Name: Student number:

Professor name: Class or Lab time:

Virtual Field Trip to Upper Texas Coast

Physical Geology - Spring 2021

Academic Honesty (Signature Required)

The Virtual Field Trip to Upper Texas Coast is to be completed by yourself; you should not work with a partner or group. Do not search for answers on the internet because 1) it is cheating; 2) answers that are posted are incorrect and we'll know where you got them from and; 3) the questions change every semester. Be careful if you watch the videos with closed captioning because the spelling of geologic terms is often incorrect or misinterpreted by the captioning software, so you may end up with a wrong answer. If you are unfamiliar with a word or geologic concept, it is okay to look it up online or and find the correct spelling and definition. If you find yourself needing help, physical geology teaching assistants staff the Geoscience Learning Center team on Microsoft Teams. Use join code **8aywj37** to add yourself to the GLC team, then go to the physical geology channel. A teaching assistant monitors the channel Monday to Friday from 9:00 am to 5:00 pm.

By submitting this work, I attest that I have not violated the UH Academic Honesty code. I did this work by myself and did not copy any portion of my answers from a website, another student or any other source _____ (your signature or initials here)

Assignment Submission

Save your completed written assignment as "yourlastname_firstname_VFTUpperTXcoast". Email your file to eas.uh.physical.geology@gmail.com. You will not get a confirmation that it has been received.

Teaching Assistants will begin grading submissions after the deadline. You will receive an email from a TA when your assignment is graded. If your assignment requires resubmission, you will have 48 hours to do so.

How the virtual field trip works.

There is an interactive field trip with a map of locations for each stop you will visit. First, you need to watch the introductory video by clicking on the red video icon located near University of Houston. Then, you should click on each stop (green circle). This will take you to an immersive 360 panorama. Use your mouse to explore the entire area. Within the 360 panorama, pay attention to icons that will take you to either videos and/or panoramas. Use the navigation bar at the bottom to come back to the map and move to other stops. The stop order is:

Stop UH	Welcome to the Coast Virtual Field Trip and Methods in the field
Stop 1	Brazos river
Stop 2	Modern Brazos river delta

Stop 3	Paleo Brazos river delta
Stop 4	Galveston State Park Beach and Bay side
Stop 5	Galveston Seawall
Stop 6	Galveston NE end

Welcome to the Coast Virtual Field Trip and Methods in the field

When a geologist goes on a field trip or does their field research, they take notes and make sketches of what they see and also try to interpret these rocks (outcrops). So, to do this field trip you will be asked to take notes on what you see using both the videos and 360 images. The first step at every outcrop is to identify if you are looking at igneous, metamorphic or sedimentary rocks. Then, describe features of the rocks and possibly sketch them. After describing the rocks, you need to describe any deformation that has occurred. The general process for writing rock descriptions is to start off with a general description (color, grain size, texture, etc.), followed by identification of the minerals within the rock (the mineral assemblage), the name of the rock (deduced from the assemblage) and then finally your interpretation on how and where it was formed. If you need help describing rocks, your text has many figures that are helpful. We've noted many of the figures for each stop. All figures referred to are from Earth, 12th Edition by Tarbuck, Lutgens, and Tasa. All answers should be written as full sentences and not one or two words.

EXERCISE 1

In the Google earth image of the Texas coast (Figure 1) identify the different coastal elements, listed below. Use Figure 2 with the definitions below. Mark these on the image.

1. Shoreline
2. Coastline
3. Dunes
4. Bay
5. Swamp

6. Label the coast, backshore, foreshore, nearshore, and offshore areas

Figure 1. Google Earth image (2018) showing the Texas coast for exercise 1.

