

PHY 115: Descriptive Astronomy Fall 2008

The seeds of great discoveries constantly float around us, but only take root in minds prepared to receive them- Joseph Henry

Text: *Pathways to Astronomy* (with Starry Night CD), S. Schneider, T. Arny.

Instructor: Dr. Matt Marone Room 243 Science and Engineering Building

Phone 301-2597, e-mail: marone_mj@mercer.edu

Office Hours: T 2:00-3:00 SEB 219 or by appointment. You may also email me your questions.

Lecture: Section 1 MWF 11:00-11:50 Room 144 Science and Engineering Building

Lab: R 6:30PM-10:00 PM. Locations are Room 214 Science and Engineering Building, "Duck Pond", or the Vullo's field. Location depends on conditions or laboratory objectives. Labs will be 2 hours and 40 minutes. Starting time will depend on sunset and you will be notified of the starting time for that week.

Additional Equipment: A small **red** flashlight is required and must be purchased by the student. A low cost LED flashlight can be found at local discount and hardware stores. You will also need clothing and supplies appropriate for field work as described below.

General:

This is an introductory Astronomy class. Astronomy is the oldest of the observational sciences. Observing the sky is a very important part of this class. We will not only learn about current theories in astronomy but we will go out and observe the night sky. By the end of this class you will be familiar with astronomical terminology, theories, and be able to perform some simple calculations. You will also learn how to setup and properly use a telescope. There are 88 official constellations, not all of which can be seen in our location. You will, however be able to find some of the more common constellations, asterisms, and deep sky objects. Since this is a Physics class, we will discuss the physical principles behind the topics we cover.

We will have to travel off campus to dark sites for much of our viewing. You will need to provide your own transportation and help transport equipment. If you are transporting equipment, you must **arrive 30 minutes before the start of lab**. The best time to observe is on cold clear winter nights. These are also the least comfortable. You should be prepared for cold dark nights in remote locations away from lights and restrooms. Dr. Marone, the Physics Department and Mercer University will not be held responsible or liable for your safety. This is your own personal responsibility. To participate in this class you must agree to this and other transportation and safety rules.

Grades:

A (90 and above), B+ (85-89), B (80-84), C+ (75-79), C (70-74), D (60-69) F (below 60)

Your Final class grade will be derived from the following percentages **less** any deductions from your final average.

Average of 4 Tests (45%)
In-class Quiz (10%)
Final Exam (15%)
Labs (30%)

You will **not** be graded on a “**curve**”.

Extra Credit will only be available on in class exams, **if** available at all.

Deductions: Our observing sessions are not parties or social events. For some reason students become very “chatty” when out in the field. Setting up the telescopes and finding objects can be difficult and we need to concentrate. You need to be fully engaged and not standing around with your hands in your pockets complaining about how cold it is. We are not interested in your alcohol capacity, romances or the latest gossip. If I feel you are talking too much and causing a distraction, you will be warned. After that warning you will receive 3 point deductions from your final average for each incident. It is very easy to lower your grade by one letter or more.

Observing Sessions: You are required to be at the observing site on time. Please allow yourself enough time to travel to the site. If you are more than 15 minutes late to a session, you will have points deducted from your grade for that lab. You will lose points at a rate of **2 points per minute after the 15 minute grace period**. You are required to **sign in and out** of the observing session. Observing the sky is a very important part of this class. The weather does not always cooperate with our intentions. There are some nights that we may be clouded or rained out. This is common in astronomy. When lab is not held at the observing site, we will meet in the lab room (214 SEB). Some nights we will work with computer simulations and there will be no observing session. I will try to e-mail the class if there is a change in plans. If it is obviously raining, just come to the lab room. It is important that you check your e-mail for any schedule changes. Many students do not use their Mercer e-mail. I must have an e-mail address that you check on a regular basis. **Please e-mail me as soon as possible**, so that I can create an e-mail list for the class. Some instructors will require you to attend special evening events. According to the Dean of our college; your lab class has priority over such events if the exact dates are not listed in the syllabus for that class. If there is a conflict between this lab class and a scheduled class event you must try to resolve the conflict with your instructor. If you are unable to resolve the conflict, please let me know.

