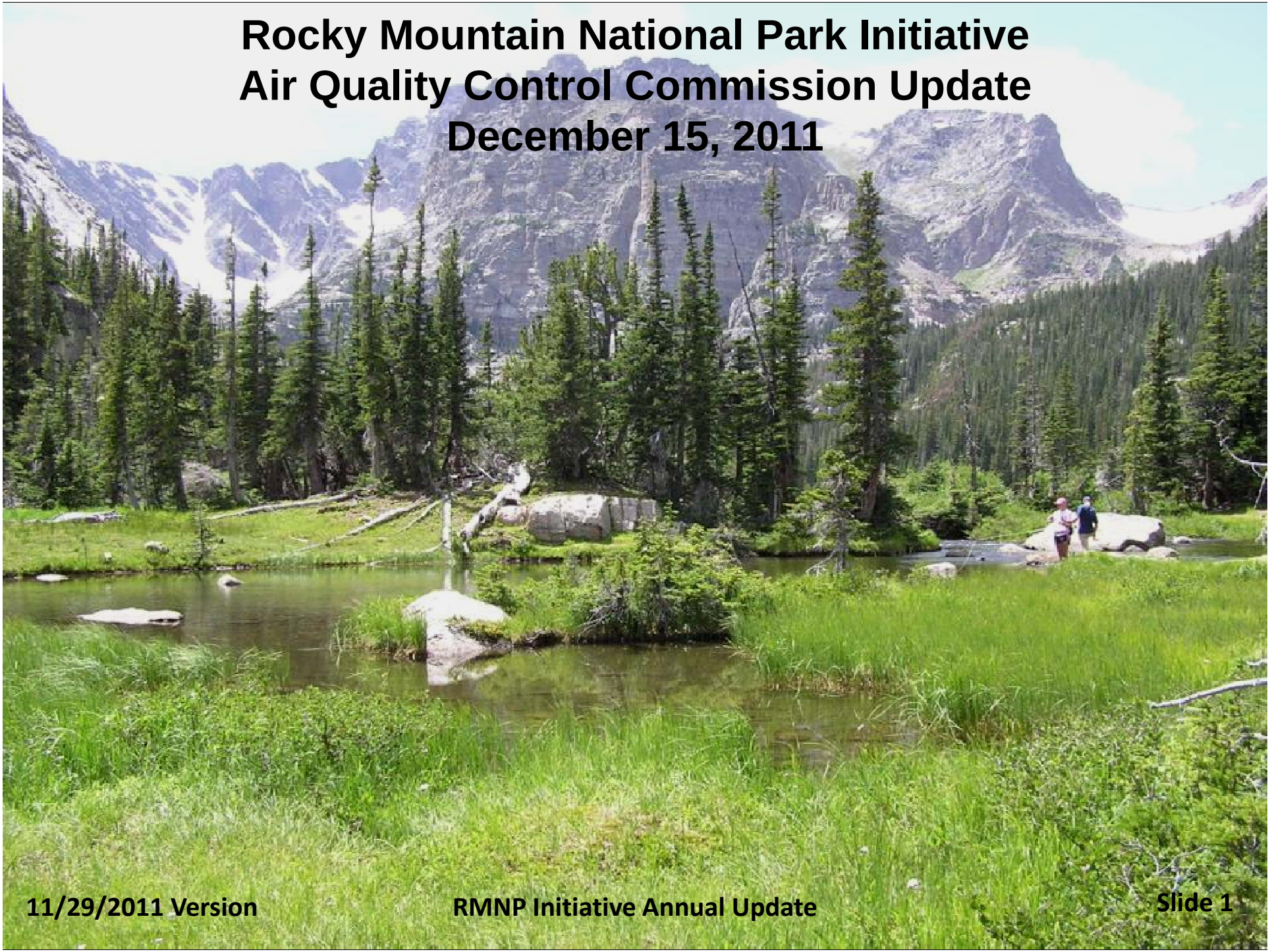
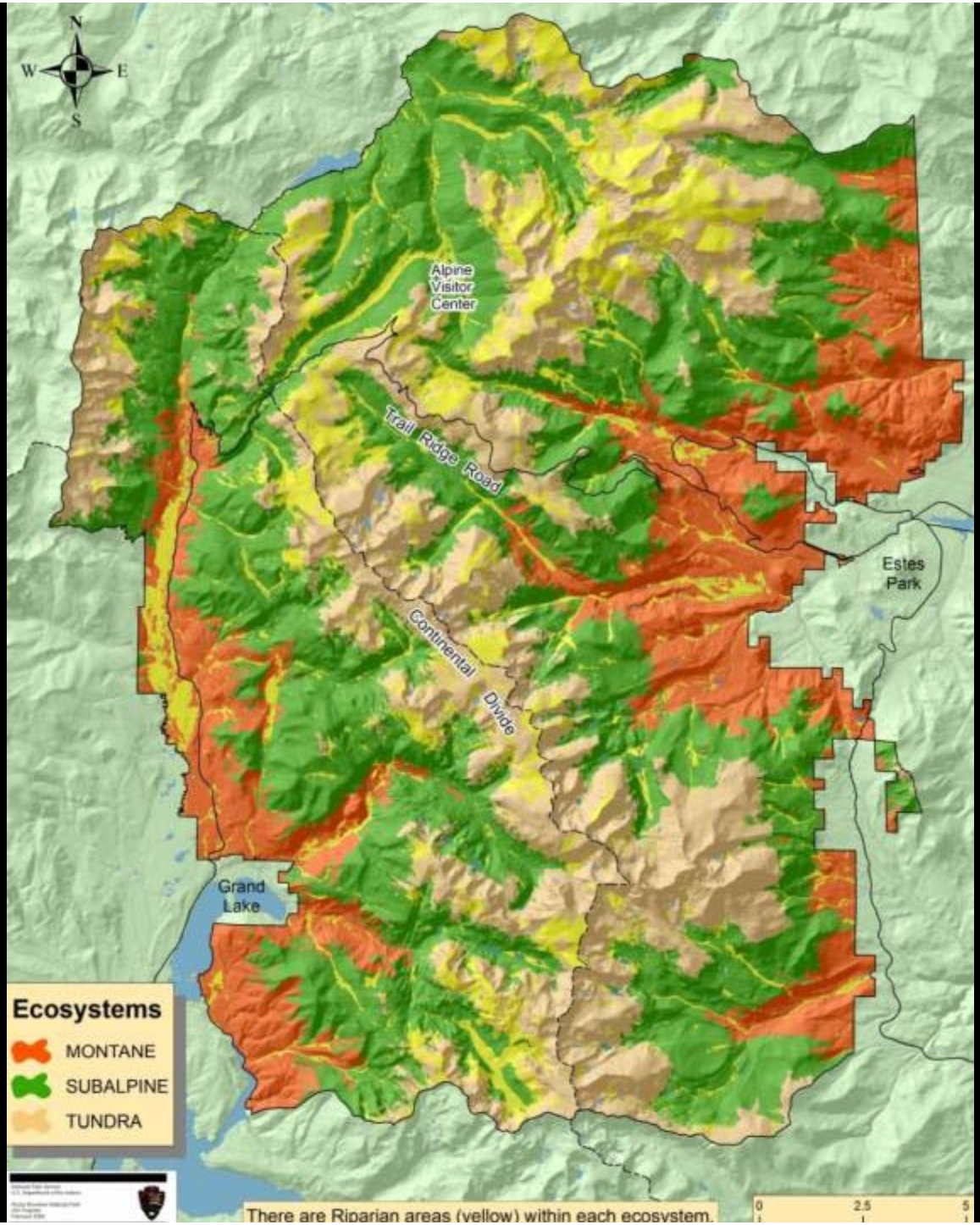
Rocky Mountain National Park Initiative
Air Quality Control Commission Update
December 15, 2011



