Completing America's Inventory of Public Parks and Protected Areas

AN ACTION PLAN FOR 2016–2020

A huge range of governmental, public interest, and private sector users need to be able to look at a map and find every park in America.

The Protected Areas Database of the U.S. (PAD-US) is the official national inventory of protected areas. Mostly complete for federal and state lands and waters, it needs to be finished for local parks and bolstered as a data management system.

Completing PAD-US in three years is achievable thanks to a range of efforts now underway. Taking advantage of this opportunity requires an investment of $7 million over three years — we invite your support of this initiative.

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EXECUTIVE SUMMARY

PURPOSE: This report defines and clarifies the nature and role of a national GIS database of public parks and other protected areas, describes how this database relates to other data and organizational initiatives, and sets forth an action plan for completing, using, and maintaining this data set.

VISION: A single, continuously-updated geospatial database that allows users to find exact boundaries and essential attribute information for every public park and other protected area in the United States.

Types of lands in the national inventory

Partial listing, from top left: national parks, habitat reserves, metropolitan regional parks, wilderness areas, national forests, wildlife refuges, urban parks, mini parks, marine protected areas; private lands with easements are not represented here but are in the national inventory.

WHY THIS PROJECT?

A spatial inventory of public parks and other protected areas throughout the United States involves a very large number of organizations and programs, and is crucial to **a wide range of public and private sector needs**. This project was undertaken to define and better understand the relationships between groups and needs, and to build agreement on and support for an agenda to **complete this database** over the next three years and provide it continuing support.

If we have comprehensive and accurate geospatial data for public parks and protected areas, users of all types can apply it to addressing their needs and issues. Users can also enhance the core data with related information on management, condition, facilities, trails, etc. The goal of a national database is to provide a solid foundation for all of this related work.

1. The importance of a national geospatial inventory of public parks and other protected areas

An accurate and complete geospatial inventory of public parks and other protected areas is essential to meet a broad range of critical public needs: public health improvement, recreation provision, biodiversity conservation, ecosystem adaptation, wildland fire management, land use planning, and much more.

This importance holds at all levels: national, cross-state, and statewide, and at the regional and local levels (cities, counties and metropolitan agencies). While individual cities and towns may have full inventories of their own lands, they sometimes do not track all the other protected areas in their jurisdictions. Virtually any level of government or community benefits from a national inventory.

Absent a completed and accurate inventory, there is a great risk of decisions being made with incomplete data, and of data confusion and waste from multiple competing, inconsistent data sets.

With such a broad array of needs, a national inventory of public parks and open space areas must be designed and maintained to support a wide diversity of users.

With a completed national inventory, the federal government can enable the following capacities:

- Give every individual or family the ability to know what parks and recreation opportunities are nearby, to strengthen community life and promote healthier living

- Improve the effectiveness of wildfire management, flood prevention, ecosystem adaptation, renewable energy siting, and many more public policy issues

- Support businesses and data users to aid tourism and other economic development, recreation-focused web application development, and other activities

- Accurately define areas needing conservation action for habitat and wildlife, and track the status of efforts to steward these biodiversity resources at global, national, and local scales

2. About public park and other protected areas data

Data on public parks and other protected areas can be in simple table form (spreadsheets or equivalent) or can be geospatial (GIS), where geographically located objects (polygons, points, lines) are linked to attributes about those objects. The main focus in this report is on a geospatial inventory of the boundaries of public parks and other protected areas, including core attributes of name, owner/manager, access level, conservation status, etc.

Related data sets that can be linked to this inventory of boundaries include park entry points, reservable features (points or attributes), facilities/amenities, trails and trail heads, and other use activity attributes. The national inventory called for here should be designed to connect well to such related data created and maintained by others, but not to integrate it all into a single data set.

3. The Protected Areas Database of the U.S. (PAD-US)

A robust national inventory of park and protected area boundaries already exists in the USGS PAD-US, the official national GIS inventory of these areas (note that PAD-US also includes private and other conservation easement lands published through the National Conservation Easement Database, NCED, as well as marine protected areas). It is now mostly complete for federal and state holdings, but only a few states have detailed local and regional parks data.

PAD-US is created by: a) integrating data from federal land and water agencies (plus national nonprofits), b) working with stewards in states to incorporate local/regional parks and preserves, and c) incorporating others' easement data. PAD-US has grown from its initial primary focus on biodiversity to the objective of now including data for all public park and other protected areas in the U.S.

While great progress has been made in developing PAD-US, funding for its operations is currently limited, supporting a very small staff and a past program of small technical data improvement grants to state stewards and others.

The following are the main needs for completing PAD-US and ensuring its ongoing usefulness:

- Define PAD-US as the national inventory of public parks and other protected areas

- Complete and integrate into PAD-US data on all urban and regional public parks and open spaces

- Improve PAD-US with a new database platform, including stronger web data services

- Provide stronger support to state data stewards for state, regional and local data, including encouragement of efforts to help individual agencies improve their own data inventories or park land

- Conduct more outreach to and engagement of PAD-US users in the use and improvement of the data

- Continue to strengthen the relationship between PAD-US and the U.S. Recreational Information Database (RIDB)

- Improve the ranking of areas in PAD-US for biodiversity conservation

- Continue improving federal lands integration into PAD-US and the quality of this data

- Support continued updating and improvement of NCED easement data

- Develop additional opportunities for PAD-US data use

4. Recommended data practices

Those working on and with data related to PAD-US should consider PAD-US as the comprehensive national inventory of public parks and other protected areas in the United States, and support its standards and processes wherever possible.

The PAD-US data standard scheduled for adoption by the Federal Geographic Data Committee designates PAD-US as a National Geospatial Data Asset pursuant to Office of Management and Budget's Circular A-16. To most efficiently develop the national inventory, federal, state, and other related data efforts should seek to be reasonably consistent with the PAD-US standard and should contribute data to their state steward organizations or to PAD-US.

PAD-US should continue to be structured to support related data sets, including state steward inventories, the federal RIDB, the World Database of Protected Areas, and others.

PAD-US will be best developed and maintained if other agencies' and organizations' programs relating to PAD-US are coordinated with and supportive of the plan set forth in this paper. PAD-US should also engage such organizations in developing the inventory and ensuring it reasonably meets users' needs.

The USGS Gap Analysis Program should remain the manager of PAD-US, with defined responsibilities for data, standards, user support, and other aspects of the program. The nonprofit managers of National Conservation Easement Database should continue managing their data and contribute it to PAD-US, while NOAA will continue to manage marine protected area data.

5. Action plan

The following are the main elements of the PAD-US action plan aimed at completing the national inventory by 2020 and maintaining it thereafter:

- Adequate funding for the core PAD-US operation, to enable data improvements, technical and user support, and overall coordination and engagement of partners

- Implementation of a new technical data framework for the inventory, to better support a broad user base

- Support for state stewards who develop state, regional and local data, and for integration of the urban parks data work of the Trust for Public Land and the work of State Comprehensive Outdoor Recreation Plans, State Wildlife Action Plans, and other related efforts

- Expanded outreach and engagement of users, including more effective support for their use of the data at national, state and local levels (including Recreation.gov, the National Map, the Census, and other specific federal programs)

- A more robust partnership framework for PAD-US among federal agencies but also including nongovernmental organizations and state steward groups

- Expansion and improvement of the National Conservation Easement Database

The budget for implementing this plan over three years is $5 million, of which approximately $1 million is currently budgeted, leaving an additional $4 million of funding to be secured for this multi-year period.

In addition to this funding, the Trust for Public Land's ParkServe program is expending approximately $1.8 million improving data on parks within urban regions, particularly underserved areas. This data will be contributed to PAD-US as it is completed.

INTRODUCTION

The **objectives** of this report are to clarify relationships among a wide range of public park and other protected areas data and to define a nationally agreed-upon action plan that will complete the development of a geospatial inventory that can then be widely shared and continually updated.

The USGS **Protected Areas Database of the United States** (PAD-US) is the data set that forms the core of this strategy, providing boundaries of parks and open space areas that range from national parks and refuges to neighborhood parks. While PAD-US is not yet complete in all states, it provides the only proven national framework for such data, and resources should be provided for its completion and maintenance, as presented later in this report. PAD-US also is connected to the **National Conservation Easement Database** (NCED), which tracks lands protected with such easements. The main focus in this report, however, is on PAD-US.

Many **other related datasets** can be connected to such a national inventory: campgrounds and other reservable sites, trails, overlay areas defining special management protections or practices, etc. The objective of the strategy presented here is to enable effective relationships between these other datasets while allowing them to be independently developed and used.

There are many user needs that support having a completed and regularly updated national inventory of public parks and open space areas: policy makers and analysts, land managers, visitor service/tourism agencies and businesses, health policy researchers and officials, energy managers, nongovernmental groups, researchers, businesses and many others.

Also supporting the need for this inventory are **laws, regulations, and public-sector initiatives** that are in need of such information to accomplish their aims, including:

- **Economic development** - there is a broad desire for data and applications that can help with economic development in today's America. Recreational and resource use of public parks and open lands are powerful forces for jobs and community economic well-being, through tourism, equipment sales, and related activity.

- **America's outdoor recreation Initiatives** — these encourage recreational use of the country's natural resources and park land and include improvements to the Recreation.Gov reservations system and its related Recreational Information Database (RIDB).

- **Healthy Americans** initiatives — programs that encourage physical activity especially through outdoor recreation – guiding people to these outdoor resources requires solid information on the location of park and protected lands.

- **Endangered Species Act** — the Act requires conservation of threatened and endangered species with plans often following assessments of protection status across multiple management agencies.

- **Global conventions** — the World Conservation Monitoring Center tracks the degree of protected area conservation in relation to overall Convention on Biological Diversity treaty goals, with a target of at least 17 percent of each land ecosystem secured for conservation by 2020.

- **Health care** in relation to a national epidemic of chronic disease — climbing rates of **obesity** impose large costs on taxpayers, businesses, and the public generally, as well as on individuals; parks are a key element in expanding the role of physical activity in addressing obesity and other chronic diseases.

- **State Comprehensive Outdoor Recreation Plans (SCORPs)** — The Land and Water Conservation Fund has required states receiving LWCF funds to prepare SCORPs every five years. The plans frequently address assessments of the supply of and need for recreational facilities (LWCF projects are required to remain in recreation use in perpetuity).

- Other forces also drive the need for an effective parks inventory, such as the movement for **helping underserved communities**, which includes ensuring that all Americans have access to neighborhood and other parks.

Together, all of these users and drivers inform those who can bring resources to bear to improve data and make it readily accessible to users. These include public agencies at the federal, state, and local levels; private philanthropy; universities; national nonprofits; and even private businesses.

But to connect the data that users need to the funding and other resources required to develop that data requires agreement on a **strategy and a specific action plan**.

To help achieve that agreement, this report brings together the experience of organizations and agencies with more than a dozen years in the development and use of protected lands data, as well as the perspectives of scores of individual stakeholders consulted during the project. It presents both an overall strategy and a specific road map for completing — and then maintaining — the national inventory of public parks and protected areas that so many have been calling for. The goal of a robust data set is within reach over the next three years, and needs only relatively modest funding to be achieved.

YOUR ROLE

We invite you to **join us** in bringing about this future, where anyone can have access to a complete nationwide inventory of public parks and other protected open space areas. You can:

- Learn more about PAD-US and the program to improve what the data that it offers – see http://gapanalysis.usgs.gov/padus for more information

- Contribute data and resources to state coordinating stewards, and to the overall PAD-US program

- Provide stories of how PAD-US data has helped with your work, or guidance on how it could help meet your needs

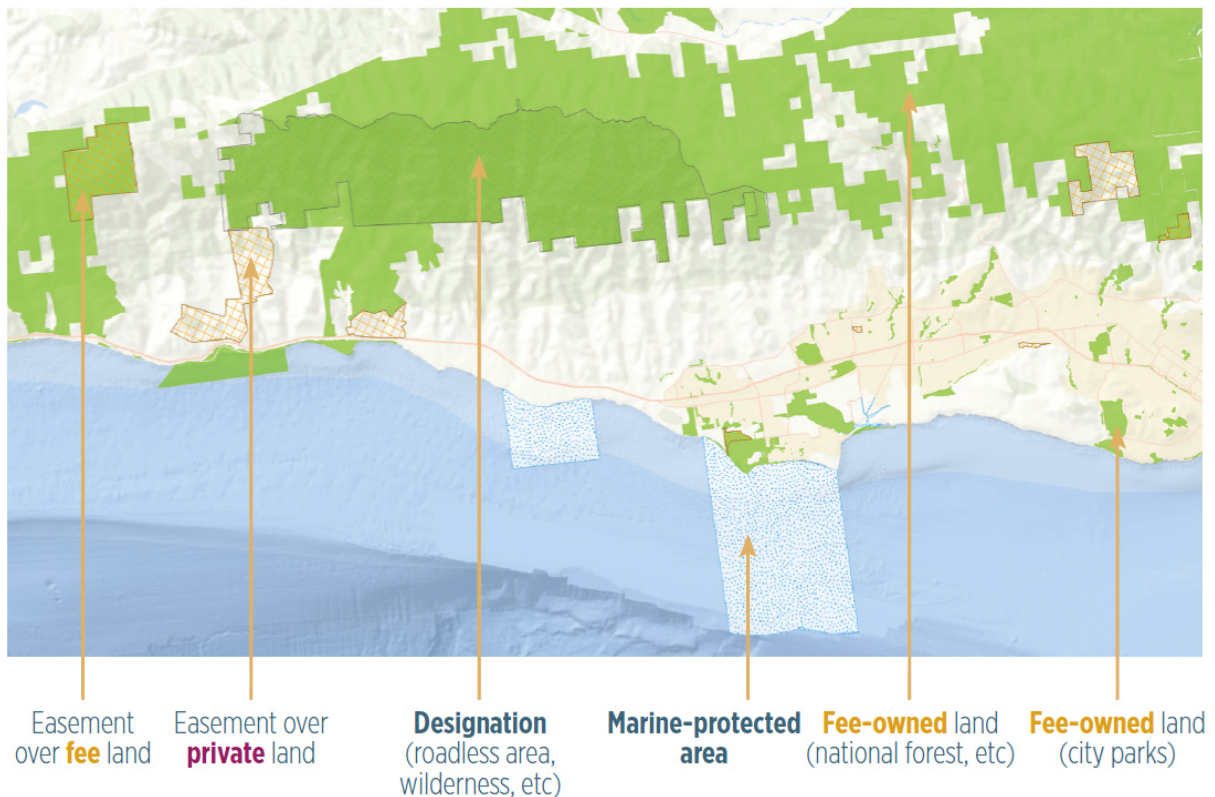# 1. Starting Points — Rationales and User Needs

A. OVERVIEW OF DATA NEEDED

This report presents a strategy for reaching the goal of a comprehensive national database of public parks and other protected areas. These areas range from small neighborhood playground parks to large national parks, forests, refuges, and other extensive land and marine preserves.

