

1.3 Sherlock NOx: The Mystery of Unnatural Pollution in Natural Places

Engage

Surveying the Scene

Video: "[On the Air: Air Quality](#)" (5:34)

Our National Park Service aims to protect vital natural resources for wildlife, their habitats, and visitors alike. Do our national parks have good or poor air quality? This video provides an introduction the National Park Services' air quality research program. As you watch the video, complete the "fast facts" to gather initial clues about air quality in our national parks.

1. National Parks are pristine (unspoiled) places. True or False?
2. The visibility (clarity of the air) in National Parks is increasing / decreasing.
3. Name the top five air pollutants that are a concern in our National Parks.
4. List the most common sources of air pollution that affect our National Parks.
5. Greenhouse gases are recognized as air pollutants, which is making efforts to understand and respond to the effects of climate change. True or False?
6. National Parks are raising public awareness about air quality issues and reducing their own contributions to air pollution by:
 - a) _____
 - b) _____

Explore

Tracing the Tracks of Air Pollution in the Park

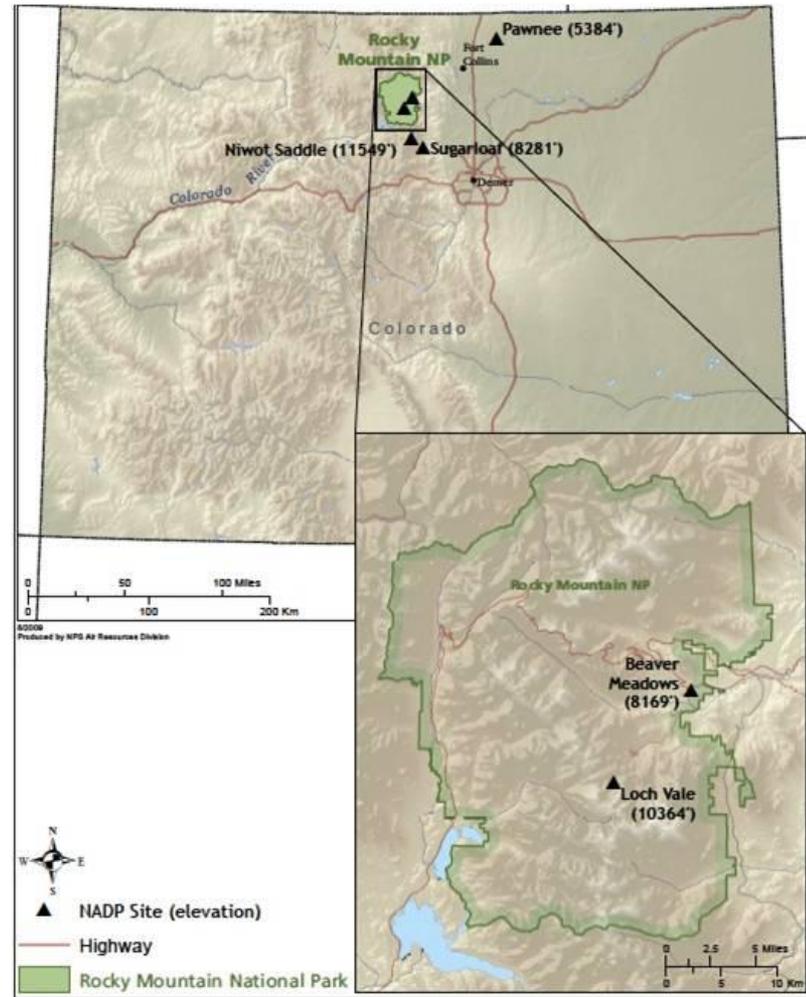
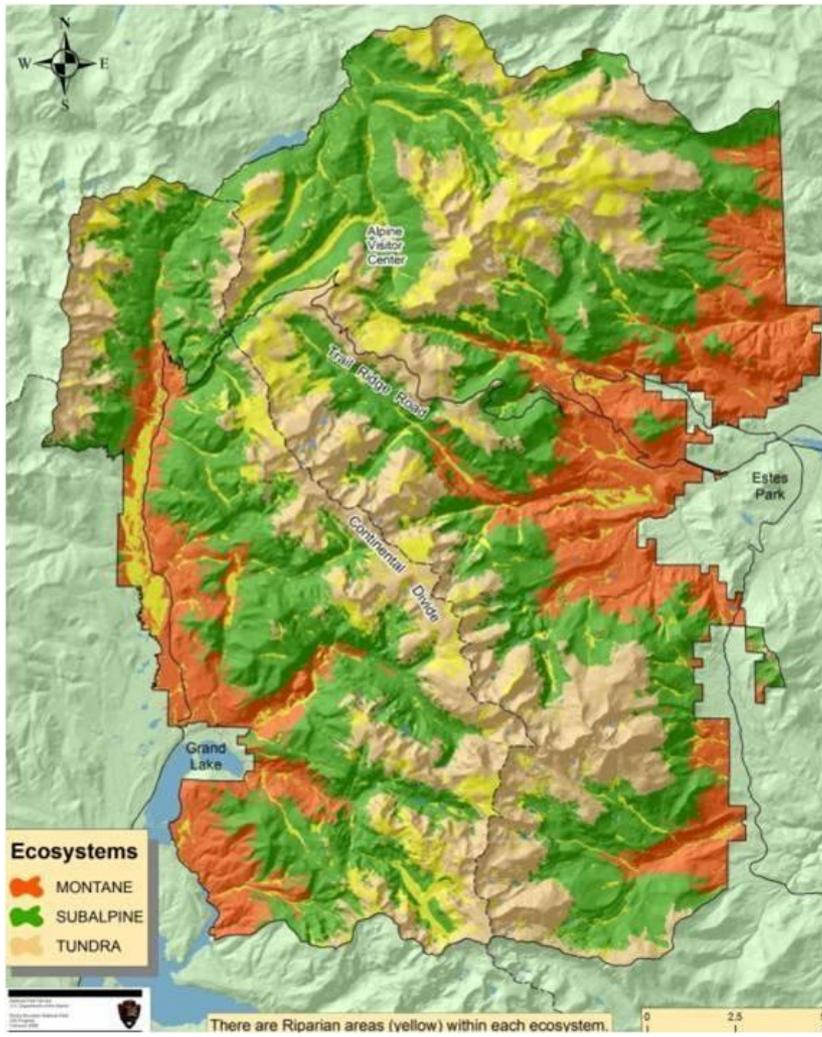
Video: "[Rocky Mountain National Park Science Behind the Scenes – Air Quality](#)" (10:02)

