



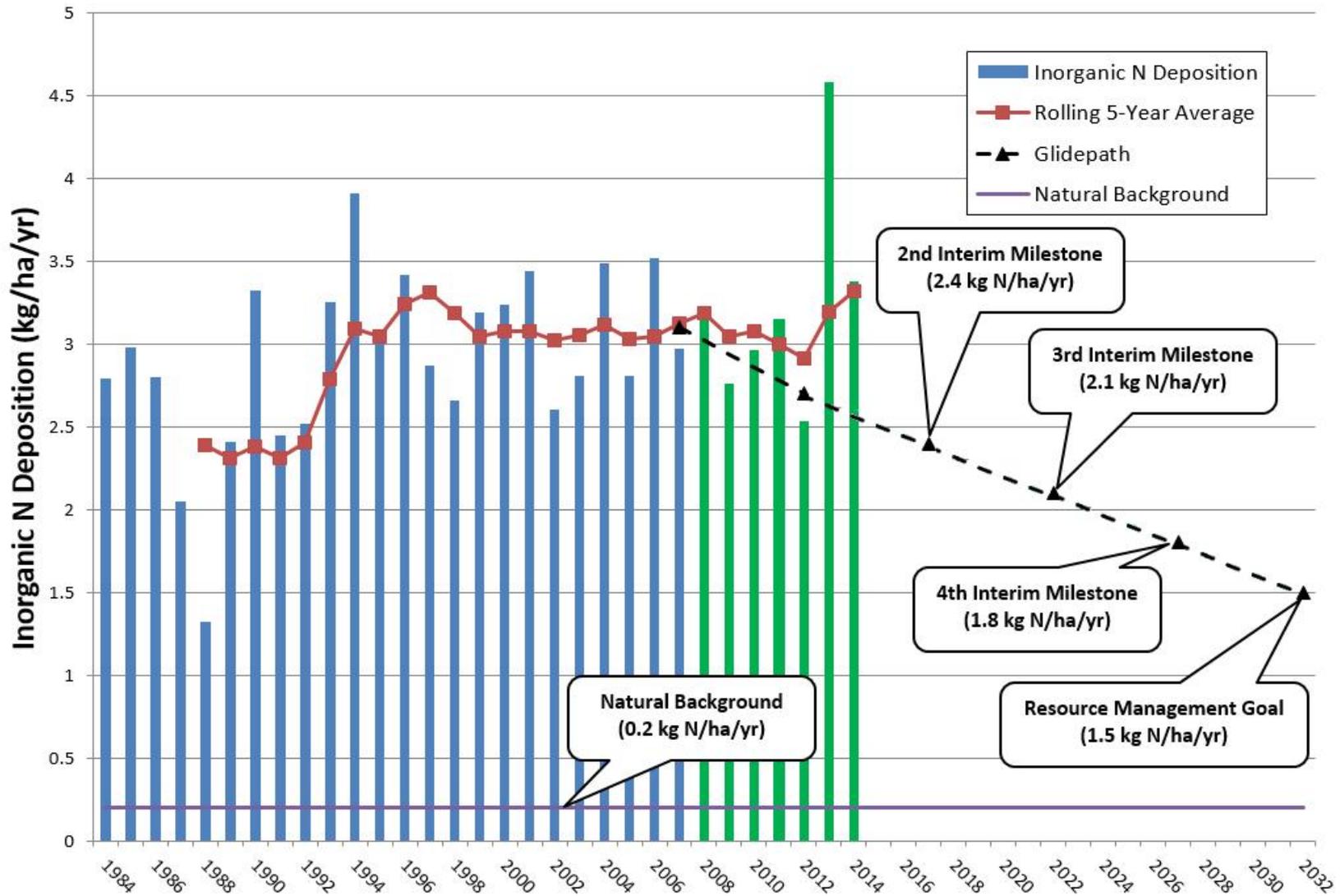
Nitrogen Deposition Early Warning System for Rocky Mountain National Park

