The USA National Phenology Network

A national science and monitoring framework for phenology

USFS FFACCTs, June 2015

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Outline

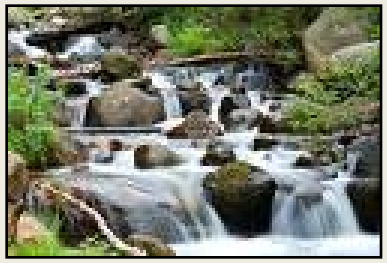
- **Why build a national phenology network?**
- **A framework for capacity**
  - ***Protocols***
  - ***Database***
  - ***User interface (*Nature's Notebook*)***
  - ***Data products***
- **Data product development and delivery framework**

Why build a national phenology network?

Science, management, decision-making, policy










Enquist et al., Intl J Biomet 2014

Why build a national phenology network?

Phenology is…

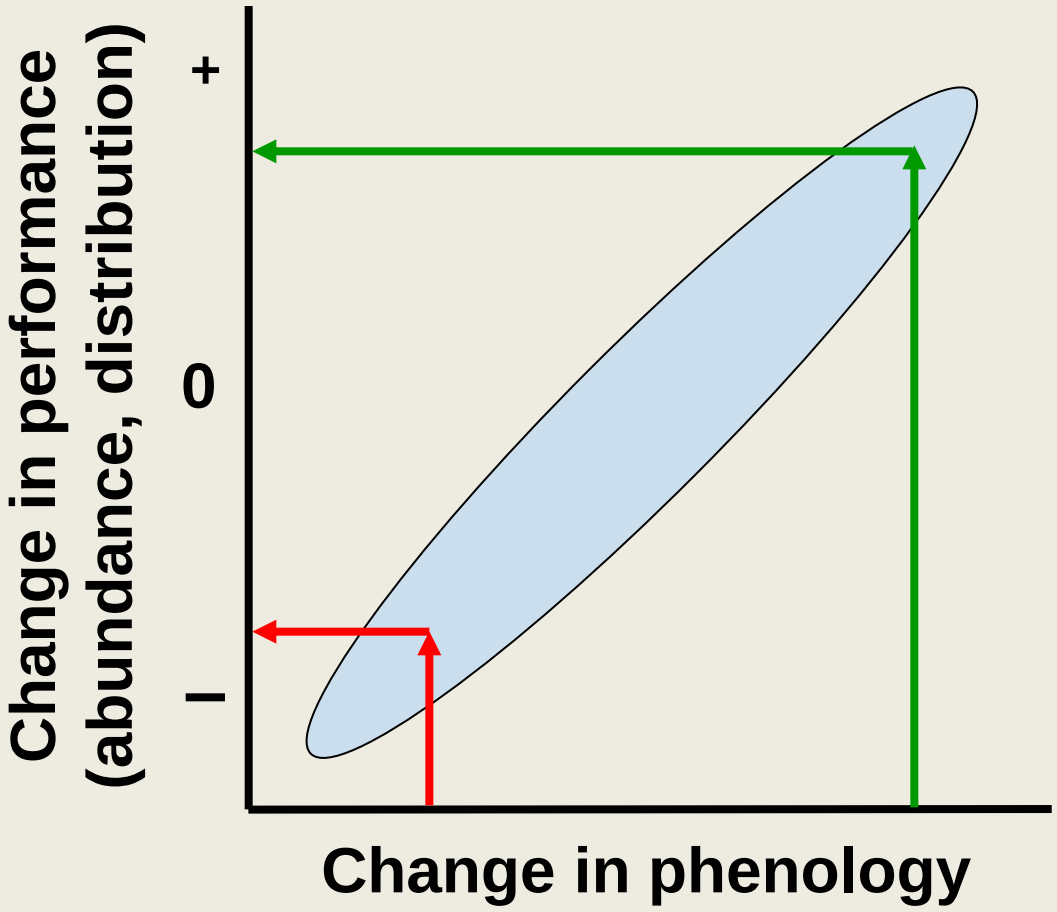
- Easy to observe

- Sensitive to environmental variation

- Links to populations, communities, ecosystems and ecosystem services

- Scales from 'leaf to globe'

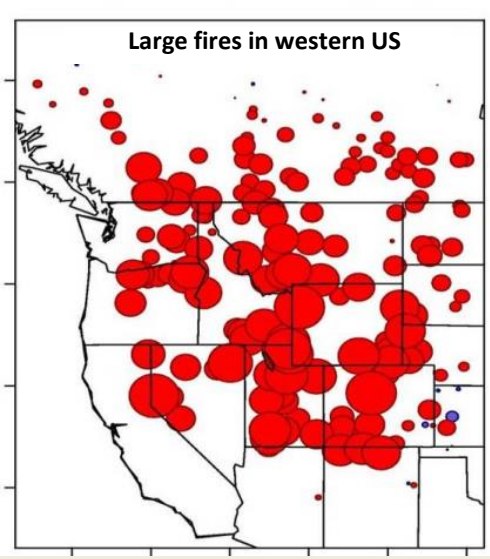
Why build a national phenology network?



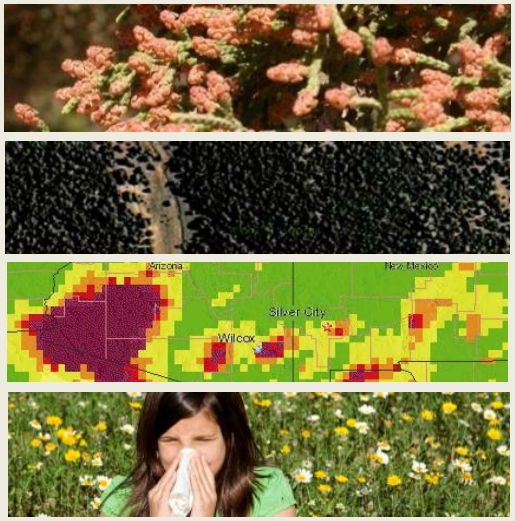
Willis et al. 2008 PNAS
Moller et al. 2008 PNAS
Willis et al. 2010 PLOS Biology
Ozgul et al. 2010 Nature
Hulme 2011 New Phyt.
Cleland et al. 2012 Ecology
Wolkovich et al. 2013 Am J Bot
Polgar et al. 2014 New Phyt

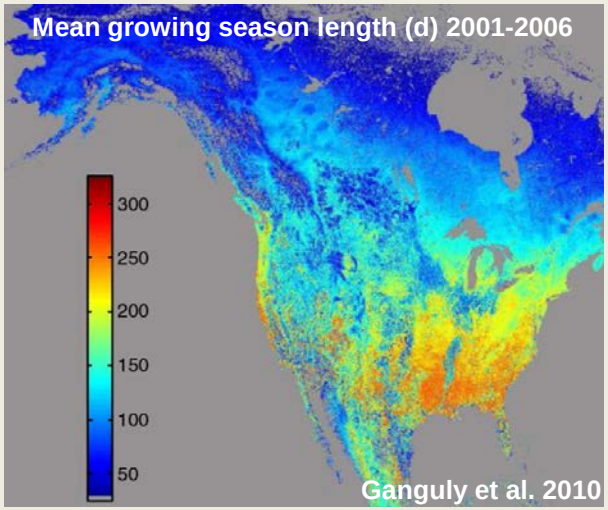
Why build a national phenology network?

USA-NPN serves science and society by collecting, organizing and distributing phenological information to aid decision-making and adaptation to variable climates and changing environments.



