Natural History of Belize: Tropical Ecosystems & Conservation
ENVS 340/ BIO 361/INTS
J-term 2016
Loyola University Chicago

Instructor: Fr. Stephen Mitten SJ
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Credit: 3
Class Schedule: J-term January 4 - 13, 2016

ENVS 340 Natural History of Belize
Cross-listed with
BIO 361 Natural History of Belize

Pre-requisite: Biology (with ecology emphasis) BIO 102 & 112. BIO 265
Environmental Science majors/minors - ENVS 137 and 237 and ENVS 280
Environmental Studies major/minors -- ENVS 137 and ENVS 237
International Studies --- Junior or senior standing or UCSF 137

This course fulfills the following academic requirements:
• ENVS Major/Minor Elective
• Background course for Environmental Action & Leadership Minor
• BIO Major/ Minor Elective for ecology emphasis
• INTS Major/Minor Credit
• Science course elective for Anthropology students.
• Satisfies the University Engaged Learning requirement in the Service Learning category.

Main Texts:
A Neotropical Companion, John Kricher, 2nd Edition
The Maya (Eighth Edition), Michael D. Coe (the last three chapters)
Birds of Belize, 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
The Last Flight of the Scarlet Macaw, Bruce Barcott
Jaguar: One Man's Struggle to Establish the World's First Jaguar Preserve, Alan Rabinowitz

Course Site: Monkey Bay Field Station and various sites across Belize

Course Description: This is a unique Study Abroad immersion field course designed to build on the foundations learned in Ecology, Environmental Science/Studies, Anthropology and International Studies classes by examining first hand and in more depth the biodiversity and tropical ecosystems of Belize, by exploring the country’s rich cultural traditions of some of its peoples, particularly the Mayans; and learning how local communities are involved in protecting
and sustaining ecological and natural sites through community based conservation and sustainability practices and the impacts, both positive and negative of ecotourism.

**Rational:** This ten-day program immerses the student with a number of other students across disciplines in the tropical ecosystems of Belize, an English-speaking country in Central America that lies on the Caribbean Sea. Throughout this traveling course, students will study a number of tropical ecosystems, learn various tropical ecology field techniques, and examine Belizean culture and development. Academic excursions into Belizean ecosystems will be coupled with field labs, discussions, and lectures from local experts. The course focuses on experiential learning through exciting activities such as hiking through a Community Baboon Sanctuary, exploring one of the largest cave structures in the world, canoe paddling down the Sibun River while observing anthropomorphic effects by doing water testing and collecting macro-invertebrate samples, and snorkeling the Mesoamerican Barrier Reef System. Students will also tour ancient Mayan ruins, the Belize Zoo, the Maya Centre Village and Cultural Museum, 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 interest.
3) And upon completion of this course all student should have a working understanding of 1) tropical climates, 2) geography of tropical ecosystems, 3) rain forest structure, function and ecology, 4) coral reef formation, structure, function and ecology, 5) mangrove formation, structure and ecology, 6) the ecological interactions between mangrove, seagrass, and coral reef ecosystems, 7) tropical river ecology, 8) subtropical savanna ecology, 9) ecology of the littoral forest, 10) types and formation of cayes, 11) Karst formation, 12) ethnobotany as practiced by the Creole and Mayan peoples, 13) history of the protected areas of Belize, 14) conservation and development of ecotourism in a developing country with respect to tradeoff s between costs and benefits, 15) community organized conservation sanctuaries, 16) ancient and contemporary Mayan communities, 17) human ecology and deforestation, and 18) be introduced and appreciate the rich biodiversity found in Belize, especially its flora and avian species, and 19) understand how US consumption rates influences ecosystems degradation in the developing world.

While Belize is known to have 85 distinct terrestrial and aquatic ecosystems, and a number of human cultural traditions, we will be only examining its most prominent major ecosystems and visit only two cultural traditions. In addition to the above mentioned objectives, our other goals this semester 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

**Course Content:**

Tropical Climate and weather patterns (rainfall)
Tropical Soil Formation and Classification
Karst formation and structure
   Mayan significance