If you miss an observing session for a valid excuse (as Defined by the University Handbook) you can make up the credit by one of three ways. You may attend a public observing session at the Macon Museum of Arts and Sciences. These sessions are held on clear Friday nights. You should call the museum for exact times. You can also make up the credit by attending an observing session with the Middle Georgia Astronomical Society. Their observing schedule can be found at <http://www.mgas.org/>. One final way to make up the credit is to attend an observing session with the Mercer Astronomy Club. Students often meet on the weekends at the same location we use. In all cases you will be required to document your make up session. I will provide you with the necessary form, which must be signed by the session leader.

The best indicator of observing conditions is the “Clear Sky Clock” which can be found at <http://cleardarksky.com/c/MaconGAkey.html>

Electronic Submission of Assignments:

Students bear sole responsibility for ensuring that papers or assignments submitted electronically to a professor are received in a timely manner and in the electronic format(s) specified by the professor. Students are therefore obliged to have their e-mail client issue a receipt verifying that the document has been received. Students are also strongly advised to retain a copy of the dated submission on a separate disk. Faculty members are encouraged, but not required, to acknowledge receipt of the assignment

Tests: Make-up exams will only be given to students with valid excuses as defined by the university handbook (illness, emergency, class trips with prior notification). The make-up exam may be harder or easier than the regular in-class exam. Any disputes concerning a test grade must be resolved within one week from the time the tests are returned or from the time the grades are made known to the class. Partial credit will be awarded depending how many steps were done correctly in a multi-step problem. The amount of credit will be at the discretion of the instructor. ***No equation sheets are permitted.*** A list of useful equations and constants will be provided with the test.

Quizzes: There will be a 5-10 minute quiz every week. This quiz will cover any material discussed in class up to that point of time. Make-up quizzes are subject to the same conditions as make-up tests. The Quiz will usually be on Friday. It may be necessary to change the day and the change will be announced.

Final Exam: The final exam may include **any** material discussed in class. Make-up exams will be subject to the same conditions as make-up tests.

Homework: Homework problems will be posted on a class web page. These problems will not be graded, but it is suggested that students work all the homework problems. Homework problems will occasionally show up on tests and quizzes so you need to do them.

Honor code: You are bound by the Mercer honor code. The College’s academic misconduct policy will be followed. All work, for which a grade is received, must be the **original** work of the **student** without aid or assistance of another party, or any printed and or electronic data/information. Academic misconduct cases will be referred to the honor council and the student will automatically receive a grade of incomplete (IC) pending a ruling by the honor council.

Cell Phone and Pager Usage: Out of courtesy for all those participating in the learning experience, all cell phones and pagers must be turned off before entering any classroom, lab, or formal academic or performance event

Classroom etiquette: You are expected to conduct yourself as a mature student, respectful of your classmates and instructor. You may be asked to leave the room if your behavior is disturbing the instructor or your fellow students.

Documented Disability Statement:

Students with a documented disability should inform the instructor at the close of the first class meeting. The instructor will refer you to the office of Student Support Services (SSS) for consultation regarding evaluation, documentation of your disability, and recommendations for accommodation, if needed. Students will receive from SSS the *Faculty Accommodation Form*. On this form SSS will identify reasonable accommodations for this class. The form must be given to the course instructor for signature and then returned to SSS.

To take full advantage of disability services, it is recommended that students contact the Office of Student Support Services, immediately. The office is located on the third floor of the Connell Student Center.

Important Dates

Late Registration Drop/Add August 19-22

**Last day for late registration, drop/add, and to apply for the Georgia tuition grant
August 22**

Holiday - Labor Day September 1

Fall Break October 9-10

Last Day for Course Withdrawal October 24

Thanksgiving Break November 26-28

Last class day December 5

FINAL EXAM: December 11

9:00 a.m. - 12:00 p.m.

