

Research summary: RCN CE³SAR

Luis Cifuentes, Principal Investigator

For more than 20 years, Dr. Luis Cifuentes has been in the thick of science education, higher education administration and research development. In September 2010, he assumed the post of associate vice president of research and scholarly activities and dean of graduate studies at Texas A&M University-Corpus Christi, a Hispanic Serving Institution.

Dr. Cifuentes began his career with Texas A&M University in 1988 as an assistant professor of oceanography. Beginning in November 2004, Dr. Cifuentes served as Executive Associate Dean and Associate Dean for Research in the College of Geosciences and in July 2007, assumed the position of Interim Vice Provost for the University. In March 2009, he again served as Executive Associate Dean and Associate Dean for Research in the College of Geosciences, at which time he was heavily involved with the Integrated Ocean Drilling Program.

Dr. Cifuentes has taught oceanography courses at both the undergraduate and graduate level at Texas A&M. His research interests include stable isotope biogeochemistry with emphasis on carbon and nitrogen isotopes, biogeochemistry of estuarine and coastal waters, human impacts on aquatic environments, coastal sustainability and the use of scientific data in developing public policy.

Dr. Cifuentes has an extensive background and passion for research development and is recognized as such having served as convener of the University System Council at Texas A&M University. He was recently asked to chair a committee charged by Texas A&M University System chief research officer with creating a proposal for a System-based Office of Research Development.

He is involved in international research and education, having played a key role developing of a joint Ph.D. program with the Ocean University of China, an initiative begun during his tenure as executive associate dean and associate dean for research in the TAMU College of Geosciences. During that time, he was instrumental in developing cooperative education and research programs with INOCAR in Ecuador.

Among recent accomplishments of relevance to CE³SAR RCN, Dr. Cifuentes established the Gulf Coast Operations, Response and Policy (GCORP) consortium in fall 2010. This consortium is a group of institutions within Texas that will jointly conduct research to address the unprecedented environmental damage created by this oil spill. While at Texas A&M-College Station, he organized, managed and sought funding for a university-wide symposium dealing with the changing landscape of scholarly communication in the digital age, which attracted some of the best minds in the nation as speakers.

Dr. Cifuentes has a strong interest enhancing diversity in higher education. He organized and chaired a session at the 2009 national conference for the Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) titled, "Demographic inequities, resource scarcity, and populations at risk." He was a key player in the development of an NSF-funded Geosciences Education project titled, "Diversity and Innovation for Geosciences in Texas (DIG Texas)," which is establishing statewide partnerships at the primary, secondary, and post-secondary educational levels in Texas to improve, among other things, climate-change education in formal and informal settings. Finally, he is currently a co-investigator on a proposal to the NSF Alliances for Graduate Education and the Professoriate Program to strengthen STEM education across the Texas A&M University System.

Research summary

Professor Gary Jeffress , Co-Principal investigator
The Conrad Blucher Institute for Surveying and Science

The Conrad Blucher Institute (CBI) presently operates more than ninety ocean observing stations along the Gulf of Mexico coastline in Texas, Alabama, and Mississippi. All aspects of the operation of this network including instrumentation, measurement procedures, maintenance, and data management follow National Ocean Service equipment and instrumentation, data quality control, maintenance and operation procedures, and standards. Data transfers are completed via Internet Protocol Modems, and/or GOES satellite communications. The data is accessed through the World Wide Web, at <http://lighthouse.tamucc.edu/>, and through dedicated phone lines typically within 15 minutes of collection. The operation and management of the network is entirely based on the World Wide Web. The underlying software has been developed at CBI starting in the mid-nineties using open source technologies such as Linux and Perl with the advantage that CBI is not subject to changes in proprietary systems and has the flexibility to replace and evolve software components as new technologies become available. During the past five years data intensive models such as neural network based water level predictions have been implemented for real time operations. These models are designed to take advantage of the latest data available from the network and support the decision making process, particularly during emergency situations.

The data shows net sea level rise along the Texas Gulf Coast, which is a combination of both global sea level rise and coastal subsidence rates. The trend indicated by these long-term data series indicates near-term coastal inundation events happening at ever increasing frequencies, which are very likely to result in major impacts to the physical and social infrastructure in coastal South Texas and the Rio Grande River valley. Tropical storm surge (hurricane) inundation of coastal areas on top of this slowly increasing seal level will happen with increasing frequency. The cumulative effect of repeated and more severe coastal inundation from year to year will force significant changes in South Texas. Inundation models will be established and will be based on these accurate sea level rise data trends and will show policy makers the risks and physical extent coastal destruction as a result of frequent high water inundation in the rapidly growing South Texas coastal areas and Rio Grande valley corridor.

