COASTAL MORPHOLOGY & PROCESSES (GEOL 363/563 or EVPP 363/563)

Spring 2022
Thursdays (4:30 to 7:10 p.m.) in Exploratory Hall 1005
Primarily face-to-face lectures

Professor: Dr. Randy McBride
Office: 3417 Exploratory Hall (Fairfax campus) and 3118 Potomac Science Center
Office hours: by appointment
e-mail: rmcbride@gmu.edu

REQUIRED TEXTS: Davis, R.A. and Fitzgerald, D., 2020. Beaches and Coasts, Wiley, 2nd edition, 536 p. **e-Book (ISBN: 978-1-119-33451-4)** or Hardcopy (ISBN: 978-1-119-33448-4). NOTE: I highly recommend ordering the e-Book because it's less expensive!

Note: Additional readings may be assigned.

COURSE DESCRIPTION: This course explores global coastal geomorphology, with an emphasis on U.S. Atlantic and Gulf coasts. Primary environments to be discussed include barrier systems, estuaries, deltas, and chenier plains. Factors affecting coastal morphology will be examined, such as plate tectonics, eustatic and isostatic changes, fluctuations in sediment supply, wave and tidal energy, and storm impacts (i.e., hurricanes, winter storms). Important environmental issues will also be addressed including sea level rise, shoreline erosion, wetland loss, and pollution (e.g., oil spills). A major weekend field trip is an essential element of this class.

GOAL: Examine form/process relationships along different coasts (both in the classroom and in the field) so students will have a familiarity with primary coastal environments worldwide.

PREREQUISITES: Undergraduates- GEOL 101 and GEOL 102, as well as GEOL 317 or GEOL 309 or BIOL/EVPP 309 or 9 credit hours in geography including GEOG 309; Graduates- Geology or Oceanography course or permission of instructor.

COURSE REQUIREMENTS: Attendance at lectures, reading of textbooks and journal articles, participation in class-led discussions, completion of written exams, participation in a major field trip, submittal of handwritten field books and digital photojournals, preparation of a multi-stage term paper, and an oral presentation in class (graduate students only) and in the field for all students (Note: term papers will be compiled into a class field guidebook as individual chapters). ***Participation in 3.5-day field trip is required***.

METHOD OF INSTRUCTION: Lectures given by & discussions led by instructor/guest speakers/students during class times and during field trips; student-led discussions in class and/or in the field; reading of class textbooks and journal articles outside of class; and an "in-the-field" presentation by each student regarding their term paper locality and topic. Portions of this class will emphasize the technique of ***active learning***. In other words, ***student-centered learning*** instead of teacher-centered learning.

TECHNOLOGY: Students are required to use PowerPoint and to communicate via e-mail, use Blackboard (e.g., Collaborate Ultra), and conduct web-based research. All registered GMU students are allocated a GMU e-mail account.

***************TENTATIVE TOPICS: SUBJECT TO CHANGE WITHOUT NOTICE*****************

DATE	**TOPIC**	**READINGS** (D = Davis & Fitzgerald)
Jan 27	Introduction; Plate Tectonics	Ch. 1 & 2 (D)
Feb 3	Plate Tectonics, the Seafloor, & coasts	Ch. 2 & 3 (D)

