

**Time:**

1-2 hours, can be spread over a few days, depending on teacher pacing

Level:

6-8, with a focus on 7th grade standards

Goals:

Students will be able to explain that forests in Utah are not all alike – there is great diversity that varies with geographic location, proximity to water, elevation, and aspect, resulting in many types of forests that are classified differently

Objectives:

Students will classify their local forest type using the Utah Open Tree Map.

Students will explain why certain species of Utah trees will be found in some forests and not others.

Materials:Equipment

- Game and worksheets included in lesson plan printed for each student
- 20m of string, 2 stakes, permanent marker,

Forest Diversity

by Hilary Lambert and Megan Dettenmaier

Correlations to Core Curriculum:

Grade 7, Standard 5 Objective 2: Use and develop a simple classification system. a. Using a provided classification scheme, classify things (e.g., shells, leaves, rocks, bones, fossils, weather, clouds, stars, planets). c. Generalize rules for classification. d. Relate the importance of classification systems to the development of science knowledge. e. Recognize that classification is a tool made by science to describe perceived patterns in nature.

NGSS and CCSS-M Practices:

MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

STEM Integration:

Problem solving
Interpreting Data
Modeling
Investigation and tool use
Looking for and using structure
Attending to precision

21st Century Skills:

Commitment
Communication
Computational thinking
Collaboration
Critical thinking and problem solving

Background Information:

Forests in Utah are not all alike – there is great diversity that varies with geographic location, proximity to water, elevation, and aspect.

- Most productive coniferous forests grow in upper elevation basins and mountain slopes, favoring northern to eastern aspects
- Low elevation forests are water limited, which require forests to grow primarily near riparian

and forestry guide for transect study

Did you know?
The Great Basin
Bristlecone Pine is the
world's oldest living tree.

areas – more cottonwoods and willows grow there, which are able to tolerate warmer temperatures, and are more drought tolerant

- o Mid elevation (moderate precipitation), woodlands of drought tolerant trees like pinyon, juniper, oak, maple are most dominant on northeastern aspects
- o South and west aspects are usually devoid of forests

Activity 1: Diversity in Utah Forests

Engage (5-10 minutes) - Divide students into pairs and give each pair of students the matching game (see attached .pdf, print and cut the game cards). Students will match tree facts and pictures as they begin to explore and visualize common species in Utah forests.

Explore (30 minutes or more) - Students will work in pairs or teams to classify trees on/near their campus using a transect study.

1. Give teams of students 20m of string and have them tie it between two stakes that pass through an area of vegetation (the more dense, the better!) Then, using a permanent marker have students mark the string in 5m increments.
2. Have students count the trees that are within 1m of the string on both sides.
3. Using field guides or a tree identification app (see resources section), have students identify the trees they counted. This can be done in the first lesson or can be an ongoing project. The rest of this lesson should be completed after students have identified all trees within their transect.

Explain (30 minutes or more) - After counting and identifying the trees within their transected habitat have students draw a map of their surveyed area. Multiple trees of the same species should be color coded accordingly. Then, have student groups share with each other what species dominate their surveyed area. Finally, have all groups compare their maps with the Utah Forestry Map <http://forestry.usu.edu/files-ou/forestmapFINAL.pdf> and discover what forest type their surveyed area is in. Pose questions to students about the comparisons they make.

- Are you surprised about what species you found in your survey based on how the map classifies the region in which you did the transect study?
- What growing conditions exist in the forest you surveyed compared to other parts of Utah?
- What ages do you suppose the trees in your study area are?
- What adaptations do the trees in your forest type exhibit?

Elaborate (10 minutes) - Students will play the matching game (to solidify their understanding of different species, their adaptations, and where they are found in Utah forests. The game can be played two ways. The more simple version is to match three cards together showing the species picture, name, and forest type. The more challenging version is to randomly put all cards face down in a grid and play “memory” to match sets of three together.

