COMMUNICATION OF PAST ADAPTATION: USING LOCAL HISTORY IN RURAL PLANNING FOR SEA LEVEL RISE

By

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To my girls Katie, Juniper, and Raleigh for their unwavering support, love, and patience

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LIST OF ABBREVIATIONS AND DEFINITIONS

ADAPTATION EVENT	Adaptation events are defined as natural or man-made events that forced fundamental changes in the politics, cultural identity, and/or economy of rural communities
CPA	Communication of Past Adaptation
CRITICAL ACTORS	Critical actors in community decision making are those within a community that directly impact planning processes and decisions. This can include politicians, community activists, private organizations, average citizens, and scientists.
GTM NERR	Guana Tolomato Matanzas National Estuarine Research Reserve
ICW	The Intra-Coastal Waterway. Florida's major marine shipping and transportation route on the east coast
PAE	Past Adaptation Event. Events that provide the impetus for community change and transformation
RESILIENT	Resilience can refer to a community's ability to recover after chaotic events such as natural or economic disasters. It can also refer to a community's capacity to adapt to changing conditions like long term climate change and sea level rise (Mehaffy 2011)
SLR	Sea Level Rise

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The changing climate is tasking regions and communities to adapt in order to survive and prosper in the long term (Jancaitis 2008). This is especially true in rural coastal areas affected by rising sea levels. Much research has been done on planning for sea level rise in urban areas however; research on rural coastal communities has lagged far behind. Additionally, planning and adaptation in small coastal communities has been further complicated by challenges such as limited financial resources that are faced in rural planning in general (Stauber 2001, Woods 2005, Jensen 2009).

This is tasking rural coastal communities to find solutions that balance the social, political, and technical realities of sea level rise planning. To address this problem, exploratory research and historical analysis of rural coastal communities in Florida was conducted. This effort was driven by two primary research questions: (1) Is local history an important factor in rural planning for sea level rise? and, (2) Can historical analysis and communication of past adaptation events be effectively employed to support sea level rise planning in rural communities?

The research methodology and the resulting development of the Communication of Past Adaptations method will be situated within the literature and current practice of adaptation planning, resilience planning, rural planning, and historical analysis. To test and develop this technique it was also applied to two case studies. Communication of Past Adaptations provides a broad-based, iterative, and cost-effective tool that can foster successful sea level rise planning and ultimately, resilient rural coastal communities.

CHAPTER 1
INTRODUCTION

Global climate change is expected to cause significant direct impacts to cities, economies, and ecosystems during the 21st Century (IPCC 2007). The changing climate is tasking regions and communities to adapt in order to survive and prosper in the long term (Jancaitis 2008). This is especially true in rural coastal areas affected by rising sea levels. These areas are dominated by natural resource systems and economies as well as the human interaction with these systems (Ratner 2009). This often leaves small coastal communities highly vulnerable to systemic shocks. Rising sea levels will force natural and human systems to adapt and while much research has been done on planning for sea level rise in urban areas, research on rural coastal communities has lagged far behind. Additionally, planning and adaptation in small coastal communities has been further complicated by the challenges faced in rural planning in general (Stauber 2001; Woods 2005; Jensen 2009). In most cases, rural communities lack the financial resources to support the highly technical analysis of sea level rise impacts. This is exacerbated by the inexorable draw that highly populated and well funded urban planning initiatives have on academic research. In addition, rural communities often lack the political and/or cultural capacity necessary for sea level rise planning and a growing number of communities are openly hostile towards planning or are at least perceived as such (Wilson 2006; Bernard 2010).

This is tasking rural coastal communities to find solutions within limited resources that balance the social, political, and technical needs of successful sea level rise planning. To address this problem, exploratory research, historical analysis, and comparative analysis of rural communities in Florida with specific focus on rural coastal

communities was conducted. This effort was driven by two primary research questions; (1) Is local history an important factor in rural planning for sea level rise? and, (2) Can historical analysis and communication of past adaptation events be effectively employed to support sea level rise planning in rural communities? By analyzing the impact that local history has on the governance and politics, social and cultural views, and technical analysis and communication of rural coastal planning, the research presented led to the development of a Communication of Past Adaptations (CPA) method.

The CPA method is a process that is based primarily on historical analysis of rural communities and the communication of that analysis to facilitate communication, build social capacities, and foster resilient sea level rise planning. Structurally, the method is intended to be rigid enough to be as organized and rigorous as possible but is also intended to be highly flexible. This built-in flexibility allows the method to be applicable to the broad variety of rural settlements. It also allows the method to adapt over time; a critical necessity of any climate change adaptation strategy. The literature reviewed for this research argues strongly that while the value and potential power of historical analysis to planning is widely accepted, attempts to research and organize that power have been few and far between (Abbot and Adler 1989).

The research methodology and the resulting development of the Communication of Past Adaptations method will be situated within the literature and current practice of climate change adaptation planning, resilience planning, rural planning, and historical analysis. To test and further develop this technique, it was applied to two case studies; (1) the National Estuarine Research Reserve System Science Collaborative project in Matanzas Inlet, Florida and (2) the Florida Sea Grant Big Bend project in Levy County,

Florida. Through these cases the initial application of elements of the method will also be described. Communication of Past Adaptation provides a broad-based, iterative, and cost-effective tool that can foster successful sea level rise planning and ultimately, resilient rural coastal communities.

CHAPTER 2
LITERATURE REVIEW

Climate Change and Adaptation Planning

Scientists expect the 21st century trend in global climate change to cause significant direct impacts to cities, economies, and ecosystems. The broad and far reaching effects of rising average temperatures are beginning to be seen globally. Losses through property and agricultural damage are increasingly the result of weather patterns that are becoming characterized by more intense and frequent storm events (U.S. Environmental Protection Agency 2010). In coastal areas, rising sea levels will result in widespread inundation, shoreline recession, and resulting property damage compounding climate change problems. Much of human development is centered on the world's coasts and in the United States twenty-nine percent of the population is settled in areas potentially directly affected by sea level rise (Leatherman and Douglas 2008). Among the highly vulnerable are key infrastructure systems - wastewater treatment plants, power plants, municipal water supply wells, transportation arteries, and seaports – add to that oceanfront development, and natural resource economies (including protected areas). These vulnerable developments represent a significant portion of capital investment and infrastructure (IPCC 2007).

Moreover, the gradual pace and long term nature of climate change and sea level rise requires planning with a long time horizon and presents its own set of planning problems. Communication of complex scientific concepts and data can create significant barriers to decision making and public collaboration (Brown 2011). Even when successfully communicated, the data may not provide a clearly tangible or immediate impetus for change. To date, climate change planning initiatives that address long term

problems have faced difficulties in gaining public support (Deyle 2007; Bedsworth 2010; Tobey 2010). Tasking communities and regions to adapt in order to remain economically viable and culturally prosperous in the long term, planning for climate change is proving to be a challenge (Jancaitis 2008).

The concept of adaptable communities is captured in the term community resilience (Beatley 2009). Resilience can refer to a community's ability to recover after chaotic events such as natural or economic disasters. It can also refer to a community's capacity to adapt to changing conditions like long term climate change and sea level rise (Mehaffy 2011). Currently dominant in climate change planning, theories and initiatives developed on creating community resilience are characterized by building governmental, cultural, and technical capacities for planning within a community. Of particular importance to community resilience is the successful communication of technical data to decision makers and the public. The primary argument is that solutions to complex and long term planning problems such as climate change and sea level rise will take multi-faceted and iterative solutions developed through networks of professionals, scientists, politicians, and the public (Goldstein 2011). Furthermore, resilience theory argues that adaptable public health, infrastructure, economic, and emergency systems will require a balance of interwoven needs and realities that are best divulged through open public participation and collaboration.

In order to better address the climate-related challenges ahead, practitioners and academics are also developing new planning approaches in addition to resilience theory that focus on the technical aspects of adaptation planning. These approaches, such as anticipatory governance and extending the planning time horizon (Quay 2010), along

with the development of more strictly science-based impact/vulnerability analyses, model regulations, and strategy assessments, represent important advances in adaptation planning (e.g., NOAA's Coastal Center, Science Collaborative, Sea Grant). These practices, while critical to successful planning for climate change, can be further strengthened by incorporating more socially, culturally, and historically centered approaches. These approaches are critical to improving community receptivity to adaptation planning and capacity for envisioning the future thereby making more purely science-based approaches more practical and influential in their application and practice.

The central lynchpin in resilience theory, climate change, and adaptation planning is building social and organizational capacity to adapt. This then suggests that in order to foster resilient rural coastal communities, planning processes must be developed that not only produce concrete science-based information but also more qualitative socially and culturally-based data. Additionally, in order to be truly effective, sea level rise planning must also successfully communicate both types of data to decision makers as well as the public and provide avenues for learning and policy revision over the long term.

Rural Planning

The primary focus of the vast majority of the planning literature pertaining to climate change adaptation and sea level rise planning approaches is centered on large urban areas (Deyle et al. 2007; 2007 UN Global Risk Report). The adaptation planning approaches developed for these urban areas are heavily driven by technical methods and/or traditional interest group participation techniques. The biggest difficulty in applying urban approaches to rural areas is that technical and group participation

approaches are often undertaken with access to significant resources and capital. Adaptation planning in urban areas tends to be heavily supported by private, state, and even federal entities with major financial and political power. Rural areas on the other hand, depending on which state they may be located, are usually offered limited planning support (Lapping 2005). As such, planning processes developed with the resources afforded by an urban area can be either financially impractical or politically and socially impossible in rural settings. However, the unique characteristics of rural areas make them uniquely suited as planning laboratories to further develop emerging social, cultural, and historical approaches in adaptation planning (Titus 2009). When more fully developed, these new approaches will strengthen the practice of adaptation planning in both urban and rural areas by providing additional tools that can cover a broad range of scenarios and challenges.

Rural areas have important social, cultural, economic, and ecological assets that are deserving of quality, proactive planning (Stauber 2001; Woods 2005; Agrawal 2008). In the United States, rural areas make up 80% of the land area and nearly fifty million people, roughly 16%, live in nonmetropolitan areas (USDA 2011). Rural coastal areas are uniquely vulnerable to climate change due to related sea level rise, increased frequency of intense weather events, and other coastal hazards. Faced with already limited or non-existent resources with which to plan, sea level rise will tax rural communities to find effective and low-cost solutions to confront this threat. The need to develop approaches with limited support and resources has led many rural communities to turn inward in an attempt to develop innovative approaches to planning for sea level rise (Ratner 2009; Jenson 2009; Climate Community of Practice in the Gulf of Mexico

2012). However, as with planning in rural areas in general, the lack of economic, institutional, and social capacity to support planning initiatives remains a significant barrier to planning in rural coastal regions and communities. Evidence to this effect can be seen in a study published in the *Journal of Homeland Security and Emergency Management* that identified rural counties as often having the least disaster resilience (Cutter 2010). This deficiency in capacity for planning makes developing sea level rise adaptation strategies solely from within a rural community a daunting task. Developing capacity for planning can also be an important way to counter-balance the power wielded by urban areas. As mentioned, urban areas dominate planning and politics, especially at the regional level where resource exploitation decisions come to the fore. However, small communities with a well organized and articulated capacity for planning can have major influence (Florida Senate 2011; Withlacoochee Area Residents 2012). As a result, not only must the development of any planning initiative address limited resources, but it must also address establishing, building, and maintaining community capacity for planning.

It is imperative that techniques are developed that, while allowing communities and regions to adequately plan for climate change and sea level rise, also take into account the variety of human settlements, unique cultural and historical assets, intact ecological systems, and natural resource based economies of rural areas. Among the unique characteristics of rural areas are the interactions of linked social and ecological systems (Adger 2000). Often centered on the exploitation or use of marine or estuarine natural resources systems and economies, this link is especially apparent in small coastal communities. The cultural merger of social and ecological systems can be a

vital source of support for more resilient, adaptable, and ecologically harmonious planning. Not simply concerned with the protection of capital and infrastructure investments, rural communities can be the testing grounds for a variety of sea level rise and adaptation planning approaches. To paraphrase James Titus of the U.S. Environmental Protection Agency: “It is in areas that are not built out where other options [beyond protecting existing development] may be feasible, but only if the planning is done now before capital investments are made in private development and public facilities and infrastructure” (Deyle et al. 2007, p. 2, citing Ludwig 2007, p. 30).

In addition to the presence of a socio-ecological link, rural planning literature suggests that the strong rural identity and sense of cultural heritage that are central characteristics of rural communities (Woods 2005) can also be resources that small coastal communities can begin to leverage for sea level rise planning. The local history or cultural heritage of a community can be used to relate long term concepts such as sea level rise and resilience to scientists, decision makers, and the public (Krupa 2000). By creating public awareness and facilitating the exchange of information between scientists and decision makers, local history can also be used to build institutional and social capacity for sea level rise planning. Despite this, it is important to note that historical identity can also be a potential barrier to planning. In a growing number of communities throughout the U.S. there is a pervasive sense of apathy or outright denial towards climate change (Norgaard 2011). In coastal communities that have experienced severe floods and storms, apathy may bear itself out as an ‘I’ve survived before, so what?’ mentality, making motivating the public and decision makers towards planning difficult. The persistent denial of climate change is a particularly troubling obstacle to

adaptation planning. In some communities, local historical events or cultural identity have resulted in the discussion of climate change and sea level rise morphing into a political battle over 'big' and anti-government ideology (Bernard 2010). Unfortunately, the active rejection of climate change science by some community members must be accounted for in any planning approach or its application. In all cases, planners should be aware of public self perception and cultural identity and take appropriate steps to use knowledge of that identity to foster long term planning.

Historical Analysis in Planning

"Defined by a concern with causal analysis, an emphasis on process over time, and the use of systematic and contextualized comparison," (Mahoney and Rueschemeyer 2003) historical analysis is well suited for projects requiring the study of complex management systems over the long term, such as planning. Historical analysis can be a "universal problem solving tool" (Abbot and Adler 1989). However, research into historical analysis in planning and decision making remains highly limited. To begin to visualize what the future may look like, communities often look to the past. For communities that have long histories of human settlement, historical analysis and the communication of history can be tools that facilitate long term planning by relating it to a lengthy past. In the case of communities with limited histories of human settlement, a more technical and ecologically focused historical analysis of changes in natural systems can inform planning decisions concerning ecosystem services and natural resource management (Adger 2005).

Not merely limited to reflection of the past, historical analysis is also an essential tool for understanding the present. Research into the social, political, economic, and environmental context of rural communities is critical to developing adaptive and

resilient sea level rise planning (Folke 2006). Adapting to climate change and sea level rise will require the development of complex management systems. Considering the aforementioned socio-ecological links and other unique characteristics of rural areas, this is likely to be particularly true for small coastal communities. Successfully managing and developing these complex systems will require intimate knowledge of communities as well as how each constituent part works, or does not work, together. Furthermore, each community has its own unique set of characteristics and relationships. Historical analysis can reveal these elements where technical analysis alone does not. Attempting to apply uniform or socially and politically blind approaches that assume uniform values has lead to many of the negative outcomes in planning history (Abbot and Adler 1989). Where planning in one coastal community may be influenced by the cultural value placed on harvesting in-shore and off-shore natural resources for example, another may be more influenced by tourism and its connection to the local economy and environment.

History and 'myth making' is an essential part of cultural identity (Friedman 1992). A community's vision of itself is perhaps the most influential factor in uniting a people (Keith and Pile 1993; Gotham 1999). When a common experience is perceived, it can pull groups together and can act as a rallying point for decision making and compromise. Planning for community resilience requires the incorporation of social and cultural factors and, as such, communicating a common history, or storytelling (Throgmorton 1996), can be a powerful tool if not an essential part of resilient sea level rise planning. By developing a sort of communal psychological resilience, communities not only use their past to inform decisions about the future, but also often use a

perception of past success as a source of motivation to face difficult planning challenges (Bonanno et. al. 2007; Campanella 2010).

Historical analysis also lends itself to sea level rise planning in rural coastal communities in that it can be utilized by planners and communities of varying levels of planning resources. In communities with significant resources for example, intensive archive research and analysis supported by technical analysis can be combined with a campaign to relate, and/or create, an historical identity that can be used to promote and develop adaptive planning initiatives. At a less intensive and smaller scale, and therefore more relevant to most rural coastal communities, it can simply consist of relaying memories of past shoreline migrations or disaster responses to participants in a community workshop or town hall meeting. The use of community history can also be useful to Asset-Based Community Development approaches, a movement within the practice of planning that focuses on identifying and maximizing a community's available resources. As articulated by Kretzmann and McKnight (1993), "collecting stories about community successes and identifying the capacities of communities that contributed to success" is the first step in fostering successful planning and community initiatives (Mathie and Cunningham 2002). Asset-Based Community Development allows citizens more influence over planning and community initiatives and is becoming the dominant paradigm in resilience and climate change adaptation planning particularly in rural areas.

