



# The National Nonindigenous Aquatic Species Database

The U.S. Geological Survey (USGS) Nonindigenous Aquatic Species (NAS) Program maintains a database that monitors, records, and analyzes sightings of nonindigenous aquatic plant and animal species throughout the United States. The program is based at the USGS Wetland and Aquatic Research Center in Gainesville, Florida.

The initiative to maintain scientific information on nationwide occurrences of nonindigenous aquatic species began with the Aquatic Nuisance Species Task Force, created by Congress in 1990 to provide timely information to natural resource managers. Since then, the NAS database has been a clearinghouse of information for confirmed sightings of nonindigenous, also known as nonnative, aquatic species throughout the Nation. The database is used to produce email alerts, maps, summary graphs, publications, and other information products to support natural resource managers.

## The NAS Database in a Nutshell

The NAS database includes records of aquatic plants and animals occurring outside of their native range. It is freely accessible online (<http://nas.er.usgs.gov>), and users can query the database to view current species distributions.

The NAS database encompasses aquatic ecosystems (wetlands, lakes, rivers, estuaries, and coastlines) throughout the United States and its territories. As of February 2017, the database contains records for 1,271 species dating back to 1850, and new records are continuously added by NAS Program staff. The database also offers a searchable reference database on nonindigenous aquatic species, informational profiles on individual species, distribution maps, and new location notices.

Maps produced from the database are widely used in scientific talks, publications, web pages, and news outlets.



## MANAGEMENT AND POLICY USES

### Risk Analysis

- The U.S. Army Corps of Engineers used the NAS database to examine the risk of nonindigenous species introduction across watershed connections to help prioritize which connections to sever and which to monitor.
- The U.S. Fish and Wildlife Service uses the database as input data for their models to produce ecological risk screening summaries.
- The U.S. Forest Service used the database to identify infested source waters, thereby lowering the risk of unintentionally spreading nonindigenous species while airdropping water drawn from natural sources, such as lakes and ponds, to fight fires.

### Monitoring and Prevention

- Data and alerts are used by natural resource agencies to determine where to focus monitoring efforts.
- Federal and nongovernmental partners have prepared field guides for early detection of invasive marine fishes.
- Ecological modelers use NAS data in predictive modeling to show possible distributions of species in future invasions.
- South Carolina State planners used pathway analysis to determine where to direct their public education to help decrease new invasions.

### Management and Planning

- Occurrence data supports national assessments of aquatic invasions and regional management of nonindigenous aquatic species.
- Reports from NAS have been used to document range expansion of invasive species throughout a region of concern.

### Federal Policymaking

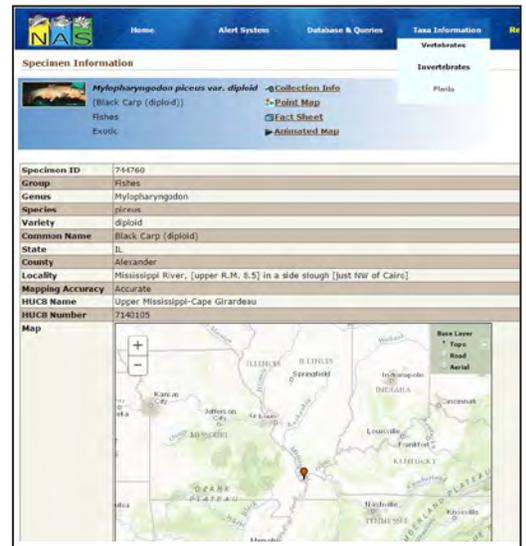
- Data and reports from NAS have been used to make decisions about Lacey Act listings.
- NAS provides information for Congressional testimonies.

## NAS Specimen Records

Each specimen record documents a nonindigenous aquatic species in a particular location at a point in time. The specimen may not have survived or reproduced after the sighting; however, the record provides documentation of the event, allowing researchers to analyze trends and pathways in introductions. All specimen records include the location, date, and identity of the nonindigenous aquatic species. Other details, such as museum specimens (if the organism was collected) or herbarium vouchers are available for some records. To the extent possible, the database includes the best available information on the population status of each species, documenting whether it has failed or established a self-sustaining wild population. The database also distinguishes between native transplants (that is, species native to the United States that are moved to a different region) and exotics, which are species that originate from other countries.

Records are compiled from published materials, such as books, journal articles, and technical reports, as well as records and reports from Federal and State fish and wildlife agencies, museum holdings, and university researchers. Anglers, boaters, divers, and other members of the general public also submit reports of sightings.

To ensure the integrity of the data, the identity and reported location of each species are verified by NAS Program staff before each new specimen record is entered into the database. Supporting documentation like collection information, photographs, supporting academic literature or other documentation are attached to the specimen record (fig. 1).



