

# Course Syllabus for EcoFS' 2018-19

## Caribbean Ecosystem Field Studies

A marine field course developed by Professor Steve Johnson  
Affiliate Faculty of the University of Montana Environmental Studies Program



### A 3-WEEK, COLLEGE-ACCREDITED, HANDS-ON SCIENTIFIC ANALYSIS OF THE WONDROUS CARIBBEAN ECOSYSTEM

**LOCATION:** Xpu-Ha Beach, Mexico – 1-hour south of Cancun along the safe & beautiful Riviera Maya Coast.

**COURSE CREDITS:** ENST 391-Caribbean Ecosystem Field Studies for 3 undergraduate semester transfer credits through the University of Montana, Environmental Studies Program & is open to students from **any university or major**.  
*While over 180 universities have accepted EcoFS courses for transfer credit, students must confirm with their department or advisor exactly how these credits transfer for their specific degree.*

**DATES:** December 27, 2018 – January 16, 2019

(this class will also be offered over summer-break, approximate time-frame is late May to mid June)

**CLASS SIZE:** 20-22 Students

Xpu-Ha Beach offers an exceptional opportunity to study a healthy & diverse Caribbean ecosystem. Daily snorkels, SCUBA dives, hikes, and hands-on scientific investigations provide incredible coral reef & coastal academic learning experiences. Students will synthesize & apply information they have gained from their classroom & textbook context while actively studying & exploring a spectacular ocean environment.

To learn more & **APPLY**- visit  
**[www.ecofs.org](http://www.ecofs.org)**



# ECOSYSTEM Field Studies

Caribbean Ecosystem Field Studies is a hands-on, 21-day field class that provides incredible academic opportunities for experiential investigation of marine ecosystems. Ecological concepts & field methods that pertain to the Caribbean coral reef are examined in the greatest detail yet the knowledge & techniques gained are applicable to any ecosystem. Instruction is delivered with inquiry-based activities incorporating observation & data collection, small working groups, lecture, focused exploration through daily SCUBA dives/snorkels, hikes, guest speakers & off-site trips. During the second half of the course students create and implement an original ecosystem field research project. Upcoming summer-break students have the exciting opportunity for participation in sea-turtle nest monitoring.

## Course Objectives:

### Students will...

- Achieve a deep knowledge base of the structure & functioning of coral reef & coastal ecosystems of the Caribbean.
- Gain expertise in utilizing a variety of ecosystem field tools & techniques.
- Learn rigorous scientific research skills including observation, hypothesis formation, sampling, mapping, modeling & data analysis.
- Build proficiency in SCUBA diving/snorkeling skills & the ability to conduct basic ocean/reef research.
- Participate positively in a safe, rewarding & challenging group educational experience.

## Course Location

### Xpu-Ha Beach, Caribbean coast of Mexico

Xpu-Ha (pronounced Eshpoo-Ha and is a Mayan word for morning dew) is a small beach community along the tourist friendly Riviera Maya coast of Mexico approximately 50 miles south of Cancun, between Playa del Carmen and Tulum on an easy 1-hour drive. Xpu-Ha consists of a mile-long spectacular white sandy beach within a sheltered bay bordered by rocky points and with a vibrant coral reef directly offshore. The relatively undeveloped beach is an important nesting ground for green and loggerhead sea turtles. Xpu-Ha is a very quiet and safe location providing exceptional field learning opportunities.

The Caribbean EcoFS field site is on the private property of the La Playa Xpu-Ha Beach Club ([www.laplayaxpuha.com](http://www.laplayaxpuha.com)). The course uses the Beach Club's comfortable bungalow rooms and beach campground for our accommodations. The Xpu-Ha-EcoFS Field Research Cabaña serves as our central meeting & studying area. Our classroom is the spectacular beach, coastline, coral reef and ocean just steps away.

