Up Next

5 Things Land Trusts Need to Know about GIS

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Who We Are

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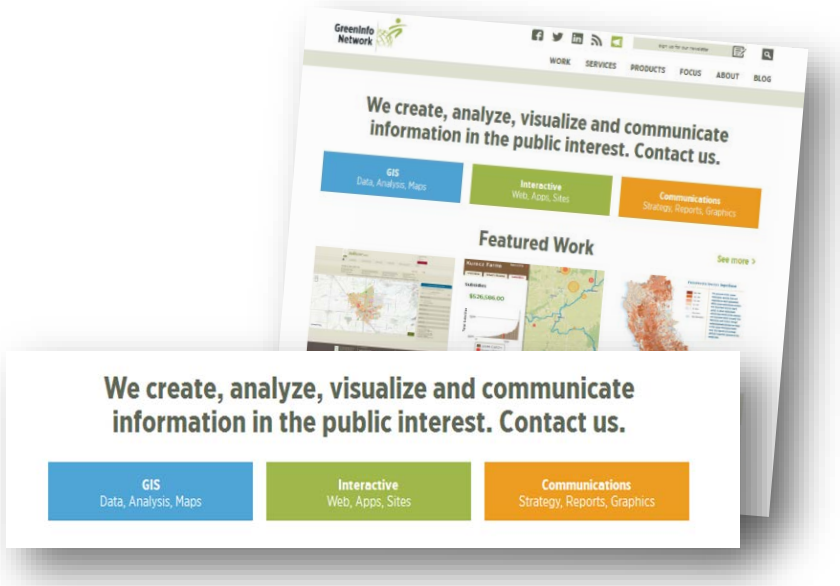
AECOM



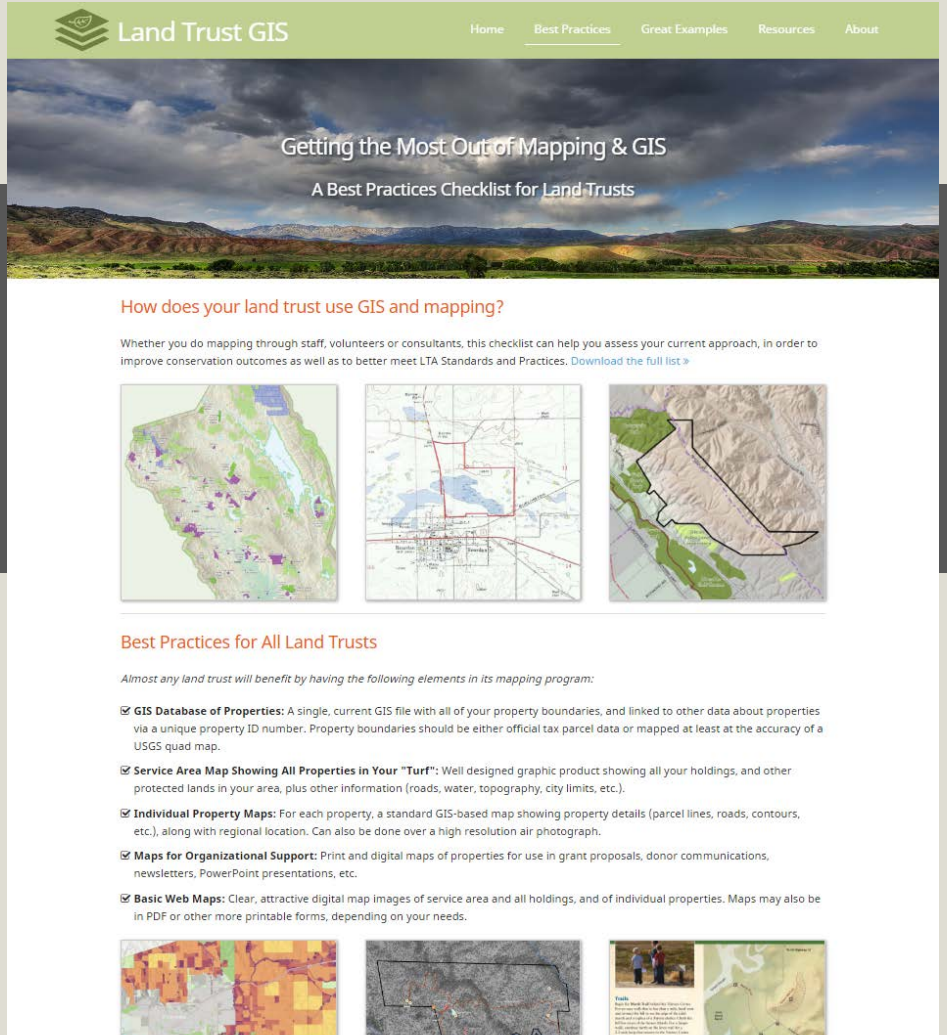
PACIFIC FOREST TRUST

Road map

1. What is GIS?
2. What do land trusts do with GIS?
3. How do you get there? (data, software)
   - Must-have data
   - Software on a budget
   - Case study: ArcGIS Online for field collection
4. Contributing to public datasets
5. Storytelling (you did it! now what)

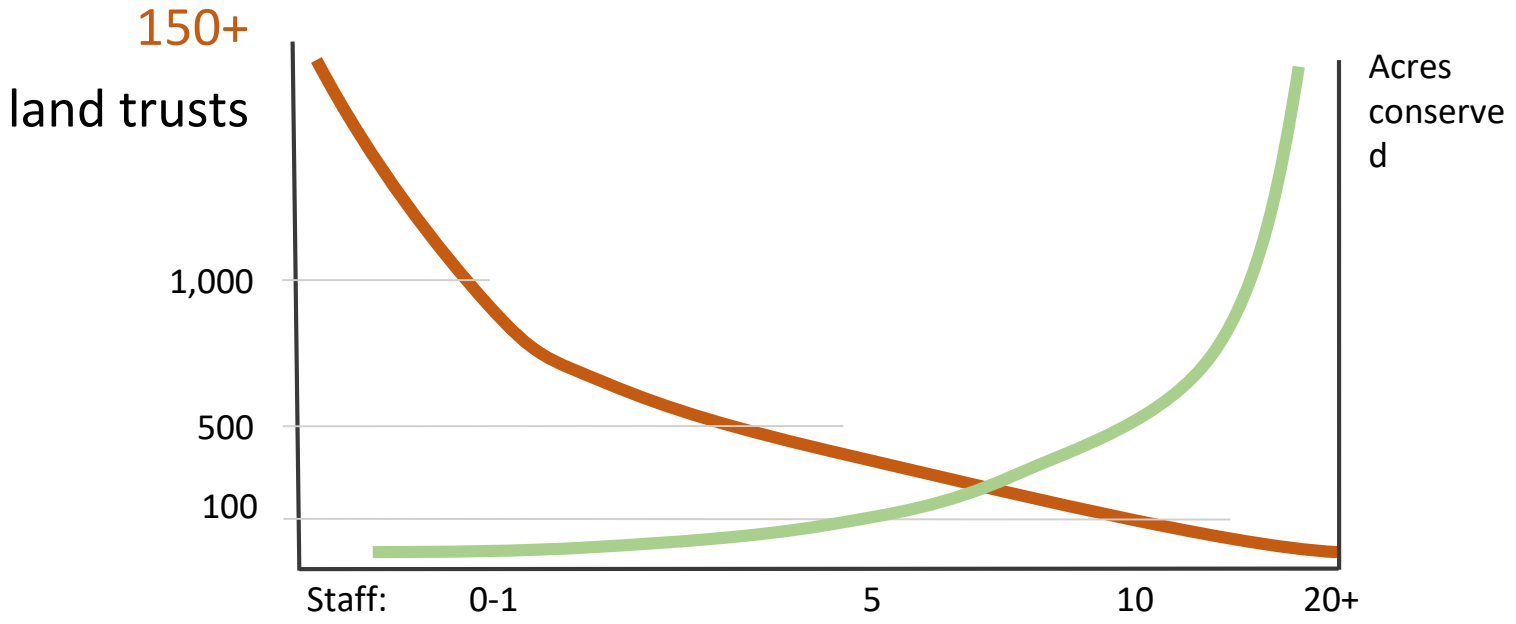
Announcing . . .

www.landtrustgis.org

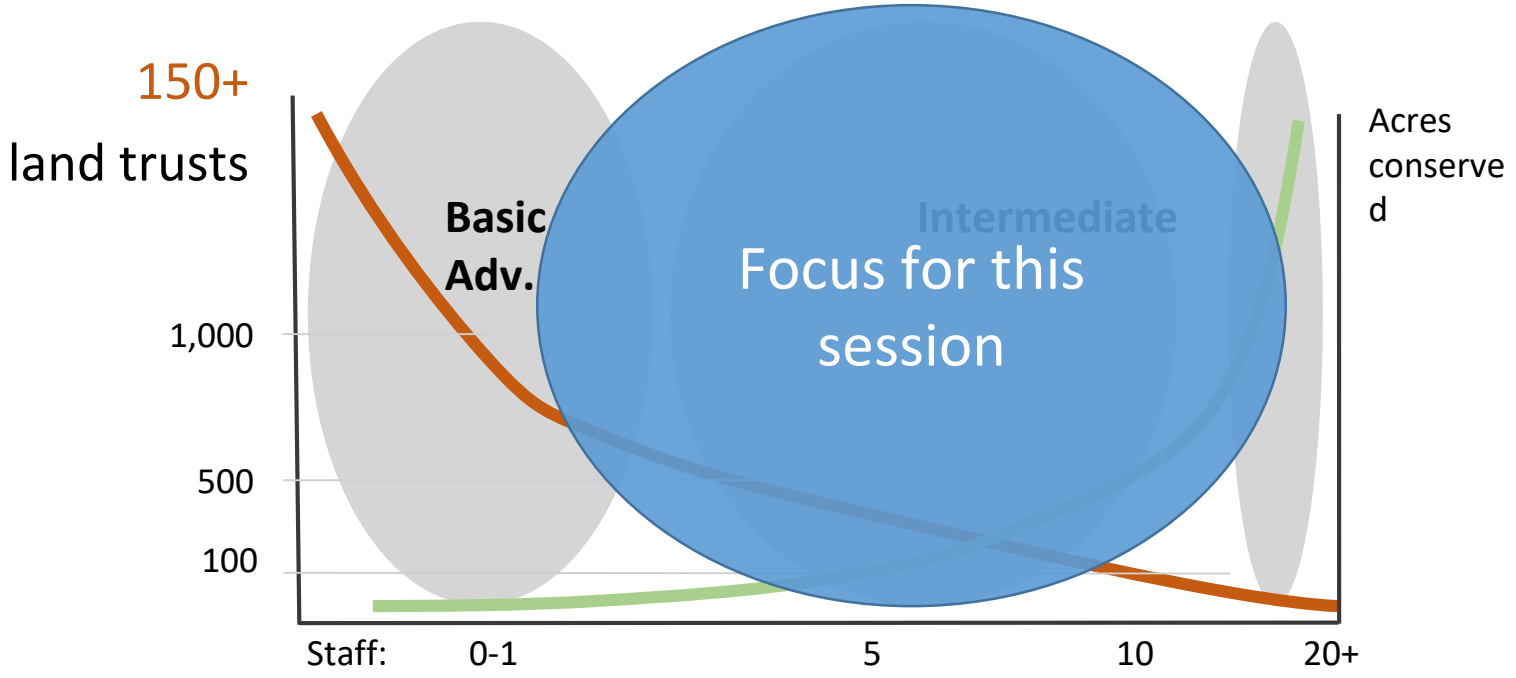


Who’s here?

Land Trusts – Size, Capacity for GIS



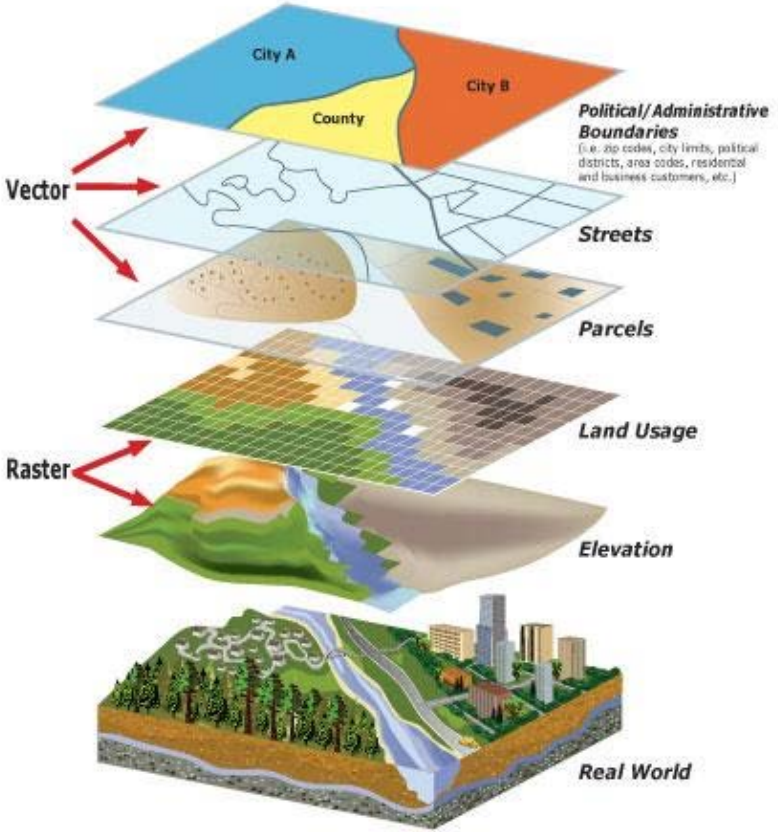
Land Trusts – Size, Capacity for GIS



1. “What’s GIS again?”

What's GIS and Geospatial?

- GIS = location + data
  - Points, Lines, Polygons (plus pixels)
  - Layers
- Data + software, but PEOPLE!



