

Weather, Climate and White-tailed Deer

Students will understand:

Disciplinary Core Idea:

ESS2.C The Roles of Water in Earth's Surface Processes

ESS2.D Weather and Climate

ESS3.C Human Impacts on Earth Systems

NGSS Standards:

ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

ESS3-3 Human environmental impacts, both negative and positive (Earth and Human Activity)

Students will be able to:

Science and Engineering Practices:

Plan and carry out investigations by collecting data to serve as the basis for evidence to answer scientific questions using multiple variables and evidence to support explanations or solutions.

Analyze and interpret data to determine the effect on White-tailed Deer population in New Hampshire.

Develop and use models to explain global weather patterns and local weather changes.

Construct an explanation and design a solution to include multiple sources of evidence consistent with scientific ideas, principles, and theories.

Part 1: Weather vs Climate

Lesson 1: Weather vs Climate

Essential Question:

What is the difference between weather and climate?

Purpose for Activity:

Students will be able to differentiate between weather and climate.

Students will explain why we have different climate zones.

Students will compare the climate of different regions.

Activity:

1. What do you know about Weather and Climate?

Create a chart of background knowledge from students that can be used throughout the Weather vs Climate lessons.

2. Definitions of weather and climate (Science Notebook):

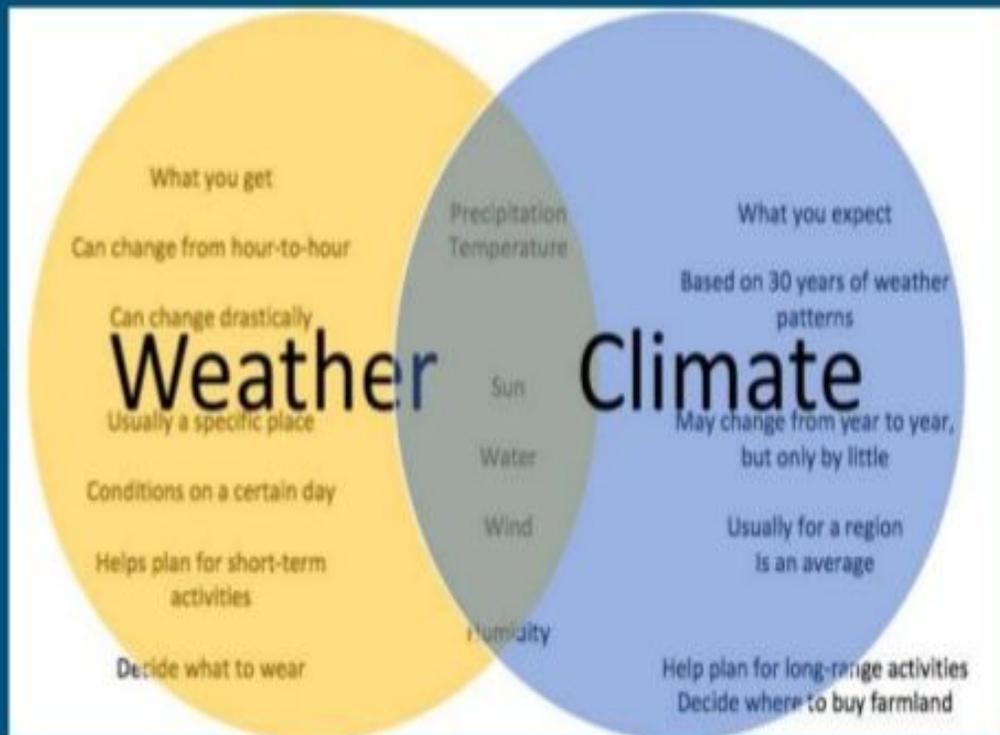
Weather: the state of the atmosphere of a specific place and time, such as heat, dryness, sunshine, wind and precipitation.

Climate: weather conditions for a specific region over a long period of time.