While no single phrase conveys the many variations of these resource types, **"public parks and other protected areas"** is the main term used in this report. It includes the three types of areas that a national inventory needs to consider:

1. Lands owned **outright** ("in fee") by public agencies and other public-serving organizations: local parks, national forests, regional parks, refuges, etc. The USGS PAD-US program develops this data, in collaboration with federal and state agencies, and national nonprofits.

2. Lands secured under conservation or open space **easements**, mainly private (but some public) lands that must be maintained in open space, with easements held by public agencies or nonprofit land trusts and related organizations. This data is managed by the National Conservation Easement Database (NCED), a nonprofit consortium which contributes its data to PAD-US.

3. **Marine protected areas** which cover swaths of coastal waters and open oceans, coordinated by the National Oceanic and Atmospheric Administration (NOAA) and contributed to PAD-US.

ILLUSTRATION OF PAD-US DATA ELEMENTS

Easement over **fee** land | Easement over **private** land | **Designation** (roadless area, wilderness, etc) | **Marine-protected area** | **Fee-owned** land (national forest, etc) | **Fee-owned** land (city parks)

B) WHY WE HAVE PUBLIC PARKS AND OPEN SPACES

There are important reasons why we acquire and manage public parks and open lands and areas of all types:

- **Recreation** (lands that provide for physical activity, mental respite, social interactions, and community gathering) — neighborhood, city, regional, state and national sites that function as parks, playgrounds, activity fields, lands with hiking/biking/riding, wildlife viewing areas, etc. The recreational rationale for local parks also includes the induced activity of walking or bicycling to them.

- **Managed resource production** (agriculture, forestry, energy, fishing and other managed resource production) — public lands that are used to produce what comes from their soils or other intrinsic qualities. These can include national and state forests that are actively logged, grazed range, soil (cropland) and water reserve areas, and other public lands being used for the products that can come from them. The value of these lands also includes their ecosystem service functions.

- **Economic contributions** — these include products (food, wood, fish, etc.), direct and supporting jobs, expenditures for park development and maintenance, community savings from disaster avoidance and other ecosystem services (like flood management and water quality protection), and the increased property values of lands near parks (which increase tax revenues). Tourism is a strong element in the economic role of parks and open space lands, including lodging, concessions, guides, equipment suppliers, and many other types of tourism-driven business activity. Overall, the economic contribution of public parks and open space lands is enormous. The National Recreation and Park Association estimates that in 2013, operations and capital spending at local and regional park and recreation agencies generated nearly $140 billion in economic activity and supported almost one million jobs. Adding in national and state parks increases the total activity to over $200 billion.

- Health benefits have not been quantified but chronic disease in the U.S. is estimated to cost over $1 trillion annually and can be positively affected by contact with nature and the associated physical activity.

- **Cultural heritage protection** (cultural and historic resources) — protected landscapes that have particular meaning for how people have used them in the past, or continue to do so now. Includes historic sites (e.g., battlefields, buildings, etc.), parks that showcase the history of human habitation and connections to nature, scenic landscape viewpoints, and other such sites.

- **Natural resource conservation** (biodiversity, wilderness, water/ocean ecosystems) — areas that are important for their habitat/species value now or in the future, lands that safeguard aquifers or watersheds, lands that are wild. These areas all provide crucial ecosystem services which have tangible economic values, as well as nature preservation values.

- **Hazard mitigation** (lands that should not be developed or can reduce impacts on developed areas) — coastal areas subject to sea level rise, floodplains and buffers, areas susceptible to landslide, wildfire, earthquakes, etc. These areas can be connected to outdoor recreation opportunities as well.

- **Shaping development** (buffers, greenbelts, etc.) — lands that are used to guide infrastructure and other development into efficient and more effective forms, preventing sprawl, providing civic identity, and other such purposes.

- **Human well-being** (mental stress reduction through nature contact, social engagement in interaction with friends and family; community building events) — for example, urban parks almost always support human well-being, with family celebrations and other gatherings being frequent, important park activities. These parks can also help neighborhood identity and involvement. Larger natural landscapes also play critical roles in psychological well-being and physical health (for example, just seeing natural areas can trigger measurable improvements in stress and other factors).

C. THE VALUE OF HAVING A NATIONAL GIS PARKS INVENTORY

Having a robust **nationwide geospatial database** of public parks and other protected areas, including lands conserved under easements, enables a wide range of important benefits and uses (see page 8 for map illustrations of lands included in the inventory).

A complete national inventory can provide these benefits:

- A key part of a base map for the U.S. Recreational Information Database (RIDB), which drives the $90+ million per year Recreation.gov reservations program

- A resource for public health researchers and policy analysts assessing the role of parks in addressing critical health needs, such as the relationships between obesity, the physical environment and population characteristics

- A valuable asset for those seeking to guide people to local parks, whether for health reasons or to encourage recreation

- Resource data for county and regional recreation and open space planning

- An authoritative source of approved data for private/commercial uses (for example, Google, Bing and ESRI and many other commercial base maps/data services; and as background information for applications to support hunting and other recreational travel guides)

- The context for the National Park Service Inventory and Monitory Program, helping with management and analysis of National Park units

- A key element in the USGS National Map program, including source data to be included in topographic maps published by the agency

- Framework for the wildfire community to determine fire jurisdiction quickly and accurately (the federal National Wildfire Coordinating group uses PAD-US to analyze and depict fire landscapes)

- A primary data layer for habitat conservation and adaptation and mitigation analyses, necessary to achieve the missions of the USGS Gap Analysis Program, including the North American Intergovernmental Committee for on Cooperation for Wilderness and Protected Area Conservation (NAWPA) program

- Serve as the source of US protected areas information in the World Database for Protected Areas (WDPA)

- A data layer that supports Census research to plan field efforts during the decadal census (fewer canvassing resources are required in and around large public open space areas with little development)

- Support for key programs at other federal agencies, including the U.S. Fish & Wildlife Service (State Wildlife Action Plans), the Environmental Protection Agency's EnviroAtlas program, operations and planning within Homeland Security, and many other federal agency efforts

- A data standard and best practices framework for local agencies who are developing their own inventories, as well as a starting inventory for those desiring to have local data on parks and protected areas

Conversely, **not having a complete inventory** of public parks and open spaces can create these issues:

- Duplication of other governmental data aggregation efforts, resulting in partial or conflicting answers to overlapping policy issues (for example, all of these federal groups/programs relate to a national inventory: USGS PAD-US, BLM SMA, USGS National Map, Recreation.gov, Federal Recreation Council, Landscape Conservation Cooperatives, USFS Forest Inventory and Assessment, NAWPA, CDC, NPS/SCORPs), leading to institutional confusion and unnecessary programs

- Different user interpretations of similar subjects from competing data, leading to ineffective analysis and frustration among users

- Purchase of commercial data that may be very incomplete and has not been given the careful standards and attributes that would characterize a public agency-created inventory, resulting in confusion and wasteful data procurement

- Inefficiencies among commercial map vendors, leaving the public to sort out conflicting differences and forcing businesses to absorb the costs of each trying to maintain their own inventories of parks and open space data

Public agency funding for effective data is generally hard to come by. Bringing together many parties to create a commonly needed data set like an inventory of public parks and open space areas is far preferable to several independent, partial efforts.
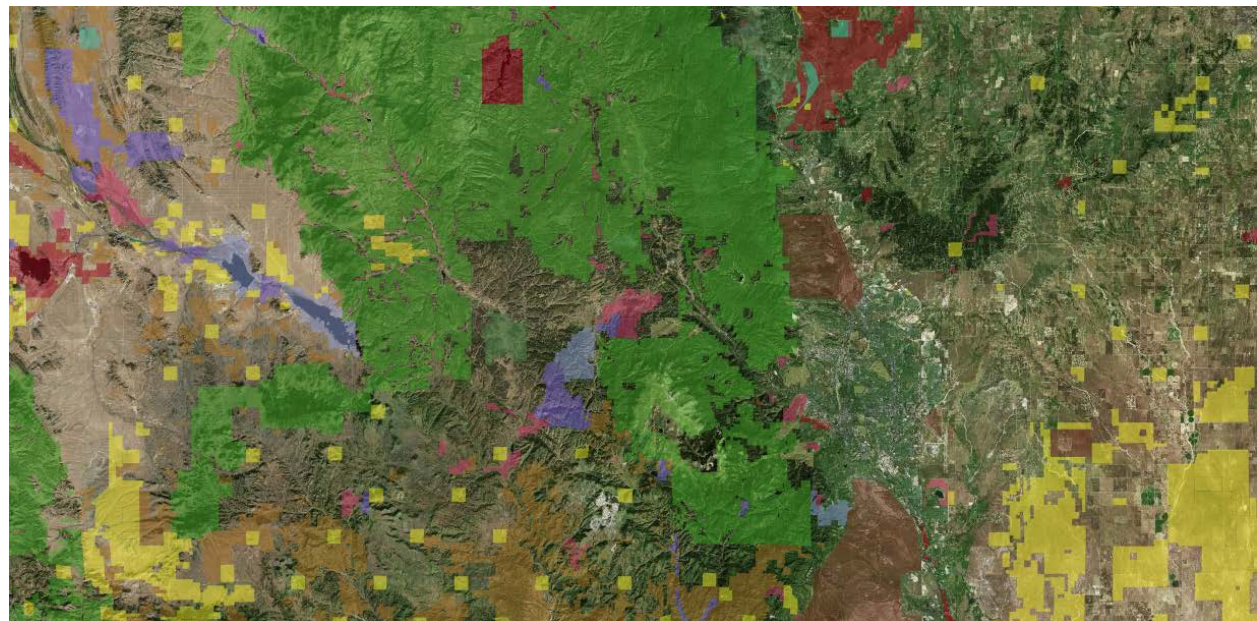
WHAT A COMPLETE GEOSPATIAL PARK INVENTORY LOOKS LIKE

A complete national inventory has accurate data at the neighborhood, regional, and local levels, as well as for large landscapes:

Neighborhood, Local, and Regional Parks
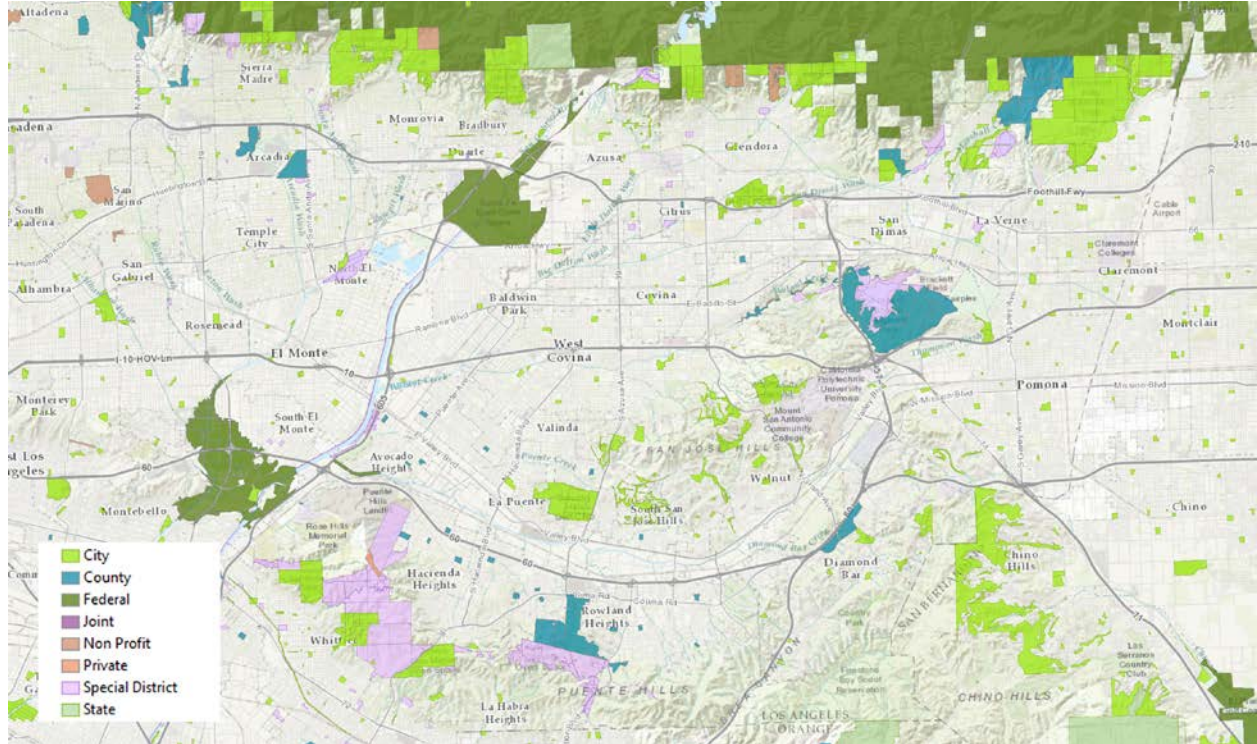
Large Rural Landscapes and Wilderness Areas

D. WHAT USER NEEDS SHOULD THE INVENTORY SUPPORT?

STARTING POINT: THE *PUBLIC* FOCUS OF THIS DATA

The focus of this report is on **publicly owned or managed** park and other protected areas. These areas include lands owned outright by public agencies and nonprofits, as well as some private lands held under conservation or open space easements (note that some easements allow public use).

While we recognize the importance of **private**, **commercial** land and recreational facilities (hunting clubs, golf courses, commercial campsites, swim/tennis clubs, etc.), we believe that the public sphere — mainly governments and nonprofits — is the most crucial to address when looking at data on park and other protected areas.

There are five main reasons that a **public** focus for a park and protected areas inventory is appropriate:

- Parks are a strong public good. Few things are as identifiable and symbolic of our civic life as parks are to us as citizens, giving us free or low-cost access to public gathering places and treasured resources.

- Public parks and other protected areas are mostly under the direct management/stewardship of governments, which provide public engagement in the establishment and use of these lands, and have statutory responsibilities for that stewardship.

- For private lands secured under conservation easements, the tax deductions allowed for these lands establish an initial and ongoing public trust.

- Public park and other protected areas are strongly influenced by public campaigns and governmental actions to provide significant financial resources (local park agency and statewide bond campaigns and expenditures, the Land & Water Conservation Fund, etc.), and are therefore also important to taxpayers.