GIS Software – Esri

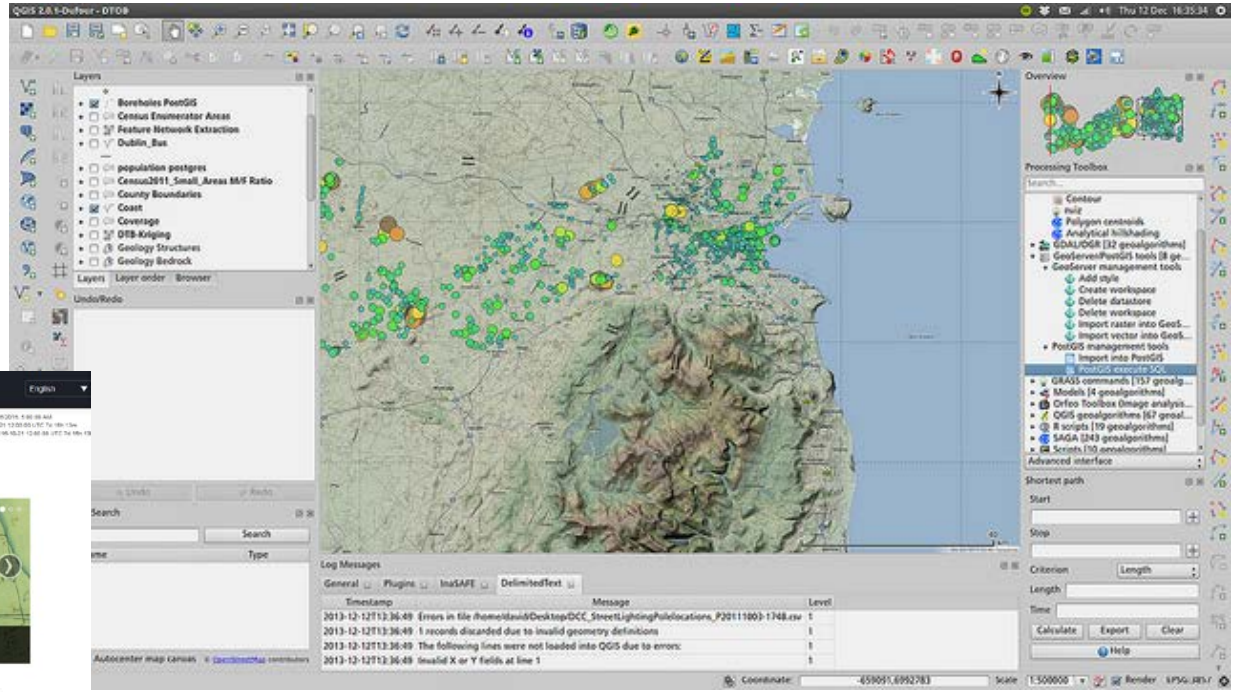
- ArcGIS: ArcM … ns (Earth)

Products A-Z

ArcGIS Platform
AppStudio for ArcGIS
ArcGIS 3D Analyst
ArcGIS API for JavaScript
ArcGIS Data Interoperability
ArcGIS Data Reviewer
ArcGIS Defense Solutions
ArcGIS Earth
ArcGIS Editor for OpenStreetMap
ArcGIS Engine
ArcGIS Explorer Desktop
ArcGIS for AutoCAD
ArcGIS for Aviation: Airports
ArcGIS for Aviation: Charting
ArcGIS for Defense
ArcGIS for Desktop
ArcGIS for Desktop Extensions
ArcGIS for Developers
ArcGIS for Electric Utilities
ArcGIS for Emergency Management
ArcGIS for Gas Utilities
ArcGIS for INSPIRE
ArcGIS for Local Government
ArcGIS for Maritime: Bathymetry
ArcGIS for Maritime: Charting
ArcGIS for Parks & Gardens
ArcGIS for Personal Use
ArcGIS for Server
ArcGIS for Server Extensions
ArcGIS for State Government
ArcGIS for Telecommunications
ArcGIS for Water Utilities
ArcGIS for Windows Mobile
ArcGIS GeoEvent Extension for Server
ArcGIS Geostatistical Analyst
ArcGIS Image Extension for Server
ArcGIS Maps for Adobe Creative Cloud
ArcGIS Maps for Office
ArcGIS Maps for Power BI
ArcGIS Network Analyst
ArcGIS Online
ArcGIS Pro
ArcGIS Publisher
ArcGIS Runtime SDKs
ArcGIS Schematics
ArcGIS Spatial Analyst
ArcGIS Tracking Analyst
ArcGIS Workflow Manager
ArcPad
ArcReader
CityEngine
Collector for ArcGIS
Community Maps Program
Configurable Apps
Content
Data Appliance for ArcGIS
Districting for ArcGIS
Drone2Map for ArcGIS
Esri Business Analyst
Esri Community Analyst
Esri Defense Mapping
Esri Demographics
Esri Developer Network (EDN)
Esri Geoportal Server
Esri Maps for IBM Cognos
Esri Maps for MicroStrategy
Esri Maps for SharePoint
Esri Production Mapping
Esri Redistricting
Esri Reports
Esri Roads and Highways
Esri S-57 Viewer
Explorer for ArcGIS
Full Motion Video
GeoCollector
GeoPlanner for ArcGIS
Insights for ArcGIS
Living Atlas of the World
Navigator for ArcGIS
Open Data
Operations Dashboard for ArcGIS
Portal for ArcGIS
Story Maps
StreetMap Premium for ArcGIS
Survey123 for ArcGIS
Tapestry Segmentation
Web AppBuilder for ArcGIS
WMC Client for ArcGIS
Workforce for ArcGIS
World Geocoder

QGIS

- Open source GIS
- www.qgis.org



GIS Online

- ArcGIS Online & ArcGIS Server
- Phones and mobile

GIS is becoming “geospatial”

But GIS on its own still matters . . .

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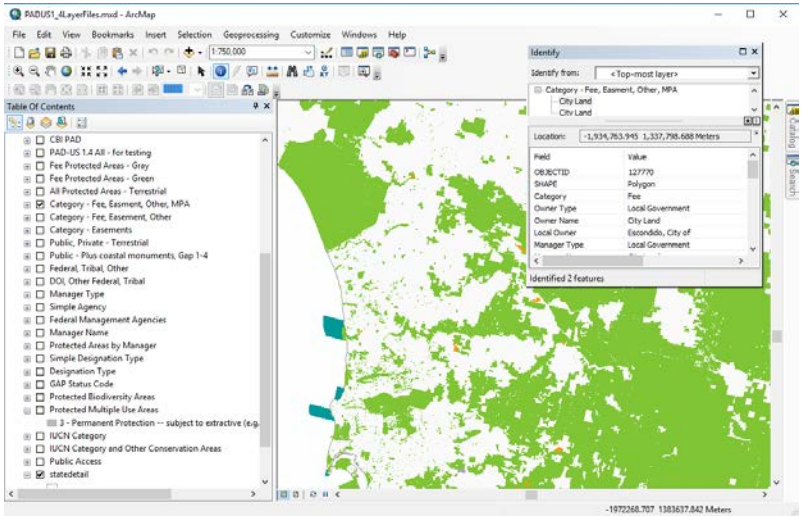
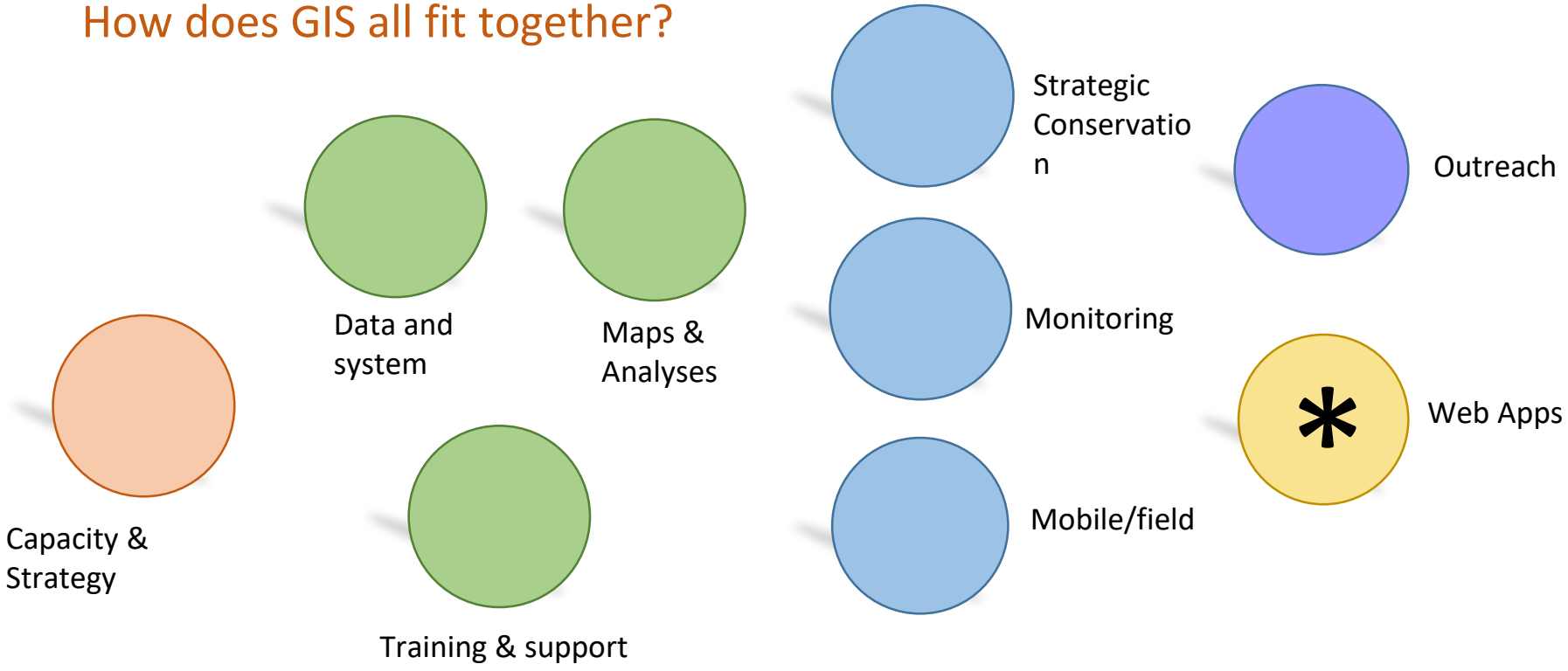


GIS: Vision for land trusts

How does GIS all fit together?



2. What land trusts DO with GIS

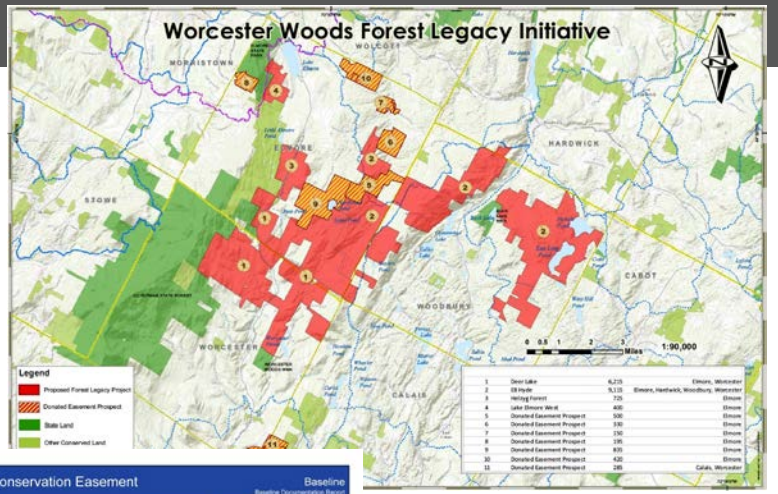
GIS and Land Trusts

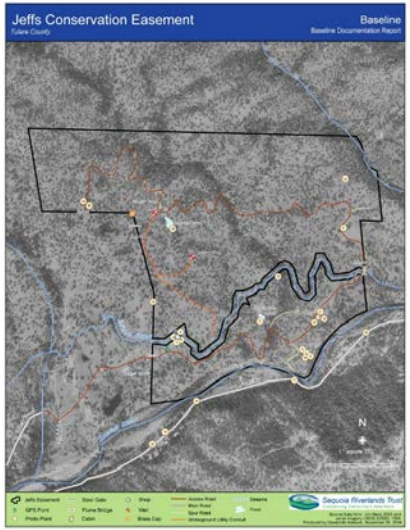
What you can **DO** with GIS:

- **Conservation planning** – prioritization/support
- **Project development** – fundraising, baseline documents
- **Property holding** – stewardship, monitoring
- **Organizational support** – shared vision, fundraising
- **Education** – hikes, tours, interpretatio
- **Engagement** – events, targeting
- **Impact analysis** – Climate change, flooding, drought

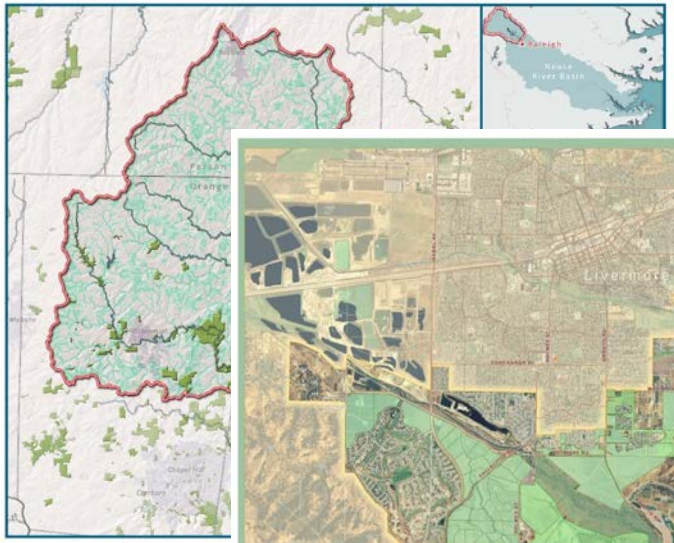
Land trust maps

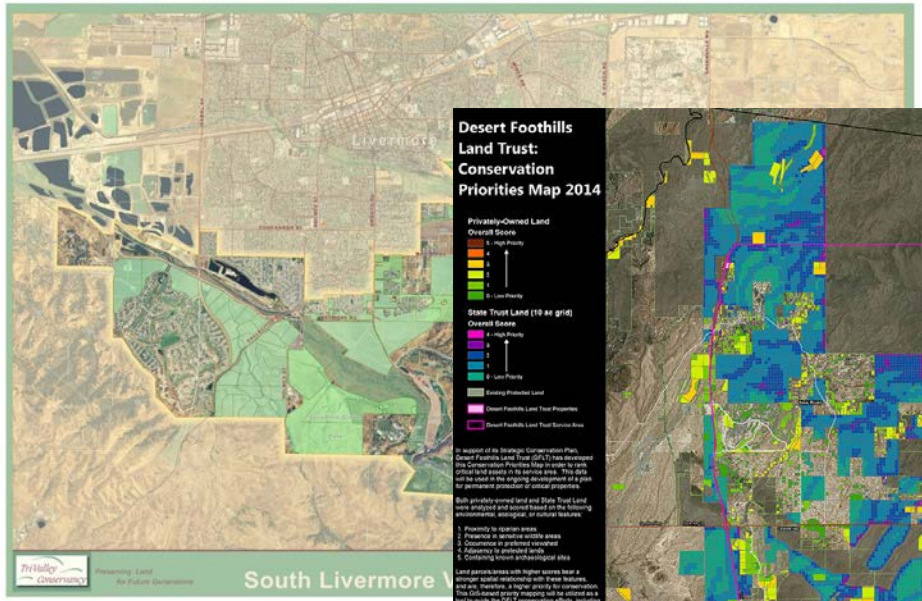
Map Examples

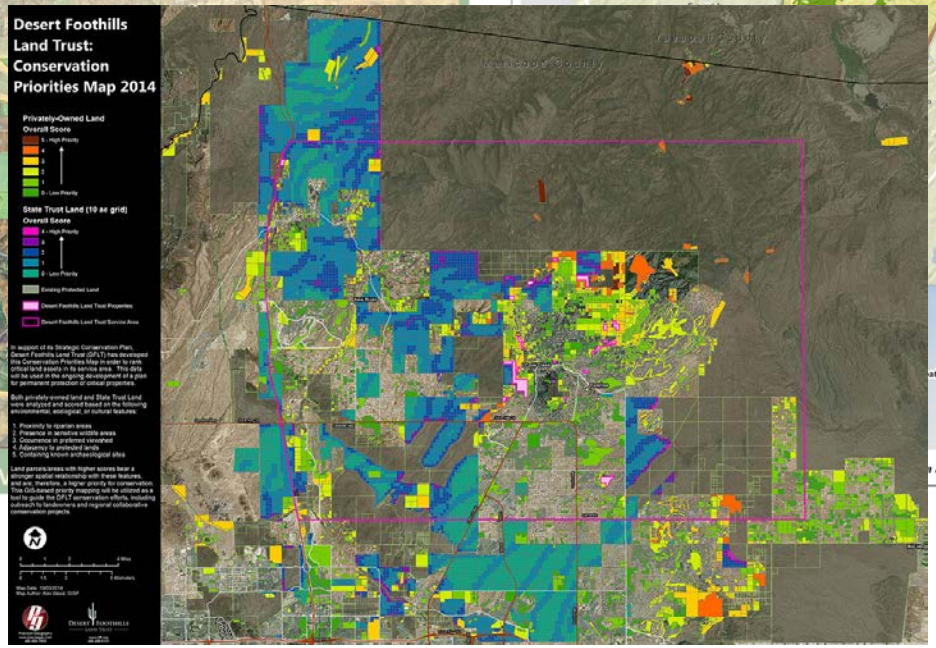


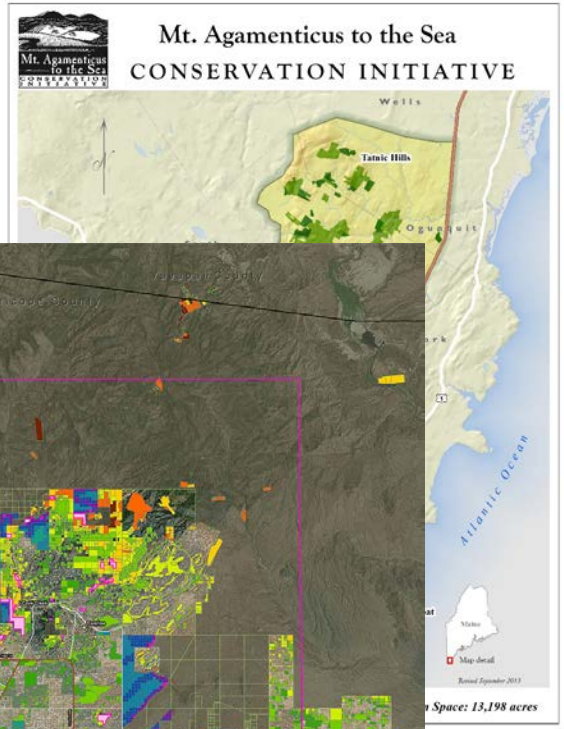


Map Examples









GIS and Land Trusts

So how do you get there?

