1

OVERVIEW OF RANGELANDS
MODULE 1 | Investigating Rangeland Systems and Practices

SKILL LEVEL

Middle School: Grades 6, 7, 8

KEY TERMS

Abiotic, biotic, grassland, shrubland, woodland, savanna, desert, cropland

EDUCATION STANDARDS

SD Science:
- MS-LS2-2
- MS-LS2-3

NGSS:
- MS-LS2-2
- MS-LS2-3

TIME NEEDED

Activity 1A: 45 min
Activity 1B: 30 min
Activity 2: 10 min

MATERIAL LIST

- Chalkboard or whiteboard
- Printable items from Appendices
- Computer w/ projector
- Materials listed for each activity

FUNDING ACKNOWLEDGEMENT

EXPECTED LEARNER OUTCOMES

OBJECTIVE 1
Students will be able to identify rangelands and explain how they differ from other ecosystem types.

OBJECTIVE 2
Students will be able to describe the relationships between the organisms and non-living components in a rangeland.

BACKGROUND

 "Rangeland" is a term that developed in the 1800's and is commonly used to refer to the unforested areas of the western United States. The term has expanded to characterize "rangelands" as land with limited precipitation, somewhat sparse vegetation, climatic extremes, variable soils, and diverse topography. Rangelands can be found all over the world - from South Dakota to Washington to the African plains and the Australian deserts (Figure 1). Around the world, rangelands are called different names. Depending on where you are in the world, these names include prairies, plains, grasslands, swards, stepps, pampas, shrublands, scrublands, woodlands, savannas, deserts, semi-deserts, and arid land.
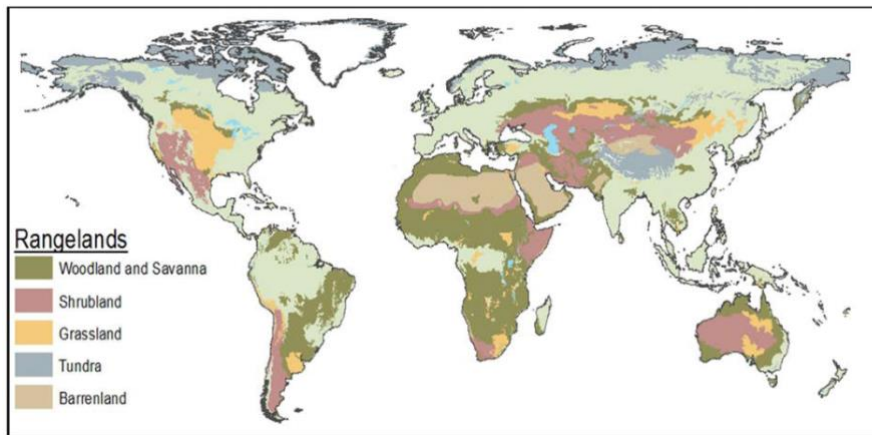
Figure 1. Rangelands of the World. (Map created by E. Strand, K. Launchbaugh, C. Bernau, University of Idaho).

Rangelands are a type of land. They are not farmed (non-cultivated), they do not have thick forests, and they are not covered with solid rock, ice, or pavement. Rangelands can have scattered trees and are typically dominated by diverse plant communities that are composed of grasses and forbs (flowering plants, like a sunflower). The landscapes of rangelands are diverse and complex and support plants, animals, and humans.

In the U.S. about 36% of the land area is considered rangeland. Some of that rangeland exists in the Northern Great Plains (NGP), which consists of the states of South Dakota, North Dakota, Nebraska, and Kansas (Figure 2). The NGP encompasses nearly 85 million hectares of land (about 210 million acres). Much of that land (40%) is used for livestock production.

In South Dakota, about half (50%) of the state is considered rangeland and most are privately owned by farm and ranch families. There are over 17,000 family-owned and operated ranches in South Dakota. These lands provide grazing for approximately 4.05 million beef cattle and 255,000 sheep. Livestock production is critical to South Dakota's economy, resulting in approximately $3.2 billion in total cash receipts (Census of Agriculture National Agriculture Statistics Service, 2017). In addition to livestock (cattle, sheep), rangelands are home to different plant and wildlife species that we will learn about in Module 2: Rangeland Plants and Module 3: Rangeland Animals. These plants and animals have key roles in creating healthy, functioning ecosystems that we all enjoy.

