Conservation and Sustainability of Neotropical Ecosystems
ENVS 345 E/ BIO 395 E
Spring Semester 2016
Loyola University Chicago

Instructor: Fr. Stephen Mitten SJ
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Credit: 3
Class Schedule: Class meets once a week starting spring term with trip to Belize @ March 4 - 13, spring break.

ENVS 345 E Special Topics: Conservation and Sustainability of Neotropical Ecosystems
Cross-listed with
BIO 395 E Special Topics: Conservation and Sustainability of Neotropical Ecosystems

Pre-requisite:
Biology (with ecology emphasis) - BIO 102, 112 and BIO 265
Environmental Science majors/minors – ENVS 137 and ENVS 237 and ENVS 280

This course fulfills the following academic requirements:
- ENVS Major/Minor Elective
- BIO Major/ Minor Elective for ecology emphasis

Main Texts:
Tropical Conservation Biology. 2008. Navjot Sodhi, Barry Brook, & Corey J.A. Bradshaw
Wiley-Blackwell Scientific Publishing
Birds of Belize, 2001. H. Lee Jones
There will be additional readings (Articles and PowerPoint lectures)’s posted on Sakai.

Recommended Texts:
A Natural History of Belize: Inside the Maya Forest, Samuel Bridgewater

Course Site: Loyola University Chicago and Monkey Bay Field Station, Belize and various sites across Belize

Course Description: This course provides a comprehensive introduction to conservation ecology as it is applied in a variety of Neotropical ecosystems by way of classroom lectures prior to trip and experiential learning activities in Belize. Student will be first introduced to the ecology of the major Neotropical terrestrial and aquatic (both fresh and marine) ecosystems, learn about the key environmental threats to these ecosystems, will review the conservation
status of the biodiversity within each of these ecosystem, and then examine the principles of conservation management that are applied to their protection and sustainability. Student will also be provided with some practical experience with basic environmental monitoring and biological survey methods. Ecosystems studied include coral reefs, mangroves, littoral forests, gallery forests, subtropical rain and dry forests, savannas, rivers, lagoons and wetlands.

**Introduction and Rational:** Local actions influence global environments! Neotropical biodiversity is under threat by human’s exploitation of these regions and its natural resources for the provision of food products and raw materials primarily for the developed world. Biodiversity in the Neotropical region is of enormous importance and the loss of Neotropical ecosystems will represent the loss of processes, economic values and ecosystem services. The more we learn the value and the importance of these ecosystems, and understand how our immediate actions and behaviors influences the long term sustainability of these ecosystems, the more likely these ecosystems can be maintained.

This spring course coupled with a ten-day program during spring break immerses the student in the tropical ecosystems of Belize, an English-speaking country in Central America that lies on the Caribbean Sea. While not as large as its neighbors, Belize is known for having 85 distinct ecosystems and is rich in biodiversity. It is home to more than 560 species of birds, 150 species of mammals, 150 species of amphibians and reptiles, nearly 600 species of freshwater and marine fish and 3,408 species of vascular plants. Having more that 50% of its natural areas still intact and 28% in protection; this course focuses on a variety of models of conservation and management schemes as they are applied in Belize to a number of these various Neotropical ecosystems and identifies the benefits of these protected areas. A number of various conservation organizations are also involved in the conservation of these ecosystems/flora or fauna and they too will be reviewed. Ecological and economical knowledge of these tropical ecosystems and their function, the examination of the array of biodiversity within these ecosystems and the models of conservation to sustain them are explored in this course. Academic excursions into Belizean ecosystems with extended day field trips, investigative field exercises, environmental monitoring, coupled with both classroom and in the field lectures from local experts provide the students with a dynamic learning opportunity.