Assessment (20 minutes): Students will complete the writing project (see worksheet below) individually or in pairs during which they explain why different species are found in different classifications of forest, using the Utah Forest Map as a guide.

Extensions:

- This lesson can be planned out as a week long mini-unit, doing one piece each day and allowing ample time for identification and map making.
- Students could use ARCGIS to make a digital map of your transect area as a geography extension

Resources:

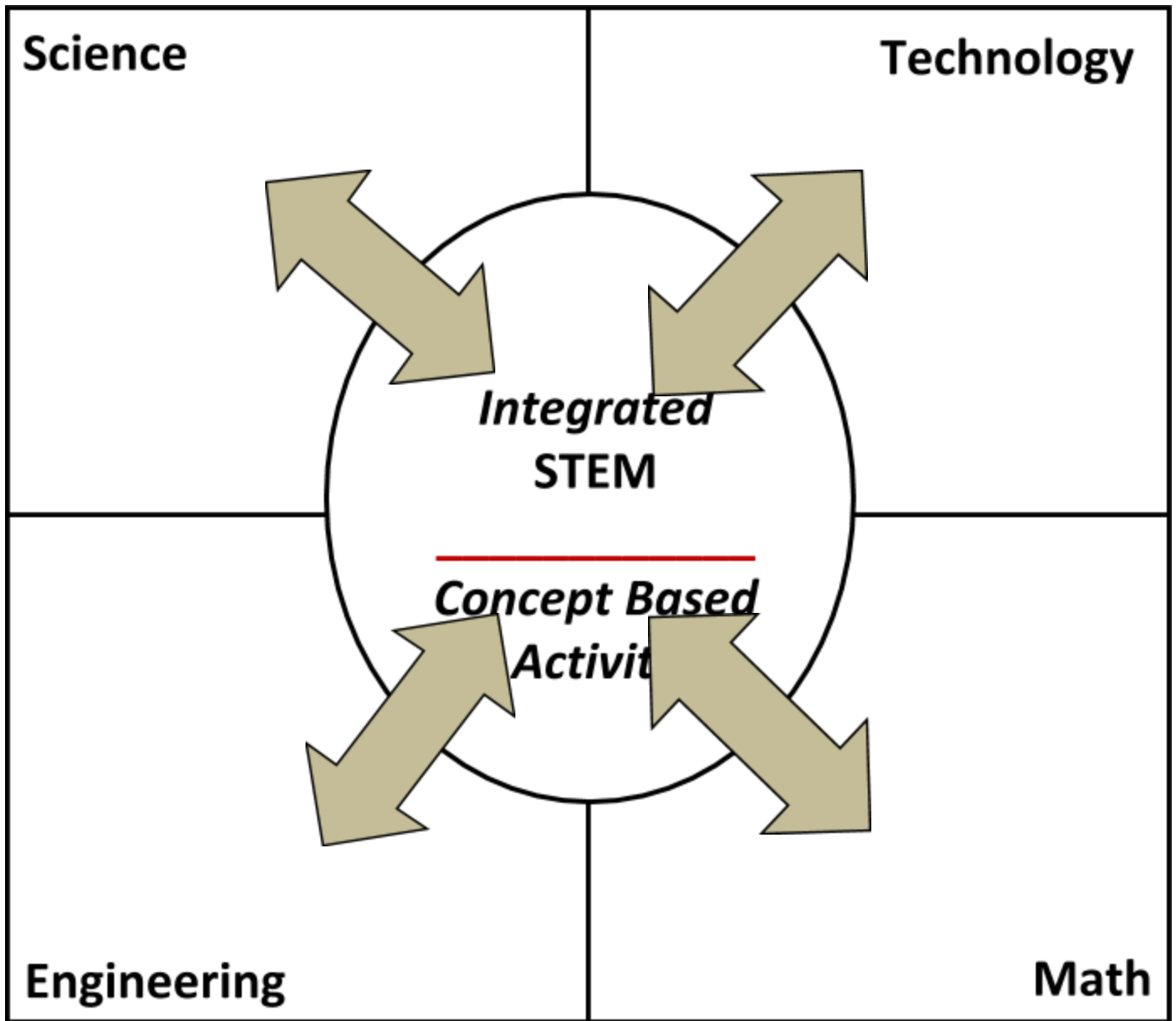
Books

- Utah Tree Field Guide, Michael Kuhns
- Woody Plants of Utah, Renee Van Buren, Janet G. Cooper, Leila M. Shultz, and Kimball T. Harper

