

# Colorado Trails Mapping Project

## Phase I: Concept and Feasibility Investigation



**Fall, 2006**



Prepared by:



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## INTRODUCTION AND OVERVIEW

### **Mission Statement**

This investigation was initiated at the request of the Colorado State Parks State Trails Program. The Overall Mission is to create a sustainable statewide universal trail system mapping, information, way-finding program and inventory. The goal is to create a system that will be usable by, and accessible to: the general public; local trail planning and advocacy officials; local trails management agencies; public safety agencies; GOCO State Trails; tourism promotion organizations; the tourism industry; and others with an interest in using, managing and promoting trails in Colorado.

When ultimately completed, the system will address publicly accessible trails funded by the State Trails Program and trails on local, county, state and federal jurisdictions, open to the public. The system will address all types of trail uses.

The project will explore practical, cost effective media for disseminating and routinely updating (at least annually) the trails information including: digital information available on disk; digital information available by downloading from the Internet; digital information available by downloading to personal digital assistant devices (PDA's) including conventional PDA's and web-enabled cell phones; Global Positioning System (GPS) devices; digital kiosks at airports, shopping centers and other activity centers and digital trailhead displays. The system will also be designed for cost-effective information contribution and updating by local entities and agencies with an accessible user-friendly and uniform platform that allows each participant to routinely enter their latest trail system information into the statewide system using a uniform digital template.

### **Tasks Completed**

This effort described herein constitutes the first phase in a multi-stage effort to create a comprehensive digital mapping system. The scope of work of this phase (Phase I) included:

- Task I: Identify Optimal Mapping Information System
- Task II: Layout, Art and Template Concepts
- Task II: Sustainable Information Reporting System Recommendations
- Task IV: Implementation Recommendations and Conclusions

## Work Products

The work products delivered include:

- **Web Template and Example Art**—a multi-layered (from statewide to local trail descriptions) Web template with art concept.
- **Prototype Software Application Concept Recommendations**—for a digital mapping/ data platform for trail users and for GIS-type trails management mapping
- **Content Development/Management Mechanism**—a recommended digital method for timely and continual uploading of trails information by local entities to the statewide system
- **Proto-Type Test Project Description**—A proto-type project description and costs estimate that demonstrates the system, system content and graphics that can be tested on a user population, refined and perfected
- **Study Report**--a report with specific recommendations

## Study Financial Support

This effort has been funded by a grant from the Colorado State Trails program matched by in-kind staff and consultant services and concepts and from a variety of other sources with an interest in this project.

## **CHAPTER 1**

### **IDENTIFY OPTIMAL MAPPING INFORMATION SYSTEM**



## CHAPTER 1: IDENTIFY OPTIMAL MAPPING INFORMATION SYSTEM

### The Needs Addressed

- There is no up-to-date, comprehensive information source for monitoring the status of the State Trails system including addressing: gaps; planning and progress; expenditures; crime and accident data; and other information that could make statewide and local planning more effective.
- The previous mapping (produced by the Colorado Lottery) and many privately-distributed guide maps and publications do not take advantage of new digital technologies and information dissemination methods such as the Internet.
- Current commercial trail information services on the Internet such as guides, maps, and Web sites are not comprehensive, may be out of date, lack specific local information for users, are scattered and not readily accessible.
- Information about the current Colorado State Trails System needs updating. The previous “paper” system of mapping (non-digital) is costly to maintain, produce and distribute. A cost-effective way should be developed to facilitate regular and accurate updating of the State Trails information base.
- Colorado has one of the nation’s premier trail and greenway networks with both urban and non-urban resources. Both residents and tourists would benefit from a comprehensive, easy to assess and useful trails information system.
- There is an increase in health costs due in part to lack of physical activity. Trail use has been shown to promote better health but comprehensive, readily available trails information is lacking. Readily available information and trails, trails accessibility, surface type, degree of difficulty, other information may help promote trail use.

### Concept and General Performance Criteria

1. Create a statewide trail mapping, information, way-finding and inventory system that updates and enhances the current “paper” mapping system. Can serve as a clearinghouse for statewide data.
2. The system will be usable by – and accessible to – the general public; local trail planning and advocacy officials; local trails management agencies; public safety agencies; *State Trails*; tourism promotion organizations; the tourism industry; and others with an interest in using, managing and promoting trails in Colorado.

3. The system will be simple and convenient to use by non-technical consumers and agency staff.
4. This is a layered system with workable levels at the state, regional, county/metro area, community and neighborhood levels with “click-on” packets of user and management agency information. Users will be able to “drill down” using a map-based graphic system.
5. When completed, the system will address all existing publicly available funded by the State Trails Program, and trails on local, county, state and federal jurisdictions open to the public. The system will address all types of trail uses including non-motorized, motorized and paddle craft.
6. The project will identify and utilize practical, cost effective media for disseminating and routinely updating (at least annually) trails information including: digital information available on the Internet; on disk; and, where feasible, in printable media. Potentially, digital information could be available by downloading to personal computers, digital assistant devices (PDA’s) including conventional PDA’s, web-enabled cell phones; Global Positioning System (GPS) devices; digital kiosks at airports, hotels or shopping center and other activity centers and digital trailhead displays.
7. The system will also be designed for cost-effective information contribution and updating by local entities and agencies with an accessible user-friendly and uniform platform that allows each participant to routinely enter their latest trail system information into the statewide system using a uniform digital template.
8. The system will include a “managers information” useful to trail planners, trail developers and managers for tracking trail inventory, identifying gaps, addressing operations and maintenance needs and related purposes.
9. The system will be financially sustainable and access free to users.

### **Applicability and Benefits**

- User access and wayfinding on the State Trails system and local trails networks
- Useful information source for trail users to greatly increase access and use of trails in Colorado
- Useful informational and promotional tool for tourism and real estate industries



- Promote fitness by enabling and broadening trail use through easy access to trail information
- Information source and clearinghouse for visitors to Colorado and local Colorado communities
- Local and state agency planning and monitoring
- Tool for State Trails Committee and staff to plan, monitor the system, identify gaps and deal with issues
- Tool for local trail entities to plan, monitor and manage trail facilities
- Tool to monitor safety and security issues
- Potential revenue source for trail programs

### **Overview of Trail and Amenity Definitions and Queries**

An important aspect of a successful information system is clarity and commonality of definitions of types of activities and types of trails. Although a number of states, federal agencies, local and other entities that have put forward definitions—including the recent comprehensive definitions developed by the *Colorado Outdoor Training Initiative* (COTI), there is, presently no common user-oriented glossary of trail terms. There are also a number of terms in common usage as well as vernacular and “slang” terminology—especially in the mountain biking realm.

See <http://www.americantrails.org/http/coti/trailterm2005.pdf> to download and view the COTI definitions. See for <http://nps.gov/gis/trails/> and particularly [http://nps.gov/gis/trails/documents/Appendix\\_A.htm](http://nps.gov/gis/trails/documents/Appendix_A.htm) for federal agency definitions.

This presents somewhat of a challenge because different terms mean different things to different people or groups. In addition, with the development of new equipment technologies, levels of accessibility and new outdoor pastimes, the list of types of trail activities expands and changes each year. Part of the challenge of the mapping system will be to identify a usable, easy-to-comprehend set of descriptions with the ability to update and modify as trends change over time. Chapter 2 of this report strives to consolidate and optimize definitions into a manageable set of query fields for both trail users and managers.

The objective here is to put forward a commonality of language to facilitate consumer access to the information system. Thus, the broader list of both

technical and common use definitions have been distilled into a working practical query base presented in Chapter 2 for applicability to the proposed Colorado statewide digital mapping system.

Additional information can also be found in AASHO *Guide to the Development of Bicycle Facilities*, 1999 (commonly accepted technical definitions and standards for bicycle trails and on-street routes. See also *accessibility software at <http://www.beneficialdesigns.com/trails/trailware.html>*; *Designing Sidewalks and Trails for Access, Part II of II: Best Practices Design Guide*, 2001; (FHWA Publication # FHWA-EP-01-027 HEPH/8-01(10M) E, *Universal Access to Outdoor Recreation*, 1993 by PLAE, Inc (guidelines for accessibility across a broad range of user abilities) and *Street Design Guidelines for Healthy Neighborhoods*, 2002, by Dan Burden, Center for Livable Communities.

***Note: Program development should consider possible legal implications of definitions as well as map information such as, but not limited to, level of difficulty, availability of amenities, patrol and other information and include disclaimers stressing that the trail user is ultimately responsible for his or her trail use decisions.***

In addition to trail and amenity definitions, a listing of the addition types of desired information (user queries) was identified. The list of categories below was derived from categories commonly found in various trail publications and at a number of trail Web sites surveyed. (The intent is for all of the trail types and information categories to be ultimately distilled to approximately three-dozen primary queries with additional queries potentially available at “drill-down” levels now or in future):

- Location (Country, State, Region, Nearby Town)
- Locate by Map with Zoom Tool
- Trail Name/Trail Number
- Activity Type (i.e. biking, hiking, 4-wheeling, etc.)
- Trail Type (paved shared-use, gravel, dirt, etc.)
- Distance/Duration
- Elevation Gain
- Accessibility
- Skill Level/Difficulty
- Amenities (Water/Toilets/Picnic/camping/Refreshments/Lodging/Bike shops/Rentals, etc.)
- Terrain Features (roads, topography, streams, rapids, dams, hazards, etc.)
- User Density/Crowding
- Highlights/Descriptive Commentary/Mile by
- Photo Images of Trail
- Mile Descriptions/Traffic
- Interpretive Information/Wildlife/Bird-watching

- Trail Conditions, Closures, Construction & Detours
- Climate and Seasonal Weather Conditions
- User Commentary/Feedback
- Websites/Phone Contact/More Information
- Emergency Numbers
- Outfitters and Tour Operators
- Fees

In addition to the above a number of *manager queries* are identified:

- Accessibility
- Deferred Maintenance, Potential Hazards and Problem Spots
- Accident, Incident and Crime Information/Crowding and User Conflicts
- Gaps and Below-Standard Segments
- Upgrades Needed or Recommended
- Environmental Issues
- Wildlife Sensitivities, Conflicts, Pests
- Vegetation Management/Weeds and Invasive
- Extension and Linkage Opportunities
- Amenities: Existing, Needed or Desired

## **Comparable Delivery Platforms and Programs**

### ***Overview***

The goal of this investigation is to determine the state-of-the art in mapping and information systems. This is helpful in identifying current information and mapping techniques, graphic schemes, cost and pricing of services, available products, and possible applicability to the Colorado Trails Mapping System. This report presents leading examples of services and products and commentary on the applicability of each product or process.

### ***Research Method***

The research included: a scan of sites and services available on the Internet, a survey of state trails coordinators nationwide; review of published trails guides including books, maps, newspaper feature articles; and interviews with mapping experts in the public and private sector. In a number of cases the service investigated is not a trail service per se but has a format that is applicable.

### ***Platforms and Outlets***

Following are identified outlets and platforms that would facilitate consumer (trail users) information and, in some instances, benefit trail manager agency personnel access to a database.

## 1. "Paper" Maps and Guide Books

### Definition and Example:

Includes published maps, books and trails guides, (see also "Newspaper Features and Media below").

Selection of content is by author or publisher.

Example: *Falcon Guides*. Also includes weatherproof maps—typically USGS base with text on back and showing urban, rural and wilderness trails with individual trail descriptions, grade profiles and amenity information.

### Opportunities:

Increasingly, "paper" maps are available as viewable and/or downloadable on the Internet or CD's. A number of Web trails information services link to downloadable (pdf) "paper" maps. It is easily accessible to a broad range of users and transportable to the field. Maps offer good graphic examples that much of the public is familiar with.

### Constraints:

Does not offer comprehensive trails information access—rather content is selected by author. There is a high cost of printing and updating and long turn-around time to update.

### Follow-up:

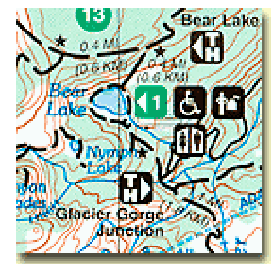
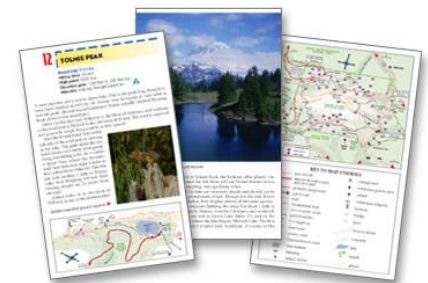
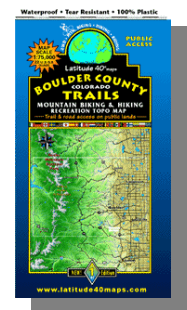
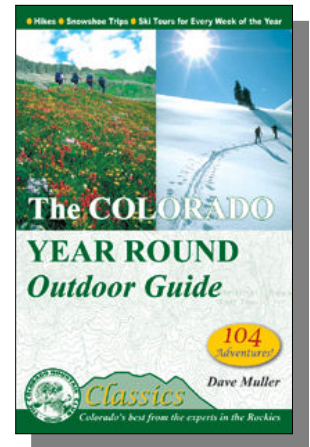
Could be helpful to have a referral link at Colorado's future Trails Web site accessing a library of "paper" map projects—a kind of reference resource library. Systems like *Google* will likely improve access to a broader range of "paper" maps and publications.

**Fees or Cost:** Purchase price of books---\$15 to \$30. Maps run \$10 to \$12.

**Contact Information:** Visit [www.Trails.com](http://www.Trails.com) for access to guides and other resources. See *Latitude 40*. Contact is Grant Morrison [www.latitude40maps.com](http://www.latitude40maps.com), [lat40@indra.com](mailto:lat40@indra.com))

## 2. Newspaper and Media Features Guides

**Definition and Example:** Weekly newspaper feature of a single trail with a brief description and trail user details such as distance, elevation, difficulty, relevant



aps, and how to reach the trailhead. See *Denver Post* “Hike of The Week”

<http://www.denverpost.com/Stories/0,1413,36%257E77%257E2539718,00.html?search=filter> See also

“Biking Trail of the Week” in the *Rocky Mountain News*” [www.rockymountainnews.com/adventure](http://www.rockymountainnews.com/adventure), and various trail guidebooks. *Channel 9 News* has also been working on an information site called “Explore Colorado” that will include trails information

The *Rocky Mountain News* Web site cited above provides access to descriptions of trails by region throughout Colorado with hundreds of trail descriptions available. Write-up includes reader feedback on trails. The system has a simple entry query with boxes to check for activity and region of the state. It does not include maps.

### Opportunities:

Presentation and graphic format is very useful at the trail-specific level of cut but generally limited to one or a few trails. Currently this is a non-digital system but adaptable. Maps are simple and comprehensible in both color and grayscale and can be read in a small format such as a PDA-size screen. References are major roads and towns. Topography is typically not shown in newspaper maps, though a trail profile may be shown. Usually an inset depicts the location in the state relative to major Interstates. Use is very easy and concise.

**Constraints:** Limited to author’s selection, cost of updating.

**Follow-Up:** Work with authors in developing maps and links. Recruit to Review Group.

**Fees or Cost:** Free, authors have books for sale.

**Contact Information:** David Muller, MD, author, of the *Denver Post* feature trails and Lori Rabinowitz ([lorii.rabinowitz@9news.com](mailto:lorii.rabinowitz@9news.com)), 9 News who has been assembling the *Explore Colorado* site.

A screenshot of a web application titled "escapes planner". It features three numbered sections: 1. "What do you want to do? (you can select multiple)" with checkboxes for HIKE, BIKE, CAMP, FISH, RAFT, GOLF, and FESTIVALS/EVENTS. 2. "Where do you want to do it?" with a dropdown menu showing "Denver - metro" and a link to "View a regional map". 3. "When do you want to do it?" with a dropdown menu showing "MONTH: May" and a button labeled "plan my escape".



### 3. Computers With Internet Capability

#### Definition and Example:

Includes all types of computers and devices that access the Internet. Allows browsing, review and downloading of all publicly accessible as well as proprietary sites (with access permission).



#### Opportunities:

Fast, convenient access. Lower cost of production, maintenance and use. Worldwide portability and access (from any Internet site).

#### Constraints:

Limited to speed and content capability of computer and service provider—especially with dial up type services. This may preclude a significant segment of the user market from home use, though this should change rapidly as technology and broadband service availability improves. “Take-with” map size is limited to standard home printer sheet sizes.

#### Follow-up:

Continue to explore available Web-based services and opportunities to adapt existing software or develop new software that enables broad distribution of *Colorado Trails Mapping* information.



**Fees or Cost:** Some sites free, some have subscription (more information below).

**Contact Information:** See Web sites listing below

### 4. Portable Digital Devices (Pocket Computers, PDA's, Cell Phones, “IPOD”, etc., GPS)

#### Definition and Example:

Refers to the array of portable Web capable portable digital devices such as Personal Digital Assistants (PDA's/“Palm Pilots” “ Blackberry’s”).



#### Opportunities:

With dropping prices, ease of use and improvements in both hardware and software, portable Web-capable devices are widely used. In addition many of these capabilities are being integrated into as single portable appliance that often includes a cell phone.

A number of these products have some level of GPS capabilities (from emergency location to mapping and Wayfinding) as well. Audio devices such as “IPOD’s” and satellite radio receivers are also dropping in price and increasing in capability. High likelihood of fully integrated cell phones with GPS, download capability, as well as audio (MP3) and visual playback and display in the near future.

Interface with information systems such as *Google* now allow new levels of information access of all kinds from virtually any location where there is reception. These devices will likely offer increasing abilities, a broader range of reception even greater affordability and higher speed downloading. Voice recognition software would also allow straightforward queries.

It is not difficult to image the ability to access a trail mapping site from a wireless device, download a map, a guide, etc. for use on a trail even after the user goes out of radio range since the trail information has already be downloaded. It is also likely that with *Google*-type technology virtually all information will be available almost everywhere through a common query system. In other words, an individual would use the same portal (such as *Google* to access trail information as they would to find a restaurant or look up a newspaper article.

Portable devices offer almost limitless application capabilities from measuring calories consumed on a hike to offering an audio/video interpretive tour. It might also be possible to interface personal devices with printers so that fold out maps can be printed were needed.

### **Constraints:**

Small size of portable devices will limit screen size so all maps would be the size of a pocket device screen though zoom in and drill-down capability might mitigate this somewhat.



Small screen size may reduce space for advertising possibly making revenue generation more difficult.

Displaying commands and legends as well as how user enters the commands may be difficult. Short of voice recognition, used input will remain somewhat awkward on a small keypad.

Portable devices still suffer from radio reception problems, dropped calls and similar reliability problems although this is improving.

There may be licensing and access permit challenges in making a site available on a cell phone or PDA network.

A certain segment of the public will not own such devices, so alternative public access systems will be important.

**Follow-up:**

It is likely that portable devices will be the major point of information access of all kinds. Any system should consider compatibility with a small screen and organizing information so it can be used in small screen portable device formats. Monitor and perhaps work with information source services such as *Google* and *Map Quest* to explore user access systems.

In the interim, digital system should work on both full-size computer screens and portable digital devices.

**Fee or Cost:** PDA sets and PDA-Capable phones may cost \$250 to \$600 or more and/or may require a user contract. Prices have been dropping; however. *Apple* is now offering an IPOD for \$200 though video-capable systems are more expensive.

**Contact Information:** Visit product Web sites.

## **5. Digital Kiosks**

**Definition and Example:**

A number of companies manufacture digital kiosk systems. Many of these are touch screen based and



might be found in shopping centers, hotel lobbies and airports. A trail kiosk system was recently deployed in Detroit.

### **Opportunities:**

With proper design they could be located outdoors including trailheads, highway rest areas etc. These might interface with the same *Google*-type information portals allowing information access at strategic locations to those who do not own computers or have such access. Such devices might also allow data transfer from the kiosk to a personal portable device.

### **Constraints:**

Devices are costly (\$5,000 more each) require maintenance and prone to vandalism and the elements. They are difficult for user to take information with them without a printer and data transfer mechanism.

### **Follow-up:**

Such devices may be useful at strategic locations such as state parks, airports, information centers, recreation centers, libraries, etc. A partnership with other information interests to bundle information might be useful.

**Fee or Cost: Free to users.** Device costs \$5,000 plus. Possible joint venture with commercial interests.

### **Contact Information:**

<http://www.kioskmarketplace.com/futuretrends.htm>

### **Software Interface Systems**

The following are identified information software systems with potential applicability to the *Colorado Trails* mapping system.

#### **1. Commercial and Organizational Web Site Definition and Examples**

Includes commercial and organizational trails information services available on the Web. Some offer national directories and maps with topographic and aerial views. Typical access queries include: by



**Elroy-Sparta State Trail** (exit DNR) A delightful, 32.5-mile ride that includes three century-old railway tunnels and a succession of friendly, small towns. Hike, touring bike, snowmobile. C/o P.O. Box 99, Ontario 54651. (608) 337-4775 or (608) 463-7109. [State map](#)

activity; by zip code; by layered map browsing—starting with a national map and clicking to local level; by city; by national park, etc. In most cases, end result is a listing of trails with basic information and sometimes a rudimentary map.

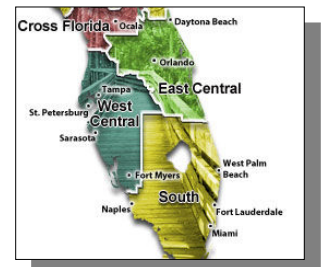
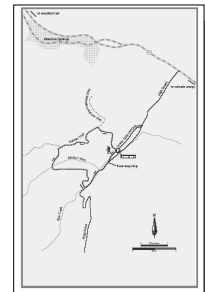
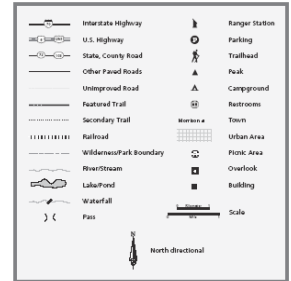
In addition to national and international sites there are numerous regional state and local services. Eagle County, Colorado offers “Ecosports” site—an excellent example. See *EcoSports.com* ([www.ecosports.com](http://www.ecosports.com))

Services like *Rand McNally* offer *Trip Tick*-style recreational planning using a layer map system for “drilling down” to local information by categories. This is primarily scenic and tour driving with attractions and amenities listed. Many sites include advertisements. See *Garfield County, Utah* ([www.utah-trails.com](http://www.utah-trails.com)), *Florida Office of Greenways and Trails* ([www.dept.state.fl.us/gwt/guide/](http://www.dept.state.fl.us/gwt/guide/)), *Wisconsin DNR – Find a State Trail* ([www.dnr.state.wi.us/org/land/parks/specific/findatrail](http://www.dnr.state.wi.us/org/land/parks/specific/findatrail))

Subscription services offer trail-specific guidebook excerpts in *pdf* format (usually from a partner like *Falcon Guides*) with description, map, grade profile and other information. *Trails Illustrated* allows users to make a custom trail map on a *USGS* base map with access via the Web and kiosks in outfitter stores.

A web site entrepreneur launched a recreation access site for the Denver metro area that includes trail descriptions. See [www.inmotion365.com](http://www.inmotion365.com).

An number of leading services of this kind include: *Trails.com* ([www.trails.com](http://www.trails.com)); *Trails Illustrated* ([www.trailsillustrated.com](http://www.trailsillustrated.com)) ; *Dirt World* ([www.dirtworld.com](http://www.dirtworld.com)); *BikePaths.com* ([www.bikepaths.com](http://www.bikepaths.com)); *Trailsource* ([www.trailsource.com](http://www.trailsource.com)); *Trail Monkey* ([www.trailmonkey.com](http://www.trailmonkey.com)); *ATV Connection Trail Guide* ([www.atvconnection.com](http://www.atvconnection.com)); *Recreation.gov* ([www.recreation.gov](http://www.recreation.gov)); *Rand McNally*



([www.randmcnally.com](http://www.randmcnally.com)); Coleman Outernet ([www.coleman.com/outernet](http://www.coleman.com/outernet)) and Guide Gurus ([www.guidegurus.com](http://www.guidegurus.com)).