**Tentative List of Units to be
Covered**

Unit 1 Our Planetary Neighborhood
Unit 2 Beyond the Solar System
Unit 3 Astronomical Numbers
Unit 5 The Night Sky
Unit 40 Mars
Unit 43 Jupiter and Saturn
*****Test 1*****
Unit 11 Planets
Unit 12 Beginnings of Modern
Astronomy
Unit 70 Stars of the Milky Way
Unit 72 Gas and Dust in the Milky Way
Unit 41 Asteroids
Unit 47 Comets
Unit 48 Impacts on Earth
***** Test 2*****
Unit 21 Light Matter and Energy
Unit 22 The Electromagnetic Spectrum
Unit 23 Thermal Radiation
Unit 24 Atomic Spectra
Unit 25 The Doppler Shift
Unit 6 The Year

Unit 7 The time of Day
Unit 37 Our Moon
Unit 8 Lunar Cycles
Unit 9 Calendars
*****Test 3*****
Unit 10 Geometry of EMS
Unit 49 The Sun
Unit 50 The Sun's Source of Power
Unit 51 Solar Activity
Unit 52 Surveying the Stars
Unit 54 Light and Distance
Unit 55 Composition and Temperature
of Stars
Unit 56 The Masses of Orbiting Stars
Unit 57 The Size of Stars
*****Test 4*****
Unit 58 The H-R Diagram
Unit 59 Stellar Evolution
Unit 60 Star Formation
Unit 61 Main Sequence Stars
Unit 62 Giant Stars
Unit 63 Variable Stars
Unit 74 A Universe Of Galaxies
Unit 75 Types of Galaxies

Annual Meteor Showers

Date	Description	Duration
January 4	Quadrantids: Radiant--Bootes. Very short lived shower, less than one day. Variable rate, but generally around 60 per hour. Speed 41 kps and bluish color.	
January 16	Delta Cancrids: Radiant--just west of Beehive. Minor shower, rate about 4 per hour. Very swift.	
January 18	Coma Berenicids: Radiant--near Coma star cluster. Only one or two per hour, but among fastest meteors known--65 kps.	
February 26	Delta Leonids: Radiant--midway in Leo's back. Feb. 5 to Mar. 19 with peak in late Feb. 5 per hour at 24 kps.	
March 16	Corona-Australids: Radiant--16 hr 20 min, -48 deg. 5 to 7 per hour from Mar. 14 to Mar. 18.	
March 22	Camelopardalids: No definite peak, with only one per hour. Slowest meteors at 7 kps.	
March 22	March Geminids: Discovered in 1973 and confirmed in 1975. Rate generally about 40 per hour. Seem to be very slow meteors.	
April 4	Kappa Serpentids: Radiant--near Corona Borealis . 4 or 5 per hour from Apr. 1 to 7.	
April 7	Delta Draconids: Radiant--near Cepheus border. From Mar. 28 to Apr. 7. Slow meteors at about 5 per hour.	
April 10	Virginids: Radiant-- near Gamma in bowl of Virgo. 20 per hour.	
April 15	April Fireballs: Radiant-- between The Water Jar and Scutum, very erratic. From April 15 to 30 many bright bolides from Southeastern sky.	
April 17	Sigma Leonids: Radiant-- at Leo Virgo border actually has moved into Virgo in recent years. Weak shower of 1 to 2 per hour.	
April 22	Lyrids: Radiant-- near Vega. 15 per hour, bright and long lasting meteors. From Comet Thatcher.	
April 25	Mu Virginids: Radiant--near Libra. 7 to 10 per hour of medium speed meteors.	
April 28	Alpha Bootids: Radiant-- near Arcturus. From Apr. 14 to May 13. Slow meteors with fine trails.	
May 1	Phi Bootids: Radiant--near Hercules. From Apr. 16 to May 12. 6 per hour.	
May 3	Alpha Scorpiids: Radiant-- Near Antares. From Apr. 16 to May 9.	
May 4	Eta Aquarids: Radiant-- near Water Jar. From Apr. 21 to May 12. 21 per hour, yellow with bright trails. Comet	