Betancourt et al. in prep





USA-NPN 5-year Strategic Plan
www.usanpn.org/pubs/reports

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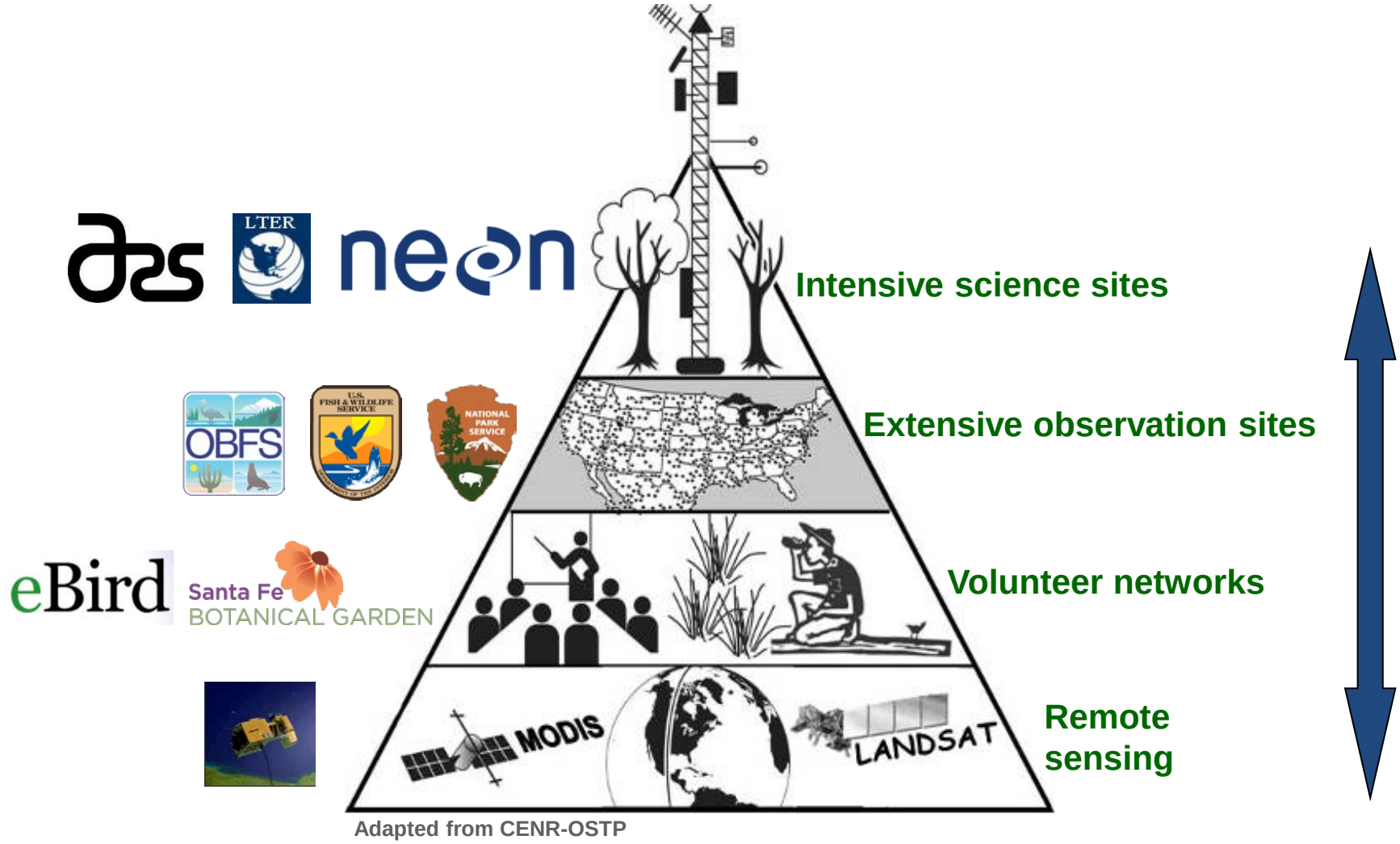
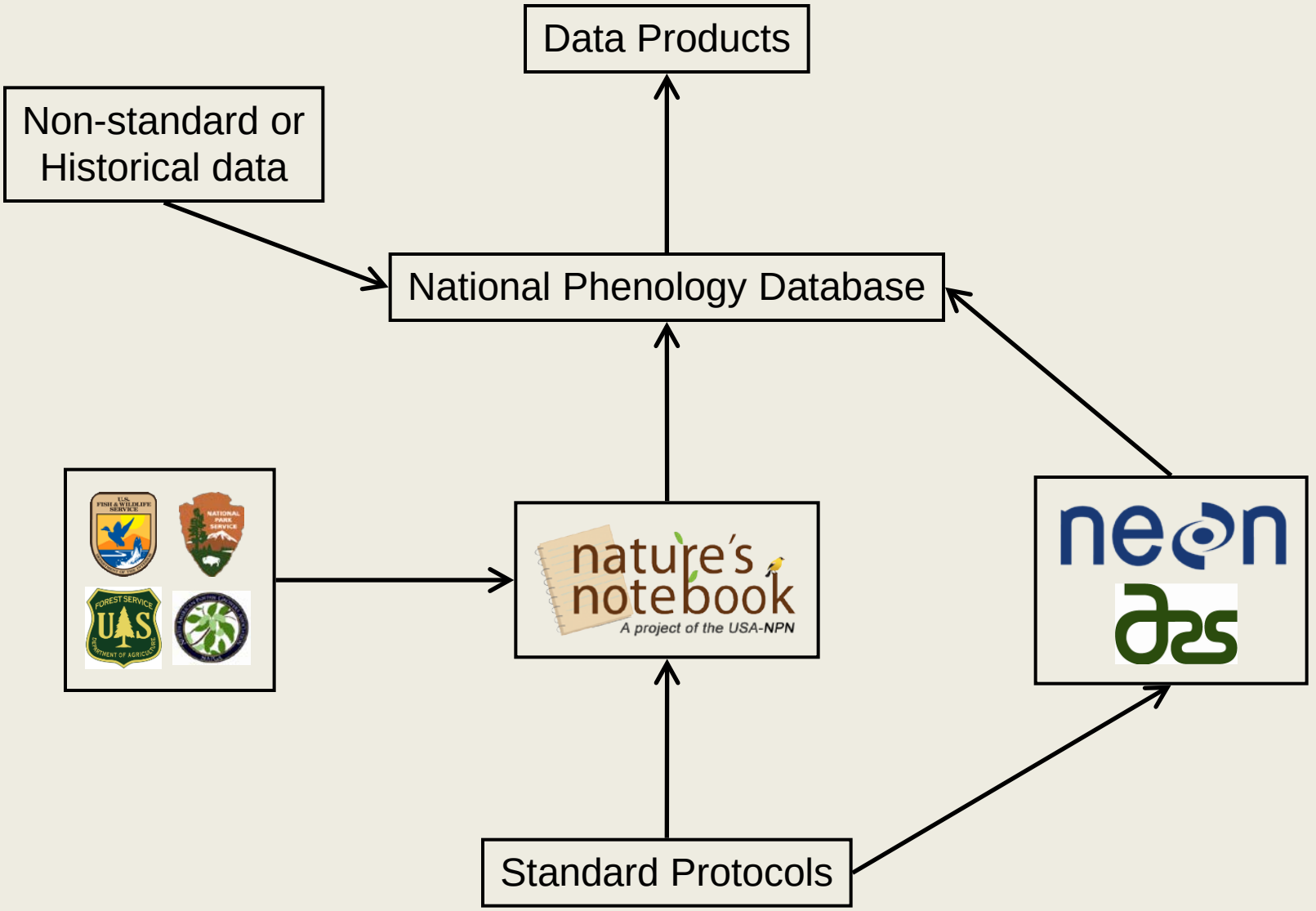
A Framework for Capacity



Adapted from K.B. Jones et al. 2010

A Framework for Capacity



Standard Protocols

- Organism-based
  - status (presence/absence)
  - abundance or intensity
- Standard protocols
  - 1,000+ species (plant+animal)
  - vetted & published
  - version control
  - "cross-walks"
- Web services

Denny et al., Intl J Biomet 2014

nature's notebook
A project of the USA-NPN

USGS
USA npn National Phenology Network

A ground-based, multi-taxa, national-scale observing system

- Uses standard protocols
- Web & mobile apps
- > 20 contributing groups
- >5,000 active observers
- > 7,000 active sites
- Local to national campaigns
- QA/QC documented
- 15 data pubs to date
  - usanpn.org/pub/results

OMB Control #: 1028-0103

National Phenology Database

Data, metadata, documentation freely available

DOWNLOAD PHENOLOGY DATA

Download customized datasets from the National Phenology Database using the filters below to specify dates, regions, species and phenophases of interest.