- Public parks are civic infrastructure and are usually supported by taxes, similar to how schools, streets, public buildings, and water systems are managed and financed. As infrastructure, they may be planned and managed by agencies with overlapping jurisdictions and missions — having a comprehensive data inventory of parks enables better coordination in these situations.

USERS AND THEIR SPECIFIC QUESTIONS

A national inventory of parks and other protected areas will be directly useful in addressing questions like these below. While a boundary inventory may need to be supplemented with other types of attribute or geospatial data, it provides the foundation for addressing the kind of user questions that follow.

Recreation Seekers

- How can I find a park with the facilities and activities I'm looking for? (picnics, walking trails, open fields, wildlife, climbing, fishing, etc.)

- Where is the nearest playground, ball field, picnic area, skate park, trail?

- Where are parks near to my home?

- Where are parks I would like to visit regularly and during my vacation?

- Do I need to make reservations or obtain permits?

- Where can I find parks with wilderness or nature experiences?

- Where's a trail that fits my needs?

- How do I get to a park? (walking, biking, transit, driving)

Businesses and Related Organizations

- How can I encourage more outdoor engagement so that I can sell more products or services?

- How can I access parks data that can support my advertising program for my web application?

- How can I route people to the entry point of a particular park?

- Where can my employees recreate?

- How can I easily offer a "park prescription" to my patients to help them exercise?

- Are there adequate parks in a community in which I might locate a facility?

- How "green" are the areas in which my employees live or could live?

- Where are best public lands for renewable energy facilities?

Researchers/Policy Analysts/Planners and Other Officials

- What neighborhoods don't have parks or parks of a particular size relative to the surrounding population?

- How can my State Comprehensive Outdoor Recreation Plan (SCORP) reflect the actual supply of park and recreation opportunities in my state?

- How can I find out: what percent of an area's population lives near a park (e.g., within a half mile of a park, or within a 10 minute walk), or what park and open space lands are near underserved populations? Do the park assets match the needs of their community, and where are the greatest opportunities for investment for new and/or renovated park facilities? (Note: the National Environmental Public Health Tracking Network has identified "access to parks" as a built environment public health indicator and needs reliable data to determine populations that live within a half mile of a park boundary).

- For specific parks or jurisdictions, what percent of the population living within a half mile of a park boundary has less than a half mile walk route to an entrance? How can parks be made more accessible for people?

- What lands have been protected with what funding (LWCF, bonds, taxes, etc.), and what is their current status/use?

- Are there public open space lands that can help with flood control and ground water recharge?

- What public lands can be managed to maximize their ecosystem services (carbon storage, water quality, etc.)?

Conservation Organizations and Agencies

- What is the degree of protection of important habitat on public land?

- Are there animal or plant species whose populations are in steep decline on public lands?

- Where are lands suitable for wilderness protection?

- Are public lands available as refuge for species predicted to respond negatively to climate change?

- Are there opportunities to connect habitat islands through migration pathways?

- Where are public lands least suitable (that is, have high conservation values) for energy production or transmission corridors?

2. PUBLIC PARKS AND PROTECTED AREAS DATA

This section outlines in general terms concepts and background information that go into defining and creating a national inventory of public parks and other protected areas. Particulars about PAD-US are in the following section.

A. BASIC CONCEPTS AND TERMS

Geospatial data is information represented as a polygon, line, or point, defined by specific latitude-longitude coordinates in a geographic information systems (GIS) framework. Because it be more easily used, adjusted and shared, geospatial data is different than just drawings of park boundaries or tables of information without geographic locations.

Public Parks and Other Protected Areas mean the full spectrum of outdoor areas owned by government agencies and nonprofits who maintain them for open space uses (see the earlier description of these uses), from neighborhood mini parks to large national parks, refuges, or forests. Includes open space areas and wildlands, as well as developed outdoor recreation areas, and also includes marine protected areas and lands under open space/conservation easement.

"Parks" in this report does **not** include privately owned camping or other such private outdoor facilities. At the scale of urban neighborhoods, some lands may be considered parks by some jurisdictions but not by others (e.g., very small traffic circle green areas, recreation center buildings, small hardscape plazas). These are gray areas that are acceptable to leave somewhat undefined in a nationwide inventory of publicly owned outdoor open spaces, as long as they are flagged with attributes that can be used to filter them out as needed. However, in principle, parks owned by home owners associations will be included but flagged as restricted access (permit required) and noted as privately owned.

Another unclear area is the inclusion of "parks" that are just buildings with indoor recreation facilities. This will need further consideration and discussion, as the main focus of the current inventory is sites that are mainly open space.

Protected Areas is a general term used here for all publicly managed park and open space land (as in the Protected Areas Database of the U.S.) and is also used by those working to safeguard biodiversity to mean the degree to which lands are managed for conservation. In the latter meaning, measures of "protected" are often defined by "gap codes" (1-4 scores that rank how lands are managed for biodiversity purposes) or IUCN categories (I-VI, similar to gap codes).

Management or designated areas are geographic areas that can overlay parks and protected areas — for example, Wilderness Areas, or Wild and Scenic River corridors, or forest management zones. These are not the same as park/open space ownerships, but they are important for defining what uses can occur on such lands. Later in this report is a discussion of these areas and how to integrate them.

Recreation activities include hiking, fishing, climbing, ball and court sports, etc. In this report, these are mainly considered attributes of parks and protected areas, not separate geospatial point data.

Recreation facilities are defined functional areas for particular types of recreation, such as campgrounds, visitor centers, picnic areas, open play fields, baseball fields, swimming pools, etc. Recreation facilities and activities are closely related but are distinguished by activities being an attribute of geospatial data, while the facilities are specific locations (usually a point defined by

latitude-longitude). Other important visitor support facilities (sometimes termed "amenities") are restrooms, water fountains, seating, parking lots, etc., which can be attributes of parks or specific locations (points) within parks.

Trails are linear features that can be attributed as paved/unpaved, or single or multiple uses, along with other qualities (width, etc.). Trails are mostly inside of protected areas, but are sometimes routes in their own right (narrow greenways, etc.) where these are not "parks." Trails can be represented as segments or as named routes (which are often made up of individual segments). Separate work is underway on various approaches to integrating trails data within agencies, between agencies and at a metropolitan and national scale. In contrast to linear trails, trail heads (where defined trail segments begin) are usually represented as points.

Entry Points are often related to trail heads but are usually separate point locations indicating where public is invited to move in or out of a park property. Sometimes they are classified as primary and secondary, where primary is a gateway and secondary is simply a place where a visitor can just walk or drive into a park area.

User-defined content is data created directly by users of parks/open space mainly using interactive tools, and most typically seen as trails in web applications such as OpenStreetMap, Strava, AllTrails or other such initiatives. User defined content can include campgrounds, entry points and many other information types, but can often be inconsistent with authoritative agency/owner data. (Note: this project does not focus on defining standards for trails or other user-created data, but such data can be connected to the national inventory of public parks and protected area boundaries presented here.)

Another class of user-defined content is **media** — mainly photographs of parks, which can be linked to the polygon data on each park. Agencies sometimes have such photo libraries, but the vast majority of photos are now shared through social media posts (Instagram in particular, but others as well, including Twitter, Flickr and Yelp). It is possible to connect these images through tags, or through the actual location data associated with most photos.

B. ABOUT GEOSPATIAL (GIS) DATA

Here are some **basic principles** about geospatial inventories:

Data generally: Broadly, data inventories can be **lists** (just rows in a spreadsheet) or they can be **geospatial** (geographic objects like points, lines or polygons with attributes — mapped locations with associated information). The focus of this report is on **geospatial** data, primarily created using Geographic Information Systems (GIS) software. Geospatial data can also be linked to list data, if a connecting identification field exists (for example, a GIS inventory of parks can become more useful when linked it to a table of the recreation activities available in each park).

Particularly for urban parks, **not all** owning agencies have geospatial data of their holdings. There are over 20,000 municipalities and many thousands more special recreation districts in the U.S., and these agencies often lack resources for creating geospatial data of their holdings. Most such agencies, however, do at least have lists on websites and/or in brochures, often with expanded descriptions of each park. Filling in this gap in available geospatial data is a big challenge for completing a national inventory.

GIS Data Types: GIS data on parks and protected areas can be **polygons** (showing boundaries) or **points** (showing the center point of a site). Related data can be points, polygons or lines for associated facilities (campground points, trail lines, management areas, etc.). The very best GIS data sets for parks and open space are based on the actual **ownership** boundaries of these lands, often called tax parcel, assessor or, in GIS terms, "cadastral" data. Having park boundaries match ownership lines allows both more authoritative data and matching with other parcel-related information.

TYPES OF PARKS/PROTECTED AREAS GIS DATA
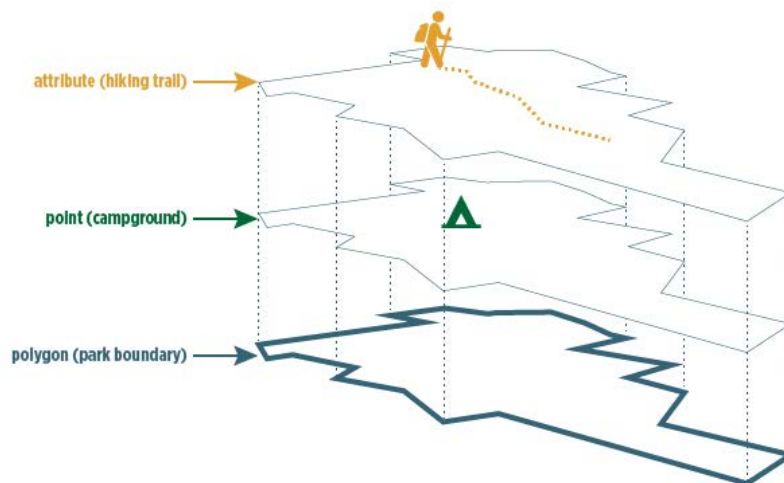
GIS also can attach **attributes** to each of the data types: e.g., for a park, whether there is hiking, biking, picnicking allowed; how many campsites are in a campground point; the name and type of a trail line, etc.

GIS Data Standards: Beyond these basic characteristics, a park and open space GIS data set should conform to any broad, overall **standards** for how data fields are structured and populated, as well as to any general database relationships that may be in such standards.

C. THE STRUCTURE OF PUBLIC PARKS AND OTHER PROTECTED AREAS DATA

Building from the general overview above, we now turn to the specifics of how to approach GIS data for a national inventory of public parks and other protected areas.

One overall data set is key: The focus here, as noted earlier, is on **public** lands owned or managed for park and other open space uses. A wide range of lands fall into this definition, from small local parks to very large swaths of unnamed public land holdings to prominent national parks and refuges.

It is critical for the effective long term management and usability of the data being considered here that it **not be limited** to just, for example, park and recreation areas, or to just lands that have strong habitat value. Many such areas provide dual benefits, inseparable from one another — to track just one category would limit seeing these interrelationships. A comprehensive database can include attributes that allow filtering for different types of open space ("find all *city parks*"; "find *federal* lands within 50 miles") which means that a broad definition of included lands allows for one data set to serve a very large number of users.

Since financial resources can be scarce for data development programs, having a **broad user base** makes it easier to gain support. As noted above, if two or more partial datasets compete for resources, there is risk of each falling short and public confusion over which does what. Having a wide scope also allows for answers to questions that might otherwise be limited by compartmentalized data ("find any public park larger than 200 acres that has a certain species richness and is within a certain distance of public transit access", or "find all baseball fields within 10 miles of concentrations of young persons"). Developing two or more data sets to address such questions would likely result in incompatible data structures and missing or overlapping data.

What should be in the data set: Using our earlier description, a national inventory should include the boundaries of public parks and other protected areas that are owned outright by a public agency, nonprofit or other public-serving entity whose purpose is to manage it for an open space use, or protected under an easement. These lands should be characterized by core attributes that define their most important features (name, owner, manager, access, size, designation, etc.). A national inventory has have to have a limited set of core attributes, but these can be "extended" by other tabular data that links to the core data via a standard identification field.

The PAD-US data structure provides a "core" framework and is discussed further in the next section. The following summarizes major data attributes that can be considered for the national inventory in a more general manner, beyond the provision of ownership boundary lines themselves:

- Name of unit — the owner-defined standardized name of the unit of land, plus a local name where that is different.

- Fixed ID for holding — having a unique identifier that does not change (wherever possible, these should be mirrored by the authoritative data steward in each agency) is very important for effective use of a national inventory but requires careful coordination between national inventory aggregators and individual federal and state stewards.

- Name of owning agency and manager — these ideally come from a "domain list," essentially a related table of all agencies so that there is not misspelling of names or varied abbreviations. This agency table can then have attributes for those agencies: type category, agency web link, contact, etc. that are common for all lands held by that agency.

- Designation — a summary type for the holding (local park, national park, etc.), complemented by a local designation ("neighborhood park," "regional preserve") that comes from the owning/managing agencies. These are typically managed by branching tables that fit local designations to one or two summary hierarchies

- Access — how open for public use (open, restricted/permit, closed)

- Size — acres, usually calculated from GIS software (may differ slightly from source if based on survey data)

- State, county (with provision for those units that cross boundaries)

- Unit web site, if available (direct access to an individual unit web page, or overall agency web page)

- Editing information — source of data, last edited by, etc.

Depending on future discussions of user needs, this structure is likely to evolve, but in general will be close to the above elements.

Management overlays: A challenging framework for a national inventory is tracking overlay boundaries of management types — for example, national Wilderness Areas are drawn by Congress on top of ownership areas (e.g., National Forests) and don't always cover a particular named ownership unit, or management plans for forests may cover just part of a forest holding. For conservation ranking, these overlays are very important, as they define how much land is subject to a legal protection (versus a privately held inholding) and are used in assessing global biodiversity protection targets. Whether a national inventory should include these boundaries directly or have them as separate layers is an open question in database design (PAD-US currently includes many such boundaries in a layer separate from ownership but future approaches may change this to a different method).

What should NOT be included in an inventory: A national aggregated inventory should seek to accommodate local definitions of public parks and open space lands, and not unduly limit local choices. However, the inventory should have a standard data structure (noted above) and attributes that allow for filtering the data set to include or exclude certain types of lands (for example, very small landscaping features, such as traffic circles or medians, which might be defined in a local inventory but less valuable to a statewide or national inventory).

Another area of inclusion/exclusion concerns buildings that house recreational activities (gyms, recreation centers, etc.). They are often located on public park land and occupy sites that are part of the public park inventory, though sometimes are free standing buildings. These can be very important for providing active recreation, but can lead to data difficulties when placed into an inventory that is mostly composed of sites that are open spaces. Further discussion is needed on this topic. (It should be noted that this is related to the efforts of the National Parks and Recreation Association and its PROGRAGIS inventory framework, discussed later).