3. GIS for Land Trusts

GIS – Selected Best Practices

1. Evaluate your capacity (staff, budget, org culture, consults)
2. Organize – efficient and long term
3. Get software – Esri grants program
4. Essential data needs
5. Communicate visually

Best Practices – Structure Your Capacity

1. Desires, needs, budget, capacity
2. Volunteers – expert, not, enthusiasm
3. Staff – part-time, full-time
4. Consultants
5. Other – universities, etc.

Best Practices – Organize Your GIS System

Shape files (shp)

Easements_baosdb.dbf	2/8/2006 4:44 PM	DBF File	10 KB
Easements_baosdb.prj	2/8/2006 4:35 PM	PRJ File	1 KB
Easements_baosdb.sbn	2/8/2006 4:44 PM	SBN File	1 KB
Easements_baosdb.sbx	2/8/2006 4:44 PM	SBX File	1 KB
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Easements_baosdb.shx	2/8/2006 4:44 PM	SHX File	1 KB
from_grid.dbf	9/25/2006 5:17 PM	DBF File	1 KB
from_grid.prj	9/25/2006 5:17 PM	PRJ File	1 KB
from_grid.sbn	9/25/2006 5:17 PM	SBN File	1 KB
from_grid.sbx	9/25/2006 5:17 PM	SBX File	1 KB
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ltnc_prop_from_parcels.shp	2/7/2006 12:09 PM	SHP File	10 KB
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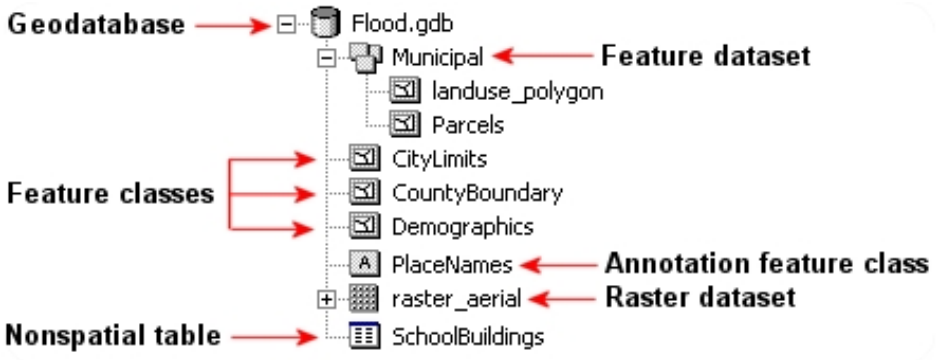
Geodatabase (gdb)

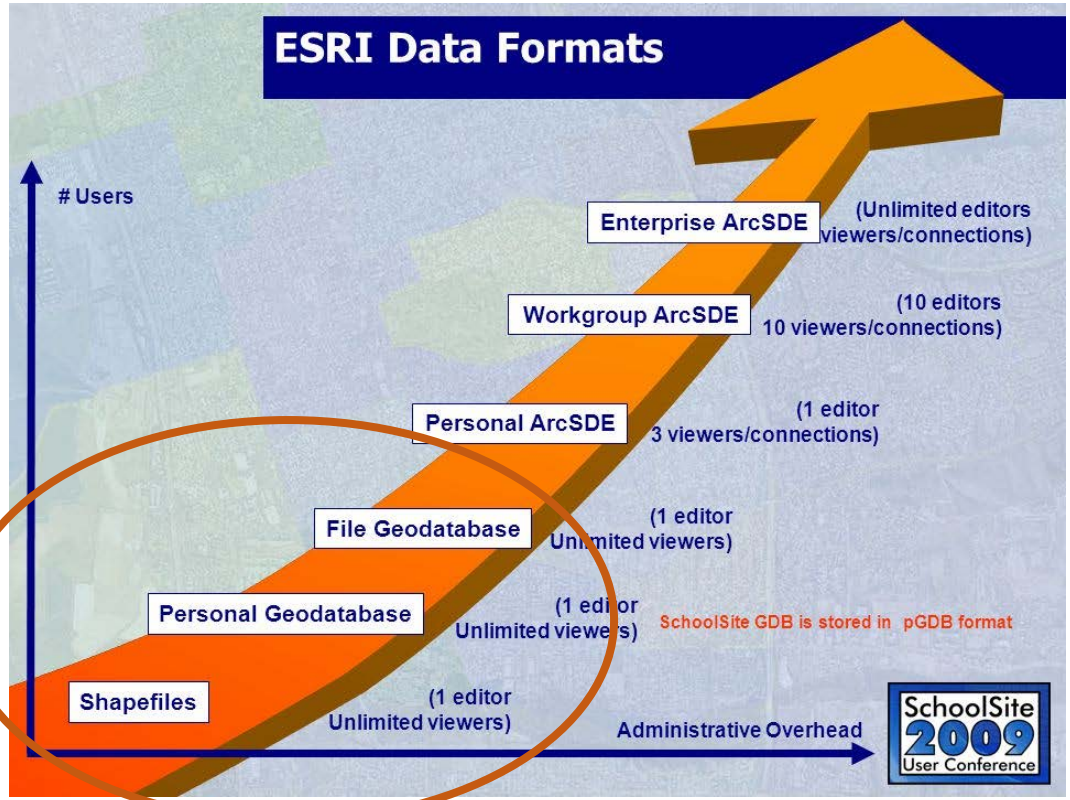


GDB best for large, organized data systems

File GDB better than Personal GDB

Best Practices – Organize Your GIS System

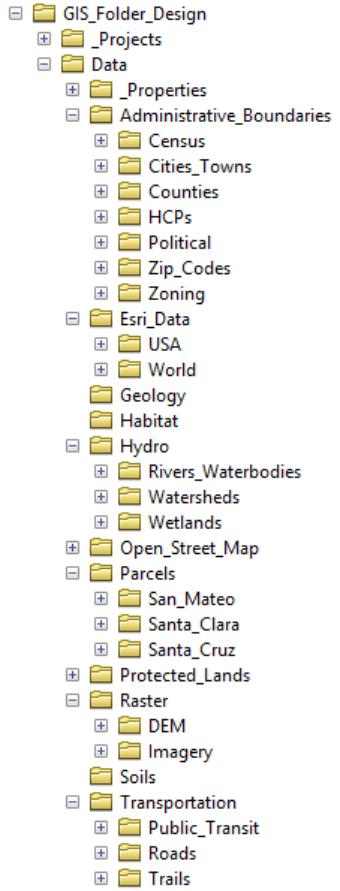
Esri Data Ecosystem



Best Practices – Organize Your GIS System

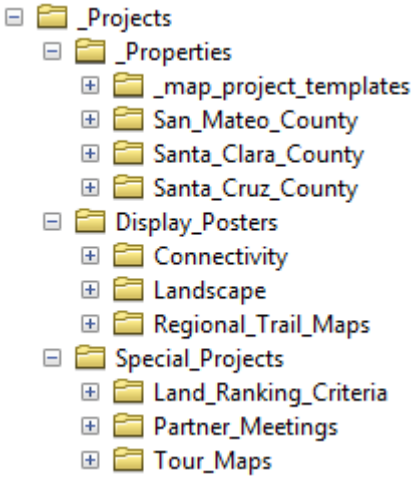
Data - Vector/Raster

Content Categories

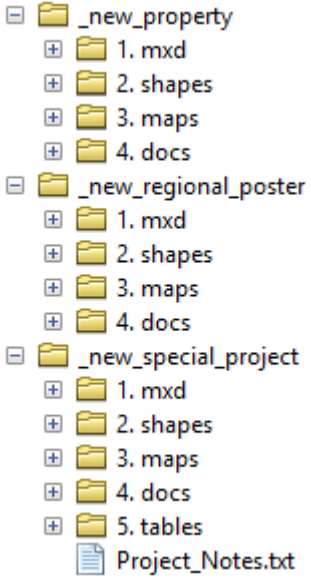


Best Practices – Organize Your GIS System

PROJECTS

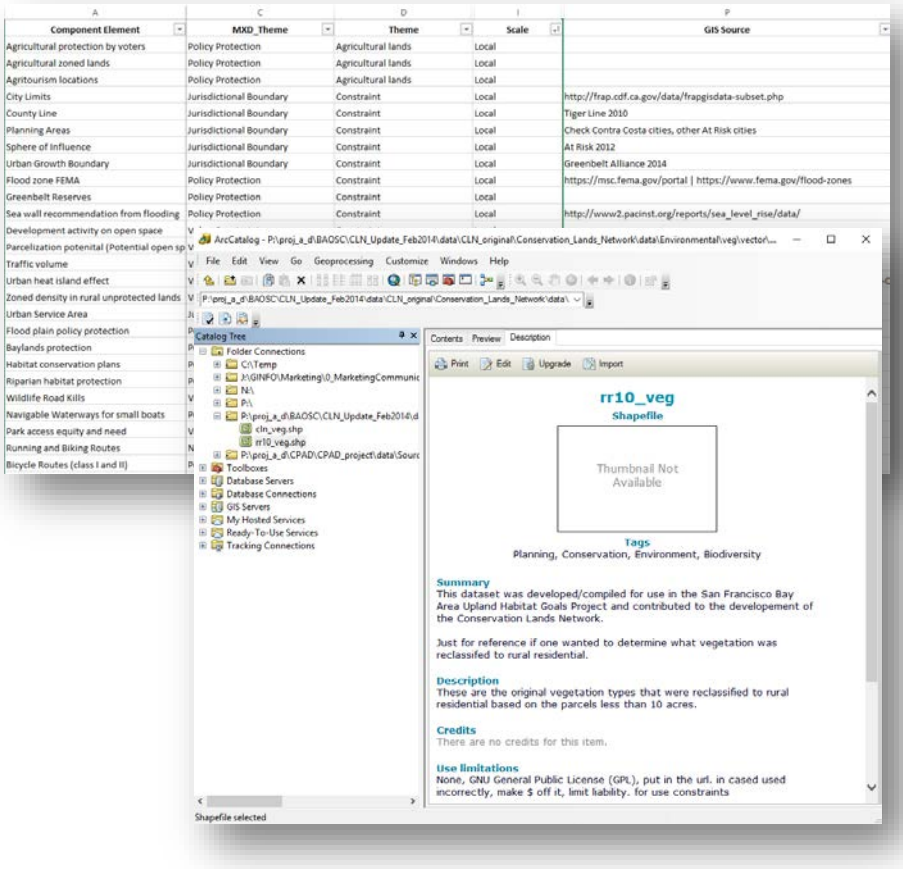


Standard Project Folders



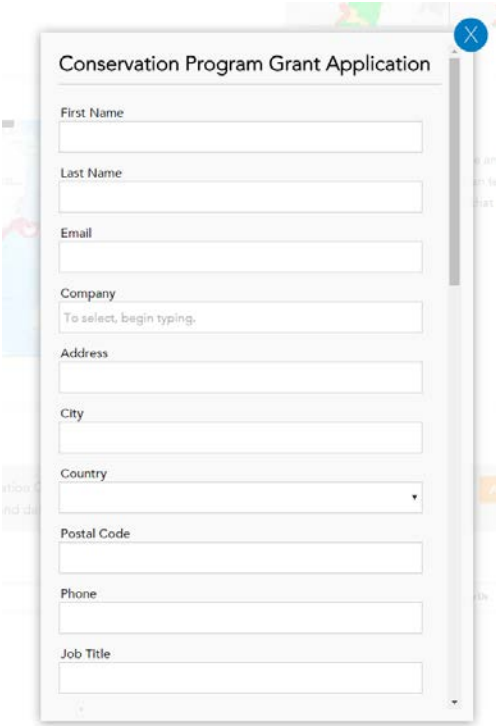
Best Practices – Be Systematic About GIS Program

- ***People** come and go . . .*
- Data/project files . . .
- Documentation – data and projects
  - External spreadsheet
  - Metadata in file
  - Online – use Gdocs
- Map templates



Best Practices – Grants and Resources

1. ESRI Conservation Program
   - www.esri.com/esri-conservation-program
   - www.conservationgis.org
   - New online application! Yahoo!
   - Maintenance…
2. Nonprofit GIS Program - www.esri.com/nonprofit
3. Personal use of ArcGIS - $100 (includes **everything**)
4. Training, SCGIS.org



How to develop a GIS

What do you need?

