What if you could find the location of any park or protected open space in the United States? By zooming in on a map you could see detailed boundaries and all nearby protected lands, and you could analyze this data to inform decisions about conservation, recreation, or land use planning. For the first time, you and millions of others would have a reliable, current inventory of all of the nation's protected areas.

We're actually almost there — turn this page to find out the steps we need to take to make this vision a reality...

A MAP FOR THE FUTURE

Creating the Next Generation of Protected Area Inventories in the United States

PAD-US will give the American people a full accounting of all of our investments in protected areas — this comprehensive inventory of wilderness, parks and open space is essential for more effective conservation plans, land management and recreational access. Guided by a public-private partnership, PAD-US will collaborate with states, federal agencies, land trusts, local governments, private businesses and other groups to maintain a comprehensive record of America's land conservation accomplishments.

— *Ken Salazar, Secretary, U.S. Department of the Interior*

July 2009 | **The Protected Areas Database—U.S. (PAD-US) Partnership**

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The **PAD-US Design Project** was created to develop the organizational and technical strategies proposed in this report. The members of the project steering committee thank the Doris Duke Charitable Foundation (and the National Fish and Wildlife Foundation) and the USGS Gap Analysis Program for the financial support that made this effort possible.

The **PAD-US Partnership** was created by the Design Project Steering Committee in April 2009 as the coordinating organization for further developing and managing a national protected areas inventory. The Partnership's founding members include: the U.S. Geological Survey, Bureau of Land Management and USDA Forest Service; the Conservation Biology Institute, The Nature Conservancy and Land Trust Alliance.

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PAD-US
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SUMMARY

It's time to create a comprehensive and current inventory of America's protected lands — a Protected Areas Database of the United States (PAD-US). A public-private collaboration, the PAD-US Partnership, is bringing together the best practices and resources of federal, state and non-governmental groups to achieve this goal.

Over the next three years, the PAD-US Partnership will oversee the transformation of current protected land inventories:

- A **single database** will focus many state and national efforts into a highly flexible and technologically robust nationwide data management system.

- **States** will be supported with resources to greatly improve their inventories that in turn form the foundation of the national data.

- **Federal** agencies will improve their coordination and data gathering, gaining better overall information for less cost.

- The **usefulness** of protected area inventories to the public, government and business will grow, enabling much more evidenced-based global, national, regional and local conservation planning and assessment,

PROTECTED AREAS IN THE UNITED STATES

Protected Areas are lands dedicated to the preservation of biological diversity and to other natural, recreation and cultural uses, and managed for these purposes through legal or other effective means.

This map shows the data from the first PAD-US, released in April 2009 by USGS GAP, and based on federal, state and other inventories gathered by GAP, Conservation Biology Institute and The Nature Conservancy. Future releases will improve coverage and have a more robust data structure. Download PAD-US at: http://gapanalysis.nbii.gov/PADUS

In many areas of the U.S., there is only incomplete mapping data on what lands are protected open space. In this California example, data sets from just four years ago showed only a partial picture of all the publicly protected lands in a coastal region (at left) — a new, comprehensive and highly accurate state inventory shows the full picture (at right).

far more accurate land use and acquisition planning, and easier and more complete public knowledge of recreational opportunities.

■ Emerging challenges of how to address **climate change** and improve **fiscal and economic productivity** will be better met by this confluence of many unconnected data gathering efforts into a single system for planning and monitoring.

This ambitious agenda is challenging but extraordinarily timely. The plans of public and private organizations, the capacity of technology, and the driving need to finally assemble a full national database of protected areas have all converged to make this the exact right moment for launching the Partnership and PAD-US.

The Partnership has already secured much of the funding needed to achieve this agenda, but needs to ensure that the entire program is fully supported, financially and organizationally. We welcome new partners who can support the PAD-US project with funding or in-kind contributions.

We invite you to join us in taking this great step forward.

STARTING POINTS

America's tremendous asset base of protected lands is critical for biodiversity conservation, resource management, recreation and more. But a failure to keep up good accounting for this asset has left us unclear about what we have. The PAD-US Partnership is a public-private effort to substantially improve our inventories of precious natural lands and is issuing this report as a call to action.

America's Natural Legacy

An expanse of prairie grassland…a national park of soaring granite peaks and lush valleys…a river parkway that runs for miles…wetlands that host clouds of migrating birds…a city park filled with kids playing…working forests that stretch as far as the eye can see…vast deserts that hold secrets of beauty and life…

When these lands are owned outright or under a conservation easement by an agency or non-governmental organization dedicated to keeping them as natural open space, they become a key part of America's legacy of protected areas. They include national parks and forests, state beaches and parks, county open space reserves, city parks, land trust preserves and many other types of holdings. Altogether, these areas extend over 1 million square miles and are owned and managed by thousands of public agencies and non-profit organizations that together serve the 300,000,000 people in our 50 states.

This is America's natural asset base — the lands that we have secured for biodiversity conservation, recreation, scenic value, resource management, watershed health, community well-being and much more.

We're Not Keeping Track of Our Land Assets

While many individual agencies and a number of states have developed effective inventories of protected areas, these individual parts fall short of making up an authoritative, effective national database.* The fact is, we spend billions on land conservation but don't invest well in managing data that could tell us how to better prioritize acquisitions or how to respond to challenges like climate change, loss of habitat and growing recreation needs. If we were a private business, we would likely flunk our audit on the basis of not knowing our asset inventory well enough.

A Geographic Information Systems (GIS) database, where software and spatial data are used to accurately locate and describe features and places.

There is good news in this picture: it is likely that we have as much as ninety percent of all protected areas in current geospatial inventories. But some of this data is not highly accurate or standardized, and is not regularly updated. Further, with recent large expansions of funding for land protection coming from state and local actions over the past several years, we're falling behind in keeping track.

The PAD-US Design Project

Over the last five years, there has been a growing sense of urgency in addressing this issue. The PAD-US Design Project was created to develop a strategy for moving forward. The project came about from the convergence of a *major foundation* (the Doris Duke Charitable Foundation) needing better information on determining the conservation impact of their philanthropic investments in land protection, *public agencies* (US Geological Survey, US Forest Service and Bureau of Land Management) needing to improve the extent and timeliness of their land inventories, and a number of *nonprofits* (Conservation Biology Institute, The Nature Conservancy and others) working to provide data for education, research and planning, and support of public decision making.