Overview – RMNP Initiative

- RMNP Initiative Rationale
- Resource Management Goal
- Monitoring Updates
- NOx Reductions (current/future)
- Ammonia BMP Status
- 2010 – 2011 Nitrogen Deposition Reduction Plan Actions
- Accomplishments & Future Goals

Rocky Mountain National Park



RMNP Initiative - Basis

- Petition from Environmental Defense and Colorado Trout Unlimited - Sept 2004
  - ID's adverse impacts to ecosystem from air pollution
  - Nitrogen, ozone, haze
- CDPHE, NPS and EPA began a process for addressing these concerns (2004 and 2005)
  - The "RMNP Initiative" began
  - Nitrogen deposition is the focus of the Initiative
- Developed Nitrogen Deposition Reduction Plan (NDRP)

RMNP Nitrogen Deposition Reduction Plan

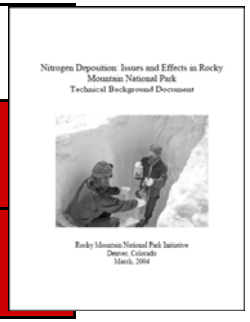
Journal article estimates “critical load”(April 2006)

Resource management goal established & endorsed (June 2006)

CDPHE, NPS, EPA MOU (Dec 2005)

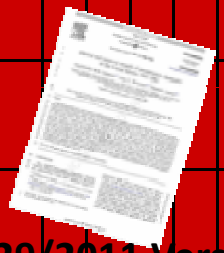
AQCC Subcomm formed (Sept 2005)

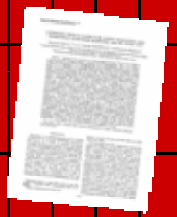
Nitrogen Deposition Issues and Effects Technical Background Document” (CDPHE, NPS & EPA – March 2004) **-based on 60 peer-reviewed papers**



>80 peer-reviewed publications form the basis for assessing nitrogen deposition and impacts at RMNP

>140 Peer-Reviewed Publications on the Effect of Nitrogen on Natural Resources and Systems