- GIS data
- GIS software
  - Workflow/Data storage
  - Data collection/Mobile solutions

- **Case Study:** Pacific Forest Trust Conservation Easement Monitoring

GIS Data

Standard GIS Datasets all Land Trusts should have for their conservation easements:

- Project Boundary
- Ownership/Parcels
  - Land use/Zoning
  - Township & Range
  - Transportation (roads, railroads, trails)
- Management Zones
- Topography (slope, elevation, DEM)
- Habitat/Vegetation
- Hydrology (wetlands, streams)
- Geology/Soil
- Species (present, endangered, threatened)
- Remote Sensing (Imagery, Lidar)

GIS Data

Standard GIS Datasets all Land Trusts should have for their conservation easements:

- Project Boundary - Landowner\County
- Ownership/Parcels - County
- Land use/Zoning - County
- Township & Range - County\State
- Transportation (roads, railroads, trails) - County\State
- Management Zones - Landowner, on the ground field surveys
- Topography (slope, elevation, DEM) - Landfire, USGS
- Habitat/Vegetation - Landfire, CWHR
- Hydrology (wetlands, streams) - NHD, NWI
- Geology/Soil - NRCS Soil, Landfire
- Species (present, endangered, threatened) - CNDDB
- Remote Sensing (Imagery, Lidar) - Landfire, USGS, Landsat, NAIP

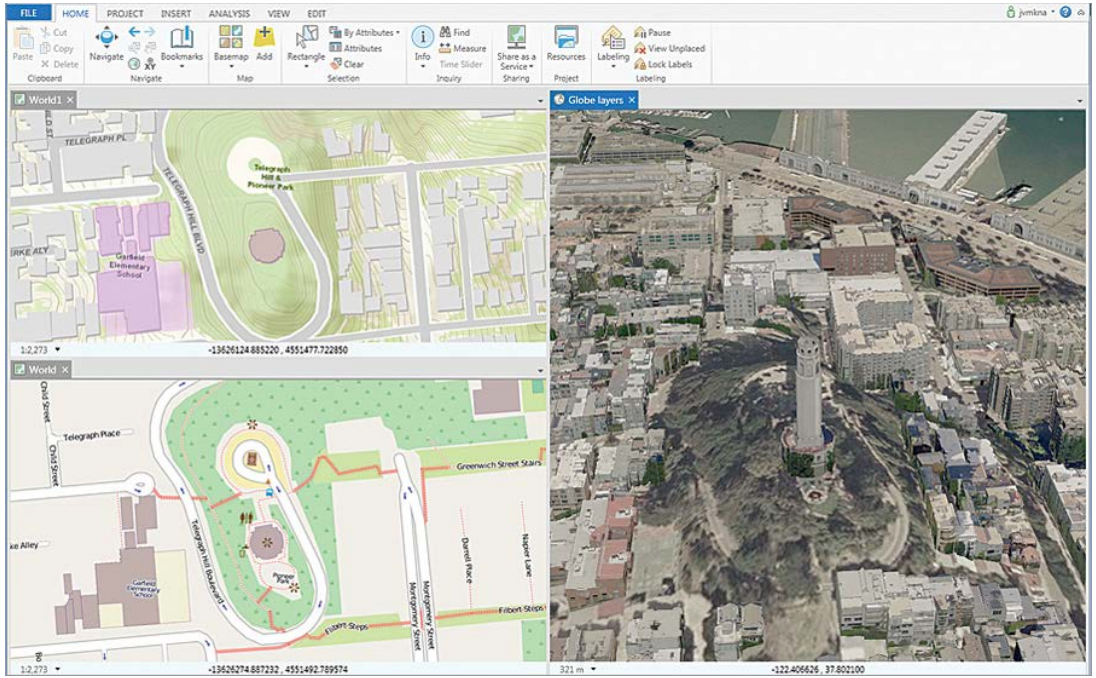
GIS Software

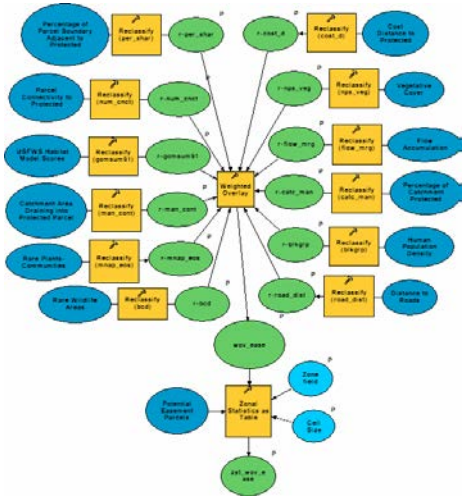
Wide range of options including:

- Esri
  - Wide range of products
  - Advanced spatial analysis
  - Non-profit
- QGIS
  - Free, but no support
- Google Earth
  - Free or at a cost, but with limited functionality
- Mapbox
  - Software as a service

GIS Software – Esri

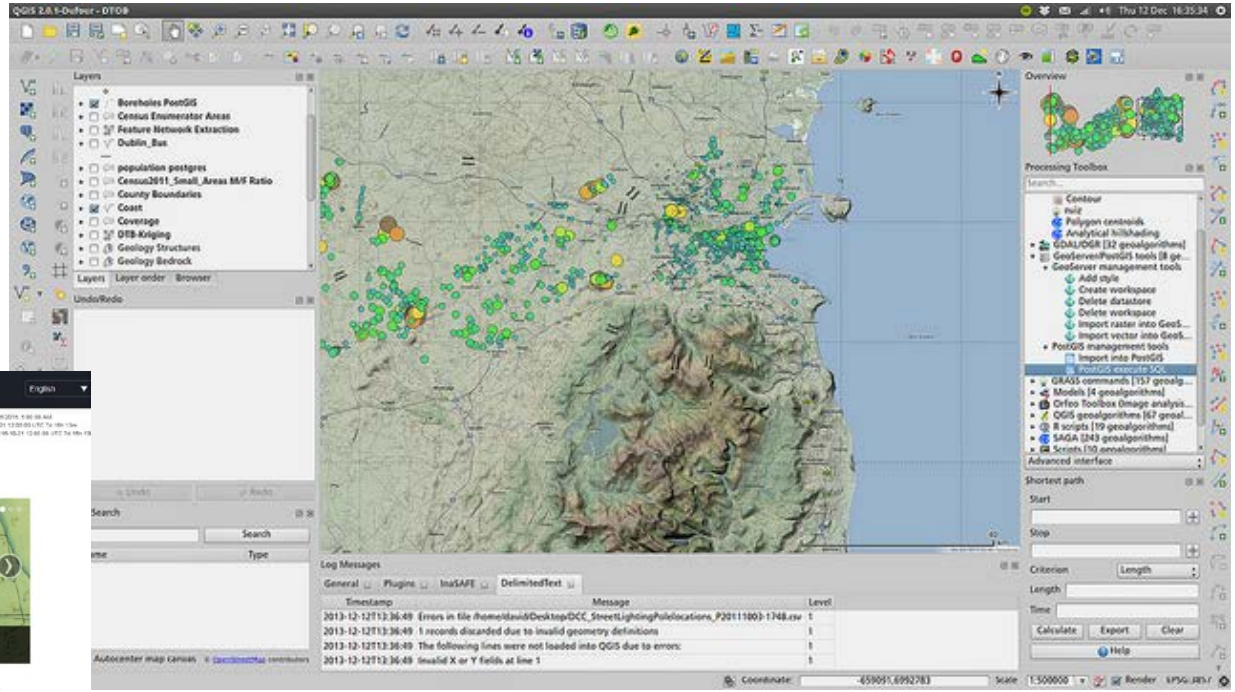
- ArcGIS: ArcMap, ArcGIS Pro, ArcGIS Server, ArcGIS Online



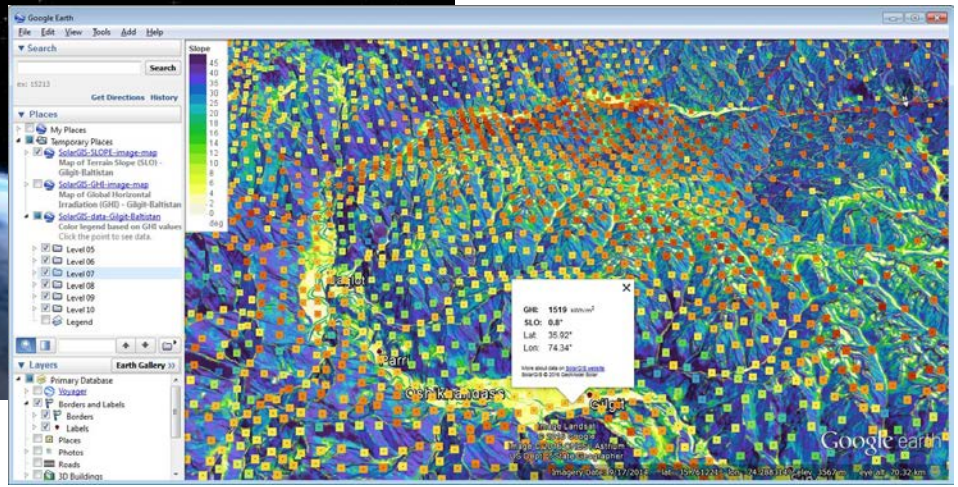


GIS Software - QGIS

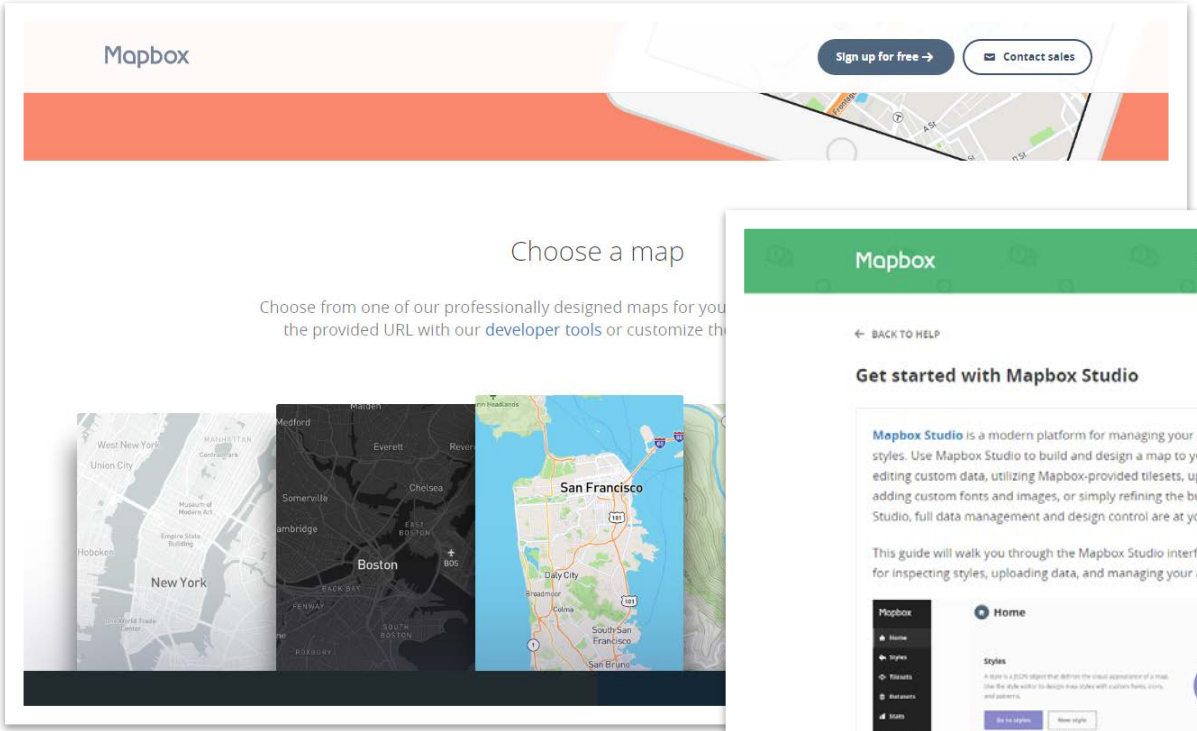
- Open source GIS
- www.qgis.org

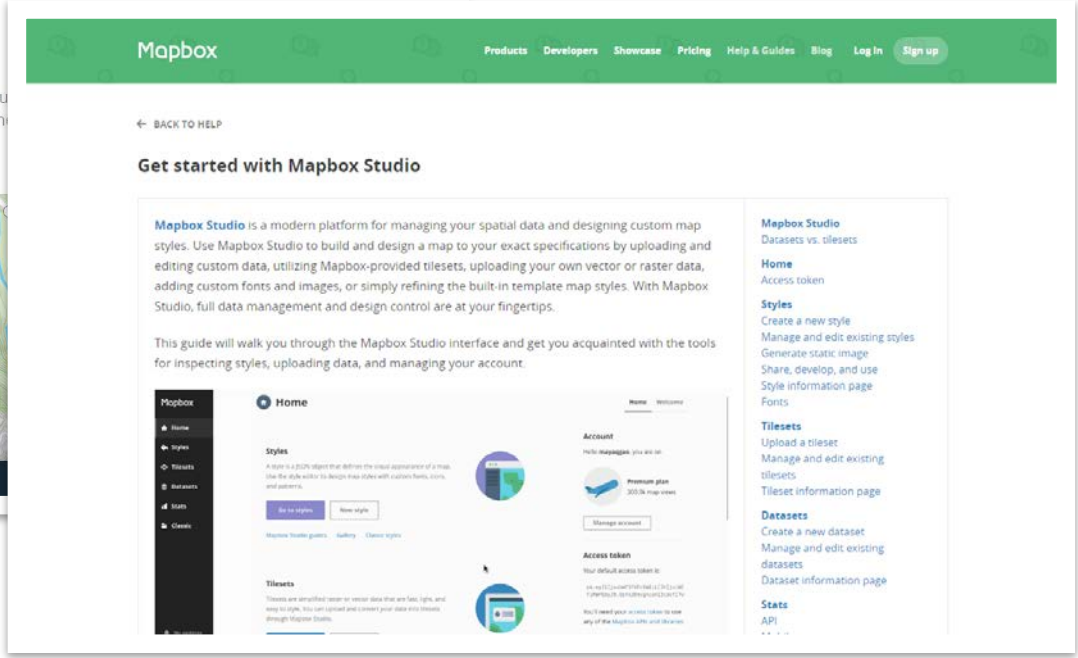


GIS Software - Google Earth



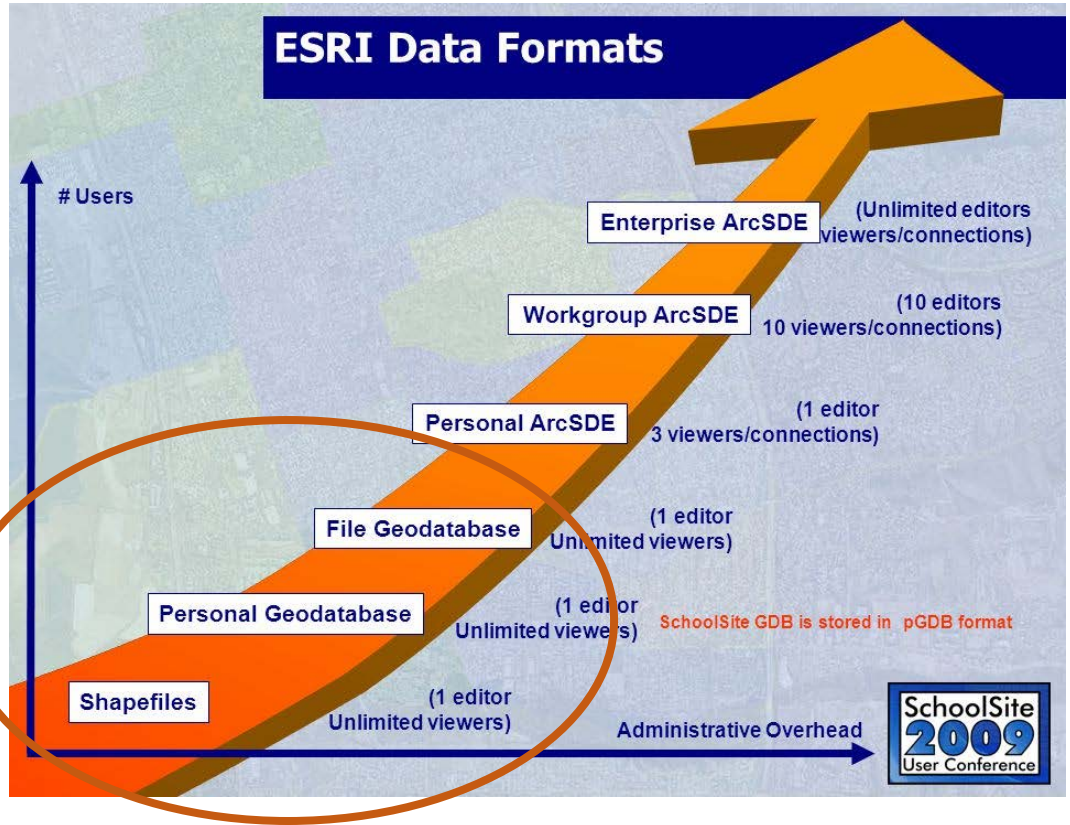
GIS Software - Mapbox.com





GIS – Data Storage

Esri Data Ecosystem



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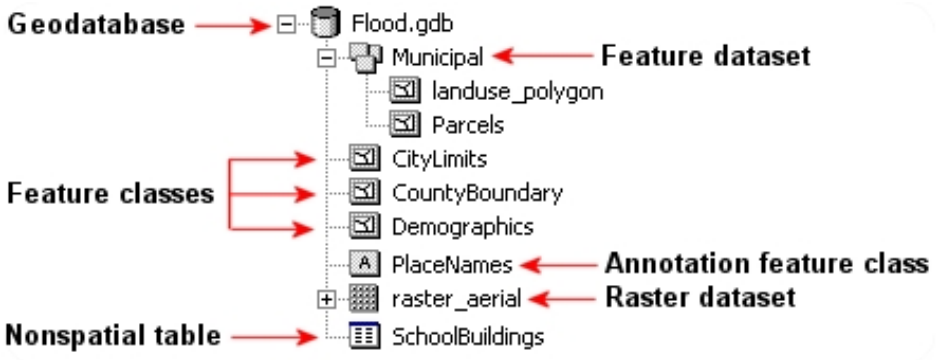
Geodatabase (gdb)



GDB best for large, organized data systems

File GDB better than Personal GDB

GIS - Mobile Solutions

- Hardware
  - Garmins
  - Trimbles
  - Cell Phone/Tablet

How to develop a GIS

How to decide with so many options?