These data and modeled outcomes will form the basis of an educational and outreach program that will produce the next generation of scientists and policymakers that will have the knowledge and skills to deal with these water level increases, both short-term due to hurricanes and long-term sea level rise shown in the tide gauge records. These data and information products are displayed in near real time on geographic information system online displays and can be easily integrated into decision support software. The data and information become critical during severe weather events, which are expected to become more frequent as climate change occurs.

Research Summary

Wesley C. Patrick

Vice President, Geosciences and Engineering Division
Southwest Research Institute
San Antonio, Texas 78228

As vice president of the Geosciences and Engineering Division of Southwest Research Institute[®], (SwRI[®]), Dr. Patrick is fully responsible for the overall technical, administrative, and operational functions of the division, including the Center for Nuclear Waste Regulatory Analyses (CNWRA[®]) and the Department of Earth, Material, and Planetary Sciences (DEMPS). He applies his program management and technical expertise to successfully execute complex, highly visible, multidisciplinary projects. He is highly skilled in communicating complex technical, policy, and regulatory issues to government agencies, the general public, and the technical community. Dr. Patrick has proven capability in establishing, coordinating, and actively managing multiple-participant projects and establishing priorities for timely, effective completion of work within established resources.

Southwest Research Institute (SwRI)

Established in 1947, SwRI is an independent, nonprofit applied research and development organization. Its more than 3,200 scientists, engineers, and support staff are organized into 11 technical operating divisions that specialize in creating and transferring technology in engineering and the physical sciences.

SwRI is located on about 1,200 acres of land; it has about 2.2 million square feet of office space, state-of-the-art laboratories, and on-site test facilities. Total SwRI revenue for fiscal year 2010 was \$548 million, with about 60 percent generated from government and 40 percent from the commercial sector. To stimulate innovation, and to maintain and enhance its technological standing, SwRI directed \$6.7 million of the fees earned on externally funded projects to a broad-based internal research and development program.

SwRI has a vigorous student employment program, engaging individuals from high school through graduate school in projects that benefit the students, clients, and SwRI. Upon graduation, many students find post-doctoral or regular full time employment at SwRI. Furthermore, numerous staff members serve as adjunct faculty at local universities and regularly serve on M.S. and Ph.D. committees.

Experience in Collaborations and Consortia

SwRI regularly teams with companies, universities, and other research institutes. It has both a long history in and established infrastructure for developing and effectively implementing consortia in a wide range of technical and programmatic areas that involve commercial and governmental partners. Dr. Patrick (i) has established memoranda of understanding with a spectrum of universities, research institutes, and companies in Asia and Mexico; (ii) led formation of a multi-industry collaboration on renewable and low-carbon energy, engaging industry and government agencies; (iii) established a joint industry research collaboration on the role of faults in petroleum recovery; (iv) initiated a major Climate Change Impact Assessment internal research and development program; and (v) was co-principal investigator on an initiative that launched SwRI as a major R&D source for NASA missions and analyses related to Mars.

Research summary
Rudolph Rosen, Co-Principal Investigator
River Systems Institute (RSI)
Texas State University
San Marcos, Texas

Through collaborative research, public advocacy, and education RSI affirms the unique role of water in the environment and the lives of people.

Selected Projects:

- Regional Framework for Sustainable Use of the Rio Bravo.
- Development of a leadership initiative focused on improving management of nonprofit conservation organizations.
- Technical and Educational Assistance to Groundwater Conservation Districts in Texas.
- Learning Urban Watersheds Outreach and Community Engagement Project.
- Conjunctive Management of Surface and Groundwater in the Rio Grande Basin.
- Sustainable Agriculture Water Conservation in the Rio Grande River Research Project.
- Texas Stream Team, a network of over 1,400 trained citizen volunteers and supportive partners working together to collect water quality data on lakes, rivers, streams, wetlands, bays, bayous, and estuaries in Texas. This is a partnership between Texas State University, the Texas Commission on Environmental Quality, and the U.S. Environmental Protection Agency.
- Blanco River Basin Land Use and Land Cover Change.
- Development and Implementation of the San Marcos River Observing System.
- Watershed Protection Planning for the Cypress Creek Watershed and the Upper San Marcos Watershed.
- Instream Flow Assessments for Preservation and Restoration of Endangered Flora and Fauna of the San Marcos and Comal River systems during Critical Drought Management.
- Ecological Characterization of the Blanco River Basin.
- Watershed Planning and Implementation: Monitoring and Data Analysis in Texas State Parks and Other Target Areas.
- Characterization of Estuarine and Riparian Wetland Changes in the Rio Grande Basin.
- Large-scale Composting as a Means of Managing Invasive Plants in the Rio Grande.
- Sustainable Agriculture Water Conservation: Integration of GIS Datasets for Development of a Standardized Watershed Characterization Report Tool and Stakeholder Dissemination and Training.