Take a virtual field trip to Rocky Mountain National Park to learn how national park staff and scientists conduct air quality research in the park and complete the table below.

Air Monitoring System	What is measured?
1.	1.
2.	2.
3.	3.

Explore

Tracing the Tracks of Air Pollution in the Park



Explain

Identifying and Interpreting N-Dep. Evidence

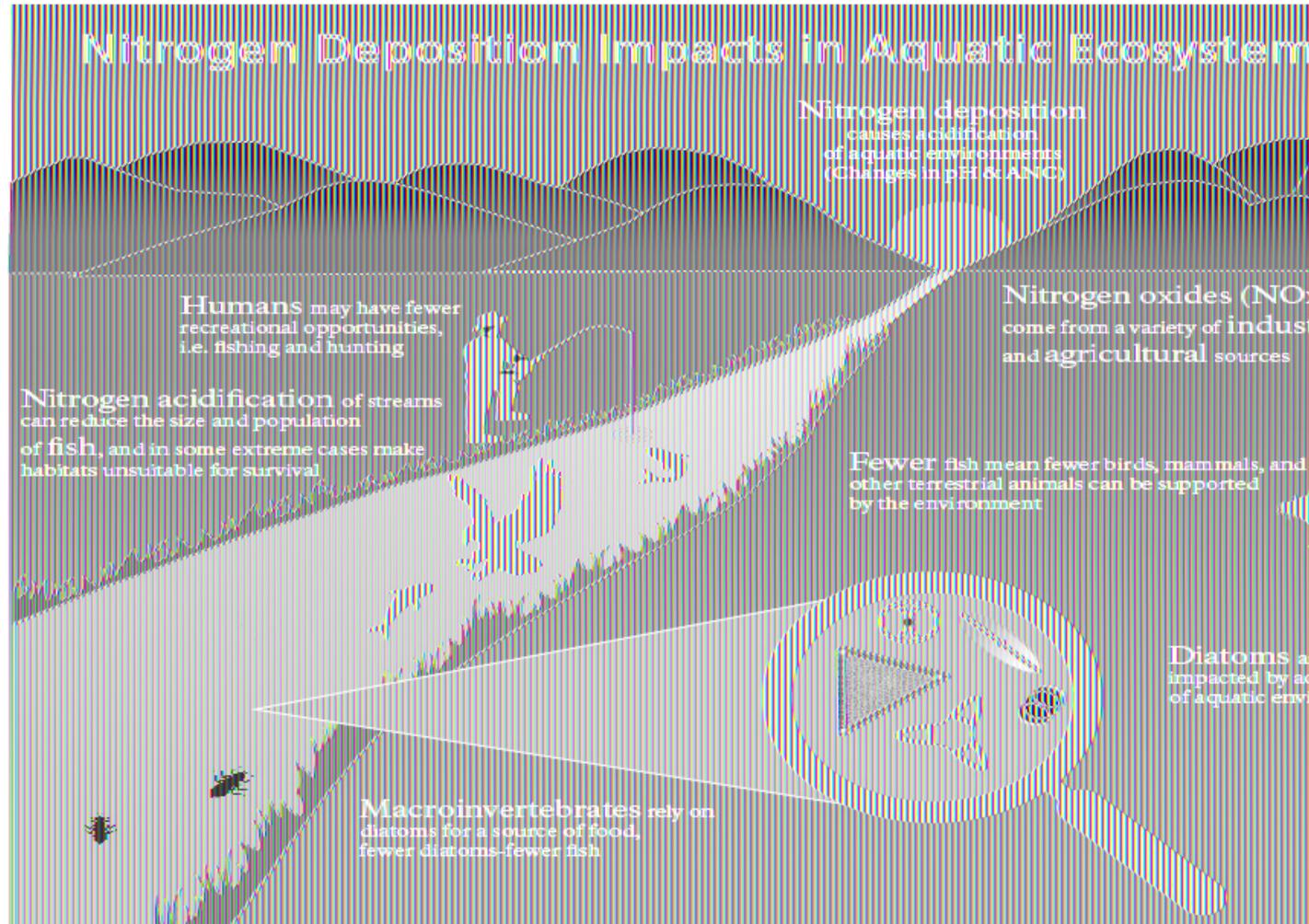
Read the “[Nitrogen Deposition: Issues and Effects in Rocky Mountain National Park](#)” National Park Service brochure for an overview of the causes and effects of nitrogen deposition in the park.

What are the impacts of nitrogen on RMNP ecosystems?

What is the nitrogen deposition level in RMNP?

