UF in Yucatan, Mexico (GLY 4930 “Tropical Ecology” and GLY 4930 “Humans and the Environment of the Yucatan Peninsula”)

The combined courses, “Tropical Ecology” (3 credits) and “Humans and the Environment of the Yucatan Peninsula” (2 credits) present an overview of the ecology of the Yucatan Peninsula and focus on long-term interactions between humans and the environment in the region. Classes are taught in English by faculty members from University of Florida and the Department of Veterinary Medicine and Animal Science at the Autonomous University of Yucatan (UADY). Classes are held Monday through Wednesday. The classes provide background in ecology and explore ecosystems on the peninsula in southeastern Mexico. Among the topics covered: physical geography, climate and karst geology, Maya culture and ethnoecology, paleoecology, freshwater ecosystems (cenotes, lakes, rivers), coastal saline lagoons and mangroves, marine reefs and beaches, vegetation types and plant diversity (low and high forest), and wildlife management areas. Field excursions are scheduled for Thursday-Saturday/Sunday. There are field trips to caves, cenotes, lakes, springs, coastal mangroves, salt ponds, Caribbean beaches and reefs, offshore islands, low and high forest, indigenous agricultural systems, and Maya archaeological sites. In past years we have seen monkeys, crocodiles, sea turtles, boa constrictors, flamingos, and other wildlife. The major goal of the course is to provide students with an overview of tropical ecosystems in a field setting, enable them to see how people live in this landscape, and make students aware of the environmental challenges that this tropical region faces. The class is combined with Spanish language classes (3 credits) offered at multiple levels, which are taught by UADY faculty members. The classes are open to graduate and undergraduate students and there are no prerequisites. All GLY students receive a packet of bound readings that supplement information provided in lectures. Each student must bring a camera on field excursions and take photographs that illustrate ecological principles covered in class. Students give short group presentations in class the following week, highlighting their field experiences and using the photos to reinforce concepts discussed in class.
FIELD TRIP 1. General Features of the Yucatán Peninsula: the Northern Karst Plain
(The northern karst plain, north of Mérida: Dzityá, Dzibilchaltún, Progreso and Uaymitún).

OBJECTIVES:

1) Examine the characteristics of the karstic plain north of Mérida.
   A) Observe the main features of this region with respect to topography, vegetation, hydrology, soil, and coastal landforms.
   B) Observe human activities in this region and their impact on the environment.

DESCRIPTION:

During this field trip we will travel north of Mérida. We will visit the small town of Dzityá, the archaeological site of Dzibilchaltún, the port town of Progreso, and Uaymitún. Just inside the Mérida city limit, we will see a steel factory. Our first stop is Dzityá, which lies 10 km north of Mérida. We will visit a cenote (sinkhole waterbody) located adjacent to a pig farm. Many people in Dzityá work with limestone and wood. We will visit a cooperative where people make handicrafts using tropical woods, and later visit a stonework factory. As we travel northward, you will see one of the new industries (maquiladoras) in the area. Many new factories of this sort have opened as a consequence of NAFTA and other trade agreements.

Our next stop will be the archaeological site of Dzibilchaltún. This Maya site provides evidence of the long-term relationship between humans and environment on the Yucatán Peninsula. We will visit the Museo del Pueblo Maya and an example of a typical, rural Mayan house. Next we will walk along the path that leads to the archaeological site. Along the way, you will be able to observe the vegetation and soils
that typify this part of the Yucatán Peninsula. You will also be able to stop at several information boards to read about the local ecology. Keep your eye out for birds, lizards and insects. Next we’ll tour the archaeological site and visit Cenote Xlakáh. Bring a snorkel to swim in the cenote, as it is possible to see several species of fish, turtles, and aquatic plants.

Next we will go to Progreso, the main port of the state of Yucatán. We will visit the long pier where ships dock with their cargo. Note how shallow the water is at a considerable distance from shore. Lastly, we will travel along the coast toward Uaymitún and you will have an opportunity to view the coastal wetlands. You should be able to see numerous wading birds in the mangroves, including flamingoes.