In most cases, a perceived common history is an asset that is already present, though it is likely under-utilized (Abbot and Adler 1989). The use of community history can facilitate both the motivation of collective action and the building of social capital,

integral parts of adaptation planning for communities (Adger 2003). Often lacking in institutional and financial support, many rural areas have responded to the challenge of sea level rise by utilizing assets from within the community rather than pursue a needs-based approach that requires action from external entities (Frank et. al. 2011). The literature shows clear evidence that while the task of adapting to sea level rise and climate change in rural coastal communities is a daunting one, the resourceful researchers, decision makers, citizens, required to drive the movement to more sustainable and resilient communities are out there (Campanella 2010).

CHAPTER 3
METHODOLOGY

Research Questions and Methods

The literature review of climate change adaptation and resilience planning, rural planning, and historical analysis in planning revealed a sizable disconnect as the three relate to sea level rise planning research. Resilient climate change and sea level rise adaptation strategies argue for the development and application of approaches that address the technical, social, political, and cultural needs and realities of coastal communities (Adger 2000; Adger 2003; Adger 2005; Mehaffey 2011; Beatley 2009). Despite this, research and development of such approaches in rural areas remains scant. Noticeably rare within the literature are ways that rural communities can develop sea level rise planning approaches with limited resources. Additionally, while the literature on rural planning and historical analysis suggests that local history and the communication of that history can be powerful tools for planning with limited resources (Abbot and Adler 1989; Friedman 1992; Gotham 1999), research on applying historical analysis approaches to sea level rise planning in rural areas is virtually non-existent. This disconnect led to the development of the two primary research questions. First, is local history an important factor in rural planning for sea level rise? More specifically; does knowledge or perception of local history have an impact on critical actors conducting rural sea level rise planning? Second, can a testable and transferrable method be developed that addresses the needs of resilient rural sea level rise planning?

In order to begin answering these questions, three methodologies were developed. The first methodology focused on analyzing the use of historical identity and knowledge in rural planning in Florida. The second methodology focused on analyzing

the practical needs of rural sea level rise planning initiatives and developing a framework to address those needs. Finally, the framework developed by the second methodology was applied to two case studies in order to analyze its potential utility.

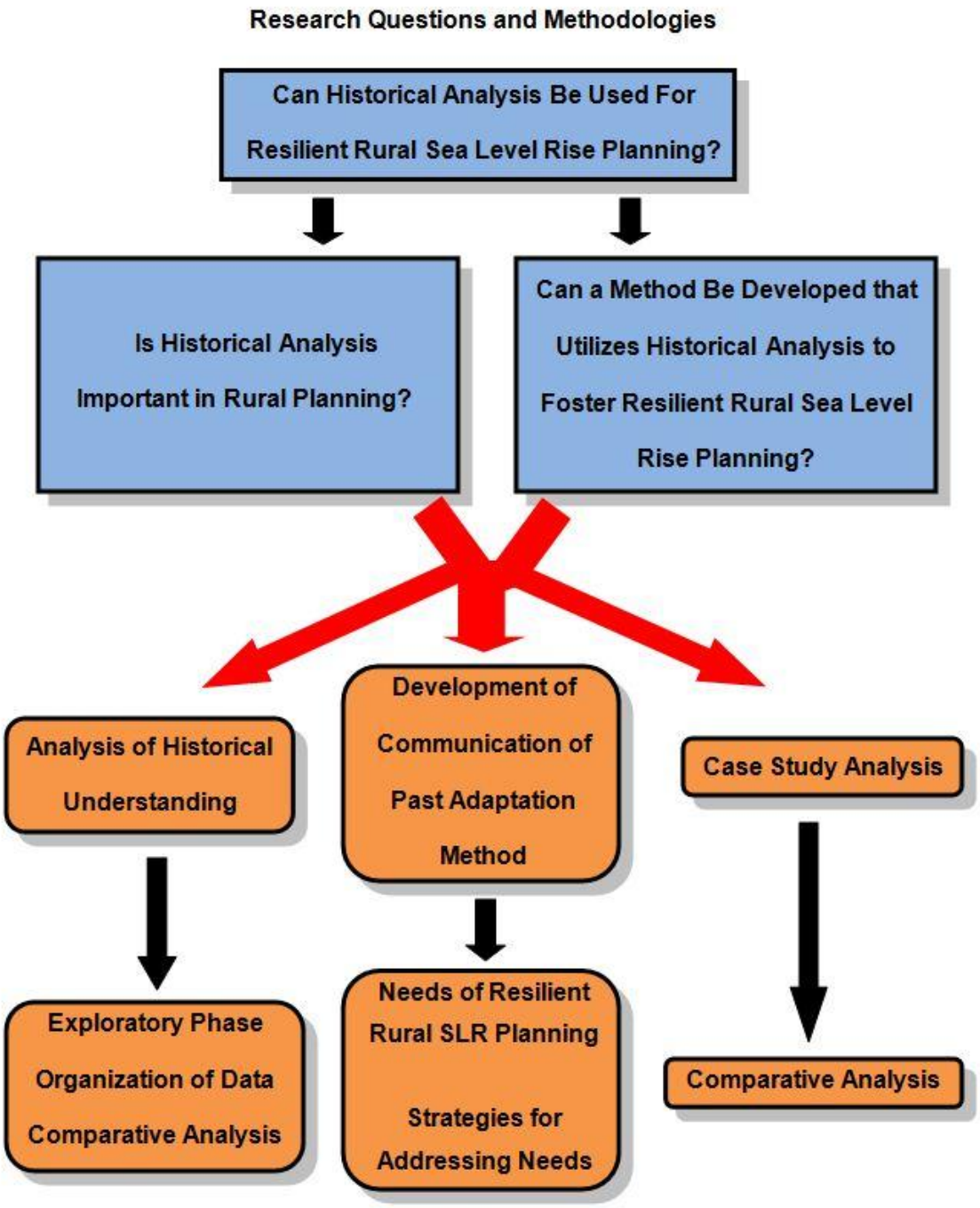

Figure 3-1. Diagram of research questions and methodologies. (Source: Author)

Analyzing the Use of Historical Understanding in Rural Sea Level Rise Planning in Florida

The first methodology began by indentifying a research area and critical actors in sea level rise planning in rural communities. The State of Florida was selected for several reasons. With 1197 miles of coastline and much of its population and development on the coast, Florida is an obvious choice for a sea level rise research area. Also, while there has been heavy development on Florida's coasts, there are still many rural coastal areas that are relatively independent of larger urban areas. Additionally, Florida was selected due to its large quantity of easily accessible and highly valuable resources. The combination of public records, the public university library collections, and the State Library collections of Florida provided an abundance of primary and secondary source data used in researching local history and its impact on social and political attitudes and critical actors involved in decision making surrounding sea level rise planning.

Exploratory phase

Taking place for more than a year between Spring 2011 and Spring 2012, the exploratory research (Babbie 1989) began with searches of databases and archive catalogs for materials that related to the use of local history and its impact on cultural identity and decision making. This search was further bound by limiting data to the thirty three rural counties of Florida (Table 3-1) as defined by the 2000 U.S. Census. The 2000 Census was selected in order to capture data on counties that have only recently transitioned from rural to urban. This allowed for comparisons between the newly urban county and its former rural character. It also allowed for data comparisons between the newly urban counties and the counties that have remained rural. Catalog searches and

database search terms included the rural county seats of government and selected rural coastal communities (Table 3-2). These communities were selected by three criteria; coastal geographic location, county seats of government, and/or community population figures relative to county population. This allowed for a focus on central governmental decision making processes while also taking into account larger rural communities that may not necessarily be seats of county government.

Table 3-1. Florida rural counties as defined by the 2000 and 2010 U.S. Census.

2000 Census County	Density	2010 Census County	Density
Baker	38.03	Baker	46.3
Bradford	88.98	Bradford	97.3
Calhoun	22.94	Calhoun	25.8
Columbia	70.89	Columbia	84.7
DeSoto	50.54	DeSoto	54.7
Dixie	19.64	Dixie	23.3
Franklin	20.71	Franklin	21.2
Gadsden	87.34	Gadsden	89.9
Gilchrist	41.38	Gilchrist	48.5
Glades	13.67	Glades	16.7
Gulf	23.59	Gulf	28.6
Hamilton	25.88	Hamilton	28.7
Hardee	42.26	Hardee	43.5
Hendry	31.41	Hendry	34.0
Highlands	84.95	Highlands	96.1
Holmes	38.47	Holmes	41.3
Jackson	51.05	Jackson	54.3
Jefferson	21.58	Jefferson	24.7
Lafayette	12.94	Lafayette	16.3
Levy	30.80	Levy	36.5
Liberty	8.40	Liberty	10.0
Madison	27.07	Madison	27.8
Monroe	79.80	Monroe	73.3
Nassau	88.49		
Okeechobee	46.38	Okeechobee	51.7
Putnam	97.51		
Sumter	97.76		
Suwannee	50.67	Suwannee	60.4
Taylor	18.48	Taylor	21.7
Union	55.94	Union	64.6

Table 3-1. Continued

2000 Census County	Density	2010 Census County	Density
Wakulla	37.68	Wakulla	50.7
Walton	38.39	Walton	52.0
Washington	36.17	Washington	42.9
Total # = 33	44.69	Total # = 30	45.1

Table 3-2. Florida rural coastal counties, county seats, and selected communities.

County	County Seat	Additional selected communities
Baker	Macclenny	
Bradford	Starke	
Calhoun	Blountstown	
Columbia	Lake City	
DeSoto	Arcadia	
Dixie*	Cross City	
Franklin*	Apalachicola	Carrabelle
Gadsden	Quincy	
Gilchrist	Trenton	
Glades	Moore Haven	
Gulf*	Port St. Joe	Wewahitchka
Hamilton	Jasper	
Hardee	Wauchula	
Hendry	La Belle	
Highlands	Sebring	
Holmes	Bonifay	
Jackson	Marianna	
Jefferson	Monticello	
Lafayette	Mayo	
Levy*	Bronson	Cedar Key, Chiefland, Inglis, Yankeetown
Liberty	Bristol	
Madison	Madison	
Monroe*	Key West	Marathon, Islamorada, Key Largo**
Nassau*	Fernandina Beach	
Okeechobee	Okeechobee	
Putnam	Palatka	
Sumter	Bushnell	
Suwannee	Live Oak	
Taylor*	Perry	Steinhatchee**
Union	Lake Butler	
Wakulla*	Crawfordville**	St. Marks, Sopchoppy

Table 3-2. Continued

County	County seat	Additional selected communities
Walton	Defuniak Springs	
Washington*	Chipley	

*Denotes coastal counties.
**Denotes unincorporated communities.

Hundreds of maps, images, and art collection data collected are dominated by a focus on local history, community heritage, or an attempt to understand and relay the past. Additionally, nearly 100 legal documents, public meeting agendas, and published documents from stakeholder and technical groups were combined with the collection of Comprehensive Plans from the thirty three rural counties and their county seats. Seventeen incorporated rural coastal communities and three unincorporated communities were also included within the data collection (Table 3-2). These legal and technical documents reveal the priorities and/or politics behind decision making and planning in Florida rural communities and show that local history is an important factor in governance. A Google and Google Scholar internet search was also used to support the collection of technical documents pertaining to rural sea level rise research and planning initiatives, such as the Charlotte Harbor Estuary Program (CHNEP 2012), currently underway in Florida . Most critical to the research was the review of over two hundred oral histories and first person interviews conducted between 1990 and 2011. These documents consist of detailed and personal accounts from citizens and government officials that highlight the role local history plays in decision making and community identity (Hinchman 2001). The sheer volume of collected and available data is in itself a testament to the significance of local history to critical actors within Florida rural communities.

Organization of data

Critical actors in community decision making were identified in climate change adaptation and rural planning literature as those within the community that directly impact planning processes and decisions. This can include politicians, community activists, private organizations, average citizens, and scientists. For the purposes of this research, the critical actors and relating data were broken into three categories: (1) Political/Governmental Actors such as elected politicians, staff of state, federal, and local governmental agencies, and public and private interest group leaders, (2) Social/Cultural Actors such as community leaders, social activists, local artists, and religious or spiritual leaders, and (3) Technical Actors such as academic researchers, public and private planners, systems modelers and analysts, and natural and social scientists. This categorization not only facilitated the organization of a large volume of data on rural Florida communities but also allowed for the creation and research of research sub-questions, namely; does local history impact political, social, and/or technical actors involved in planning and decision making? Using historical and comparative analysis, data collected was then subsequently organized by identified topical commonalities, namely; Economic History, Social History, Political History, and Environmental History (Figure 3-2). In organizing data by commonalities two questions were asked; (1) Did subjects or actors use, relay, or relate to local history and, (2) What is the content focus of that local history that is used, relayed, or related to? Question (1) was formulated to ascertain whether local history is relevant to decision makers, the public, or scientists which will support or refute the argument that local history has an impact on critical actors in rural sea level rise planning. Question (2) was formulated to ascertain what types or subjects of local history have an impact on critical actors in

community planning. The results of this research will provide more specific detail as to what kind of local history may be used to influence decision making and support sea level rise planning.

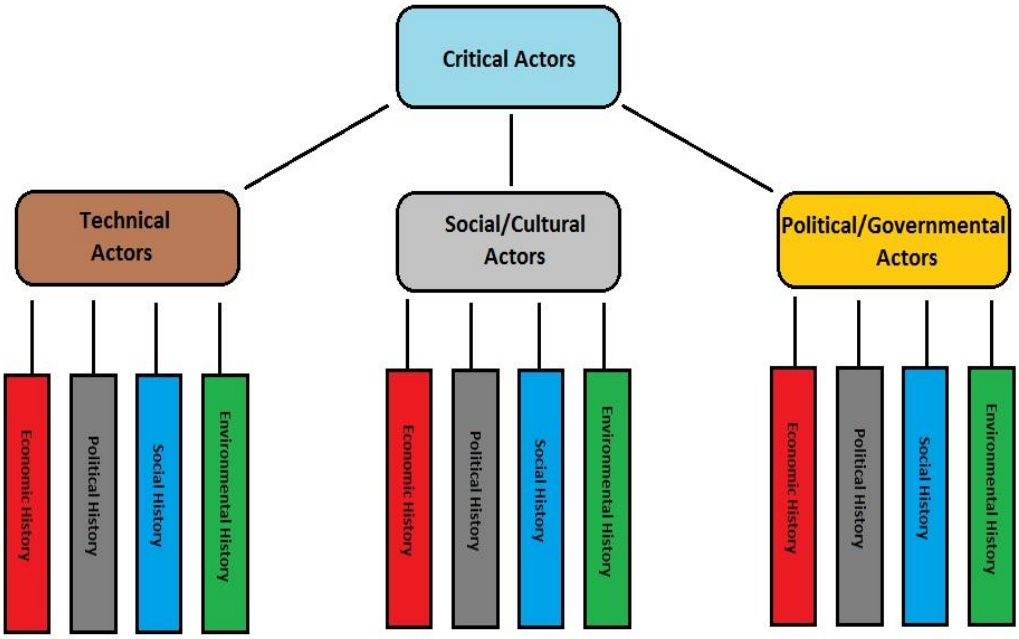

Figure 3-2. Historical analysis organizational chart. (Source: Author)

Comparative analysis

The comparative analysis undertaken following the exploratory phase and during the organization of data phase also served another purpose. By identifying specific commonalities among critical actors the analysis suggested that a framework could be developed to bring science-based sea level rise data to rural decision making. The comparative analysis also suggests that a framework of communication could be developed to harness and articulate these commonalities in a way that fosters community-centered sea level rise planning.

Methodology for the Development of the Communications of Past Adaptation Framework

The development of the Communication of Past Adaptation Framework was guided by two premises. First, a successful framework must identify the needs of resilient sea level rise planning for a rural community. Second, the framework must identify and implement strategies to address these needs.

