Leadership in Managing Natural Resources for Ecosystem Services and Resilience: The Case of Estero Bay

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Leadership in managing natural resources for ecosystem services and resilience: The Case of Estero Bay

Learning objectives

This case study will be used in a graduate course titled FNR 6668 Natural Resources in a Changing Climate during Spring 2023 semester.

Upon completion of the case study, learners will be able to:

- *Describe* the roles of parks/preserves and *defend* their conservation.
- *Describe* and *compare* management strategies to improve resilience and resistance of natural resources to natural disasters and climate change.
- *Critique* natural resource management plans and related disaster plans.
- *Describe* leadership frames, *evaluate* the contributions of leadership frames in natural resource management, and consider how to *apply* leadership frames in their own careers.

This course has students enrolled in both synchronous, face-to-face, and asynchronous distance sections. Students will engage with the case study content over a two-week period. Students will read/view case study materials outside of class and engage in either asynchronous or synchronous discussion activities to critically examine the role of leadership frames in natural resource management and disturbance resilience/resistance.

Leadership Frames

Effective leadership is essential to implement management plans and in preparing for and responding to natural disasters. As situations change, it is important to be able to reframe the way people and organizations perceive a situation and adjust their responses. Bolman and Deal (2013) describe four frames that can guide our perceptions of effective leadership. These include the structural, human resource, political, and symbolic frames.

The Structural Frame focuses on the division of labor, policies, and hierarchies in the organization's environment. The Human Resource Frame emphasizes the role of individuals in the organization and focuses on individual needs, skills, and limitations. The Political Frame views organizations as coalitions in which power structures and networks are foremost. The Symbolic Frame recognizes how vision, mission, and values are part of the culture of organizations that unites individuals.

Discussion Question:

- What leadership frames might be important in managing natural resources?

Keep these frames in mind as you consider the role of leadership in managing the Estero Bay Complex before, during, and following, a natural disaster.

- **Read***:*
  Sowcik, M., H. Carter, and V. McKee. 2017. Reframing leadership. UF/IFAS Extension, AEC622. https://doi.org/10.32473/edis-wc284-2017

The Roles of Parks and Preserves

From botanical gardens to national forests, parks and preserves are spaces set aside for human enjoyment and recreation for the protection of wildlife and natural habitats, or for both. Beyond preserving habitats and providing recreational opportunities, parks and preserves serve an essential role in providing valued ecosystem services, including provisioning (e.g., freshwater), regulating (e.g., erosion control), supporting (e.g., nutrient cycling), and cultural (e.g., mental and physical health) services. Natural ecosystems, maintained in parks and preserves, are also increasingly being recognized as playing key roles in the mitigation of climate change and natural disasters.

Discussion Question:

- What ecosystem services do parks and preserves provide?

- **Read:**
  Dudley, N., L. Higgins-Zogib, M. Hockings, K. MacKinnon, T. Sandwith, and S. Stolton. 2011. National parks with benefits: How protecting the planet's biodiversity also provides ecosystem services. *Solutions for a Sustainable and Desirable Future* **2(6):** 87-95. https://www.thesolutionsjournal.com/article/national-parks-with-benefits-how-protecting-the-planets-biodiversity-also-provides-ecosystem-services/

Management Strategies for Resilience and Resistance

Resilience is the capacity of an ecosystem to respond to a perturbation or disturbance by resisting damage and recovering quickly. An important contributor to resilience is resistance, the ability of a system to remain un-impacted by disturbance or stress. Managing ecosystems for resistance and resilience will maintain and increase their contributions to mitigating climate change and natural disasters. Management strategies include reducing anthropogenic stressors, protecting key ecosystem features, maintaining diversity, managing replicate systems, and restoring function.

Discussion Question:

- What management practices might increase resilience and resistance to perturbations such as climate change and natural disasters?

- **Read:**
  West, J.M., S.H. Julius, P. Kareiva, C. Enquist, J.J. Lawler, B. Petersen, A.E. Johnson, and M.R. Shaw. 2009. U.S. Natural Resources and Climate Change: Concepts and Approaches for Management Adaptation. *Environmental Management* **44:** 1001-1021.

  Munang, R., I. Thiaw, K. Alverson, J. Liu, and Z. Han. 2013. The role of ecosystem services in climate change adaptation and disaster risk reduction. Current Opinion in Environmental Sustainability 5: 47-52.

Introduction to the Estero Bay Complex

Estero Bay Aquatic Preserve, in Lee County Florida, was established in 1966 as Florida's first aquatic preserve. Aquatic preserves are set aside for the purpose of "being preserved in their essentially natural or existing condition for the enjoyment of future generations." The Estero Bay Aquatic Preserve was established to buffer the Bay from encroaching development. The Preserve is comprised of 11,000 acres of submerged lands, seagrass meadows, mangroves, rookery islands, and oyster beds. Like other sites in the Aquatic Preserve Program, Estero Bay is administered by the Florida Department of Environmental Protection's (DEP) Florida Coastal Office.

