

# Plant and pollinator Interactions- Understanding relationships via data at USDA

Diana Cox-Foster

Research Leader and Entomologist

USDA/ARS Pollinating Insect Research Unit

Christine Taliga

Plant Ecologist, National Plant Data Team

USDA Natural Resources Conservation  
Service

Elizabeth (Izzy) Hill

USDA Honey Bee and Pollinator Research  
Coordinator

Office of the Chief Scientist



United States Department of Agriculture

## USDA Mission

- Serve all Americans
- Provide effective, innovative, science-based public policy leadership in:
  - agriculture
  - food and nutrition
  - natural resource protection and management
  - rural development
- Commitment to deliverable equitable and climate-smart opportunities that inspire and help America thrive

## USDA Pollinator Coordination

- Recognized that healthy pollinators are essential for the productivity of agricultural and natural ecosystems via roles in plant reproduction
- Mandated by legislation of 2018 Farm Bill
- Strategic Pollinator Research Priorities
- Coordination within USDA and among partners





## *The challenge for North America-*

- Over 4,000 species of bees and many other pollinators
- Over 38,000 plant species are found in agricultural and natural ecosystems

*How to begin to understand the interactions of the pollinators with the plant species?*

## *The Data Bases*

- Data base associated with the US National Pollinating Insect Collection (NPIC)
  - One of the largest bee collections (over 1.8 million specimens)
  - Data for individual specimens include plant associations
- PLANTS database
  - Standardized information about vascular plants, mosses, liverworts, hornworts, and lichens
  - One of the most widely utilized websites within federal government, with over 12 million views annually
- Darwin Core Standards for categorizing biodiversity are used in both data bases



## US National Pollinating Insect Collection (NPIC) and Database

- ~1.8 million specimens, worldwide coverage (137 nations) with focus on USA
- Database: USA- 779,000 records; 34,533 localities
  - Each specimen given unique number and matrix code
  - Species name and collector and identifier's names
  - Sex of bee
  - Collection location and GPS coordinates
  - Collection date and time of day
  - **Plant associations (plant names from PLANTS data base)**
  - Additional data (method of collection, link to herbarium specimens, parasitism data, nesting information, genetic data, etc.)
- Other data associated with unique specimen number
  - Genomic Data (sequences for genomes, ultra conserved elements, bar codes, or microsatellite data)
  - Hi-Density images (X/Y/Z composite images, Keyence microscope/camera)
  - Pollen slides
  - Publications
- Efforts to move database to publicly accessible format and create software to capture collection data in field





# Developing a National Native Bee Monitoring Program

## Current status:

- Limited information on the population status and ranges for the majority of the 4,000 endemic native bees in the continental U.S., giving a need for native bee monitoring using strategic partnerships with federal and non-federal entities

**Goal:** Monitor native bees and determine their distributions across the United States to give reliable baseline information on bee species ranges and floral associations.

- **Federal Native Bee Monitoring Task Force** - multiple federal agencies across many departments
- **US National Native Bee Monitoring Research Coordination Network (RCN)** is coordinating efforts for federal and non-federal entities
  1. Defining scope, aims, and cost of a national native bee monitoring program
  2. Improving national capacity in bee taxonomy and systematics
  3. *Gathering and cataloging data that are standardized, accessible, and sustainable*
  4. Identifying core survey methods and prioritizing taxa to monitor
  5. Prioritizing geographic areas to be monitored