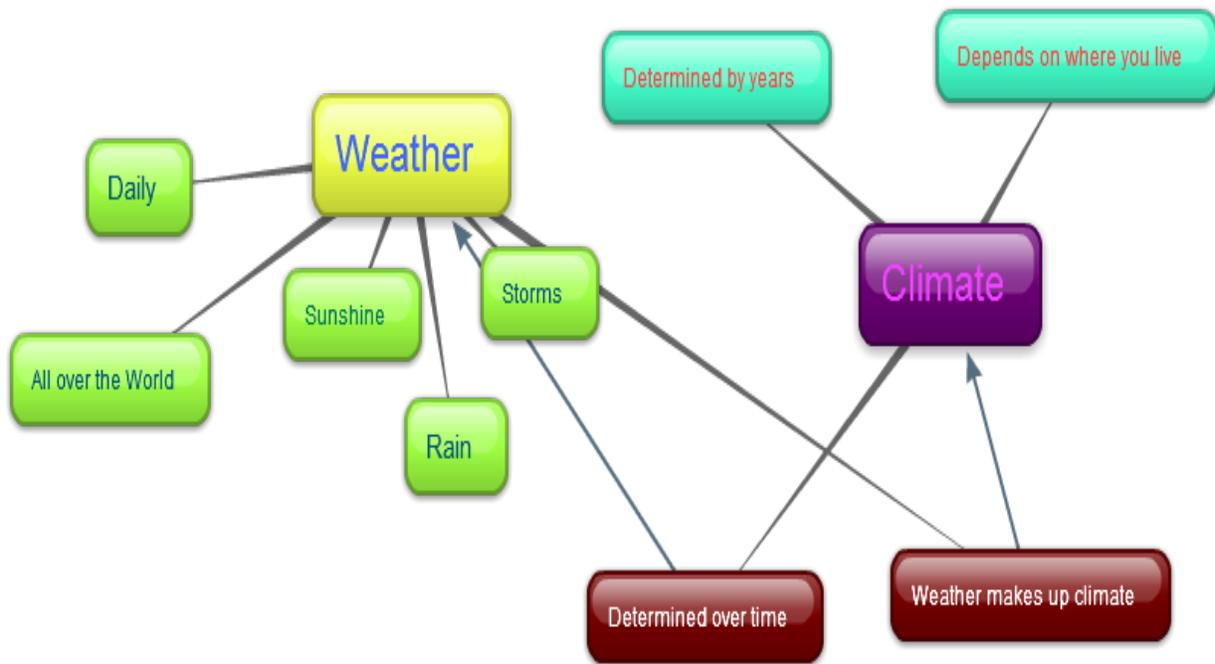
3. Venn Diagram (Science Notebook):

Draw and discuss similarities and differences.

Weather & Climate



4. Graphic Organizer (Science Notebook):



Lesson 2: Climate Zones

Essential Question:

Why do we have different climates?

Purpose for Activity:

Students will be able to explain why there are different climate zones.

Activity:

1. Show “Weather vs Climate Slideshow” (Google Slides).
2. Add diagrams to Science Notebook with discussion.

Diagram 1: High and Low Pressure Zones (below)

Diagram 2: Surface Wind Bands (below)

Diagram 3: Global Climate Zones jpg. (Located in Unit Folder)

Diagram 1:

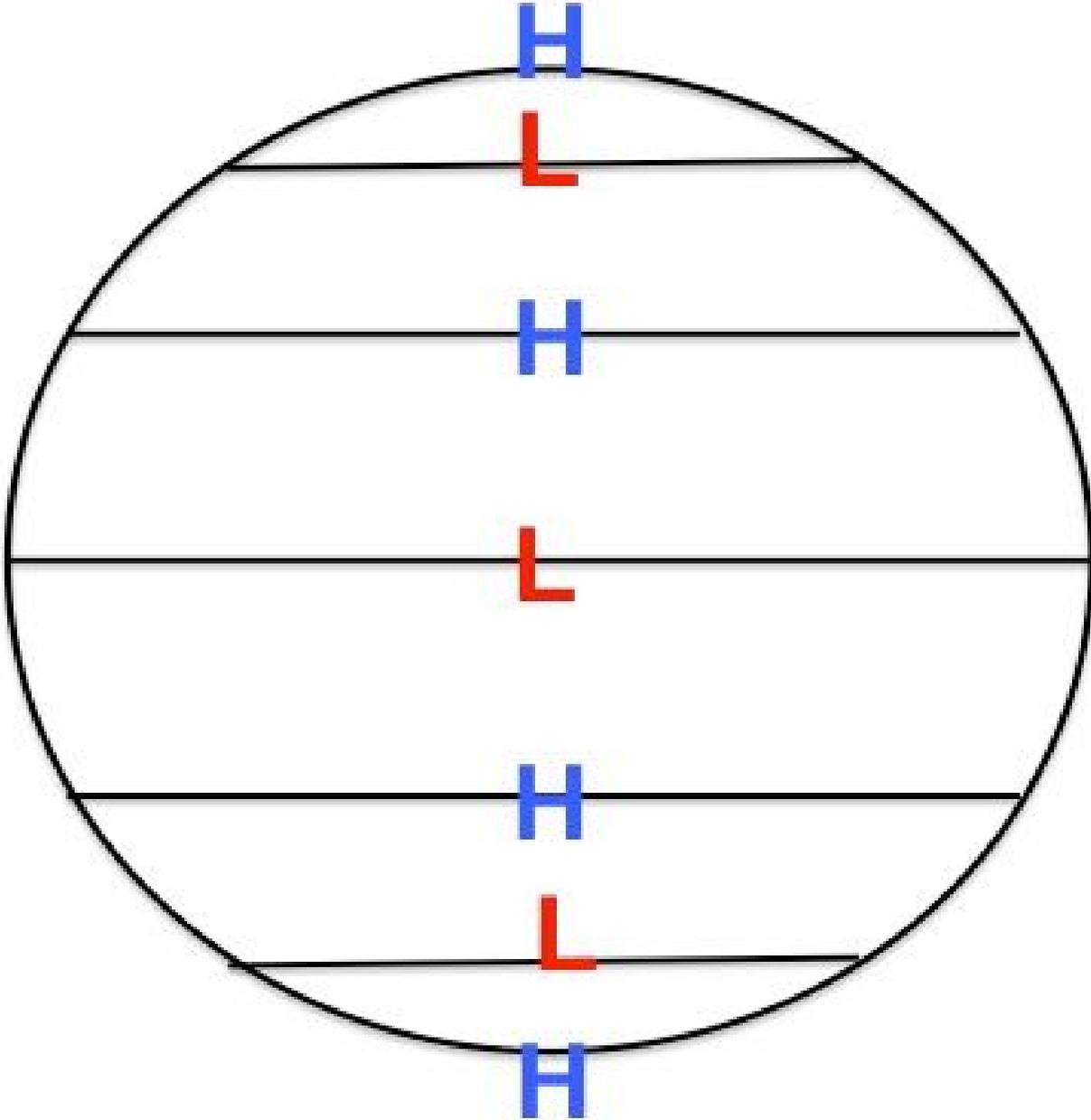
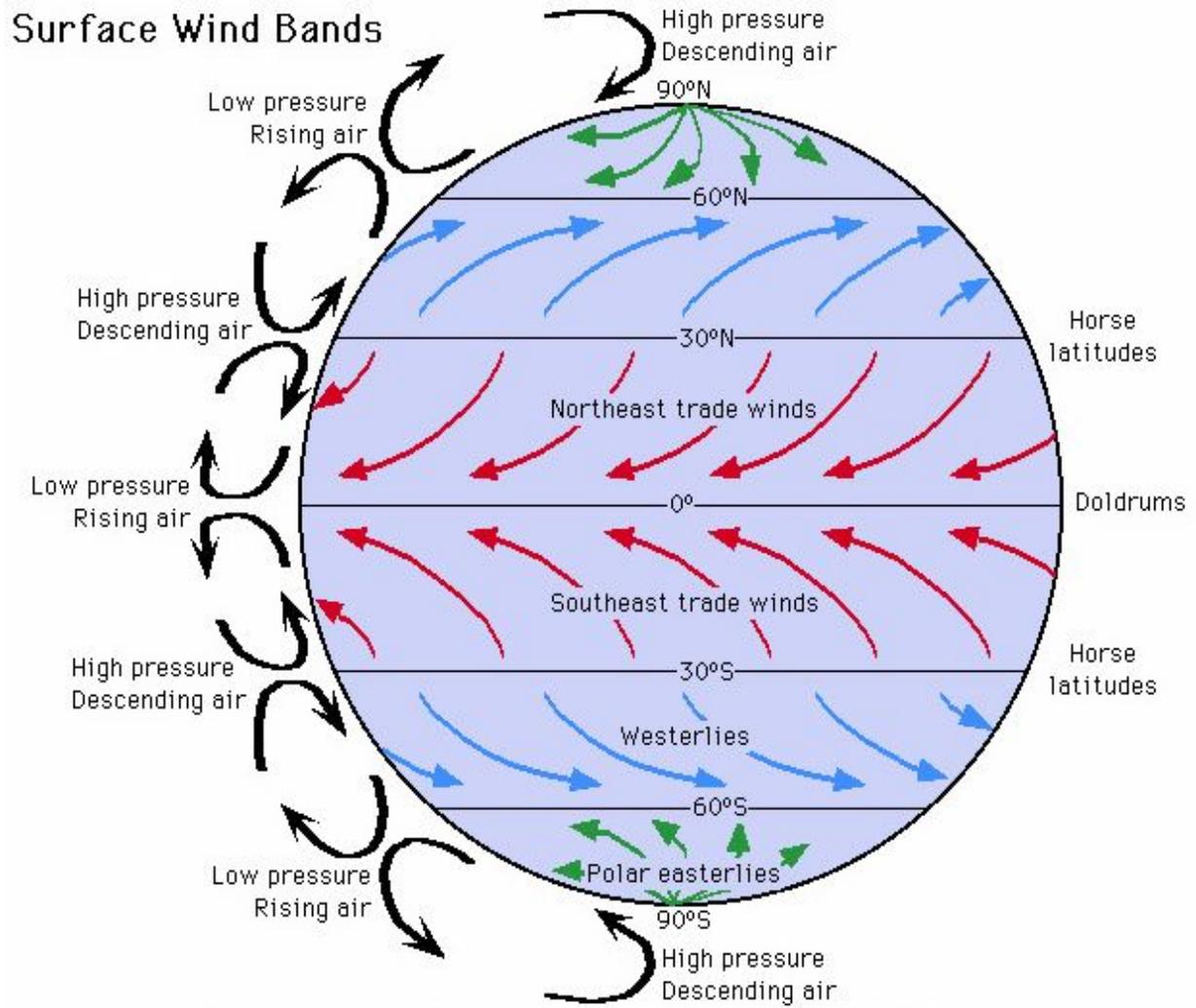