Data Sources

Data available include: (1) data collected via Nature's Notebook phenology observation program (2009-present), and (2) Lilac and honeysuckle data (1955-present).

Data Use and Attribution

By downloading these data sets you acknowledge that you have read and agreed to the USA-NPN Data Use , Data Attribution and Privacy policies. Your email will only be used to contact you directly about data use.

Data Types

- **Raw status data:**
  - Each row in this data type represents the status of one phenophase for one individual plant or animal species at a given site, on a single date and time. FGDC Metadata for raw data (web page, XML)
- **Summarized data:**
  - This data type supports estimates of phenophase onset, duration and end. Each row of this dataset represents a series of consecutive "yes" phenophase status records, beginning with the date of the first "yes" and ending with the date of the last "yes", submitted for a given phenophase on a given organism over the course of a user-defined season of interest. Note that more than one consecutive series may be present within a single growing season. FGDC Metadata for summarized data coming soon.

Metadata & Documentation

- USA-NPN Protocols and Plant and Animal Phenophase Definitions
- Documentation of Nature's Notebook User Interfaces

Get Data

- Phenology Data Overview
- Data Dashboard
- Phenology Visualization Tool
- **Download Phenology Data**
- Data Search Tools
- Share Existing Data

LEARN HOW TO DOWNLOAD AND SUMMARIZE RAW DATA

Downloading and Summarizing Raw Data Part 1: The Data Download Tool

Downloading and Summarizing Raw Data Part 2: Summarizing and Graphing Data

DATA DASHBOARD

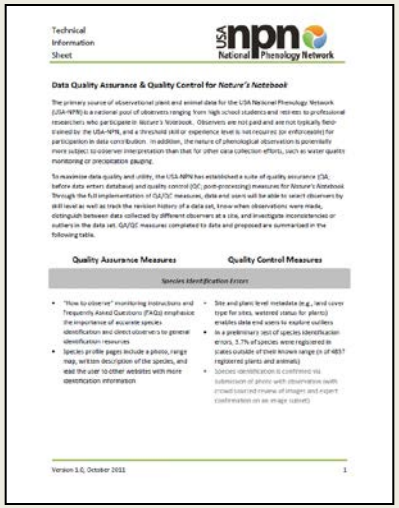
Welcome to our Data Dashboard page where you can find automated, up-to-the-minute summary metrics of the data found in our National Phenology Database for the current year and past time periods.

Roll your mouse over the highlighted link for an explanation of each metric.

Please note the following: (1) the "total" column currently represents values in different formats (counts, percentages, and averages), (2) an "observation" includes the entire suite of phenophase status records taken for an individual plant or animal species on a given date/time; a single observation may contain up to 12 phenophase status records depending on the species, and (3) the phenophase record tables are not yet automatically generated. This page will continue to be updated periodically.

DATA DASHBOARD

METRIC	PRE-2010	2010	2011	2012	2013	2014	TOTAL
Registered Observers	2,243	795	1,067	2,042	3,173	3,875	13,195
Active Observers	566	443	561	970	1,471	1,786	4,396
Days Observed/Observer	25.34	10.1	12.16	13.86	12.18	13.02	18.26
Registered Sites	0	77	1,186	1,583	3,382	2,857	14,176
Active Sites	2,620	615	904	1,453	1,580	1,807	6,836
Observations	146,413	31,335	55,382	117,320	144,355	169,651	664,456
Status Records	267,617	218,849	430,597	932,146	1,174,944	1,417,168	4,441,321
Observed Organisms	5,439	2,726	4,525	8,509	8,947	10,105	27,846
Observed Plants	5,395	2,203	3,424	6,527	6,416	7,525	21,315
Observed Animals	44	523	1,101	1,982	2,531	2,580	6,531


Technical Information Sheet

USA-NPN National Phenology Network

Data Quality Assurance & Quality Control for *Nature's Notebook*

The primary source of observational plant and animal data for the USA National Phenology Network (USA-NPN) is a national pool of observers ranging from high school students and retirees to professional researchers who participate in Nature's Notebook. Observers are not paid and are not typically field-trained by the USA-NPN, and a threshold skill or experience level is not required (or enforceable) for participation in data contribution. In addition, the nature of phenological observation is potentially more subject to observer interpretation than that for other data collection efforts, such as water quality monitoring or precipitation gauging.

To maximize data quality and utility, the USA-NPN has established a suite of quality assurance (QA, before data enters database) and quality control (QC, post-processing) measures for Nature's Notebook. Through the full implementation of QA/QC measures, data end users will be able to select observers by skill level as well as track the revision history of a data set, know when observations were made, distinguish between data collected by different observers at a site, and investigate inconsistencies or outliers in the data set. QA/QC measures completed to date and proposed are summarized in the following table.

Quality Assurance Measures	Quality Control Measures
Species Identification Errors	
• "How to observe" monitoring instructions and Frequently Asked Questions (FAQs) emphasize the importance of accurate species identification and direct observers to general identification resources • Species profile pages include a photo, range map, written description of the species, and lead the user to other websites with more identification information	• Site and plant level metadata (e.g., land cover type for sites, watered status for plants) enables data end users to explore outliers • In a preliminary test of species identification errors, 3.7% of species were registered in states outside of their known range (n of 487 registered plants and animals) • Species identification is confirmed via submission of photo with observation (with crowd-sourced review of images and expert confirmation on an as-needed subset)