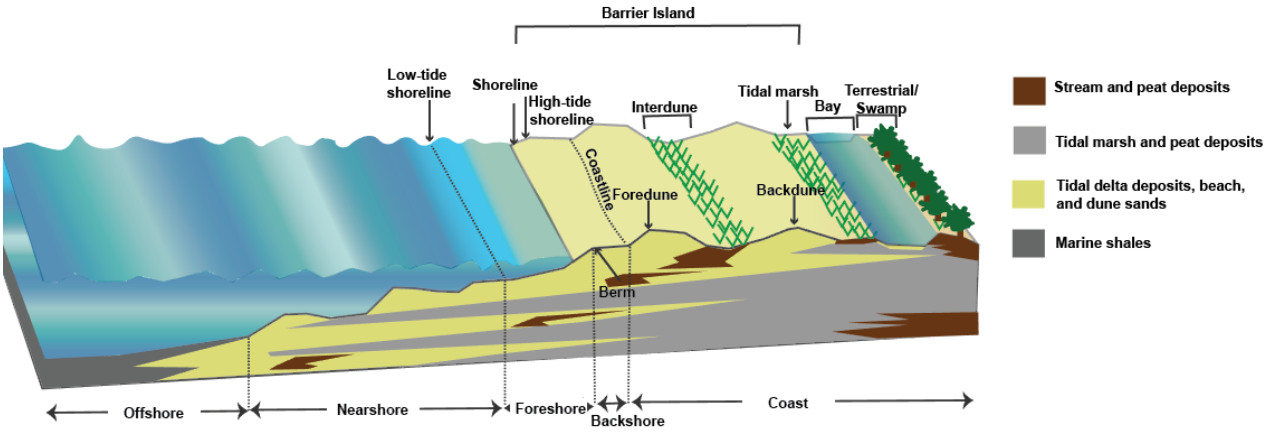

Figure 2. Coastal elements and facies.

BACKDUNE	It is the dune area behind the foredunes, after the trough. The backdune is usually forested and provides shade to its inhabitants. The backdune provides cool temperatures and moist soil adequate for many plants and animals.

BACKSHORE	Zone that is dry under normal conditions, it is characterized by present of berms and it has no vegetation. The backshore is only exposed to waves under extreme events with high tide and storm surge.
BERM	Terrace of a beach that has formed in the backshore, above the water level at high tide. Berms are commonly found on beaches that have fairly coarse sand and are the result of the deposition of material by low-energy waves.
COAST	It is the strip of land that extends from the coastline landward to the first major change in the terrain features, which are not influenced by the coastal processes.
DUNE	Ridges of loose, wind-blown sand (fine to medium) forming on the backshore.
FOREDUNE	It is the dune area directly behind the beach. The sand dunes are usually covered by grass, that help stabilize the sand.
INTERDUNE	It is the depressed area between the foredune and the backdune. The trough often fills with groundwater causing interdunal ponds where many organisms survive in this more stable habitat.
NEARSHORE	Extents seaward from the low water line beyond the breaker zone; it defines the area influenced by the nearshore currents.
OFFSHORE	Extents seaward from the nearshore zone.
SHORELINE	The line that marks the contact between land and sea. It migrates up and sown as the tide rises and falls.
COASTLINE	The coast's seaward edge. The landward limit of the effect of the highest storm waves on the shore.
TIDAL MARSH	It is a type of wet land regularly inundated by the tidal action. It is located in the back part of the barrier Island.
SWAMP	It is a type of wetland characterized by low, generally saturated land covered intermittently or permanently with shallow bodies of water. It can be covered by either aquatic vegetation or vegetation that tolerates periodical inundation. The water of a swamp may be fresh water or salt water.

STOP 1. BRAZOS RIVER

After watching the video with Dr. Wellner discussing the Brazos River, you should be able to answer the following questions.

- What type of river is the Brazos River?

- During the last couple million years, how often the sea level rises and falls?

- What are the main differences between a channel and a valley?

- Is the Brazos River within its channel?

- In which part of the channel the coarser grains are moving today?

- Which side of the Brazos River is gaining land over the years?

EXERCISE 2

a) Look at the outcrop picture (Figure 3), identify the layers boundaries and mark the different sedimentary structures. Then label the different intervals according to the typical bar river section diagram (Figure 4). Hint: the picture can start and end at different typical bar river section intervals, so it can be missing the bottom or top intervals.

