



## Maple Sugar Time

### Summary:

In the past 400 years, maple sugar production evolved from a winter survival food to a luxury item. During your Maple Sugar programs we are trying to emphasize how maple sugar affected peoples' lives and not just a story about the technological advances in maple sugar production.



### Objectives: Students will be able to:

1. state that they are in a national park, which is their place to develop a sense of wonder and excitement regarding nature and history.
2. state how our harm to our environment can threaten this natural American process  
state that this place is special and protected.
3. explain maple syrup's changing role in history--how it was important to the American Indians, the pioneers, and the Chellbergs of the 1930's.

**What to expect during your field trip:** A ranger or volunteer-naturalist led one-hour tour of maple sugaring process through time followed by 30 minutes of house tour.

**Setting:** Chellberg Farm fields, wooded paths, and historic structures.

**Age/grade:** All grades and ages.

**Ratio of students to ranger:** up to 32; one adult for every ten students.

**Safety issues:** Weather conditons such as wind, cold, rain & snow. The farm grounds and surrounding trails may be hazardous when frozen. Some program sites have fire so be aware of blowing smoke, flames or hot stoves.



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## Background Information:

The earliest maple sugar farmers were the American Indians of the northeastern part of the United States and eastern Canada. They discovered that in the early spring when the nighttime temperatures were still below freezing, but the daytime temperatures rose about 40 degrees, the sap of the maple tree was slightly sweet. A process of cooking the sap was developed using hot rocks. When the cooking was complete, the sap had boiled down into sugar. Early pioneers and farmers refined the process of cooking the sap into syrup. Today, compared to days of yesteryear, few maple trees remain to produce syrup. Most pancake syrup in stores today contains corn syrup, not maple.

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## Prerequisite Classroom Activities:

### Math Ideas

1. It takes forty gallons of maple sap to make one gallon of maple syrup. Count to forty by ones, fives and tens.
2. Make a pile of 40 blocks and another with just one.
3. Create a dot-to-dot drawing (using forty dots) of a maple tree, bucket or sugar shack.
4. Challenge the students to create as many math problems as they can that have the answer 40.
5. How many drops of sap are needed to make a gallon? Using an eyedropper, let the students count the number of drops that are needed to make an ounce. Use the data from all the groups to determine the average number of drops in an ounce. Multiply the average to figure the number of drops in one gallon. How many are needed for forty gallons?

### Story Problems:

#### Problem 1:

The owners of a 50-acre sugarbush tap 600 maple trees. They tap  $\frac{1}{4}$  of the trees twice and hang two buckets; they then hang one bucket on all the rest. How many buckets do they hang in total?

Problem 2:

In the Chellberg sugarbush, the number of times a tree is tapped is determined by its diameter. One tap is used for a 12" diameter; another tap is used for each additional 6" in diameter. No more than 3 taps per tree are allowed at the Chellberg Sugarbush, but in other places the number of taps per tree can be higher than three.

If a tree has a diameter of 20 inches, how many taps can be drilled?

How many for a 15 inch diameter tree?

For a tree with a diameter of 32 inches in the Chellberg Sugarbush?

For a tree with a diameter of 32 inches in a different sugarbush?

Why do you think we don't allow anymore than three taps here at the Chellberg Farm in the national lakeshore?

Problem 3:

Forty gallons of sap makes one gallon of maple syrup.

How much sap must be collected to make five gallons of syrup?

To make twelve gallons of syrup?

Would you want to carry all that sap yourself up the ravine?

Problem 4:

If you tapped a maple tree in your backyard and filled up a three-pound coffee can each day for four weeks, how much sap would you collect?

A coffee can is a  $\frac{3}{4}$  gallon capacity.

How much maple syrup would it make?

Problem 5:

It takes 48 drops of sap to fill one tablespoon.

How many drops would be needed to fill a gallon?

16 T spoons = 1 cup and 16 cups = 1 gallon

Problem 6:

A gallon of syrup weighs about 11 pounds. If it is cooked longer to make candy, 2 pounds of water are lost. If candy pieces are measured out to weigh  $\frac{3}{4}$  ounce, how many pieces of candy can be made from a gallon of syrup?

Problem 7:

Maple sugar farmers use the "Rule of 86" when buying maple sap from other farmers. The sweeter the sap, the more they will pay for it. The "Rule of 86" says:

86 divided by the % of sugar content = how many gallons of sap to one gallon of syrup

How many gallons of sap would it take to make one gallon syrup if the sap sugar content was 2%, 3%, or 6%?