With a strong foundation obtained from their readings and class discussion on Neotropical ecology and conservation prior to the field course, students will then experience and study a number of these Neotropical ecosystems, learn various tropical ecology field techniques, and examine a number of conservation sites that are under governmental, private, NGO’s and local community conservation management authorities. Both terrestrial and aquatic ecosystem conservation areas will be visited. Course activities focus on human influences, threats, conservation difficulties and management solutions within the ecological and social context of each site. The course focuses on experiential learning through exciting activities such as a full day canoe paddling down the Sibun River while stopping to examine anthropomorphic effects and applying environmental monitoring sampling techniques, hiking through a local community managed Black howler monkey sanctuary, exploring one of the largest cave structures in the world, taking a night canoe excursion into a crocodile sanctuary, camping in the world’s largest Jaguar Preserve and snorkeling the Mesoamerican Barrier Reef System. Students will visit
Monkey Bay Wildlife Sanctuary, Sibun River Watershed Association, the Belize Zoo, The Tropical Education Center, Mesoamerican Biological Corridor, Cox Lagoon Crocodile Sanctuary, St. Herman’s Cave and Blue Hole National Parks, Cockscomb Basin Wildlife Sanctuary (Jaguar Preserve), the Maya Centre Village Forest Garden, South Water Caye Marine Reserve, Man-O-War Caye Bird Sanctuary, and the Smithsonian Institute’s Western Caribbean Marine Research Station.

Course Objectives:

1) Give students an opportunity to study abroad.
2) Have students participate in an experiential learning course in a topic of global concern.
3) Engage in a service learning project.
4) Learn conventions of writing both non-scientific and scientific papers.
3) And upon completion of this course all student should have a working understanding of 1) tropical climates, 2) both neotropical terrestrial and aquatic ecosystems and 3) various applied conservation and environmental practices such as nature reserve design and management, in-situ and ex-situ conservation, community-based resource management, and ecotourism, 4) some applied environmental monitoring techniques, and 4) In addition to the above mentioned objectives, other goals for this course will be:
   ➢ to understand the many social justice dimensions of environmental issues
   ➢ to appreciate our own responsibility as citizens of our planet
   ➢ to transform our current unsustainable practices to those that are more life-giving.
   ➢ collect data to be supplied to both local community-based conservation organizations and global conservation initiatives.

Course Content:

Tropical Climate and weather patterns (rainfall)
Tropical Soil Formation and Classification
Karst formation and structure.
Conservation Ecology
➢ What is Neotropical conservation?
➢ In-situ conservation
➢ Ex-situ conservation
➢ Ethics and values
➢ Conservation priorities
Conservation, Preservation and Natural Resource Management in Belize
➢ Types of Protected Areas
   • Forest Reserve: These areas are designed for sustainable timber extraction without destroying the biodiversity of the location. Companies are given permits to extract after being reviewed by the Forests Department.
   • Marine Reserve: These are designated for the conservation of aquatic ecosystems, including marine animals and their habitats, as well as for the sustainable extraction of marine resources.
   • National Park: These parks are areas of recreation and tourism, as well as environmental protection.
• Natural Monument: This protected area is designated for unique geographic features of the landscape, to preserve them for research projects and future generations.
• Nature Reserve: These parks enjoy the highest level of protection; permits are required to enter the area and are restricted to researchers only. Nature reserves are typically pristine, wilderness ecosystems.
• Private Reserve: Either official or unofficial, these reserves are owned and operated by private conservation initiatives, and enjoy various levels of protection.
• Wildlife Sanctuary: These areas are created for the preservation of an important keystone species in the ecosystem. By preserving enough area for them to live in, many other species receive the protection they need as well.

➢ Community Run Wildlife Sanctuaries (Community Baboon Sanctuary, Manatee Special Development Areas)
➢ Private Wildlife Sanctuaries (Monkey Bay Wildlife Sanctuary, Cox Lagoon Crocodile Sanctuary)

Management
➢ Ministry of Natural Resources and the Environment.
➢ Belize Audubon Society (BAS) oversees a total of nine protected areas, including 4 natural monuments, 2 national parks, 2 wildlife sanctuaries and 1 nature reserve. [http://www.bas.org]
➢ PACT (Protected Area Conservation Trust) [http://www.pactbelize.org/]
➢ Private Reserves are co-ordinated under the Belize Association of Private Protected Areas.
➢ Toledo Institute for Development and Environment (TIDE) [http://www.tidebelize.org/]
➢ The Programme for Belize (PfB) [http://www.pfbelize.org/]