In 2007 the Duke Foundation commissioned a brief assessment by Lyme Timber Company Conservation Consulting Services and the non-profit GreenInfo Network, from which emerged a consensus that a major effort was needed to advance a broader design for protected areas data. That larger project began in May, 2008, co-funded by the Duke Foundation and the U.S. Geological Survey Gap Analysis Program and coordinated by GreenInfo Network with support from the Conservation Biology Institute.

During the course of the PAD-US Design Project, teams of experts have worked on proposing key elements of a much-improved system for keeping track of protected areas in the U.S. This work has been coordinated by a steering committee of federal agency and non-profit organizations, and advised by state agency leaders and outside consultants.

In early 2009, the Design Project transformed into the PAD-US Partnership, signaling the commitment to major, continuing steps forward toward the vision developed in the Design Project.

A Map for the Future summarizes the work of this project and announces a formal partnership to lead in the implementation of the recommendations for a Protected Areas Database of the United States.

THE IMPORTANCE OF A BETTER INVENTORY

Good decisions require good information. A complete and current database of protected areas is a critical tool for national, state and local agency land managers, land use planning endeavors, foundations and other funders, land trusts, the general public, private real estate businesses and others. It's also an essential resource for meeting our global reporting responsibilities, as well as a means to greatly advance existing systems of land planning.

A National Inventory Has Broad Benefits

For those working in a particular locality or just within the bounds of land management for a single agency, a comprehensive national dataset of protected areas may at first seem to be of modest value. In the few states where complete data already exists, that inventory may meet most local planning needs.

But there is a strong case to be made for maintaining **a thorough national inventory**, in addition to any more localized systems.

■ **Measures of Conservation Accomplishment** — One of the driving reasons for a better national inventory is to answer the question, "are we succeeding in protecting biodiversity in the face of extreme land use threats to nature and ourselves?" We don't have a good response to this critical issue, because we don't have the data that clearly tells us how we're doing. Foundations, research organizations and agencies, legislators and governors — all need a common base of information to inform their own evaluations and decision making.

■ **Open Space Acquisition Planning** — In this era of limited financial resources, we need to be efficient with public funding of any type. Without a clear understanding of where protected lands are, we can't make the best prioritization decisions for future protection. Those who fund acquisitions — from foundations to agencies, to voters — all need to be assured that land protection is strategic and effective. The looming impacts of climate change make having such an inventory even more critical, as rapid shifting of habitats requires us to determine migration pathways in the pattern of existing protected areas.

■ **Expanded Recreational Access** — With renewed emphasis on active living and growing reliance on web searching for leisure opportunities, having a clear national source of all protected parks and open spaces provides many citizens and businesses with information they need, all in a consistent manner.

MEASURING BIODIVERSITY CONSERVATION

In the United States, the long standing measurement of land protection for biodiversity purposes comes from the U.S. Geological Survey's Gap Analysis Program (GAP). Gap status codes of 1–4 rank highly protected lands (wilderness areas, national parks, etc.) down to lands for which no planned protection is known. Globally, the International Union for the Conservation of Nature (IUCN) has a 10 step ranking process. There are efforts underway to expand these ranking systems to capture more details about the effectiveness of stated conservation intents. PAD-US is designed to accommodate GAP, IUCN measures and other future strategies to expand conservation measurement.

CASE STUDY

HOW DOES A PAD-US HELP?

The U.S. Forest Service needs to develop an accurate and comprehensive analysis on the amount and condition of protected old-growth forests across all ownerships in a region in order to ensure that management on National Forests is contributing sufficiently to maintaining habitat for endangered species. The analysis depends on having objective classifications of protected status for all public and private lands within and surrounding the National Forests in order to correctly classify and analyze forest inventory data. The lack of accurate information on the conservation status of all the forests in the region makes it difficult to justify conservation decisions on the National Forests themselves.

PAD-US will be a valuable resource when used in services such as Data Basin, a major conservation data web center created by Conservation Biology Institute, where users can create their own maps and add their own data. www.databasin.org

■ **Better State Data and Collaboration** — Where a state does not maintain a full inventory, a national system may be able to fill in the gaps, by building up the state's base lands inventory and by improving their technology practices. Where two or more states adjoin, a national data set can support more efficient regional land use planning.

■ **Public Education and Engagement** — Knowledge fuels action: when people understand why landscapes are important, they're more highly motivated to vote for funds and other actions that can protect them. Having a full national database will be a valuable asset for efforts like LandScope America (a biodiversity web portal), for the news media covering natural resource stories, and for many other efforts.

■ **Global Reporting** — A thorough national database will allow the U.S. to better meet key treaty obligations for reporting on the state of conservation to the World Conservation Monitoring Centre, the Commission on Environmental Cooperation (CEC) and other international organizations. It may even assist other countries struggling to find effective inventory strategies.

■ **Support for Private Land Owners and Land Trusts** — When considering the option to place their land under easement, private landowners (and nonprofit land trusts) need a reliable and easy-to-access information source that lets them see what is nearby, what other lands are protected. Efforts like Landscope America and the Private Landowners Network are also working to provide other helpful information on biodiversity and property ownerships, and will greatly benefit from an improved PAD-US.

■ **Tools for Businesses** — Current economic crises underscore the absolute importance of investing with a clear understanding of context. Title companies, real estate developers, hazard insurance businesses and others need to have easy access to precise patterns of public ownership before committing finances to particular places or customers.

■ **Collaborative Learning** — A national protected lands database system is a useful laboratory that can help state, regional and local land inventories and data management systems. The PAD-US will enable extensive sharing of new technology and best data practices for data management among states and agencies.

By building on current inventories and transforming them into a single and more robust land tracking system, we can create tangible and important benefits for the public, governments and private business. The PAD-US Design Project is setting out the road map for this crucial journey.

