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

Spring 2021
Thursdays 4:30 to 7:10 pm
Lecture: Online Teaching using BlackBoard Collaborate Ultra
*******Real-Time, Synchronous Lectures*******

Professor: Dr. Randolph A. McBride
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 will 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 islands, estuaries, deltas, and chenier plains. Factors affecting coastal morphology will be examined, such as plate tectonics, eustatic and isostatic sea-level 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 a required component of this class. NOTE: If the face-to-face field trip is canceled because of the pandemic, then a virtual field trip will replace it.

GOAL: Examine form/process relationships along different coasts (both in online lectures and in the field) so students will have a foundation 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 online lecture sessions, reading of textbook chapters and scientific publications, participation in online class-led discussions, completion of online exams, participation in a major field trip, scan submittals of handwritten field books and digital photojournal, preparation of a 6-stage term paper, and an oral presentation in class (graduate students only) and in the field for all students. ***Participation in 3.5-day field trip is required***. NOTE: If the face-to-face field trip is canceled because of the pandemic, then a virtual field trip will replace it.

METHOD OF INSTRUCTION: Online synchronous lectures given by instructor and possibly guest speakers using Blackboard Collaborate Ultra, lectures in the field, reading of textbook chapters and scientific publications outside of lecture sessions, and oral presentations by each student online using Blackboard Collaborate Ultra and face-to-face in the field.

TECHNOLOGY: Students are required to use PowerPoint, Blackboard (e.g., Collaborate Ultra), and Word; to communicate via e-mail; and conduct web-based research.

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

DATE	**TOPIC**	**READINGS** (D = Davis & Fitzgerald)
Jan 28	Introduction; Plate Tectonics	Ch. 1 & 2 (D)
Feb 4	Plate Tectonics, the Seafloor, & Coastal Classification	Ch. 2 & 3 (D)
Feb 11	Coastal Change: Relative & Eustatic Sea Level (Transgressions & Regressions)	Ch. 4 (D)

Feb 15	***Students email technical review (Word w/ Track Changes) of global barrier system to professor by 11 pm***	
Feb 18	Coastal Processes: Waves ***Each student presents mini-lecture on global barrier system (email PowerPoint talk to professor by 11 pm on 17 Feb 2021)***	Ch. 6 (D)
Feb 25	Coastal Processes: Tides ***By 11 pm, students email paper outline, figures, & references due***	Ch. 7 (D)
Mar 4	Storms ***By 11 pm, graduate students email talk outline, references, & figures***	Ch. 5 (D)
Mar 11	Online Mid-Term EXAM	
Mar 18	Beach & Barrier-Island Systems ***By 11 pm, students email paper (1st complete version) to professor***; ***classmate assigned for peer review***	Ch. 13-15 (D)
Mar 25	Tidal Inlets & Estuaries ***By 11 pm, each student emails peer review to professor (paper w/ track changes + 2 filled out rubrics)***	Ch. 16, 9-12 (D)
Apr 1	Former Tidal Inlets ***By 11 pm, each student emails fully-revised paper to professor (2nd version, Word)***	Ch. 16 (D)
Apr 8	Deltas; Mississippi River Delta & Chenier Plains	Ch. 8 (D)
Apr 11	***Professor emails edited paper (Word Track Changes) to each student***	
Apr 15	Catchup, class discussions, & field trip preparation ***By 11 pm, each student emails final, fully revised paper (3rd final version)***	
Apr 22-25	Coastal Field Trip (coastal VA, MD, & DE)	Ch. 15 & 16 (D)
Apr 29	Exxon Valdez oil spill, Alaska; Lessons learned from Exxon Valdez ***Take-home exam emailed out***	Ch. 17 & 18 (D)
May 7, 11p	Take-home final exam due by 11 pm (***Email following documents to professor: 1) final exam [Word .doc], 2) digital photojournal [PowerPoint, .ppt], & 3) scanned digital copy of field note book***)	

IMPORTANT DATES:

Feb 15	***Student emails technical review of specific global barrier system***
Feb 18	*Student presents mini-lectures (5 PowerPoint slides) on specific global barrier system*
Feb 25	***Student emails detailed paper outline, primary figures & tables w/ captions, & references***
Mar 4	For grad students only, outline, references, & figures for in-class oral presentations
Mar 11	Mid-term Exam
Mar 18	***Student emails paper to professor: 1st complete version***
Mar 25	Student emails peer review to professor
Apr 1	***Student emails completely revised paper to professor: 2nd version***
Apr 11	Professor returns edited papers
Apr 15	***Student emails final, fully-revised paper to professor: 3rd version***

