A Journey Down the Corkscrew Watershed:
An Activity-Based Curriculum Focused on Sustainability

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Primary Course Objectives

- To enhance baseline scientific knowledge relating to global sustainability by developing the critical thinking skills necessary to understand the environmental problems we face
- To gain an understanding of the ecology of regional ecosystems, natural goods and services provided by these ecosystems, and how human interactions disrupt natural functions
- To introduce the concept of sustainability and demonstrate an ability to apply this concept to practical real-life situations in an urbanized society

Abstract

Using the Corkscrew Watershed as a specific case study and the mosaic of local Southwest Florida ecosystems as the natural backdrop, critical environmental issues, ecology, and socio-economic conditions of an urbanized, coastal region are examined. Sustainability is the integrative theme, highlighting the importance of economic growth while understanding that environmental responsibility and social well-being are critical factors for the new triple bottom line. The purpose of the capstone project is to reinforce key concepts related to course objectives that increase knowledge and awareness of local history, ecology, and socio-economic situations. Students are asked to "create" a sustainable eco-friendly resort located in the SW Florida region, while simultaneously mitigating ecological damage and restoring disturbed areas. This project complements a rigorous schedule of laboratory activities and field excursions for non-science majors. Freshwater supply concerns and importance of watersheds are two primary focal points of the activity-based curriculum.

Field Excursions: A Journey Down the Corkscrew Watershed

Hand's-on educational opportunities are provided to each student through off-campus visits to regional sites. We begin our journey as "raindrops" who have fallen in the interior of the peninsula at the headwaters of the Corkscrew Watershed (CREW). As a class, we travel down the watershed and visit Corkscrew Swamp Sanctuary. Next, we paddle the Imperial River and hike near the Estero River. We finish our journey at Bunche Beach. The concept of "raindrops" and visiting the sites in this order emphasizes the importance of habitat connectance and of the services provided by a healthy watershed for an urbanized, coastal region (*Figure 1*).

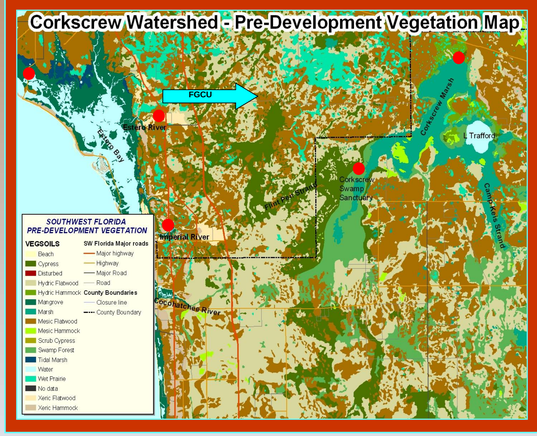

Figure 1. The Corkscrew Watershed, illustrating the mosaic of interconnected ecosystem types across the landscape. The red dots indicate off-campus field excursion sites. Students follow the watershed and relate elevation differences, hydroperiod, and soil characterisitics to the vegetation structure observed in each ecosystem. Natural goods and services provided by the Corkscrew Watershed are explained throughout the site visits.

Academic Activities

Multiple sources of information including the textbook, scientific journal articles, lab exercises and personal observations are used. The textbook provides background information, while journal articles examine current issues and explore topics including freshwater supply concerns, urbanization, overexploitation of resources, and global climate change. Laboratory exercises apply textbook concepts to the FGCU campus, and provide an activity-based and group-learning environment (*Figure 2*). A Nature Journal is kept throughout the class and allows student observations and reflections at a nature spot of their choosing. The final project reinforces all class activities by relating sustainability to the socio-economic and environmental issues previously explored. Field excursions provide opportunities to engage student interest by exploring locations throughout the Corkscrew Watershed to assist with understanding of water conservation, purification, and aquifer recharge.

Figure 2. Multiple ecosystem types are visited throughout the semester in an effort to increase awareness of the regional landscape, to help foster a sense of respect and responsibility for the natural world, and to use the surroundings as a "living laboratory". Depicted in this series of photos is a pine flatwood (A), a cypress dome (B), and a riverine mangrove system (C) on the Imperial River.