Rocky Mountain National Park

Nitrogen Deposition Reduction Plan

Memorandum of Understanding
Agencies

Vaughn Baker, Superintendent, Rocky Mountain National Park

Michael Snyder, Acting Director, National Park Service, Intermountain Region

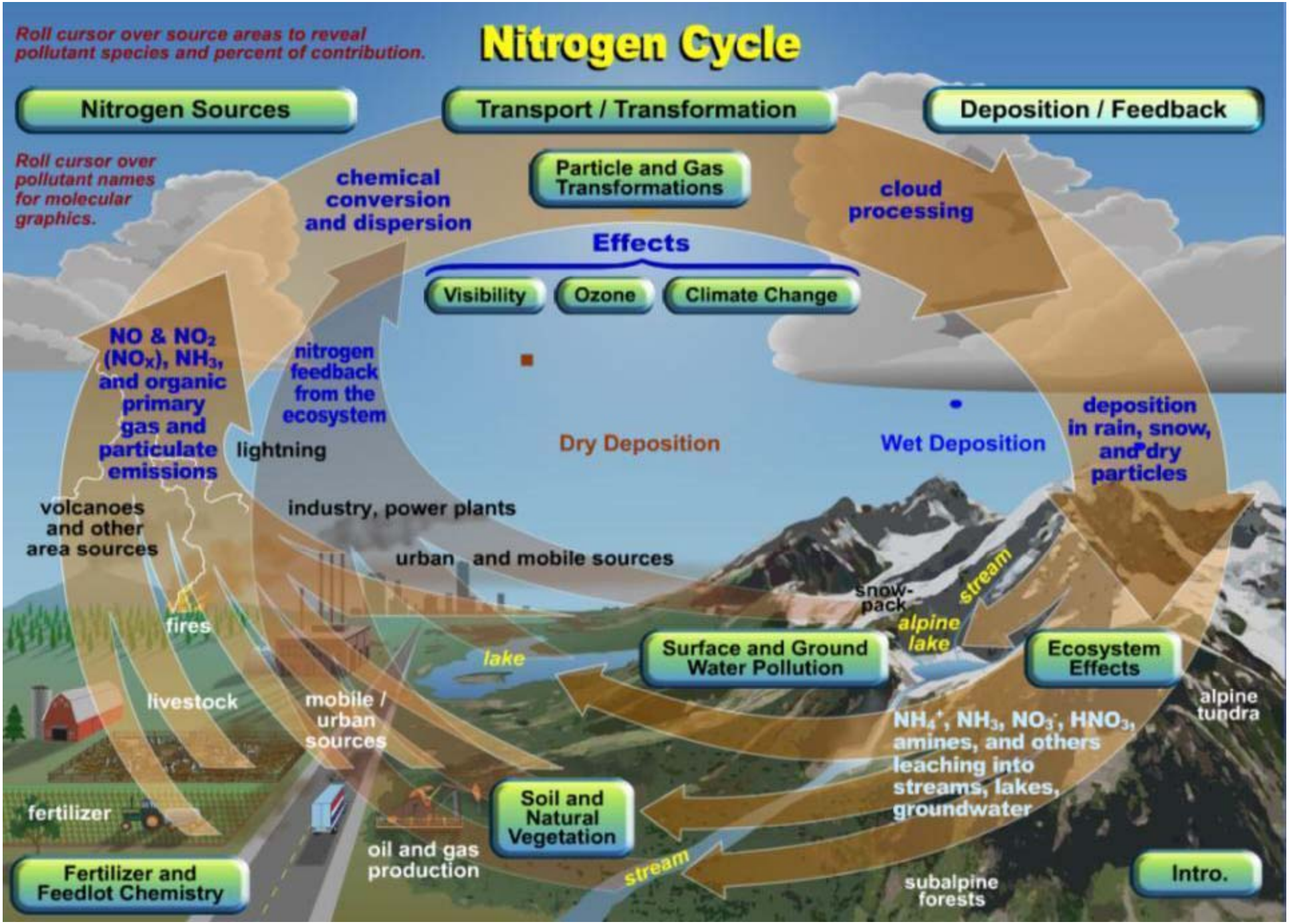
for Robert E. Roberts, Regional Administrator, Environmental Protection Agency, Region 8

James B. Martin, Executive Director, Colorado Department of Public Health & Environment

August 16, 2007

RMNP Initiative - Basis

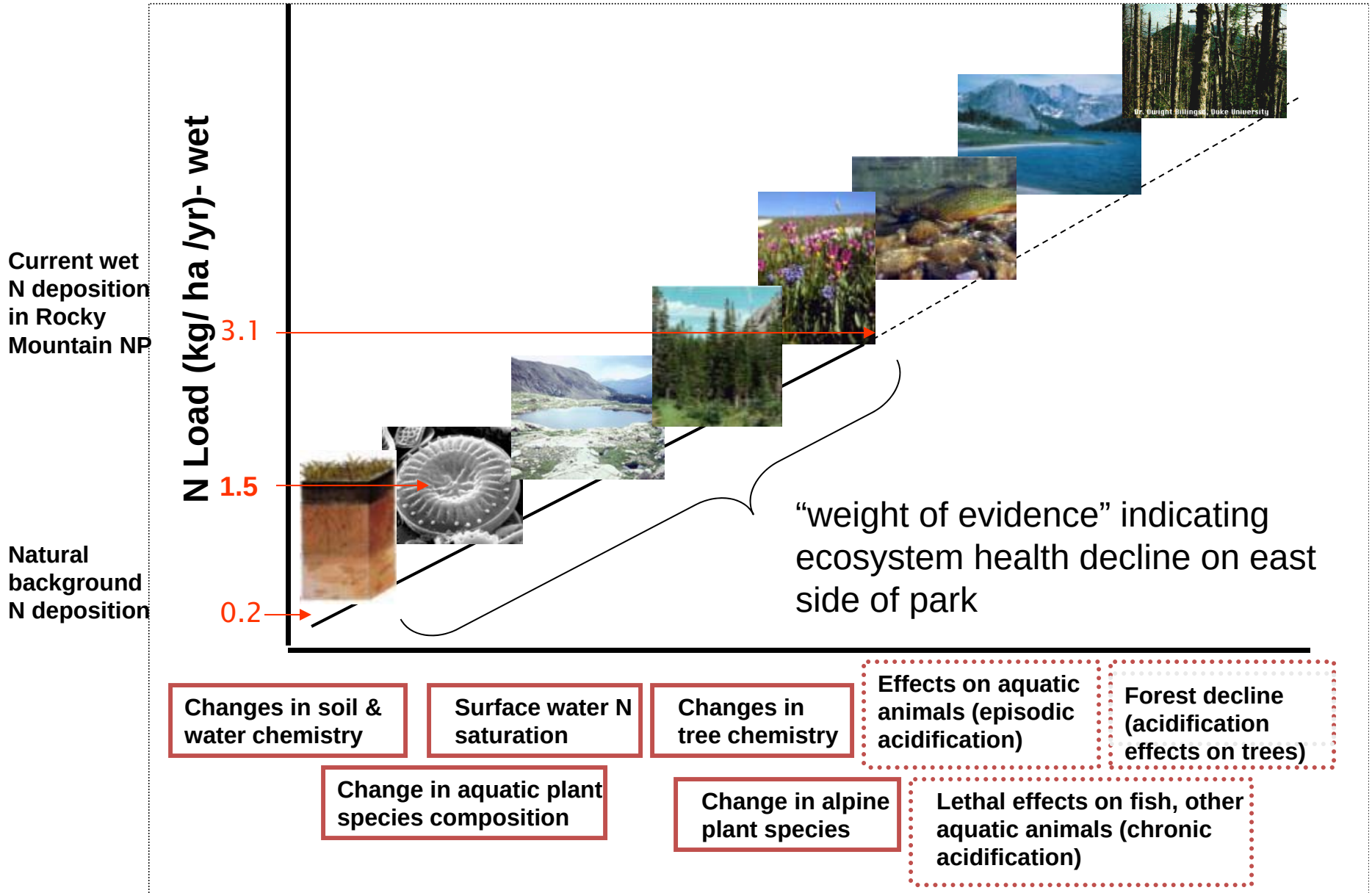
- Agencies support this collaborative, preventative approach in lieu of legal/regulatory mechanisms that could be triggered
  - AQRV's (air quality related value)
  - PSD increment consumption
  - Petitions/lawsuits


