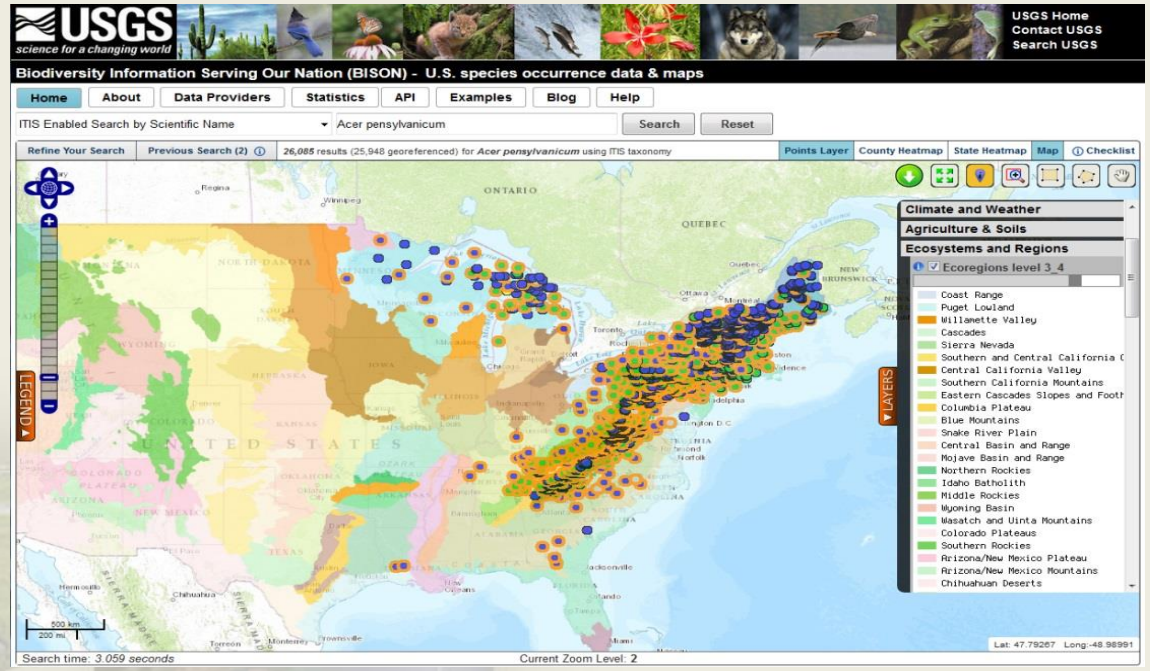
BISON (Biodiversity Information Serving Our Nation)



Tracking the invaders

Gerald “Stinger” Guala, Ph.D.
Branch Chief: Eco-Science Synthesis
USGS

(BISON.USGS.GOV)

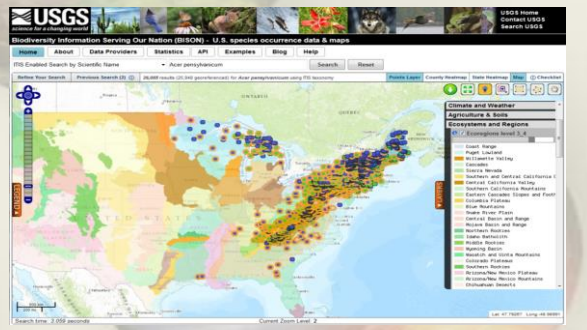
- "Big Data" for species presence and distribution

- US National Clearinghouse for biological occurrence data
- 381+ million records & growing
  - 15M are non-natives
  - 100M available nowhere else
- US Node Application of GBIF
- Nearly all species in US
  - Including 10K non-natives
- Taxonomic standardization
- Every state and county
- Who, what, when, where for every record (at a minimum)
- Saves repeated re-investment in data integration.

"I have been spending a lot of weekends using BISON and the data have been extremely helpful in my analyses. I am very grateful to have this resource - thank you for all you've done to make this what it is."
September 14, 2016. Laura T. Bortolin, Harvard Medical School, Dept. of Genetics, Boston, MA

"...I am very impressed with BISON and am happy the USGS is making biodiversity data available as it is desperately needed. Keep up the good work! "
December 14, 2015. Robert Irwin, Resource Conservationist, Sacramento River Forum, Red Bluff, CA.

"...we're really excited at its performance in producing and mapping extremely large search-result sets (I generated one with 1.8 million hits in a matter of seconds)."
April, 22, 2013. Scott L. Cross, Ph.D.. NOAA National Oceanographic Data Center/National Coastal Data Development Center, Charleston, SC.



"...thanks a million for this application. It is really adding to the number of records I have been able to acquire for numerous amphibian and reptile species."
April 29, 2013. Bill Sutton, Ph.D., Postdoctoral Research Associate, Clemson University, School of Agricultural, Forest and Environmental Sciences.

USGS

What BISON Does

- **Provides a fully integrated and comprehensive clearinghouse for US species occurrence data** with extensive web services to power other websites, scientific analyses and applications.

- **Delivers Federal data sets, increasing usage, visibility and consistency,** including millions of records not suitable for GBIF.

