

## Sustainable Akumal: Turtles, tourists, cenotes and coral reefs

January 2022 Study Abroad

CFAN 3522 3credits

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Course Canvas site: <https://canvas.umn.edu/courses/>

Venue:

28 December 2021 – 16 January 2022 Tortuga Escondida, Quintana Roo, MX

Prerequisite: CFAN3422 Intro to Sustainable Akumal, 1 cr Fall 2021

## Background and Description

Our coastal systems present the interface of terrestrial, freshwater and marine systems and are among the most developed and stressed systems on the planet. They support a disproportionate population base (< 5% of earth's land area supports 17% of world population) and provide income and food to residents and a large percentage of global marine food resources. These areas attract increasing tourism development, which attracts further population growth and ecological stresses and can result in wealth inequities that further stress the system.

The eastern coast of the Yucatan Peninsula, the Riviera Maya in Quintana Roo, MX, presents an exemplary system to study the ecology of coastal ecosystems, along with the effects of increasing development and tourism. Although nearby cities such as Cancun and Playa del Carmen, which expanded from a population of 3000 in 1990 to almost 200,000 in 2014, are already highly developed and impacted, less developed places remain and provide context for ecosystems-past, with development to come. Akumal, the Mayan "place of the turtles", presents an ideal location to study relatively un-impacted natural systems and the evolution of tourism and development with a documented history. The long-term (since 1990) presence of the Akumal Ecological Center (Centro Ecológico Akumal; CEA) provides a history of ecological study and ecotourism and connections to researchers and resources.

Akumal has seen increasing development pressure that can impact water quality of the cenotes, that can affect lagoons and the coral reef. Increased tourism, and in particular snorkel tours to see the turtles that inhabit the bay, has led to reef degradation and concern for effects on sea grass and turtles. Akumal was founded by well-to-do divers (Pablo Bush; CEDAM founder) and was one of the first tourist communities in Q Roo (rivaling Cozumel and with roots before Cancun and Playa del Carmen). It remained relatively tranquil and low key until tours of cenotes and turtles were developed that attracted tourists from Cancun and cruise ship tourists from Cozumel. This presented opportunities for entrepreneurs from the local community, but put ecological pressure on the resource that had been somewhat protected by the elites. The interaction of the federal

government (the area has federal protections that are not yet enforced), local community, established hotels and CEA presents a typical but difficult scenario of protecting the resource while presenting opportunity to the local community as well as established businesses.

### **Course Objectives:**

The aim of this course is to introduce students to coastal systems and coastal ecology, the effects of tourism and development on these systems, and potential strategies to promote sustainable development and tourism and mitigate impacts. Specifically, we will cover the karst geology, underground rivers, and cenotes of the region, their connection to and ecology of lagoons and mangroves. We will assess coastal beaches and sea turtle nesting habitat and the near shore sea grass communities that support juvenile loggerheads and green turtles. We will study near shore and deeper reef systems and how these are affected by increasing development and tourism, directly and via nutrient input and strategies used to reduce and mitigate development and waste impacts. Finally, we will introduce students to ancient Mayan history, ruins and culture, and how these relate to contemporary development in the region that attempts to capitalize on that history; resultant conflicts between established entrepreneurs, ecologically minded ex-pats, local Mestizo worker communities, a long established ecological center and recent tourism developments will be explored. Students will also learn how to conduct projects that address issues of concern to local researchers, managers, and the community. Working in small teams you will tackle a specific topic related to your interests and expertise and present the results to colleagues, and local scientists, managers and community members.

### **Student Learning Outcomes:**

This course directly addresses four of the University of Minnesota Student Learning Outcomes.

#### 1. Have mastered a body of knowledge and a mode of inquiry

This class provides an introduction to coastal and marine ecology as affected by tourism and development. Students will learn about the development and tourism history of the region and the geology, ecology and water quality interactions in the coastal and marine environments. You will learn identities and roles of key animals and plants in these systems and how they interact. You will gain understanding and experience into how this information is gathered, interpreted and used, the approaches to inquiry used by marine ecologists and managers, and how that information can also be used to assess and mitigate the effects of humans on marine resources.