Version 1.0, October 2011 1

www.usanpn.org/results/data

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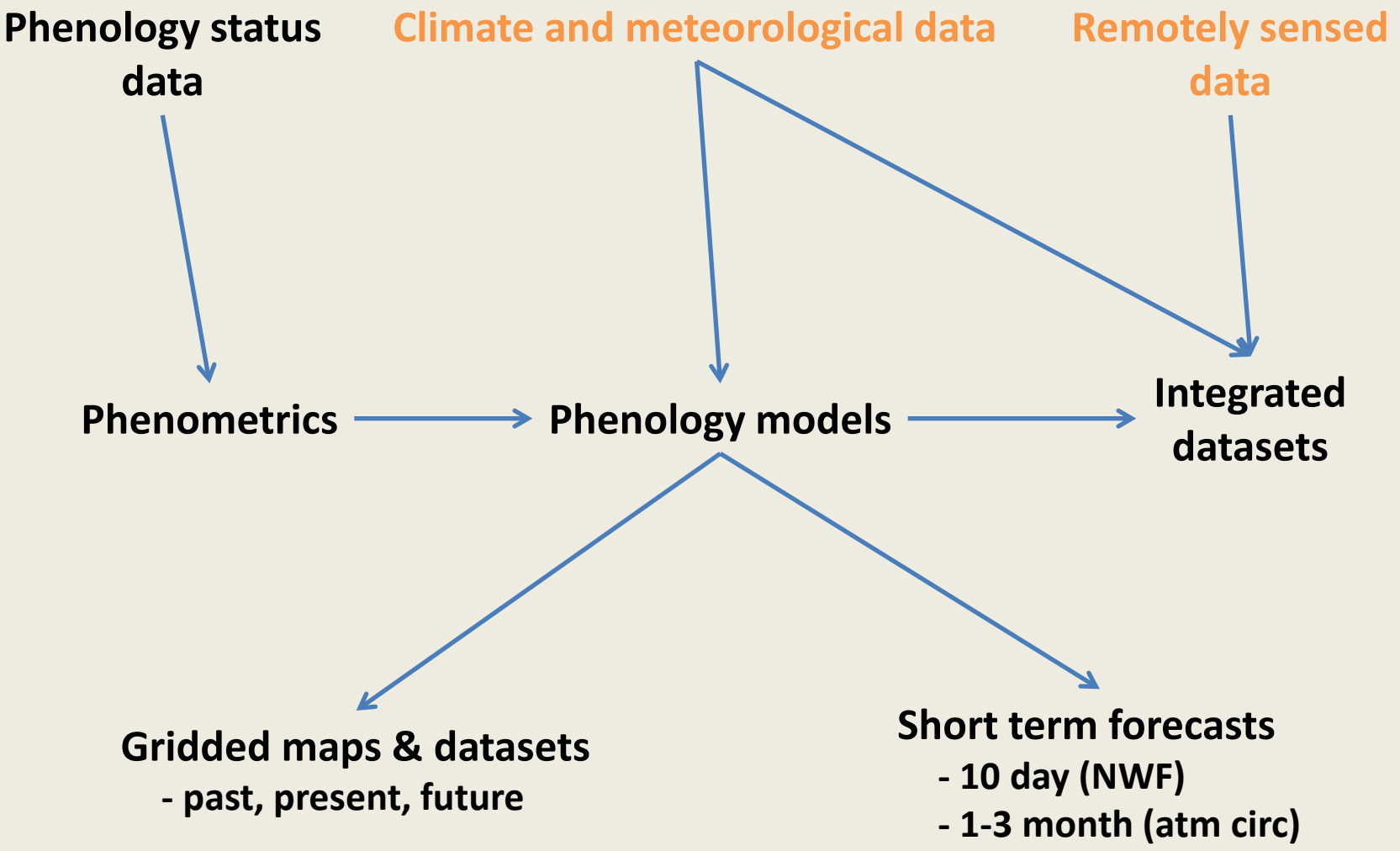
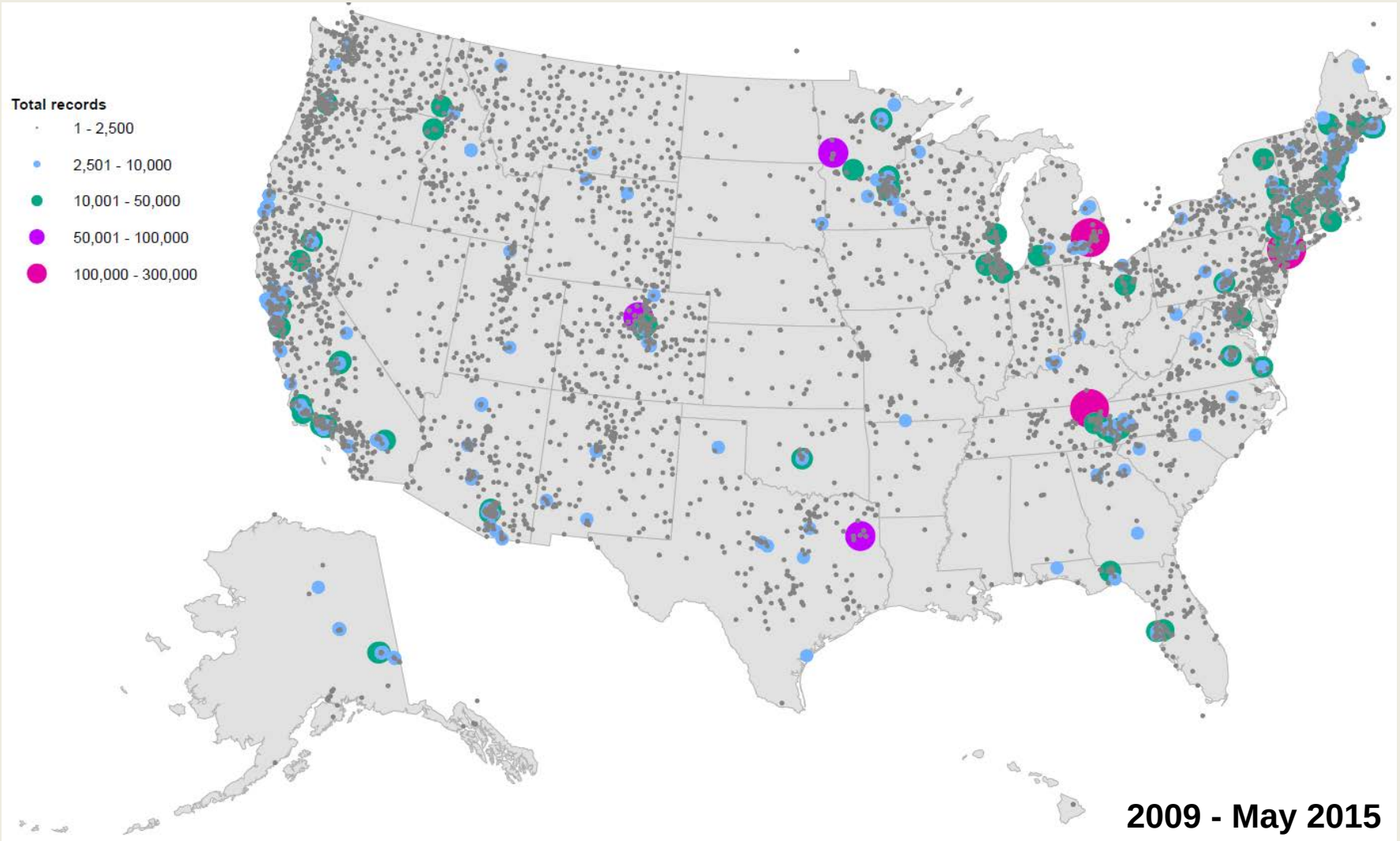
Data Products