***This is Where Your Classroom Education Comes to Life!***



## A Typical Day...

### Instruction days begin with an exciting, academically focused SCUBA dive or snorkel

Our dives and snorkels involve a scientific focus that includes data collection with underwater slates and research equipment. We then savor an all-you-can-eat brunch buffet at the La Playa Xpu-Ha Beach Club. We'll finish the morning with analysis of our amazing marine and reef observations, typically in small group discussions. Lunch is typical American style fare and prepared by our group out of our Field Research Cabaña. Afternoons include lecture on ecosystem concepts and activities that we investigate with hands-on field work and data collection. Typically, afternoons include snorkels, 1-2-mile coastal walks, field investigations and labs. There are 3-4 off-site visits to other amazing ecosystem locations such as coastal lagoons, Akumal Bay to study green sea turtles, cenotes/caves.

Our academic day ends at 5:30 pm and dinner is prepared by a fantastic local chef and enjoyed oceanside. The remainder of the day is for homework, independent study, and personal time. Independent study is phased in during the second half of the course & individual research projects become the academic focus. Days are very full and academic expectations are high so there is minimal "vacation-like" time. EcoFS' accommodations at Xpu-Ha are in beach bungalow double occupancy rooms with full beds, air conditioning, showers **or** in our beautiful beach campground under the palm trees in spacious tents with access to showers and the cabana. Wi-Fi is available, and all accommodations and facilities are steps from beautiful Xpu-Ha beach & ocean.

### A few words regarding safety

The Xpu-Ha area and the Riviera Maya is an extremely safe & friendly place for tourists. There is a major medical clinic & United States Department of State Embassy office in Playa del Carmen (15 minutes from Xpu-Ha) and a major hospital in Cancun (1 hour from Xpu-Ha). This course has a Family Physician on call in the United States for phone and/or internet video consultation. All students are covered with a comprehensive international health/medical insurance through the University of Montana. EcoFS has safely taught this class in this area 12 times in the past 6 years.

# Course Schedule of Topics & Activities:

Each day runs 8:00 am to 5:30 pm

## Day 1- Arrival & Introduction

Fly to Cancun!

Flights arranged by students -must land by 4 pm

EcoFS staff meets students at airport -approximate 1-hour highway drive south along Riviera Maya coast in private shuttle

Arrive in Xpu-Ha

Settle into accommodations, orientation to facilities

**Evening** -Group introductions



## Day 2- Xpu-Ha Bay Snorkel & Caribbean Overview

Lecture/discussion topics:

**Course introduction** -syllabus, educational approach, safety, emergency procedures, Mexico travel concerns

**SCUBA/snorkel training** -safety, swimming & buoyancy, equipment overview & check, communication & navigation, boat safety

**Ecosystem data collection**- scientific observations

**Climatology** -global climate processes, coastal weather factors, measurement

Field Activities:

**AM- Snorkel in Xpu-Ha Bay** -snorkel skills overview, reef investigation

**PM- Weather data collection** -measure climatologic variables including air & ground temperature/humidity, cloud cover/type, wind speed/direction, ocean/sand temperature, wave height, tides. Compare various locations.



## Day 3- Yucatan Geography & Oceanography

Lecture/discussion topics:

**Geographic overview** -Caribbean Sea, Yucatan Peninsula, Xpu-Ha topography

**Oceanic features** -currents, tides, waves, beaches

**Maps** -types, scientific research uses, Google Earth utilization

Field Activities:

**AM- SCUBA dive/snorkel** -skill reviews, reef observation

**PM- Xpu-Ha beach walk**- investigate beach topography

**Beach survey** -conduct geographic survey of Xpu-Ha beach including measurement of layout, profile, slope, angle, aspect, composition, current

## SCUBA & Snorkel

**SCUBA & snorkel are key features of this course that provide exceptional marine & coral reef study opportunities.**

**Students choose a SCUBA & Snorkel option or a Snorkel-only option for the course. All SCUBA & snorkel activities are beginner level and no prior experience is required.**

**All info related to SCUBA & snorkel, such as certification, can be found on the SCUBA/Snorkel page of the EcoFS website.**



## Day 4- Reef Structure & Water Quality

Lecture/discussion topics:

**Reef topography**- types of reef, reef formation, bathymetry, rugosity, field measurement techniques

**Geologic overview** -processes, geologic features, Yucatan Peninsula

**Water quality** -chemical & physical properties, unique Yucatan hydrology, human influence, impacts to reef

Field Activities:

**AM- SCUBA dive/snorkel** -assess reef structure & topography

**PM- Coastal hike** -geologic investigation of limestone coast, rock & fossil analysis, intertidal zone community exploration

**Water quality field & lab analysis** -perform chemical/physical tests of ocean, brackish & tidepool water. Measure temperature, ph, salinity in various locations.

