

ES202 Lab 8 - Glacial Processes and Climate Change

Updated Feb. 2012 – AGI Lab Manual 10th Ed.

PART 1 – LAB MANUAL REVIEW QUESTIONS

Use your lab manual to answer the following questions / define the following terms.

- 1-1. Review **Fig. 13.1 on p. 331** and read the text below. Define the following terms.
Glacier

Zone of Accumulation

Zone of Ablation

“Drift”

Ice Shelf

Sea Ice

Ice Sheet

Mountain Glaciers

True or False: Antarctica and Greenland are covered by ice sheets.

True or False: Oregon is associated with extensive permafrost conditions.

- 1-2. Review **Fig. 13.4-13.5 on p. 334-335**; Define the following terms / answer the following questions:

Hanging Valley

Horn

Arete

Cirque

True or False: mountain glaciation results in eroding flat-bottomed U-shaped troughs or valleys.

True or False: a tarn is also known as a cirque lake

- 1-3. Review **Fig. 13.6-13.7 on p. 336-337**. List, sketch and briefly define the following:

A) Three types of depositional features associated with alpine glaciers.

B) Three types of depositional features associated with continental glaciers.

C) Three types of water bodies associated with continental glaciers.

1-2. Review **Fig. 13.8-13.9 on p. 338** and read the text below. Draw a sketch and define the following terms.

Terminal Moraine

Kettle

Esker

Drumlin

True or False: continental ice sheets cover much larger areas than mountain glaciers.

True or False: continental glaciation results in disrupted drainage patterns, poorly drained areas and numerous lakes.

1-3. Compare the map on **Figure 13.12 p. 341** to the continental ice block diagrams on **p. 338 (Figure 13.8-13.9)**. Identify the glacial landforms shown on the map on **Fig. 13.12**, which type of glacial feature are they? Explain your answer.

1-4 Compare the map on **Fig. 13.13 p. 342** to the continental ice block diagrams on **p. 338 (Figure 13.8-13.9)**. Identify the glacial lake features shown on the map on **Fig. 13.13**, which type of glacial feature are they? Explain your answer.

1-5. Compare the map on **Fig. 13.14 p. 343** to the mountain glacier block diagrams on **Fig. 13.4, p. 334**. Identify the glacial landforms for the following features:

Cerulean Lake (center-south of map)

Porcupine Ridge (east-center of map)

Boulder Peak (north-center of map)

PART 2. IN- LAB MATERIALS

Station 8-1.

- A. Compare the two cobbles labeled “A” and “B” on the counter. One deposit is associated with river processes, the other is associated with glaciations. Compare each sample to the description of “glacial striations” listed under erosional glacier features on [Fig. 13.5, p. 335](#). Which cobble was likely transported by river water and which by ice. Describe your observations and reasons for your hypotheses.
- B. Sample C - examine the melting glacial ice model, fresh from the freezer.

Is this a sample best termed “bedrock” or “regolith”? _____

Will the resulting deposit be well sorted or poorly sorted? _____

What is the range of grain size of the melt-out sediment from sample? _____

Review the descriptions of depositional features on [Fig. 13.4 \(p. 297\)](#) of lab manual. Find the description for the deposit C that best fits your observations. Provide the name and explanation for it’s origin here...

Will the resulting deposit from the model be best termed “outwash” or “till” ([see p. 331](#))

Station 8-2. Examine the Three Sisters, Oregon topographic map in the lab and answer the following questions.

A. Do you see active glaciers on this quadrangle? If yes, where (list locations by Township and Range; note a review of the Township and Range Public Land Survey System in on [p. 240](#) of the lab manual).

B. List the elevation range of the following features:

Prouty Glacier _____

Carver Glacier _____

Lost Glacier _____

Diller Glacier _____

Collier Glacier _____

C. Is there a relationship between glacier occurrence and elevation? What is the minimum elevation that you observe active glaciers?

3-4. What is the meteorological explanation for your observations in 3-3 above? Why does that relationship exist?

3-5. Why are there no glaciers on Mt. Washington? Do you see evidence for past glaciation? If so list.