Explain

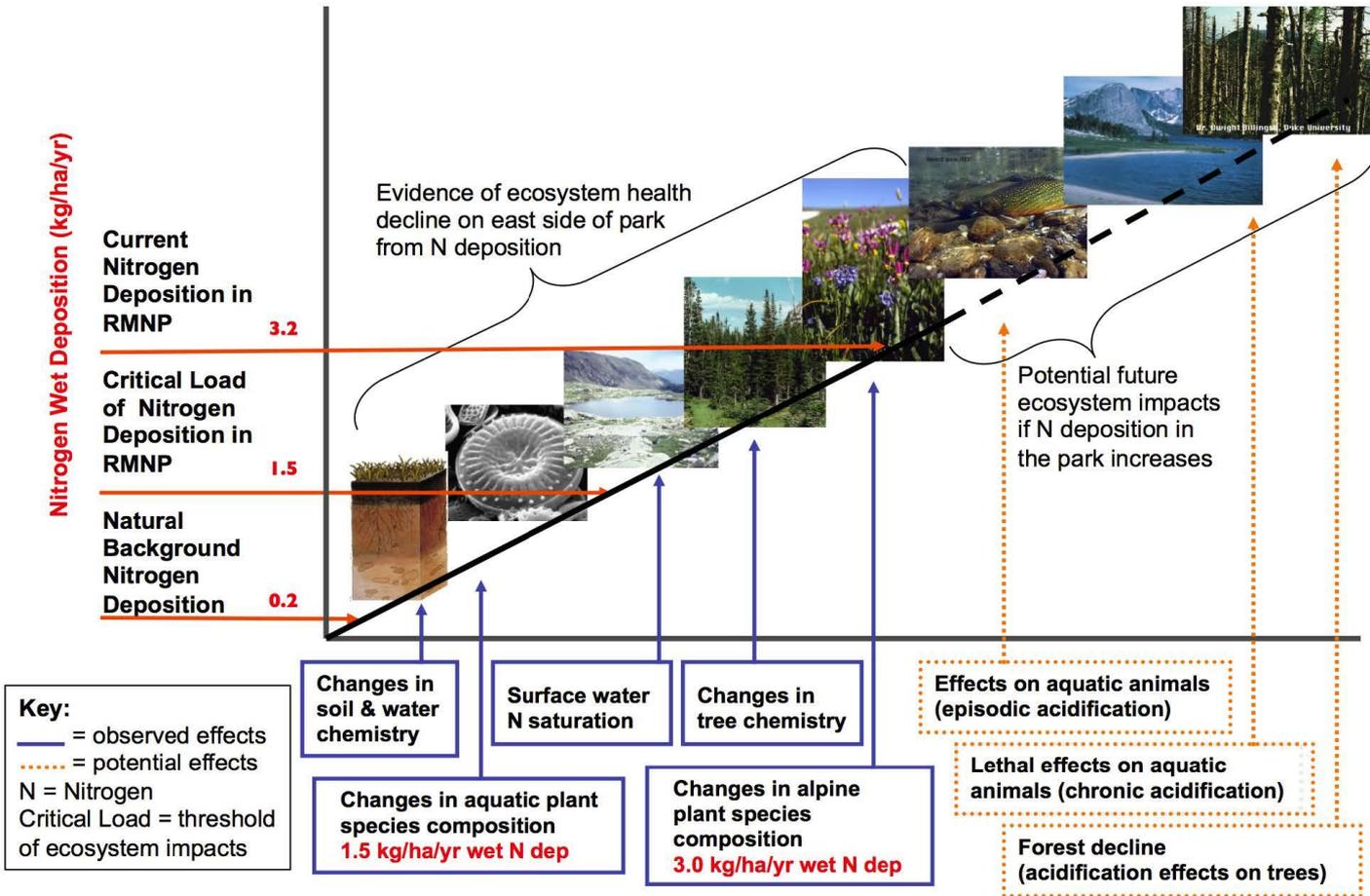
Identifying and Interpreting N-Dep. Evidence