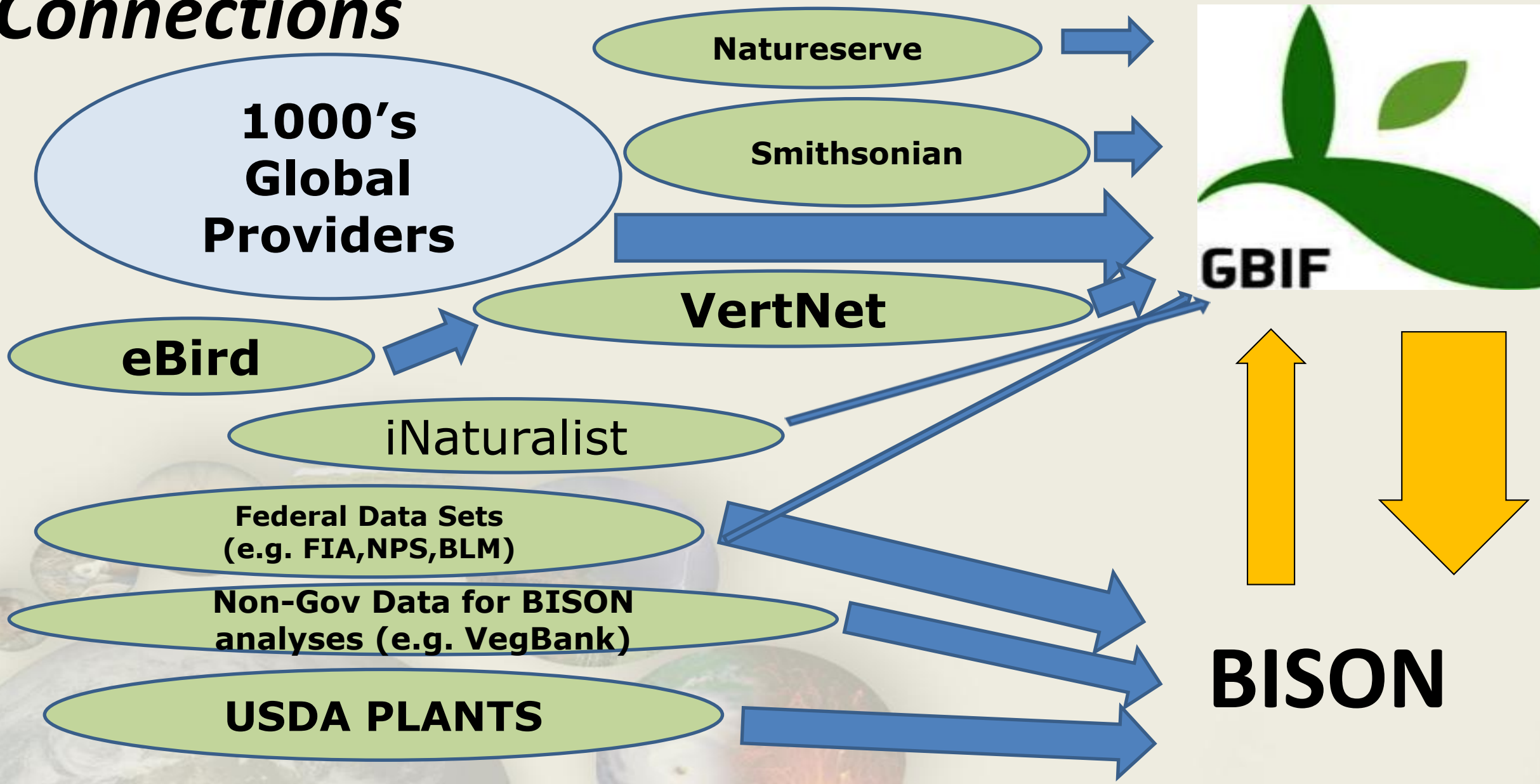
- **Identifies and mobilizes targeted data sets (Federal and Non-Federal) to produce comprehensive coverages.** Emphasis groups: Invasives, Birds & Pollinators

- **Provides US relevant taxonomic and geospatial binning (e.g. ITIS, Counties, States).** Automatic customized checklists for any State, County or custom polygon.

- **Offers community engagement, training and support.** Integrates internationally with GBIF and trains others in proper delivery and use of biological occurrence data.