RMNP Agriculture Subcommittee

November 12, 2015

Nitrogen Deposition Reduction Plan

NADP Inorganic Nitrogen Deposition at Loch Vale



Step 1. Forecasting

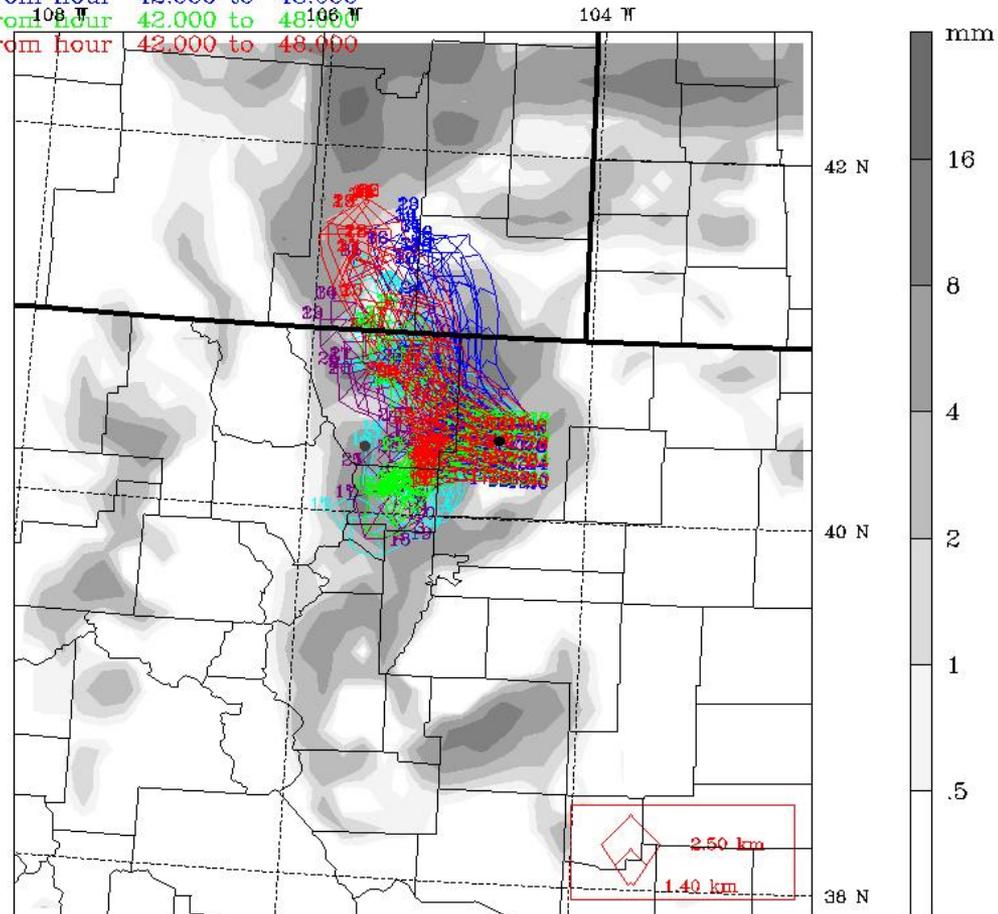
Init: 0000 UTC Tue 20 May 14

Fcst: 48.00 h

Valid: 0000 UTC Thu 22 May 14 (1800 MDT Wed 21 May 14)

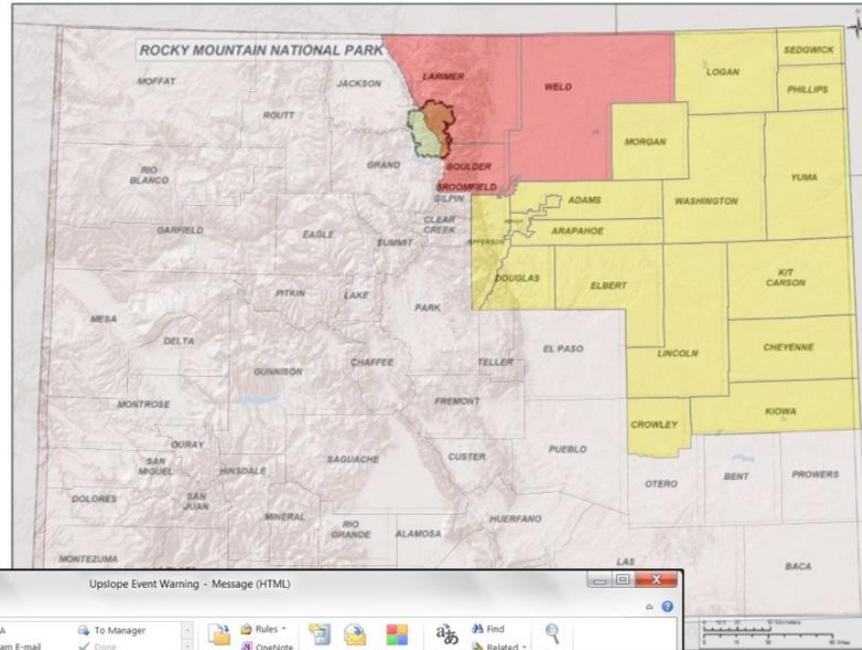
Total precip. in past 3 h

Trajectories from hour 42.000 to 48.000



Step 2. Issue Warnings

Warning System Website Map



Upslope Event Warning - Message (HTML)