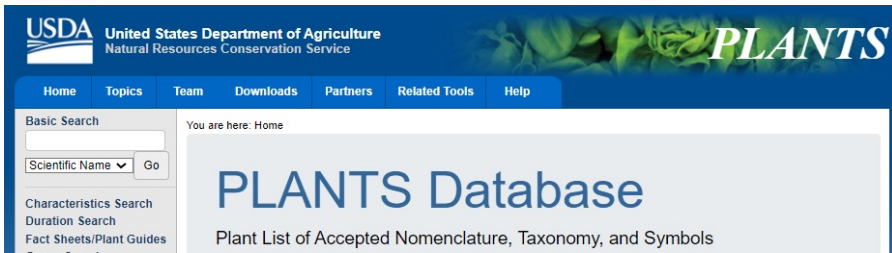


James Weaver, USFWS

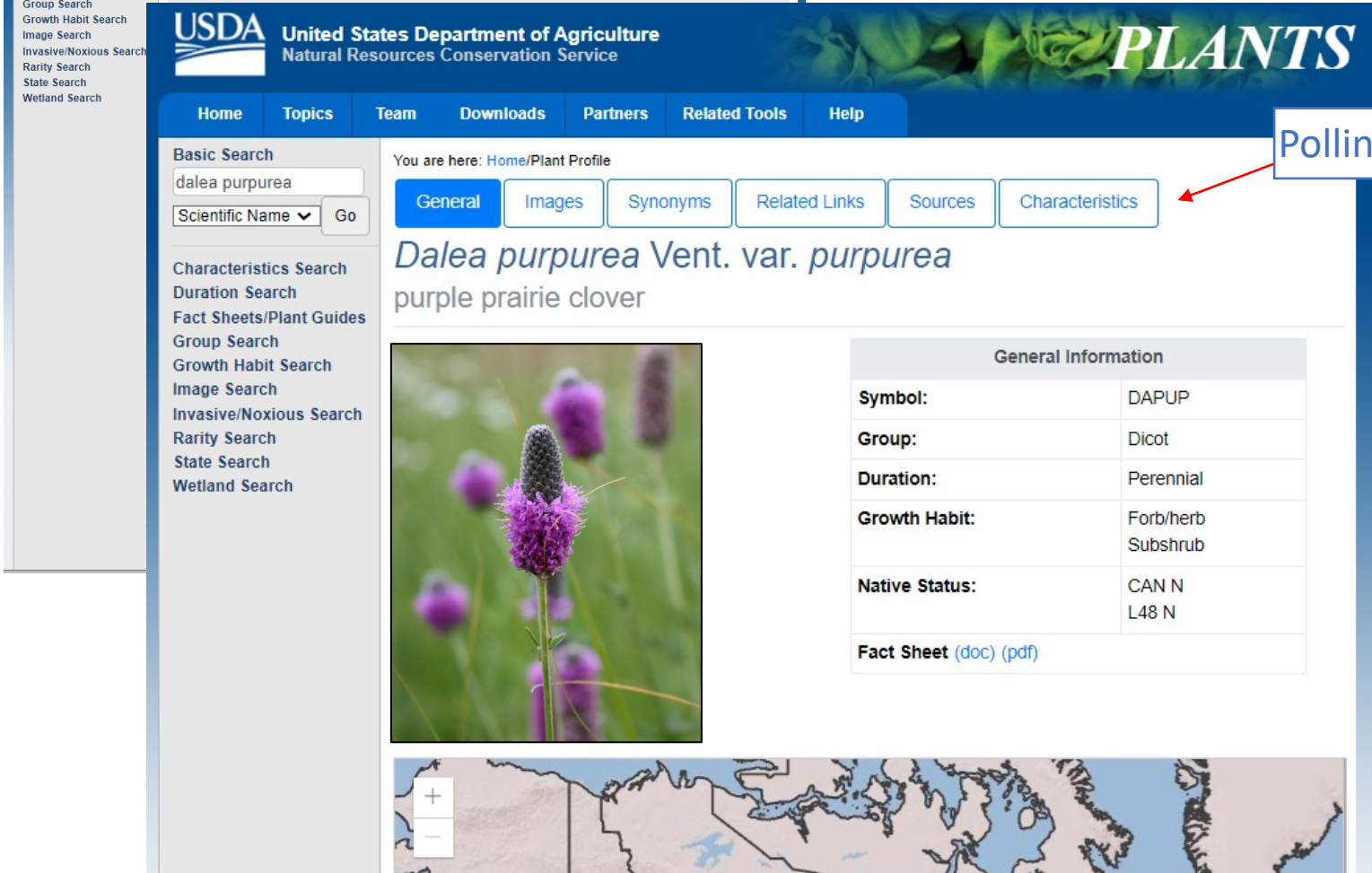
# NRCS PLANTS Database

- Internationally recognized resource for plants naturally occurring in the U.S. and its territories
- Includes vascular plants, mosses, liverworts, hornworts, and lichens
- Standardized information for individual species giving Characteristics, Names, Taxonomy
  - State and county level distribution for vascular plants
  - Morphology/physiology, growth habit
  - Legal status (Wetland, Endangered/Threatened/Rarity, Invasive/Noxious)
  - Distribution and Nativity
- Based on vetted and verified distribution information and current taxonomic status
- [plants.sc.egov.usda.gov/home](https://plants.sc.egov.usda.gov/home)