- Identify the goals of the project/land trust
- Get a budget range for the GIS system
  - Initial and continuing costs
- Evaluation the skills sets in your organization
  - Contract GIS
  - In-house GIS
- Evaluation the cost and available support of the software
  - Out-of-the-box low cost software vs. free software with more setup time
- Workflow/Data storage
  - Shapefile, Database, Server
- Data collection/Mobile solutions
  - Expensive with high accuracy vs. lower cost with less accuracy

Case Study - Developing a GIS System for PFT

- Stewardship Manager at Pacific Forest Trust (PFT)
  - Established in 1993
  - PFT pioneered the use of "**working forest conservation easements**"
  - 28 conservation easements over 98,420 acres
    - Redwoods, Mt. Shasta, Sierra, Oregon
    - Families, commercial enterprises, investors
  - Own and/or manage 12,000 acres (OR + CA)

PACIFIC FOREST TRUST

Case Study - Developing a GIS System for PFT

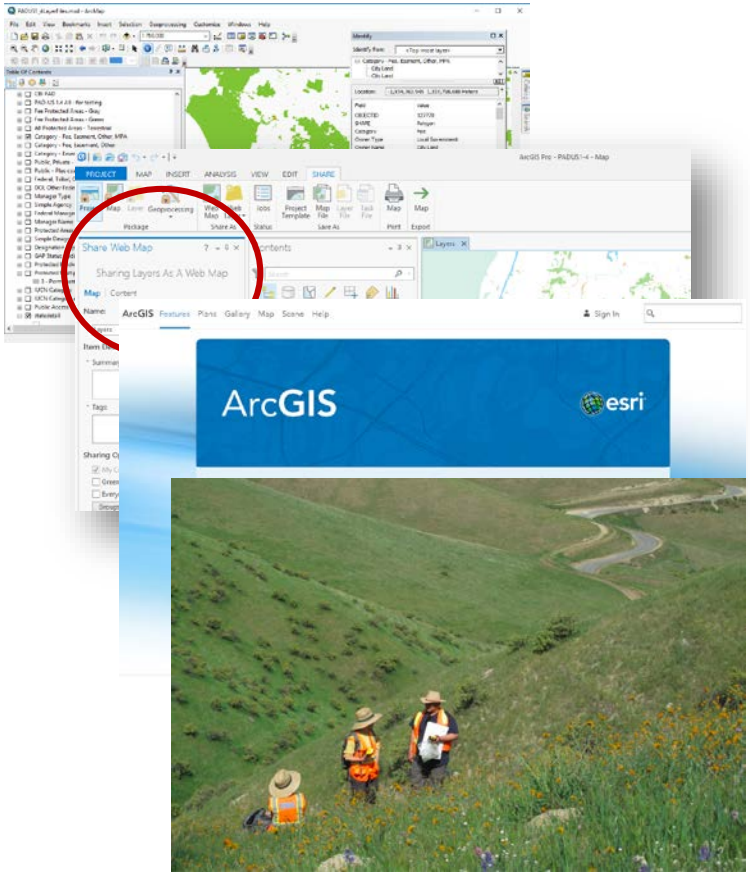
- **Evaluate the situation**
  - **Goals:** Manage the existing conservation easements and developed new projects. Develop a system that improves data collection and sharing within the organization. Manage numerous datasets and base data for two states.
  - **Budget:** Limited non-profit budget
  - **Expertise:** One GIS specialist in the office with Esri experience, multiple staff with interest in access GIS.

Case Study - Developing a GIS System for PFT

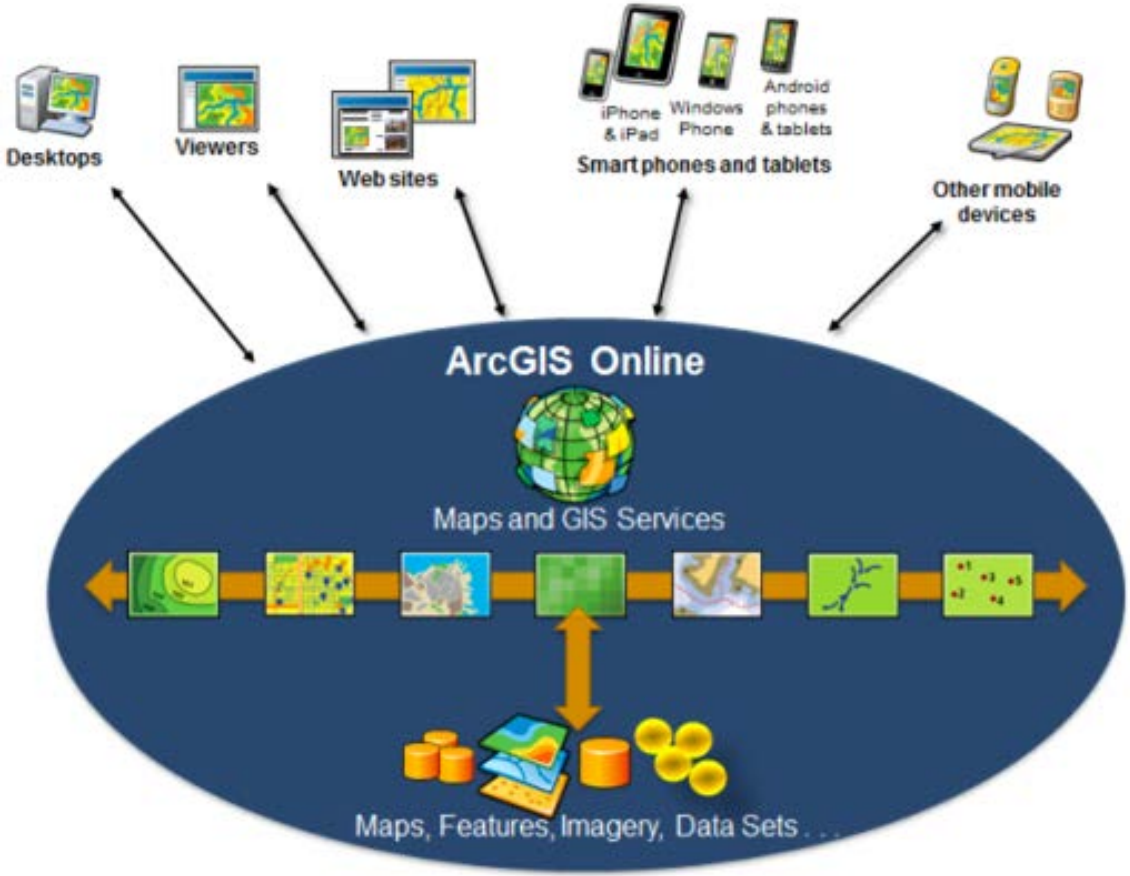
- **Solution**
  - **Software:** Esri Products (ArcGIS Desktop, ArcGIS Pro & ArcGIS Online)
    - Nonprofit GIS Program - www.esri.com/nonprofit
  - **Data Storage:** File Geodatabases
    - 1 FGDB per Conservation Easement
    - Multiple FGDBs for basedata
      - County level data (one FGDB)
      - State level data (California, Oregon)
      - County level data (one per county)
  - **Mobile Solution:** ArcGIS Collector App
  - **Mobile Hardware:** Cell Phone
  - **Data Management\Workflow:** ArcMap > ArcGIS Pro> ArcGIS Online > ArcGIS Collector

Case Study - Developing a GIS System for PFT

- **Esri Software**
  - **GIS desktop**
    - **ArcGIS Desktop (**Data development, map production)
    - **ArcGIS Pro** (Upload and management web data)
    - **ArcGIS Online** (Wide range of available data, base maps, cloud storage, easy to access and share)
    - **ArcGIS Collector App** (integrates with ArcGIS Online for seamless data integration)



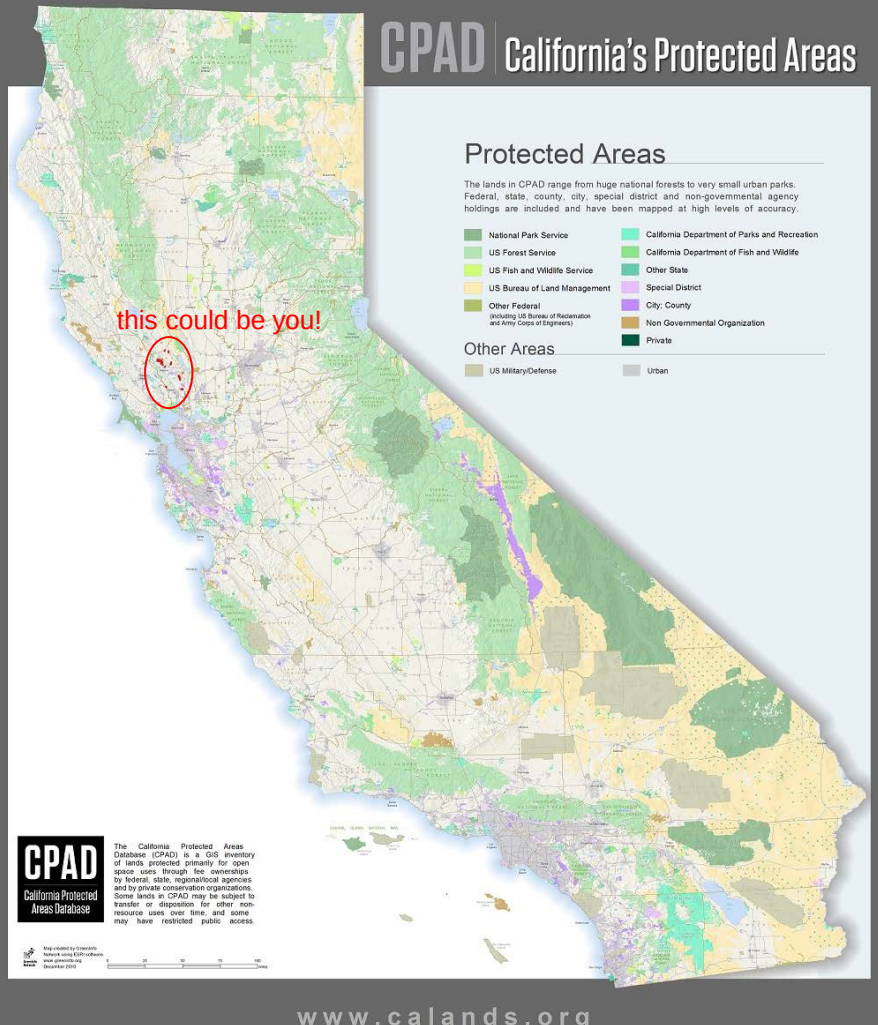
Case Study - Developing a GIS System for PFT



Case Study - Developing a GIS System for PFT

- **ArcGIS Collector**
  - **Works offline:** No data server required, download the data before you get out in the field.
  - **Standardize data collection:** can require specific attributes
  - **Take photos and attach them to data points:** Georeferenced photos
  - **Usage:** Easy to use and share, anyone in your organization can easily collect useful data

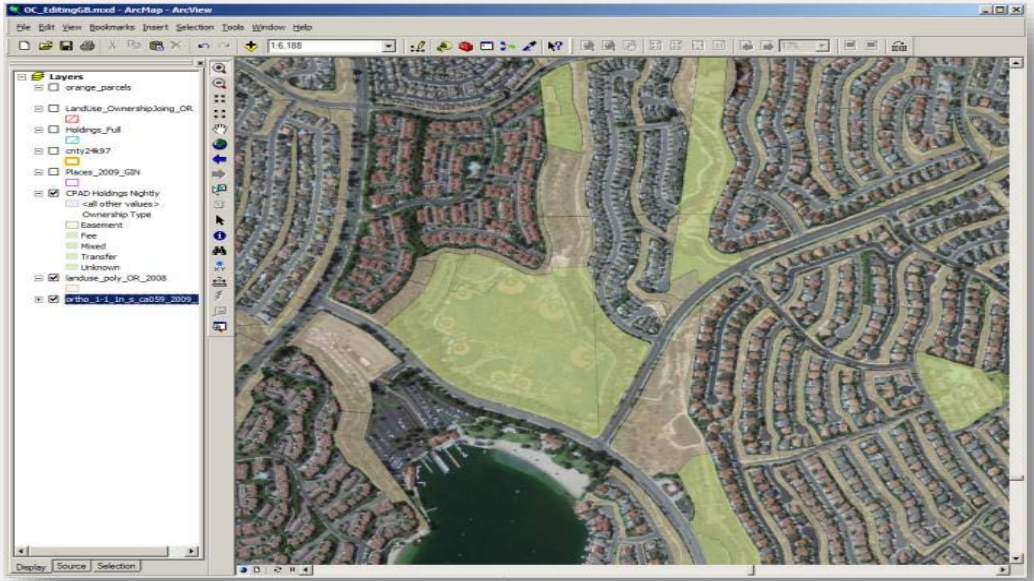
3. Share your Data



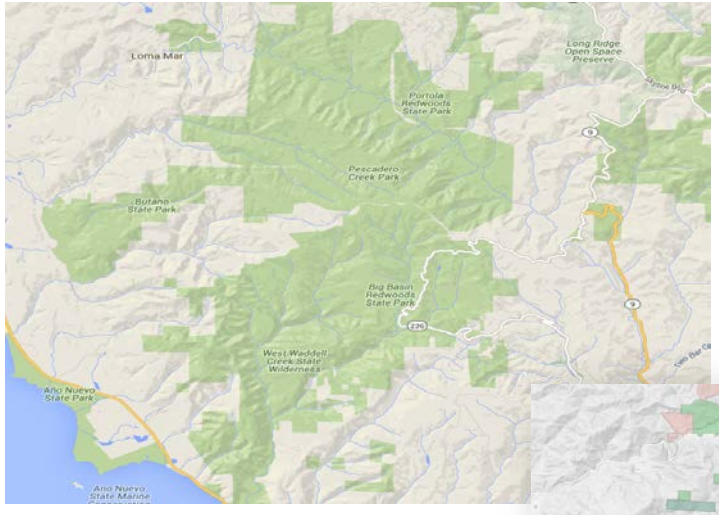
What is the California Protected Areas Database?

What is the California Protected Areas Database?