Research summary

Jorge Vanegas, Co-Principal Investigator

The *Center for Housing and Urban Development (CHUD)* in the *College of Architecture (CARC)* at *Texas A&M University (TAMU)*, particularly through its *Colonias Program*, is uniquely positioned to support the overarching goal of the proposed CE3SAR to form a robust and evolving research and educational network of regional universities and research centers and institutes that focus on the use of sustainability science to meet the regional needs of the historically underserved South Texas Region over the next twenty years. The Colonias Program in CHUD was created by the Texas State Legislature in 1991 to provide residents of the predominantly Hispanic disadvantaged populations of the Colonias of Texas along the Texas/Mexico border with access to programs and services that would reduce their isolation, increase their ability to become self-sufficient, and enhance the quality of their life and of the place where they live. Colonias are defined by The Office of the Texas Secretary of State as residential areas that lack some of the basic living necessities, such as potable water and sewer systems, electricity, paved roads and safe and sanitary housing.

The relationship between CHUD and the proposed CE3SAR is based on three key foundations. First, with funding from the State of Texas, leveraged with additional funding obtained through grants, contracts, and contributions from multiple and diverse funding sources from the private sector and the public sector at a federal, state, and local levels, CHUD maintains and provides access to five infrastructures: (1) *a physical infrastructure* – composed of 41 community resource and service centers embedded in the (recently expanding to include disadvantaged rural communities in general, and extending its geographic scope of operations to Corpus Christi); (2) *a human infrastructure* – composed of over 75 promotoras/outreach workers; (3) *a transportation/mobility infrastructure* – composed of vans; (4) *a communications infrastructure* – that provides broad connectivity; and (5) *an infrastructure of networks* – composed of over 400 sponsors, partners, and allies. Second, with these infrastructures, CHUD supports diverse learning/teaching, research/creative work, and engagement initiatives, programs, projects, services, and events in seven knowledge domains: (1) *health and human services* focused on the well being of individuals, families, and communities; (2) *education and workforce development* programs for young women and men, adult women and men, and the elderly; (3) *economic development* programs; (4) *urban planning and design*, and also planning and design of semi-urban/semi-rural, and rural environments; (5) *critical civil infrastructure systems*, with an emphasis on water, energy, transportation/mobility, sewage and stormwater, and communications systems; (6) *housing and critical community facilities*, with an emphasis on affordable housing and community resource/self help centers; and (7) *vulnerability and resilience to disasters*. Third, CHUD's *transdisciplinary, transinstitutional, and transnational* nature supports both a vision of an enhanced quality of life for people and an enhanced quality of the place in which they live (i.e., the natural, built, and virtual environments) in the colonias and beyond, and a mission to conceive, develop, and deliver innovative products, processes, services, and business models that fulfill this vision, by: (1) implementing an integrated approach to *practice, outreach, and service*, through *education and research*; (2) operating within a continuum of *research, development, demonstration, deployment, evaluation, and dissemination* in these seven knowledge domains; and (3) applying principles of *sustainability, of lean project delivery, and of fully integrated and advanced technologies*, within what CHUD does (i.e. its products), how it does it (i.e., the processes followed), and with what (i.e., the resources used).

Finally, in support of the proposed CE3SAR, CHUD will act as both a *Portal* providing access, and a *Bridge* providing connection, to the diverse resource base of CARC specifically, and of TAMU at large, to: (1) answer questions through innovative research; (2) solve problems through innovative planning, design, procurement, construction, and/or operation; (3) satisfy needs through innovative services; (4) realize opportunities through innovative entrepreneurship; and (5) fulfill aspirations through facilitation, coaching, and training, all five thrusts aimed at enhancing the quality of life for the people served, and enhancing the quality of the place where they live and interact.

Research summary

RCN CE3SAR

Jude Benavides

University of Texas at Brownsville

Jude Benavides is an Assistant Professor in the Department of Environmental Sciences at UTB/TSC. He joined the faculty there in 2005 and has spent the last 6 years establishing and managing a bachelors program in Environmental Sciences at UTB. His research interests include hydrologic modeling and water resources management. Specifically, his current research projects focus on flood damage reduction and hydrodynamic modeling, GIS applications in hydrology and water quality, as well as the monitoring and restoration of the Bahia Grande coastal wetland system. His current focus is on investigating water quality protection and management options for local area "resacas", which are older river distributaries and ox-bows of the Rio Grande. These water features play a vital role in habitat preservation, stormwater management, and water supply issues for deep South Texas and have historically been understudied and often mismanaged.