**Graphic Presentation Format/Map System:** Digital, various products and software.

### Data Management System:

Much of the information at the commercial site appears to come from affiliate guide publishers. Leading states such as Florida and Wisconsin have some drill-down capability to trail-specific descriptions.

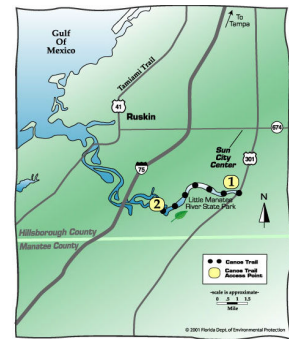
**Fees or Cost:** Subscription or unit purchase of products. Annual subscription for trails.com and similar services run \$30 to \$50. Federal, state and local agencies are free.

**Applicability:** Many of the systems appear selective rather than comprehensive based on available guides and published information. *Trails finder*, for example, does not allow the ability to drill down to regional and local maps rather it provides a list of trails by name in a given locale and selected activity such as mountain biking. *Topo Finder* allows access and drill-down of USGS-type topo and aerial mapping. Leading states are working to expand and enhance their level of comprehensiveness and details.

### Contact Information:

See web listings above – Typical commercial site is Trails. COM, Inc. Seattle, WA. *Trails.com* seems to be the flagship with many sites such as the International Mountain Biking Association (IMBA) linking to Trails.com for trails information.

The *Florida Office of Greenways and Trails* has an exceptional digital guide and management system. The contact is Jim Wood, *Office of Greenways and Trails*. *Guide Gurus* can provide a Web management service in partnering mode for a potential Colorado site with technical development and hosting services. Contact is John Frandsen, Watershed Communications, Inc. Whitefish, MT, [jfrandsen@watershedinc.com](mailto:jfrandsen@watershedinc.com)



**Major Activities**

**Counties:** Hillsborough

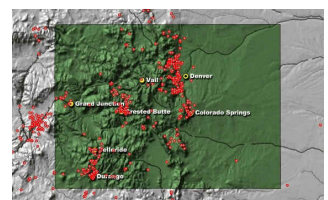
**Mileage:** 5

**Skill Level:** Beginner

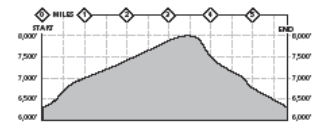
**Difficulty:** Easy to Moderate

**Usual Current:** Slow (0-1 mph) to average (2-3 mph)

**Notes and Precautions**  
 Water levels can fluctuate rapidly following heavy rains. Check for local conditions before beginning. The river is also influenced by tides. You can extend the trip by beginning at the Leonard Lee Road Bridge south of SR 674 (moderate to difficult trip – tight curves). An optional ending is at



See also *Bike Paths.com*, a Colorado based service.  
Contact is Glen Hanket at [glen@bikepaths.com](mailto:glen@bikepaths.com)



## 2. Web Based Referral Services

**Definition and Examples:** Web site provides link to other Web-based services by region and state. See *American Trails*, *IMBA*, *Rails to Trails Conservancy*.

**Graphic Presentation Format/Map System:** Web site with link buttons.

**Data Management System:** by Web host

**Fees or Cost:** Typically free and can subscribe as an organizational member.

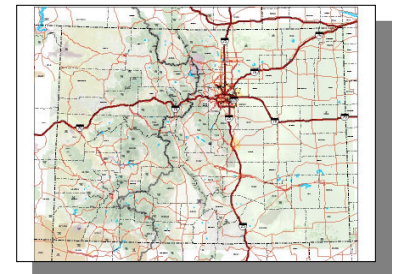
**Applicability:** Informational only with links to other providers

**Contact Information:** Stuart Macdonald,  
[www.americantrails.org](http://www.americantrails.org)

| Select                | Report              |
|-----------------------|---------------------|
| <input type="radio"/> | City Maps           |
| <input type="radio"/> | County Maps         |
| <input type="radio"/> | Statewide Maps      |
| <input type="radio"/> | Traffic Volume Maps |
| <input type="radio"/> | Travel Map          |

## 3. Government Mapping Services

**Definition and Examples:** Web site provides mapping information (includes trails on public lands) maintained by USGS and USFS. Offers links to other Web-based services as well as ordering paper maps where applicable. USGS site includes: *The National Map* and *National Atlas* of the United States ([www.nationalmap.usgs.gov/](http://www.nationalmap.usgs.gov/) and [www.nationalatlas.gov](http://www.nationalatlas.gov))



Web sites offer an interactive map service reflecting an interagency partnership providing a broad range of geo-spatial data. Offers a lot of data and shows trails but may be too complex for the proposed Colorado site and for promoting easy trail-user access.

Services include: *USGS*, *USFS*, Colorado *DOLA/CDOT*

Colorado *DOLA* site includes primarily demographic data as opposed to geo-spatial data. *CDOT* site offers detailed layered mapping information from statewide to city level maps downloadable as *pdf* files. Also



offers access by point of interest as well as other criteria.

Discussions with Lew Henefeld, Manager GIS Support, CDOT, 303-757-9809  
[louis.henefeld@dot.state.co.us](mailto:louis.henefeld@dot.state.co.us),  
suggests that CDOT is the leader in this type of mapping service in the Colorado State government.

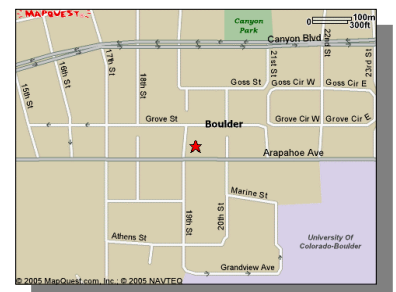
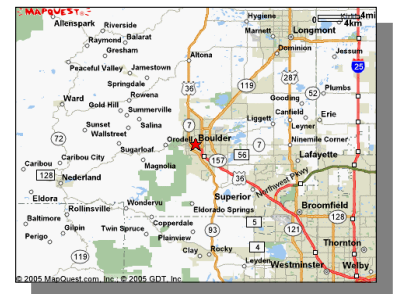
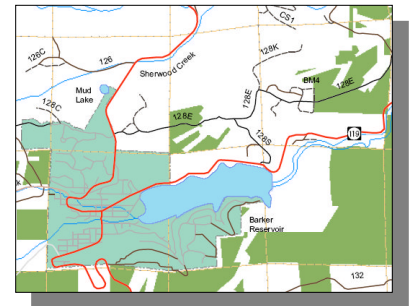
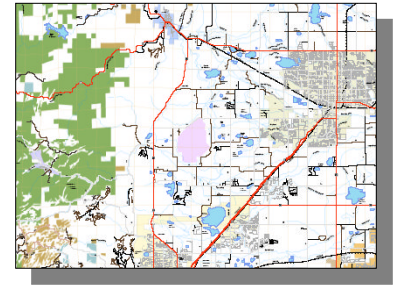
They use *ARCGIS* for data with an *ARCIMS*-based management system—both by *ESRI* that provides mapping at State, County and local levels much of which is downloadable on the Web. The survey queries communities annually to determine gas tax redistribution. Each jurisdiction must respond stating that either nothing has changed or provide a digital update to CDOT. They can send copies of their own database or copies of paper plat maps.

CDOT manages three layers: highways; function class roads, and local roads. Other GIS and base data are derived from common information sources from other agencies. A staff of four people maintains the map information. Specifically, it takes 2.5 person years (FTE of \$60k per year) or \$170k to \$200k per year to process and update statewide system. Set up has taken years since early 1980's.

Part of their implementation is to create a standardized feedback system. Main contact is Marv Koleis, Manager, 303-757-9802. For roadway inventory, contact Paul Tessar 303-757-9805. Mr. Henefeld said State Parks is welcome to use CDOT base data they have, but must have GIS software.

Words of wisdom from Lew Henefeld:

*Have a pretty good understanding of the content goal—think real—nail something down specific. START SMALL. Avoid the rat holes, (analysis paralysis and information overload). There are many different sources and a lot of mixed formats and this will take a lot of sorting out.*



It was suggested that State Parks also contact State GIS Coordinator, Jonathan Gottsegen, 303-866-3925. He has a broader perspective and may have some ideas on approach. State Parks may also contact Betsey Jacobson, Bike Coordinator. Visit [http://www.dot.state.co.us/App\\_DTD\\_DataAccess/Maps/index.cfm?fuseaction=MapsMain&MenuType=Maps](http://www.dot.state.co.us/App_DTD_DataAccess/Maps/index.cfm?fuseaction=MapsMain&MenuType=Maps) to view of their maps.

Missouri has a “build-your-own-map” approach as well on their state GIS website, <http://maproom.missouri.edu/>, that offers maps of various coverage areas and layers of information.

A number of local agencies are working on trails mapping systems including *Jefferson County Open Space* (hoping to launch a Web trails site in 2006), *Douglas County, South Suburban Parks and Recreation, City of Arvada*, and the *Town of Breckenridge*. The *City of Denver* has launched a comprehensive and sophisticated information system that includes access to parks, recreation, bicycling and some trail information. Visit [www.denvergov.org/denvermaps](http://www.denvergov.org/denvermaps).

**Graphic Presentation Format/Map System:** Typically GIS systems using USGS, state or local base maps.

**Data Management System:** By agency personnel. CDOT reports that they receive GIS files from some jurisdictions and “paper” information from others and maintain a staff to interpolate and incorporate into statewide system.

**Fees or Cost:** Free at Web site and can order paper maps.

**Applicability:** Important source for trails in federal lands in Colorado. May want to refer via link from *State Trails* info site. May be a source for base maps and management system models.

**Contact Information:** Rob Aiken, USFS 303-275-5200, David Vincent, USGS 801-975-3435.

#### 4. Commercial Mapping Services

##### Definition and Examples:

These are private companies that provide various types of mapping services including GIS both on paper and digitally. Some of the services such as *Delorme* and *National Geographic* offer trails information but not at the comprehensive level pursued in this study.

*Delorme* and *ESRI* offer a number of software systems with potential applicability. Contact was also made with Sid Stevenson with the *Recreation Resources Division* of *Kansas State University* (<http://www-personal.ksu.edu/~sstevens/>). He is developing a trails mapping system for the State of Kansas. Costs for mapping and updates runs about \$70 to \$100 per mile for detailed information suitable for both users and managers. Discussions with *Delorme* and *Rand McNally* did not indicate an interest in joint-venture development at this time.

*Map Quest* ([www.mapquest.com](http://www.mapquest.com)) is probably the best-known Web mapping information service in common public use. It is accessible on both computer and cell phone with the cell phone version available for a monthly subscription of \$3-\$4. It is a street map system and does not currently provide trails information. *Google* has a similar competitor to *Map Quest* at [www.maps.google.com](http://www.maps.google.com). The *Google Earth* mapping system, features aerial views worldwide impressive capacity.

*Rand McNally* offers both paper and Web mapping information services. A telephone conversation with Alan Yelsky at *Rand McNally* indicated that they have had some preliminary discussions of a trails/recreational product but have yet seen a market to justify a joint venture to develop. He suggested perhaps *National Geographic* or *Delorme* could have an interest.

*Spatial News Daily* provides regular digital updates on the state-of-the-art in digital and GIS mapping products ([www.spatialnews.geocomm.com](http://www.spatialnews.geocomm.com)).

**Graphic Presentation Format/Map System:** *GIS*, Aerial, Satellite, Highway Road Map, **USGS** base and others.

**Data Management System:** By staff or consultants as well as student labor in some instances.

**Fees or Cost:** Varies by product. There is not cost for basic *Google Earth* or *Map Quest*.

**Applicability:** A number of these products and services may be of use for technology, actual mapping, access portals, and possible joint ventures.

**Contact Information:** *Delorme* (Jonathan Braden [jonathan.braden@delorme.com](mailto:jonathan.braden@delorme.com)) *Rand McNally* (Alan Yefsky [ayefsky@randmcnally.com](mailto:ayefsky@randmcnally.com)). Sid Stevenson, Kansas State University ([sstevens@oznet.ksu.edu](mailto:sstevens@oznet.ksu.edu)).

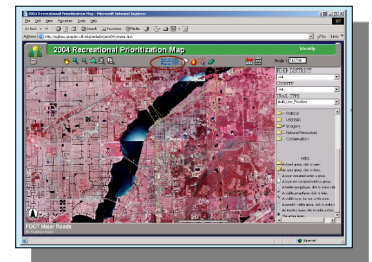
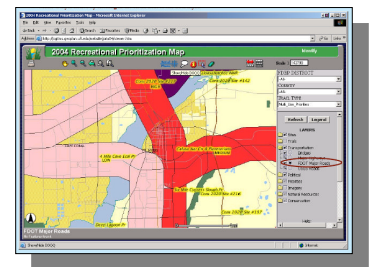
## 5. Up-loadable Management and Participatory Mapping Services

### Description and Examples:

This refers to GIS based feedback service where users or managers can manipulate maps and upload undated information, comments, feedback, etc. in a graphic format. An example is the *Recreational Prioritization Map* used by *Florida Office of Greenways and Trails*, developed by University of Florida allows access and input. Visit (<http://ogt.geoplan.ufl.edu/>) to view tutorial for Florida's feedback and upload system.

Delorme and ESRI offer a number of software systems with potential applicability. Discussions with Delorme did not indicate an interest in joint venture development but possibly the availability of software for purchase. Leading software in this area includes: *ArcGIS*; *Intergraph's GeoMedia*; *MapInfo Professional* and *Bentley's GeoGraphics*.

Discussions with *Silver Salmon* a Web company in Colorado ([www.silversalmon.com](http://www.silversalmon.com)) suggests there may be existing products and network architectures





that may serve Colorado's desired trail mapping function in an affordable way. They have offered to provide more details.

**Graphic Presentation Format/Map System:** Various systems available in *GIS* and other formats.

**Data Management System:** Varies

**Fees or Cost:** Negotiated with software developer or vendor.

**Applicability:** Florida system shows great.

**Contact Information:** Florida Office of Greenways and Trails and University of Florida *GeoPlan* ([www.ogt.geoplan.ufl.edu](http://www.ogt.geoplan.ufl.edu)).

#### Summary List of Web Sites

[www.trails.com](http://www.trails.com)  
[www.pedaling.com](http://www.pedaling.com)  
[www.trailmonkey.com](http://www.trailmonkey.com)  
[www.coleman.com/outernet](http://www.coleman.com/outernet)  
[www.bikepaths.com](http://www.bikepaths.com)  
[www.trailsources.com](http://www.trailsources.com)  
[www.denvergov.org/denvermaps](http://www.denvergov.org/denvermaps)  
[www.inmotion365.com](http://www.inmotion365.com)  
[www.guidegurus.com](http://www.guidegurus.com)  
[www.trailsillustrated.com](http://www.trailsillustrated.com)  
[www.americantrails.org](http://www.americantrails.org)  
[www.dept.state.fl.us/gwt/guide/](http://www.dept.state.fl.us/gwt/guide/)  
[www.dnr.state.wi.us/org/land/parks/specific/finda-trail](http://www.dnr.state.wi.us/org/land/parks/specific/finda-trail)  
[www.ecosports.com](http://www.ecosports.com)  
[www.utah-trails.com](http://www.utah-trails.com)  
[www.railtrails.org](http://www.railtrails.org)  
[www.recreation.gov](http://www.recreation.gov)  
[www.sledcity.com](http://www.sledcity.com)  
[www.atvconnection.com/resources/trails/](http://www.atvconnection.com/resources/trails/)  
[www.randmcnally.com](http://www.randmcnally.com)  
[www.nationalmap.usgs.gov/](http://www.nationalmap.usgs.gov/)  
[www.nationalatlas.gov](http://www.nationalatlas.gov)  
[www.spatialnews.geocomm.com](http://www.spatialnews.geocomm.com)  
[www.dirtworld.com/trails/](http://www.dirtworld.com/trails/)  
[www.ogt.geoplan.ufl.edu](http://www.ogt.geoplan.ufl.edu)

[www.dot.state.co.us/Appl\\_DataAccess/Maps/](http://www.dot.state.co.us/Appl_DataAccess/Maps/)  
[www.trailexplorer.org](http://www.trailexplorer.org)  
<http://mapper.sbsgov.net/gis/viewer.htm>  
[www.silversalmon.com](http://www.silversalmon.com)

### **Project Advisory Review Group Comments**

Input from peers, agency staff, lay people and other stakeholders was secured through the creation of a *Project Review Group*. The participants were contacted individually, by e-mail and telephone and asked to commit to two to three review and comment sessions over a 6-month period requiring up to 2 hours of their time in total. There have also been a number of informal discussions with Web and GIS experts, artists, and business people as well as planners and staff from a number of jurisdictions in Colorado and other states. The review process was not a scientifically derived or a complete listing of all representatives. Rather, it has been an informal “focus group” that is, hopefully, diverse enough to provide good critique and advice at key points in the effort.

The group includes:

- Lay persons
- Trail user group representatives
- Members of the State Trails Committee
- Members of the CORP group
- Federal, state and local agency trails managers (Colorado and Out of State)
- Mapping and trails information vendors and experts
- Computer/internet experts
- Trail user equipment vendors
- Recreation and tourism business representatives

The members of the group were asked to review and comment on:

- Background reports
- The Web page layout concept
- Mapping graphic and trail description prototype
- User interface concepts such as digital kiosks
- Agency (and user) information upload systems

### **Typical Questions Asked**

Following area typical questions asked:

1. Is the information accurate and complete and how can it be more accurate and complete?
2. Is this prototype visually appealing and how can it be made more appealing?

3. Is the prototype comprehensible and easy to use and how can it be made user-friendlier?
4. Does the concept work? Why? Why Not?
5. How often would you use this system?
6. Would you pay to use the system, if so how much?
7. Do you currently use a digital trails information service? If so which one?
8. Suggestions as to how to make this system financially self-sustainable.
9. Other Comments

In addition to the Review Group input a number of interested agencies in Colorado and the other 49 states were contacted with a written questionnaire. (Please see states feedback in the appendix to this report).

### **Summary of Findings**

#### ***General State of The Art***

- The state of the art of digital and Web-based mapping systems is rapidly evolving and there is an increasing array of accessible, user-friendly mapping services and systems.
- There are a number of affordable Web-Based trail information services both commercial and public though none as yet seem to offer comprehensive and complete statewide trail inventory mapping.
- Some states including Florida are on the leading edge of this capability including interactive feedback Web access.
- A number of communities and organizations such as *The Colorado Fourteeners Initiative (CFI)* and Douglas County have been successful in plotting trail using a ranger, intern or employee walking the trails with a GPS unit. One non-profit organization was able to plot roughly 1000 miles of trails with an intern for approximately \$4,000.

#### ***Portals and User Access***

- The Internet has become the prime point of information access to a wide cross section of the public. It is likely the portals like *Google.com* will set the standard for information access.

- Cost of computers is rapidly dropping while capacity and capability is rapidly increasing with expanded affordability it is anticipated that most Colorado residents and visitors will have access to the Internet.
- Speed of service (broadband vs. dial up) may initially limit the level of content though it is anticipated that high speed Internet will become almost universal either through home access, portable device access or public outlets such as Kiosks.
- Wireless Internet access is expanding rapidly and wireless devices such as cell phones are now integrating other capabilities such as Web service, audio and video capabilities, GPS and other services. It is likely that this will be the preferred platform for receiving trail information. Therefore trail mapping must be formatted to function on the small screen size of a portable digital device such as a cell phone.

#### ***Cost To Develop, Manage and Maintain***

- With a system as extensive as Colorado's and based on mapping costs such as those in Kansas, the cost to build a base map and maintain mapping will be substantial. Though innovative approaches such as those used by the *Colorado Fourteeners Initiative* and Douglas County might reduce costs.
- Local entities should be encouraged (successful grant applicants required) to update mapping annually to keep current.
- Partnerships with other interested agencies; non-profits or other entities such as tourism promotion should be explored.
- Advertising revenues as a way to fund the program should be investigated
- A number of local entities are developing sophisticated mapping capabilities. Colorado Trails should identify and tabulate the capabilities of local entities such as cities, counties and special districts to map their own trails. The key will be working out a workable interface system with common terminology, protocol and content so content from local entities with GIS capability can be easily integrated into a statewide map "clearinghouse".

#### ***Local Agency Feedback, Reporting and Upload Capabilities***

- An online local agency reporting and upload system should be developed. The site should be secured with password entry, screening and other mechanisms to protect data.
- Local entities should be required to provide an annual report via the upload system.

- The system must be kept simple and user friendly by non-technical staff to assure functionality. While local entities may wish to develop more extensive and rich GIS data for their planning, this may not be necessary at the statewide level. It is recommended that information fields, in addition to the basic name and contact information, be kept to 10 or less items – including graphic information placed on maps.
- Agencies should be encouraged to include a Web link to allow state (and other agency) planners and managers to access local GIS systems for more detailed and complex information if needed.
- Agencies should be encouraged to agree to a commonality of definitions and information fields to facilitate information exchange.

#### *Less May Be More*

- Trails information should be kept as simple as possible yet provide sufficient information to the user such as trail type, location, degree-of-difficulty, type of experience, etc.
- Information should be stacked in a “drill down” format allowing the user to dig deeper if he or she so chooses. Top-level layers should be very basic and readable on a small screen.
- Trail definitions, terms and hierarchy of information will be important to the success of the program.
- A prioritization and phasing strategy for mapping the state’s trail inventory should be developed. In addition, were compatible, local governments, state and federal sites should be linked to the publicly accessible database.

## **CHAPTER 2**

### **LAYOUT, ART AND TEMPLATE CONCEPTS**



## 2: Layout, Art and Template Concepts

### Definitions, Layout and Template Concepts

The goal of this task is to develop an attractive and easy-to-use access, query and feedback system. A key first objective in the process is to identify an unambiguous list of trail and trail component definitions or “fields”. While there are many terms and definitions used to define trails and trail components – some technical and some common vernacular – a concise and comprehensive list is essential to assure ease of access and use by both the public and trail managers (who are not likely GIS experts). To that end a listing of definitions/query fields was refined under the five categories of:

1. **Trail Activities** – Types of activities such as hiking or mountain biking (14 fields).
2. **Trail Facilities** – Types of facilities that accommodate trail uses such as paved trail (13 fields).
3. **Trail Amenities** – Facilities that support trail use such as trailheads or restrooms (13 fields).
4. **Trail Accessibility and Difficulty** – Includes grades, terrain, length, and surface conditions (5 fields).
5. **Trail Manager’s Elements** – Items of interest to trail managers such as gaps, accident sites or planned projects (8 fields).

A second key objective is to create a Web format or sequence of graphic Web pages that are presented to the user (Chapter 3 discusses strategies for system architecture, content building, sustainability and long term Web site management). The goal is to have the system follow a logical sequence with attractive designs and clear directions that quickly lead the trail user or trail manager to the information they are seeking. Part of this process also considers a prioritization of information with the potential for “drilling down” at the user’s option for more detailed levels of information such as interpretive information.

### Trail Components Defined

For each of these categories, the following definitions are proposed.

