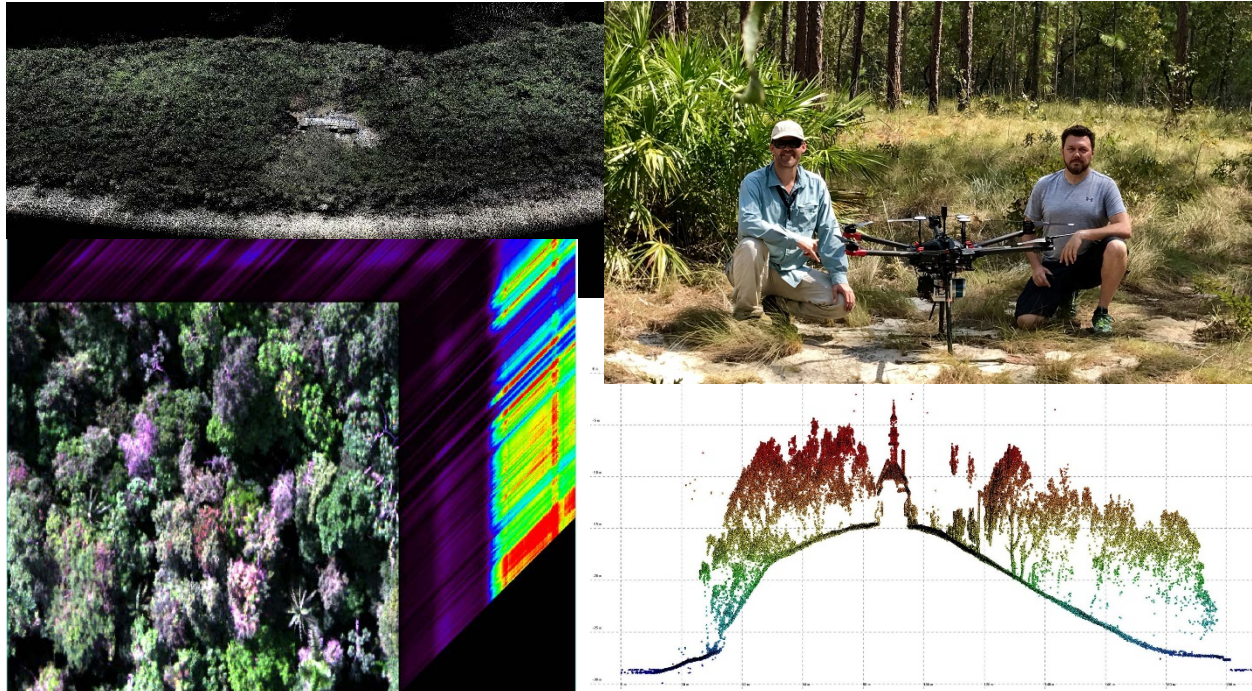## **Drone Ecology** (3 credits) SUR 6934. Spring, 2018

Lectures and Discussion Thursday (periods 6, 12:50 to 1:40 PM); Reed Lab (RLA) 302.

Laboratory Tuesday (periods 3-6 (9:35 AM – 1:40 PM); Meet in the breezeway below Newins-Zeigler Hall at 9:30.

Instructor: Dr. Eben N. Broadbent, Assistant Professor, Forest Ecology & Geomatics

Spatial Ecology & Conservation Lab, www.speclab.org
GatorEye Unmanned Flying Laboratory, www.gatoreye.org
Forest Ecology and Geomatics, 303 Reed Lab, School of Forest Resources and Conservation
Mobile: 650-204-1051, Email: eben@ufl.edu
Office hours: To be decided. Always possible to set up an appointment by email or phone.

Course Description: This course is designed to provide students with an overview of (1) ecological applications of geospatial data collected by unmanned aerial systems, (2) applications of these principals to a number of current environmental problems (biodiversity crisis, global environmental change, tropical deforestation and degradation, protected area monitoring, and others) impacting ecosystems, and (3) learn through discussion, field, and computer lab exercises how spatial ecologists use data from UAS to answer questions related to ecology and conservation across spatial and temporal scales, *with specific consideration of how UAS might function to integrate social and biophysical sciences*.

