Caribbean Ecosystem Field Studies

2025-26 Course Syllabus

Conducted by Ecosystem Field Studies: www.ecofs.org

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

www.ecofs.org

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 Environmental Studies Program of the University of Montana at Missoula and is open to students from any university or major. ****While over 250 universities have accepted EcoFS courses for transfer credit, students must confirm with their department concerning exactly how these credits will transfer for their degree.****

DATES: December 28, 2025 – January 17, 2026

CLASS SIZE: 20-24 Students

INSTRUCTOR: Steve Johnson, Director of Ecosystem Field Studies, an official academic partner to the University of Montana at Missoula. *Contact for further questions: steve@ecofs.org*

CONTACT HOURS: Each day runs 8:00 am to 5:00 pm with two 45-minute breaks: **Total contact hours = 142**
(18 days of 7.5 hours, 1 day (Day 1) of 2 hours, 1 day (Day 9) of 5 hours)

DESCRIPTION: This course at Xpu-Ha Beach offers exceptional opportunities to study a healthy & diverse Caribbean ecosystem. Daily snorkels, SCUBA dives, hikes, field trips and hands-on scientific investigations provide rich learning experiences focusing on coral reef & coastal communities. Students will synthesize & apply information they have gained from their classroom & textbook context while actively studying & exploring a spectacular environment.

COST: First, students choose an accommodation option of camping or bungalow room. Camping is in a private, campground in individual, provided spacious tents. Bungalow rooms are triple-occupancy with AC and hot showers.
$3,190 Camping or $3,590 Bungalow Room
Second, students choose between a Snorkel only option or a SCUBA/snorkel option.
Add $700 for SCUBA/Snorkel option. Add $0 for Snorkel option.

Cost includes all meals, transportation to/from Cancun airport, accommodations, instruction and activities. Students provide their own transportation to Cancun Airport in Mexico.

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 will have special opportunity to observe & study sea turtle nesting & hatchling activity.

Course Objectives:

Students will…

- **Achieve a deep knowledge base of the structure & functioning of coral reef and 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 & 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 & 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 summer 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). 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.

A Typical Day…

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

Our dives & snorkels involve a scientific focus that includes data collection with underwater slates & research equipment. Then we 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 & reef observations, typically in small group discussions. Lunches is typical American style fare & prepared by our group out of our Field Research Cabaña. Afternoons include lecture on ecosystem concepts & activities that we investigate with hands-on field work and data collection. Typically, afternoons include snorkels, 1–2-mile coastal hikes, field investigations & labs. There are 3 off-site visits to other amazing ecosystem locations such as coastal lagoons, cenotes and caves.

Our academic day ends at 5:00 pm and dinner is prepared by an amazing local chef and enjoyed oceanside. The remainder of the day is for homework, independent study, & personal time. Summer nights at Xpu-Ha offers ample occasion to observe and study nesting sea turtles. Independent study is phased in during the second half of the course & individual research projects become our focus. Days are very full & academic expectations are high so do not expect "vacation-like" time.

Accommodations: EcoFS' accommodations at Xpu-Ha are in beach bungalow triple occupancy rooms with full beds, air conditioning, & hot showers or in our beautiful beach campground under the palm trees in spacious, private tents with access to showers and the cabana. Wi-Fi is available, and all accommodations and facilities are steps from beautiful Xpu-Ha beach and ocean

A few words regarding safety: The Xpu-Ha area and the Riviera Maya is an extremely safe & friendly place for tourists. Xpu-ha is a private location with secure access. 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). 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 15 times in the past 10 years.

This is Where Your Classroom Education Comes to Life!

Course Schedule of Topics & Activities:

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

Day 1: Arrival & Welcome to the Course & Mexico!!!