RELATED DATA THAT CAN BE LINKED TO NATIONAL INVENTORY:

A national inventory of public parks and open space lands can be connected to many other types of data but should maintain a degree of separation from these related data sets, as building too complex a database can become a limit on effective use.

As noted earlier, the following **separate but related** data can be set up to link to the main geospatial inventory of public parks and open space areas as needed:

- **Entry locations** (points) — main and secondary park entries, often used to guide navigation to parks.

- **Trailheads** (points) — locations for starting hikes (these also used for navigation applications, and help users see features available around those points).

- **Trails** (lines) - can be either defined as named routes or as segments that can be combined to make variable or named routes (note: "trails" can also be considered an attribute of parks — length in miles, presence/absence, etc.) - much like other recreational activities.

- **Recreation Facilities** (points for actual locations, but can be attributes of parks for general reference) — visitor centers, recreation centers, swimming pools, sports fields, open play fields, playgrounds, and many more (distinct from activities, below).

- **Recreation Activities** (usually applied as data attributes of parks) — hiking, biking, camping, fishing, hunting, etc. These can be short (12-20) or long lists (20-50+), but when applied to a statewide or national inventory, it is best for the list to be short.

- **Reservable locations and activities** (usually points) — recreation areas, facilities and activities (campsites, events/programs, tours, trail permits, historic sites, etc.), and, in the case of Recreation.gov, can include sites beyond parks.

- **Media** related to above locations and/or activities (video, pictures, sounds).

- **Condition of parks** (as an attributes of parks), for example, the maintenance level/quality of parks and/or facilities.

Derived data: In addition to this core and related data, there is also **derived** data that requires other information to develop. For example, "parksheds" can show the area within a half mile walk to a park entry, using streets data that indicate sidewalks and other access features, or crime point locations that can be used to analyze park safety, assessing proximity of crime points to park boundaries. These are all data sets that can use the foundation of a national inventory of park boundaries, then apply the power of geospatial analysis to develop new insights.

D. WHO'S WHO?

Given that we are discussing a national data inventory of hundreds of millions of acres and tens of thousands of park sites, there are a very large number of interests and organizations that engage with this and related data. The following listing covers the major (currently known) agencies, organizations and businesses. These organizations are stakeholders of differing levels to be considered in developing and implementing the action plan at the end of this paper (definition of unexplained acronyms is provided at the end of this list):

Federal agencies — land holding/management for conservation, production and recreation:

- Department of Interior (NPS, FWS, BLM, USGS, BOEM, USBR and others, including specific programs within these agencies) — also processes/programs such as SCORPs, SWAPs, LWCF, LCCs, NGDA Themes, etc.)

- Department of Agriculture/USFS (land management, resource inventories/assessment)

- Department of Defense (Army Corps of Engineers, plus base natural areas and base buffer/flight path management)

- Department of Commerce (mainly NOAA/Marine Protected Areas)

Federal agencies — users of data:

- Centers for Disease Control (understand park access and health relationships)

- Environmental Protection Agency (support EnviroAtlas, other)

- Department of Transportation (defining transit and other access to parks)

- Department of Commerce (Census data gathering)

- Department of Homeland Security (define, manage hazards)

- Department of Energy (aid in facility siting)

- Department of Housing and Urban Development (assist parks grants, programs; urban development patterns)

State, local government, others — manage land, manage and use data

- State parks, wildlife, forestry and related agencies (SCORPs, SWAPs, etc.)

- Local/regional agencies (planning, parks, transportation, health) — 3,000 counties, estimated 35,000 cities and special recreation districts

- Native tribes (park projects in/near their lands)

National/Other nongovernmental organizations — coordination/education, land trusts, funders, health organizations, etc.

- National Recreation and Park Association (NRPA)

- The Nature Conservancy, other conservation or recreation nonprofits

- The Trust for Public Land (just launching a major urban parks program) — includes ParkScore, ParkServe, Conservation Almanac and LandVote sites, plus network of field offices

- NatureServe (and state heritage programs)

- Foundations supporting conservation, recreation, equity, sustainable land use, climate, etc.

- Health related nonprofits and associations (American Public Health Association, NAACHO, Heart and Lung Associations, etc. — plus some hospitals) Kaiser Foundation, Blue Cross/Blue Shield, others

- Universities/colleges — research programs

- Youth and family organizations (youth outdoor access groups, YMCAs, Boy/Girl scouts, Big Brothers and other such groups)

- Foundations, other philanthropic organizations providing funding for parks, conservation

- Land trusts and their national association, the Land Trust Alliance

- Land/recreation advocacy and educational organizations

- City Parks Alliance

- International conservation organizations (especially IUCN)

Commercial and other organizations — recreation, conservation, energy, consumer, media, data

- Recreation focused businesses/associations (e.g., REI and many other recreation providers, plus sports organizations such as the International Mountain Bike Association)

- Outdoor recreation associations and programs, including Boy/Girl Scouts, Outward Bound, NOLS, etc.

- Open source coding programs/organizations (Open Street Map, Code for America, etc.)

- Software and application developers (Esri, Google/Bing/Apple, Strava, All Trails, etc.)

- Web base map and cartography businesses (Mapbox, Cartodb, etc.)

- Media — outdoor/recreation magazines and media companies, local media, bloggers, etc.

- Businesses using navigation/mapping that includes parks and open space lands

Government associations — policy, research, coordination

- National, state and regional associations of county, city and regional agencies

- Mayors Conference

- Governors — national, regional associations

Professional organizations — standards, networking, outreach, policy

- National Recreation and Park Association

- State Park Directors Association

- National Association of State Outdoor Recreation Liaison Officers

- Association of State Fish & Wildlife Agencies

- Design organizations: American Society of Landscape Architects, American Planning Association, American Institute of Architects

Organizations publishing periodic reports on parks/open space:

- USGS Gap Analysis Program (biodiversity information, PAD-US)

- Trust for Public Land (TPL) Parkscore, Conservation Almanac, ParksCentral, and ParksServe (forthcoming)

- NRPA Benchmarks (for park agencies)

- American Fitness Inventory (http://americanfitnessindex.org)

- Land Trust Alliance (conservation easements)

- NatureServe (biodiversity information)

- Some state resource agencies

- State agencies preparing SCORPs (due every 5 years, per LWCF)

ACRONYMS not otherwise defined above:

Federal agencies - BLM — Bureau of Land Management; NPS — National Park Service; FWS — Fish & Wildlife Service; NOAA — National Oceanic and Atmospheric Administration; USGS — U.S. Geological Survey; USFS — U.S. Forest Service; BOEM — Bureau of Ocean Energy Management, USBR — U.S. Bureau of Reclamation

IUCN — International Union for the Conservation of Nature

LCC –Landscape Conservation Cooperatives, U.S. regional collectives of agencies and organizations coordinating on science research and analysis

LWCF — Land and Water Conservation Fund, managed by the National Park Service, provides funding for federal and state agencies, as well as defines SCORP process

NGDA — National Geospatial Data Asset, part of the federal government's digital data management system

SCORP — State Comprehensive Outdoor Recreation Plan

SWAP — State Wildlife Action Plan

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# 3. THE PROTECTED AREAS DATABASE OF THE UNITED STATES (PAD-US)

The USGS Gap Analysis Program's (GAP) Protected Areas Database of the U.S. (PAD-US) is the official GIS-based national inventory of park and protected area boundaries within the U.S. While it does not yet contain the boundaries of all such areas, PAD-US has now become:

1. the official geospatial database for public park and other protected area **boundaries** for the U.S., with core **attributes** about each identified unit (the owner or manager of a park or area, site access level, etc.);

2. a data coordination, gathering and integration **framework** that synthesizes federal agency data, encourages the development of comprehensive, standardized inventories by state "stewards" which are folded into PAD-US, and gathers other data that can help move it toward the goal of inventorying all public parks and open space lands (PAD-US also brings in conservation easement data and information on Marine Protected Areas); and,

3. a data **resource** for many different users to apply to research, land management, policy analysis and development, service targeting, and more.

PAD-US is **unique** because it is:

- **Comprehensive** — it includes (is intended to include) all public park land and other public open areas, covering everything from small neighborhood parks to huge wilderness and marine protected areas.

- **Publically available** (to support all public and commercial applications and research) — PAD-US is published by the federal government; it is open and free to use.

- **Validated** — The PAD-US data standard has developed over time through rigorous review and testing by data stewards across jurisdictions. The process for Federal Geographic Data Committee (FGDC) endorsement is underway.

- **Authoritative** — PAD-US is the official inventory of America's protected areas, a National Geospatial Data Asset, aggregated from authoritative data sources.

- **Adaptable** — PAD-US is designed to support a wide range of uses, not just a specific type of use.

- **Expected** — having a single, federally led source of information on public parks and open space lands makes it intuitive to look for these national data.

- **Collaboratively managed** — PAD-US uses a process based on partnerships with federal agencies and affiliations with key groups in each state plus national nonprofits and other organizations.
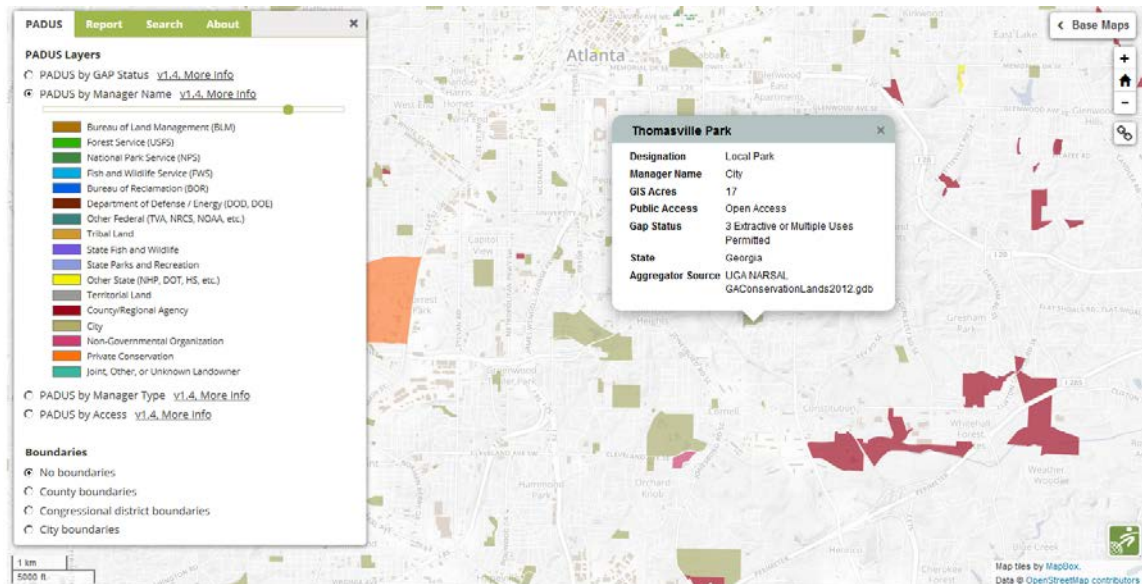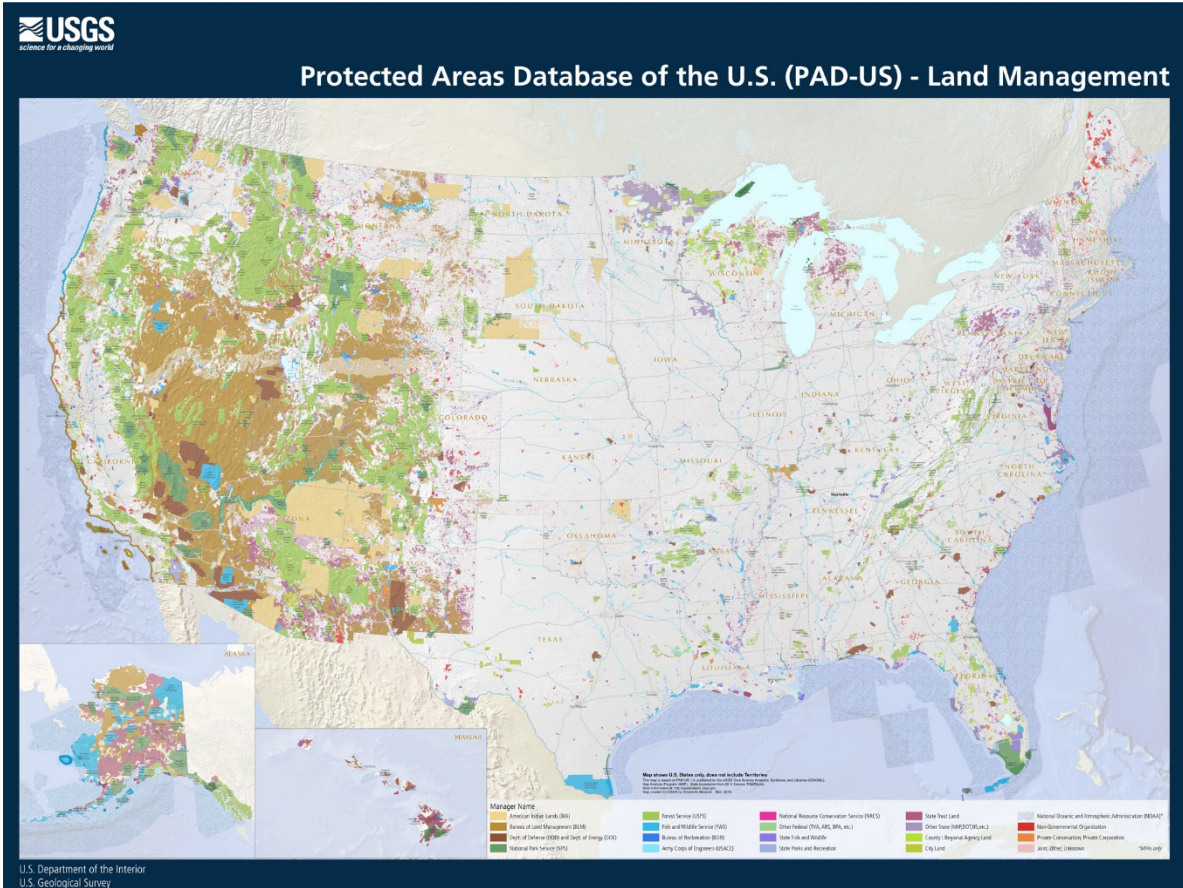
(Above view is from www.Protectedlands.net)

A. THE STATUS OF PAD-US

- PAD-US now contains boundaries for almost **all federal- and state-owned lands** (and draws in Marine Protected Areas from NOAA and easements from the National Conservation Easement Database) and has excellent or very good local and metropolitan regional lands data for about 25 states.