Figure 2 . Rangeland locations in the United States. Note the location of the Great Plains. (Map created by K. Launchbaugh, University of Idaho).

VOCABULARY

ABIOTIC: The non-living components of an ecosystem, such as rocks.

BIOTIC: The living components of an ecosystem, such as the soil, animals, and plants.

GRASSLANDS: Dominated by grasses, they have different names like "prairie" and "meadow." Grasslands occur on all continents except Antarctica.

SHRUBLANDS: Have abundant stands of shrubs (woody, short plants) that have an understory of grasses and forbs (flowering plants).

WOODLANDS AND SAVANNAS: Dominated by widely spaced trees (in contrast to a dense forest) with an understory of grasses and forbs. Tree species are typically juniper, oak, mesquite, and pine.

DESERTS: The driest rangelands that have unpredictable precipitation and extreme water shortages. Deserts are typically dominated by shrubs and plants such as cactus.

CROPLANDS: These are NOT rangelands. These are lands utilized for crop production. Students may find that these have distinct rows of plants, whereas rangelands do not. Rangelands are managed differently than cropping systems - there is no intensive planting in rows that occurs, like we do with corn or soybeans. Some rangelands are rocky or have hills, which are not conducive to moving around large farming equipment. Rangelands also differ from cropping systems in that fertilizer and irrigation are not used to increase plant growth and production.

ACTIVITY #1A: RANGELANDS AROUND THE WORLD

ESTIMATED TIME: 45 MIN

Materials
- 10 pictures from Appendix (make 1 copy per group of students)
- Flip chart paper (1 per group)
- Markers (1 set per group)

1. Separate students into small groups of 2-4.
2. Provide each group with a set of 10 pictures (found within Appendix B)
3. Have the students compare and contrast the images. Based on what they see, have them categorize them into groups.
4. Have the groups explain their categorization to the remainder of the class.
   a. How many different categories did each group define?
   b. What types of themes did each group use for categorization? (location, climate, plant life, animal life, etc.)
   c. As a large group, what categories would the images be sorted?
5. Introduce rangeland:
   "Rangelands are a type of land. They are not farmed (non-cultivated), they do not have thick forests, and they are not covered with solid rock, ice, or pavement. Rangelands can have scattered trees and are typically dominated by diverse plant communities that are composed of grasses and forbs (flowering plants, like a sunflower). The landscapes of rangelands are diverse and complex and support plants, animals, and humans."
6. Based on the definition of rangeland, have the students assess their categorizations. What would they change? What would they keep the same? Are there any pictures that wouldn't fall into the category of rangeland?
7. Provide students with the formal definition of type of rangeland and the corresponding photos.
   i. **Grasslands**: dominated by grasses, they have different names like "prairie" and "meadow." Grasslands occur on all continents except Antarctica.
   ii. **Shrublands**: have abundant stands of shrubs (woody, short plants) that have an understory of grasses and forbs (flowering plants).
   iii. **Woodlands** and **savannas**: dominated by widely spaced trees (in contrast to a dense forest) with an understory of grasses and forbs. Tree species are typically juniper, oak, mesquite, and pine.
   iv. **Deserts**: the driest rangelands that have unpredictable precipitation and extreme water shortages. Deserts are typically dominated by shrubs and plants such as cactus.
   v. **Croplands**: these are NOT rangelands. These are lands utilized for crop production. Students may find that these have distinct rows of plants, whereas rangelands do not. Rangelands are managed differently than cropping systems - there is no intensive planting in rows that occurs, like we do with corn or soybeans. Some rangelands are rocky or have hills, which are not conducive to moving around large farming equipment. Rangelands also differ from cropping systems in that fertilizer and irrigation are not used to increase plant growth and production.
8. Assign each group one of the types of rangeland.
9. Provide each group with a large sheet of drawing paper (i.e. flip chart size paper) and markers.
10. Ask students to list aspects of their rangeland category. Things they should include are:
    a. Living (biotic) organisms – examples:

        i. Plants
       ii. Animals such as birds, deer, antelope, cows
     iii. Soil (Soil is living! It is home to lots of microbes like fungi and bacteria.)
     iv. Humans
- b. Nonliving (abiotic) aspects – examples:
  - i. Rocks
  - ii. Water
  - iii. The sun
  - iv. Climate
- c. Relationships between abiotic & biotic aspects – examples:
  - i. Competitive
  - ii. Predator/Prey
  - iii. Mutually Beneficial
11. As groups finish up their lists, have them compare with other groups. Are they missing vital aspects of their ecosystems?
12. Have groups keep their lists for Part B.