Student's knowledge of biota will be assessed via in-country practical exams. Their understanding and use of modes of inquiry will be assessed via class discussion, field assessments, journal entries, and team presentations.

#### 2. Can communicate effectively

Each evening, students will present and describe 1 photo addressing a scientific or management insight gained that day and 1 photo addressing a cultural insight; this sharing will spark further discussion among the group. Student teams of 2-4 will develop and orally present a research topic proposal and upon completion a lightning talk giving final results of their project to classmates, collaborators and

community member. Via peer review and feedback you will also gain insights into effective communication.

The student proposals and lightning talks will be graded for content, scientific merit, style and relevance to management.

### 3. Understand diverse philosophies and cultures within and across societies

Students will be exposed to a variety of cultures and views including a scientific community, a tourist culture, tourism business owners and workers, environmentally enlightened expats, immigrant service workers and a few long-term indigenous residents, all set in a historical context that extends to the ancient Maya. In addition, all but the tourist community is predominantly Spanish speaking. You will also be introduced to conflicts regarding corporate tourism development, local opportunity and ecological impact, and ways to reconcile development, social justice, and ecological health. In addition to direct experience, an extensive literature on these issues will be consulted including several recent papers specific to issues in Akumal.

Students will take the intercultural development inventory (IDI) prior to departure to get an assessment of your own perspective. The daily photo journal reporting addresses cultural issues and experiences and the ensuing discussion and journal entries will be assessed. Students are expected to reflect on their cultural observations and insights in their journal entries.

### 4. Have acquired skills for effective citizenship and life-long learning

Students will learn about a variety of issues affecting coastal systems and how human actions (including their actions) affect marine ecosystems and the communities that rely on them. You will learn how to identify common reef organisms and their place in coastal systems. You will see first hand the impact of tourists on the local human and natural communities and be exposed to ways to assess and mitigate such effects and challenged to propose new solutions. Specific topics such as waste management and water quality, effects of water quality on sea grass and fish, and effects of these and tourists on turtles and coral reefs, will be covered such that students will understand these issues, learn potential ways to address these issues and be able to remain informed as you grow older.

This material will be assessed via quizzes and examination and will be the topic of classroom discussions and graded journal entries in response photo presentations. The ability to continue life-long learning will also be assessed by the insights presented in the final lightning talks.

## **Liberal Education Themes**

This course fulfills the Global Perspectives Theme and the Environment Theme. The designated themes are topics central to an understanding of contemporary life. Investigating these themes helps prepare you to become knowledgeable, ethical, and engaged public citizens. All theme courses have the common goal of cultivating a number of habits of mind:

- Thinking ethically about important challenges facing our society and world
- Reflecting on the shared sense of responsibility required to build and maintain a community
- Connecting knowledge and practice
- Fostering a stronger sense of individual roles as historical agents

In Sustainable Akumal, we integrate all of these habits in the understanding of the influence of tourism and development outside of the US on the local coastal and marine environment and its inhabitants and culture. The course specifically addresses the Global Perspectives Theme and the Environment Theme.

### Global Perspectives

This course, by focusing on the Mexican Caribe and experiencing three weeks in Mexico, provides significant academic exposure to the world beyond the U.S. borders and the opportunity to consider the implications of this knowledge for the international community and your own lives.

We will focus on Akumal, Quintana Roo, Mexico and address the environmental and social challenges and opportunities related to tourism and development in this region. Due to the mix of visitors, scientists and managers present you will also experience an international perspective on dealing with a complex local problem that is globally common (sustainable development of a previously pristine and sparsely populated area). In addition, you will learn the history of colonization and development in the region and how that interacts with indigenous, immigrant and expat communities.

