Local Ecological Knowledge as a Pathway to Coastal Resilience, Hazard Mitigation, and Adaptation

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Abstract

Local ecological knowledge (LEK) is the experiential knowledge of local people gained through day-to-day interactions with the environment. LEK can provide detailed, real-time information about target species, ecological resources, and rapid state shifts in ecosystems. LEK is becoming more important as a source of data for conservation research and management. LEK can supplement conventional ecological surveys and data by providing rich context and detail on the state of local ecosystems by the people who work on these ecosystems every day as part of their livelihoods (Burbidge et al., 1988, Turvey et al., 2010b). Many communities in the Coastal Bend region of Texas have citizens whose livelihoods depend entirely on ecosystems as well as economies largely dependent on ecotourism. Ecotourism important to Coastal Bend economies includes recreational fishing, coastal parks, birding, and other forms of wildlife tourism. These same communities were majorly impacted by Hurricane Harvey and are continuing to slowly recover one year after the storm. Ecotourism stakeholders possess detailed knowledge on 1) changes to the ecosystem post Harvey across scales, 2) the needs for prioritized ecosystem restoration and conservation initiatives that may quicken ecotourism recovery post-Harvey, and 2) possible blind spots for conservation and resource management of which decision-makers may be unaware. Given the urgency and heavy financial burden of hurricane recovery, LEK can be pathway to resilience. Resilience in the Coastal Bend post-Harvey would see communities, ecosystems, and economies not only recovering quickly to their pre-storm states, but also harnessing the ability to absorb similar shocks in the future. LEK can act as a pathway to resilience during hurricane recovery as it is inexpensive, first-hand, detailed knowledge of changes to ecosystem functions linked to economic development. These changes may be addressed by decision-makers and resource managers looking to enable post-storm recovery. This presentation discusses how ecotourism-dependent communities in the Texas Coastal Bend use LEK to recover from Hurricane Harvey and build resilience to future extreme events as a model framework for how LEK can be used more widely to enhance resilience, respond to hazards, and facilitate adaptation.

Local Ecological Knowledge of Texas Coastal Bend Fishing Communities For Resilience

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Introduction

Along the coast of the Gulf of Mexico, there is demonstrated need to improve understanding of the short and long-term evolution of coupled natural-human systems to inform decisions made across scales (NASEM 2018).

Because fishing livelihoods are the cornerstone of communities on the South Texas Gulf Coast (i.e. "the Coastal Bend"), with recreational and commercial fisheries contributing hundreds of millions of dollars to the Texas economy, they are ideal pilot locations for capacity building to include fishermen's LEK in decision-making (NOEP 2016, Ropicki et al. 2016). Increasingly, research calls on agencies to base decisions on LEK in the fisheries livelihoods context (Davis and Wagner 2003, Olsson and Folke 2001, Silvano and Valbo-Jorgensen 2008). Although fishermen stakeholders possess detailed LEK on the near- and long-term evolution of Gulf ecosystems, coupled impacts to livelihoods, and desired management responses, it is rarely included in decision-making (Brook 2005, Olsson and Folke 2001).

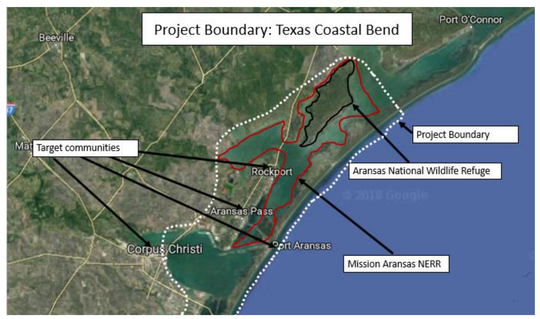
This is because significant capacity must be built 1) among resource manager/agency/decision-maker personnel to incorporate LEK into decisions and 2) among fishermen who seek a greater role in science-based decision-making. Due to the large demands of time, money, and expertise, this seldom occurs (Davis and Wagner 2003, NASEM 2018, Olsson and Folke 2000 Silvano and Valbo Jorgensen 2008).

Objectives

1) build capacity among both fishermen and decision-makers to engage in participatory ecosystem restoration planning,
2) offer fishermen-created educational programs directed at fellow fishermen to build capacity to act as stewards and to enable participation in science-based decision-making and
3) provide actionable information to decision-makers in the form of a participatory restoration needs report that makes LEK easier to use.

Target Coastal Bend fishing communities for this project include Port Aransas, Aransas Pass, Rockport, and Corpus Christi. Project boundaries will include the coastal ecosystems within the Mission Aransas Estuary, covering over 200,000 acres of coastal habitat (see Figure 2 in the appendix).