The skeleton of the framework was built upon the issues identified by the historical analysis in planning, climate change adaptation, and rural planning literatures. It was also heavily build upon the exploratory research of historical identity and understanding in Florida. Specifically, the literature and the research stress that the framework must provide an avenue for science-based but also community-centered approaches to sea level rise planning. Critically, the framework must foster communication and collaboration between a variety of interest groups and stakeholders. Additionally, because of the long term incremental nature of sea level rise, the framework must be an iterative process and build community capacity for planning over time and in the long term. Ultimately, the combination of each of these needs should result in a resilient planning process that is communicable and transferrable.

The body of the framework was structured around developing specific strategies to address the needs identified in the literature and by the research of rural Florida. As stated, communication between stakeholders was identified as the central lynchpin of successful sea level rise and rural planning processes. As such, the body of the framework provides strategies for the development, testing, and redevelopment of visualization and communication materials. It also provides strategies for the

organization and dissemination of scientific data in a managed way. This addresses the need for a process that can navigate the volatile climate of sea level rise planning. Additionally, the body was developed with the intention that the development and dissemination of communication and visualization is undertaken as a two-way process. To put it more clearly, scientific data is brought to the community where by the community influences and directs the substance of future communication materials and planning decisions.

Methodology for the Selection and Analysis of Case Studies

The Communication of Past Adaptation framework was applied to case studies to analyze its efficacy and relevance to on-the-ground research and planning processes. First, two cases were selected; the University of Florida and Florida Sea Grant: Rural Coastal Region Adaptation Planning for Sea Level Rise project, and the University of Florida and Guana-Tolomato-Matanzas National Estuarine Research Reserve System Science Collaborative project. These cases were selected for several reasons. Most obviously, they were each selected for their rural and coastal characteristics. Also, the cases occur on Florida's opposite coasts. This allowed for the comparison of two distinct eco-regions and their potential impacts on the communities within them. While Florida's east coast is more of a 'traditional' coastal area with sand dunes and broad sandy beaches, the west or Gulf Coast of Florida is far more flat and characterized by swampland. The selection of two similar but also distinctly unique communities allowed for the comparative analysis of the importance of shared or differing cultural and social factors. Where both communities share the social and cultural foundations of being Floridian, the economic, social, and political histories of each community have affected

community values and capacities as they relate to sea level rise planning in different ways. Limited influence and control over each of the project's parameters limited the research to the real-time comparative analysis of the Communication of Past Adaptation method's relevance to the case studies. As a member of both project teams the author had access to project team leaders and stakeholders but little influence over the direction and management of each project.

CHAPTER 4
RESULTS OF ANALYSIS OF USE OF HISTORICAL UNDERSTANDING IN RURAL PLANNING IN FLORIDA

Historical Identity in Rural Planning in Florida

The thorough research of rural Florida archive material supports the argument that local history has a significant impact on critical actors in decision making and planning in rural communities of Florida. With 1197 miles of coastline, approximately 4500 islands of 10 acres or more, Florida is a geographically obvious choice for sea level rise planning research. It is also home to some of the most rapid coastal development in the United States. From 1980 to 2003, Florida saw the greatest percent coastal population change, reaching nearly 75 percent. Of the ten coastal counties that experienced the greatest increases in population during the same time period, three were in Florida (Crosset et. al. 2005). This makes sea level rise planning research particularly salient for the state.

Although there is rapid development of Florida's coastal areas, there are still numerous rural coastal communities that provided the focus of the research (Figure 4-1). As of the 2000 Census, thirty three of Florida's sixty seven counties are considered rural based on the statutory definition of an area with a population density of less than 100 individuals per square mile or an area defined by the most recent United States Census as rural (Table 3-1). Thirty percent of its total land area is in farmland and state and federal parks, forests, wilderness areas, wildlife preserves, and national seashores set aside for recreation and preservation comprise an additional ten percent of the state (Florida Department Of Health 2012). This provides an opportunity to conduct sea level rise planning research in rural laboratories that may provide more opportunities for the development of various sea level rise approaches as discussed by James Titus and

others (Deyle et al. 2007, p. 2, citing Ludwig 2007, p. 30). The large number and variety of rural coastal communities in Florida and their close proximity to urbanized areas facilitates the use comparative analysis, one of the main tenets of historical analysis.

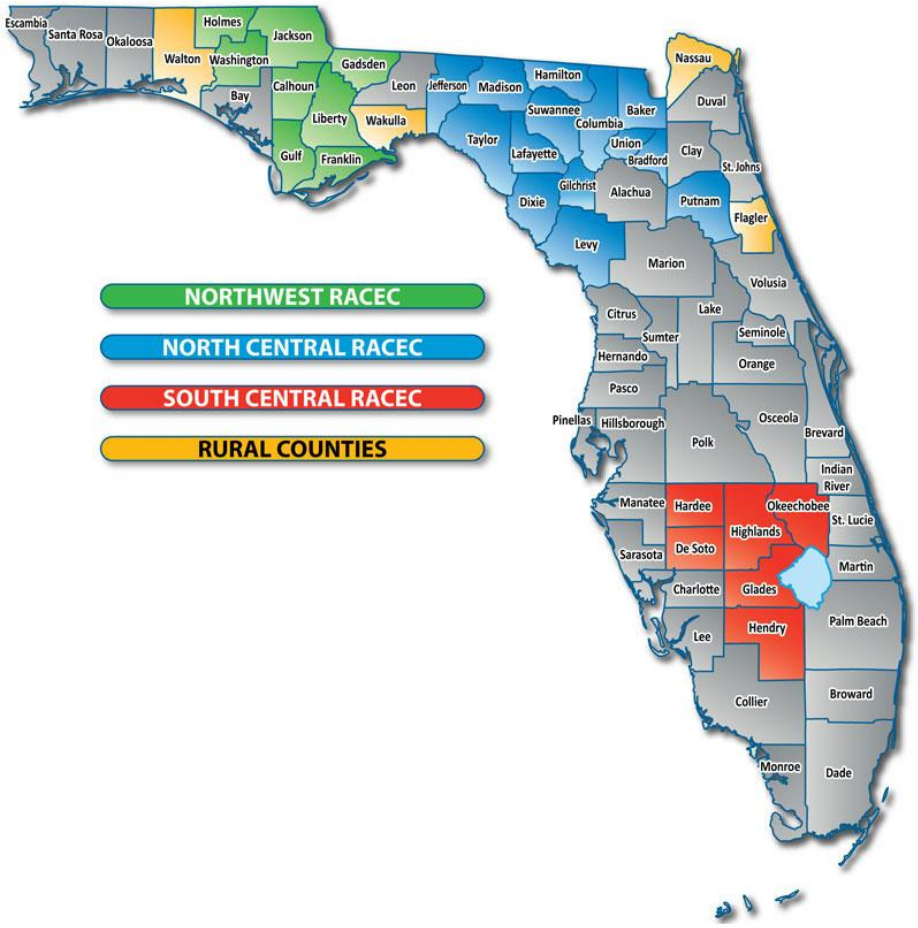

Figure 4-1. Rural areas of critical economic concern in Florida. (Source: Enterprise Florida 2012)

Sea level rise research, historical analysis, and rural planning research in Florida are also facilitated by several highly valuable academic resources. The George A. Smathers Libraries of the University of Florida contain numerous historical texts, access to academic publications, and houses a Special Collections department. Within the Special Collections is the P.K. Yonge Library of Florida History, a treasure trove of maps, archives, manuscripts, and images that date back to Florida's Spanish colonial

history. Also at the University of Florida and maintained by the Department of History is the Samuel Proctor Oral History Program. This collection of over 5,000 interviews is one of the largest and most diverse oral history repositories in the United States (University of Florida Department of History 2012). The University of Miami Libraries also contains a Special Collections Division that houses the Florida Collection. This collection of rare titles covers a wide range of topics including the social, cultural, historical, and political development of the state with materials that also date back to the sixteenth century.

Each of the public universities in Florida also has access to the Publication of Archival Library and Museum Materials Collections “a cooperative initiative of the public universities of Florida to provide digital access to important source materials for research and scholarship” (PALMM 2012). Among this archive’s host of collections are Archives Florida, Aerial Photography Florida, Florida Environments Online, The Florida Heritage Collection, Florida Historical Legal Documents, Florida Historical Quarterly, Florida Voices, and Linking Florida’s Natural Heritage. These collections represent an extensive repository of maps, legal documents, historic texts, academic literature, historic and technical imagery, and oral histories that are an invaluable resource for historical analysis research and planning in general.

The State Library of Florida also houses extensive collections of material relating to sea level rise planning research. The Florida Electronic Library is composed of nearly 100 separate collections included two that were the most relevant to the research; the Florida Memory Project and the Florida on Florida collections. The Florida Memory Project consists of “more than 475,000 individual records from select collections housed in the State Library and Archives of Florida” that includes the Florida Folklife Collection

(Florida Memory Project 2012). This collection provides oral histories, interviews, art, literature, and other items of 'folklife' that provide a detailed insight into the historic, political, cultural, and social diversity of Florida communities. The Florida on Florida Collection supplements the Florida Folklife Collection by adding "collections held by libraries, archives, museums, and historical societies throughout Florida" (Florida on Florida 2012).

The State of Florida also has extensive digital resources relating to nearly every facet of governance and institutional organization from local to state and federal levels. Florida's Sunshine Laws, a set of laws intended to guarantee access to public records passed in 1992 (State of Florida Attorney General 2012; Florida Statutes 2011), and subsequent digitizing initiatives provide easy access to nearly every legal and organizational document of each government and public agency of the state. This includes public meeting minutes and agenda, contractual agreements, and comprehensive plans. These resources provide historical insight into decision making processes, what issues have influenced those processes, and how those issues have affected the organizational apparatus and function of governmental bodies. Also, as local and state governmental bodies and their actions are generally reflective of the sentiments of the citizens they serve; these public records collections also provide unique insight into the political and social attitudes within individual Florida communities. The collection of newspaper articles, maps, images, comprehensive plans, rural and public meeting minutes and agenda, oral histories, and folk art, confirmed what climate change adaptation, rural planning, and historical analysis literature all suggest; that local history has a significant impact on critical actors involved in the development of rural

planning approaches and decision making. By organizing research subjects into three categories; political, social, and technical actors, a more detailed identification of the impacts of local history on individual critical actors was made possible. Research revealed that each group of critical actors was impacted by local history and in unique ways.

Critically important to the application of the research, topical commonalities within and between groups of critical actors and the relative strengths of each topic also show what types of historical data are most influential to specific actors. While categorizing materials by their relation to Social History, Economic History, Environmental History, and Political History is difficult and specific criteria difficult to isolate, the organization into these four topical areas greatly facilitates the research and analysis. Social History refers to events that pertain mostly to social endeavors or influences such as community events like festivals, fairs, community meetings, and society meetings. The identification of Economic History is pretty straight-forward. This is the history that directly deals with past occupations, jobs data, current employment figures, and economic systems. Environmental History is that which pertains to the natural environment but also how humans relate to or use the natural environment. Identifying materials that detail activities centered on the environment or natural resources can be difficult to separate from Social History. This is especially true in rural areas that are often closely linked to the natural environment either through tourism and natural resource economics. Political History is defined as history within the materials that pertain specifically to political machinations and processes. Policy crafting, contract negotiation, and general governmental business were all considered as Political History.

Governmental/Political Actors

Resources and material categorized as pertaining to Governmental and Political Actors showed a strong link between local history and governance. Materials also revealed unique emphases on specific historical topics among these actors. The Comprehensive Plans, oral histories and interviews, public records, technical maps, and other resources are invaluable to understanding the impact local history has on decision making and planning processes.

Communities in Florida must develop Comprehensive Plans as required by Chapter 163 section 3177 of the Florida Statutes. Developed through political negotiation, public participation, and stakeholder collaboration, Comprehensive Plans are a reflection of the priorities of governments in Florida (Carriker 2006). Analysis of the Comprehensive Plans of rural counties and selected communities, specifically the Future Land Use, Conservation, Recreation and Open Space Elements, which are required by statute, and the Coastal Management and Historic Preservation Elements when applicable, show a clear link to local history and cultural heritage. In Marathon, Florida for example, the high level of interdependency between human and natural systems in the Florida Keys island chain bears itself out. “Through cooperative programming with resource agencies and local educational advisors, park and recreation resources shall serve as instruments for teaching both residents and visitors about the importance of and the need for preserving the City’s natural resources (Marathon 2012).” Analysis of rural Comprehensive Plans also shows an emphasis on economic and social history while environmental history is overwhelmingly discussed only as it related to Social and Economic history. For example, in Yankeetown, Florida

the Conservation and Coastal Management Chapter of their Comprehensive Plan states that, “The marine and freshwater resources of Yankeetown support the Town's economic base, providing fin fishing and shell fishing industries, and a potential tourist industry (Yankeetown 2009).” In addition, political history could be identified in some ways through the language and structure of the Comprehensive Plan but much less directly.

Records of public meetings paint a slightly different picture however. Economic and Social history continue to play primary roles decision making but Environmental history begins to play a more significant role in its own right. The impact of Political history on Governmental/Political Actors is also more clearly identified and has a much stronger presence in public records. Also, interviews and oral histories of Governmental/Political Actors show a slight difference in emphases of historical topical commonalities. Providing a much more individual and personalized view of the decision making processes and the impact of local history, the oral histories collected show a continued heavy emphasis on Economic and Social History, but also an equal emphasis on Environmental History. Political History remains an important element but decreases significantly in importance.

The resources and materials, as well as their comparative organization reveal interesting patterns among Governmental/Political Actors. First, as local history or relating it through storytelling becomes more personal and individualized, the emphasis on the natural environment increases, and an emphasis on politics or political history decreases. Second, data shows that Economic and Social History are of the utmost

importance to Governmental/Political Actors in planning and decision making (Figure 4-2).

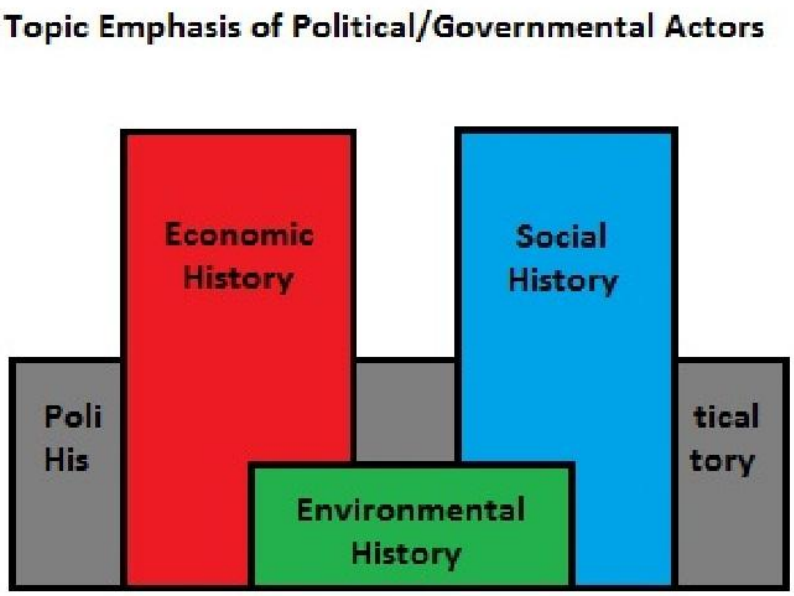

Figure 4-2. Topic emphasis of political/governmental actors. (Source: Author)

Social/Cultural Actors

Resources and material categorized as pertaining to Social and Cultural Actors showed a strong link between local history and cultural heritage or community identity. As with Governmental/Political Actors, these resources also revealed unique emphases on specific historical topics among Social and Cultural Actors. Here public records and oral histories continue to be important resources, but art, photographic images, local news articles, and other more culturally centered materials are additional resources that are key to understanding the impact local history has on community identity, public participation, and sentiments surrounding planning processes within each community.

The collected oral histories and interviews play a critical part in researching impacts of local history on Social and Cultural Actors in a way similar to Governmental and Political Actors. Again, these resources provide a much more individual and personalized view of the decision making processes and the impact of local history. The oral histories categorized as pertaining to Social and Cultural Actors also show a heavy emphasis on Economic, Social, and Environmental History. Political History remains relevant but with a much smaller emphasis. Research into public records revealed a similar pattern of topical emphasis in that Economic, Social, and Environmental History were important factors in public sentiments surrounding community governance and planning.

Local art can also be used to ascertain the impacts of local history on cultural identity (Kay 2000; Mankowski 1995). Crafts, literature, folklore, and photography provide more culturally centered resources and are a reflection of community values. The overwhelming majority of local art and imagery collected in this research focuses on social and environmental topics. This is, of course, hardly surprising as politics and economics rarely make for moving artistic subjects. However, the intensity of the emphasis on social and environmental history relative to political and economic history is relevant to the research.