Students will be able to consider their role as visitors and tourists and how these experiences may be made available to others without disrupting the desired environment and the local communities that support them. You will be expected to relay your insights to the local community and contribute to longer-term solutions. You will be challenged to envision solutions that can be applied in Mexico and elsewhere.

### Environment Theme

The environment theme courses engage you in complex environmental issues. Finding solutions to these environmental issues will have you vigorously debating the myriad of solutions; weighing the costs with the benefits among alternative policies and practices; exploring the roles of science and technology; and learning to become involved, informed, and a constructive citizen after graduation.

To satisfy the environment theme requirement, a course must meet these criteria by:

- Raising environmental issues of major significance  
The impact of increasing development and tourism on coastal and marine systems is a global environmental problem. Effects of waste management and nutrient pollution of groundwater and coastal systems is a major factor in declines in sea grass beds and coral reefs. Destruction of mangroves for development and direct effects of tourists on lagoons and reefs is also a world-wide problem. These topics are the main focus of this class along with approaches to mitigate and solve these problems.
- Giving explicit attention to interrelationships between the natural environment and human society  
The effects on the natural environment are a direct result of human actions, but the tourism industry and development also depends on a healthy and relatively undamaged environment. These interrelationships are fundamental to understanding the problems addressed in the class and defining the research and management approaches to solve or mitigate these problems.

- Introducing the underlying scientific principles behind the environmental issues being examined  
The foundation of the course is a basic understanding of the geology, chemistry, and ecology of the coastal and marine systems in the region, the scientific approaches to collecting data and addressing the environmental problems, and an evaluation of approaches that might be used to mitigate these problems.
- Having you explore the limitations of technologies and the constraints of science on the public policy issues being considered  
A fundamental problem in sustainable development and tourism is to balance various social interests with ecological problems and environmental impacts. This is further complicated when local, state and federal governmental agencies have different agendas and where resources for environmental protection are limited and the demand for development is high.
- Teaching you how to identify and evaluate credible information concerning the environment  
Students will examine published literature and the data they and others collect to assess environmental conditions and problems. You will gain experience collecting and evaluating this information, presenting it to peers and critiquing peers.
- Having you demonstrate an understanding that solutions to environmental problems will only be sustained if you are consistent with the ethics and values of society  
Experiences in Akumal will be developed in the context of the ethics and values of the local communities, entrepreneurs and government. Comparing these problems and solutions to those in the US will further expand the understanding of this concept.

**Assessment of student performance in the course:**

Identification (and ecology) of organisms will be assessed by presentation of two field photo collections on site, one for plants and inverts and the other for vertebrates from a list provided in class. Specific skills and concepts will be tested with 5 brief practical quizzes. Students will take photos each day and during the class debrief each evening, will present one photo representing a scientific insight from that day and one representing a cultural insight for discussion with the class. Students will record their experiences, insights, questions and personal reflection in a journal that will be reviewed by the instructors once weekly. Participation and professionalism will be judge by engaged attendance, questions and discussion and contribution to activities. The main research products will be a brief, 5-10min presentation of the team (2-4 students) research proposal during the end of the second week, and a 10min talk presentation of research findings/results to students, staff and interested public on the penultimate day in country. The research talks will be backed up with an annotated data report including raw and summarized data that can be used by cooperators or future students.