Despite heavy development in the area, Estero Bay Aquatic Preserve is bordered by state parks and other recreational sites, including Estero Bay Preserve State Park. The State Park was established in 1987 to serve as a land buffer along 10 miles of Estero Bay. This park is managed to represent "The Real Florida." Natural resources include wetlands, mesic flatwoods, scrub, salt flats, and other critical habitat for terrestrial and aquatic plants and animals. The park also protects several important archeological sites. Like Estero Bay Aquatic Preserve, the State Park is under the management of the DEP Florida Coastal Office.

Koreshan State Park also serves as a land buffer for Estero Bay Aquatic Preserve. The park was home to a unique pioneer group, beginning in the 1890's. In 1961 the remaining members of the community deeded 305 acres of their land to the state. This historic settlement included landscaped grounds and nonindigenous vegetation from around the world.

Discussion Questions:

- What stakeholders may have an interest in the management of the Estero Bay Aquatic Preserve?
- What leadership frames may be involved in stakeholder relationships?

- **Explore:**

Estero Bay Aquatic Preserve https://floridadep.gov/rcp/aquatic-preserve/locations/estero-bay-aquatic-preserve

Estero Bay Preserve State Park https://www.floridastateparks.org/parks-and-trails/estero-bay-preserve-state-park

Koreshan State Park https://www.floridastateparks.org/parks-and-trails/koreshan-state-park

Further Discussion Questions:

- What ecosystem services does the Estero Bay Complex provide?
- How does the Estero Bay Complex mitigate climate change and natural disasters?
- How does each leadership frame (structural, human resource, political, symbolic) contribute to the successful function of parks and preserves in general? Of the Estero Bay Complex, in particular?

Estero Bay Aquatic Preserve Management Plan

The long-term goals of the Florida Coastal Office Aquatic Preserve Program are to protect and enhance ecological integrity, restore areas to their natural condition, encourage sustainable use and stewardship, and improve management effectiveness through sound science, evaluation, and reassessment. The hallmark of the Aquatic Preserve Program is issue-based management, allowing for an integrated approach to addressing goals and objectives. Currently, the five management issues are water quality, coastal and watershed development, submerged resources, nesting birds, and public use. Each issue has associated goals, objectives, management strategies, and performance measures.

In implementing issue-based management strategies, the Aquatic Preserve Program considers the surrounding area, geology, hydrology, climate, natural communities, species, and archeological and historical resources. The realized and potential impacts of climate change such as rising air and sea surface temperatures, sea level, and hurricane intensity are also cited. The Plan discusses the implications of these changes, and especially the combined impacts of sea level rise and escalating storms on the Preserve's natural resources, which include blackwater streams, mollusk reefs, salt marshes, seagrass beds, and mangrove swamps. Red mangroves are of particular importance in the provision of ecosystem services such as nursery and nesting habitat, substrate, and food, as well as in sediment stabilization and nutrient cycling. In addition, mangrove forests protect uplands from storm winds, waves, and floods.

- **Watch:**

  https://youtu.be/kT_MnbygQRM

  https://youtu.be/qX7TU_kKxTc

Discussion Questions:

- What management strategies are currently being employed in the Estero Bay Complex that contribute to resistance and resilience to climate change?
- How do mangroves and pines contribute to the climate resistance and resilience to the Complex and surrounding areas?

- **See also:**

  Florida Department of Environmental Protection. 2015. Estero Bay Aquatic Preserve Management Plan. 218 pp. https://floridadep.gov/rcp/aquatic-preserve/locations/estero-bay-aquatic-preserve

Discussion Questions:

- Who manages natural resources, in general? Who makes decisions concerning management of the Estero Bay Complex?
- What management strategies are currently being employed in the Estero Bay Complex that contribute to resistance and resilience to climate change? To disturbance, such as hurricanes?
- What other management strategies could be implemented to improve the resistance and resilience of the Estero Bay Complex?
- What barriers might be encountered in implementing different/new management strategies?
- How do leadership frames (structural, human resource, political, symbolic) contribute to management barriers? Alternatively, how might each leadership frame contribute to opportunities in shifting management strategies?