Again, the resources and materials, as well as their comparative organization, reveal interesting patterns among Social and Cultural Actors. In the more organized arena of public meetings, Social Actors involved in decision making tend to emphasize Social, Economic, and Environmental History in equal amounts while Political History plays a relevant but minor role. As social and cultural data collected becomes less

associated with organized governance, the emphasis on the natural environment and cultural identity of rural communities becomes greater. This material also comes with a virtually non-existent treatment of Economic and Political History. This suggests that in the public sphere Social and Cultural Actors are more likely to include Economic History in their decision making processes or discussions of planning issues. However, as resources and materials become more artistic, personal, and culturally identifiable the topical emphasis becomes overwhelmingly focused on Environmental and Social History. This may suggest that either Environmental and Social History are of the utmost importance to Social Actors and that Economic History is a necessary reality of operation in the public sphere or, simply that more culturally centered materials relating to Social and Environmental History have a profound impact on individuals or, both may be the case. In either case, research into the perceptions of local history by Social and Cultural Actors shows the power of culturally centered material, particularly visual art, in the minds of individual actors and stakeholder groups concerned with community planning (Figure 4-3).

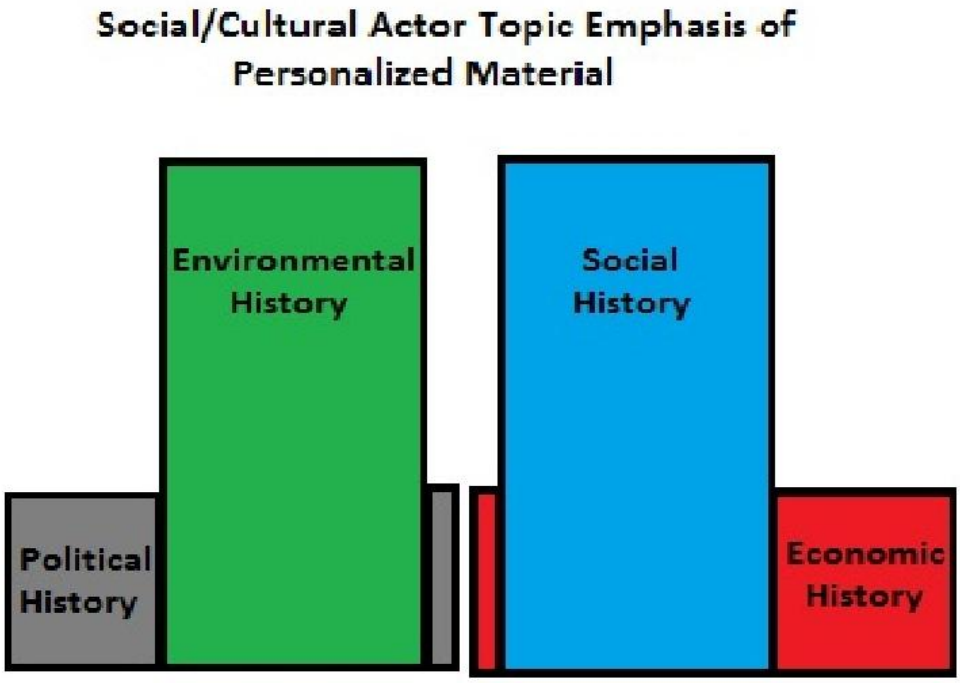

Figure 4-3. Social/cultural actor topic emphasis of personalized material. (Source: Author)

Technical Actors

As to be expected, the primary focus of material relating to Technical Actors in rural decision making deals with more concrete analysis of specific problems within adaptation and rural planning. The majority of this material pertains to natural sciences and quantitative research while a relatively limited amount of social science research has been undertaken. This creates the appearance of a strong emphasis on economic and environmental issues among Technical Actors. However, important factors complicate this interpretation. In an echo of the adaptation and rural planning literature, much of the natural science research argues that greater emphasis should be placed on social and policy issues and their historical significance to make research more relevant and practicable. Additionally, technical analysis is often bound by specific time periods

and historic frames of reference. This is intended to produce more focused and detailed research for the sake of practicing good science but also suggests more human purposes. First, scientists want their work to be relevant and relatable and basing research on specific time periods or historical frames of reference is a way to achieve that goal. Second, history and time frames can provide mental anchors for data collection, organization, and synthesis facilitating research practice. Third, history can be a common frame of reference for practitioners of different scientific disciplines. Bound by common timeframes and historical markers, scientific collaboration can be more easily undertaken, coordinated, and communicated (Mahoney and Rueschemeyer 2003).

In summation, materials related to Technical Actors place a direct emphasis on Economic and Environmental History with little direct evidence of addressing Social and Political History. However, materials produced by Technical Actors also argue for a greater balance of emphases. The resources also show that history and historical analysis are critically important to the practice of science and research (Figure 4-4).

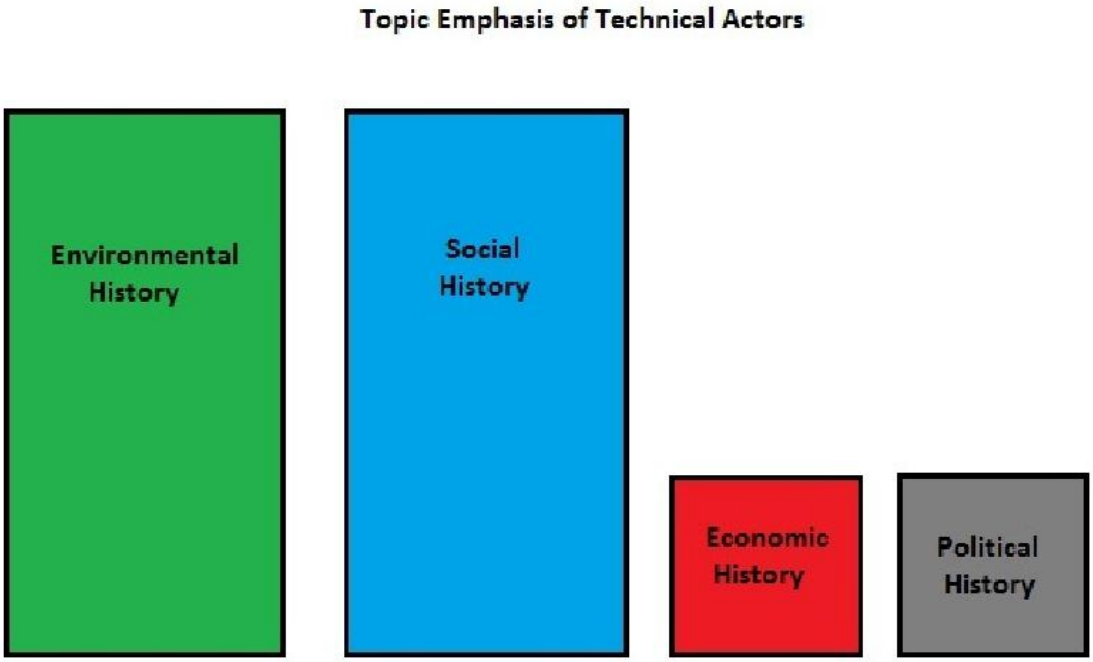

Figure 4-4. Topic emphasis of technical actors. (Source: Author)

Applications

This research revealed topical commonalities within and between groups of critical actors facilitating the creation of planning strategies targeted towards these groups. This data suggests that each critical actor group places varying emphases on environmental, social, economic, and political concerns depending on the method of communication or interaction. This knowledge can be critical to the development of communication and visualization techniques. By knowing which topics to emphasize at various forums or community exchanges sea level rise planning initiatives can design highly flexible and specifically tailored materials. For example, the presentation and display of information to Social/Cultural Actors at a public meeting (impersonal interaction) would emphasize different points than materials that would be used in a door to door campaign (personal interaction).

However, because each group of critical actors has unique emphases, communication between groups of critical actors can pose a challenge. The multitude of needs and values of each group of critical actor can make using an easily relatable, common set of information when developing sea level rise planning approaches seem impossible. Fortunately, along with the topical emphases of each critical actor group, another overarching and unexpected pattern emerged in the data. Throughout the majority of resources and materials collected, critical actors focused on specific historical events, and more specifically, adaptation events. This characteristic becomes particularly evident in rural coastal communities. For the purposes of this research, adaptation events are defined as natural or man-made events that forced fundamental changes in the politics, cultural identity, and/or economy of rural communities. When reflecting on or relaying local history, resources and materials pertaining to all three critical actor groups focused on events like hurricanes, disruption of natural systems, and the resulting social and economic evolution of rural communities following such events.

This unifying tendency to relate to specific events that make up pivotal moments in the establishment of a community's identity can be a common thread that sea level rise planning communication and collaboration can be centered upon. Being able to relate past adaptation experiences to climate change adaptation and sea level rise can facilitate communication, collaboration, capacity building, and planning among the public, governmental bodies, and stakeholders. As climate change and sea level rise are often perceived as imminent disasters, sea level rise planning initiatives and associated communication materials can relate historic natural and manmade disasters

to great effect. The subsequent community adaptations following past disasters can also be used as a communication tool among critical actors in rural communities. By relating past adaptations to current decision making, a community can begin to have an open dialogue over inherent vulnerabilities and their own vision for the future.

CHAPTER 5
THE COMMUNICATION OF PAST ADAPTATION METHOD

The Method

By developing a testable method that utilizes local history organized and communicated around Past Adaptation Events (PAE), this paper can begin to answer the second research question: can historical analysis and communication of past adaptation events be effectively employed to support sea level rise planning in rural communities? Climate change and adaptation, rural planning, and historical analysis in planning literature all identify a central requirement of resilient rural sea level rise planning. This literature argues that planning policies or initiatives must balance the social, political, and technical needs of rural communities to foster successful sea level rise planning.

To address these needs, important factors as identified by planning literature and the earlier described research were incorporated into the Communication of Past Adaptation method. With limited budgets and resources, the affordability of employing any proposed method is of particular practical importance to rural communities. The literature and previously described research also argue that to create policies or plans that are the most responsive to community needs and that also address technical the realities of sea level rise it must come from within a community. That is, sea level rise plans, policies, and adaptation strategies must be developed in partnership with public, private, and governmental stakeholders through collaboration and negotiation. As sea level rise and climate change are slowly developing events, planning initiatives or projects must be iterative in order to address the maintenance of and capacity building required for sea level rise plans over the long term. Additionally, the literature and the

previous research points out the need for resilient sea level rise planning to incorporate natural and social science research and to facilitate the synthesis of technical analysis across multiple disciplines. Of particular importance to the practice of planning, methods fostering sea level rise planning should be testable, repeatable, and transferable. Ultimately any resilient sea level rise planning method or policy should facilitate communication, collaboration, and negotiation between social, governmental, and technical actors. The Communication of Past Adaptation (CPA) method addresses each of these important factors through several phases (Figure 5-1).

Identifying Past Adaptation Events

As it is the central lynchpin in the CPA method, how to identify Past Adaptation Events warrants more thorough treatment. To do so, it is helpful to break the concept into its two parts; the types of events that spur needed adaptation, and the adaptation strategies themselves. At first glance, the historical context of rural coastal community planning may seem wholly centered on rapid and devastating natural disasters. However, these communities are also tied to many more subtle events and subsequent adaptations.

Natural disasters are easily identifiable as PAEs. Storm events such as hurricanes, floods, and rapid erosion from storm surge can all do severe physical and psychological damage to a community. In many cases, the rebuilding and healing process following disasters can mark an adaptation as it can become an integral part of the community fabric (Lindell and Prater 2003). Events requiring adaptation are not limited to natural disasters however. Many rural coastal communities are also faced with man-made challenges that require adaptation. For example, a community may face

economic challenges brought on by regulation or costly maintenance of shoreline hardening, dredging, and armoring. Resource depletion can also serve as a man caused Past Adaptation Event. With the loss of a vital economic or subsistence resource, communities are forced to fill the void or migrate elsewhere. Since the very nature of PAEs is relatively flexible, the temporal characteristics are also varied. Natural disasters can happen rapidly of course, but depletion of natural resources can occur over decades.

PAEs should also be identified by their adaptation responses, or lack thereof. There are three response strategies for addressing sea level rise; retreat, accommodation, and protection (IPCC 2010). Retreat refers to the inland migration of a coastal community to avoid rising sea levels. Accommodation refers to the practice of building or rebuilding the community in a way that accepts the continued risk of flooding. Examples include building houses on pylons and converting agriculture to aquaculture. Finally, protection indicates a community that has chosen the strategy of fortifying itself against intruding seas. Generally, this entails building sea walls, dikes, or levees to keep the water out. In communities where these strategies are being employed, they are being employed against Past Adaptation Events of one form or another.

Initially, identifying PAEs can seem frustratingly broad however, this is by design. While it is important to have a coherent definition of PAEs for the facilitation of communication, especially initially among Technical and Governmental/Political Actors, it is also important to maintain a balance of rigidity and flexibility in order to be as transferrable, iterative, and community-centered as possible. The Communication of Past Adaptation process is built to ultimately produce science-backed dialogue and

communication that is centered on events that the community itself identifies as important.

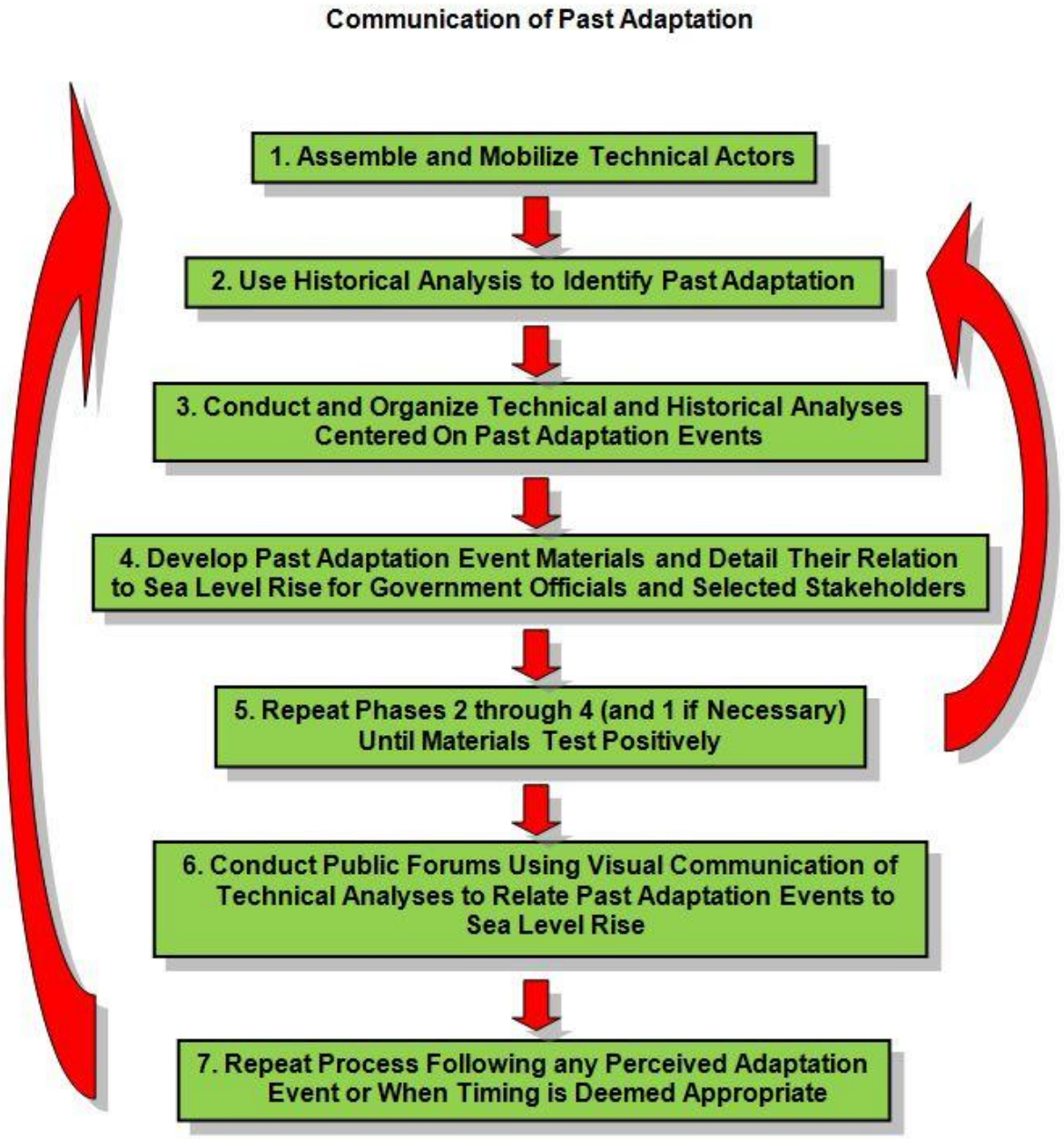

Figure 5-1. Diagram of communication of past adaptation method. (Source: Author).