Apr 22-25	Field trip to coastal VA, MD, & DE (meet at 12:30 pm & depart Exploratory Hall loading dock by 1:15 pm on Thurs and return Sun evening). Will involve driving your own car and riding in VIMS boats, all day hiking in primitive conditions, staying at marine lab dormitory in Wachapreague, VA, & camping one night.
May 7 by 11 pm	***Take-home final exam (comprehensive) due plus digital photojournal (.ppt file) & scanned handwritten field notebook (.pdf file)***

GRADING:

	Undergraduates	Graduate
Mini-lecture & Review of Global Barrier Systems	7%	7%
Exam	18%	15%
Final Exam	22%	20%
Full lecture & Outline (grad students only)	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, Publication-Ready Copy (**5%**)		
Field Oral Presentation (**10%**)		
Digital Photojournal & Field Notebook for Field Trip	10%	10%
Online Lecture Session & Field Trip Participation	8%	8%
	100%	100%

Extra Credit: Attend a GMU Writing Center 50-minute session regarding the editing of your research paper and provide signed email documentation from Writing Center (5% on paper grade only). More details later.

Exams may cover online lecture sessions, mini-lectures, text readings, assigned articles, PowerPoint slides, 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.

MINI-LECTURES & REVIEW OF GLOBAL BARRIER SYSTEMS (Morphodynamics of Barrier Systems)

Each student will perform a detailed review of a specific barrier system from around the world as found in the "Morphodynamics of Barrier Systems: A Synthesis" chapter (McBride et al.) of the Treatise on Geomorphology. This detailed review will not only consist of reading and learning about a specific barrier system globally but will also involve a detailed technical edit of the scientific publication (e.g., sentence flow, check to see if figure & table callouts in the text are correct, check figure & table captions, cross check all references cited in text against list of references, check if references are in alphabetical order, etc.). Student will

email detailed technical edit (Word document using Track Changes) to professor. Based on this detailed review, each student will construct a mini-lecture consisting of no more than five PowerPoint slides (5 minute talk): 1) **Title Slide** (name of barrier system, your name, bullet points outlining your talk), 2) **Location Slide** (map showing where barrier system is specifically located and what plate tectonic setting [i.e., tectonic coastal classification]), 3) **Photographs or Diagrams** of barrier system to show what the barriers look like, 4) **Sea-Level Change Figure** showing what sea level has done over the past 8000 years or so, and 5) **Summary Slide** synthesizing the most important points (bullet points) about the barrier system emphasizing geology, physical processes, and coastal geomorphology, (e.g., tectonic coastal classification, sea-level rise or fall [or combination] over past 8000 years, source of sediment supply, average tidal range, average wave height, net longshore sediment transport direction, type of barriers, etc.).

ORAL PRESENTATION (GRAD STUDENTS ONLY):

Each graduate student will provide a 40 to 45-minute PowerPoint talk (Collaborate Ultra) on a certain topic as outlined below and then lead a discussion on it. The online 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. The online PowerPoint talks will be presented using BB Collaborate Ultra 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, by 11 pm on the evening before your presentation, email a digital copy of your PowerPoint file to me, as well as any video clips.

Topics:

1. Astronomical tides of the Chesapeake Bay: How do they work?
2. Global synthesis of former wave-dominated tidal inlets and why they close: dynamics, geomorphology, sedimentology, and stratigraphy
3. Impact of relative sea-level rise on the salt marsh distribution, dynamics, and viability: U.S. Atlantic coast vs. coastal Louisiana

FIELD TRIP

This course involves one required 3.5-day field trip (NOTE: If the face-to-face field trip is canceled because of the pandemic, then an online virtual field trip will replace it). Transport for the field trip will be your personal vehicle because of pandemic. The field trip will go to coastal VA, MD, and DE and will involve staying at marine lab housing, riding in boats, hiking on barrier islands in remote & primitive conditions, and camping one night. Meals will be prepared on site by students or obtained at restaurants. ***NOTE: It is suggested that each student bring ~$50.00 as spending money for the field trip.***

DIGITAL PHOTOJOURNAL & FIELD NOTEBOOK

Each student will complete their own unique digital photojournal and handwritten 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 photographs and video clips taken using their personal cell phone or digital camera. These digital photographs 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 about 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, publication-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 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