Figure 3. Outcrop picture showing a typical bar river section.

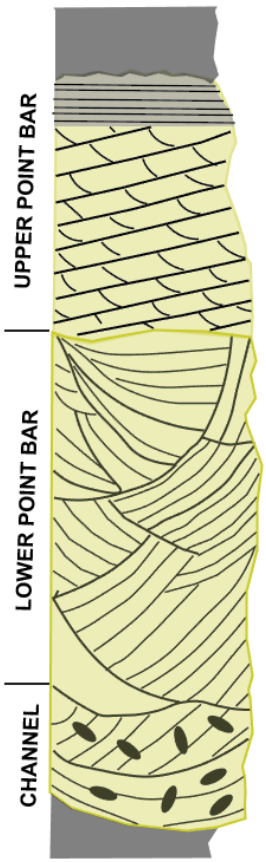

Figure 4. Typical Bar river section. showing sedimentary structures present at each interval.

EXERCISE 3

a) The purpose of this exercise is to locate the NOAA water level station in google maps and get water levels. Follow the steps below:

1. In the link below look for the LAT and Lon of the Brazos River near Rosharon station.
http://water.weather.gov/ahps2/hydrograph.php?wfo=HGX&gage=ROST2
LAT:_____.
LON:_____.

2. Check water levels for the Brazos River near Rosharon station in the link below, take a print screen and report today's water level:
http://water.weather.gov/ahps2/hydrograph.php?wfo=HGX&gage=ROST2

Date:_____ Time:_____ Water level (ft): _____.

STOP 2 & 3. MODERN AND PALEO BRAZOS RIVER DELTA

- What type of coastal deposit feature was discovered by Dr. Sisson in the current mouth of Brazos River? What is it called?

- Can this feature be seen today?

EXERCISE 4. THE FORMATION AND EROSION OF RIVER DELTAS: THE PALEO AND MODERN BRAZOS DELTA

a) Using the images below, describe the evolution of the old and the new Brazos river delta through time.

