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POSTER SESSION DISPLAYS
(No Abstract Submitted)

Southern California Earthquake Center Education and Outreach
Mark Benthien

Sharing Materials from Center for Disaster Research & Education
Henry Fischer III

Texas Flood Documentary
March Frech

Association of State Floodplain Managers Foundation
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Inland Flooding Component of HURREVAC Model for Tropical Cyclones

In the last 33 years, 82 percent of deaths in the U.S. caused by tropical cyclones have been due to flooding. Emergency managers need real-time access to the best available information related to current and projected flood impacts to help reduce these tragic consequences. Inland flooding, as opposed to storm surge, has been responsible for 59 percent of flood-related deaths, and 63 percent of these deaths have occurred in inland counties. As part of the Coastal Storms Initiative, the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center is partnering with the Federal Emergency Management Agency (FEMA), the U.S. Army Corps of Engineers (USACE) and the NOAA National Weather Service (NWS) to develop an operational inland flood evacuation planning and response tool to address the needs of federal, state, and local emergency management agencies related to inland flooding.

In 1988, FEMA, USACE, and NWS developed the HURREVAC Model, a computer program used by many federal, state, and local government emergency managers to track hurricanes to assist in evacuation decision making for their communities. The HURREVAC Model currently has over 3,600 registered government users in the Atlantic, Caribbean, Western Pacific regions, and it is the number one tool used by emergency managers for tracking and responding to tropical systems.

Through this project, an Inland Flooding Operational Module of the existing HURREVAC Model will be developed. The tool will enable emergency managers to access real-time flood related information in textual and graphical formats, such as current rainfall estimates, rainfall forecasts, current and forecasted river stages, general flood alerts, and information on historical flood impacts. In November 2003, the operational module for two hurricane-prone states, Florida and North Carolina, was completed. Based on positive feedback from state and local users in Florida and North Carolina, the tool is currently being expanded to include all coastal states from Texas to Maine and the U.S territories of Puerto Rico and the U.S. Virgin Islands. Portions of the expansion will be completed prior to the end of the 2004 hurricane season and the remaining areas will be completed by the 2005 Atlantic hurricane season.

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**Nuclear Waste Transportation:
Training Issues for Yucca Mountain Shipments**

The future campaign to transport large quantities of highly radioactive waste to the forthcoming Yucca Mountain High Level Radioactive Waste Repository will impact many local communities, municipalities, and states. Ballard has a decade-long interest in these issues and offers advice and suggestions on relevant training issues to the first responder community, hazards mitigation professionals, and policy makers.

This poster offers best estimates of the number of shipments that will transpire, defines expectations for the length and scope of the shipment campaign, identifies the various modes of transportation necessary to move these materials, and delineates some of the concerns previously vetted in research on this subject. It provides initial information to those who will be tasked with planning for these shipments in their jurisdictions, start a dialog with those who may be asked to respond to an incident involving these materials, and provide information to those who must plan for contingencies in the event of a radiological accident or human initiated event involving these shipments.

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EDUPLANhemisférico

The Unit for Sustainable Development and Environment (USDE) of the Organization of American States (OAS) will present current work in the education sector of the Americas to reduce natural hazards vulnerability.

In particular, the poster session will outline *EDUPLANhemisférico*, an action plan for vulnerability reduction in the education sector to socio-natural disasters, which was created in Caracas in 1997. *EDUPLANhemisférico* focuses on three distinct working areas:

Physical Infrastructure – upgrading and improving school facility design, construction, maintenance, and retrofitting for natural hazard event resiliency

Academic Aspects – introducing risk issues and hazard vulnerability reduction in curricula at all formal education levels

Public Information and Participation – general awareness-raising through educational programs at the community and policy levels

EDUPLANhemisférico consists of technical secretariats comprised of institutions, organizations, and educators who volunteer to make the education sector more disaster resilient. This network is supported by the OAS, which works to find volunteers and partners.

A new education sector initiative of the OAS in collaboration with *EDUPLANhemisférico* is *Disaster Vulnerability Reduction of University Campuses in the Americas (DRUCA)*. DRUCA focuses on the issue of vulnerability reduction of university campuses to natural hazards events. OAS wishes to set up a working group of experienced specialists from throughout the hemisphere to produce a technical guidance document for undertaking vulnerability assessments and a vulnerability reduction plan. The scope of participation is expected to grow, and the OAS wishes to identify additional universities in the Americas willing to participate in the program.

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**Application of Experimental ADCIRC Modeling to Demonstrate
Increased Hurricane Storm Surge Resulting from Louisiana Coastal Land Loss**

It has widely been held that there may be a culture in southern Louisiana of “staying through hurricanes,” and there is now an initial 2004 population data survey for New Orleans that supports this contention. Anecdotal and recent survey evidence indicates that in some cases, not only do some residents not leave for major storms, but they stay and start partying. Some residents who have ridden out fierce storms in the past (such as Hurricane Betsy in 1965, Camille in 1969, or Andrew in 1992), and have miraculously been left unscathed may feel relatively confident that it is not worth the expense or hassle to evacuate for hurricanes or major tropical storms. They fail to perceive that the threat is any different now than it was then, and may even find it amusing when newcomers evacuate.

This poster will demonstrate the difference in storm surge that southern Louisiana may realize if a major hurricane were to follow a track similar to Betsy or Andrew. In fact, coastal land loss, including erosion of Louisiana’s barrier islands, as well as subsidence and other human factors, have made coastal Louisiana much more vulnerable to storm surge and increased inland flooding. Utilizing the Advanced Circulation Model for Ocean Hydrodynamics (ADCIRC) storm surge prediction tool, experimental hindcasts from Hurricanes Betsy and Andrew are compared with trial model runs from 2002 Tropical Storm Isidore and Hurricane Lili. The increase in expected storm surge is demonstrated and discussed against the backdrop of coastal land loss.

Poster collaborators: Ivor van Heerden, Joannes Westerink, Kate Streva, and Hampton Peele.

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The Extension Disaster Education Network

Solid, established working relationships between agencies and people enhance efforts during the four phases of disasters (mitigation, preparedness, response, and recovery). A recent survey of Extension Disaster Education Network (EDEN) delegates showed that building relationships was one of the highest concerns of Extension staff members involved in disaster education across the nation.

Extension has been involved in disasters, ranging from tornadoes in the Midwest to the attacks on September 11, and, more recently, the outbreak of Sudden Oak Death. EDEN, an affiliation of land-grant university specialists from 47 states and territories, is federally aligned with the U.S. Department of Agriculture (USDA), through the Extension Service, and works cooperatively with agencies such as the Federal Emergency Management Agency, National Oceanic and Atmospheric Administration, APHIS, and the Department of Homeland Security to deliver educational materials to communities. All services are targeted to the county level and are geared toward the four phases of disaster.