- GIS data
- 49+ million acres
- 14,000 parks
- v. 2016b (Dec. 2016)
- www.calands.org

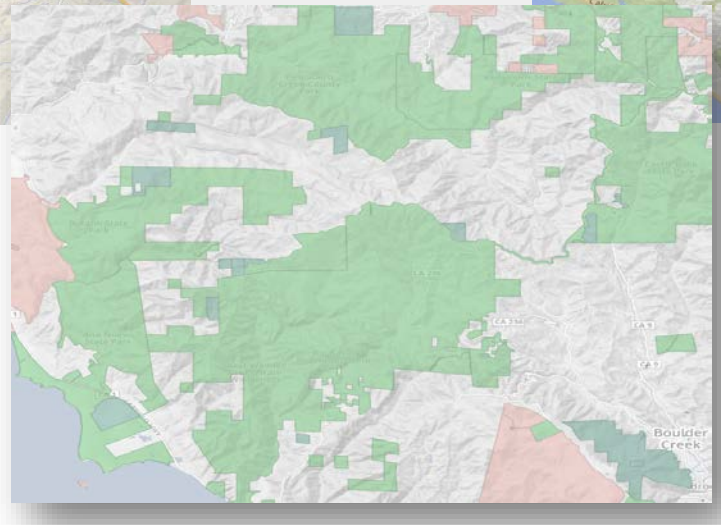


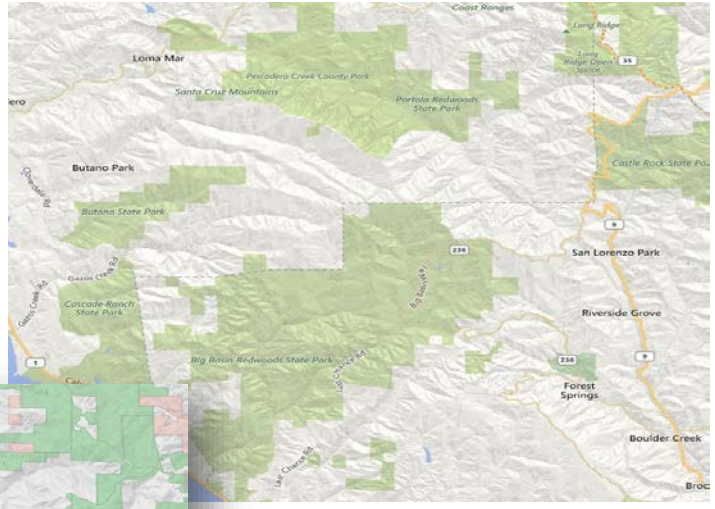
Why a Good Inventory Matters



Google

CPAD

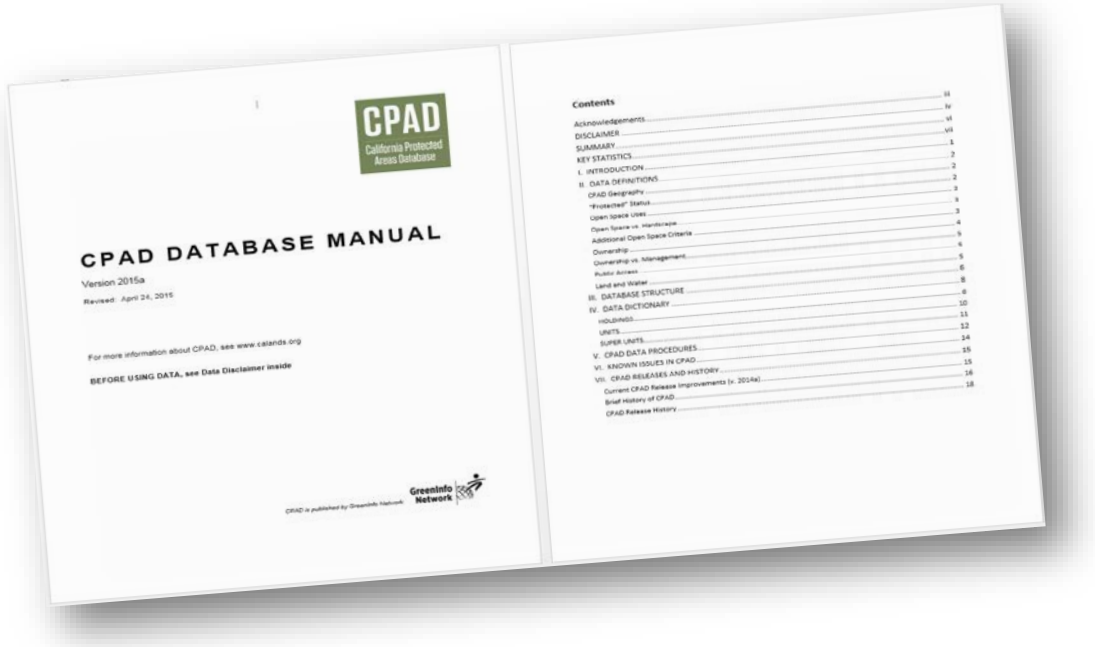




Bing

Structure

- Detailed documentation in the CPAD user manual - see www.CALands.org



CPAD
California Protected Areas Database

CPAD DATABASE MANUAL

Version 2015a

Revised: April 24, 2015

For more information about CPAD, see www.calands.org

BEFORE USING DATA, see Data Disclaimer inside

CPAD is published by GreenInfo Network

GreenInfo Network

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Structure

- Relational GIS database
  - Holdings (parcel)
  - Units (analysis)
  - Super Units (“park”)

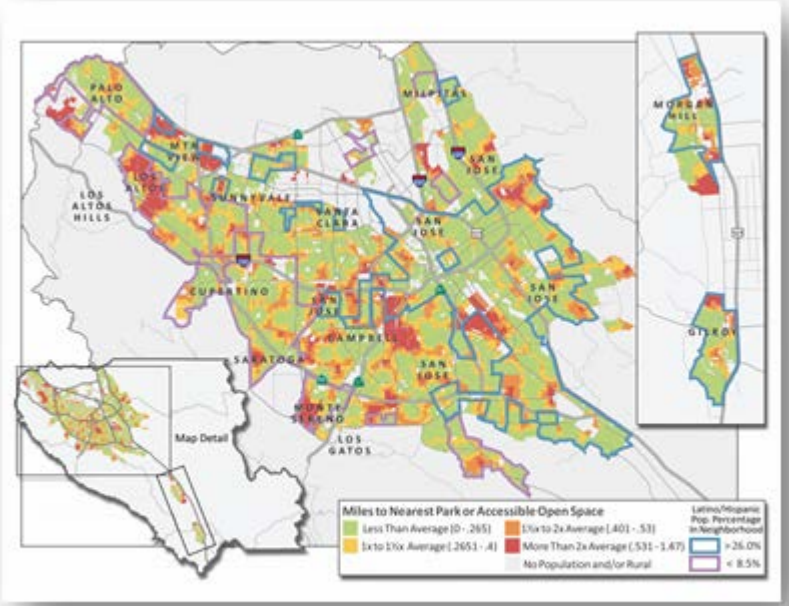
- Core attributes
  - **Full name***
  - **Manager***
  - **Access***
  - **Owner**
  - Bonus - acquisition/establishment date

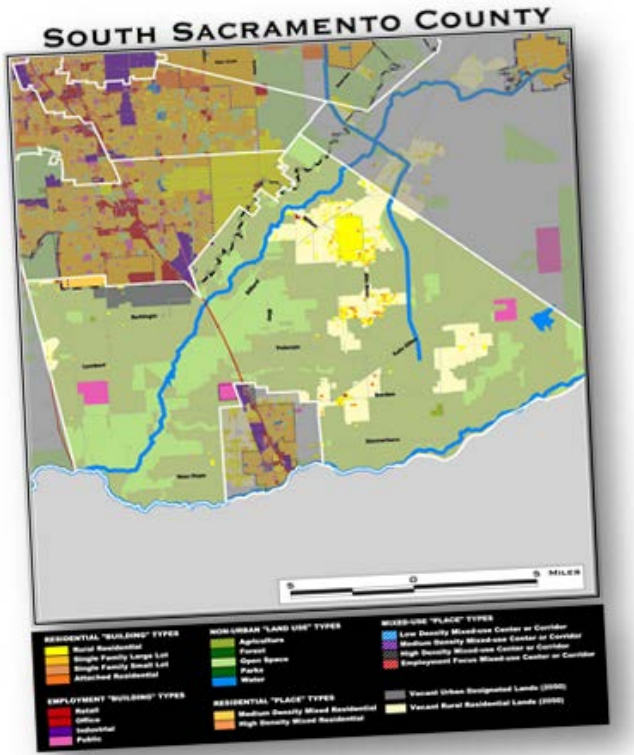
How CPAD is Used

- Best use: multi-jurisdictional plans/programs/analyses

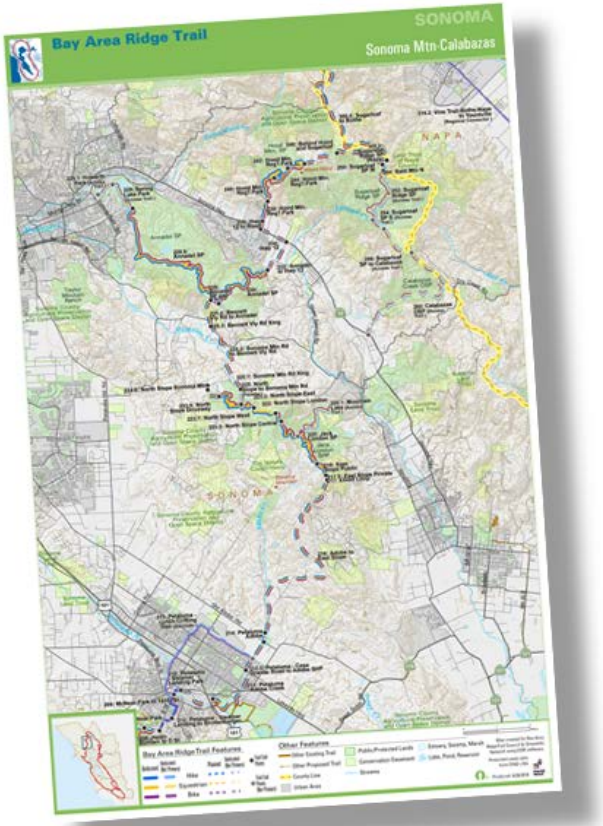
- Typical uses:
  - **Recreation** access
  - County **general plans**
  - **Land conservation** planning
  - Utilities – siting, routing, etc.
  - **Environmental impact** reports
  - Transportation facility siting, advance **mitigation**
  - **Emergency planning** and response
  - **Climate** adaptation

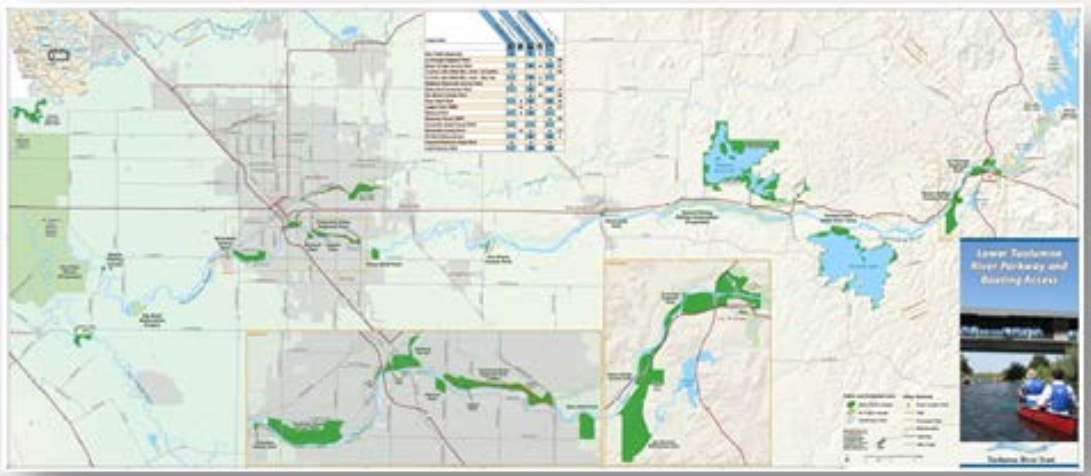
How CPAD is Used





How CPAD is Used

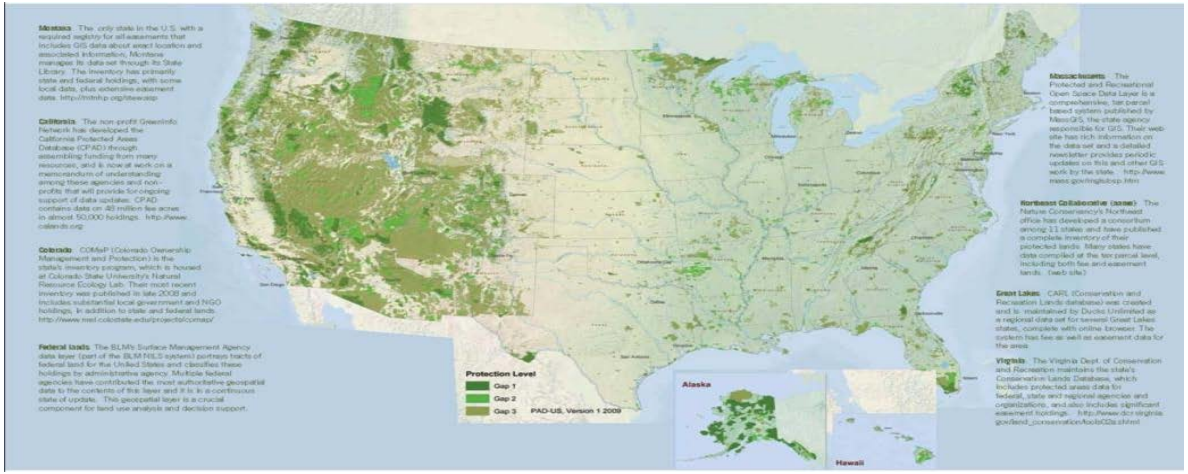


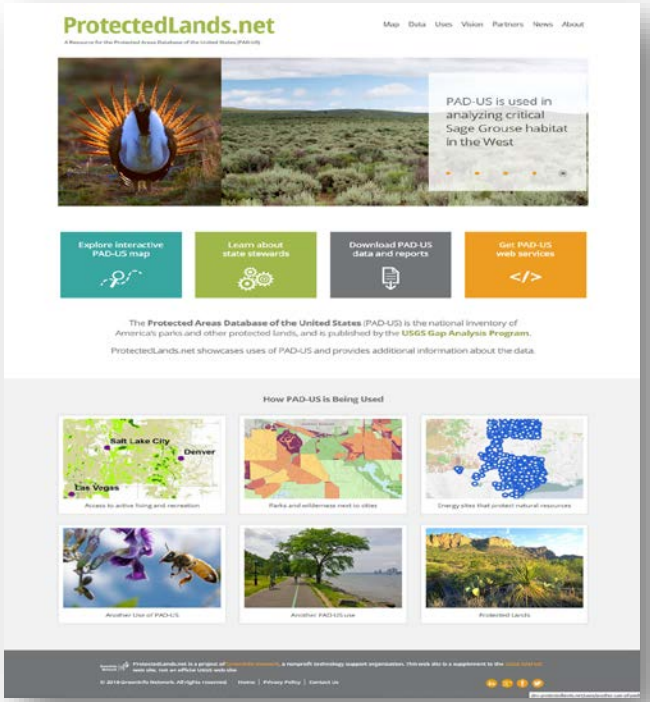


How CPAD is Used

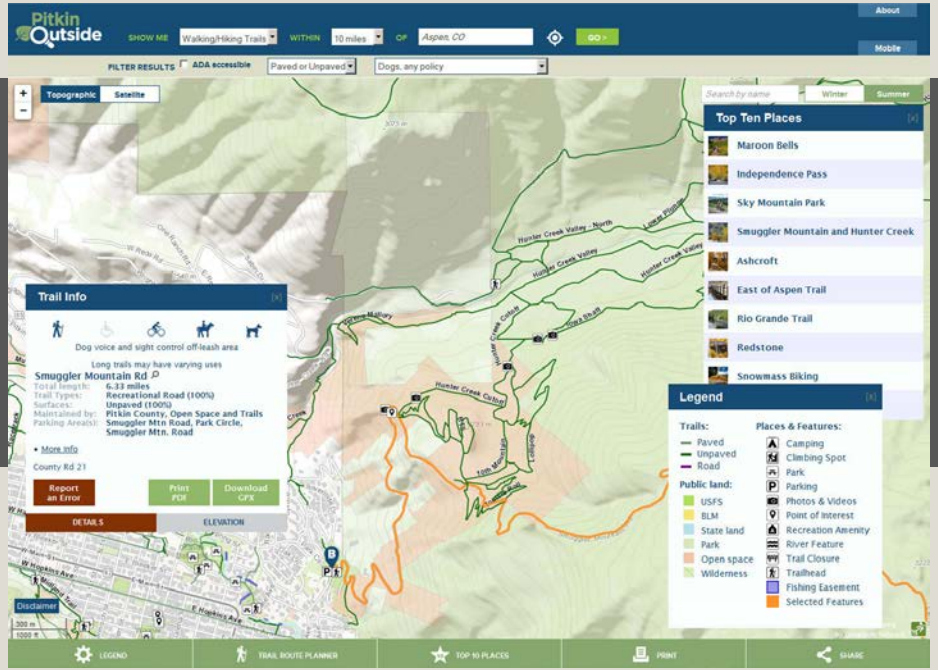
From California to National Scale - PAD-US