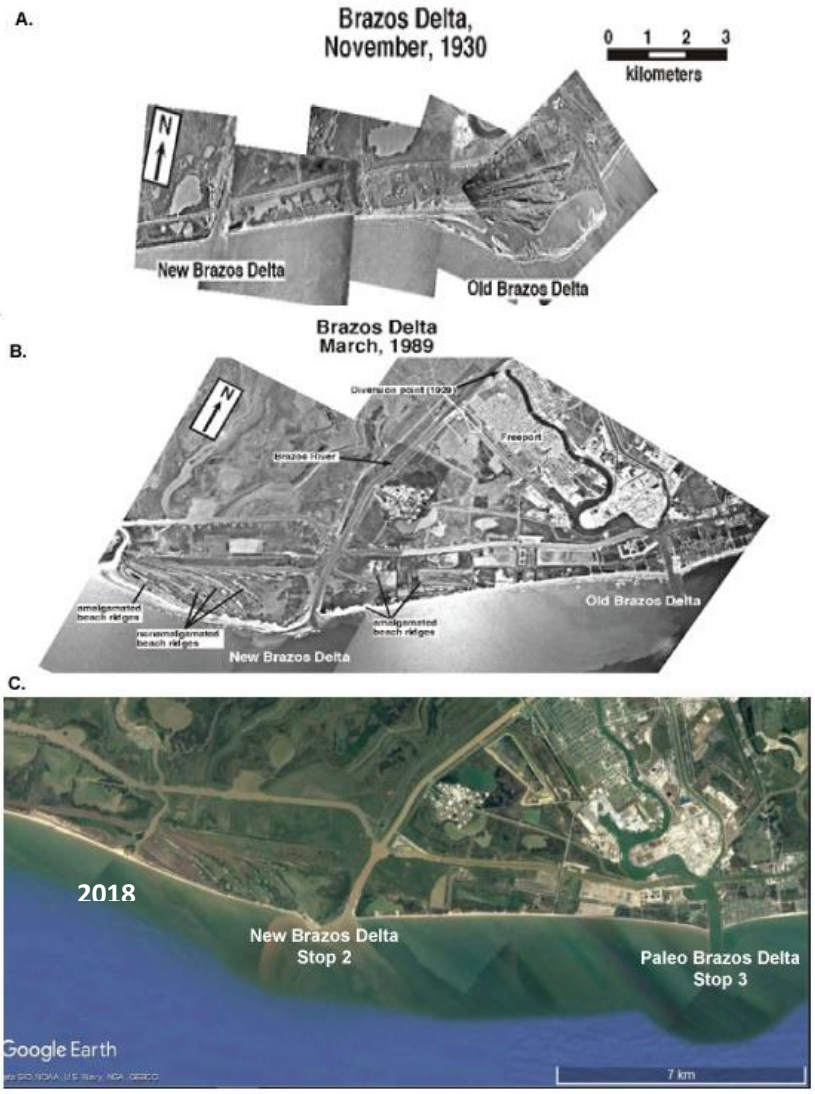

Figure 5. Time photos evolution Brazos river old and new deltas. Photos A and B from Rodriguez, A., et al., 2000. Photo C from Google Earth.

Stop 3 Paleo Brazos river delta

True or False:

_____ The waterway is tidal at stop 3.
_____ In the Gulf Coast, there is a very narrow continental shelf. So, the tidal forces are very large here.
_____ The high and low tides occur always at 2:00 am and 11:00 pm, respectively.
_____ In wintertime the wind is commonly flowing from the north to the south.
_____ The beach profile will change depending on the winds.
_____ In the summertime the beaches are often broader and flatter than in the wintertime.

EXERCISE 5. AEOLIAN DUNES FORMATION

a) Using the image below, describe the formation of aeolian ripples and dunes. Which stratigraphic structures can be seen?
b) Assuming the blue arrow is pointing North, what is the direction of progradation of the ripples and dunes?

Figure 6. Aeolian Dunes and ripples.

STOP 4. GALVESTON STATE PARK

- What are the main differences between the sediments observed between the beaches and the back bay?
- Why the vegetation that grows in the water is important in the CO_2 cycle and climate change?
- What are the four main factors that control the existence of the beach?
- What is the typical direction of sand movement caused by the currents in the beach?
- Why is the water on the beach not blue?
- What can we say about the dark shells? From which geologic age do they come from?

BEACH SIDE:

EXERCISE 6: UNDERSTANDING WAVE RIPPLES AND THE LONGSHORE DRIFT CURRENT

a) Using the picture below (Figure 7), answer the following questions:
   1. How do you think these ripples are being form?

Figure 7. Wave ripples at the Galveston State Park beach.

b) The longshore drift is the movement of material along a coast by waves that approach at an angle to the shore but recede directly away from it. In what direction are the waves approaching the shore in Figure 7? what is the longshore drift direction in the Texas coast? Hint: Use what you learn about longshore drift currents at the stop 3.

Figure 8

STOP 6. NE END OF GALVESTON

EXERCISE 7: NOT EVERYTHING IS EROSION

a) In this exercise you will quantify how fast is the northeast end of Galveston Island is growing (accreting). Using the time pictures below (Figure 9) calculate the Beach area for each year at the spit. Use this to determine growth (accretion) or erosion rate.

1954=____m^2

1969=____m^2

1982=____m^2

1995=____m^2

2006=____m^2

2018=____m^2

Average beach growth rate = _____ m/yr

Tip: draw a shape representing the perimeter of the spit to the east of the jetty (straight line) in the image and compare them.

Describe the changes in area for this spit.