Roll cursor over source areas to reveal pollutant species and percent of contribution.
Nitrogen Cycle
Nitrogen Sources
Transport / Transformation
Deposition / Feedback
Roll cursor over pollutant names for molecular graphics.
chemical conversion and dispersion
Particle and Gas Transformations
cloud processing
Effects
Visibility
Ozone
Climate Change
NO & NO2 (NOx), NH3, and organic primary gas and particulate emissions
nitrogen feedback from the ecosystem
lightning
Dry Deposition
Wet Deposition
deposition in rain, snow, and dry particles
volcanoes and other area sources
industry, power plants
urban and mobile sources
fires
snow-pack
stream
alpine lake
lake
Surface and Ground Water Pollution
Ecosystem Effects
livestock
mobile / urban sources
alpine tundra
NH4+, NH3, NO3-, HNO3, amines, and others leaching into streams, lakes, groundwater
fertilizer
Soil and Natural Vegetation
oil and gas production
stream
subalpine forests
Fertilizer and Feedlot Chemistry
Intro.

NDRP Resource Management Goal

- **Weight of evidence indicates excess nitrogen deposition is negatively affecting ecosystems within the park.**
- **Current 5-year average wet deposition is ~ 3.1 kg N/ha/yr (equivalent to 2.7 lbs/acre/yr)**
- **Natural background estimated at 0.2 kg N/ha/yr**
  - **Current deposition about 15.5 times higher than pre-industrial levels**
- **Peer-reviewed research shows natural resource impacts occur at wet deposition levels above 1.5 kg N/ha/yr.**

Rocky Mountain NP: Continuum of Impacts to Ecological Health– As N deposition rates increase, more resource types are impacted



Nitrogen Deposition Reduction Plan

- Plan endorsed by NPS, EPA and CDPHE and by the Colorado Air Quality Control Commission on August 16, 2007

❖Significant Aspects of the Plan

1) Management approach based on collaborative process
2) Voluntary approach, no mandatory requirements or standards
3) Sets long-term (25 year) resource management goals
4) Sets timeline and interim (5-year) milestone goals intervals to achieve nitrogen reduction goal by 2032
5) Strategy to achieve goals
6) Identifies options that can be implemented on a voluntary basis

NDRP Accomplishment Timeline

2005

- APCD/NPS Joint Staff "Options" Paper
- Memorandum of Understanding signed by CDPHE, EPA, & NPS
- Ammonia inventory published (2002 data)

2006

- Established resource management goal (critical load)
- RoMANS field campaign
- RMNP Agriculture Subcommittee formed

2007

- Pollution control measure options analyzed
- Glidepath approach determined
- NDRP endorsed by AQCC in August 2007

2008

- Ag Subcommittee Ammonia Monitoring Network Report
- 1st AQCC Progress Update
- Contingency Planning begins

2009

- RoMANS Study Results published
- Three public Ag AQ forums
- NADP Loch Vale Monitor Improvements

