 2004.
- cxxviii. 2004: Conducted introductory SWAT modeling workshop as part of *SWAT SUMMER SCHOOL*, 2004 at University of Giessen, Germany. July 19-23, 2004.
- cxxix. 2004: Presented a seminar titled “Real-time application of GIS for Water Resources” at University of Ghent, Belgium. June 22, 2004.
- cxxx. 2004: Conducted one-day BASINS-SWAT workshop at *AWRA's 2004 Spring Specialty Conference Geographic Information Systems (GIS) and Water Resources III*, Nashville, TN. May 15, 2004.
- cxxxi. 2004: Presented a seminar titled “*Developing Spatial Clustering Algorithms for Bacteria Source Tracking*” at TCEQ (Texas Commission on Environmental Quality), Austin. Texas on March 19, 2004.

- cxxxii. 2004: Beijing Normal University invited Dr. Allan Jones and I to discuss long-term cooperation and simulation of NPS for the entire country of China. Presented 7 seminars at Beijing Normal University, China Agricultural University and Chinese Academy of Sciences. In addition, conducted SWAT workshop for 20 graduate students. March 6-20, 2004.
- cxxxiii. 2004: Lead a seminar/discussion series titled *Weather modeling, ET, and water management workshop*, during 2004 Agriculture Program conference from Jan 6-8, 2004.
- cxxxiv. 2003: Presented a seminar titled *GIS applications in Water Resources* to the Texas A&M University student chapter of the American Water Resources Association on October 15, 2003.
- cxxxv. 2003: Invited to join University of Geissen, Germany to study the N-cycle in-stream process developed for SWAT model from June 12 – July 25, 2003.
- cxxxvi. 2003: Organized and served on technical and organization committees of *2nd International SWAT Conference*, held at Bari, Italy from July 2-4, 2003. There were 60 participants from 20 countries and over 40 presentations presented in this conference.
- cxxxvii. 2003: Presented an invited seminar at Southwest Texas State University at San Marcos, TX on *Application of Spatial Technologies to Address Water Resource Issues* as part of their “WATER RESOURCES SEMINAR,” sponsored by Edwards Aquifer Research and Data Center. February 20, 2003.
- cxxxviii. 2002: Invited to Punjab Agricultural University in Ludhiana, India under an UNDP project, *Information Technology: Sustainable Agriculture for Punjab*. Conducted training on field scale crop and environmental simulation models and performed field visit for ten days. December 13 - 24, 2002.
- cxxxix. 2002: Presented a seminar about the *Use of GIS and Homeland Security* to the Animal Health Inspection steering committee at Austin, TX on October 3, 2002.
- cxl. 2002: Invited to present a seminar in joint session of Biological and Agricultural Engineering and Civil Engineering departmental seminar series at Texas A&M University on *Near Real-Time Water resources modeling using Spatial Science*, October 2, 2002.
- cxli. 2002: Invited to present a guest lecture on *GPS theory and applications* to graduate level class in Civil Engineering at Texas A&M University on April 29, 2002.
- cxlii. 2002: Invited to speak on *Statewide real-time drought related research products* by Texas Drought Preparedness Council on February 7th, 2002 at the Department of Public Safety office at Austin, TX. <http://www.txwin.net/dpc/>.
- cxliii. 2002: Invited to participate as a panel member to discuss *Where do we go from here?* in *An Environmental Forum on TMDL in Texas* held at J. J. Pickle Research Campus Commons Building, The University of Texas at Austin, TX, February 7-8, 2002.
- cxliv. 2001: Invited to present a seminar on the *Role of GIS in Watershed Management* by the Department of Geography Colloquium. November 30, 2001.
- cxlv. 2001: October 8-12 2001, invited to India by Department of Science and Technology under an UNDP program of *GIS for local governments*. Participated in various technical discussions and committees of this conference, and presented a technical paper on *Advances in Watershed Modeling and Management using GIS*. About 200 participants attended the workshop/conference.
- cxlvi. 2001: Conducted a workshop on the Soil and Water Assessment Tool (SWAT) and its interfaces on October 1-2, 2001, at Zurich, Switzerland through EAWAG. Thirty scientists