Settle into accommodations, orientation to area, safety, dinner

Day 2: Xpu-Ha Bay Snorkel & Caribbean Ecosystem Overview

Lecture/discussion topics:

Course introduction- personal introductions, course syllabus, daily overview
Safety overview- health, environmental & social concerns, emergency procedures
Sea Turtles- species, ecology, behavior, conservation efforts, nesting habits, connection to global processes,

Field Activities:

AM- Snorkel in Xpu-Ha Bay- snorkel skills overview, coral reef investigation
PM- SCUBA/snorkel review training- safety, skills, logistics, equipment overview
Coastal walk- investigate Xpu-ha beach, discuss global ecosystem influences

Day 3: SCUBA/Snorkel Skills & Beach Topography Investigation

Lecture/discussion topics:

Reef topography- types of reefs, coral reef importance, formation & structural characteristics, field observation & measurement techniques
Beach Ecosystems- erosion & deposition patterns, species of interest, human influence, Xpu-Ha topographical characteristics

Field Activities:

AM- SCUBA dive/snorkel- skills reviews, coral reef scientific observations
PM- Xpu-Ha beach hike & analysis- investigate beach topography, ecology, erosion & deposition patterns, sea turtle nest patterns and distribution
Conduct geographic survey of Xpu-Ha beach- measurement & data collection of beach topography including layout, profile, slope, angle, aspect, composition, current

Day 4: Reef Topography & Yucatan Hydrogeology

Lecture/discussion topics:

Geologic overview- processes, geologic features, Yucatan Peninsula characteristics
Water quality- chemical & physical properties, human influence, impacts to reef
Stony corals- ecological role for reefs, physiology & ecology, Caribbean species of interest, ecosystem impacts to corals & reefs, identification skills

Field Activities:

AM- SCUBA dive/snorkel- analyze reef structure & topography
PM- Coastal hike- geologic investigation of spectacular Yucatan limestone coast
Intertidal zone community exploration- investigate fascinating tidepool species
Water quality field analysis- perform chemical/physical tests of ocean, brackish & tidepool water. Measure temperature, ph, salinity in various locations.
Snorkel/swim in unique freshwater output to ocean
Explore "secret" Mayan ruin on coast- Mayan culture and ecosystem connection

Day 5: Stony Corals & Soil/Sand Analysis

Lecture/discussion topics:

Reef Fish- identification, Caribbean species of interest, importance to reefs, behavior opportunities, species interactions, research methods
Soil/Sand- formation, composition, classification, ecosystem importance & connection to reef & coastal organisms

Field Activities:

AM- SCUBA dive/snorkel- stony coral analysis, identify and describe stony coral species, analyze distribution & health
PM- Soil/sand field & lab analysis- dig soil/sand pits, identify horizons, measure infiltration rate, moisture, temperature. Classify soil/sand type, sorting, composition

Day 6: Reef Fish & Cenote/Jungle Exploration

Lecture/discussion topics:

Animal Behavior- animal observation skills, pros & cons of behavioral studies, ethogram usage
Yucatan Cenotes- geologic/hydrologic formation & features, connection to ocean and reef system
Yucatan Jungle- ecosystem characteristics, plant and animals species of interest

Field Activities:

AM- SCUBA dive/snorkel- fish observation & identification
PM- Off-site trip to Rancho Santa Cruz, a private cenote/cave in jungle – explore Yucatan jungle hike & swim through a dry spectacular dry cave & cenote (submerged areas of caves, open to sunlight), discover beautiful cave formations & features, underground hydrogeology

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, 3rd ed., 2023

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 7: Animal Behavior & Coastal Lagoon Investigation

Lecture/discussion topics:

Soft coral & Sponges, identification groups, major species of Caribbean, interactions with other species

Coastal communities- mangroves & lagoons

Field Activities:

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

PM- Off site trip to Yal-Ku Lagoon- snorkel in a beautiful coastal lagoon, investigate mangrove community ecology, observe fish populations

Day 8: Soft Corals & Sponges & Biodiversity Sampling Methods

Lecture/discussion topics:

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

Biodiversity- types, indices, ecosystem importance

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- Biodiversity study in intertidal zone- calculate species richness & abundance

