Tallgrass Prairie Storyline

Notes to Educator:

- We use different colors to specify information we are providing to you.
- **Red** is used to connote scientific terms with their definitions. We encourage you to ask your students what they think the terms means before providing the definitions. You might be surprised, and this might inspire a discussion within the class – which is a good thing, right?!
- **Purple** is used to designate notes from us to you. **Purple** may also indicate questions you can ask your students. Answers aren't always provided because there may not be definitive answers available.
- **Blue** are the Driving Questions – the overarching questions that drive the flow of the material

Lesson 1: Tallgrass Prairie Phenomenon

Driving questions: **What is a good is a prairie? How does a prairie maintain its' health?**

NOTES TO TEACHERS: Start by asking your students the driving questions.
- Are the two questions different?
- Is there any value to the prairie? What might that value be?
- Who is the prairie valuable to?
- Is there a difference between a good prairie and a bad prairie?

Terminology & Concepts
- *Ecosystem* = a community of organisms and non-living elements (weather, geology, soil, etc...) that interact within a specific environment.
- *Environment* = the sum total of all the living (biotic) and non-living (abiotic) elements and their effects that influence life.
- *Tallgrass Prairie* = prairie found on the eastern edge of the North American Great Plains where the average annual rainfall is higher than that further west.
- *Watershed* = an area of land that drains or "sheds" water into a specific body of water – it can be a creek at the bottom of a hill, for example.

A. Observe and Question

Check out the following photograph. This was taken at the Konza Prairie Biological Station (outside of Manhattan, Kansas). Look at the right side of the road and compare it to the left side of the road. What do you notice? Photo provided in Lesson 1 PowerPoint

B. In your notebook, divide your paper into 3 columns. Title the columns with "I notice", "I wonder", and "Could it be?" Record as you observe:

I notice...	I wonder...	Could it be...

C. Let's take a closer look... provided in Lesson 1 PowerPoint

Possible discussion questions:

Now that you see the two different sides of the road can you see:
- The two sides are different.
- Why are they different?
- One side has a fence and the other side does not – why?
- One side is fencing in animals and the other side is not.
- What animal(s) do you think are fenced in on the left?
- What impact do you think the fenced animals are having on the left side?
- The plants are different between the two sides of the fence, why is that?
- Which side is the better ecosystem? Is there a better side?
- If you were a butterfly, which side would you go to? Why make that choice?
- If you were a coyote, which side would you go to? Why make that choice?
- If you were a rancher, which side would you say is the better side? Why make that choice?

D. Now, let's look at the two sides of the road from the viewpoint of a coyote as it walks through the prairie:

https://www.youtube.com

"Prairie Left" vs "Prairie Right" (Ground Level)

Possible discussion questions:

Now that you see the two different sides of the road from the coyote's point of view:

- What are the differences between the left and right sides?
- Someone is eating the grass on the left side – who do you think that might be?
- Is the removal of grass on the left side affecting life there?
- Is the presence of grass on the right side affecting life there?
- Where do you see more insects – on the left or the right side?
- Is the abundance of insects on one side affecting other kinds of life there?
- Which side has the better ecosystem? What defines a good ecosystem?
- If you were a butterfly, which side would you go to? Would it matter? What do butterflies want?
- If you were a cattle rancher, which side would you prefer?
- Look through the eyes of an insect, or a coyote, or a bison, or a cattle rancher. You will see things differently with each set of eyes (literally and figuratively – your priorities will change depending on what you want the land to do for you).

E. Now let's look at the two sides from the viewpoint of a bison – at 5m high:

https://youtu.be/kOOVrygo4Os

"Prairie Left" vs "Prairie Right" (Altitude = 5 m)

Possible discussion questions:

Now that you see the two different sides of the road from the bison's point of view:

- What are the differences between the left and right sides?
- Someone is eating the grass on the left side – who do you think that might be?
- Is the removal of grass on the left side affecting life there?
- Is the presence of grass on the right side affecting life there?
- Where do you see more insects – on the left or the right side?
- Is the abundance of insects on one side affecting other kinds of life there?
- Which side has the better ecosystem? What defines a good ecosystem?
- If you were a butterfly, which side would you go to? Would it matter? What do butterflies want?
- If you were a cattle rancher, which side would you prefer?