Since its inception in 1994, EDEN has delivered resources on a spectrum of disasters. The events of September 11 resulted in the addition of homeland security and agrosecurity. This effort has been enhanced by a supporting grant from USDA. Indeed, the interest in homeland security, while distracting from efforts on specific natural hazards, has elevated the consciousness of our clientele about preparedness in general and resulted in an increased need for, and appreciation of, disaster preparedness education.

History shows that when a disaster occurs, county-level educators and agents are called upon for information, ranging from repairing buildings to returning to a normal lifestyle. The EDEN network allows states to share resources nationwide so those educators who are less experienced in a particular subject can quickly obtain credible resources from those more experienced. The EDEN web site, <http://www.agctr.lsu.edu/eden/>, is the vehicle through which EDEN disseminates newly developed educational materials and through which delegates can share and retrieve information by disaster type or from state-by-state resource pages.

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The Pacific Disaster Center's (PDC) mission is to provide applied information research and analysis support for the development of more effective policies, institutions, programs, and information products for the disaster management and humanitarian assistance communities of the Asia Pacific region and beyond. Such support is crucial since over *80 percent of all lives lost due to disasters in the last decade occurred in the Asia Pacific region*. Disaster losses are often due to interactions between a constantly changing natural environment and a rapidly expanding society.

Recognizing that natural and human-caused disasters are predominantly local issues with regional, national, or global impacts, PDC, in conjunction with its managing partner, the East-West Center, is working to create an extensive network linking U.S. research and technology organizations with experts in the Asia-Pacific region. This cooperation fosters the establishment of viable personal and institutional relationships between regional decision makers who then work together on real-life issues.

PDC's strategic program focuses on five areas: Decision and Policy Support; Risk and Vulnerability; Institutional Capacity Development; Humanitarian Assistance Support; and Security and Sustainability. Central to these strategic areas is the innovative use of information, technology, and applied research in support of comprehensive emergency management. PDC applies advanced digital technologies, including remote sensing, Geographic Information Systems, disaster modeling, and web-based information distribution. These activities are designed to:

- Promote proactive, rather than reactive, planning that includes hazard mitigation as a key element of sustainable development.
- Foster partnerships to raise awareness among widespread segments of the disaster management community.
- Increase efficiency of operational organizations by introducing innovative, and appropriately scaled, information resources, tools, and analyses.

PDC's highly-skilled professional team is strategically located on the islands of Maui and Oahu, Hawaii, in the middle of the Pacific Ocean. Using state-of-the-art technologies, PDC helps others build disaster-resistant communities in the Asia Pacific region by providing applied research and analysis to disaster management and humanitarian assistance agencies.

Since 2001, the East-West Center has been the managing partner of the Pacific Disaster Center. The Pacific Disaster Center is a public-private partnership sponsored by the PDC Program Office (ASD/NII). The content of the information does not necessarily reflect the position or policy of the U.S. Government and no official Government endorsement should be inferred.

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Wildfire Hazards and Policy Theory

Wildland fires pose severe threats to many communities and ecosystems in the U.S. The risk of wildfire disaster has escalated over time due to the longstanding failure of American wildfire policy. This study explores the policy processes that have generated and reinforced this policy failure. The concepts of bounded rationality, punctuated equilibria, and self-reinforcing mechanisms are applied to the evolution of American wildfire policy between 1905 and the present. This study finds that a self-defeating wildfire suppression policy was established in the period 1905-1911, and subsequently reinforced for more than five decades. This policy did not include a complementary program to counteract the gradual accumulation of flammable organic materials (fuels) that occurs in many ecosystems when fires are suppressed. The resulting fuel accumulations have greatly increased the risk of damaging high-intensity wildfires in a range of American wildlands. A combination of fire suppression and fuel reduction programs will be needed to manage this risk in the future.¹

¹ Busenberg, G. J. (2004). "Wildfire management in the United States: The evolution of a policy failure." *Review of Policy Research*, 21(2), 145-156.

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The Hazards Research Lab at the University of South Carolina

Established in 1995, the Hazards Research Lab (HRL) specializes in the application of geographic information science to environmental hazards analysis and management. There are twelve faculty affiliated with the HRL. Twelve graduate students and one undergraduate student are funded on HRL projects. In addition to research and training, the HRL has an active outreach program that provides technical expertise to state and local governmental agencies. The HRL also houses the editorial offices of the journal, *Environmental Hazards*, co-edited by Susan Cutter and James K. Mitchell (Rutgers University). Among the new HRL projects are:

1. Development of Remote Sensing-Assisted Natural and Technological Hazards Decision Support Systems. Projects involve the development of new spatial decision support systems related to natural and technological hazards. There is also an education and technology transfer of products and services component to the project.

2. Development of Climate Indices for Vectors of West Nile Virus. Development of indices to determine climatic thresholds governing mosquito abundance and potential for transmitting disease (West Nile virus) and improved monitoring of weather and climate conditions associated with the spread of vector-borne diseases.

3. South Carolina Hazards Assessment. GIS support for South Carolina hazards assessment (mandated by DMA 2000) including the development of the South Carolina Hazards Map Interface, a web-based data source for county level hazard assessments (<http://www.cla.sc.edu/geog/hrl/scemdmmain.htm>).

4. Spatial Data Needs and the Use of GIS and Remote Sensing in State-Level Hazard-Related Offices. Analysis of a national survey on spatial data needs and use of geo-technologies in state emergency management offices.

5. Baseline Methods for Reconstructing United States 19th Century Climate Extremes from Historical Data. Development of a methodological baseline for reconstructing large-scale historical climate extremes for North American and adjacent oceans by integrating daily instrumental and documentary climate data together using weather data for 1849 as an exemplar.

Student research projects are focused on tornado hazards and vulnerability in the US from 1950-2002, frost hazard events in the Southeastern US, measuring the social and biophysical vulnerability of small island nations (Barbados and St. Vincent), and development of a methodology for floodplain delineation using hydrologic and digital elevation models.

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**Integrating Hazards and Impact Assessment: The Case of
Constructing a Rail Spur to Yucca Mountain**

The construction of a spur to Yucca Mountain will be the largest new rail construction undertaken in the United States since World War I. The proposed 319-long rail spur traverses some of the most rugged terrain in the nation.

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Integrated Web-Based Oracle and GIS Access to Tsunami and Significant Earthquake Data for Quality Control and Analysis

The National Geophysical Data Center (NGDC) catalogs information on tsunamis and significant earthquakes, including effects such as fatalities and damage. NGDC also maintains a large collection of geologic hazards photos. All of these databases are now stored in an Oracle Relational Database Management System (RDBMS) and accessible over the Internet as tables, reports, and interactive maps.