Diagram 2:



Adapted from Duxbury, Alyn C. and Alison B. Duxbury. *An Introduction to the World's Oceans*, 4/e.
Copyright © 1994 Wm. C. Brown Publishers, Dubuque, Iowa.

Lesson 3: Weather vs Climate Sorting Activity

Essential question to consider:

When do we use weather data and when do we use climate data?

Purpose for Activity:

Students will be able to sort weather and climate data.

Students will explain why they sorted their data as either weather or climate.

Students will work as a group to discuss and sort their data.

Activity:

1. Assign students into small groups of 3-4 students
2. Hand students a Weather vs Climate Sorting Activity sheet
3. Hand students a baggie of data strips to be sorted
4. Students should work as a group to sort the data strips carefully
5. Students should be monitored for their participation and discussion

(See Activity Below)

Weather vs Climate Sorting Activity

Weather:

Description of the atmosphere in a certain place at a certain time

Climate:

Information that describes the weather for a long time, including weather patterns in a certain area

Today's high temperature is 63°Fahrenheit

The average annual rainfall in San Antonio is 31.96 inches

Today's track meet is canceled due to rain

Michigan averages 150 to 250 inches of snow per year

The spring season is wetter in Oregon than it is in Utah
If it is sunny Saturday, I will go to the park
The Antarctic region is drier than the Arctic region
People move to Florida because it never gets too cold
The forecast called for rain today, but sun tomorrow
Three years ago we had snow on Christmas day
Thunderstorms dropped 6" of rain on Boston this week
The desert Southwest is generally hot and dry
The cloud coverage today is 75%
Winds are coming in from the northeast
This is what you get
There is a 90% chance of precipitation
Precipitation patterns
The average global temperature shows an increase over the past
century
This is what you expect
It is only 65°F today, but should be 80°F tomorrow

*This activity could be used as a pre/post assessment as well as a group activity or repeated several times to ensure a deeper understanding of weather vs climate. This activity could also include graphs and maps to be sorted as well.

PART 2: White Tailed Deer

Lesson 4: Introduction to White Tailed Deer

Essential questions to consider:

Why is it important to track the survival of White-tailed deer in New Hampshire?

Purpose for Activity:

- Students will gain experience in data collection, communication, problem solving, knowledge of white-tailed deer, knowledge of wildlife management and real-life application.
- Students will gain confidence and a sense of empowerment in their abilities to affect their community and natural environment.

Activity: (see detailed notes)

Why do we care about White-tailed Deer and other wildlife populations?

- History of settlement of the North America (abundance of animals and plants, coastal settlements and farms, altering of many species along with the land)
- Natural predator: impact of eradicated mountain lion and timber wolf populations
- Species that flourished: white-tailed deer as a forest-edge species
- In the 1800's, farmers abandoned farms to move westward, causing fields to become meadows and white-tailed deer to flourish in population.
- Deer became overpopulated, too many competing for food source and lack of natural predators resulted in unhealthy deer and overused habitat
- Wildlife management techniques were introduced to maintain a healthy population

How can deer and other wildlife be managed?