F. Finally, let's be a hawk and take off from the ground and fly up – 50m – onto the sky and see what the prairie looks like from the sky:
https://www.youtube.com/watch?v=FfJhLAPZqjQ

"Prairie Left" vs "Prairie Right" (Altitude = 50 m)

Possible discussion questions:

Now that you see the two different sides of the road from the hawk's point of view:

- What are the differences between the left and right sides?
- Someone is eating the grass on the left side – who do you think that might be?
- Is the removal of grass on the left side affecting life there?
- Is the presence of grass on the right side of the road affecting life there?
- Which side has the better ecosystem? What defines a good ecosystem?
- If you were a cattle rancher, which side would you prefer?
- Did the different perspectives change how you thought about the value of the two different sides of the prairie?
- Did your opinions about the value of the prairie change as the discussion progressed?
- Did you change your mind at all about what you think of the prairie?

Lesson 2: History

(Provide to the students: colored pencils and a paper map of the United States – in Lesson 1 PowerPoint at bottom of document)

ACTIVITY: Let's step back and discover where prairies are found in the United States. Work with a partner.

A. Place a dot on the map where you think you live.
B. Choose a different color and draw the outline of where you think "prairie/grasslands" used to be. Think 200 years ago…
C. With a different color, draw the outline of where you think "prairie/grasslands" exist today.

D. Now, let's take a look at a map (Lesson 1 PowerPoint) that shows the historical ranges of the three primary kinds of prairie in the United States:
   a. Tallgrass Prairie
   b. Mixed-grass Prairie
   c. Shortgrass Prairie
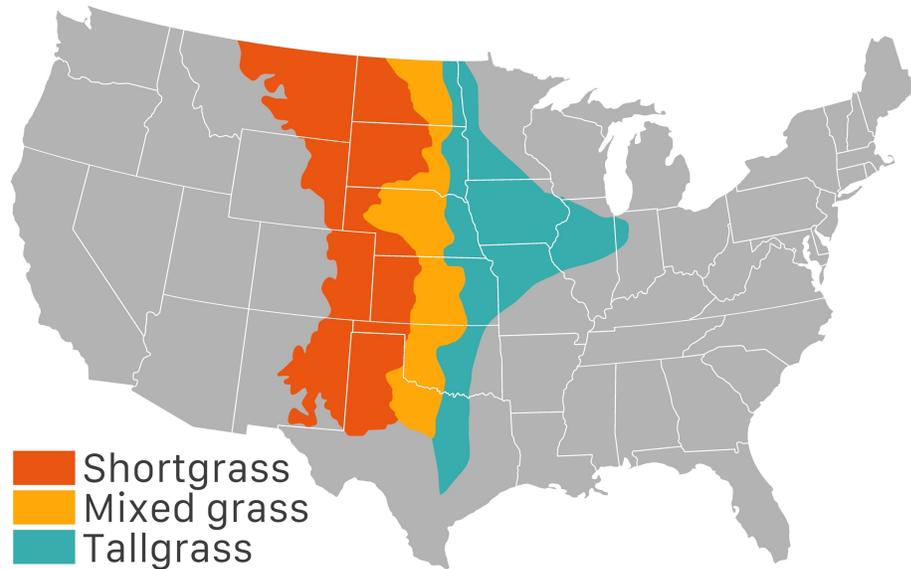
QUESTIONS:
   - How does this map compare to the one you and your partner drew?
   - Does this surprise you at all?