From: info@rmwarningsystem.com
To: Brock Faulkner
Cc:
Subject: Upslope Event Warning

Sent: Tue 5/6/2014 2:13 PM

An upslope event is expected to move air from over Boulder, Broomfield, Larimer and Weld counties towards Rocky Mountain National Park from 05/07/2014 through 05/07/2014. During these days, please apply management practices that minimize emissions of nitrogen.

Archive: 5/6/2015

Email/Text Notification

Step 3. Collect Responses

Rocky Mountain National Park Early Warning System [Brock Faulkner \(sign out change password\)](#)

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[Messages](#) | [Producers](#) | [Notifications](#)

SUBMIT RESPONSE

Title
Upslope Warning (Dates)

Message
An upslope event is predicted for Eastern Colorado from XXXX to YYYY. Please avoid practices that may lead to unnecessary nitrogen emissions during this period. Respond to this warning by clicking here.

Response

I am changing practices based on the issued warning.

I am NOT changing practices based on the issued warning.

I intend to change practices for a portion of the warning period.

Reactive nitrogen emitted from eastern Colorado is contributing to elevated deposition in Rocky Mountain National Park (RMNP), leading to undesirable ecosystem changes. Nitrogen emitted east of the Park often moves into the mountains during synoptic-scale upslope events that can be predicted.

The goal of the early warning system is to inform agricultural producers of impending weather conditions that are likely to transport nitrogen from eastern Colorado into RMNP. These warnings will allow producers to strategically implement management practices that reduce nitrogen emissions but are not feasible for year-round implementation.

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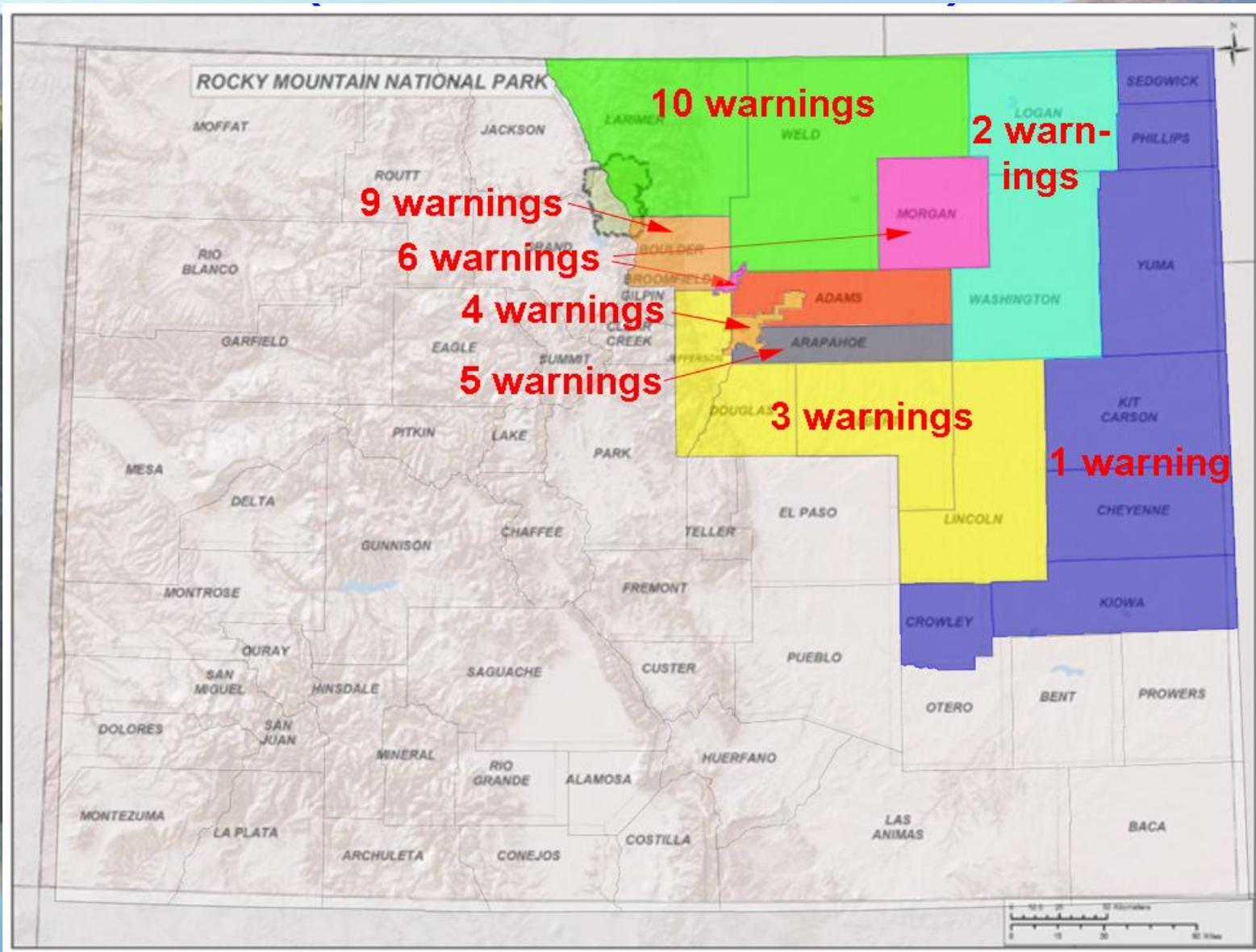
I intend to change practices for a portion of the warning period.