ACTIVITY #1B: RANGELANDS AROUND THE WORLD

ESTIMATED TIME: 45 MIN

Materials
- Flip chart paper (1 per group)
- Markers (1 set per group)

1. Utilizing the lists developed in Part A, have groups begin drawing their rangeland ecosystem. Be sure to have them include both **biotic** and **abiotic** components.
2. While they are drawing, discuss the relationships noted in their lists.
   a. Where do the various organisms get their energy? How are things connected? What flows where? Is energy moving such as energy from the sun to plants during photosynthesis? Is matter moving, such as the decomposition of cow manure?
      i. Plants from the sun and compost
      ii. Herbivores from the plants
      iii. Carnivores from other animals
   b. What happens if something in the list goes away? Or increases in number?
      i. There is a drought
      ii. A species becomes endangered or extinct
      iii. There become too many of a specific animal (i.e. deer or coyotes)
3. Have the groups incorporate the flow of energy and matter among the living and nonliving parts of the ecosystem in their drawing.
4. Have students share their drawings and the connections they made in their rangeland model. Ideally, discussion will lead to:
   a. Cycling of matter – examples:
      i. Plants grow, eventually die, decompose, and become part of the soil
      ii. Plants grow, animals eat the plants, and humans eat the animals
      iii. Water flows from the atmosphere in the form of rain or snow, gets captured by the plants, plants use it for photosynthesis, and water is also held in the ground by plant roots
      iv. Water flow from the atmosphere in the form of rain or snow, gets captured in landscape drainages, ponds, streams, and rivers and is used by animals
   b. Flow of energy – examples:
      i. Sun provides energy, in addition to carbon dioxide and water, to plants that make energy for themselves during photosynthesis
      ii. Thermal energy comes from the sun, and is absorbed by the landscape, creating a warm environment for us to live in
      iii. Thermal energy powers evaporation and transpiration (the evaporation of water from plants), helping to pull water into the water cycle
      iv. Soil microbes breakdown organic matter (matter that contains carbon), making it into usable forms for plant roots, that then uptake nutrients such as nitrogen, and use them for growth and other processes