- As of May 2016, a **new release** of PAD-US data (version 1.4) has been published, including significant improvements in total lands inventoried and in their accuracy over the past release.

- Integration of federal lands data into PAD-US is supported by a **Federal Lands Working Group,** (coordinated by USGS, BOEM, and Census) which has developed protocols for integrated federal agency data into PAD-US and is composed of key lands staff for each federal agency.

- The vision for PAD-US is that a system of **state data stewards** will organize all state and local/regional data, with limited support from USGS. At present, about 25 states have effective aggregating organizations or agencies (some government, some university, some nonprofit). Only about 10 states have full inventories to the local level; California is the most extensive of these complete systems, which also include Massachusetts, Georgia and others. See below for more details.

- The **Trust for Public Land** (TPL) has just initiated a three-year "Parks for People" program with major foundation support to push for parks in urban areas (general goal: a park within a short walk of all residents, especially those of limited means). This program includes developing urban parks GIS data for all 20,000+ urban places in the country not yet in PAD-US (creating TPL's ParkServe data system), which is very good news for PAD-US as it will help provide most of the local/regional parks data missing in PAD-US. TPL and USGS coordinate actively on this data and on the TPL Conservation Almanac data (which tracks parks acquired with public expenditures).

- In the coming year, USGS will begin development of PAD-US **Version 2** which will embrace technical evolution in data management that will improve PAD-US usability (especially related to management designation overlaps), while also pushing for raw data improvements, and broader user education.

- PAD-US has had **very limited funding** for its national mission (only two staff, limited consulting support, and a modest program of mini-grants to state steward organizations to help them build consistency with the PAD-US approved data standard). While state grants totaling $750,000 have been made in the past several years to help individual states adapt to PAD-US data standards, this funding, and support for related projects, is now limited (this is further discussed in the Action Plan, later).

- **More information** on PAD-US can be found at http://gapanalysis.usgs.gov/padus and at www.ProtectedLands.net

PAD-US has been developed using a data structure that will be the **official national standard**, approved by the Federal Geospatial Database Committee (FGDC). A USGS standards document (publication forthcoming in 2016 or 2017, provisional draft available) sets forth the details of this data structure (which is also the primary approach recommended in this report, and is described further in the next section on PAD-US).

It should be noted that the National Recreation and Park Association (NRPA) also has a parks data framework called Park Metrics (http://www.nrpa.org/metrics/) that provides a starting structure for individual agencies to develop park, facility, and trail databases (formerly the PRORAGIS mapping system). NRPA encourages its member agencies to use this GIS framework. NRPA and the PAD-US program have cooperated to develop consistency between Park Metrics and PAD-US.

B. THE STATUS OF PAD-US BY STATE

The following map illustrations summarize the current general capacity of state level steward institutions to create and maintain complete inventories, and the overall completion level of local and regional parks in state inventories.

The rankings are updated frequently as situations change — see www.ProtectedLands.net/partners for most current information. Maps below are as of September, 2016.

SUMMARY OF STATE STEWARD CAPACITIES
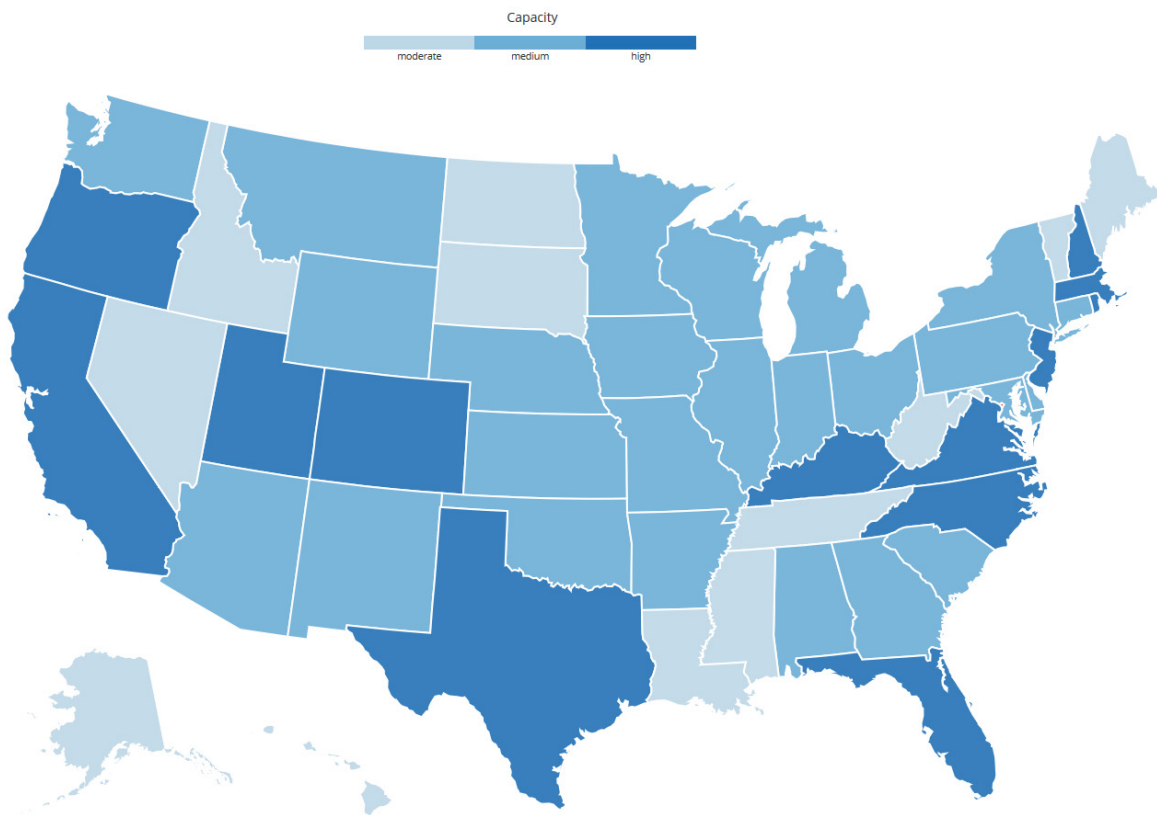
The status of state steward data collections for lands **other** than federal or state owned is summarized the map below — darker colors indicate a higher level of completion of inventories (e.g., darkest green is 95% or better complete).

SUMMARY OF PAD-US LOCAL/REGIONAL PARK INVENTORIES (V 1.4)

Local Lands

Minimal	Partial	Moderate	Complete
0-39	40-69	70-94	95-100
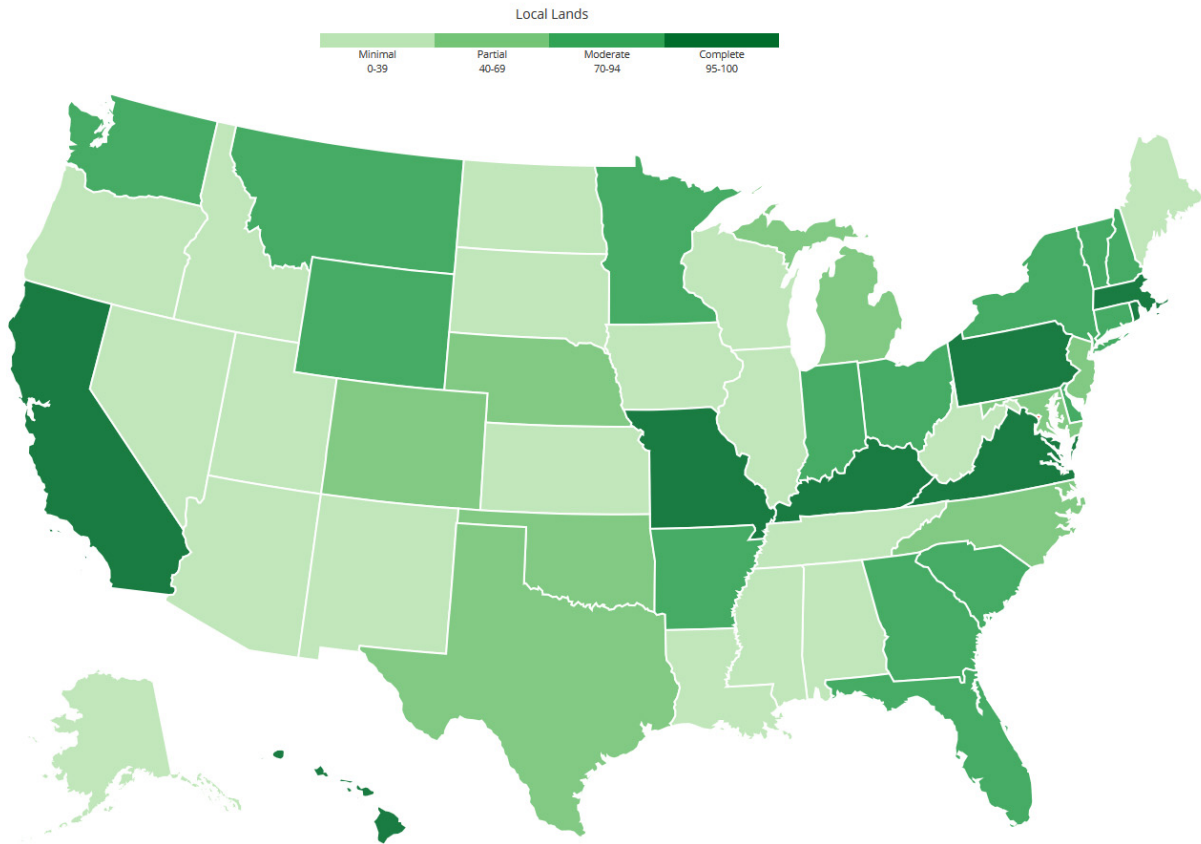
C. HOW PAD-US IS DEVELOPED

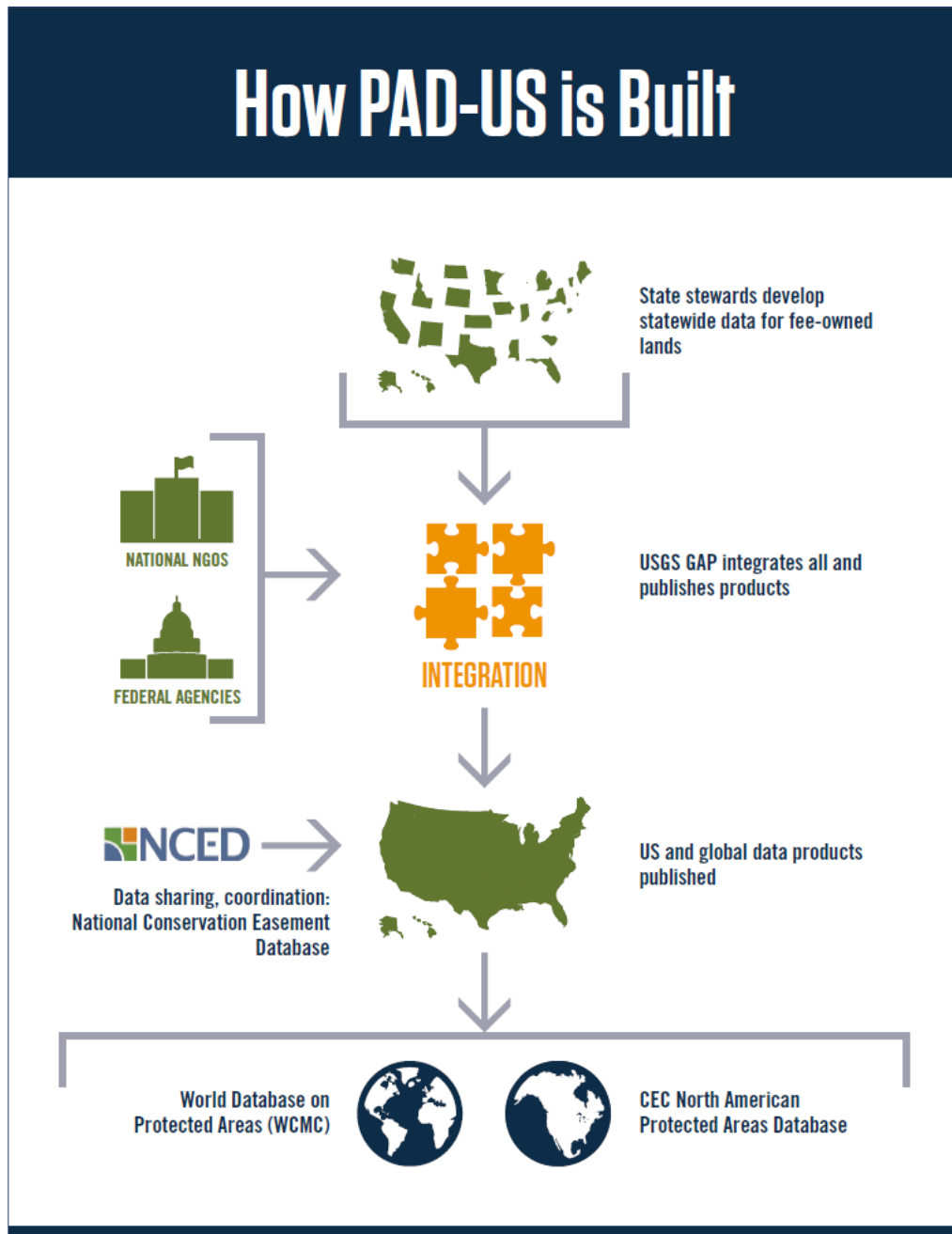PAD-US is developed in two main processes: lands integration among federal agencies (managed by Federal Lands Working Group) and some national nonprofits (The Nature Conservancy and the Trust for Public Land), and state-by-state inventories that are rolled into the national PAD-US structure. Other information is linked to PAD-US, which is in turn adapted into other data products, as shown.