Websites

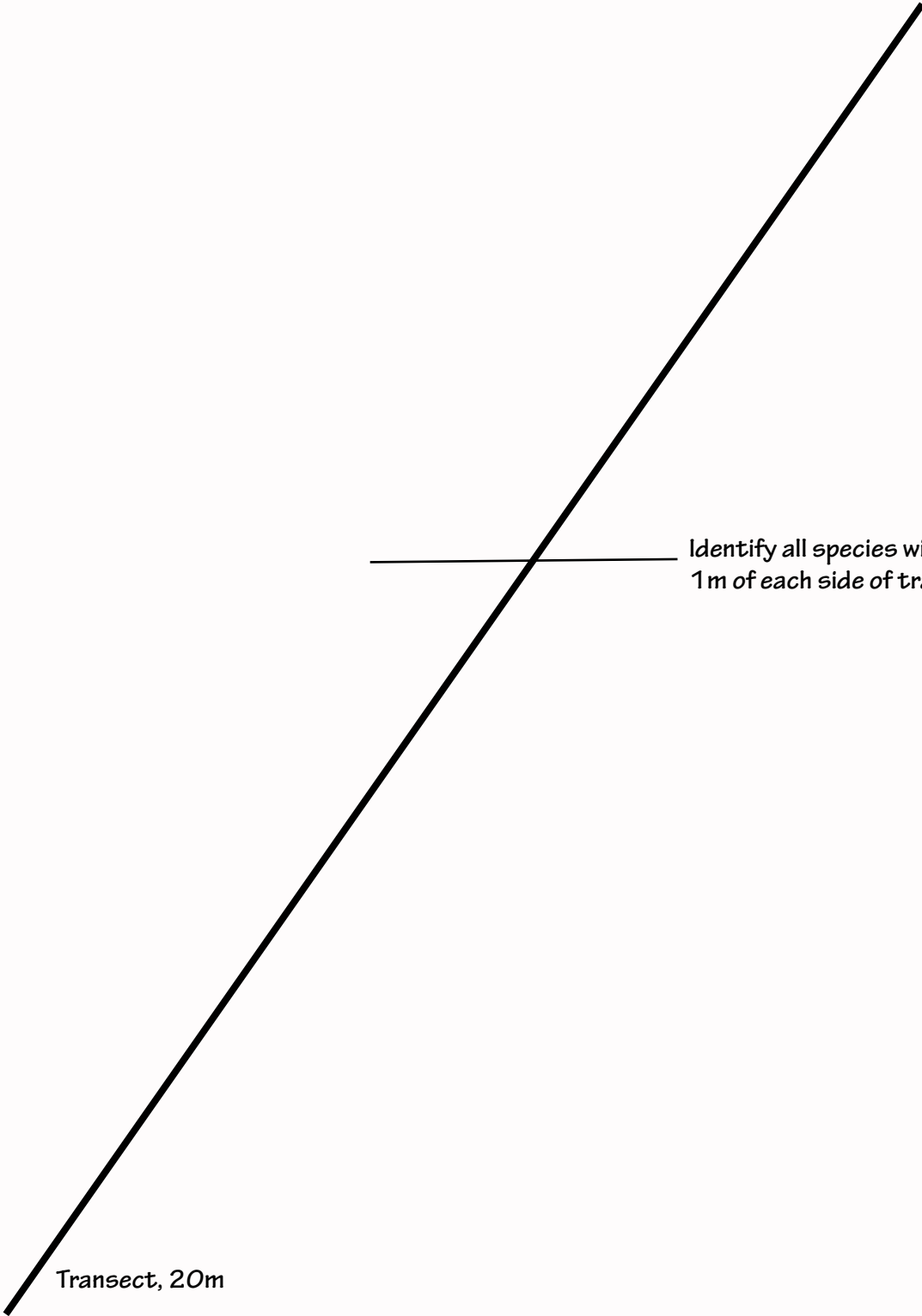
- The transect activity was taken from <http://www.discoveryeducation.com/teachers/free-lesson-plans/looking-for-biodiversity.cfm>
- The following are links to applications students can use to identify species during the transect activity. They work on mobile devices/ipads.
 - <https://www.arborday.org/trees/whattree/Whattree.cfm?ItemID=W6A>
 - <http://www.treehugger.com/natural-sciences/leafsnap-is-a-new-app-to-identify-trees.html>
 - https://play.google.com/store/apps/details?id=org.pottsssoftware.agps21&feature=search_result#?t=W251bGwsMSwyLDEsIm9yZy5wb3R0c3NvZnR3YXJlMFnCHMyMSJd

