COLLABORATIVE RESEARCH: GEOSPATIAL MODELING FOR PRO-ACTIVE FLOOD MITIGATION IN THE RURAL MIDWEST

PROJECT SUMMARY

Intellectual Merit

This project will help to bridge a divide between the physical flood sciences (hydrology, fluvial geomorphology, hydraulic modeling), social sciences (psychological-sociology, anthropology), and on-the-ground applications of floodplain management. Our goal is to model the physical, hydrological, economic, and social landscape of rural floodplains of the Mississippi, Ohio, and Illinois Rivers to identify community vulnerability and potential for meaningful "pro-active" mitigation. We will create a quantitative and spatially explicit framework for linking flood risk, community vulnerability, and mitigation potential. **This framework will center on an integrated physical-social GIS model of vulnerability to catastrophic flooding** that will include:

- physical-hydrologic-engineering metrics of flood vulnerability (*from hydraulic modeling and GIS and other geospatial data sources*)
- socioeconomic metrics of flood vulnerability (*from hydraulic modeling, Hazus-MH [risk assessment] modeling, and 2010 Census data*)
- socio-psychological metrics of perceptions of risk and attitudinal variables and impediments to mitigation *(survey data)*

This model will be constructed for a study area spanning 640 km of the Mississippi, Ohio, and Illinois Rivers (>12,600 km^2 of floodplain), including study reaches with contrasting flood histories. We will develop a structural equation model to test the ability for physical and socioeconomic vulnerability, perceptions of risk, and attitudes to predict mitigation planning at the community and level.

Repetitive flooding severely affects rural communities in the Midwest and nationwide. "*The crucial point about understanding why disasters happen is that it is not only natural events that cause them. They are also the product of social, political, and economic environments*" (Wisner et al., 2004). The goals of this project are to quantify the vulnerability of rural floodplain communities, their capacity to recover from catastrophic flooding, and local attitudes that present both opportunities and challenges to meaningful mitigation of flood hazard.

Broader Impacts

Broader impacts of this proposed research include: tangible mitigation applications, community outreach activities, and educational objectives. Educational activities include involvement of 1 PhD student at SIU, 1 MS student at Lehigh, and an undergrad student at WIU. These students will be integrally involved in the research here, mentored by their respective faculty advisors, and will conduct and publish research from this project. We can also attest that there is a clamorous demand for undergraduate training in the area of disaster preparedness and disaster research in general. We propose to submit an NSF REU project to create a multi-institutional and multi-disciplinary undergraduate research experience, building upon the project here as well as the PI's on-going mitigation activities (see below).

In terms of practical applications, our group has worked extensively with floodplain residents, flood victims, local leaders, the Corps of Engineers, and state and federal disaster agencies. Along with its research goals, **this project will promote public awareness of flood risk and foster coordinated mitigation efforts in some of the nation's most at-risk communities along the Mississippi, Illinois, and Ohio Rivers.** Specific outreach activities are outlined in the final section of this proposal.

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*Proposers may select any numbering mechanism for the proposal. The entire proposal however, must be paginated. Complete both columns only if the proposal is numbered consecutively.

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COLLABORATIVE RESEARCH: GEOSPATIAL MODELING FOR PRO-ACTIVE FLOOD MITIGATION IN THE RURAL MIDWEST

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RESEARCH OVERVIEW

This project will assess the physical, hydrologic, socio-economic, and human perceptual vulnerability of rural floodplain communities within the framework of an integrated physical-social GIS model. Among the questions we will attempt to address are: 1) are communities that are more vulnerable to flooding more likely to undertake active and meaningful ("pro-active") mitigation efforts, and 2) if vulnerability fails to predict pro-active mitigation, then what are the major contributors or impediments to such efforts. Model construction will identify variables critical for reducing vulnerability of rural floodplain communities and encouraging flood-risk reduction through mitigation.

In applied terms, this research will assess both opportunities and impediments to mitigation of flood hazard. These impediments are particularly challenging for small rural communities across much of the U.S., which may explain why more substantive mitigation efforts have not been widely emulated in these areas. We seek to use this GIS-based tool and research findings to identify rural communities that are simultaneously at the greatest risk of catastrophic flooding but may have the right constellation of attributes that make them suitable for large-scale flood-risk mitigation.

The team here is multi-institutional, cross-disciplinary, and well qualified to conduct this project. The Southern Illinois University (SIU) team has extensive experience modeling potential disasters and working with local governments across Illinois. The group has produced or is producing FEMA mitigation plans for >40 Illinois counties. The SIU group has also been working with Olive Branch, IL in its efforts to relocate wholesale off the Mississippi floodplain after severe damage during the 2011 flood. The Western Illinois University (WIU)–Lehigh University anthropological team has been studying rural community flood resilience from a social perspective since the 2008 floods, with the goal of integrating their findings with bio-physical data. Co-PI Dennis Knobloch was Mayor of Valmeyer, IL and architect of its wholesale relocation following the 1993 flood. Valmeyer remains the textbook case of successful mitigation, widely cited but rarely emulated subsequently, and Knobloch is a national advocate of effective mitigation strategies.

Proposed study area

We will screen communities along **four floodplain study reaches**, together encompassing 4880 square miles (>12,600 km^2) of rural Midwestern floodplain:

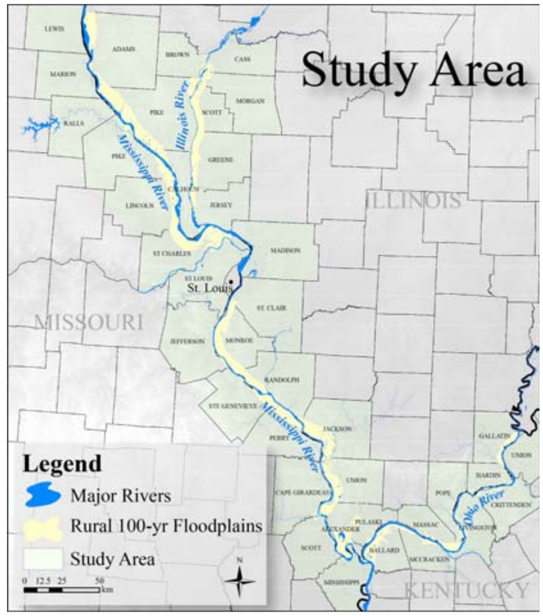

Fig. 1. Study location map.

(1) along the Mississippi River from Cairo, IL to Oakville, MO (River Mile [RM] 0-168; flooded in 1993; locally in 2011),

(2) upstream on the Mississippi from Winfield, MO to Quincy, IL (RM 241-325; extensively flooded in 2008),

(3) the Ohio River from Cairo to the Illinois-Indiana border (RM 981-848; last severe flooding in 1937), and

(4) the Illinois River from Grafton to Meredosia, IL (RM 0-71; multiple moderate floods recorded, including as recently as 2002).

These four rural floodplain reaches were chosen because of their contrasting histories of recent flooding, and because of the availability of substantial pre-existing data. The group at SIU maintains several regional databases, including high-resolution topographic data, extensive historical geospatial data (Remo et al., 2008), a range of working 1D and selective 2D hydraulic models, and local assessor and other detailed infrastructure data for communities and individual structures. This study will be further facilitated by the availability of 2010 Census data.

DISASTER RECOVERY, VULNERABILITY AND RISK MITIGATION

"The crucial point about understanding why disasters happen is that it is not only natural events that cause them. They are also the product of social, political, and economic environments" (Wisner et al., 2004). Floods in particular are natural and even potentially beneficial functions of rivers except where humans and human infrastructure impose themselves upon the natural domain of flooding, which is the floodplain (Pielke, 1999). In theory, this dangerous conjunction provides simple solutions: (1) prevent population encroachment and other infrastructure-intensive utilization of floodplains, and failing that (2) mitigate those risks where such utilization already exists. In reality, the U.S. has a notably mixed record avoiding flood hazard. Towns and cities have located on U.S. floodplains since their founding, and if anything, floodplain development has accelerated in recent years despite safeguards put in place by the National Flood Insurance Program (NFIP, NWF, 1998). Between 1978 and 1995, there were 74,501 repetitive loss properties in the U.S. costing the NFIP $2.581 billion, but these numbers grew to 153,000 properties costing taxpayers $10.692 billion by 2004 (Conrad, 2010). Even following catastrophic damages after the great flood of 1993, short-lived caution was followed by a surge of development that added >$2.2 billion in new floodplain infrastructure to land that was under water in 1993 (Pinter, 2005).

Disaster recovery, mitigation, and resilience

At the present moment, disaster-recovery and resilience research are in the cross-hairs of U.S. public-policy discussion. Following the vision outlined in President Obama's Policy Directive PPD-8, FEMA and its partner agencies have developed a new National Disaster Recovery Framework (NDRF) that was released in September of 2011. This is an overarching policy strategy that is currently being phased into agency practice (FEMA, 2011). The NDRF puts new emphasis on several disaster-recovery principles, in particular pre-disaster planning, mitigation, sustainability, and community resilience. The NDRF focuses on " *how best to restore, redevelop and revitalize the health, social, economic, natural and environmental fabric of the community and build a more resilient Nation… A successful recovery process promotes practices that minimize the community's risk to all hazards and strengthens its ability to withstand and recover from future disasters*" (FEMA, 2011).

The principles now being implemented under NDRF draw heavily on disaster and disaster-recovery research spanning the past couple of decades. As Petterson (1999) summarized, "*The ability to conceptualize recovery and understand its nature would appear to be a critical prerequisite to developing a framework for postdisaster community recovery.*" Nonetheless, disaster recovery has been characterized as the least studied element of the disaster cycle and hazard management (Smith and Wenger, 2006). Several studies have focused on identifying the factors necessary for efficient and sustainable disaster recovery (see review in Rubin, 2009). Other studies have worked to create a conceptual framework for community recovery, often focusing on the concept of resilience (e.g., Norris et al., 2008; Masten and Obradovic, 2008). Looking at flood hazard in particular, several authors have emphasized the central role of perceptions of flood risk by local residents, often trumping more objective factors in guiding pre-flood and post-flood actions (e.g., Ludy and Kondolf, 2012; Thieken et al., 2007). We here particularly note the conclusion of Rubin (2009): "*Among the many challenges is the essential step of enlisting more multi-disciplinary research teams to engage in needed studies … Recovery will remain problematic for the forseeable future because it is very messy, difficult to do, and requires long-term attention and resources.*"

Perhaps the key to long-term disaster recovery and community resilience to hazards is aggressive pre-disaster planning and hazard mitigation (e.g., FDCA, 2010). Mitigation includes a broad range of options to reduce damages (e.g., FEMA, 2012). It has been estimated that concerted mitigation measures can reduce flood damages by up to 80% (ICPR, 2002). The SIU group is working with >40 Illinois counties modeling potential disasters and producing FEMA-required Hazard Mitigation Plans for these counties and their communities. Despite prodding for more sweeping solutions, mitigation solutions selected by these communities have been mostly uniformly small in scale and scope, and largely reactive rather than pro-active (Fig. 2). Among the 356 mitigation strategies enumerated to date, 330 of these can be characterized as business-as-usual measures (no change in behavior for residents). For those communities that did list

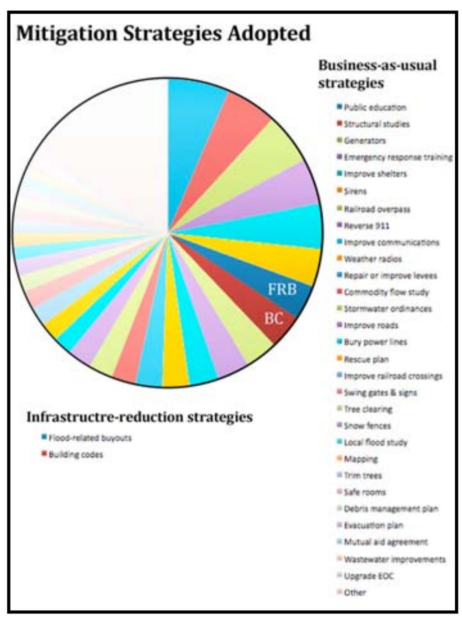

Fig. 2. Mitigation strategies adopted.

floodplain property acquisitions, however, most listed these buyouts as a "moderately high" to "high" priority. After severe damage during the May, 2011 flood on the Ohio and Mississippi Rivers, SIU has been working the town of Olive Branch, IL (pop. ~850) in its efforts to move wholesale off the floodplain, including a >$13 million FEMA HMGP application now pending.

The National Flood Insurance Program (NFIP) was established in 1968, providing flood insurance to individuals within communities that adopt floodplain management practices (Krimm, 1998; Platt, 1999; Marlett et al., 2001; Schwartz, 2005). The goal of NFIP was to transfer the financial burden of flooding from the federal taxpayer to the at-risk home or business owners (Fraser et al., 2003; Schwartz, 2005). The NFIP encourages self-efficacy by fostering sound local floodplain management and mitigation efforts (Godschalk, 1999; Pielke, 1999; Marlett et al., 2001; Fraser et al., 2003). Several programs for NFIP communities provide funds to enact effective mitigation, including: the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA), Pre-Disaster Mitigation (PDM) planning; etc. (Mileti, 1999; Platt, 1999; Marlett et al., 2001; Schwartz, 2005). These programs seek to create more disaster-resistant communities.