- **Trail Activities** These are depicted on the entry screen to the Web site but not as legend items on the maps. Users pick an activity and the search engine then displays maps that show facilities that accommodate the requested use. These are not definitions per se but key words – in common use vernacular – that lead to the appropriate map information

1. Bike
  2. Walk/jog
  3. Mountain Bike
  4. Paddle
  5. Horseback
  6. Skate
  7. Backpack
  8. X-Country Ski
  9. ATV
  10. 4 x 4
  11. Dirt Bike
  12. Snowmobile
  13. Accessible Trails (a link to maps of trails that accommodate limited mobility)
  14. Dogs Off Leash Permitted/Pack Animals (a link to maps of trails that allow dogs or pack animals and/or information about animal policies.)
- **Trail Facilities** These are depicted by specific graphic symbols on the maps and in the legends or pop-up information.

#### *Non-Motorized Trails*

1. **Paved Bike Path**— Typically a 10' to 12' wide paved (asphalt or concrete) shared-use path that accommodates bikes, pedestrians, equestrian, roller skates, etc.
2. **Crushed Gravel Trail**—Typically a 10' to 12' wide crushed stone path trail that accommodates all-terrain bikes, equestrians and pedestrians.
3. **Hiking Path**—Typically an 18" to 48" wide dirt surfaced path that accommodates walking, hiking, jogging and mountain biking and horses. Generally refers to trails in or near urban areas.
4. **On-Road Bike Route**— A street or highway that has been identified or designated for bicycle use. Includes roads with striped and signed bike lanes, roads signed as bike routes and other on-street routes that may be more desirable for on-street bicycling.
5. **Back Country Trail**—Generally refers to a natural surfaced trail for day hiking and backpacking in a more remote area—not shared with motorized vehicles—including wilderness areas.
6. **Mountain Bike Trail**—Typically an 18" to 48" wide dirt surfaced trail suitable for mountain biking (usually shared with other uses). Some trails



may be touring trails or technical trails depending on the trail difficulty rating.

7. **Paddleway**— Refers to a river or stream corridor suitable for canoeing, rafting or kayaking. Such a corridor would typically include access points, wayfinding and possible stream improvements such as boat chutes through dams. May also refer to a kayak course.
8. **Sidewalk Tour Route**— Refers to a designated sidewalk route such as a historic walking tour or fitness route through an urban area. May include interpretive signs or other wayfinding systems.
9. **X-Country Ski/Snowshoeing Trail**— A designated or groomed trail for cross-country skiing or snowshoeing. Includes trails with a set skier track and without set track for skiers.

#### *Motorized Trails*

10. **4 x 4 Trail**— A trail wide enough and with adequate surface to accommodate four-wheeled vehicles such as a Jeep. The trail will generally accommodate other motorized uses and non-motorized uses unless otherwise indicated.
  11. **ATV Trail**— A trail wide enough and with adequate surface to accommodates off-highway vehicles including three-wheeled and four wheeled types as well as dirt bikes unless otherwise indicted. May also accommodate non-motorized uses.
  12. **Dirt Bike Trail**— A trail wide enough and with adequate surface to accommodate dirt bikes (two-wheeled motor cycles) but does not accommodate or permit other motorized vehicles.
  13. **Snowmobile Trail**— A designated route for snowmobiles. It may exist only seasonally. Cross-country skiing may also be permitted.
- **Trail Amenities** These are depicted by specific graphic symbols or pop-ups on the maps and in the legends.
    1. **Trailhead**— Typically a designated and marked point of access to a trail system. Some trailheads include parking while others may not.
    2. **Parking**— Parking facilities for trail use (indicate if equestrian and wheelchair accessibility provided).

3. **Stopping Point**—Typically a resting spot along a trail with a bench and possibly other amenities such as drinking water, trash receptacle or toilet.
  4. **Water**—Potable drinking water available (indicate if equestrian water facilities provided).
  5. **Toilet**—Public toilet available. May or may not include washing facilities.
  6. **Shelter**—An overhead shelter that may offer some protection from storms or sun.
  7. **Convenience Store**—A commercial establishment such as a convenience store where snacks and drinks can be purchased.
  8. **Picnic Facility**—Picnic table or picnic area or similar facility for picnicking (Indicate if grills or fire ring available).
  9. **Camping**—Facilities for overnight camping available to the public. Might be a public or privately operated facility.
  10. **Lodging**—Overnight accommodations such as a hotel, motel or bed and breakfast.
  11. **Interpretive**—Includes interpretive signs, tours, exhibits and other information or displays of historic, ecological, cultural or educational interest.
  12. **Park**—A public park or feature area.
  13. **Transit**—Access to public transportation such as a bus or light rail stop.
- ***Trail Accessibility and Difficulty*** This is a rating system for trails that presents the degree of accessibility and/or difficulty based on such criteria as terrain, length, surface, etc. These are non-technical rankings and would include a disclaimer as such.
    1. **Easier**—Comparatively gentle terrain, firm level surfaces, relatively short distances to complete a loop. Wayfinding is clear and obvious. Minimal level of fitness and skills required.
    2. **Moderate**—Some hills and elevation change, longer distances to close a loop, some uneven surfaces plus other factors such as exposure to the elements. Wayfinding may be unclear in some areas. Some endurance and skills required.

3. **Difficult**—Extended or frequent terrain and elevation changes, rough surfaces with obstructions and exposure to the elements. Wayfinding may be difficult. Significant endurance and user skills may be needed.
  4. **Technical**—Very steep or rough terrain, fast current, need to scramble over rocks. For highly skilled users only.
  5. **Accessible**—Facilities accommodate people with limited mobility and/or using mobility aids.
- ***Trail Manager's Elements*** The following are typical likely fields for manager and planners information. This will be refined and expanded when prototype tested in the next phase of the project.
    1. **Gaps**—Missing or not up-to-standards gaps in the trail or trail system that planners and managers would like to improve. Could also include priority information and estimate cost in the data field.
    2. **Remedial Maintenance Needed**—Includes long-term problem areas such as an erosion prone hillside.
    3. **Crime Sites**—Pinpoints location of reported crimes with data on nature of the crime, police report reference code and follow up action proposed or taken.
    4. **Accident and Incident Sites**—Pinpoints places where accidents or other user problems or conflicts have occurred with description of the accident, extent of injuries, police report reference code and follow-up action proposed or taken.
    5. **Barriers**—Shows problematic barriers to trail use such as a busy, difficult to cross intersection.
    6. **Environmentally Sensitive Sites**—Shows environmentally sensitive areas such as wetlands, wildlife migration routes, etc. (This could interface with State mapping systems.)
    7. **Land Use Conflicts**—Shows sites of reported conflicts or complains vis-à-vis adjacent property owners.
    8. **High Priority Projects**—Shows sites of proposed projects of high priority (in the next 1-2 years) such as a pedestrian bridge or dual trail with alignment, cost estimate and proposed completion date.

## Sample Web Page Layouts with Typical Graphics

The following graphics represent, in sketch concept form, the appearance and sequence of the proposed trails “search engine”. Users would enter the site either via a “logo” link icon placed on other related sites such as a town or city’s home page or other likely information resource like the Colorado Lottery home page or a newspaper or TV station home page. The graphics below were circulated among the project “Review Group” for comment and modified per their input.

**Note:** Actual art for these concept pages will be developed as part of the next phase of this effort.



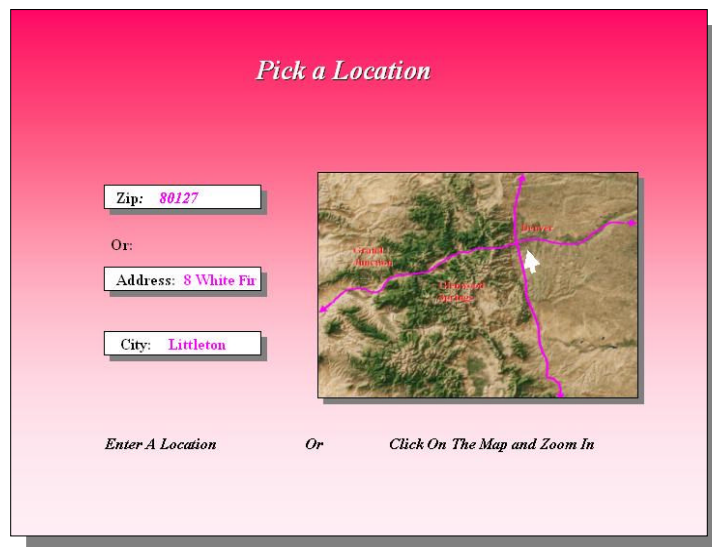
### Entry Link Icon Example



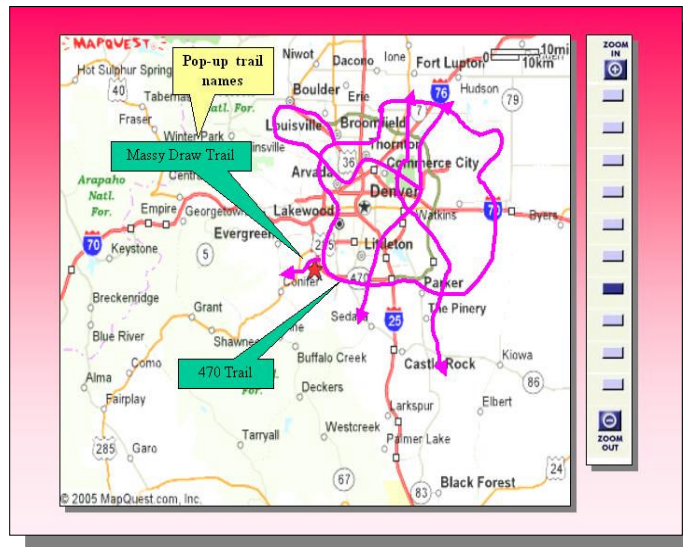
*Web Site Home Page (may also include GOCO and Lottery Logos with their approval.)*



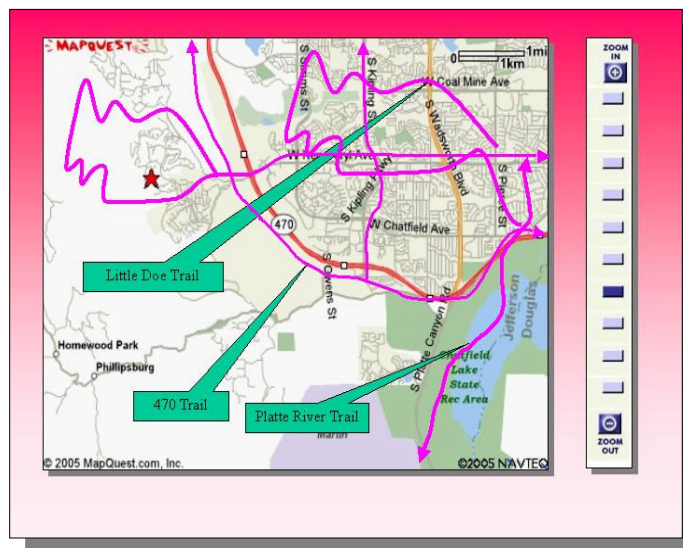
*Pick an Activity Page*



*Pick a Location Page*

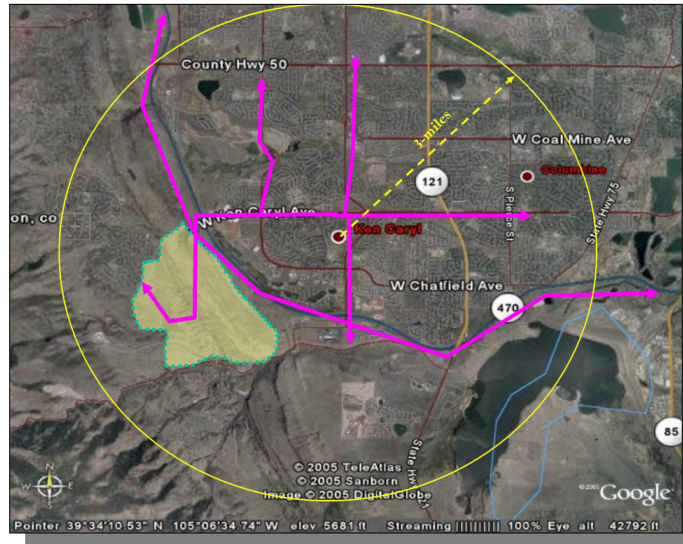


*Regional Trail Map Page (With pop-up regional trail names)*



*Neighborhood Trail Map Page (With pop-up local trail names. Can be reached by zoom bar)*





*Alternative Aerial Format Base Map*



*Specific Trail Page (Can be reached by zoom bar or clicking on trail name pop-up. Has pop-up trail amenity information and grade profile.)*



Trail Description Page (Has written narrative about trail and other information include trail manager's name, where to make a donation, etc.)

[www.trailsfeedback.com](http://www.trailsfeedback.com)

**Please share your comments:**

There is no public trailhead on the Little Doe Trail—Please correct your map.

This trail is pretty good except, I fell in the mud where the trail washed out near the barn.

**May we contact you?**

**Name:** Joe Trail Blazer

**Address:** 8 Smith Street, Las Vegas, NV 20223

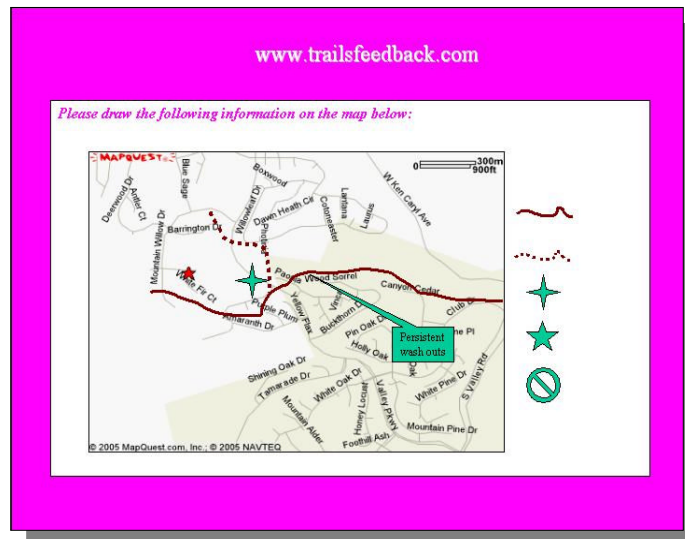
**E-Mail:** Joetrl@aol.com

**Phone:** 702-444-4444

**Click here to send us your comments:**

User Feedback Page (Interactive page where user can post brief comments or questions.)





*User Interactive Feedback Map (Allows trail users to draw in information and upload.)*



*PDA-size Format Concept*

### **Managers and Planners Feedback Form**

The system will also include a password-protected trail manager's site. This will offer a detailed interactive feedback form allowing local, state, and agency managers and planners to upload and store interactive trail planning and management information. The actual form, layout and art will be developed in the next phase of the project.

## **CHAPTER 3**

### **SUSTAINABLE CONTENT & INFORMATION REPORTING SYSTEM**



### 3: Sustainable Content & Information Reporting System

#### Overview of System Data Requirements and Architecture

(Please see the GIS consultant's technical report –Appendix 1)

The digital mapping system has basic software and hardware functions including:

- Data collection and entry of data in to the system
- Management of data and graphic platforms such as mapping
- User interface that allows both trail users and managers to enter and utilize the system from their computers via the Web. This includes a Web access and interactive Web site.
- Software and software applications to manage, maintain, and process data.
- System architecture/server system including hardware to store data and handle incoming requests.

**Data Collection**— The GIS consultant (Daniel Elroi) describes the data needs as follows:

*The data that the State needs to collect is the approximate location of trails, i.e. not to engineering detail, plus attributes that pertain to both the users and maintainers of the trails. User attributes will include length, permitted uses, facilities, elevation gain and slope, surface material, and other attractions. Along with the trails, the State would like associated data, such as parking lots, picnic areas, emergency services, and toilet facilities. Photographs may enhance the user experience, so these may be collected as well. Owner information will include who maintains the trails, who to contact for repairs or questions, and who provides associated services, such as clean up and user experience activities. The State would also like to be able to collect and maintain transient information, such as temporary closures, as well as public safety information, such as accident locations and descriptions or car break-ins and personal attacks. Presumably usage statistics that can be interpreted as popularity, density of use, and "value" for the State's investment, would also be collected where possible.*

*For the purpose of distribution, the State would also need other information, such as a base map, landmarks, a DEM (Digital Elevation Model) to generate cross-sections from trail traces, possibly orthophotography, and if necessary for geo-coding, a road centerline database as well. Profiles that use 20-50 ft. contour intervals appear sufficient to the State at the moment.*

*Data collection must anticipate source data in any and all formats: GIS, CAD, PDF, art, paper, traces on maps, etc. An approximate trail route and description is seen as better than no route or description.*

The consultant has recommended using an existing software product such as ARC SDE, with RD BMS, IIS and ARC IMS to receive, store and manage incoming data. (Please see the discussion of content building below regarding approaches to collecting and processing the data.)

### **Management of Data**

Management of data will include both the appropriate hardware and software systems and an individual or individuals trained to receive, review, convert, input and maintain data according to specific quality standards and consistency. It is likely this will require at least one full time technician familiar and capable with the software as well as having an understanding trails and needs of trail users and managers.

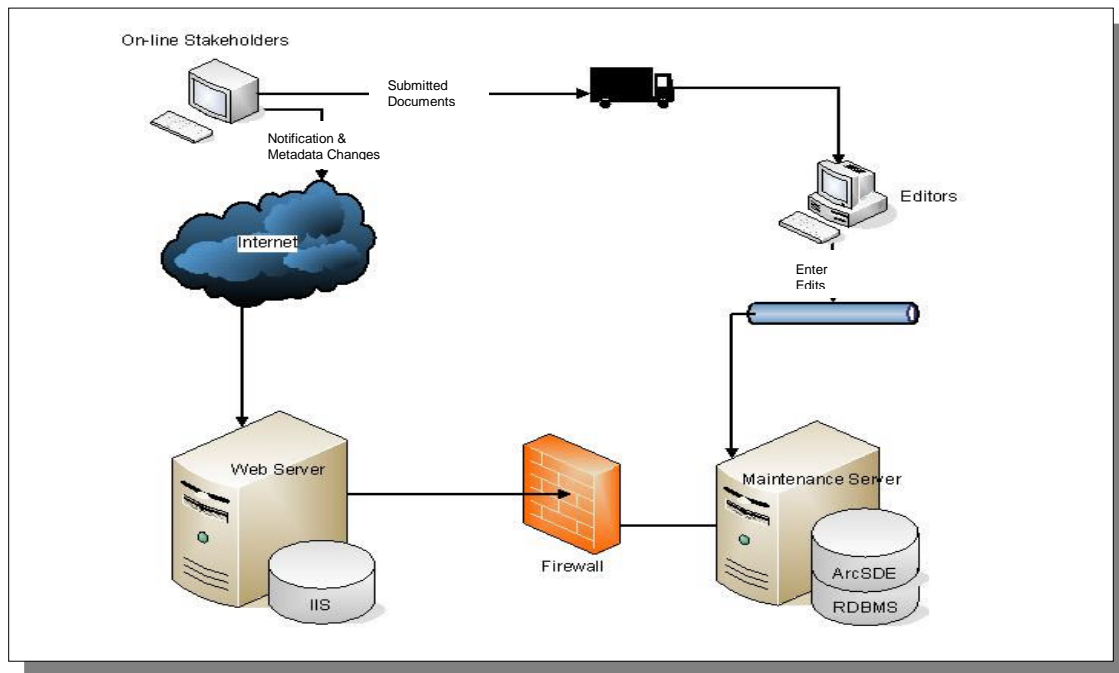
This might be an in-house staff or a contracted service. Some managerial time will be needed as well to supervise the technical person. There should be written manuals that contain guidelines for trail mapping, input and management of data. This could be supplemented with an interactive data entry software application that specifically directs the technician as to where and how each data element should be entered to minimize error. In addition there will be a need for a systems maintenance person available as needed to repair, correct and otherwise keep the system operational on a round the clock basis.

No specific guidelines have been developed relative to performance and security, apart from our initial estimate of 400,000 site visits per year (at build-out), which would amount to about 75 site visit per hour during a peak 14 hours per day, 365 days a year. By way of reference, the Colorado lottery site – not a trail-specific Web locale – currently receives approximately 9600 to 15,600 downloads per year of its very modest library of pdf trail maps.

Security is managed in several ways including a locked and protected back-up data base, a protected working data base and certain firewall protections for the consumer access “storefront” data base that the public enters and retrieves maps and data.

In other words, to achieve this, two distinct but interconnected components would receive, process, manage and output requested data. The first would be a standard computer terminal where the project administrator at the “processing center” enters data. The second element is a Web-based system for distributing the information that is linked to the data entry terminal. For security reasons there would likely be redundant database and server systems one of which is security protected.

Since data may arrive in different formats such as CAD, GIS or paper there will be a need for software and human capabilities to scan, convert, or integrate material in an optimal manner. There will also be the need to review, process and, where appropriate respond to public and manager feedback.



*Illustration of the Key Components and Their Interface (Drawing by Daniel Elroi)*

## User Interface

User interface will be via a Web “home page” or domain accessible via a direct Web address such as [www.trailscolorado.com](http://www.trailscolorado.com), an interactive link icon placed on other sites that connects to the Web domain or via a keyword search engine such as Google or Yahoo. The proposed Web site, as described in Chapter 2, will use existing Web software with an application designed to allow interactive use, uploading of feedback and possible upgrading in the future with more “drill down” for information opportunities. Ultimately the system should be compatible with handheld devices such as a “pda”, Ipod™ or similar product offering a display screen.

## Software, Applications and Hardware

### *Software--GIS Consultant's Recommended Software Solution*

The GIS consultant has recommended the use of ERSI software products because of their suitability to the objectives of the system and the current broad use and therefore compatibility with applications used by associated public and private entities. Products include:

#### For Compilation

- ArcEditor or ArcInfo – Digitizing, integration, project, QC, mapping
- ArcSDE – Database storage and management
- SQL Server or Oracle – Database platform for ArcSDE

#### Distribution

- ArcSDE – Database storage and management
- ArcIMS – Web mapping and spatial user interface
- ASP.NET – Core Web page automation tools

### *Potential Alternative or Interim Software Strategies*

While the ESRI line of products is the most commonly used software, there may be other software solutions such as Delorme X-Map/GIS Editor ([www.delorme.com/professional](http://www.delorme.com/professional)) that may be workable for this project. Other Web access products such as CITRIX may also have applicability to the goals of this project ([www.citrix.com](http://www.citrix.com)). Web hosting services such as Verio ([www.verio.com](http://www.verio.com)) and Oracle products may have applicability (<http://www.islandnet.com/~tmc/html/articles/orareln.htm#What%20is%20a%20>)

Several available software products will be evaluated in the next phase of the work. In addition to software options there may be alternative workable approaches to setting up the system with potential applicability either on an interim basis for testing a proto-type or for permanent use. One potential alternative approach would be to establish a graphics-only set-up. In this instance all lines, symbols, legends and “queries” would be associated only with a graphic item on the maps. There would be no associated or imbedded information as with a typical GIS system.

The advantage of this approach would be a simpler, less costly, and less complicated set-up of the maps files and working proto-type. The disadvantage would be the limitations on the amount of available information.

To an extent, this would limit the capabilities of the “manager’s” component. In addition, it would require reworking the graphic information in the future, if the State decided to upgrade the system to full GIS capabilities. In the interim, however, data and information could be stored in another format—such as notes



in Word, Excel, MS Access or other commonly used software in a discrete file associated with each jurisdiction and with each trail for later use.

Regardless of the approach, it is strongly recommended that the software application be capable of easily importing and depicting GPS-gathered data including trail alignment within a 20' to 30' error factor (of either side of the actual real world trail alignment and point elevations of the trail given every 50' with a minimum resolution of 5' countours.