COMMENTS AND QUESTIONS:

The Yucatán Peninsula is a limestone platform that projects northward into the Gulf of Mexico and Caribbean Sea. At first glance it may appear to be environmentally uniform, but geographic variation in climate (rainfall) and topography gives rise to a peculiar environmental heterogeneity. The region has been divided into different physiographic districts. The zone around Mérida belongs to the northern karst plain.

What is the main topographic characteristic of this region? Given what you have seen today, think about the following questions: do you think the steel factory has an impact on the environment? Considering the prevailing winds, do you think it affects the city?

During our trip, we travelled northward from Mérida to Progreso. What changes did you observe with respect to soils and vegetation as we approached the north coast? What might account for the differences? What natural resources did you see being exploited by people? What kinds of agricultural activities did you observe? Do you think these activities are sustainable? Do they have an impact on the environment?

Cenotes are characteristic features of the Yucatán Peninsula and the water you see in them is the exposed groundwater aquifer. Did you notice any difference in the appearance of water in the cenote at Dzityá and the one at Dzibilchaltún? From an environmental perspective, why do you think the ancient Maya chose to settle at Dzibilchaltún? The plants you find at Dzibilchaltún are adapted to a dry environment and are typical of the vegetation in northern Yucatán. What types of plants did you observe and did you see any special adaptations to the dry environment? Did you observe the area in the dry or wet season?

Near the coast, you will observe that recent road construction altered the local hydrology, and had a negative impact on the mangrove forest. Steps are being taken to restore the original hydrologic regime in the area. Do you think this effort will be successful?
coast is a sand belt with a very gradual slope offshore. Consequently, a very long pier had to be built to reach deeper water and accommodate large ships. How do you think that the various sections of the pier, with their different designs, affect the immediate environment and the coastline. The wetlands at Uaymitún were almost dry, but were flooded again after Hurricane Gilbert (1988). Once the water entered the site, flamingoes, which previously nested around Río Lagartos (near the Quintana Roo border), started to nest here. Should humans intervene to guarantee that the site near Uaymitún remains inundated?
FIELD TRIP 2. Coastal Ecosystems in the Yucatán: The Western (Gulf) coast.  
(Celestún Reserve - a coastal lagoon).

OBJECTIVES:

1) Observe the main characteristics of a coastal lagoon.
2) Observe the human economic activities (fishing, eco-tourism) in this zone.

DESCRIPTION:

During this field trip we will visit the Celestún Reserve on the west coast (Gulf side) of the state of Yucatán. You will have the opportunity to see the fishing village of Celestún and observe a large coastal lagoon with distinctive hydrologic features. We will travel southwest from Mérida, pass through the Ciudad Industrial (the part of the city where the main industries are located), and see some towns and haciendas that flourished when the henequen (sisal) industry was at its peak. After we cross the bridge over the Celestún lagoon, we will stop on the west side of the lagoon and board tourist boats. We will travel north into the upper reaches of the lagoon. Observe the environment (lagoon morphometry, color of the water, surrounding mangrove forest, submersed plants, bird life, human activities and impact on the environment). We will also travel to the east side of the lagoon where you can observe a “bird island,” have a closer view of the mangrove ecosystem, and look at (and swim in) a spring that discharges freshwater into the lagoon. Check out the fish that inhabit the spring. We will also travel south to the mouth of the lagoon, where it opens into the Gulf of Mexico. Here we can disembark and walk along the beach on the western edge of the extensive coastal sandbar. After we complete the boat tour, we will visit the town of Celestún where we will have lunch. On the return trip to Mérida, we will stop and observe a cenote and see features of some distinctive vegetation islands, or “petenes,” that surround springs.
Coastal lagoons on the Yucatán Peninsula are formed by the development of a sandbar parallel to the coastline. The resultant lagoon maintains a connection to the sea. The Celestún lagoon is almost 21 km long, running from NE to SW. It has a maximum width of ~2 km, and a mean depth of 1 m. It is bordered by mangrove forest and receives fresh water from groundwater springs. Elsewhere in the world, coastal lagoons generally receive freshwater inputs from rivers. Because it is a feeding site for the pink flamingo (*Phoenicopterus ruber*) and other resident and migratory birds, Celestún lagoon was decreed a Special Biosphere Reserve. The lagoon is open to the Gulf only at its southern end. In 1979, the bridge was constructed to enable people from Celestún to travel quickly to and from the mainland. The bridge restricts water flow into and out of the lagoon. The lagoon exhibits a gradient with respect to water salinity. Given what you know about the hydrology of the system, where would you expect to find the most saline water? The least saline water? Do you think that bridge construction may have affected the salinity or other characteristics of the lagoon? The mangrove forest is a highly productive ecosystem and many animal species rely on the organic material that mangroves produce. Mangroves also serve as nursery grounds for many important fisheries. Mangroves also serve to prevent catastrophic damage during tropical storms, by reducing wind velocities and protecting coastal sediments from erosion. There are four mangrove tree species. Can you identify them? Observe the adaptations of mangroves that enable them to survive in this stressful environment. This community provides resting and nesting sites for several species. Look for at least five of them. What is the role of freshwater input in the functioning of the lagoon? How are humans exploiting resources in this ecosystem? What human activities might have negative impacts on this ecosystem?
(The Puuc Route: Maxcanu, Muna, Ticul, Loltún, and Maní)

OBJECTIVES:

1) Observe the main characteristics (topography, vegetation, human activities) of the hilly karst plain.
2) Observe the karst characteristics of this area, such as caves and cenotes.
3) Observe traditional uses of natural resources in this region.

DESCRIPTION:

During this fieldtrip we will visit towns in the state of Yucatán, including Muna, Maxcanu, Ticul, Oxkutzcab, Maní and perhaps Tecoh. There are many archaeological sites in this region and we will visit several (Oxkintok, Uxmal, Kabah, Sayil). We will also visit two large cave systems, Loltún and Calcetok. Bring your flashlights and bathing suits.

Day 1.- We will travel southwest to Maxcanu and visit solares (kitchen gardens). Take note of the variety of flora and fauna that are managed within the confines of the kitchen garden. We will travel south to Cuch Holoch where we will go into some small caverns to observe Yucatec women making hats of palm leaves. We will also go to San Antonio Sihó and visit a “desfibradora,” that was until recently one of the few remaining factories where henequen fiber (sisal) was processed. We will return to Maxcanu and visit the archaeological site of Oxkintok. Next, we will visit the Calcetok cave system and watch the bats emerge at nightfall. We’ll then head to Ticul where we’ll check into a hotel and have a late dinner.

Day 2.- From Ticul, we will travel to Muna. From a high point on the Sierrita, we’ll observe the differences between three physiographic regions (northern karst plain, Sierrita de Ticul and hilly karst plain). Then, we will go south to the Puuc archaeological sites Uxmal, Kabah and Sayil, that
lie on the hilly karst plain. Weather permitting, we’ll go to the “light and sound show” at the archaeological site of Uxmal. We will return to Ticul at night.

**Day 3.** Our first stop is Loltún, another example of the limestone cave formations in this region. Next we’ll travel to the town of Maní, an historically important town for Maya culture. Here we will visit a project that was designed to preserve and disseminate indigenous knowledge about the local environment. The ultimate objective of this program is to promote wise management of natural resources. We will return to Mérida in the evening.