WHERE WE STAND NOW

As much as 90 percent of all protected areas may now be in GIS inventories, but incompleteness of data, varied formats, data structures and core elements, accuracy issues, timeliness of updates, and lack of funding to assemble multiple sources of data stand in the way of a truly effective national inventory. Using emerging technology opportunities, the strong base of data that does exist and the new strategy of the PAD-US Partnership, there is now an outstanding opportunity for moving forward.

Inventories of protected areas exist at all levels of government and among many non-profits. Together these lands add up to as much as ninety percent of all protected areas in the United States. Where does this data all come from?

- **Local** (cities, counties, etc.) — 3,000 counties and 20,000 cities, plus many other special recreational and regional open space districts comprise the local government element of protected area inventories. For local governments, most such lands are parks and related recreational facilities, but also include watersheds, habitat areas and other resource lands. Some local governments maintain good geospatial data, but many do not — and most data is in inconsistent formats, making it hard to assemble into larger sets. But these lands are crucial to the national picture — local open space acquisition has been rapidly growing in the last decade, with over $7 billion approved in taxes and bonds in 2008 elections.

- **States** — Each of the 50 states in the U.S. has half a dozen or more agencies that hold protected open space. Fish and wildlife agencies, parks departments, specialized resource agencies for coasts, waterways, forests and farming all protect land that needs to be tracked. Some states have highly effective inventories, but many only have inventories in individual agencies and few track local government lands, or easements. In some areas, statewide non-profits (land trusts or other organizations) play key roles in tracking protected lands data and need to be engaged in connecting their information to an overall system.

- **Federal agencies** — Approximately 10 federal agencies administer millions of acres of protected open space areas, including the National Park Service, Bureau of Land Management, Forest Service and Fish & Wildlife Service. In general, these agencies maintain effective land inventories, although there are challenges in the fit between them, varying data scales and the

LAND STATUS IN THE U.S.

Private 76%

Local/NGO 1%   State 3%   Federal 20%
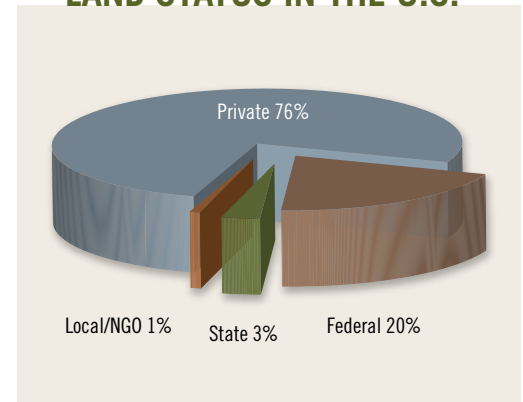
The current national inventory of protected lands shows 715 million acres held by federal, state and local agencies and by non-governmental organizations (fee lands only — easements would add at least 40 million acres), out of a total land area of 2.3 billion acres. Improved inventories will likely raise this figure some as more state, local and NGO lands are accounted for.

April 2009, marked a milestone with the release of version 1.0 of PAD-US by the USGS Gap Analysis Program. Updates and improvements to this will be made by the end of 2009, resulting in a version 1.1, to be created by the Conservation Biology Institute and USGS. This first publication of PAD-US has emerged from two major data gathering efforts:

■ **The CBI Protected Areas Database (PAD)** — First published in 1999 by the non-profit Conservation Biology Institute, the PAD is a national data inventory of federal, state and many local lands, with conservation rankings (GAP and IUCN scores). Updates have been published several times, with support from federal agencies and private foundations.

■ **USGS Gap Stewardship Layer** — The U.S. Geological Survey Gap Analysis Program (GAP), started in the mid-1980s, provides a national view of several types of biodiversity data and extensive conservation assessments. Like the PAD, the Stewardship Layer tracked protected areas, primarily at state and regional levels and assigns GAP and IUCN scores to each area. Prior to 2005, this data was gathered state by state, before transitioning to multi-state regions and releasing a national database in 2008.

The PAD-US version 1 data is also being used in global conservation assessments by the World Conservation Monitoring Centre and the Commission on Environmental Cooperation. To download PAD-US, go to: http://gapanalysis.nbii.gov/PADUS

fullness of attributes about holdings. For federal agencies, the need is more for integration and coordination than data development.

■ **National nonprofits** — The Nature Conservancy (TNC), along with Ducks Unlimited and other groups that work across all states have data systems that track their own protected lands. These are sometimes implemented state by state, but TNC has developed a framework for a full national accounting of its substantial land holdings, making easier the connections to a national inventory. One TNC program in the northeast states has made great progress in building a regional protected lands data collaborative. The Land Trust Alliance and other groups are working on how to improve protected areas data needed by the country's 1,700 local and regional land trusts.

■ **Easements** — While the PAD-US proposal presented here does not directly address tracking data about lands protected by conservation and other easements, a parallel project to do that was initiated in mid-2009. Sponsored by the U.S. Endowment for Forestry and Communities, this two year effort will create a database compatible with PAD-US and assemble existing data into a national inventory. Key partners in this work are the Conservation Biology Institute, Ducks Unlimited, Defenders of Wildlife, NatureServe and The Trust for Public Land.

While many state and federal inventory efforts are conducted by agencies with statutory mandates to manage land resources (e.g., state departments of natural resources, park deparments, land boards and other agencies, and Federal land management agencies like the BLM, USFS, NPS and USFWS), some inventories are done as part of State Natural Heritage programs. Other collective efforts include work by park and recreation agencies to define special standards for their data needs, through the National Recreation and Park Association, and the efforts to support implementation of State Wildlife Action Plans, coordinated through Defenders of Wildlife and other groups. The PAD-US project has taken these programs into account in making its recommendations.

What's Missing From Current Inventories?

Protected lands inventories at all levels vary from extremely accurate and complete to sparse. In general, however, there are two major shortcomings of existing inventories that require improvements:

#1 — Data Quality Issues

- **Completeness** — few state data inventories include all holdings at state, regional, county and city/town levels, and many states do not have integrated data even across state agencies. With the huge amounts of local bond funding for protected areas acquisition over the past decade, not tracking these sub-state lands is a major gap. In addition, easements and data about lands protected for defined periods of time are inconsistently tracked.