Mitigation options that meaningfully reduce risk are available and have been implemented in the past. After the 1993 flood, Missouri Governor Mel Carnahan stated that "in the long run, it is less expensive to purchase floodplain property from willing sellers than to continue repetitively paying insurance claims and providing disaster relief." Catastrophic damages during 1993 prompted widespread buyouts of 7700 floodplain properties worth $56.3 million (Pinter, 2005). Criticisms of buyouts often focus on **institutional barriers** that limit their effectiveness and implementation. Some barriers that have been noted include:

- lag time in securing funds, following the disaster itself
- time and amount of paperwork involved
- overlapping or conflicting local, state and federal regulations

(Mileti, 1999; Fraser et al., 2003; Knobloch, 2005; Schwartz, 2005). Lag times are repeatedly noted as impediments to more widespread retreats from the floodplain following a disaster (Casagrande and Mcilvaine-Newsad, 2010). Some communities view buyouts as a form of social and economic erosion. Mitigation efforts are further complicated by potentially conflicting regulations. Well-intended state and federal regulations and policies create formidable obstacles for local leaders who must negotiate the pressing post-disaster demands of their community and their capacity to navigate complicated institutions (Kick et al., 2011; Mileti, 1999; Knobloch, 2005).

Previous successes and failures show that mitigation-based resilience requires four components, each of which we will analyze here in relation to the other as follows:

1) Mitigation is focused on communities at the greatest risk

2) Community support

3) Local leadership

4) State and federal guidance, regulations, constraints and resources

Snapshot of a community at risk: Brookport IL, population 1054 (2000 Census), is located on the Ohio R. floodplain. Brookport's levee was built in 1940 and has failed Corps and IL state inspections for 10 consecutive years (Martindale and Osman, 2010). We performed a Hazus-MH user-defined analysis for Brookport, showing that a 100-year flood today would damage 372 structures (nearly the entire town), with building losses alone topping $89.2 million, incl. damage to Brookport Elementary, fire station, police station, and town hall.

A recent FEMA map revision would revise the SFHA to include Brookport and adjoining areas. The town's total annual household income is $12,386,000 and median home values are <30% of the IL average. Brookport's resources are deemed insufficient to affect levee repairs either directly or through local cost-share.

The leadership of Brookport is aware of the local flood risk and the gross deficiencies of their levee. "*There's nothing that would be left if we have a major flood, nothing would be left here in Brookport*" (A. Copley; KFVS interview 2/25/09). We have met with Mayor Copley and believe that with outreach, support, and perhaps external financial inducements, Brookport would consider options such as a buyout-based retreat from its flood risk.

Socio-economic vulnerability

Our approach in this project is based on the hazards-of-place model of vulnerability (Cutter et al., 2003); in particular, how biophysical vulnerability interacts with social vulnerability to influence mitigation. Socioeconomic vulnerability is the lack of economic resources or social capital for accessing technology, infrastructure, or organizational expertise necessary to mitigate risk or cope with disaster when it occurs (Cutter et al., 2003). Within social vulnerability, we intend to clarify and quantify the influence of risk perception and socioeconomic vulnerability on mitigation. Cutter and others have identified 31 key variables that represent general human attributes like age, income, race, gender, and residential characteristics at the county level. Our fieldwork and mitigation planning in rural Illinois communities supports the importance of these variables (Casagrande and McIlvaine-Newsad, 2010). We will follow the methodology of Cutter et al. (2003), using principle components analysis to reduce Census data to a set of independent variables. Census data here will be aggregated at a finer scale than counties (Tate et al., 2010).

Perception of risk

Numerous studies have documented the importance of risk perception in mitigation behavior (e.g., Grothmann and Reusswig, 2006; Siegrist and Cvetkovich, 2000; Slovic, 1987; Terpstra et al., 2009). One assumption is that people who are at high risk of catastrophic disaster, but fail to perceive their risk as important, are unlikely to engage in disaster planning or meaningful mitigation. Our past research shows that some floodplain residents with strong socio-economic resources are unlikely to adopt comprehensive mitigation solutions like re-location. Instead, they attempt to downplay risk in their discourse. An important contribution of the research proposed here would be to include perceptions of risk and attitudes as a third variable set, along with physical exposure and socio-economic vulnerability, to predict community-scale mitigation potential. Structural equation modeling at the community level would address a current gap in knowledge about the psychological and social processes through which risk perceptions influence behavior. Failure to appreciate risk is complicated by variables beyond simple knowledge and understanding of risk. Paine (2001) and Ruck (1993) posit that risk is socially constructed. Decisions to rebuild in the same location after a disaster are weighed against unknown risks incurred from being relocated to a new and unfamiliar place (Oliver-Smith, 1986). Our past research indicates that an individual's perception of risk is influenced by how others talk about and behave toward risk, in addition to factual knowledge and personal experience. Structural equation modeling, in-depth analysis of interview data, and participant observation will provide a more comprehensive understanding of the causal relationships between these variables in the processes of developing attitudes toward mitigation.

Human behavioral theory

Attempts to model mitigation decisions often assume individual rational choice (e.g., Kick et al., 2011; MacDonald et al., 1987; Rashid et al., 2007). Our experience shows other concerns can override individual rational choice (Casagrande and McIlvaine-Newsad, 2010). Several interviewees in the 2008 flood study whose homes and/or farms were damaged by floods in 1960, 1993 and 2008 refused to move out of the floodplain. They fully understand this is a poor economic decision. Their emotional attachment to their floodplain land, family history on the land, sense of allegiance to others who will not relocate and tendency to direct blame to federal agencies override rational economic trade-offs. Some researchers have attempted to include both financial and emotional variables in their models (e.g., Kick et al., 2011). These are qualitatively different ways of thinking about reality and cannot be treated as psychological tradeoffs in a rational choice model. More recently, disaster mitigation researchers are turning to socio-psychological theory (e.g., Grothmann and Reusswig, 2006). The socio-psychological literature shows behavior is heavily influenced by what we think other people will do and how we want others to perceive us in addition to rational choices or perceptions of risk (McKenzie-Mohr and Smith, 1999; McKimmie et al., 2003; Mileti, 1999: 142). Our goal is to model these interactions based on sound behavioral theory.

Ajzen's theory of planned behavior (1985) provides a model of intention to engage in behavior that makes explicit the causal relationships between variables and accounts for social processes. It is one of the most widely used socio-psychological theories for explaining human behavioral intention, is supported by extensive empirical research, and explicitly accounts for the role of social (or subjective) norms (Kaiser et al., 1999). The theory of planned behavior states that action is preceded by perceived control over outcomes (self efficacy), attitude toward the behavior in question (including perceived value and likelihood of outcomes), and subjective norms (how we perceive others and want others to perceive us). Factual knowledge must precede attitude toward behavior and perceived control because it forms the basis for estimating likely outcomes. We have modified Ajzen's theory of planned behavior to also include the effect of perceived risk on attitudes toward mitigation behavior.

In our modeling, socio-political independent variables will include the following. **Attitudes toward mitigation behavior:** Attitudes toward behaviors are based on people's beliefs about outcomes, how strongly they value outcomes, and how they perceive their ability to achieve the outcomes (Ajzen, 1985). Attitude toward mitigation behavior is a quantifiable variable that directly influences intention to engage in mitigation. **Self-efficacy (perceived control):** People are less likely to engage in behaviors if they don't think their actions will make a difference or don't feel they have the capacity to achieve a desired outcome (Ajzen, 1985; Hines et al., 1986; Taylor, 1989). Grothmann and Reusswig (2006) found that perceived ability to perform activities influenced flood mitigation actions. We will include questions in our survey that allow us to quantify self-efficacy. **Factual knowledge:** Literature reviews clearly indicate that factual knowledge alone is insufficient for motivating behavior (Hines et al., 1986; Kaiser et al., 1999; Kollmuss and Agyeman, 2002). But knowledge forms the basis for estimating likely outcomes and therefore is a prerequisite for changing behavior (Ajzen, 1985; Hines et al., 1986; Kollmuss and Agyeman, 2002). **Attachment to place and community:** Our research (Casagrande and McIlvaine-Newsad, 2010) and the literature show that social responsibility and identity may conflict with needs to minimize risk (Ingles and McIlvaine-Newsad, 2007; Oliver-Smith, 1986; Paine, 2001; Ruck, 1993). **Subjective norms:** Behavior is significantly influenced by the perception a person has of social pressure to engage in a behavior (McKenzie-Mohr and Smith, 1999; Olli et al., 2001; Ajzen, 1985; McKimmie et al., 2003; Chen et al., 2009). In accord with the theory of planned behavior, our survey will include questions allowing us to measure the importance of subjective norms. **Problem orientation**: Several interviewees from the 2008 flood study (Casagrande and McIlvaine-Newsad, 2010) explicitly stated that they should not have to relocate because they did not create the "problem." People in activist networks spend considerable time and personal expense lobbying for changes in state and federal policy. **Financial loss**: Our interviews of flood victims reveal they fear financial losses. Several of them concluded after careful assessment it would be less risky to rebuild in the floodplain and pay higher flood insurance premiums than risk being undercompensated. **Commuting distance:** Interviews of flood victims in the 2008 Mississippi River flood study revealed the importance of commuting distance in decisions to relocate after the flood.

METHODOLOGY

Impacts of catastrophic flooding can be described as a combined function of three sets of determinants: **flood exposure** *(hydrology)*, **flood sensitivity** *(infrastructure in place on the floodplain)*, and **attitudes to flooding** *(human perceptions and potential actions before, during, and after a flood)* (McCarthy et al., 2001; Grothman and Reusswig, 2006). We propose a methodology that quantitatively integrates those three determinants within a spatially explicit framework. This project will involve six primary tasks:

(1) generate hydrologic metrics of flood vulnerability (*from hydraulic modeling and GIS and other geospatial data sources*)

(2) generate socioeconomic metrics of flood vulnerability (*from hydraulic modeling, Hazus-MH [risk assessment] modeling, and 2010 Census data*)

(3) generate socio-psychological metrics of perceptions of risk and attitudinal variables and impediments to mitigation *(large-scale mail survey, with surveys based on field-based ethnographic analysis)*

(4) synthesis of the components above within an integrated socio-hydrologic GIS model of vulnerability, perception, adaptation, and mitigation potential to catastrophic flooding

(5) structural equation modeling to test: (A) ability to predict pro-active mitigation, and (B) the potential and value for community-scale mitigation

(6) outreach targeted to 5 communities identified and prioritized in the model above

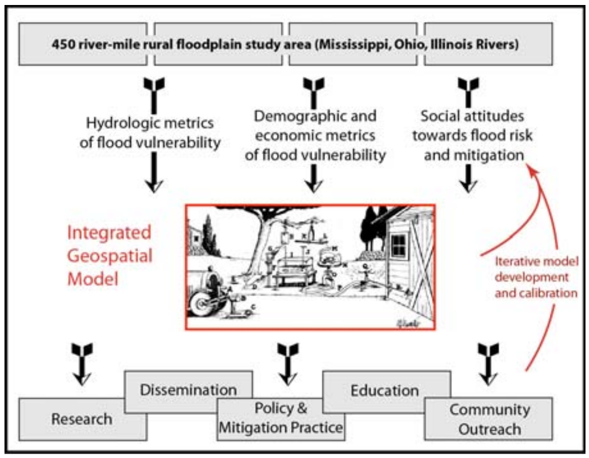

Figure 3. Schematic project flowchart. Detailed structure of the input variables and GIS-based geospatial model shown in Fig. 4 and outlined in the text.

We will quantify the exposure, sensitivity, existing adaptation to flooding, and perceptions and potential for flood-mitigation actions across our 450-RM, >12,600 km^2 study area. We will create a GIS-based geospatial model that integrates hydraulic modeling, flood-risk assessment derived from FEMA's Hazus-MH (see below), known floodplain infrastructure (levees), community demographics from 2010 Census data, and local attitudes towards flood risk and mitigation from large-scale surveys and detailed ethnography from 25 selected communities.

(1) Hydrologic metrics of flood vulnerability

The first element of our model will quantify vulnerability by using existing tools that focus on the first two of the determinants above (exposure and sensitivity). These determinants can be quantified using a range of physical and infrastructure-related GIS data as well as hydraulic modeling of the study area. Quantifiable metrics of flood hydrology and hydrology-based vulnerability include the following:

(A) topographic and hydrologic flood occurrence:
- frequency of overbank discharge,
- flood severity: distribution of inundation depths for 100-year event,
- floodplain topography: relief in/out of 100-year inundation area,
- temporal trends: magnification of flooding over time, • etc.