Day 9: Marine Macro-algae & Other Invertebrates

Lecture/discussion topics:

Invertebrates (other than corals)- major relevant phyla, Caribbean species of interest, observation skills, research methods

Field Activities:

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

PM- Prep for Book discussion group

Day 10: Ecological Research Design & Night Snorkel

Lecture/discussion topics:

Research Design- scientific method detailed analysis

Nocturnal reef species

Field Activities:

PM- How to Do Ecology Book discussion activity- relevance and application to Independent Research Projects

Evening:

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

Day 11: Independent Research & Sharks

Lecture/discussion topics:

Shark Conservation & Ecology- Guest Speaker, Olimpia Berdeja, shark researcher& dive instructor.

Field Activities:

AM/PM- Dive/snorkel/land research option

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

Individual consultations- advisement for research projects

Day 12: Independent Research & Coral Reef Restoration

Lecture/discussion topics:

AM- Guest Speaker on local Coral Restoration Projects, Dr. Ania Banaszak, Coral Reef Biologist, National Autonomous University of Mexico (UNAM), Field Activities:

AM/PM- Dive/snorkel/land research option

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

Day 13: Independent Research

Field Activities:

AM/PM- Dive/Snorkel/land research option

Independent research- intensive data collection

Day 14: Independent Research & Casa Cenote Exploration

Field Activities:

AM- Off-site trip to Casa Cenote- SCUBA dive or snorkel in a safe and spectacular open cenote, explore mangrove community

PM- Dive/Snorkel/land research option

Independent research- intensive data collection

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.

No specific scientific research background is necessary to take this course. This is an excellent opportunity to learn if field research is a good fit for you. Additionally, for students who have research experience, this course is an opportunity to take their skills to a higher level.

See below for a list of Past Research Projects

Day 15: 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

Independent advisement consults on data analysis

Day 16: Independent Research

Field Activities:

AM/PM- Dive/snorkel/land research option

Independent research- intensive data collection

Day 17: Independent Research & Night Dive

Lecture/discussion topics:

Night diving overview

Field Activities:

AM/PM- Dive/snorkel/land research option

Independent research- final data collection, data analysis

Evening:

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

Day 18: Presentation Prep

Lecture/discussion topics:

Presentation techniques- effective public speaking, displays & presentations

Field Activities:

AM/PM- Dive/snorkel/land research option

Independent research- data analysis, presentation prep

Day 19: Student Presentations

Lecture/discussion topics:

AM/PM- Student presentation of field research projects

Day 20: Student Presentations & Ecosystem Restoration

Lecture/discussion topics:

AM- Presentations (continued)

PM- Ecosystem restoration- goals, methods, challenges

Field Activities:

PM - Coastal trash clean-up

Closing

Evening: special farewell dinner fiesta!!!

Day 21: Departures

Shuttles to airport throughout day

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. Al Scuba & snorkel activities are beginner level and no prior experience required.

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

Caribbean EcoFS Past Research Topics

2024

Microplastic Accumulation in Seagrass Bed of Xpu-Ha Beach
Mapping Symmetrical Brain Coral Population
A Size Analysis of the Caribbean Spiny Lobster (Panulirus argus) Population
Different Methods of Plastic and Marine Sediment Separation
Gorgonian Coral Morphology Determines Strength Holding Capacity
The Health of Three Brain Coral Species Varied at Depth Ranges
Change in Oil Sorption between Processes Samples of Seaweed
Infiltration Rate along Xpu-ha Beach in High & Low Tourism Areas
Soil Size, Type, Angularity, and Assortment at Varying Ocean Depths
Dark Kite Swallowtails Correlation with Sargassum
Frequency of Aggressive Behavior Displayed by Yellowtail, Threespot, and Dusky Damselfish
Tannin Levels in Brown, Green and Red Macroalgaes
Greenness of Foliage in Relation to Infiltration of Soil
An Analysis Comparison of Scaridae and Acanthuridae in Juvenile Thalassoma bifasciatum Cleaning Stations
Location Mapping and Assessing Environmental and Human Impact on Sea Turtle Nesting
Negative Non-consumptive Effects of Invasive Red lLonfish (Pterois volitans) on Localized Biodiversity of Native Fishes
Influence of Abiotic Factors on Number of Organisms in a Feeding Swarm Around ArtificialLlight
Damselfish Aggressiveness Change based on Depth
Comparing Two Coral Reef Substrates and Their Effects on Coral Biodiversity
A Survey of Factors Influencing Habitation Rates of the Pink Vase Sponge and Azure Vase Sponge
Diversity of Edge Reef Patches
Mapping the Distribution and Abundance of Millepora complanata and Millepora alcicornis Fire Corals
Parrotfish Feeding Behavior Based on Size

