Name_____ Date_____

Lab: Investigating the Taku Glacier

Background Information: Figure 1 is a map of the southern portions of the Juneau Icefields in Alaska created from surveys conducted in 1948. It illustrates the Taku, Norris, and Hole-in-the Wall Glaciers as well as land and water features. The historical positions of the the end of the Taku Glacier or **Terminus** is shown on the map. Glaciers gain and lose snow and ice each year. The amount of snow and ice added to a glacier is called **accumulation** and causes the glacier to advance. The amount lost due to melting is called **ablation** and causes the glacier to retreat up the hill. This relationship is called the **glacial budget**.

In this lab, you are going to analyze a series of local maps and make predictions about future movements of the Taku glacier. By determining the rate of advance or retreat, we can predict where the glacier will be in the future. Of course, this may depend on the rate not changing over time.

Pre-Lab: After reading the background information complete definitions for each of the following vocabulary terms.

Glacier: _____

_____

Terminus: _____

_____

Accumulation: _____

_____

Ablation: _____

_____

Glacial Budget: _____

_____

Procedure Part 1: On the 1948 map of the Taku glacier, make a prediction for the position of the Terminus in the year 1980.

1. Measure the distance in km from the 1909 Terminus to the 1931 Terminus, record this distance in data table 1.
2. Calculate the number of years elapsed from 1909 to 1931, record in data table 1.
3. Calculate the rate of movement from 1909 to 1931 by using the formula below.\

$$Rate\ of\ Movement\ (km/year)\ = \frac{distance\ traveled\ (km)}{time\ (years)}$$

4. Repeat steps 1 - 3 for the years 1931 to 1948 and record it in Data Table 1.
5. Now that you have calculated the rate at which the Taku glacier is advancing, decide what Rate of Movement you will use to determine where the glacier's terminus is in 1980. You may use either of the calculated movements from Data Table 1, or if you've noticed a trend you may use a new rate. You will need to justify your decision later. Record this in Data Table 2.
6. Calculate the number of years elapsed from 1948 to 1980, record in data table 2.
7. Calculate the predicted distance the glacier will move from 1948 to 1980 using the following formula:

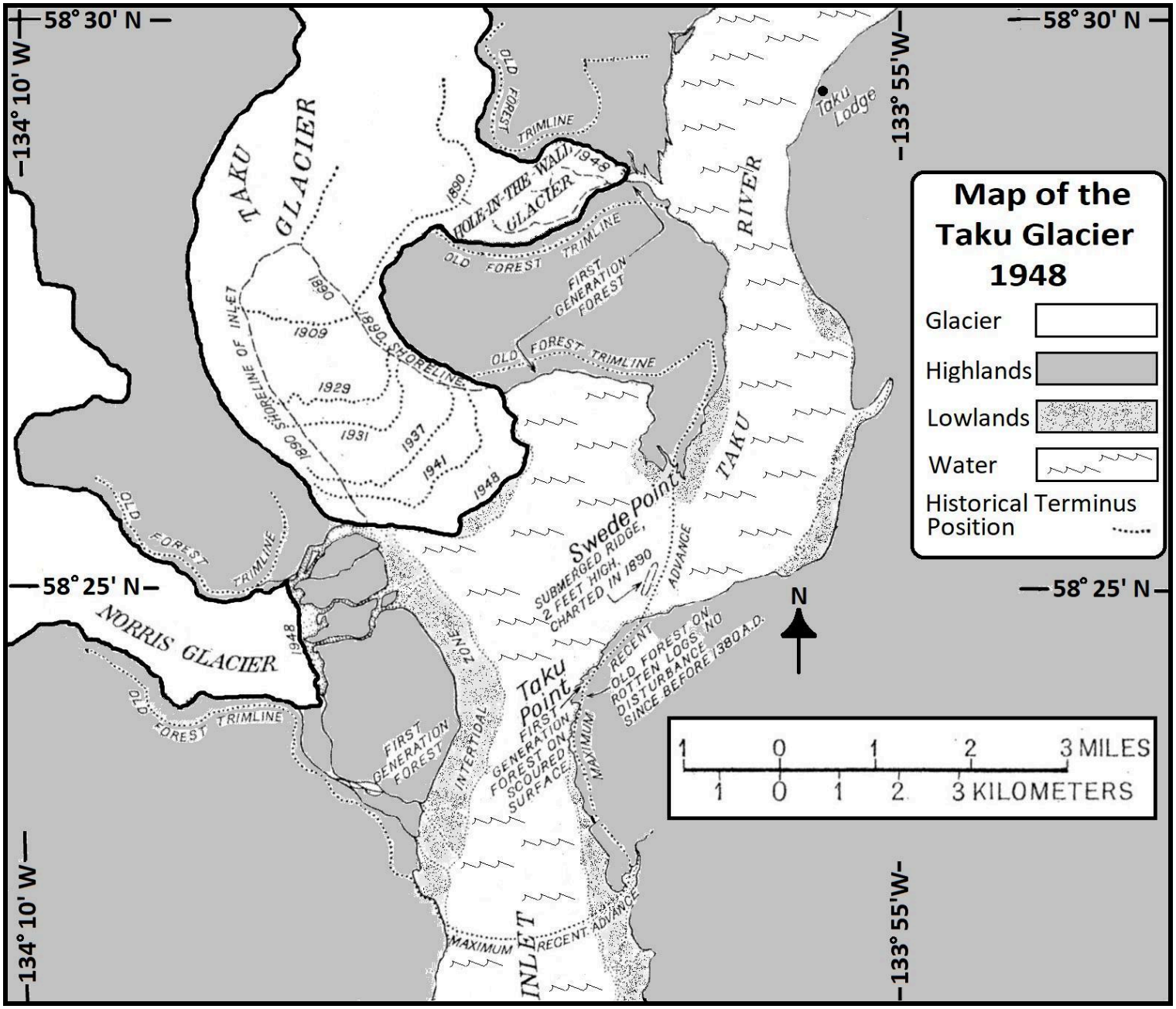
$$Distance\ Traveled\ (km)\ = Time\ (years)\ \times\ Rate\ of\ Movement\ (km/year)$$