### *Hardware and System Architecture*

In addition to standard desktop type computer terminals, the system will require three main hardware components including:

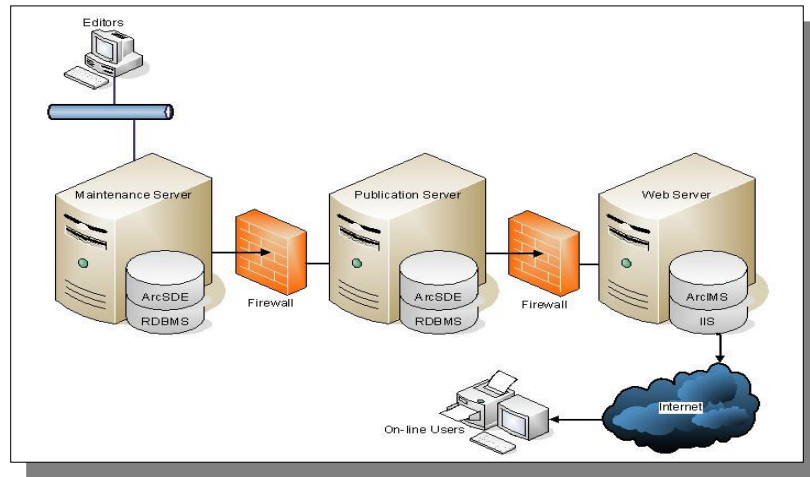
1. A maintenance server—a firewall-secured unit that receives and manages inputted data.
2. A publication server—a firewall-secured unit that provides day-to-day access to the maps and other information.
3. A web server—a unit that links to the outside world of trail users and managers via the Web.

The GIS consultant states that:

*Brand names or even specifications are not crucial at this level of design, but it is important to understand that a large database and Web site consist of different servers and computers. This is done for performance reason, as well as for security, and because data compilation, storage, and distribution are often performed in different locations.*

Networking would include internal connections at the *data center* and external links between the *data center* and the Web Server (if a different locations) and external links between the Web Server and the public/trail managers.

The illustration below demonstrates how the system might be configured showing the basic hardware components.



*Illustration of the Configuration of Hardware Components (Drawing by Daniel Elroi)*

### Estimated System Costs

The GIS consultant has provided very preliminary estimates for setting up and managing a basic system. This estimate would be subject to refinement as the proto-type is developed and tested and does not include the cost of collection of data or field inventory work. Additional amounts should also be anticipated for consultants, licensing and other factors.

**Data Warehouse**—Cost shown here are for a brand new internal solution. Outsourcing or a cooperative arrangement can reduce costs.

|                                                                                                                 |    |                      |
|-----------------------------------------------------------------------------------------------------------------|----|----------------------|
| ▪ File server                                                                                                   | \$ | 6,000                |
| ▪ ESRI ArcSDE database storage software                                                                         |    | 10,000 (retail cost) |
| ▪ Two editor workstations                                                                                       |    | 6,000                |
| ▪ ESRI ArcInfo software (1)                                                                                     |    | 10,000 (retail cost) |
| ▪ ESRI ArcEditor software (1)                                                                                   |    | 7,000 (retail cost)  |
| ▪ Wide format scanner                                                                                           |    | 12,000               |
| ▪ Basemap for background for statewide data                                                                     |    | 10,000 (or less)     |
| ▪ Design of hardware & software configuration                                                                   |    | 5,000                |
| ▪ Design of database                                                                                            |    | 10,000               |
| ▪ Installation and configuration of system                                                                      |    | 5,000                |
| ▪ Design of data capture, maintenance, QC procedures and tools (assuming this is done ahead of hiring of staff) |    | 20,000 (or more)     |

**Data Capture**— Assumes capture of 5,000 of miles per year, would likely require two people, one at a GIS Technician, and one at a GIS Analyst level. Maintaining the database after the majority of conversion is performed, and assuming no new large data conversion tasks are added, may be reduced to one GIS Analyst. Contracted staff may be assumed to cost about three times the base salary listed below.

- GIS Technician \$ 35,000 + benefits per year
- GIS Analyst 50,000 + benefits per year

**Web Site**— The Web site can be divided into two major components: data discovery, mapping, and output; and data capture and input. Both can be accommodated on the same Web site. In these estimates it is assumed that the three-server configuration suggested in this design will be used. A hosted solution can reduce some of the upfront costs, and can help offset some of the consulting and colodation fees.

- Data distribution file server \$ 3,000
- ESRI ArcSDE database storage software 10,000
- Web server 3,000
- ESRI ArcIMS Web mapping server software 10,000
- Basemap and other enhanced data used as background and reference in maps, e.g. satellite images, street database for address-matching, etc. 25,000+ (per year)
- Web site design and construction (both output and input components) 100,000+
- Design of networking and updates between maintenance and distribution servers 20,000
- Server collocation fees and data throughput fees variable

**Note:** The assumption is that the site will be free to users. If it is not, then an e-commerce site will have to be established as well, perhaps another \$35,000.

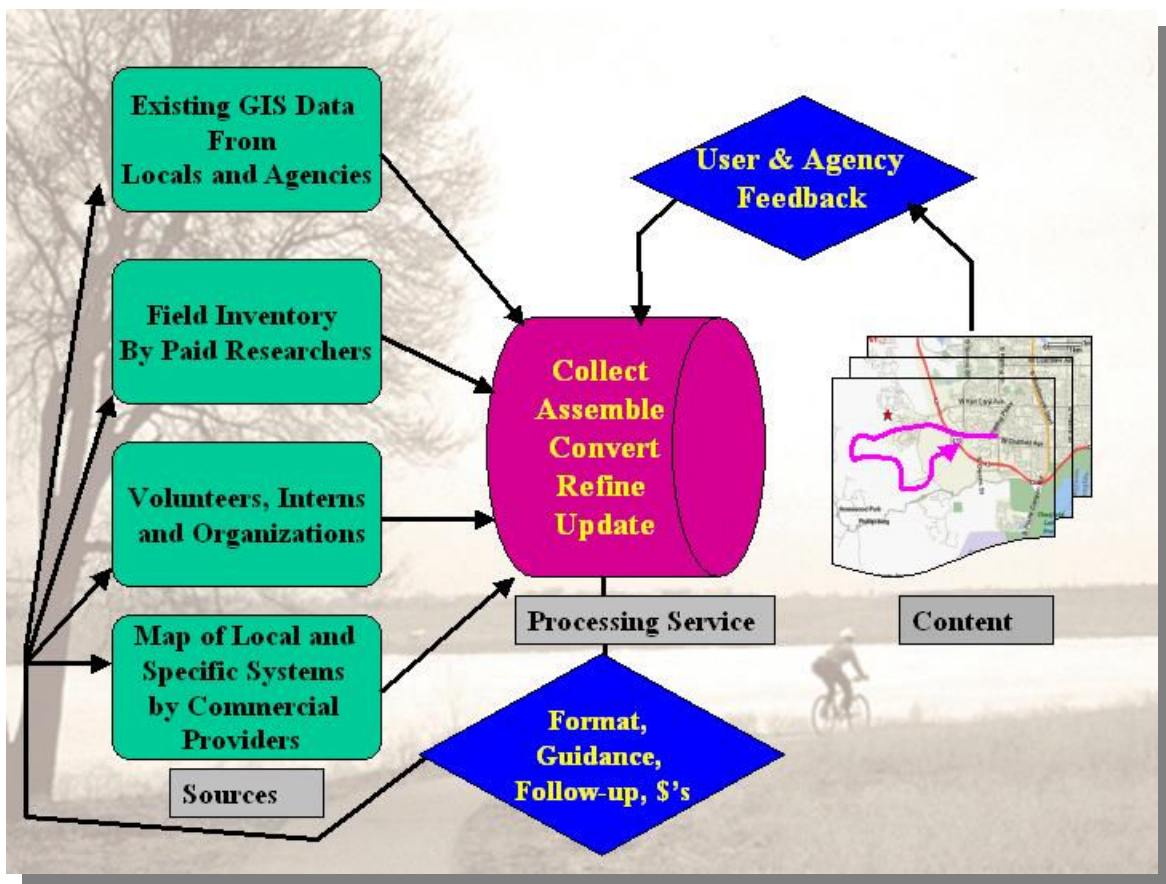
### **Content Building, Survey and Reporting Mechanisms**

The term “content” refers to the actual maps of the trails that would be made available. This could ultimately include tens of thousands of miles of trails in hundreds of jurisdictions statewide. While a number of jurisdictions have mapped their trails either in digital format or on “paper” there is no uniformity of trail definitions, graphics or GIS coding. In addition there are no agreements for sharing information. By comparison CDOT maintains several full time positions to map highways and streets and jurisdictions are required to provide data annually to CDOT in return for revenue distributions.

Clearly content building and maintenance is the most formidable task in building a workable, affordable digital trails mapping system. (Please see Chapter 4 for a discussion of prioritization on content building.) At a minimum the following are needed to achieve a workable content collection and maintenance system:

1. Agreement to a uniform and universally shared system of trails and trail component definitions.
2. Agreement to a uniform and universally shared system of graphic representations or interchangeable GIS queries.
3. Agreement to uniform standards of quality for mapping and local data management—updated at least annually.
4. An easy-to-use Web-interactive upload system that allows local entities to upload trails information. Or, alternatively, a central staff of technicians who can digitize or convert data provided by local entities.
5. Incentives to promote compliance by local jurisdictions.
6. Staff time to administer the program, coordinate with local entities, provide training to locals, etc.
7. A Web site for depositing and accessing the map information and a central server or storage facility for data.
8. System architecture and software applications to manage and process the data.

The illustration below depicts how content might be acquired and managed.



As the graphic depicts, there are at least four main sources for content information ranging from actual field documented data to converting “paper” or non-interactive “pdf” maps provided by participating entities. A processing service, run in-house or outsourced, collects the data and assists local entities in formatting information. A feedback system allows local entities and trails users to comment, enhance or correct the data. Following are strategies for optimal cost-effective content building.

### *Trails User Mapping and Services*

These are the actual maps users will access on the Web. As depicted above it will take a combination of efforts to assemble and digitize the content. Following are the pros and challenges of each:

#### **1. Gather Existing Digital Maps and Data from Local Entities**

Survey counties, cities, towns and other entities including willing private mapping services and organization to identify existing digital trails mapping. Gather all available maps and transpose into the statewide system. If necessary, field survey and verify unclear, uncertain or missing segment and integrate into the database.

The process might also include a link to trails on federal lands. The state system, though, would not include mapping all federal trails. It might include, however,

segments of other trails or trail systems that happen to cross federal lands. State Parks has already initiated a survey of the major Colorado jurisdictions to identify trail mileage and existing data management systems.

**Pros:**

- This is the most cost-effective way to gather and maintain mapping data.
- Built out of a cooperative partnership between the statewide and local systems.

**Challenges:**

- Cost to contact local entities, gather and assemble data files.
- Some jurisdictions might be unwilling, hesitant or slow to comply.
- Formidable task to scan and covert existing data to statewide protocol.

**Costs and Resources:**

- Cost is unknown at this time. Could be determined in pilot project phase.
- Possibility for a partnership with a university or with local entities to covert data.

**2. Conduct Field Inventories of Existing Trails Using Paid Researchers**

This involves sending crews into the field with GPS unit and a content development guide to survey existing trails.

**Pros:**

- Likely the most accurate source of information
- State would have some control over schedule of the mapping vs. awaiting compliance by local entities
- No need to convert data. Information will be recorded directly into the State Trails Mapping System format

**Challenges:**

- Cost to perform mapping
- Need careful supervision to assure quality and accuracy of the product
- Given cost and budget constraints, could take many years to complete
- On-going cost to update

**Costs and Resources:**

- One consultant estimates \$100 per mile
- Possibility for a partnership with a university or other entities

**3. Volunteers and Organizations Provide Data**

This includes recruitment of volunteers, interns or GOCO youth program crews to provide mapping services using GPS equipment and content manual. State would provide training, data input formats and other support. Trail and user organizations could also assist by providing data.



**Pros:**

- Low cost for volunteers and donated information
- Engages trail advocacy entities in the process and hopefully promotes ongoing feedback and improvement

**Challenges:**

- Cost to coordinate, supervise and maintain quality control
- Possible diminished quality
- Difficult to demand completion deadlines
- Some organizations, especially those that sell maps may be unwilling to partner (Though the case could be made that a statewide digital system could help expand sales of organization's maps by providing links on the statewide site)

**Costs and Resources:**

- Cost is unknown at this time. Likely, at least a half-time supervisor data manager
- Numerous organizations that might participate

**4. Gather Existing "Paper" and "Pdf" Maps and Convert**

State Parks would survey entities and collect all publicly available paper maps and maps in pdf format. Agreements would be needed with owners to use any proprietary mapping by public or private sector owners. The materials would then be reviewed and digitized into the statewide format. Field surveys and follow up calls will be needed to verify unclear, incomplete and missing data.

**Pros:**

- Relatively low cost of gathering the paper and pdf mapping
- Local entities benefit from the digitization of their maps.

**Challenges:**

- Cost to contact local entities, gather, assemble and digitize data files
- Some jurisdictions and private entities might be unwilling, hesitant or slow to comply
- Formidable task to scan and convert existing data to statewide protocol

**Costs and Resources:**

- Cost is unknown at this time—could be determined in pilot project phase
- Possibility for a partnership with a university or with local entities to convert data

**5. Use of Remote Sensing Techniques Such as Satellite or Aerials Mapping**

While not ever likely to be a major data source, remote sensing might be a tool for verification or quality checks on data provided from other sources. Assumes high resolution, up to date material is available.



**Pros:**

- A relatively low cost way to verify mapping and detect some trails

**Challenges:**

- Limited reliability of information and obscuring by tree cover, etc.
- Cost of current, high definition remote sensing information

**Costs and Resources:**

- Cost is unknown at this time— could be determined in pilot project phase
- Possibility for a partnership with a university or other entity that has remote data available

***Trail Manager's Services***

The trail manager's information service provides essential trail planning and management information. The system is designed for cost-effective information contribution and updating by local entities and agencies with an accessible user-friendly and uniform platform that allows each participant to routinely enter their latest trail system information into the statewide system using a uniform digital template. Here are some of the kinds of information that state trail planners and administrators as well as local planners and managers might use:

**Planning Factors**

- The overall trails master plan for the area if available
- Trail development opportunities
- Greenway and conservation corridor conservation opportunities
- Sensitive areas including ecological, adjacent residents, security zones, hazards.
- Level-of-service provided (miles per 1000 population) and level-of-usage, if available (data sheet)

**Project Status**

- The completeness of the existing system showing gaps and sub-standard segments and components
- Status of projects under development—especially those involving GOCO funds with information (call-out points inc. contract #, grant amount, completion deadline, status, notes)

**Operations and Maintenance** (See managers query fields in Chapter 2 above)

- Crime, accident and conflict statistics and problem areas if any
- Operations and maintenance needs and costs

**Sustainable Information Reporting System**

The purpose of the information reporting system is twofold:

1. Facilitate timely and accurate updating of the information base
2. Support a trail manager's information service

*Note: System may also be used to support content development for the trail users component.*

Following are performance criteria for the reporting system:

- **User-Friendly**—System is clear and simple to use by all agency staff without special computer training or technical skills. System is designed for cost-effective information contribution and updating by local entities and agencies with an accessible user-friendly and uniform platform that allows each participant to routinely enter their latest trail system information for local use and uploading into the statewide system using a uniform digital template.
- **Comprehensive and Expandable**—System covers key information needs of trail managers such as trail type, trail location, site specific location, gaps, planning and progress, costs of construction and maintenance, proposed improvements, accident and crime data, sensitive areas, conflicts, and other trail-related queries as well as typical GIS information. Additional categories and queries can be added.
- **Provides Graphic and Written Content**—System accommodates maps and images as well as written information.
- **Secure and Protected Data**—Information can be backed up and stored at a number of locations. Unauthorized access is blocked. Uploaded information is filtered for quality, accuracy and compliance with data base standards.
- **Uniformity**—System is uniform to all users.
- **State-of-the-Art Digital Systems**—System reflects the state-of-the-art in digital information management and is, where practicable, updateable to evolving new systems.
- **Sustainability**—Mechanisms are identified for the sustainable, long-term management and maintenance of the system.
- **Commonly Available Hardware**—System is designed to function on currently and widely used consumer-grade computers, operating systems and software such as Windows XP and MAC OS. It functions over commonly available broadband level Internet services such as DSL and cable Internet.
- **Current Information/Timely and Accurate Update**—Capacity and incentive to be routinely updated (at least annually).
- **Affordable to Build and Maintain**—System is affordable to create and manage. Participants contribute to updating. System is built using existing off-the-shelf software systems and products rather than a created, original, esoteric system.

- **Ability to Import and Transpose Existing GIS Layers** – A number of local agencies have sophisticated GIS mapping. Goal is to be able to import these layers and covert them to a statewide format in a cost-effective way. Ideally a program can be developed to assist in this process.

### **Recommendations**

1. Provide each local jurisdiction (counties, municipalities, public land managers such as Denver Water and the U.S. Forest Service) a uniform reporting form for regular information update and feedback. The form should be on line in digital format and available in paper form (only in the instance that the jurisdiction does not have computer capability).
2. Each jurisdiction is encouraged to file updates anytime there is a change in the trail system.
3. Each jurisdiction is required to file an annual update to be eligible for GOCO State Trails funding.
4. Initial system is simple and limited to a manageable number of query fields with capability to add additional layers in the future.
5. There is a back-up mechanism to verify completeness and accuracy of the information provided. This requires clear definitions, guidelines and graphic protocols. It also requires either a capable staff person or consultant to manage quality and content. This is likely to require up to 500 person hours per year at a cost of \$ 10,000 to \$15,000 or more.
6. The reporting system consists of a brief questionnaire and a map for reporting trails information.

Following is a conceptual query form concept:

**Agency:** Greentown, CO Parks and Recreation **Coverage Area:** Greentown Service Area (600 square miles)

**Contact Person:** Jeff Orson

**Title:** Trails Planner III

**Phone:** 970-555-5555

**E-Mail:** jorson@aol.com

**Web Site:** www.greentown.org

**Population of your jurisdiction:** 500,000

**Miles of Trails By Type (See Definitions Below):**

| Trail Type         | Miles | LOS | Trail Type        | Miles | LOS | Trail Type           | Miles | LOS |
|--------------------|-------|-----|-------------------|-------|-----|----------------------|-------|-----|
| Paved Shared-Use:  | 30    | .06 | Hiking Trails     | 20    | .04 | Loop Trails          | 50    | .10 |
| Gravel Shared-Use: | 30    | .06 | Greenways         | 20    | .04 | Cross Country Ski    | 15    | .03 |
| 4 x 4 Trails       | 20    | .04 | Snowmobile Routes | 50    | .10 | Mountain Bike Trails | 40    | .03 |
| ATV Trails         | 50    | .01 | On-Road Routes    | 100   | .06 | Sidewalk Routes      | 20    | .02 |
| Equestrian Routes  | 50    | .01 | Paddleways        | 15    | .03 | Technical Trails     | 10    | .01 |

*Level of Service Calculator (program calculates level of service (LOS in mile per 1000 population) automatically.*

**Do you have a trails and greenways master plan?**

Yes/Year Completed 2003 In Process/Year To Complete        No Plan       

**Please provide a digital "pdf" of your plan map.**

**Do you have any GOCO Trails Funded Projects in Progress?**

| Project/Contract Number   | Program     | Location                                   | Completion Date | Status/Comments                                                       |
|---------------------------|-------------|--------------------------------------------|-----------------|-----------------------------------------------------------------------|
| Rabbit Creek Trail/#43670 | GOCO Trails | 2 <sup>nd</sup> Street to Main along creek | 2006            | Pending final negotiation of right of way. Will need extension to 208 |
| Green River               | GOCO Legacy | City Limit to City Limit along River       | 2010            | Need additional matching funds due to federal cutback on TEA program  |
|                           |             |                                            |                 |                                                                       |

**Do you plan to apply for GOCO Funds for Trail in the next two years?**

| Project/    | Program     | Location                 | Application Year | Status/Comments                                       |
|-------------|-------------|--------------------------|------------------|-------------------------------------------------------|
| Green River | GOCO Trails | 20 <sup>th</sup> to Main | 2006             | Need additional matching funds due to federal cutback |
|             |             |                          |                  |                                                       |
|             |             |                          |                  |                                                       |

**Accident, Conflict and Crime Reporting**

| Trail        | Location (GPS)                                         | Nature of Event                                      | Date    | Remedy/Comments                                                   |
|--------------|--------------------------------------------------------|------------------------------------------------------|---------|-------------------------------------------------------------------|
| Rabbit Creek | Between 2 <sup>nd</sup> and 5 <sup>th</sup> (00°46'53) | Bike collision two hospitalized in serious condition | 7.21.04 | Blind curve arrows installed. Police to ticket reckless cyclists. |
| Rabbit Creek | 8 White Fir Court (00°46'53)                           | Complaint regarding drug use                         | 8.3.04  | Police to monitor this area, enforcement.                         |
| Rabbit Creek | 8 White Fir Court (00°46'53)                           | Drugs, disorderly conduct                            | 8.5.04  | Police arrest home occupant.                                      |
|              |                                                        |                                                      |         |                                                                   |