Hurricane Irma

On average, the Estero Bay region is affected by tropical storms every 2-3 years and by hurricane force winds every 6-8 years (NOAA National Weather Service, 2019). The Estero Bay Aquatic Preserve has been impacted by Hurricanes Charley (2004) and Wilma (2005) and Tropical Storms Faye (2008), Isaac (2012), and Debby (2012). Hurricane Irma made landfall, approximately 40 miles south of Estero Bay, in Marco Island as a Category 3 on September 10, 2017. The center moved into central Florida, passing east of Estero Bay, and into northern Florida as it weakened. With an estimated 6+ million people under orders to evacuate, stores ran out to food and water and gas stations ran out of fuel 1-2 days before Irma hit. With sustained winds of 112 mph and up to 20 inches of rain, south Florida had tree and structural damage, as well as flooding damage from storm surge and rainfall. Bracketing Estero Bay to the north and south, Fort Meyers and Naples had sustained winds of 81 and 44 mph, respectively and Naples experienced a 5- foot storm tide.

Discussion Question:

- What social, economic, and ecological impacts did Hurricane Irma have on South Florida?

- **Explore:**

  The National Weather Service, Hurricane Irma Local Report/Summary
  https://www.weather.gov/mfl/hurricaneirma

  Cangialosi, J.P., A.S. Latto, and R. Berg. 2018. Hurricane Irma. National Hurricane Center Tropical Cyclone Report. AL 112017. 111 pp.
  https://www.nhc.noaa.gov/data/tcr/AL112017_Irma.pdf

- **See also:**

  NOAA National Weather Service, Miami-South Florida National Weather Service Forecast Office. 2019. 2019 Florida Severe Weather Awareness Week.
  https://www.weather.gov/media/mfl/news/HurcnWeb_2019.pdf

Estero Bay and Hurricane Irma

In addition to the Estero Bay Aquatic Preserve Management Plan, each park has a Protection Plan that includes "major hurricane." This plan, updated every 10 years, is approved by DEP. Each park staff member must annually indicate that they have read the Protection Plan. Although officially approved every 10 years, parks update information each season with information particular to their location. This Plan includes specific information on the preparation of chain saws, fuel, oil, water, trashcans, computers, and so on. Prior to a storm, particular advisories trigger different activities such as park evacuation. Following a storm, park managers conduct a preliminary assessment and then communicate with park staff to prioritize activities and allocate resources. Staff safety is a priority. In the aftermath of a storm, staff meet daily to reassess. "Hurricane Strike Teams" of state park staff with particular skills (clearing roads, felling trees) may be deployed to other Florida state parks; however, DEP employees are not directed to help other entities. In the long-run, contractors may be hired for labor and heavy equipment-intensive tasks such as clearing debris.

Zach Lozano is the Park Manager at Estero Bay Preserve State Park. Justin Lamb is an Environmental Specialist with the Florida Park Service. His responsibilities include trail maintenance, invasive plant removal, prescribed burn planning, and overseeing volunteers. Numerous volunteers and interns assist with maintenance needs throughout the park.

- **Watch:**

  https://youtu.be/Q6CKHot-O9Q

Discussion Question*:*

- Where both the natural and human resources of the Estero Bay Complex well-prepared for Hurricane Irma?
- **See also:**

  "Manager's Message" and "People Make the Park, " Estero Bay Preserve State Park https://www.floridastateparks.org/parks-and-trails/estero-bay-preserve-state-park

Further Discussion Questions:

- Was Estero Bay well-prepared for a natural disaster/disturbance event such as Hurricane Irma? Consider the natural and human resources associated with the Complex.
- How did the natural resources of Estero Bay Complex successfully/unsuccessfully contribute to mitigating this disturbance event?
- How did each leadership frame (structural, human resource, political, symbolic) contribute to the Complex's success or failure in mitigating the impacts of Hurricane Irma?
- In addition to hurricanes, what other acute or chronic disturbance events might impact the natural resources and ecosystem services of the Estero Bay Complex?
- How might each leadership frame contribute to improving the management of the Estero Bay Complex to better respond to future hurricanes or other disturbance events?

Synthesis

Discussion Questions:

- Effective leadership is essential for successful natural resource management, at all levels, from technician to administrator.
- How has this exercise shaped your ideas about the role of parks/preserves and their natural resources in the provision of ecosystem services and in mitigating climate change and natural disasters?
- How has this exercise shaped your ideas about disaster planning in natural resource management?
- How has this exercise shaped your ideas about leadership, in general? Leadership in your organization?
- Moving forward, how might you apply what you have learned about leadership frames to your own organization or career?

All Questions

Role of Estero Bay Complex

- What ecosystem services does the Estero Bay Complex provide?
- How does the Estero Bay Complex mitigate climate change and natural disasters?
- How does each leadership frame (structural, human resource, political, symbolic) contribute to the successful functioning of parks and preserves, in general? Of the Estero Bay Complex, in particular?

Estero Bay Complex management

- Who manages natural resources, in general? Who makes decisions concerning management of the Estero Bay Complex?
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Estero Bay Complex and Hurricane Irma

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