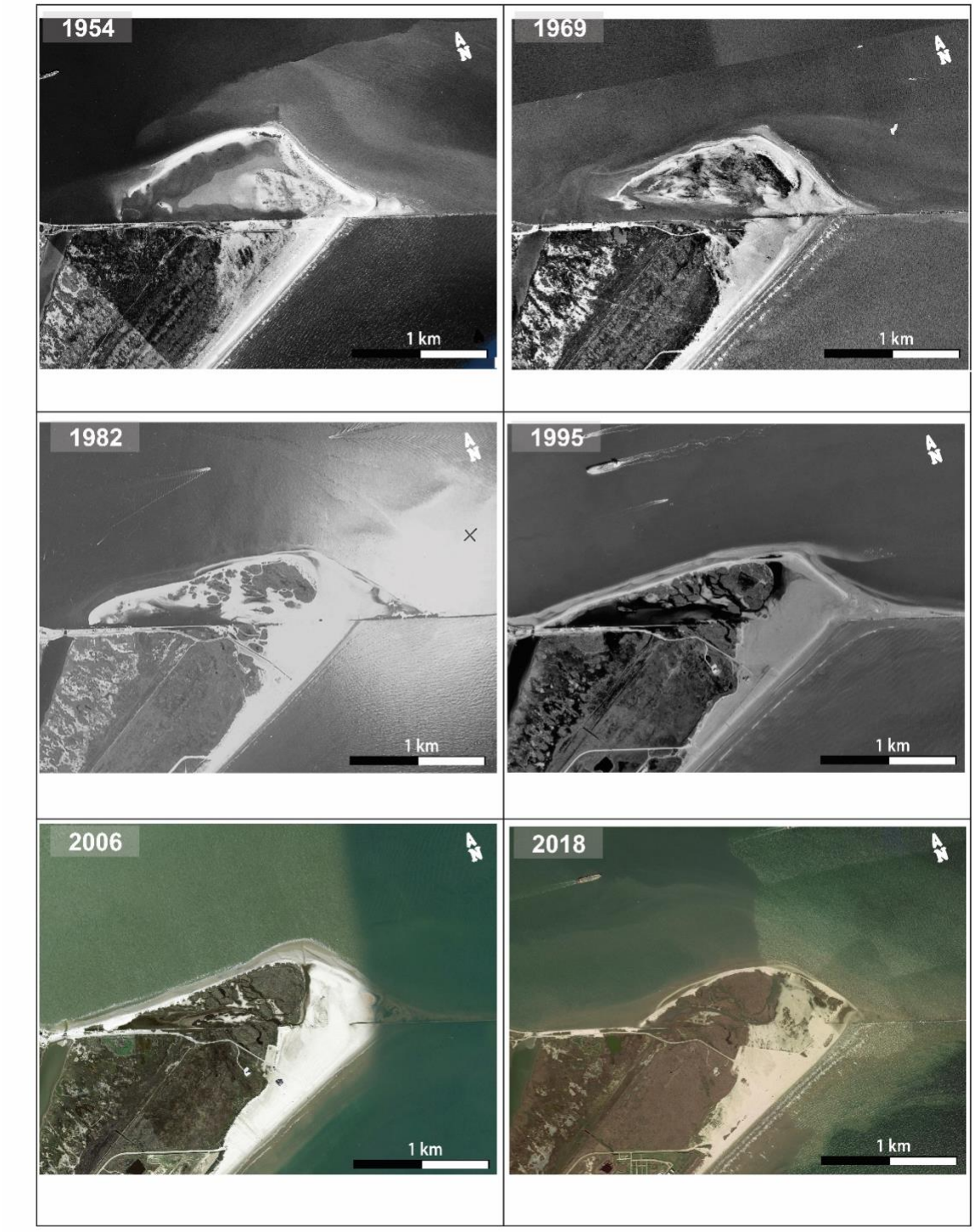

Figure 9. Galveston Island NE end through time. Photos from Google Earth.

EXERCISE 8: IKE DIKE

The Ike dike has been the focus of continued discussion (figure 9). Much of the recent discussion is about the entrance between the east end of Galveston Island that you saw at Stop 6 and was the subject of the previous exercise.