(B) structural flood protection (from new National Levee Database and SIU GIS databases [see text])
- design protection level (e.g., 50-year, 100-year) of levee system
- annual levee maintenance budget/kilometer
- identified deficiencies (USACE inspection reports)

(2) Socio-economic metrics of flood vulnerability

We suggest that two sets of socioeconomic factors are most likely to affect a community's level of vulnerability to flooding: (1) likely economic damages when and if a catastrophic-flood occurs, and (2) local income, commerce and other economic resources available for recovery, including mitigation activities. More specifically we intend to investigate the following quantifiable socioeconomic metrics and their influence on flood vulnerability:

(A) community characteristics (from 2010 census):
- population, • median age, • household income, • employment,
- under-represented populations

(B) community context
- commuter distance to major outside employers
- mean distance to retailers > e.g., 25,000 ft^2
- proximity to undeveloped non-floodplain land

(C) flood risk parameters (from Hazus-MH analysis):
- gross property value on floodplain,
- estimated flood losses ($damage, e.g. in 100-year flood),
- distribution of losses (%area, %structures, %occupancy class, etc.)
- past repetitive losses (from FEMA data).

To assist in determining appropriate socioeconomic elements, we will reference Cutter et al. (2003) and their developed Social Vulnerability Index (SoVI). The SoVI looked at 250 variables, and after testing for multicollinearity among variables and use of a factor analysis, Cutter et al. narrowed their social indicators to 42 independent variables. We will investigate each of these variables and see how they relate to socioeconomic characteristics that we determine as essential in our flood vulnerability model.

We will use Hazus-MH to extract socioeconomic characteristics for our study area. Hazus-MH is a GIS-based software application that comprises a series of models for estimating potential losses from floods, earthquakes, and hurricanes on regional scales. Hazus-MH was released by FEMA in February 2004. The software is widely used for natural hazards mitigation and decision-making in the U.S. (Schneider and Schauer, 2006; Scawthorn et al., 2006a). The Hazus-MH flood-loss model is designed to identify and quantify estimated damage and other losses from riverine and coastal flooding through hydraulic analysis and flood-loss estimation. Depending on the availability of local data and the degree of user expertise and effort, the Hazus-MH flood model can be run at three levels: I, II, and III. A Level I analysis is based mostly on out-of-the-box input data provided with the software. A Level II analysis improves flood-loss estimates by considering additional local data such as local hazard data, inventory, updated demographics (i.e., 2010 Census data), or site-specific damage curves. A Level III analysis incorporates results from engineering or economic studies using customized analyses and input data not included with Hazus-MH, such as user-run hydraulic modeling (Scawthorn et al., 2006a; Scawthorn et al., 2006b). We propose to use a Level III analysis, using data from our hydraulic modeling in step 1 and local data to extract socioeconomic characteristics for the study area.

(3) Perceptions of risk, attitudinal variables, and impediments to mitigation

Socio-psychological metrics of risk perceptions and attitudinal variables will be based on survey data from 25 communities in the study area, and those surveys will be developed based on ethnographic analysis in four "training" communities with histories of damaging floods.

The goals of the ethnographic analysis are to: 1) design survey questions about risk; 2) design survey questions that will inform attitudinal variables; 3) verify other attitudinal variables that may contribute to or impede mitigation; and 4) identify non-quantifiable social processes that impede or contribute to mitigation and pre-disaster planning. The ethnographic analysis will include participant observation, focus groups, and in-depth interviews in four Illinois communities that have experienced extensive flooding within the past 20 years. The four communities represent a diversity of pro-active mitigation and stage of disaster recovery. Valmeyer, IL is a community that successfully relocated off the floodplain after floods in 1993. Keithsburg, IL was flooded in 1993 and 2008 and has attempted pro-active mitigation, including relocation, with mixed results. Meyer, IL was completely inundated in 1963, 1993, and 2008. Comprehensive pro-active mitigation has never been attempted in Meyer. Olive Branch, IL was flooded in 2011 and is currently attempting to develop a pro-active mitigation plan. Two teams (McIlaine-Newsad and student assistant and Casagrande with student) will each work in two communities. Our research team already has extensive experience working in these four communities and has developed strong relationships with community members. One team member, Dennis Knobloch, was the mayor of Valmeyer and orchestrated its relocation after 1993.

We will conduct two focus-group interviews in each community. Participants will be shown maps and flood scenarios to stimulate discussion about risk and mitigation. Conversation will be loosely structured around a set of pre-prepared questions and also include probe questions and interviewer paraphrasing of interviewee statements (Kempton et al. 1995). All discourse will be audio-recorded for full transcription and thematic content analysis. From the focus group discourse, we will develop questions for subsequent, semi-structured, in-depth interviews with individuals identified at focus groups or through our knowledge of the communities. These interviews will also be audio recorded and transcribed. We will use thematic content analysis to identify primary themes and metaphors residents use to think and talk about risk. The software we will use for thematic coding is NVivo 9 (Gibbs, 2002).

We will use participant observation to map the process by which leaders adapt to perceptions of risk and mitigation, paying particular attention to 1) the sources of information they focus on, 2) past experience with bureaucratic institutions, and 3) concerns of constituents. We will supplement our field analysis with an extensive review of local, state and federal guidelines, and the literature on regulations or policies that impact mitigation. In the event our statistical models fail to predict pro-active mitigation, these qualitative data will yield crucial explanatory insights.

Thematic analysis of transcriptions will allow us to develop survey questions worded specifically for our study participants (Kempton et al., 1995). We will use structured questionnaires to quantify level of concern about risk and commitment to attitudes in 25 floodplain communities randomly selected from each of the four river reaches. Respondents will rank responses to statements using a 4-point Likert scale (strongly agree, somewhat agree, somewhat disagree, strongly disagree). Respondents might be asked: "How well do you agree with the following statement: 'I'm concerned I might loose my home in a flood'? or "I'm concerned I might loose money if I relocate my house." We will also include a section on background characteristics including gender, income, and occupation, and ask respondents to share their thoughts in their own words. We will limit the questionnaire to about 60 questions and ensure that it takes no more than 30 minutes to complete. The survey instrument will be pre-tested with a focus group in one of the four ethnographic communities.

Our goal is to link individual-level responses to geo-spatial data in 25 communities. A list-based sample will be used to obtain names and addresses for 7,200 residents selected from the 25 communities from *Survey Sampling, Inc*. To achieve a random sample, the cover letter will instruct respondents with the "next birthday" to complete the questionnaire, a very common technique for household sampling (Dillman, Smyth, and Christian 2009). Our goal is to have at least 100 responses per community to allow for comparisons among communities and within communities. In cases where communities have less than 100 residents, we will canvass the entire town. Simple random sampling will be utilized in communities with greater than 100 residents. We will distribute 7,200 questionnaires to obtain 2,500 responses with a 35% response rate. No financial incentive will be provided. It is our experience that people are eager to express their opinions on this topic and previous surveys in this region yield response rates between 30% and 50%. Responses from each community will yield a 10% margin of error and the overall margin of error for the survey will be less than 3%. By incorporating community-level data with individual-level survey data, we will be able to disaggregate variance explained at each level of analysis. That is, we can examine the direct and interactive effects of individual-level characteristics that impact risk assessment, community conditions that impact risk assessment, and how those factors may interact to produce risk-related decisions. Our study will be one of the few to quantify the degree to which community conditions impact individual-level decision-making.

The questionnaire will be prepared, printed and mailed by the Western Survey Research Center (WSRC). Located on WIU's campus, WSRC has extensive experience with large-scale surveys on rural social issues, which will increase the speed and accuracy of the survey process. WSRC will develop the survey, prepare the address-based sample, handle all mailing, and monitor returns. Postcard reminders will also be mailed. Mail surveys are less expensive to administer than telephone surveys and can provide similar response rates. They are especially relevant in rural populations where residents are more likely to have their addresses listed.

(4) GIS modeling of vulnerability, perception, adaptation, and mitigation potential to catastrophic flooding

The three major input parameter sets above (hydrological, socio-economic, and perceptual) will be integrated in a spatially explicit multivariate statistical model implemented in a GIS. The SIU team has extensive experience using GIS and, more specifically, in modeling complex, large, and seemingly disparate data sets within a GIS framework (e.g., Pinter et al., 2008, Pinter et al., 2010, Heine and Pinter, 2011; Pinter and Vestal, 2005; Ellison et al., in press; etc.). In logistic regression modeling, for example (e.g., Pinter and Vestal, 2005), independent variables can be numerical, categorical, or Boolean, and the regression model produces the log odds of a particular outcome for conditions at any point within the study area, given the overlapping conditions (e.g., flood recurrence, levee protection level, median family income, etc.) at each location. GIS-based implementation of such models is ideal because both input data (e.g., median age by census block. etc.) and output variables are geospatially explicit and typically easily and effectively visualized in map format.

We propose to develop at least three output variables (more possible following development of the model):

- an Index of Flood Vulnerability (IFV)
- an Index of Community Resilience (ICR)
- for communities with high vulnerability and/or low resilience, an Index of Mitigation Potential (IMP)

For the IFV, our GIS model will integrate the input metrics (hydrology, socio-economics, and perceptions) to characterize the magnitudes and extent of vulnerability throughout the study area. For illustration purposes, the input metrics can be subdivided into five categories using a GIS overlay analysis (Figure 4). The resulting IFV will be shown on a map of vulnerability, either a continuous raster of the study area or subdivided by geographic boundary (e.g., aggregated by census block). Generalized input data and sources and their associated tools are listed in Table 1.

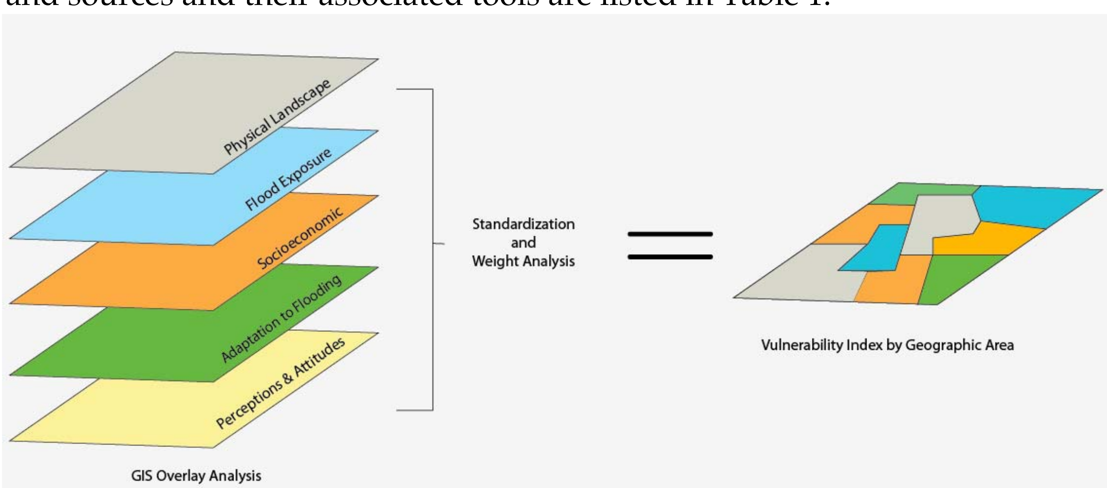

Figure 4 (above) and Table 1 (below).

Vulnerability Parameters	Specific Elements	Tools	Data Sources and/or Comments
Physical Landscape	• floodplain and surrounding topography • 100- and 250-year flood extents and depths; • levee	Hec-RAS, Hazus-MH, ArcMap	DEMs, DFIRMs, Flood frequency analyses (USACE), National Levee Database

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	extents and protection levels		
Flood Exposure	• number of at-risk structures • gross property value on floodplain • distribution of losses (see text)	Hazus-MH, ArcMap	Local assessor's data (where available), critical infrastructure, default Hazus-MH aggregate data
Socio-Economic Characteristics	• age distribution • population • employment • family incomes [see text for others]	Hazus-MH, ArcMap	2010 Census data, Hazus-MH aggregate data, American FactFinder, SocioEconomic Profiles
Perception and Attitudes	• perception of risk • problem orientation • self-efficacy • attachment to place [see text for others]	Survey questionnaire	Survey questions developed through ethnographic research, survey managed by WIU Survey Research Center
Adaptation to Flooding	• past repetitive losses • FEMA-funded flood-mitigation projects (# of projects, impact, cost)	ArcMap	FEMA repetitive loss data files, Mitigation project documentation from IEMA

To cohesively compare parameters and model IFV, we will normalize each metric using guidelines from Karmakar et al. (2010) and Wu et al. (2002), as follows:

$$V_i = \frac{V_i - V_{min}}{V_{max} - V_{min}}$$

where V_{min} and V_{max} are minimum and maximum values of the indicator for all geographical boundaries, V_i is the actual value for that boundary. Subsequently, to determine the most influential parameters on vulnerability, we will use multivariate regression analysis to identify significant independent variables (vulnerability elements), weighting functions, and equation structure that best predict the outcome. To calibrate and verify the resulting IFV, we will compare actual versus the perceived risk of flooding using multivariate analysis, potentially structural equation modeling following the Bayesian approach (Tatano, 1999; Viscusi, 1990; Lee, 2007; Terpstra, 2011). Actual vulnerability has been defined as a function of (1) susceptibility to flooding as defined by hydraulic studies and (2) flood exposure (cost of infrastructure and other potential socioeconomic losses). Perceived vulnerability is determined using the survey method to calculate the perception and attitudes towards flooding and mitigation.