2023

Classification of Organisms Inhabiting the Azure Vase Sponge
Differences in Grazing Behavior Between Stoplight and Yellow-tail Parrot fish
The Common Sea Fan Conditional Preferences Of The Flamingo Tongues
Behaviors of Great-Tailed Grackles Based on Time of Day
Impact of Macroalgae Coverage on Fish Abundance and Biodiversity
Determining Sea Turtle Nesting Preferences on Xpu-ha beach
Distribution of Blue Crust Coral Across Reef Flat Zone
Evidence for Soft Coral Induction Based on Sediment Composition
Behavioral Differences Between Species and Phases of Parrotfish
Depth-Dependent Investigation on Sea Urchin Abundance and Grazing on Green Algae
Abundance of Fish Diversity in Relation to Patch Reef Size
Difference in the Diurnal Behavior of Sharpnose Pufferfish
Dynamics of Tide Pool Size, Algae, and Invertebrates
Temporal Behavioral Difference of Four-eye Butterflyfish
Reef Topographic Complexity Effect on Fish Diversity and Abundance
Determining the Topographical Factors that Correlate to Long Spined Sea Urchin Residence
Abiotic Determinants on Sediment Channels Within Coral Reefs
How do Abiotic and Biotic Factors Influence the Levels of Aggression for Dusky Damselfish?
Cleaning Station Success Dependent on Frequency of Visits
Influences on Occupancy of Giant Barrel Sponges
Effects of Abiotic Conditions on the Shannon Diversity Index of Rocky Tidal Pools
Does Life Stage Affect Intraspecies Group Feeding Size in Parrotfish?
Habitat Complexity and its Effect on Abundance of Sharpnose Pufferfish

2022

Factors Impacting the Abundance of Sea Urchins in the Intertidal Zone
How Density, Depth, and Size Affect the Severity of Disease in the Common Sea Fan
Abiotic Soil Components in Relation to Varying Locations
Reef structural rugosity correlation with coral & fish diversity
Cleaning Symbiosis of Juvenile Blue Head Wrasse
Relationship Between Turf Algae on Christmas Tree Worm Tubes and Overall Host Coral Health
Sargassum Algae Effect on pH levels in Ocean Water
Spatial Distribution of Microplastics in Terrestrial Surface Sands and at Ocean Depth
Parrotfish and Damselfish Relationship to Overgrown Algae
Sediment Type and Distance to Ocean
Fish behavior in the presence of a visual stimulus
Stony Coral Disease Prevalence in Relation to Depth

2020

Quantifying Microplastic Concentrations by Ocean Depth
Parrotfish and Macro-Algae: How their Relationship Affects Reef Health
Algae-Induced pH Fluctuations: Sargassum and Marine Water Quality
Behavioral Differences Between Longfin and Sergeant Major Damsel Fish
Diversity of Tidepools During Day vs Night
Effect of Karstic Freshwater Outputs on Salinity Levels and Algal Species
Parrotfish and Macro-Algae: How their Relationship Affects Reef Health
Sargassum Effect on pH, Salinity and Temperature in Tidal Pools
The Effects of Depth and Distance from An Existing Reef on Distribution, Health, and Surface Area of Elkhorn Coral