**COMMENTS AND QUESTIONS:**

Although the limestone platform of the Yucatán Peninsula seems quite uniform, small topographic changes combined with spatial variation in climate, provide heterogeneity that is reflected in the different plant associations found throughout the peninsula. Natural vegetation around Mérida was seriously altered by *henequen* cultivation, but has recovered in fallowed areas that were not replanted with other crops (e.g., citrus). Observe this vegetational succession in some areas during the trip. Natural resource management now reflects a mixture of Maya, Spanish and modern influences. Traditional Maya agricultural methods are threatened by global development. For instance, women who traditionally maintained kitchen gardens (*solares*) are increasingly brought into the work force as wage earners. Also, new technologies for cultivation (fertilizers and pesticides) are constantly promoted. Think about the costs and benefits of using the traditional methodologies versus “modern” agricultural techniques. How is food production affected by other shifts in the economy? What differences did you observe between the industry of hat-making (using palm leaves) and fiber production (using *henequen*)? How did the environmental impacts of the two “industries” compare?

Take note of the soils and vegetation around the archaeological sites we visit. Do you think that the natural resource base in the region was conducive to cultural florescence? The Sierrita de Ticul is an important topographic feature in the state of Yucatán. Observe the environmental differences north and south of the Sierrita. In the Sierrita we find several solution features that are characteristic of karst environments. The most impressive are caves, which played an important role for prehispanic inhabitants of the region. The caves reflect geological processes on the peninsula and provide habitat for a fauna that is adapted to special environmental conditions. Did you observe any of these organisms? It has been said that the past is the foundation of the present and the future. Some believe that traditional knowledge can be used to improve the use and management of natural resources. Do you
agree? Do you see a mixture of traditional and modern knowledge in the techniques taught at the school of ecological agriculture?
FIELD TRIP 4. The Caribbean coast (coral reefs), lakes, and dry tropical forest.

Eastern Yucatán: Quintana Roo state, Cancún, Playa del Carmen, Akumal, Tulum, Cobá and Punta Laguna.

During this field trip we will travel to the east of Mérida, enter the state of Quintana Roo, and visit the Caribbean coast.

OBJECTIVES:

1) Observe the main characteristics (topography, vegetation, and human activities) on the fault block district.
2) Observe the characteristics of the ecosystems in this area (coral reefs, beach dunes, lakes, and medium stature dry tropical forest).
3) Observe the main economic activities in this region (e.g. tourism) and their impact on the environment. Observe traditional resources use.

DESCRIPTION.

Day 1.- We will travel through the eastern part of the state of Yucatán on our way to Quintana Roo. We will travel directly to the tourist area of Cancún to observe the consequences of coastal development. Then, we will travel south along the coast road, Cancún-Tulum to visit the Botanical Garden “Alfredo Barrera Marín.” After this, we travel south and spend the night along the coast.

Day 2. – In the morning, we will travel south to Akumal and swim over the coral reef ecosystem. Next we will stop at the coastal archaeological site of Tulum. We will then drive westward (inland) toward the archaeological site of Cobá and check into a hotel. We will have dinner in Cobá, and go on a night walk in search of reptiles, amphibia and other nocturnal fauna such as tarantulas. We will spend the night at Cobá.
**Day 3.** – In the morning, we will have breakfast and visit the archaeological site of Cobá. Next we travel north to Punta Laguna. We will take a walk through the forest at this spider monkey reserve and swim in the lake. Next we will travel west to Valladolid where we will spend the night.

**Day 4.** – We will go to the archaeological site of Chichen-Itza and return to Mérida.

COMMENTS AND QUESTIONS:

The eastern part of Yucatán state is a little higher than Mérida. Near Valladolid, the mean ground level is about 25 m above sea level. How do you think this fact is reflected in the shapes of *cenotes* in this region? The vegetation in the eastern sector is generally taller. Why? Note where you begin to see the vegetation change. Cancún lies on the Caribbean (east) coast of the Yucatán Peninsula. You will notice how different the east coast beach is from beaches of the northern (Progreso) and western (Celestún) coasts of Yucatán. What are the main differences? Why do you think they occur? How does the sand on the Caribbean beaches differ from what you are used to in Florida? Hurricane Gilbert caused great damage to the hotel zone at Cancún. Why do you think the area suffered so much damage? What could have been done to minimize the damage? The botanical garden preserves a good example of natural forest in the region. What type of vegetation characterizes this area? Which species are typical of this vegetation, but not found near Mérida? In the botanical garden you will see many examples of plants with medicinal properties. Others provide building material or food. Keep your eye out for local fauna and think about the food web in this environment. How do you think development along the Caribbean coast has affected the environment? How do you think it has affected the Maya people who once owned much of the real estate in this region? Observe the biological diversity on the coral reef. What constitutes the structure of the reef? Why are coral reefs at risk, and what are the major environmental problems that threaten them? Check out the stature of the vegetation at
Tulum. What special adaptations does it display? Why do think people settled at this site? Observe the soils and vegetation at the Punta Laguna reserve. How do they differ from what you saw at Dzibilchaltún? Describe the characteristics of the lake at Punta Laguna reserve. While you are swimming, scoop up some sediment from the bottom and look at it closely. What are the main components? Note the odor of the sediment. What accounts for the special odor? Observe the aquatic plants and fish that live in the lake.
FIELD TRIP 5. Río Lagartos Biosphere Reserve and Las Coloradas.
(Izamal, San Felipe, Río Lagartos.)

During this field trip we will travel to the north-central coast of the Yucatán Peninsula.

OBJECTIVES:

1) Observe the characteristics of a hypersaline lagoon.
2) Observe salt production at Las Coloradas.
3) Observe the fishery at San Felipe.
4) Observe springs and cenotes of this region.

DESCRIPTION:

Day 1. - We will travel north and then turn eastward and move along the coast road to San Felipe. We will move from the former henequen zone to the cattle region. We will go directly to the coastal town of San Felipe where we will check into our hotel and you can observe the mouth of the Río Lagartos coastal lagoon. Next we will visit a small cenote that is home to a number of Morelet’s crocodiles. Then we’ll go to Las Coloradas, the town founded for salt industry workers. Here we’ll see the coastal dune area, the salt factory and its evaporation ponds. We’ll also see the eastern part of the lagoon and
coastal environment that serves as habitat for many animal species. You should observe flamingoes, pelicans, and perhaps a roseate spoonbill. We will spend the night in San Felipe.

**Day 2.** - We will go to the town of Río Lagartos and take a boat trip into the upper reaches of the lagoon. The waters here are hypersaline, i.e. have greater salt content than seawater. We will travel to the north edge of the coastal sandbar and snorkel. We will also visit and swim in Cenote Chiquilá, a spring that discharges relatively fresh water into the lagoon. We will have dinner in Río Lagartos and later we will return to Las Coloradas and search for sea turtles coming up to nest on the beaches. In the past, we have seen green turtles and Hawksbill turtles.

**Day 3.** - We will make our way back to Mérida, stopping at the archaeological site of Ek Balam on the return trip. We will also visit the town of Ek Balam, where you will have an opportunity to purchase hammocks directly from people who make them.

**COMMENTS AND QUESTIONS:**

San Felipe is located at the mouth of the longest coastal lagoon in the state of Yucatán. It is one of the primary nesting sites on the peninsula of the pink flamingo (*Phoenicopterus ruber*). The Río Lagartos Special Biosphere Reserve is bordered by the cattle region, an extensive zone that was cleared of its original vegetation so that grass could be grown for cattle ranching. The region also possesses one of the largest salt production industries in Mexico. How does the Río Lagartos lagoon differ from the lagoon at Celestún? Describe the salinity gradient at Río Lagartos. What human activities in the region might negatively impact the local fishery? The commercial fishery in Yucatán is largely for red grouper (*mero*), octopus (*pulpo*) and spiny lobster (*langosta*). Did you observe any of these species? What other species did you see? Río Lagartos is trying to develop eco-tourism. What do you consider to be the major attractions of the area? Do you envision any negative impacts of this kind of tourist activity? Having seen the turtle nesting beaches of Las Coloradas, what challenges do you think turtles face if they attempt to nest on the Caribbean beaches?