Storing the data in a RDBMS facilitates the search for earthquake and tsunami data related to a specific event. For example, a user might be interested in all of the tsunami events near Japan. The user could then directly access related information from the tsunami tables such as tsunami runups, additional comments, and references. If the event is in the significant earthquake database, the user could access related information from the earthquake tables without having to run a separate search of the significant earthquake database. Users could also first access the significant earthquake database and then obtain related tsunami information.

The ArcIMS-based interactive maps provide integrated Internet-based GIS access to these databases as well as additional auxiliary geospatial data. The first interactive map provides access to individual GIS layers of tsunami sources, tsunami effects, significant earthquakes, volcano locations, and various spatial reference layers including topography, population density, and political boundaries. The map service also provides FTP links and hyperlinks to additional hazards information such as NGDC's extensive collection of geologic hazards photos. For example, a user could display all of the tsunamis that have caused damage in Alaska and then, by using a hyperlinks tool, display images showing damage from a specific event such as the 1946 Aleutian Islands event.

The second interactive map allows users to display related natural hazards GIS layers. For example, a user might first display tsunami source locations and select tsunami effects as the related feature. Using a tool developed at NGDC, the user could then select a specific tsunami event and automatically display the tsunami effect locations related to that event. The user could also select significant earthquake events and display tsunami events related to specific quakes.

These tools improve data access and are being used to quality control the data. These capabilities also help coastal communities assess their risks, identify hazards, and promote public awareness of tsunamis and earthquakes.

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Prompt Assessment of Global Earthquakes for Response (PAGER)

The U.S. Geological Survey (USGS) is developing a system to immediately assess the potential human impact of global earthquakes and distribute concise alarms to relief agencies, USGS scientists, and government officials. The system, "Prompt Assessment of Global Earthquake for Response" (PAGER), will estimate human impact by combining calculations of ground-shaking intensities with the number of people exposed to shaking and the vulnerability of the affected population. Alarms and information will then be electronically disseminated. Additionally, supplementary information including maps and other supporting information will be posted on a designated Internet site. The framework for the PAGER system is in place, but time and effort must now be directed toward developing seismological tools, assembling the necessary datasets, calibrating the system, and designing the user interface. In addition, collaborations must be forged among professionals working in seismology, loss estimation, GIS, and other fields as well as the end users who will benefit from this real-time earthquake assessment tool.

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Multiple Agency and Jurisdiction Organized Response (MAJOR)

Since September 11, 2001, the problems of coordination in disaster response are well-known, yet little understood. Evidence of the basic state of our knowledge is the fact that most coordination preparation still comes through empirical drills, scenarios and table-top exercises. These types of activities test the political and cultural differences among agencies and jurisdictions.

Working with public authorities in Michigan and Ontario, an interdisciplinary team at Wayne State University, in Detroit, Michigan, consisting of members from anthropology, computer science, education, communication, business, civil engineering, and medicine, is developing a set of modeling tools and simulations to better understand the processes of adaptation and coordination of disaster response. As part of this effort, a "Go-Team" has been assembled, using ethnographic methods of participant observation and interviews, to participate in scenarios as evaluators or volunteers in order to identify and explore the factors that lead to improved inter-agency communication and coordination in the public safety arena. The Go-Team has conducted several observations of full scale drills and table top exercises. The team used an observation protocol, an interview protocol, a debriefing protocol, a non-verbal communication assessment tool, and an evaluation form. After each scenario, specific recommendations have been made for improving coordination.

The MAJOR effort at Wayne State has included a seminar series on Security and Preparedness from 2003 to 2004 and a forthcoming international workshop on border security. MAJOR has proposed the development of an agent-based simulation tool to model the effects of multiple parties responding to a disaster.

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Fire Following Earthquake in Urban Areas: GIS Modeling in New Zealand

Two GIS-based models of fire-spread in urban areas, one static and one dynamic, have been developed.

The static model uses the idea of a “critical separation,” which is defined as being the maximum distance that a fire can jump from one building to another. A GIS buffer operation is used to identify groups of buildings that are closer together than the “critical separation.” The process takes a birds-eye view of buildings and draws a buffer with a width equal to half the critical separation around each building. Where buffers touch or overlap the corresponding buildings are coded as belonging to a “burn-zone,” with the assumption that whenever a building in a particular burn-zone is ignited, all buildings in that zone will be consumed. Fires do not spread from one burn-zone to another because, by definition, the distances between burn-zones are always greater than the critical separation.

The dynamic model uses a “cellular automaton” technique to model the spread of fire over time. A GIS is used to divide a map of the area of interest into a set of equal-sized square cells. Each cell is then allocated the properties of whatever fills it. A cell mostly occupied by a building is deemed to be fuel and takes on the properties of the building, i.e. the cladding material, roof type, height, proportion of windows, and so on. Spread of fire from one cell to another (represented as a change of cell state) depends on the initial state of the cell (burning or not), cell attributes (fuel or not), and a set of rules. The rules are complex and take into account such things as the size of the burning fire-front, the temperature of the fire, the decrease in heat flux with increasing distance (i.e. increasing size of gap), and the flammability of cladding materials. The dynamic model allows fire to spread to flammable structures by contact (for adjacent cells), spontaneous ignition (for cells heated by intense radiation across a gap), piloted ignition (through sparks falling on preheated surfaces), and branding (pieces of burning material blown across a gap by wind). Structures with non-flammable claddings can be ignited by piloted ignition following collapse of an adjacent non-fire-rated roof or by piloted ignition through openings like broken windows. The model includes factors for wind direction and strength but does not yet account for other biasing factors such as ground slope and active suppression.

The models were populated with data for buildings in Wellington City and simulations were run to determine the consequence of post-earthquake fire. The models have also been validated against the Napier 1931 magnitude 7.8 earthquake when hundreds of buildings were destroyed by fire.

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Mapping Active Faults and Mitigating Surface Rupture Hazard in the Kapiti Coast District, New Zealand

The Kapiti Coast District, traversed by several active faults, is also the fastest growing area in the Wellington region of New Zealand. In recognition of the surface rupture hazard posed by these active faults, the Kapiti Coast District Council and Greater Wellington Regional Council commissioned the Institute of Geological & Nuclear Sciences to more accurately define the location of the active faults in the district, and present the fault location results in GIS format in a fashion wholly compatible with the interim guidelines “Planning for Development of Land On or Close to Active Faults” recently published by the New Zealand Ministry for the Environment (MfE). Copies of the report are available at <http://www.mfe.govt.nz> and <http://www.qp.org.nz>. Ultimately, the Kapiti Coast District Council’s goal is to formulate and implement appropriate, risk-based land use controls within its district plan pertaining to development of land on or close to active faults throughout the district.