Feb 10	Coastal Change: Relative & Eustatic Sea Level (Transgressions & Regressions)	Ch. 4 (D)
Feb 17	Coastal Processes: Waves	Ch. 6 (D)
Feb 24	Coastal Processes: Tides ***By 11 pm, students email paper outline, figures, & references (Word attachment); $10.00 for field trip***	Ch. 7 (D)
Mar 3	Storms ***By 11 pm, graduate students email talk outline, references, & figures (Word attachment)***	Ch. 5 (D)
Mar 10	EXAM	
Mar 17	Spring break, no class	
Mar 24	Beach & Barrier Systems ***By 11 pm, students email paper (1st complete version) to professor***; ***classmate assigned for peer review***	Ch. 13, 14, & 15 (D)
Mar 31	Tidal Inlets & Estuaries (graduate student presentation) ***By 11 pm, each student emails peer review to professor (paper w/ track changes + 2 filled out rubrics)***	Ch. 16, 9-12 (D)
Apr 7	Former Tidal Inlets (graduate student presentation) ***By 11 pm, each student emails fully-revised paper to professor (2nd version, Word)***	Ch. 16 (D)
Apr 14	Deltas; Mississippi River Delta & Chenier Plains	Ch. 8 (D)
Apr 17	***Professor emails edited paper (Word Track Changes) to each student***	
Apr 21	Catchup, class discussions, & field trip preparation ***In class, each student hands in final, fully revised, camera-ready papers (3rd final version, 1 hard copy [Do not staple your paper, just use a paper clip])***	
Apr 28-May 1	Coastal Field Trip (coastal VA, MD, & DE)	Ch. 15 & 16 (D)
May 5	Exxon Valdez oil spill, Alaska ***By 11 pm, profesor emails take-home final exam***	Ch. 17 & 18 (D)
May 16	Take-home final exam due by 1 pm at Front Desk in 3400 Exploratory Hall (***In a sealed envelope, submit a 1) hardcopy of final exam, 2) digital photojournal [PPT file saved on a memory stick], & 3) hardcopy of field note book***)	

IMPORTANT DATES:

Feb 24	***By 11 pm, students submit detailed paper outline, primary figures w/ captions, & references***. Also, cash or personal check for field trip is due ($10.00) to reserve spot and covers unexpected expenses (e.g., tolls, entrance fees to lighthouses, etc.)
Mar 3	***By 11 pm, graduate students email talk outline, references, & figures (Word attachment) for oral presentations***
Mar 10	Mid-term Exam
Mar 14-18	Spring Break
Mar 24	***By 11 pm, students email paper (1st complete version) to professor***
Mar 31	***By 11 pm, each student emails peer review to professor (paper w/ track changes + 2 filled out rubrics)***

Apr 7	***By 11 pm, each student emails fully-revised paper to professor (2nd version, Word)***
Apr 17	***Professor emails edited paper (Word Track Changes) to each student***
Apr 21	***Final, fully-revised, camera-ready copy (hard copy) of term paper due: 3rd version***
Apr 28-May1	Major class field trip to coastal Virginia and Maryland (meet at 12:30 pm & depart Exploratory Hall loading dock by 1:15 pm on Thursday and return Sun evening). Will involve riding in GMU vans and VIMS boats, all day hiking in primitive conditions and staying at marine lab dormitory in Wachapreague, VA & camping one night.
May 16 by 1 pm	Take-home final exam (comprehensive) due plus digital photojournals (saved on memory stick), & field hard-copy notebook

GRADING:

	Undergraduates	Graduate
Mid-term exam	18%	15%
Final exam	22%	20%
Full lecture & Outline (grads)	Na	10%
Field Guide Chapter (term project)	35%	30%
Paper Outline, Figures, & References (5%)		
1st draft of Paper (classmate peer review; satisfactory or unsatisfactory [up to 5% deducted on 2nd draft grade for reviewer & author])		
2nd draft of Paper (15% undergrad/10% grad)		
Final, Revised, Camera-Ready Copy (5%)		
Field Oral Presentation (10%)		
Digital Photojournal & Field Notebook for Field Trip	12%	12%
Field Trip Participation	8%	8%
Classroom participation	5%	5%
	100%	100%

Extra Credit: Attend a GMU Writing Center one-hour session regarding the editing of your research paper and provide signed documentation from Writing Center (5% on paper grade only). More details later.