	Halley debris.	
June 3	Tau Herculids: Radiant--near Corona Borealis. About a month long, 15 per hour max, most quite faint.	
June 5	Scorpiids: Radiant--near Ophiuchus. 20 per hour with some fireballs.	
June 7	Arietids: About 30 per hour. Slow moving with some fireballs.	
June 13	Ophiuchids: Radiant-- near Scorpius. Only 3 per hour but fast moving bolides are common.	25 days
June 16	June Lyrids: Radiant--near Vega. Another part of May Lyrid meteor stream. 15 per hour, faint blue meteors.	
June 20	Ophiuchids: Radiant-- near Sagittarius. Rate varies from 8 to 20, with occasionally many more.	
June 30	June Draconids: Radiant--near handle of Big Dipper. Rate varies from 10 to 100 per hour. Pons-Winnecke Comet is parent.	
July 28	Delta Aquarids: Radiant--near Capricornus. 25 per hour, slow (24 kps) with yellow trails.	40 days
July 30	Capricornids: Radiant--near Aquarius. Tough to tell these from Delta Aquarids. 10 to 35 per hour with bolides.	
August 10	Perseids: Radiant--near Double cluster. 50 to 100 per hour, yellow with trails and bolides. The best modern dependable shower.	5 days.
August 20	Kappa Cygnids: Radiant--near Deneb. 12 per hour with many fireballs. Duration--15 days.	
August 31	Andromedids: Radiant-- near Cassiopeia. Occasionally spectacular, usually 20 per hour. Some red fireballs with trails. Biela's Comet parent.	
September 23	Alpha Aurigids: Radiant-- near Capella. 12 per hour, fast with trails.	
October 7	Piscids: Radiant--near Aries. 15 per hour at 28 kps.	
October 9	Draconids: Radiant--near Hercules. Spectacular when comet Giacobinni-Zinner passes near Earth. 200 per hour when comet is close is not uncommon, 1000 per hour sometimes.	
October 20	Orionids: Radiant--near Taurus. 30 per hour, fast (67 kps) often in colors with long trails.	8 days.
November 5	Taurids: Radiant--near Pleiades. 10 per hour with many fireballs. Debris from comet Encke.	45 days.
November 12	Pegasids: Radiant--Near Square. from Oct. 10 to late Nov., 10 per hour, used to be spectacular.	
November	Leonids: Radiant--near Sickle. Most	4 days.

17	spectacular of modern showers. 1966 saw 500,000 per hour-- 140 per second. Comet Temple--Tuttle is parent. 20 per hour between 33 year shows, fastest known at 71 kps.	
December 10	Monocerids: Radiant-- near Gemini. 12 per hour.	
December 11	Sigma Hydrids: Radiant--near Head. 12 per hour, fast.	
December 14	Geminids: Radiant--near Castor. 60 per hour, many bright, white but few trails. Icarus, the Earth-crossing astroid seems to be the parent.	6 days.
December 14	Leo Minorids: 10 per hour, somewhat faint. Discovered by amateurs in 1971.	
December 20	Delta Arietids: 12 per hour, must view in early evening, before radiant sets.	
Dec. 22	Ursids: Radiant--Little Dipper Bowl. Medium speed, 20 per hour, many with bright trails.	2 days

Field Work and Cautions

We will be outside for several hours at night. There are certain hazards associated with such activities. Our location is away from city lights because we need a dark sky. The observing area needs to remain dark so that we can see faint objects. You must not cause any light pollution with car headlights or flashlights. This presents a tripping hazard, since it is difficult to see where you are walking. Red light will preserve our night vision, so students must only use Red LED flashlights.