Most ecologically important areas in the country;
➢ Río Bravo Conservation and Management Area
➢ Aguacaliente Wildlife Sanctuary
➢ Bacalar Chico Marine Reserve
➢ Glover's Reef Marine Reserve
➢ Crooked Tree Wildlife Sanctuary
➢ Shipstern Nature Reserve
➢ Community Baboon Sanctuary

Other Major Conservation Organizations in Belize
➢ Belize Zoo and Tropical Education Center [http://www.belizezoo.org/]
➢ Birds without Borders [http://www.zoosociety.org/conservation/bwb-astf/]
➢ United Nations Development Program (UNDP) [http://www.undpbelize.org/]
➢ Friends of Nature [http://www.friendsofnaturebelize.org/AboutUs.htm]
➢ Ya’axché Conservation Trust (YCT) [http://www.yaaxche.org/]
➢ World Wildlife Fund [http://www.wwfca.org]
Wildlife Conservation Society  
http://www.wcs.org/international/latinamerica/mesoamerica/belize

Belize Harpy Eagle Restoration Program,

Friends for Conservation and Development (FCD) http://www.fcdbelize.org/

Southern Environmental Association (SEA) http://www.seabelize.org/

Green Reef http://ambergriscaye.com/greenreef/

Healthy Reef http://www.healthyreefs.org/

Nature Conservancy –Belize http://www.nature.org/wherewework/centralamerica/belize/

The Belize Wildlife Conservation Network

The Environmental Research Institute (ERI) -University of Belize (UB)

Central American River Turtle Protection

Belize Foundation for Research and Environmental Education (BFREE)  
http://bfreebelize.net

Socio-Economics of Conservation in Belize

- Belize/ Guatemala Dispute
- Population growth rates around protected areas
- Poverty and unemployment

Design

- Mesoamerican Biological Corridor
- Methods of Conservation ecology
- Landscape Scale Conservation
- Buffer zones

Conservation and Management applied to the following ecosystems/ species:

Neotropical Marine Ecosystems and Conservation

1. Coral

- Coral formation
- Coral structure and zonation
- Major types of Caribbean Coral
- Ecological and economic significance
- Reef macro-organism and biodiversity
- Threats and disturbance
- Conservation, Management and Restoration
- Fishing Industry

2. Seagrass ecosystems- ecological function and major species

- Manatee conservation
- Turtle conservation

3. Mangrove ecosystems

- Major flora and fauna
- Plant adaptations
- Soil ecology
- Ecological and economic value
Biodiversity
Threats and disturbance
Conservation, Management and Restoration

Freshwater Aquatic Ecosystems and Conservation
1. Tropical river ecology
   - Watersheds (Sibun River Watershed)
   - Tropical River Continuum Theory – aquatic indicator species
   - Cultural eutrophication (gravel extraction, agriculture, aquaculture)
   - Water monitoring and testing
2. Wetlands and lagoons – swamps, marshes
   - Ecological importance - Flood plains
   - Crooked Tree Wildlife Sanctuary

Terrestrial Ecosystems and Conservation
1. Tropical Cayes - types and formation
   - Protection and Restoration
2. Palmetto Palm Savannas
   - Aquaculture (tilapia and shrimp)
3. Caribbean Pine Savannas (upland and lowland)
   - Succession – fire management
   - Soil ecology – soil tests
   - Ecological and economic value
   - Restoration
   - Indicator species
4. Riverine (Gallery) forest ecology
   - Black howler Monkey
5. Tropical Forest Ecology
   - Soil ecology – soil tests
   - Plant adaptations
   - Biodiversity – flora and fauna
   - Ecological and economic value – ethnobotany
   - Biodiversity
   - Threats and disturbance
   - Conservation, Management and Restoration
   - Endangered species – parrots, raptors, big cats, monkeys, tapirs,
   - Ecoagriculture and Mayan Forest Gardens

**Course Elements:** Will include but are not limited to the following:

**Lectures**
Lectures will be delivered in the classroom and in the field throughout the course by the instructor and guest lecturers covering various major content areas related to our topics.
Those enrolled in the spring semester will meet for class once a week for an one hour period
prior to departing to Belize during spring break. There will be only a few class sessions after
the formal course in Belize.