Dr. Benavides is very active in South Texas water resources issues with a strong emphasis on outreach and engagement with policy / decision makers. He is co-founder and a member of the board of directors for the Arroyo Colorado Conservancy, a 501c3 organization dedicated to improving the water quality and associated riparian and aquatic habitat within the Arroyo Colorado and surrounding watersheds. He is also a member of the Basin and Bay Expert Science Team (BBEST) for the Lower Rio Grande River, its estuary and the Lower Laguna Madre. He has served as an associate editor for the Journal of Hydrologic Engineering and is a founding member of the Severe Storm Prediction, Education, and Evacuation from Disaster (SSPEED) Center located at Rice University.

Research summary

RCN CE³SAR: Connecting, Informing, and Representing SEES in a Semiarid Region

Ping Chang

**Director, Texas Center for Climate Studies
Texas A&M University**

Chang's expertise is on global and regional climate modeling. He is currently the director of the Texas Center for Climate Studies and the holder of the Louis & Elizabeth Scherck Chair in the Department of Oceanography at Texas A&M University. For over 21 years he has managed a strong research group in global and regional climate modeling studies. The group includes 2 research scientists, 2 postdocs, 2 visiting scholars and 7 doctoral students, and has developed collaborative relationships with many institutions in the US, including the National Center for Atmospheric Research (NCAR) and the Geophysical Fluid Dynamics Laboratory (GFDL), as well as foreign institutions, such as the Royal Netherlands Meteorological Institute (KNMI). Chang's group is among the first to develop a high-resolution, fully coupled regional climate model capable of simulating and predicting extreme climate events, such as hurricanes, severe droughts and summer heat waves, at regional scales. Collaborating with his colleagues at Texas A&M University, University of Texas and the Department of Energy's Pacific Northwest National Laboratory (PNNL), Chang is actively engaged in the development of a next generation Regional Earth System Model (RESM). The RESM includes atmosphere, ocean, land surface, and coastal ocean components with a range of physical, terrestrial and marine biogeochemical, and ecosystem processes. This modeling approach supplements and complements global climate modeling efforts at other national centers. The higher resolution and detailed processes possible with the RESM decrease dependence on model parameterizations, allow more explicit treatment of coupling processes, provide climate projections on space scales appropriate for impacts analysis, and produce more realistic simulations of extreme events. The RESM will be applied to the study of the potential impacts of climate change on precipitation patterns, coastal and river systems, water resources, vegetation, and biogeochemical cycles in the south-central US and along the northern coast of the Gulf of Mexico, with emphasis on extreme events (drought and high-intensity rain events, including tropical storms and hurricanes). The overarching goal of this ongoing research is to advance our understanding and predicting ability of decadal-scale variations in extreme climate events and their impacts on the Gulf states and on ecosystems along the northern coast of the Gulf of Mexico.

Chang's research focuses on climate variability and predictability in the tropical ocean-atmosphere coupled system. His work has made significant contributions to the understanding of important climatic phenomena and their predictability, such as El Nino-Southern Oscillation (ENSO), tropical Atlantic variability (TAV), Atlantic Multidecadal Oscillation (AMO) and the Atlantic Meridional Overtuning Circulation (AMOC). He and his colleagues have published a range of papers on the theory of ENSO and TAV and their predictability, as well as on AMO/AMOC dynamics. He is the author of more than 85 peer-reviewed journal publications and book chapters, including a number of high profile publications in *Nature* and *Science*. Some of his research has been used to guide the design of major international research programs, such as the Climate Variability and Predictability (CLIVAR). He is a contributing author to the Intergovernmental Panel (IPCC) on Climate Change Fifth Assessment Report that will be finalized in 2014.

Research summary

RCN CE³SAR: Connecting, Informing, and Representing SEES in a Semiarid Region

Hudson DeYoe, PhD

Director, Center for Subtropical Studies

University of Texas-Pan American, Edinburg

The coastal waters of the United States are critically important yet heavily impacted due to man's activities. The severity of this impact will increase as coastal development proceeds and threatens the sustainability of coastal resources. The coastal waters of south Texas may be some of the least impacted in the nation but are threatened by explosive regional population growth. To reduce or avoid impacts to south Texas ecosystems, it is necessary to have an adequate understanding of the ecosystems and the key organisms on which they depend. My research is largely oriented towards understanding the effects man has on the environment especially the aquatic environment.