**Figure 1.** The specimen record provides details about a single introduction of the black carp, including a map of where it was found.

## Queries and Searches

Users can perform text-based searches by genus, species, or common name, or browse all occurrences within a broader taxonomic group, such as frogs, mammals, or fishes (fig. 2). Specimen records can also be queried according to geographic criteria, including

- State,
- County,
- Major drainage area–2-digit Hydrologic Unit Code (HUC),
- Drainage–6-digit HUC,
- Watershed–8-digit HUC.

Using advanced text searches, users can filter results by additional criteria, including year, freshwater or marine environments, introduction pathway, and species origin. Additionally, users now have the ability to perform searches (including spatially enabled queries) directly from the database’s point map interface.

## Assessing Trends in Introduction

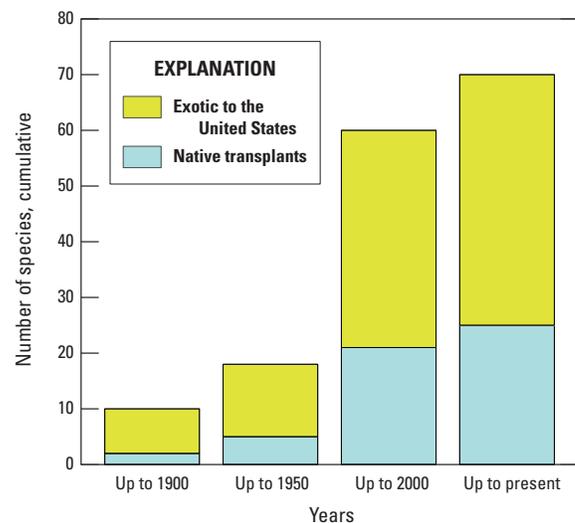
The NAS database offers summary graphs and charts (figs. 3 and 4) that display key facts and trends, such as origins of nonindigenous aquatic species, as well as pathways and environments where they have been introduced. The graphs can include all species in the United States or can be displayed by taxonomic group (fishes, mollusks, crustaceans, reptiles, amphibians, and plants). Graphs can also summarize information across the entire United States or by individual State.

Types of graphs currently available include

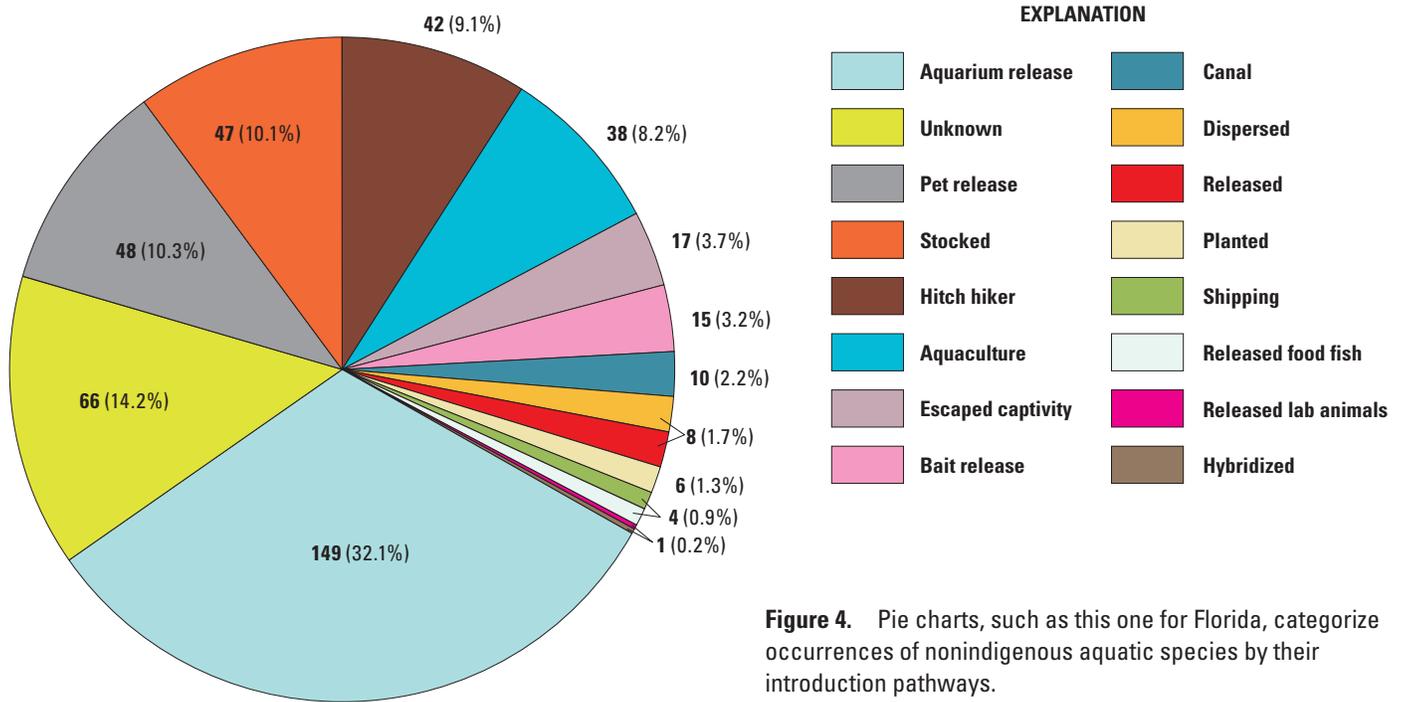
- Introductions over time,
- Introductions by taxonomic group,
- Introduction pathways,
- Native transplants versus exotics, and
- Continent of origin of exotic species.