Field trips and Activities
Activities will take place in the field throughout the course. These activities will include
field observations, field labs, environmental monitoring, and other activities that are to be
included in your field journal. The data we collect will be given to various community –
based conservation organization such as the Sibun Watershed Association, Community
Baboon Sanctuary as well as national and global citizen-science organizations such as e-bird
(Cornell Laboratory of Ornithology) and Biodiversity & Environmental Resource Data
System of Belize (BERDS).

Methods of Evaluation and Grading Procedures:

Evaluation will be based on but not limited to the following:
1) Participation, cooperation, punctuality, quality of contributions to discussion and oral quizzes.
2) Exams over topics covered in the course.
3) Eight 2-3 page essays that summarize the chapter readings
3) Journals: During the field course students will be required to keep a daily journal regarding
their experiences and impressions (See below). These journals will be collected at the end
of the time in Belize. Ten entries worth ten points each are expected and will be graded
according to guidelines established prior to departure.
4) Field research proposal on biodiversity/conservation (see below).

You will be graded out of 350 points, distributed as follows:
Chapter Exams 100
Daily Journal reflections 100
Research Proposal 100
Participation & Oral Quizzes in Field 50

Journal / Field Notebook.

You will each keep a journal, similar to a diary, in which you record the events of the day and
your personal reflections. The journal should be detailed and meaningful; it will be the final
scientific record of your trip, to which you will likely refer back on many occasions. The journal
is for daily documentation of student activities, thoughts, and observations. Journals should
include the following: participation in field sampling, lab analysis, presentations, and group
discussions; reflections on field observations and data interpretation from the context of topics
covered in lecture; lists and sketches to document personal sightings of amphibians, reptiles,
birds, mammals, and invertebrates; and a list of plant species with sketches if not identified. In
addition, I am asking that you include at the end of your entries, one or two questions that you
might have with possible hypothesis as to an answer. Bio/Environmental Science/Anthropology majors will take one of these hypotheses for their research proposal. Part of your writing should be done alone, where you sit in the forest or on the beach, reflect, and write. This will isolate you from the group and give you a chance to interact with habitats on your own terms. These will be quiet, reflective times, not hectic "I have to write a paper" times. Journals should include habitats and identifications of species observed and relevant natural history observations. Journal entries MUST be made DAILY, while the information is fresh in your mind. Journals will be collected and read by instructors at the end of the course. The journal is a relatively easy component to complete, but you must allocate time for writing daily. In brief, the journal should be a detailed account of the day’s events with major learning’s; it should be documented with page numbers from the text book that corresponds to the day’s learning’s, it should include a personal reflection on the day’s events, (i.e. thoughts and feelings) and questions with possible hypotheses to an answer to that question. The last and 10th day of the trip should be a summary of one’s feelings and thoughts about the course coupled with major things learned.

**Final Paper:** Field research grant proposal: After the completion of the trip, students are to write up a research proposal for a possible field research experiment on some ecological/conservation question that arose while they were on the trip from one of their hypothesis recorded in their journal. The research needs to address explicitly how it will benefit conservation of particular species or ecosystems and how it would be applied by way of community-based conservation practices. Additional information and procedures along with an example of what I am expecting will be distributed prior to the trip. (But see simplified example below)

**BIODIVERSITY AND CONSERVATION FOUNDATION GRANT PROPOSAL**

**PROJECT TITLE:**

**PRINCIPAL INVESTIGATOR:**

**PROJECT PERIOD:** How long would it take to do the research?

**PROJECTED COST WITH BUDGET:** How much will it cost?

**ABSTRACT:** Brief summary of the proposal.

**INTRODUCTION:** Why is this research important or necessary or significant?

**BACKGROUND INFORMATION:**

**PRIOR RESEARCH AND CONSERVATION ACTION:** (on this topic)

**PROJECT DESCRIPTION:**

1. **SPECIFIC RESEARCH OBJECTIVES.**

   (1) To examine the effects of……
(2) To examine what the current state is of the……

(3) To increase the knowledge on the reproductive ecology of …

(4) To design appropriate management plans for the protection of …

(5) To implement training workshops to transfer the simple and effective ……

2. HYPOTHESES.

3. METHODS. Be specific and detailed.

REFERENCES:

Grading Policy:

Grading scale: (in percentages out of 100%)

A = 100%-93%, A- = 92%-90

B+ = 87%-89%, B = 83%-86%, B- = 80%-82%

C+ = 77%-79%, C = 73%-76%, C- = 70%-72%

D+ = 67%-69%, D = 60%-66%

F < 60%

Course Expectations:

• Students are expected to report to class on time.
• Students are expected to act in a mature manner at all times with an eye out for safety of persons and equipment.
• Assignments are to be typed unless otherwise noted and turned in on the due date.
• Students are expected to consult with the instructor as necessary about individual concerns, progress, and/or any other relevant issues.