2010 – 2011 NDRP Actions

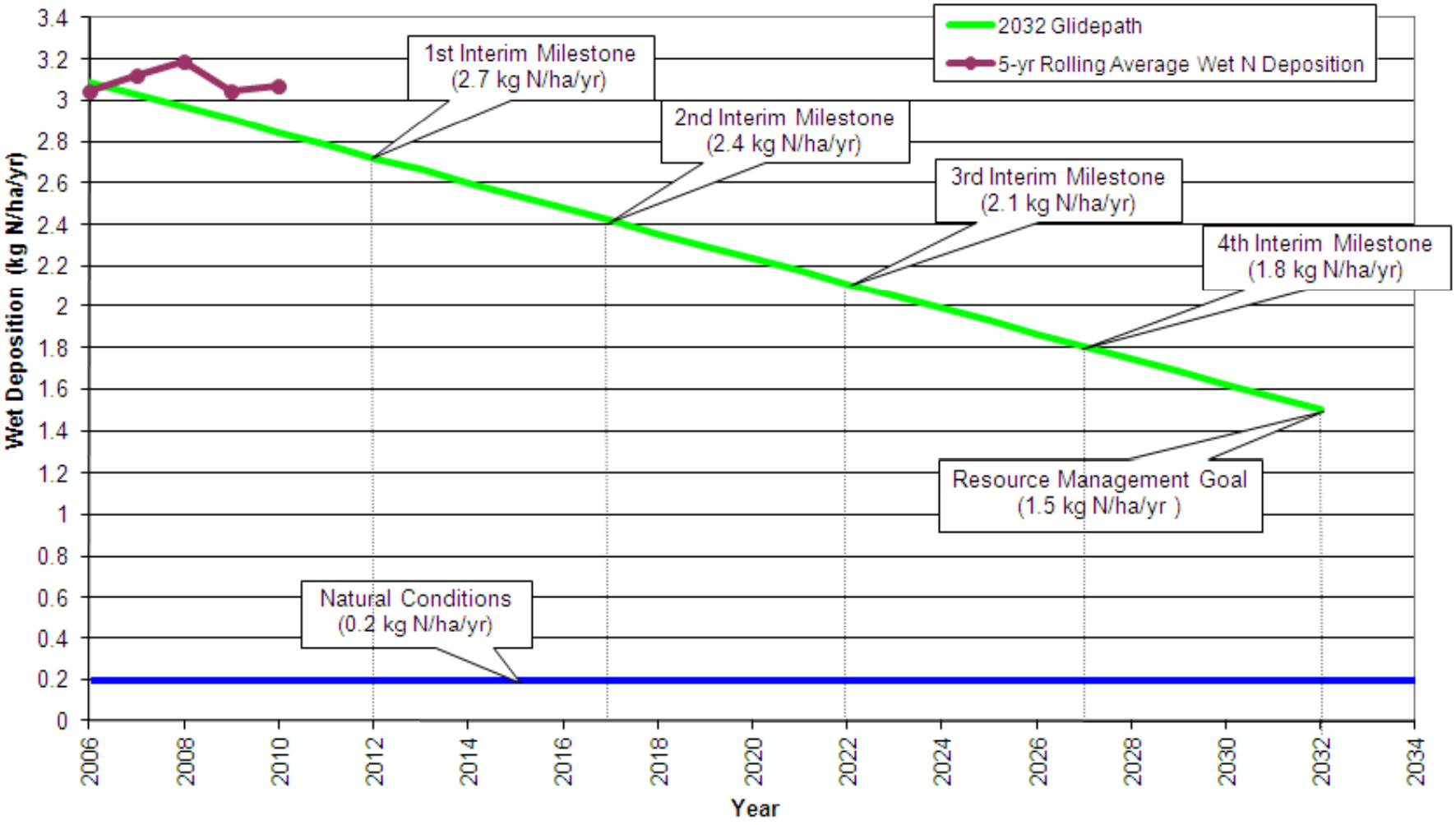
- **Inventory Development (Ammonia and NOx)**

- **Nitrogen Deposition Research and Monitoring**
  - **Analyze Annual Deposition Data**
  - **RoMANS II**
  - **AMON Network**
  - **Ecological Effects**

- **Emission Reduction Strategies**
  - **Ammonia BMP Progress**
  - **NOx Reductions Current & Future**

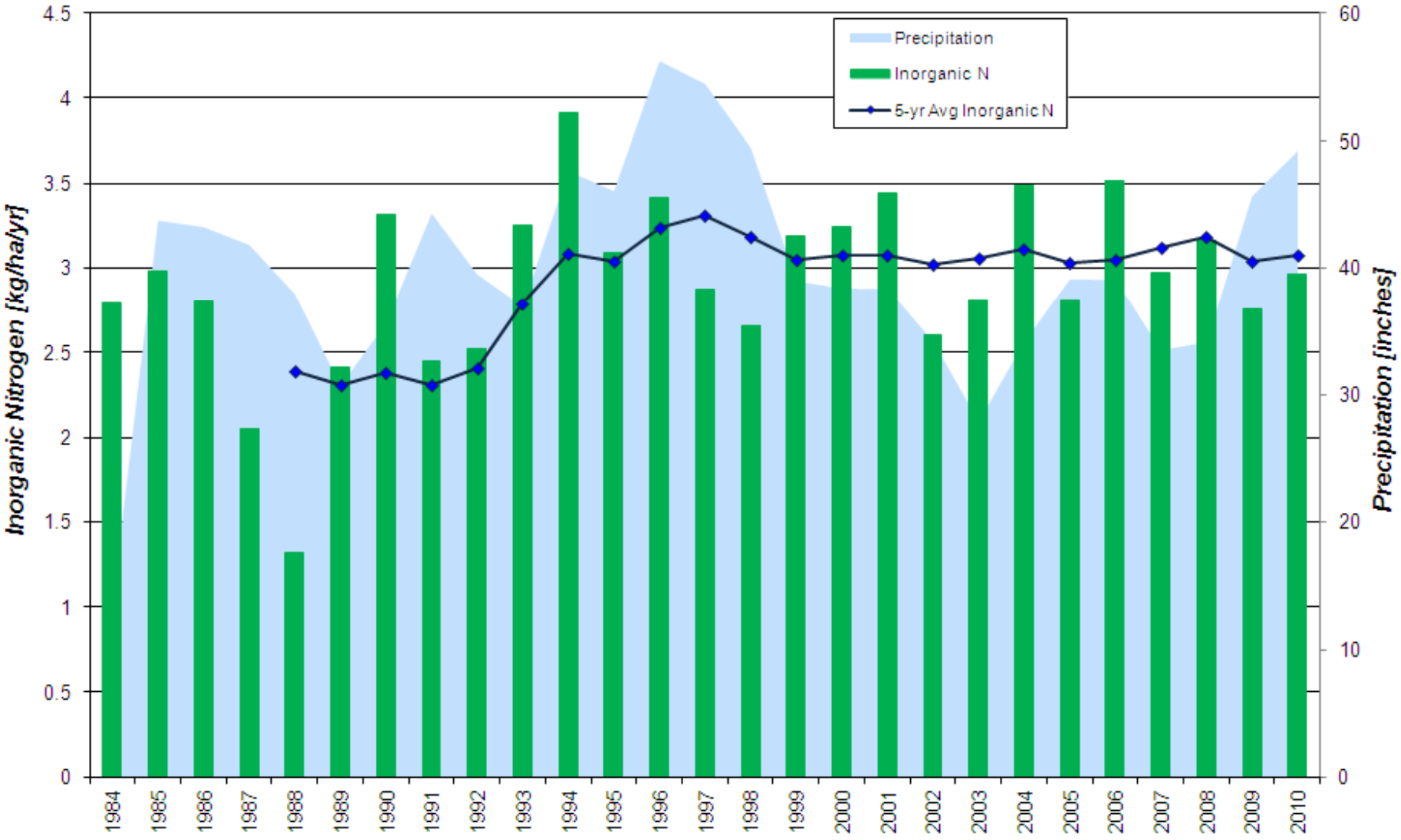
- **Legal & Policy Tracking**
  - **Secondary NO2 Standard**
  - **EPA Agriculture Rules**
  - **Ozone Standard and Agency Planning**