USGS

Connections



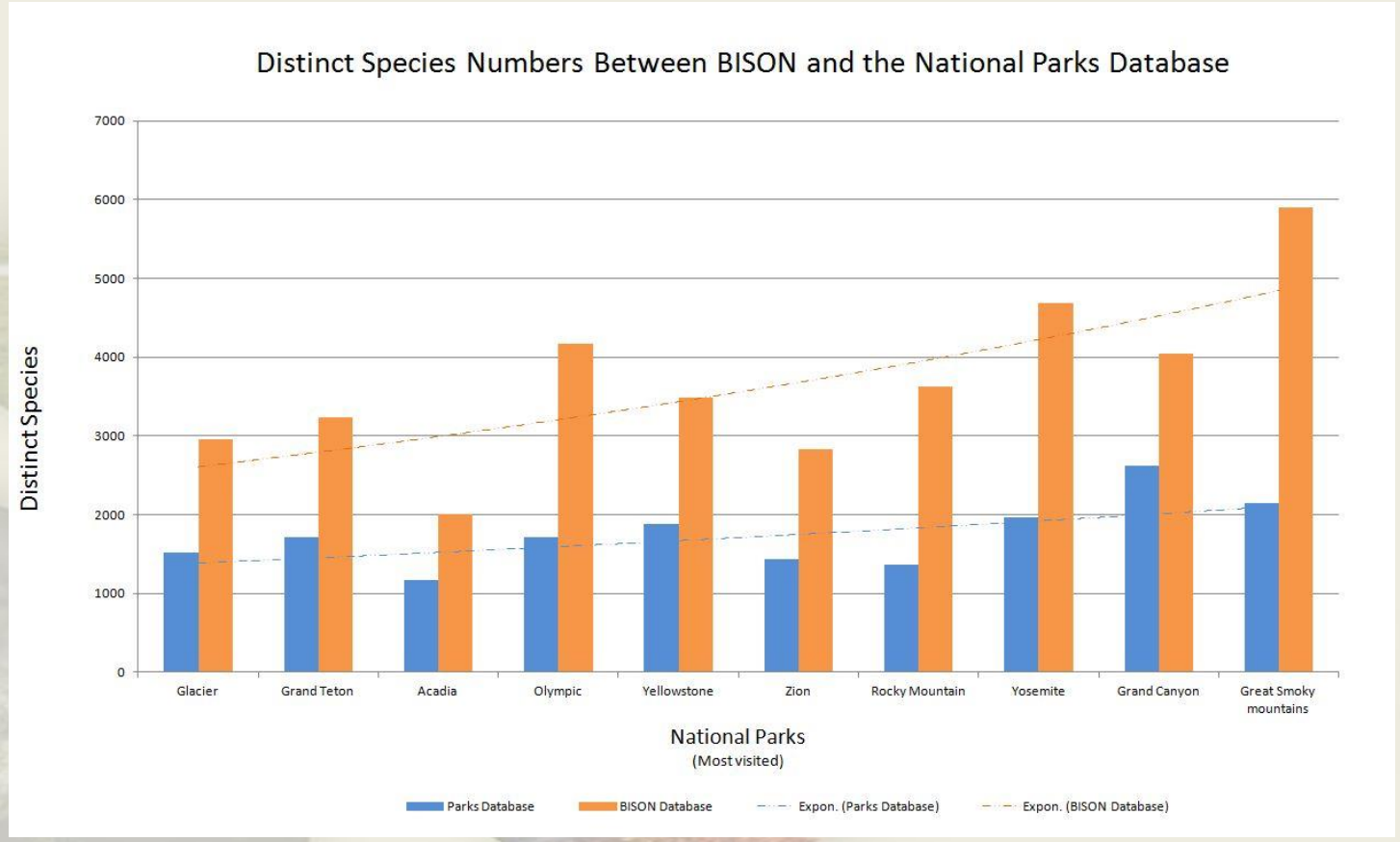
USGS

More than a million different people have collected the data points now in BISON

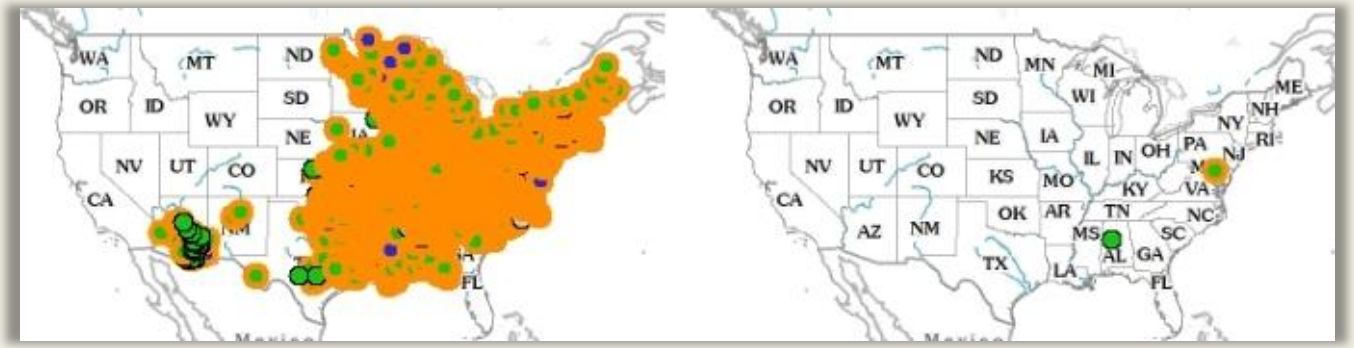
Power in Data from Multiple Sources

Species coverage in checklists of National Parks
NPSpecies vs. BISON

Theo Burton,
USGS Patuxent Wildlife Research Center
Student project



USGS



Go to Print Version

***Rubus flagellaris* Willd.**

Taxonomic Serial No.: 24921

Download data (Download Help) ***Rubus flagellaris*** TSN 24921

Taxonomy and Nomenclature

Kingdom:	Plantae
Taxonomic Rank:	Species
Synonym(s):	Rubus scambens L.H. Bailey
	Rubus aboriginum Rydb.
	Rubus apogaeus L.H. Bailey
	Rubus aptatus L.H. Bailey
	Rubus arenicolus Blanch.
	Rubus arizonensis Focke
	Rubus arundelanus Blanch.
	Rubus ashei L.H. Bailey
	Rubus baileyanus Britton
	Rubus cacaponensis H.A. Davis & T. Davis
	Rubus celer L.H. Bailey
	Rubus centralis L.H. Bailey
	Rubus clarus L.H. Bailey
	Rubus curtipes L.H. Bailey
	Rubus deamii L.H. Bailey
	Rubus decor L.H. Bailey
	Rubus depavitus L.H. Bailey
	Rubus enslenii Tratt.
	Rubus exsularis L.H. Bailey
	Rubus fecundus L.H. Bailey
	Rubus felix L.H. Bailey
	Rubus grimesii L.H. Bailey
	Rubus hancinianus L.H. Bailey
	Rubus injunctus L.H. Bailey
	Rubus invisus (L.H. Bailey) Britton
	Rubus ithacanus L.H. Bailey
	Rubus kentuckiensis L.H. Bailey
	Rubus leviculus L.H. Bailey
	Rubus meracus L.H. Bailey
	Rubus michiganensis (Card ex L.H. Bailey) L.H. B
	Rubus multifer L.H. Bailey

Rubus mundus L.H. Bailey
Rubus nefrens L.H. Bailey
Rubus obsessus L.H. Bailey
Rubus particeps L.H. Bailey
Rubus plicatifolius Blanch.
Rubus profusiflorus L.H. Bailey
Rubus pronus L.H. Bailey
Rubus roribaccus (L.H. Bailey) Rydb.
Rubus russeus L.H. Bailey
Rubus sailori L.H. Bailey
Rubus schoolcraftianus L.H. Bailey
Rubus steelei L.H. Bailey
Rubus temerarius L.H. Bailey
Rubus uvidus L.H. Bailey
Rubus vixalacer L.H. Bailey
Rubus whartoniae L.H. Bailey
Rubus arenicola Blanch.
Rubus iniens L.H. Bailey
Rubus obvius L.H. Bailey
Rubus pernagaeus Fernald
Rubus plexus Fernald
Rubus sewardianus Fernald
Rubus alacer L.H. Bailey
Rubus alius L.H. Bailey
Rubus almus (L.H. Bailey) L.H. Bailey
Rubus armatus (Fernald) L.H. Bailey
Rubus austrinus L.H. Bailey
Rubus bollianus L.H. Bailey
Rubus bonus L.H. Bailey
Rubus botruosus L.H. Bailey
Rubus bretonis L.H. Bailey
Rubus camurus L.H. Bailey
Rubus canaanensis H.A. Davis & T. Davis
Rubus cathartium Fernald
Rubus census L.H. Bailey
Rubus clandestinus L.H. Bailey
Rubus coloniatus L.H. Bailey
Rubus complex L.H. Bailey
Rubus conabilis L.H. Bailey
Rubus connixus L.H. Bailey
Rubus cordialis L.H. Bailey
Rubus cordifrons (L.H. Bailey) L.H. Bailey
Rubus currulis L.H. Bailey
Rubus dives L.H. Bailey
Rubus eflagellaris L.H. Bailey