E. Now, let's take a look at a map of the current range of the 3 main kinds of prairie in the United States:
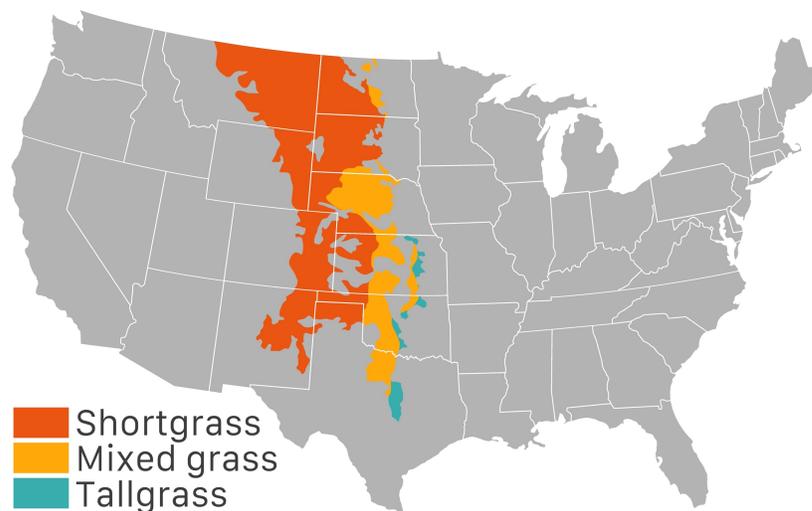
QUESTIONS:
   - How does this map compare to the one you and your partner drew?
   - Does this surprise you at all?

F. Take a look at this statement:

No one is alive today that remembers what the Tallgrass Prairie once looked like. A "Sea of Grass" 167 million acres strong (Samson and Knopf, 1994) once stretched from the eastern edge of Illinois tracking west encompassing Iowa and southern Minnesota and skimming the eastern edges of North and South Dakota, Nebraska, Kansas, and Oklahoma and then snaking down through the eastern side of Texas completely to the Gulf of Mexico. It doesn't look like that now.

Accounts vary but the amount of tallgrass prairie remaining (since before European settlement from approximately 1830) ranges from about 4% to 13% with the majority still present in the Flint Hills of Kansas (Samson 2004). The Flint Hills with its shallow, rocky soil was impervious to the plow and thus, the prairie remains there today, in places like the Konza Prairie Biological Center.

ACTIVITY: Give one, Get one, Move on – "Go, Go, Mo,"

A. After looking at the maps and the information on the tallgrass prairie make notes in your "Notice, Wonder, Could it be" notebook.
B. Do the Go, Go, Mo worksheet – have student write one piece of information in each square and pass the sheet around the classroom until all the blocks (12 blocks in each sheet) are filled with different facts about the tallgrass prairie.
C. Discuss with the class what they found.

Lesson 3: Explore – What is a "Good" Environment?

The tallgrass prairie at the Konza Prairie biological station is an example of an environment that is native to central Kansas. It contains plants and animals that are also native to that area. Do you think it is a "good" environment? What makes a good environment? There are other environments around us and are part of our everyday lives. What do you think makes a "good" natural environment?

ACTIVITY: Comparing and contrasting different environments in our daily lives. (Use Environment Cards – located at the bottom of this document. Printed and laminated, if possible. Students will use them as sets – make one set of all cards for each group of students)

- Put students into groups/or partners.
- BEFORE handing out the Environment Cards – ask the students these questions about the tallgrass prairie:

  o Do you think the tallgrass prairie is a healthy environment?
  o Where would you put the tallgrass prairie along the scale of healthy environments? Low, Medium, or High? Why?
  o What do you think determines the health of an environment?
- NOW hand out the laminated Environment Card sets – one set for each group of students. Ask them to do the following tasks:
  o You have 3 minutes – put them in order from "Least healthy" to "Most healthy" environment.
  o Report your order to the class – put them in a chart on the board.