Any student behavior that results in the disruption of the schedule or activities of the class, especially those resulting from consumption of alcohol or use of illegal drugs will be sent home and reported to the Office of International Programs, the Office of the Dean for disciplinary action as discussed under University Policies (alcohol) in the Student Handbook.
**Academic Integrity:**

You will be held to the University’s standard of academic integrity, which is described at: [http://www.luc.edu/academics/catalog/undergrad/reg_academicintegrity.shtml](http://www.luc.edu/academics/catalog/undergrad/reg_academicintegrity.shtml). Please read this statement and do not hesitate to ask me for further information about plagiarism and how to appropriately cite the work of others if you have any questions. The University is a community of learning. A community is based on trust. Any member of this course who violates that trust may receive a zero for a given test or assignment, or, if the violation is particularly egregious, he or she may be asked to leave this course.

**Students with Disabilities Policy:**

This is a field course that requires a certain level of physical fitness to access the various ecosystems (hike through mangroves, swim, canoe, explore caves and climb mountains). If you have any concerns please see the Office of International Programs. The Office of Services for Students with Disabilities coordinates and ensures services and accommodations for registered students with disabilities. Services for Students with Disabilities (SSWD) must have documentation of the disability on file to provide academic accommodations. General guidelines about services can be found at: [http://www.luc.edu/sswd/index.shtml](http://www.luc.edu/sswd/index.shtml).

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**Working Draft**

Loyola University Chicago
Tropical Biodiversity Conservation
10-Day Spring Itinerary 2016
Feb 28-March 9

The following itinerary may be changed and other activities and site visitation substituted depending on local environmental conditions.

Day 1, Friday
March 4, 2016

**Arrive Philip Goldson International Airport**; transfer to Monkey Bay Wildlife Sanctuary for settling in, orientation.

- Staff introductions, campus walking tour, orientation presentations on safety and security, cultural awareness and sensitivity, walk or drive to Sibun River for swim if time allows
- Dinner 6pm
- 7:00pm Lecture by Fr. Mitten on watersheds and Sibun River Watershed Protection.
- Journal entry of day’s activities

Accommodations: Monkey Bay Wildlife Sanctuary
Day 2, 
Sat
March 5, 2016

Monkey Bay – Full day on Sibun River with Fr. Mitten and Melito Bustamante

- Breakfast at MBWS 7:30
- 8:30am Lecture by Fr. Mitten on tropical river continuum theory and preparation for river trip.
- Pack picnic lunch to carry and serve on river canoe paddle
- Transfer to launch point for Sibun River trip
- 10am Begin Sibun River Trip; accompanying streamside lecturer, Fr. Mitten with assistant guide Melito Bustamante.
- Experiential learning activities include water quality sampling, aquatic invertebrate identification, riparian species diversity, and observation of land use impacts and direct effects of gravel extraction, citrus farms, etc.
- Return to Mbay for dinner 6:00 PM
- Evening Lecture: Protected Areas and Community Conservation, Dr. Colin Young, Faculty Associate with the Institute for Sustainable International Studies, ISIS Belize, is the CEO of the Government of Belize Ministry of Energy, Science and Technology, and Public Utilities. Dr. Young is an ethnobotanist and environmental scientist whose father was one of the founders of the CBS.
- Journal entry of day’s activities---Overnight