Explain

Identifying and Interpreting N-Dep. Evidence

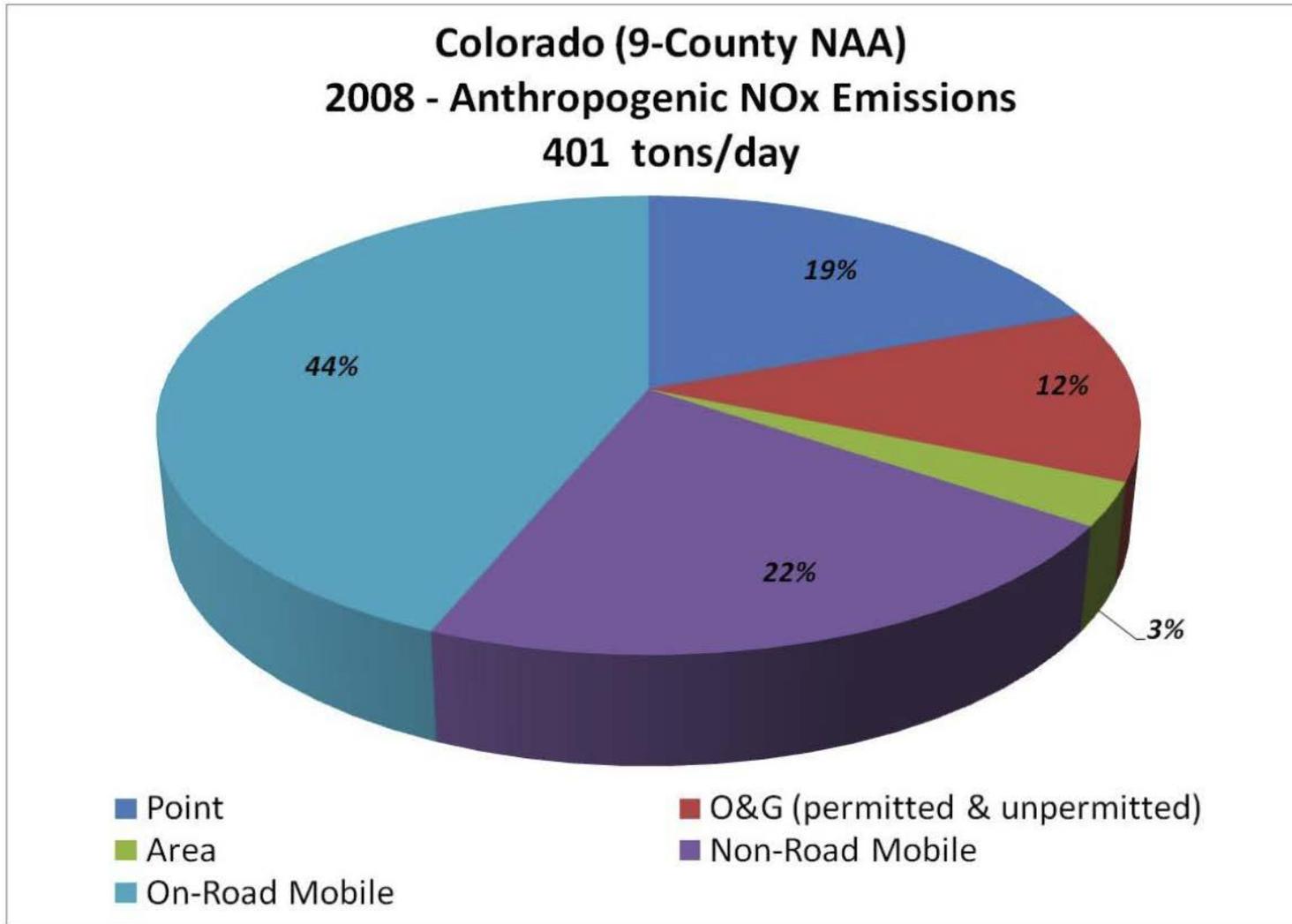
Impacts of Nitrogen Deposition on Ecosystem Health in Rocky Mountain National Park