1. Assemble and Mobilize Technical Actors

The method begins with the assembly of Technical Actors for several reasons. In general, rural areas lack the grassroots, institutional, or political capacity to self-start sea level rise planning. In most rural cases it is up to a researcher, an elected official, or a concerned citizen to begin the community discussion of sea level rise and potential impacts. Also, the literature argued strongly for science-based solutions to resilient planning. By establishing the Technical Actors as the lead, the CPA method is designed to be driven by science. As such, this phase consists of the initial collection of social and natural scientists willing to study and be a part of sea level rise research within the rural community. This can be initiated either by the researchers themselves with participation of local governmental or social actors or vice versa. In urban areas with significant funding and resources this can be achieved simply by paying and/or attracting staff, scientists, academics, and researchers. To address issues of affordability and limited resources, rural planners or researchers will have to conduct their own outreach to participants willing to be a part of research and analysis with limited compensation. Fortunately, the growing awareness and support of climate change and sea level rise planning has created a growing body of funding opportunities and inexpensive resources such as academic collaborative and student conducted research.

2. Use Historical Analysis to Identify Past Adaptation Events

The exploratory research revealed the power of historical analysis and the influence of historical identity. Historical Analysis is a relatively low-cost method for

revealing the values and attitudes of rural communities that has been highly underutilized (Abbot and Adler 1989). Furthermore, the literature and the research suggest that a common thread or community stories are powerful forces in planning. If community identity is ignored it can either exist as an underutilized resource at best or as a direct opposing force to sea level rise planning at worst.

Historical analysis should be used in this phase to identify Past Adaptation Events such as natural disasters or other events resulting in systemic shocks and community adaptations. Oral histories, interviews, local newspaper articles, art, and archive research can be used to highlight these events and to illustrate which events and which adaptations are the most salient to Critical Actors in sea level rise planning and decision making. Once again, this can be conducted on an exhaustive, well funded, scale but more importantly to rural areas, this can be done less expensively. For example, limited, first-person interviews could be conducted by rural government staff, public forums specifically focused on relating historical and cultural identity could be hosted, or basic internet searches of archives and libraries could be conducted. This flexibility in the method design takes into account the varying capacities of rural communities to conduct research and analysis as well as the varying availability of resources. It also allows for the foundation of the sea level rise planning initiative to have variable levels of public involvement at multiple stages of the process. However, while flexible in the scale of its potential use it is important to note that greater inclusion of multiple sources minimizes the effects of bias. If there is a larger pool of social and cultural resources for historical analysis, then the greater the dilution of the influence of one historical resource.

3. Conduct and Organize Technical and Historical Analyses Centered On Past Adaptation Events

Climate change adaptation and rural planning literature argue that there is a critical need for greater communication when undertaking planning initiatives. This need exists within each Critical Actor group as well as between each group. This means that methods must foster the information exchange between scientists of varying disciplines, between scientists and the community, between different social organizations, between organizations and government officials, and between government officials and agency staff. Research suggests that communication can be facilitated by using a common thread or themes. The historical analysis of rural areas in Florida revealed that Past Adaptation Events can be the unifying thread needed for sea level rise planning communication.

To facilitate the collection and organization of material relating to Past Adaptation Events, the categorization methodology previously described should be used. Specifically, this should consist of categorizing local historical analysis data into materials relating to Governmental/Political, Social/Cultural, and Technical Actors, followed by the subsequent organization of materials by topical commonalities within local history i.e., Social, Political, Environmental, and Economic History. Surveys or interviews of Critical Actors should also be conducted in this phase. Surveys should identify, but not be limited to: what respondents know about sea level rise, what they feel about planning for sea level rise, what challenges or past adaptations have been faced by the community, and what is their vision for the future of the community. Also, care should be taken to allow the respondents to identify their profession or affiliations.

This will continue to allow the responses to be categorized into the three Critical Actor groups and further inform the development of communication materials.

On a technical level, the use of Past Adaptation Events can serve as a common frame of reference for practitioners of different disciplines. It can also identify the need for specific Technical Actors depending on the particular topical emphases of each targeted critical actor group. For example, if a Past Adaptation Event centers on an economic event, economists can be recruited to the research project or environmental scientists if the event is largely environmental. Bound by common timeframes and historical markers, scientific collaboration can be more easily undertaken, coordinated, and communicated (Mahoney and Rueschemeyer 2003).

The thematic organization will also facilitate the creation of visualization and communication materials tailored to each or all critical actor group. The adaptation and rural planning literature argues that these tailored solutions are critical to science-backed community-based planning. Further, the historical analysis research revealed general topical emphases within and between critical actor groups. The method allows for materials to be created that specifically target actors. By highlighting the shifts in topical emphases within actor groups that are dependent on the mode of communication, it can also identify communication strategies that may be needed in specific venues or formats. For example, if the communication materials are to be used for presentation in a public meeting, the needed topical emphasis will be different from those needed for a smaller meeting with an individual stakeholder group.

4. Develop Past Adaptation Event Materials and Detail Their Relation to Sea Level Rise for Government Officials and Selected Stakeholders

The primary purpose of this phase is to relate science, data, and historical context of Past Adaptation Events to current sea level rise data and begin the dialogue among government officials and selected stakeholders concerning future planning scenarios. Phase 4 consists of the actual production of communication and visualization materials and the articulation of those materials to community leaders. This is the first major opportunity within the Communication of Past Adaptation method for community direction and development of not only the communication materials but the planning process itself. Here, the science of local sea level rise (Phase 1), specifically tailored by social and cultural context (Phase 2 and 3), is brought to community leaders and decision makers for discussion and potential implementation.

Communication materials should be developed using elements gleaned from the research of Past Adaptation Events and surveys of Critical Actors from Phase 3. Materials such as posters, storyboards, digital presentations, and graphics should be highly visual. The efficacy of visual communication is supported by collaboration and communication literature (Worth 1981; Efland 2002) and is made obvious by the successful efforts of the marketing and advertising fields. The research into rural planning in Florida showed that reflections on the past were strongly influenced by conjured images of social, environmental, and economic history. It further showed that the more personal the dialogue or interaction concerning past adaptations was, the higher the emphasis on social and environmental history. This evidence points to the strong need, at this phase, for visual communications that relate past social and

environmental adaptations to the social and environmental threats posed by sea level rise.

Selected stakeholders in this phase should be limited to those stakeholder groups that are immediately affected by sea level rise namely large property owners, representatives of small properties, and community and organizational leaders from directly affected neighborhoods or organizations. Selection can be undertaken by the researchers but selection by elected officials is preferable. This will not only utilize the knowledge of political actors as to which members of the community should be initially involved but will also allow the researchers to remain politically neutral agents. Neutrality is particularly important to maintain in communities that may be hostile to sea level rise planning in order to keep science separate from politics as much as possible (Beatley 2009; Bernard 2010). Hostility towards planning is a common characterization of many rural communities in Florida (Spear 2010), though this perception has not been verified or refuted by this research, and a perception of neutrality can go a long way in fostering trust between Technical Actors and the community.

As in Phase 3, participants in Phase 4 should be surveyed or interviewed to identify initial knowledge of and capacity for sea level rise planning. They should also identify the values and attitudes towards sea level rise and its relation to future visions of the community. Again, care should be taken to identify individual professions and affiliations to highlight the efficacy of various materials to the various Critical Actor groups. Participants of these initial communication presentations should then be resurveyed following the presentation of materials to identify any changes in

perceptions after presentation and to identify which materials were or were not effective tools.

The adaptation and rural planning literature, as well as the exploratory research, showed a high level of volatility of issues surrounding resilient sea level rise planning and as mentioned earlier, some cases show outright hostility towards planning in general. This makes it imperative that communication materials are tested and developed by community leaders first. The limitation of communication to elected officials and Selected Stakeholders is important at this phase for several other reasons. First, it allows Technical Actors to develop and test the communicative effectiveness of materials and techniques in a semi-controlled initial testing ground. This initial testing phase can also reveal which materials are more or less effective to each of the Critical Actors, enabling the creation of an early portfolio of specifically tailored materials. Also, these selected stakeholders can disseminate information back to the community in an introductory way laying the foundation for planning capacity building (Chaskin 2001). Successful materials will have been vetted and can therefore be more easily explained and defended when disseminated to a larger audience. As for unsuccessful materials, having limited stakeholders initially limits the exposure of ineffective or failed communication materials to a smaller number of participants. The materials can then be adjusted and adapted in Phase 5 before widespread exposure, limiting the risks of potential widespread miscommunication.

5. Repeat Phases 2 through 4 (and 1 if Necessary) Until Materials Test Positively

In the event that communication materials survey poorly amongst government officials or selected stakeholders, they should be refined, reevaluated, or scrapped

altogether. Phases 2 through 4 should be reviewed to determine either what went wrong with the interpretation of data and subsequent creation of material or to reveal new potentially influential data. If the failure of communication materials seems to be due to a lack of necessary expertise or ability by the project's Technical Actors, Phase 1 will also have to be repeated. Ultimately, the majority of survey respondents should support the continued use of particular materials and preferably the vast majority.

6. Conduct Public Forums Using Visual Communication of Technical Analyses to Relate Past Adaptation Events to Sea Level Rise

Following the development of visual materials tailored to elected official and selected stakeholder specifications and recommendations, public information and participation meetings should be organized. These meetings can consist of forums, town halls, and/or planning workshops. Just as with the earlier elected official and selected stakeholder meetings, the main goal for the public meetings is to relate science, data, and historical context of Past Adaptation Events to current sea level rise data and community planning. Its purpose is also to begin the dialogue within the community concerning future planning scenarios and the values inherent in potential decisions. Once again, before and after surveys of meeting participants should be conducted. This will not only benefit research and collaboration in the same manner as the selected stakeholder surveys but will also allow citizens, planners, and elected officials to identify and evaluate the values and priorities of the community. By taking the materials and concepts to the public at large, this phase of the CPA method incorporates a broad level community-based element to the planning process.

One of the most important outcomes of utilizing the Communication of Past Adaptation Events method is that it builds community and governmental capacity to not only address sea level rise, but to plan in general as well. By facilitating and organizing the collaboration between Critical Actors, this method will produce science-based, specialized solutions developed from within the community. However, it is important to note that, as in nearly all public endeavors, sea level rise science and planning has its opposition. There is a growing discussion within the planning profession about how to address members of the public who may not believe the overwhelming volume of scientific data (Norgaard 2011; McCright 2003). While every member of the community should be engaged directly, a process that caters to the rational or irrational wants of each individual is impractical at best and destructive at worst. By developing trust and directly engaging the community in multiple phases, and by strategically testing materials and communication techniques early in the process, the CPA method can diffuse hostility and resistance while also directly addressing any attitudes of denial or apathy.

7. Repeat Process Following any Perceived Adaptation Event or When Timing is Deemed Appropriate

The Communication of Past Adaptations method is also intended to be an iterative process. As all human and natural systems are dynamic, it is imperative that community plans and the processes that develop them are also adaptable. As the sea rises and communities grow or evolve, effects on the ground will challenge even the best laid plans. The gradual pace of sea level rise may prevent it from being an immediate threat in public perception, but when coupled with the drastic shifts in natural systems over

relatively short periods of time (Florida's Oceans and Coast Council 2010; IPCC 2007), will require planning processes that are publicly engaging and adjustable (Agrawal 2008; Bedsworth 2010; Campbell 1996).

When new adaptation events occur, Communication of Past Adaptations should begin again. Hurricanes, species decline, shifts in terrain, and other transformative events will result in shifts in human systems (IPCC 2007) and may subsequently alter the public values, politics, economies, and technical requirements of sea level rise planning. The identification and specific definition of new adaptation events is intentionally left relatively vague. This is to allow local leaders, stakeholders, or governmental bodies the flexibility to address the planning problems as they are defined by themselves, not a technical group of 'outsiders.' The Communication of Past Adaptations method will repeat the process but reveal any new shifts in attitudes among Critical Actors. Repetition of the process would be greatly aided by the participation of the same bodies or representatives as in the past but this is not a requirement. Repeating the method will also add to, or rebuild, the portfolio of visualization and communication materials that can effectively communicate a community's sea level rise planning needs. While it is unlikely, of course, that any process will be able to predict every challenge created by climate change and sea level rise, Communication of Past Adaptations will go a long way towards preparing a community for major shifts and in facilitating future adaptations.

CHAPTER 6
CASE STUDIES

Selection of Cases

While the Communication of Past Adaptations method has not been specifically tested by the research presented here, it is possible to analyze the application of elements of the strategy through two case studies. The first is the Florida Sea Grant research project underway in Levy County, Florida. The second is the Guana-Tolomato-Matanzas National Estuarine Research Reserve project also underway in the Matanzas Basin of Florida. These cases were selected primarily because they are among the first rural sea level rise planning projects in the U.S. and Florida. Additionally, both locations have limited resources with which to plan and as such, are prime targets for this research. The projects are also among the first to focus on developing science-based community solutions, not simply technical analysis of future impacts. These cases also offer excellent material for comparative analysis in that they share many similarities but whose differences may also shed new light on planning processes.

An obvious similarity is the coastal location and imminent threat to human and natural systems from sea level rise. Both cases also share the same State governance and political apparatus, limiting confounding variables that may arise from state-to-state comparisons. Levy County and the Matanzas Basin share lengthy histories of human settlement exposing both communities to numerous past adaptation events and greatly facilitating the collection of historical data. Highly important to this research is that the projects share many of the same technical actors and are lead by the same research team coordinated by Dr. Kathryn Frank of the Department of Urban and Regional

Planning at the University of Florida. This allows for a more uniform analysis of research methods and techniques while also allowing testing of their efficacy in each community.

Differences between the two areas greatly affect community identity, political interactions, economic foundations, and planning processes. One major difference is in settlement and development patterns. Levy County on the one hand, is dominated by a history as a military and shipping hub centered on the nearly continuously occupied town of Cedar Key. Today Cedar Key is a vibrant community with aquaculture, tourism, and timber industries as the primary economic drivers. The Matanzas Basin however, has also been characterized by its historic military purpose but in a cursory and indirect way as a rearguard outpost. More modern settlement has been centered on an enclave of local fishermen, vacationers, and eco-tourists. Further similarities and differences become apparent in the closer study of the cases.

University of Florida and Florida Sea Grant: Rural Coastal Region Adaptation Planning for Sea Level Rise (Cedar Key and Levy County, FL)

The Florida Sea Grant project is centered on Levy County, Florida but aims to influence regional planning for the Big Bend area of the state. The Big Bend region is a unique, ecologically valuable expanse of tidal marshes among numerous estuaries spanning 229 miles, or a four and a half hour drive, from Tarpon Springs near St. Petersburg to Panacea just east of St. George Island. As seen in Figure 6-2, sea level is predicted to significantly affect these habitats. The Big Bend Seagrasses Aquatic Preserve covers over 900,000 acres of submerged lands in the region, and there are numerous land-based natural preserves, however they tend to occur on the coastline but were designed with habitat and species migration in mind not sea level rise

adaptation (Figure 6-1). The region is also a critical ecological corridor identified in the Florida Ecological Greenways plan that connects the Florida Panhandle to the Peninsula (Hoctor 2000). There are more than 600,000 acres of publicly owned or leased land in the region. There are also 12 small coastal communities for which the economies are based in fishing, aquaculture, and tourism each with its own unique sense of community identity and unique historical context.