Reason:

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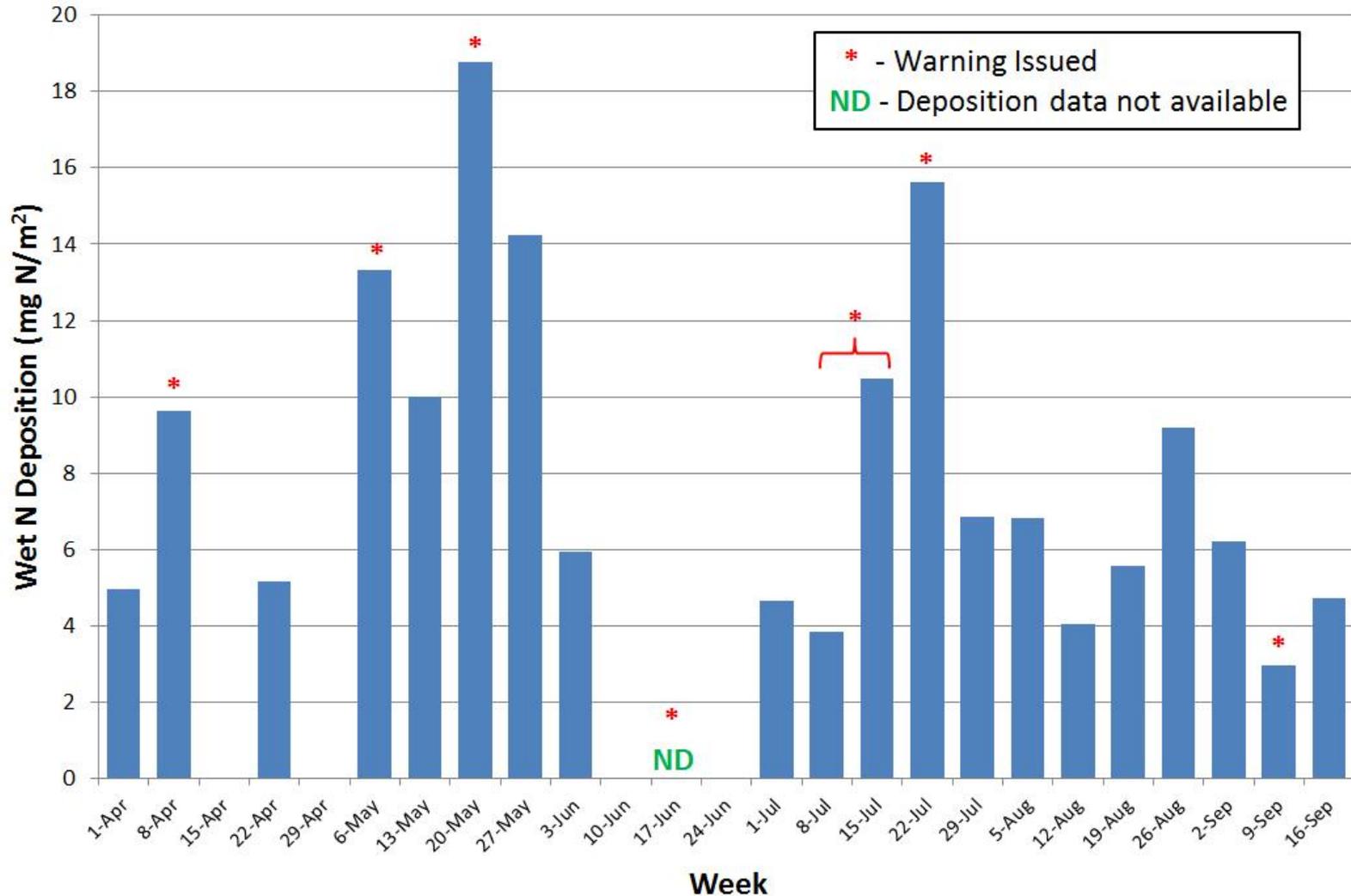
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Step 4. System Evaluation