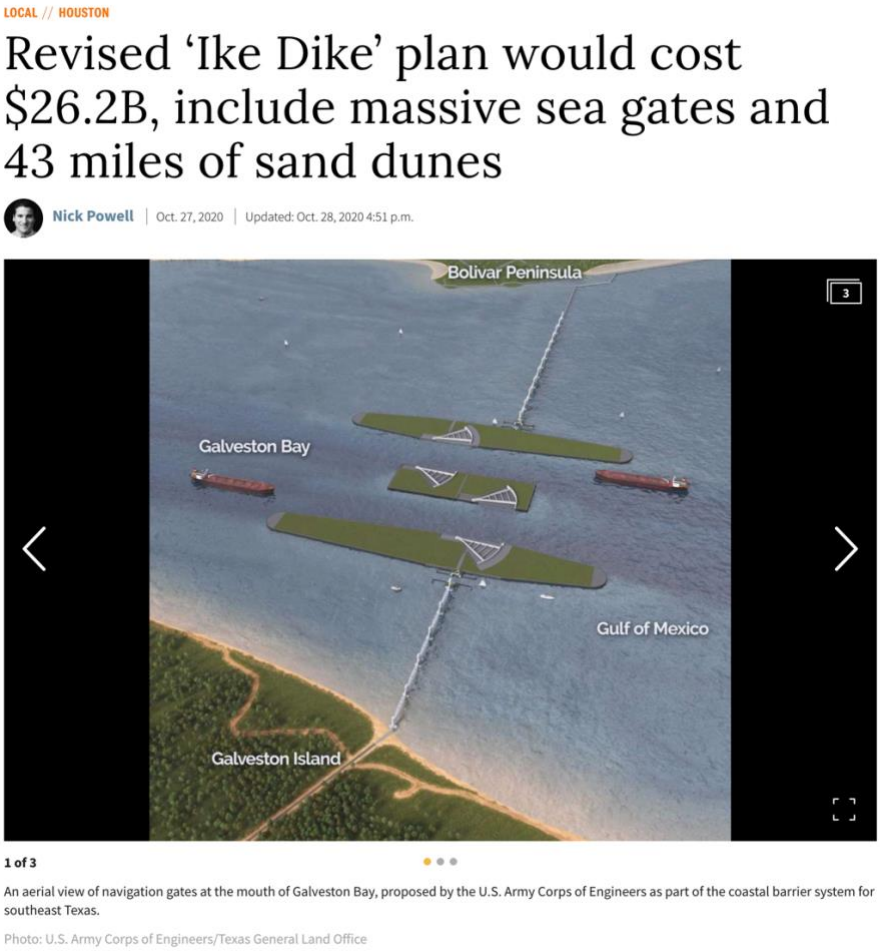

Figure 10. News about Ike dike.

The Ike Dike is a proposed coastal barrier project of about $26 billion, proposed by Dr. Bill Merrell of Texas A&M University at Galveston, that will protect the Galveston Bay in Texas. The project encompasses three different elements (figure 10): 1. Enhancement to the existing Galveston Seawall, 2. Two floodgates located in Bolivar roads and San Luis Pass, which would protect Galveston, the Bolivar Peninsula, the Galveston Bay Area, and Houston. 3. Extended barrier across Galveston Island and the Bolivar Peninsula, that will be covered by manmade dunes.

Recently there have been two articles about the Ike Dike in the Houston Chronicle. The first is a petition by State Rep Gene Wu of Harris County to President Biden. The second is about a bill (SB1160) before the Texas Senate that proposes a way to fund the Ike Dike. Write a paragraph in which you explain your position on the Ike dike, be sure to use the geology concepts learn in class and in this Virtual field trip (be sure to use the information you got in Exercise 7), what changes do you think will happen to the beaches? Will all the sand that is accreting to the end of Galveston Island be deposited on the bay side of the new barrier or will it bypass the barrier and be deposited on the beaches? Do you think the proposed funding mechanism is appropriate?

Figure11. Summary propose elements for the Ike dike.