Strategic Plan for the Aquatic Component of the USGS Gap Analysis Program (GAP) 2005-2010

Developed by the USGS Aquatic GAP Guidance Committee

June, 2005

A Note on the Development of this Plan

This strategic plan for the aquatic component of the Gap Analysis Program was developed with the input of numerous individuals. A rough outline of a strategic plan was initially produced by USGS personnel and presented to a guidance committee for their review. This guidance committee was composed of personnel from the USGS Biological Resources Discipline, aquatic GAP project managers, and aquatic GAP partners from state and federal agencies and nongovernmental organizations. Using this draft document as a guide, the guidance committee met in January 2005 in a facilitated session to further develop the goals and direction of the program. This collective input was melded into the draft document to produce this strategic plan.

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2005-2010

Executive Summary

The U.S. Geological Survey's (USGS') 2005-2010 Strategic Plan for the aquatic component of the Gap Analysis Program (GAP) discusses the USGS' goals for the program and the strategies that will be used to achieve them.

The Plan provides guidance for managing and implementing the program on a national basis, and ensuring that goals are met in the most efficient manner possible. It also provides direction for aquatic projects to ensure consistency nationwide and clarifies program direction. The goals, detailed herein, are:

- Improve Information Integration and Analysis
- Conduct Effective Outreach
- Provide Strong Program Management
- Provide a Strong Research and Modeling Component
- Develop Strong Partnerships

Accomplishing the vision for aquatic GAP will take strong program leadership from USGS and support from a variety of partners, users, policy makers, and customers.

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Background

What is GAP?

Gap analysis is a scientific method for identifying the degree to which native animal species and natural communities are represented across the landscape. Those species and communities not adequately represented in the existing network constitute conservation "gaps".

The purpose of the USGS Gap Analysis Program (GAP) is to provide broad geographic information on the status of ordinary species (those not threatened with extinction or naturally rare) and their habitats in order to provide natural resource managers, planners, scientists, and policy makers with the information they need to make better-informed decisions.

History of Gap

Gap Analysis was originally developed for terrestrial ecosystems as a tool for use in resource management activities at a variety of scales.[1] The aquatic component of GAP has been designed to identify the degree to which species and natural assemblages of species are represented in areas managed for conservation as well as to identify important localities where such efforts are lacking. Until the development and establishment of the Gap Analysis Program, there was no national goal to evaluate the conservation status of aquatic biodiversity. The aquatic component of Gap Analysis takes into account the interrelationships among land and water and provides a mechanism for examining aquatic systems within a landscape context. It further builds upon the methodologies of the terrestrial GAP and functions to compile information on aquatic ecosystems across the United States.

While GAP has made significant strides in developing information on the biogeography of terrestrial environments for conservation assessments, much less has been accomplished for aquatic environments. The program's initial focus on terrestrial vertebrates and vegetation types was a choice based on what was achievable in the early phases. A feature of both programs is that the work is accomplished through extensive partnerships. The GAP business model is a state-by-state approach that necessitates cooperation and contribution from a suite of state- and national-level organizations. Although this business model has worked for terrestrial GAP programs, an integrated watershed approach will be used for developing GAP projects for aquatic systems that will rely just as much on the development of strong state, federal, and local partnerships.

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[1] Scott JM, F Davis, B Csuti, R Noss, B Butterfield, C Groves, H Anderson, S Caicco, F D'Erchia, TC Edwards Jr., J Ulliman, and RG Wright. 1993. Gap Analysis: A geographic approach to protection of biological diversity. *Wildlife Monograph*s 123:1-41.

The Need for GAP

The need to apply the GAP methodology to aquatic environments is increasingly becoming more 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 all 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 an indicator of habitat destruction and degradation of water resources that are vital for economic growth and environmental stability.

The conservation of aquatic and terrestrial ecosystems, where land acquisitions plays a major role in the conservation of intact ecosystems, must be largely achieved by cooperative management practices. There is, therefore, a need for reliable information about the status of aquatic resources such as information that is available to, and used by, all resource managers and planners. Managers and planners at all levels need better information about the location, status, and habitats of aquatic resources that will lead to informed decisions on conservation, development, and restoration. Additionally, while many other groups are working on national water resource issues, they typically do not examine the problems at a national scale with specific interest in aquatic species management and the viable representation of assemblages of natural species. Aquatic GAP projects will provide tremendous value by "scaling up" the vast amount of data from local and state sources into information that is usable at the regional and national levels for such purposes.