**Annual Trails Maintenance Budget: \$ 230,000**

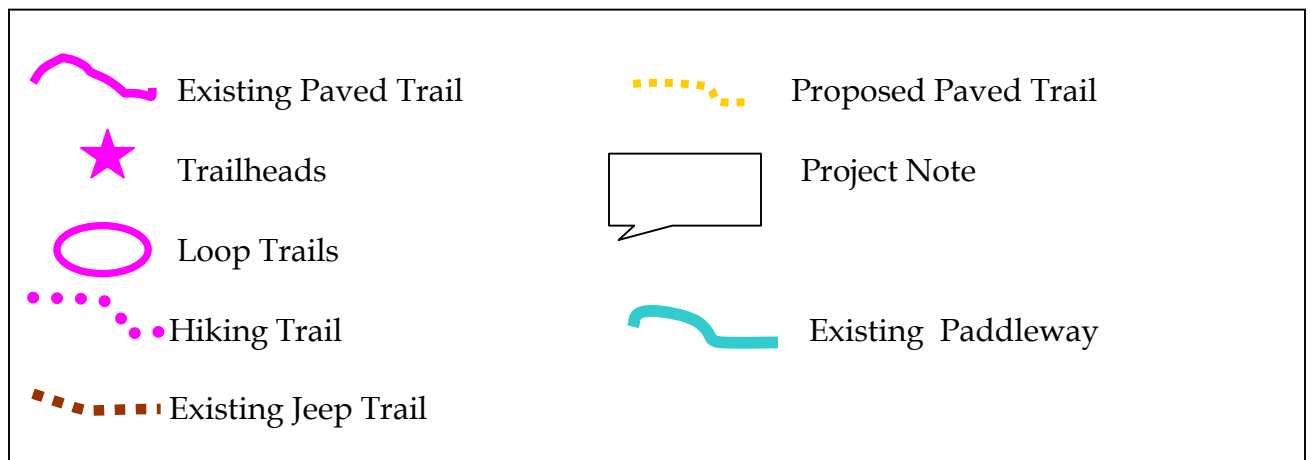
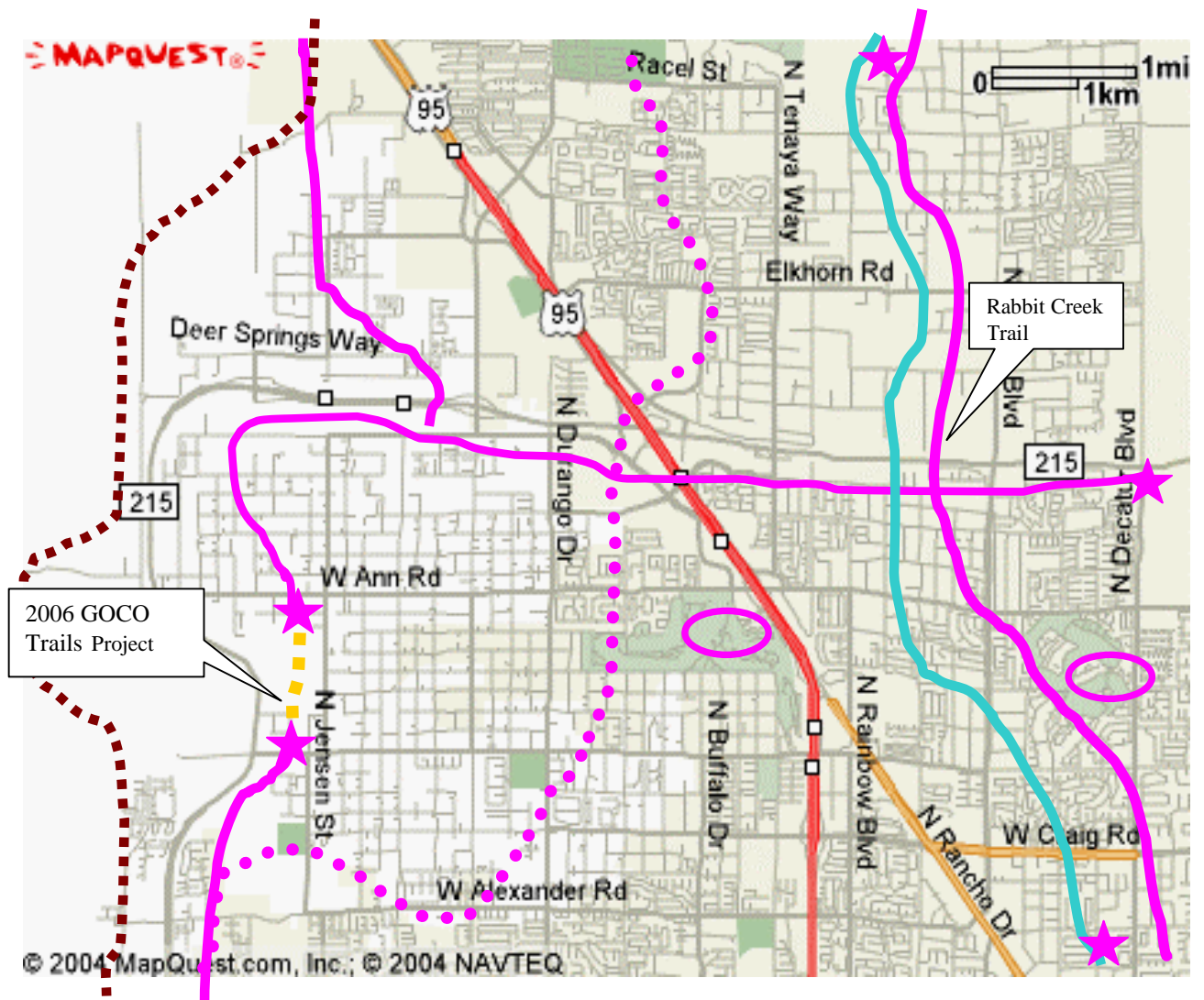
**(maintenance per mile calculator)**

**Operations and Maintenance Issues/Substandard Segments**

| Trail        | Issue               | Location       | Status/Comments                                                                                                 |
|--------------|---------------------|----------------|-----------------------------------------------------------------------------------------------------------------|
| Rabbit Creek | Bridge deck rotting | W. Bowles      | Wooden bridge plank broke under weight of pedestrian. Minor injury. Estimate 10k to replace with concrete deck. |
| Rabbit Creek | Wash out            | Claremont Ave. | 500' of trail washed out in July 05 floods.                                                                     |
|              |                     |                |                                                                                                                 |

**Please Complete Attached Map**

Following is reporting map concept.



## **CHAPTER 4**

### **IMPLEMENTATION RECOMMENDATIONS & CONCLUSIONS**





## **4: Implementation Recommendations & Conclusions**

### **Overview of Challenges and Solutions**

With a many as 30,000 miles of trails in Colorado or more, the task of mapping and maintaining a comprehensive statewide digital mapping system (“content”) will be formidable. While the effort can be phased with priority on more commonly used and accessible trails, there will still need for a “critical mass” of available trails information if the system is to be well used. There will be the challenge of funding the on-going long-term management of the database to be sure information is accurate, comprehensive and usable. There will also need to be a way to document, manage and respond to feedback from both trail users and trail managers.

The recommended approach is a logically phased effort that includes the development of a proto-type software application (using existing software mapping products) and the broad acceptance of a common language and mapping protocols system. This might best be accomplished with the development of a prototype pilot project that is “beta” tested on a Colorado community (pop. 10-15 thousand). The test community should currently have a variety of trail types, terrain types, open space types and a working Web home page. More details on this effort are described under the heading “Recommended Pilot Projects and Partners” below.

Building partnerships and local jurisdiction cooperation will be essential to the success of this program. Partnerships might be created with a university or other entities to develop software applications and to build and maintain content. In addition there may be interested parties, both public and private, that might want to share in marketing, promotion or other services of mutual interest. Information sharing with other states or agencies may also be helpful.

Ideally, the majority of the local jurisdictions and other entities that build and manage trails in Colorado can be persuaded to embrace the trails and trail component definitions, graphics and software used in the statewide system proposed here so that local information can easily be uploaded and exchanged back and forth.

### **Funding and Financial Sustainability Options**

To accomplish the mapping effort, a number of potential funding and management scenarios were considered. An overriding objective is to minimize the cost of the project in public dollars while both building content and maintaining of the system.



Since the present goal of this project is to offer the service fee of charge to the public, alternative funding sources must be identified. Potential revenue sources, that could be applied individually or in combination, include:

- **State Appropriations** from the legislature, from the Great Outdoors Colorado Fund or in-kind services from a university or other state agency.
- **Commercial Advertising Fees** based on the investigation of the potential market and return on advertising vs. the cost of building and maintaining the system as well as state regulatory requirements for collection and utilization of advertising fees.
- **“Sponsorships”** where both public and commercial entities contribute to the program in return for recognition on the Web site. Again, this must be in conformance with state regulations.
- **Participation by Local Entities and Organizations** (such as a city, county or homeowners association or a statewide trails user group) in the form of fees collected from local entities that wish to participate in the program. In other words, each participating jurisdiction would pay all or part of the cost of for their own map development and maintenance. Either State Parks could provide the service for a fee to the local jurisdiction or the local jurisdiction could produce the content using the state-provided software application, mapping graphics, content manual and other tools. This might involve building the system on a jurisdiction-by-jurisdiction basis with content available both to the local entity and to the statewide system. Participants would agree to conform to all graphic and digital mapping protocols of the statewide trails mapping system.
- **Philanthropic Grants** from foundations or individuals willing to support the program. This source would likely be challenging in the face of competing charitable needs.
- **Convention and Tourism Agencies** may have an interest in supporting this program.
- **Possible Pooling of Resources** such as software applications and sever space with other states or jurisdictions with similar objectives.

In addition to potential revenue sources, alternative management structures were considered. In pursuit of a sustainable management and funding program, four options were explored:

1. State Funded and Operated

2. Partnership with a University
3. Independent Commercial Provider
4. Cooperating Commercial Provider

### ***State Funded and Operated***

Under this scenario a State of Colorado agency or conglomerate of agencies fully funds and operates the entire program either in-house or by outsource contract.

#### **Pros**

- State could set up program on its schedule when it wants to assume available funding.
- State has consistent control over content, style and quality.
- Potentially State could accept sponsorships from outside entities and generate revenue to fund the program if consistent with State regulations.

#### **Challenges**

- Very substantial cost to develop and maintain unless offset by sponsorships.
- Subject to budget appropriations and thus would not necessarily have a consistent, predictable revenue stream to fund the program.
- Staffing and logistical costs to operate the program.

### ***Partnership with a University***

In this scenario a university with GIS mapping capability contracts to set up and maintain the program. Funding might come from a number of sources including: the *State Trails Program*, *Great Outdoors Colorado* or other sources as feasible and appropriate. Currently, the *Florida Office of Greenways and Trails* has such a program working with the University of Florida <http://ogt.geoplan.ufl.edu/>. Both faculty and students would participate in the program.

#### **Pros**

- Potentially less costly than a commercial provider.
- Access to state of the art know-how and technology.
- Supports State's higher education institutions.
- Benefits to students who participate.

### Challenges

- Trails mapping not the prime business of a university GIS program.
- Funding must still be provided to compensate the participating university.
- May not be permanent if university's objectives change over time.
- May be difficult or impossible to secure outside revenue such as sponsorship or advertising if run through a state university institution.

### *Independent Commercial Provider*

In this scenario a private, commercial provider sets up and operates the program independent of the State. This approach may not necessarily include a trail manager's component unless negotiated with the provider. Perhaps such a service could be offered for a fee or in return for other considerations. Ideally, there would be some coordination and cooperation between State agencies and the commercial provider. There are already several commercial providers of such services but the content is not comprehensive and usually limited to excerpts of printed trail guides, and periodically updated maps and descriptive articles on selected trails

### Pros

- No out-of-pocket cost to State.
- No staffing or management burden to State.
- Program sustainable if revenues can be generated commercially.
- Promotes private sector initiative and efficiencies.

### Challenges

- No state control over content, style and quality.
- Commercial provider may not benefit from State input.
- State does not receive revenue or manager's benefits.
- Long term free user access not guaranteed

### *Cooperating Commercial Provider*

This is a "hybrid" approach where a private sector provider — in partnership with the State— sets up and operates the trail user element of the program and cooperates with the State on the trail manager's element. The parties agree to standards of quality, comprehensiveness and other elements of the program.

Under this mixture, there might be a range of partnership options such as the State developing the software and initially contributing to building all, or part of, the content and providing on-going coordination and updating services to the private provider. The private provider would agree to reimburse the State for content provided and other elements through a “concessionaire” agreement based on a fair rate of return both to the commercial provider and the State. Ideally there will be a trails and open space “enterprise fund” where the revenues are devoted to reimbursing public sector costs for content development and maintenance. Establishment of this arrangement would have to be in conformance with State contracting policies and procedures and perhaps special legislation would be required.

### **Pros**

- Minimal out-of-pocket cost to State over the long term.
- Promotes private sector initiative and efficiencies.
- State control over content, style and quality through agreements.

### **Challenges**

- Less control over content, style and quality, than if run totally in-house.
- Depending on contracting and revenue requirements, State does not receive revenue or gets less revenue.
- Long-term free user access not guaranteed.

### **Recommended Pilot Project and Partners**

A pilot project has been recommended for completion in 2006-7. The effort involves the recruitment of a cooperating jurisdiction that will provide a broad cross section of trail, terrain and, ideally, open space types. The test community should have a physically active population of at least 10,000 to 15,000, its own community Web site and newspaper and a full time staff and other features that can facilitate and optimal development and test of software, graphics and other elements. The scopes of work presented below describe the specifics of the pilot effort.

### **Scope of Work to Develop a Working Prototype**

This might be achieved through a partnership between State Parks and a technical provider such as a university. The following scope of work with the parties working cooperatively is recommended:

1. Create a mapping software application (initially this might be a graphics-only system not fully capable GIS software due to cost.)

2. Create a manager's feedback and operational documentation software application
3. Assist and advise with creation of the content manual
4. Assist and advise with GIS data attribute development
5. Identify and recruit a participating test community
6. Map trails in the test community
7. Create a proto-typical Web page
8. Deploy the Web page in the test community
9. Assist with refinements of Web Page

A second phase of the effort will perfect the application and Web site per the findings of the first phase and pursue the on-going building of mapping content. Deliverables include:

- Proto-type software application
- Content "Development Manual"
- Digital trails content for the host community.
- Proto type Web page and Web link icon.
- Newspaper article and notice flyers describing the effort and requesting feedback
- Report of Findings

### **Conclusions and Next Steps**

There is a high cost of creating and distributing traditional "paper" trails maps. Keeping them current is also prohibitive. With the growing broad availability of digital and Web-based capabilities, the time is right for Colorado to develop a comprehensive digital mapping system.

The initial phase of investigation has shown broad enthusiasm and support for such a system and software programs are available that can support applications for the mapping. The key challenge is the creation and maintenance of the content with literally thousands of miles of both motorized and non-motorized trails.

It is not likely that the entire trails system in Colorado can be affordably mapped in the short term, however, a logical phased approach, working with partners, could be pursued with the goal of creating a “critical mass” of mapped Colorado trails available to both residents and visitors. This would be an area of sufficient coverage to make it usable and meaningful.

This can best be done on a jurisdiction-by-jurisdiction basis working in cooperation with local entities such as towns, cities and counties as well as partnering federal agencies and amalgamating this content into a larger database that expands over time.

Creating a successful working proto-type will be an effective first step both perfecting the system and demonstrating its efficacy to other jurisdictions or entities that will want to “jump on board”.

Accordingly the specific next steps are summarized as follows:

1. State Parks should continue to circulate and update the trails inventory spreadsheet files sent to each participating Colorado jurisdiction (described in Chapter 3 above) with a goal of having a majority of the jurisdictions on file by the end of 2006.
2. State Parks should store and maintain a permanent digital trails “jurisdiction trails inventory file” for each participating jurisdiction.
3. Recruit a cooperating jurisdiction to “beta” test and perfect trails mapping software, Web site, and content development techniques. Complete this in 2007.
4. Prepare a “Content Development Manual” with uniform trails and trail components definitions, layouts and protocols for information storage, management and dissemination. Complete this in 2007.
5. Pursue a cooperative effort with a university or other appropriate partner to develop a proto-type trails software application and assist in building content. Complete this in 2007.
6. Work cooperatively with the GOCO Open Space Mapping effort to the mutual benefit of the participating entities and to minimize unnecessary duplication of efforts.
7. Explore potentials for partnerships with entities that share common interests such as the Colorado Lottery.



8. Encourage local jurisdictions to embrace the Statewide Trails Mapping definitions, "Content Development Manual", and software protocols, to map their local trails per the manual and feed into the statewide database and Web access system.
9. Explore optimal financial and management options to identify and pursue cost-effective and cost-sustainable data content building and management.
10. Complete a perfected working proto-type and Web site by the end of 2007.
11. Work with motorized groups to build a similar motorized trails working proto-type in 2007 or early 2008.
12. Set priorities for mapping coverage (such as major Front Range and mountain resort communities) so as to build workable critical mass content that will be widely used and expanded each year as content is built.
13. Identify and deploy an entity that will provide on-going content building and management. Complete this in 2007.
14. Launch on-going content building and expansion of the system per the priority list to complete statewide access and use by 2008.

# Appendix 1. Conceptual Design and Feasibility Study for Colorado State Trails Web Site.

**Prepared for:**

The Greenway Team, Inc. and Colorado State Trails

## CONCEPTUAL DESIGN

**DRAFT**


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August 2005

|                     |                                                                          |              |                                         |                                                                                       |                     |
|---------------------|--------------------------------------------------------------------------|--------------|-----------------------------------------|---------------------------------------------------------------------------------------|---------------------|
| <b>Title:</b>       | Urban Edges Conceptual Design                                            |              |                                         |  |                     |
| <b>Description:</b> | Conceptual Design for Urban Edges Colorado State Trails Web Site Project |              |                                         |                                                                                       |                     |
| <b>Author:</b>      | Daniel Elroi, Elroi Consulting, Inc.                                     |              |                                         |                                                                                       |                     |
| <b>Last Update:</b> | 21 September 2006                                                        | <b>File:</b> | Appendix 1 Conceptual GIS System Design |                                                                                       | <b>Page 1 of 18</b> |

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## SUMMARY

*The Greenway Team, Inc.* has been hired by Colorado State Trails to perform a feasibility study for automating the trails data for State Trails. Specifically, State Trails would like to:

- Create a database of all the trails in Colorado. This includes non-motorized and motorized trails on public lands.
- Create a methodology for updating the database with as little manual labor involved as feasible, primarily from the caretakers of these trails, of which there are dozens or hundreds of entities.
- Create a Web site for disseminating the data in a way that would put Colorado trails to best use.

*The Greenway Team* has to date performed a sizable survey of how other states are maintaining and disseminating such data, and how commercial trails Web sites do their business. Elroi Consulting has been hired to provide expert GIS and Web mapping expertise to *The Greenway Team*, in order to contribute a conceptual design and implementation cost estimates to *State Trails*.

This report contains Elroi Consulting's understanding of the technical requirements of the project, a conceptual design to accommodate these needs, and rough costs that can be used for ball-park budgeting of such a design. The contents of this report may be included in *The Greenway Team* report to State Trails of Colorado.

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## INTRODUCTION

*The Greenway Team, Inc.* has been hired by State Trails to perform a feasibility study for automating the trails data for State Trails. Specifically, State Trails would like to:

*The Greenway Team* has to date performed a sizable survey of how other states are maintaining and disseminating such data, and how commercial trails Web sites do their business. Elroi Consulting has been hired to provide expert GIS and Web mapping expertise to *The Greenway Team*, in order to contribute a conceptual design and implementation cost estimates to State Trails.

The Greenway Team has expressed several general constraints and directions thus far:

- *State Trails* is likely to prefer an outsourced public/private arrangement for collecting, managing, and distributing the data, or at least the latter part.
- The distribution site would likely be advertiser-supported, in order to keep *State Trails* costs low, and to help compete with existing commercial sites for exposure. Furthermore, *State Trails* might consider participating in a site that is used by several states, though each state may have its own “branded” front page.
- The data collection and management component may be supported in some way by the distribution Web site, such as to collect user input directly on the Web. But it will also entail professional, hands-on, GIS support.
- No one knows how many miles of trails there are, because they have literally never been mapped. Estimates range in the 30,000 – 40,000 miles. However, many are financed by *State Trails*, from State Lottery money, via grants given to towns, neighborhood associations, etc. which have few facilities for mapping this information.
- In addition to mapping and distributing trails information, *State Trails* would also like to map and distribute information about motorized trails on Federal lands. The Federal government has data that can be incorporated into *State Trails* database.
- There are commercial sites that sell trails data nationwide. Although in some ways they would compete with *State Trails*, whether *State Trails* goes it alone or via a commercial partner, the commercial sites are limited in several areas: They are not comprehensive, particularly in urban areas, which is where *State Trails* expects to get a lot of interest in their data; they are not comprehensive in the trails they promote, but rather are driven by availability of data and by their sponsors’ interests. Ideally, the *State Trails* site can enhance the material provided by commercial sites and vice versa.

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## USER NEEDS ASSESSMENT

This brief user need assessment is based on Daniel Elroi's conversations with Robert Searns of *The Greenway Team* who has, in turn, interviewed and interpreted *State Trails* needs.

### Data

The data that *State Trails* needs to collect is the approximate location of trails, i.e. not to engineering detail, plus attributes that pertain to both the users and maintainers of the trails. User attributes will include length, permitted uses, facilities, elevation gain and slope, surface material, and other attractions. Along with the trails, *State Trails* would like associated data, such as parking lots, picnic areas, emergency services, and toilet facilities. Photographs may enhance the user experience, so these may be collected as well. Owner information will include who maintains the trails, who to contact for repairs or questions, and who provides associated services, such as clean up and user experience activities.


*State Trails* would also like to be able to collect and maintain transient information, such as temporary closures, as well as public safety information, such as accident locations and descriptions or car break-ins and personal attacks. Presumably usage statistics which can be interpreted as popularity, density of use, and "value" for *State Trails*'s investment, would also be collected where possible.

For the purpose of distribution, *State Trails* would also need other information, such as a basemap, landmarks, a DEM to generate cross-sections from trail traces, possibly orthophotography, and if necessary for geocoding, a road centerline database as well. Profiles that use 20-50 ft. contour intervals appear sufficient to *The Greenway Team* at the moment.

### Process


There are three main processes that need to be accounted for in this project: The collection and management of data, its dissemination, and its maintenance.

- Data collection. The Greenway Team envisions setting up a data collection and maintenance shop for *State Trails*, or teaming up with an existing operation, either commercial or cooperative. This operation will spend a lot of time building data up-front, estimating a progress of building about 5,000 miles of trails in the first year. Collection and processing will taper after a while, but if this project becomes commercial, production should be able to pick up again with other states' data. Data collection must anticipate source data in any and *all* formats: GIS, CAD, PDF, art, paper, traces on maps, etc.

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An approximate trail route and description is seen as better than no route or description.

- Data dissemination. This is the role of the Web site, which should offer the user a variety of means for searching for trails. Some of the methods envisioned so far are:
  - Address location, including an intersection.
  - Landmark location, such as hotel, other tourist site, or mountain peak name.
  - Names of other trails (as in “show me what other trails are near the Wounded Deer trail?”).
  - In any of the search methods, a certain buffer around the location should be applied. Also, a description of the desired use should be possible, potentially with complex relationships such as “a walking trail that excludes mountain bikes.” Twelve such categories are envisioned at the moment. Buffers may be expressed in distance, or in time to travel by a certain mode of transportation, e.g. show me trails that are about 10 minutes away from my hotel, or are about an hour drive’s radius from this highway turn-off.”
  - The results of searches should yield some sort of an area map that shows where trails were found, possibly with icons, plus a listing of information below the map. The user should be able to navigate to the list from the map, or possibly use map tips on the map to discover some information about each trail first.
  - Once a trail is inspected, the user should be able to see information such as a map, photos, a profile that is stretched out to the linear length of the trail.
  - Eventually trails may have a PDF information sheet that the user can print out, that will be attractive and include a map as just one component. A facility for creating the map components of these “info sheets” may be required as well.
  - Maps will be limited to 8.5 x 11 sheets, but like MapQuest, can give the user the option of zooming and panning, and printing out multiple map portions.
  - If commercialized, pages will display general ads, but also links to detailed guides or printed maps, preferably those that are relevant to a particular trail or area.
  - The Greenway Team was guessing at 400,000 site visits per year.
- Data maintenance. The site should support certain maintenance activities on-line, such as accepting both trail-user and trail-owner input regarding maintenance of the trail, facilities, problems, closures, etc. Whether the site also offers trail-owners the ability to upload maps in certain formats on-line, or even sketch-digitize in the browser, is left as an option, but is not seen as a likely necessity or possibility.

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## Hardware/Software

No specific needs have been expressed relative to hardware or software for the system.

## Performance and Security


No specific needs have been expressed relative to performance and security, apart from the estimate of 400,000 site visits per year, which would amount to about 75 site visit per hour during a peak 14 hours per day, 365 days a year.