- **Timeliness** — some states and agencies update their holdings every year or two, others have longer gaps (however, one federal agency, the U.S. BLM, updates its data every day!).

- **Data standards** — attributes for protected areas are often incomplete or inconsistent, and methods for gathering together data can be hit or miss. This hinders the ability to create consistent data at regional, statewide, or national levels.

- **Conservation status and other coding** — lands that haven't been inventoried do not have conservation codes (GAP, IUCN), and more refined coding is needed in some areas. Other important codes, such as public access status, may not be present.

- **Spatial Accuracy** — in some areas, holdings are official ownership boundaries (parcels or tax lots), in others land boundaries are defined on quadrangle maps with mixed accuracy. The lack of consistent coastlines and water boundaries also creates complications.

- **Technological Tools** — there is limited awareness and use of special GIS applications that can greatly improve data collection and aggregation.

#2 — Ability to Sustain Ongoing Inventories

Perhaps more significant than the weaknesses of existing data is the lack of funding and organization needed to ensure good inventories by states, federal agencies and NGOs, and to aggregate those into a solid national product. While some states and agencies function well, more often there is limited funding for assembling aggregate data, and unclear responsibility for how to organize this work. The PAD-US Partnership believes that the issue of creating reliable, ongoing support for effective protected area inventories at the state and national level is equal in importance to the technical concerns noted above about the actual data on these lands.

BEST PRACTICE EXAMPLES FOR U.S. PROTECTED AREA

Montana: The only state in the U.S. with a required registry for all easements that includes GIS data about exact location and associated information, Montana manages its data set through its State Library. The inventory has primarily state and federal holdings, with some local data, plus extensive easement data. http://mtnhp.org/stew.asp
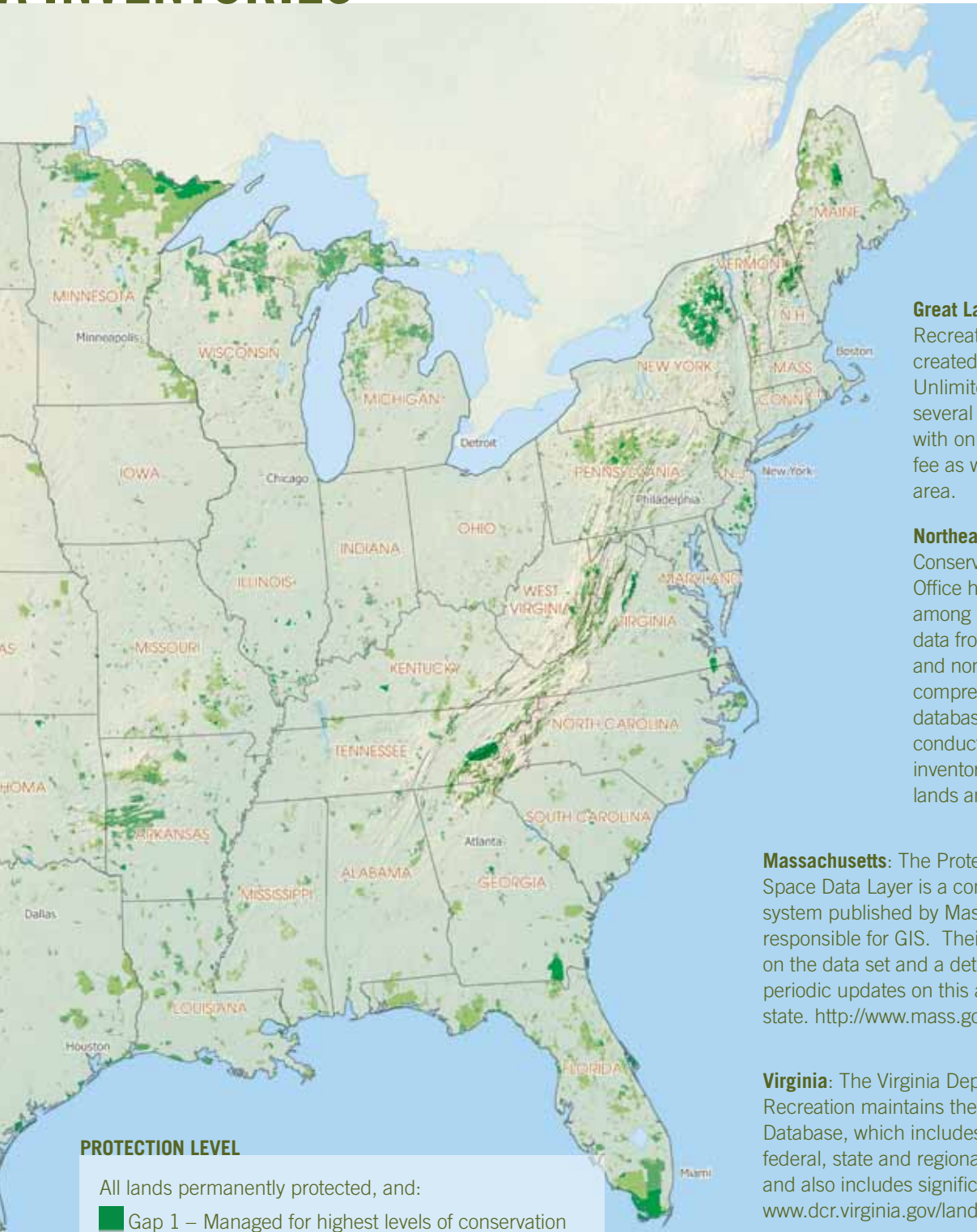
California: The non-profit GreenInfo Network has developed the California Protected Areas Database (CPAD) through assembling funding from many resources, and is now at work on a memorandum of understanding among these agencies and non-profits that will provide for ongoing support of data updates. CPAD contains data on 48 million fee acres in almost 50,000 holdings. http://www.calands.org

Colorado: COMaP (Colorado Ownership Management and Protection) is the state's inventory program, which is housed at Colorado State University's Natural Resource Ecology Lab. Their most recent inventory was published in late 2008 and includes substantial local government and NGO holdings, in addition to state and federal lands. http://www.nrel.colostate.edu/projects/comap/

Federal lands: The BLM's Surface Management Agency data layer (part of the BLM NILS system) portrays tracts of federal land for the United States and classifies these holdings by administrative agency. Multiple federal agencies have contributed the most authoritative geospatial data to the contents of this layer and it is in a continuous state of update. This geospatial layer is a crucial component for land use analysis and decision support.