Exams may cover lectures, mini-lectures, text readings, assigned articles, PowerPoint slides, overheads, video clips, field trip information & localities, and any handouts. Exams must be taken as scheduled. **Makeups will not be given**, unless for exceptional circumstances, and only if scheduled PRIOR to the exam date with a legitimate excuse (e.g., signed doctor's excuse). Otherwise, any missed exams will be scored a "zero."

GRADE SCALE:
A+ = 97-100%
A = 93 - 96%
A- = 90 - 92%
B+ = 87 - 89%
B = 83 - 86%
B- = 80 - 82%
C+ = 77 - 79%
C = 73 - 76%
C- = 70 - 72%
D = 60 - 69%
F = 0 - 59%

Adherence to The GMU Honor Code is expected of all students.

ORAL PRESENTATION (GRADS):

Each graduate student will provide a 40 to 45-minute PowerPoint talk on a certain topic as outlined below and then lead a discussion on it. The talks will emphasize the coastal/oceanographic/geologic processes and impacts to shoreline geomorphology. Talks should be dominated by photographs, satellite images, video clips,

quantitative data & graphs, maps, quantitative modeling, or simulations that show and explain the physical processes and geomorphic response of the shoreline. Your outline, references, and primary figures are due as scheduled above. Presentations will be given in class as scheduled and should include the following minimum components: ***Title***, ***Intro & Objectives, Location Map***, ***Regional Setting, Brief Methods if applicable***, ***Results***, ***Discussion,*** and ***Conclusions***. Also, on the day of your presentation, submit a digital copy of your PowerPoint presentation on a memory stick, as well as any video clips.

Topics:

1. Comparison of Holocene relative sea-level changes along the US Atlantic coast, Brazilian coast, and Australian coast over the past 10,000 years (Cat)
2. Astronomical tides of the Chesapeake Bay: How do they work? (Carissa)
3. Impact of relative sea-level rise on coastal wetlands: U.S. Atlantic coast vs. coastal Louisiana

FIELD TRIP

This course involves one required 3.5-day field trip. Transport will be provided using GMU vans connected by CB radios. The field trip will go to coastal VA, MD, and DE and will involve staying at marine lab housing. To reserve a spot, **all students must pay $10.00** (cash or check) by the deadline stated above (important dates), which covers unexpected expenses such as tolls, entrance fees to lighthouses & parks, etc. ***but not meals***. Meals will be prepared on site by students or obtained at restaurants. ***NOTE: It is suggested that each student bring ~$45.00 as spending money for the field trip.***

DIGITAL PHOTOJOURNAL & FIELD NOTEBOOK

Each student will prepare their own unique digital photojournal and field notebook by documenting the daily scientific aspects, observations (i.e., date, time, moon phase, field location, field conditions [weather, temperature, wind direction & speed, wave height, tidal range, etc.]), and discoveries while on the coastal field trip through actual, high-quality digital photos and video clips taken using their personal cell phone or digital camera. These digital photos and video clips, along with explanatory text (see entry below), field notes, and figures, will be compiled chronologically in PowerPoint (ppt file) to document the student's scientific exploration during the 3.5-day field trip. Each student must have a high-quality cell phone or digital camera and field notebook. Also, I recommend field books with waterproof pages in case it rains or dropped in water.

April 26, 2014 (full moon- spring tides)
Oregon Inlet, NC; 70^{o} F w/ clear sunny skies, moderate E winds (15 knots), 1 m waves; spring low tide (-1m)

1230 Lunch on beach

1300 Walking on flood-tidal delta, take photos and video clip; winds change to NW, seas calm; swash bars on flood ramp exposed (see simple sketch below). Susan McWilliams gives talk on Oregon Inlet w/ following points: XXXXXX

1400 Heading north along Outer Banks to Jockey's Ridge, NC (large sand dune)

FIELD GUIDE CHAPTER (Term Project):