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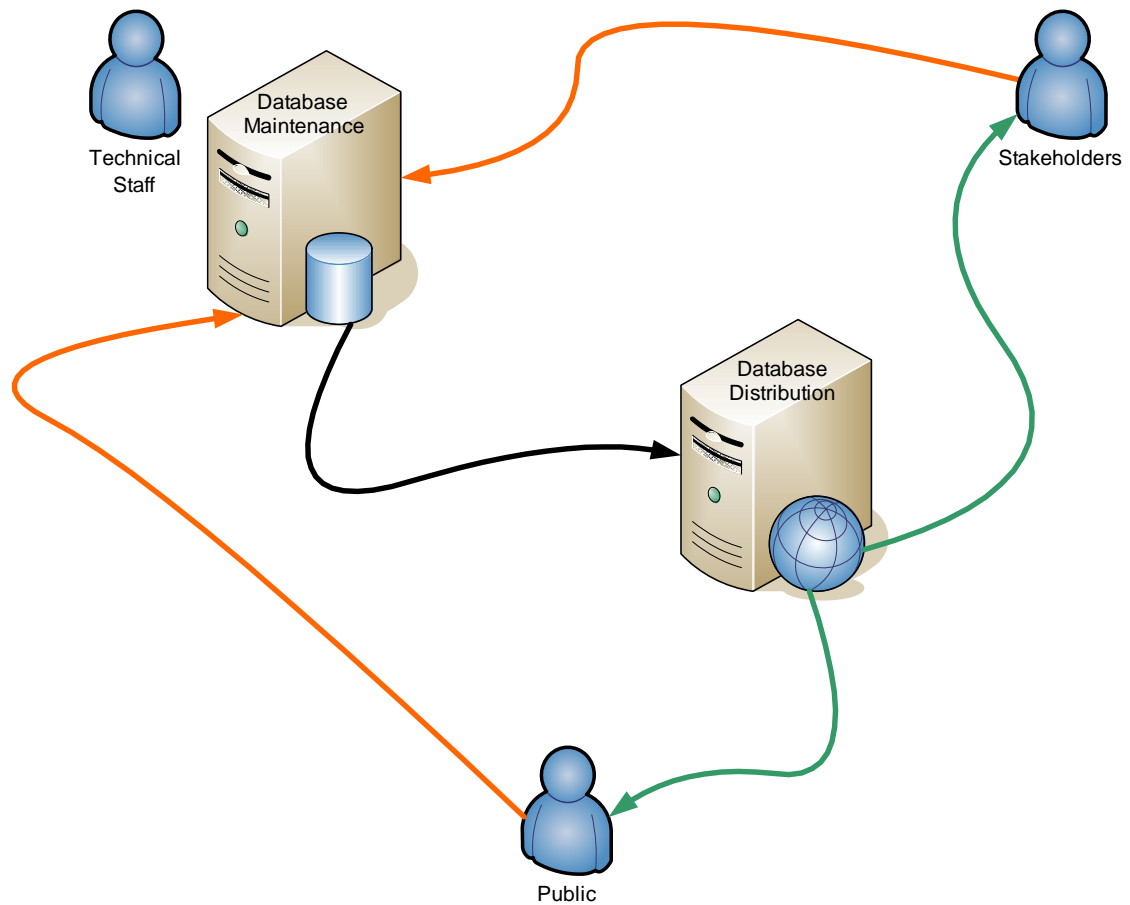
## CONCEPTUAL DESIGN

The trails system will consist of two separate systems – a traditional desktop system for capturing and managing information, and a Web based system for distributing information – with a Web-based “bridge” between the two. The desktop system will be housed in a traditional GIS data processing center, at State Trails or with a contractor/partner. It will be staffed by GIS technicians and supervisors. Access to the data will be via a Web browser. There will be two types of users: Public and Stakeholders. Both will have similar access, but stakeholders will have access to more functionality. The Web application and the data behind it do not have to reside in the same facility, or even be managed by the same group of people as the data maintenance activities.

The highlights of the system are described here.


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## Basic Architecture

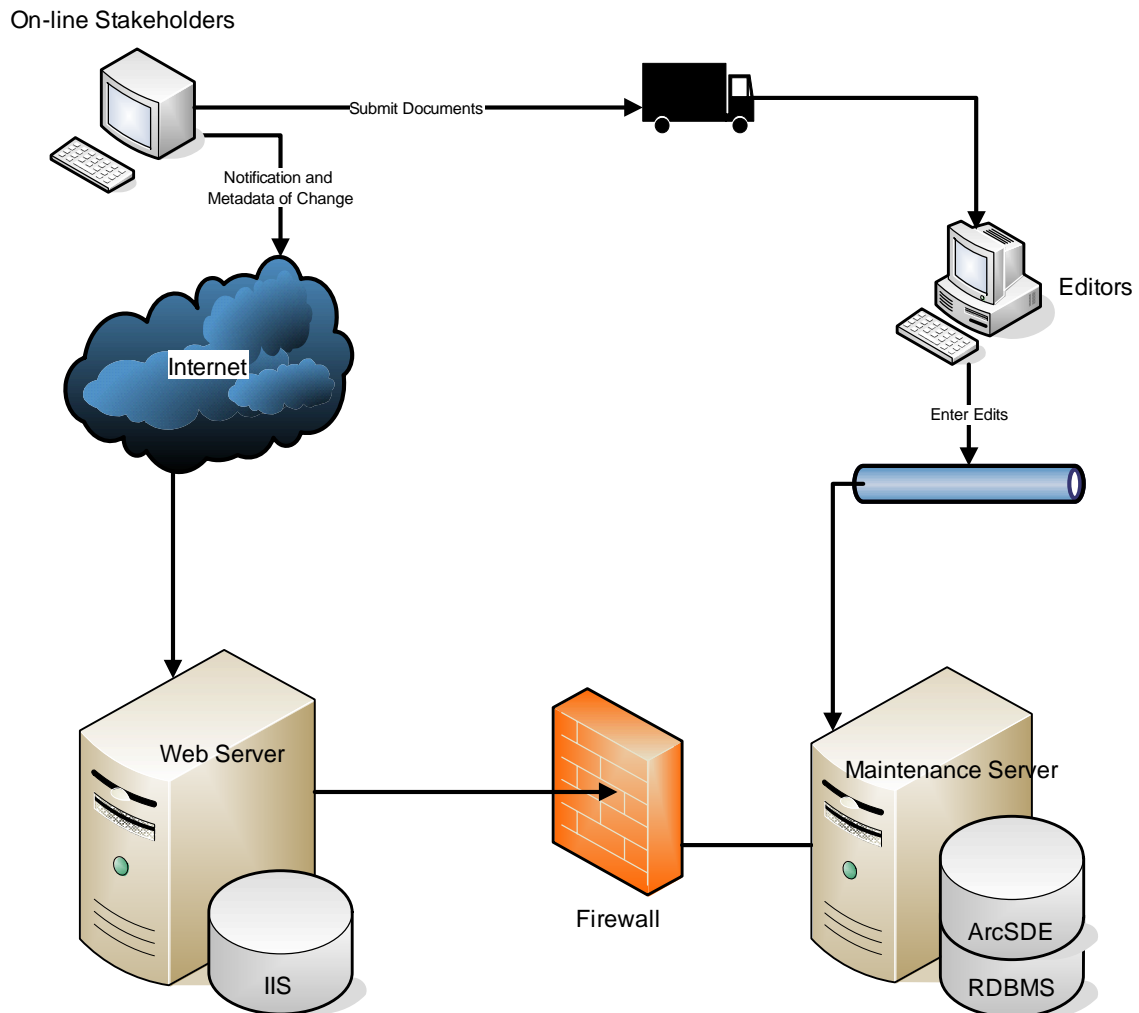


**Figure 1: Basic Architecture - Maintenance and Distribution are separate but linked**

- The data maintenance database and data distribution database will most likely use two separate servers and database systems, satisfying both performance and security needs.
- A system for replicating or communicating data between the two servers will be required to send updates to the public.
- In terms of data retrieval, stakeholders are grouped together with the public. Stakeholders are users who represent organizations that fund trails, as well as those that build and maintain them. In concept, access may be given to public safety organizations as well.
- Some components may be “live”, so they can react to time-sensitive information more easily, such as trail closures. The majority of data, however, will need to be quality-checked before being made available, and will therefore not be 100% “live”.


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## Data Capture




**Figure 2: Getting Data into the Database**

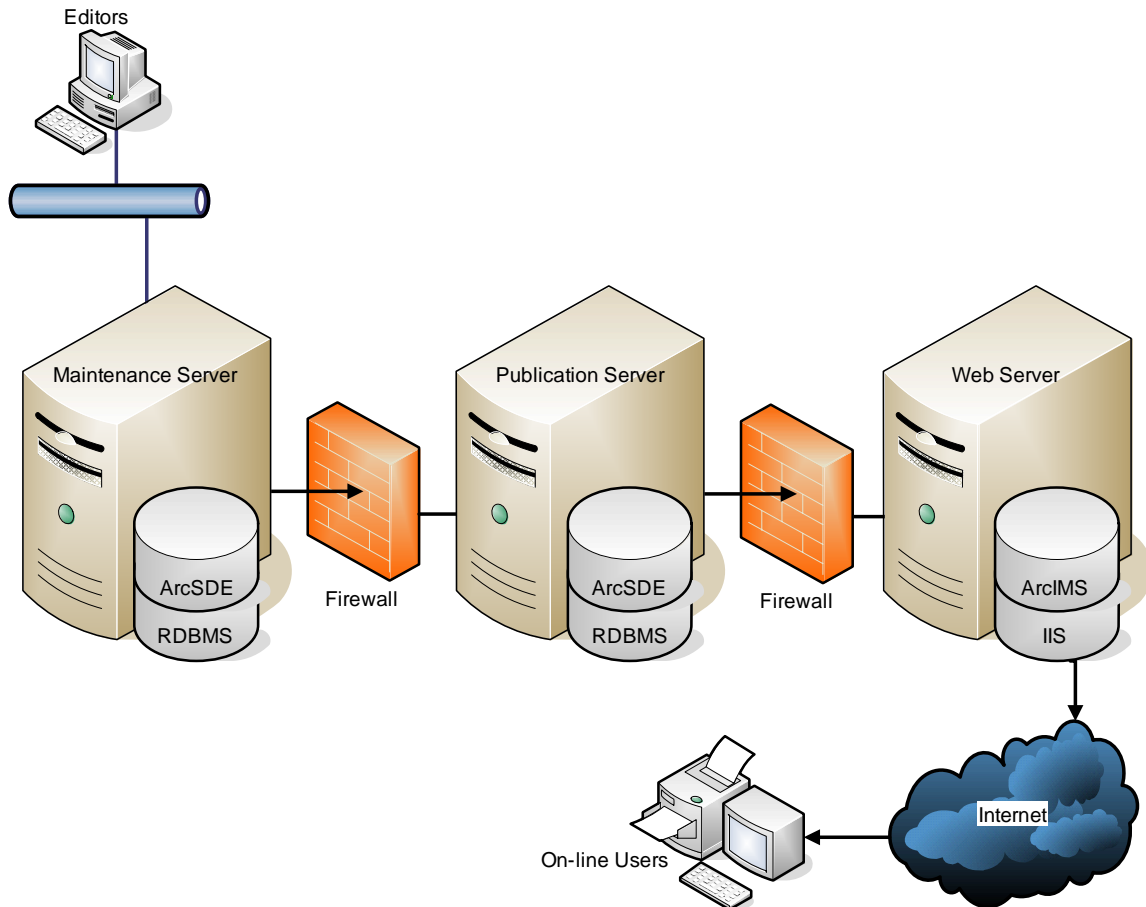
- In the beginning, large amounts of data will be converted in batch. Over time, data maintenance will switch to an as-needed basis, with greater emphasis on maintaining information *about* the trails that on capturing *where* the trails are.
- A good basemap will be important, in order to permit stakeholders to indicate where their trails lie. This might be achieved interactively, via a Web application. Or it may be achieved by enabling users to print a special map from the Web application, which will contain registration tics. Stakeholders will then sketch on the paper map, and mail or fax it back to the data center, where the trails will be digitized, using the registration tics to realign the map with the database. The basemap may be obtained commercially, or in cooperative effort with other state or federal agencies. This may or may not be the basemap used on the Web site.

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- Data from more technically capable stakeholders may come in as CAD files, or as paper maps prepared by surveyors. Probably the exception will be stakeholders that can provide trail data in ready-made GIS digital format. As a consequence, the data center must be able to scan, board digitize, convert formats, project, and rubbersheet data, i.e. have a complete data center capability.
- In order to ease workload on the technical staff maintaining the database, the stakeholders may be responsible for initiating changes by logging them in a Web-based interface, then following up by sending supporting documentation to the data center. Most supporting documents will be shipped in paper format, but some may be delivered as electronic CAD or GIS files, or as scanned maps, directly or via a Web interface. Additionally, textual updates that do not need to be entered by technical staff, will be entered on-line by stakeholders themselves, then verified by technical staff prior to being published.
- The public will also have a way to send feedback back to the system, and it too will be checked, verified, or filtered before being published, in order to make sure only appropriate data is redistributed. Examples of public feedback might include a rating of actual trail difficulty, peer-to-peer opinion and advice. However, being a State site, the feedback may need to be filtered for language, political messages, and commercial content, and this may pose an unacceptable burden on State Trails's (or State Trails's contractor's) resources.
- The data center will be responsible for data backups, data security, disaster recovery, etc.
- The data center will adhere to whichever metadata record standards required by State Trails. In order to facilitate this, custom metadata forms will have to be developed, to make this task faster, cheaper, and more reliable than the default metadata tools available now. A metadata server, as such, is not expected for this database.

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## Data Distribution



- The Web interface for stakeholders may be similar to the public's, but with more options. For example, a stakeholder may retrieve data filtered by responsible party, e.g. all trails maintained by a particular county, or a stakeholder may be able to see statistics related to which trails generate the most number of searches on the Web site. Stakeholder access will be controlled by means of user names and passwords.
- Users will need different display options, depending on whether they are browsing for trails, printing a trail guide or map, or printing a map in order to mark it up with corrections and send it back to the data center.
- Printing will have to accommodate the fact that most users only have access to Letter size printers, but that trail maps, in order to be useful, may need to be larger. A PDF-format trail "booklet" may be an option. Potential components for a booklet may include area map, directions from a starting point, description of facilities, difficulty of trail, highlights, detailed map (possibly over several pages), and an elevation profile generated from a digital elevation model.

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- It is envisioned that the data distribution Web site will be sponsored by advertisers. Therefore, a means for associating links to various trails will have to be established and maintained. For example, a trail may have a link to a book that contains a description of that trail, or to a vendor who sells maps relevant to that trail. Links may not always be that specific, but the better the links, the more valuable they may be to advertisers. A means for automatically checking for dead links will have to be included in the system. Also, a Google AdWords type of pricing system may be established to let advertisers compete for placement and exposure on the site's pages.
- The site may incorporate the concept of a Premium Subscriber, a paying customer who may have access to value-added services, such as maps that can be printed on a large format plotter.

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## Data

Much of the base data required for the site will be obtained from free or inexpensive government sources. The trail data, on the other hand, will be compiled internally, whether directly or via contract, from a variety of sources and formats. Additional data, in the form of satellite images or aerial (“ortho”) photographs will be obtained commercially to provide an attractive background to Web displays and, potentially, printed maps as well. Finally, DEMs (Digital Elevation Models) required to generate trail profiles, will also need to be obtained either commercially or from academic or government sources.

- Vector Data
  - Basemap
    - Geocodable roads
    - Railroads
    - Rivers
    - Lakes
    - Mountain peaks
    - State, county , city boundaries
    - National and State parks and monuments
    - Public lands (federal, forest, BLM, BIA)
    - Contours
  - Trails
  - Trailheads
  - Support facilities
    - Gates
    - Picnic areas
    - Campgrounds
    - Toilets
    - Equine facilities
    - Sheriff, police
    - Hospitals, clinics
    - Accommodations
- Raster Data
  - DRGs
  - Satellite images
- Other Data
  - DEMs
  - Cross-sections

## Software

Compilation and maintenance of data requires entirely different software than data display, query, and distribution. The former requires desktop-based software, whereas the latter requires Web-based software. Some crossover software may also be

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required if the Web site will permit spatial data updates via a Web browser, though this is not a major component of the site at the moment.

The primary vendor of GIS software that spans desktop, server, and Web is ESRI. ESRI's software is recommended, especially on the desktop, because it is the software most often used by government agencies that are most likely to provide data to the trails database. The element of compatibility is an important one if the database will contain frequent updates from dozens of even hundreds of organizations related to trails ownership and maintenance. With regards to ESRI's Web server software, it is the one considered the most scalable of the commercial map servers, and again, is the one most frequently used by government agencies. Although there is not an issue of "compatibility" when it comes to the map server software, ESRI's software certainly receives the endorsement of a large number of government and private users.

- **Compilation**
  - ArcEditor or ArcInfo – Digitizing, integration, project, QC, mapping
  - ArcSDE – Database storage and management
  - SQL Server or Oracle – Database platform for ArcSDE
- **Distribution**
  - ArcSDE – Database storage and management
  - ArcIMS – Web mapping and spatial user interface
  - ASP.NET – Core Web page automation tools


## Hardware

Brand names or even specifications are not crucial at this level of design, but it is important to understand that a large database and Web site consist of different servers and computers. This is done for performance reason, as well as for security, and because data compilation, storage, and distribution are often performed in different locations.

- Maintenance server
- Publication server
- Web server

## Networking

- Internal at Data Center
- External between Data Center and Web Server (if different locations)
- External between Web Server and the public/stakeholders

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## COSTS

Thinking about costs at this level of the conceptual design requires State Trailsment of assumptions, along with rough costs. Costs are presented based on consulting rates. Office costs are not included. Costs presented here are for rough budgeting purposes *only*. They do not represent a quotation, a proposal, or a precise estimate, and should only be used as a guide. It would be prudent to add a healthy buffer to the consulting estimates. With regards to software licenses, depending on how exactly the site is funded, more expensive licenses of ArcIMS and ArcSDE may need to be purchased (known as ASP licenses).

### Data Warehouse

Costs shown here are for a brand new internal solution. Outsourcing or a cooperative arrangement can reduce costs.

- File server - \$6,000
- ESRI ArcSDE database storage software - \$10,000 (retail, not State cost)
- Two editor workstations - \$6,000
- ESRI ArcInfo software (1) - \$10,000 (retail, not State cost)
- ESRI ArcEditor software (1) - \$7,000 (retail, not State cost)
- Wide format scanner - \$12,000
- Basemap required as background for data capture for Colorado – up to \$10,000
- Design of hardware & software configuration - \$5,000
- Design of database - \$10,000
- Installation and configuration of system - \$5,000
- Design of data capture, maintenance, QC procedures and tools (assuming this is done ahead of hiring of staff) - \$20,000+


### Data Capture

Assuming capture of 5,000 of miles per year, using two people, one at a GIS Technician, and one at a GIS Analyst level. Maintaining the database after the majority of conversion is performed, and assuming no new large data conversion tasks are added, may be reduce to one GIS Analyst. Contracted staff may be assumed to cost about three times the base salary listed below.

- GIS Technician - \$35,000 + benefits per year
- GIS Analyst - \$50,000 + benefits per year


### Web Site

The Web site can be divided into two major components: data discovery, mapping, and output; and data capture and input. Both can be accommodated on the same Web

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site. In these estimates it is assumed that the three server configuration suggested in this design will be used. A hosted solution can reduce some of the upfront costs, and can help offset some of the consulting and colodation fees.

- Data distribution file server - \$3,000
- ESRI ArcSDE database storage software - \$10,000
- Web server - \$3,000
- ESRI ArcIMS Web mapping server software - \$10,000
- Basemap and other enhanced data used as background and reference in maps, e.g. satellite images, street database for address-matching, etc. – 25,000+ per year.
- Web site design and construction (both output and input components) - \$100,000+
- Design of networking and updates between maintenance and distribution servers - \$20,000.
- Server collocation fees and data throughput fees are variable.
- The assumption is that the site will be free to users. If it is not, then an eCommerce site will have to be established as well, perhaps another \$35,000.

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## ABOUT US

Elroi Consulting, Inc (Elroi) in the USA and Explorer Graphics Limited (EGL) in New Zealand are two affiliated companies of Geographic Information Systems (GIS) professionals who are experienced in all aspects of projects involving GIS technology. Both companies have a focus on the implementation and development of GIS and related services in target market sectors in support of geospatial related decision making business requirements.

EGL and Elroi are official business partners of Environmental Systems Research Institute (ESRI) - the leading international provider of GIS solutions.

In the US, ECI has been serving the GIS needs of clients in real estate, mining, local and state government, oil and gas, and non-profits for close to a decade. Amongst ECI's clients are some of the largest in their class – second largest city in the US, largest gold mining company in the world, largest coal mining company in the world, and so on. ECI services range from atlas publishing and field data collection automation, to high-end databases, remote sensing, and most often, software and applications development.

Across the globe, EGL consultants represent a team almost without parallel in New Zealand in terms of GIS expertise and practical experience. EGL offers a range of services from GIS project management through to GIS software implementation and development. EGL currently works with over 25% of New Zealand local government, the majority of whom rely on EGL to develop and support either corporate deployment of geospatial and related information systems or specific application development and strategic consultancy in support of their business requirements.