Email 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. Totally 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 the 1st version of your paper a completely finished manuscript (no sections missing). 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 student can further revise paper for final publication-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
- Literature review (very brief synthesis of most important articles regarding your field locality such as Jones, 1999; Williams et al., 2000)
- 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?).
- 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 tectonic setting, geologic province (i.e., Coastal Plain), local geology, & climate if applicable

Results (Detailed Description) (~4 pages)

- Describe modern and/or ancient geomorphic features and quantify processes (e.g., tidal range [m], average wave height [m], tidal prism [m^3], longshore sediment transport volume [m^3/yr], & net direction [compass 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:
    - Geologic framework (if applicable)
    - 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 figure source. For example: *Figure 1. Historical shoreline changes of Parramore Island, VA from 1852 to 2006 (Richardson & McBride, 2007).*
- 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, Publication-Ready Copy

As per the schedule above, your fully revised field guide chapter is due (i.e., a complete hard-copy, publication-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. Parramore Island, VA: barrier island geomorphology, processes, & shoreline changes
2. Cedar Island, VA: barrier island geomorphology, processes, former tidal inlets, & shoreline changes
3. Wachapreague Inlet, VA: geomorphology, processes, inlet dynamics, & shoreline changes
4. Trackline, meteorological history, storm surge, and coastal impacts of the 1962 Ash Wednesday storm vs. 2012 Hurricane Sandy

5. Geomorphic evolution of the recurved spit complex at the southern end of Assateague Island, VA, including paleospits, Fishing Point, Chincoteague Island, and Chincoteague Inlet
6. Assateague Island, MD-VA: barrier island geomorphology, processes, and former tidal inlet dynamics
7. Ocean City Inlet, MD: geomorphology, coastal processes, engineering structures, & downdrift impacts on northern Assateague Island, MD
8. Indian River Inlet, DE: geomorphology, coastal processes, engineering structures, & the downdrift shoreline impacts
9. Cape Henlopen, DE: geologic development, geomorphology, coastal processes, & shoreline changes (Scott Wilkinson)

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.