Since the weather will be cold in the winter, you should dress appropriately. Dress in layers and bring or wear the following items:

Jackets

Gloves

Long underwear

Blankets

A thermos with a warm drink is helpful

There are dangers associated with the local flora and fauna. Among these are poisonous plants, mosquitoes, ticks, and snakes. We will be near a lake so mosquitoes will be particularly troublesome in the spring. Some mosquitoes can carry West Nile virus and you should use repellent containing DEET. The Biology department has extensive information concerning field work and hazards which can be found at

http://bio-oak.mercer.edu/misc/field_work.htm

You are **required** to read and comply with the policies and suggestions found at the following links:

<http://bio-oak.mercer.edu/misc/tick.htm>

<http://bio-oak.mercer.edu/misc/mosquito.htm>

<http://bio-oak.mercer.edu/misc/transportation.htm>

http://bio-oak.mercer.edu/misc/field_work.htm

You will sign a statement that you read and understood these policies before you are allowed to attend the observing sessions.

The University will not provide transportation. You must provide your own transportation and travel at your own risk. You are expected to arrive at the observing site on time and we will not wait for you. Dr. Marone, the Physics Department and Mercer University will not be held responsible or liable for your safety. This is your own personal responsibility.

If you cannot comply with these requirements you must drop the class.

Directions to the Duck Pond (Tobesofkee Recreation Area E) **Observing Site**

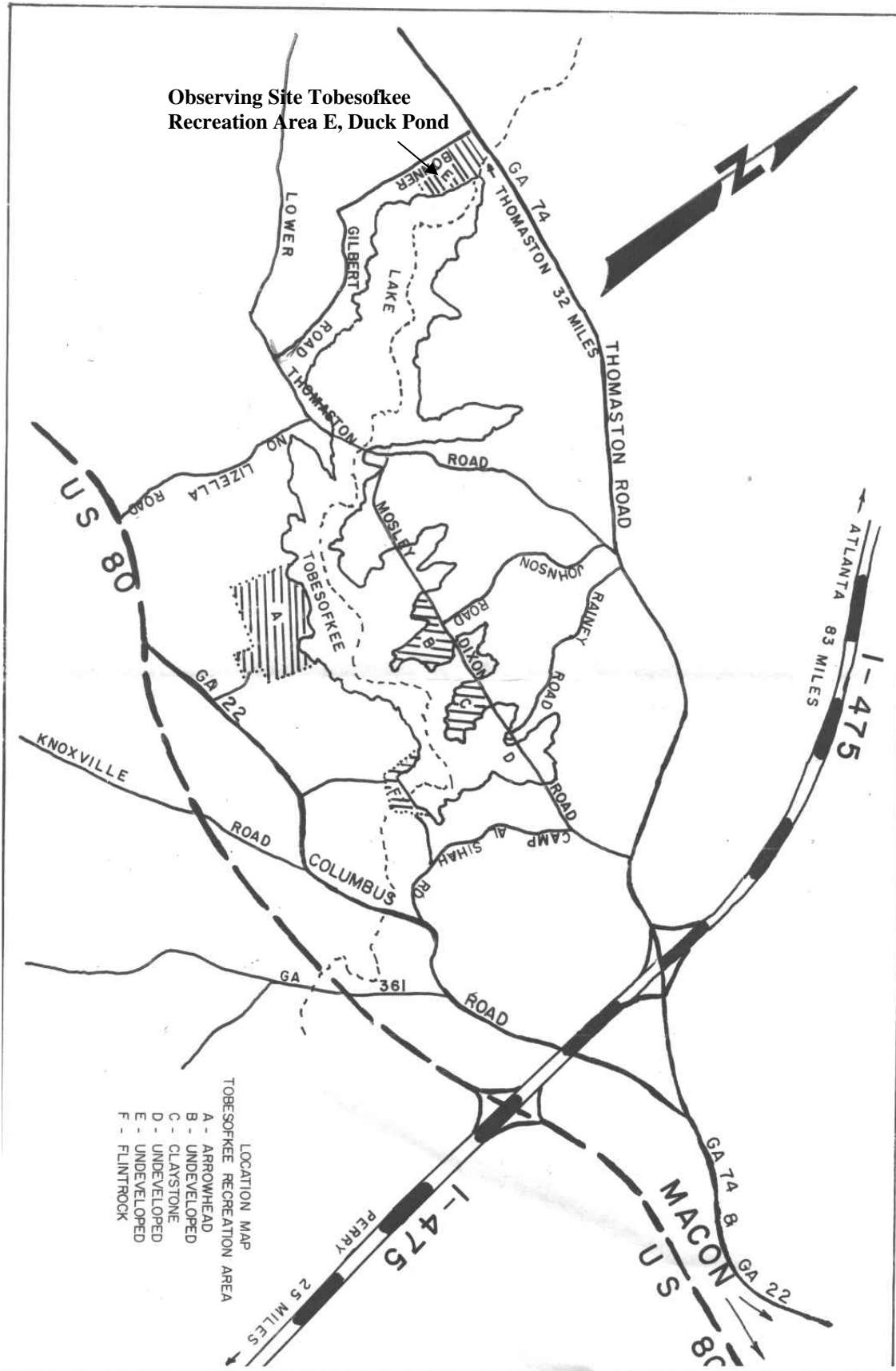
You should make your first visit to this site in the **daylight before our lab** so that you will not get lost.