- from Switzerland, Austria, Sweden, Spain, Italy, the UK, and Germany attended the workshop.
- cxlvii. 2001: Presented a seminar on *GIS in public health* for an infectious disease epidemiology class for School of Rural Public Health course at TAMU on September 17, 2001.
 - cxlviii. 2001: Presented a seminar on *Evaluation of Environmental Policies using biophysical Models* at Phoenix Park Hotel, Washington DC, for the Farm Bill and the Environment organized by Winrock International on June 28, 2001.
 - cxlix. 2001: Presented a seminar on *Comprehensive watershed management using GIS and Water Quality models* at EAWAG (Swiss Federal Institute for Environmental Science and Technology), Zurich, Switzerland on May 9, 2001.
 - cl. 2001: Presented a seminar on *Calibration/validation of SWAT model for the Bosque Watershed for TMDL development* at EPA Region VI, Dallas, TX on April 23, 2001.
 - cli. 2001: Presented a seminar on *Role of Spatial Sciences on Hydrologic and Water Quality Modeling* at Range Science department at TAMU on March 6, 2001.
 - clii. 2000: Presented seminars on several topics at various institutions in China, including the Chinese Academy of Science, the Department of Science and Technology, Beijing Normal University, the Institute of Ecology, and Nanjing Forestry University. Topics included the latest development and use of spatial sciences and watershed technologies for hydrologic and water quality applications. The Chinese Academy of Science invited me to make a series of presentations at various places including Beijing and Nanjing. October 21, 2000-November 5, 2000.
 - cliii. 2000: Presented seminar on the *Role of Spatial Sciences for Natural Resources Management* to the Agriculture Development Council on October 6, 2000 at College Station, TX.
 - cliv. 1998-present: Presented various guest lectures (1998, 1999, 2000, and 2001) on spatial technology role in public health to various courses offered by the graduate classes of the School of Rural Public Health. Also helped graduate students in the public health area to use the analytical tools developed on the internet to analyze public health data.
 - clv. 1999: Presented two invited papers on *Hydrologic modeling and role of spatial technologies for large watershed management* in Germany for Giessen University and the Potsdam Research Institute in May 1999.
 - clvi. 1998-1999: On several occasions, presented the HUMUS topic to graduate seminar classes at Texas A&M University in the Civil Engineering and Agricultural Engineering departments (1998, 1999).
 - clvii. 1998: Presented methods and materials of modeling and GIS concepts to a graduate class at Mississippi State University, Civil Engineering Department. January 26-28, 1998.
 - clviii. 1995: Invited as a resource expert in conducting the workshop entitled “Role of GIS in Developing and Transferring Sustainable Agriculture Technologies in the Tropics” at the Asian Institute of Technology, Bangkok, Thailand, from February 20, 1995 to March 7, 1995. The workshop was sponsored by several international organizations including FAO, USAID, ICRISAT, IRRI, GRID, and UNEP.
 - clix. 1993: Guest speaker at International Conference on Hydrology and Water Resources at New Delhi, India. December 20-22, 1993.
 - clx. 1992: Conducted a short course entitled “Advanced Geographic Information Systems and Applications using GRASS” at the University of Lisbon, Portugal. September 5-15, 1992.

Administrative Duties

a. Director of spatial sciences laboratory (2000-present):

- i. Responsible for budget, project fiscal, personnel, network and project (technical) management for a staff of eight full-time employees, eight graduate students, and four undergraduate student workers.
- ii. Signed an MOA between SSL and ZagZig University of Egypt with Dr. Nawara (VP for research) and presented a tour and technical presentation about spatial sciences, watershed modeling, workshops, and distance education to the VP on May 24, 2002 (participants included Dr. Nawara, Dr. Khadid Drandaly, and Mr. Mohamed Aly).
- iii. During summer 2002, the lab was moved back to the West Campus Research Park (Centeq Building). During this process I was responsible for the planning, moving, and organizing of the new place for teaching computer labs and progress on various research projects so that it continued to run smoothly.
- iv. During 2000, the lab was moved from the West Campus Research Park (Centeq Building). During the planning, moving, and organizing the new place for teaching computer labs, progress on various research projects continued to run smoothly.
- v. Successfully negotiated with PCI Geomatics Inc. to provide unlimited licenses of their remote sensing software for the next five years (2001-2006).
- vi. An MOA was signed between EAWAG (Swiss Federal Institute for Environmental Science and Technology) and TAES/SSL for a five-year (2001-2006) cooperation in *Use of the SWAT (Soil and Water Assessment Tool) and GIS and HUMUS (Hydrologic Modeling for United States) for Switzerland*.
- vii. Integrated ERDAS (a remote sensing) software from various departments and off-campus research centers through coordination, and the lab is acting as the technical support for the software users in 2001.
- viii. Acted as the technical support (help desk) for all the ESRI (a GIS software) products for the entire TAMUS system since 1999. The software is licensed through SELL (Software Evaluation Loan Library).
- ix. Worked with U.S. COE Fort Worth office to establish a four-way partnership by establishing a MOU (Memorandum of Understanding) with U.S. COE, the University of North Texas, Stephen F. Austin, and the Spatial Science Laboratory (TAES) (2000). This MOU helps to overcome any limitation in transfer of resources between the agencies. Previously, U.S. COE's limit was \$100,000 per year for a cooperative agreement.
- x. Instrumental in developing a cooperative research relationship with the Mexican government agriculture and forest research organization, INIFAP. Currently, through the Office of International Agriculture of Texas A&M Agriculture Program, a MOU between TAES and INIFAP is under negotiation (2000). Recently, the Agricultural Communications of the Texas A&M Agriculture Program published a success story article about our research and fruitful relationships (Appendix 8).