How PAD-US is Built

State stewards develop statewide data for fee-owned lands

NATIONAL NGOS

FEDERAL AGENCIES

INTEGRATION

USGS GAP integrates all and publishes products

NCED

Data sharing, coordination: National Conservation Easement Database

US and global data products published

World Database on Protected Areas (WCMC)

CEC North American Protected Areas Database

D. THE STRUCTURE OF PAD-US

The full data **attribute** structure of PAD-US is presented in Appendix 1. The following table provides a general overview of the **types of lands** included in PAD-US. These categories are the summary of the "designations" attribute in PAD-US, where every unit is given a generalized descriptor while tracking separately any specific designations given by agencies:

TYPES OF PUBLIC PARK AND PROTECTED AREAS IN PAD-US*

FEDERAL ELEMENTS
National Park
National Monument or Landmark
Conservation Area
National Forest
National Grassland
National Public Lands
National Scenic or Historic Trail
National Wildlife Refuge
Wilderness Area
Wild and Scenic River
Wilderness Study Area
Marine Protected Area
National Recreation Area
National Scenic, Botanical or Volcanic Area

National Lakeshore or Seashore
Inventoried Roadless Area
Area of Critical Environmental Concern
Research Natural Area
Recreation Management Area
Resource Management Area
Watershed Protection Area
Research or Educational Area
Historic or Cultural Area
Mitigation Land or Bank
Access Area
Military Land*
Native American Land*

STATE ELEMENTS
State Park
State Wilderness
State Conservation Area
State Recreation Area
State Historic or Cultural Area
State Resource Management Area
State Other or Unknown

LOCAL ELEMENTS
Local Park
Local Conservation Area
Local Recreation Area
Local Historic or Cultural Area
Local Resource Management Area
Local Other or Unknown

*Private elements (for example, Private Forest Stewardship or Conservation Easement) are also included.
**Native and Military lands are in PAD-US because of its federal role but can be removed for use related to recreation or other public access types of classifications.

TYPES OF AGENCIES IN PAD-US

Another way of seeing what lands PAD-US includes is by looking at the types of **agencies** it covers. PAD-US tracks specific owning and managing agencies for each land unit then categorizes them as follows:

Federal
State (parks, wildlife, forests)
Special District (parks, recreation)
Local Government (city, county, etc.)
Non-Governmental Organization (land trusts, others)
Private (mostly easements)
Jointly Owned (few)
Unknown Land Owners
Territorial (federal lands)
Native American (but not public land, these are sovereign lands under federal trust)

OTHER ELEMENTS IN PAD-US

PAD-US also looks at lands by their degree of public **access** — whether they are open, restricted (permit required), or no access. This attribute is very important for using the data set to address recreation and other public activity on these lands. Note: "access" in PAD-US does not refer to disabled access opportunities but rather to whether a unit is open for public use, closed, or has special entry restrictions.

The **many other data attributes** within PAD-US (see the appendix for the full PAD-US data structure) include the following:

- Unit name — "Jones Park", etc. (PAD-US also includes also an option for a locally-defined name)

- Category — type of ownership: fee, easement, designation (these are overlapping areas, such as Wilderness Areas), or other

- Owner and manager name — actual agency names, including easement holder if easement (from NCED)

- Acre size — determined from GIS files

- Biodiversity ranks* - degree of protection for biodiversity (this is defined by both a USGS GAP Status Code, a 1 to 4 system, and a 1-10 code from the International Union for the Conservation of Nature, or IUCN)

- Data sources, edit dates, and other management fields

*In the future, USGS will consider publishing its **biodiversity (or "gap") rankings** as a related product, based off the core PAD-US land ownership/management database. The same process could also lead to publishing a recreation-focused data product out of the core PAD-US. Such products would retain their relationships to the base PAD-US data and would not be new, competing data sets, as they are created using algorithms that arrange the core data a different way. Overall, this approach is part of the **Version 2** strategy for PAD-US, described later in this report.

D. DATA RELATED TO PAD-US

PAD-US is the national spatial database of public park and open space boundaries. As noted earlier, in addition to PAD-US, however, there are many other data sets that are or can be **related** to these lands.

Below is an overview of these aforementioned related data sets, with more information about their type of data manager/creator.

1. Government Agency and Nonprofit Organizations

RIDB (and Recreation.gov) — The Recreational Inventory Database (RIDB) is the engine that drives Recreation.gov. It includes the following data types (the intention of RIDB is that it contain all federal, and perhaps even state-level, agency information, but at present it is only part-way to that goal):

- **Areas** - parks/open space lands, mainly represented as center (or other) point locations. Moving forward, RIDB expects that its boundary data will come from PAD-US

- **Facilities** — a wide range of reservable point locations, as well as other point locations

- **Campsites** — reservable campgrounds (sometimes with greater detail on individual camp sites)

- **Events/Programs/Tours** — locations that are provided by agencies and tied to reservations

- **Activities** — generally attribute codes (fishing, biking, etc.) that attach to facilities and areas

- **Entry points** — park entry points

- **Related media** (photos, video, etc.), often linked to source agencies

Recreation.gov is re-contracting for management of its reservations system, which will bring a new five-year contract (extendable for five more). By early 2017, it may become clear whether this re-contracting will provide resources for PAD-US and/or other related data development.

Web links for RIDB and Recreation.gov:

http://www.Recreation.gov

http://ridb.recreation.gov/

https://github.com/USDA/RIDB

Trails — USGS National Map program is developing approaches for integrating federal agencies' trails data. This work is in early stages and is a long-term project, as trails geospatial data are extremely complex to aggregate. See above for discussion of the OpenTrails effort, and below for NRPA's work on trails data and OpenStreetMap's data.

Park entry points/trailheads — individual federal, state, and local agencies have varying approaches and completeness for this data. In general, federal agencies' data on these points exist (some in RIDB), but getting integration, completeness, and coordination is still a challenge. Few individual states have this data in an integrated from (Kansas is one of the only ones). Between individual agencies, there is a wide range of standards and approaches. Regardless of these differences, trail entry points are usually easy to relate to PAD-US unit boundaries.

Recreational activities for state/local parks — Individual agencies often have listings of a wide range of recreational activities available in individual parks, sometimes integrated into their GIS data, sometimes just in documents/web lists. Few states have integrated frameworks for activities across many agencies. California has one example at www.Caliparks.org, which associates a select list of 15 or so activities at the 800 largest parks from the California Protected Areas Database (CPAD — www.calands.org); but CPAD has 14,000 individual parks. Georgia has developed a similar system for all parks, using a set of 15 or so facility activity types. Generally, many agencies mix facility attributes and activity attributes (e.g., baseball fields could be both a location point and a general attribute of a park), so there is some inconsistency here.

NRPA Park Metrics system — As noted earlier, NRPA has developed a standardized GIS framework that it recommends for its member local and state agencies who want to track parks, facilities, and trails. Park Metrics has an online application to aid members in creating and storing such data and includes spreadsheet/list tools for those not able to work in GIS data formats. NRPA and the USGS PAD-US team cooperate in data sharing.

TPL Parkscore/ParkServe — As mentioned above, the Trust for Public Land has developed Parkscore, a system for inventorying parks in the 100 largest U.S. cities and providing rankings of the extent of their park systems including indicating socio-demographic relationships. In 2015, TPL received significant foundation funding that it is using to develop ParkServe. By 2019, TPL should be able to provide parks data for most urban areas of the U.S., including rankings as to whether there are parks within a ten minute walk of any urban neighborhood. TPL is coordinating its work in developing urban parks data with the USGS PAD-US program, offering the opportunity to transfer data on urban and metropolitan parks into relevant state inventories, or to be placed directly into PAD-US. This is very good news for PAD-US and all concerned with a national inventory of parks and open spaces, filling in one major task area of the strategy outlined later in this report.

Conservation Easements — The Trust for Public Land, Ducks Unlimited, and other nonprofits have created the National Conservation Easement Database (NCED — conservationeasement.us), which is coordinated with PAD-US (PAD-US mainly covers lands owned in fee) and included in the published PAD-US data. Easement-protected lands are rarely recreational resources, as they usually remain privately owned, but with conservation restrictions. Funding for NCED has come primarily from private foundations and some public agencies with some additional support from USGS GAP.

2. Commercial Data on Parks and Open Space

It is important to distinguish between commercial data efforts and commercial web applications and software development — the latter is akin to a car that needs fuel (data) to function. Esri, for example, produces excellent GIS and web application **software,** but this requires good **data** from others for its applications to function well.

In general, the following are the **commercial** efforts to develop or use recreation and open space related data:

Google, Bing, Apple, other businesses developing map services - These large organizations are making huge investments in mapping technology and data in the U.S. and globally, mainly for navigation and commercially focused local search. While they maintain data on parks and open space areas, its quality is mainly limited to urban neighborhoods — in broader metropolitan and rural areas, the depiction of parks and other protected areas is often very inaccurate and incomplete. In general, these businesses are likely consumers of improved (federal/governmental) data, whether through periodic download or active Application Programming Interfaces (APIs). Park and open space data is not (yet) commercially valuable to these businesses, limiting their interest in investing in accuracy.

This "space" is dynamic — for example, a consortium of German automakers recently acquired major elements of Here, the old Navteq data framework used by Microsoft in its Bing mapping applications. Recently, Uber and Apple have announced very large forthcoming investments in expanding their geospatial data. But none of this alters the basic conclusion that no commercial data is available to meet the overall needs discussed in this memo. While companies like Apple and Google could apply resources many times those available to federal and state governments, this does not seem likely in relation to public parks and protected areas.

An example comparison of Google data with PAD-US data is provided on the following page.

An additional potential source of data are two major web map providers — **MapBox** and **Carto**. While these differ somewhat, they are increasingly pursuing similar approaches. MapBox, which has specialized in base map provision and cartography tools in 2015 launched its "Outdoors" base map that includes park and open space boundaries, incorporating data from OpenStreetMap (more on OSM below).

Comparison of Commercial Data with PAD-US

The images below offer an August 2016 comparison of Google map data to PAD-US data. PAD-US, which is comprehensive and highly accurate for this area southwest of Silicon Valley, covers far more land than Google and does so much more accurately (red areas in the PAD-US are closed to the public and would not be on a Google map).
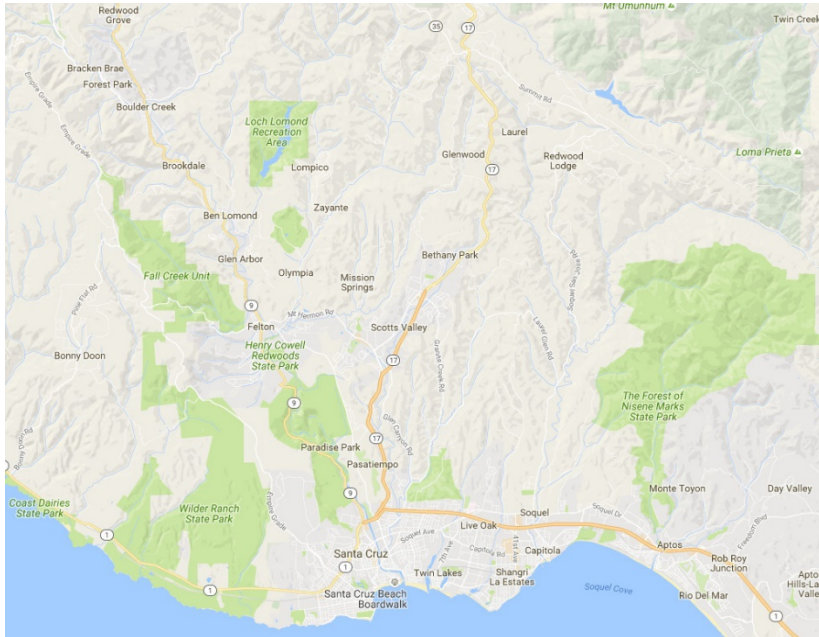
Google map

(Bright green areas are "parks", gray green shows vegetation)
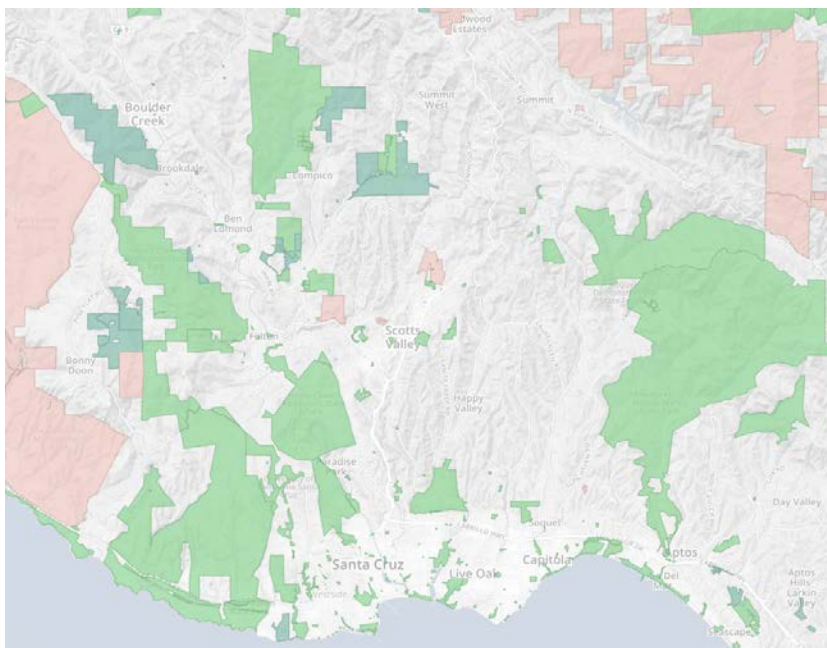
PAD-US data

(Brighter green areas show open access parks and other protected areas, gray-green areas require permits for access, and red areas are closed to public use)

3. Open Source Data

There are growing numbers of efforts to create data developed by dedicated volunteers — often termed "open source data" or "volunteered geographic information." **OpenStreetMap** (OSM - http://www.osm.org) is the premier open source geospatial data effort, using contributions from thousands of volunteers (and increasingly automated sensors and data derived from aerial imagery) to create a credible global street map with other information. While effective at the core streets role, OSM data on parks do not follow any standards, have very limited attributes, and are a mix of land use and owner designation (e.g., sometimes protected areas are defined as "forest", other times as a specific park or protected land unit). OSM is not, at this point, a useful framework for protected land boundaries and associated data, though individual (mostly smaller) parks often have admirable and accurate facility and trail locations, but again, without rigorous attributes and consistency from site to site. This latter data (points for restrooms and parking lots, trail lines, and other) can be extracted and are often accurate but are sometimes at odds with land managing agencies' own data. OSM serves many valuable/essential other purposes, however, and is providing a vital pathway for open source data efforts.

A complete and well-maintained PAD-US would be a great resource **for** OSM and other open data work, as it would provide a primary authoritative data source to use for public parks and open space.

4. Recreation web applications

Another form of volunteered geographic data comes from commercial ventures that provide platforms that individual users contribute data to — mainly routes of their hikes, runs and biking. For those that are nature- or recreation-focused, their mapping visualizations or platforms often reference public parks and open space data (sometimes by drawing in Google or Bing maps, sometimes using other sources and sometimes using their own created/managed data).