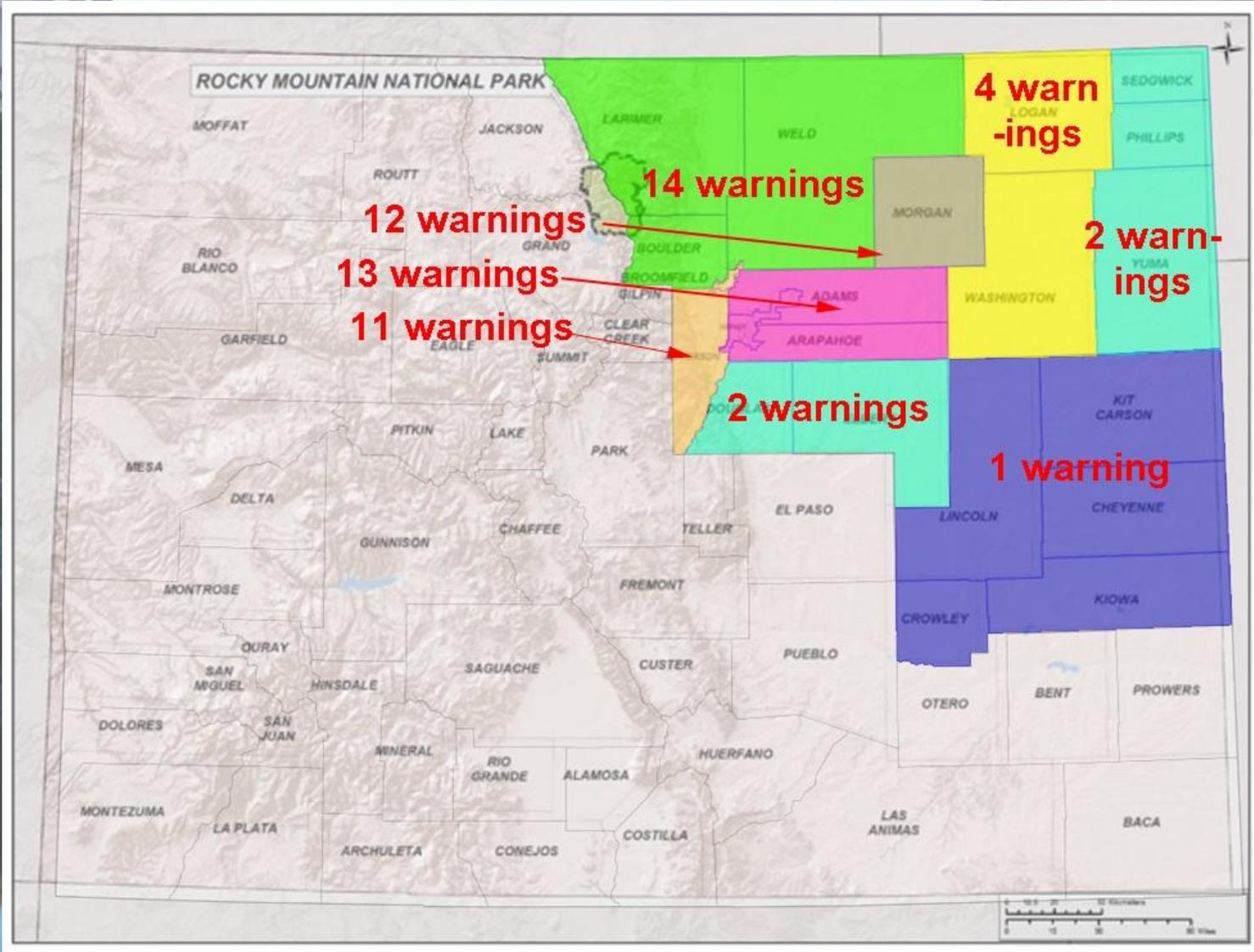


2014 Warnings

Preliminary 2014 Loch Vale NADP Data (CO-98)