Accommodations: Monkey Bay Wildlife Sanctuary

Day 3, 
Sunday
March 6, 2016

Community Baboon Sanctuary, Traditional Creole Lunch

- Breakfast at Monkey Bay 7:30 am
- Transfer to Community Baboon Sanctuary (CBS) Bermudian Landing Village for day tour. Suggested reading material in preparation for CBS entitled, “A Belizean Rainforest” by Dr. Rob Horwich and Jon Lyon (Gays Mill, WI.).
- CBS Natural History museum tour followed by Guided tour of sanctuary forest edges (Gallery Forest) to view Black howler monkeys in the wild with onsite lectures and guided hike through sanctuary for medicinal plants ID (Creole ethnobotany) and wildlife viewing.
- Mid-day meal with Ms. Edna Baptist, Creole style prepared over the fire hearth and served at her backyard café.
- Transfer back to Monkey Bay with biodiversity stops along the way.
- Dinner 6:00pm
- Evening Lecture- Pine savanna ecology and management with final discussion of days activities
- Journal entry of day’s activities---Overnight

Accommodations: Monkey Bay Wildlife Sanctuary
Day 4,
Monday
March 7, 2016

**Belize Zoo Tour; Canoeing Excursion to Cox Lagoon Crocodile Sanctuary**

- Breakfast 7:30am
- 9:00 am Depart to the nearby Belize Zoo for guided educational tour where you will observe Belize’s unique fauna in natural surroundings. Black howler Monkey, Jaguar, Harpy eagle, Scarlet macaw, Tapir and Crocodile to name a few. Lecture on Belize Zoo Conservation Projects.
- Tropical Educational Center -- Savanna hike with infield lecture and soil testing and discussion of Mesoamerican Biological Corridor Project,, Birds without Borders.
- Lunch at MBWS 12:00 pm
- 1:00 PM Lecture Fr. Mitten on Conservation Management of wetlands.
- Mid-afternoon departure to Cox Lagoon Crocodile Sanctuary for a full evening of exploring by canoe the wetland habitats of this diverse thirty thousand acres private reserve. The diverse habitat supports a natural diversity of animal and bird life with opportunities to observe Laughing falcon, Jabiru Stork, 14 species of reptiles (including an abundance of Morelett’s crocodiles), Black howler monkeys, Baird’s tapir and Jaguar. Since these creatures are best observed from canoe, students paddle from Cox Creek into the wide lagoon surrounded by swamp forest, marshland and mud flats. Picnic style dinner served at the lagoon.
- Return to Monkey Bay for Lecture on karst formation by Fr. Mitten and Journal entry of day’s activities---Overnight

*Accommodations: Monkey Bay Wildlife Sanctuary*

Day 5,
Tuesday
March 8, 2016

**Blue Hole National Park, Maya Center**

Transfer to St. Herman’s Blue Hole National Park (BHNP):

- Breakfast at MBWS 7:30
- Depart 9am for mid-morning arrival to BHNP
- Welcome by Park Director and overview of the protected area by park manager on duty. 10am
- Guided forest tour and cave tour (standard visit- will need headlights for all participants)
- Pack Lunch at Blue Hole NP
- Depart St. Herman’s Blue Hole National Park for transfer to Cockscomb Basin Wildlife Sanctuary (CBWS)
- Continue on to the CBWS station and settled into bunkhouse accommodations. Suggest reading material for CBWS discussions entitled “Jaguar” by Alan Rabinowitz
- Dinner
- Lecture on Rainforest Ecosystem w/Discussion
- Guided Night Walk (headlamps required + Journal entry of day’s activities and overnight in bunk house.)
Accommodations: Cockscomb Basin Wildlife Sanctuary

Day 6, Wednesday March 9, 2016

Cockscomb Basin Wildlife Sanctuary (Jaguar Preserve)
- Early Morning Bird ID walk 6:00am
- Late Breakfast 8:30am
- Will ask guide to cover park history and overview or wildlife research conducted in the park.
- Lunch at noon
- Tiger Fern Trail hike to waterfall and swim. With trail side lectures.
- Dinner
- Lecture on Rainforest Ecosystem (continued)
- Guided Night Walk (headlamps required) + overnight in bunk house