Problem 8:

Trees will give, on the average, 10 gallons of sap per tap hole.

If Tree A has four taps giving 3% sugar sap, and Tree B has 2 taps giving 2% sugar, how much syrup can be made in a season from those trees?

### Answers to Maple Math Story Problems

Problem 1:

$$600/4 = 150 \times 2 = 300$$

$$600 - 150 = 450$$

$$300 + 450 = 750$$

Problem 2:

$$20'' = 2 \text{ taps} \qquad 15'' = 1 \text{ tap}$$

$$32'' = 3 \text{ taps at Chellberg}$$

$$32'' = 4 \text{ taps at commercial Sugar Bush}$$

(We are a national park so we only want to take enough sap to show you the process.)

Problem 3:

$$40 / 1 = x / 5$$

$$x = 200 \text{ gallons of sap}$$

$$40 / 1 = x / 12$$

$$x = 480 \text{ gallons of sap}$$

Problem 4:

$$\frac{3}{4} \text{ gal} \times 28 = 84 \text{ divided by } 4 = 21 \text{ gal of sap}$$

Which is about a half gallon of syrup.

Problem 5:

$$48 \times 16 = 768 \text{ crops per cup} \times 16 \text{ cups} =$$

$$12,288 \text{ drops per gallon}$$

Problem 6:

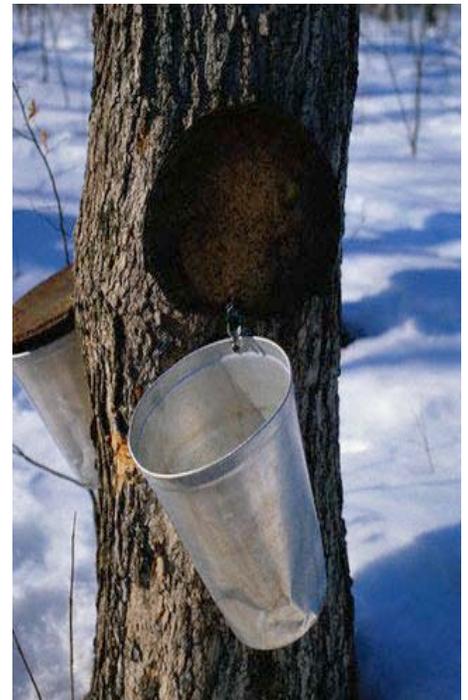
$$16 \text{ oz per pound} \times \frac{3}{4} \text{ oz each} = 21.3 \text{ pieces per pound}$$

$$11 \text{ pounds} - 2 \text{ pounds} = 9 \text{ pounds of candy}$$

$$9 \text{ pounds} \times 21.3 \text{ pieces} = 192 \text{ pieces}$$

Problem 7:

$$43, 28.66, 14.33$$



Problem 8:

Tree A =  $4 \times 10 = 40$  gallons of sap per season with 3% sugar

Tree B =  $2 \times 10 = 20$  gallons of sap per season with 2 % sugar

Tree A = Rule of 86 divided by 3% = 28.66 gallons of sap to one gallon of syrup.

40 gallons collected divided by 28.66 gallons needed = 1.4 gallons of syrup

Tree B = Rule of 86 divided by 2% = 43 gallons of sap to one gallon of syrup.

20 gallons collected divided by 43 gallons needed = .46 gallons of syrup

Total =  $1.4 + .46 = 1.86$  gallons of syrup

### Language Arts Activity Ideas

Write or tell a story. Suppose you lived on Chellberg farm and you broke a gallon jug of maple syrup. Tell how the accident happened and how you felt. How did you tell your parents? What was it like to clean up the mess?

Pretend the Chellberg family asked you to design a label for their maple syrup jugs. Draw a picture and write an advertisement that would attract people to buy the syrup. Develop a jingle or song for a radio commercial.

Read the label from a syrup container. Does it contain maple syrup?

Have the students make a drawing or write a letter to their ranger. The ranger is interested in hearing about how the students felt about the work involved in making maple sugar.

Make a joke book of farm and maple syrup jokes.

Perform a skit showing how people made maple sugar during the past 300 Years.

Write a poem or haiku about maple trees or making maple sugar.