8. Using a colored pencil and the scale on the map, draw a new terminus at the distance you predicted in step 7 away from the 1948 terminus.

Data Collection Part 1:

Date Table 1: Rate of Movement of Taku Glacier 1909 - 1948			
Time Period	**Distance Moved** (km)	**Years Elapsed** (years)	**Rate of Movement** (km/year)
1909-1931			
1931-1948			

Data Table 2: Predicted movement of Taku Glacier 1948 - 1980		
Rate of Movement (km/year)	**Time Elapsed** (years)	**Distance Moved** (km)



Lab Analysis Part 1:

1. What is the rate of movement you used for your prediction of the Taku Glacier's terminus in 1980? _____
2. Why did you choose this rate (support your decision)? _____

   _____

   _____
3. What factors do you think are the biggest contributors to whether speed at which a glacier advances or retreats? _____

   _____

   _____

4. How does your prediction for 1980 compare to the actual surveyed terminus?

   _____

   _____

5. Why do you think this is? _____

   _____

   _____

Procedure Part 2: On the 1980 map of the Taku glacier, make a prediction for the position of the Terminus this year (2019).

1. Measure the distance in km from the 1948 Terminus to the 1980 Terminus, record this distance in data table 3.
2. Calculate the number of years elapsed from 1948 to 1980, record in data table 3.
3. Calculate the rate of movement from 1948 to 1980 by using the formula below.

$$Rate\ of\ Movement\ (km/year)\ = \frac{distance\ traveled\ (km)}{time\ (years)}$$

4. Now that you have calculated the rate at which the Taku glacier is advancing, decide what Rate of Movement you will use to determine where the glacier's terminus is in 2019. You may use the calculated movement from Data Table 3, or if you've noticed a trend you may use a new rate. Record this in Data Table 4.
5. Calculate the number of years elapsed from 1980 to 2019, record in data table 4.
6. Calculate the predicted distance the glacier will move from 1980 to 2019:

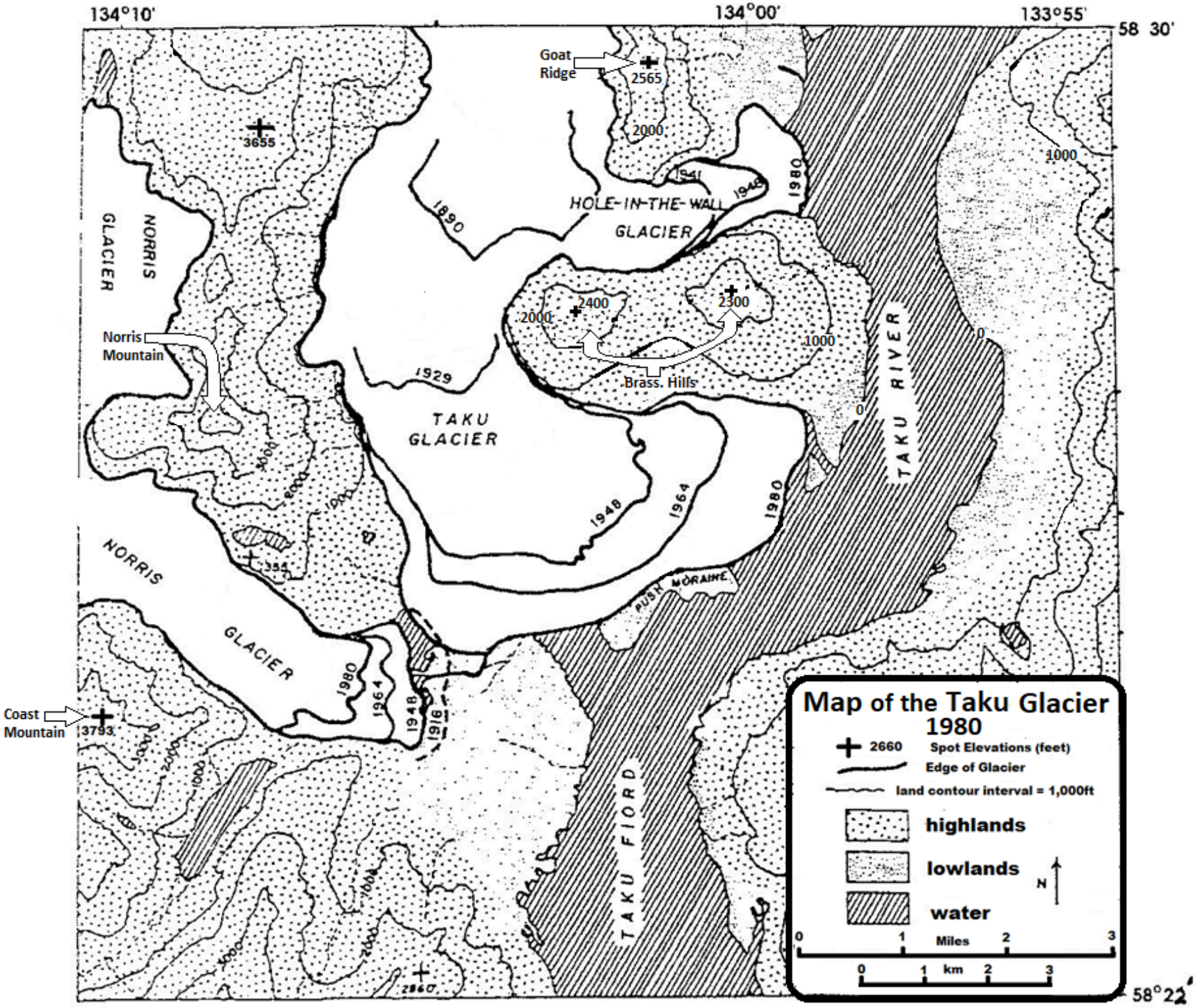
$$Distance\ Traveled\ (km)\ = Time\ (years)\ \times\ Rate\ of\ Movement\ (km/year)$$

7. Using a colored pencil and the scale on the map, draw a new terminus at the distance you predicted in step 7 away from the 1980 terminus.

Data Collection Part 2:

Date Table 3: Rate of Movement of Taku Glacier 1948 - 1980			
Time Period	**Distance Moved** (km)	**Years Elapsed** (years)	**Rate of Movement** (km/year)
1948-1980			

Data Table 4: Predicted movement of Taku Glacier 1980 - 2019		
Rate of Movement (km/year)	**Time Elapsed** (years)	**Distance Moved** (km)


134°10'
134°00'
133°55'
58 30'
Goat Ridge
2565
3655
2000
1000
1980
1941
1946
HOLE-IN-THE-WALL GLACIER
1890
NORRIS GLACIER
NORRIS
Norris Mountain
2400
2300
2000
1000
0
1929
Brass. Hills
TAKU GLACIER
TAKU RIVER
1948
1964
1980
NORRIS
GLACIER
PUSH MORAINE
1980
1964
1948
1916
Coast Mountain
3793
TAKU FIORD
2860
58°22'
Map of the Taku Glacier
1980
2660 Spot Elevations (feet)
Edge of Glacier
land contour interval = 1,000ft
highlands
lowlands
water
N
0 1 Miles 2 3
0 1 km 2 3

Lab Analysis Part 2:

1. Look up the Taku Glacier on Google Earth to find its current position. Does this align with your prediction? _____

   _____

2. Propose a logical reason that the Taku glacier has not advanced as much as your initial prediction: _____

   _____

   _____

   _____

3. The Rhone Glacier in Switzerland has been retreating for the past 150 years. Figure 2 below is a postcard dated 1870. Figure 1 is a 2018 satellite image of the same location. What effect might the melting of the Rhone Glacier have on the surrounding areas? _____

   _____

   _____

4. Propose a reason for the rapid retreat of the Rhone glacier illustrated in the differences seen between figure 1 and figure 2 below. _____

   _____

   _____

   _____