

## **DRAINAGE BASIN PATTERNS AND STREAM COURSES**

Sue Swanson  
Beloit College, Beloit, Wisconsin  
[swansons@beloit.edu](mailto:swansons@beloit.edu)

This is a two- to three-day classroom activity and writing assignment that is designed to help students recognize typical drainage basin patterns and stream courses. In addition to discussing common drainage basin patterns and stream courses in lecture, students make determinations on their own by studying individually-assigned topographic and geologic maps and writing short paragraphs to describe their interpretations of their study areas. On the first day, students describe drainage basins and submit their written work to the instructor. On the second day, the written work is redistributed to a different student and this student must edit the paragraph, if necessary, and add information on stream courses. Final paragraphs are submitted to the instructor and redistributed to the entire class, so that each student has a full set of paragraphs and maps for use throughout the rest of the term.

### Geomorphic topics addressed in the activity/assignment:

Fluvial Geomorphology

### Context:

- Designed for an undergraduate course in geomorphology.
- Has minimal/no quantitative component.
- The exercise is completed over a two to three day period. It requires approximately 10 minutes of class time on the first day and approximately 5 minutes of class time on the second day. The rest of the assignment is completed outside of class.

This exercise requires familiarity with topographic and geologic maps. It is included as part of the first two days of a chapter on fluvial geomorphology.

### Content/concept goals:

Students who complete this exercise should develop greater familiarity with topographic and geologic maps. They should also understand that more than one drainage basin pattern can exist in a region and drainage basin patterns are often more complex than typical textbook diagrams.

### Higher order thinking skills goals:

Students who complete this exercise synthesize information from topographic and geologic maps to make determinations of the types of drainage basins and stream courses in their study area.

### Other goals:

Students who complete this exercise gain experience in writing and peer review. They also gain experience in working with topographic and geologic maps.

### Description:

This exercise is typically integrated with lecture during the first two days of a chapter on fluvial geomorphology.

*Day 1:*

The first day of class begins with a discussion of the components of a drainage basin and typical drainage basin patterns, including dendritic, parallel, trellis, rectangular, radial, annular, and multibasinal. After viewing the typical textbook diagrams of these drainage basin patterns, each student is given his/her own topographic map and a geologic map from the same region. The students are given the following instructions:

1. Write a one paragraph description of your study area, and include the following information:
  - Quad. name
  - Drainage basin pattern(s) – in **bold**
  - Geological influence
2. Email the paragraph to me as an MS Word document by 9:00AM on [date – next day]. I will read the paragraph, but I will not modify any wording, so make sure it is accurate and well-written.

The maps are usually distributed in the last 10 minutes of a 50-minute class period, so that the students have some time to get familiar with the maps and ask any questions that arise immediately. Recommended 7.5 minute quad.s for the exercise include:

- dendritic: Effingham, IL; Alma, WI-MN
- parallel: Ithaca West, NY; Antelope Peak, AZ
- trellis: Waldron, AR
- rectangular: Hillsboro, KY; Cumberland MD-PA-WV
- radial: Mt. Rainer, WA
- annular: Maverick Spring, WY
- multibasinal: Whitwell, TN; Oolitic, IN

The Website <http://rockyweb.cr.usgs.gov/outreach/featureindex.html> is also a useful reference for other topographic maps.

*Day 2:*

On the second day of class, we discuss the initiation of channels and basin morphometry. After lecturing on topics like tractive force, micropiracy, cross-grading, and bifurcation, we discuss typical stream courses (i.e., insequent, consequent, subsequent, obsequent, and resequent). In the last 5 minutes of class, the paragraphs from the previous day are redistributed in such a way that every student has a paragraph written by one of their peers and a new set of maps. The students are given the following instructions:

1. Rewrite/edit what you have been given, if necessary, to emphasize the **bolded drainage pattern**.
2. Decide whether the stream patterns are representative of **consequent, insequent, or subsequent** stream courses.
3. Explain your reasoning using the geologic map.
  - Discuss the influence of the resistance of geologic materials on the stream course.
  - Discuss the influence of slope on the development of the stream course.
4. Email the paragraph to me as an MS Word document by 9:00AM on [date – next day].

Once final paragraphs are submitted, they are redistributed to the entire class so that all students have a complete set of paragraphs describing a variety of drainage basin patterns and stream courses from a variety of geologic settings. Maps remain in the classroom for the duration of the term so that students can reference them if they choose to.

Evaluation:

The initial paragraph that each student submits is not graded; however, the students are motivated to do a good job on it because they know it will be given to one of their peers. The final paragraph that each student submits is graded. I evaluate both writing and the student's conclusions regarding the drainage basin patterns and stream courses.

Supporting References:

<http://rockyweb.cr.usgs.gov/outreach/featureindex.html>