ACTIVITY #2: CLASSROOM ASSESSMENT

ESTIMATED TIME: 10 MIN

One-minute paper for Activities #1A and 1B

1. Have each student get out a piece of paper to write on.
2. Ask students to: describe a rangeland; discuss where rangelands are located across the world; and what matter and energy cycles and flows occur in a rangeland ecosystem.
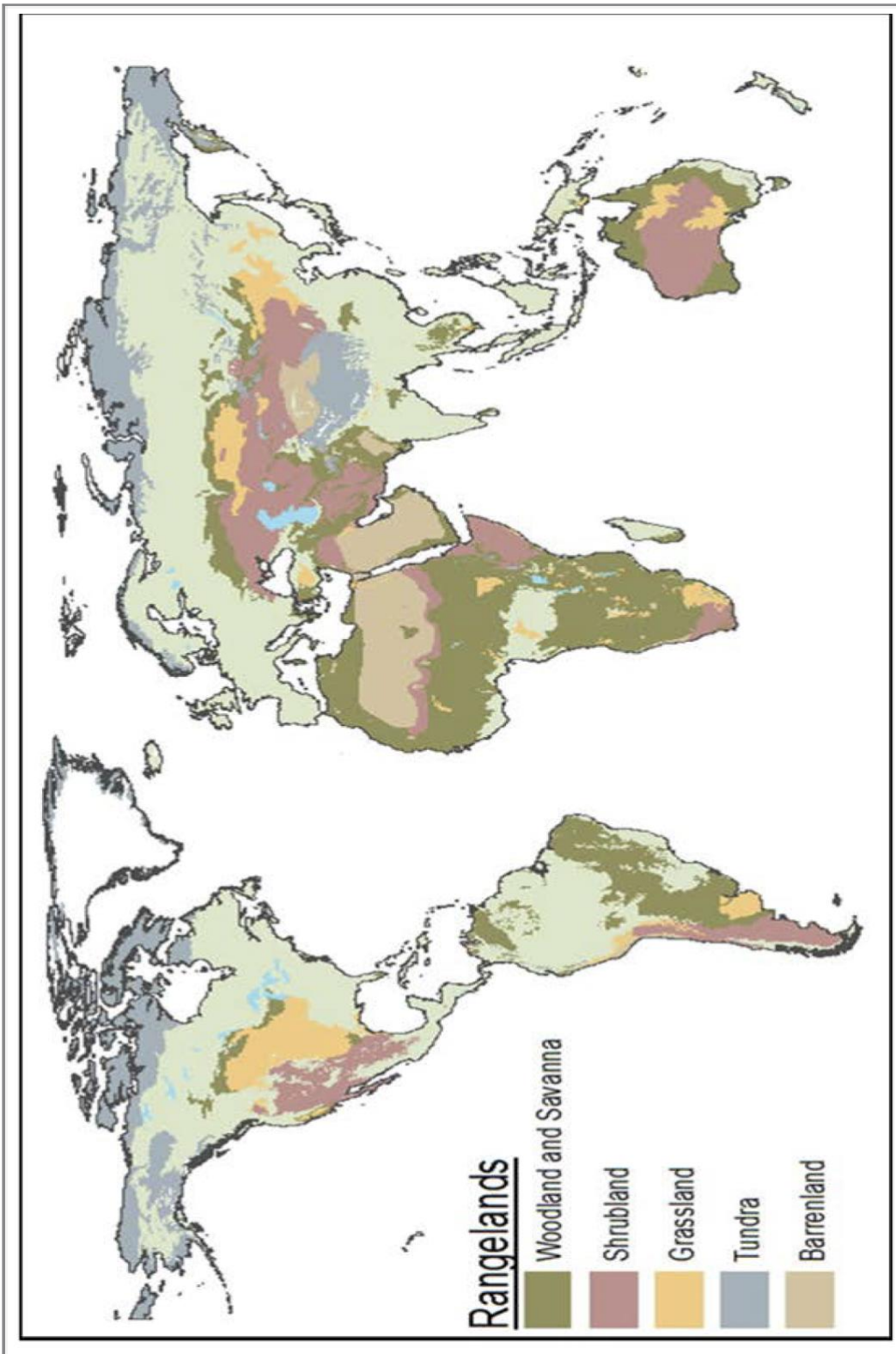
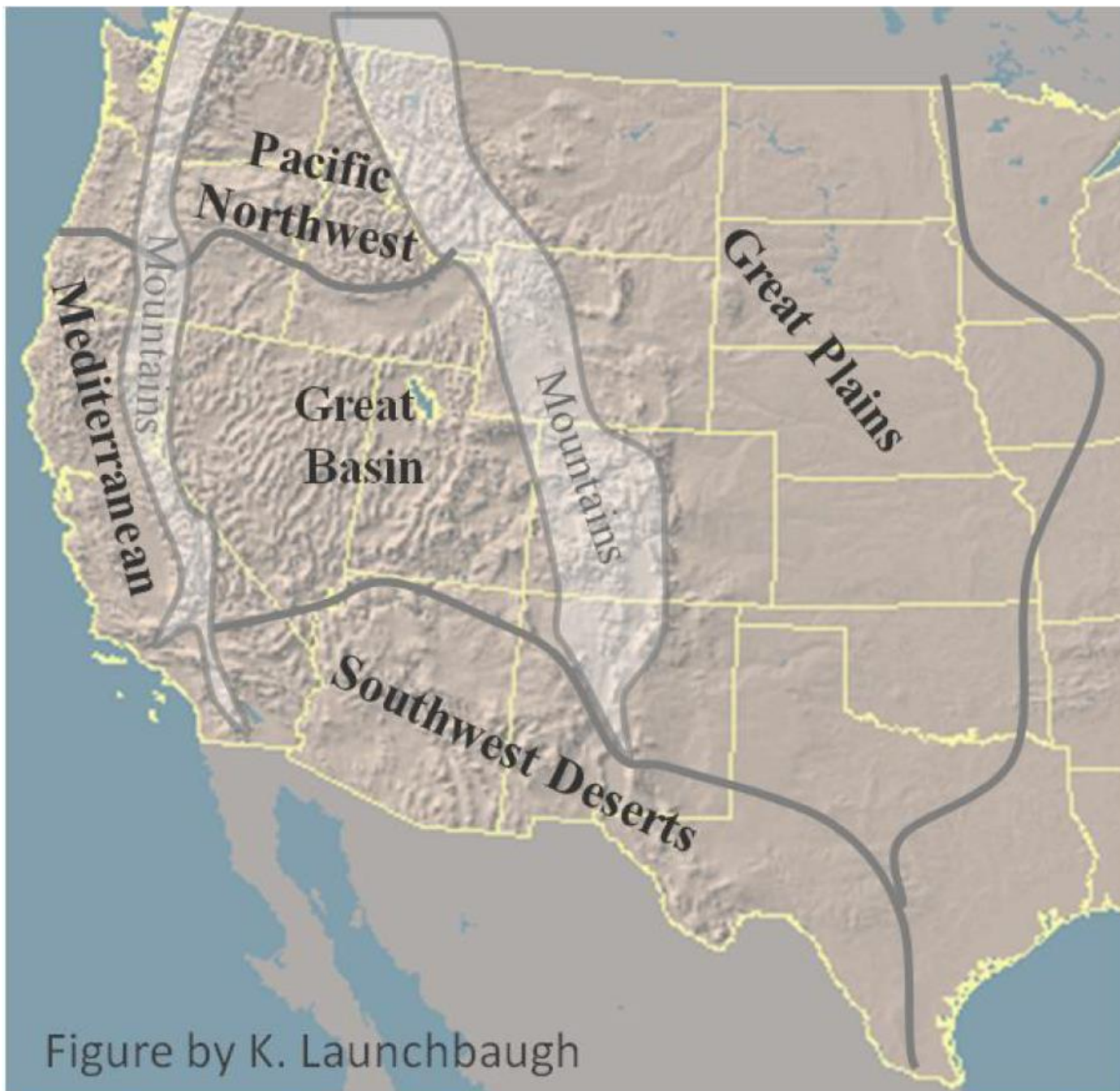*Figure 3. Rangelands of the World. (Map created by E. Strand, K. Launchbaugh, C. Bernau, University of Idaho).*