Accommodations: Cockscomb Basin Wildlife Sanctuary

Day 7, Thursday March 10, 2016

Cockscomb Basin Wildlife Sanctuary
- Early Morning Bird excursion 6:00 am
- Late Breakfast 8:00 am
- Field Trail Hike to Plane wreck and on-site lecture tropical soils and testing.
- Lunch at noon
- 2:00pm continue on to Maya Centre Village, a buffer community to Cockscomb Basin Wildlife Sanctuary (CBWS) with 3:00pm arrival. 4:00 pm tour of “Mayan Garden” with focus on eco-forestry and ethnobotany (medicinal plants)
- Dinner 6
- Evening lectures; mangroves, coral reefs, seagrass and littoral forests
- Journal entry of day’s activities ---Overnight

Accommodations: Maya Center Guest House (Aurora Saqui hosting)

Day 8, Friday March 11, 2016

South Water Caye Marine Reserve guided excursion.
- Breakfast at MCGH at 7:00am
- Depart host location 8:00am; quick stop for visit Mayan woman’s co-op, transfer 1 hour to Dangriga Town for ½ hour water taxi (10:30am) ride to Tobacco Caye.
- Arrival orientation and settling in accommodation.
- Lunch at noon
- Afternoon snorkeling workshop to become comfortable with snorkeling gear and familiar with reef etiquette
- Explore reef ecosystems with guide
- Dinner at Hotel, Tobacco Caye
Evening classroom lecture: Mesoamerican Barrier Reef System and conservation strategies for sustainable management. Hosted by Tobacco Caye Marine Station (TCMS) Station Manager

Night exploration of marine organism.

Journal entry of day’s activities --- Overnight.

Accommodations: Hotel, Tobacco Caye

### Tobacco Caye, South Water Caye Marine Reserve

<table>
<thead>
<tr>
<th>Day 9, Saturday March 12, 2016</th>
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<tbody>
<tr>
<td>Breakfast 7:15 am</td>
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<tr>
<td>Depart 8:00am to explore reef ecosystems, sea grass beds, mangrove lagoons; guided multiple snorkeling drops at select sites</td>
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<td>Man-O-War Caye protected nesting site for Magnificent frigate and Brown-footed booby birds</td>
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<tr>
<td>Visit to Smithsonian Institute’s Western Caribbean Marine Research Station</td>
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<tr>
<td>Lunch</td>
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<td>1:30 water taxi back to Dangriga Town</td>
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<td>Monkey Bay bus to meet group at 2pm and transfer back to MBay for last overnight. Group should get back to MB by 4:30pm.</td>
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<tr>
<td>6 pm Dinner at Monkey Bay</td>
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<td>Final program wrap up classroom lecture, reflections, program evaluation, travel organization for departure flight....Journal entry of day’s activities</td>
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Accommodations: Monkey Bay Wildlife Sanctuary

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<tr>
<th>Day 10, Sunday March 13, 2016</th>
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<tr>
<td>Depart to Philip Goldson International Airport from Monkey Bay</td>
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<tr>
<td>Breakfast at Monkey Bay 7:30</td>
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<tr>
<td>Morning time to pack, Journal entry of entire course, group photo</td>
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<tr>
<td>Transfer to Belize Intl Airport for departure to home destination.</td>
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- Program Concludes -

**Field Course Guidelines:**

Bring appropriate clothing and equipment as advised. A more detailed list will be given upon enrollment. The following will give you a good idea to as what to bring. A day pack is a must as is a pair of binoculars. Bring necessary items to avoid discomfort such as insect repellant (lots of it), sun block, special medication (if necessary) and anti-bite medication for insect bites. Place note book and journals in Ziploc bags for protection. Bring limited pocket money. Do not bring much jewelry. Cellular phones and music are only allowed in the bus or in camp, not in the field. For camping and hiking, bring Qt size water bottle that can be hooked onto pack, flashlight and spare batteries, Halogen head lamps are ideal and leave hands free. Bring a small mosquito netting to drape over bed in case it is needed. Lightweight long-sleeved shirts and long trousers – the zip off short types are ideal. Comfortable hiking shoes and strap on sandals for the river and beach. Bring at least 7 pairs of socks; light rain jacket, hat, bandana, sunglasses, bath and swim towel, swimsuits, shorts, t-shirts for swimming. Personal toiletry items; motion sickness
tablets. Camera if you have one. Bring an abundance of positive attitudes. Please do not litter. Safeguard the lives of your peers.

**Course Bibliography:**