Course Objectives: In addition to gaining understanding of important ecological concepts, students will:

- develop and practice "geospatial ecological thinking" toward a question or problem - analyzing how different abiotic and biotic factors and processes might affect the issue under investigation
- understand how ecological principles work across different forest types and spatial scales
- be able to read, interpret and use scientific literature, with a focus on interpreting graphs and tables
- learn how to use environmental monitoring equipment
- understand the workflow for drone data collection and processing
- learn basics of geospatial data analysis and integration with field data
- develop ecological questions to investigate with field studies – designing and carrying out data collection, analyzing the data and presenting the analysis and conclusions
- make scientific arguments that are supported by data, logic and credible sources of information
- improve written and oral communication skills

Course is Designed For: Independent *graduate students and advanced undergraduates* interested in conducting field research, and leading and collaborating on discussions, field trips, and group projects.

Drone Ecology is a new *Tropical Conservation & Development (TCD)* methods core course for PhD students.

Course Resources:

- For scientific literature, the "web of science" is available to students free of charge on campus or when connected by the campus VPN (virtual private network). http://apps.webofknowledge.com/UA_GeneralSearch_input.do?product=UA&search_mode=GeneralSearch&SID=4AS8kteP7SRmsEaOyXA&preferencesSaved
- Google Scholar is an excellent resource for finding peer-reviewed scientific literature. https://scholar.google.com If you access on campus or have VPN set up then you can download articles directly using UF subscriptions.
- To set up the VPN on your computer, go to https://connect.ufl.edu/it/wiki/Pages/glvpn.aspx

Format: This is a 3-credit course, consisting of instruction in both the classroom and the field. I minimize the amount of lecturing both in the classroom and field, instead seeking your active engagement in (1) classroom discussions and activities and (2) field based observations, data collection and project development, and (3) computer lab based geospatial and statistical analysis. It is expected that you will read the assigned materials by the due date. You should be prepared to engage in discussions. You will develop classroom and lab activities, with guidance from the instructor and fellow students. There will be in-class activities (e.g., case studies, analysis of figures, reading and interpretation of peer-reviewed articles) that require you to work through material and apply concepts alone and in groups.

Field laboratory: Much of the lab work done in this course is conducted in the field. For these field sessions, students will be active participants in making observations and taking measurements. Field trips will proceed under inclement weather conditions unless dangerous. Whenever field (outdoor) labs are scheduled, students need to wear appropriate field clothing and bring pencil/pen and a notebook. If an outdoor lab is scheduled and weather prevents

completion of the lab, it will be rescheduled. Never assume the lab is cancelled. All field trips are mandatory. The departure point for field trips is always the breezeway underneath Newins-Ziegler Hall. We try to leave promptly at 9:35 am. We will not wait for late comers. In some cases, students want to drive directly to the field site. That is fine, but it is your responsibility to let the teaching staff know in advance of the field trip, and get to the right place on time – we do not have time to track you down.

Things to bring in the field:

1) Footwear, clothes, and rain gear. Do not wear sandals or shorts. On most trips, there is a good chance you will be walking through thick bushes and grasses. Wear long pants and closed-toed shoes you do not mind getting wet, or boots. If there is even a small chance of rain, bring a raincoat and/or umbrella. The field trips will proceed even if it is raining and you will *not* be excused from full participation in the activities if you are not dressed appropriately.

2) Water – Bring water! 4 hours is a long time to be in the hot sun. We will have a water cooler to refill your bottle.

3) A way to take notes in the woods (i.e. a small clipboard or pocket notebook), a pack to carry supplies, pencils (work at odd angles even when wet). Examples of waterproof field notebooks (these are not required, but can be handy in the field):

http://www.forestry-suppliers.com/search.asp?stext=rite%20in%20the%20rain

4) Insect repellent. You most likely encounter mosquitoes, tick and chiggers. Covering your body with long pants and a long shirt helps. Insect repellent is the next line of defense. Always thoroughly check your whole body for ticks and chiggers upon return from the field.