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## *Appendix 2*

### *Colorado Trails Mapping Project*

### *Survey of State Trails Programs*

### *Findings*

Robert Searns, The Greenway Team, Inc. Consultant  
with  
Lori Collins Malcolm Colorado State Trails Program

*Note: The planning team surveyed the trails programs in each of the 50 states. A request for information was e-mailed to each trails coordinator. Although a small number of written responses were received, the planning team also visited the Web address of each state and the findings are noted below. In addition telephone conversations took place with several state trails officials kind enough to share their time and comments.*




**Survey Response: no**

**Program Found at Web Site: yes**

**Comments: Easy to use map based drill down system with attractive trail description and usgs map for 41 trails in the state. Worth a look!**

**<http://wwwdev.dnr.state.ak.us/parks/aktrails/ats.htm>**

*The findings below primarily reflect what was found at the respective Web addresses listed by each state as of January, 25, 2005. A number of states are working on developing and improving trails information and map sites.*

*The red arrow  denote states with more impressive trail mapping activity at this time.*

*The listing was derived from the FHWA Recreational Trails Program State Administrators lists found at:*

**[http://www.fhwa.dot.gov/environment/rectrails/rt\\_pstate.htm](http://www.fhwa.dot.gov/environment/rectrails/rt_pstate.htm)**

### **1. ALABAMA**

**[www.adeca.state.al.us](http://www.adeca.state.al.us)**

**Kate Hubert, State Trails Administrator**

Dept of Economic & Community Affairs

Street: 401 Adams Ave Suite 580

Montgomery AL 36104

Mail: PO Box 5690

Montgomery AL 36103-5690

334-242-5445; Fax 334-242-3381

**[kateh@adeca.state.al.us](mailto:kateh@adeca.state.al.us)**

Jon C Strickland, Rec Programs Manager

334-242-5483; Fax 334-242-3381

**[jons@adeca.state.al.us](mailto:jons@adeca.state.al.us)**

**Survey Response: no**

**Program Found at Web Site: none**

**Comments: Web link to a published paper trail guide to Alabama.**

### **2. ALASKA**

**[www.dnr.state.ak.us/parks/aktrails/index.htm](http://www.dnr.state.ak.us/parks/aktrails/index.htm)**

**Samantha D Carroll, Trails Coordinator**

Alaska State Parks

550 W 7<sup>th</sup> Ave Suite 1380

Anchorage AK 99501-3561

907-269-8699; Fax 907-269-8907

**[samantha\\_carroll@dnr.state.ak.us](mailto:samantha_carroll@dnr.state.ak.us)**

Tina Long, Grants Administrator

Alaska State Parks

550 W 7<sup>th</sup> Ave Suite 1380

Anchorage AK 99501-3561

907-269-8709; Fax 907-269-8907

**[tina\\_long@dnr.state.ak.us](mailto:tina_long@dnr.state.ak.us)**

### **3. ARIZONA**

**[www.pr.state.az.us](http://www.pr.state.az.us)**

**Annie McVay, Recreational Trails Coord**

Partnership Division

Arizona State Parks

1300 W Washington St

Phoenix AZ 85007-2932

602-542-7116; Fax 602-542-4180

**[amcvay@pr.state.az.us](mailto:amcvay@pr.state.az.us)**

**Survey Response: no**

**Program Found at Web Site: no**

**Comments: Leads to some information about Arizona Trail and Great Western OHV Trail**

### **4. ARKANSAS**

**[www.ahtd.state.ar.us](http://www.ahtd.state.ar.us)**

**Steve Weston, Transportation Study Coord**

Highway and Transportation Dept

10324 I-30

PO Box 2261

Little Rock AR 72203-2261

501-569-2020; Fax 501-569-2476

**[steve.weston@ahtd.state.ar.us](mailto:steve.weston@ahtd.state.ar.us)**

**[www.arkansas.com](http://www.arkansas.com)**

Ian Hope, State Trails Coordinator

Arkansas Dept of Parks & Tourism

#1 Capitol Mall

Little Rock AR 72201

501-682-1227; Fax 501-682-0081

**[ian.hope@mail.state.ar.us](mailto:ian.hope@mail.state.ar.us)**

**Survey Response: no**

**Program Found at Web Site: no**

**Comments:**

### **5. CALIFORNIA**

**[www.cal-parks.ca.gov](http://www.cal-parks.ca.gov)**

**[www.caltrails.org](http://www.caltrails.org)**

**John Schmill, Manager**

Office of Grants and Local Services

California State Parks

Street: Room 918

1416 Ninth St

Sacramento CA 94296-0001

Mail: PO Box 942896

Sacramento CA 94296-0001

916-651-8460; Fax 916-653-6511

**[jschm@parks.ca.gov](mailto:jschm@parks.ca.gov)**

Ken McKowen, Statewide Trails Manager,

Room 108

916-653-6501; Fax 916-653-4458



[kmcko@parks.ca.gov](mailto:kmcko@parks.ca.gov)  
Doug Wilber, Trails Funding Coordinator  
916-651-6916; [dwilb@parks.ca.gov](mailto:dwilb@parks.ca.gov)  
[www.ohv.parks.ca.gov](http://www.ohv.parks.ca.gov)  
**Clark Woy, Off Highway Vehicle Recreation**  
Recreational Trails Program Grant Admin  
OHMVR Division  
California State Parks  
Street: Suite 200  
1725 23rd St  
Sacramento CA 94296-0001  
Mail: PO Box 942896  
Sacramento CA 94296-0001  
916-324-1567; Fax 916-324-1610  
[cwoy@parks.ca.gov](mailto:cwoy@parks.ca.gov)

**Survey Response: no**  
**Program Found at Web Site: no**  
**Comments: Offers a "findatrail" link to National Rails**  
**To Trails searchable data base and has a find a park**  
**map to drill down to find state parks by region. See**  
[www.traillink.com](http://www.traillink.com)

#### 6. COLORADO

<http://parks.state.co.us/trails>  
**Lori Collins Malcolm**  
**Recreational Trails Program Manager**  
13787 South Hwy 85  
Littleton CO 80125  
303-791-1954 x131, Fax 303-470-0782  
[lori.malcolm@state.co.us](mailto:lori.malcolm@state.co.us)  
Tom Metsa, State OHV Program Manager  
(same address)  
303-791-1954 x132, Fax 303-470-0782  
[thomas.metsa@state.co.us](mailto:thomas.metsa@state.co.us)

**Survey Response: yes**  
**Program Found at Web Site: Yes**  
**Comments: Has Trail-finder system giving a statewide**  
**map and listing of trails in State Parks with vital**  
**information. Working on a comprehensive system.**

#### 7. CONNECTICUT

<http://dep.state.ct.us>  
**Leslie Lewis, Environmental Analyst**  
State Parks Division  
Department of Environmental Protection  
79 Elm St 6th Floor  
Hartford CT 06106-5127  
860-424-3578; Fax 860-424-4070  
[leslie.lewis@po.state.ct.us](mailto:leslie.lewis@po.state.ct.us)

**Survey Response: no**  
**Program Found at Web Site: no**  
**Comments:**

#### 8. DELAWARE

[www.destateparks.com/greenway](http://www.destateparks.com/greenway)  
**Susan Moerschel, Manager**  
Park Resource Office  
Delaware State Parks  
89 Kings Highway

Dover DE 19901-7305  
302-739-5285; Fax 302-739-3817  
[susan.moerschel@state.de.us](mailto:susan.moerschel@state.de.us)  
David Bartoo, Trail Specialist  
[david.bartoo@state.de.us](mailto:david.bartoo@state.de.us)

**Survey Response: no**  
**Program Found at Web Site: no**  
**Comments: Offers a list of brochures maps and**  
**booklets**

#### 9. DISTRICT OF COLUMBIA

**Theodore Pochter, Chief Planning & Design**  
Department of Recreation and Parks  
3149 16th St NW 4th Floor  
Washington DC 20010-3302  
202-673-7693; Fax 202-673-3424  
[ted.pochter@dc.gov](mailto:ted.pochter@dc.gov)

**Survey Response: no**  
**Program Found at Web Site: no**  
**Comments:**



#### 10. FLORIDA

[www.dep.state.fl.us/gwt/index.htm](http://www.dep.state.fl.us/gwt/index.htm)  
[www.floridagreenwaysandtrails.net](http://www.floridagreenwaysandtrails.net)  
**Alexandra H Weiss**  
**Community Assistance Consultant**  
Office of Greenways & Trails  
3900 Commonwealth Boulevard MS # 795  
Tallahassee FL 32399-3000  
850-245-2052; Fax 850-245-2082/2083  
[alexandra.weiss@dep.state.fl.us](mailto:alexandra.weiss@dep.state.fl.us)

**Survey Response: yes plus phone discussions**  
**Program Found at Web Site: yes**  
**Comments: Outstanding program, good examples. We**  
**have been working collaboratively with Florida.**  
**See also: <http://ogt.geoplan.ufl.edu> and click on 2004**  
**Recreational Prioritization Maps. FL is continuing to**  
**perfect their feedback system for 2005 in conjunction**  
**with the Univ. of FL.**

#### 11. GEORGIA


<http://www.gastateparks.org/grants/>  
**Antoinette Norfleet, Grants Project Officer**  
Department of Natural Resources  
2 Martin Luther King, Jr. Dr., SE Suite 1352  
Atlanta GA 30334-9000  
404-656-6536; Fax 404-651-5871  
[antoinette\\_norfleet@mail.dnr.state.ga.us](mailto:antoinette_norfleet@mail.dnr.state.ga.us)

**Survey Response: yes**  
**Program Found at Web Site: no**  
**Comments: Have a find a park system including a**  
**distance from zip code search.**

#### 12. HAWAII

[www.hawaiitrails.org/home.asp](http://www.hawaiitrails.org/home.asp)  
**Curt Cottrell, Trail & Access Program**  
**Manager**  
Department of Land and Natural Resources

Division of Forestry and Wildlife (DOFAW)  
Na Ala Hele Trail and Access Program  
Kalanimoku Building  
1151 Punchbowl St  
Honolulu HI 96813-3089  
808-587-0062; Fax 808-587-0064  
[curt.a.cottrell@hawaii.gov](mailto:curt.a.cottrell@hawaii.gov)

 **Survey Response: no**  
**Program Found at Web Site: yes**  
**Comments: Attractive map with drill down capability and pop-up trail information. Easy to use.**

### 13. IDAHO

[www.idahoparks.org/about/grants.html](http://www.idahoparks.org/about/grants.html)

**Brian Miller, State and Federal Aid Program Manager**

Idaho Dept of Parks and Recreation  
Street: 5657 Warm Springs Ave  
Boise ID 83716-8700  
Mail: PO Box 83720  
Boise ID 83720-0065  
208-334-4180 ext 233; Fax 208-334-3741  
[bmiller@idpr.state.id.us](mailto:bmiller@idpr.state.id.us)

David Claycomb, OHV Recreation Coordinator  
208-334-4180 ext 257; Fax 208-334-3741  
[dclaycomb@idpr.state.id.us](mailto:dclaycomb@idpr.state.id.us)

Leo Hennessy, Non-Motorized Trails Coord.  
208-334-4180 ext 228; Fax 208-334-3741

[lhenness@idpr.state.id.us](mailto:lhenness@idpr.state.id.us)  
Chuck Wells, State Trails Supervisor  
208-334-4180 ext 231; Fax 208-334-3741  
[cwells@idpr.state.id.us](mailto:cwells@idpr.state.id.us)

**Survey Response: no**  
**Program Found at Web Site: no**  
**Comments: "Trail Guides of Idaho" link not working.**

### 14. ILLINOIS

[www.dnr.state.il.us/trails.htm](http://www.dnr.state.il.us/trails.htm)

**Richard Westfall, Supervisor**

Greenways & Trails Section  
Department of Natural Resources  
1 Natural Resources Way  
Springfield IL 62702-1271  
217-782-3715; Fax 217-524-4177  
[dwestfall@dnrmail.state.il.us](mailto:dwestfall@dnrmail.state.il.us)

**David Sellman, Senior Grant Administrator**

RTP and motorized programs  
217-782-7481; Fax 217-782-9599  
[dsellman@dnrmail.state.il.us](mailto:dsellman@dnrmail.state.il.us)  
[www.dot.state.il.us](http://www.dot.state.il.us)

**Todd Hill, Bicycle & Pedestrian Coordinator**

Div of Highways Bureau of D&E  
2300 South Dirksen Parkway  
Springfield IL 62764-0002  
217-785-2148; Fax 217-524-9357  
[hilltw@nt.dot.state.il.us](mailto:hilltw@nt.dot.state.il.us)

**Survey Response: no**  
**Program Found at Web Site: minimal**

**Comments: access to regional map with listings of some facilities. Difficult to access.**

### 15. INDIANA

[www.in.gov/dnr/outdoor](http://www.in.gov/dnr/outdoor)

**Bob Bronson, Grants Section Chief**

State & Community Outdoor Rec Planning  
Department of Natural Resources  
402 West Washington St Room W271  
Indianapolis IN 46204-2212  
317-232-4070; Fax 317-233-4648

[bbronson@dnr.state.in.us](mailto:bbronson@dnr.state.in.us)

Steve Morris, Streams & Trails Section Chief  
[smorris@dnr.state.in.us](mailto:smorris@dnr.state.in.us)

**Survey Response: yes**

**Program Found at Web Site: yes**

**Comments: Web site takes you to tabular listings of trails with some descriptions, contact info, etc. Also offers a trail inventory update from (<http://www.in.gov/dnr/outdoor/trails/documents/formative.pdf>). Still working on the system.**

### 16. IOWA

[www.dot.state.ia.us/trails](http://www.dot.state.ia.us/trails)

<http://www.inhf.org/iowatrails.htm>

**Steve Bowman**

**Trails Coordinator**

Iowa Department of Transportation  
Office of Systems Planning  
800 Lincoln Way  
Ames IA 50010-6993  
515-239-1337; Fax 515-233-7857  
[steven.bowman@dot.state.ia.us](mailto:steven.bowman@dot.state.ia.us)

[www.state.ia.us/government/dnr](http://www.state.ia.us/government/dnr)

David Downing  
Snowmobile and ATV Program Coordinator  
DNR Parks, Recreation, and Preserves Div  
Henry A Wallace State Office Bldg  
502 East 9th  
Des Moines IA 50319-0034  
515-281-3449; Fax 515-281-6794  
[david.downing@dnr.state.ia.us](mailto:david.downing@dnr.state.ia.us)

**Survey Response: no**

**Program Found at Web Site: yes**


**Comments: Links to Iowa Heritage Foundation for listing of trail guides, books, lists and maps, etc.**

### 17. KANSAS

[www.kdwp.state.ks.us](http://www.kdwp.state.ks.us)

**Jerry Hover, Director of State Parks**

Kansas State Parks  
512 SE 25th Ave  
Pratt KS 67124-8174  
316-672-5911; Fax 316-672-2972  
[Jerryrh@wp.state.ks.us](mailto:Jerryrh@wp.state.ks.us)

 **Survey Response: Yes via Sid Stevens**  
**Program Found at Web Site: minimal**

**Comments: Some downloadable State Parks mpas and inf. Working on a comprehensive GIS mapping system.**

#### **18. KENTUCKY**

[www.parks.ky.gov](http://www.parks.ky.gov)

##### **Jodie McDonald, State Trail Coordinator**

Division of Local Resources  
Governor's Office for Local Development  
1024 Capital Center Dr Suite 340  
Frankfort KY 40601-8204  
502-573-2382; Fax 502-573-1519  
[jodie.mcdonald@ky.gov](mailto:jodie.mcdonald@ky.gov)  
Carey Tichenor, State Naturalist  
Kentucky State Parks  
Division of Recreation & Interpretation  
Capital Plaza Tower Floor 12  
500 Mero St  
Frankfort KY 40601-1974  
502-564-2172 ext246; Fax 502-564-9096  
[Carey.Tichenor@mail.state.ky.us](mailto:Carey.Tichenor@mail.state.ky.us)

**Survey Response: no**

**Program Found at Web Site: minimal**

**Comments: State map with click on drill down info on state parks and historic sites. Drills down to Map Quest for driving directions.**

#### **19. LOUISIANA**

##### **Shawn D Wilson**

Governor's Office of Community Programs  
PO Box 94042  
Baton Rouge LA 70804- 4042  
225-379-1200; Fax 225-379-1851  
[ShawnDWilson@dotd.louisiana.gov](mailto:ShawnDWilson@dotd.louisiana.gov)  
[www.lastateparks.com](http://www.lastateparks.com)  
Cleve Hardman, Director of Outdoor Recreation  
Office of State Parks  
*Street:* Third Floor Reception Area  
1051 N Third St  
Baton Rouge LA 70802-5239  
*Mail:* PO Box 44426  
Baton Rouge LA 70804-4426  
Phone: 225-342-8188; Fax: 225-219-9429  
[chardman@crt.state.la.us](mailto:chardman@crt.state.la.us)

**Survey Response: no**

**Program Found at Web Site: minimal**

**Comments: State map with click on drill down info on state parks and historic sites.**

#### **20. MAINE**

[www.maine.gov](http://www.maine.gov)

##### **Bud Newell, Program Manager**

Maine Department of Conservation  
Bureau of Parks and Land  
State House Station #22  
Augusta ME 04333-0001  
207-287-4962; Fax 207-287-3823  
[bud.newell@maine.gov](mailto:bud.newell@maine.gov)  
Scott Ramsay, Supervisor  
Off-Road Vehicle Division

207-287-4956; Fax 207-287-2400  
[scott.ramsay@maine.gov](mailto:scott.ramsay@maine.gov)

**Survey Response: no**

**Program Found at Web Site: minimal**

**Comments: State map with click on drill down info on state parks.**

#### **21. MARYLAND**

[www.sha.state.md.us/exploremd/oed/trails/trails](http://www.sha.state.md.us/exploremd/oed/trails/trails)

##### **Terry Maxwell, Recreational Trails Coord**

Office of Environmental Design  
Maryland State Highway Administration  
*Street:* 707 N Calvert St Mailstop C-303  
Baltimore MD 21202-3668  
*Mail:* Mail Stop C-303  
PO Box 717  
Baltimore MD 21203-0717  
Phone 410-545-8640 or 800-446-5962  
Fax 410-209-5003  
[tmaxwell@sha.state.md.us](mailto:tmaxwell@sha.state.md.us)  
Sylvia Ramsey, Manager, Environmental Programs  
Maryland State Department of Transportation  
PO Box 8755  
BWI Airport MD 21045-8755  
410-865-1100; Fax 410-691-2198  
[sramsey1@mdot.state.md.us](mailto:sramsey1@mdot.state.md.us)

**Survey Response: no**

**Program Found at Web Site: minimal**

**Comments: Some listings by category.**

#### **22. MASSACHUSETTS**

[www.state.ma.us/dem/programs/trails/](http://www.state.ma.us/dem/programs/trails/)

##### **Jennifer Howard, Director**

DEM Greenways Program  
136 Damon Rd  
Northampton MA 01060-1818  
413-586-8706 x 18; Fax 413-784-1663  
[jennifer.howard@state.ma.us](mailto:jennifer.howard@state.ma.us)

**Survey Response: no**

**Program Found at Web Site: minimal**

**Comments: Some listings. Hard to find.**

#### **23. MICHIGAN**

<http://www.michigan.gov/dnr>

##### **Jim Radabaugh**

##### **State Trails Coordinator**

Forest, Mineral, and Fire Management Division  
Department of Natural Resources  
Stevens T Mason Building  
PO Box 30452  
Lansing MI 48909-7952  
517-373-1276; Fax 517-373-2443  
[radabauj@michigan.gov](mailto:radabauj@michigan.gov)  
Mark Mandenberg, nonmotorized trails  
517-335-3037; [mandenbm@michigan.gov](mailto:mandenbm@michigan.gov)  
Steve Kubisiak, OHV coordinator  
517-373-1665; [kubisias@michigan.gov](mailto:kubisias@michigan.gov)

Dan Moore, Recreation Specialist  
906-293-5131-x 4045; [mooredw@michigan.gov](mailto:mooredw@michigan.gov)

**Survey Response: no**  
**Program Found at Web Site: minimal**  
**Comments: Some drill down to pdf maps and lists.**

**24. MINNESOTA**  
[www.dnr.state.mn.us/trails\\_waterways](http://www.dnr.state.mn.us/trails_waterways)

**Tim Mitchell, Grants Specialist**  
DNR Trails and Waterways Division  
500 Lafayette Ave  
St Paul MN 55155-4052  
651-297-1718; Fax 651-297-5475  
[tim.mitchell@dnr.state.mn.us](mailto:tim.mitchell@dnr.state.mn.us)

**Survey Response: yes**  
**Program Found at Web Site: minimal**  
**Comments: Some drill down information, lists, and descriptions of specific facilities. Working on a GIS mapping system.**

**25. MISSISSIPPI**  
[www.mdwfp.com](http://www.mdwfp.com)

**Robert T Boxx, RTP Administrator**  
Division of State Parks  
MS Dept of Wildlife, Fisheries, and Parks  
1505 Eastover Dr  
Jackson MS 39211-6374  
601-432-2225; Fax 601-432-2236  
[tommyb@mdwfp.state.ms.us](mailto:tommyb@mdwfp.state.ms.us)

**Survey Response: no**  
**Program Found at Web Site: minimal**  
**Comments: Drill down map of state parks leads to specific park descriptions.**

**26. MISSOURI**  
[www.dnr.state.mo.us](http://www.dnr.state.mo.us)  
**Chris Buckland, Grants Administration**  
Division of State Parks  
Department of Natural Resources  
*Street:* 1659 E Elm St  
Jefferson City MO 65102-0176  
*Mail:* PO Box 176  
Jefferson City MO 65102-0176  
573-751-0848; Fax 573-526-4395  
[chris.buckland@dnr.mo.gov](mailto:chris.buckland@dnr.mo.gov)  
**Erika Jaques, RTP Coordinator**  
573-751-3442; [erika.jaques@dnr.mo.gov](mailto:erika.jaques@dnr.mo.gov)  
Jessica Terrell, State Trail Administrator  
573-751-5359; [jessica.terrell@dnr.mo.gov](mailto:jessica.terrell@dnr.mo.gov)

**Survey Response: no**  
**Program Found at Web Site: minimal, except good map of KATY Trail**  
**Comments: KATY Trail offers good map and drill down user info.**

**27. MONTANA**  
<http://www.fwp.state.mt.us/parks>  
**Bob Walker, Trails Program Coordinator**  
Department of Fish, Wildlife, and Parks  
*Street:* 1420 East Sixth Ave  
Helena MT 59601-3872  
*Mail:* PO Box 200701  
Helena MT 59620-0701  
406-444-4585; Fax 406-444-4952  
[bwalker@state.mt.us](mailto:bwalker@state.mt.us)

**Survey Response: no**  
**Program Found at Web Site: minimal**  
**Comments: minimal**

**28. NEBRASKA**  
[www.ngpc.state.ne.us/parks/parks.html](http://www.ngpc.state.ne.us/parks/parks.html)  
**Duane Westerholt, State Trails Admin**  
Nebraska Game and Parks Commission  
*Street:* 2200 N 33rd St  
Lincoln NE 68503-1417  
*Mail:* PO Box 30370  
Lincoln NE 68503-1417  
402-471-5511; Fax 402-471-5528  
[dwester@ngpc.state.ne.us](mailto:dwester@ngpc.state.ne.us)  
Michelle Stryker, RTP Grants  
[mstryker@ngpc.state.ne.us](mailto:mstryker@ngpc.state.ne.us)

**Survey Response: no**  
**Program Found at Web Site: minimal**  
**Comments: Found drill down listing of Canoe Trails by name with good descriptions.**

**29. NEVADA**  
<http://www.parks.nv.gov/trails.htm>  
**Cheryl Surface, RTP Manager**  
Nevada Division of State Parks  
1300 S Curry St  
Carson City NV 89703-5202  
775-687-4383 ext 237; Fax 775-687-4117  
Brad A Eckert, State Trails Coordinator  
[rectrails@parks.nv.gov](mailto:rectrails@parks.nv.gov)

**Survey Response: no**  
**Program Found at Web Site: no**  
**Comments: Working on a list of trails. Currently has some links to trail Web sites.**

**30. NEW HAMPSHIRE**  
[www.nhparks.state.nh.us/trbureau.html](http://www.nhparks.state.nh.us/trbureau.html)  
or [www.nhtrails.org](http://www.nhtrails.org)  
**Christopher Gamache, Program Specialist**  
NH Bureau of Trails  
*Street:* 172 Pembroke Road  
Concord NH 03302-1856  
*Mail:* PO Box 1856  
Concord NH 03302-1856  
603-271-3254; Fax 603-271-3553  
[cgamache@dred.state.nh.us](mailto:cgamache@dred.state.nh.us)  
Paul Gray, Chief, Bureau of Trails  
[pgray@dred.state.nh.us](mailto:pgray@dred.state.nh.us)

Bob Spoerl, Program Specialist  
[bspoerl@dred.state.nh.us](mailto:bspoerl@dred.state.nh.us)

**Survey Response: no**

**Program Found at Web Site: Yes/limited**

**Comments: Drill down info links to trail descriptions, nicely organized site. Won American Trails Web site award.**

### 31. NEW JERSEY

[www.state.nj.us/dep/index.html](http://www.state.nj.us/dep/index.html)

**Larry Miller, Trails Coordinator**

NJ Department of Environmental Protection  
Division of Parks and Forestry  
Office of Natural Lands Management

*Street:* 22 S Clinton Ave

Trenton NJ 08625-0404

*Mail:* PO Box 404

Trenton NJ 08625-0404

609-984-1014; Fax 609-984-1427

[larry.miller@dep.state.nj.us](mailto:larry.miller@dep.state.nj.us)

**Survey Response: no**

**Program Found at Web Site: minimal**

**Comments: Find a park map and drill down by region to find park descriptions.**

### 32. NEW MEXICO

[www.emnrd.state.nm.us/nmparks](http://www.emnrd.state.nm.us/nmparks)

**Sandra Massengill, Planner Director**

State Parks Division, EMNRD

*Street:* Wendell Chino Building 2nd Floor

1220 S St Francis Dr

Santa Fe NM 87505-4000

*Mail:* PO Box 1147

Santa Fe NM 87504-1147

505-476-3392 or 888-667-2757

Fax 505-476-3361

[smassengill@state.nm.us](mailto:smassengill@state.nm.us)

**Survey Response: non**

**Program Found at Web Site: minimal**

**Comments: Find-a-park box with listings and drill down to park description and maps. Maps are graphically attractive. See**

**<http://www.emnrd.state.nm.us/nmparks/PAGES/PARKS/RGNC/Rgnc.htm>**

### 33. NEW YORK

<http://nysparks.state.ny.us>

**Robert W Reinhardt, Director of Planning**

Parks, Recreation, and Historic Preservation

Agency Bldg #1 17th Floor

Empire State Plaza

Albany NY 12238

518-474-0415; Fax 518-474-7013

[robert.reinhardt@oprhp.state.ny.us](mailto:robert.reinhardt@oprhp.state.ny.us)