Each student will be responsible for writing a term paper (8 pages for undergrads; 10-12 pages for graduates) about a certain field locality or specific topic that is directly related to our major field trip in April. A topic will be assigned to each student from the enclosed prepared list. When completed, the individual papers will be compiled into a field guidebook that we use on our coastal field trip. There are ***six stages*** to the field guide chapter and the stages are worth a certain percentage of your grade: 1) detailed paper outline, primary figures and figure captions, & references, 2) 1st draft, 3) peer review of your paper by a classmate, 4) 2nd revised draft, 5) professor review of 2nd draft, and 6) final, fully revised, camera-ready copy. Grading of the field guide chapter will be based on adherence to the guidelines below and overall scholarly quality. **Ten points will be subtracted for each day the particular assignment is late**.

The purpose of the term project is threefold: 1) gain experience writing in the scientific style; 2) experience the difference between writing about something and observing something in the field, and 3) contribute to the compilation of a field guidebook. The scientific writing style is concise, factual, non-verbose, and nonfiction. It

should not contain jargon and should be presented in a logical fashion so that facts build upon facts. Scientific writing is no place for fanciful leaps of faith or implied truths. Facts rule! In terms of the audience, assume the reader has your working knowledge of geology, geomorphology, environmental science, and/or physical geography.

Paper Outline, Figures with Captions, & References

Submit a detailed outline of your paper in the correct format as described below including the following: official title, name, affiliation, all primary headings, potential secondary headings, text bullets, primary figures (especially the location diagram) and typed figure & table captions, and 5 (undergraduate) or 10 (graduate) references. In other words, you should submit a complete skeleton of your paper (framework is there, only the sentences are needed). Your outline should NOT contain paragraphs of written text, just headings and bullets points.

The reference section must contain at least 5 bibliographic citations (10 for graduate students) from the following specific sources: journal articles, books, book chapters, government documents, theses/dissertations, and published field guides. Avoid using published abstracts. Five or 10 bibliographic citations (references) represent minimum numbers, you are expected to exceed these minimum numbers. Also, information from the World Wide Web and other sources (e.g., National Geographic) are acceptable but must be in addition to the 5 or 10 citations mentioned above. Newspaper articles are unacceptable sources of information. *NOTE: Avoid citing your textbook as one of your references.*

Research Paper (Field Guide Chapter)

Your term paper should follow the guidelines outlined below and include all the appropriate components and headings. You should consider your paper a completely finished manuscript (1st version). Classmates will peer review (review/edit) your term paper and return it so you can make further revisions/corrections/additions for submittal of your 2nd version to professor. Professor will return edited paper so the author can further revise paper for final camera-ready version (3rd version). ***A grading rubric and guidelines will be provided to explain the classmate peer-review process. Furthermore, each peer reviewer will receive either a satisfactory (no points deducted) or unsatisfactory grade with up to 5% points deducted from 2nd draft grade for unsatisfactory work.***

1. Papers should be ***eight typed pages for undergraduates and 10-12 typed pages for graduate students*** (excluding figures, tables, references, and appendices), double-spaced, 1" margins on all four sides, a simple 11-point font (e.g., Times Roman), and fully justified.

2. Each page should be numbered sequentially in the upper right-hand corner (this means that every page you hand in should have a page number including the references, all figures & tables, and appendices).

3. Spelling errors are unacceptable (use your spell-checker and proofread your text before submittal) because points will be subtracted for misspellings.

4. Your paper should follow an outline of a scientific paper with primary headings and format as shown below:

Morphodynamics of Oregon Inlet, Outer Banks of North Carolina

Joe Green
Department of Atmospheric, Oceanic, and Earth Sciences
George Mason University
Fairfax, Virginia 22030

Abstract (½ page, single spaced)

- Extremely concise overview of field locality or topic (250 words or less)
- Address primary points regarding morphology, processes, deposits,or environments
- Address primary human factors in field locality if applicable (e.g., jetties)

Introduction (≤1 page; one or two paragraphs each; double spaced)

- General introductory statement
- Scope of paper (e.g., What will be covered in your paper?) In other words, physical and scientific boundaries of your topic (i.e., All tidal inlets along Assateague Island or a subset?).
- Literature review (very brief synthesis of most important articles regarding your field locality such as Jones, 1999; Williams et al., 2000)
- Specific scientific goal & objectives of your research paper (i.e., What are you going to do exactly?)