The ICR will be calculated by overlaying a range of parameters that predict communities that have a high ability to avoid or recover from flood disasters (Bruneau et al., 2003; Chang et al., 2004). Quantifying resiliency is challenging because of its case-dependency (Cutter et al., 2008; Bruneau et al., 2003; Chang et al., 2004). To do so, we suggest Bruneau et al.'s methods of breaking down resiliency into four categories and running Monte Carlo simulations: technical, organizational, social, and economic (Bruneau et al., 2003; Chang et al., 2004). The performance measurement for each category will be determined upon further analysis. However, we anticipate that these measurements will include metrics of: personal and community income, leadership (whether government or private), age distribution, economic activity (e.g., high employment rates, steady family income, strong commercial activity), etc.

The IMP will be calculated similarly. Whereas substantial research has been published on disaster resilience, little work has been done specifically characterizing mitigation potential in disaster-affected communities. A major goal of the ethnographic analysis in step 3 above – involving research in communities in various stages of recovery from past disasters – will be to inform and guide the determination of IMP here. In addition to survey data, additional potential data sources include FEMA and state (IEMA) records of previous track records of mitigation activity in communities in the study area. These data may be used as an additional input parameter (independent variable) in constructing the model, or alternatively as a separate data set for validation. Similarly, we propose to test whether repetitive losses (available from FEMA or IEMA to universities under selective conditions) may be useful for quantifying mitigation potential.

(5) Structural equation modeling

We will use structural equation modeling (Kline, 2005) to predict pro-active mitigation potential. The unit of analysis is the community, because decisions are made at the community level. A political unit cannot mitigate without community approval, and our research and the socio-psychological literature point to a "critical mass" effect on mitigation behavior. The weighted vulnerability parameters produced by the geospatial tool will be treated as independent variables describing each of the 25 communities and modeled using LISREL for Microsoft Windows. Our dependent variable is pro-active mitigation quantified as a scale of 0.0 to 1.0 derived from FEMA repetitive loss data files and mitigation project documentation from IEMA. The model will be evaluated using the maximum likelihood estimation method (Kline, 2005: 112). The model will allow us to estimate the magnitude of causal linkages between variables. Relationships between variables will only be considered significant at the $p = 0.05$ level or less, and R-square values will indicate relative strength of relationships between variables.

(6) Community outreach

"To motivate residents in flood-prone areas to take their share in damage prevention, it is essential to communicate not only the risk of flooding and its potential consequences, but also the possibility, effectiveness and cost of precautionary measures" (Grothmann and Reusswig, 2006). We propose to conduct outreach programs in five communities identified and prioritized by the model developed here. This effort will be spearheaded by co-PIs Pinter and Knobloch. Pinter has presented numerous lectures on natural disasters and mitigation in small towns across Illinois as part of his FEMA-funded work, and Dennis Knobloch has lectured widely and met with local officials contemplating large-scale mitigation options and community relocation. Pinter, Knobloch, and staff researcher Ellison have also been working with the town of Olive Branch is its efforts to move off the floodplain following the 2011 Mississippi River flood.

As part of this outreach, we will inform community leaders about governmental and non-governmental sources of funding for hazard mitigation, including novel solutions like community relocation. Post-disaster recoveries at present focus almost exclusively on governmental resources such as flood insurance payouts from the NFIP. There is extensive interest among environmental NGOs to purchase conservation, wetlands, and inundation easements. Such benefits include potentially large reductions in flood levels for neighboring stretches of river, reconnection of channel to floodplain environments, wetland habitat restoration, nutrient and carbon sequestration, preservation of agricultural and other open space, promotion of green infrastructure, installation of alternative energy sources, innovations in small-town planning, etc. (e.g., Opperman et al., 2009; Sparks and Spink, 1998; Costanza et al., 1997; see "Broader Impacts"). Ideally, these outreach activities would spark pre-disaster planning in those communities and lead to the kind of active and meaningful – pro-active – mitigation measures that most researchers and practitioners agree is the path to community resilience.

BROADER IMPLICATIONS

This research will help fill gaps in our theoretical understanding of community vulnerability and impediments to mitigation by identifying the importance and causal pathways of physical risk socio-economic vulnerability, knowledge, self-efficacy and perception of risk. We will also document the way people think and talk about these in order to identify practical intervention policies. To our knowledge, no study has attempted to synthesize these processes in a comprehensive model. The three indices proposed here – vulnerability (IFV), Resilience (ICR), and mitigation potential (IMP) – hopefully will serve as useful tools in disaster research, preparedness, and response.

We envision this research as a **springboard to real-world advances in rural mitigation and disaster resilience**. This project will promote public awareness of flood risk and foster mitigation efforts in some of the nation's most at-risk communities on the Mississippi, Illinois, and Ohio River floodplains. Past mitigation successes and past failures highlight that many, perhaps most, problems in the mitigation process are linked to either (1) time delays or other issues associate with their ad hoc, post-disaster nature, or (2) the real threat posed to floodplain communities by piecemeal erosion of population and economic base. We suggest that these problems could be dramatically reduced if such initiatives were rigorously planned in advance, and implemented as the wholesale community scale. The focus of the project is mitigation planning and impediments to mitigation *in advance* of future damaging floods. As practical outcomes, this project is intended to study, inform, and stimulate mitigation efforts on rural U.S. floodplains by providing lessons in resilience-building and by providing models for pro-active mitigation planning.

DISSEMINATION OF RESEARCH RESULTS

Research results will be disseminated to municipal, regional, state, and federal governing bodies as well as at technical conferences and journal publications spanning several different disciplines. Research results will also be reported back to panels of participants, as well as integrated into state policy, providing an outstanding opportunity to address issues of social justice and human quality of life in long-term planning. At the national level, reports will be presented to FEMA. We will also meet and discuss research results with municipal governments, state legislators and U.S. legislators. Funds have also been budgeted for travel to 2-3 scientific conferences and for page charges for at least 2-3 journal articles in the social science, hazards, planning, floodplain management, and/or public policy literature.

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Smith, G., 2009. Planning for sustainable and disaster resilient communities. In J. Pine (Ed.), Hazard Analysis, pp. 221-247. Washington, D.C.: Taylor Francis.

Sparks, R. E. and J.B. Braden, 2007. Naturalization of developed floodplains: An integrated analysis. Universities Council on Water Resources, 136: 7-16.

Sparks, R.E., and A. Spink, 1998. Disturbance, succession and ecosystem processes in rivers and estuaries: effects of extreme hydrological events. Regulated Rivers: Research and Management, 14: 155-159.

Strauss, C., 2005. Analyzing discourse for cultural complexity. In: Quinn, N. (Ed.), Finding Culture in Talk: A Collection of Methods. Palgrave Macmillan: New York, pp. 203-242.

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Tate, E., S.L. Cutter, et al., 2010. Integrated multihazard mapping. Environment and Planning B: Planning and Design 37(4): 646-63.

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Terpstra, T., M. K. Lindell, et al., 2009. Does Communicating (Flood) Risk Affect (Flood) Risk Perceptions? Results of a Quasi-Experimental Study. Risk Analysis 29(8): 1141-55.

Terpstra, T., 2011. Emotions, Trust, and Perceived Risk: Affective and Cognitive Routes to Flood Preparedness Behavior. Risk Analysis, 31: 1658-1675.

Thieken, A.H., H. Kreibich, M. Müller, and B. Merz, 2007. Coping with floods: Preparedness, response and recovery of flood-affected residents of Germany in 2002. Hydrological Sciences–Journal des Sciences Hydrologique, 52: 1016-1037.

Tobin, G.A., 1995. The levee love affair: A stormy relationship? Water Resources Bulletin, 31: 359-367.

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Ward, J.V., and J.A. Stanford, 1995. Ecological connectivity in alluvial river ecosystems and its disruption by flow regulation. Regulated Rivers: Research and Management, 11: 105-119.

Warner, J. et al., 2002. Public Participation in Disaster-Prone Watersheds: Time for Multi-Stakeholder Platforms? Paper for the Water and Climate Dialogue. Wageningen University, The Netherlands.

Wasserman, S., and K. Faust, 1994. Social Network Analysis: Methods and Applications. Cambridge University Press: Cambridge, UK.

West, J., 2010. Personal Communication with Heather McIlvaine-Newsad. Peace Corps Fellows Workshop. Macomb, IL February 19.

Wisner, B. et al., 2004. At Risk: Natural Hazards, People's Vulnerability, and Disasters, Second Edition. Rutledge: New York.

Wu, S.Y., et al., 2002. Vulnerability of Coastal Communities to Sea-Level Rise: A Case Study of Cape May County, New Jersey, USA. Climate Research, 30: 255-270.

Yen, B.C. 1995. Hydraulics and Effectiveness of Levees for Flood Control. Paper presented at: U.S.- Italy Research Workshop on the Hydrometeorology, Impacts, and Management of Extreme Floods, November 1995.

Yin, Y., 1998. Flooding and forest succession in a modified stretch along the Upper Mississippi River. Regulated Rivers: Research and Management, 14: 217-225.

NICHOLAS PINTER
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Southern Illinois University
Carbondale, IL 62901-4324
(618) 453-7375
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A. Professional Preparation

1988 - 1993 PhD., Geology, University of California, Santa Barbara
1986 - 1988 M.S., Geology, Penn State University, Univ. Park, PA
1982 - 1986 B.A., Geology and Archaeology, Cornell University, Ithaca, NY

B. Appointments

1996 - Full (since 2005) Professor, Southern Illinois University
Author: Prentice Hall and John Wiley & Sons
1995 - 1996 Postdoctoral Researcher, Yale University

C1. Related Publications

Remo, J.W.F., M. Carlson, N. Pinter, 2012. Hydraulic and flood-loss modeling of levee, floodplain, and river management strategies, Middle Mississippi River, USA. Natural Hazards, in press.

Flor, A.D., N. Pinter, and J.W.F. Remo, 2011. The ups and downs of levees: GPS-based change detection, Middle Mississippi River USA. Geology, 39: 55-58.

Pinter, N., A.A. Jemberie, J.W.F. Remo, R.A. Heine, and B.A. Ickes, 2010. Empirical modeling of hydrologic response to river engineering, Mississippi and Lower Missouri Rivers. River Research and Applications, 26: 546-571.

National Research Council, 2010. Missouri River Planning: Recognizing and Incorporating Sediment Management. National Academy Press: Washington, DC.

Pinter, N., 2005. Policy Forum: One step forward, two steps back on U.S. floodplains. Science, 308: 207-208.

C2. Other significant publications

Heine, R.A., and N. Pinter, 2011. Levee effects upon flood levels: An empirical assessment. Hydrological Processes, doi: 10.1002/hyp.8261

Pinter, N., 2010. Historical discharge measurements on the Middle Mississippi River, USA: No basis for "changing history." Hydrological Processes, 24: 1088-1093.

Remo, J.W.F., N. Pinter, and R.A. Heine, 2009. The use of retro- and scenario- modeling to assess effects of 100+ years river engineering and land cover change on Middle and Lower Mississippi River flood stages. Journal of Hydrology, 376: 403–416.

Remo, J.W.F., N. Pinter, B. Ickes, and R. Heine, 2008. New databases reveal 200 years of change on the Mississippi River System. Eos, 89(14): 134-135.

Pinter, N., A.A. Jemberie, J.W.F. Remo, R.A. Heine, and B.S. Ickes, 2008. Flood trends and river engineering on the Mississippi River system, Geophysical Research Letters, 35, L23404, doi:10.1029/2008GL035987.

D. Synergistic Activities

E.U. Marie Curie Fellowship: 2010, Stockholm University

Panelist, National Research Council: Sediment management, Missouri River basin: Water Sciences and Technology Board

Convener, American Association for the Advancement of Science Workshop: Managing rivers and floodplains for the new millennium. AAAS national meeting, 2006.

NATO Advanced Research Workshop (Convener): The Adria microplate: GPS geodesy, tectonics, and hazards. Veszprém, Hungary; April, 2004.

Pardee Keynote Symposium (Convener): Pinter, N., and J.F. Mount, 2002, Flood Hazard on Dynamic Rivers: Human Modification, Climate Change, and the Challenge of Non-Stationary Hydrology. Geological Society of America national meeting, 2002.

