**Dynamic Planet Division B**

This is the Dynamic Planet Division B test.

You may divide up this test, but if you do so please put your team number on every page.

You are allowed four double-sided pages of notes and two non-graphing calculators.

Good luck!

Section A.: 18 points _____ Final tiebreaker is score on this section

Section B: 12 points _____ Third tiebreaker is score on this section

Section C: 30 Points _____ First tiebreaker is score on this section

Section D: 25 Points _____ Second tiebreaker is score on this section

Section E: 15 points _____ Fourth tiebreaker is score on this section

Total: _____

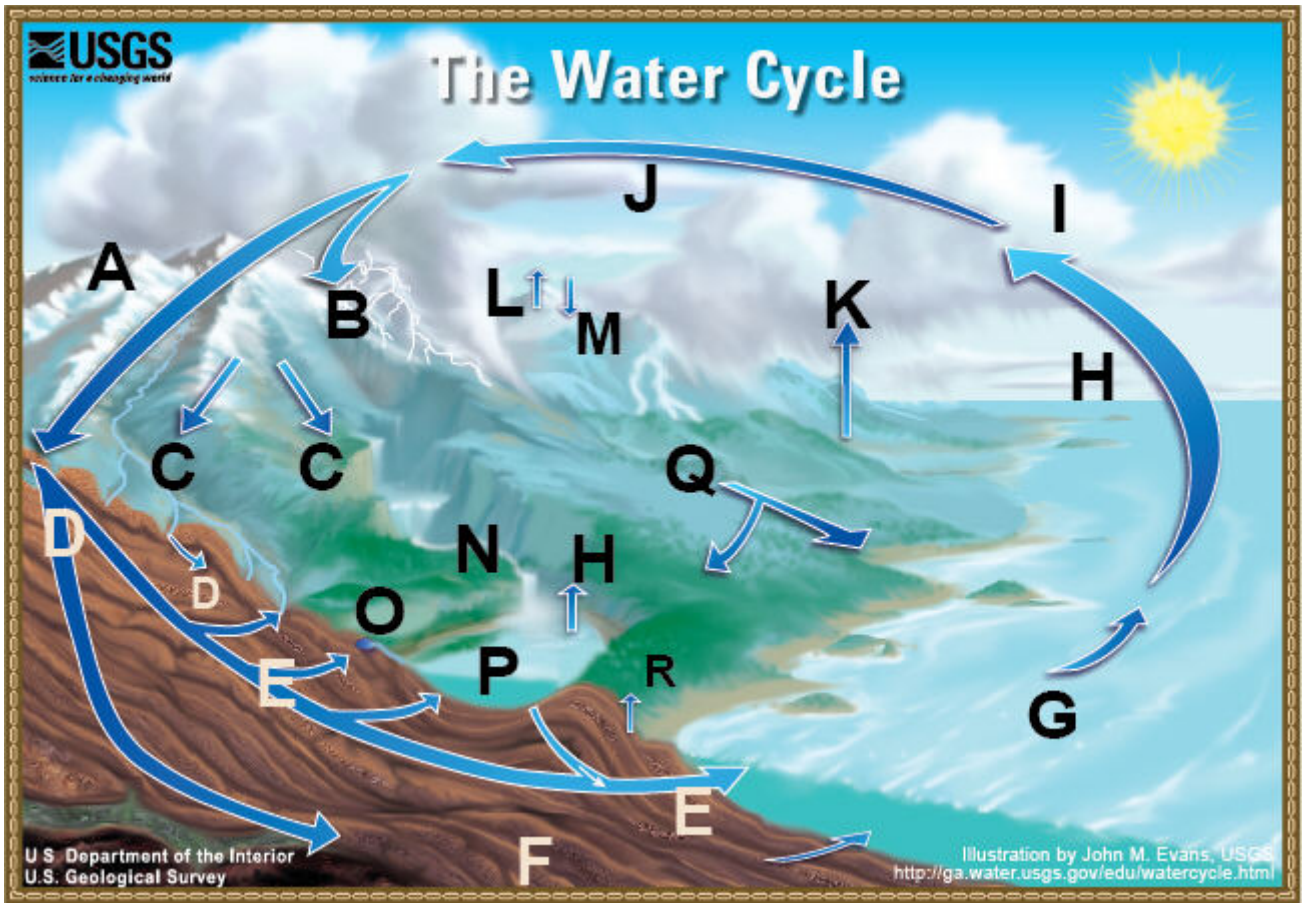



Figure 1: An illustration of the water cycle