Write a story from a maple tree's perspective. Tell about the changes the tree has seen in the past 100 years.

How many words can the students make by using the letters in "maple syrup"?

Use a gallon jug to show the student how big it is. Let the student predict how many glasses you can fill with a gallon.

On a level spot in the playground pour a gallon of water out in a circle. Pretend that circle is a large pancake. Have the students predict how much area the water will cover.

Using a squeeze bottle put a taste of honey on each child's finger. Then taste real maple syrup. Do they taste the same? Try molasses and sugar water. Do maple sugar and sugar water taste the same? Discuss where these sweeteners come from.

Have a pancake breakfast in the classroom and use real maple syrup.

Make a survey of how many students would like to live on a farm, be a Native American 300 years ago; like maple syrup, etc.

Make a maple sugar song and record it on tape.

Adopt a maple tree and get to know it, how it feels, how it lives, how it changes.

Make or bring in some maple fudge or cookies or make the recipes below.

#### Sugar on Snow

A snowfall that comes late in the maple sugar season is called a "sugar snow". It is at this time of year that the syrup is being evaporated into sugar. A special treat for children who live near a sugar bush is sugar-on-snow or Jack Wax.

You may use fresh maple syrup, brown sugar mixed with water, or commercial maple flavored syrup.

Pour two cups of syrup into a saucepan. Bring it to a boil until it reaches the hard sugar stage on a candy thermometer, or until it remains waxy when dropped from a spoon on well-packed snow. Pour the syrup in bite size pools on well-packed snow or into a bowl of crushed ice. Serve with a fork to twirl wax.

#### Maple Syrup Fudge

2 cups of maple syrup

3/4 cup thin cream

1 tsp. Vanilla

3/4 cup walnut or butternut meats, coarsely chopped

Combine maple syrup and cream into a saucepan and place over a low flame. Stir constantly until the mixture begins to boil. Continue cooking without stirring until small amount of syrup forms a soft ball in cold water, about 30-35 minutes. Remove from fire and cool to lukewarm. Beat until the mixture

thickens and loses its gloss. Add vanilla and nuts, pour into a buttered pan. When cool cut into squares.

## Science Activities

Have the students mix salt with water in a glass jar. Boil the salt solution until the water evaporates. Demonstrate how the water comes off as steam and the salt is left behind.

Make a top ten list of ideas to answer the following question "What clues in nature can you see that tells us spring is coming?" Accept all the students' ideas (even the wrong ones) and write them on the blackboard. After collecting the ideas, let the students vote for the best ones. Limit each student to two or three votes. Tally the votes for each idea to make your top ten list.

Introduce the students to the parts of a tree. What does each part do?

Find out how a tree transports its food and water. We have a heart to pump our blood? Does a tree?

Draw a maple tree through all the seasons showing how it changes.

Investigate which animals use the maple tree for food eating sap, seeds, flowers and use the tree for shelter. Find out what kinds of animals live in a Beech-Maple forest. Each student could choose such an animal to investigate. Then in front of the class the student becomes that animal, telling all about him or herself. The class has to try and guess what animal that is.

## Social Studies

Talk about tree conservation, clear-cutting, or urban sprawl.

Make spiles from Elderberry or Sumac branches. Elderberry branches have warts on them and Staghorn Sumac is fuzzy like a deer antler in the velvet stage. With a piece of coat hanger push out the pith until the twig is hollow. Cut one end off at an angle so it will go into the tree. Remove the top half of the other end of the spile to make a trough.

Ask students to write a story as if they were an Indian child at the time maple sugar was discovered. They would never have tasted anything sweet but wild berries.

Study maple trees; how to identify them, and all their uses to wildlife and humans.

Student could be asked to go home and list everything they can find in their house that comes from maples and other trees.

## Maple Talk

(Ten of these thirteen words can be found in the crossword puzzle)

Sugarshack – The building where maple sap is boiled to make syrup.

Maple – A tree including sugar maples, red maples, silver maples and box elders.

Sugar Maple – The species of maple trees most often tapped for sap.

First Run – The first quality sap flow in the spring.

Sap – The liquid that carries water, minerals and food throughout the trees and other plants.

Tap – The hole drilled into a tree – about 2 inches deep. One tap to a 12-inch diameter tree. Two taps to an 18-inch diameter tree.