Group #	Least Healthy Environment									Most Healthy Environment
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

- DISCUSS:
    o Did the groups' choices match? Where were there big differences? Why were there differences?
    o Were there certain environments (cards) that were difficult to place? Were there others that were easier to place? Why?
    o What factors seem the most important when determining if an environment is healthy or not?

ACTIVITY: Give each student (or pair of students) a copy of the Konza Prairie Biological Station Experimental Design Map, the Konza Satellite Map, and the Konza Vegetation Map.

Explanation:

Experimental Design Map: This map shows that the Konza Prairie Biological Station is broken up into individual units – termed "watersheds". There are 61 watersheds on the site – all of them are burned at some point. The frequency of the burn is indicated by the number in its code, e.g. K1B = burned every year. Some are grazed by bison ("N" watersheds) and others are grazed by cattle ("C" watersheds). Those without an N or C are ungrazed. The "K" watersheds contribute their water to Kings Creek.

Konza Satellite Map: Shows an aerial view of Konza Prairie. The trees and shrubs are seen as dark green – seen especially at the bottoms of the watersheds. The lighter green is grass – seen especially in those watersheds that are burned annually.

Konza Vegetation Map: Shows more clearly the different vegetation on Konza. Green is grass, yellow are shrubs, pink are evergreen trees (primarily Eastern Red Cedar), and purple are deciduous trees (primarily Rough-leaf Dogwood and Smooth Sumac).

QUESTIONS:

    o Which of the watersheds do you think is the healthiest?
    o What criteria did you use to make your decision?
    o We'll talk more about the watersheds and how they're different as we progress through the Story Line.

4.   Driving Question Board – Return to Your Questions

Return to your "I Notice, I Wonder, Could it Be" chart in your notebook.

I notice...	I wonder...	Could it be...

Put a star next to the two questions in your chart that you feel must be answered to better understand your observations.

We will now create a Driving Question Board with your questions.

Based on our class discussion our driving question is...
We are gently directing the students towards this: "**How to environments maintain their health**?" They may or may not come up with it – it's up to the instructor whether to introduce this question or not.

5.   Model – How Do Environments Maintain Their Health?

ACTIVITY: Have students draw an initial model in their notebooks that answers the question: "How do environments maintain their health?" Here are some guidelines to help them:
- Feature one or more of the environments portrayed in the Environment Cards
- Utilize terms and concepts discussed in class to the best of their ability; e.g.: Tallgrass prairie, Ecosystem, Environment
- Show the ideas written in the "Could it be" column of their notebooks.

Here's some assistance in understanding the components of a scientific model:

PowerPoint– "Scientific Model"

ACTIVITY: A tool that may be used to help keep track of your discoveries as you progress through this Storyline is an **Incremental Modeling Tracker (IMT)**. The IMT will help us keep track

of important discoveries and think through how we can prioritize our ideas and discoveries to revise or build upon our model of how the prairie ecosystem works.

IMT – found below – print and copy one for each student.

With your IMT in front of you – ask yourself these questions:
- What have we discovered so far?
- What are the components of our model?
- What information is missing? What do you want to discover?
- Record your current thinking about these questions on your IMT

Throughout our investigation of the ecology of the tallgrass prairie, we will be using the Incremental Modeling Tracker (IMT) as a thinking tool to help us keep track of and figure out important discoveries. You will refer back to the IMT regularly to help prioritize ideas and revise or build on our models. We will also use the IMT as a way to think with others about what is important in our models.

DRIVING QUESTION: **What is a healthy prairie and how does a prairie maintain its health?**

LESSON QUESTION (What Question Are We Trying to Answer?) & **LESSON NICKNAME**	**WHAT DID WE FIGURE OUT?** Which parts of what we figured out (if any) can help us with our model? (Highlight them!)	**BASED ON OUR PROGRESS THIS LESSON, HOW CAN WE ADD TO OR REVISE OUR MODEL?** How should we represent our ideas in our model? (Use pictures, words, or symbols)
1		

Lesson 1 - Exit Assignment – Producing an ecological model

Product submitted by student: an uploaded photograph
Points: 4

Assignment Overview

Addressing the question: "How do environments maintain their health?", you developed an initial model that shows prior ideas and understanding.