Dozens of recreation application providers use parks and open space data in various forms. Some of them use federal and state GIS data to depict national and state parks (Oh Ranger! is perhaps the best example, publishing both a mobile application for finding parks and activities and a number of park-specific brochures which also have extensive local information and advertising. Their coverage, however, is just national and some state parks and refuges, and they do not always include all federal and state lands that are in PAD-US. They do not cover local parks at all.

There are a number of commercial web applications for trails data — AllTrails.com (National Geographic is a partner), Trails.com (owned by Demand Media), and TrailLink.com (Rails to Trails Conservancy site). These sites use base maps of parks, mostly national and state parks, with occasional individual agency parks, but nothing widespread or consistent below the national level. Other web applications are based more on user input, often from GPS tracks that users upload to these sites (for example, MapMyTrail.com, and Strava.com, which has running and biking GPS tracks).

Another commercial web site example is OnXMaps.com (recently renamed from HuntingMapsGPS.com), which provides the hunting community with web/interactive maps showing public protected lands along with private lands that are suitable for hunting.

Trailhead Labs is taking a different approach. It seeks to offer ready-to-use mobile and web applications for agencies that upload their data into the Trailhead Labs cloud storage system and subscribe to its payment plan. This approach requires agencies to either use the Trailhead labs data model or have them create a translation application.

Finally, iNaturalist and eBird are two of a number of nature-tracking applications, enabling inventories of observed species occurrences and tracking of observed birds, respectively.

In addition to these more data-driven efforts, a great many blogs and news media posts include digital image or interactive maps of hikes and travels, sometimes gathered from official sources but often just reflecting a hiker's own direct experience. These are often very rich sources of information and could benefit over time from access to a single national data set of all public parks and open space lands.

E. PAD-US: WHAT MORE IS NEEDED?

1. Define PAD-US as the nation's inventory of parks and public open space

PAD-US is a tremendous resource for public good, incorporating over 25 years of lessons learned from geospatial professionals, landscape ecologists, and recreation and conservation practitioners. The dynamic data standard, built up through state, regional, and national projects, offers a robust framework to meet common needs across various public jurisdictions. This "grassroots" development strategy ensures broad support for the resulting geodatabase.

To date, most available funding resources have had been to be spent on PAD-US data production, leaving little budget for needed outreach and user engagement. Though awareness of PAD-US is increasing, many potential partners and users do not yet understand the opportunities that it presents. Others appreciate the existence of these aggregated data but are challenged by interpretation or technical issues. In evaluations, agency data stewards have called PAD-US, "the most complex yet intelligently designed, database of its kind," and, "a powerful tool that exceeds expectations," while others note that "nothing like this exists." Moving forward, continued support within the Department of Interior and the Federal Land Working Group, plus other relevant federal agencies will benefit the development of PAD-US.

2. Complete and integrate local/regional park and open space data

Enabling PAD-US to support those working on urban parks and recreation issues is very important. Because of the Trust for Public Land's foundation-funded efforts, crucial work is underway on urban parks data development and is slated for completion toward the end of 2018. However, other parks and areas are not likely to be inventoried in the TPL project. This leaves a need to encourage support for data work from other agencies and organizations. These include those involved with LWCF (NASORLO and member agencies, the National Park Service, and the SCORP process, as well as agencies with grant programs that might aid this data work, such as HUD, USFS Urban & Community Forestry, foundation grant makers, and other funding opportunities. This work should also encompass adjustments to PAD-US data and structure to best serve those seeking to use it to address urban recreation issues and opportunities.

The urban parks data work will also support state steward efforts to improve inventories, as noted below.

3. Improve PAD-US systematically by developing a new database platform internally and more effective data serving externally

While PAD-US is a very robust database, the long-term vision for its use requires a revised technical framework, which is termed Version 2 by USGS. A revised framework will allow for more efficient intake and validation of data, improved data quality, and most important, the capacity to publish two or more "products" out of a core PAD-US data set — one for use in biodiversity assessments, and one for recreational applications. This is relatively major technological work and will require significant resources to accomplish.

A key part of this Version 2 framework is more capacity for PAD-US to actively support those working on recreational applications (park finders, research programs, etc.). PAD-US as a biodiversity data set requires one approach to engaging with its data, while using and developing it to support finding and analyzing parks requires another approach. A core tenet of the Version 2 concept is that PAD-US should serve both these needs equally well.

4. Provide stronger support for state stewards and state data aggregations

Having more states with effective data stewards is central to the long-term quality of a national public parks protected areas database. There are many approaches for "stewards," but the core notion is that each state has an organization that is mission-focused on developing a high quality, PAD-US-standard dataset of parks and open space lands. A steward organization can be governmental, academic, or nonprofit, as long as it can create and maintain a statewide inventory that is compatible with PAD-US. In some areas, nonprofits such as the Trust for Public Land, The Nature Conservancy and the National Recreation and Park Association assist in developing state inventories where stewards' capacities are limited.

Providing funding for these stewards to develop their capacities and to improve their data collecting and editing will be important. This funding could be a mix of federal, foundation and state funding sources.

5. Stronger outreach to and engagement of PAD-US users

Building a great data product is just part of the formula for an effective national inventory of parks and open space. Supporting and developing users of the data is a central task as well. This includes broader outreach to inform potential users about PAD-US, development of means to absorb feedback from these users, and the creation of efficient ways of providing support for users. In particular, those working on urban parks issues (CDC researchers and many others) are a key audience for this outreach, which can be aided by TPL's work, noted earlier. But recreation application users (trails, camping, hunting, etc.) are also crucial and the new Recreation.gov contract may help here, too, along with groups like NRPA, City Parks Alliance, state tourism agencies, and others. Finally, direct engagement of web application developers will be key, given the very dynamic nature of this sector.

Overall, outreach needs to be targeted rather than just broad. For example, the USGS-supported Federal Lands Working Group is a great framework for letting key federal agencies know more about PAD-US. Individual state steward organizations are likewise nodes that can assist with education in their own areas. Other agencies and nonprofits have their own circles that can help, too.

This outreach is very important to extend to the commercial sector and to support tourism, web-based map routing applications, and other uses by businesses.

6. Continue to strengthen PAD-US/RIDB relationships

The RIDB (federal database of reservable public park locations managed by the Dept. of the Interior) is essential to Recreation.gov, which in turn expects to grow from its already considerable size. This means that weaving in PAD-US into RIDB in an effective manner is a key task, and may also involve tweaking the Version 2 PAD-US data model as noted earlier. One big advantage for RIDB in using PAD-US is that it would greatly aid the Recreation.gov vision of being a general one-stop framework for reservable recreation for all levels of parks: federal, state, and local.

7. Improve biodiversity ranking of protected areas in PAD-US

For those working at any level on habitat or species conservation, connectivity or climate change adaptation, having effective conservation measure in PAD-US is key to their planning efforts. More work is needed to have effective ranking of the biodiversity status of all protected areas.

8. Continue improving federal lands integration and data quality in PAD-US

The Federal Land Working Group described above has proven to be a remarkably successful collaboration, and its efforts promise much better coordination among the federal managing agencies. However, support for this inter-agency coordination is limited and needs a stronger base for future work, as do efforts within individual agencies.

9. Support continued development of NCED easement data

Data on conservation and open space easements are critical for conservation and land use planning at all levels — national, state, and local. There are also significant areas under easement that allow for recreational use (sometimes under permits). While NCED is managed by a nonprofit consortium, it is closely related to PAD-US and should be considered as part of the PAD-US data product.

10. Develop additional opportunities for PAD-US data use

Beyond developing the coverage and quality of the inventory, there are opportunities to extend its use in governmental programs run by other departments and agencies. For example, working closely with the National Park Service's Land & Water Conservation Program might bring closer connections between State Comprehensive Outdoor Recreation Plans and the development of improved state data inventories and stewards, which would then feed into PAD-US. Various federal grant programs for housing and transportation could also provide local improvement of data that could in turn move into state steward inventories. National programs that report on park, park use and access, and related topics could make use of PAD-US and contribute to its development. The emerging Parks Rx movement requires a completed national database of parks and could be a valuable partner in helping complete the data for PAD-US, as well as make it helpful to others.

In addition, working with the National Recreation and Park Association to support local agencies' use of PAD-US or local state data steward inventories would ensure that local and regional planners are aware of and provide feedback about PAD-US data.

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4. RECOMMENDED PRACTICES FOR PUBLIC PARKS AND OPEN SPACE GIS DATA

While individual agencies or states will have variations for their own needs, all types of users of PAD-US data will benefit by **common guidelines** about GIS inventories of public parks and open space lands. The PAD-US data standard is a strong beginning for this, but all of those who contribute data to PAD-US could themselves do more to make their data easier to incorporate into or relate to PAD-US.

This does not challenge specific other approaches by individual agencies, but it does underscore that a national inventory that supports a wide range of users will be most effective when those contributing to it share increasingly the same data approaches. This may be limiting at times, but such a choice is essential to providing the most broadly usable overall product. The recent work by USGS with the Federal Lands Working Group is an outstanding example of this approach to integration through standards.

The following, then, are the **major elements of the PAD-US program** that should gain widespread support from all types of PAD-US stakeholders:

a) General principles

- A single national geospatial inventory of public parks and open space lands is essential for a wide range of policy, research, management, consumer, and business needs.

- PAD-US is the official national inventory and is managed by the US Geological Survey, on behalf of a wide array of public, private, and nongovernmental users.

- All other public parks and protected areas data efforts should strive to coordinate and enhance PAD-US and should avoid creating or supporting products or approaches that compete with it.

- PAD-US should be managed with frequent and meaningful user engagement in order to remain relevant and merit widespread support for ongoing development.

- PAD-US should strive for as much completeness and accuracy as possible, understanding, however, that a national inventory will always have gaps and areas for improvement, particularly in comparison to agency source data.

b) Data framework

PAD-US is a broad inventory of many types of lands — local parks, regional/state parks and preserves, federal parks, lands, refuges, and more. This data therefore needs to be configured to support a **wide range of users**, including the ongoing incorporation into PAD-US of the National Conservation Easement Database (**NCED**).

The specifics below are highlights of a much more complex set of **data management principles** and practices followed in developing and publishing PAD-US.

What's in/out of PAD-US

Protected areas in PAD-US are defined as:

> *areas dedicated to the preservation of biological diversity and other natural, recreational or cultural uses, managed for these purposes through legal or other effective means (other means could mean, for example, administrative designations documented in an agency management plan like BLM Areas or Environmental Concern, or ACECs).*

This definition is intended to be broad, covering the full range of open space uses noted at the beginning of this paper — from small urban parks all the way to large wilderness areas. And it allows the inclusion of lands conserved under open space-type easements as well as Marine Protected Areas.

In addition to its strong land **management** focus, the PAD-US geodatabase should be re-designed so that it better tracks land **ownership**, with related layers that can be used to publish a limited number of specific PAD-US versions (Biodiversity PAD-US, Recreation PAD-US, etc.). This will enable better functionality for particular user clusters. This is a key element in the strategy for Version 2.0 PAD-US, requiring a fairly major upgrade in the geospatial database technology and procedures being used to create and publish PAD-US.

PAD-US Data Standards and Structure

The PAD-US data standard manual should be the recognized and common framework for how PAD-US data are organized and attributed. The standard is currently being evaluated by the Federal Geographic Data Committee (FGDC) for official endorsement. The core attributes of PAD-US should be relatively few and well defined. The current attributes are shown in Appendix 1, and defined with much more detail in the PAD-US standards manual. Separate standards define NCED.

Over time, there should be opportunities to refine the PAD-US data standard with appropriate user input. However, because of the official nature of PAD-US and the scale of it as a data product, major changes to structure are unlikely. The Version 2 work will offer a useful opportunity for such review and needs to be properly funded to allow for this.

c) Management of PAD-US

USGS currently manages PAD-US. Within USGS, the Gap Analysis Program (GAP) developed the data and is now in charge of its ongoing improvement and use. The role of USGS as the database manager includes these **responsibilities**:

- Defining and maintaining overall data **standards**, in collaboration with users, and educating a range of users about that data standard

- **Coordinating federal agencies'** land data managers to ensure the federal PAD-US lands are consistent with their source data (including helping them resolve differences between their data sets, supporting the Federal Lands Working Group, etc.)

- Coordinating with **national nonprofits** (The Nature Conservancy, Audubon, Ducks Unlimited, etc.) regarding their land data systems

- Creating and, within available resources, **supporting state aggregators** of state/local lands

- Coordinating with the **National Conservation Easement Database** (NCED) nonprofits

- Maintaining liaison with **RIDB and Recreation.gov** (through National Park Service)

- **Outreach to and engagement** of other non-land-owning federal agencies in relation to this data (CDC, Homeland Security, etc.)

- Developing **new approaches** to the PAD-US database (see later section for details), and technical improvements to data aggregation and processing

- **Supporting users** of PAD-US, including establishment of web services, limited technical support, provision of web resources, hosting of webinars, etc.

- **Promoting PAD-US generally**, to agencies, nonprofits, universities, and private businesses, to encourage use of and support for the data

d) Relation to NCED

PAD-US will be developed to retain the current approach of incorporating non-sensitive easement data suitable for publication into the public domain, from the National Conservation Easement Database, but NCED will continue to be developed by its current data publishers, led by Ducks Unlimited and the Trust for Public Land. NCED has its own management program that addresses relations state by state with data providers, as well as its own data publishing process. Close collaboration and coordination will continue between PAD-US and NCED to ensure the efficiency of each program.

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5. ACTION PLAN

The overall goal for PAD-US is a complete national inventory of public parks and protected areas, with support for improvement and use of this data system long into the future.

The main **steps** in the action plan are as follows — timing and funding are discussed in the following section:

1. Expand **official support** of PAD-US as the national inventory for public parks and open space areas. This assures other federal agencies and outside funders that there is no duplication of effort and that there is a common commitment among core agencies.

2. Confirm USGS as the **manager** of PAD-US and USGS GAP as lead group (USGS and Department of Interior processes, but also support from stakeholders).

3. Endorse current PAD-US **standards and data practices** as the near-term framework for the inventory, while future efforts are launched to improve this framework.

4. **Maintain** ongoing PAD-US operations for data collection, improvement, publication, and user support.