Loch Vale Nitrogen Deposition Reduction Plan Glidepath



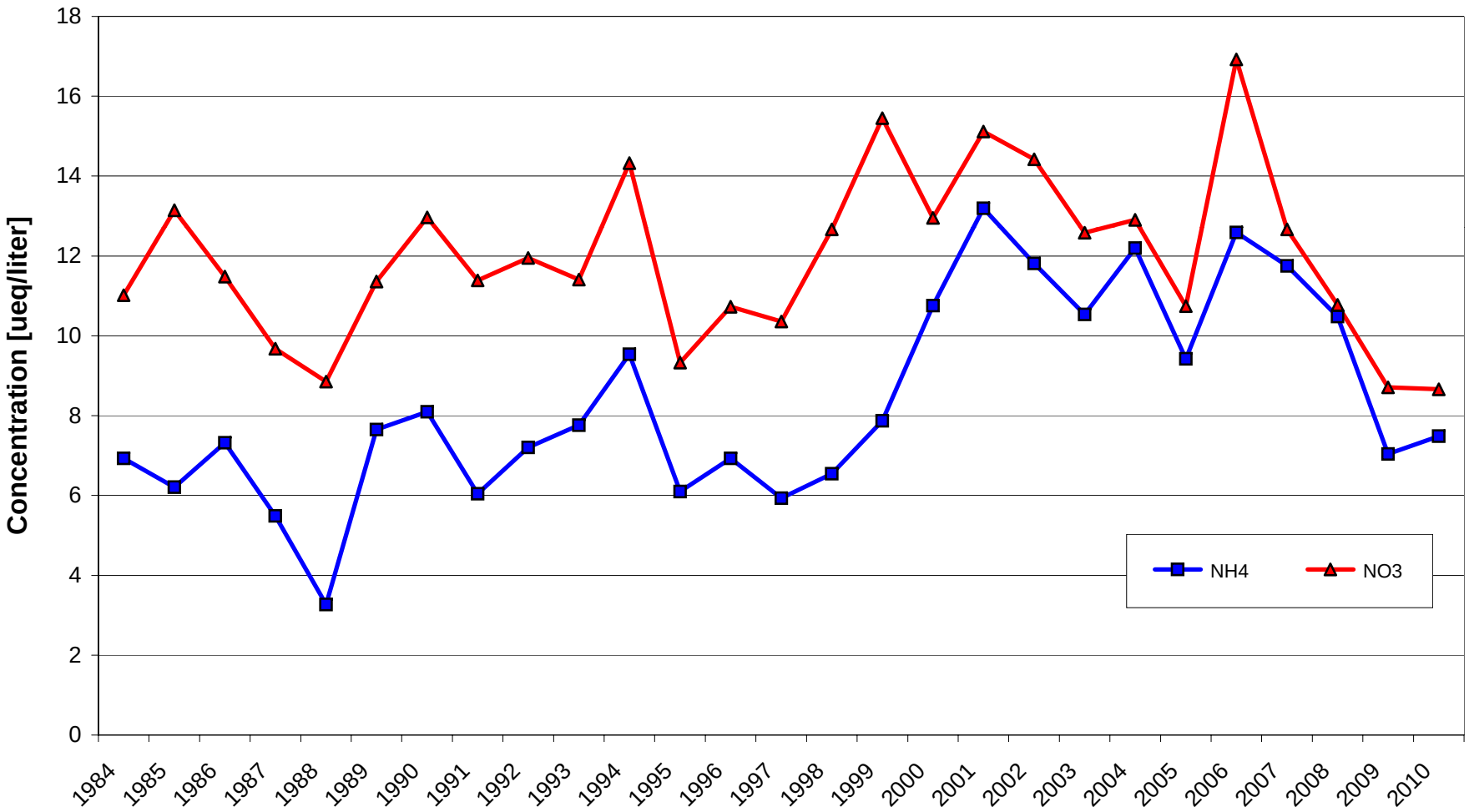
Rocky Mountain National Park

Wet Nitrogen Deposition at Loch Vale Monitor 1984 - 2010

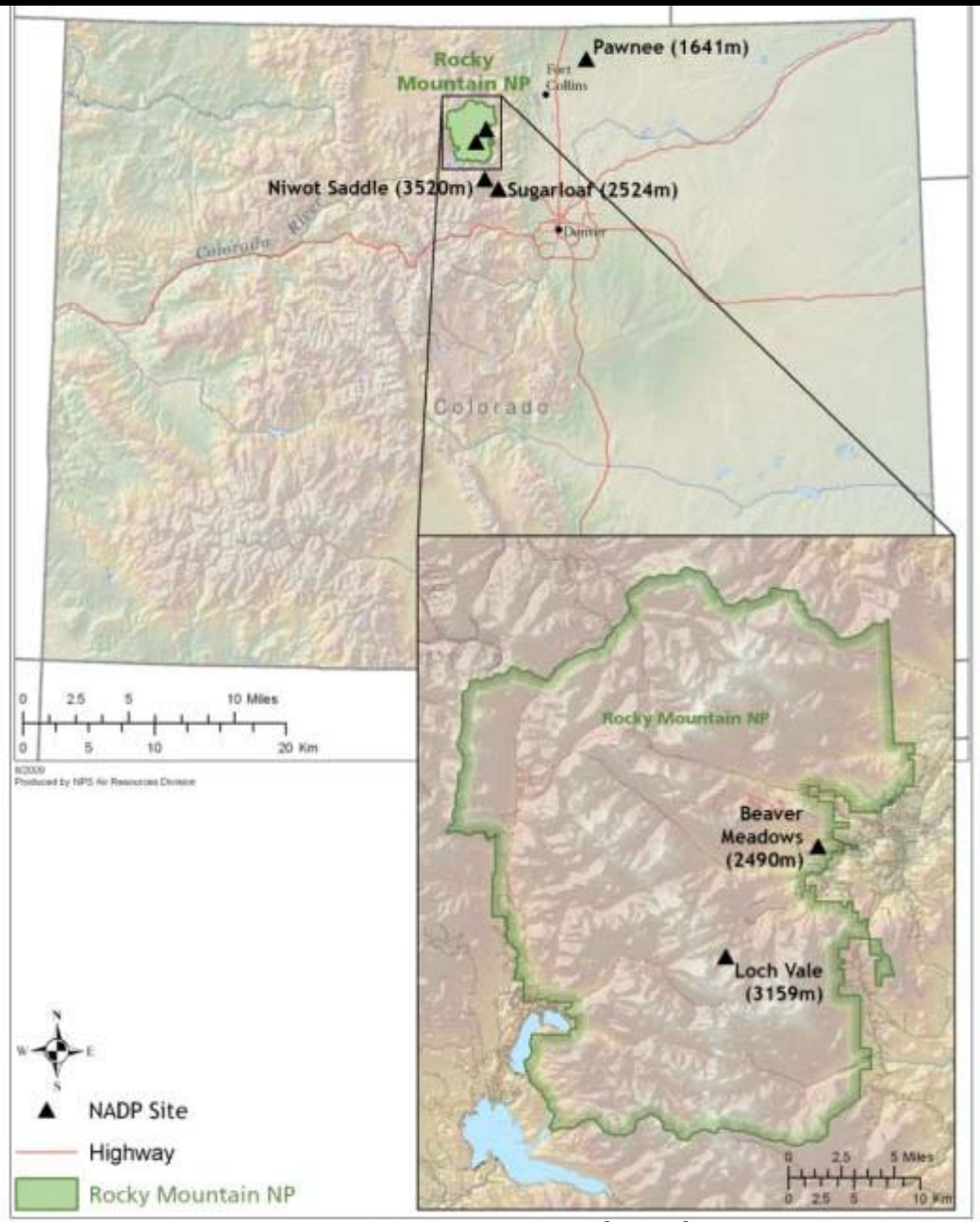