HAWAI'I

ALASKA

Great Lakes: CARL (Conservation and Recreation Lands database) was created and is maintained by Ducks Unlimited as a regional data set for several Great Lakes states, complete with online browser. The system has fee as well as easement data for the area.

Northeast Collaborative: The Nature Conservancy's (TNC) Eastern Resource Office has developed a consortium among 14 TNC state offices collecting data from federal, state, local, private, and non-profit sources to create a comprehensive protected areas database for the region. TNC has conducted this tax-parcel based inventory of both fee and easement lands annually since 2005.

Massachusetts: The Protected and Recreational Open Space Data Layer is a comprehensive, tax parcel based system published by MassGIS, the state agency responsible for GIS. Their web site has rich information on the data set and a detailed newsletter provides periodic updates on this and other GIS work by the state. http://www.mass.gov/mgis/osp.htm

Virginia: The Virginia Dept. of Conservation and Recreation maintains the state's Conservation Lands Database, which includes protected areas data for federal, state and regional agencies and organizations, and also includes significant easement holdings. http://www.dcr.virginia.gov/land_conservation/tools02a.shtml

PROTECTION LEVEL

All lands permanently protected, and:

- Gap 1 – Managed for highest levels of conservation (wilderness areas, etc.)
- Gap 2 – Managed for continuation of natural state
- Gap 3 – Managed to allow for intensive resource use

Not shown: Gap 4 - lands without protection from conversion

data source: PAD-US version 1.0, 2009

A land protection agency of the U.S. government receives a request from a Congressional committee considering proposals for mining and drilling in a number of regions of the country. How much protected land is at stake in this debate, they want to know? The agency manager is forced to respond with what he thinks are the best estimates for federal lands involved and can only make a reasonably informed guess about state and local lands, as there is no easy source for that data.

An Opportunity Now

As serious as these challenges of data quality and sustainable funding are, the PAD-US strategy now offers us a way forward:

- **Needs** are rapidly growing for government agencies and foundations to be more efficient and effective in targeting land for protection, particularly in light of current fiscal and economic difficulties. Accurate land inventories are critical to sound public and private decision making.

- **Technology** has rapidly progressed in the past five years to aid in developing good inventories. The widespread availability of high quality air photography is a resource for accuracy (and a driver of public expectations for same). Tools like Google Maps and other mashups offering a wide range of simple online mapping applications, the increasing prevalence of GPS devices and data, advances in GIS software and other mapping technology — all of these provide a golden opportunity for doing much more for far less cost than ever before.

- **Parcel maps** in GIS format are increasingly common in states and counties (there is even a long-term national effort to assemble all of these into a "framework" data layer). While significant issues remain, protected areas can be more easily tracked with official parcel data available.

- **Standards** are badly needed to coordinate the growing number of local and state protected areas datasets, to ensure that integration at state and national levels is efficient and to improve the overall quality of data being gathered.

- **Collaboration** is increasing among many governments, across non-governmental sectors and in philanthropy. Efforts to develop and share information used by a wider audience all help inform and spur the protected areas initiative.

- **State and local funding** for protection of open space has grown dramatically over the past decade. In the 2008 elections, over $7 billion dollars were authorized in state and local measures and taxes — far more than the overall federal budget for land acquisition. Much of the future increases in protected lands will come from these state and local efforts and inventories must account for them.

- **Momentum now** — finally, and not least — **the PAD-US strategy** has created a surge of interest and support that can now be taken advantage of. Failure to seize this opportunity will set back for many years the prospects for a more effective national database of protected lands.

THE PAD-US SYSTEM

The PAD-US system consists of technology, standards and a collaborative organization. Its database technology uses emerging capabilities in GIS to integrate many data sources into an inventory that can then be distributed in many forms to many users. The PAD-US data standards create a common framework that can be incorporated by states and agencies into their own inventories. The organization leading this system is the public-private PAD-US Partnership.

A national database that contains information on almost all protected lands in the U.S. is a bold initiative — but it's also feasible and close at hand. The specifics of how the database is to be organized are driven by the vision adopted by the PAD-US Partnership (see sidebar).

The initial focus of PAD-US is on **fee-owned lands** that are protected in perpetuity. Efforts to incorporate data on private land **easements** will be undertaken in a parallel effort that balances the needs of private owners with the importance of knowing where easements are for strategic conservation assessments, acquisitions and land use planning. PAD-US will also begin with emphasis on lands critical for biodiversity preservation, but at the same time enhance data on recreation and other open space lands.

Other protected areas data will also be considered in the future — marine protected areas, lands protected for limited periods of time, and other types of restrictions will be evaluated for inclusion into PAD-US.

The PAD-US takes advantage of a rapidly growing movement in information technology — aggregation of like things into overall collections. Work by the Federal Geographic Data Committee to define and compile "framework" data sets as part of a National Spatial Data Infrastructure (NSDI) underscores this trend. Also, with the advent of extensive web-based mapping, there is a broad popular expectation that a user can "drill down" into data, zooming in for more details. Over time, PAD-US will meet these needs.

The **PAD-US Database Design** includes both *technology* and *standards*, as well as the organization of the *PAD-US Partnership* to ensure sustainability on the inventory effort.

PAD-US VISION

A spatially explicit inventory that lets any user — from the general public to professional land managers — know exactly what lands are protected anywhere in the United States and allows them to easily use this inventory in conservation, land management, planning, recreation and other uses.