Rubus eflagellaris L.H. Bailey
Rubus exemptus L.H. Bailey
Rubus exutus L.H. Bailey
Rubus fandus L.H. Bailey
Rubus florenceae L.H. Bailey
Rubus foliaceus L.H. Bailey
Rubus folioflorus L.H. Bailey
Rubus frustratus L.H. Bailey
Rubus fuscus Weihe & Nees ex Bluff & Finge
Rubus geophilus Blanch.
Rubus gordonii L.H. Bailey ex Core
Rubus housei L.H. Bailey
Rubus ignarus L.H. Bailey
Rubus imperiorum Fernald
Rubus indianensis L.H. Bailey
Rubus inobvius L.H. Bailey
Rubus jactus L.H. Bailey
Rubus jaysmithii L.H. Bailey
Rubus lassus L.H. Bailey
Rubus longipes Fernald
Rubus lundelliorum L.H. Bailey
Rubus macdanielsii L.H. Bailey
Rubus mainensis L.H. Bailey
Rubus maltei L.H. Bailey
Rubus masseyi L.H. Bailey
Rubus minnesotanus L.H. Bailey
Rubus neonefrens L.H. Bailey
Rubus occidualis (L.H. Bailey) L.H. Bailey
Rubus occultus L.H. Bailey
Rubus pauper L.H. Bailey
Rubus peracer L.H. Bailey
Rubus pityophilus S.J. Sm.
Rubus pohlii L.H. Bailey
Rubus polulus L.H. Bailey
Rubus polybotrys L.H. Bailey
Rubus prior L.H. Bailey
Rubus problematicus L.H. Bailey
Rubus redundans L.H. Bailey
Rubus rhodinsulanus L.H. Bailey
Rubus ricei L.H. Bailey
Rubus rosagnetis L.H. Bailey
Rubus sanfordii L.H. Bailey
Rubus satis L.H. Bailey
Rubus semierectus Blanch.

Rubus serenus L.H. Bailey
Rubus subinnoxius Fernald
Rubus subuniflorus Rydb.
Rubus tantulus L.H. Bailey
Rubus tenuicaulis L.H. Bailey
Rubus terraltanus L.H. Bailey
Rubus tetricus L.H. Bailey
Rubus tracyi L.H. Bailey
Rubus uncus L.H. Bailey
Rubus uniflorifer L.H. Bailey
Rubus urbanianus L.H. Bailey
Rubus usus L.H. Bailey
Rubus arundelanus var. jeckylanus (Blanch.)
Rubus flagellaris var. almus L.H. Bailey
Rubus flagellaris var. humifusus (Torr. & A. G
Rubus flagellaris var. occidualis L.H. Bailey
Rubus jaysmithii var. angustior L.H. Bailey
Rubus obsessus var. unilaris L.H. Bailey
Rubus recurvicaulis var. armatus Fernald
Rubus villosus Aiton
Rubus procumbens Muhl.
Rubus brevipedalis L.H. Bailey
Rubus clairbrownii L.H. Bailey

98% of records in BISON are covered by ITIS

Custom Maps & Checklists

For Any Area Including User Polygons

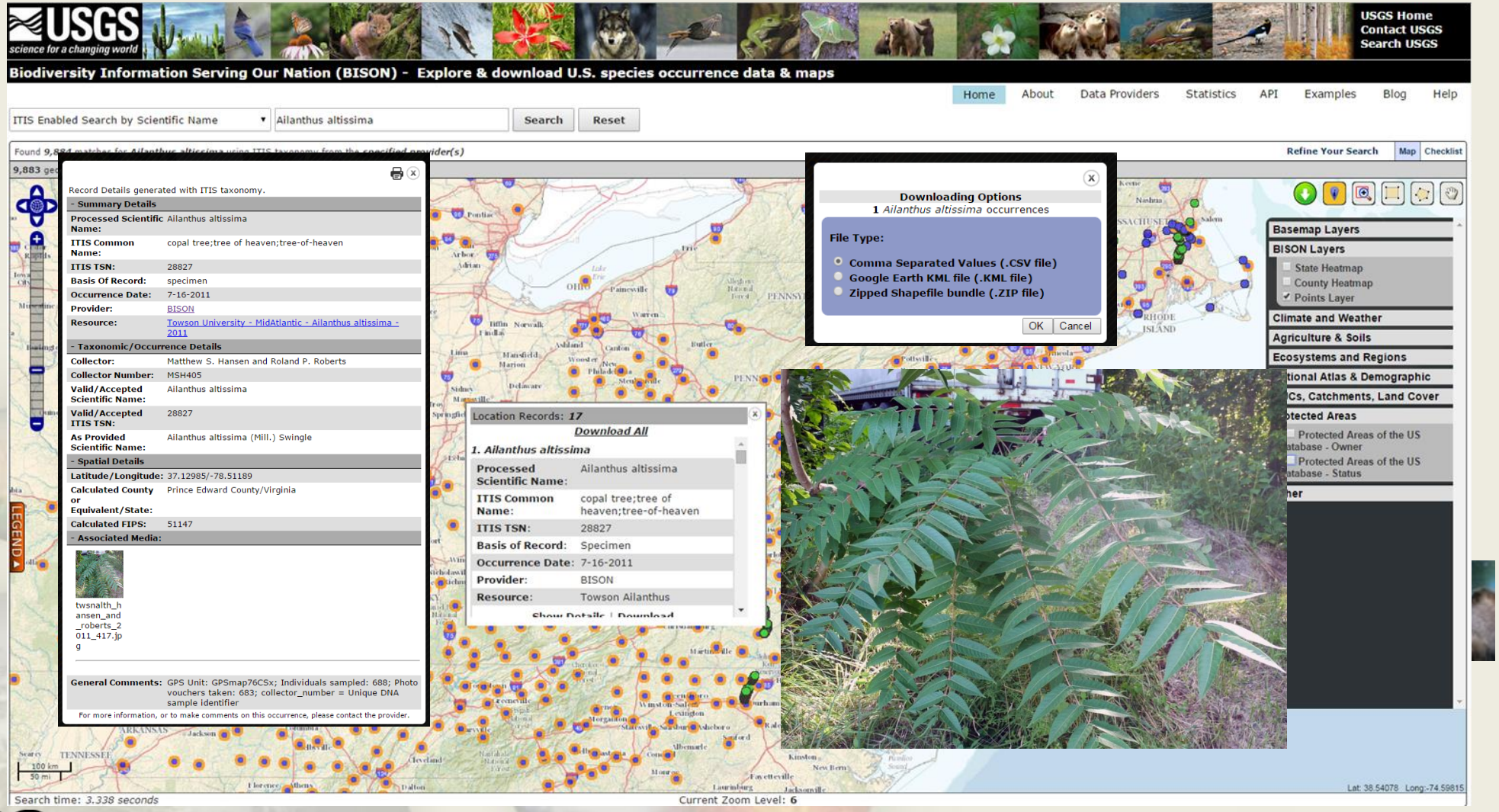
Found **9,070,998** matches for **all species** us