Vicki Fradenburg

RTP Grant Administrator 16th Fl

518-474-0698; Fax 518-486-7377

[vicki.fradenburg@oprhp.state.ny.us](mailto:vicki.fradenburg@oprhp.state.ny.us)

Kevin Burns, Chief, Grants Management

518-474-0427; [kevin.burns@oprhp.state.ny.us](mailto:kevin.burns@oprhp.state.ny.us)

Victor Wood, Natural Resource Planner

Marine & Recreational Vehicles Office

Snowmobile Program

518-474-0445; Fax 518-486-7378

**Survey Response: no**

**Program Found at Web Site: minimal**

**Comments: Can drill down for information. Found map of Erie Canal Trail that is attractive and easy to use. See <http://www.canals.state.ny.us/maps/index.html>**

### 34. NORTH CAROLINA

<http://www.ils.unc.edu/parkproject/trails/home.html>

**Darrell L McBane, State Trails Coordinator**

NC Division of Parks & Recreation

12700 Bayleaf Church Road

Raleigh NC 27614-9633

919-846-9995; Fax 919-870-6843

[darrell.mcbane@ncmail.net](mailto:darrell.mcbane@ncmail.net)

**Survey Response: no**

**Program Found at Web Site: yes**

**Comments: Prominent trail link to listing of trails by name that leads to a nice system of maps and drill down opportunities. See**

**<http://www.ils.unc.edu/parkproject/trails/m2c/maps.html>**

### 35. NORTH DAKOTA

<http://www.ndparks.com/Trails/RTP.htm>

**Lee Ann Barnhardt, State Trails Coordinator**

Parks and Recreation Department

1600 E. Century Avenue, Suite 3

Bismarck ND 58503-0649

701-328-5364; Fax 701-328-5363

[lbarnhardt@state.nd.us](mailto:lbarnhardt@state.nd.us)

Keri Vammer, Program Manager, Snowmobile

701-328-5377; [snodak@btinet.net](mailto:snodak@btinet.net)

**Survey Response: no**

**Program Found at Web Site: minimal**

**Comments: Listings and descriptions of various trails can be found.**

### 36. OHIO

[www.ohiodnr.com/](http://www.ohiodnr.com/)

**Mary Fitch, State Trails Administrator**

Division of Real Estate & Land Management

Department of Natural Resources

1952 Belcher C-4

Columbus OH 43224-1386

614-265-6477; Fax 614-267-4764

[mary.fitch@dnr.state.oh.us](mailto:mary.fitch@dnr.state.oh.us)

William Daehler

Land Management Administrator

Division of Real Estate & Land Management

Department of Natural Resources

1952 Belcher C-4

Columbus OH 43224-1386

614-265-6402; Fax 614-267-4764

[bill.daehler@dnr.state.oh.us](mailto:bill.daehler@dnr.state.oh.us)

**Survey Response: no**

**Program Found at Web Site: map and drill down**

**Comments: Nice graphics and listings and maps can be found from a drill-down master map. See**

**<http://www.ohiodnr.com/mappopup/>**

### 37. OKLAHOMA

[www.otrd.state.ok.us/rd](http://www.otrd.state.ok.us/rd)

**Susan Henry, Planning Coordinator**

Planning and Development Div 6th Floor

**Survey Response: yes**

**Program Found at Web Site: minimal**

**Comments: Site offers a trails guild with listings of trails by type. State is currently exploring a searchable GIS system.**

### 38. OREGON

[www.prd.state.or.us](http://www.prd.state.or.us)

**Sean Loughran, State Trails Coordinator**

Oregon Parks and Recreation Department

725 Summer Street Suite C

Salem OR 97301

(503) 986-0750; Fax 503-378-6447

[sean.loughran@state.or.us](mailto:sean.loughran@state.or.us)

**Survey Response: no**

**Program Found at Web Site: minimal**

**Comments: Leads to lists of pdf maps, etc. of selected resources.**

### 39. PENNSYLVANIA

[www.dcnr.state.pa.us](http://www.dcnr.state.pa.us)

**Vanya Tierney, State Trails Administrator**

Greenways and Conservation Partnerships Div

Bureau of Recreation & Conservation

PO Box 8475

Harrisburg PA 17105-8475

717-783-2654; Fax 717-772-4363

[vtierney@state.pa.us](mailto:vtierney@state.pa.us)

Snowmobiles & ATVs

Matthew Beaver, Recreation Section

Operations & Recreation Division

Pennsylvania Bureau of Forestry

PO Box 8552

Harrisburg PA 17105-8552

717-783-7941; Fax 717-783-5109

[mbeaver@state.pa.us](mailto:mbeaver@state.pa.us)

**Survey Response: no**

**Program Found at Web Site: Drill down master map.**

**Comments: Impressive mapping system with drill down to regions. Can click on individual trails for more details. See**

**<http://www.dcnr.state.pa.us/railtrails/alltrails.asp>**

### 40. RHODE ISLAND

[www.state.ri.us/dem](http://www.state.ri.us/dem)

**Richard Tierney, State Trails Coordinator**

RI Dept of Environmental Management

235 Promenade St

Providence RI 02908-5767

401-222-2776 ext 4310; Fax 401-222-2069

[rtierney@dem.state.ri.us](mailto:rtierney@dem.state.ri.us)

*Funding administered by:*

[www.dot.state.ri.us](http://www.dot.state.ri.us)

Div of Intermodal Planning

Rhode Island Dept of Transportation

2 Capitol Hill Room 372

Providence RI 02903-1190

Steve Church, Bicycle and Pedestrian Coord

401-222-4203 ext 4042; Fax 401-222-2207

[schurch@dot.state.ri.us](mailto:schurch@dot.state.ri.us)

Recreation, Planning, and Engineering

1205 Pendleton St Rm 246

Columbia SC 29201-3790

803-734-0130; Fax 803-734-1042

[wcoplen@scprt.com](mailto:wcoplen@scprt.com)

Amanda Brooks Queen, Trails Coordinator

SC State Park Service

1205 Pendleton St

Columbia SC 29201-3790

803-734-0539; Fax 803-734-1017

[aqueen@scprt.com](mailto:aqueen@scprt.com)

**Survey Response: no**

**Program Found at Web Site: minimal**

**Comments: Drill down master map for park sites.**

### 41. SOUTH CAROLINA

[www.sctrails.net](http://www.sctrails.net)

**Wendy Coplen, State Trails Coordinator**

SCPRT – State Trails Program

**Survey Response: no**

**Program Found at Web Site: Master map drill down**

**Comments: Very impressive drill down from master map system by county. See**

**<http://www.sctrails.net/trails/MAPS/SCmap.html>**

### 42. VERMONT

[www.state.vt.us/anr/fpr/recreation](http://www.state.vt.us/anr/fpr/recreation)

**Sherry Smecker, Grants Administrator**

Tourism & Recreation Department

15 North Robinson Suite 100

Oklahoma City OK 73102-5403

405-521-2904; Fax 405-522-5356

[shenry@otrd.state.ok.us](mailto:shenry@otrd.state.ok.us)

**Survey Response: no**

**Program Found at Web Site: minimal**

**Comments: Lists of maps and other resources.**

### 43. SOUTH DAKOTA

[www.state.sd.us/gfp](http://www.state.sd.us/gfp)

**Scott Carbonneau, State Trails Administrator**

Division of Parks and Recreation

Dept of Game, Fish, and Parks

523 E Capitol Ave

Pierre SD 57501-3182

605-773-6671; Fax 605-773-6245

[scott.carbonneau@state.sd.us](mailto:scott.carbonneau@state.sd.us)

**Survey Response: no**

**Program Found at Web Site: minimal**

**Comments: Listings and drill down to maps.**



#### 44. TENNESSEE

[www.state.tn.us/environment/recreation](http://www.state.tn.us/environment/recreation)

**Alice Burke, Grants Administrator**  
TDEC Recreation Educational Services  
10th Floor L&C Tower  
401 Church St  
Nashville TN 37243-0439  
615-532-0765; Fax: 615-532-0778  
[alice.burke@state.tn.us](mailto:alice.burke@state.tn.us)

**Survey Response: no**

**Program Found at Web Site: Interesting format**

**Comments: Drill down map for trails with all info pop up on page. Different! See**

**<http://www2.state.tn.us/tdec/GREENWAYS/tmmap.htm>**

#### 45. TEXAS

[www.tpwd.state.tx.us](http://www.tpwd.state.tx.us)

**Andrew Goldbloom, Program Admin**  
Texas Parks and Wildlife Dept  
4200 Smith School Road  
Austin TX 78744-3291  
512-389-4737; Fax 512-389-4469  
[andy.goldbloom@tpwd.state.tx.us](mailto:andy.goldbloom@tpwd.state.tx.us)

**Survey Response: no**

**Program Found at Web Site: minimal**

**Comments: Find-a-park drill down from master map.**

**See <http://www.tpwd.state.tx.us/park/findapark.htm>**

#### 46. UTAH

<http://parks.state.ut.us>

**John Knudson, Trails Program Coordinator**  
Division of Parks & Recreation  
Dep of Natural Resources  
*Street:* 1594 West North Temple Suite 116  
Salt Lake City UT 84114-6001  
*Mail:* Box 146001  
Salt Lake City UT 84114-6001  
801-538-7344; Fax 801-538-7378  
[johnknudson@utah.gov](mailto:johnknudson@utah.gov)  
Fred Hayes, OHV Coordinator  
801-538-7357; [fredhayes@utah.gov](mailto:fredhayes@utah.gov)  
103 South Main St Bldg 10 South  
Waterbury VT 05671-0601  
802-241-3690; Fax 802-244-1481  
[sherry.smecker@anr.state.vt.us](mailto:sherry.smecker@anr.state.vt.us)

**Survey Response: no**

**Program Found at Web Site: drill down map**

**Comments: State map with drill down to trail descriptions for select trails. See**

**[http://www.utah.com/bike/trails/bike\\_trail\\_map.htm](http://www.utah.com/bike/trails/bike_trail_map.htm)**

#### 47. VIRGINIA

[www.state.va.us](http://www.state.va.us)

**Jerry Cassidy, Grant Administrator**  
Dept of Conservation and Recreation  
203 Governor St Suite 326  
Richmond VA 23219-2049  
804-786-3218; Fax 804-371-7899

[jcassidy@dcr.state.va.us](mailto:jcassidy@dcr.state.va.us)

**Survey Response: no**

**Program Found at Web Site: minimal**

**Comments: Listing of trails**

#### 48. WASHINGTON

[www.iac.wa.gov](http://www.iac.wa.gov)

**Greg Lovelady, Recreation Resource Planner**  
Interagency Committee for Outdoor Recreation  
Salmon Recovery Funding Board  
*Street:* 1111 Washington St SE  
Olympia WA 98504-0917  
*Mail:* PO Box 40917  
Olympia WA 98504-0917  
360-902-3008; Fax 360-902-3026  
[gregl@iac.wa.gov](mailto:gregl@iac.wa.gov)  
[www.parks.wa.gov](http://www.parks.wa.gov)  
Colleen Maguire, Winter Rec Program Mgr  
Parks and Recreation Commission  
*Street:* 7150 Cleanwater Lane  
Olympia WA 98504-2662  
*Mail:* PO Box 42662  
Olympia WA 98504-2662  
360-586-6646; Fax 360-586-6651  
[colleenm@parks.wa.gov](mailto:colleenm@parks.wa.gov)

**Survey Response: no**

**Program Found at Web Site: minimal**

**Comments: Mastermap with drill down information on state park facilities. See [www.parks.wa.gov/parks](http://www.parks.wa.gov/parks)**

#### 49. WEST VIRGINIA

[www.wvdot.com](http://www.wvdot.com)

**Bill Robinson, Community Development Specialist**  
West Virginia Dept of Transportation  
Division of Highways Rm 863  
State Capitol Complex Building 5  
1900 Kanawha Blvd East  
Charleston WV 25305-0430  
304-558-3165; Fax 304-558-3783  
[wrobinson@dot.state.wv.us](mailto:wrobinson@dot.state.wv.us)

**Survey Response: no**

**Program Found at Web Site: minimal**

**Comments: Drill down master map and list of pdf maps of select trails. See West Virginia State Parks site.**

#### 50. WISCONSIN

[www.dnr.state.wi.us](http://www.dnr.state.wi.us)

**Larry Freidig, Manager**  
Motorized Recreation Grant Programs  
Bureau of Community Financial Assistance  
Wisconsin Department of Natural Resources  
*Street:* 101 South Webster St  
Madison WI 53707-7921  
*Mail:* PO Box 7921  
Madison WI 53707-7921  
608-266-5897; Fax 608-267-0496  
[larry.freidig@dnr.state.wi.us](mailto:larry.freidig@dnr.state.wi.us)  
Brigit Brown, State Trails Coordinator



Bureau of Parks & Recreation  
Wisconsin Department of Natural Resources  
*Same address as above*  
608-266-2183; Fax 608-267-7474  
[brigit.brown@dnr.state.wi.us](mailto:brigit.brown@dnr.state.wi.us)

Washington DC 20005  
*Mail:* 1849 C St NW (Org Code 2235)  
Washington DC 20240-0001  
202-354-6920; Fax 202-371-5179  
[cherri\\_espersen@nps.gov](mailto:cherri_espersen@nps.gov)



**Survey Response: Telephone Conversation**  
**Program Found at Web Site: yes**  
**Comments: Find-a-trail and find-a-park. Nice master map with drill down for trails information. See**  
<http://www.dnr.state.wi.us/org/land/parks/specific/finda-trail.html#map>

#### 51. WYOMING

<http://wyotrails.state.wy.us>

**Greg Bischoff, Trails Program Manager**  
Div of State Parks & Historic Sites  
Dept of State Parks & Cultural Resources  
2301 Central Ave. Barrett Bldg.  
Cheyenne WY 82001-3084  
307-777-7550  
[gbisch@state.wy.us](mailto:gbisch@state.wy.us)

**Survey Response: no**  
**Program Found at Web Site: minimal**  
**Comments: Limited material. One link leads to trail maps for snowmobiles.**

**FEDERAL CONTACTS**  
**FEDERAL HIGHWAY ADMINISTRATION**  
[www.fhwa.dot.gov/environment/rectrails](http://www.fhwa.dot.gov/environment/rectrails)  
**Christopher B Douwes**  
**Trails and Enhancements Program Manager**  
FHWA HEPN-50 Room 3240  
400 Seventh St SW  
Washington DC 20590-0001  
202-366-5013; Fax 202-366-3409  
[christopher.douwes@fhwa.dot.gov](mailto:christopher.douwes@fhwa.dot.gov)

**NATIONAL PARK SERVICE**  
[www.nps.gov/ncrc](http://www.nps.gov/ncrc)  
**D Thomas Ross, Assistant Director**  
Recreation & Conservation  
National Park Service  
*Street:* 1201 Eye St NW (Org Code 2220)  
Washington DC 20005  
*Mail:* 1849 C St NW (Org Code 2220)  
Washington DC 20240-0001  
202-354-6900; Fax 202-371-5179  
[tom\\_ross@nps.gov](mailto:tom_ross@nps.gov)  
Steve Elkinton, Program Leader  
National Trails System Program  
202-354-6938; [steve\\_elkinton@nps.gov](mailto:steve_elkinton@nps.gov)  
Cherri Espersen  
Rivers, Trails, and Conservation Assistance  
National Park Service  
*Street:* 1201 Eye St NW (Org Code 2235)

**BUREAU OF LAND MANAGEMENT**  
[www.blm.gov](http://www.blm.gov)  
Deb Salt, National Trails Coordinator  
Bureau of Land Management  
FS Exp Station  
4955 Canyon Crest Dr  
Riverside CA 92507-0714  
951-680-1560; Fax 951-683-5984  
[deb\\_salt@blm.gov](mailto:deb_salt@blm.gov)  
Anna Atkinson  
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1849 C St NW (LSB-204)  
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202-452-7771; Fax 202-452-7709  
[anna\\_atkinson@blm.gov](mailto:anna_atkinson@blm.gov)

**US FISH & WILDLIFE SERVICE**  
[www.fws.gov](http://www.fws.gov)  
Connie Lanahan  
Program Analyst  
National Wildlife Refuge System  
4401 N Fairfax Dr Room 670  
Arlington VA 22203  
703-358-1968; Fax 703-358-2248  
[connie\\_lanahan@fws.gov](mailto:connie_lanahan@fws.gov)

**USDA FOREST SERVICE**  
[www.fs.fed.us](http://www.fs.fed.us)  
**Jim Miller, Manager**  
Dispersed Recreation Program  
USDA Forest Service 4th Fl  
14th & Independence St SW  
Washington DC 20090-6090  
202-205-1313; Fax 202-205-1145  
[jbmiller01@fs.fed.us](mailto:jbmiller01@fs.fed.us)

**ACCESS BOARD**  
[www.access-board.gov](http://www.access-board.gov)  
**Peggy H Greenwell (recreation)**  
Training Coordinator  
U.S. Access Board  
1331 F St NW Suite 1000  
Washington DC 20004-1111  
202-272-0017; Fax 202-272-0081  
TTY 202-272-0082  
[greenwell@access-board.gov](mailto:greenwell@access-board.gov)  
Lois E L Thibault (public rights of way)  
202-272-0023; Fax 202-272-0081  
TTY 202-272-0082  
[thibault@access-board.gov](mailto:thibault@access-board.gov)

**US ARMY CORPS OF ENGINEERS**  
[www.usace.army.mil/public.html](http://www.usace.army.mil/public.html)  
**George E Tabb, Chief**  
Recreation Program Section  
US Army Corps of Engineers

Street: 441 G St NW  
Washington DC 20314-1000  
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Washington DC 20314-1000  
202-761-4827; Fax 202-761-5096  
[george.e.tabb@usace.army.mil](mailto:george.e.tabb@usace.army.mil)

**NATIONAL ENDOWMENT FOR THE ARTS**  
[www.arts.gov](http://www.arts.gov)

**Tony Tighe, Intergovernmental Specialist**  
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Washington DC 20506  
202-682-5616; Fax 202-682-5613  
[tighet@arts.endow.gov](mailto:tighet@arts.endow.gov)

### **Summary of Written Information Requests Reponses**

Name: Antoinette Norfleet  
E-mail address: [Antoinette\\_Norfleet@dnr.state.ga.us](mailto:Antoinette_Norfleet@dnr.state.ga.us)

**State: Georgia**

Agency/Title: Department of Natural Resources/ Director  
of Grants

Is your state pursuing, or thinking about pursuing, digital  
trails mapping? (If "No", please skip to the last question)  
If yes, can you briefly describe your program?

Not at this time.

Name: Steve Morris

E-mail address: [smorris@dnr.in.gov](mailto:smorris@dnr.in.gov)  
Steve Morris  
Indiana DNR  
Ph: 317-232-4751

**State: Indiana**

Agency/Title: Department of Natural Resources

Is your state pursuing, or thinking about pursuing, digital  
trails mapping? (If "No", please skip to the last question)  
If yes, can you briefly describe your program?

Indiana DNR maintains a trails inventory that links Arc  
Info GIS data with information stored in a Microsoft  
Access database. The inventory differentiates trails  
according to trail surface and uses accommodated. Trails  
that are under development or planned are also included.  
Mapping is done either through GPS or digitizing from  
maps drawn on 1:24000 topo maps.

Does your system include a digital mapping component  
that citizens can access for trail information? If yes, can  
you briefly describe?

The trail inventory is posted on our website, however the  
mapping element is not currently available as real time

information. We are working on improving Internet public  
access to real time mapping information.

If you have a Web site where your trails mapping  
information can be accessed, can you please provide it  
below?

[www.in.gov/dnr/outdoor/trails](http://www.in.gov/dnr/outdoor/trails)

Does your system include a digital reporting mechanism  
that local entities can use to provide timely updates on local  
trails and trail conditions? If yes, can you briefly describe?

We provide a trail inventory update form on the website  
and ask that trail managing entities either provide  
geographic data files or submit a 1:24000 topo map  
drawing.

Can you describe software you are using or thinking about  
using? Has the software been satisfactory?

ESRI ArcGIS and Microsoft Access are currently being  
used. In most ways the combination has been satisfactory.  
ESRI ArcSDE and ESRI ArcIMS software will be used to  
improve performance and provide interactive mapping via  
the internet.

What is your mechanism for administering the mapping  
system to keep it accurate and comprehensive?

We are currently two years behind in updating the trails  
inventory. For the last major update, we used a mass  
mailing to request updates. We also used information  
gathered from various grant applications, parks &  
recreation masterplans, and transportation plans.

Have you explored partnerships with the private sector to  
fund, develop and manage the system? If so can you briefly  
describe?  
No

Are you aware of any other agency, company or entity  
pursuing this kind of mapping system in your state? If so,  
can you please provide any information sources?  
No

Any other comments or suggestions?

We try to list only those planned trails that already have  
right-of-way ownership and/or have demonstrated solid  
public support. This helps to avoid public controversy  
issues and having to remove trails that never get built. Also,  
trails less than 0.5 mile in length are generally not included.  
Name: Doug Hawthorne

E-mail address: [dhawthorne@otrd.state.ok.us](mailto:dhawthorne@otrd.state.ok.us)

**State: Oklahoma**

Is your state pursuing, or thinking about pursuing, digital  
trails mapping? (If "No", please skip to the last question)  
If yes, can you briefly describe your program?

Yes, we are currently researching the possibility of developing an Integrated Mapping System (IMS) for Oklahoma State Parks. The system would include a layer with spatial and attribute data for trails within the state.

Does your system include a digital mapping component that citizens can access for trail information? If yes, can you briefly describe?

Yes, it (the IMS) would include a searchable layer for trail information.

Can you describe software you are using or thinking about using? Has the software been satisfactory?

The IMS database will be similar to the one used by the Oklahoma Department of Environmental Quality. You can see their IMS at <http://deq.state.ok.us/>. The basic software will be ArcGIS and trail mapping will be done with a Tremble XT GPS data collection device.

What is your mechanism for administering the mapping system to keep it accurate and comprehensive? The IMS will be maintained through a contract with a private IMS provider that will be responsible for updating data.

Have you explored partnerships with the private sector to fund, develop and manage the system? If so can you briefly describe?

NO

Are you aware of any other agency, company or entity pursuing this kind of mapping system in your state? If so, can you please provide any information sources?

Yes, Department of Environmental Quality, Oklahoma Wildlife Department, Oklahoma Conservation Commission, and Oklahoma Department of Agriculture.

Any other comments or suggestions?

Name: Tim Mitchell

E-mail address: [tim.mitchell@dnr.state.mn.us](mailto:tim.mitchell@dnr.state.mn.us)

State: **Minnesota**

Agency/Title: Department of Natural Resources, Trails and Waterways Division

Is your state pursuing, or thinking about pursuing, digital trails mapping? (If "No", please skip to the last question) If yes, can you briefly describe your program? We attempted to digitally capture as many trails as we could between 1998 and 2002. Basically what we accomplished was to develop a good, but not complete database which was linked to GIS data.

Does your system include a digital mapping component that citizens can access for trail information? If yes, can you briefly describe? No

If you have a Web site where your trails mapping information can be accessed, can you please provide it below?

Does your system include a digital reporting mechanism that local entities can use to provide timely updates on local trails and trail conditions? If yes, can you briefly describe? No

Can you describe software you are using or thinking about using? Has the software been satisfactory? Used Arcview which is produced by ESRI at the time.

What is your mechanism for administering the mapping system to keep it accurate and comprehensive? Funding for our project was cut and the project has laid dormant for several years now.

Have you explored partnerships with the private sector to fund, develop and manage the system? If so can you briefly describe? Not to date.

Are you aware of any other agency, company or entity pursuing this kind of mapping system in your state? If so, can you please provide any information sources? No

Any other comments or suggestions?