Regional Setting (~½ page)

- Briefly describe where your locality is using a clear ***location map*** showing important geographic locations
- Briefly describe physiographic region, local geology, climate if applicable

Detailed Description (~4 pages)

- Describe modern and/or ancient geomorphic features and quantify processes (e.g., tidal range, average wave height, tidal prism, longshore sediment transport volume & net direction, etc.) responsible for creating the features; compile a table that quantifies the processes; discuss geomorphic evolution of feature or landscape; discuss shoreline change (include figure)
- If applicable, describe coastal engineering structures (e.g., jetties, seawalls, groins) and activities (channel dredging, beach nourishment projects, dune building, etc.)
- Include the most important figures that summarize field locality
- ***Must include a good map or image of study area*** *(e.g., satellite image, photograph, or topographic map at scales of 1:24,000 or 1:64,000 or larger)*
- Specific subheadings may include most or all of the following:
    - Geomorphology
    - Physical Processes (e.g., tidal range, tidal prism, tidal currents, predominant wind direction, average wave height, net longshore transport rate & direction)
    - Shoreline Changes (i.e., change rates)
    - Coastal Engineering Structures (if applicable)

Discussion (<1 page**)**

Conclusions (~½ page)

- What do you conclude from all of the above? What are the primary geomorphic features, processes, deposits, and/or environments? What are the primary points that need reiterating (e.g., geomorphology or policy)? What are the major coastal problems?

References

All material cited in the text (e.g., George, 1998; Abston et al., 1987; McBride and Moslow, 1991) must be listed alphabetically in the reference section (all authors must be listed in the reference section). Follow a specific citation method shown below. ***All ideas not your own must be cited otherwise you have plagiarized. Some paragraphs might include a citation for every sentence (e.g., Regional Setting)***.

Book

Dawson, A.G., 1992. Ice Age Earth: Late Quaternary geology and climate. Routledge Publishers, London, 293 p.

Journal article

McBride, R.A. and Moslow, T.F., 1991. Origin, evolution, and distribution of shoreface sand ridges, Atlantic inner shelf, USA. Marine Geology, v. 97, pp. 57-85.

Paper or chapter in edited book or proceedings volume

Abston, J.R., Dinnel, S.P., Schroeder, W.W, Shultz, A.W., and Wiseman, W.J, Jr., 1987. Coastal sediment plume morphology and its relationship to environmental forcing. Main Pass, Mobile Bay, Alabama. In: Kraus, N. (editor), Coastal Sediments '87, American Society of Civil Engineers, v. 2, pp. 1989-2005.

Government Report

Folger, D.W., 1972. Characteristics of Estuarine Sediments of the United States. U.S. Geological Survey Professional Paper 742, U.S. Government Printing Office, Washington, D.C., 94 p.

Theses and dissertations

George, S.M., 1988. Sedimentology and mineralogy of the Pensacola Bay system. M.S. thesis, Department of Geology, University of Southern Mississippi, 93 p.

Figures

- All figures must be clear and readable (if you can't read it, don't include it!!!)
- Each figure must be numbered sequentially starting with #1 and has a typed figure caption that describes the figure. A citation should occur at the end of the figure caption indicating the source of the figure. For example: *Figure 1. Shoreline changes of Parramore Island, VA from 1871 to 1999 (Vidal and McBride, 1999).*
- Topographic maps should be given a figure number and referenced in the text.

Tables

All tables must be numbered sequentially starting with #1 and have a typed table caption. A citation should occur at the end of the table caption indicating the source of the table (Note: use same format as above for figure caption, except replace Figure 1 with Table 1).