9,070,998 georeferenced

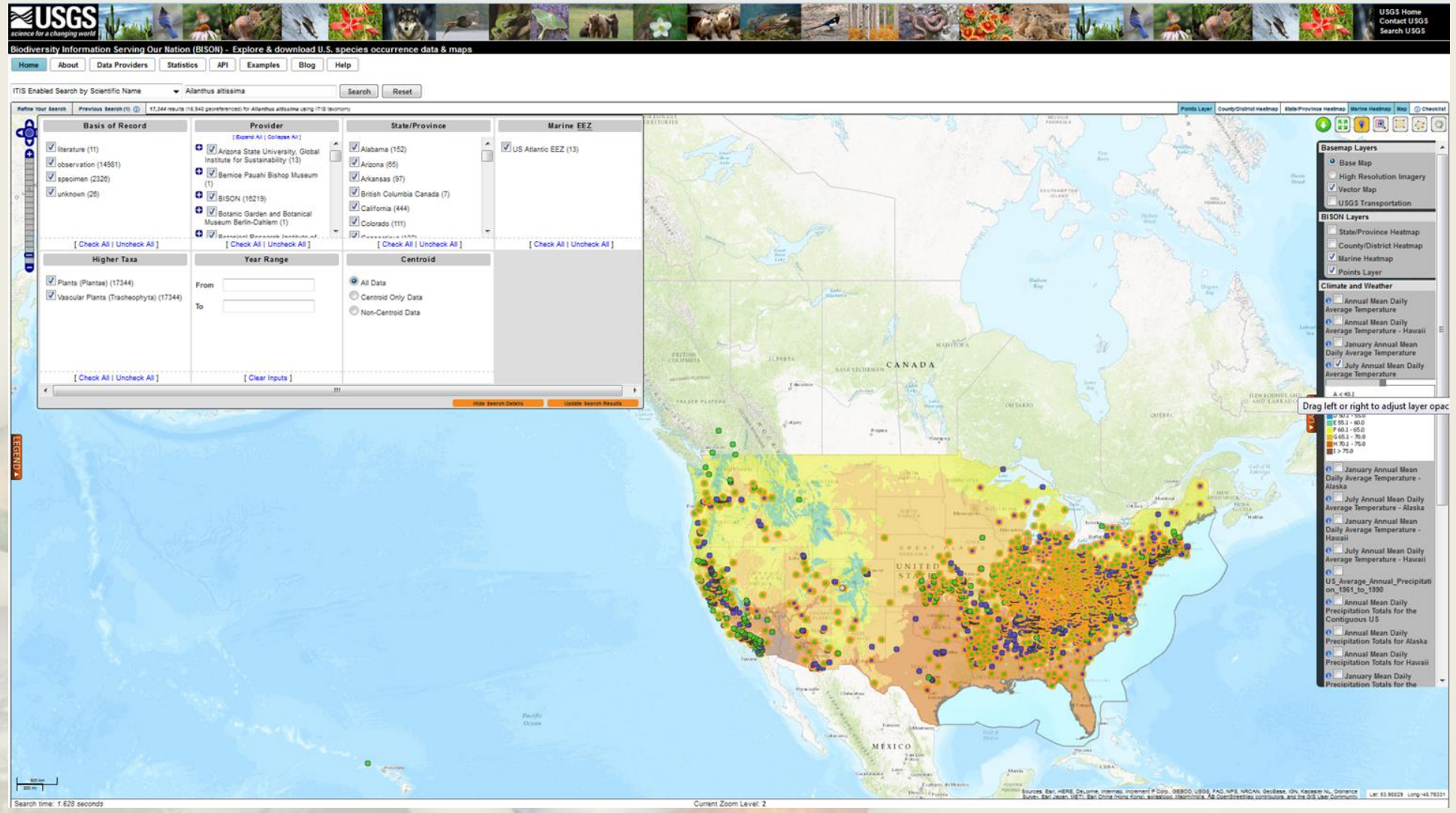
Kingdom	Count
Animalia	7974656
Chromista	10808
Fungi	2651
Plantae	454729
ITIS Scientific Name	**Count**
Abies balsamea	12807
Abies balsamea balsamea	28
Abies homolepis	2
Abies magnifica	1
Abies procera	1
Abietinella abietina	5
Abutilon theophrasti	39
Acacia baileyana	1
Acacia cultriformis	1
Acacia ligulata	1