5) Food: Field labs are long and conditions can be hot, wet or both. If you tend to lose energy during long stretches of outdoor activity, be sure to bring snacks and liquids to maintain your energy and be active in the field exercises. We do not provide food.

6) Snake Chaps: We will have snake chaps available if you choose to wear them.

7) Allergies: If you are allergic to insect bites, or if you have other medical conditions for which emergency treatment may be required, it is your responsibility to inform the instructors before the course starts, about: (1) your specific condition, (2) where you keep your medicine, and (3) how to administer emergency treatment should the situation arise. Please let us help you be safe.

8) Appropriate behavior and language: You will spend a lot of time in the field with your lab members, teaching staff and guest lab leaders. You are expected to be respectful of everyone, recognizing the diversity of backgrounds of those involved in this class.

9) Please talk to me about any other issues or concerns you have about being out in the field. I am happy to discuss any issues or discomforts you might have and work with you on a solution.

Assessments:

Module development and implementation (10% each week)	40%
Reports (4) (10% each report)	40%
Participation (attendance, discussions, activities, etc)	20%
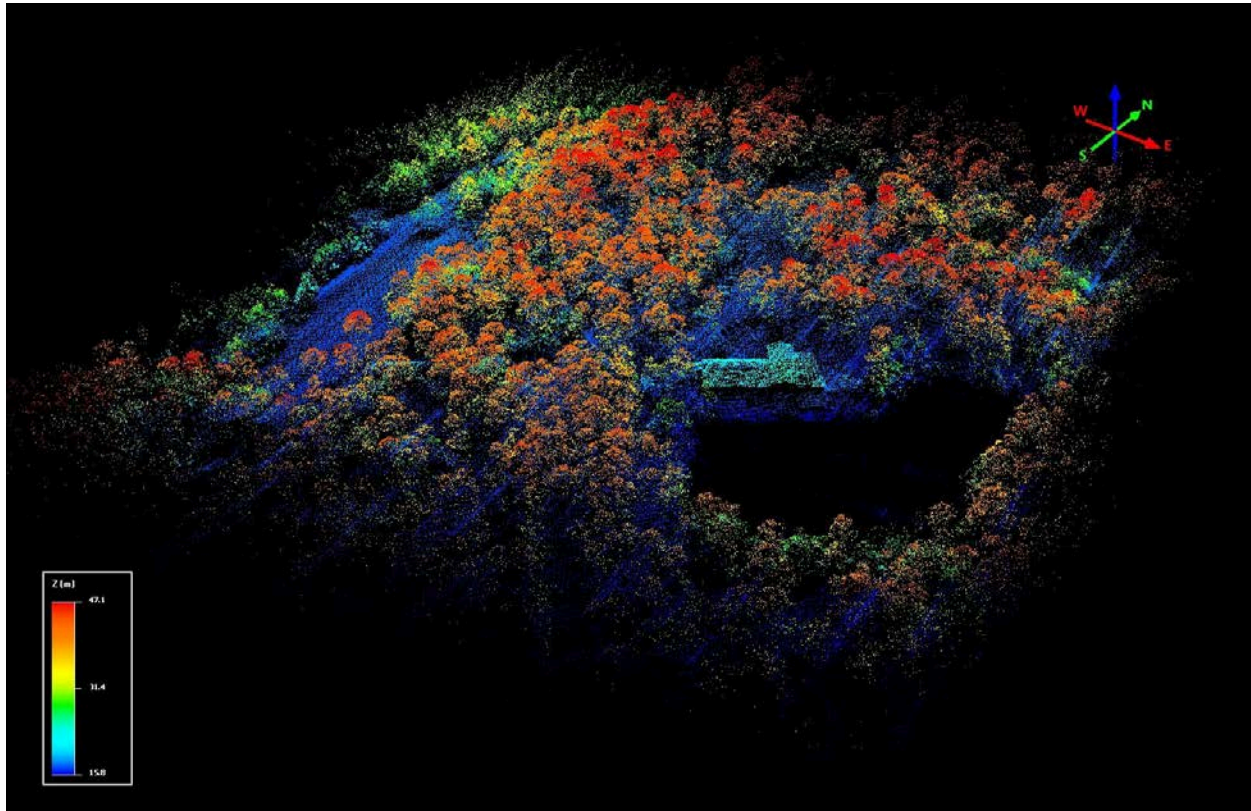
Written assignments need to be submitted electronically and *all will be checked by software for plagiarism* with other students' work from this and other classes, web and published literature including the textbook. Plagiarism will result in no credit for the assignment and follow-up according to university policies (see Academic Honesty section). The final report must be written individually. Do not copy written text from your group mates from this or other classes for the final report. Please see instructor or TA with any questions regarding what constitutes plagiarism.