Rocky Mountain National Park

Precipitation-Weighted Mean Concentrations at Loch Vale Monitor



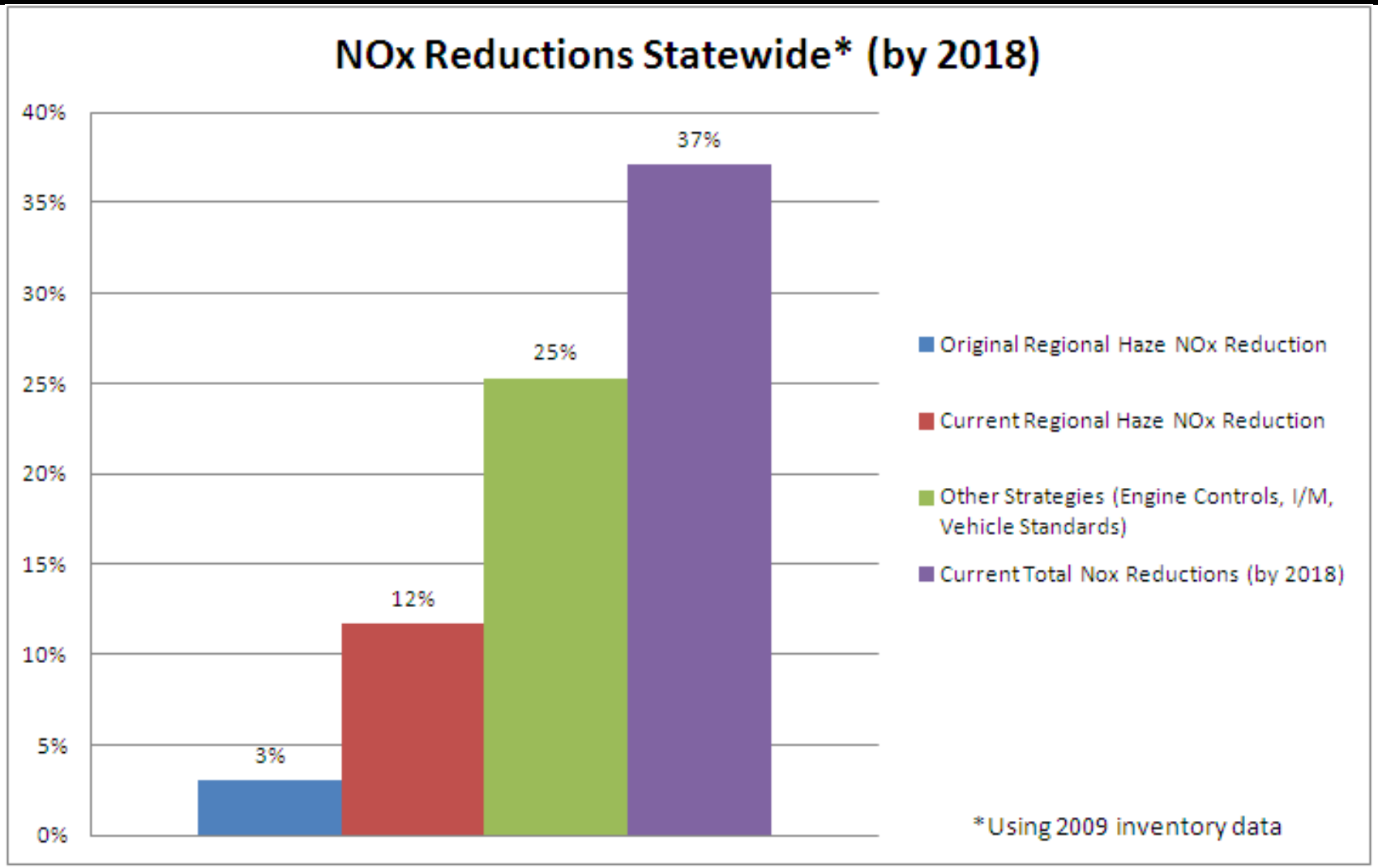
Monitoring Regional Nitrogen Deposition Trends To Determine Effectiveness