There is also a lack of tools to objectively measure changes in aquatic biological resources or the success of management policies and restoration efforts; decision makers and resource managers need tools to measure aquatic resource health which can assist them in assessing management strategies. The aquatic component of GAP is designed to address and accomplish all of these challenges.

Guiding Principles

Within the Gap Analysis Program, business is conducted according to the following guidelines:

- **Collaboration** - Catalyze and value the contributions of partners and recognize that GAP is built in the spirit of multi-sector cooperation.
- **Inclusiveness** - Work constructively with a variety of federal, state, local, academic, non-government, private, and international partners to develop and implement products and services that will benefit all users.
- **Integrity** - Maintain professionalism in our partnerships and in the development and delivery of products and services, as well as treat partners and users with respect.
- **Quality** - Affirm a commitment to data quality and an infrastructure that ensures data integrity. Metadata provided by partners is reviewed to ensure its compliance with

standards. Availability of metadata allows users to understand the quality and suitability of the data for their intended purpose.

- **Technical Excellence** - Produce and provide the best possible state-of-the-art tools and technologies needed by our partners.
- **Responsiveness** - Provide assistance to users and partners in developing or using GAP products.
- **Flexibility** - Allow for flexible methods among projects to meet partner needs.
- **Stability** - Assure long-term stability of the Aquatic GAP program.

Adhering to these principles helps to ensure integrity, excellence, and the ultimate success of USGS efforts to realize the biological community's vision for GAP.

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. These products include:

1. Maps and taxonomic aquatic ecoregions and habitats
    a. maps of aquatic subregions.
    b. estuarine/marine systems.

2. Fish/habitat models
    a. predicted distribution models for all species.
    b. habitat affinity information with literature cited.
    c. hyperdistribution.

3. Conservation status of aquatic ecosystems and individual species
    a. limiting factors (physical).
    b. mapping important habitat drivers.
    c. conservation opportunities for biodiversity.

4. National integrated geospatial data on biological and habitat resources.

Customers

Customers of Aquatic GAP could include any governmental or private organization that had need for spatially referenced data on aquatic resources. Primary customers would include government agencies at all levels – national, state, and local. Nongovernmental customers – including businesses and nonprofit groups – would also benefit from the availability of GAP products. The fields of application are as varied as the customers, but could include research, resource management and land use planning, among others.

A higher priority must be placed on serving the educational customer base. Increasing the use of GAP products at all stages of the educational system will help to instill within the American people the utility of the applications that are possible with GAP.

An emerging customer base would include organizations involved in homeland security. Aquatic GAP products provide invaluable planning tools to assist in their missions.

A potential list of customers in included in Appendix II. Although not entirely inclusive, this list provides an indication of the cope of users to whom aquatic GAP projects will be useful.

Mission

The mission of the aquatic component of GAP is to promote conservation of biodiversity through information by providing conservation assessments of natural communities and native species. The overall framework for the aquatic program entails answering 3 questions:

1. How well are all aquatic species and their habitat types represented within places managed for their long-term persistence?
2. Which species and habitat types are under-represented in aquatic biodiversity management areas or management activities?
3. Which species and habitat types are at risk?

Answering these questions entails developing a rigorous scientific basis for identifying regions which are both characterized by rich or unique aquatic floras and faunas and which are not currently being managed to sustain those resources, identifying the extent to which current management efforts are conserving aquatic biodiversity, and making this information available to federal, state, and local resource managers.

Goals

One of the 2000-2005 USGS Strategic Plan's goals is:

> .. to "ensure the continued availability of long-term environmental and natural resource information and systematic analysis and investigations needed by customers, . . . for informed decision-making about natural systems."

The USGS has started improving the accessibility of the nation's biological data and information through GAP's website so that research data and information can be readily identified, accessed, and applied to solve natural resource problems. The Gap Analysis Program is an important resource and tool for a wide variety of organizations from all sectors that need readily available, integrated biological information.