Grading:	points
Field ID photo reports 2 @ 20 pts each	40
Evening photo share	40
On site practical quizzes 5 @ 10 pts each	50
Journal (hand in weekly)	50
Participation and professionalism	20
Research proposal presentation	30
Project 10min talk (60) and data report (40)	<u>100</u>
Total	330

Grading will follow the University of Minnesota's [Uniform Grading Policy](#):

A	Achievement that is <b>outstanding</b> relative to the level necessary to meet course requirements. Typically, only the very best students get an A and as appropriate, class grades may be scaled so A is the top grade.
B	Achievement that is <b>significantly above</b> the level necessary to meet course requirements.
C	Achievement that <b>meets</b> the course requirements in every respect. Most students can expect to receive at least a C.
D	Achievement that is worthy of credit, even though it <b>fails to meet</b> fully the course requirements.
F	Represents failure and signifies that the work was either: 1) completed but at a level <b>not worthy</b> of credit, or 2) <b>not completed</b> and there was no agreement between the student and instructors that the student would be awarded an Incomplete.
I	Assigned only in the case of extraordinary circumstances that prevent normal completion of course requirements.

The final grade will be based upon the percentage of total points possible (e.g., 93-100% = A; 90-92.9 = A-, 87-89% = B+, 83-86 = B; 70-79 = C, etc...). Final grades will not be lower than specified above, however the instructor may adjust the grades upward based on final scores if needed.

### Materials and Supplies:

A detailed list of suggested and required attire and gear is provided separately but a summary of more expensive items is provided here. One component of this course is learning to plan and outfit a 3-week learning and research excursion. A laptop computer or tablet is needed to compile literature, analyze data, develop presentations, write reports and conduct GIS analysis. If you do not have such a computer or tablet, one can be borrowed from CFANS. Each student will need their own snorkel gear (mask, fins, snorkel and wetsuit or rash guard). Finally, each student will need their own waterproof/underwater capable camera for the daily photo share and reporting of taxa IDs and sightings. Students will need a notebook or journal to record notes and share their insights and reflection. See the checklist for more information.

Certified (Open water or beyond) Scuba divers will have the option of participating in 2 two-tank (4) dives; more dives for group projects may be possible if a group can arrive at a suitable projects. Dives are not included in the course and course fees; two-tank dives are \$70 + \$15 for gear (e.g., BC and Reg).

**Workload and Expectations:**

A three credit course is expected to require at least 135 hrs of effort. On site, expect long days (often 8AM to 8PM) with an average of at least 6.5 hrs of classroom, field, or data processing/analysis per day. A typical day includes a morning lecture followed by field demonstration or activity and an afternoon lecture or demonstration followed by a field activity. An evening session will review the day and lay plans for next day. Additional prep work or study will often be required later in the evening. Time outside of formal activities is primarily spent reading, entering/analyzing data and completing assignments.

<http://policy.umn.edu/education/studentwork>

**Inclusiveness and Respectful Environment:**

An array of topics is covered in the class and students are expected to be respectful of the opinions and views of others. Enlightened discourse is encouraged but be aware that not everyone views the world through the same lens and the key to successful management is to consider and embrace of diversity of views. Furthermore, we will be visitors in a foreign country and extensively interacting with a variety of persons with vastly different cultures, experiences and world views. Respect for their values, cultural norms and perspective is expected as is respect for the environment you will be studying and working in.

Students with disabilities that may hinder their ability to fully participate in the course or achieve their potential should contact me and may also wish to contact Disability Services in 180 Gateway Building on 200 Oak Street (624-4037) for additional assistance.

**References to specific policies**

The University requires that you be informed of the following specific policies in your syllabus in addition to the information given above. Rather than use up several more pages of paper I summarize below and refer you to this link for complete information

[http://policy.umn.edu/Policies/Education/Education/syllabusrequirements\\_appa.html](http://policy.umn.edu/Policies/Education/Education/syllabusrequirements_appa.html)

**Student Conduct Code:**

As a student at the University you are expected adhere to Board of Regents Policy: *Student Conduct Code*. To review the Student Conduct Code, please see: [http://regents.umn.edu/sites/default/files/policies/Student\\_Conduct\\_Code.pdf](http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf)

**Use of Personal Electronic Devices in the Classroom:**

The University establishes the right of each faculty member to determine if and how personal electronic devices are allowed to be used in the classroom. For complete information, please reference:

<http://policy.umn.edu/Policies/Education/STUDENTRESP.html>.