Monitoring & Trends Update

- Two NADP sites in RMNP (Beaver Meadows/Loch Vale)
  - Additional co-located site in 2009 at Loch Vale
- NPS Monitoring/Tracking Report (Sept. 2011)
  - Highlights long- and short-term trends for RMNP and three other regionally located sites (total of 5 NADP sites used in trend analysis)
  - Long-Term Statistical Trend (since early 1980s):
    - Ammonium is increasing at 4 out of 5 sites
  - Short-Term Statistical Trends (7-years – 2004 – 2010):
    - Wet nitrogen deposition is decreasing at 1 out of 5 sites (Niwot Saddle)
    - Ammonium is decreasing at 2 out of 5 sites
    - Nitrate is decreasing at 4 out of 5 sites
    - Nitrogen deposition has decreased in the region, but not significant at Loch Vale

Nitrogen Reductions (on-the-way)



Ammonia BMP Status

2010 Accomplishments:

- Crop/land use trends data
- State-level USDA, NRCS Air Quality Committee formed to evaluate air quality BMPs
- Grants
  - CSU BMP Field Trials
  - Longmont/Boulder Conservation District Nitrogen Fertilizer Study
  - CLA BMP Mini Grant
- Livestock Tour & Other Outreach

2011 Accomplishments:

- $1.15 million in new CSU livestock air quality grants (N & NH_3)
- RMNP Agriculture Factsheet published
- BMP Focus Group meeting to develop second BMP survey
- Six Ammonia Factsheets published by CSU
- Crop Tour & Other Outreach

2012 Preview:

- RMNP Ag Air Quality Symposiums – February 16th & 17th
- Baseline BMP data
- Continued BMP Research & Implementation
  - Seasonal BMPs
  - Early Warning System
- Outreach & Education

Ammonia BMP Developments

- Seasonal BMPs (Spring and Summer).

- "Early warning system" would advise agriculture producers to avoid high nitrogen-emitting activities (e.g. manure handling) during specific periods of time when weather conditions could readily transport nitrogen into the park (CSU).

- Crop production nitrogen use – Advances in fertilizer application optimizing fertilizer amounts, timing, and placement.

- Future research need – Improve understanding of effect of different fertilizer application methods on ammonia emissions.

- Bottom line - BMPs for ammonia require an integrated approach.

2010 – 2011 NDRP Actions Continued

- **Contingency Plan Endorsement and Development**
  - **Contingency Plan implemented if glidepath milestones are not achieved based on consideration of in park and regional deposition trends**

- **Collaborative Efforts**
  - **MOU Steering Committee Meetings**
  - **RMNP Ag Subcommittee**
  - **Water/Solid Waste/Env. Ag. Interactions at CDPHE**

- **Outreach**
  - **Public Presentations**
  - **Ag Symposiums**
  - **Educational Tours**

- **Future/Next Steps**

NDRP Accomplishment Timeline

2010

- Contingency Plan (CP) endorsed by AQCC in June 2010
- RoMANS Two Study
- Ag AQ Symposiums
- CLA BMP Mini Grant
- Ag Livestock Tour

2011

- Regional Haze SIP submitted to EPA
- Agricultural Producer Fact Sheet Published
- Ammonia inventory update effort initiated (2008 data)
- NADP Loch Vale Monitor Improvements
- 2009 NADP Monitoring Trends Report

2012

- Evaluate Loch Vale monitoring data
- Ag AQ Symposiums
- Ammonia inventory effort continues
- BMP survey and baseline data

2013

- Critical load interim goal to be reviewed with respect to NDRP and CP

Acknowledgements

NPS

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Laurel Dygowski
Monica Morales

Questions?

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RMNP Website: http://www.cdphe.state.co.us/ap/rmnp.html