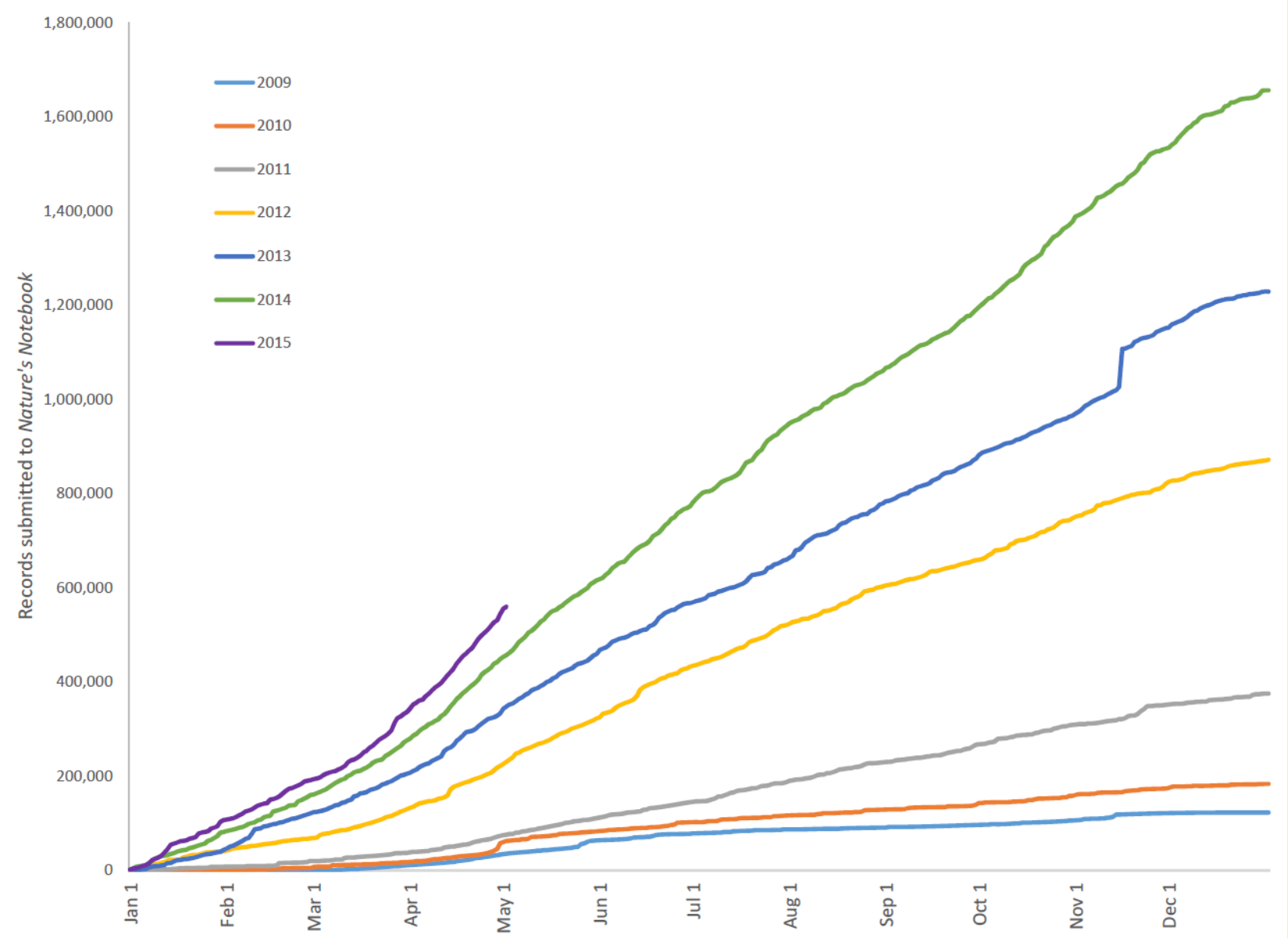


Gerst et al., 2015; www.usanpn.org/pubs/reports

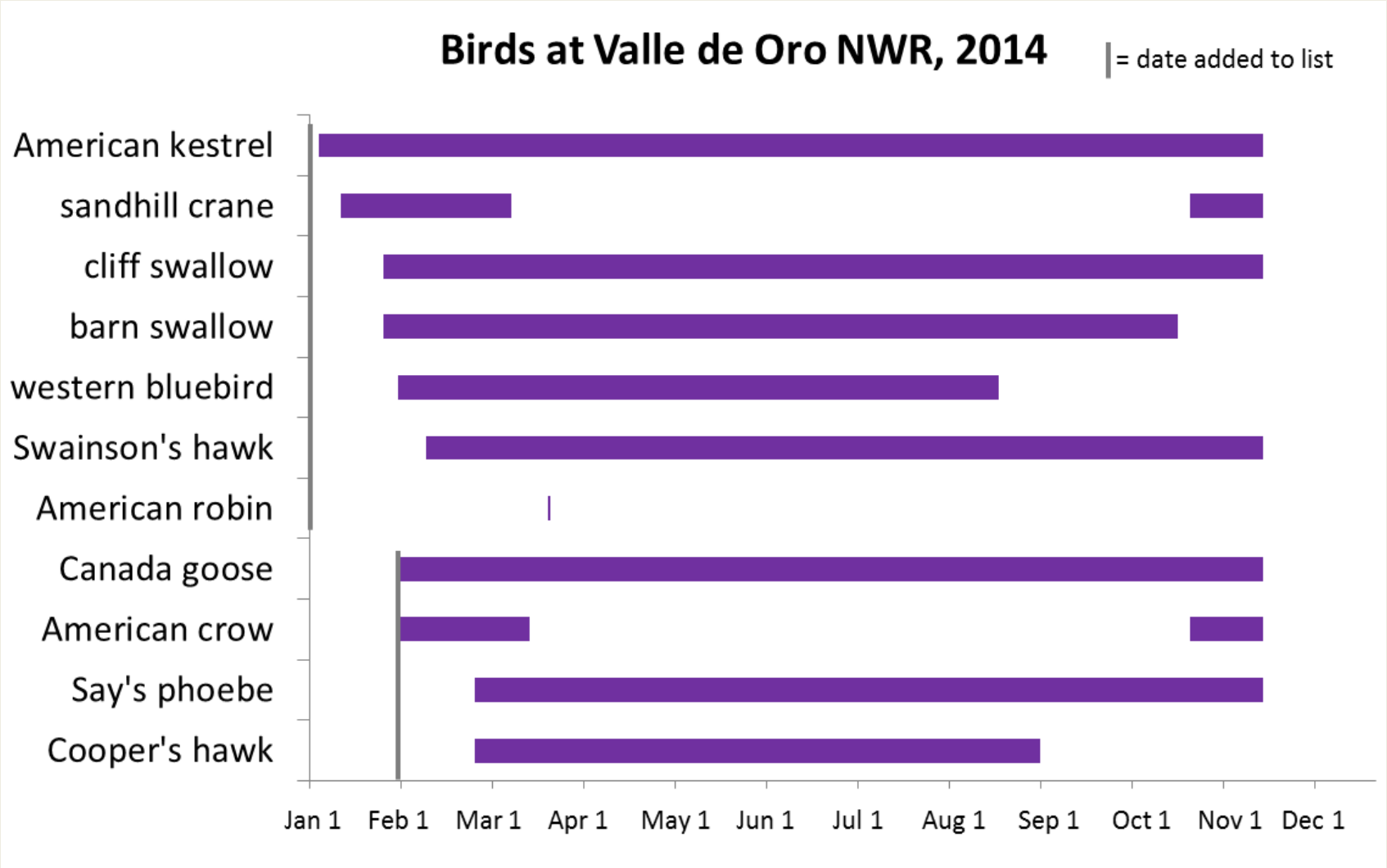
Phenology Status Data: Sites



Phenology Status Data: Records



Phenometrics: Calendars



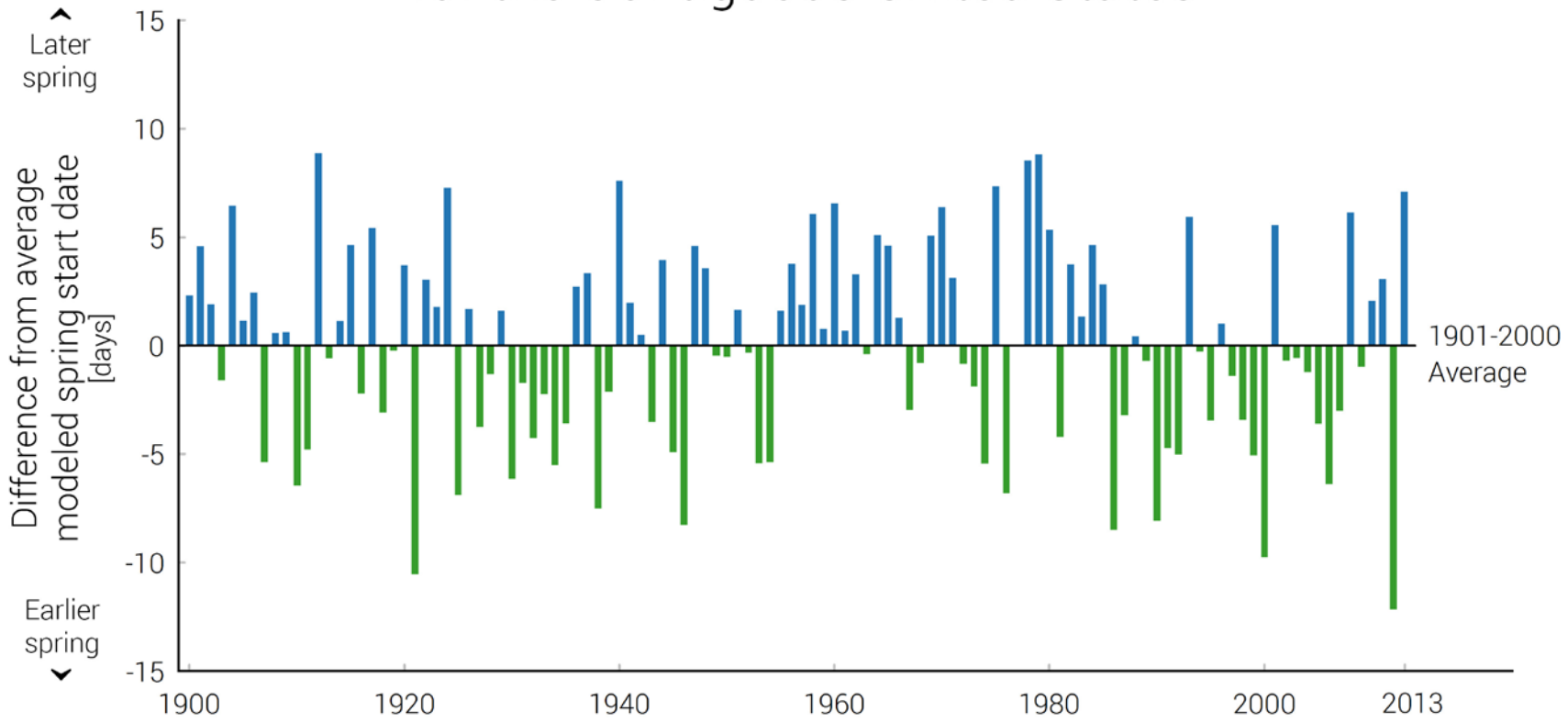
Results provisional

www.usanpn.org/fws/vdo

Phenology Models: Time Series

GlobalChange.gov
U.S. Global Change Research Program

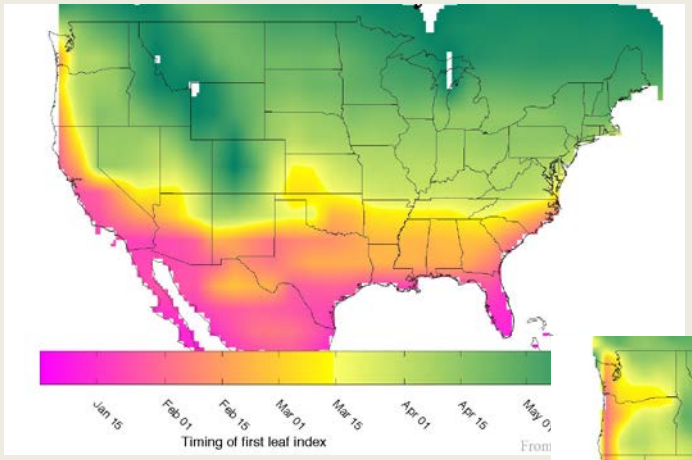
Annual Start of Spring for the Contiguous United States