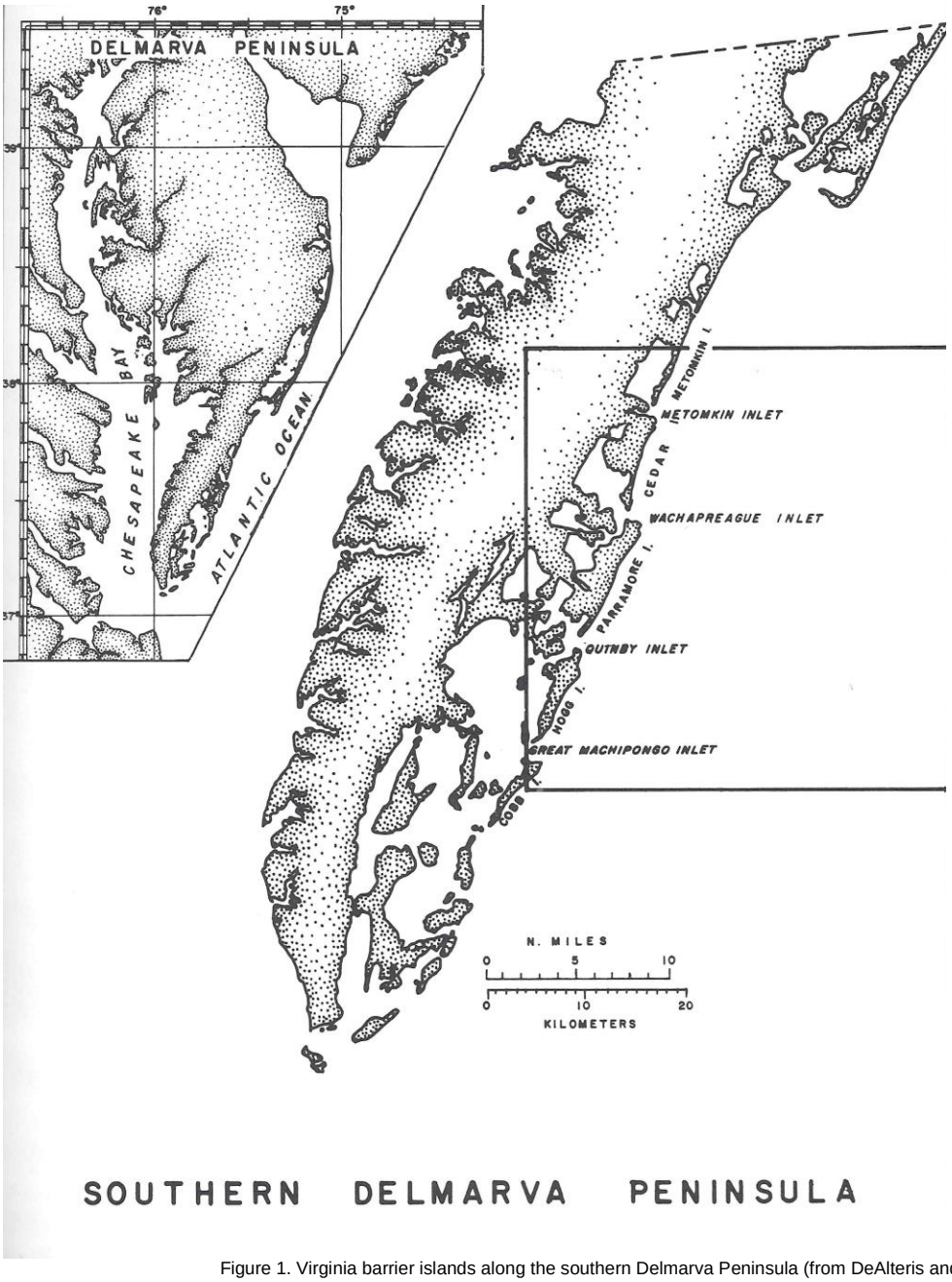

Figure 1. Virginia barrier islands along the southern Delmarva Peninsula (from DeAlteris and Byrne, 1975).

Jan 2020

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.*** MOTTO: There is no bad weather, just bad gear!

1. Tent
2. **Waterproof coat or shell** (or warm coat and $3 plastic rain poncho from Wal-Mart)
3. **Waterproof pants**
4. **Coat liner**: fleece
5. **Long underwear**
6. **Warm gloves or ski mittens** (durable & made for cold, wet weather)
7. **Winter hat** (covers ears)
8. **Full brim hat or baseball cap** (sun protection)
9. Old pair of **hiking** or **tennis shoes (*required to be closed toed for VIMS boats, no sandals, flip-flops, etc. in field*)**
10. **Water shoes, booties, or 2nd pair of hiking or tennis shoes** (***must be closed toed, no sandals, flip-flops, etc. in field***)
11. **Sleeping bag** (if cold natured, then pack an extra warm blanket, rolled with bag)
12. Pillow
13. **Waterproof hiking boots or rubber boots**
14. **Day backpack**
15. **Water bladder** (inserted in day backpack) **or hiking water bottles** that can be clipped to your day backpack
16. **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)
17. 1 long-sleeved shirt (sun protection)
18. T-shirt (one for each day)
19. Quick-dry long pants (two pair that are loose fitting so long underwear or swimsuit can fit underneath)
20. 4 pairs of socks (smart wool hiking socks)
21. 4 pairs of underwear
22. 1 towel (the smallest one you can fully dry yourself with)
23. Sun glasses with sport strap
24. **Sunscreen or sun block**
25. **Insect repellent**
26. Shower shoes (flip flops, etc.)
27. Small shampoo bottle and deodorant
28. Toothbrush & toothpaste
29. 1 Comb or brush
30. Small bar of soap
31. Put items 24-30 above in a plastic bag or small overnight bag
32. Quarter or half roll of toilet paper in separate plastic sandwich bag
33. **Head lamp or flash light** 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)
34. A flexible travel bag in which to put your personal items (no hard suitcases)
35. **Trash bags** for your wet and/or dirty clothes
36. Extra trash bags (~two large heavy duty types)
37. Pocket knife
38. Digital phone or camera with a protective case or plastic freezer bag with charging cables
39. **Waterproof field notebook**
40. **Other toiletry items (e.g., feminine hygiene products)**
41. Medications and medical kit (band aides, Advil, etc.)
42. Sealed medical information (Give to Randy in sealed envelope before trip begins)
43. At **least $45.00** in spending money (snacks, meals on the road, etc.)
44. A **positive, can do attitude** and a willingness to lend a helping hand at anytime!!

Recommendation: Bring your day backpack or fanny pack to carry the following items in the field: your field guidebook, waterproof field notebook, pencils/pens, light SNACKS, phone/camera, 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 online 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 11 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.