Dynamic Planet - Glaciers Name: _____

Materials required: **Grinnell Glacier**

- Series of twelve boundary maps of Grinnel Glacier
- Acetate graph with individual squares of $1/10^{th}$ kilometer each
- Thin line, water soluble marker of any color
- Paper towels – one moist; the other dry

Part I: Use the images and the grid you have been given to answer the following questions.

1. Is the Grinnell Glacier located on land or at sea? a. _____ How do you know b. _____

   _____

2. How many individual squares are needed to blanket an area of one square kilometer?

   _____

3. What value represents the area within each individual square? _____ Km^2

Part II: Determining the surface area of each glacier in square kilometers.

- Place the acetate onto the image and trace the outer boundaries of both parts of the glacier. (To avoid damaging the grid printed on the acetate, place the acetate so the title appears as a mirror image, i.e. you working on the reverse side of the acetate.)
- Place the acetate with the outline you have drawn onto a sheet of plain white paper for better viewing.
- Count and record the number of "whole" squares, within the boundaries of the glacier. You need only touch the center of each square with the tip of the marker leaving a small dot on each as you count.
- Make "wholes" out of partial squares, i.e. 2 halves equal one, 3 thirds equal one, etc. Add these totals to determine the area of the glacier for each year given and record these on the chart on page 2. These estimates, though not perfect, are accurate enough to make inferences about the size and wasting of the glacier.

TABLE I: Wasting of the Grinnell Glacier

Year	Years between readings	Area in Km^2	Actual loss or gain in area	Average loss or gain in area per year
1860	----	Km^2	----------	----------
1890	Years	Km^2	Km^2	Km^2
1911	Years	Km^2	Km^2	Km^2
1920	Years	Km^2	Km^2	Km^2
1927	Years	Km^2	Km^2	Km^2
1945	Years	Km^2	Km^2	Km^2
1950	Years	Km^2	Km^2	Km^2
1960	Years	Km^2	Km^2	Km^2
1966	Years	Km^2	Km^2	Km^2
1970	Years	Km^2	Km^2	Km^2
1985	Years	Km^2	Km^2	Km^2
1993	Years	Km^2	Km^2	Km^2

Part III: Interpreting your results

4. Calculate the area of the Grinnell Glacier in 1993 as compared to its area in 1860? State your response as a percentage. _____

5. a. Between which years did the Grinnell Glacier actually increase in size? _____

   _____

   b. What caused that increase in size? _____

   _____

6. What types of records might one consult to determine the relationship between glacial melting and global warming? _____

   _____

   _____

7. May the measurements of the Grinnell Glacier's area during the span of these observations be used to prove that global warming is currently occurring? _____ Explain.

   _____

   _____

8. May the measurements of the Grinnell Glacier's area during the span of these observations be used to prove that man's activities are at least partially responsible for the shrinkage of earth's glaciers? _____ Explain. _____

   _____

9. Between which years was the average yearly growth in area the greatest? _____

   _____

10. Between which years was the average yearly loss in area the greatest? _____

    _____

11. a. Where is Grinnel Glacier wasting at the fastest pace? _____

       _____

    b. Form a hypothesis as to why the glacier is wasting at that location rather than wasting evenly on its entire surface. _____

       _____

       _____

       _____