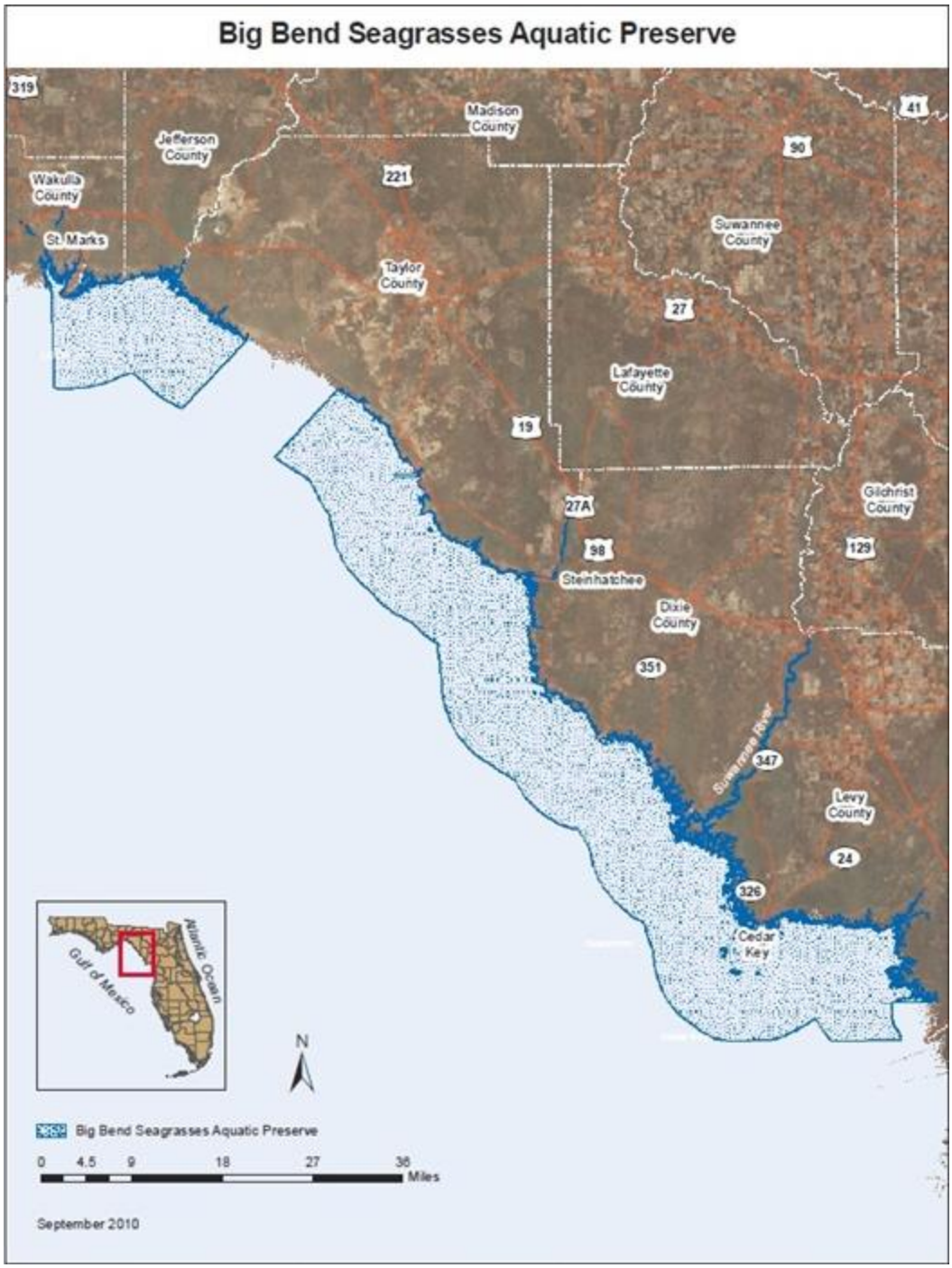

Figure 6-1. Big Bend Seagrasses Aquatic Preserve. (Source: Florida Department of Environmental Protection Sept.2010)

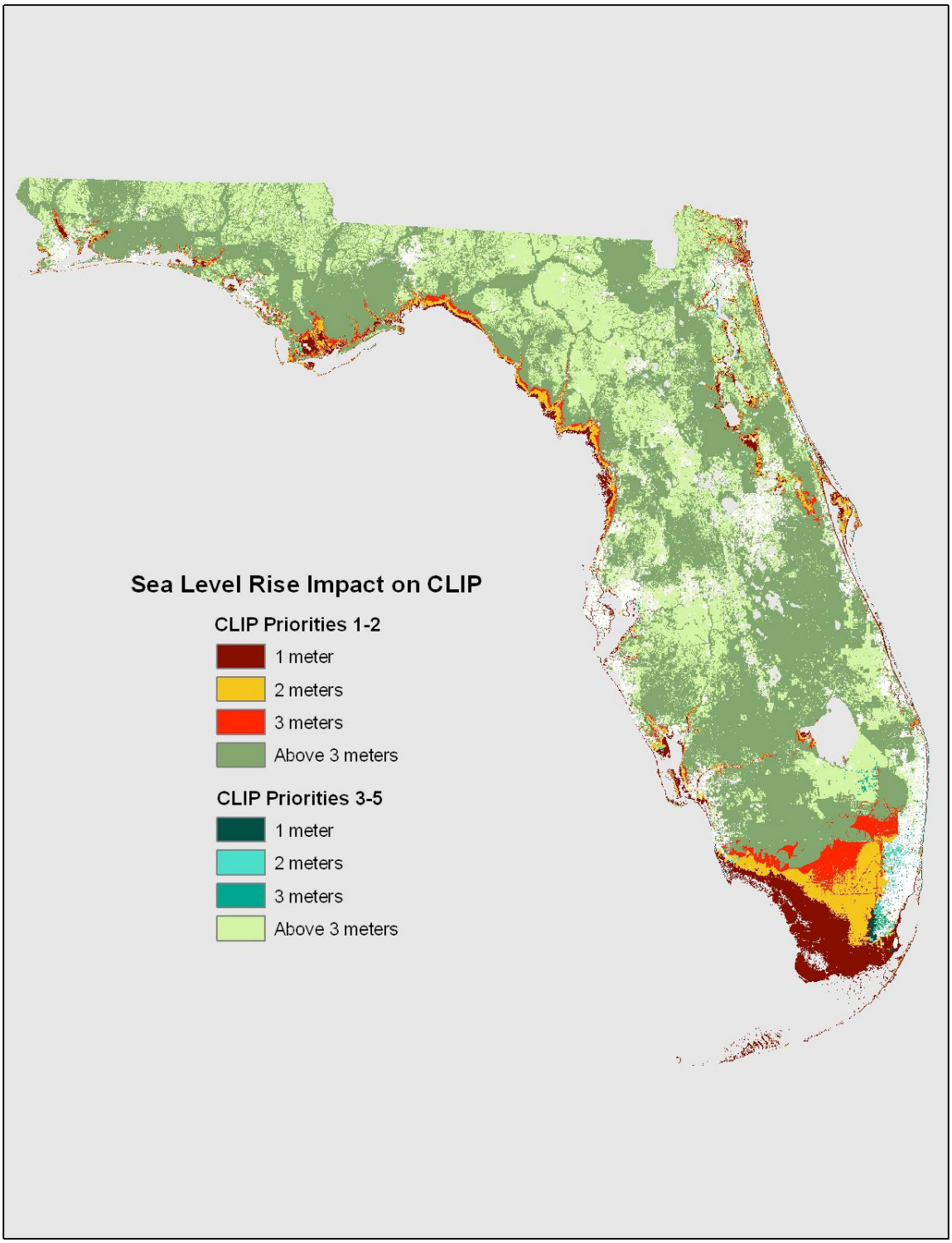

Figure 6-2. Impact of sea level rise on lands and waters identified for conservation. (Source: Critical Lands and Waters Identification Project (CLIP) 2007 Tom Hoctor, UF)

One of the twelve small coastal communities in the Big Bend region is Cedar Key, FL. The City of Cedar Key has a population of about 1,000 people and is located on a small island (or key) along the Gulf Coast region of north Florida (Figure 6-3). The village is low-lying, with elevation generally 10 feet above sea level or less. This makes recent estimates in Florida that predict sea level rise of 2 and 4 feet by 2100 (Parkinson 2010) especially alarming. Nature preserves surround Cedar Key, including the Cedar Key National Wildlife Refuge encompassing 800 acres of 13 offshore islands. The economy is primarily based on aquaculture (offshore clam farming), fishing, tourism, and residential retirement. Cedar Key has rich aboriginal and American histories and the island has 139 buildings and archaeological sites listed on the National Register of Historic Places. It also has a long history of adaptation to either gradual shifts in the natural environment or dramatic changes directly caused by natural and man-made disasters. This makes the town an exceptional case for study in using and leveraging historical identity for fostering sea level rise adaptation. Additionally, the extremely small and rural character of the town, marked by access to limited resources, also allows for an evaluation of the use the Communication of Past Adaptation method.

Figure 6-3. Location and aerial photo of Cedar Key, Florida. (Source: Wikipedia.org)

Historical Analysis and Identification of Past Adaptations

Originally founded by the Spanish on nearby Atsena Otie Key, Cedar Key has had a long history that includes pirates, tales of sunken treasure, Civil War era battles, and railroad barons. The town of Cedar Key has had experienced many Past Adaptation Events that have had a profound impact on the town, its citizens, and its resulting cultural identity. One such experience was a hurricane in 1896 that completely wiped out the original town leaving only the graveyard intact. Much of the namesake cedar trees (which were actually juniper) were destroyed along with facilities belonging to the Faber pencil company. The losses in its primary manufacturing resource forced the company to relocate its operations, leaving the forests completely depleted and the local economy devastated. Seemingly undeterred, many of the citizens floated the remaining buildings on barges over to Way Key where the town was reestablished.

Figure 6-4. 1884 bird's eye view of Cedar Key, FL. (Source: Stoner, 1884 P.K. Yonge Library of Florida History M2.1884.006.2010.0557)

In more recent history, Hurricane Easy of 1950 had similar drastic effects and was recounted in a report from the U.S. Weather Bureau the following year (Norton 1951). Looping twice over western Florida, the eye of Hurricane Easy centered over Cedar Key for 2.5 hours and battered the town with winds exceeding 100 mph for more than 9.5 hours. Rainfall totals on the island reached 24.5 inches in a 24 hour period and the 38.7 inches in 24 hours experienced by Yankeetown, Florida on the southern border of Levy County remained a national record until 1979 and remains the record for Florida. Gathering completely accurate wind and rain data was hampered by the fact that all instrumentation was blown and washed away. Roughly 90% of the island's structures were damaged with 50% being "unfit for rehabilitation" (Norton 1951). Damage to crops,

the area's major employment center, and the destruction of the entire fishing fleet of 100 vessels decimated the primary economic engines of the area (Williams and Duedall 1997). These clear Past Adaptation Events, along with several fires, other devastating storms, and tidal surges have ingrained an inherent awareness of the unpredictability of the natural environment among the community. This awareness lives on and is propagated each day by the town's museums, shops, decorations, and its folklore (CedarKey.Net 2012).

Past Adaptation Events are not strictly natural disasters and can include man-made events. Heavy destruction to fisheries in the mid 1990s prompted the introduction of the Gill Net Ban legislation to the Florida Constitution. Gill nets are vertical panels of mesh netting that are usually stretched across a channel used by migrating fish or drug behind fishing trawlers. In 1994 voters passed the ban by referendum. Heavily reliant on gillnetting, this essentially single-handedly wiped out the commercial fishing industry in the Big Bend area. Once again left without their primary economic engine, and left virtually helpless by the state, citizens of Cedar Key looked to their own assets to adapt once more. Initially begun as part of a high school 4-H program by former mayor Sue Colson (Personal communication with Dr. Kathryn Frank 2012) many of the fishing families have since turned to clam farming and today Cedar Key is the leading producer of farm raised clams in the U.S. While still a highly sensitive issue, many of the former fishermen now recognize that, "It's probably better economic times now than when we had net fishing" (Voyles 2010).

A potential adaptation event in Levy County today is the BP Deepwater Horizon oil spill. While evidence of potential long term effects of the oil and the chemical

dispersants used to manage the spill are still unknown, there is a pervasive sense of unease among commercial fisherman, town residents, and clam farmers especially. However, the occurrence of these events alone may not be enough to spur genuine community discussion of, and participation in, long term planning issues. Interviews with local residents indicate emergence of two mentalities. The first, apathy towards adaptation (Jepson 2006), is marked by a feeling of helplessness or the inevitability of eventual destruction and is perceptible in the attitudes of some of the citizens. The Gill Net Ban was particularly powerful in this regard. Feeling assaulted by 'outsiders' ranging from economic competition from other states and industries, State government, and even their own fellow Floridians, many residents are simply weary and wary of planning. For the purposes of sea level rise planning, it is perhaps more important to note the strong feeling that many Cedar Key residents possess that no matter the circumstances they will adapt, survive, and bounce back stronger as a community (Jepson 2006). Evidence to this effect can be seen in the community healing ceremony years after the net ban. Symbolizing the economic and social transition from a gill net fishing economy, citizens and community leaders held a healing ceremony where old nets were burned and ultimately a memorial to the fishermen who lost their jobs was dedicated and placed in front of City Hall on July 4th, 1995 (McCarthy 2007).

Many citizens have also expressed that they would like to, or at least should, continue to find new ways to develop more sustainable practices in natural resource management. Their very livelihood directly dependent on these resources, the people of Cedar Key are acutely aware of the importance of the links between the human, economic, and natural systems. This recognition of the importance of resource

management has become a central part of the cultural identity of Cedar Key and is an invaluable asset that can be related to the need for sea level rise and climate change planning. Because the public has the capacity to adapt and sees the importance of incorporating the natural environment into adaptation strategies, Cedar Key is positioned at the forefront of adaptation planning, resilience development, ecoregional planning (Beck 2001), and asset-based community development (Kretzmann and McKnight 1993). Communication of Past Adaptation can utilize this strong sense of historical identity and cultural link to natural resource management to support rural sea level rise planning and may finally be the tool that is needed to move the historical management strategy from one that is reactionary and needs-based to one that is community driven, proactive, and highly resilient.

Application of Communication of Past Adaptation

While still in the very early stages of the process, the Florida Sea Grant: Rural Coastal Region Adaptation Planning for Sea Level Rise project has already utilized some elements of the Communication of Past Adaptation method or has illustrated the need for the use of the method. Phase 1, or Assemble and Mobilize Technical Actors, has already begun. Coordinated by Dr. Kathryn Frank, researchers and scientists from Florida Sea Grant (a program of the Florida Department of Environmental Protection), the University of Florida, the Cedar Key National Wildlife Refuge, and the Big Bend Seagrasses Aquatic Preserve are scheduled to meet, delegate duties and tasks, and develop a common background framework. At the outset, due to the lengthy settlement of Cedar Key and the complexities of resilient sea level rise science, Technical Actors expressed a need for a common temporal framework as well as a socio-cultural context.

The need for the development of a common historical context and background among Technical Actors was corroborated by the previously detailed research that led to the development of the Communication of Past Adaptation method. Communication of Past Adaptation directly addresses this need in two ways. Phase 2 establishes a common frame of reference among the Technical Actors assembled in Phase 1 by organizing analyses around Past Adaptation Events. Critically, the method also provides an avenue for the communication and collaboration of this common frame of reference in Phase 3.

Also of interest in these early stages of the project is the location of the first meeting of Technical Actors. This introductory meeting took place primarily on small boats travelling to and from historical markers on outlying protected islands. This suggests that even if not intentional, the tendency for Technical Actors and humans in general to attempt to relate problems of the future to circumstances of the past is very powerful. Communication of Past Adaptation takes this tendency, operationalizes it, and utilizes it as an important tool for the communication and collaboration of Technical Actors. Further evidence to support this assertion stems from interactions with participants of planning studio course at the University of Florida whose curriculum was linked to the Sea Grant project. Citing a sense of disorganization and of being overwhelmed by data (Personal communication with Dr. Ferdinand Lewis 2012), the author was solicited by faculty to present historical research to students in the studio. Following a presentation on the importance of historical analysis to rural planning and the use of Communication of Past Adaptation to organize and communicate research, the author, faculty, and students also engaged in a question and answer session. One

week later, studio faculty informed project participants that the students had a renewed focus and were developing a “social marketing tool” that will be designed to “foster science-based community-centric solutions to sea level rise planning” and that “community context will form this technique” (Personal communication with Dr. Ferdinand Lewis 2012). This illustrates once again that historical analysis and Communication of Past Adaptation can help organize data and facilitate communication between Technical Actors, and in this case that includes actors of differing education levels.