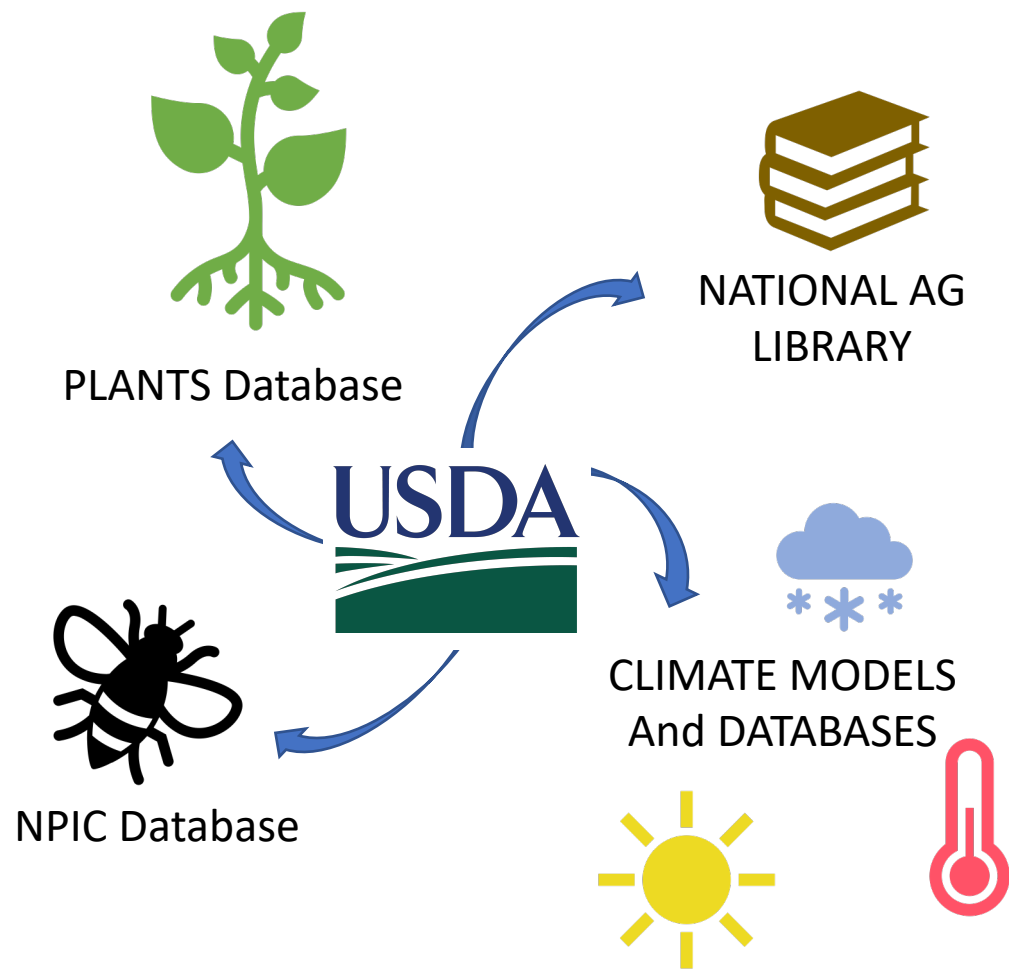


# Modernization of PLANTS



- Add a tab for plant-pollinator interactions, listing pollinating and visiting species
- Include bees, flies, moths and butterflies, etc.
- State level distribution for pollinator/visitor interactions
- Data based on verified distribution information (NPIC, other data bases, and peer-reviewed journals)
- Add nutritional composition of pollen to the characteristics tab for each species.
  - Collected pollen analyzed for lipids, proteins, fatty acids, and amino acids.
- Web services (API) and Search engine optimization





## Integration of Databases

- Integration of the plant and pollinator databases and other information at the National Agriculture Library
- Ability to integrate with ArcGIS spatial climate models and databases
- Spatiotemporal tracking of impacts of climatic change
  - Changes in distribution of bees and plants
  - Bloom time phenology
- Early detection of changes will assist USDA in preventing declines in plant reproduction and pollinator forage





# Summary

*Our efforts will-*

- Yield a rich repository of data for plant-pollinator interactions, pollinator benefits, and climatic impacts on bee and plant species
- Help to ensure protection of rich, diverse, and flourishing habitats in both agricultural and natural ecosystems





# Thank You for listening!

## Thank you to our Collaborators:

- Cynthia Parr, USDA National Agricultural Library; Assistant Chief Data Officer, USDA/ARS
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- Nicholas Balfour, University of Sussex
- And many others...