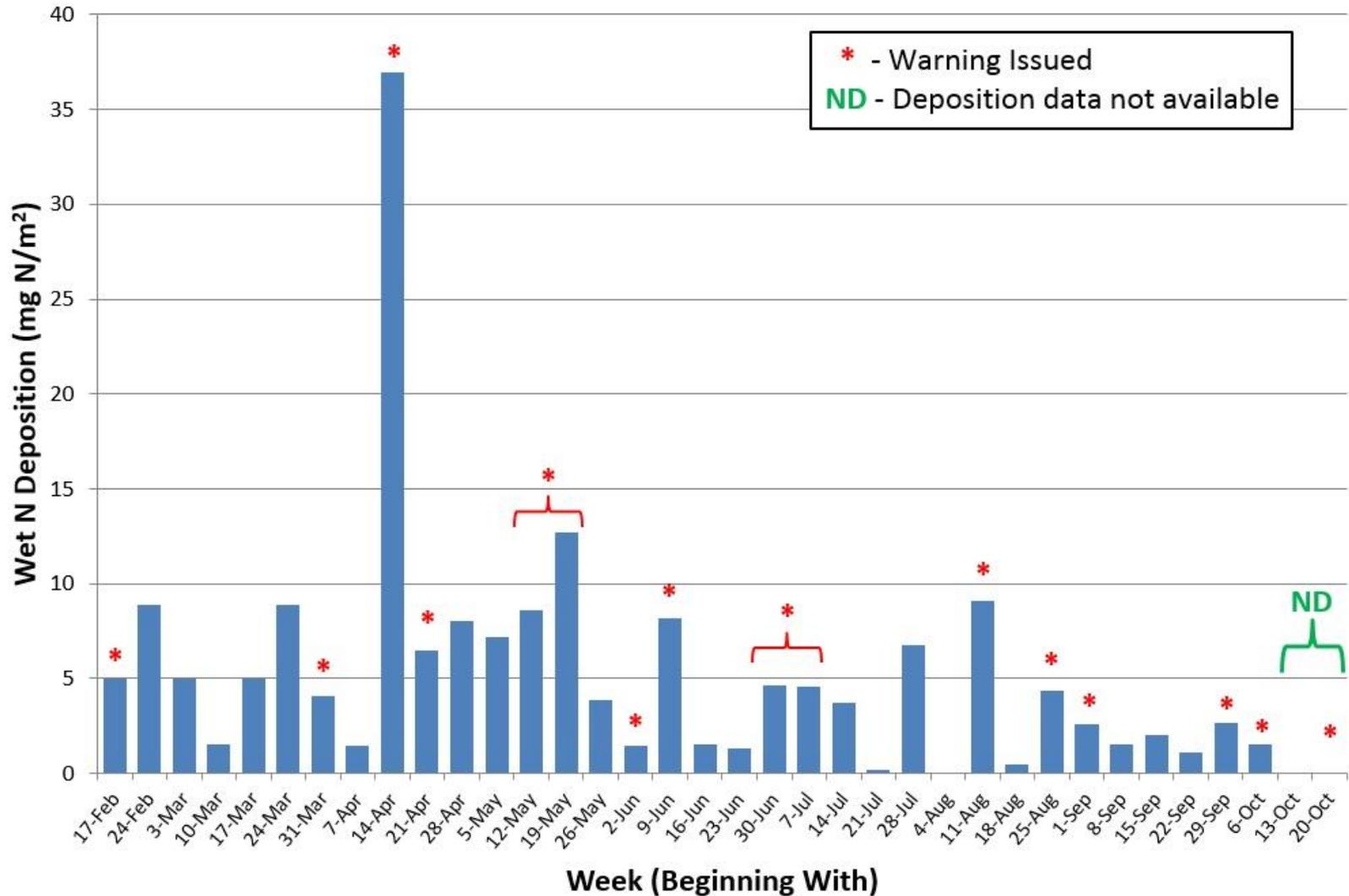


2015 Warnings



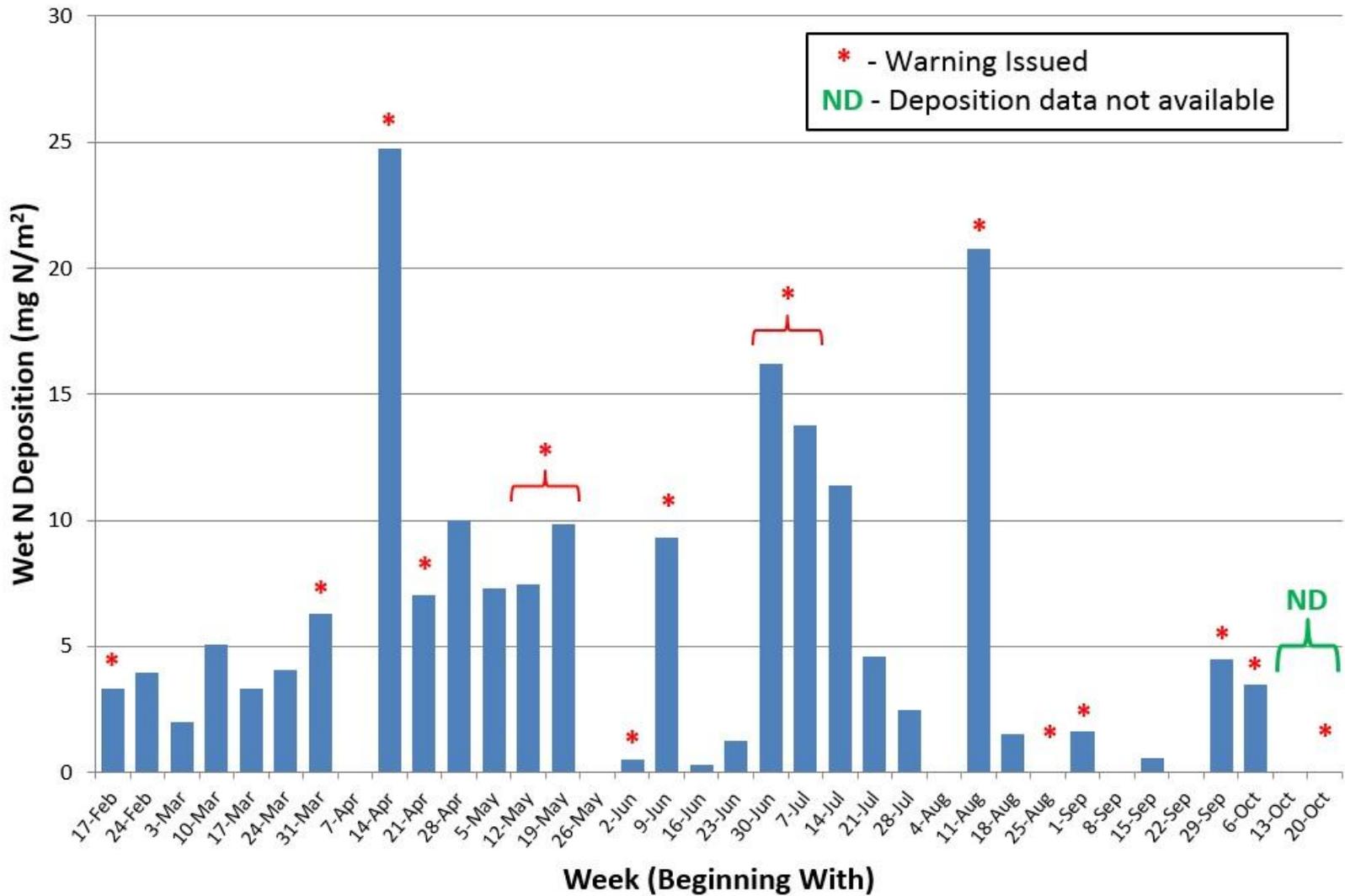
2015 Warnings

Preliminary 2015 Loch Vale NADP Data (CO-98)



2015 Warnings

Preliminary 2015 Beaver Meadows NADP Data (CO-19)



2014-2015 Warnings

- Participating producers affected ranged from 15 to 27
- Response rates ranged from 30 to 69 percent of affected producers
- On average
 - 58 percent of respondents changed practices for the full warning period
 - An additional 16 percent changed for a portion of the warning period

Barriers to Changing Practices

- Labor availability
- Animal health concerns
- Other weather concerns
- Few warnings issued