The interim guidelines characterize the surface rupture hazard of an active fault by two parameters 1) fault location/complexity, and 2) fault activity, as measured by its Recurrence Interval Class (RIC) based on the fault’s average recurrence interval of surface rupture. In the Kapiti District, all known active faults have now been defined and fault avoidance zones identified. Fault avoidance zones are described in the GIS database as being *well defined*, *distributed*, *uncertain-constrained*, or *uncertain-poorly constrained*, and they range in width from about 40 meters to greater than 300 meters. Each identified active fault has been attributed a RIC.

Risk arising from fault rupture is a function not only of the fault location, complexity, and activity, but must also take into account the building proposed for the site that may be impacted by fault rupture. Building Importance Category (BIC) is used to characterize building type based on life safety. The guidelines propose an avoidance relationship between RIC and BIC. For example, structures that pose a low risk in terms of life safety (such as farm sheds and fences) would be allowed to be built across active faults with high recurrence intervals, whereas more significant structures with a higher risk in terms of life safety (such as schools, airport terminals, and large hotels) would not be allowed across faults with even low recurrence intervals. By linking BIC with fault rupture hazard parameters (RIC and Fault Avoidance Zones), and with the development status of a site (developed or an undeveloped Greenfield), a matrix of appropriate, risk-based land use planning controls (*permitted*, *controlled*, *discretionary*, *non-complying*) is defined that aim to facilitate the mitigation of surface rupture hazard of land on or close to the active faults.

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Partnering for Business Continuity

The Center for Emergency Management and Homeland Security Policy Research at the University of Akron in Akron, Ohio, is undertaking a business continuity/resumption project sponsored by the Bureau of Justice Assistance. Whether natural or human-made, disasters can claim lives of employees or customers, shut down businesses, disrupt operations, cause physical and environmental damage, and threaten an organization's financial standing. In order to limit this damage and loss, the Center is partnering with entities interested in business continuity/resumption in order to:

- educate businesses about preparedness and recovery options;
- research the barriers to adopting business continuity and resumptions practices and the success of procedures which are adopted; and
- publish information in a manner which can be used by medium and small businesses.

In the past few years, interest in business continuity has grown and there are several private and non-profit entities that provide assistance. Even so, there are a number of businesses without good service and the Center is partnering with existing entities to provide basic services and reduce costs of implementing a minimum level of disaster preparedness.

To date, the Center has partnered with American Red Cross Business and Industry Council on Emergency Planning and Preparedness (BICEPP), a non-profit IT continuity testing laboratory called Platform Labs, and a private business consultant. The Center provides personnel expertise through collaborating on workshops and seminars with its partners. The Center presents seminars to facilitate increased business preparedness and resumption.

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UCLA Center for Public Health and Disasters

This poster describes the mission, course offerings, and public health preparedness activities of the Center for Public Health and Disasters at the University of California, Los Angeles (UCLA), School of Public Health.

The Center was established in 1997. Its mission is to promote interdisciplinary efforts to reduce the health impacts of domestic and international, natural and human-generated disasters.

The Center has an extensive curriculum in emergency and disaster public health, which is offered through the departments of Community Health Sciences and Epidemiology in the UCLA School of Public Health and to community partners through UCLA Extension.

In 2002, the Center was designated by the Centers for Disease Control and Prevention as an Academic Center for Public Health Preparedness (A-CPHP). The A-CPHPs are charged with the responsibility of addressing the training needs of state and local public health professionals for bioterrorism, infectious disease, and other public health threats and emergencies, and improving the competency of front-line public health workers to respond to current and emerging public health threats. As such, the Center offers on-site trainings, disaster exercises/drills, and other technical assistance to local and out-of-state health departments. The poster describes specific topics that are covered by the Center's on-site trainings; the types of disaster exercises/drills that the Center conducts, with some photographs from the a recent mass prophylaxis/vaccination exercise carried out in Orange County, California; and the state-wide public health workforce training needs assessment that was recently completed.

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**Static and Dynamic Methods for Visualizing Fire Progression
and Evacuation Orders: The Case of the 2003 Southern California Wildfires**

During the months of October and November of 2003, Southern California suffered one of the worst wildfire outbreaks in history. The major fires affected Ventura County, Los Angeles County, San Bernardino County, and as far south as San Diego County. These particular fires had many evacuation orders associated with them as a result of the increasing amount of development in the urban-wildland interface and forested regions. To further complicate the situation, the fires involved numerous communities, cities, and counties, which may have created logistical issues concerning evacuations and sporadic information about the timing and scope of evacuation orders.

Attempting to understand the sequence of events proved to be a difficult exercise in *mental visualization*. Therefore, *external visualizations* needed to be produced to assist in the understanding and reconstruction of events. This poster exhibits two external visualization techniques for representing events associated with the firestorm. One approach represents the spatial and temporal dynamics of the fire as a static map and the other approach demonstrates an animated representation of the fire progression and evacuation orders. With the aid of both a static map and an animation, patterns and anomalies concerning the fire percolation and the timing of the evacuation orders may be identified. These maps can facilitate an integrated communications strategy for disseminating the dynamic events in various media like the interactive space of the Internet and in static print. Additionally, further inquiries and analysis may be fueled by the production of these exploratory visual maps.

The poster is part of an ongoing project in collaboration with Tom Cova, Center for Natural and Technological Hazards (C^{nth}), at the University of Utah. The project receives funding from the National Science Foundation (NSF).



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**Disaster Resistant California 2005 Conference:
Offering Innovative Solutions for Today's Changing
Emergency Management Environment**

The California Governor's Office of Emergency Services (OES) and the Collaborative for Disaster Mitigation take great pleasure in inviting you to join us for the fifth annual *Disaster Resistant California (DRC) Conference*, to be held **May 16-18, 2005**, in Sacramento, California. This conference series continues its multidimensional approach to emergency management by offering plenary panels, breakout sessions, and workshops focused on innovative solutions for today's changing emergency management environment. The underlying theme of the conference continues to center around the importance of risk reduction through disaster mitigation, planning, preparedness, response, recovery, and homeland security in order to create disaster resistant communities within California and the world.

The mission of the conference is simple: to provide attendees with the most current emergency management information and the opportunity to collaborate with public and private sector representatives to discuss the practical application of this information. By bringing together emergency management professionals, local and state government representatives, and private business partners, the *DRC* has successfully hosted a forum for these discussions and assisted in bridging the gap between the public and private sectors in the area of overall risk-reduction. As in past conferences, the *DRC* will be accepting papers for consideration in the conference program. Please visit the *DRC* website for additional information on topics and abstract submission deadlines.