PAD-US DATABASE DESIGN STAGING

|	
2009–2010	System design, PAD-US version 1, Partnership, preparation for implementation
2010–2012	Full system implementation, PAD-US v.2, support for states' data, integration technology
2012+	Ongoing operation and continued development

I. PAD-US — Database Design

How Data Will Be Gathered

The key to PAD-US is the quality of the component data sets that are integrated into the national system. Some agencies, states and organizations have very complete and well-structured data and their information can be easily imported into PAD-US. Others have data that will need adjustments and other revisions to fit into PAD-US. For some states, only partial data is available and the PAD-US effort may have to commission work to create and bring together missing elements to create a more complete statewide dataset. The proposed strategy for creating the full implementation of PAD-US therefore has two types of data organizations:

- **Data Partners**: groups whose data can be imported with little adjustment or who have the capacity to create data that can be easily imported. Data Partners also include specific contractors or other organizations designated by the PAD-US Partnership.
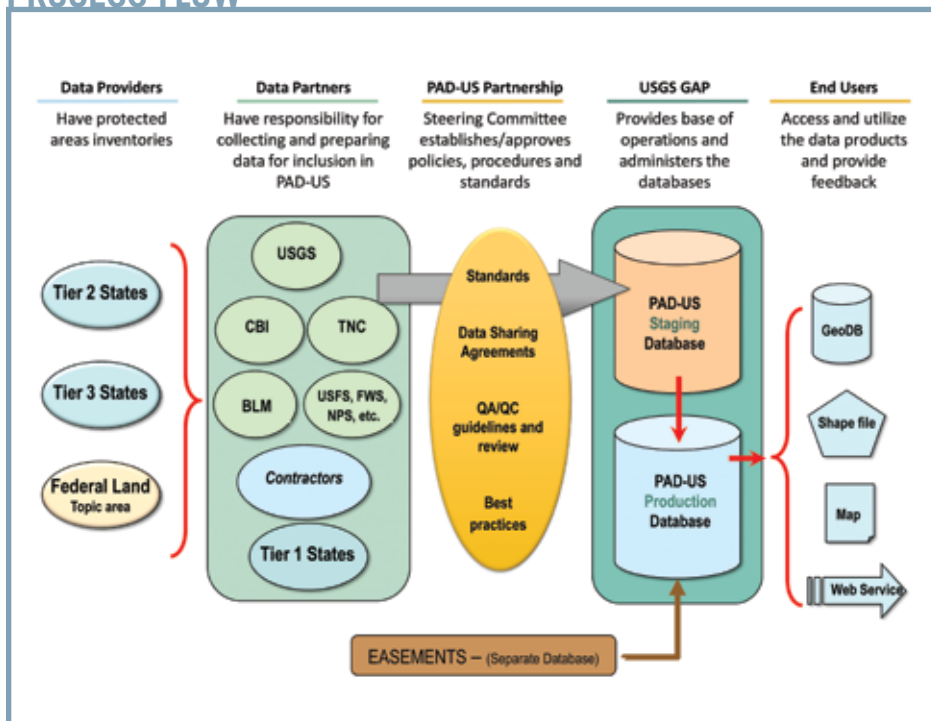
- **Data Providers**: groups who have data for a single agency or for some or all of a state, but whose data structure, content or quality is not fully compatible with the PAD-US database, and who will need support in the data gathering and formatting processes.

The data gathering and integration process is illustrated in the accompanying diagram. In addition to Partners and Providers, there is technical oversight by the PAD-US Partnership, to ensure data integrity and resolve policy level issues about designations, definitions, alternative sources, etc. Properly prepared data is held in a Staging Database until deemed sound enough to be moved into the master PAD-US Production Database which will be published to the public.

Once data has been aggregated into PAD-US a review process will then be initiated to allow for feedback and suggested corrections. It is extremely important to PAD-US to receive this type of user input and to establish processes so that input can be used to correct errors and improve data quality.

PROCESS FLOW

During PAD-US data gathering, some states will have complete inventories that fit well with PAD-US standards (Tier 1 States), others will need some assistance (Tier 2 States) or substantial assistance (Tier 3 States).
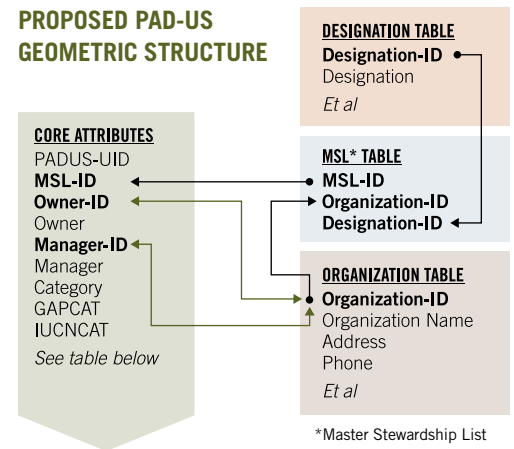
The Structure of the Database

Current protected areas databases are mostly "flat files" — each geographic object in the database has a series of spreadsheet-like columns that hold attributes about that object (name, size, owner, etc.). The PAD-US in its full implementation will use a more robust structure, the design of which is guided by these principles:

1. Be simple and intuitive while also capturing the inherent complexity of protected lands data

2. Support future growth and management efficiency by allowing for increasing automation of the data management and updating processes in the future

3. Preserve flexibility in the range of data products that can be produced

The key components of the PAD-US database are its *geometric structure* and its *core and supplemental attributes*. The proposed **geometric structure** (see diagram) promises a way past a key challenge in current inventories, arising from the fact that a single piece of land may be "protected" in several different ways. For example, a holding might be owned by an agency that is primarily dedicated to forestry, but part of this land could be separately designated as a Wilderness Area and another part managed as a recreational site, while cutting through both subareas could be a river conservation zone. The proposed PAD-US database design's geometric structure is able to maintain these overlapping designations and relate them to the core land parcel. In this structure, the most basic element is the ownership boundary, with other designated forms of protection (e.g. the Wilderness Area) overlaying this base line geometry.

The second key element of the PAD-US database structure is a set of **core and supplemental attributes**, the descriptors of lands in the inventory. The initially proposed core attributes (the information available for *all* features in the inventory) are shown in the accompanying table. Additional, specialized attributes that may not be available for all features will be considered during the full implementation of PAD-US and can be established through relational tables.