USGS

Documentation with a Click & Download



Advanced Search and Environmental Layers

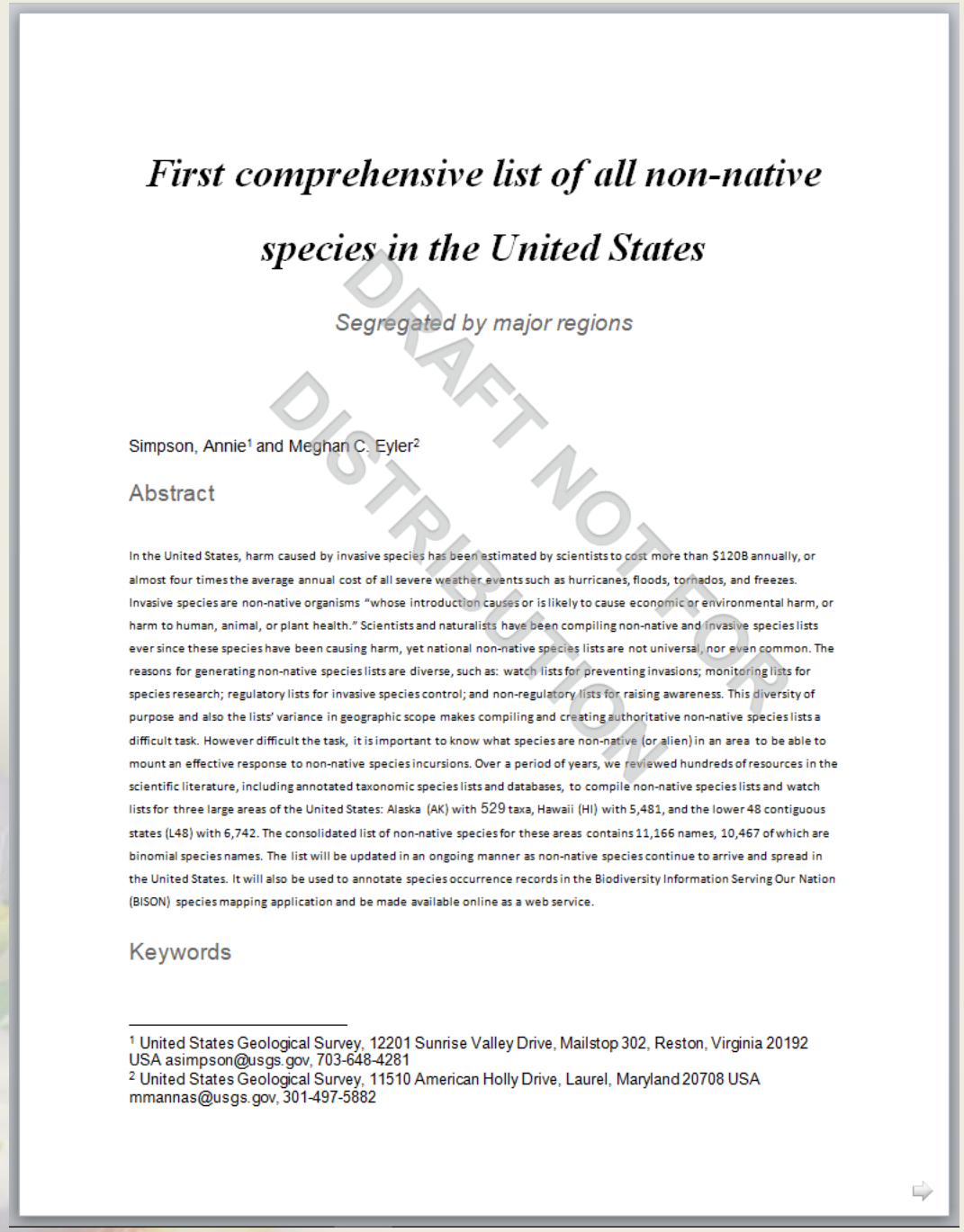


Establishment Means
(Designation of Non-Natives)

11,166 Taxa
10,467 Species

Alaska: 529
Hawaii: 5481
L48: 6742

Search/Filter capability
to be included in
the BISON GUI and
web services in FY18



First comprehensive list of all non-native species in the United States

Segregated by major regions

Simpson, Annie[1] and Meghan C. Eyler[2]

Abstract

In the United States, harm caused by invasive species has been estimated by scientists to cost more than $120B annually, or almost four times the average annual cost of all severe weather events such as hurricanes, floods, tornados, and freezes. Invasive species are non-native organisms "whose introduction causes or is likely to cause economic or environmental harm, or harm to human, animal, or plant health." Scientists and naturalists have been compiling non-native and invasive species lists ever since these species have been causing harm, yet national non-native species lists are not universal, nor even common. The reasons for generating non-native species lists are diverse, such as: watch lists for preventing invasions; monitoring lists for species research; regulatory lists for invasive species control; and non-regulatory lists for raising awareness. This diversity of purpose and also the lists' variance in geographic scope makes compiling and creating authoritative non-native species lists a difficult task. However difficult the task, it is important to know what species are non-native (or alien) in an area to be able to mount an effective response to non-native species incursions. Over a period of years, we reviewed hundreds of resources in the scientific literature, including annotated taxonomic species lists and databases, to compile non-native species lists and watch lists for three large areas of the United States: Alaska (AK) with 529 taxa, Hawaii (HI) with 5,481, and the lower 48 contiguous states (L48) with 6,742. The consolidated list of non-native species for these areas contains 11,166 names, 10,467 of which are binomial species names. The list will be updated in an ongoing manner as non-native species continue to arrive and spread in the United States. It will also be used to annotate species occurrence records in the Biodiversity Information Serving Our Nation (BISON) species mapping application and be made available online as a web service.

Keywords

[1] United States Geological Survey, 12201 Sunrise Valley Drive, Mailstop 302, Reston, Virginia 20192 USA asimpson@usgs.gov, 703-648-4281
[2] United States Geological Survey, 11510 American Holly Drive, Laurel, Maryland 20708 USA mmannas@usgs.gov, 301-497-5882