NPS-ARD 2015

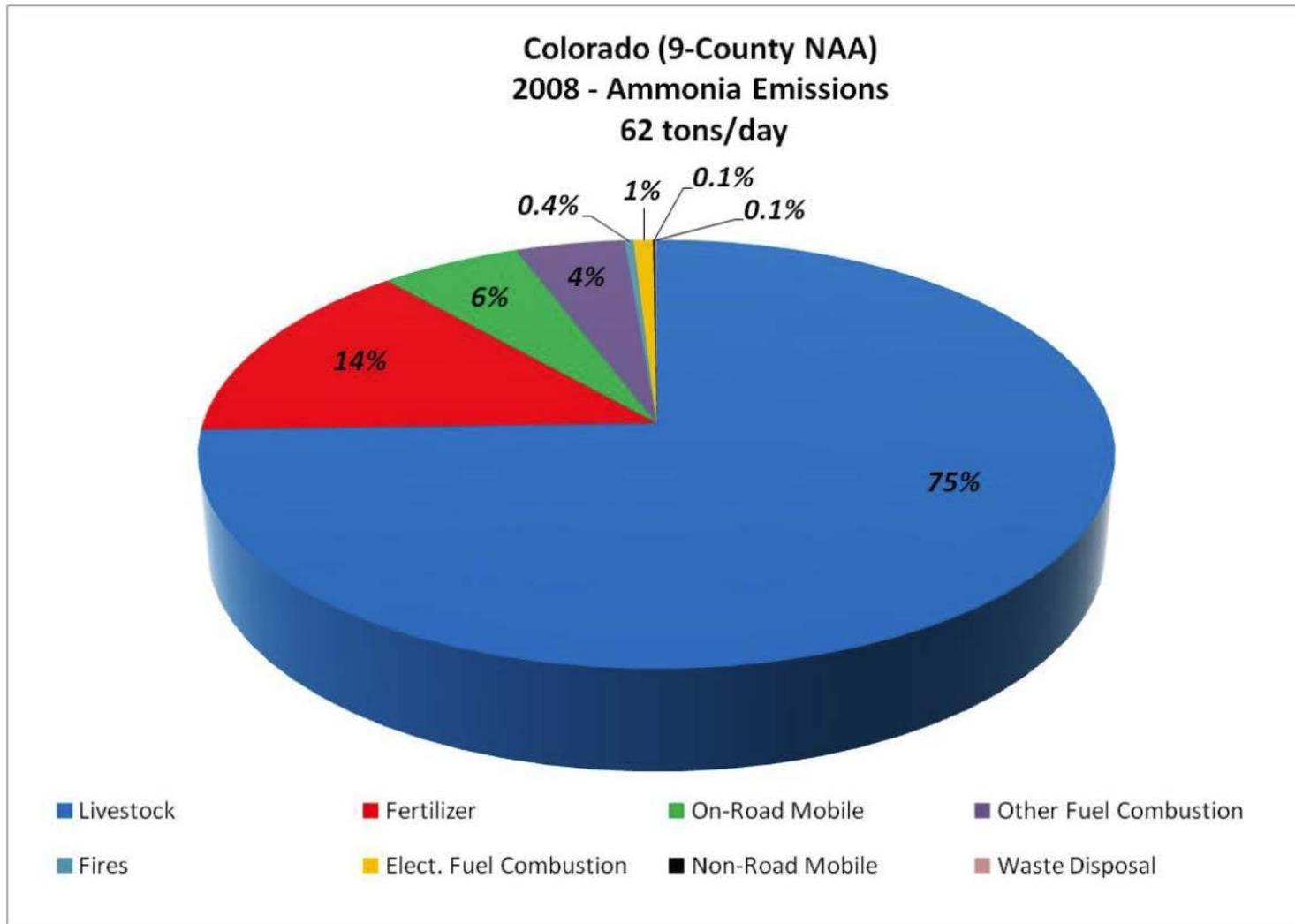
Elaborate

Connecting the N-Dep. Dots



Elaborate

Connecting the N-Dep. Dots



Elaborate

Connecting the N-Dep. Dots

First, watch the video to see how ammonia gas that is emitted from livestock and farming activities combines