Over the years, professional development courses have become a staple of the program. In addition to an array of courses designed to address a wide variety of emergency management topics, the *DRC* is pleased to welcome back the Disaster Recovery Institute International (DRII) to our sessions. DRII will once again offer a business continuity course and exam to satisfy the requirements for DRII's Business Continuity Planner (BCP) certification. Joining our training program this year will also be the Emergency Management Accreditation Program (EMAP). Classes will be offered before and after the normal conference schedule of events for the convenience of the participants.

Focusing on the importance of building disaster resistant communities, the conference's exhibits, displays, and demonstrations will emphasize successful systems, technologies, and strategies for the practical application of risk-reduction in today's emergency management environment. As in the past, there will be a diverse representation of vendors and exhibitors from the public and private sectors on-site to answer questions and showcase the latest developments in emergency products.

Please visit the *DRC* website at <http://www.drc.ca.gov> or contact Victoria LaMar-Haas, California OES, at 916-845-8531 for more information.

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NCAR Program on the Societal Impacts of Weather Information

All sectors of the economy are affected by weather that, if predicted with greater accuracy, could reduce economic risks and improve personal safety resulting in billions of dollars of savings annually. National Center for Atmospheric Research (NCAR), with funding from the U.S. Weather Research Program, has established the Societal Impacts Program to develop a dedicated focal point for gathering, assessing, coordinating, and synthesizing information on the societal impacts and economic benefits of weather information. The program focuses primarily on weather information from short (up to 3 days) to extended range (two week). It will identify, characterize, and communicate opportunities and priorities for weather research and applications that offer the best economic return on public research investments. The program also aims to improve the likelihood that society as a whole gains from weather forecasting capabilities that result from various programs and to significantly enhance on-going and future sponsored weather research programs. The program also will ensure that the societal impacts and user benefits of weather information applications are properly represented in the planning, execution and post analysis efforts.

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Vulnerability of Industrial/Petrochemical Facilities to Hurricane Winds: A GIS Case Study

This poster presents a model of vulnerability of existing petrochemical structures to the effects of wind-induced forces. It is also somewhat applicable to other types of industrial facilities such as chemical and agrichemical plants and many structures found in marine and bulk materials handling facilities. The lack of building codes, standards, and other technical guidance for wind design for these facilities, coupled with common misunderstanding of existing design criteria has resulted in the construction of facilities with widely varying design strengths. In many cases, the design strength falls significantly short of the intended criteria, a particularly serious problem in hurricane-prone regions. Decisions about whether or not to shut down plant operations and move, store, and/or destroy on-site hazardous materials are often made on the basis of forecast hurricane wind speed rather than the “intended” design wind speed for structures at a given plant. Therefore, the actual wind-induced forces on tanks, vessels, pipe racks, and open frame structures are of particular interest because of the potential economic, environmental, and life-safety risks posed by the possibility of these structures experiencing significant damage.

The Energy Division of the American Society of Civil Engineers (ASCE) published a comparative report several years ago detailing inconsistencies in the treatment of wind loads for petrochemical facilities. This report also presented guidelines for determination of wind loads on the types of structures found in these plants. Utilizing these studies of industry practices and the design values determined using ASCE recommendations, a statistical distribution that models the design of existing facilities is developed. This distribution is then converted into an expectation of damage in the form of vulnerability or fragility curves. A case study illustrates usage of the developed methodology for the heavily industrialized and hurricane-prone area near New Orleans, Louisiana. The case study is presented in GIS format, which provides both a physical and spatial perspective of the magnitude of damage that may be expected on a regional basis under extreme wind conditions.

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Mapping Social Vulnerability: A Case Study of Shelby County, Tennessee

Understanding the spatial distribution of disaster impact is important to disaster mitigation, preparedness, response, and recovery at the local level. The degree of disaster impact depends not only on physical exposure, but also on social vulnerability or the capacity to anticipate, cope with, resist, and recover from a disaster (Blakie, Canon, Davis, and Wisner, 1994). Compared with physical risk mapping, the technique of social vulnerability mapping is still undeveloped. The current block mapping method for social vulnerability distorts some measurements such as population density and the spatial sense of social vulnerability within a community.

This poster uses Shelby County, Tennessee, as a study area to present an advanced social vulnerability mapping technique that combines disaster-related resources, demographic characteristics, and land use patterns. This new mapping technique improves the current method of social vulnerability mapping, visualizes the spatial pattern of social vulnerability of a community, and supports disaster planning for a safer community.



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The Gender and Disaster Network

The Gender and Disaster Network (GDN) is an educational project initiated by women and men interested in gender relations in disaster contexts. It emerged from an early morning meeting during the July 1997 Hazards Research and Applications Workshop in Denver, Colorado. Understanding that communication technology is not fully accessible and that we work in many languages and contexts, we hope to utilize the Internet in the support of a global network of researchers and practitioners.

Broadly stated, our goals are to:

- Document and analyze women's and men's experiences before, during, and after disaster, situating gender relations in broad political, economic, historical, and cultural context;
- Work across disciplinary and organizational boundaries in support of collaborative research and applied projects;
- Foster information sharing and resource building among network members; and
- Build and sustain an active international community of scholars and activists.

GDN is now an international forum for discussion, networking, and information exchange. Its web site is maintained by the Northumbria University, Division of Geography and Environmental Management (webspinner Maureen Fordham). The content is generated by the network members. There is also a discussion list managed by Texas A&M University, which can be subscribed to at http://online.northumbria.ac.uk/geography_research/gdn/register.html.

The GDN poster display describes the goals and history of GDN, highlights the 2004 winner of the Mary Fran Myers award (as well as past winners of the award, including Betty Hearn Morrow, one of the founders of the GDN). The display also illustrates recent publications, projects, and research efforts being undertaken by GDN members. For more information on the Gender and Disaster Network, visit http://online.northumbria.ac.uk/geography_research/gdn/.

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Evacuation Perceptions

Self-efficacy for dealing with post-traumatic demands has repeatedly demonstrated strong relationships with psychological recovery. The purpose of this study was to determine if evacuation perceptions from a massive wildfire were related to perceptions of self-efficacy relative to recovering from the wildfire. The sample consisted of 102 (58%) female, predominantly Caucasian (97%) individuals living in the evacuation zones for two major Colorado wildfires in the summer of 2002.

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Emergency Preparedness: The Influence of Disaster Experience and Gender

This poster reports on some of the findings from a larger project entitled “Enhancing Municipal Disaster Prevention,” funded by the Institute of Catastrophic Loss Reduction (ICLR). The project compares the risk perceptions and emergency preparedness attitudes in two communities in Canada Pine Lake, Alberta and North Dumfries, Ontario. Both of these communities are rural in nature, adjacent to an urban center, have similar demographic characteristics, and are located in tornado-prone regions. However, only the first community, Pine Lake, has any recent experience with disaster. On July 14, 2000, an F3 tornado raced through the area killing 12 people, injuring over 140 people, and causing \$15 million in damage. One of the goals of the study is to evaluate the extent to which this disaster experience has affected area residents’ emergency preparedness attitudes and activities. The project is distinct in that it undertakes a comparative analysis and concentrates on emergency preparedness in a developed-world context.