DEMO

BISON

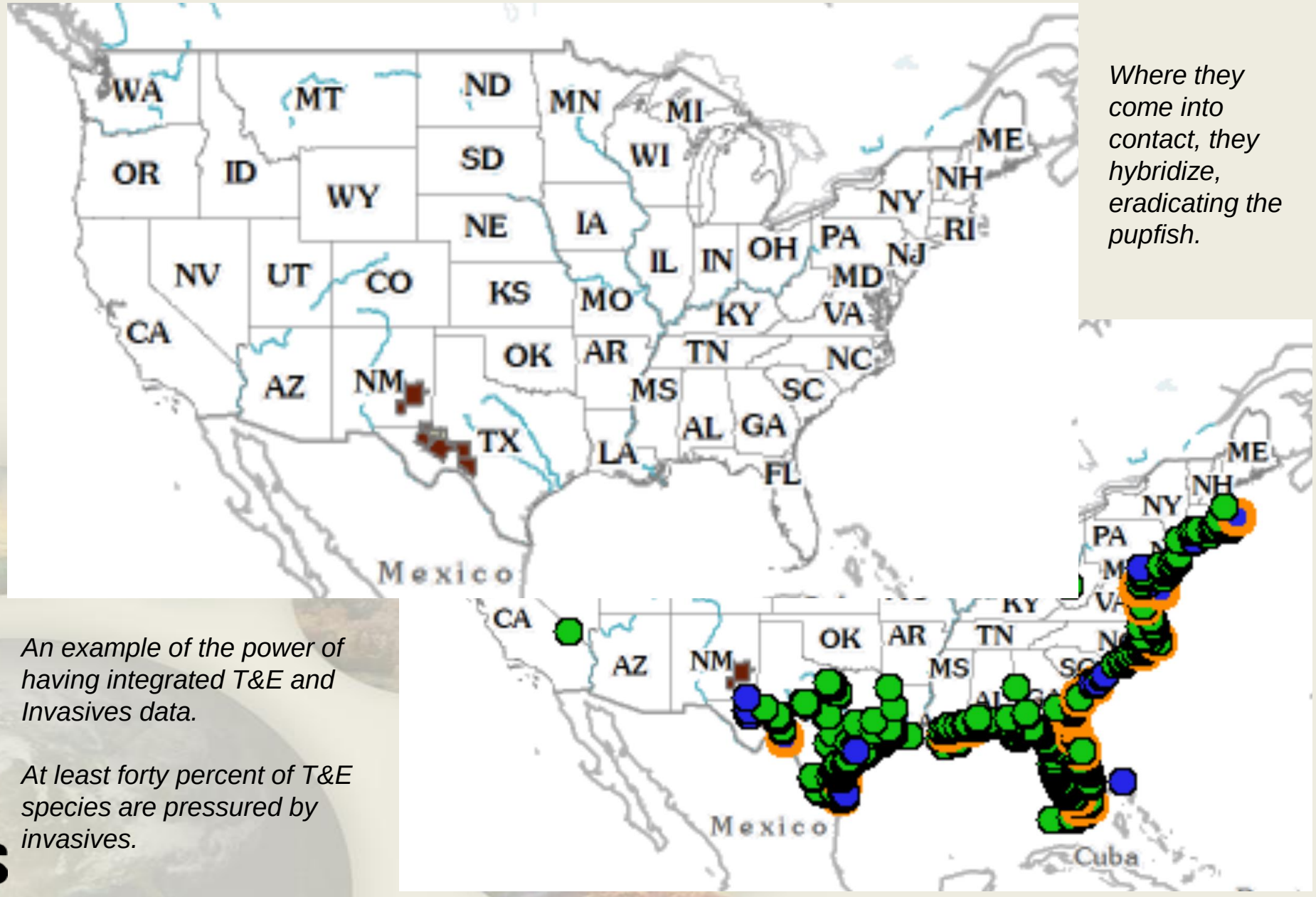
Animated Maps of Spread Over Time

Note that the data only reflects what is in the databases and may not reflect actual routes of dispersal or original introductions

- Kudzu
- Tree of Heaven

USGS

Invasion of Rare Native Pecos Pupfish by Invasive Sheepshead Minnow



Where they come into contact, they hybridize, eradicating the pupfish.

An example of the power of having integrated T&E and Invasives data.

At least forty percent of T&E species are pressured by invasives.

USGS

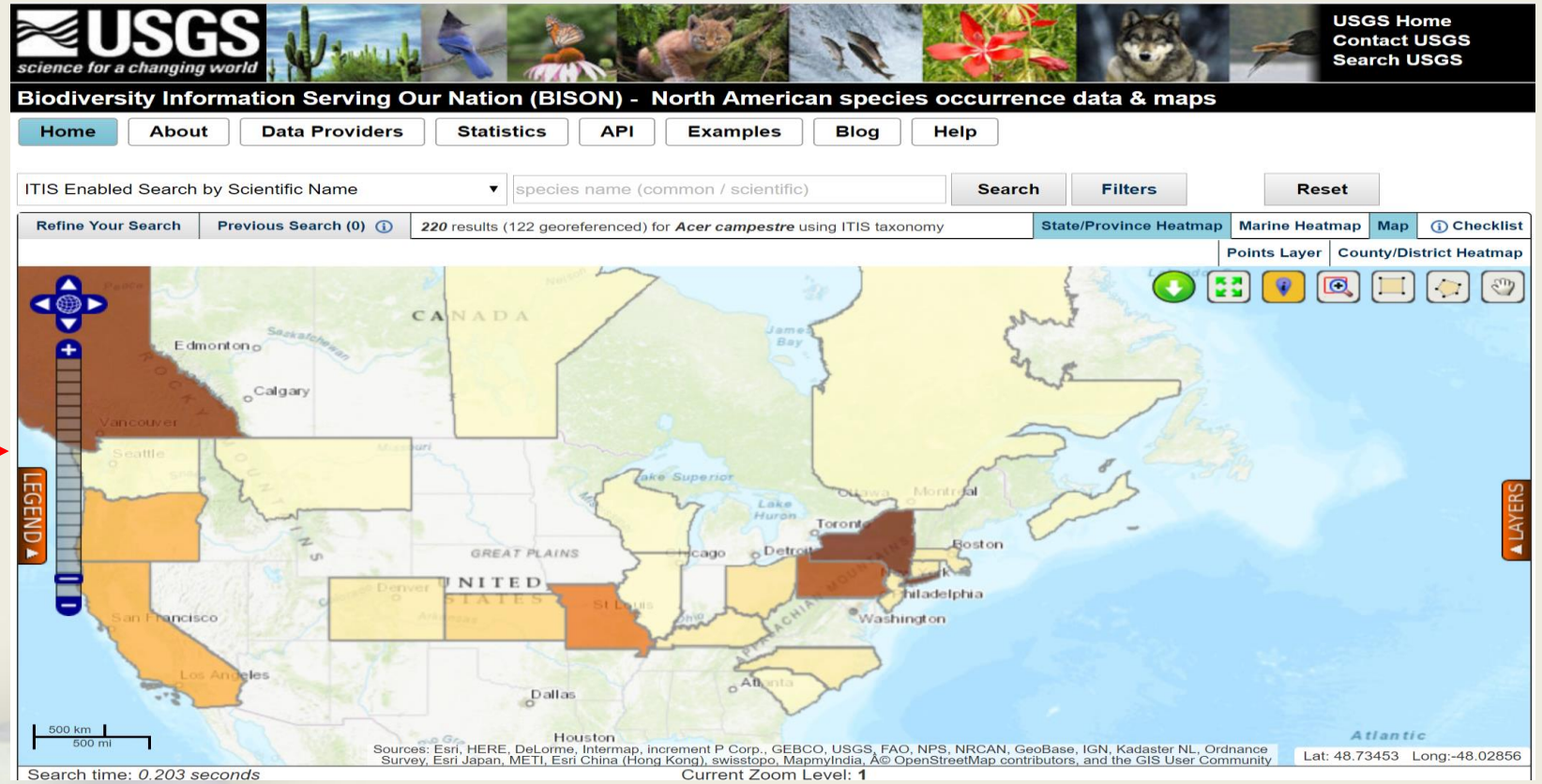
DEMO

Pick a State:
Virginia ▼ Submit

There are 772 species of non-natives documented in states bordering this state that are not documented in the state itself in BISON
Click on a name to open a tab with the species full distribution in BISON.

Abelmoschus esculentus
Abies alba
Acantholyda erythrocephala
Acer campestre
Acer tataricum
Achillea filipendulina
Achillea ptarmica
Achyranthes japonica
Achyranthes japonica hachijoensis
Acmella decumbens
Actinidia polygama
Acyrthosiphon pisum
Adonis annua
Adonis vernalis
Aegilops crassa
Aethusa cynapium
Aglaonema commutatum
Agrilus subrobustus
Agrimonia eupatoria
Agropyron cristatum
Ahasverus advena
Ajuga genevensis
Allium atroviolaceum
Allium oleraceum
Allium sativum
Allium schoenoprasum
Allium tuberosum
Alloglossidium corti
Alnus cordata

USGS



A simple list of what is in your "bad" neighbor's yard

Note that all data and methods here are provisional until published according to USGS Fundamental Science Practices (FSP)

Click on a state and get a list of all non-native species (and subspecies) that are documented in the states bordering that state but not documented in the state itself.