Spile – The hollow metal spike hammered into a tap hole.  
Sap flows through the spile into the bucket.

Sugarbush – The area where sugar maples grow.

Evaporator – A flat pan used to boil the water out of the sap. It usually takes 40 gallons of sap to make one gallon of syrup.

Maple Syrup – Syrup made from evaporating most of the water from the sap of a maple tree.

Syrup Grade – Quality of syrup based usually on color. The lighter the color, the better the syrup.

Wax - Pouring hot candy-stage syrup on snow makes Maple Wax .

Roots – The underground storage tanks for the sap during the cold winter.

Maple Sugar Time  
Word Search

C	L	O	T	T	I	E	C	S	U	E	A	B	N	E	L	L
O	C	M	B	M	R	A	F	G	R	E	B	L	L	E	H	C
W	D	F	O	R	T	Y	G	A	L	L	O	N	S	S	Q	J
G	I	N	G	E	R	Y	F	A	R	M	V	X	U	R	J	S
S	I	N	D	I	A	N	A	D	U	N	E	S	G	E	O	P
T	E	Z	L	D	O	O	W	E	R	I	F	P	A	E	H	I
O	C	H	I	C	K	E	N	S	A	A	R	A	R	N	N	L
N	A	T	I	O	N	A	L	L	A	K	E	S	H	O	R	E
E	F	N	Z	N	G	O	A	T	H	I	E	U	Q	I	T	S
B	U	C	K	E	T	S	X	C	V	P	Z	T	J	P	Y	G
O	G	K	Y	G	C	H	R	I	S	T	I	E	T	R	W	E
I	P	O	T	A	W	A	T	O	M	I	N	D	U	L	R	E
L	C	A	T	L	M	G	O	O	S	E	G	P	Q	S	E	S
H	M	A	P	L	E	T	R	E	E	S	D	O	J	U	D	E
J	N	E	H	O	I	F	E	B	R	U	A	R	Y	E	P	H
C	O	L	D	N	I	G	H	T	S	Q	Y	P	I	G	N	O
H	O	R	S	E	S	S	U	G	A	R	S	H	A	C	K	G

There are at least nine farm animal names written here in the puzzle also. ☺

Indiana Dunes  
 National Lakeshore  
 February  
 March  
 Cold Nights  
 Above Freezing Days  
 Maple Trees  
 Spiles  
 Buckets  
 Forty Gallons  
 Sap  
 One Gallon  
 Syrup  
 Sugar  
 Potawatomi  
 Stone boil  
 Pioneers  
 Kettle  
 Firewood  
 Chellberg Farm  
 Sugar Shack



## Maple Sugar Word Search

C	K	S	C	H	I	C	K	E	N	S	F
L	M	A	P	L	E	O	B	B	J	H	I
D	H	P	P	N	E	W	S	U	G	A	R
F	O	R	T	Y	R	G	Q	C	M	C	E
A	G	S	I	W	T	A	P	K	R	K	S
R	E	H	B	O	I	L	A	E	B	U	D
M	O	E	H	O	E	L	T	T	E	K	U
W	E	E	V	D	H	O	R	S	E	S	N
F	R	P	G	Y	U	N	G	O	O	S	E
P	I	G	C	A	T	S	Y	R	U	P	S
X	F	E	B	R	U	A	R	Y	T	Z	A
G	O	A	T	H	O	G	M	A	R	C	H

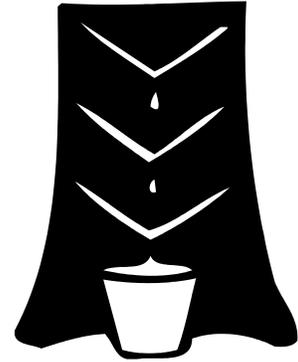
Maple  
Tree  
Tap  
Bucket  
Sap  
Boil  
Forty  
Gallons  
Kettle  
Fire  
Wood  
Sugar  
Shack  
Farm  
Syrup  
Horses  
February  
March

At least eight more farm animal names are written in the puzzle too.

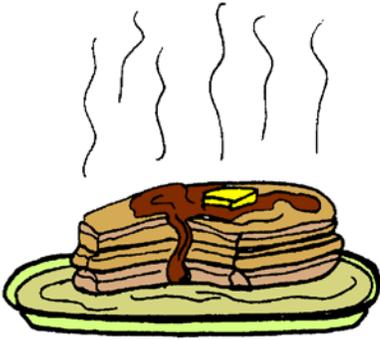
Draw a line from the sweet to the type of plant they come from.