E. Collaborators and Other Affiliations

[i] Collaborators during last 4 Years

Gabor Bada
Helge Bormann
Simon Elfert
Phillip Gans
Mathias Gieska
Gyula Grenerczy
Reuben Heine
Gunnnar Hoefer
Brian Ickes
Scott Ishman
Bjorn Johns
Susann Lueddecke-Pinter
Damir Medak
Kenneth Miller
Peter Schweigert
Christopher C. Sorlien
Seth Stein
Rienk R. van der Ploeg
W. Dean Vestal
John C. Weber
Joseph H. Wlosinksi

[ii] Graduate Students

Constanza Casanova
Steven Cochran
Andrea Heady
Reuben Heine
Brian Ickes
Brandy Little
Kenneth Miller
Samantha Hayes
Emily Molander
Andrew T. Scott
Russell Thomas
Quentin Vandal
W. Dean Vestal
Christopher Williams
Yuang Hong
Anne Hayden
Andrew Podoll
Simon Elfert
Megan Carlson
Elizabeth Evanoff
Jennifer Diereuer
Devin Mannix
Stephanie Jarvis

[iii] Graduate and Post Doctoral Advisors

Mark Brandon, Yale University, Post-doctoral advisor
Edward Keller, U.C. Santa Barbara, PhD advisor
Thomas Gardner, formerly of Penn State University, M.S. Advisor
Teresa Jordan, Cornell University, B.A. Advisor

ELIZABETH J. ELLISON
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A. Professional Preparation

2004 – 2008	B.A., International Studies – Geography, University of Wisconsin – Eau Claire
2008 – 2010	M.A., Geography, Miami University, Ohio

B. Appointments

2010 -	Researcher and Project Manager at Southern Illinois University - Carbondale

C1. Related Publications

No current related publications

C2. Other significant publications

Ellison, E.J., N. Pinter, 2011. Using HAZUS-MH in Pro-Active Mitigation of Flood Risk. Association of American Geographers, 107th (2011) Annual Meeting, Seattle, W.A., April 12-16.

Ellison, E.J. and W.H. Renwick, 2010. Synthetic flow histories of Ohio reservoirs. Report to the ODNR, Division of Wildlife.

D. Synergistic Activities

Curriculum editor, HAZUS-MH: 2011, writing new curriculum for the new release of HAZUS-MH, hazard loss estimate software. Collaborating with The Polis Center, IUPUI.

Professional certificate, HAZUS-MH: 2010, received training to reach professional certification from HAZUS-MH & FEMA.

Facilitator, Conference Discussion: 2007, Armed Conflict in the 21st Century: Lessons from Rwanda, Darfur and Bosnia, Americans for Informed Democracy

E. Collaborators and Other Affiliations

[i] Collaborators during last 4 Years

Robbyn Abbitt	Kevin Mickey	William H. Renwick
John Buechler	Stephanie Morrice	Jonathan Remo
Jon Denlinger	Nicholas Pinter	
Scott Hale	Monica Rakovan	

[ii] Graduate Students

No graduate students

[iii] Graduate and Post Doctoral Advisors

Nicholas Pinter, Southern Illinois University
William H. Renwick, Miami University, M.A. Advisor
Jerry Green, Miami University, M.A. committee
Jason Rech, Miami University, M.A. committee
Doug Faulkner, University of WI – Eau Claire, B.A. Advisor
Harry Jol, University of WI – Eau Claire, B.A. Advisor
Ingolf Vogeler, University of WI – Eau Claire, B.A. Advisor

DENNIS M. KNOBLOCH
P.O. Box 136
210 West Woodland Ridge
Valmeyer, IL 62295
618-935-2142
Knobloch@htc.net

A. Professional Preparation

1975 B.S., Education from Southern Illinois University - Edwardsville

B. Appointments

1989 - 1995 Mayor of Valmeyer, Illinois
1997 - County Clerk & Recorder – Monroe County, Illinois
1997 - Valmeyer Village Administrator

C. Related Publications

Knobloch, D.M., 2005. Moving a Community in the Aftermath of the Great 1993 Midwest Flood. Journal of Contemporary Water Research and Education, 130: 41-45.

D. Synergistic Activities

Participant, "NACO Peer to Peer Exchange Program: 1996-1997, worked with the following communities affected by flooding:

- Marlinton, W.V./Pocahontas County – following flooding of the Greenbrier River
- Grand Forks, N.D. – following flooding of the Red River
- East Grand Forks, N.C. – following flooding of the Red River
- Devils Lake, N.D. – following flooding of Devils Lake

President Clinton's Council on Sustainable Development: 1996, Presidential Award for relocation of Valmeyer following the 1993 Midwest floods

East West Gateway Council on Governments: 1996, received award for orchestrating the Valmeyer recovery and relocation project, St. Louis, MO

Participant, "Creating a Sustainable Development Toolbox for Disaster Affected Communities": 1994, Racine, Wisconsin

Earth Day Participant with President Bill Clinton: 1994, Meridian Hill Park, Washington, D.C.

Testimony before U.S. Senate: November 1993, testifying before the Subcommittee on the Environment and Public Works regarding the 1993 Mississippi River flooding in the Midwest.

E. Collaborators and Other Affiliations

[i] Affiliations

Vice-President, Valmeyer Community Heritage Society

Biographical Sketch: David G. Casagrande

I. Professional Preparation

Southern Connecticut State University	Geography	B.Sci.	1984
Yale School of Forestry and Environmental Studies	Forest Science	M.F.Sci.	1996
University of Georgia	Cultural Anthropology	Ph.D.	2002
Arizona State University (Postdoctoral Associate)	Human Ecosystems	2003-2005	

II. Appointments

2012-present	Associate Professor, Lehigh University
2009-2012	Associate Professor, Western Illinois University
2005-2009	Assistant Professor, Western Illinois University
2003-2005	Post-doctoral Research Associate, Central Arizona-Phoenix Long-Term Ecological Research Program, Arizona State University
Spring 2003	Visiting Instructor, Department of Anthropology, Appalachian State University
1996 – 1997	Staff Ecologist & Policy Analyst, Center for Coastal & Watershed Systems, Yale School of Forestry & Environmental Studies
1986 – 1993	Policy Analyst, Connecticut Department of Transportation
1984 – 1986	Transportation Planner, South Central Council of Governments (Connecticut)

III. Publications

i. publications most closely related to the proposed project

Larson, K. L., D. G. Casagrande, S. Harlan, & S. Yabiku. 2009. Residents' yard choices and rationales in a desert city: Social priorities, ecological impacts, and decision tradeoffs. *Environmental Management* 44 (5): 921-937.

Casagrande, D.G., & M. Vasquez. 2009. Restoring for cultural-ecological sustainability in Arizona and Connecticut. Pp. 195-209 in Marcus Hall (Ed.), *Restoration and History: The Search for a Usable Environmental Past*. New York: Routledge.

Haenn, N., and D. G. Casagrande. 2007. Citizens, Experts, and Anthropologists: Finding Paths in Environmental Policy. *Human Organization* 66(2):99-102.

Rands, G., B. Ribbens, D. Casagrande, and H. McIlvaine-Newsad. 2007. Envisioning an ecologically sustainable society: An ideal type and an application. Pp. 22-59 in S. Sharma, M. Starik and B. Husted (Eds.), *Organizations and the Sustainability Mosaic: Crafting Long-Term Ecological and Societal Solutions*, Edward Elgar Publishing.

Cook, W., D. Casagrande, D. Hope, P. M. Groffman, and S. L. Collins. 2004. Learning to roll with the punches: Adaptive experimentation in human-dominated systems. *Frontiers in Ecology and the Environment* 2(9): 467-474.

ii. other significant publications

Yabiku, S., D. G. Casagrande and E. Farley-Metzger. 2008. Preferences for landscape choice in a Southwestern desert city. *Environment and Behavior* 40: 382-400.

Hope, D., C. Gries, D. Casagrande, C. L. Redman, N. B. Grimm, and C. Martin. 2006. Drivers of spatial variation in plant diversity across the Central Arizona-Phoenix ecosystem. *Society and Natural Resources* 19(2):101-116.

Casagrande, D. G. 2004. Conceptions of primary forest in a Tzeltal Maya community: Implications for conservation. *Human Organization* 63(2):189-202.

Stepp, J. R., E. C. Jones, M. Pavao-Zuckerman, D. Casagrande, and R. K. Zarger. 2003. Remarkable properties of human ecosystems. *Conservation Ecology* **7**(3): 11

Casagrande, D. G. 1999. Information as verb: Re-conceptualizing information for cognitive and ecological models. *Journal of Ecological Anthropology* 3:4-13.

IV. Synergistic Activities

Casagrande has integrated ecological and social science principles and methods into several interdisciplinary research projects. 1) In his post-doctoral research at the Central Arizona - Phoenix LTER, he worked with ecologists, meteorologists and sociologists to develop a controlled, experimental manipulation of 30 household landscapes to study effects on residents' ecological knowledge, perceptions and social interaction. 2) Between 1995 and 1997 Casagrande led a team of researchers at Yale University studying wetland restoration as a process of which humans were an integral part, and edited a published volume on the subject with contributions from team members in 1997. 3) Between 2006 and 2008 Casagrande collaborated with business management specialists to study the effects of migration from the Republic of the Marshall Islands on environmental sustainability. 4) Professional experience as a policy analyst combined with interdisciplinary teamwork has enabled Casagrande to effectively integrate social science into public policy. Casagrande's current research on the 2008 Mississippi floods is integrated into state and federal policy at the request of the governor. Other examples include forest conservation in Chiapas, Mexico, and integrating folk ecological knowledge and cultural models into water policy decisions in Phoenix, Arizona. In 2007, Casagrande (with Dr. Nora Haenn) guest-edited a special issue of *Human Organization* dedicated to anthropology and public policy. 5) Casagrande's service to the broader scientific community includes serving as editor-in-chief of the *Journal of Ecological Anthropology* from 1999-2003. He is currently production editor of the *Journal of Ecological Anthropology*, associate editor of the *Journal of Ethnobiology & Ethnomedicine* and topical editor of environmental anthropology and human ecology for the wiki-based *Encyclopedia of Earth*. He is a founding member of the Society for Anthropological Sciences. Among other conference activities, he chaired a special session on "Manipulative experiments with in situ human subjects" at the first General Scholarly Meeting of the Society for Anthropological Sciences, co-organized a session on human ecosystems at an annual meeting of the Ecological Society of America, and was presidential session chair and co-organizer of a session dedicated to Gregory Bateson at the Annual Meeting of the American Anthropological Association in 2004. 6) To more effectively bring social science into the classroom, Casagrande requires undergraduate students to conduct original research. Casagrande co-teaches ethnobotany with a biologist. Students in this course integrate Western scientific principles with indigenous ways of knowing using plants as a common denominator. As a member of the advisory board and curriculum committee for Western Illinois University's Institute of Environmental Studies, Casagrande also advocates for an interdisciplinary, science-based, environmental curriculum that includes social sciences.

V. Collaborators & Other Affiliations

i. Collaborators and Co-Editors: William M. Cook (St. Cloud State University), Corinna Gries (Arizona State University), Nancy B. Grimm (Arizona State University), Nora Haenn (Arizona State University), Diane Hope (Arizona State University), Eric C. Jones (University of North Carolina at Greensboro), Christopher Martin (Arizona State University), Heather McIlvaine-Newsad (Western Illinois University), Gordon Rands (Western Illinois University), Charles L. Redman (Arizona State University), Barbara Ribbens (Western Illinois University), Michael Vasquez (Northern Arizona University), Scott Yabiku (Arizona State University), Rebecca Zarger (University of South Florida)

ii. Graduate and Postdoctoral Advisors: Steven R. Beissinger (University of California, Berkeley), Brent Berlin (University of Georgia), Charles L. Redman (Arizona State University)

iii. Thesis Advisor and Postgraduate-Scholar Sponsor: None

Biographical Sketch: Heather L. McIlvaine-Newsad

I. Professional Preparation

Denison University	German	BA	1990
Universität Heidelberg	German	Certificate	1988-1989
Ohio University	International Studies	MA	1995
University of Florida	Cultural Anthropology	PH.D.	2000

II. Appointments

2009-present	Full Professor, Western Illinois University
2004-2009	Associate Professor, Western Illinois University
2000-2004	Assistant Professor, Western Illinois University

III. Publications

i. publications most closely related to the proposed project

Ingles, P. and H. McIlvaine-Newsad. (2007) Any Port in the Storm: The Effects of Hurricane Katrina on Two Fishing Communities in Louisiana. *NAPA Bulletin 28: Anthropology and Fisheries Management in the United States: Methodology for Research Issue.*

Rands, G., B. Ribbens, D. Casagrande, and H. McIlvaine-Newsad. 2007. Envisioning an ecologically sustainable society: An ideal type and an application. Pp. 22-59 in S. Sharma, M. Starik and B. Husted (Eds.), *Organizations and the Sustainability Mosaic: Crafting Long-Term Ecological and Societal Solutions*, Edward Elgar Publishing.

McIlvaine-Newsad, H. and M. J. Clark. 2006. Community Health Mapping: Participation, Collaboration and Positive Outcomes. *Public Health Practice in Illinois*. Volume 6, Number 2, pp. 41-48.