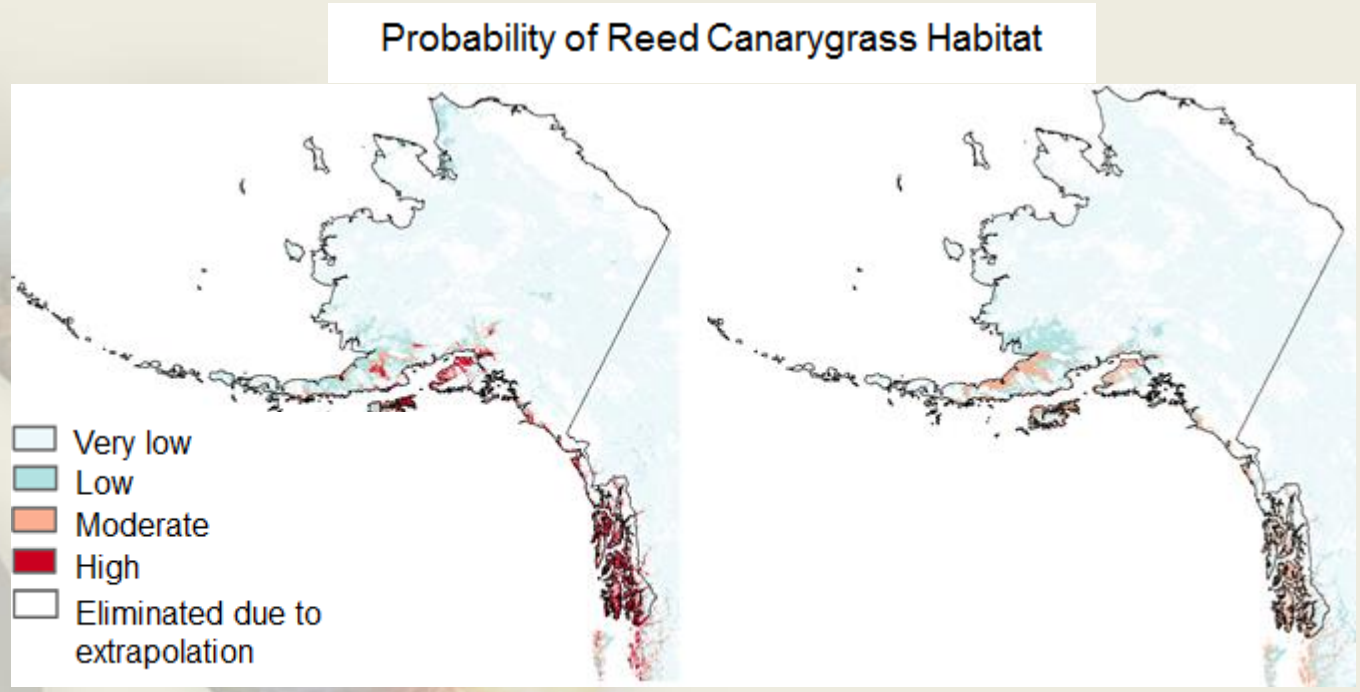
A **NISC** Product – *Powered by **BISON***

Modeling Species Distributions

*Invasive species – Collaboration with **USGS FORT – Catherine Jarnevich***

What is the risk of spread of invasives into Alaska?

- Summer NASA DEVELOP project partnering with Alaska USFWS
- BISON provided North America presence locations



USGS

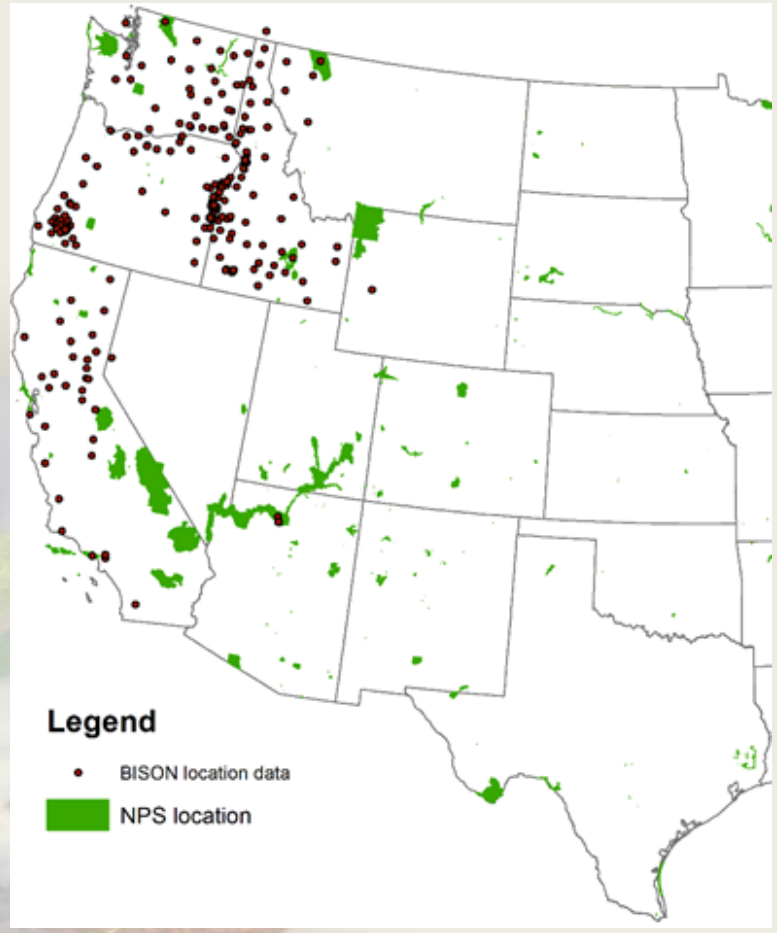
Modeling Species Distributions

*Invasive species – Collaboration with **USGS FORT – Catherine Jarnevich***

Watch lists for EDRR

- Park species lists
- Lists of invasive species of concern system wide

What subset should be focused on for detection in Parks?



Eric Coombs, Oregon Department of Agriculture, Bugwood.org

USGS