**Scholastic Dishonesty:**

You are expected to follow the Student Conduct Code. The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty:

<http://www1.umn.edu/oscai/integrity/student/index.html>.

**Makeup Work for Legitimate Absences:**

Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. For complete information, please see:

<http://policy.umn.edu/Policies/Education/MAKEUPWORK.html>.

**Appropriate Student Use of Class Notes and Course Materials:**

Please see: <http://policy.umn.edu/Policies/Education/STUDENTRESP.html>.

**Grading and Transcripts:**

The University utilizes plus and minus grading on a 4.000 cumulative grade point scale. For additional information, please refer to:

<http://policy.umn.edu/Education/GRADINGTRANSCRIPTS>

**Workload and Expectations:**

Consistent with University policy, this 3-credit class will require approximately 130 hrs of contact time and effort for the average undergraduate student. See more detailed information above.

<http://policy.umn.edu/education/studentwork>

**Sexual Harassment**

"Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy: <http://regents.umn.edu/sites/default/files/policies/SexHarassment.pdf>

**Equity, Diversity, Equal Opportunity, and Affirmative Action:**

The University will provide equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy:

[http://regents.umn.edu/sites/default/files/policies/Equity\\_Diversity\\_EO\\_AA.pdf](http://regents.umn.edu/sites/default/files/policies/Equity_Diversity_EO_AA.pdf).

**Disability Accommodations:**

See above in syllabus and consult with me about issues. .

For more information, please see <http://policy.umn.edu/education/syllabusrequirements-appa> or the DS website, <https://diversity.umn.edu/disability/>.

**Mental Health and Stress Management:**

There is a broad range of confidential mental health services available on campus via the Student Mental Health Website: <http://www.mentalhealth.umn.edu>

**Academic Freedom and Responsibility:**

Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled. Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help. Contact the instructor, the Department Chair, your adviser, the associate dean of CFANS, or the Vice Provost for Faculty and Academic Affairs in the Office of the Provost.

## Tentative Schedule/Itinerary January 2022 updated 16 May 2021

Akumal On site 28 December 2021 - 16 January 2022 @Tortuga Escondida, Akumal  
Hosted by Marti Johnson, Tortuga Escondida (TE)

## General Daily Schedule

Morning lecture/background followed by activity  
Afternoon – repeat with new topic or continue activity from morning  
Evening – debrief and photo review; plans for next day

## 28-Dec Travel

PM Flight to Cancun, Quintana Roo, Yucatan Peninsula  
Arrival Akumal, orientation to facilities and Akumal

## 29-Dec Introduction to Region, Geology and the Underworld

AM Geology and Geography; introduction to region, groundwater and cenotes  
Snorkel check – TE pool  
PM Trip to local cenote / Ecopark Chikin Ha

## 30-Dec Local Akumal background and issues

AM Akumal history. Tour of Akumal Pueblo; waste, community, Art festival  
PM Akumal Bay site visit – snorkel tour of Akumal Bay  
Akumal local perspectives – meet with Bibliotek, former Mayor  
Eve More local perspectives: long-term resident / local business / town resident

## 31-Dec Coastal ecology, reef life and taxa review

AM Lecture on coastal ecology and communities; review of taxa  
PM Half Moon Bay Snorkel for field plant, coral and fish ID review  
Eve Mexican New Years Eve celebration

## 1-Jan AM Chill out at TE

PM Discussion of papers on Akumal, Goup project planning  
Lecture on Mangrove ecology or Maya history

## 2-Jan Mangrove ecology

AM Travel to Sian Ka'an Biosphere Muyil; Tour ruins  
PM Mangrove tour, kayak lagoon

## 3-Jan Yal Ku Lagoon – nutrient input and snorkel/ tourism impacts

AM Ground water – lagoon connections, nutrient review Head to Yal Ku by 10AM  
PM Yal Ku Snorkel – fish, invert, coral and plant ID/inventory  
Water quality sampling and mapping