In the spring and summer of 2003 we conducted face-to-face structured survey interviews with 76 respondents from Pine Lake and 128 from North Dumfries. An identical survey instrument was used in each community. For the purposes on this paper we have extracted only a few of the variables to evaluate the influence of the disaster experience. We also assess the degree to which gender affects emergency preparedness and attitudes. Based on a review of the literature, we hypothesized that the disaster experience would result in heightened feelings of vulnerability leading to a more proactive attitude in many areas of emergency preparedness, including the household, community, and government contexts. We further suggested that perceptions, preparedness activities, and attitudes would also be influenced by traditional gender roles and stereotypes.

Among other things, our results demonstrate that the disaster experience had a statistically significant influence on disaster perceptions and preparedness and influenced the type of emergency preparedness information sought out. Pine Lake respondents viewed the possibility of disasters as more likely and undertook more emergency preparedness activities. They also seemed to more proactively search out emergency preparedness information. In terms of gender, traditional roles were strongly evident, particularly surrounding the division of labor between indoor and outdoor household preparedness activities.

The effects of disaster experience, however, are not straightforward. In some instances, (e.g. when evaluating whether or not respondents would invest in their homes to increase disaster resilience) Pine Lake residents stated that they were *less* likely to consider making any investment. Further, gender did not always contribute to the differences among respondents. Taken together, these results suggest that assumptions about emergency preparedness perceptions and behavior must be tempered by an in-depth understanding of the communities involved. Otherwise, policy decisions or risk communication exercises based on taken-for-granted assumptions may not have the intended effects in mitigating risk or increasing emergency preparedness.

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Grand Bayou Louisiana: Coastal Vulnerability and Community Sustainability

This collaborative research project offers a unique, exploratory methodology for hazards research in a small coastal community, Grand Bayou, Louisiana. This intercultural Native American (Atakapa, Houma) and Cajun community of 125 represents a natural research laboratory well-suited to the study of community sustainability in an area of high coastal vulnerability. Grand Bayou is only accessible by water, is located in coastal wetlands south of New Orleans, and lies one mile west outside the protection of the Mississippi levee. It is perched on the edge of survival due to repeated natural disasters, coastal erosion, and economic losses, as well as threats to cultural heritage and social networks. Grand Bayou is struggling to balance the threat of natural hazards, economic development, and community sustainability.

Participatory action research (PAR), currently being undertaken in Grand Bayou, represents a viable and culturally appropriate research strategy that will: (1) observe and record community efforts and activities; (2) document and understand Grand Bayou heritage both orally and visually; (3) assess human, built, and natural systems; (4) apply a methodology unique to hazards research that uses a broad-based interdisciplinary team. Due to the precariousness of this community from natural disaster, anticipated deaths among the elders, and migration for economic and physical survival, rapid data collection is imperative. Small unincorporated and rural communities such as Grand Bayou often lack adequate attention, advocacy and resources in facing, responding to, or recovering from disasters. Grand Bayou represents an appropriate location for inquiry designed to generate knowledge on communities most vulnerable to loss but with a culturally based potential to survive.

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Project Team Members: Shirley Laska, Center for Hazards Assessment, Response and Technology at the University of New Orleans (UNO); John Pine, Louisiana State University (LSU) Disaster Science and Management; Kristina Peterson, Presbyterian Disaster Assistance; Brenda Phillips, Oklahoma State University; Kristina Phillips, Grand Bayou Families United; Pam Jenkins, UNO Sociology; Barrett Kennedy, LSU School of Architecture; Hassan Mashriqui, LSU Hurricane Center; and Patricia Stukes, Sociology at Texas Woman's University.

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Disaster by Management: Managerialism and Normal Accident Theory in the Columbia Accident and FBI Headquarters' Response to Field Office Concerns Before September 11

A key element in contemporary technological accidents and in the September 11 terrorist incidents is the interaction of risk assessment and risk management in complex public organizations. Risk assessment communication moves along the spokes of an organizational hierarchy toward socially and spatially more concentrated hubs of decision-making, each of which makes risk management decisions in politicized contexts peculiar to its own scale. These contexts affect the outcome of a given risk assessment communication: Is the risk managed by an active and effective decision maker at that level? Is the communication passed along yet another spoke to still another hub in search of an effective decision maker at a more influential level? Or is the risk assessment suppressed with either no decision taken to alter risk or with sanctions applied to the messengers of risk?

This paper compares the structure of human errors in two disasters with sociogenic causes: the Columbia Shuttle accident and the FBI failure to act on intelligence presaging the September 11 terrorist attack. In each case, technical information suggesting disaster was weakly transmitted within an elaborate bureaucracy, high-level decision makers failed to authorize action, and, in at least one case, actively overrode actions taken by lower-level decision makers that may have prevented tragedy. The result was truly “disaster by management.”

To analyze risk assessment communication flows along NASA and FBI hierarchies, respectively, this paper integrates several theoretical frameworks: managerialism, organizational theory, functions of government theory, accident theory, risk perception, risk assessment and risk management relations, and the spatiality of NASA and the FBI. Data consist of public documents concerning these two disasters.

The paper concludes that both the Columbia accident and the FBI handling of field office concerns before September 11 seem to validate normal accident theory. Communication about risks appears to have been hog-tied in complex bureaucracies. Unpredictable external constraints acted on both agencies and led to a shift in risk managers' perception of the relative importance of the precautionary principle.

In NASA's case, the failure in communication can be traced to the organization's external political environment and funding base, its geographically ornate and hierarchical structure, and the lower status and timidity of risk assessors compared with managers. In the FBI's case, the most consequential failure of communication was between the most senior levels of the Bureau and the lower-ranked personnel there at Headquarters, which affected their decision-making concerning the distant field offices.

The consequence of these and other barriers to communication along hierarchies, between chains of command, and across space was an imbalanced focus on the managerialist concerns of efficiency, budget, scheduling, and rules and regulations, instead of on the risk to human life. Managers had normalized anomalies and resisted data that contradicted their perception biases, leading to what one NASA engineer called “worlds of pain.”

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The George Washington University

The George Washington University's Institute for Crisis, Disaster, and Risk Management (<http://www.gwu.edu/~icdrm>) will display information about the graduate programs and degrees available and some recent publications. Also included in the display is information about the new e-journal, the ***Journal of Homeland Security and Emergency Management*** (<http://www.bepress.com/jhsem/>).