with nitrogen oxides emitted from cars and other combustion sources to create nitrogen particles (ammonium nitrate) in the air.

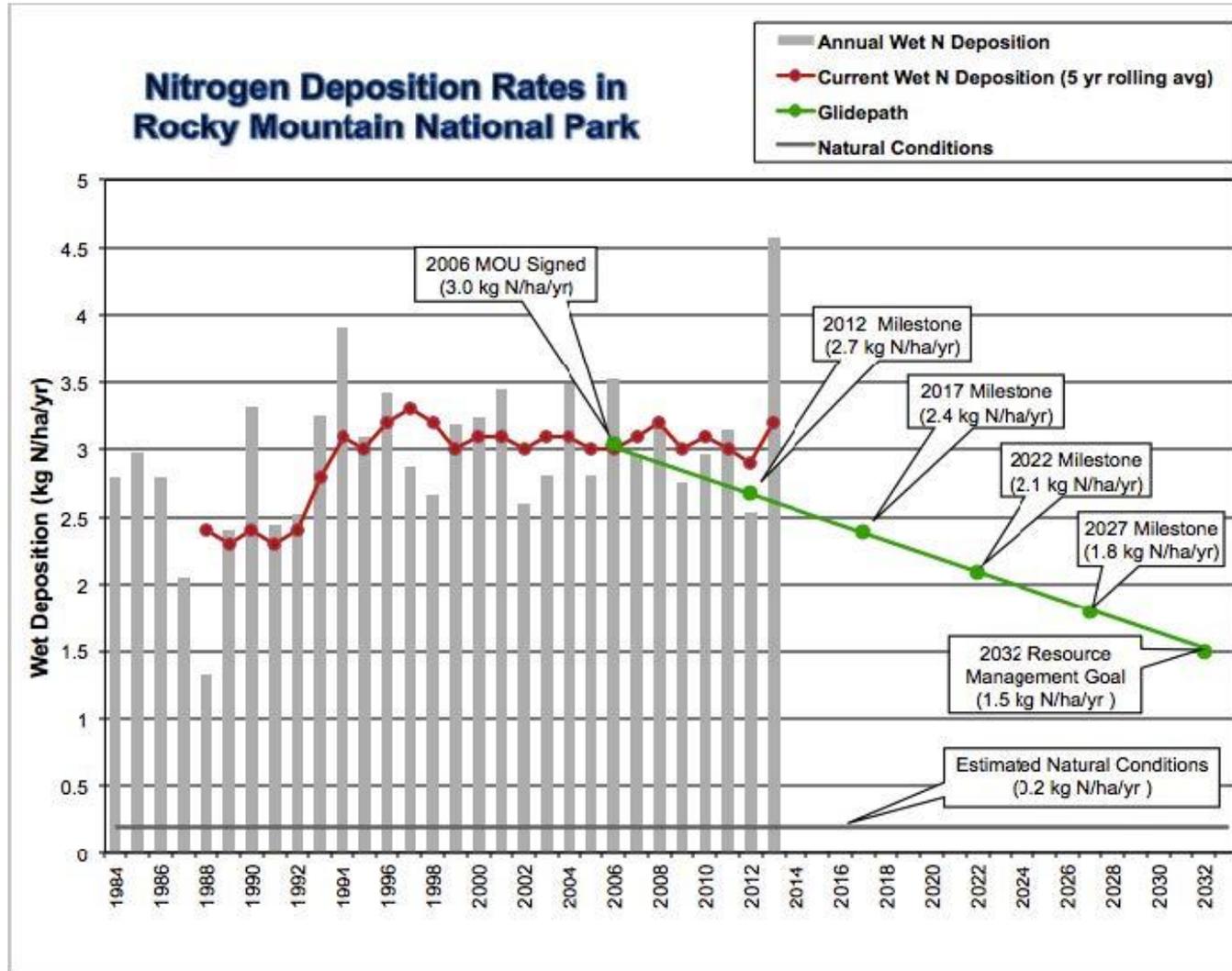
Video: "[Ammonia Deposition in Rocky Mountain National Park: What Is the Role of Animal Agriculture?](#)" (12:47)