## 4-Jan Cenotes and the Maya underworld

AM Background, Sam Meacham Technology to study the underworld

- PM Rio Secreto cavern system
- 5-Jan Akumal Reef Ecology and Management – ~~Coral Restoration~~ and Lion Fish  
 AM Lionfish – lecture and overview of activities  
 PM Lionfish and coral restoration dives for divers –  
 Snorkelers in Akumal bay  
 Coral restoration (transplants / project baseline) / lionfish  
 Lionfish lunch or dinner
- 6-Jan Maya culture and cenotes Tres Reyes  
 AM Coba – ancient Maya Ruins  
 PM Tres Reyes – community celebration and cenote visit
- 7-Jan Sea turtles: Akumal / Soliman Bay – turtle program, sea grass, algae & nutrients  
 AM Kathy Slater lecture on sea turtles in Akumal Bay; CEA Sea Turtle program?  
 PM Simulated turtle walk to nesting sites, beach management (CEA) or  
 Turtle program and Sea Grass mapping on Soliman
- 8-Jan Xel Ha – ecopark and ecotourism  
 AM Xel Ha breakfast; Behind-the-scenes tour and waste management  
 PM visit Cenotes / Lagoon / Private business conservation projects
- Jan 8-10  
 Evenings – research project proposals and feedback
- 9-Jan Akumal Reef Ecology and Management – Coral Restoration 2  
 AM Coral restoration – lecture and overview of activities  
 PM Coral restoration in bay, reef dives for divers –  
 Snorkelers in Akumal bay  
 Coral restoration (transplants / project baseline)
- Or  
 Fisheries and Fish Refuge (second dive day)  
 AM Background and monitoring program Early Lunch  
 PM Divers dive day 2 or Boat and snorkel tour, coastal marine fish surveys
- 10-Jan Tulum –Maya Culture and contemporary tourism impacts  
 AM Guided tour Tulum Archeological site  
 PM Tourism development in Tulum and solid waste management  
 Constructed wetlands, septic, waste water treatment
- 11-14 Jan Project work – data collection, analysis and presentation preparation.  
 Evening debrief every day – progress and problems reports  
 Subject and groups depend on final # students and itinerary

- 13 Jan Regional development history, sustainability challenges & waste management
- AM Puerto Aventuras site visit Brief lecture on PA history and development issues  
 Tour of various development sites – golf course, marina, nutrient management  
 Observation of captive marine mammals (no swimming with dolphins)  
 Puerto Aventuras - lunch
- PM Work on projects

#### Student projects

- Projects 2-4 students per project – These locations may change  
 Project will be determined by end of Fall semester Intro to Sustainable Akumal

#### Seagrass and bathymetric mapping – sea grass/hard structures in local bay

- Nutrients and inputs Yal Ku Lagoon  
 Submarine groundwater input – Soliman or Half Moon Bay  
 Seagrass mapping; Akumal Bay, South Akumal, or Solimam

#### Water Quality

- Akumal Bay, Half Moon Bay, South Akumal; Yal Ku  
 Regional cenotes

#### Cenote connections

- Map in Arc or Google Earth

#### Bay use – snorkel activity visitor counts & observation

#### Recycling in Quintana Roo

#### Bay reef health

#### Coral transplant success (diving)

#### Project baseline (existing surveys, reports)

#### REEF fish surveys

#### Lionfish harvest and abundance

#### Turtle related – summary reports sea turtle tourism/ nesting

#### 15-Jan Last full day

AM Presentation preparation

PM Group project presentations to classmates, locals and staff at TE

Eve Final banquet

#### 16-Jan Departure –

AM clean up and transfer to airport

PM back to MSP

See Checklist Required Gear and Packing list for suggested and required elements

See Akumal literature for publications about, from or relevant to Akumal and coastal marine ecology.