Current or proposed research projects:

- Characterization of the flow regime and water quality of the tidal-segment of the Rio Grande (TWDB funded)
- Effects of tropical storms on the Lower Laguna Madre (current, TWDB partial funding)
- Arsenic stress physiology of the seagrass *Thalassia testudinum* (NSF URM Program student project)
- Salinity and nutrient effects of the Arroyo Colorado on primary producers of the Laguna Madre (pending Texas Sea Grant proposal- partner with TSU)
- Use of N Isotopes for N Source Determination in Primary Producers of the Lower Laguna Madre, Texas (pending NOAA proposal- partner with TAMUK)

Capabilities

- Field sampling of local aquatic environments except offshore
- Continuous water quality monitoring using sondes (Greenspan, Eureka, Seabird)
- Chlorophyll analysis (phytoplankton, sediment, plant tissue)
- Nutrient analyses (TSS, nitrate-nitrite, ammonium, phosphate- dissolved and total)
- Sediment grain size and ash-free dry weight
- Algae and seagrass productivity measurements
- Algal and seagrass culturing
- Light and electron microscopy (SEM and TEM)

UTPA Campus Facilities

Lab with fluorometer, spectrometer, microscopes, fume hood, sterile hood
Building supplied with reverse-osmosis, UV-sterilized water
Scanning and transmission electron microscopes
Environmental chamber with lighting
Outdoor culture area

UTPA Coastal Studies Lab

- Pick up truck with 4WD
- 24' Carolina skiff with 115 hp motor
- 14' john boat with 30 hp motor
- 16' john boat with 10 hp motor
- ATVs
- Outdoor culture area with tanks
- Treated seawater system

Research Summary

Fidel Hernández

*Caesar Kleberg Wildlife Research Institute
Texas A&M University-Kingsville*

The Caesar Kleberg Wildlife Research Institute (CKWRI) at Texas A&M University-Kingsville is a nationally recognized program in wildlife ecology. The Institute, which also comprises the Department of Animal, Wildlife, and Rangeland Sciences at Texas A&M University-Kingsville, is the premier university wildlife program in Texas and is recognized as one of the leading programs in North America.

The Institute is comprised of 17 Research Scientists-Faculty with specialties in a variety of fields including Wildlife Ecology, Wildlife Nutrition, Molecular Ecology, Rangeland Restoration and Ecology, Wildlife Diseases, Wetland Conservation, Statistics, and Spatial Technologies. The research program at the Caesar Kleberg Wildlife Research Institute currently consists of approximately 40 M.S. and 20 Ph.D. graduate students. Upon graduation, students have been employed at key positions with various institutions including Texas Parks and Wildlife Department, U.S. Fish and Wildlife Service, Department of Defense, and Mexican institutions. Former students form a critical component of the wildlife-professional community in the United States and Mexico.

The Caesar Kleberg Wildlife Research Institute is uniquely positioned to collaborate on sustainability issues in Texas and the nation for several reasons. First, research scientists have access to a wide diversity of expertise and thinking given the diversity of faculty specialties present at the Institute. Research at the Institute is collaborative in nature; thus, solutions to research problems benefit from a diversity of thinking and approaches. Second, the Institute investigates core areas of sustainability—water, space, and use—via research projects on a diversity of topics including rangeland management and restoration, wetland management, and wildlife conservation and management. CKWRI research has provided important information on critical issues such as sustainable grazing, endangered species conservation, and invasive species control. Third, CKWRI research is applied not only on land but also in policy. For example, recent national efforts directed at quail conservation—The Northern Bobwhite Conservation Initiative—relies heavily on the expert knowledge and research of the professors, research associates, and graduate students of the quail research program at CKWRI. This initiative involves both state and federal agencies, as well as non-profit, non-governmental organizations, with a common objective of restoring declining quail species at a landscape scale. Finally, CKWRI faculty provide myriad expert services to the people of Texas responsible for the stewardship of wildlife and their habitats. This intimate relationship with the land managers and stewards of the state's natural resources makes knowledge transfer direct, personal, and timely.

In short, the faculty, research, and facilities of the Caesar Kleberg Wildlife Research Institute form an integral component of the proposed Research Coordination Network in Climate, Energy, Environment, and Engagement in Semi-Arid Regions.

Research Summary

RCN CE³SAR: Connecting, Informing, and Representing SEES in a Semi-arid Region

Rogelio Saenz

Dean
College of Public Policy
University of Texas at San Antonio
San Antonio, TX 78207

Professor
Department of Demography
University of Texas at San Antonio
San Antonio, TX 78207

As Dean of the College of Public Policy at the University of Texas at San Antonio (UTSA), beginning on June 1, 2011, Dr. Saenz is responsible for representing the College and providing leadership in research and academic programs, especially in UTSA's five collaborative excellence areas, two (environment energy and sustainability) of which are directly related to the RCN CE³SAR project. As a Professor of Demography, Dr. Saenz's research focuses on demography, Latina/os, social inequality, and immigration.