## Day 5- Stony Corals & Cenote Exploration

Lecture/discussion topics:

**Stony corals** -ecological role for reefs, physiology & ecology, Caribbean species of interest, ecosystem impacts to corals & reefs, identification skills

**Cenotes** -geologic/hydrologic formation & features

Field Activities:

**AM- SCUBA dive/snorkel** -stony coral analysis, identify and describe stony coral species, analyze distribution & health

**PM- Cenote/cave exploration** -hike & swim through a dry cave & cenote, analyze underground hydrogeology, explore Yucatan jungle



## Day 6- Reef Fish & Coastal Lagoon Investigation

### Lecture/discussion topics:

**Fish** -identification, Caribbean species of interest, importance to reefs, behavior opportunities, species interactions, research methods

**Coastal communities**- Yucatan ecosystems

### Field Activities:

**AM- Yal-Ku Lagoon snorkel & study**-investigate mangrove community ecology, analyze water quality parameters, observe fish populations

**PM- SCUBA dive/snorkel** -fish identification & diversity study

## Day 7- Sea Turtles & Animal Behavior

### Lecture/discussion topics:

**Sea Turtles**- ecology, behavior, population status, & conservation efforts

**Populations** - basic concepts of age, size, reproduction, distribution, niche, habitat

**Animal Behavior**- animal observation skills, pros & cons of behavioral studies, ethogram usage

### Field Activities:

**AM- Green sea turtle investigation in Akumal Bay** -conduct population & behavioral observations

**PM- SCUBA dive/snorkel** -animal behavior observation & analysis, create and utilize ethograms

### Nighttime throughout course:

Sea turtle nest monitoring. Assist in patrols of beach, collect data for nesting Green and Loggerhead sea turtles, relocate nests to hatchery, if necessary

## Day 8- Soft Corals & Soil/Sand Analysis

### Lecture/discussion topics:

**Soft corals** -difference between hard & soft corals, identification groups, major species of Caribbean, interactions with other species

**Soli/Sand** -formation, composition, classification, ecosystem importance & connection to reef & coastal organisms

### Field Activities:

**AM- SCUBA dive/snorkel** -soft coral focused analysis. Identify physiological groups & soft coral relationship with abiotic factors & other organisms, observe polyp behaviors

**PM- Soil/sand field & lab analysis** -dig soil/sand pits, identify horizons, measure infiltration rate, moisture, temperature. Classify soil/sand type, sorting, composition & perform chemical tests for ph.

## Day 9- Research Design & Night Snorkel

### Lecture/discussion topics:

**Convene at 1:30pm** -How to Do Ecology Book discussion activity.

Application to course research projects.

### Evening:

**Night snorkel** -shallow reef in Xpu-Ha Bay using lights, investigate nocturnal species

## Day 10- Sponges & Other Incredible Invertebrates

### Lecture/discussion topics:

**Invertebrates** -major relevant phyla, Caribbean species of interest, observation skills, research methods, diversity.

**Sponges** -taxonomy, physiology, ecology, research methods

### Field Activities:

**AM- SCUBA dive/snorkel** -invertebrate diversity investigation

**PM-** invertebrate diversity study in intertidal zone, calculate species richness and abundance

## Day 11- Marine Algae & Reef Health

### Lecture/discussion topics:

**Macro Algae** – types, role in ecosystem, interactions with corals & other reef organisms, phase shift towards macro-algae dominated reefs

**Reef Monitoring**- health parameters, conservation efforts

### Field Activities:

**AM- SCUBA dive/snorkel** -algae types and coverage assessment, algae vs. living coral analysis, species of concern

**PM- Independent Study Preparation**

## Assignments

& Percentage of Overall Grade

\* **35% = Daily homework assignments**  
(Homework is given nightly for the first half of course to synthesize & apply data & observations from the day.)