Station 8-3 Plastic Block Models

Examine plastic “Block Model #6”. Using your **lab manual, p. 334 and p. 338**, answer the following questions:

- A. Does this model represent an alpine or continental glaciated landscape?
- B. What is the name of feature “A”, describe the process of how it forms during glaciation?
- C. What is the name of feature “B”, describe the process of how it forms during glaciation?
- D. What is the name of feature “C”, describe the process of how it forms during glaciation?
- E. What is the name of feature “D”, describe the process of how it forms during glaciation?

Examine plastic “Block Model #1”. Answer the following questions:

- F. Describe the cross-sectional shape of the valley labeled “A”, how does it compare to valley “D” in “Block Model #6”.
- G. Using the contour lines and law of “V’s”, which direction is the stream flowing in Valley “A” in block model #1.
- H. Compare the relief (landscape elevation change from lowest to highest points) between block models #6 and #1. Are they the same, different? Which one is greater or lesser in overall relief?
- I. Has the landscape in “Block Model #1” been glaciated? Why or why not, list your observations that support your answer.

Photo Station 8-4 (Crystal Set 1 Photos 6L/6R).

- A. If north is to the top of the photo, which direction is this glacier flowing?
- B. What are the names of the linear cracks present near the snout of the glacier? Are the transverse or longitudinal with respect to glacial flow?
- C. Note the small glacier in the lower left of the photo. What is the name of the bowl-shaped depression that it is occupying? How does it form?

- D. Note the waterfall emanating from the small glacier. What is the name of this type of tributary glacial valley?

- E. Does your observation suggest that the main valley ice was much thicker in the past? Cite your reasoning.

- F. Note the fan-shaped deposit of sediment along the main glacier front. Where is this sediment coming from? What is this fan being deposited into? What is the name of this type of deposit (remember back to river systems)?

Photo Station 8-5 (Crystal Set 1 Photos 8L/8R).

This photo set is from northern New England. The area was extensively glaciated by the Laurentide Ice Sheet, ~20,000 years ago.

- A. Note the "hummocky" topography in the norther 1/2 of the photo. Given the glacial history of the area, what are these deposits composed of? What is the name of this type of glacial deposit? Comment on the likely nature of sorting in these types of deposits.

- B. Note the numerous lakes inset into the glacial deposits. What are the names of these types of glacial lakes? How do they form?

- C. Does it look like this land is being used for agricultural crop production? Explain why you think this is so.

Station 8-6 Glacial Model 1

- A. Using the block diagrams of glacial landforms in your lab manual, was this portion of upstate New York subject to valley glaciation, continental glaciation or NO glaciation?

- B. Depending on your answer in A above, identify the landforms represented by the small hills in the vicinity of point D. How are these landforms created (hint: use your lab manual). Are they erosional or depositional landforms?

- C. Examine plastic "Block Model #2" labeled with the call-out arrows next to the upstate New York map. Compare to [Figure 13.9 on p. 338](#), identify the landform.

Based on the discussion of process on **Fig. 13.6, p. 336**, is this a depositional or erosional feature?

Provide a discussion of how it forms. Is it associated with alpine or continental glaciations?

Station 8-7 Glacial Model 2

- A. The deposit located on the plastic tub was melted out of ice left in the freezer for a week. Describe the sorting and texture of this “melt-out” glacial deposit.

What is the general name for this type of material that is deposited by a glacier?

- B. Using the block diagrams in your lab manual, identify the landform located at point A. How did it form? Is it erosional or depositional?
- C. Using your lab manual, explain the nature of the drainage pattern located in the vicinity of point B. Why is this type of drainage indicative of glacial landscapes?
- D. Identify the group of hilly landforms in the vicinity of point C. Are they erosional or depositional? How do they form? Based on their topographic configuration, determine the paleo-ice flow direction in this landscape (i.e. which direction was the continental glacier moving over the landscape).

Part 3 - Lab Manual Exercises.

The primary objective of this lab is to compare glacial features represented on topographic maps and air photo features to those represented on block diagrams and charts (**Figures 13.1-13.9** in lab manual). Examine these figures and charts before answering the lab manual questions.

Complete Activity 13.2 p. 349-350.

Complete Activity 13.3 p. 351

Complete Activity 13.4 p. 352