College of Public Policy (COPP)

The College of Public Policy is dedicated to the advancement of salient public policy and practice through research, rigorous academic programs, service, and collaborative partnerships that contribute to the public good within a diverse society. The College of Public Policy enrolls more than 1,300 students, including more than 400 graduate students, in the Departments of Criminal Justice, Demography, Public Administration and Social Work. The College offers four graduate and two undergraduate programs, including the new bachelor of public administration degree approved to begin in fall 2011. In addition, the Institute for Demographic and Socioeconomic Research and the Center for Policy Studies are housed within the College. Faculty members in COPP currently have eight active external grant projects in the amount of \$1.3 million.

Saenz's Research Program

Rogelio Saenz has written extensively in the areas of demography, Latina/os, social inequality, and immigration. He is a co-editor of *Latinas/os in the United States: Changing the Face of América* (Springer, 2008) and also co-edited a special issue of *Southern Rural Sociology* on "Environmental Issues on the Mexico-U.S. Border" in 2009. Saenz, who is a native of South Texas, has written extensively on the demography of this region. He shares research interests with faculty members in the Department of Demography and the Institute for Demographic and Socioeconomic Research with particular emphasis on demographic techniques, population projections, and geographic analysis.

Research summary

RCN CE³SAR

Venkatesh Uddameri

Center for Research Excellence in Science and Technology—Research on Environmental Sustainability in Semi-Arid Coastal Areas (CREST-RESSACA)

Dr. Venkatesh Uddameri is currently Associate Professor in the Department of Environmental Engineering at Texas A&M University-Kingsville. He also serves as the Director of the Center for Research Excellence in Science and Technology – Research on Environmental Sustainability in Semi-Arid Coastal Areas (CREST-RESSACA), interdisciplinary research center funded at over \$10 Million by the National Science Foundation (NSF). His research has also been funded by other federal, state and local agencies including – the US Department of Defense (DoD), National Oceanic and Atmospheric Administration (NOAA), Department of Energy (DOE), the Texas State Soil and Water Conservation Board (TSSWCB) and several Groundwater Conservation Districts in South Texas.

Dr. Uddameri's research and teaching is focused on sustainable management of water resources with a particular emphasis on planning and management of groundwater aquifers. His research aims to develop innovative decision support systems to foster scientifically-credible and risk-informed collaborative decision making. A unique aspect of this research is the integration of conventional groundwater flow modeling techniques with soft computing methodologies to characterize intrinsic geologic and perceptual uncertainties. His research has focused on both national (US) and international groundwater issues and he has collaborated on projects in US, Mexico, Brazil and India.

Dr. Uddameri has published extensively and provided several invited presentations. During his doctoral research, he was one of the five recipients of the American Petroleum Institute/National Ground Water Association Scholarship in 1994. More recently, he was awarded the Frank H. Dotterwiech College of Engineering Presidential Award for Excellence in Research and Scholarship (2004) and the Texas A&M University-Kingsville Javelina Alumni Association Distinguished Researcher Award (2008). He currently serves on the Editorial Board of the Clean Technologies & Environmental Policy Journal (Springer Verlag) and as the Associate Editor (Subsurface Hydrology) for the Journal of the American Water Resources Association. In addition, he has served as the Associate Editor for the Journal of Spatial Hydrology (2007-2008) and Guest Edited a special issue of the Environmental Geology Journal (Springer Verlag) titled – Using Systems Approaches for Sustainable Aquifer Management in Semi-Arid South Texas. His book Applied Environmental Systems Modeling (ISBN: 978-1-57808-516-3; Science Publishers Inc., 450pp) is slated for release later this year.

Statement of research relevance

RCN CE³SAR

Arnold Vedlitz

The Institute for Science, Technology and Public Policy (ISTPP) is a nonpartisan, interdisciplinary public policy institute in The Bush School of Government and Public Policy at Texas A&M University. Founded by former Bush School Dean Robert Gates in 2000, it continues under the leadership of its founding director and chaired faculty member, Dr. Arnold Vedlitz. The Institute pursues a dual mission: the scholarly examination of public policy issues and the communication of research-based knowledge to other scholars, the public and decision makers.

ISTPP has been conducting interdisciplinary research for a decade. ISTPP is a much sought after policy/social science partner on research initiatives at Texas A&M and other universities. It has partnered with 36 Texas A&M departments and numerous research centers, institutes and programs. To date, the Institute has received over \$15 million in competitive funding from federal and state agencies. These projects advised funding agencies that include the National Science Foundation (NSF), U.S. Environmental Protection Agency (USEPA), the National Oceanic and Atmosphere Administration (NOAA), the Department of Homeland Security (DHS), among others.

The Institute disseminates research findings to both academics and policymakers through scholarly publications and presentations, as well as presentations and reports to both government agencies and practitioners. It also trains postdoctoral researchers, Ph.D. and masters students. Institute researchers and students have produced an MIT Press book, over 50 published scholarly articles, 18 published book chapters, 10 dissertations and master's theses, and numerous reports and conference presentations. Approximately half of these are published in top field/disciplinary journals and the other in top subject-matter journals. Many are co-authored with faculty in other disciplines.