\* **15% = 10-minute presentation on the research topic & project**

\* **30% = 10-page written paper expanding on the field research project**  
(Due two weeks after course ends)

\* **10% = Course participation**

\* **10% = Final (take home) written exam**  
(Due one week after course ends)

## Readings

How to Do Ecology- A Concise Handbook,  
Karban & Huntzinger, 2nd ed., 2014

Reef Coral Identification: Florida, Caribbean, Bahamas, Humann & DeLoach- 3rd ed., 2013

Reef Creature Identification: Florida, Caribbean, Bahamas, Humann & DeLoach, 3rd ed., 2013

Reef Fish Identification: Florida, Caribbean, Bahamas, Humann & DeLoach, 4th ed., 2014



## Day 12- Sampling Methods

### Lecture/discussion topics:

**Sampling methods-** transects/quadrats, randomization & replication, GPS/GIS application

### Field Activities:

**AM-** SCUBA dive/snorkel - sampling techniques, practice & use with a variety of tools such as GPS, transects, quadrats, compass.

**PM-** Independent research- process scientific observations, devise hypotheses, create initial methodology & research design

**GPS use-** basic research utilization, collect waypoints & record tracks

**Individual consultations-**advisement for research projects

## Day 13- Independent Research Prep

### Field Activities:

**AM/PM-** Dive/snorkel/land research option

**Independent research-** process observations, refine hypotheses & experimental design, begin data collection

**Individual consultations-**advisement for research

## Day 14- Independent Research

### Field Activities:

**AM/PM-** Dive/Snorkel/land research option

**Independent research -** intensive data collection

## Day 15- Night Dive/Snorkel

### Lecture/discussion topics:

**Night diving/snorkeling overview**

### Field Activities:

**AM/PM-** Dive/snorkel/land research option

**Independent research -** intensive data collection

### Evening:

**Night Dive/Snorkel-** shallow reef dive using lights to observe incredible nocturnal reef species

## Day 16- Ecological Data Analysis

### Lecture/discussion topics:

**Data analysis** -basic analysis methods, statistics overview

### Field Activities:

**AM/PM-** Dive/snorkel/land research option

**Independent research -** intensive data collection

## Day 17- Presentation Prep

### Lecture/discussion topics:

**Presentation techniques** -effective public speaking & presentations

### Field Activities:

**AM/PM-** Dive/snorkel/land research option

**Independent research -**final data collection, data analysis

## Day 18- Caribbean Restoration Ecology

### Lecture/discussion topics:

**Reef restoration** -goals & methods

**Caribbean/ocean conservation** -human impacts, restoration efforts

### Field Activities:

**AM/PM-** Dive/snorkel/land research option

**PM -** Coastal trash clean-up

**Independent research -**data analysis, presentation prep

## Day 19- Student Presentations

### Lecture/discussion topics:

**Student presentation of field research projects**

## Day 20- Student Presentations

### Lecture/discussion topics:

**AM/PM-** Presentations (continued)

**Evening:** Closing & farewell dinner

## Day 21- Departures

Shuttles to airport throughout day

**COURSE END**

## **Research Project**

The culminating assignment is a field research project & presentation. Students develop an original research project based upon scientific field observations they perform. In their project students will process observations, formulate hypotheses, design an experimental methodology, conduct background research, & collect & analyze field data. A culminating class presentation outlines the research project & expands on key concepts. Finally, post course, students complete a written scientific research paper that encapsulates the project.

### **Examples of past research topics:**

- *Fish diversity in relation to lionfish presence*
- *Ph levels of water & sediment at various depths*
- *Octopi camouflage response mechanisms*
- *Evaluating the effects of coral community diversity on disease prevalence*
- *Sand sorting in relation to wave energy*
- *Effect of turbidity on stingray abundance*
- *Damselfish aggression levels in relation to varying habitats*
- *Yellow band disease prevalence in star corals*
- *Coconut palm tree growth patterns in relation to beach slope*
- *Sea urchin density as an indicator of reef health*
- *Soft coral poly response time to disturbance*
- *Sea fan growth pattern in relation to dominant current*
- *Snail abundance & diversity as a function of tidepool depth*
- *Comparison of parasitic flatworm prevalence on hosts at varying depths*



For all further course info including details on costs, credits & application please visit:

**[www.ecofs.org](http://www.ecofs.org)**