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Terrorism Time Line Chart (1993-2003)

Claire B. Rubin & Associates will display the latest *Terrorism Time Line Chart (1993-2003)* and related narrative reports. The new chart was supported by the Public Entity Risk Institute (<http://www.riskinstitute.org>). Free copies of the latest chart will be available at the poster session.

Copies can be ordered on-line by visiting <http://www.disaster-timeline.com>.

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Linking Science and Society: The USGS *Science Impact* Program

U.S. Geological Survey (USGS) science is used every day by decision-makers throughout the U.S. and the world to address a broad spectrum of environmental, natural resource, and hazards-related issues. In recent years, however, technology, decision-making processes, and data accessibility have changed dramatically. Decisions are increasingly decentralized, analytical capabilities are expanding, and data accessibility is growing. Decision makers and citizens now demand accessible, timely, and integrated science information that objectively addresses policy-relevant issues. As the world changes, USGS must increase and strengthen efforts to make its research and information as useful as possible.

Science Impact is a focused effort to improve and expand the use of USGS science information to support decision making at the Department of the Interior, at other federal, state, and local government organizations, as well as by the public. *Science Impact* will build on the excellent work that USGS is currently doing to link science with societal decisions. *Science Impact* focuses on three principal activities:

- **Science Synthesis:** identifying, developing, and evaluating needs and opportunities for science to support decision making. Societal issues, disputes, and problems are linked with current and future science capabilities to determine the context in which science can support decisions, resulting in the identification of science questions and information needs.
- **Tool and Product Development:** collaborating with public, academic, and private partners to develop interdisciplinary tools, products, models, and processes that describe the physical, economic, and social implications of alternative decisions.
- **Science Impact Education and Training:** training activities designed to improve the interface between scientists, decision-makers, and citizens and to facilitate informed and effective use of USGS science information, tools, models, and products.

USGS efforts to develop a *Science Impact* program include innovative integrated natural and social science research, the development of university partnerships, and community and other institutional outreach efforts. The success of *Science Impact* depends on the active participation of scientists, managers, and others both within and outside USGS. Only through this participatory approach can the best practices and strategies for maximizing the potential of USGS science to inform public-policy decisions be identified and implemented. For more information on *Science Impact*, e-mail us at science_impact@usgs.gov.

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EQNET: Earthquake Information Network

The Earthquake Information Network (EQNET) web site (<http://www.eqnet.org>) provides one-stop access to authoritative earthquake-related Internet resources through an extensive list of categorized earthquake information. EQNET covers a wide variety of multidisciplinary earthquake subject areas, such as seismology, tsunamis, structural and geotechnical engineering, disaster management, policy/planning, socioeconomic issues, and others.

This poster introduces EQNET's major features. In addition to lists of categorized earthquake information, EQNET features shortcuts that link to current seismicity and regional/state earthquake information; an earthquake image collection; a continuing education calendar; and a calendar of conferences and meetings on topics related to earthquake engineering. EQNET also includes "Significant Earthquake Pages" that offer links to reports and news articles on each major earthquake since 1999. EQNET is an interactive Internet resource that enables users to submit new sites and information requests.

A project of the Earthquake Information Provider's Group (EqIP), EQNET is funded by the Federal Emergency Management Agency (FEMA), with additional support from the National Science Foundation (NSF).

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**Business Executives for National Security (BENS)
“Company Primer on Preparedness and Response Planning
for Terrorist and Bioterrorist Attacks”**

Primarily driven by the events of September 11, 2001, many corporate businesses are actively seeking guidance on how best to protect their workplace and allay employee concerns about their personal safety at work. Employees (and the public at large) assume that businesses are being proactive in working with government agencies and that they are developing adequate health and safety programs and crisis prevention plans, and are actively participating with local and state governments on emergency response and recovery initiatives. Further, no fewer than fifteen industries now have regulations requiring the design, development, and implementation of emergency preparedness and response training programs, policies, and procedures to ensure the health and safety of all employees as an integral part of overall company policy, and as part of an overall community-based response.

Business Executives for National Security (BENS) found that companies of all sizes want guidance on what constitutes a reasonable response for firms developing Preparedness and Response Plans (P&RP). With the assistance and support of the Georgia Homeland Security Department and Division of Public Health, BENS created a “Company Primer” intended to raise awareness of corporate business leaders about potential threats and to provide policy and procedural guidance, particularly to companies not large enough to have dedicated health and safety or security departments.

Though many of the P&RP guidelines detailed in the primer are specific to bioterrorism, the plans are all-hazards in approach. Threats to businesses can come not only from radical international organizations but also from domestic extremist groups, ex-employees, or even potentially disgruntled employees, and involve a wide range of conventional or unconventional weapons. Most common threats are natural while other hazards are non-illicit in nature. Companies therefore must plan for a variety of hazards and understand the governmental framework in place to respond to all types of emergency situations. The BENS primer is not intended to be exhaustive. Rather, by helping to develop an awareness and understanding of the potential risks, companies will be better able to address these issues.

The BENS Primer can be accessed at <http://www.bens.org>. Specific information includes:

- The scope and scale of terrorist threats and various types of attacks;
- An overview of bioterrorism (agents, methods of attack, and treatment and control);
- Background on local-state-federal relationships and special powers under a public health emergency;
- Specific procedures for recognizing and responding to bioterrorist attacks; and
- Guidelines for maintaining critical business and infrastructure functions in the event of an attack.

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Plan Quality Evaluation on Natural Hazards Mitigation Provisions: Adding Wildfires and Drought Assessment Indicators in the State of Arizona

Natural Hazard Mitigation Plans (NHMP) have multifold advantages to reduce community vulnerability to hazards and it has been widely argued that for sustainable planning and a more resilient community against hazards such plans should be integrated with comprehensive (land use) plans (UNISDR 2003²Burby et al 2000³; Godschalk, Kaiser, and Berke 1998⁴). Though there is no current initiative to integrate the ongoing hazards planning with comprehensive land use plans in Arizona, interviews with comprehensive planners and emergency planners reveal strong support for such a move.

Once integrated, these plans would have to be evaluated and updated for quality improvement. Past studies on “Plan Quality Evaluation” have focused on floods, hurricanes, earthquakes, and tsunamis. These hazards do not form a substantial fraction of hazards in Arizona. Thus, any plan evaluation protocol must be revised to suit Arizona and focus on hazards like wildfires and droughts apart from floods. As part of my research on Natural Hazard Mitigation Planning in Arizona, I refine this protocol by adding assessment indicators relevant to wildfires and droughts. This is done using in-depth reviews of research done on wildfires and drought by various agencies and research institutions. A specific evaluation tool and protocol would be of great value for evaluating quality of plans for many other states, apart from Arizona, where wildfires and drought is a recurring menace.

² UNISDR. (2003). *Reduction Disaster Education and Sustainable Development*, United Nations, International Strategy for Disaster Reduction. <http://www.unisdr.org/>. Visited December 12, 2003.

