

# The USGS National Aquatic Gap Analysis Program (Aquatic GAP)

## Promoting the conservation of aquatic biodiversity

### Overview

The National Gap Analysis Program (GAP) promotes biodiversity conservation by developing and sharing information on where species and natural communities occur and how they are being managed for their long-term survival.

“Gap analysis” is a scientific method for identifying the degree to which native animal species and natural communities are protected across the landscape; species and communities not adequately represented constitute conservation “gaps.”

GAP was launched in 1989 as a research project exploring how to develop predictive information to manage the nation’s biodiversity so that ordinary plant and animal species would not be threatened with extinction. Since then, important new methods to manage biodiversity across large areas have emerged. A range of tools and procedures are available, including standards for classifying natural vegetative communities, consistent satellite images from which to render digital databases, and methods to apply



*Crayfish are just one of many species for which aquatic GAP techniques are being developed.*

Photo credit: U.S. Fish and Wildlife Service

GAP information to everyday resource decisions and long-range planning. Today, GAP is operational nationwide and enjoys substantial international interest.

### The Need for Aquatic GAP

Gap analysis was originally developed for terrestrial ecosystems. The aquatic component emerged more recently and was designed to identify the degree to which aquatic species and natural assemblages are represented in areas managed for conservation, and to identify areas where such efforts are lacking. Aquatic GAP takes into account the interrelationships between land and water and provides a mechanism for examining aquatic systems within a landscape. It builds upon the methodologies of the terrestrial GAP

to compile information on aquatic ecosystems across the United States.

The need to apply the GAP methodology to aquatic environments is increasingly critical to the survival of many aquatic species. Aquatic environments are among the most severely degraded and imperiled ecological systems. Water use practices, in-stream activities, and land-based development have contributed to the destruction of aquatic habitats and threatened a large number of aquatic species. The decrease of aquatic biodiversity – the variety of freshwater and marine living organisms and the ecological complexes of which they are a part – is a major concern of state and federal natural resource management agencies. This loss is a result of habitat destruction and

the degradation of water resources that are vital for social and economic development as well as environmental stability.

The conservation of aquatic and terrestrial ecosystems, where land acquisition plays a major role in the conservation of intact ecosystems, must be largely achieved through cooperative management practices. Resource managers and planners need reliable and easily accessible information about the status of aquatic resources. Managers and planners at all levels need better information about the location, status, and habitats of aquatic resources. While many groups are working on water resource issues, they typically do not address the representation of natural species assemblages on a national scale. Aquatic GAP projects provide value by “scaling up” the vast amount of data from local and state sources into information that is usable at regional and national levels.

In addition, GAP projects employ “predictive modeling” to map species that may breed or use habitats in a given geographic area. To predict their distributions, species are associated with mapped habitat characteristics using computerized geographic information system (GIS) tools. The resulting maps are checked for accuracy against verified checklists and published reports of species occurrences and are peer-reviewed by experts, species-by-species. Terrestrial GAP began by mapping distributions

of amphibian, bird, mammal, and reptile species. Recognizing that biodiversity includes all life forms, aquatic GAP techniques are being developed to cover fish, mussel, crayfish, snail, and will include additional species as knowledge and resources allow.

There is a need for such tools to objectively measure changes in aquatic biological resources or the success of management policies and restoration efforts. They are also utilized by decision-makers and resource managers to measure aquatic resource health and to assist them in developing management strategies. The aquatic component of GAP is designed to address these challenges.

## Products

Aquatic GAP products include geospatially referenced data on aquatic resources and resulting predictive models of the likelihood of occurrence of aquatic biota in given habitat types.

Some examples are:

- Maps of taxonomic aquatic ecoregions and habitats, including estuarine and marine systems;
- Fish species and habitat models, including predicted distribution models and habitat affinity information with literature citations;
- Conservation status of aquatic ecosystems and individual species; and
- Regional and national (in development) integrated geospatial

data on biological and habitat resources.

Aquatic GAP data and reports are currently available from the program manager or directly from partners. In the future, aquatic GAP data will be made available on the GAP Web site: <<http://gapanalysis.nbii.gov>>.

## Partnership Opportunities

GAP projects could not be conducted without the participation of state and federal agencies, academic and nonprofit institutions, and other partners and organizations. Partnerships often link entities that may not have previously worked together and provide benefits to all parties. As part of the overall National Biological Information Infrastructure (NBII) Program, GAP investigators are helping many organizations apply GAP data to their projects and missions. Partners interested in submitting project proposals should contact the program manager directly at the information listed below.

## For More Information

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