The Effect of Time of Day on Male Great-Tailed Grackle Vocalizations
A Comparison of Infauna Biodiversity of Azure Vase Sponge and Giant Barrel Sponge

2019

Reef Fish Reaction to Visual Stimulus in Relation to Predatory Behavior
Organism Activity within Lettuce Coral
Abiotic Factors Affecting Species Distribution in the Intertidal Zone
Foraging Success of Brown Pelicans Using Two Different Strategies
Compared Invertebrate Abundance and Richness Between Brown Algae Species
Percent Coverage of Stony Corals as Compared to Macroalgae with Increasing Depth
Abiotic Factors Affecting Species Distribution in the Intertidal Zone
Sexual Dimorphic and Temporally Independent Vocalizations of the Great-Tailed Grackle
Correlation Between Green Algae and Common Periwinkle
An Assessment of Algae, Coral and Fish Abundances to Analyze Coral Reef Health
Trends and Correlations Between Marine Sponge Species and Marine Motile Organisms
Sand Sorting in Relation to Wave Energy
Social Behavior of Juvenile Bluehead Wrasse at Cleaning Stations

2018

Influence of Water Movement on Substrate Distribution in Xpu-Ha Bay
Effects of Sargassum on Sea Turtle Nests' Frequency and Location
Biodiversity in Sargassum Found in The Ocean vs On the Beach
Parrotfish Diet Variation Between Species and Life Stages
Dusky Damselfish Pathway Usage and Behaviors at Different Coral Reef Depths
Microclimate Fluctuations in the Intertidal Zone and their Impact on Biodiversity Levels
Dusky and Longfin Damselfish Interactions at Varying depths
Effects of Snail Density and Algal Competitors in an Intertidal Community
Relationship Between Osculum Area of Pink Vase Sponges and the Organisms that Inhabit Them
Disease Prevalence of Star and Brain Coral
Red and Green Algae Abundance and Coverage Dependence on Depth
Influence of Grouping Behavior on Blue Tang Feeding Time
Terminal Phase Male Bluehead Wrasse Behavior in Relation to Initial Phase Female Presence

2017

Depth vs. Age of Giant Barrel Sponge
Abundance of Caribbean Yellow Band Disease in Lobed Star Coral
Retraction Rate of Christmas Tree Worms in Relation to Colony Health
Brain Coral Health in Correlation to Colony Position on Reef
Fish Diversity and Abundance in Relation to Tide Pool Characteristics
Sanderling and Sandpiper Foraging Competition on Xpu-Ha Beach
Territorial and Behavioral Patterns within Algae-Farming Damselfish
Sea Fan Coral Colony Size Preference of Flamingo Tongue Snails
Tide Pool Phylum Diversity in Relation to Distance from the Ocean, Salinity, pH and Temperature
The Effects of Depth and Flatworm Parasite on the Size of Adult Atlantic Blue Tangs
Correlation between Algae Density and the Distribution of Carnivorous and Herbivorous Fish
On and Off-shore Aspects in Topography Correlation with Abundance of Common & Venus Sea Fan

2016

Spatial Location of Green and Loggerhead Sea Turtle Nests and the Influence of Vegetation
The Effects of Light Pollution on Nesting Sea Turtles
Barrel Sponge Size in Relation to Depth
Disease Prevalence Based on Depth of Star Corals
Relation of Algae Coverage on Abundance of Thin Leaf Lettuce Coral
Wind Speeds and Magnificent Frigatebird Activity
Demographics and Behavior Changes in Bluehead Wrasse with Presence of Terminal Male
Basic Patterns in Wave Behavior
Sea Fan Variance Based on Location and Orientation
Diver Approach Effects on Damselfish Behavior
Soil Composition's Influence on Sea Turtle Nesting
Stony Coral Abundance in Relation to Depth
Lionfish Effects on Reef Head Populations