Biosolids Applicators

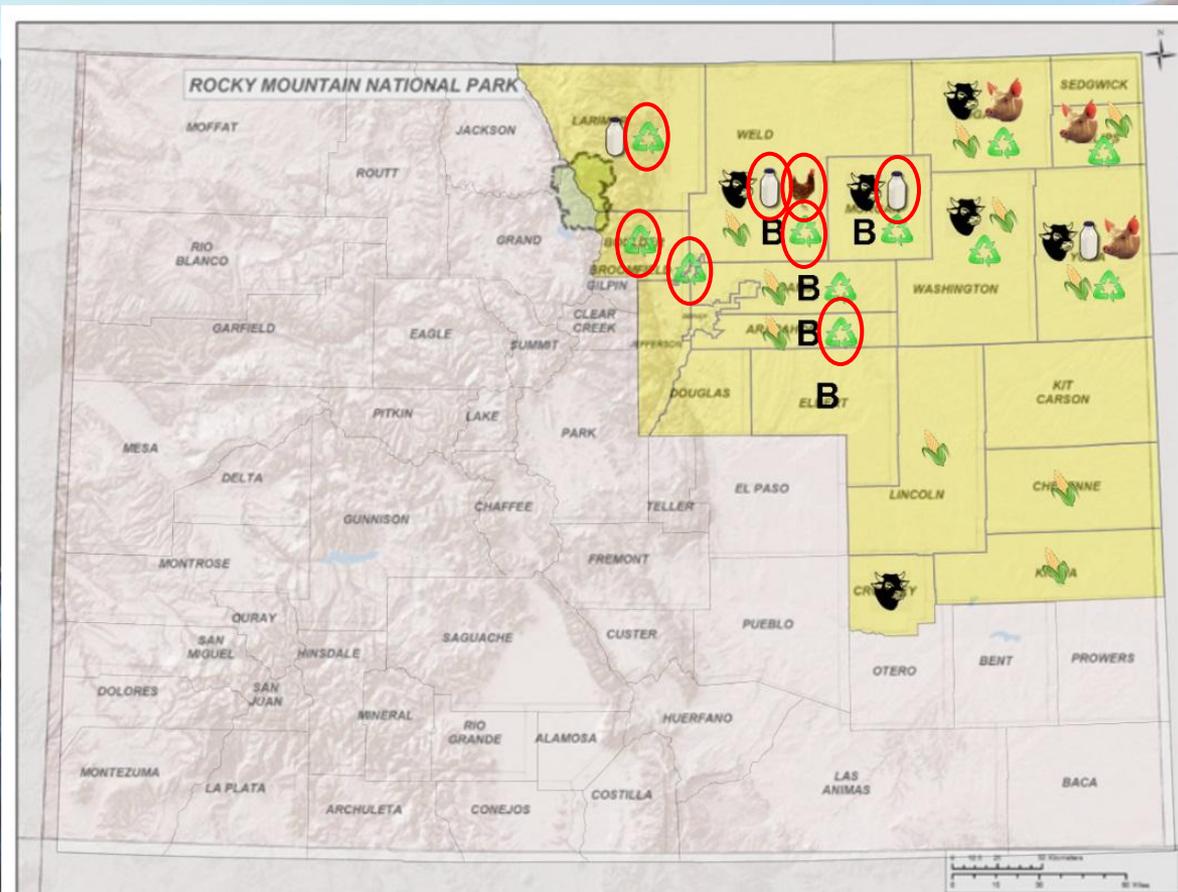
EWS Pilot Participants

Pilot-scale warning system participants.

Operation Type	Participants ^[a]
Feedyards >50% of cattle on feed in modeling domain	18 (11)
Dairies 10-15% of milking cows...	8 (7)
Swine producers ~50% of swine...	8 (5)
Poultry producers >33% of layers...	2 (1)
Crop producers ~2% of cropped acres...	9 (9)
Composters	6 (6)
Biosolids applicators + additional ~2% of cropland...	2 (1)
“Non-responding” recipients	27
Total People Receiving Warnings	78

Number of individuals shown first; number of operations represented in parenthesis.

EWS Pilot Participants



Feedyard



Swine



Dairy



Poultry



Crop



Biosolids



Compost

EWS Next Steps/Goals

- Continue analyzing warnings issued in 2015
- Evaluate forecasting reliability and move towards system automation
- Outreach to / recruitment of additional participants in Front Range counties

Scaling and Implementation?

