

Aquatic Invasive Species: A National Inventory and Early Detection System

Invasive species affect each of our lives, all regions of the United States, and every nation in the world. Society pays a great price for invasive species – costs measured in billions of dollars, damaged goods and equipment, environmental degradation, increased disease epidemics, and lost lives. Alien species invasions can result in native species and biological diversity loss at a rate second only to habitat destruction. Some of the most serious and costly invader species include human, animal, and plant diseases (e.g., West Nile virus, trout and salmon whirling disease, sudden oak death), agricultural pests (e.g., Japanese beetle, Russian thistle), and a host of seemingly innocuous species whose sheer numbers overwhelm ecosystems (e.g., zebra mussels and hydrilla).



Beautiful and venomous, Indo-Pacific lionfish are a recent East Coast U.S. introduction. Photo: NOAA NCCOS

Barriers to Early Detection

Controlling invasive species is difficult because scientists know little about when new invaders reach our waters. In only a few dozen locations has long-term biological monitoring been conducted at intervals frequent enough to allow for the early detection of aquatic alien species. Those data have yet to be linked into an integrated network that can be easily used to produce comprehensive maps. In fact, most of the data are not in standard formats that would allow for them to be easily linked into a common data warehouse.

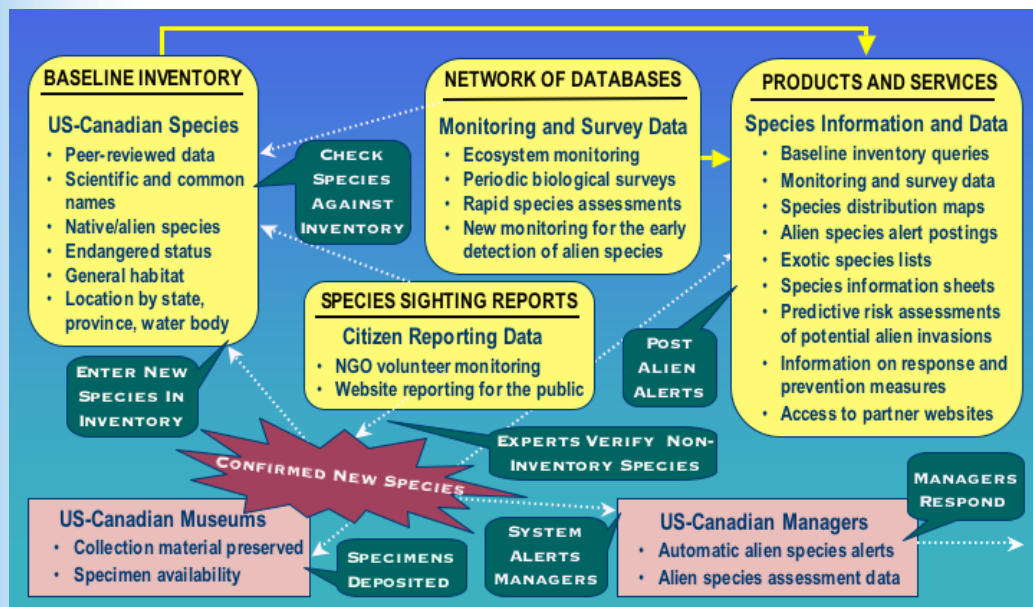
Developing a Unified Response

NOAA, the U.S. Geological Survey (USGS), and the Smithsonian Museum have a new cooperative venture. They agreed to make their databases interoperable, help link other public and private databases into a distributed network, and build a single web portal that will allow users to search databases by species name or geographical location, map species distributions, and download the data. The goals of this project are to detect and confirm the presence of new alien species before they spread beyond the point of initial introduction, assess the risks posed by the new aquatic invader, and alert natural resource managers of potentially invasive species in their region.

Further, few websites exist where the public can report an unusual species and have a taxonomist verify its identification. And finally, few inventories exist that identify plant and animal species (native and alien) known to reside in U.S. and Canadian waters, and those, because of their sheer size and taxonomic complexity, are nearly impossible to keep up to date.

Despite these barriers, managers need to know when a species is introduced to their region and where they can get sound information to help them decide whether to extirminate, mitigate, or tected areas and forecasting harmful algal blooms.

NOAA's National Coastal Data Development Center (NCDDC) is building the inventory and warning system and will facilitate the development of the unified, distributed database network. Additionally, NCDDC is helping managers of long-term monitoring programs standardize and dynamically link their data to the network (i.e., when the respective manager makes a new collection or revises his/her database, it will be automatically changed on the initiative system). The first database to be integrated into the system is NOAA's National Benthic Inventory Program, surveying soft-sediment communities in estuarine and coastal marine waters since 1990.



A diagram of the structural components of the Hawaiian pilot website and general logic for the early detection and warning system.

The project was initiated in FY03 through a Hawaiian Pilot. After testing in FY04, other regional data nodes will be added to the Hawaiian pilot to build a distributed network for the early detection of invasive species. Further, the partnership likely will begin monitoring in one or more regions of the United States by FY05 to fill gaps in geographic coverage. It is hoped that a U.S. and Canadian aquatic species network will be operational within five years. By the end of FY04, visitors to this website will be able to:

- 1) Query the inventory, report species not on it, and have a taxonomic expert verify its name;
- 2) Check any alien species alerts (participating managers will be notified by direct e-mail);
- 3) Search the species database network, map species distributions, and acquire data free-of-charge;
- 4) Find in-depth information on aquatic species and risk assessments predicting the likelihood of an alien species becoming invasive; and
- 5) Access other relevant databases via partner organization websites.

Aquatic Species Inventory

Partners have committed to prepare an 'official' inventory of species (e.g., native and alien species listed by location). Nongovernmental organizations (NGOs) are major contributors to building and maintaining the inventory. The American Fisheries Society

gave permission to use its series of volumes on the names of aquatic invertebrates and fishes of North America. Bishop Museum provided a list of Hawaiian species. Smithsonian Museum taxonomists and those from other museums, aquaria, and scientific societies have agreed to peer-review draft lists of species and help keep the inventory up to date through time.

Alien Species* Early Detection

Other NGOs with structured monitoring and exotic species reporting programs will contribute to the early detection of alien species in recreational waters. One of these will be the product from a new cooperative agreement among The Nature Conservancy, the Marina Operators Association of America, and NOAA. Boaters will report species they believe unusual in their region to participating marinas. Marina operators will assure that the report and any specimens or photographs are sent to an expert who will verify the species name. Volunteer SCUBA divers from another partner NGO, the Reef Environmental Education Foundation, will share its fish survey data (over 70,000 surveys done to date in U.S. and Canadian waters). Further, over 100 taxonomists have volunteered to verify identifications and send any specimens of new species to a museum for preservation. The system will automatically alert resource managers of species verified by these experts as new to their region.

*An alien or nonindigenous species is non-native to the region where it has been introduced, intentionally or unintentionally, and has established reproducing populations. Invasive species are thriving alien populations that have expanded their range with generally increasing ecological, environmental, economic, or human health consequences.



National Centers for Coastal Ocean Science

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