Images	Group	Family	Scientific Name	Common Name	More Info	Native Habitat	Species Origin
	Plants	Alismataceae	Sagittaria brevirostra	short-beak arrowhead	Collection Info Point Map FactSheet Animated Map	Freshwater	Native Transplant
	Plants	Alismataceae	Sagittaria graminea graminea	grassy arrowhead	Collection Info Point Map FactSheet Animated Map	Freshwater	Native Transplant
	Plants	Alismataceae	Sagittaria guyanensis guyanensis	Guyanese arrowhead	Collection Info Point Map FactSheet Animated Map	Freshwater	Exotic
	Plants	Alismataceae	Sagittaria montevidensis montevidensis	giant arrowhead	Collection Info Point Map FactSheet Animated Map	Freshwater	Exotic
	Plants	Alismataceae	Sagittaria rigida	sessilefruit arrowhead	Collection Info Point Map FactSheet Animated Map	Freshwater	Native Transplant

**Figure 2.** Text-based search for “arrowhead” as a common name returned these five plant species. From here, users can access a species profile and a point map showing sighting locations.



**Figure 3.** This bar graph shows the number of mollusk species introduced since 1850, and indicates the proportion of species that are exotic versus transplanted.

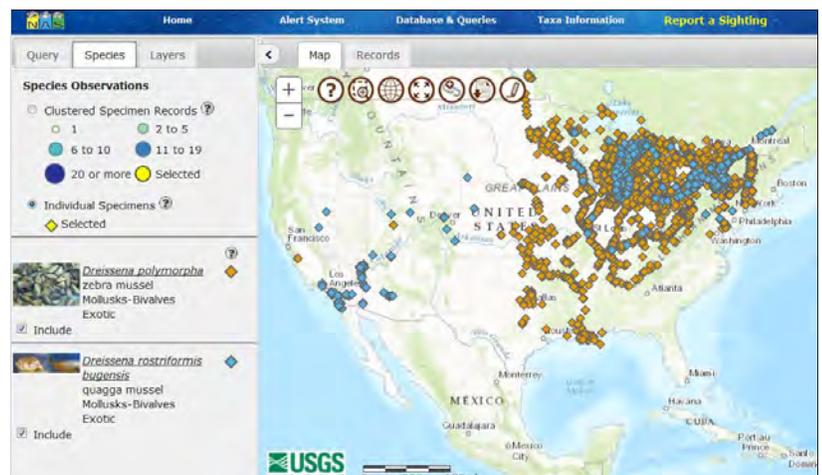
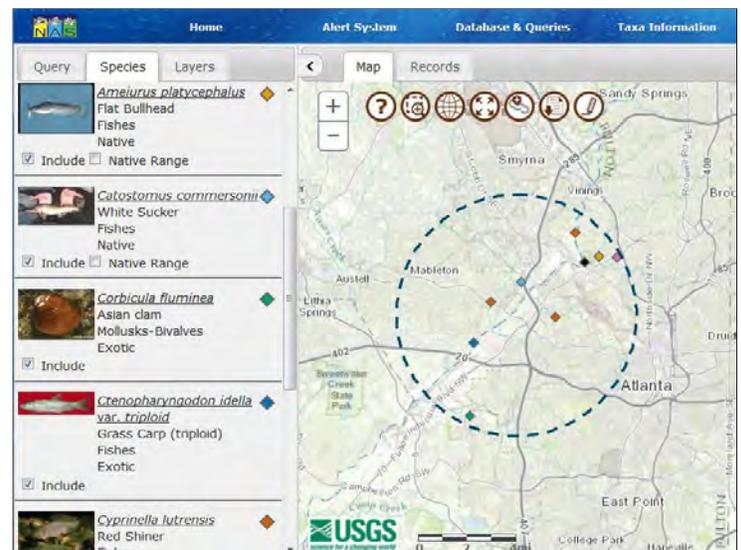


**Figure 4.** Pie charts, such as this one for Florida, categorize occurrences of nonindigenous aquatic species by their introduction pathways.