5. Undertake the following **additional initiatives** during a three year period:

   ▪ Extend the efforts of the FGDC National Boundaries Group/Federal Lands Working Group to better integrate federal agency land data into PAD-US and endorse the PAD-US Data Standard

   ▪ Build the capacity of state steward organizations to complete and maintain state inventories, including public and foundation funding of this work, as well as incentives in related programs, such as close coordination with the LWCF state assistance program

   ▪ Collaborate with the Trust for Public Land's ParkServe project on improving local and regional park data in urban areas, while also involving/supporting state steward organizations

   ▪ Improve PAD-US attribute consistency and coverage, and geometric accuracy

   ▪ Design and implement Version 2 of PAD-US (revised database structure/technology)

   ▪ Launch core outreach initiatives for users in public health, climate, multi-jurisdictional collaboratives, commercial mapping companies and application developers, and RIDB/Rec.gov, among others

   ▪ Educate PAD-US actual and potential users about the availability and best uses of PAD-US data

   ▪ Build a PAD-US partnership framework to support and encourage PAD-US development, including public, private, and academic interests

   ▪ Support NCED process for developmental and ongoing work on conservation easements

SCHEDULE

The timing of these steps depends on both refining the intended steps and engaging agencies and others in discussion of funding options. The following is the currently planned approach:

2016: Planning and funding/resources development, including stakeholder engagement; design of Version 2 series data framework approach; data work and outreach on current PAD-US data

2017: Support for state steward development and other state/local data improvements efforts; ongoing work by TPL on urban parks, Version 2 PAD-US development leading to new data structure for 2017 release; further partnership development and outreach

2018-19: TPL parks data completion; ongoing PAD-US data improvements and outreach; publication of first "complete" PAD-US product by 2019, with associated educational outreach and user support

2020: PAD-US now contains all current public park and other protected areas and has a stable system for ongoing data maintenance and user support, including support of NCED for easement data

FUNDING

PAD-US is a core component in the national spatial data infrastructure of the United States —like coastlines, waterways, interstates, census demographics, and many more elements of US data infrastructure, PAD-US serves critical, ongoing needs. It can't serve this mission if it is not complete, current and effective.

During the 2014-2016 period, PAD-US has been supported by USGS with a budget of approximately $350,000 per year, including staffing (2+ staff), grants to states, and some support for NCED and limited outside consulting. USGS also provides other substantial information technology assistance to the PAD-US and related projects. With this very minimal budget, much has been accomplished.

But without a more robust investment, PAD-US can't be the critical element in the nation's information system that its users want and need it to be. The following is the estimated budget required to complete an inventory of what is now public parks and protected areas, over a three-year program.

INITIATIVE (proposed for 2017-2019)	Year 1	Year 2	Year 3	TOTAL
Core PAD-US work on data updates, publishing, management	$500,000	$500,000	$500,000	$1,500,000
Federal agency coordination and collaboration on data, standards (USGS only, does not include in-kind from FLWG agency efforts)	50,000	50,000	50,000	150,000
State stewards and data (including TPL and local agency coordination, local grants)	400,000	400,000	400,000	1,200,000
Special PAD-US data improvement project (improve existing data over 3 years, including in certain states)	200,000	150,000	100,000	450,000
Version 2, technical and user-focused design and implementation	150,000	100,000	50,000	300,000
Special educational outreach initiatives, focused on general user groups, audiences	100,000	150,000	50,000	300,000
User outreach and support for those applying PAD-US to particular needs	100,000	100,000	100,000	300,000
Partnership development, agency, nonprofits, states	75,000	75,000	50,000	200,000
NCED data expansion, improvement and system development	200,000	200,000	200,000	600,000
TOTALS	**$1,775,000**	**$1,725,000**	**$1,500,000**	**$5,000,000**
Est'd. USGS GAP Funding	$350,000	$350,000	$350,000	$1,050,000
NET NEW FUNDING NEEDED	*$1,425,000*	*$1,375,000*	*$1,150,000*	*$3,950,000*
INKIND — Est. TPL ParkServe	$600,000	$600,000	$600,000	$1,800,000
TOTAL RESOURCES IN PROJECT	**$2,375,000**	**$2,325,000**	**$2,100,000**	**$6,800,000**

Sustainability Funding (annual)

While the exact funding required for ongoing support and maintenance is difficult to estimate, the following is a **possible** annual framework, assuming that most public parks and protected areas data have been entered into PAD-US and that ongoing work is mostly maintaining and incrementally improving PAD-US:

Core PAD-US team: $500,000 (data/technical, outreach, support, management)

State stewards*: $200,000 (competitive grants for data development)

Special projects: $150,000 (selected subject or technology focused efforts, including national reports on the PAD-US inventory)

NCED support: $150,000 (supplemented by NCED fundraising, foundations)

TOTAL: approximately $1 million/year

*In general, it is not likely that all 50 states will have fully functioning steward organizations in the near future. These grants are primarily to help those who seek to become stewards or improve their capacity to efficiently transfer their data into PAD-US. During the three-year phase, data development funding is also focused on "filling in" states where capacity is low.

Funding sources

Funding sources can include direct federal agency budgets, special authorizations or projects, support from other agencies, in kind or assigned staffing, private philanthropy, joint ventures with nonprofit organizations, special projects in particular regions or with particular partners that offer synergistic opportunities to address PAD-US needs (e.g., LWCF SCORP process), and funding in individual states for their own inventories.

Federal programs with potential for direct and indirect support include the following:

- Individual land management agency data collection and management while automating their PAD-US updates (e.g., USFS, BLM, NPS, FWS, etc. – note that these agencies already invest considerable resources in managing their own lands data and coordinating with PAD-US through the Federal Land Working group)

- BLM Surface Management Agency program (official aggregation of federal transaction records, BLM State Offices digitize GIS representation following title recordation)

- USGS National Map (aggregates fed lands boundaries, PAD-US state lands and other related features — trails, cemeteries, etc.)

- National Wildfire Coordinating Group (which itself aggregated federal lands in the past to determine fire jurisdiction, but not uses PAD-US)

- Recreation.gov (the national reservations database which derives much of its data from RIDB)

- Programs in EPA, HUD, Transportation, Homeland Security, and other departments

In addition to all these programs, there are also possibilities for partnerships with recreation industry associations and retailers.

The exact mix of funding for PAD-US will emerge from year-by-year decisions as well as other opportunities.

APPENDICES

APPENDIX 1:   PAD-US Data Attribute Structure (version 1.4, 2016)

The following are the current attribute fields in PAD-US. GAP and IUCN fields refer to biodiversity rankings. Easement data included in PAD-US are a subset of the more extensive attributes for easement data available in NCED.

FIELD	FIELD NAME
Owner Type	Own_Type
Owner Name	Own_Name
Local Owner	Loc_Own
Manager Type	Mang_Type
Manager Name	Mang_Name
Local Manager	Loc_Mang
Designation Type	Des_Tp
Local Designation	Loc_Ds
Unit Name	Unit_Nm
Local Name	Loc_Nm
State Name	State_Nm
Aggregator Source	Agg_Src
GIS Source	GIS_Src
GIS Source Date	Src_Date
GIS Acres	GIS_Acres
Source Protected Area ID	Source_PAID
WDPA Site Code	WDPA_Cd
Public Access	Access
Public Access Source	Access_Src
GAP Status Code	GAP_Sts
GAP Status Code Source	GAPCdSrc
GAP Status Code Date	GAPCdDt
IUCN Category	IUCN_Cat
IUCN Category Source	IUCNCtSrc
IUCN Category Date	IUCNCtDt
Date of Establishment	Date_Est
Comments	Comments
Easement Holder	EsmtHldr
Easement Holder Type	EHoldTyp

Appendix 2: - Summary of State Stewards

See www.Protectedlands.net/partners for status of states and steward capacities

Alabama	Alabama Department of Conservation and Natural Resources (ADCNR)
Alaska	University of Alaska Anchorage, Alaska Natural Heritage Program
Arizona	Arizona Game and Fish Dept., AZ Dept. of Lands
Arkansas	Arkansas Geographic Information Office
California	GreenInfo Network (CPAD, www.calands.org)
Colorado	Colorado State University, COMaP
Connecticut	Connecticut Department of Energy and Environmental Protection
Delaware	Delaware State Parks
Florida	Florida Natural Areas Inventory, Florida State University
Georgia	Georgia Department of Natural Resources
Hawaii	Hawaii Department of Land and Natural Resources
Idaho	Idaho Fish and Game
Indiana	Indiana State Land Office
Iowa	Iowa Department of Natural Resources
Kansas	Kansas Biological Survey - Kansas Natural Heritage Program
Kentucky	KY State Nature Preserve Commission
Louisiana	Louisiana Office of State Lands
Maine	Department of Agriculture, Conservation, and Forestry
Marshall Islands	USDA Forest Service, International Institute of Tropical Forestry
Maryland	Maryland Department of IT
Massachusetts	Executive Office of Energy and Environmental Affairs
Michigan	Michigan Department of Agriculture and Rural Development
Minnesota	Minnesota Department of Natural Resources
Mississippi	Mississippi Automated Resource Information System (MARIS), MS Institutions of Higher Learning
Missouri	Missouri Resource Assessment Partnership (MoRAP), University of Missouri
Montana	Montana Natural Heritage Program
Nebraska	Nebraska Game and Parks Commission
Nevada	Nevada Natural Heritage Program
New Hampshire	NH Geographically Referenced Analysis and Information Transfer System (GRANIT)

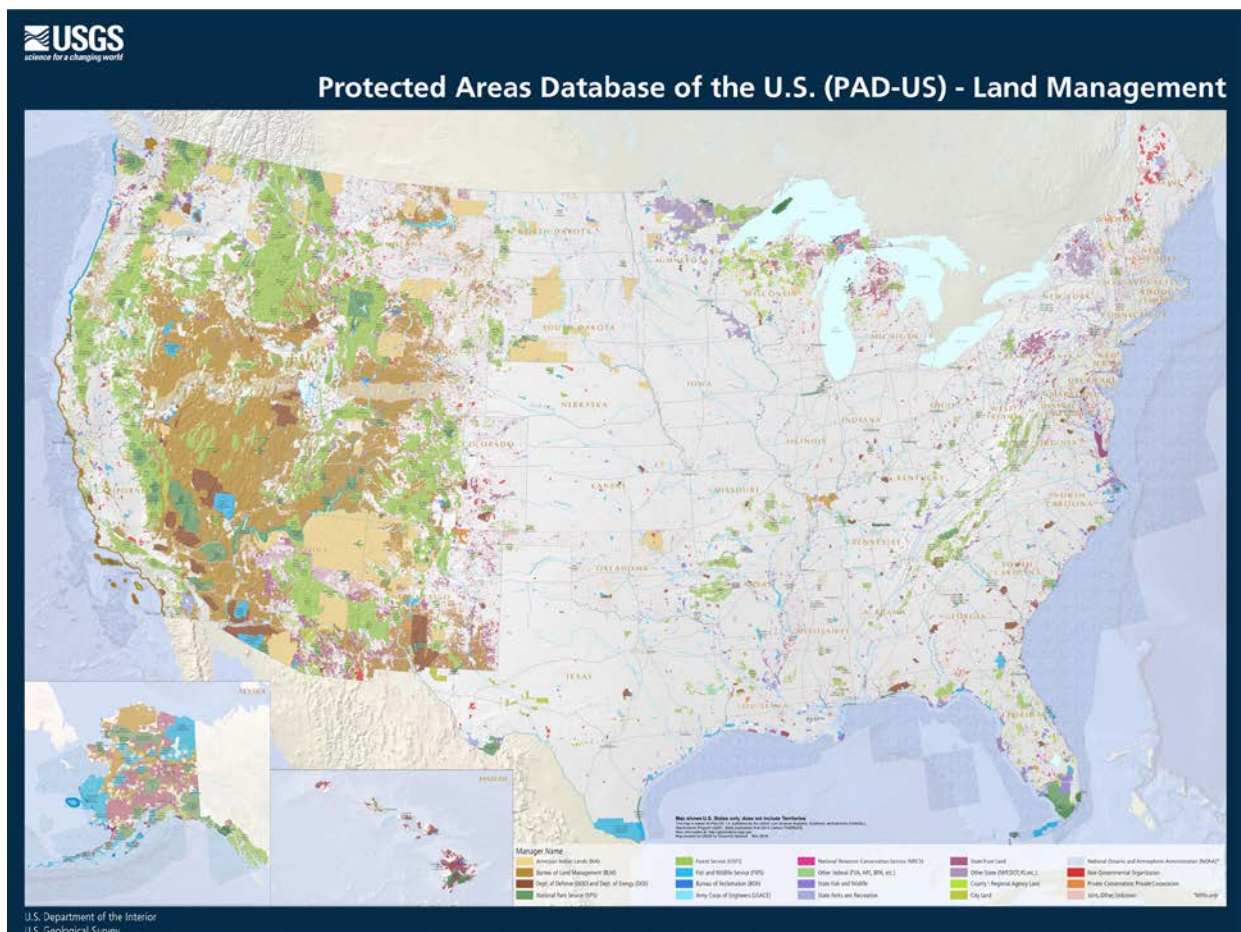|	
New Jersey	NJ Office of IT of Geographic Information
New Mexico	Natural Heritage New Mexico, University of New Mexico
New York	New York Natural Heritage Program
North Carolina	North Carolina Dept. Natural Resources, North Carolina Natural Heritage Program
North Dakota	North Dakota Recreation Department
Ohio	Trust for Public Land
Oklahoma	Oklahoma Biological Survey
Oregon	Oregon Biodiversity Information Center (ORBIC)
Pennsylvania	Delaware Valley Regional Planning Commission
Puerto Rico	USDA Forest Service, International Institute of Tropical Forestry
Rhode Island	Rhode Island Department of Environmental Management
South Carolina	South Carolina Department of Natural Resources
South Dakota	South Dakota Game, Fish & Parks Wildlife Division
Tennessee	Tennessee Wildlife Resources Agency
Texas	Texas Parks and Wildlife Department
U.S. Virgin Islands	USDA Forest Service, International Institute of Tropical Forestry
Utah	Utah Automated Geographic Reference Center (AGRC)
Vermont	The Nature Conservancy
Virginia	Virginia Department of Conservation and Recreation, Virginia Natural Heritage Program
Washington	Washington Department of Fish and Wildlife
West Virginia	West Virginia University, WV GIS Technical Center
Wisconsin	Ducks Unlimited CARL Database
Wyoming	Wyoming Geographic Information Science Center, University of Wyoming

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PAD-US

The Protected Areas Database of the United States

PAD-US is America's official national inventory of public parks and protected areas. These lands and waters include local and regional parks, national parks, preserves and forests, marine protected areas, and lands conserved under conservation easements (from the National Conservation Easement Database).

Total areas in PAD-US cover over 3 billion acres (including marine areas) in 150,000 parks/protected areas, managed by over 15,000 agencies and nongovernmental organizations. PAD-US is published by the USGS Gap Analysis Program.

More information on PAD-US at http://gapanalysis.usgs.gov/padus, and at www.ProtectedLands.net