- Hunting for recreation, sport and food (venison)
- Unregulated hunting :1700's species was nearly eradicated due to few restrictions on deer harvesting and hunting seasons
- US Fish and Game or Fish and Wildlife departments establish regulations
- New Hampshire collects data in sections called Wildlife Management Units for wildlife biologists and managers to estimate deer populations
- Examining deer populations through measuring daily temperatures and snowfall during winter months (December 1st through April 30th): Winter Severity Index
- Data is used for recommendations with upcoming hunting seasons

Lesson 5: Winter Severity Index & NH Map

Essential Question:

How can the Weather Severity Index (WSI) help to track trends and patterns for wildlife survival?

Purpose for Activity:

Students will understand the importance of monitoring the WSI for white-tailed deer survival in NH.

Activity:

Background:

- New Hampshire is one of the most northern locations of white-tailed deer. Because of this, severe winter weather greatly influences their survival in these areas, affecting their management.
- In New Hampshire, deer are managed according to specific sections of the state called Wildlife Management Units (WMU's). Different WMU's are based on differences in climate, topography, land use, and human populations. (See Map)
- The severity of winters in New Hampshire varies considerably from one WMU to another. The highest severity is in the far north (A) and the lowest on the seacoast (M).
- Winter Severity is a system that keeps track of the number of days when the minimum temperature is less than 0 degrees Fahrenheit and the number of days where the snow on the ground equals 18" or more. These measurements are taken daily between December 1st and April 30th. When below 0 degrees or 18" or more in depth, a point is earned. The maximum possible for each day is 2 points.

Why 0 Degrees?

- White-tailed deer have learned to adapt to New Hampshire's winter weather for survival. One adaptation that deer have more over time is the development of a thick coat to insulate them from the cold.

- Based on research done at the University of New Hampshire, it was found that deer do not start burning extra calories to stay warm until the ambient temperature is below -20 degrees Fahrenheit.
- The Winter Severity Index uses 0 degrees Fahrenheit to include the impact of wind chill on the temperature. This helps to register how much thermal stress deer can handle in the winter.

Why 18 inches of snow?

- White-tailed deer have a belly height of about 18 inches. When snow depth reaches or exceeds this height, the deer find it difficult to move around. This causes deer to expend a lot of energy with efforts to find food.
- Although deer will begin to find it difficult to move in snow above 10 inches, which is the height of the first joint-ankle, studies indicate snow in the excess of 18 inches as a threatening snow depth. Snow points are accumulated when the snow stake reaches 18 inches or above.

What to do?

Each day, from December 1st through April 30th, record the number of snow points and the number of temperature points collected. At the end of each month, total the snow points and temperature points and report them to NH Fish and Game.

Lesson 6: Graphing Data (over 5 months)

Essential questions to consider:

How can the weather data collected and graphed help to analyze patterns, trends, and changes over time?

Purpose for Activities:

Students will track weather data on minimum temperature and snow depth from December 1st - April 30th.

Students will report the WSI for white-tailed deer in NH to the NH Fish and Game.

Students will analyze patterns, trends, and changes over time.

Activities:

1. At the end of each month December through April:
Have the students calculate and keep track of the winter severity data for Newport and compare with updates from NH Fish and Game.
Have them graph the results each month for minimum temperature and snow depth. Are the deer in danger of survival? How does data around the state compare with Newport's data? How does it compare to last winter's data?
2. After all 5 months of data have been collected and graphed:
Review the 5 months of data...what can you predict about the deer population from this past winter? What are some of the positive connections? Negative connections? Graphing, patterns, trends, individual months compared to the 5 months compared to the last several years.

Lesson 7: Deer Harvest

Essential questions to consider:

Why is it important to track the survival of White-tailed deer in New Hampshire?

What patterns, trends, and changes occurred over the 5 months? From this year to last year?

Purpose for Activity:

Students will analyze weather data on minimum temperature and snow depth collected from December 1st - April 30th.

Students will review data collected in previous years on white-tailed deer in NH through the NH Fish and Game.

Activity:

What percent of deer was harvested in our WMU? Compare the percentage of deer harvested in our WMU other areas in the state?

Discuss reasons for high and low harvests.

Lesson 8: What is a White-tailed Deer? How do they survive in New Hampshire?

Essential Question:

How do white-tailed deer survive in the NH environment?

Purpose for Activity:

Students will work in small groups to research one aspect of the white-tailed deer living in New Hampshire.