In-class activities: Working in groups, students will read and analyze scientific papers and other materials on major concepts in the course. Students will discuss these materials in class. Students will then summarize their findings and/or opinion via presentations. Many classes will have an in-class activity, due at the end of the class.

Group lab projects: There will be several group lab projects. The data collection will be done as a group. Any written reports and worksheets required for **the lab project must be written and submitted by individual lab members in his or her own words, not written as a group**.

Final lab project written report: *Each individual will also write his or her own lab report that needs to be written individually entirely in his or own words.* You will be graded individually on your written report. You will receive feedback from the instructors on your report. You must incorporate conceptual improvements into subsequent reports. Plagiarism of group reports from other courses will result in a 0% grade for this assignment, and follow-up according to university policies (see Academic Honesty section).

Peer rating: There is a lot of group work in this class (and other in the SFRC curriculum), so some of your grade will depend on how well your group works as a whole. For some group activities, you will be required to submit a peer rating in which you rate and briefly describe the participation of each member in your group. This gives each student that chance to communicate if there are group members that are not participating, and helps hold each student accountable. If a student is repeatedly indicated as having poor group participation, the student's grade will suffer a deduction for those activities. Peer ratings are never shared with other students. If you are having issues working with members of your group, please come talk to the teaching staff.

Website and Electronic Communication: We use the canvas course management system for this course. Go to "https://elearning.ufl.edu/", click on "e-learning in canvas" and find course listed at the top of the page. I will send frequent communications about readings, assignments and other course activities via the elearning/canvas course website e-mail. IT IS YOUR RESPONSIBILITY TO CHECK THE COURSE E-MAIL FREQUENTLY. "I did not read my course e-mail" is not a valid excuse for missed or incorrectly executed assignments and class activities. To email me please just email directly to my UFL email provided in my contact information above. This will result in a much faster response (although both will be checked).

Grades and Grade Points: Grading follows University standards and will based on the following scale: A (95-100), A⁻(90-94.99), B⁺ (87-89.99), B (83-86.99), B⁻ (80-82.99), C⁺(77-79.99), C (73-76.99), C⁻(70-72.99), D⁺(67-69.99), D (63-66.99), D- (60-62.99), E (<60). For information on current UF policies for assigning grade points, see: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Late Assignments, Absences, and Make-Up Work: Assignments turned in after the posted deadline will have the earned grade reduced by 10% for each 24 hours that it is late. Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx If you have an excused absence, you must contact the instructor <u>before</u> the missed class to arrange make-up assignments.

Academic Honesty: As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.*" You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "*On my honor, I have neither given nor received unauthorized aid in doing this assignment.*"

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: http://www.dso.ufl.edu/SCCR/honorcodes/honorcode.php

Software Use: All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Campus Helping Resources: Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575,* www.counseling.ufl.edu/cwc
- *Sexual Assault Recovery Services (SARS)*, contact Student Health Care Center, 392-1161.
- *Career Resource Center,* First Floor JWRU, 392-1601, www.crc.ufl.edu
- *U Matter, We Care*: Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Academic Resources

- E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learningsupport@ufl.edu. https://lss.at.ufl.edu/help.shtml.

- Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. http://www.crc.ufl.edu/

- Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Evaluations: Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

Services for Students with Disabilities: The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services, and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation 0001 Reid Hall, 352-392-8565, **www.dso.ufl.edu/drc/**

Drone Ecology Syllabus, Spring, 2018

Course Topics and Schedule *

Week of	Date	Type	Topic	Activity	Assignments due
Jan 8	9th	-	-	NO CLASS	-
	11th	Lecture	Introduction	Intro to Drone Ecology	-
Jan 15	16th	Lab	Planning	Module planning and intro to drones	-
	18th	Lecture	Forest Succession	GatorEye overview and forest succession discussion	-
Jan 22	23rd	Lab	Forest Succession	Forest succession (NATL)	-
	25th	Lecture	Water Ecology	Drones for Water Ecology & Sustainability (Water)	Group 1 leads discussion
Jan 29	30th	Lab	Water Ecology	Field orientation (OSBS)	Group 1 leads lab
	Feb 1st	Lecture	Water Ecology	Define questions, methods, and logistics	Group 1 leads discussion
Feb 5	6th	Lab	Water Ecology	Field data collection (OSBS)	Group 1 leads logistics
	8th	Lecture	Water Ecology	Summary and statistics planning	Group 1 leads discussion
Feb 12	13th	Lab	Water Ecology	Data analysis and writing (ACF / PC lab)	Group 1 leads
	15th	Lecture	Forest Ecology	Drones for Forest Ecology & Sustainability (Forest)	Group 2 leads discussion
Feb 19	20th	Lab	Forest Ecology	Field orientation (OSBS)	Group 2 leads lab & **Water report due**
	22nd	Lecture	Forest Ecology	Define questions, methods, and logistics	Group 2 leads discussion
Feb 26	27th	Lab	Forest Ecology	Field data collection (OSBS)	Group 2 leads logistics
	29th	Lecture	Forest Ecology	Summary and statistics planning	Group 2 leads discussion
Mar 5	6th	Lab	-	SPRING BREAK – NO CLASS	-
	8th	Lecture	-	SPRING BREAK – NO LAB	-

Drone Ecology Syllabus, Spring, 2018

Mar 12	13th	Lab	Forest Ecology	Data analysis and writing (ACF / PC lab)	Group 2 leads
	15th	Lecture	Wildlife Ecology	Drones for Wildlife Ecology & Sustainability (Wildlife)	Group 3 leads discussion
Mar 19	20th	Lab	Wildlife Ecology	Field orientation (TBD)	Group 3 leads lab & **Forest report due**
	22nd	Lecture	Wildlife Ecology	Define questions, methods, and logistics	Group 3 leads discussion
Mar 26	27th	Lab	Wildlife Ecology	Field data collection (TBD)	Group 3 leads logistics
	29th	Lecture	Wildlife Ecology	Summary and statistics planning	Group 3 leads discussion
Apr 2	3rd	Lab	Wildlife Ecology	Data analysis and writing (ACF / PC lab)	Group 3 leads
	5th	Lecture	Fire Ecology	Drones for Fire Ecology and Management (Fire)	Group 4 leads discussion
Apr 9	10th	Lab	Fire Ecology	Field orientation (TBD)	Group 4 leads lab & **Wildlife report due**
	12th	Lecture	Fire Ecology	Define questions, methods, and logistics	Group 4 leads discussion
Apr 16	17th	Lab	Fire Ecology	Field data collection (TBD)	Group 4 leads logistics
	19th	Lecture	Fire Ecology	Summary and statistics planning	Group 4 leads discussion
Apr 23	24th	Lab	Fire Ecology	Data analysis and writing (ACF / PC lab)	Group 4 leads
	26th	-	-	NO CLASS	-
Apr 30	May 1st	-	-	NO CLASS	**Fire report due**

* May be subject to change at instructor's discretion depending on weather, availability, logistics, etc… Ample notice will be provided.

References, grouped by module theme

Spatial Ecology & UAS overview

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Forest Ecology & Monitoring

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Wildlife Ecology & Conservation

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