- Draw that model that shows the following components:
  - Plants
  - Animals
  - Weather
  - Anything else you can think of that should be part of a system

- Show how the components interact.

- Indicate the biological mechanisms at work:
  - How or why is the phenomenon happening?
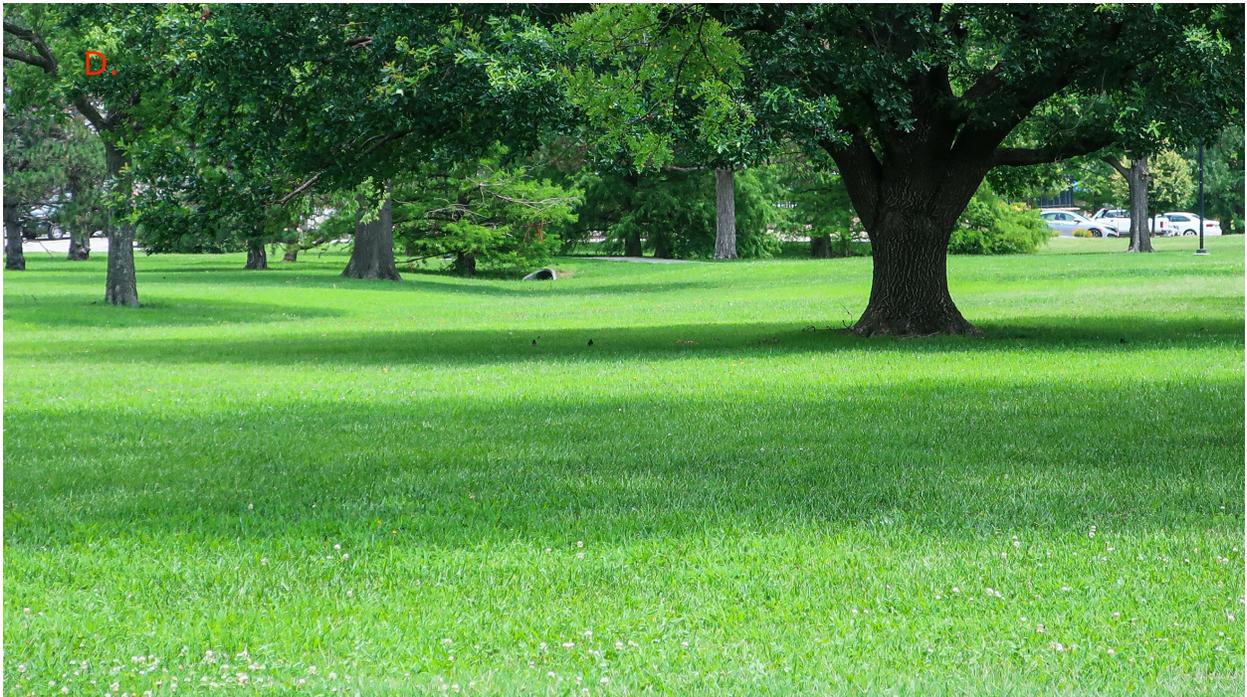 - What connection to biological process is occurring?

When completed, **take a photograph** of your initial model from your notebook and upload the image.

Suggested Rubric:

Initial Model Rubric (1) (1)

Criteria	Ratings					Pts
1) Explain Phenomena/Answer the Question:	2.0 pts Advanced	1.5 pts Meets Expectation	1.0 pts Approaches Expectation	0.5 pts Not Yet	0.0 pts No Attempt	2.0
4) Clarity of Communication:	2.0 pts Advanced	1.5 pts Meets Expectation	1.0 pts Approaches Expectation	0.5 pts Not Yet	0.0 pts No Attempt	2.0
					Total points:	**4.0**

Environment Cards:

C.