In recent years, USGS planning efforts have increasingly recognized and focused on the value of its information assets, as well as the role the USGS should play in natural science information, and the importance of accessibility and usability of natural science information for its customers who need readily available, integrated biological information. GAP is an integral part of USGS' overall information services, functioning as a major biological component in the range of natural sciences information services promulgated by the USGS. GAP goals and strategies are aligned with those of USGS, and serve as a model for the direction in which the USGS is moving.

Goal 1. Improve Information Integration and Analysis

GOAL STATEMENT: Develop Aquatic GAP methodology to apply at various regions of the national and international areas using a watershed-based approach.

Strategy 1. **Apply ecoregion approach**.

Action 1. Where appropriate classify ecological streams using appropriate classification procedures. Explore and develop linkages for fish and other aquatic species to these classifications for data analysis and animal modeling.

Action 2. Expand the aquatic GAP program using a watershed approach. Focus on linking current projects with logical watershed extensions. Use a holistic approach that identifies parts of the country with key concerns and issues to start new projects in watersheds, estuaries and lakes.

Action 3. Develop 1:100,000 watershed predictive distribution maps for fish, mussel, and crayfish species.

Strategy 2. **Integrate Terrestrial and Aquatic Systems to perform ecosystem analyses**

Action 1. Assure that products integrate well: focus on integration of product delivery to achieve seamless data

- Identify and incorporate common elements for each Aquatic and Terrestrial GAP project.
- Incorporate a measure of reliability (good housekeeping seal) for each element.

Action 2. Identify and focus on mutual benefits (recognizing the differences between terrestrial and aquatic systems).

Action 3. Hold integrated meetings between Terrestrial and Aquatic GAP projects.

Action 4. Optimize Aquatic GAP approaches with proven Terrestrial GAP approaches.

Action 5. Develop a pilot project that integrates terrestrial and aquatic GAP projects within a region. This should include all aspects of GAP projects, including production, research, outreach and training.

Action 6. Coordinate with ongoing terrestrial GAP projects in foreign countries to develop an ecosystem based GAP pilot project in an international setting. Potentially focus initial pilot studies on small island states, where an integrated terrestrial and aquatic GAP project can be done for the entire nation.

Strategy 3. **Develop Aquatic GAP technical protocols to facilitate project development while maintaining integrity and credibility of the program.**

Action 1. Develop and implement standards for all projects that recognize flexibility in methods and approaches. Develop examples of national level products that allow creation of one integrated national aquatic GAP assessment.

Action 2. Conduct risk assessment for each aquatic GAP project that determines the various risk layers need to be identified for the regional aquatic Gap projects.

- Conduct pilot studies to experiment with different approaches to Gap Analysis that may be used to establish new guidelines from which all projects can benefit.
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Goal 2. Conduct Effective Outreach

GOAL STATEMENT: Facilitate information transfer, and provide information and education opportunities for fisheries and aquatic resource professionals and managers, decision-makers, the public and others interested in protection of aquatic resources by using aquatic GAP resources.

Strategy 1. **Increase exposure and recognition of Aquatic GAP**

Action 1. Form an outreach committee, comprised of individuals interested and experienced in developing user-friendly products and communication strategies.

Action 2. Make presentations at all aquatic biodiversity conservation meetings in which GAP representatives participate.

Action 3. Publish a basic Aquatic GAP science article in an appropriate professional (peer reviewed) journal.

Action 4. Include a broad base of partners and USGS personnel in Aquatic GAP sessions at professional meetings (e.g., AFS).

Action 5. Support student and graduate studies internships programs focused on aquatic biodiversity conservation as part of the aquatic GAP analyses.

Action 6. Develop formal agreements between the aquatic GAP program and other agencies to develop and distribute resource information to broad audiences.

Action 7. Develop tools to demonstrate the use of data utility and application for research and management**.**

- Develop targeted data, tools, and products for specific groups, including use for educational purposes / schools and general educational outreach.