- New PAD-US in May 2016 – v 1.4
- New Protectedlands.net web site
- Plan for major improvement over next 3 years
- **CPAD represents California in PAD-US**





5. Tell Your Story



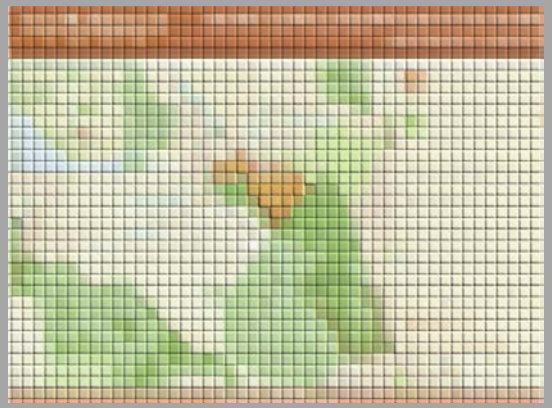
Communicate Visually

1. Maps are **stories**

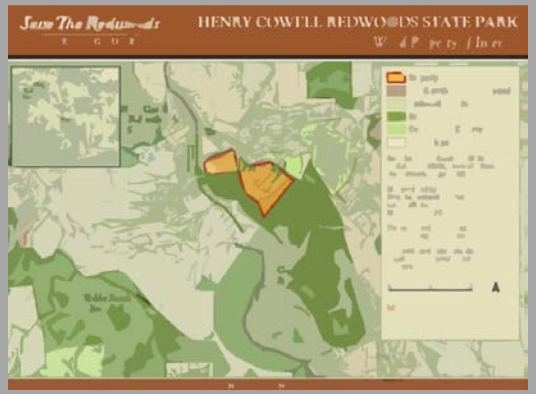
2. Design for the **viewer** who is interested but pressed for time

3. Unfold them in **layers** of meaning

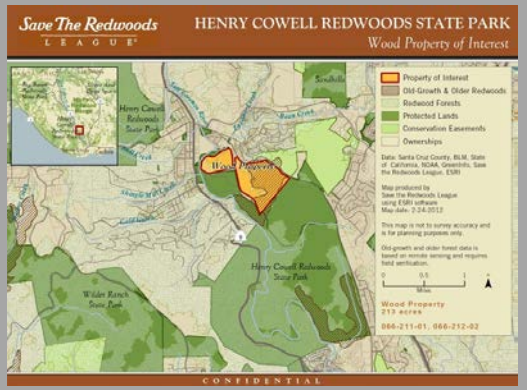
How your brain perceives



<1 second



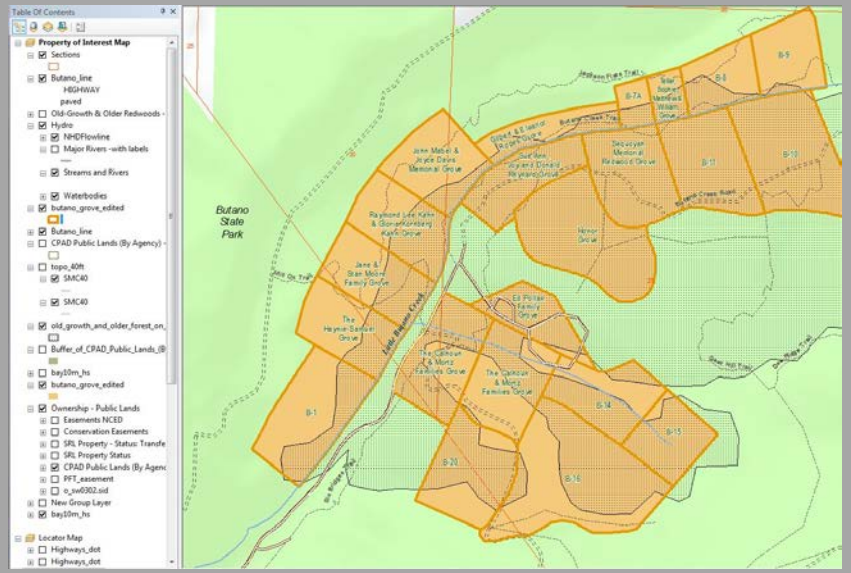
1-2 seconds



3+ seconds

First glimpse is critical for engagement

From raw data to story



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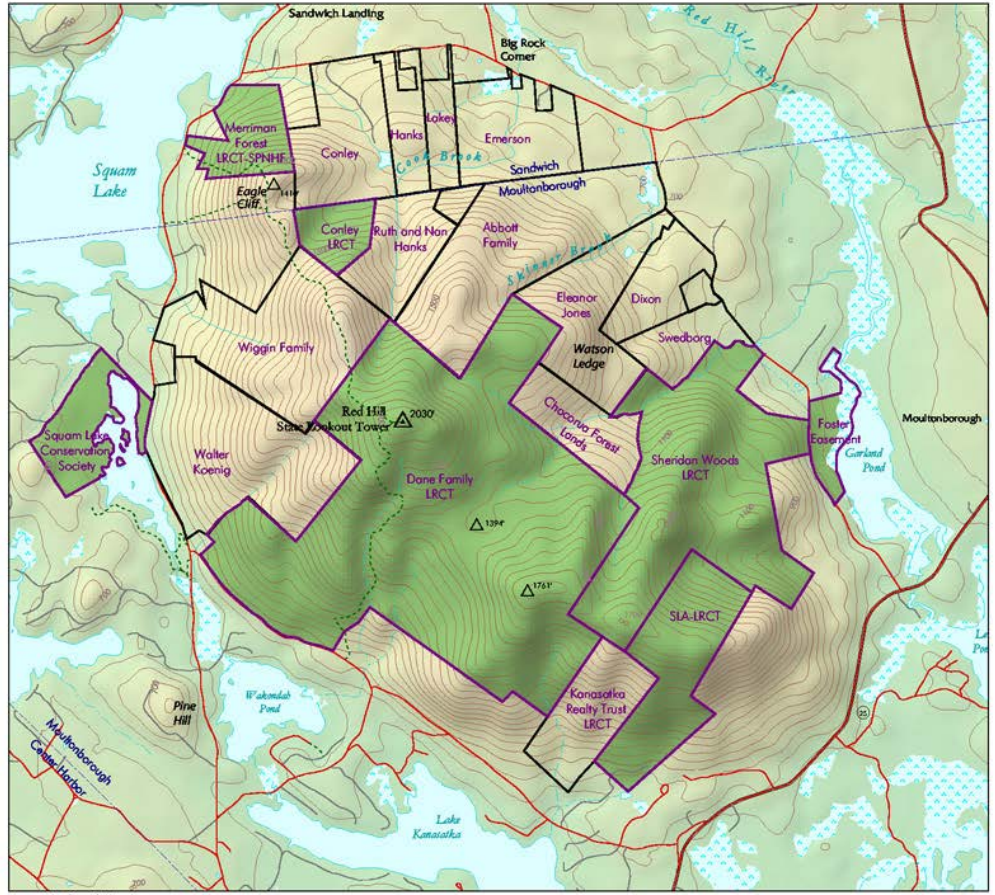
Red Hill

Land Ownership



Conservation Lands

Parcels

Transportation

- Primary Route
- Secondary Route
- Local Roads
- Trails

Water Features

- Wetlands or Bog
- Lake or Pond
- Stream
- Intermittent Stream

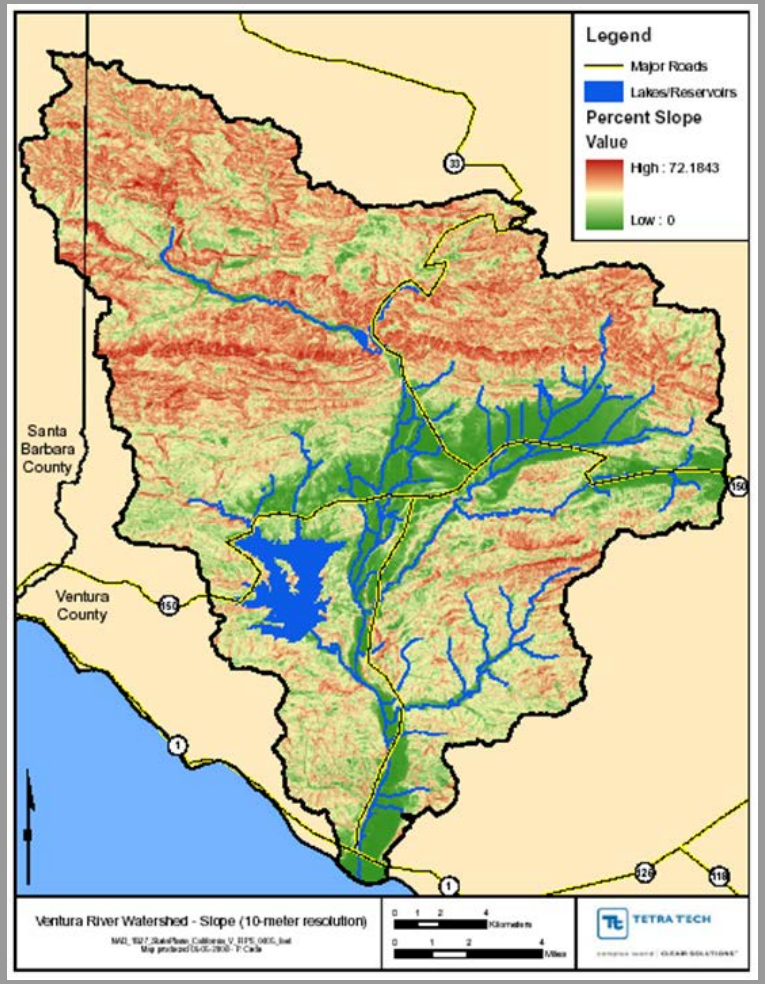
Town Boundaries

contour interval 40 feet

data sources:
USGS 7.5 minute digital elevation model for terrain

USGS digital line graph for roads and trails and water features

Acquired using the UNH GRANIT system, 2002


Legend
Major Roads
Lakes/Reservoirs
Percent Slope
Value
High : 72.1843
Low : 0
Santa Barbara County
Ventura County
Ventura River Watershed - Slope (10-meter resolution)
TETRA TECH

VENTURA COUNTY
SANTA BARBARA COUNTY
Ventura River
Matilija Creek
Matilija Reservoir
Mainers Oaks
Ojai
Lake Casitas
San Antonio Creek
Canada Larga Creek
Pacific Ocean
Ventura
Slope
Ventura River Watershed
Percent Slope
0% - 10% - 35.00 square miles of watershed
10.01% - 45% - 84.41 square miles of watershed
> 45% - 106.88 square miles of watershed

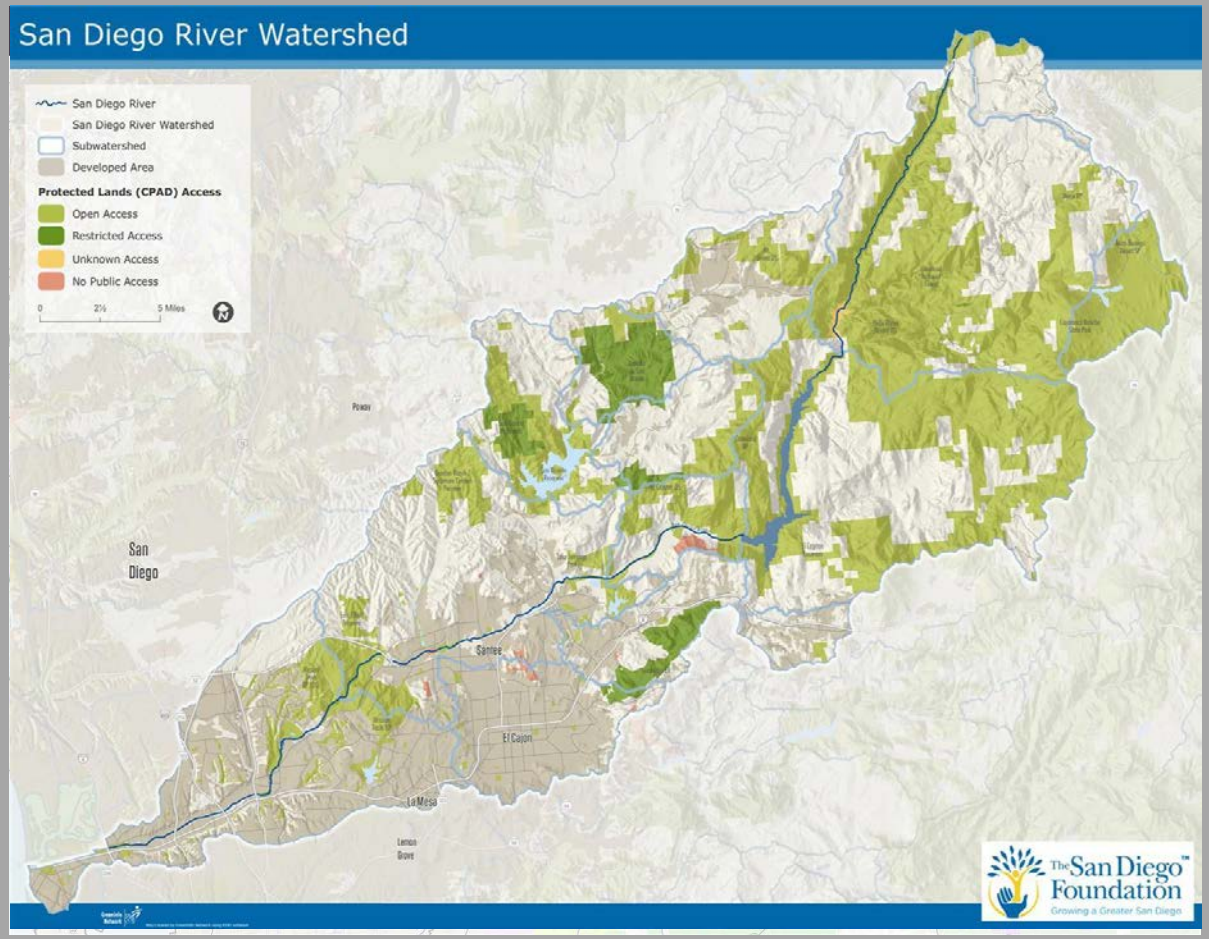
Branding

Simple look & feel

Color

Logo

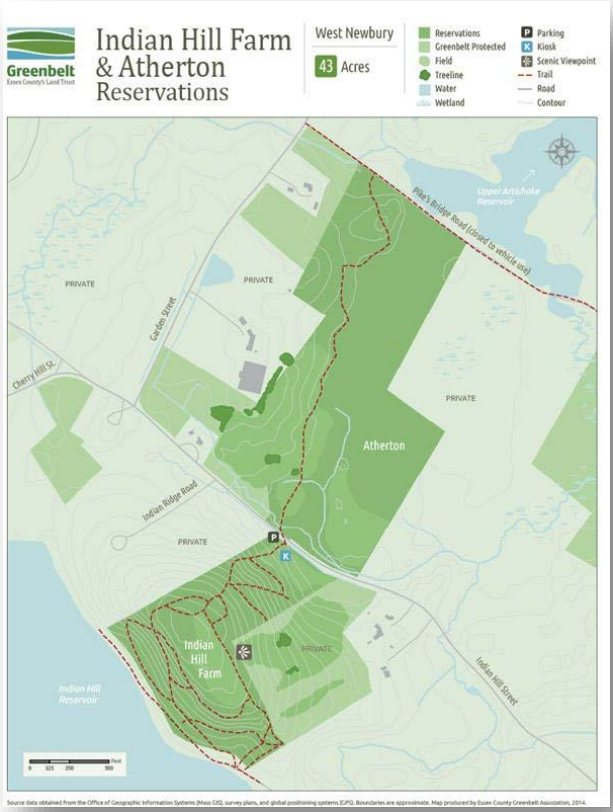
(fonts)



Best Practices – Communicate Visually!