Next, review the "[Agricultural Best Management Practices](#)" National Park Service fact sheet for an overview of how the National Park Service is working together with the agricultural community to reduce nitrogen deposition in RMNP.

1. Name two specific agricultural practices that create ammonia emissions and contribute to the nitrogen deposition concern in Rocky Mountain National Park?
2. How do the nitrogen particles emitted (released) in the Front Range end up in the mountains of Rocky Mountain National Park?
3. List three environmental impacts on ecosystems caused by increased nitrogen deposition in Rocky Mountain National Park.
4. How are ranchers and farmers reducing the amount of ammonia gas they release into the air? How do these actions benefit both the agricultural community and Rocky Mountain National Park?

Evaluate

Exit Ticket



Evaluate

Exit Ticket

Assess the graph that combines NADP wet deposition data and the Nitrogen Deposition Reduction Plan milestone goals. Then briefly review the “[RMNP Air Quality](#)” fact sheet nitrogen deposition sections. Evaluate the evidence and predict the outcome of nitrogen deposition in Rocky Mountain National Park.

N-Dep. Reflection - State Your Case:

1. Which year was the nitrogen deposition rate the lowest?
2. Which year was the nitrogen deposition rate the highest?
3. Is the overall nitrogen deposition rate increasing, decreasing, or stable?
4. Between which years was the increase in the 5-year average rate of nitrogen deposition the greatest?
5. Between which years was the 5-year average rate of nitrogen deposition approximately 3.0 kg/ha/yr?
6. The critical load (the threshold where ecosystem impacts are observed) of the annual nitrogen deposition rate is 1.5 kg/ha/yr. How many times greater is the current level nitrogen deposition than the critical load? Than natural background nitrogen levels?
7. The Nitrogen Deposition Reduction Plan was adopted in 2007. The plan’s first milestone goal was in 2012. Between these two dates was the rate of nitrogen deposition increasing, decreasing, or stable?
8. Based on past actual annual wet nitrogen deposition levels, make a prediction as to whether future Nitrogen Deposition Reduction Plan milestones between 2017 and 2032 will be reached. Explain your prediction.

Scientist Snapshot

Meet the scientists who conduct groundbreaking research to understand and find solutions to improve air quality for people, places, and all living things!



Jim Cheatham, National Park Service
Environmental Protection Specialist – Park Planning & Technical Assistance