STEM Integration



Name _____

Use this to map your transect area and record what you find there.



Transect, 20m

Identify all species within
1m of each side of transect

Scoring Rubric

Learning Objective	Exemplary (12 pts)	Proficient (9 pts)	Developing (6 pts)	Minimal (3 pts)	Score
Completes transect lab experience, tree identification, and transect map	Transect line is properly marked and all trees properly identified and mapped	Transect line is properly marked and most trees are properly identified	Transect line is marked and some trees are properly identified	Transect line is not marked and many trees are not identified	
Participates in class discussion during which groups compare their study area to Utah Forestry Map	Asks questions, provides data from study area to peers, answers teacher questions				
Completes transect lab worksheet	Correctly and completely answers all questions	Answers all questions	Answers most questions	Answers few questions	

Student Name:

Points: /

Aspen

These trees have defense strategies against pressure from deer, elk, cows and other animals that want to eat the young trees. Aspen creates a bad tasting chemical which is exuded in their flower bud. This chemical makes the plant material taste bad and is even toxic to the browsing animal, allowing the tree to grow tall enough that herbivores can't damage them.

Cottonwood

These fast growing trees do not like shade, so they grow quickly to outcompete other trees in their habitat. They are found in riparian areas and have distinctly yellow and green leaves.

Ponderosa Pine

Once these trees reach 6 years of age they grow a thick bark that can pop off the tree during a fire, preventing the tree from burning up. Ponderosa Pine also have "self-pruning" branches, as the tree grows its lower branches drop off, making the bottom of the tree less likely to catch fire.

Bristlecone Pine

The Great Basin Bristlecone Pine is the the longest-living tree in the world. It grows slowly, creating dense wood that insects, fire, and erosion cannot destroy. Their waxy needles store water, making this tree drought tolerant as well.

Limber Pine

The branches and needles of a limber pine are so flexible they can bend backwards without breaking, allowing them to survive high winds and heavy loads of snow. Their seeds are spread along rocky ridgelines by Clark's Nutcracker and Pinyon Jays.

Rocky Mountain Maple

This tree has adapted to grow in rocky, sandy soil. It can be found near streambeds and in gravelly areas.



Name _____

Using your knowledge of different Utah forest types and the Utah Forestry Map as a guide, answer the following questions.

Q: What species would you expect to find if you conducted this line transect survey:
In your backyard?

At Beaver Mountain?

In Bryce Canyon?

How come we might not expect to find a great basin bristlecone pine along a streambank in the valley bottom? i.e. along the Logan River?

Could a Rocky mountain maple live in the desert of Moab?

What kind of trees would you expect to find if you climbed a high mountain peak, where the slopes were rocky, windy, and not very vegetated?

Mark a point 65 miles east or west of your location on the map (your choice). What is the dominant forest type there? How is it different from the forest near your campus?