**Sugar**



**Tree**



**Maple Syrup**



**Flowers**



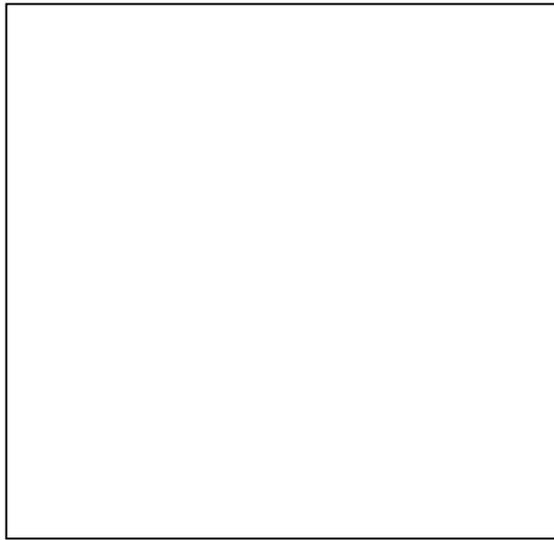
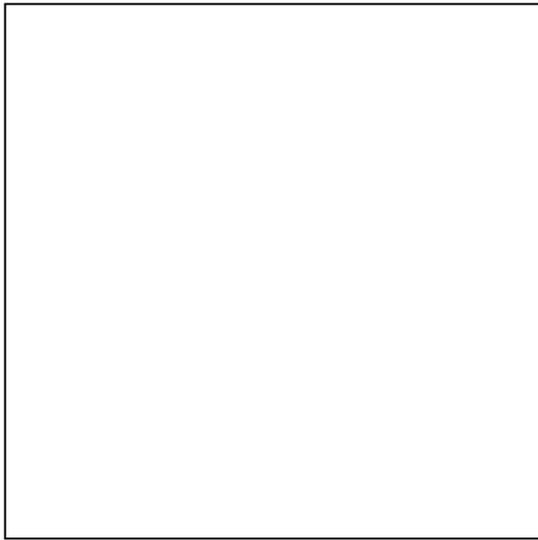
**Honey**



**Cane**

**Time Photographs by** \_\_\_\_\_

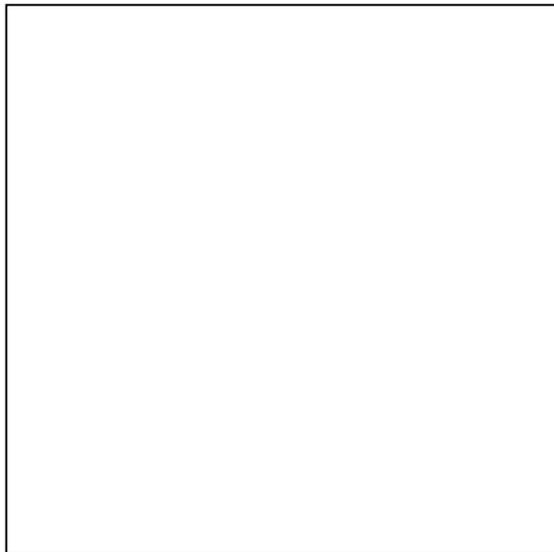
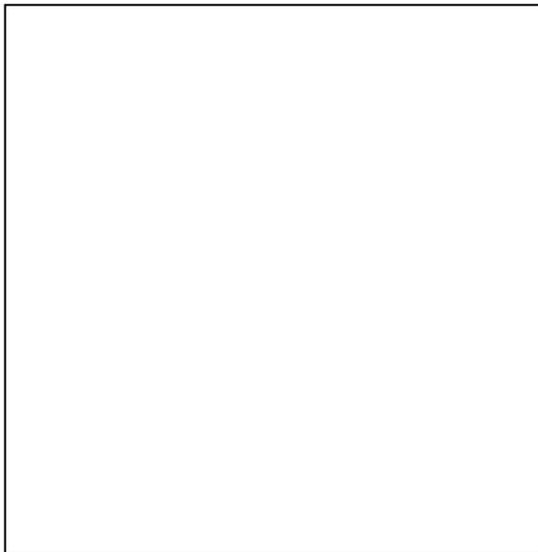
Pretend you found a camera that would allow you to go back into time and take a picture of people making maple sugar. Using what you saw on your trip to Chellberg Farm, draw the picture you think your camera would take. Give each of your photos a one or two sentence title. For fun, pretend a squirrel was taking the pictures.