b. Committee assignments (1993-present)

- i. Department level (2000 – present):
 1. 2007-2010: Member of P&T committee in the ESSM department (2007-present)

2. 2005-2011: Program Coordinator for the new undergraduate degree program B.S in spatial sciences. (2005-2011).
 3. 2004-2005: Member of Bio-security and Spatial Sciences faculty search committee for BAEN department. (2004-2005)
 4. 2003-2007: Member of Promotion and Tenure committee. (2003 – 2007).
 5. 2002-present: Developing a curriculum for a new environmental undergraduate degree program B.S in spatial sciences. (2002-present).
 6. 2002-2003: Chair of Remote Sensing faculty search committee (2002-2003).
 7. 2000-2006: Member of Technology Committee in the Department of Forest Science (2000-2006).
 8. 2000-2006: Chair of the Workshop/Continuing Education Committee in the Department of Forest Science (2000-2006).
 9. 2000-2007: Member of Graduate Program Committee in the Department of Forest Science (2000-2007).
- ii. College level (1993 – present):
1. 2016-2017: Appointed as reviewer of Texas A&M AgriLIFE Research faculty fellow
 2. 2013-2014: Appointed as reviewer of Texas A&M AgriLIFE Research faculty fellow
 3. 2010-2012: College level P&T committee
 4. 2002-present: Participated as a member of Rio Grande Coordinated Water Resources Data Access (a committee of representation from UTEP, NMSU, El paso utility, TAES-El Paso) at the El Paso Research and Extension Center at the request of its Resident Director, Dr. Ari Michelsen.
 5. 2003-2005: Member of faculty search committee for Water and Bio-security signature programs.
 6. 2003-present: Member of a committee to explore a water science undergraduate degree program.
 7. 2002-present: Participated as a member of Rio Grande Coordinated Water Resources Data Access (a committee of representation from UTEP, NMSU, El paso utility, TALR-El Paso) at the El Paso Research and Extension Center at the request of its Resident Director, Dr. Ari Michelsen.
 8. 2002-present: Member of the Institute for Countermeasures Against Agricultural Bioterrorism. Actively participated with this institute in several planning sessions and in proposal development for funding.
 9. 2002-present: A university member in S-1004, Development and Evaluation of TMDL Planning and Assessment Tools and Processes, a USDA-CSREES CRIS project. Participated in the kickoff meeting and presented the TAMU capabilities in the field of TMDL.
 10. 2002-present: Appointed as COALS representative for the *TITF* (Telecommunication Infrastructure Technology Fund) Committee.
 11. 2001-present: Nominated to serve on the China Archive Planning Committee, a university-level committee to deal with developing a list of the types of data to be included in the archive, along with a “user profile.”

12. 1998-present: Maintained a private computer network and associated hardware and software for research purposes at Blackland Research Center (1998 – present).
 13. 1996-present: Founding member of Impact Assessment Group (IAG) under the leadership of Dr. Neville Clarke since 1996. This is a consortium of several scientists from various disciplines including agricultural economics, agricultural engineering, range science, geography, hydrology, and watershed sciences working together to assess the impact of any government-sponsored program.
 14. 1994-present: Involved in design and operation of network and computing facilities at the Blackland Research Center (1994 – present).
 15. 1993-present: Member of CNRIT (Center for Natural Resource Information Technology) since 1993.
 16. 1993-present: Maintained large resources of UNIX and PC computer hardware and software for various projects associated with research at Blackland Research Center (1993–present).
 17. 1995-present: Responsible for project, fiscal, and personnel management of eight staff at Blackland Research Center (1995-present).
- iii. Institute level:
1. 2012: Participated as part of the planning committee of the BST conference sponsored by TSSWCB.
 2. 2012: Appointed as member of TWRI task force to review and recommend a new model to setup the TWRI with Ag and Engineering programs participation.