D.

E.

F.

G.

H.

I.

J.

KONZA PRAIRIE
BIOLOGICAL STATION

KONZA ENVIRONMENTAL
KEEP
EDUCATION PROGRAM

Konza Prairie
Experimental Design

Fire Reversals
Seasonal Burns
Grazed by Bison
Grazed by Cattle

N

0   0.5   1   Kilometers   2

White Pasture

ALF

C1SB

C3SC

C3SA

N.T. North Hill

ALA

Nature Trail

K1A

K20A

C3SB

HQA

ALB

HQB   HQE   ALC

ALD   ALE

HQC

K4A

K2A

C3A

HQD

N20A

N1A

C3B

N2A

N1A

N4B

K1B

C3C

N4C

N20B

N2B

N4A

N4D

N1B   1D   2D

C1A

R1B

4A   4B

SpA   20B   4F   SuB

R1A

SpB   FA   WA   WB

2A   1B   FB   20C

R20A   2B   2C   R20B   SuA

Vetch Hill

Konza Prairie Biological Station

Vegetation Map

2022

Legend:
- Grassland
- Shrubs
- Evergreen Tree
- Decidious Tree
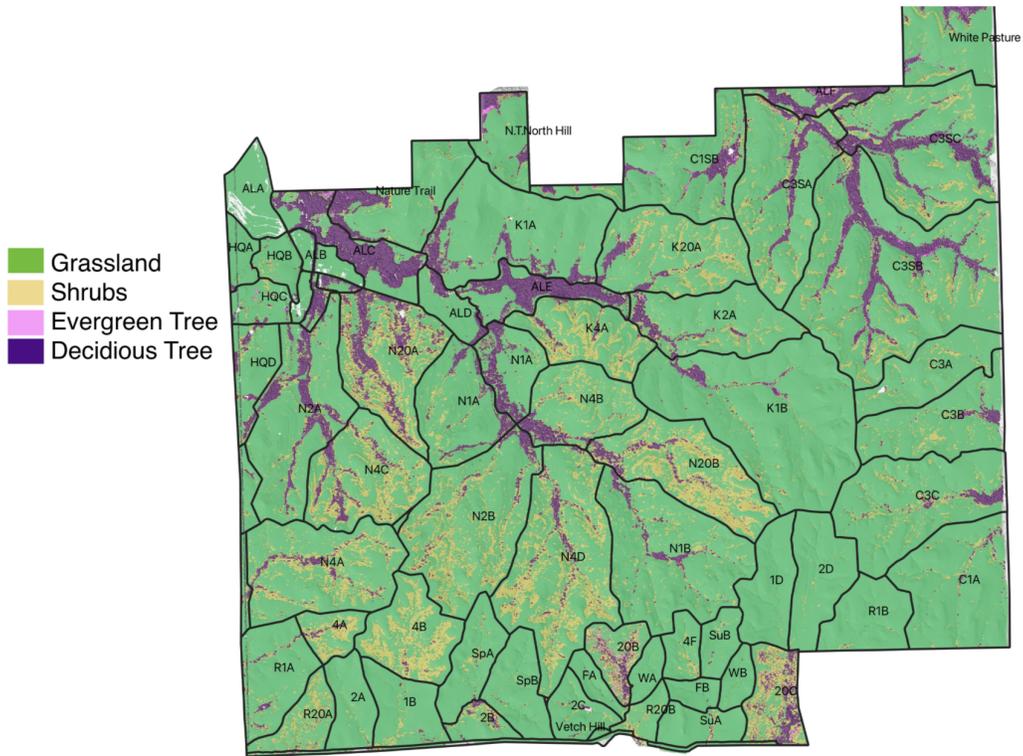
Konza Prairie Biological Station

Satellite View – Vegetation Map

2022

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