ISTPP research teams use both quantitative and qualitative methods of data collection and analysis. These include: public opinion surveys; in-depth interviews; content analysis of written materials from media, government, interest group, business and other stakeholder sources; focus groups; group observations; simulations and experiments; cost-benefit analyses; econometrics, spatial/GIS analyses and other modeling techniques. ISTPP has experience working with a wide variety of stakeholder groups: local, federal and state government, non-profit and non-governmental organizations, businesses, and citizen groups.

The Institute brings to the proposed project a wealth of experience in linking scientific and technological knowledge to specific, region-based, environmental and natural resources policies that will guide the development of a sustainable and productive living environment in the border region under study. Much of ISTPP's research has examined environmental and natural resources policy dealing directly with issues like air quality, climate change, drought and other water issues—exactly the key issues of the proposed CE3SAR project.

Important research focuses for the Institute are 1) policy analysis, 2) the process of communication of scientific information to stakeholders (the public and decision makers), 3) stakeholder use of such information to guide action and inform attitudes, and 4) analysis of regulatory frameworks and intergovernmental relationships. The effective assessment of stakeholder responses to emerging technologies and the policy and regulatory frameworks that structure their development and use will require expertise in such areas as diverse as decision-making and public perceptions of risk; acceptability by stakeholders of specific elements of policy, regulation and technology; interpretation and use of science-based information by stakeholders; and interagency communication. Also required is expertise on the development of regulatory frameworks that facilitate policy implementation and the interagency support mechanisms needed to make these work. Dr. Vedlitz and his staff at the Institute can provide empirically based information to assist in the development of the social science components of these models, and provide expertise necessary to testing them.

Research Summary

RCN CE³SAR: Connecting, Informing, and Representing SEES in a Semiarid Region

Carol Waters

Binational Center at Texas A&M International University

The Binational Center for Research, Education, Leadership and Public Service (BINC) at Texas A&M International University (TAMIU) is uniquely positioned to facilitate collaborative research that involves well-qualified faculty in Mexico and in other nations. TAMIU, through its international outreach housed in BINC, has Memoranda of Understanding with over 40 universities world-wide, including approximately 25 in Mexico and South America. As part of its mission, BINC has strong relationships with the US State Department in Mexico and with nongovernmental entities that have formed to create sustainable communities in various regions of Mexico. These NGOs have ties to the community that allow them to gather data that is not available through ordinary governmental sources. Because BINC is a trusted ally of these groups, they are willing to share information that may not be available through any official channel. Additionally, BINC counts representatives of North American Development Bank (NADB) and Border Environment Cooperation Commission (BECC) among its collaborators. In addition, BINC has a program, International Executive Seminar, which brings together elected officials and public administrators from the United States and Mexico to discuss policy concerns of mutual interest. This group fosters understanding and collaboration across international lines and provides a pool of interested policymakers. Likewise, BINC collaborates with TAMIU's Center for Earth and Environmental Studies in projects that involve applications of GIS technology.

Faculty from BINC partner universities have both the interest and the ability to contribute to scholarly research in science, engineering and policy issues related to environmental concerns. BECC and NADB, while not engaging in or supporting basic research activities, can and do serve as catalysts for implementation of new technologies to support sustainability in water, energy and conservation initiatives; as a resource for development, they also provide funding to private and governmental entities for implementation and, as policy analysts, are positioned to provide sources of information regarding needs within the area of their jurisdiction, i.e., 100 K north of the US/Mexico border, and 300 K south of that border. BINC, through its NGO partners, can facilitate data gathering in Mexican communities, particularly in the midst of the violence and unrest disrupting Mexico at the present time. And, the strong connection of BINC to the US Department of State in Nuevo Laredo and Monterrey provide additional potential sources of information and access to information.

Need for International Collaboration

BINC was created by the Texas A&M System in 2009 to facilitate the interaction of the South Texas border region and Mexico with the recognition that the present and future wellbeing of South Texas is intrinsically linked with the present and future wellbeing of Mexico. In no area is this more obvious than in issues affecting the environment. Negative health effects stemming from communicable diseases and other diseases related to water, energy emissions, and hazardous waste transportation and disposal do not respect the international border. Likewise, research that targets these concerns will be more effective if it incorporates the problem holistically, taking into consideration the conditions on both sides of the border. The environmental impact of the North American Free Trade Agreement, including the expanding Mexican trade corridors, can best be assessed by researchers inside Mexico. Working together, scientists and social policy experts can effectively seek answers to how the two nations can work together to create a sustainable environment for a secure future for South Texas.