**Potawatomis 300 years ago**\_\_ **Pioneers - 150 years ago**\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



**The Chellberg sugar shack -** **The method used today**\_\_\_\_\_

**1935**\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Illinois Content Standards:

The following is a list of the primary standards which the Maple Sugar Time program at Indiana Dunes National Lakeshore will assist you in fulfilling. There are many other curriculum standards which this program could also assist in. However, these identified here provide the strongest links between our program and your curriculum objectives.

### Early Elementary

- 16.A.1a** Explain the difference between past, present and future time; place themselves in time
- 16.A.1b** Ask historical questions and seek out answers from historical sources (e.g., myths, biographies, stories, old photographs, artwork, other visual or electronic sources).
- 16.A.1c** Describe how people in different times and places viewed the world in different ways.
- 16.B.1a** (US) Identify key individuals and events in the development of the local community (e.g., Founders days, names of parks, streets, public buildings).

**\*\*Note:** Maple Sugar Time is a program that can be adapted for all grades; however, the content of the basic program is most suited to 1<sup>st</sup> through 4<sup>th</sup> grades.

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## Extension or Follow-up Activity:

### Class reflection paper or writing sample:

Ask each student to write a short essay, letter or story about what they learned on their field trip to Indiana Dunes National Lakeshore.

Rangers love receiving mail from their students.

Send the ranger the packet of essays from your class (or a copy of them), and your ranger will send your class a certificate from the dunes.

Send your essays to:

Indiana Dunes National Lakeshore  
1100 N. Mineral Springs Road  
Porter, IN 46304

Attn: Your ranger's name or just Education Department

If you are using this essay as a class assignment for a grade, we would like to suggest that each essay contain the following elements. Use the rubric below to score them.

- \* The name of the park and the location of their field trip—for example: Douglas Center, Indiana Dunes National Lakeshore
- \* Three facts they learned on the field trip about making maple syrup and sugar.
- \* A brief explanation of why Indiana Dunes is unique and therefore a national park.
- \* At least two things the student can do to help take care of his or her national park.
- \* Fill in the blank of this statement and provide an explanation:  
I would like to learn more about \_\_\_\_\_ at Indiana Dunes.

\*\*\* For advanced groups, add the following element:  
Tell the park rangers if you would like to bring your families and friends to the dunes and if so what would you do here and where would you go.

## Assessment:

Rubric for Class reflection writing assignment:

Elements	4 points	3 points	2 points	1 point
Writing and organization	The writing sample is very well written and organized by the elements provided. It has a strong introduction, middle and conclusion.	The writing sample is well written and organized by the elements provided. It includes an introduction, middle and conclusion.	The writing sample is choppy and is not well organized. It lacks an introduction or conclusion.	The writing sample is very short and unorganized.
Grammar & Spelling	Mistakes in spelling and grammar are minor or non-existent.	Mistakes in spelling and grammar are minimal—about 4-5.	Mistakes in spelling and grammar are numerous—5-10.	Mistakes in spelling and grammar are more than 10.
Facts and content	The writing sample demonstrates the student's learning on the dunes program and includes three or more facts provided by the park staff.	The writing sample demonstrates the student's learning and includes only two facts provided by the park staff.	The writing sample does not demonstrate much learning and only includes one fact provided by the park staff.	The writing sample does not demonstrate any learning and does not include any facts provided by the park staff.

National Park Service theme	The writing sample clearly demonstrates the student's understanding of the role of the NPS in preserving the dunes by explaining why Indiana Dunes is such a unique treasure.	The writing sample mentions the NPS and its role in preserving the Indiana Dunes.	The writing sample mentions the NPS and Indiana Dunes.	The writing sample does not mention anything about the NPS or its role at Indiana Dunes.
Stewardship	The writing sample lists three things the student can do to assist in taking care of the Indiana Dunes.	The writing sample lists two things the student can do to assist in taking care of the Indiana Dunes.	The writing sample lists one thing the student can do to assist in taking care of the Indiana Dunes.	The writing sample does not list anything about what the student can do to take care of the Indiana Dunes.