³ Burby, R. J., Robert E. Deyle R. E. , Godschalk D R., Olshansky R. B. (2000). “Creating Hazard Resilient Communities through Land-Use Planning.” *Natural Hazards Review*, 1(2): 99-106

⁴ Goschalk, D. R., Kaiser, E. J., and Berke, P. (1998). Integrating hazard mitigation and local land-use planning. In *Co-operating with nature*, edited by R. Burby. Joseph Henry Press, Washington D.C.

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Public Health Threats to Low-Lying U.S. Coastal Cities from Hurricanes and Major Floods: Mitigation Strategies to Inform and Prepare Coastal Residents

Population growth and land development associated with low-lying U.S. coastal cities, particularly along the east coast, Florida, and Gulf of Mexico, expose higher numbers of people to public health threats from major storms. This is particularly true where residential and industrial areas share the coast in close proximity, introducing the possibility of complex and natural-technological disasters. The likelihood of an increase in severe storms and storm activity over the next decade further develops the possibility that hurricanes, tropical storms, or prolonged rainfall will further impact low-lying coastal cities such as Houston, Texas, New Orleans, Louisiana, and others.

This poster identifies the unique public health impacts recently encountered by low-lying U.S. coastal cities as a consequence of major storms and flooding. Mitigation strategies for these situations are outlined and supported. Ultimately, a version of this poster will be used as a visual aid to increase public awareness of the public health issues and dangers present before, during, and after major storms, with the goal of better informing and preparing coastal residents for the public health issues of extreme events.

Poster collaborators: James Diaz, Ivor van Heerden, and Ahmet Binselam.

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Natural Hazards Review

The ***Natural Hazards Review*** is a peer-reviewed journal published quarterly by the American Society of Civil Engineers (ASCE) in cooperation with the University of Colorado, Natural Hazards Research and Applications Information Center. It provides an outlet for researchers and practitioners to work together to publish the results of truly interdisciplinary approaches to loss reduction and long-term disaster resiliency.

The creation of the ***Natural Hazards Review*** was based on the realization that natural disaster losses result from interactions between the physical world, the constructed environment, and the character of the societies and people who occupy them. The journal is dedicated to bringing together the physical, social, and behavioral sciences; engineering; and the regulatory and policy communities to provide a forum for cutting-edge, holistic, and cross-disciplinary approaches to natural hazards loss and cost reduction.

The ***Natural Hazards Review*** provides innovative and practical solutions to problems and challenges faced by all sectors of the hazards community, including government, academia, the private sector, and nongovernmental organizations. Articles containing detailed case studies are complemented by those reporting original research findings, describing projects, or sharing recent knowledge on significant hazards issues.

If you are interested in contributing, send manuscript submissions, editorial inquiries, comments, or suggestions to ASCE, Journal Production Department, 1801 Alexander Bell Drive, Reston, VA 20191; 703-295-6300 (toll free: 800-548-2723); e-mail: marketing@asce.org; <http://www.pubs.asce.org>.

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EERI's Learning from Earthquakes Program

For more than 30 years, the Earthquake Engineering Research Institute (EERI) has operated its Learning from Earthquakes (LFE) Program, with funding from the National Science Foundation (NSF). The program has enabled dozens of multidisciplinary teams of researchers to carry out field investigations of significant earthquakes throughout the world, to observe and document effects on the natural and built environment and resulting social, economic, and policy impacts. Over the years the program has generated new knowledge leading to changes in practice and stimulating new research in each of the related fields. The LFE program has recently been strengthened with additional NSF funds, allowing EERI to undertake several new or expanded initiatives along with the following ongoing activities:

Clearinghouse. EERI participates in the California Clearinghouse as a member of the Management Group. The Clearinghouse concept has been integrated into the new U.S. Geological Survey (USGS) Post Disaster Investigation Plan as a way to ensure exchange of field observations between disciplines, teams and agencies. It plays a critical role in assisting and coordinating field researchers who will converge on the area from throughout the U.S. and abroad immediately after a damaging earthquake. Although ad hoc clearinghouses have been a part of post-earthquake investigations for many years, the Northridge earthquake was the first truly modern Clearinghouse and set the pattern for the current California Clearinghouse plan, involving federal and state agencies and EERI.

During the past year EERI has taken part in three exercises of the USGS Plan. Issues of communication between the involved agencies and researchers, access to damaged buildings and structures, and collection and management of data are paramount. As a result of the exercises, EERI has instituted a number of modifications to its own response and investigation plans.

Electronic Data Collection and Management. Information Technology (IT) advances in the past decade have made it possible to collect more information and to manage and access it electronically. EERI is working with a private company, Accela (<http://www.accela.com>), to develop a data collection protocol in each of the disciplines and will test the new system in the field later this summer.

Reconnaissance Teams to Recent Earthquakes. EERI sent two reconnaissance teams to study the impacts of the devastating earthquake in Bam, Iran, which occurred on December 26, 2003. Both EERI teams worked closely in the field with IEES, the Institute of Earthquake Engineering and Seismology, in Tehran. The first team included structural, geotechnical, and environmental engineers, a medical doctor, and a remote sensing specialist. The second team was invited back by IEES and was composed of social scientists and public policy specialists.

Web Site. EERI has developed a section of its web site for the LFE program that includes forms, background information, preliminary reconnaissance reports, and information on countries with seismic risk. It is linked to EERI's web-based World Housing Encyclopedia, which provides exhaustive information on single and multifamily housing structures in seismically prone areas, along with techniques and tutorials for strengthening vulnerable structures.

Upcoming reconnaissance reports on the Molise, Italy, Colima, Mexico, San Simeon, California, and Bam, Iran, earthquakes may be ordered from EERI at <http://www.eeri.org>.

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Social Vulnerability to Natural Disasters: Concepts and Measurement

Social vulnerability perspectives represent a relatively new and emerging framework within hazards research. As a concept, social vulnerability has been defined as “characteristics of a person or group in terms of their capacity to anticipate, cope with, resist and recover from the impacts of a natural hazard” (Blakie, Canon, Davis and Wisner 1994). Social vulnerability is not randomly distributed within disaster prone areas; instead it tends to concentrate in certain socio-demographic groups. To be practically applicable to local emergency management, the concept of social vulnerability needs to be converted to operational indicators. This poster presents a three-level measurement system to achieve this goal. The individual dimensions of social vulnerability are measured at the fundamental level. At the intermediate level, social vulnerability indicators are constructed to address disaster response/recovery demands for different local agencies. Finally, a “hot spot” indicator is constructed to evaluate the degree of overall social vulnerability within the local community. With these measurements, emergency planners, policy makers, and other organizations can effectively identify and focus on meeting response and recovery demands.