Strategy 2. **Develop a customer-focused program.**

Action 1. Hold regional meetings with customers. These should include regional workshops to provide information on aquatic GAP uses and to coordinate aquatic GAP activities within regions

Action 2. Develop detailed case studies of Aquatic GAP projects and utilize them in outreach materials to demonstrate how customers have used tools.

Strategy 3. **Improve formal interaction with customers**

Action 1. Develop formal MOUs and working agreements with customers.

Action 2. Implement training programs that provide opportunities for customers to learn how to implement aquatic GAP for uses such as applying ecosystem management strategies.

Action 3. Develop training opportunities for non-professionals on the use of aquatic GAP data.

Goal 3. Provide Strong Program Management

GOAL STATEMENT: Expand the aquatic GAP program, focusing on developing an integrated terrestrial and aquatic analysis and providing national and international leadership on aquatic GAP projects.

Strategy 1. **Provide long-term programmatic and financial stability for the program**

Action 1. Develop and implement a data archiving plan to ensure that legacy data sets continue to be available in the future.

Action 2. Broaden the use of GAP funds to leverage other program funds within and outside of USGS in order to maximize the impact of limited funding.

Strategy 2. **Provide direction for aquatic GAP projects.**

Action 1. Develop data standards and methods.

Action 2. Develop and disseminate handbook for Aquatic GAP Program to all projects.

Action 3. Develop a “good housekeeping seal” process by which to evaluate and improve aquatic GAP projects.

Action 4**.** Develop a RFP procedure to recruit new proposals that rely on established priorities for the aquatic GAP program.

Action 5**.** Use the national USGS GAP program and the aquatic GAP steering team to develop guidance, direction and priorities for the program using input from other

USGS programs, the aquatic GAP science committee and other interested stakeholders.

Strategy 3. D**evelop strong advocacy partners at the national and regional levels.**

Action 1. Develop positive and consistent messages that national partners can use when supporting the program.

Action 2. Highlight products to partners and solicit feedback on their utility.

Action 3. Conduct user needs assessment, particularly with national organizations such as Federal, and tribal agencies and IAFWA.

Strategy 4. **Engage the USGS leadership in key decisions**.

Action 1. Seek leadership assistance in defining and integrating multiple GAP efforts, particularly those involving the integration of aquatic and terrestrial GAP.

Action 2. Acquire leadership support for annual program of work and budgets needed to successfully execute that program.

Strategy 5. **Develop a program evaluation methodology that provides a biennial review of the entire aquatic GAP program.**

Goal 4. Provide a Strong Research and Modeling Component

GOAL STATEMENT: Continue a strong, nationally recognized program that focuses the aquatic GAP program on the development of aquatic products and provides national leadership in the area of aquatic species, habitat interactions.

Strategy 1. **Develop statistical models of vertebrate and macroinvertebrate distributions based on an analysis of geomorphology and environmental variables.**

Strategy 2. **Develop a research program that explores classification of wetlands, lakes, estuary, and nearshore aquatic systems. Support development of theoretical first principle models that assures that statistical models are consistent with theoretical predictions. Develop research studies that reconcile theoretical approaches with statistical models.**

Strategy 3. **Develop and continue to coordinate the aquatic GAP science committee that consists of experts in the field of aquatic biology and natural sciences.**

Strategy 4. **Improve research and analysis of the relationship between aquatic habitat conditions and aquatic species status and trends.**

Goal 5. Develop Strong Partnerships

GOAL STATEMENT: Strong, vibrant partnerships with customers and organizations representing customers are necessary to maintain support for Aquatic GAP and to maintain the relevancy of the program to their needs.

Strategy 1. **Develop a clear understanding of the role that each partner will play with Aquatic GAP.**

Strategy 2. **Engage national level nongovernmental organizations. (IAFWA, TNC, etc.).**

Action 1**.** Participate in, and highlight GAP accomplishments at, important partner meetings.