Final, Fully Revised, Camera-Ready Copy

As per the schedule above, your fully revised field guide chapter is due (i.e., a complete hard-copy, camera-ready version including full-text, references, figures, & tables on plain white bond paper). The format of the paper should follow the same above-mentioned guidelines under "Field Guide Chapter."

TOPICS AND/OR LOCALITIES FOR FIELD GUIDE CHAPTERS

1. Global distribution of barrier systems
2. Relative and eustatic sea-level changes along the US Atlantic coast over the past 130,000 years
3. Wave- vs. tide-dominated tidal inlets: geomorphology, processes, and deposits (modern & ancient)
4. Parramore Island, VA: barrier island geomorphology, processes, & shoreline changes
5. Ridge and runnel systems on beaches: formation, migration, and processes
6. Cedar Island, VA: barrier island geomorphology, processes, and former tidal inlets
7. Wachapreague Inlet, VA: geomorphology, processes, and inlet dynamics
8. Storm surge dynamics, overwash processes, and classification systems of storm surge (Sallenger) vs. Saffir-Simpson scale
9. Tracklines, meteorological history, storm surge, and shoreline response (overwash processes, washover deposits) of nor'easters (1962 Ash Wednesday storm, 1974 nor'easter [Leatherman], etc.)
10. Tracklines, meteorological history, storm surge, and shoreline response (overwash processes, washover deposits) of hurricane impacts along the U.S. mid-Atlantic coast (1938 New England Hurricane, Hurricane Gloria, Hurricane Irene, Hurricane Sandy, etc.)
11. Geomorphic evolution of the recurved spit complex at the southern end of Assateague Island, VA [including paleospits and Fishing Point] and the downdrift impacts on the Virginia barrier islands
12. Assateague Island, MD-VA: barrier island geomorphology, processes, and former tidal-inlet dynamics
13. Coastal dunes: depositional processes, formation, and types
14. Ocean City Inlet, MD: geomorphology, coastal processes, engineering structures, and downdrift impacts on northern Assateague Island, MD
15. Indian River Inlet, DE: geomorphology, coastal processes, engineering structures, and the downdrift shoreline impacts

Example paper format:

Human-Estuarine Processes along the Southern Delmarva Peninsula, with Emphasis on the Pocomoke River Basin and *Pfiesteria*-related Outbreaks and Conditions

David A. Greene
United States Geological Survey
Reston, Virginia 20192

Abstract

Recent outbreaks of fish kills, fish lesions, and human health problems in the Pocomoke Sound region of the southern Delmarva Peninsula have been linked to the toxic dinoflagellate *Pfiesteria piscicida*. Certain estuarine water conditions affected by a variety of both natural and human-induced coastal processes appear to trigger drastic responses in this organism. The Pocomoke River watershed of the Southern Delmarva Peninsula contains several environmental characteristics, including relatively high-water temperatures, increased salinity, and low rates of flushing, elevated acidity, high nutrient levels, and isolated storm events that make it a likely site for *Pfiesteria*-related events. This paper will examine the physical, chemical, biological, and anthropogenic conditions and processes of the Pocomoke watershed, which may be contributing to *Pfiesteria* outbreaks and their resultant effects on living resources.

Introduction

Harmful algal blooms have increased in frequency and severity in many U.S. coastal states and worldwide, causing major fish kills and increased risks to natural resources, environmental quality, and human health (Anderson et al., 1993; Anderson, 1995; Boesch, 1996; Barker, 1997). These increases may be due to increased human activity, cyclic or longer-term variations in climate, other natural processes, or some combination of these factors (Anderson, 1995; Boesch, 1996). Harmful algal blooms are normally characterized by the sudden proliferation of particular species of toxic or harmful algae, resulting from a combination of poorly understood physical, chemical, and biological mechanisms and interactions (Anderson, 1995). Most of these events are attributed to a particular class of marine algae called dinoflagellates, which can stay dormant in an encysted form in bottom sediments for years and then suddenly be triggered into a toxic, free-swimming form under certain environmental conditions (Burkholder et al., 1992; Anderson et al., 1993; Anderson, 1995).