Figure 4. Rangeland locations in the United States. Note the location of the Great Plains. (Map created by K. Launchbaugh, University of Idaho).
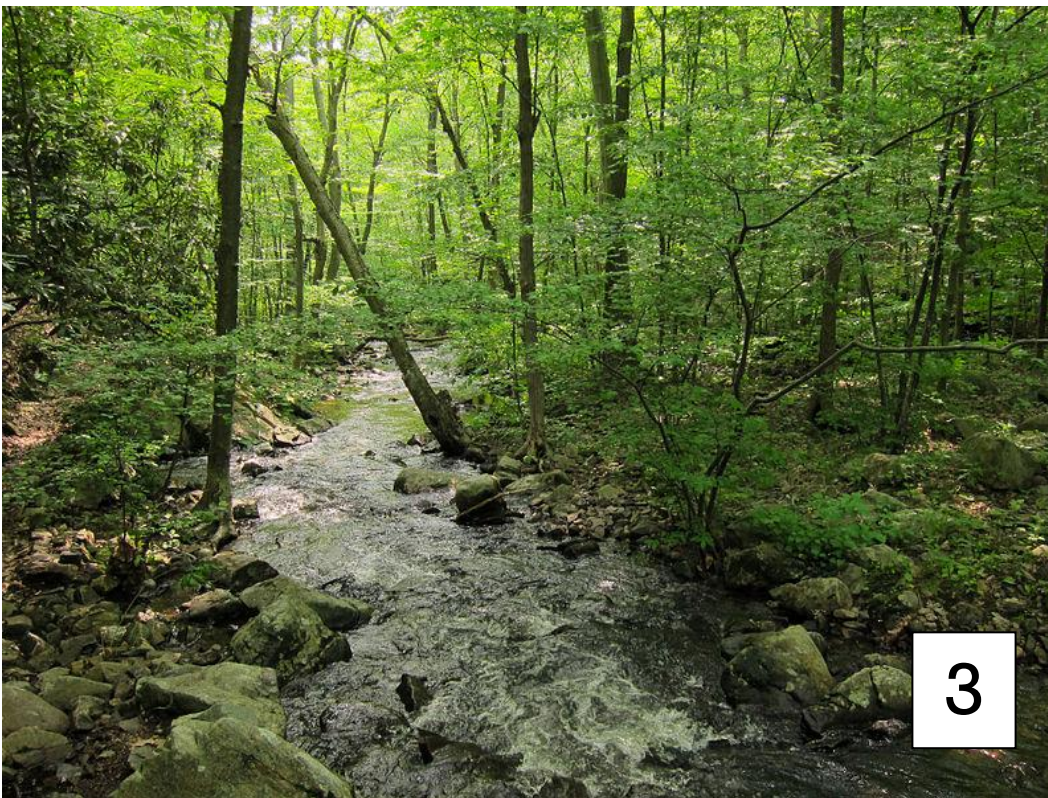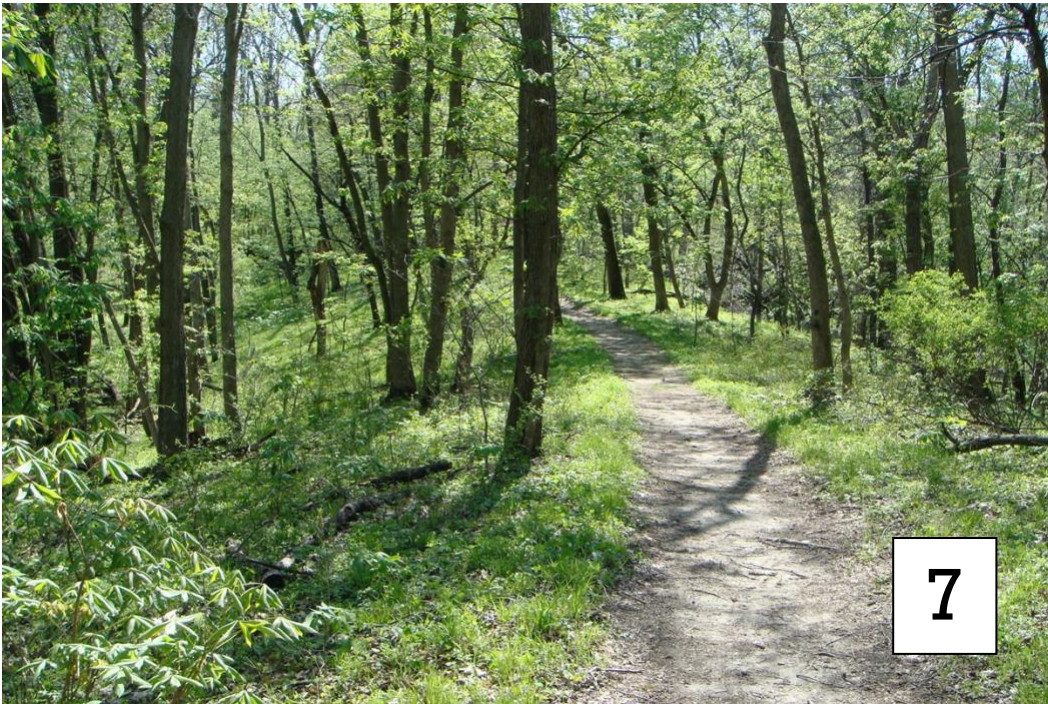
Pictures 1 and 4 are grasslands.

Pictures 9 and 2 are shrublands.

Pictures 7 and 3 are woodlands.

Pictures 8 and 5 are savannas.

Pictures 6 and 10 are croplands.

REFERENCES

Angelo TA and KP Cross. 1993. Classroom assessment techniques: A handbook for college teachers. Second edition. Jossey-Bass: San Francisco, CA.

University of Idaho, Idaho Rangeland Resource Commission. 2018. Rangelands: Wild open spaces for all. Idaho Envirothon Study Guide.