Tropical ecosystems:
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
   Restoration
2. Tropical Cayes- types and formation
   Avian ecology and conservation of protected bird species
3. Seagrass ecosystems- ecological function and major species
   Manatee conservation
4. Mangrove swamp ecosystems and other tropical wetlands (lagoons, marshes, ponds)
   Major flora and fauna
   Plant adaptations
   Soil ecology
   Ecological and economic value
   Biodiversity
   Mariculture
   Restoration
5. Palmetto Palm Savannahs
   Aquaculture (tilapia and shrimp)
6. Caribbean Pine Savannahs (upland and lowland)
   Succession
   Soil ecology – soil tests
   Ecological and economic value
   Restoration
   Indicator species
7. Riverine (Gallery) forest ecology
8. Tropical river ecology
   Watersheds (Sibun River Watershed)
   Tropical River Continuum Theory – aquatic indicator species
   Cultural eutrophication (gravel extraction, agriculture, aquaculture)
   Water monitoring and testing.
9. Tropical Forest Ecology
   Soil ecology – soil tests
   Plant adaptations
   Biodiversity – flora and fauna
   Endangered species – parrots, big cats, monkeys, tapirs,
   Avian ecology - Ant-following birds.
Ancient and contemporary Mayan culture; Creole Cuture
   Mayan Forest Gardens – ethnobotany
   Slash and burn agriculture
Conservation, Preservation and Natural Resource Management in Belize
- Mesoamerican Biological Corridor Project
- Community Run Wildlife Sanctuaries (Community Baboon Sanctuary)
- Private Wildlife Sanctuaries (Monkey Bay Wildlife Sanctuary)
- Private Wetland Sanctuaries (Cox Lagoon Crocodile Sanctuary)
- National Parks, Natural Forests and the Belize Audubon Society
- South Water Caye Marine Reserve and other Marine Protected Areas.
- PACT (Protected Area Conservation Trust)

**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. There will be a number of mandatory sessions prior to our course departure for those enrolled in J-term.

**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.

**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) Outline and summary of the major themes in the chapters of the text: A Neotropical Companion, John Kricher, 2nd Edition: Chapters 1-8, 10-11, & 14. Read through Chapter 12 & 13 but they need not be included in the summary. **Outline and summary will be collected upon arrival in Belize!**

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 for Biology/ Environmental Science and Anthropology Majors (see below). For Environmental Studies and International Studies students, a research essay assignment will be given when you enroll in the course.
You will be graded out of 300 points, distributed as follows:

- Daily Journal reflections: 100
- Research Proposal or Final Essay: 100
- Participation & Oral Quizzes: 50
- Chapter Summaries: 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 record of your trip, to which you will likely refer back on many occasions. The journal is for daily documentation of your 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: include questions and suggested hypothesis for proposals for field experiments. You should have one question and hypothesis for each entry!!!!! 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 textbook that corresponds to the days 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

1) Biology, Environmental Science and Anthropology Students

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 or anthropological question that arose while they were on the trip from one of their hypothesis recorded in their journal. 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: 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

2) Environmental Studies and International Studies Students.

Final assignment is not a grant proposal mentioned above; rather it is as follows:

1) Provide a one-page single spaced (Times New Roman 12 point font) description of a research topic you would like to pursue of an environmental studies or international issue of your choice regarding Belize. In this description provide a one paragraph summary of the current state of knowledge on this topic, provide another paragraph describing how this topic has been studied, and provide a concluding paragraph describing your idea for the next steps needed to better understand your topic. You may provide a first attempt at posing a research question at this point. Include a list of four recent and most relevant articles or books on your topic.

And
2) Term Paper: Students will be required to complete a descriptive analysis of a particular international issue that will be given out at the beginning of the course. Concrete examples are critical and necessary to achieve a “good” grade. This paper is to be 7 pages double spaced (Times New Roman 12 point font), not including the cover page or works cited page.

**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. 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.

**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.

--Tentative Draft--
Loyola University Chicago
10-Day Belize Itinerary
J-term 2016

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

Day 1, Monday
January 4, 2016
Arrive Philip Goldson International Airport; transfer to Monkey Bay Wildlife Sanctuary for settling in, orientation and night tour Belize Zoo.
- Staff introductions, campus walking tour, walk or drive to Sibun River for swim if time allows
- Dinner 6pm and begin orientation presentations on safety and security, cultural awareness and sensitivity
- Night Tour, Belize Zoo (7-9:30 PM) with Conservation lecture
- Return to Monkey Bay for overnight rest in student dorms, private rooms for leaders
- Journal entry of day’s activities
Accommodations: Monkey Bay Wildlife Sanctuary