INFO SKIPPED

References Cited

Anderson, D.M., Galloway, S.B., and Joseph, J.D., 1993. Marine Biotoxins and Harmful Algae: A National Plan. Woods Hole Oceanographic Institute Technical Report WHOI-93-02, Woods Hole, MA, 44 p.

Barker, R., 1997. And the Waters Turned to Blood. Simon & Schuster, New York, NY, 346 p.

Biggs, R.B., 1982. Estuaries. In: Schwartz, M.L. (editor), The Encyclopedia of Beaches and Coastal Environments, Encyclopedia of Earth Sciences, Volume XV. Hutchinson Ross Publishing Company, Stroudsburg, PA, pp. 393-397.

Burkholder, J.M., Noga, E.J, Hobbs, C.H., and Glasgow, H.B. Jr., 1992. New 'phantom' dinoflagellate is the causative agent of major estuarine fish kills. Nature, v. 358, pp. 407-410.

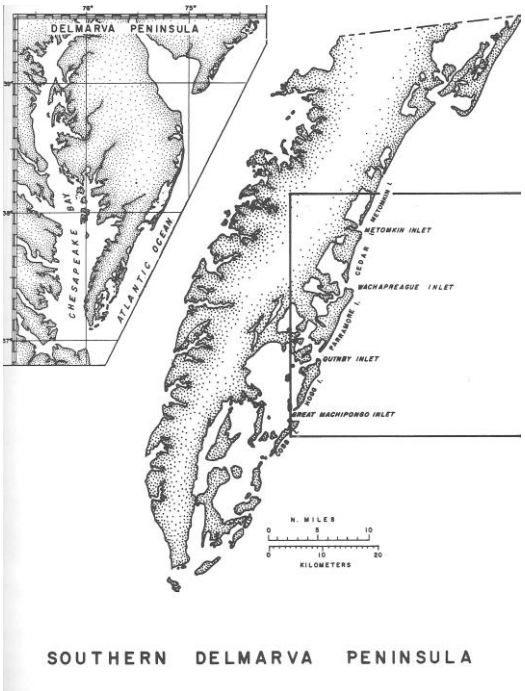

Figure 1. Virginia barrier islands along the southern Delmarva Peninsula (from DeAlteris and Byrne, 1975).

Jan 2022
McBride

Field Gear Recommendations & Field Teams for Coastal Field Trip

This list is meant as a guide to help you enjoy your field experience, especially for participants who haven't spent much time in the field. ***In a nutshell, be prepared for a spectrum of weather from cold and rainy weather to warm and sunny weather.***