Students will create a research based poster for the 6th grade to study using the research poster rubric.

Students will present their research to the class.

Research: Informational Poster Display

New Hampshire White Tailed Deer Poster Project

Topics:

1. A coat that changes color
2. Can deer have no color?
3. A sizeable profit for the environment
4. Happenin' Hooves
5. Annual antlers
6. Do does grow antlers?
7. Cud-chewing chops
8. Making "scents" of glands
9. Common "senses"
10. Home range and habitats
11. Bedding down
12. Yarding up

13. Why yard?
14. Autumn: browsing for food
15. Winter: saving energy
16. Spring: fabulous forbs
17. Summer: a season of succulence
18. How long do deer live?
19. The first deer
20. New Hampshire's deer
21. Origin of the name

Task:

1. Form Groups of around 4 students (may have 3-5)
2. Choose random topic from 1-18
3. Meet with group, read folder information, make a plan and begin research on topic
4. Plan for poster presentation for topic

NH White-tailed Deer Poster Rubric

CATEGORY	4	3	2	1
Required Elements	The poster includes all required elements as well as additional information.	All required elements are included on the poster.	Most of the required elements are included on the poster.	Some required elements are on the poster.
Graphics-Relevance	All graphics are related to	All graphics are related to	All graphics are	Graphics are somewhat

	the topic and make it much easier to understand the specific topic.	the topic and add to understanding.	connected to the general topic.	connected to the topic.
Content-Accuracy	At least 9-10 accurate facts are displayed on the poster.	At least 7-8 accurate facts are displayed on the poster.	At least 5-6 accurate facts are displayed on the poster.	There are 4 or less facts displayed on the poster.
Mechanics & Grammar	Capitalization, punctuation, spelling and grammar are correct throughout the poster.	Almost all capitalization, punctuation, spelling and grammar are correct throughout the poster.	There are some capitalization, punctuation, spelling and grammar mistakes throughout the poster.	There are many capitalization, punctuation, spelling and grammar mistakes throughout the poster.
Group & Individual Participation	Participated fully, individually and as a group. Contributed greatly to	Participated individually and as a group. Contributed to overall	Participated somewhat individually and/or as a group. Contributed to overall	Participated little individually and/or as a group. Contributed little to

	overall group progress.	group progress.	group progress in some way.	overall group progress.
Oral Presentation	Completely participated in group presentation. Spoke with clear, concise language and emphasized major points.	Mostly participated in group presentation. Spoke and emphasized points.	Participated a little in group presentation. Spoke and/or helped to emphasize points.	Did not participate in group presentation and/or just stood with group.

Lesson 9: Scavenger Hunt

Essential Question:

How do white-tailed deer survive in the NH environment?

Purpose for Activity:

Students will create a scavenger hunt using questions that each group has produced.

Students will take part in the scavenger hunt, studying each poster to find the answers to the scavenger hunt questions.

Example below:

NH White Tailed Deer: Scavenger Hunt

1. During the summer, which foods do the White-tailed Deer eat? Circle the correct answers: apples, mushrooms, oranges, acorns, squirrels
2. How many major parts are there to a deer's stomach?
3. What are hooves made out of?
4. Do deer bed down during the day, during the night, or both during the day and night?
5. A deer in the wild lives how long?
6. How much of the forest do deer use to yard? Less than a tenth, about half, or more than 80%
7. In the winter, what is the range, in acres, that male and female deer travel?
8. Can deer have no color?
9. What is the hormone that causes doe deer to grow antlers?

10. Which of these is true about deer in the winter? Deer sleep to protect themselves, they become weak from malnutrition, or they have plenty of food stored to survive
11. What is the range in hertz that deer can hear?
12. Where is the interdigital gland?
13. What is the average weight range of a male deer?
14. What is the average weight range of a newborn deer?
15. What is the soft coating that grows on antlers?
16. By the end of which month do three to five month old deer grow their grey-brown pelages?
17. How many pounds of food does the average white-tailed deer consume per year?
18. True or False: Do white-tailed deer only live in North America?
19. What is the scientific name for white-tailed deer?
20. About how many deer yard up at the same time?

Lesson 10: Deer Me: A Predator/Prey Simulation

<https://www.wolfquest.org/pdfs/Deer%20Me%20Lesson.pdf>

Lesson 11: Fish Survival in Winter

<http://glaquarium.org/wp-content/uploads/2015/11/Next-Generation-Scientists-and-Engineers-Stability-and-Change.pdf>