McIlvaine-Newsad, H., M. Dougherty, and A. Sullivan. 2003. Operationalizing the Household Timeline. *Field Methods.* Vol. 15, No. 3, pp. 305-317.

McIlvaine-Newsad, H. 2003. Ojalá que llueve algo en el campo: Cultural Influences of Developement. *International Journal of Agricultural Resources, Governance and Ecology*, Vol. No. 2, pp. 153-166.

ii. other significant publications

Martinelli-Fernandez, S., L. Baker-Sperry, and H. McIlvaine-Newsad, (Eds.) 2009. "Interdisciplinary Views on Abortion: Essays from Philosophical, Sociological, Anthropological, Political, Health and Other Perspectives." McFarland Press.

McIlvaine-Newsad, H., C. D. Merrett, W. Maakestad, and P. McLaughlin. 2008. *Slow Food Lessons in the Fast Food Midwest*. Southern Rural Sociology. 23(1) 72-93.

McIlvaine-Newsad, H. C. Merrett, and P. McLaughlin. 2004. Direct from Farm to Table: Community Sponsored Agriculture in Western Illinois. *Culture and Agriculture*. Vol. 26, No. 1-2, pp. 149-163.

McIlvaine-Newsad, H. 2007. *Unravel the Gordian Knot*. in 147 Practical Tips for Teaching Sustainability: Connecting the Environment, the Economy, and Society. Timpson, W., B. Dunbar, G. Kimmel, B. Bruyere, P. Newman, and H. Mizia Eds. Madison, WI: Atwood Publishing.

IV. Synergistic Activities

1) McIlvaine-Newsad is currently engaged in a longitudinal study with an interdisciplinary group of researchers from the NMFs (National Marine Fisheries) division of NOAA (National Oceanic and Atmospheric Association) to study the changing livelihood strategies of small scale fishermen in the Gulf Coast region. Since 2004 she has worked with partners in NMFs assessing the changes in coastal livelihood as the result hurricane damage, longitudinal changes in the natural environment, coastal development, and economic downturns.

2) In her Ph.D. dissertation research, McIlvaine-Newsad developed methods to study the effect of changes in household composition overtime on the agricultural production and forest extraction activities of smallholder farm households. *Ethnographic linear programming* uses both

quantitative and qualitative data to estimate the nutritional and cash need of resource poor farmers.
3) McIlvaine-Newsad's pre-academic work as a Peace Corps Volunteer in the Dominican Republic (1991-1993) as a community forestry project coordinator provided her with an applied understanding of the physical, economic, and environmental constraints placed on tropical island nations. Subsequent work on a United Nations/FAO grant in St. Lucia addressed issues of environmental and economic sustainability among banana farmers. Her work in western Illinois includes research on resiliency of communities located in the flood plain after the floods of 2008, and local food systems, including CSA (community supported agriculture) sustainable farms.
4) McIlvaine-Newsad's service to the broader scientific community includes membership in the American Anthropological Association, Society for Applied Anthropology, International Farming Systems Research Association, and National Women's' Studies Association. She has reviewed manuscripts for *Culture & Agriculture, Fisheries, Women's Studies Quarterly, Transforming Anthropology,* and *NWSA Bulletin.*
5) To more effectively bring social science into the classroom, McIlvaine-Newsad requires undergraduate students to conduct original research in his Anthropological Methods course. She has taken undergraduate students to the field with her in 2005 and subsequently adopted these students as "peer mentors" in her undergraduate introductory level classes. Students in her Gender, Race, & the Environment class utilize data gathered during annual fieldwork to understand the real life effects of gender and race on livelihood strategies post natural disasters like hurricane Katrina. McIlvaine-Newsad is also a member of the university's sustainability committee.

V. Collaborators & Other Affiliations
i. Collaborators and Co-Editors: David Casagrande (Lehigh University, formally Western Illinois University), Mary Jane Clark (Illinois Institute for Rural Affairs/Western Illinois University), Michael Dougherty (University of Florida), Palma Ingles (Alaska Fish and Wildlife Service) Patrick McLaughlin (Western Illinois University),Christopher Merritt (Illinois Institute for Rural Affairs/Western Illinois University), Gordon Rands (Western Illinois University), Barbara Ribbens (Western Illinois University), Amy Sullivan (International Water Management Institute, South Africa), Steve Jacob (York College), Mike Jepson (National Marine Fisheries)
ii. Graduate and Postdoctoral Advisors: Tony Oliver-Smith (University of Florida), H. Russell Bernard (University of Florida), Ann Corrine Freter-Abrahams (Ohio University), Peter Hildebrand (University of Florida), and Marianne Schmink (University of Florida)

SUMMARY PROPOSAL BUDGET

YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months)	
	Proposed	Granted
AWARD NO.		

ORGANIZATION
Southern Illinois University at Carbondale

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Nicholas Pinter

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Nicholas Pinter - Professor	0.00	0.00	1.00	10,845	
2. Elizabeth Ellison - Researcher II	6.00	0.00	0.00	19,392	
3.					
4.					
5.					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)	6.00	0.00	1.00	30,237	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0	
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0	
3. (0) GRADUATE STUDENTS				0	
4. (0) UNDERGRADUATE STUDENTS				0	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (0) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				30,237	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				13,032	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				43,269	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				5,000	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				0	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				900	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0	
3. CONSULTANT SERVICES				3,000	
4. COMPUTER SERVICES				0	
5. SUBAWARDS				0	
6. OTHER				2,500	
TOTAL OTHER DIRECT COSTS				6,400	
H. TOTAL DIRECT COSTS (A THROUGH G)				54,669	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) L. Indirect Costs (45.5% of MTDC) (Rate: 45.5000, Base: 54669)					
TOTAL INDIRECT COSTS (F&A)				24,874	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				79,543	
K. RESIDUAL FUNDS				0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				79,543	

M. COST SHARING PROPOSED LEVEL $ 0 AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Nicholas Pinter

ORG. REP. NAME*
Lori Foster

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 2

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months)	
	Proposed	Granted
AWARD NO.		

ORGANIZATION
Southern Illinois University at Carbondale

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Nicholas Pinter

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Nicholas Pinter - Professor**	0.00	0.00	1.00	**11,170**	
2. **Elizabeth Ellison - Researcher II**	6.00	0.00	0.00	**19,974**	
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	6.00	0.00	1.00	**31,144**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**31,144**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**13,423**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**44,567**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**6,700**	
2. FOREIGN				**0**	
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ **0** 2. TRAVEL **0** 3. SUBSISTENCE **0** 4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**982**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**450**	
3. CONSULTANT SERVICES				**3,000**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**2,850**	
TOTAL OTHER DIRECT COSTS				**7,282**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**58,549**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **L. Indirect Costs (45.5% of MTDC) (Rate: 45.5000, Base: 58549)**					
TOTAL INDIRECT COSTS (F&A)				**26,640**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**85,189**	
K. RESIDUAL FUNDS				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**85,189**	

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Nicholas Pinter

ORG. REP. NAME*
Lori Foster

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

2 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION Southern Illinois University at Carbondale	**FOR NSF USE ONLY** PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Nicholas Pinter	AWARD NO.		

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Nicholas Pinter - Professor	0.00	0.00	2.00	22,015	
2. Elizabeth Ellison - Researcher II	12.00	0.00	0.00	39,366	
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)	12.00	0.00	2.00	61,381	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0	
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0	
3. (0) GRADUATE STUDENTS				0	
4. (0) UNDERGRADUATE STUDENTS				0	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (0) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				61,381	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				26,455	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				87,836	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				11,700	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 0 2. TRAVEL 0 3. SUBSISTENCE 0 4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				0	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				1,882	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				450	
3. CONSULTANT SERVICES				6,000	
4. COMPUTER SERVICES				0	
5. SUBAWARDS				0	
6. OTHER				5,350	
TOTAL OTHER DIRECT COSTS				13,682	
H. TOTAL DIRECT COSTS (A THROUGH G)				113,218	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				51,514	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				164,732	
K. RESIDUAL FUNDS				0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				164,732	

M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $		
PI/PD NAME Nicholas Pinter	**FOR NSF USE ONLY** INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* Lori Foster	Date Checked	Date Of Rate Sheet	Initials - ORG

C ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

1235317

COLLABORATIVE RESEARCH: GEOSPATIAL MODELING FOR PRO-ACTIVE FLOOD MITIGATION IN THE RURAL MIDWEST

Prof. Nicholas Pinter
Elizabeth Ellison

Southern Illinois University

Budget Period: 10/1/12 – 9/30/14

BUDGET JUSTIFICATION

Funds are requested for two years of support. As outlined in the proposal and below, funds are requested for; (1) salaries and related benefits, (2) research-related travel, (3) other direct costs, and (4) indirect costs.

<u>Salaries and Benefits</u>: Funds are requested here to partially support: the Principal Investigator (PI), a staff researcher (50% time; Ellison), plus fringe benefits as required by the university and the State of Illinois. We request 1 month per year of summer salary for PI Pinter, and 12 months per year at 50% time to support Ellison. Required fringe benefits include retirement and health for the PIs at 43.1% of the salaries line. Note that co-PI Dennis Knobloch is not a university employee, and so his time his included below as an "external consultant".

<u>Travel</u>: We have requested travel funds: 1) for planning and implementation meetings with our co-PIs at WIU and Lehigh; 2) several trips for work in the (fairly extensive) study area; 3) one trip to Washington DC to meet with emergency management personnel; and 4) for modest travel funding for the Ellison to present results at one scientific meeting, tentatively the Association of American Geographers meeting. Note that SIU classifies "Travel" only as travel by university employees.

<u>Other Direct Costs</u>: Other direct costs include: (1) modest expenses for office supplies in support of the research outlined here, (2) an annual consultantship for co-PI Dennis Knobloch, (3) registration for Ellison to present results at the AAG meeting, (4) page charges for the publication of one journal article. The consultantship for co-PI Knobloch (#2) above is budgeted as $3000 in each year. We believe that Knobloch's participation is vital to the success of this project.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION: Lehigh University				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: David G Casagrande				AWARD NO.		

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. David G Casagrande - Principal Investigator	0.00	0.00	1.00	8,812	
2.					
3.					
4.					
5.					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	1.00	8,812	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0	
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0	
3. (1) GRADUATE STUDENTS				6,300	
4. (1) UNDERGRADUATE STUDENTS				3,360	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (0) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				18,472	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				3,025	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				21,497	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				2,620	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 500 2. TRAVEL 0 3. SUBSISTENCE 0 4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (50) TOTAL PARTICIPANT COSTS				500	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				500	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0	
3. CONSULTANT SERVICES				0	
4. COMPUTER SERVICES				0	
5. SUBAWARDS				0	
6. OTHER				0	
TOTAL OTHER DIRECT COSTS				500	
H. TOTAL DIRECT COSTS (A THROUGH G)				25,117	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Modified Total Direct Costs (Rate: 61.0000, Base: 24617)					
TOTAL INDIRECT COSTS (F&A)				15,016	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				40,133	
K. RESIDUAL FUNDS				0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				40,133	
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $				

PI/PD NAME: David G Casagrande	FOR NSF USE ONLY		
	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*: Troy Boni	Date Checked	Date Of Rate Sheet	Initials - ORG

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION **Lehigh University**				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR **David G Casagrande**				AWARD NO.		

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **David G Casagrande - Principal Investigator**	0.00	0.00	0.50	4,538	
2.					
3.					
4.					
5.					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.50	4,538	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0	
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0	
3. (1) GRADUATE STUDENTS				3,150	
4. (0) UNDERGRADUATE STUDENTS				0	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (0) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				7,688	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				1,416	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				9,104	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				3,430	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				0	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				0	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0	
3. CONSULTANT SERVICES				0	
4. COMPUTER SERVICES				0	
5. SUBAWARDS				0	
6. OTHER				0	
TOTAL OTHER DIRECT COSTS				0	
H. TOTAL DIRECT COSTS (A THROUGH G)				12,534	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **Modified Total Direct Costs (Rate: 61.0000, Base: 12534)**					
TOTAL INDIRECT COSTS (F&A)				7,646	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				20,180	
K. RESIDUAL FUNDS				0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				20,180	

M. COST SHARING PROPOSED LEVEL $ 0 AGREED LEVEL IF DIFFERENT $

PI/PD NAME **David G Casagrande**	FOR NSF USE ONLY		
	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* **Troy Boni**	Date Checked	Date Of Rate Sheet	Initials - ORG

2 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION **Lehigh University**				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR **David G Casagrande**				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. **David G Casagrande - Principal Investigator**	0.00	0.00	1.50	**13,350**		
2.						
3.						
4.						
5.						
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**		
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	1.50	**13,350**		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**		
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**		
3. (**2**) GRADUATE STUDENTS				**9,450**		
4. (**1**) UNDERGRADUATE STUDENTS				**3,360**		
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**		
6. (**0**) OTHER				**0**		
TOTAL SALARIES AND WAGES (A + B)				**26,160**		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**4,441**		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**30,601**		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)						
TOTAL EQUIPMENT				**0**		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**6,050**		
2. FOREIGN				**0**		
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ **500** 2. TRAVEL **0** 3. SUBSISTENCE **0** 4. OTHER **0**						
TOTAL NUMBER OF PARTICIPANTS (**50**) TOTAL PARTICIPANT COSTS				**500**		
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES				**500**		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**		
3. CONSULTANT SERVICES				**0**		
4. COMPUTER SERVICES				**0**		
5. SUBAWARDS				**0**		
6. OTHER				**0**		
TOTAL OTHER DIRECT COSTS				**500**		
H. TOTAL DIRECT COSTS (A THROUGH G)				**37,651**		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
TOTAL INDIRECT COSTS (F&A)				**22,662**		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**60,313**		
K. RESIDUAL FUNDS				**0**		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**60,313**		
M. COST SHARING PROPOSED LEVEL $ **0**	AGREED LEVEL IF DIFFERENT $					
PI/PD NAME **David G Casagrande**				FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* **Troy Boni**				Date Checked	Date Of Rate Sheet	Initials - ORG

C ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

BUDGET JUSTIFICATION

A. Key Personnel
Co-Principal Investigator - The proposed budget includes 1 month of summer support in year one and 0.5 summer months support in year two of the project for the Co-Principal Investigator (Dr. David Casagrande) for fieldwork. Salary is based on current levels with a 3% projected annual merit increase applied to support in succeeding years. The Co-Principal Investigator will be responsible for the planning of the social science research, data collection and analysis, coordinating with collaborators, supervising one graduate and one undergraduate research assistant, and assisting with reporting project results to the sponsor and the scientific community.