data.globalchange.gov/report/indicator-start-of-spring

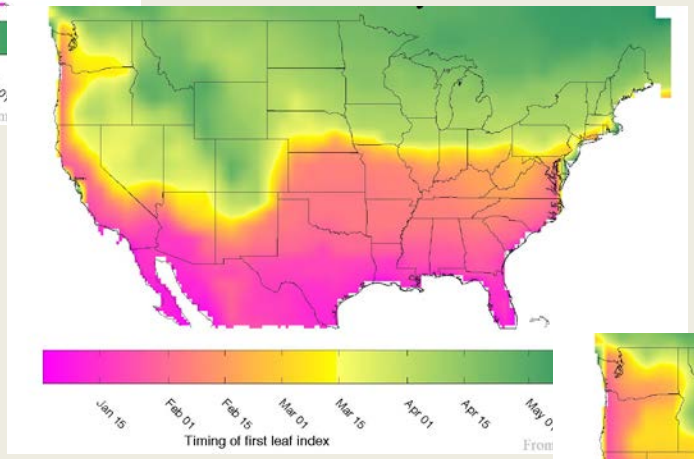
Models and Maps: Projections

2014



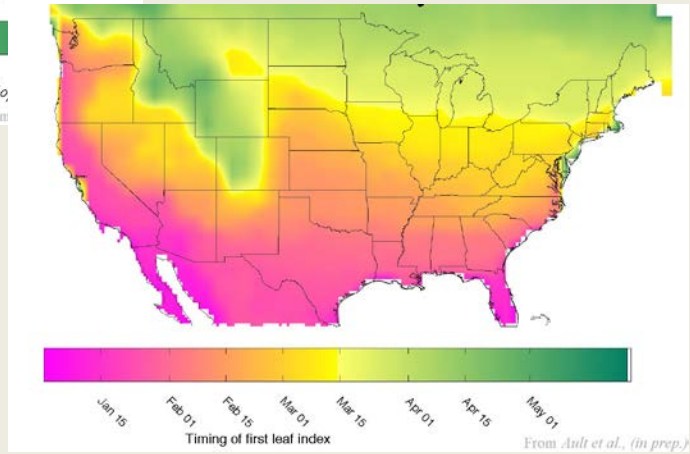
NCEP

2050



CESM RCP 8.5

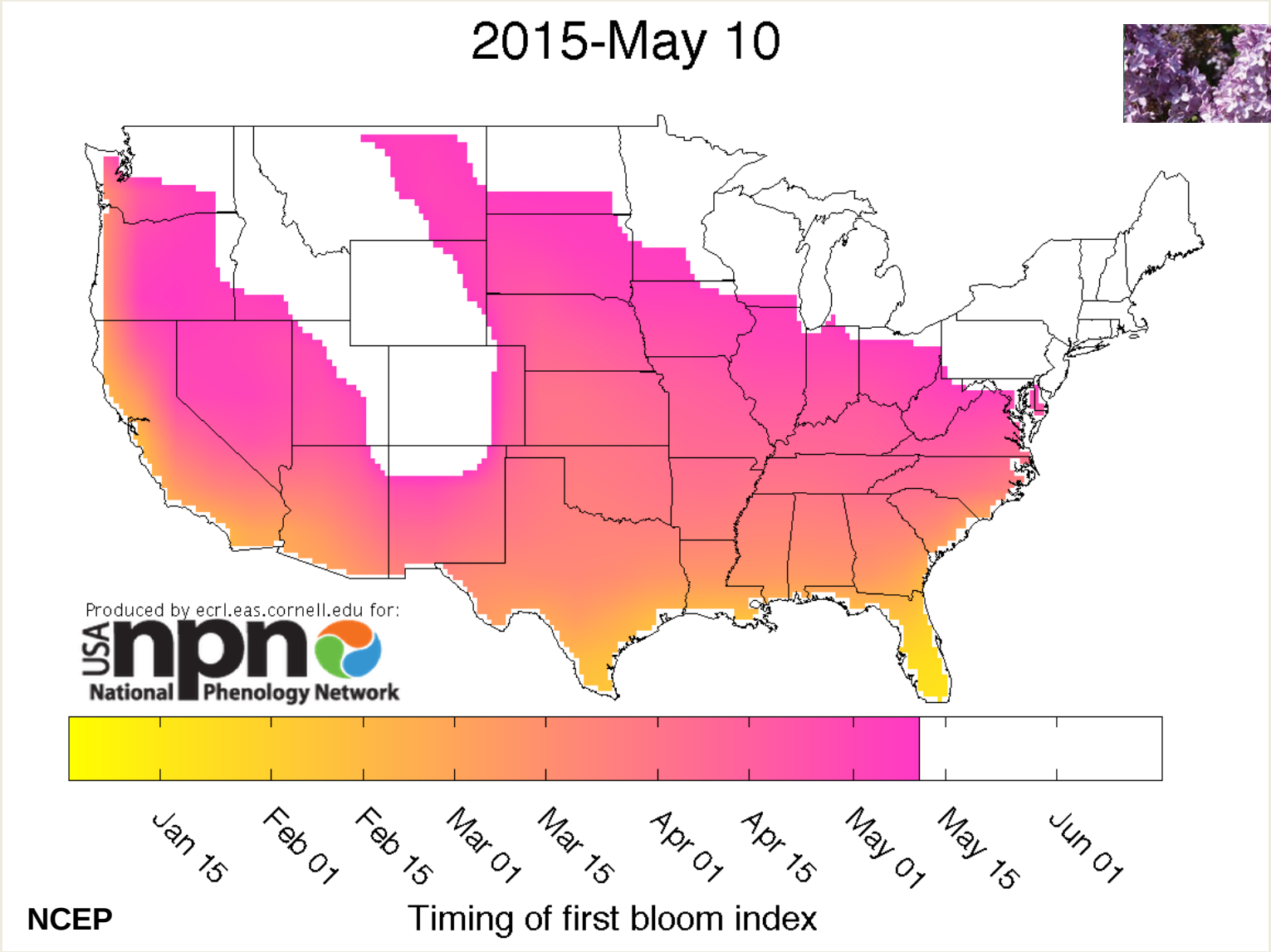
2080



CESM RCP 8.5

Ault et al. *in prep.*

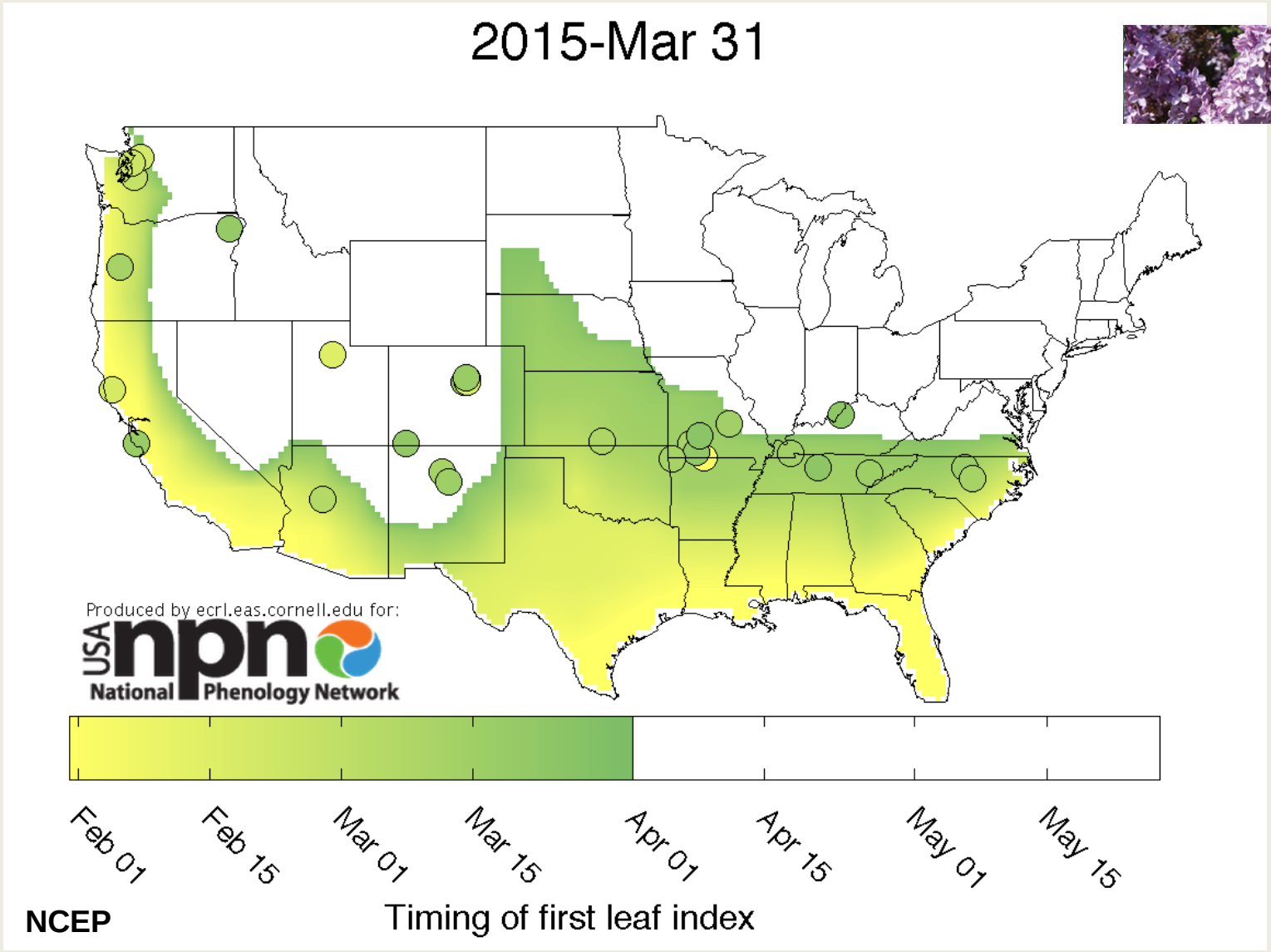
Models and Maps: Near Real-Time



Ault et al. *in prep.*

usanpn.org/data/spring

Models and Maps: Validation



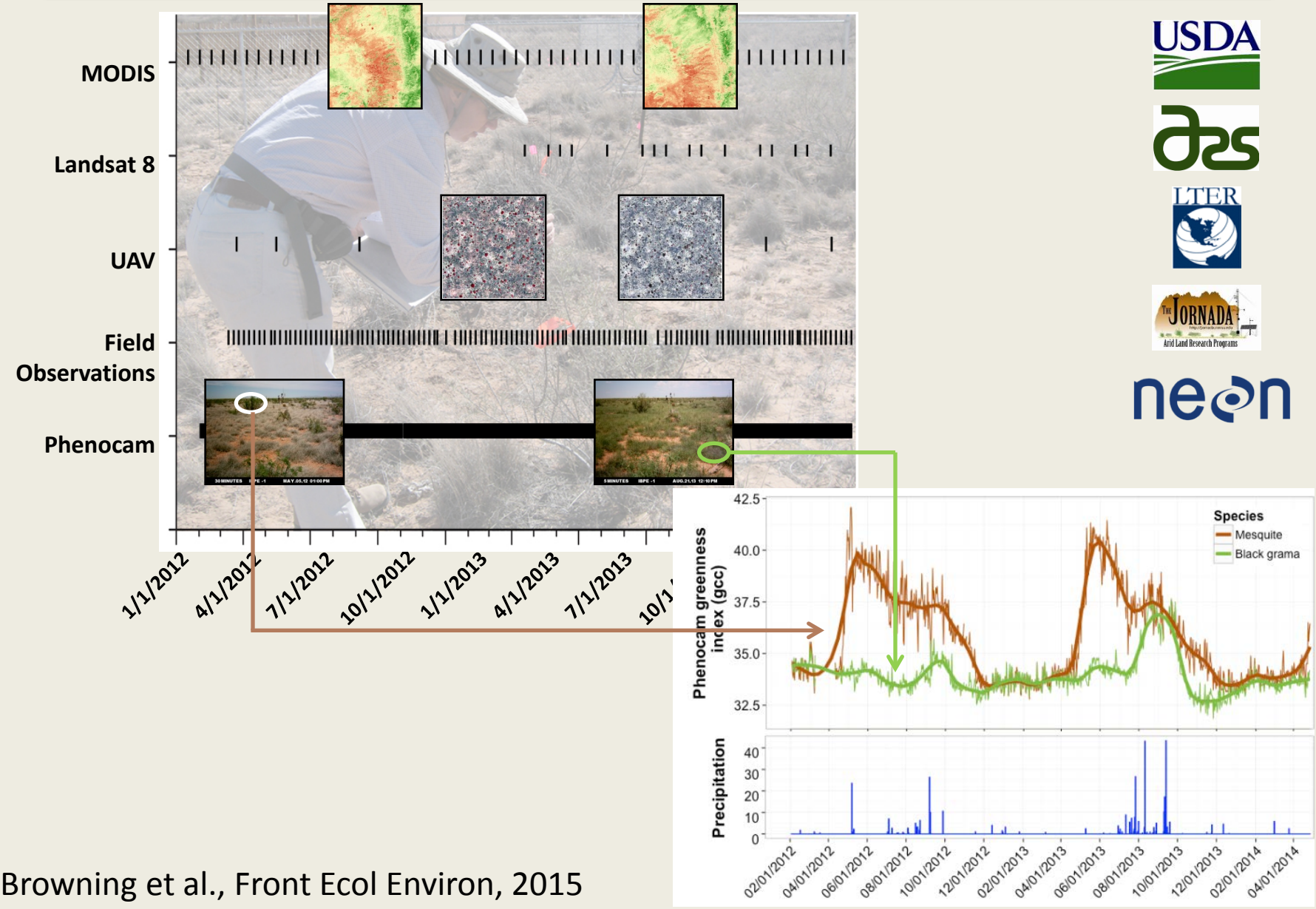
Ault et al. *in prep.*

usanpn.org/springcast

Models and Maps: 10-90 Day Forecasts

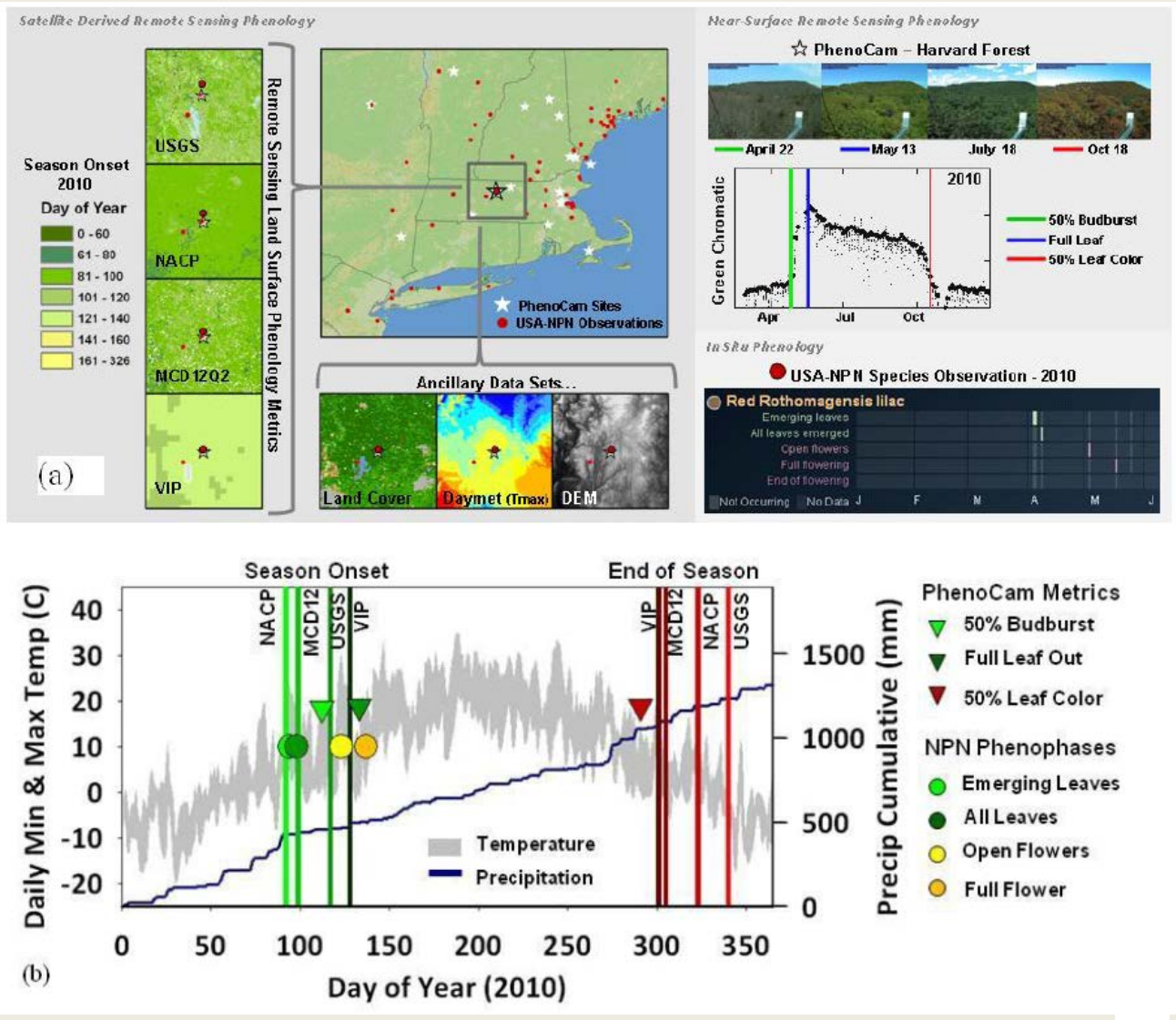
Watch this space

Towards Integrated Datasets: Monitoring



Browning et al., Front Ecol Environ, 2015

Towards Integrated Datasets: Delivery



J. Brown et al., in development

USA-NPN provides…

- Off-the-shelf capacity for collaborators and projects
- Standardized protocols facilitate data integration
- Value-added data products and tools
- Multi-scale (granular) science information
- Boundary organization to facilitate collaborations
- Custom content for partners and projects

USA-NPN can help meet…

2012 Planning Rule Final Directives

- FSH 1909.12 - Chpt 30 - Monitoring
  - Plan Monitoring
    - Questions, Indicators, Protocols
      - Ecological Conditions
      - Focal Species
      - Climate Change
      - Productivity
  - Broader-scale Monitoring

- FSH 1909.12 - Chpt 40 - Public Participation
  - Multi-party monitoring
  - Foster diversity
  - Leverage existing programs

fs.usda.gov/detail/planningrule/

Thank you…

USGS
USA npn National Phenology Network