Project Map



Research Questions

Research Questions and Objectives

How can decision-makers draw on LEK to improve understanding of socio-ecological systems and to make decisions that enhance resilience in the Coastal Bend?

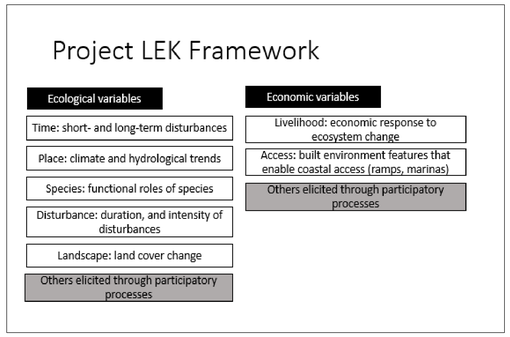
The overarching research question can be broken into three sub-questions:

1) How can LEK be deployed within a proven model for two way communication (between resource managers/decision-makers and fishermen stakeholders, facilitated by a boundary organization) to improve understanding of both near- and long-term evolution of socio-ecological systems to inform decisions at the federal, state, and local scale?

2) How can LEK of Coastal Bend fishing communities be collected, analyzed, and integrated across socio-ecological indicators (i.e. short and long term disturbances (*time*), climate and hydrological trends (*place*), functional roles of species (*species*), types, duration, and intensity of disturbances (*disturbance*), land cover change (*landscape*), and economic response to ecosystem change (*livelihood*)) in a way that enhances decision-maker capacity to use it?

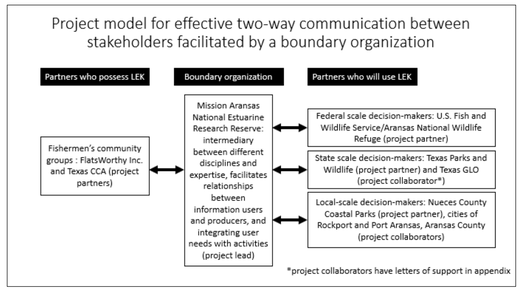
3) How can educational programs designed by fishermen stakeholders for fellow fishermen build capacity for effective two-way communication (between fishermen and decision-makers) and for participation in science-based decision-making?

Local Ecological Knowledge Framework



Methods

- For the main research question, "How can decision-makers draw on LEK to improve understanding of socio-ecological systems and to make decisions that enhance resilience in the Coastal Bend," project partners will collect data from workshops, surveys, and interviews. In workshops, focus groups will consist of resource managers and fishermen stakeholders. They will be asked approximately 10 open ended questions and their responses recorded. Additional interviews and surveys will be administered to fishermen stakeholders through a snowball selection process. This data will be analyzed according to qualitative coding methods and quantitative statistical methods.
- For subquestion 2, "How can LEK of Coastal Bend fishing communities be collected, analyzed, and integrated across socio-ecological indicators in a way that enhances decision-maker capacity to use it," Dunning and a research assistant will analyze LEK through at least 60 key informant interviews and approximately 150-400 surveys. The insights into LEK will be systematized using Olsson and Folke's *Ecosystem Management Model* creating distinct categories of actionable information on 5 areas of ecological principles (2001).
- For subquestion 3, "How can educational programs designed by fishermen stakeholders for fellow fishermen build capacity for effective two-way communication (between fishermen and decision-makers) and for participation in science-based decision-making"



Stakeholder Outreach

- Participatory workshops with fishermen stakeholders and decision-makers from the federal, state, and local scales
- Educational classes developed for anglers by anglers in ecosystem, stewardship that enable them to contribute meaningfully to science-based decision-making
- A participatory restoration needs report for the project boundary with stakeholder data, ground truthed for decision-maker use
- Training video created by fishermen stakeholders for fellow fishermen. This video discusses angler behavior (running airboats across marsh grass), linked ecosystem effects (increased erosion and channelization), and related impacts to fishermen livelihoods. Buy-in and trust is enhanced since videos are coming from peers.

Preliminary Findings

- Significant impacts to habitat critical to fishing livelihoods was made by Hurricane Harvey in 2017. These impacts are only now being understood.
- Fishermen have mapped areas (such as the bay side of San Jose Island) where significant habitat damage has occurred in order to contribute to restoration project funding and project planning.
- Areas have been identified by fishermen in early interviews that have undergone significant change from Harvey, but also from erosion, unusual high tides, and the loss of vegetation cover.

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