Lab Exercises

Lab exercises are intended to describe the scientific method, to help explain key ecological concepts, and to provide encounters with local ecosystems and opportunities for species identification (*Figure 3*).

- Freshwater Ecosystems Ecology
- Feeding Behavior of Ants
- Crayfish Ecology and Age Structure Diagrams
- Soil Characteristics
- Estuarine Ecosystems Ecology
- Intertidal Zone, Beaches, and Dunes Evaluation
- Urban Ecosystems
- Ecological Footprints

Figure 3. Dipnetting for crayfish and small-bodied freshwater fishes in the interior of a cypress dome during dry season.

Major Concepts

- Natural Goods and Services
- Watershed and Ecology Basics
- Ecosystem Structure and Function
- Wet/Dry Seasonality
- Freshwater Supply and Aquifer Recharge
- Key Indicator Species
- Limiting Factors
- Urbanization and Habitat Loss

Figure 4. Important concepts are continually revisited throughout the curriculum. Examples include food availability for indicator species, such as wading birds during nesting season and also urbanization impacts on a keystone species, like the gopher tortoise.

Calendar of Academic Topics, Themes, and Objectives

Class	Topic	Theme	Objective
1	Introduction	Introduction to Course	- To build a foundation for the course
2	Geology and Climate	Ecology Concepts	- To describe the history of the Florida Peninsula
3	Ecosystems	Ecology Concepts	- To explain ecosystem functions and processes
4	Evolution and Biodiversity; Ecology of Ants Lab	Ecology and Biodiversity	- To engage student understanding of evolution and components of biodiversity
5	Exam 1 and The 1 Degree Factor	Current Issues	- To explore issues related to global climate change and likely impacts on SW Florida
6	CREW Field Excursion	Inland/Upland/Freshwater	- To provide interaction with regional ecosystems
7	Ecosystem-based Management: The Everglades	Current Issues	- To discuss management strategies while understanding the Greater Everglades Ecosystem, human impacts, and CERP
8	Corkscrew Swamp Sanctuary Field Excursion	Inland/Upland/Freshwater	- To provide interaction with regional ecosystems
9	Human Population and Age-Structure Lab	Issues/Freshwater	- To understand exponential human population growth and consequences for natural goods and services
10	Exam 2 and Freshwater Supply Concerns	Current Issues	- To discuss issues related to supply of freshwater in Florida
11	Estero River Buffer Preserve Field Excursion	Scrub/Riverine/Estuarine	- To provide interaction with regional ecosystems
12	Bunche Beach Field Excursion & Estuarine Lab	Estuarine/Marine	- To provide interaction with regional ecosystems
13	SW Florida and Urban Ecosystems Lab	Current Issues	- To assist with comprehension of our urbanized society and the consequences of our lifestyle choices
14	Beyond the Coast, Tragedy of the Commons, Class Recap, Course Evaluations	Estuarine/Marine & Course Recap	- To explore the Tragedy of the Commons using overexploitation of marine resources as an example
15	Final Exam		

Sustainability Capstone Project Deliverables

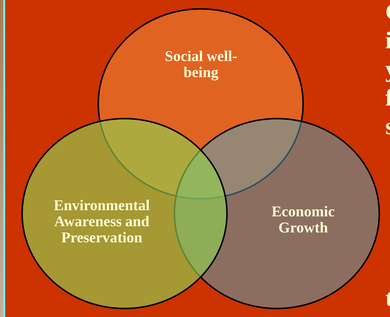

Figure 5. The Triple Bottom Line: Three factors necessary for a sustainable society

Given your new knowledge of Southwest Florida issues, ecology, and sustainable living (*Figure 5*), your consulting firm was asked to create an eco-friendly resort located in the region, while simultaneously mitigating ecological damage and restoring disturbed areas. You have several endangered species that must be protected on your land that need access to terrestrial, freshwater and estuarine systems. Provide a highly creative and professional business proposal that addresses all concepts covered in class related to sustainability of natural resources, social needs, and economic services.

Acknowledgements

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