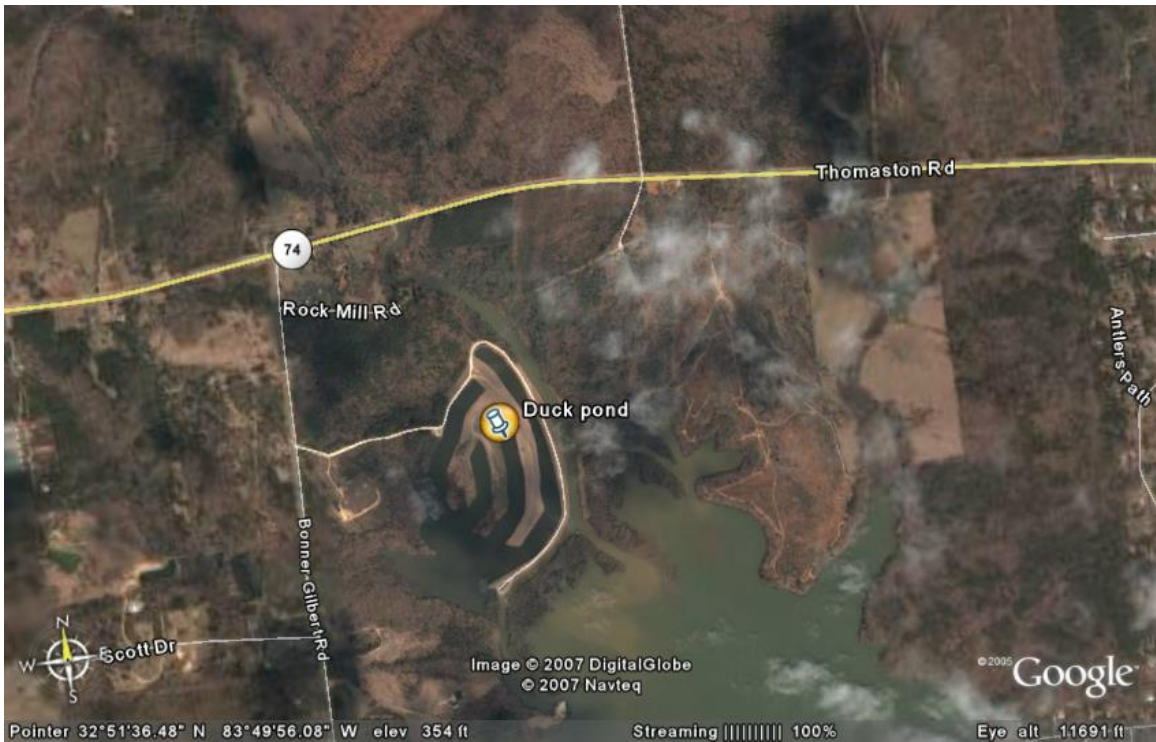
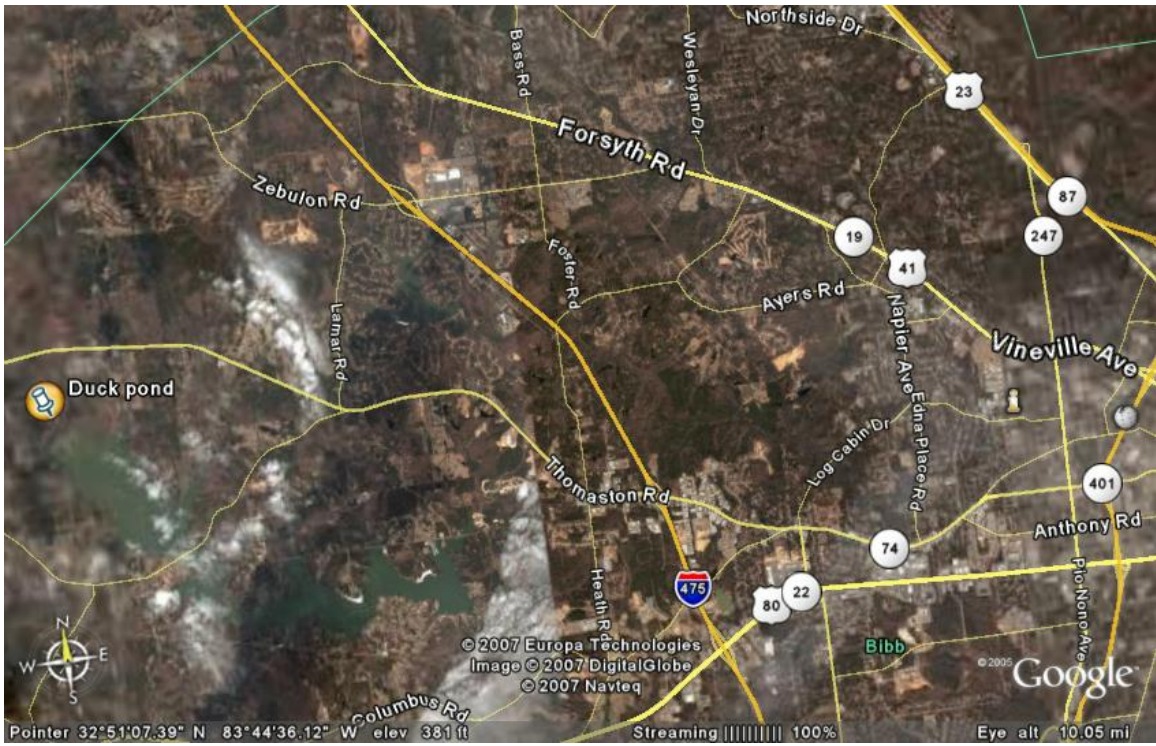
Total distance about 12.3 mi. Watch out for deer and other animals on the road!

There are no restroom facilities at the site

- 1) Exit Campus from the South Campus Entry and turn Right (West) onto Mercer University Drive in the direction of the Mall
- 2) Mercer University Drive becomes Thomaston Rd. near the I-475 overpass
Continue on Thomaston Rd until you cross Tobesofkee Creek. This is about 11.8 mi from campus
- 3) Turn left onto Bonner Gilbert Rd. which is about 0.2mi from the bridge.
- 4) Continue South on Bonner Gilbert Rd. for 0.3mi
- 5) Turn Left into the recreation area entrance. There is a sign but it is hard to see!
- 6) Continue down the dirt road and you will see a Red flashing light on the right at the observing site.
- 7) Be sure to park on **hard ground** (see illustration below)

**Observing Site Tobesofkee
Recreation Area E, Duck Pond**







Park
around
here

Observing

Duck pond

Image © 2007 DigitalGlobe
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Pointer 32°51'36.24" N 83°50'07.14" W elev 351 ft Streaming ||||| 100% Eye alt 1980 ft