Critical to the success of PAD-US is a highly detailed system for defining how any protected area is designated, or managed. A land parcel could be a state beach, a wildlife refuge, a research forest or any of over a hundred different protection designations. The **Master Stewardship List** (MSL), developed as part of the PAD-US by the US Geological Survey, which will be expanded to include additional designations, implements an organized listing and associated coding of all such protection designations. The list identifies all specific management designations of federal agencies (National Parks, Areas of Critical Environmental Concern, etc.), and also sets forth common designations (e.g., City Park, State Historic Park, Regional Watershed, Land Trust Preserve, etc.) for states and sub-state land management agencies and

PROPOSED PAD-US GEOMETRIC STRUCTURE

DESIGNATION TABLE
Designation-ID
Designation
Et al

CORE ATTRIBUTES
PADUS-UID
MSL-ID
Owner-ID
Owner
Manager-ID
Manager
Category
GAPCAT
IUCNCAT
See table below

MSL* TABLE
MSL-ID
Organization-ID
Designation-ID

ORGANIZATION TABLE
Organization-ID
Organization Name
Address
Phone
Et al

*Master Stewardship List

PROPOSED PAD-US CORE ATTRIBUTES

Field Name	Description
PADUS-UID	Unique Identifying number
Owner ID	Unique identifying number of agency
Owner Name	Entity that owns holding
Owner Type	Ownership category (9 - State, Federal, City, Private, etc.)
Name	Name of holding as received from the source ("Jones State Park and Recreation Area")
Standard Name	Standardized name according to established conventions ("Jones SP")
Category	Fee , Easement or Other
Manager ID	Entity responsible for management, if any
Manager Name	Entity that manages holding, if any
MSL ID	Master Stewardship List identifier code
Standard Designation	Designation name from MSL table
Local Designation	Designation provided by the source
Parent Site Code	Common code for multiple part protected areas
Status	Designated, Pending, or Degazetted
IUCNCAT	IUCN conservation measure
GAPCAT	GAP conservation measure
Access	Open, Restricted, Closed
State	U.S. state abbreviation
County	County name
Source	Source of the polygon data
Source Date Create	Year data first entered in PAD-US
Source Date Aggregate	Year aggregated data was provided
GIS Area	Measured from the data (units TBD)
Area	Area as reported by data steward
Comments	Comments from either the source or aggregator

organizations. The PAD-US system will track both the original agency designation as well as the standard MSL designation. The power of this designation system is its ability to support detailed analysis of protected area data (e.g.,"find all regional parks within 30 miles of a U.S. Fish & Wildlife Management Refuge") in a standard way.

Using Automation to Improve Efficiency

Moving from data gathering by manual procedures to a point where some or most data can be automatically incorporated into PAD-US is a key step for planning the future. The key to successful automation is for PAD-US to be built from partner supplied data sets, each of which already has most of the core attributes noted above. Getting to this point will take time, as states and agencies will need assistance and encouragement to create high quality, data and/ or to revise their current structures to better fit emerging PAD-US standards. PAD-US will establish defined rules that govern how data from each primary source is transferred into the national database "collection." While problems such as topology or differing ways of establishing attributes will need careful attention, if significant automation can be achieved, the costs of long term management and updating of the database could be significantly lessened.

Automation can never fully replace careful human quality control and the specific knowledge of protected lands data management. But moving protected area data integration into the new technologies that are fast-emerging, with appropriate attention to quality control, can result in a wider variety of data products and much greater cost efficiency in data management and update.

Publishing Products from the Database

At its core, PAD-US is a nationwide collection of base line data from which many products will be created:

- The full database in its GIS format, as a stand-alone file
- Data extracted by subject, jurisdiction or geography ("just lands that are Gap 2 and restricted access," or "all state parks for the southeast")
- More simply formatted data (e.g., shape files or KML files)
- Maps printed on paper or digitally (PDF, JPG, etc.)
- Statistical analyses of the numerical and other attribute data
- Web map services published from the database

During the next phase of this effort, a plan for serving PAD-US live via the Internet will also be implemented — this will enable GIS data users to receive or consume ongoing updates without having to reacquire the entire database.

For the Future

From this proposed database design, the following steps are necessary before full implementation of the PAD-US:

- Testing, refinement and creation of the proposed database, using appropriate GIS software

- Creation of the computer hardware system for editing, storing and manipulating PAD-US

- Coordination with federal efforts to integrate land ownership tracking among all federal agencies.

- Establishment of contacts and procedures for data collection/review for each federal agency, state, national land-holding NGO and including key individual agencies where states do not have statewide aggregated databases.

- Resolution of specific data management issues and challenges such as integration between existing tax parcel and PLSS* coordinate systems

   PLSS-Public Land Survey System

In addition, PAD-US will actively coordinate with the Federal Georgraphic Data Committee's efforts to promote the National Spatial Data Infrastructure (NSDI) as a non-framework data layer and to ensure proper coordination with the NSDI "cadastral" framework data layer.

**STATE BY STATE INVENTORIES—
THE KEY TO PAD-US**

States are critical to the success of PAD-US. Every state has some unique elements in how they maintain protected areas data, and PAD-US needs to build on those strengths to the greatest extent possible. In some cases, states have very complete data sets that can be easily incorporated into PAD-US; in other cases, only individual state agencies have protected lands data and there is no tracking of local and regional land holdings. The PAD-US Partnership will work with states to incorporate national standards to the greatest extent possible, and try to provide financial support to improve individual states' data holdings. Key partners in this work will include state and federal resource agencies with official land management responsibilities, State Natural Heritage network programs that manage biodiversity data, and NGOs such as land trusts and other national groups including Conservation Biology Institute, Ducks Unlimited, The Trust for Public Land and The Nature Conservancy, along with universities and other organizations.

II. The PAD-US Partnership

The PAD-US system includes both a database and an *organization*, the **PAD-US Partnership**. A voluntary collaborative, the Partnership is not a new agency or an independent institution.