Professional, Scientific, and Honor Society Activities (1997-present)

- a. Professional societies (1997-present)
 - i. American Society of Agricultural Engineers (ASAE).
 1. 1997-1999: Vice Chairperson for the ASAE Geographic Information Systems Committee, (IET-216). As the Vice Chairperson, I assisted in selecting the topics to be presented at the annual professional society meeting, and collected presentation materials from various presenters, 1997-1999.
 2. Guest Editor for Special edition collection of peer reviewed publications based on 2009 and 2010 International SWAT conferences held at Boulder, CO and Seoul, South Korea for ASABE journals.
 - ii. American Water Resource Association (AWRA).
 - 1) 2004: Member of organizing committee for *AWRA's 2004 Spring Specialty Conference GIS and Water Resources III in Nashville, TN* from May 16-19, 2004.
 - 2) 1997-2010: Associate Editor of *Journal of American Water Resource Association* (formerly known as the *Water Resource Bulletin*) since 1997. (Appendix 9)
 - iii. Editorial Board for Peer Reviewed Journals
 - 1) 2010-2014: Associate Editor of *Journal of Environmental Quality*
 - 2) Guest Editor for Special edition collection of peer reviewed publications based on 2014 Regional of Environment Change, *JEQ*, and *Journal of Limnology*

- 3) Guest Editor for Special edition collection of peer reviewed publications based on 2011 and 2012 International SWAT conferences held at Toledo, Spain and New Delhi, India for Journal of Environmental Quality, Transactions of ASABE, and Regional of Environment journals.
- 4) Guest Editor for Special edition collection of peer reviewed publications based on 2013 Regional of Environment journals, Journal of Limnology
- 5) Guest editor for Regional Environmental Change for publication of special collection of SWAT papers from the International SWAT conference held at Toulouse, France in 2013, Volume 15 · Number 3 · March 2015
- 6) Advisory board member for Turkish journal of Forest Science from 2016.
<http://dergipark.gov.tr/turkjforsci/page/1861>
- 7) 2016-2017: Guest Associate Editor for Water and Hydrology Earth Systems Sciences Journals

Federal and State Appointments (1996-present)

- i. 2006: State of Texas bacteria TMDL task force member organized by TCEQ and TSSWCB. Oct 2006 – Jan 2007
- ii. 2000: Appointed as a member of the Scientific Advisory Panel in the FIFRA Scientific Advisory Panel Meeting conducted by US-EPA on Estimating Pesticide Concentrations in Drinking Water and Assessing Water Treatment Effects on Pesticide Removal and Transformation. September 26-29, 2000.
- iii. 1998-1999: Selected by TNRCC to serve on a TMDL science and technical advisory committee to advise TNRCC about the proper procedures to adopt TMDL for the state of Texas, 1998-1999.
- iv. 1998: Appointed as a member of the steering committee by the U.S. EPA to study long-term recommendations for improving estimates of pesticide concentrations in drinking water. May 21-24, 1998.
- v. 1997: Invited by the U.S.EPA to be a member of a national panel of 13 members on the subject of “assessment of methods to estimate pesticide concentrations in drinking water.” A report outlining suggestions to the EPA was the result of this panel, October 1997.
- vi. 1996-1997: Participated and reviewed an EPA Region 6 source water protection stakeholders report, 1996-1997.

Consulting activities (1996-present)

- a) 2003: Consulted by the city of Tulsa to be an expert witness in federal court proceedings to evaluate the use of the SWAT model to identify and source allocation of phosphorus loading in a watershed to a drinking water lake due to various animal, bird, and city contributions. March 2003.
- b) 2002: Consulted with SFWMD (South Florida Water Management District) in examining methodologies that assess land use change impacts in the Lake Okeechobee watershed. June 2002.

- c) 2001: Consulted with LCRA (Lower Colorado River Authorities) to peer review their CREMS (Colorado River Environmental Model Systems) master plan report. November 2001.
- d) 2000: Consulted with Versar Inc. as a Scientific Peer Reviewer of "National Sediment Nonpoint Source Inventory and Assessment," a USEPA document. September 2000.
- e) 1998: Consulted with Cadmus Group Inc. to prepare a "BASINS 2.0 Peer Review Report," USEPA BASINS 2.0. The review included conceptual design, GIS tools for assessment, utility, watershed characterization, data layers involved, models, and ease of use. September 1998.
- f) 1996-1997: Consulted with Scott & White Hospital regarding their computer needs and the design of their World Wide Web page and database. 1996-1997.
- g) 1994-1996: Consulted with several pesticide chemical companies in assessing their compound viability for registration through models and risk assessments, 1994-1996.
- h) 1994: Conducted modeling courses for non-point source pollution assessment at Austin, TX, for state, federal, and various other consultants, January 1994.