Strategy 3. **Where applicable, work with other Department of the Interior agencies on programs such as the Endangered Species Act, Federal Assistance, and others where GAP can be useful.**

Strategy 4. **Reach out to "nontraditional' partners (government agencies), such as the Federal Highway Administration, state departments of transportation, Department of Energy, Department of Defense, etc.**

Strategy 5. **Develop Inter-agency oversight committees as a requirement of every aquatic GAP project.**

Implementation

Continued dedicated support from the USGS and DOI will be required to achieve this strategic plan's ambitious vision for the aquatic component of the Gap Analysis Program. Additionally, as the aquatic program component grows, it is the responsibility of the GAP Headquarters and the GAP National Program Office to ensure that the growth is channeled toward support of the goals, mission, and objectives of the aquatic component of GAP. Through the program efforts, information obtained from the aquatic Gap Analysis will continue to become available to assist federal, state, and local environmental policymakers identify constraints and opportunities in a timely fashion, and help avoid environmental train-wrecks that lead to last minute invocation of the Endangered Species Act and other expensive and disruptive single-species crisis management policies. Aquatic gap analysis will provide managers, planners, scientists, and policy makers with the information they need to make better-informed decisions to protect and conserve aquatic systems. It is in this ultimate implementation that the aquatic component of GAP fully supports and embodies Secretary Norton's vision of conservation through cooperation, consultation, and communication.

Appendix I: Projects that could Advance Aquatic GAP Goals

- Columbia River Assessment
- Suwanee River – SE (Note that Ted Haine already started a project in FL)
- Everglades
- Upper Mississippi River
- TNC all aquatic ecoregions (ie, in central plains)
- Brook Trout project
- CALFED – Sacramento Delta
- State Comprehensive Plans: every state doing some kind of aquatic gap component to write conservation plans, most using GAP data for terrestrial component
- State-based forestry plans
- EPA Ecological risk assessments (i.e., Region 7 using GAP data)
- Verde River Water Association (Lower CO River multi-state plan) (AZ)
- National Fire Planning
- FWS watershed modeling
- EPA Star Grants (ongoing)
- DHS developing geospatial data sets , i.e., socioeconomic data sets, deals with human stressors
- NRCS NRI Program (but difficult to get data)
- Southwest Amazon (integrated terrestrial and aquatic)
- WWF International Watershed Assessment
- Sierra Nevada project
- Chesapeake Bay
- Russian/Mongolian Watershed Assessment
- Ontario – Great Lakes Canada GAP, Ontario portion of Great Lakes (Ontario Ministry of Natural Resources)
- TNC watershed assessment in South America (marine and fresh water)
- Bolivia and Peru (NatureServe)
- Yellow River, China (TNC)
- NAWQA urbanization projects
- National River Restoration Synthesis (M. Palmer)
- NAWQA NEET Program
- NAWQA mercury study looking at aquatic systems, i.e., toxicity
- NRIS (USFS)
- US Forest Service Plans
- EPA EMAP (e-map)
- SCORP NPS (stream inventory) - St. Croix
- NPS I&M Program (user)
- Mekong River
- BLM Snake River
- BLM & FWS (fish passage)
- State-based monitoring
- Rio Grande / Mexico

Appendix II: Potential Aquatic GAP Customers

Aquatic GAP Customers	Proposed/potential Uses of Aquatic GAP Data
Transportation agencies	Ecological assessments for roads
Current GAP partners using data	
State and federal natural resource agencies	• EPA: 401 & 404 permit review process (for Env Impact statement) • Drive future sampling and biomonitoring efforts • Analysis of status and trends of habitat and biological communities • Monitoring plans • Fisheries regulations • Develop wildlife conservation strategies • Trends for developing a national scale (i.e., Heinz Center) • County boards and local regional planning commissions (tools – DSS) • Advocacy groups (lobbying groups) – local and multi-scale • Land trusts • Water modeling • Mitigation banking (i.e. for wetlands) • Species recovery plans • Tiered aquatic use (EPA) • Regional biocriteria (EPA)
Private companies	• mitigation banking (real estate developers • federal land use management plans (real estate developers)
Private landowners	mitigation banking
Researchers	Mechanistic
Power companies – federal and private	Facility and infrastructure siting; mitigation measures; etc.
Anglers and other user groups	Resource distribution maps; educational materials, etc.
NGOs	Classification of habitats
Watershed groups	Watershed planning
Congress, GAO	Policy making
Tribal agencies	Resource management, etc.
Education	Educational products (I & E folks)
Marine and coastal agencies	Resource management, permitting, etc.