Day 2, Tuesday
January 5, 2016
All day field and lab hosted by Father Mitten.
- Breakfast at Monkey Bay 7:30 am
- Depart Mbay after breakfast. 9am
- Mangroves of St John’s College, Belize City (Fr. Mitten) specimen collection
- Pack lunch
- Visitation of Belize National Museum, Belize City
- Visitation of Altun Ha, and guided tour of ancient Mayan Ruin with onsite lecture
- Return to Monkey Bay for dinner and overnight
- A lecture from Dr. Colin Young on 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
<table>
<thead>
<tr>
<th>Day 3, Wednesday January 6, 2016</th>
<th><strong>Community Baboon Sanctuary, Traditional Creole Lunch</strong></th>
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<tbody>
<tr>
<td></td>
<td>• Early morning bird savanna hike 6:15am</td>
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<td>• Breakfast at Monkey Bay 7:30 am</td>
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<td>• Transfer to <strong>Community Baboon Sanctuary</strong> (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.).</td>
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<td>• 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.</td>
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<td>• Mid-day meal with Ms. Edna Baptist, Creole style prepared over the fire hearth and served at her backyard café.</td>
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<td>• CBS Natural History museum tour.</td>
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<td>• Return to Monkey Bay</td>
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<td>• Dinner 6:00pm</td>
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<td>• Evening Lecture Pine savannahs and discussion of days activities</td>
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<td>• Journal entry of day’s activities—Overnight</td>
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<td><strong>Accommodations:</strong> Monkey Bay Wildlife Sanctuary</td>
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<tr>
<th>Day 4, Thursday January 7, 2016</th>
<th><strong>Monkey Bay – Full day on Sibun River with Fr. Mitten</strong></th>
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<td></td>
<td>• Breakfast at MBWS 7:30am</td>
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<td></td>
<td>• Lecture by Fr. Mitten on watersheds and river continuum theory. Suggested reading material in preparation for watershed entitled, “Sibun Watershed Atlas, by Dr. Ed Boles. 8:15 am-9:30am</td>
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<td>• Pack picnic lunch to carry and serve on river canoe paddle</td>
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<td>• Transfer to launch point for Sibun River trip</td>
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<td>• 10am Begin Sibun River Trip; accompanying streamside lecturer, Fr. Mitten with assistant guide Melito Bustamante (Mayan guide for the day)</td>
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<td>• Water testing and macro invertebrates sampling incorporated into the river trip</td>
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<td>• Afternoon debriefs and biological inventory of organisms seen and collected on river float.</td>
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<td>• Return to Mbay for dinner 6:00 PM</td>
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<td>• Evening Lecture Karst formations</td>
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<td>• Journal entry of day’s activities—Overnight</td>
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<td><strong>Accommodations:</strong> Monkey Bay</td>
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<tr>
<th>Day 5, Friday January 8, 2016</th>
<th><strong>St. Herman’s Cave/Blue Hole National Park, Maya Center</strong></th>
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<tr>
<td></td>
<td>• Breakfast at MBWS 7:30</td>
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<td></td>
<td>• Depart 9am for mid-morning arrival to BHNP</td>
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<td>• Welcome by Park Director and overview of the protected area by park manager on duty. 10am</td>
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<td>• Guided forest tour and cave tour (standard visit- will need headlights for all participants)</td>
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<td>• Pack Lunch at Blue Hole NP</td>
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<td></td>
<td>• Depart St. Herman's Blue Hole National Park for transfer to Maya Center (Entrance into) Cockscomb Basin Wildlife Sanctuary (CBWS)</td>
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<td>• Later afternoon arrival to Maya Centre Village, a buffer community to</td>
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Cockscomb Basin Wildlife Sanctuary (CBWS). Time for visiting women’s co-op and/or Mayan Museum and tour of “Mayan Garden” with focus on eco-forestry and ethnobotany (medicinal plants)

- Dinner
- Discussion, Journal entry of day’s activities and overnight

Accommodations: Maya Center Guest House

**Day 6, Saturday January 9, 2016**

**Cockscomb Basin Wildlife Sanctuary (Jaguar Preserve)**

- Breakfast 8:00am
- Continue on to the CBWS station and settled into bunk accommodations.
  Suggest reading material for CBWS discussions entitled “Jaguar” by Alan Rabinowitz
- Will ask guide to cover park history and overview or wildlife research conducted in the park.
- Lunch: visitors center at noon
- Tiger Fern Trail hike to waterfall and swim, with trail side lectures.
- Dinner
- Lecture on Tropical Rainforest Ecosystem with discussion.
- Night walk, journal entry of day’s activities ----Overnight

Accommodations: Cockscomb Basin Wildlife Sanctuary

**Day 7, Sunday January 10, 2016**

**Cockscomb Basin Wildlife Sanctuary**

- Early Morning Bird excursion 6:00 am
- Late Breakfast 8:30am
- Field Trail Hike to Plane wreck and on-site lecture
- Lunch at noon
- Field Lecture on tropical soils with soil testing.
- Possible River Tubing
- Dinner
- Evening lectures; coral reefs, seagrass and littoral forests
- Journal entry of day’s activities ---Overnight

Accommodations: Cockscomb Basin Wildlife Sanctuary

**Day 8, Monday January 11, 2016**

**South Water Caye Marine Reserve guided excursion.**

- Birding completion 6:00 am
- Breakfast at CBWS 7:30am
- Depart host location 8:30am; 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 presentation on Reef System Environmental Impacts and conservation
or other suitable topic at Tobacco Caye Marine Station (TCMS) by 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**

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

Accommodations: Monkey Bay Wildlife Sanctuary

**Day 10, Wednesday, January 13, 2016**
- Depart to Philip Goldson International Airport from Monkey Bay
- Breakfast at Monkey Bay 7:30
- Morning time to pack, Journal entry of entire course, group photo
- 9:30 am Transfer to Belize Intl Airport for departure to home destination.
  - 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 of what to bring. A day pack is a must as is a pair of binoculars. Bring necessary items to avoid discomfort such as insect repellent (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:**