B. Other Personnel
Graduate Student – Part-time stipend support is requested for one graduate student research assistant in each year of the project. The graduate research assistant will devote approximately 37.5 % effort (15 hours a week @ $15 per hour for 14 weeks) during the academic year. The graduate student research assistant will be responsible for entering data, transcribing audio recordings, coding transcribed data, and assisting with field research planning and logistics.

Undergraduate Student - Support is requested for one undergraduate student research assistant in year one of the project. The undergraduate research assistant will devote 100% effort (40 hours per week @ $12 per hour) in the summer months only. The undergraduate research assistant will be responsible for arranging fieldwork logistics, organizing, leading and audio recording focus groups, in-depth interviewing, participant observation and photo-documentation, and audio recording transcription.

C. Fringe Benefits
Fringe benefits are direct-charged as a percentage of salaries and wages at rates set by a DOD/ONR Audit Office Negotiation Agreement dated July 22, 2011. For Fiscal Year 2012-2013 the benefit rate is 31.2% for full-time employees and 8.2% for part-time employees. The 8.2% rate is applied to Graduate and Undergraduate Research Assistants stipends during the three summer months.

D. Equipment
None

E. Travel
E.1 Domestic – A total of $6,220 in travel support is requested to partially cover the costs of domestic travel required to conduct fieldwork.

Year 1 Four weeks of travel to field research site in Western Illinois Mississippi floodplain.
Lodging (house rental) is included in the WIU budget
Round trip air fare for Co-Principal Investigator and student $700
Per diem $32 x 2 people x 30 days $1,920

1234390

Year 2 (P.I. Only) Two weeks of travel to field research site in Western Illinois Mississippi floodplain and the campus of SIU-Carbondale.

Overnight Research Site (1 room each trip)	$60 x 15 nights	$900
Round trip Air fare	$350	
Per diem $32 x 15 days	$480	

F. Participant Support Costs

$500 is requested for participant interview incentives in the form of focus group refreshments ($200) and $10 gift certificates for approximately 30 interviewees.

G. Other Direct Costs

G1. Materials and Supplies - $500 is requested for the purchase of two audio recorders and one Wavpedal (transcription hardware and software).

I. Indirect cost:

Facilities and administrative (F&A) costs are charged as a percentage of modified total direct costs (MTDC) at a rate of 61% for Fiscal Year 2012/2013 as set by a DOD/ONR Audit Office Negotiation Agreement dated October 29, 2009.

Modified Total Direct Cost (MTDC), as defined in OMB Circular A-21, consisting of all salaries and wages, fringe benefits, materials and supplies, services, travel, and sub-grants and subcontracts up to the first $25,000 of each sub-grant or subcontract (regardless of the period covered by the sub-grant or subcontract). Equipment, capital expenditures, charges for patient care and tuition remission, rental costs, scholarships, and fellowships as well as the portion of each sub-grant and subcontract in excess of $25,000 shall be excluded from the modified total direct costs.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION **Western Illinois University**				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR **Heather McIlvaine-Newsad**				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Heather McIlvaine-Newsad - PI	0.00	0.00	1.00	9,225		
2.						
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	1.00	9,225		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0		
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0		
3. (0) GRADUATE STUDENTS				0		
4. (2) UNDERGRADUATE STUDENTS				5,880		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6. (0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)				15,105		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				1,292		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				16,397		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)						
TOTAL EQUIPMENT				0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				5,444		
2. FOREIGN				0		
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 0 2. TRAVEL 0 3. SUBSISTENCE 0 4. OTHER 0						
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				0		
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES				500		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0		
3. CONSULTANT SERVICES				0		
4. COMPUTER SERVICES				0		
5. SUBAWARDS				0		
6. OTHER				19,994		
TOTAL OTHER DIRECT COSTS				20,494		
H. TOTAL DIRECT COSTS (A THROUGH G)				42,335		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 36.0000, Base: 42335)						
TOTAL INDIRECT COSTS (F&A)				15,241		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				57,576		
K. RESIDUAL FUNDS				0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				57,576		
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $					
PI/PD NAME **Heather McIlvaine-Newsad**				FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* **Beth Seaton**				Date Checked	Date Of Rate Sheet	Initials - ORG

1 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION **Western Illinois University**				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR **Heather McIlvaine-Newsad**				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. **Heather McIlvaine-Newsad - PI**	0.00	0.00	0.50	**4,941**		
2.						
3.						
4.						
5.						
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**		
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.50	**4,941**		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**		
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**		
3. (**0**) GRADUATE STUDENTS				**0**		
4. (**0**) UNDERGRADUATE STUDENTS				**0**		
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**		
6. (**0**) OTHER				**0**		
TOTAL SALARIES AND WAGES (A + B)				**4,941**		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**692**		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**5,633**		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)						
TOTAL EQUIPMENT				**0**		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**3,683**		
2. FOREIGN				**0**		
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ **0** 2. TRAVEL **0** 3. SUBSISTENCE **0** 4. OTHER **0**						
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**		
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES				**0**		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**		
3. CONSULTANT SERVICES				**0**		
4. COMPUTER SERVICES				**0**		
5. SUBAWARDS				**0**		
6. OTHER				**0**		
TOTAL OTHER DIRECT COSTS				**0**		
H. TOTAL DIRECT COSTS (A THROUGH G)				**9,316**		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 36.0000, Base: 9316)**						
TOTAL INDIRECT COSTS (F&A)				**3,354**		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**12,670**		
K. RESIDUAL FUNDS				**0**		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**12,670**		
M. COST SHARING PROPOSED LEVEL $ **0**	AGREED LEVEL IF DIFFERENT $					
PI/PD NAME **Heather McIlvaine-Newsad**				FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* **Beth Seaton**				Date Checked	Date Of Rate Sheet	Initials - ORG

2 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION Western Illinois University				FOR NSF USE ONLY	
				PROPOSAL NO.	DURATION (months) Proposed / Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Heather McIlvaine-Newsad				AWARD NO.	

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Heather McIlvaine-Newsad - PI	0.00	0.00	1.50	14,166	
2.					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	1.50	14,166	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0	
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0	
3. (0) GRADUATE STUDENTS				0	
4. (2) UNDERGRADUATE STUDENTS				5,880	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (0) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				20,046	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				1,984	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				22,030	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				9,127	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				0	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				500	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0	
3. CONSULTANT SERVICES				0	
4. COMPUTER SERVICES				0	
5. SUBAWARDS				0	
6. OTHER				19,994	
TOTAL OTHER DIRECT COSTS				20,494	
H. TOTAL DIRECT COSTS (A THROUGH G)				51,651	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				18,595	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				70,246	
K. RESIDUAL FUNDS				0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				70,246	
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $				

PI/PD NAME Heather McIlvaine-Newsad	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* Beth Seaton	Date Checked	Date Of Rate Sheet	Initials - ORG

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

1234226

Budget justification

A. **Senior Personnel**

WIU is primarily an undergraduate education institution with a heavy teaching load (3 courses per semester), which necessitates that the ethnographic fieldwork required for the proposed research be conducted during the summer months. The majority of the ethnographic field work will be conducted during Year 1 of the project. The senior personnel is a full-time faculty on a 9-month contract. During Year 1, Heather McIlvaine-Newsad requires 1.0 month of paid summer salary (for July 2013) during the time she conducting field work in rural Illinois at a rate of .5/9 of nine-month salary ($9,225).

During Year 2 of the project 2 weeks of summer salary (July 2014) for field work in rural Illinois is requested ($4, 941).

B. Other Personnel

In Year 1, 1 undergraduate student assistant at WIU will be paid 8 weeks of base salary (June 2013 – July 2013) at $1680/month ($3,360). Also in year 1, an undergraduate student assistant will be funded for 15 hours/week for 14 weeks of base salary at $720/month ($2,520).

No student funding is requested for WIU during Year 2.

C. Fringe Benefits

Fringe benefits are calculated at 14% of senior personnel salaries.

D. Equipment

None.

E. Travel

At the study onset, senior researcher McIlvaine-Newsad (and Casagrande from Lehigh) will travel to 20 different research sites in Illinois with two undergraduate research assistants (one from each university) to conduct interviews and focus groups. Travel costs via motor vehicle for McIlvaine-Newsad in Year 1 are $2,424. Lodging for all researchers is $1100 (researchers will rent a house). Per diem for all senior personnel and 1 undergraduate student from WIU is $1,920 for Year 1.

In Year 2 $2000 is requested for the senior researcher for travel to professional conferences for dissemination of research results.

During Year 2 of the project the senior researcher from WIU will conduct 2 weeks of field work with the senior researchers from Lehigh. Travel costs for the motor vehicle total $303, per diem equal $480 and lodging amount requested is $900.

F. Participant Support Costs

None requested.

G. Other Direct Costs

1. Materials and Supplies

$500 is requested for two digital audio recorders and one Wavepedal for ethnographic documentation and qualitative analysis of research results.

2. Publication costs
None.

3. Consultant Services
None.

4. Computer Services
None.

5. Subawards
None.

6 Other
In Year 1 the Western Survey and Research Center (WRSC) will administer a mail survey to residents from 20 communities affected by the 2008 floods, with a target of approximately 100 respondents from each community. A total of $19, 1994 is requested.

No funding is requested for Year 2.

H. Indirect Costs
Western Illinois University's federally-negotiated facilities and administrative cost rate has been applied.

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Nicholas Pinter

Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Collaborative research: Geospatial modeling for pro-active flood mitigation in the rural Midwest

Source of Support: NSF

Total Award Amount: $ 164,732 Total Award Period Covered: 10/01/12 - 09/30/14

Location of Project: SIU

Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Sumr: 1.00

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Pre-disaster mitigation planning ... multiple Illinois counties

Source of Support: FEMA

Total Award Amount: $ 500,000 Total Award Period Covered: 01/01/08 - 12/31/14

Location of Project: SIU

Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Sumr: 1.00

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Olive Branch, IL Relocation Initiative: Community Disaster-Recovery Networking

Source of Support: Walton Family Foundation

Total Award Amount: $ 60,000 Total Award Period Covered: 01/01/12 - 12/31/14

Location of Project: SIU

Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Sumr: 0.00

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Summ:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Elizabeth Ellison

Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Collaborative research: Geospatial modeling for pro-active flood mitigation in the rural Midwest

Source of Support: NSF

Total Award Amount: $ 164,732 Total Award Period Covered: 10/01/12 - 09/30/14

Location of Project: SIU

Person-Months Per Year Committed to the Project. Cal:6.00 Acad: 0.00 Sumr: 0.00

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Summ:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

 USE ADDITIONAL SHEETS AS NECESSARY

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Dennis Knobloch

Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title: Collaborative research: Geospatial modeling for pro-active flood mitigation in the rural Midwest

Source of Support: NSF
Total Award Amount: $ 164,732 Total Award Period Covered: 10/01/12 - 09/30/14
Location of Project: SIU
Person-Months Per Year Committed to the Project. Cal:1.00 Acad: 0.00 Sumr: 0.00

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Summ:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending

Investigator: David Casagrande

Support: CURRENT
None

Support: PENDING
Project/Proposal Title: Collaborative Research: Geospatial Modeling for Pro-Active Flood Migration in the Rural Midwest

Source of Support: National Science Foundation
Total Award Amount: $60,313 Total Award Period Covered: 10/1/2012 - 9/30/2014
Location of Project: Lehigh University
Person-Months Per Year Committed to the Project: 1.0 month SU Year 1, 0.5 months SU Year 2

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Other agencies (including NSF) to which this proposal has been/will be submitted.