**A. Water cycle (18 points)**

**[ ] Condensation**
**[ ] Evapotranspiration**
**[ ] Groundwater discharge**
**[ ] Infiltration**
**[ ] Snowmelt runoff to streams**
**[ ] Streamflow**
**[ ] Surface runoff**
**[ ] Water storage in ice and snow**
**[ ] Desublimation**
**[ ] Evaporation**
**[ ] Freshwater storage**
**[ ] Groundwater storage**
**[ ] Precipitation**
**[ ] Spring**
**[ ] Sublimation**
**[ ] Water storage in the atmosphere**
**[ ] Water storage in oceans**
**[ ] Plant uptake**

**B. Important lakes (12 points)**

For each of the following lakes (each one is one of the top ten lakes on earth in terms of volume or area), identify where it is (1 point) and how it was formed (2 points).

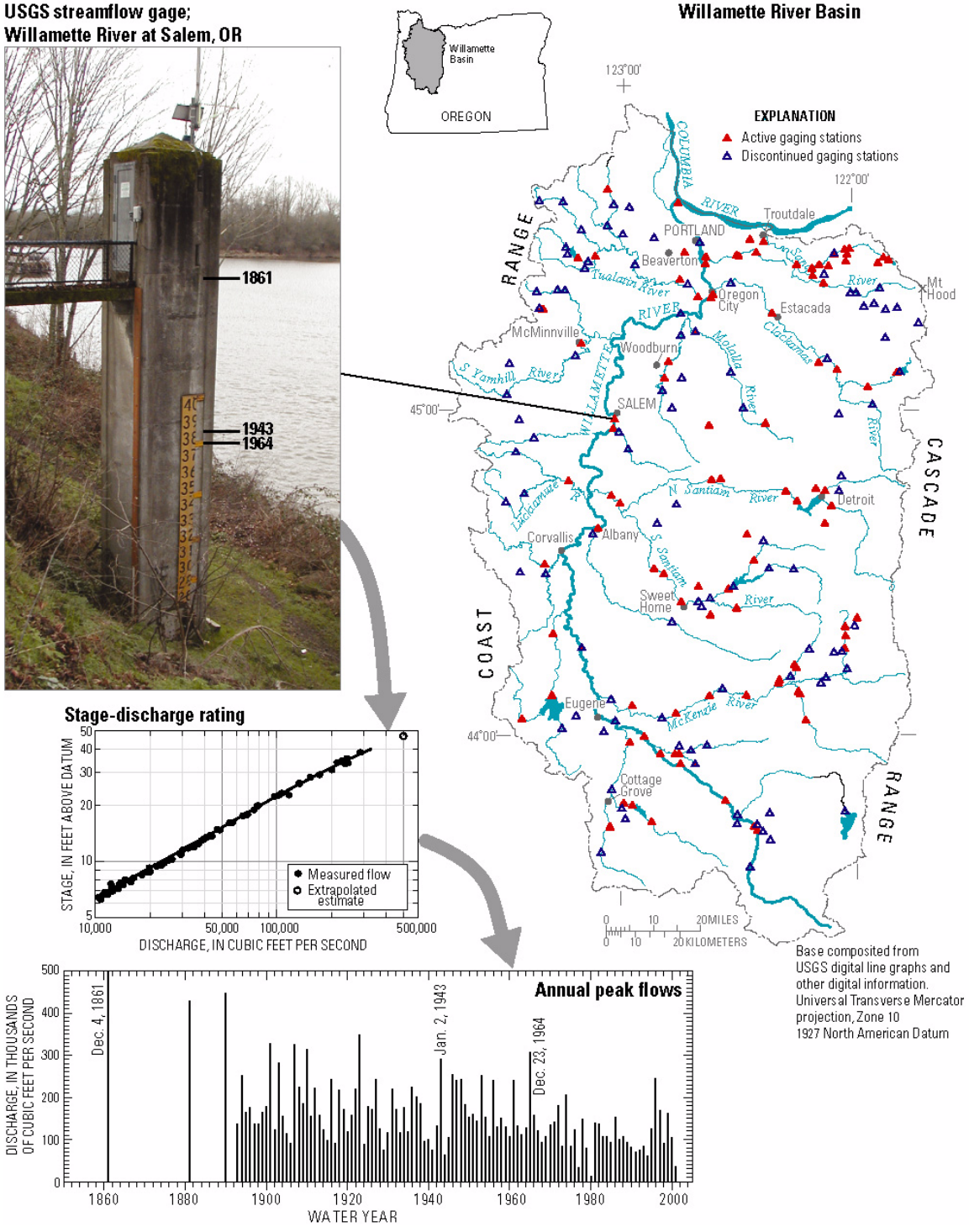
Lake Baikal:

Lake Victoria:

Lake Michigan-Huron:

Lake Vostok:

Figure 2: From O'Connor and Costa, USGS Circular 1245



**C. Floods (30 points)**

1. What is the definition of a flood? (5 points)

2. Figure 2 shows a streamflow gage on the Willamette river at Salem Oregon. Estimate the drainage area in $km^2$ for this gage. (5 points)

3. Suppose 5 cm of rain falls over this region and takes 1 day to drain away. Estimate the rate of discharge past Salem (note, 1 cubic meter is 35.3 cubic feet). (5 points)

4. Given this rate of discharge what is the stage height in ft? (5 points)

5. Estimate the height of the 30-year flood for this point for the $20^{th}$ century (5 points)

6. What sort of drainage pattern is seen in this basin? How do you know (5 points)

**D. Short answer (25 points)**

1. Will the sinuosity index of a river be higher or lower in regions of steep topography? Why?

2. What is the difference between stream competence and capacity?

3. What's the difference between porosity and permeability?

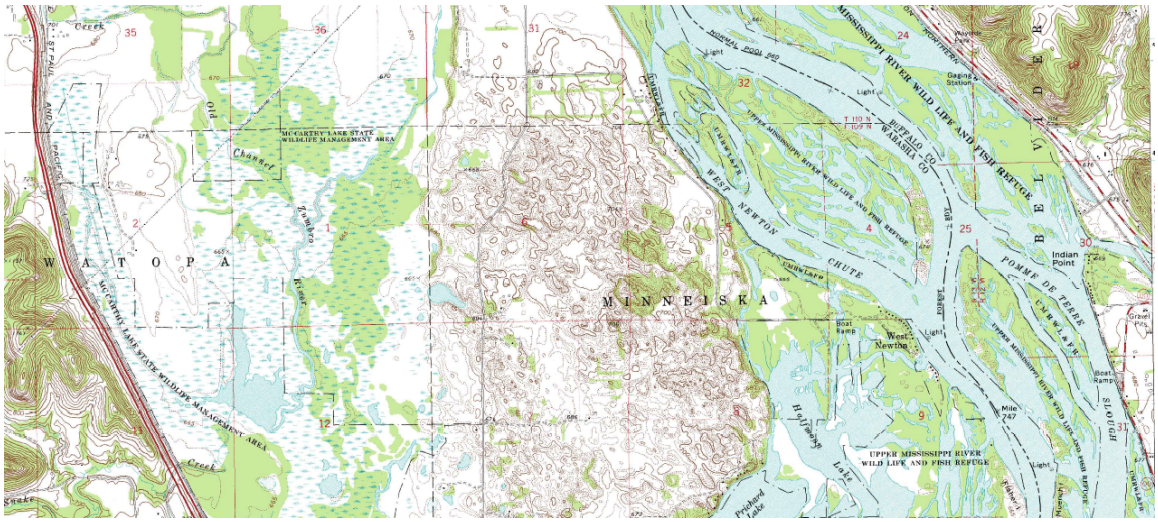
4. What is a solution valley?

5. Why are tropical lakes more likely to become hypoxic than Arctic lakes?

**Section E: Map interpretation (15 points each)**

The topographic map below shows the Mississippi just south of Kellogg, MN. The solid contour interval is 20 feet. The dashed contour interval is five feet.

On this map identify the
A. Edges of the floodplain
B. Areas of alluvium
C. Natural levees (if any), if not say so.
D. Thalweg
E. Back swamp



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