Research summary

RCN CE³SAR: Connecting, Informing, and Representing SEES in a Semiarid Region

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As Associate Director for Engineering of the TWRI since August 2007, Dr. Wurbs is responsible for representing engineering perspectives in the diverse water-related research and extension activities of the Texas A&M University (TAMU) System and the state of Texas. As a Professor of Civil Engineering, Wurbs research focuses on the WRAP/WAM modeling system.

Texas Water Resources Institute (TWRI)

The TWRI of the TAMU System fosters, facilitates, administers, and communicates water resources research and educational outreach programs throughout Texas and beyond and is a member of the national network of 54 water resources institutes representing the 50 states, three territories, and Washington, D.C. TWRI currently manages about 90 active projects with more than \$24 million in funding. Over the last 11 years, TWRI has obtained more than \$70 million for water research and extension projects. TWRI maintains joint projects with 15 Texas universities and three out-of-state universities, involving some 250 faculty and associates. TWRI partners with more than 40 federal, state and local governmental organizations and numerous other entities, including engineering firms, commodity groups and environmental organizations. Through these partnerships, TWRI links academic expertise with agencies and stakeholders to provide research-derived, science-based information to help answer diverse water questions. High-quality communications materials are produced to convey information to relevant publics.

TWRI awards funds to graduate students from Texas universities through the U.S. Geological Survey Water Resources Research Grants and the W.G. Mills Scholarship Program. These opportunities enable students to conduct research on priority water issues. TWRI's Water Resources Training Program markets and administers short courses on diverse water-related topics. The training courses provide water resources professionals with intensive hands-on instruction on the latest technologies and products of university research.

Texas Water Availability Modeling System

Over the past 20 years and continuing, Professor Wurbs has been the lead developer of the Water Rights Analysis Package (WRAP) modeling system which is contributing significantly to improving water management in Texas. The Texas Water Availability Modeling (WAM) System consists of the generalized WRAP, which can be applied anywhere, and WRAP input datasets for all of the river basins of Texas. The Texas Commission on Environmental Quality (TCEQ) requires that all water right permit applicants and their consultants apply the modeling system to assess water supply reliabilities and the impacts of proposed actions on other water users. TCEQ staff uses the model to evaluate the permit applications. WRAP is routinely applied in regional planning studies being conducted statewide by agencies and consulting firms under the direction of the Texas Water Development Board. Other water management agencies are also applying the WRAP/WAM system in an expanding range of activities. Research and development at TAMU sponsored by the TCEQ and others is currently focused on expanding WRAP/WAM capabilities for modeling environmental instream flow issues.

Research Summary

RCN CE³SAR

Dave Yoskowitz

Harte Institute for Gulf of Mexico Studies

Elucidating the link between ecological well-being and human and economic well-being is critical in addressing issues of sustainability. In South Texas the nexus between land use changes and impacts on the coastal environment is very apparent, especially as it relates freshwater availability and environmental flow. This region is projected to have an increase in population of 3.1 million over the next thirty years. The State of Texas is expected to have an increase of 25 million persons. At the same time, climate change scenarios suggest that this part of the State will see diminished rainfall. The diminished per capita water supplies and increased demand for energy will be a challenge for sustainable growth.

The Socio-Economics Group (SEG) at the Harte Research Institute works with natural and physical scientists in the development and application of tools for environmental decision making. Our primary focuses are ecosystem services in the coastal zone and the importance of freshwater inflow into bays and estuaries and the impact on habitat.

Our 2007 study assessing the value of freshwater inflow into San Antonio Bay, Texas and in the Rio Grande found that on average 61% of the survey respondents would be willing to make a one-time donation in order to protect freshwater inflow. At a donation value of \$126 per household, this amounted to an aggregate value of \$15.3 million. These results are critical in demonstrating the importance that the public places on a process, inflow, rather than a habitat. The results of this study have become important as bay-basin inflow recommendations are being made across the State and little water exist within the current permitting system. Therefore, in order to secure water for inflow rights will have to be bought.

Coastal and marine ecosystem services are not well understood, especially in the Gulf of Mexico region. The SEG has lead the effort to better understand ecosystem services and operationalize them for decision making. In June 2010 a workshop was held with stakeholders across the region to define what ecosystem services are for the Gulf and to attach specific services to particular habitats. The result of this workshop has informed the work of the Gulf of Mexico Alliance and the regional Sea Grant collaboration.

It is also important to communicate what knowledge does exist for ecosystem service monetary values. The SEG developed the Gulf of Mexico Ecosystem Services Valuation Database ([GecoServ](#)) that allows individuals to search by habitat and services for valuation studies that have taken place in the Gulf region or are at least appropriate for the Gulf if they were conducted elsewhere. It also provides a de facto gap analysis of where additional research should be conducted.