The Partnership coordinates the work of improving and maintaining the PAD-US. Individual agencies and organizations contribute staff and/or funding which is applied to tasks agreed to in an overall work plan. The key functions of the Partnership are:

1. Define strategy and direction for PAD-US
2. Oversee database and data development operations*
3. Certify major PAD-US data products and standards
4. Resolve any disagreements over coding decisions
5. Encourage standards adoption by states and agencies
6. Develop support for states and other data partners
7. Manage funding (public and private) and agreements
8. Determine partner roles and responsibilities
9. Undertake education and outreach about PAD-US

Administration of the physical database is provided by the USGS Gap Analysis Program

Just as the data that makes up PAD-US comes from many different sources, the business plan for the Partnership has a variety of elements. For example, during 2009, improvements to the PAD-US version 1.0 will be made through the joint work of the Conservation Biology Institute and the USGS GAP staff. The two organizations are pooling their efforts to undertake coordinated improvements to PAD-US for a version 1.1 of the data.

During the major expansion of PAD-US during 2010–2012, federal agency staffing and additional resources will be sought to match private foundation funding. These resources will be leveraged with other data update projects that take place in individual states or regions.

Over the longer term, the Partnership expects to have appropriate increases in federal funding for core operations nationally, supplemented by special project funding from government or private sources, including possible relationships with commercial businesses.

Sustaining a consortium to manage a complex data process is challenging. The PAD-US Partnership considered alternative forms of structuring this enterprise, but concluded that the linkage of public agencies and nonprofit organizations offered the best choice by far. By providing broad stakeholder engagement, multiple bases of support and a wide range of creativity, the Partnership is the right organizational basis for this endeavor.

MAKING IT HAPPEN

The first preliminary protected areas database has been issued in 2009, with a major project to substantially expand the data at state and national levels anticipated during 2010–12. The PAD-US Partnership invites your participation in this project, by joining the organization, helping ensure your data is included, identifying funding opportunities and more.

The PAD-US system is being developed in these stages:

- **Early 2009** — Formation of the PAD-US Partnership, presentation of theTechnical design and standards for PAD-US; release of the first version of the PAD-US database by USGS GAP.

- **2009** — Education and outreach by the PAD-US Partnership and development of work plan for 2010–2012 efforts.

- **Summer 2009** — Initiation of a parallel project to improve data on lands secured by easements. This project will be supported by the U.S. Endowment for Forestry and Communities, and will be coordinated with PAD-US.

- **Late 2009** — PAD-US version 1.1 published through collaboration between USGS and the Conservation Biology Institute, including new PAD-US-proposed data attributes and significantly expanded coverage of protected areas below the state level.

- **Early 2010 through 2012** — Major project launched by the PAD-US Partnership to implement the full database design, to make major improvements in state and sub-state data and refine the ranking codes in the database. Publication of PAD-US version 2.0 with subsequent updates, plus initiation of PAD-US web service.

- **2012 and on** — Ongoing management of PAD-US through all agency and organization partners (published updates annually or semi-annually); further development of support to states for expanded data development; continued development of PAD-US capacities.

What needs to happen **next**? There is much to do to prepare for a major implementation effort to establish the full PAD-US. You can do the following to be a part of this project:

1. **Endorse**: Agencies and organizations need to join the voluntary PAD-US Partnership, by signing a standard endorsement letter, and, where appropriate, designating a data steward as a liaison.

2. **Fund**: Commitments are needed, particularly from federal agencies, for funding to match emerging private philanthropic funding for the 2010–2012 design implementation phase. Additional private foundation funding will also be sought for particular geographic areas and subject themes (local parks and recreation, lands in river corridors, etc.).

3. **Coordinate**: Liaisons and stewards need to be identified for each state (to join those in federal agencies and national non-profits), to help refine how PAD-US can best assist state inventory efforts.

4. **Standardize**: PAD-US data standards need to be finalized and begin to be incorporated into individual state, local and federal agency protected lands databases.

5. **Collaborate**: Partnership opportunities must be identified where PAD-US projects can help expand or leverage state or regional-funded efforts to improve protected areas data.

Current information on these and other next steps can be found on the PAD-US Partnership web site, **www.ProtectedLands.net**.

Conclusion

A comprehensive inventory of America's protected areas, providing support to conservation, land management, recreation and land use planning — all in a system that gives reliable and current information to decision makers, citizens generally, agency land managers, local planners, non-governmental groups and private businesses.

Achieving this vision is the purpose of the PAD-US Partnership. We believe that the value of this effort is paramount, with benefits flowing to every sector of the United States.

The creation of the Partnership, the publication of a first major data inventory and the technical recommendations that will form the basis of the fully implemented PAD-US data product all move us substantially forward on the path we've mapped out in this report.

We hope you will join us on this important journey!

WHAT YOU CAN DO

- Join the PAD-US Partnership
- Become a state or agency data steward
- Incorporate the PAD-US Core Attributes into your inventory
- Collaborate on funding opportunities
- Help us spread the word about PAD-US

Resources
PAD-US Steering Committee Organizations

PAD-US Partnership — www.ProtectedLands.net

Conservation Biology Institute — www.consbio.org

USGS Gap Analysis Program — http://biology.usgs.gov/bio/gap.html

The Nature Conservancy — www.tnc.org

Bureau of Land Management, NILS — www.blm.gov/wo/st/en/prog/more/nils.html

Land Trust Alliance — www.lta.org

USDA Forest Service (Research & Development, State & Private Forestry) — www.fs.fed.us

GreenInfo Network — www.GreenInfo.org

Other Resources
Links to organizations and projects related to PAD-US, partial list

National Biological Information Infrastructure — www.nbii.gov

National Fish and Wildlife Foundation — www.nfwf.org

Data Basin — www.databasin.org

NatureServe — www.natureserve.org

LandScope America — www.landscope.org

Trust for Public Land — www.tpl.org

Ducks Unlimited — www.ducks.org

Defenders of Wildlife Conservation Registry — www.conservationregistry.org

Teaming With Wildlife — www.teaming.com

State Wildlife Action Plans — www.wildlifeactionplans.org

Association of Fish & Wildlife Agencies — www.fishwildlife.org

Private Land Owners Network — www.privatelandownernetwork.org/grantprograms

National Recreation and Park Association — www.nrpa.org

World Conservation Monitoring Center — www.unep-wcmc.org

International Union for the Conservation of Nature — www.iucn.org

PAD-US

PARTNERSHIP