Investigator: Heather McIlvaine-Newsad

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Collaborative Research: Geospatial Modeling for Pro-active Flood Mitigation in the Rural Midwest

Source of Support: National Science Foundation

Total Award Amount: $ 70,246 Total Award Period Covered: 10/01/12 - 09/30/14

Location of Project: Western Illinois University, Macomb, IL

Person-Months Per Year Committed to the Project. Cal: 0.00 Acad: 0.00 Sumr: 1.00

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Building Community-Based Food Systems to Enhance Food Security in Rural Western IL: McDonough County, IL Food Production Initiative

Source of Support: USDA/Western Illinois Regional Council

Total Award Amount: $ 126,966 Total Award Period Covered: 09/01/12 - 08/31/15

Location of Project: Western Illinois University, Macomb, IL

Person-Months Per Year Committed to the Project. Cal: 0.00 Acad: 0.00 Sumr: 1.00

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Summ:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Facilities, Equipment, and Other Resources – Southern Illinois University

The natural hazards group and its laboratory in the Geology Department have a long history of research on rivers, flood hydrology, and floodplain research, and it is well equipped for continuing this research in the future. Major areas of equipment and support include a GIS-dedicated computer lab, data visualization software and expertise, 1D and 2D hydraulic modeling capabilities, flood-loss estimation software (FEMA's HAZUS) and extensive training and expertise in its use, and a variety of field equipment such as DGPS, RTK, and dual-frequency GPS survey equipment.

Existing computational facilities and equipment are housed both in the natural hazards research lab and in the GIS laboratory for SIU's PhD program in Environmental Resources and Policy (ER&P). The hazards group lab is equipped with 4 Dell Precision workstations, each with dual Xeon processers and dual 22" LCD monitors. The lab computers are equipped with a combination of the ESRI suite of GIS, hydraulic, hydrologic, and flood loss modeling software: Arc-GIS; the 1D Mike-11 hydrodynamic model from Danish Hydrologic Institute (DHI); the USACE's HEC -RAS (Hydrologic Engineering Center's River Analysis System) and companion GIS interface HEC-GEO RAS; DHI's Mike 21c 2D hydrodynamic, sediment transport, river morphological software and; hydrologic modeling software HEC-HMS (Hydrologic Engineering Center's Hydrologic Modeling System); FEMA's HAZUS multi-hazard loss estimation model (flood-loss model) and the companion Comprehensive Data Management System. The ER&P GIS Laboratory houses a network of 11 Dell Precision workstations, each with dual Xeon and dual 20" LCD monitors. Additionally the ER&P lab has a 1.5 TB storage server, LaserJet and large-format DesignJet printers, and flatbed and Graphtec CS2000 large map scanners. Workstations are equipped variously with FORTRAN, C and Visual Basic software and, importantly for the project, site licenses for all ESRI products and for ERDAS Imagine.

A major resource within the SIU hazards research group is its personnel and their expertise in GIS, hydraulic modeling, flood-loss estimation modeling, hazard planning, and other related fields. With recent staff additions, the group consists of Pinter, 3 full-time post-doctoral scientists, 1 staff researcher, plus several funded graduate and undergraduate students. The group is a regional center of expertise for flood, earthquake, and other hazard analyses. As outlined in the proposal, the group is modeling hazards and compiling mitigation plans for 30+ Illinois counties. Group members have trained extensively in the use of FEMA's HAZUS-MH software, and one member (Remo) received the 2010 "HAZUS User of the Year" award, while another (Ellison) is now being contracted to write instructional curricula for HAZUS. Remo and Ellison will both be certified HAZUS-MH professionals in April.

From past and current research projects, the hazard research group has compiled extensive archival hydrologic and geospatial databases for the Mississippi, Missouri, Illinois, and Ohio rivers. The hydrologic database was compiled from archival records extending back to the mid 1800s from five different federal agencies (the National Weather Service, Mississippi River Commission, U.S. Army Signal Corps, USACE, and USGS). It contains over 6 million stage measurements and 1 million daily discharge estimates from 253 stations. Extensive archival geospatial databases containing maps from detailed scientific surveys, information on the river engineering structures, and floodplain development along these rivers were also compiled.   The historic map geospatial database contains 81 map sets (> 5000 individual map sheets) which span the last 300 years of change along these rivers. From these maps and other data sources, a detailed river engineering geospatial database spanning +125 years of river engineering activities was compiled. This database contains the location, extent, date of emplacement, and in some cases maintenance records for over 7,000 river training structures (i.e., navigation dams, wing dams, bendway weirs, etc.). We have also assembled an extensive geospatial database for the 1900 km of levees and floodwalls along the rivers of interest. The information contained within this database includes levee location, protection level, area protected, elevation, owner, and construction material type. For the portions of the Mississippi River we have a geospatial database of containing 76 historical levee failure sites, including detailed information on site characteristics (i.e., soil type dredging activity, and adjacent land cover) and geomorphic parameters (i.e., channel width, floodplain width, sinuosity, and surficial geology).

For the hazard research group's pre-disaster mitigation work, high-resolution digital elevation models (DEM; 1/9-arc-second [~3 m] resolution or higher) have been compiled for the Upper Mississippi, Illinois, and Ohio River floodplains. In addition, detailed building inventories containing more than 25,000 records have been compiled for 8 out of the 23 counties to be screened for candidate communities. The pertinent data included in these databases include georeferenced building locations, occupancy types, and assessed values. In some cases, building construction type, square footage, basement square footage, and year built are also available. These detailed building inventories will allow for the highest level of flood-loss modeling in these counties. In addition, the detailed building inventory will improve and help quantify the uncertainty where the national level HAZUS-MH building inventory database is used.

FACILITIES, EQUIPMENT & OTHER RESOURCES

FACILITIES: Identify the facilities to be used at each performance site listed and, as appropriate, indicate their capacities, pertinent capabilities, relative proximity, and extent of availability to the project. Use "Other" to describe the facilities at any other performance sites listed and at sites for field studies. USE additional pages as necessary.

Laboratory: n/a

Clinical:

Animal:

Computer: No special equipment other than existing computers will be needed to analyze and archive field data at Lehigh University. The PI has two new iMac computers with Intel chips running both Mac OS X and Windows 7, and SPSS, Anthropac, and NVivo software for processing data. These computers

Office: Office space is available for the PI, and one undergraduate and one graduate research assistant for entering and analyzing data.

Other:

MAJOR EQUIPMENT: List the most important items available for this project and, as appropriate identifying the location and pertinent capabilities of each.

OTHER RESOURCES: Provide any information describing the other resources available for the project. Identify support services such as consultant, secretarial, machine shop, and electronics shop, and the extent to which they will be available for the project. Include an explanation of any consortium/contractual arrangements with other organizations.

Continuation Page:

COMPUTER FACILITIES (continued):

host an extensive NVivo database of flood-related interviews and over 500 coded news articles about Mississippi flooding. These computers are located in the PI’s office in STEPS. Lehigh University also provides dedicated shared servers for storing and backing up data. The

FACILITIES, EQUIPMENT & OTHER RESOURCES

FACILITIES: Identify the facilities to be used at each performance site listed and, as appropriate, indicate their capacities, pertinent capabilities, relative proximity, and extent of availability to the project. Use "Other" to describe the facilities at any other performance sites listed and at sites for field studies. USE additional pages as necessary.

Laboratory:

Clinical:

Animal:

Computer: No special equipment other than existing computers will be needed to analyze and archive field data at Western Illinois University. The PI has a new iMac computers with Intel chips running both Mac OS X and Windows 7, and SPSS, Anthropac, and NVivo software for processing data. These

Office: Office space is available for the PI, and one undergraduate and one graduate research assistant for entering and analyzing data.

Other:

MAJOR EQUIPMENT: List the most important items available for this project and, as appropriate identifying the location and pertinent capabilities of each.

OTHER RESOURCES: Provide any information describing the other resources available for the project. Identify support services such as consultant, secretarial, machine shop, and electronics shop, and the extent to which they will be available for the project. Include an explanation of any consortium/contractual arrangements with other organizations.

Located on WIU’s campus, the Western Survey Research Center (WSRC) has extensive experience with large-scale surveys on rural social issues, which will increase the speed and accuracy of the survey process. WSRC will develop the survey, prepare the address-based sample, handle all mailing, and monitor returns.

FACILITIES, EQUIPMENT & OTHER RESOURCES

Continuation Page:

COMPUTER FACILITIES (continued):

computers host an extensive NVivo database of flood-related interviews and over 500 coded news articles about Mississippi flooding. These computers are located in the PI's office in Morgan Hall. Western Illinois University also provides dedicated shared servers for storing and backing up data.

Data Management Plan

1. Data Inventory

1.1. Qualitative Data (Survey & Interviews)

Data from structured surveys will be obtained from questionnaires sent to randomly selected residents of 30 communities. Survey questions will assess attitudes towards relocation. Digitally recorded interviews and focus groups will also assess attitudes towards relocation.

1.2. Quantitative Data Inventory (GIS data)

Quantitative data sets will be used to generate risk for 24 counties in Illinois along the Mississippi, Illinois and Ohio rivers. Risk assessment will be conducted using GIS-compatible software's including HAZUS-MH and HEC-GeoRAS. Data required for risk assessments include a combination of hydrologic, demographic, and topographic information. Data formats vary from polyline, point, polygon and raster.

1.2.1. Hydrologic Data

Hydrologic data from the Upper Mississippi River System Flood Frequency Study (UMRSFFS), conducted by the United States Army Corps of Engineers (USACE), will be utilized in HAZUS. Cross-sections from the UMRSFFS are within updated digital flood insurance rate maps (DFIRMs). The cross-sections will be used to generate a flood depth grid using Hec-GeoRAS. This flood depth grid, a raster, will assist in generating the risk assessment in HAZUS.

1.2.2. Demographic Data

Current demographic data is provided by HAZUS from the 2000 Census. Demographics for counties are aggregated to the census block (polygon). The 2010 Census data will be available by the start date of this project, and henceforth will be updated into the HAZUS software. 2010 Census data will be stored in a geodatabase format.

1.2.3. Topographic Data

Topographic data will be stored in raster format. Depending on available data per county, the 1/3- (10 meter) Arc Second or 1/9- (3 meter) Arc Second will be downloaded and stored on the project server.

1.3. Resulting Data (modeling)

1.3.1. Risk Assessment

Results from the HAZUS flood modeling and risk assessment are potential flood losses aggregated by census block. The risk assessment will also include summaries of demographic variables that contribute to vulnerability.

1.3.2. Heuristic Model (vulnerability)

A combination between quantitative and qualitative data will develop a heuristic model to identify vulnerable communities. This screening tool will be used to prepare a list of 30 communities in which attitudes towards mitigation and relocation will be assessed in detail. Parameters in determining the vulnerable communities will be determined by Lehigh, SIU and WIU. The resulting model and model validation will be available upon completion of project.

1.3.3. Structured equation modeling

Survey questionnaire data will be used to develop a model that predicts attitudes toward mitigation as the dependent variable at Lehigh.

2. Data and Metadata standards

2.1. Qualitative Data

Digitally recorded audio data will be transcribed verbatim and cross checked by two transcriptionists to assure the highest quality data. (Bernard, 2002)

2.2. Quantitative Data

All GIS data will abide by the Federal Geographic Data Commission (FGDC) metadata standards (U.S. Federal Geographic Data Committee, 1995). Any deviations will be documented as necessary.

3. Data Use, Privacy, and Sharing Policies

This project will develop and abide by a data release policy. Data will remain within the project until research is published, at this point data can be made available to the academic community. Confidentiality and data privacy agreements may restrict release of specific data sets.

4. The Data Management Life Cycle

4.1. Data Storage

This project will generate a series of qualitative and quantitative data sets. The qualitative data will use a series of surveys and interviews. Audio files, interview transcriptions, and mail surveys will be assigned a code. An Excel file with personal information will be the only document matching the code to an individual or family. This excel file will stored only on Casagrande's office computer and McIlvaine-Newsad's Samba drive as a backup. These computers are located at Lehigh and WIU. Both of these locations are password protected and only Casagrande or McIlvaine-Newsad will have access. Quantitative analysis will use Geographic Information Systems (GIS) to organize various geospatial data sets. Data will be stored on a project server to share between WIU, Lehigh and SIU. Data will be backed up on external hard drives.

4.2. Data Maintenance

One person from each university will be designated to maintain data sets. Data will be reviewed and validated to maintain the aforementioned data standards.

4.3. Archiving and Publication

Long-term archiving and access will be assured by including the data in the library repositories at Lehigh, SIU and WIU. Data will be stored in both digital and print formats.

5. References

Bernard, H.R., 2002, Research Methods in Anthropology: Qualitative and Quantitative Approaches. AltaMira Press, Walnut Creek, CA

U.S. Federal Geographic Data Committee. (1995). Content standard for digital geospatial metadata workbook. Washington, D.C.: FGDC, March 24, 1995.