1. Tent
2. **Waterproof coat or shell** (or warm coat and $3 plastic rain poncho from Wal-Mart) A full suit of rain gear may be purchased at Wal-Mart in the sporting goods area for ~$10 and comes folded in an 8" envelope
3. **Waterproof pants**
4. **Fleece top**
5. **Waterproof hiking shoes/boots or rubber boots**
6. **Long underwear**
7. **Warm gloves or ski mittens** (durable & made for cold, wet weather)
8. **Winter hat** (covers ears)
9. **Full brim hat or baseball cap**
10. Old pair of **tennis shoes (*required to be closed toed for VIMS boats, no sandals, flip-flops, etc. in field*)**
11. Pair of water shoes, booties, or 2nd pair of tennis shoes (***must be closed toed, no sandals, flip-flops, etc. in field***)
12. **Sleeping bag** (if cold natured, then pack an extra warm blanket, rolled with bag)
13. Pillow
14. **Day backpack with water bladder** or hiking water bottles that can be clipped to your day backpack
15. **Swim suit** for underneath your clothing in case boat can't get to shore (Suggest a 2-piece for females since we will be on undeveloped barrier island with no bathroom facilities)
16. Quick dry shirt or T-shirt (one for each day)
17. Quick dry long pants (two pair that are loose fitting so long underwear or swimsuit can fit underneath)
18. 4 pairs of socks (smart wool hiking socks)
19. 4 pairs of underwear
20. 1 towel (the smallest one you can fully dry yourself with)
21. Sun glasses with sport strap
22. **Sunscreen or sun block**
23. **Insect repellent**
24. Shower shoes (flip flops, etc.)
25. Small shampoo bottle and deodorant
26. Toothbrush & toothpaste
27. 1 Comb or brush
28. Small bar of soap
29. Put items 23-30 above in a plastic sandwich bag or small overnight bag
30. Quarter or half roll of toilet paper in separate plastic sandwich bag
31. **Personal flash light &/or head lamp** with new batteries and spare batteries (NOTE: If you are going to buy anything for this trip, a good camping headlamp/flashlight is a great investment)
32. A flexible travel bag in which to put your personal items (no hard suitcases)
33. **Two trash bags** for your wet and/or dirty items
34. Pocket knife
35. **Phone or digital camera** with a protective case or plastic freezer bag with charging cables
36. **Waterproof field notebook**
37. **Other toiletry items (e.g., feminine hygiene products)**
38. Medications and medical kit (band aides, Advil, etc.)
39. Sealed medical information (Give to Randy in sealed envelope before trip begins)
40. At **least $45.00** in spending money (snacks, meals on the road, etc.)
41. A **positive, can do attitude** and a willingness to lend a helping hand at anytime!!

Recommendation: Bring your day backpack or fanny pack in the van seat to ride with you. To carry in the field: your field guidebook, waterproof field notebook, pencils/pens, light SNACKS, phone, small pair of binoculars, water, etc.). Snacks that pack well and have a lot of energy are important (e.g., energy bars, trail mix, Snickers, etc.). You will be using a lot more energy than normal and will get hungry sooner and more often than you expect. Please be aware of your food selection: some foods/snacks don't travel well; moisture and climate may ruin products.

This is a tentative list and subject to change. If you bring the above-mentioned items, you will enjoy yourself, even in the worst weather conditions during a field trip. If you have further suggestions about the field gear, please let me know at rmcbride@gmu.edu.

Field Teams (NOTE: Please volunteer via email for two field teams before next class. Many hands make light work. If you don't volunteer, I will assign you a team. Each team will have a team leader or co-team leaders):

1. **Safety Team** (Looking for volunteers who have one or more of the following backgrounds/training: nurse, CPR, lifesaving, EMS or EMT, etc.)
2. **Mechanical & Field Gear Team** (Looking for volunteers who are experienced campers/hikers or are mechanically oriented (e.g., like to work on engines) who can take the lead on coordinating coolers for food (need at least 3 coolers), tents, firewood and fire-starting materials, jumper cables, tool box, starting an engine in a jam, etc.)
3. **Cooking Team** (Looking for 4 volunteers who like to plan, buy food, and cook for a group)
4. **Clean-up Team** (Looking for volunteers who will take the lead in washing & cleaning up after meals and cleaning up house and campsite upon departure; *I'm on this team!*)
5. **Weather Team** (Looking for 3 volunteers who love to watch and investigate the changing weather conditions on a daily basis). Before we depart, this team will compile a 4-day weather/marine forecast report (e.g., surface weather maps, fronts, air masses, temperatures, wind speeds and wind direction, wave conditions, lunar phases, perigee/apogee dates, etc.) for the eastern United States and coastal field trip area (Eastern Shores of VA & MD, as well as DE).

ACTION ITEM: By 6 Feb, please volunteer via email for ***TWO*** of the above-mentioned field teams so we can finalize details of the field trip and overall organization.