University of Florida and Guana Tolomato Matanzas National Estuarine Research Reserve System Science Collaborative (Summer Haven and Matanzas Inlet, Florida)

The Matanzas Basin is located in southern St. Johns County and connects the Intra-Coastal Waterway (ICW) along the northeast Florida coast to the Atlantic Ocean through Matanzas Inlet (Figure 6-5). Also founded by the Spanish, Fort Matanzas and the Matanzas Inlet and River that it guards also have a storied history. Translated from Spanish, *matanzas* means ‘the place of massacres.’ This stems from an event in 1565 where a force of French Huguenots intent on invading and capturing the fort and City of St. Augustine were scattered by a hurricane. After rounding up survivors, 245 prisoners were put to death on the beaches near the inlet (National Park Service 2012). While not a relevant adaptation event per se, this story further illustrates the ability of natural systems to frustrate even the best laid of human plans.

Figure 6-5. Map of Matanzas Inlet. (Source: Google Maps with Author's additions 2012)

Detailed maps and sounding charts from the British (who were ceded control of Florida in 1763) and U.S. Navies (who gained control of Florida in 1821) show drastic differences in the landscape as compared to today. In 1765 the inlet was nearly 4000 feet north of its location on maps from 1872. The island Fort Matanzas is on, now known as Rattlesnake Island, has also changed dramatically. These early maps show that the island was only roughly 22 acres where today it is over 200 acres (Figures 6-6 and 6-7).

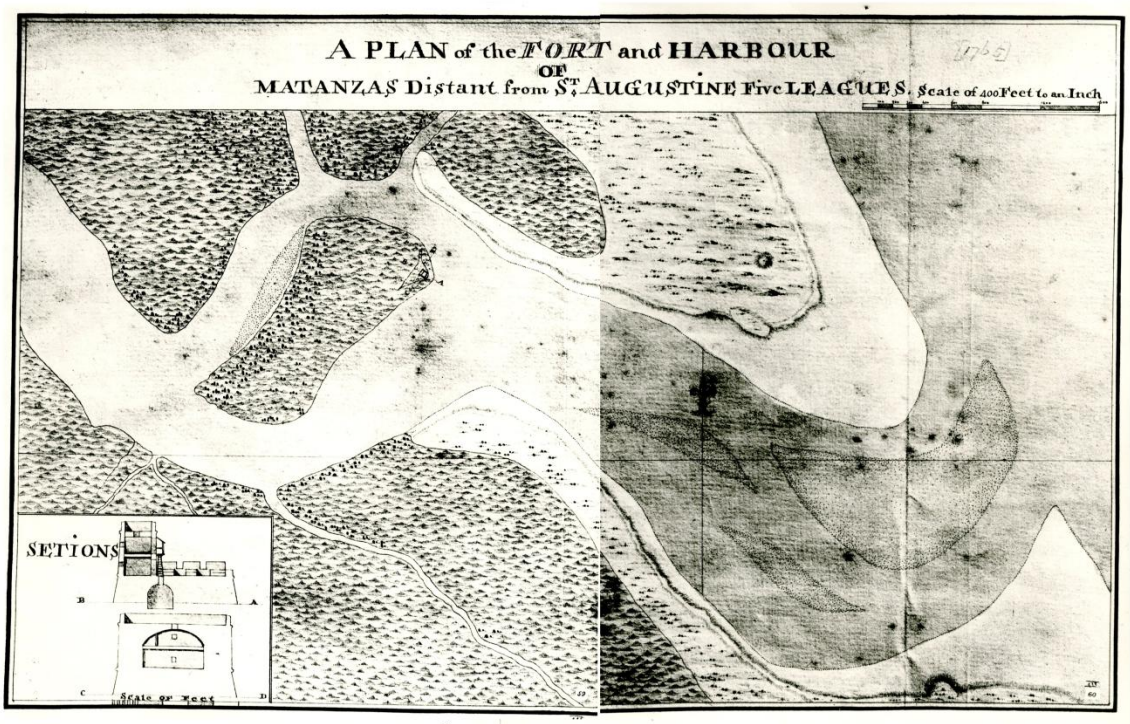

Figure 6-6. Map of Fort Matanzas and island (on the left half) in 1765. (Source: P.K. Yonge Library of Florida HistoryF912 H912c, Series III, # 59, 60)

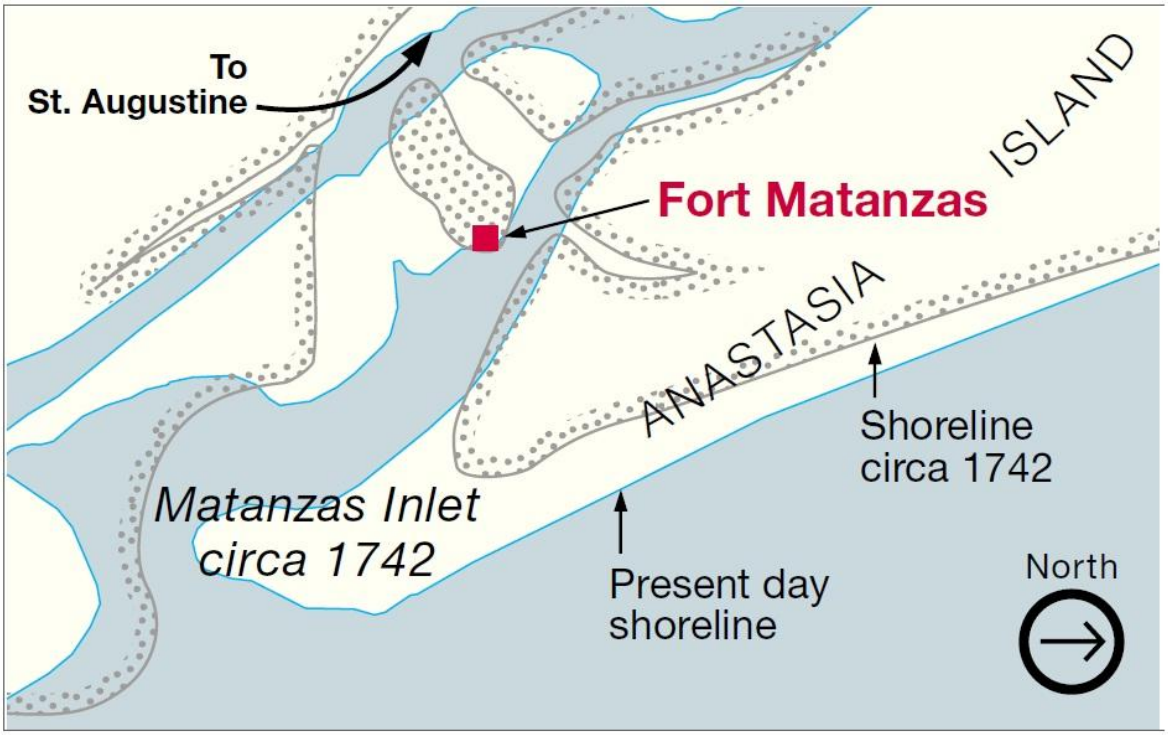

Figure 6-7. Map showing the Matanzas Inlet 1999 coastline and 1742 coastline. (Source: National Park Service)

Historical Analysis and Identification of Past Adaptations

Just as with colonial history, the modern history of Matanzas Inlet is also marked by a frustration with the ever shifting coastline. In 1925 a bridge was placed across the Matanzas inlet and highway A1A was constructed along the shoreline. To combat the dynamic nature of the estuarine environment and as a part of the construction of A1A, the shoreline up to the breach was hardened. This kept the inlet from moving in its natural southern pattern. In 1932 a by-pass channel called the Matanzas Relocation was dug that bypassed a section of the Matanzas River, also known as the Summer Haven River (GTM NERR 2012). From 1945 to 1951 the by-pass channel was cut to 12 feet deep by 125 widths ultimately resulting in a roughly 95% redirection of tidal flow away from the Summer Haven River (Mehta and Jones 1977). Further accelerating the transition from an estuarine environment to a dune and marsh ecosystem, Hurricane Dora broke through Rattlesnake Island in 1964 and the gap had widened to 310 feet by 1976. To close the breach in the island, flow to the Summer Haven River was further redirected and tidal flow in the river was reduced to 1% of the total coming through Matanzas Inlet (Mehta and Jones 1977).

Today, much of the land in the Matanzas Basin is in public ownership as parks and conservation land. Surrounded by so much public land, the enclave remains a very small community with many of the properties devoted to vacation homes or condominium rentals. This leaves the community relatively empty for much of the year and with an absentee citizenry. However, plans for large-scale development on private lands a la Palm Coast (Matanzas' newly founded and incorporated neighbor 12 miles to the south) are in the works and growth development in the near future is highly likely. These pressures complicate the social and political context of Summer Haven as it is an

unincorporated community located on a barrier island. Despite its relative isolation from development and small population, Summer Haven has nonetheless recently been the site of an intense political and legal conflict.

In 2008, a strong storm with heavy tidal surge breached the dune system that separates the ocean from the estuary. This Past Adaptation Event flooded the system with sand that almost entirely filled in the Summer Haven River over a period of two years. While it may be tempting to treat the breach and subsequent shoaling of the river as purely natural events, they were made possible and amplified by manmade processes. The reduction of the tidal flow in the Summer Haven River to 1% of the total coming through Matanzas Inlet through the dredging, hardening, and channeling of the inlet and the ICW created a system that is unable to flush out the sand. A smaller inlet that directly connected the Summer Haven River to the sea in 2008 remains completely filled in today. In this case, the Past Adaptation Events are the constantly evolving estuarine system itself, the shoreline hardening and channelization projects, as well as the 2008 storm.

As a reflection of this experience with Past Adaptation Events, surrounding landowners have convinced local decision-makers to dredge immediately to “restore” the river. In a rural coastal community with a long history centered on constructed solutions controlling to the amorphous character of coastal systems, dredging can seem like the obvious solution and the only viable option. Unique to this case, and in a clear example of how history and the perception of history are used by a community, was that the proposal centered on restoring the river system to 1870s conditions (GTM NERR 2012). Community leaders felt that the loss of the aesthetic, recreational, and cultural

value of the Summer Haven River outweighed any other factor. Despite this, natural shoreline transgression, reduced tidal exchange due to channelization, risk of degrading coastal dune habitat, and a high level of uncertainly as to the long-term maintenance costs remain factors that are impossible or at least unwise to ignore. This is especially true in light of long-term changes to coastal systems caused by sea level rise.

Application of Communication of Past Adaptation

While slightly further along than the Florida Sea Grant project in Levy County, the Guana Tolomato Matanzas National Estuarine Research Reserve System (GTM NERR) Science Collaborative project is similarly in its early stages. Also coordinated by Dr. Frank, this project intends to "document a systematic method for conducting and interpreting vulnerability analyses linked to a precautionary principle-based decision-making framework in the face of uncertainty that explicitly evaluates feedbacks between learning and implementation to improve a community's ability to understand and use this information to proactively respond to sea level rise" (Frank et. al. 2011). At the outset of the project the need for archival research of the historical, social, and cultural context of Matanzas Basin was expressed (Personal communication with Bob Grist 2012). Using the historical, social, and cultural context to develop communication materials that resonate with the community corroborates the research that suggests that history and historical analysis can be important tools for planning and communication.

Several elements of the Communication and Past Adaptation method are also applicable in this case. Phase 1, or Assemble and Mobilize Technical Actors, has already occurred. UF faculty and staff, GTM NERR staff, Rayonier (the largest private land owner in the area), the Environmental Protection Departments of the city of Palm

Coast and Flagler and St. John's Counties have already been active participants in the project with several more stakeholder groups indicating a willingness to participate. Phase 2 has largely been completed but with some markedly different findings from the earlier described case study. Unlike Levy County and Cedar Key, the Matanzas area does not have easily identifiable Past Adaptation Events such as major hurricanes or disasters with immediate and drastic effects like the BP Deepwater Horizon oil spill but rather gradual events like erosion and ecological shifts due to a history of dredging practices. The fact that Phase 2 of the Communication of Past Adaptation method was able to detect and account for this subtle difference is a testament to the technique's transferability to other rural communities that have their own unique characteristics, identities, and history. Subtle differences between the two communities can also be detected in Phase 3 and early stages of Phase 4 of the Communication of Past Adaptation method. Historical and technical analysis has been focused primarily on the shifting estuarine environment juxtaposed with the effects of trying to control that environment. As such, the development of communication materials for Phase 4 has indicated a need for animations that detail the natural and unnatural shifts in human and ecological systems over long periods of time. By also being able to identify the type or style of necessary communication materials needed, the Communication of Past Adaptations method shows its ability to be transferable, responsive, and community focused.

CHAPTER 7
CONCLUSIONS

While there are many advantages to using the Communication of Past Adaptation method, it does not guarantee an effortless implementation. A community's historical identity may hinder resilient planning for sea level rise. A perception of the past may be misused or misunderstood by segments of a community as in the Matanzas case. Recreating the Summer Haven River of the 1870s is certainly an option but when crafted by a limited portion of the community, using data limited to a specific timeframe, and without addressing long term economic and ecological costs, the proposal becomes a hindrance to developing a resilient community. However, Communication of Past Adaptation is not intended to tell citizens they are right or wrong in how they choose to respond to sea level rise, but to present a fuller body of data and a portfolio of science-based solutions developed by the community at large.

The reaction to the Gill Net Ban is another example of how historical identity may present a challenge to sea level rise planning. A community's past experiences with planning, policy making, regulation, or governance may have resulted in feelings of hostility, suspicion, or apathy (Jepson 2006). Another major consideration for the use of history and historical analysis for planning for sea level rise is that, of course, the future is not like the past. Even speaking strictly in terms of sea level rise, predictions are that it will cause much greater change and occur at a greater pace as time goes on. In any case, history can be used to inform the present and a community's perception of historical identity should be faced head on and addressed directly by sea level rise planners. By establishing a community centered focus and by providing a forum to air

grievances, discuss options, and simply interact, Communication of Past Adaptation may even serve as a 'healing ceremony' similar to Cedar Key's net ban ceremony.

The case studies presented here show the importance of history and historical analysis to rural sea level rise planning. Past tendencies can be predictors of future decision making and the CPA method identifies Past Adaptation Events and cultural tendencies and then relates them to vulnerabilities and challenges faced in a community's past. By showing how past decisions relate to these vulnerabilities and by showing the available planning options, the CPA method can be a community tool for altering cultural tendencies. Even in the cases where cultural identity poses significant challenges to resilient sea level rise planning, historical analysis and communicating historical identity is proving to be a useful tool. At the community level, the CPA method identifies, utilizes, and articulates a shared community identity. This storytelling is a powerful tool for sea level rise planning and critical to vibrant, resilient communities in general (Throgmorton 1996). The Communication of Past Adaptation method aims to utilize this important resource and coordinate its use among Social, Technical, and Political actors. While much more research is needed to verify the of total value and efficacy of Communication of Past Adaptation, early indications are that it can at the very least, serve as a focal point for organization, collaboration, and communication. As sea level rise is a highly complex problem affecting many equally complex systems, this fills a critical need.

Rural coastal communities are in dire need of resources and tools that can effectively foster resilient and adaptive sea level rise planning at low cost. While rural areas have important social, cultural, economic, and ecological assets that are

deserving of quality, proactive planning (Stauber 2001; Woods 2005; Agrawal 2008), much more research focusing on rural areas is needed. Sea levels are rising (IPCC 2007), and while it is undeniably true that efforts to plan for sea level rise in urban areas will ultimately affect more people, if rural areas are ignored, these essential 'planning laboratories' will be underutilized and their value untapped. To effectively plan for problems as complex as climate change and sea level rise, a variety of resources, capacities, and social capital will be required. By establishing a method for the organization and communication of historical analysis and community identity, Communication of Past Adaptation is a tool that builds science-based, community centered solutions to rural planning for sea level rise.

LIST OF REFERENCES

Abbott, C., & Adler, S. (1989). Historical analysis as a planning tool, *Journal of the American Planning Association, 55*(4), 467-473.

Adger, W. N., (2000). Social and ecological resilience: Are they related?, *Progress in Human Geography, 24*(3), 347-364.

Adger, W. N., (2003). Social capital, collective action, and adaptation to climate change, *Economic Geography, 79*(4), 387-404.

Adger, W. N., Hughes, T. P., Folke, C., Carpenter, S. R., & Rockström, J. (2005). Social-ecological resilience to coastal disasters, *Science, 309*(5737), 1036.

Agrawal, A. (2008). The role of local institutions in adaptation to climate change. *Paper prepared for the Social Dimensions of Climate Change Workshop*. Social Development Department, The World Bank. Washington, DC. March 5-6, 2008

Babbie, E. (2009). *The practice of social research*. (12th ed.). Belmont CA: Wadsworth.

Beck, M. (2001). Ecoregional planning in marine environments: Identifying priority sites for conservation in the northern Gulf of Mexico, *Aquatic Conservation: Marine and Freshwater Ecosystems, 11*(4), 235-242.