## Species Distribution Maps

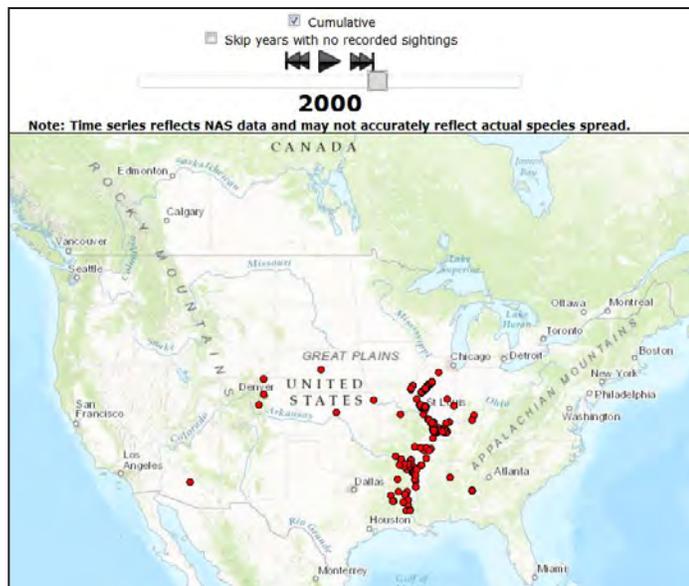
A point map is provided for each specimen showing the location of the record. Species maps are also provided for all reports for a given species to display the national distribution. In addition to text, State, and drainage queries, new spatial and multispecies queries have been created. Users can now query a specific area and see what species have been reported nearby. For example, they could see what has been found within 5 miles of their homes or in a specific park. The multispecies query can be used to show all species together on a single map. It also allows users to compare the distributions of two species, or map all species that share a common pathway. Some of the new functionality and tools present on the new map page are

- Direct spatial query (either within a circle or user-defined polygon) to find all records within a specified geographic area;
- Use of a taxonomic tree-based browser to add a species to a map;
- Color-coded display of multiple species on a single map, including native ranges (up to seven distinct species can be viewed simultaneously);
- New reference layers, including land cover, U.S. census information, Congressional districts, and climate data (with more to be added in the future);
- Highlighting individual records on the map to sort them to the top of the records page;
- Ability to save exact map layout (for example, search criteria, geographic area in map window, zoom level, base and reference layers) via a shareable URL; and
- Ability to download tabular data as a comma separated values file.



## Animated Maps

Animated maps showing the spread of species can make quite an impression! Select any species and an animated map will reveal recorded observations over the years. These animations can be paused at any time, or set for a specific year.



## Watch for New Introductions!

The NAS Alert System notifies registered users of new occurrences of nonindigenous species. These alerts are based on geographic area, species, or broad taxonomic categories.

- *State Watches* track sightings by State.
- *Species Watches* create single-species alerts.
- *Group Watches* include categories of fish, amphibians, reptiles, mollusk, crustaceans, and other taxonomic groups.

To receive alerts, visit the NAS homepage (<http://nas.er.usgs.gov>) to register.

## Report Sightings!

The public plays a significant role by acting as “early detectors” of new appearances of nonindigenous species. A recent analysis of the NAS Alert System showed approximately two-thirds of the alerts generated between 2004 and 2011 came from personal communication through the NAS database’s volunteer reporting mechanism. Users can pinpoint the waters where a nonindigenous species was seen, report the geographic coordinates by using an online map or the program’s new mobile device app, and upload photographs for NAS Program staff to verify the species identity. Both the online tool and mobile device app have been effective for reporting new invasions. Reports can be submitted online at <http://www.usgs.gov/STOPANS>.

Learn more and download the NAS mobile app for Android and iOS at <https://nas.er.usgs.gov/mobilesightingreport.aspx>.

## Partnerships

The NAS Program works closely with State agencies and develops special tools with partnerships, such as integrated reporting and custom views of the NAS database. Through partnerships, NAS offers custom, regional views of the database that allow managers to focus on a specific area of interest. One example of this is the National Oceanic and Atmospheric Administration Great Lakes Aquatic Nonindigenous Species Information System. NAS is a member of the Global Invasive Species Information Network and Global Biodiversity Information Facility, and provides data to these larger networks as well as to other invasive species databases. Data analysis, time series maps, and detailed regional maps can be designed for special projects. Potential partners can contact NAS for more information about custom maps and other tools.

## For More Information

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