Bedsworth, L., & Hanak, E. (2010). *Preparing California for Climate Change*. Public Policy Institute of California. Retrieved September 15, 2011, from http://www.ppic.org/content/pubs/report/R_1108LBR.pdf

Bernard, T. (2010). Ever vulnerable: The eastern shore of Virginia. *Hope and Hard Times: Communities, Collaboration, and Sustainability*. 90-113. Canada: New Society Publishers.

Bonanno, G., Galea, S. A., Bucciareli,A., & Vlahov, D. (2007). What predicts psychological resilience after disaster? The role of demographics, resources, and life stress, *Journal of Consulting and Clinical Psychology, 75*(5), 671-682.

Brown, B., & Cooper, R. (eds.). (2011). *Coastal resilience: Assisting communities in the face of climate change*. Oregon SeaGrant. Retrieved February 23, 2012 from http://seagrant.oregonstate.edu/sites/default/files/sgpubs/onlinepubs/w10001.pdf

Campanella, T. J. (2006). Urban resilience and the recovery of New Orleans, *Journal of the American Planning Association, 72*(2), 141-146.

Campbell, S. (1996). Green cities, growing cities, just cities? Urban planning and the contradictions of sustainable development, *Journal of the American Planning Association,62*(3), 296-312.

Carriker, R. R. (2006). *Comprehensive planning for growth management in Florida EDIS document FE642*. Food and Resource Economics Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences. University of Florida, Gainesville, FL. Retrieved February 20, 2012, from http://edis.ifas.ufl.edu/pdffiles/FE/FE64200.pdf

CedarKey.Net. (2012). Retrieved February 23, 2012, from http://www.cedarkey.net/history.html

Charlotte Harbor National Estuary Program. (2012). Retrieved February 22, 2012, from http://www.chnep.org/

Chaskin, R. J. (2001). Building community capacity: a definitional framework and case studies from a comprehensive community initiative, *Urban Affairs Review, 36*(3), 291-323.

Climate Community of Practice in the Gulf of Mexico. (2012). National Oceanographic and Atmospheric Administration and Gulf of Mexico SeaGrant Programs. Retrieved February 23, 2012, from http://www.masgc.org/climate/cop/index.html

Crossett, K. M., Culliton, T. J., Wiley, P. C., & Goodspeed, T. R. (2005). *Population trends along the coastal United States: 1980-2008*. National Oceanic and Atmospheric Administration Coastal Trends Report Series. Retrieved November 11, 2012, from http://oceanservice.noaa.gov/programs/mb/pdfs/coastal_pop_trends_complete.pdf

Cutter, S. L., Burton, C. G., & Emrich, C. T. (2010). Disaster resilience indicators for benchmarking baseline conditions, *Journal of Homeland Security and Emergency Management, 7*(1), Article 51. Retrieved February 10, 2012, from http://regionalresiliency.org/library/Diaster_Resilience_Indicators_Susan_Cutter_et_al_2010_1281451159.pdf

Deyle R. E., Bailey, K. C. & Matheny, A. (2007). *Adaptive response planning to sea level rise in Florida and implications for comprehensive and public-facilities planning*. Department of Urban and Regional Planning, Florida State University. Retrieved October 12, 2012, from http://www.coss.fsu.edu/durp/sites/coss.fsu.edu.durp/files/WPS_08_02_Deyle.pdf

Efland, A. (2002). *Art and Cognition: Integrating the Visual Arts in the Curriculum*. New York, NY: Teachers College Press, & Reston, VA: The National Art Education Association.

Enterprise Florida. (2012). Retrieved February 20, 2012, from http://www.eflorida.com/Floridas_Future.aspx?id=8188

Florida Department of Health. (2012). Florida Office of Rural Health. Retrieved February 22, 2012, from http://www.doh.state.fl.us/workforce/ruralhealth/ruralhealthhome.html

Florida Oceans and Coastal Council. (2010). *Climate change and sea-level rise in Florida: An update of the effects of climate change on Florida's ocean and coastal resources.* Tallahassee, Florida. Retrieved January 15, 2012, from http://www.floridaoceanscouncil.org/reports/Climate_Change_and_Sea_Level_Rise.pdf

Florida On Florida. (2012). Retrieved February 23, 2012, from http://fof.fcla.edu/b/bib/collection.html

Florida Memory Project. (2012). Division of Library and Information Services. Retrieved February 23, 2012, from http://www.floridamemory.com/collections/

Florida Senate. (2011). *Bill Analysis and Fiscal Impact Statement*. Professional Staff of the Community Affairs Committee. Retrieved February 29, 2012, from http://www.flsenate.gov/Session/Bill/2012/0440/Analyses/ystgNvUJ/aCuXvMozidEThDrmBU=|11/Public/Bills/0400-0499/0440/Analysis/2012s0440.pre.ca.PDF

Florida Statutes. (2011). *Title XIX, Chapter 286 Public business: Miscellaneous provisions.* Retrieved February 29, 2012, from http://www.leg.state.fl.us/statutes/index.cfm?App_mode=Display_Statute&URL=0200-0299/0286/0286ContentsIndex.html&StatuteYear=2011&Title=-%3E2011-%3EChapter%20286

Folke, C. (2006). Resilience: The emergence of a perspective for social–ecological systems analyses. *Global Environmental Change, 16*, 253-267.

Frank, K., Jourdan, D. & Obonyo, E. (2011). *Sea level rise adaptation planning for rural coastal areas in Florida*. Paper presented to ICARUS II Conference, Ann Arbor, Michigan. May 5-8, 2011.

Friedman, J. (1992). Myth, history, and political identity, *Cultural Anthropology, 7,* 194-210.

Guana Tolomato Matanzas National Estuarine Research Reserve. (2012). *The science behind the breach.* Working document presented to University of Florida and Guana-Tolomato-Matanzas National Estuarine Research Reserve System Science Collaborative Project Team January 24, 2012.

Goldstein, B. (ed.). (2011). *Collaborative resilience: Moving through crisis to opportunity*. Cambridge, MA: MIT Press.

Gotham, K. (1999). Political opportunity, community identity, and the emergence of a local anti-expressway movement, *Social Problems, 46*(3), 332-354.

Hinchman, L. P., & Hinchman, S. (2001). *Memory, identity, community: the idea of narrative in the human sciences*. Albany, NY: State University of New York Press.

Hoctor, T., Carr, M., & Zwick, P. (2000). Identifying a Linked Reserve System Using a Regional Landscape Approach: The Florida Ecological Network. *Conservation Biology, 14*(4), 984-1000.

Intergovernmental Panel on Climate Change. (2007). *Climate change 2007: Impacts, adaptation and vulnerability*. Contribution of Working Group II to the fourth assessment report of the Intergovernmental Panel on Climate Change (M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden, and C.E. Hanson, eds.). Cambridge, UK: Cambridge University Press.

Intergovernmental Panel on Climate Change. (2010). *Strategies for adaptation to sea level rise: Report of the Coastal Management Subgroup.* Response Strategies Working Group. Retrieved March 17, 2012, from http://www.epa.gov/climatechange/effects/downloads/adaption.pdf

Jancaitis, K. M. (2008). Florida on the coast of climate change: Responding to rising seas, *Environs: Environmental Law and Policy Journal, 31*(2):157-196.

Jensen, J. K. (2009). *Climate change and rural communities in the U.S.* Rural Policy Research Institute. Retrieved September 24, 2012, from http://www.rupri.org/Forms/Climate_Change_Brief.pdf

Kay, A. (2000). Art and community development: The role the arts have in regenerating communities. *Community Development Journal.* 35(4), 414-424.

Keith, M., & Pile, S. (eds.). (1993). *Place and the politics of identity.* New York, NY: Routledge.

Kretzmann, J. & McKnight, J. (1993). *Building communities from the inside out*. Chicago, IL: ACTA Publications.

Krupa, J. (2000). The importance of naturalists as teachers and the use of natural history as a teaching tool. *The American Biology Teacher, 62*(8), 553-558.

Lapping, M. B. (2005). Rural *policy & planning: Rural development paper no. 31*. Retrieved February 11, 2012, from http://nercrd.psu.edu/publications/rdppapers/rdp31.pdf

Leatherman, S. P., & Douglas, B. C. (2008). Increasing the resilience of our coasts: coastal collision course of rising sea level. *Storms, coastal erosion and development*

in sudden and disruptive climate change: Exploring the real risks and how we can avoid them. 142-153, 145. Collingwood, AU: CSIRO Press.

Lindell, M. K., & Prater, C. S. (2003). Assessing community impacts of natural disasters. *Natural Hazards Review, 4*(4), 176.

Ludwig, F. (2007). Too much water or too little? Coping with the inevitable. *Insurance News Net.* Retrieved February 20, 2012, from http://insurancenewsnet.com/article.aspx?a=top_pc&q=0&id=84548

Mahoney, J., & Rueschemeyer, D. (eds.). (2003). *Comparative historical analysis in the social sciences*. Cambridge, UK: Cambridge University Press. Retrieved February 24, 2012, from http://bilder.buecher.de/zusatz/24/24724/24724327_lese_1.pdf

Mankowski, E., & Rappaport, J. (1995). Stories, identity, and the psychological sense of community. *Advances in social cognition viii knowledge and memory: The real story*. Ch.13.

Marathon, City of. (2012). *Comprehensive plan*. Retrieved February 2, 2012, from http://www.ci.marathon.fl.us/index.aspx?NID=29

Mathie, A., & Cunningham, G. (2002). From clients to citizens: Asset-based community development as a strategy for community-driven development. Antigonish, Canada: Coady International Institute.

McCarthy, K. M. (2007). *Cedar Key, Florida: A history*. Charleston, SC: The History Press.

McCright, A. M., & Dunlap, R. E. (2003). Defeating Kyoto: The conservative movement's impact on U.S. climate change policy. *Social Problems, 50*(3), 348-373.

Mehaffy, M. (2011). What the heck do we mean by “resilient design” anyway? *New Urban Network*. Retrieved April 22, 2012, from http://newurbannetwork.com/news-opinion/blogs/michael-mehaffy/14492/what-heck-do-we-mean-%E2%80%9Cresilient-design%E2%80%9D-anyway

Mehta, A.J., & Jones, C. P. (1977). *Matanzas inlet - glossary of inlets report no. 5.* Florida Sea Grant. Tallahassee, FL: State University System of Florida.

National Park Service. (2012). U.S. Department of the Interior. Retrieved February 2, 2012, from http://home.nps.gov/foma/historyculture/index.htm

Norgaard, K. M. (2011). Climate change as background noise in the United States. *Living in Denial: Climate Change, Emotions, and Everyday Life*. Cambridge, MA: MIT Press. 177-205.

Norton, G. (1951). *Hurricanes of the 1950 season*. U.S. Weather Bureau. Monthly Weather Review. Retrieved February 23, 2012, from http://www.aoml.noaa.gov/general/lib/lib1/nhclib/mwreviews/1950.pdf

Parkinson, R. W. (2010). Municipal adaptation to sea-level rise: City of Satellite Beach, Florida. RWParkinson Consulting. Retrieved January 30, 2012, from http://spacecoastclimatechange.com/documents/100730_CSB_CRE_Final_Report.pdf

Publication of Archival Library and Museum Materials. (2012). *State University Libraries of Florida*. Retrieved February 23, 2012, from http://palmm.fcla.edu/

Quay, R. (2010). Anticipatory Governance: A Tool for Climate Change Adaptation. *Journal of the American Planning Association, 76*(4): 496-511.

Ratner, S., & Moser, S. (2009). *Community resilience and wealth: The challenges and opportunities for rural communities in a rapidly changing world*. U.S. Endowment for Forestry and Communities, Inc. Retrieved January 30, 2012, from http://www.usendowment.org/images/Community_Resilience_Report.pdf

Spear, K. (2010, February 18). Large crowd mostly hostile to epa plans for cleaning florida's lakes and rivers. *The Orlando Sentinel*. Retrieved January 13, 2012, from http://articles.orlandosentinel.com/2010-02-18/news/os-epa-water-hearing-orlando-20100218_1_lakes-and-rivers-tea-party-florida-waters

State of Florida Attorney General. (2012). *Government in the Sunshine*. Retrieved January 23, 2012, from http://www.myflsunshine.com/sun.nsf/pages/Law

Stauber, K. N. (2001). Why invest in rural America and how?: A critical public policy question for the 21st century*. Economic Review Second Quarter 2001*. Federal Reserve Bank of Kansas City. Retrieved December 15, 2012, from http://kansascityfed.com/PUBLICAT/ECONREV/PDF/2q01stau.pdf

Stoner, J.J. (1884). P.K. Yonge Library of Florida History M2.1884.006.2010.0557

Throgmorton, J. A. (1996). *Planning as persuasive storytelling: The rhetorical construction of Chicago's electric future*. Chicago, IL: University of Chicago Press.

Titus, J. G., Hudgens, D. E., Trescott, D.L., Craghan, M., Nuckols, W. H., Hershner, C. H., Kassakian, J. M., Linn, C. J., Merritt, P. G., McCue, T. M., O'Connell, J. F., Tanski, J., & Wang, J. (2009). State and local governments plan for development of most land vulnerable to rising sea along the U.S. Atlantic Coast. *Environmental Research Letters* 4(3).

Tobey, J., Rubinoff, P., Robadue Jr., D., Ricci, G., Volk, R., Furlow, J., & Anderson, G. (2010). Practicing coastal adaptation to climate change: lessons from integrated coastal management, *Coastal Management, 38*(3), 317-335.

United Nations. (2007). *Global risks 2007: A global risk network report.* A World Economic Forum Report in collaboration with Citigroup, Marsh & McLennan Companies (MMC), Swiss Re, & Wharton School Risk Center. World Economic Forum, Geneva, Switzerland.

University of Florida Department of History. (2012). Samuel Proctor Oral History Program. Retrieved September 1, 2012, from http://www.history.ufl.edu.lp.hscl.ufl.edu/oral/

U.S. Department of Agriculture. (2011). *Economic research service: the economics of food, farming, natural resources and rural America*. Retrieved October 11, 2011, from http://www.ers.usda.gov/Briefing/Population/

U.S. Environmental Protection Agency. (2011). *Coastal zones and sea level rise*. Retrieved December 1, 2010, from http://www.epa.gov/climatechange/effects/coastal/index.html

Voyles, K. (2010, May 9). Cedar key residents have become hardened by disaster. *The Gainesville Sun.* Retrieved January 24, 2012, from http://www.gainesville.com/article/20100509/articles/5091006?p=3&tc=pg

Williams, J. M., & Duedall, I. W. (1997). Florida hurricanes and tropical storms. Gainesville, FL: University Press of Florida. Retrieved February 20, 2012, from http://nsgd.gso.uri.edu/flsgp/flsgpb97001.pdf

Wilson, E. (2006). Adapting to climate change at the local level: The spatial planning response, *Local Environment, 11*(6), 609-625.

Withlacoochee Area Residents. (2012). Retrieved February 22, 2012, from http://warinconline.com/

Woods, M. (2005). *Rural geography: processes, responses and experiences in rural restructuring*. Thousand Oaks, CA: Sage.

Worth, S. (1981). *Studying visual communication*. Philadelphia, PA: University of Pennsylvania Press. Retrieved February 12, 2012, from http://www.anthro.umontreal.ca/personnel/beaudetf/media_autochtones/2-navajo/pdf/study_visual_comm.pdf last accessed on 2/13/2012.

Yankeetown, City of. (2009). Comprehensive Plan. Retrieved February 2, 2012, from http://yankeetownfl.govoffice2.com/index.asp?Type=B_BASIC&SEC={3509A776-0A50-4489-9E09-CA04B996CE3A}

BIOGRAPHICAL SKETCH

Born to a rural Virginian father and a rural Iowan mother, Forrest Eddleton has always been drawn to the interactions between human systems and the natural environment. As a child growing up in North Central Florida, the natural environment, particularly the ocean, multitude of lakes, rivers, creeks, springs, and swamps, had an enormous influence on his life and worldview. This worldview was sharpened in the pursuit of undergraduate degrees at the University of Florida. After receiving a bachelor's degree with a double major in history with a Florida environmental history focus and in political science with a Florida environmental politics focus, Forrest applied this knowledge to positions in local government. Returning to UF to pursue a Master of Arts in Urban and Regional Planning with an environmental planning specialization, Forrest is seeking to further hone and develop his knowledge of the interactions between human and ecological systems with the ultimate goal of making this knowledge more practicable.