Easy wins:

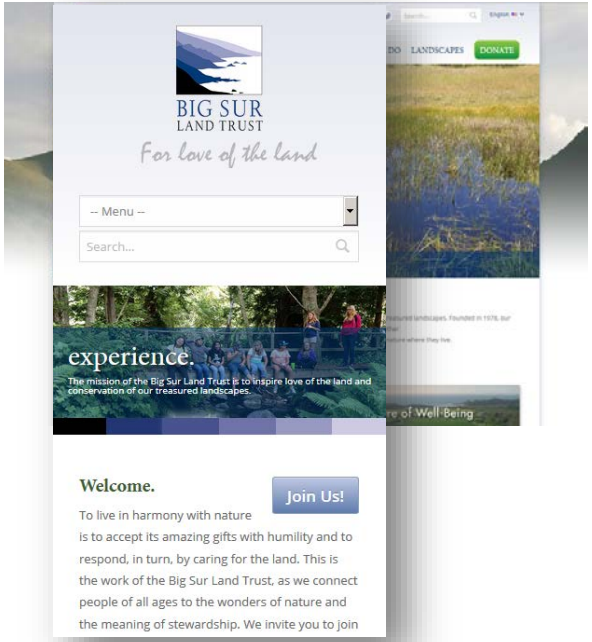
- Branding – use consistently
- Reduce, reduce, reduce map content
- Limit lined boxes
- Go beyond default fonts (serif, sans)
- Test maps on viewers, get design support



Web - web app formats

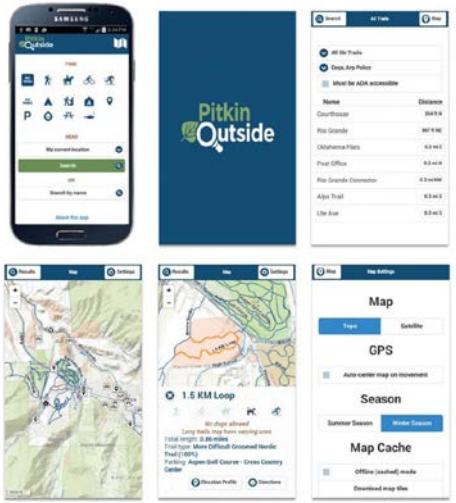
responsive

Website



hybrid app

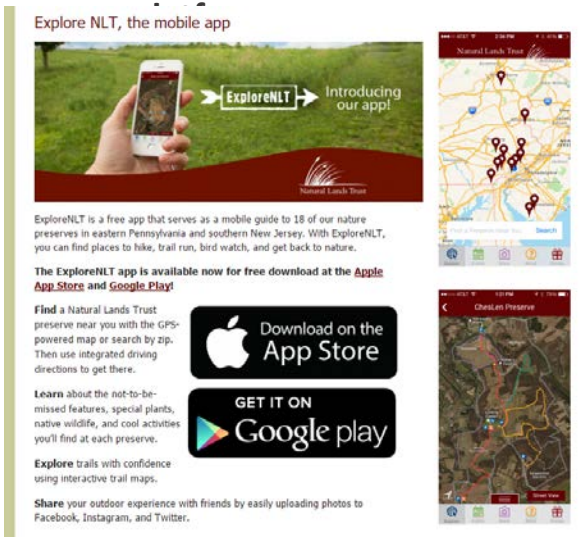
One build, fits 2+



$
$

native apps

For each

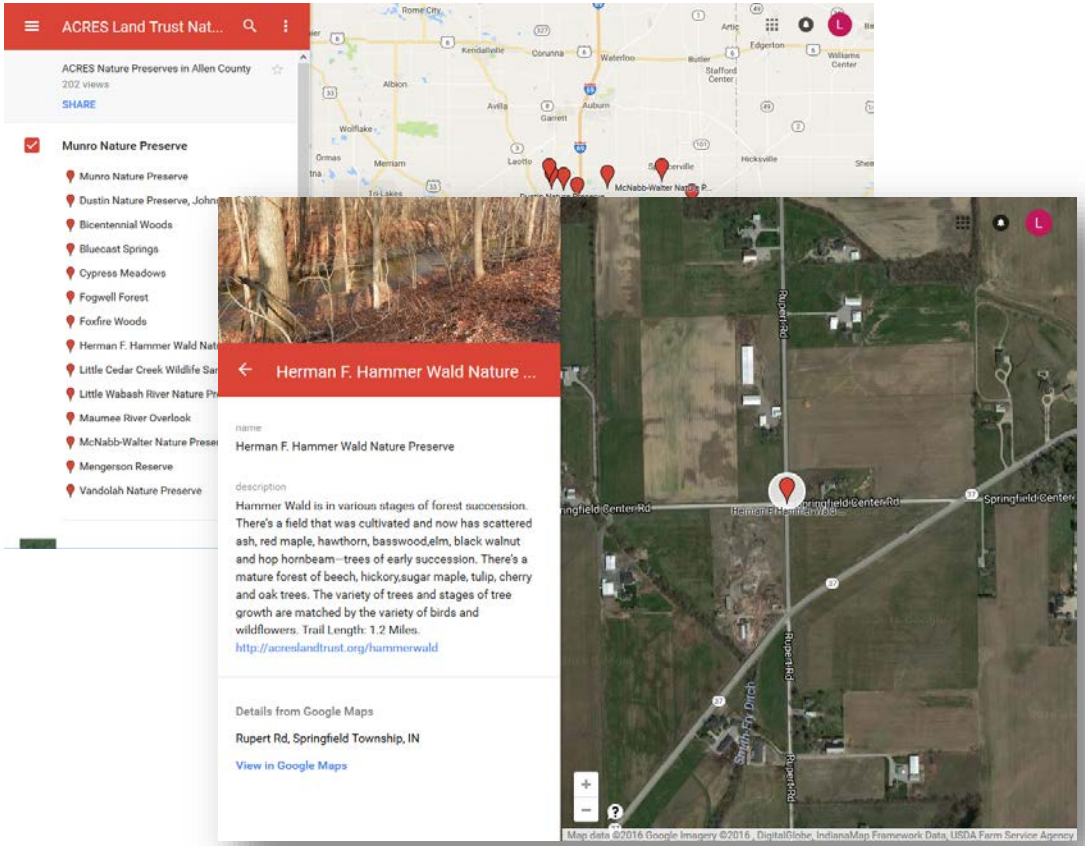


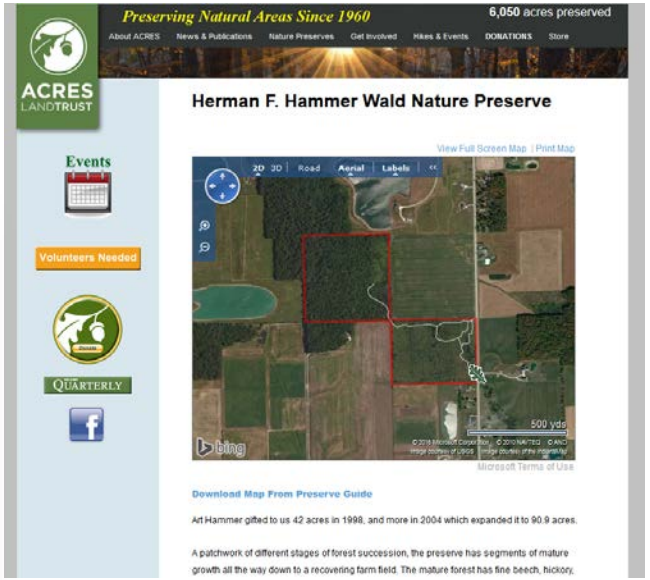
$$$ +
$$$

Web Technologies for Mapping

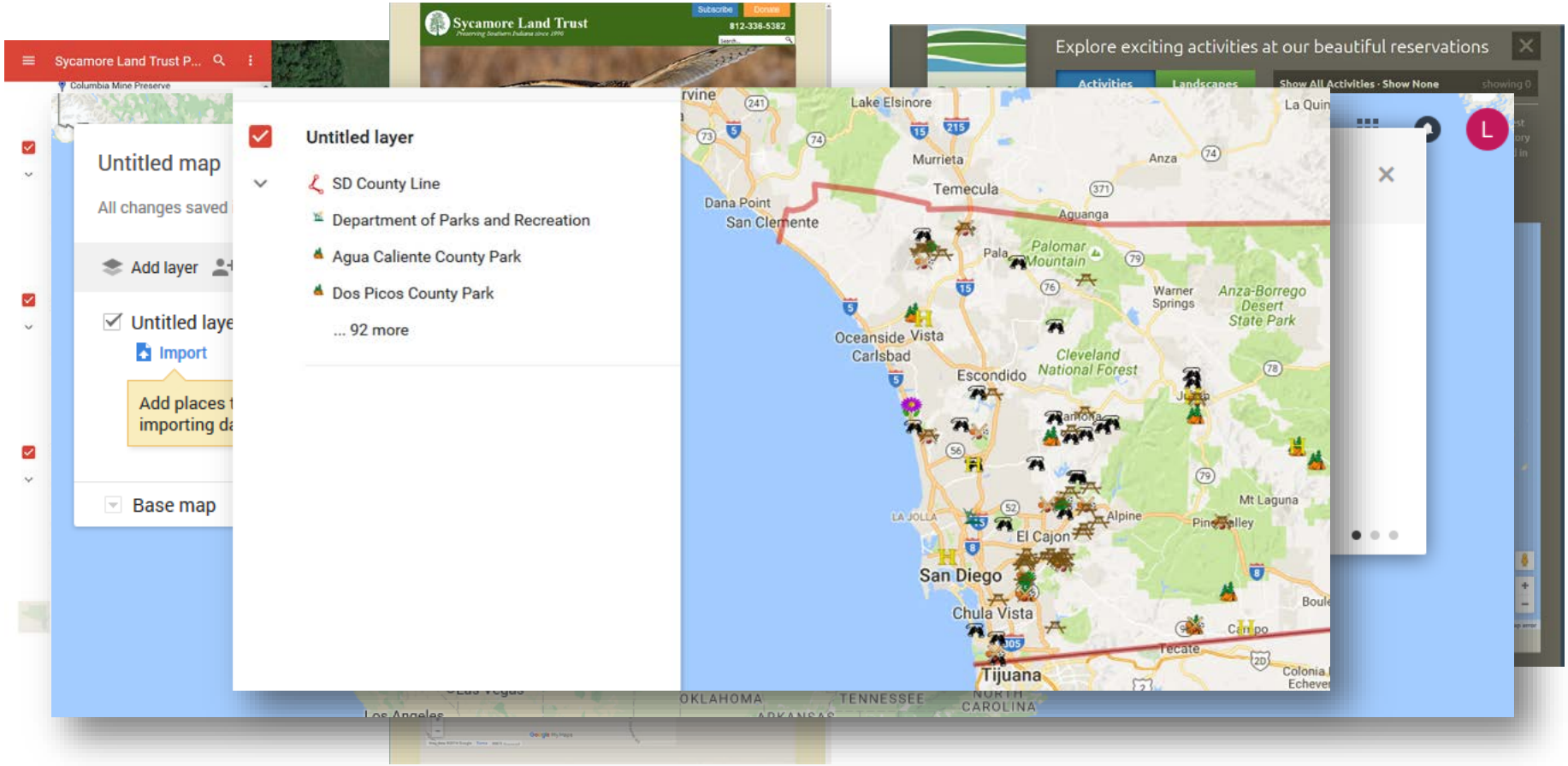
- **Static** maps
- *(ArcGIS Online covered before)*
- **Google** Maps, MyMaps (but there's life beyond Google!)
- **Mapbox**, Carto
- **Open source** tools
- Story maps

Web – Google MyMaps, Earth, api

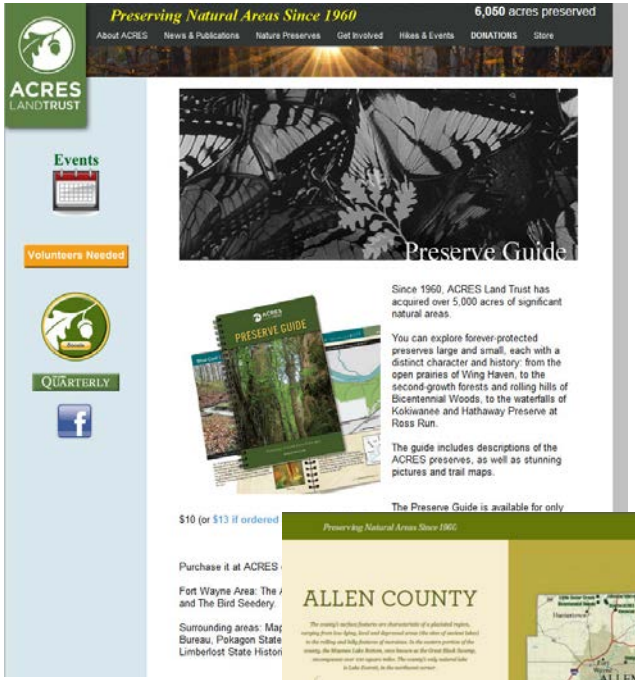


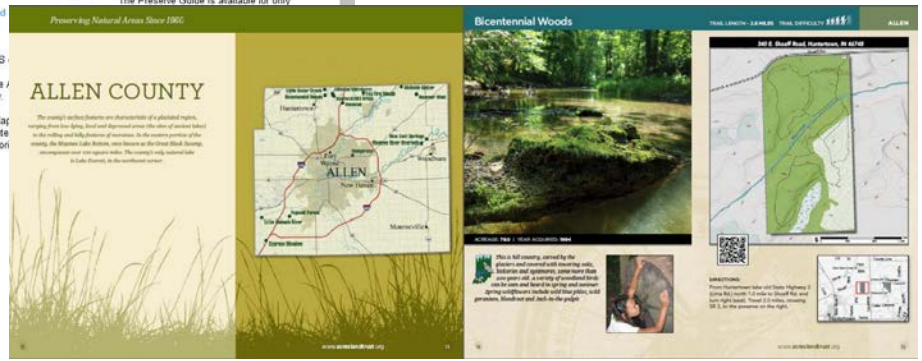


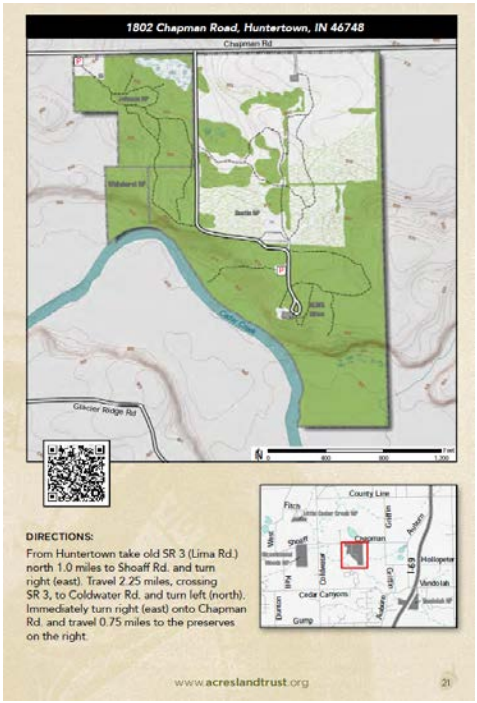
Web – Google MyMaps, Earth, api



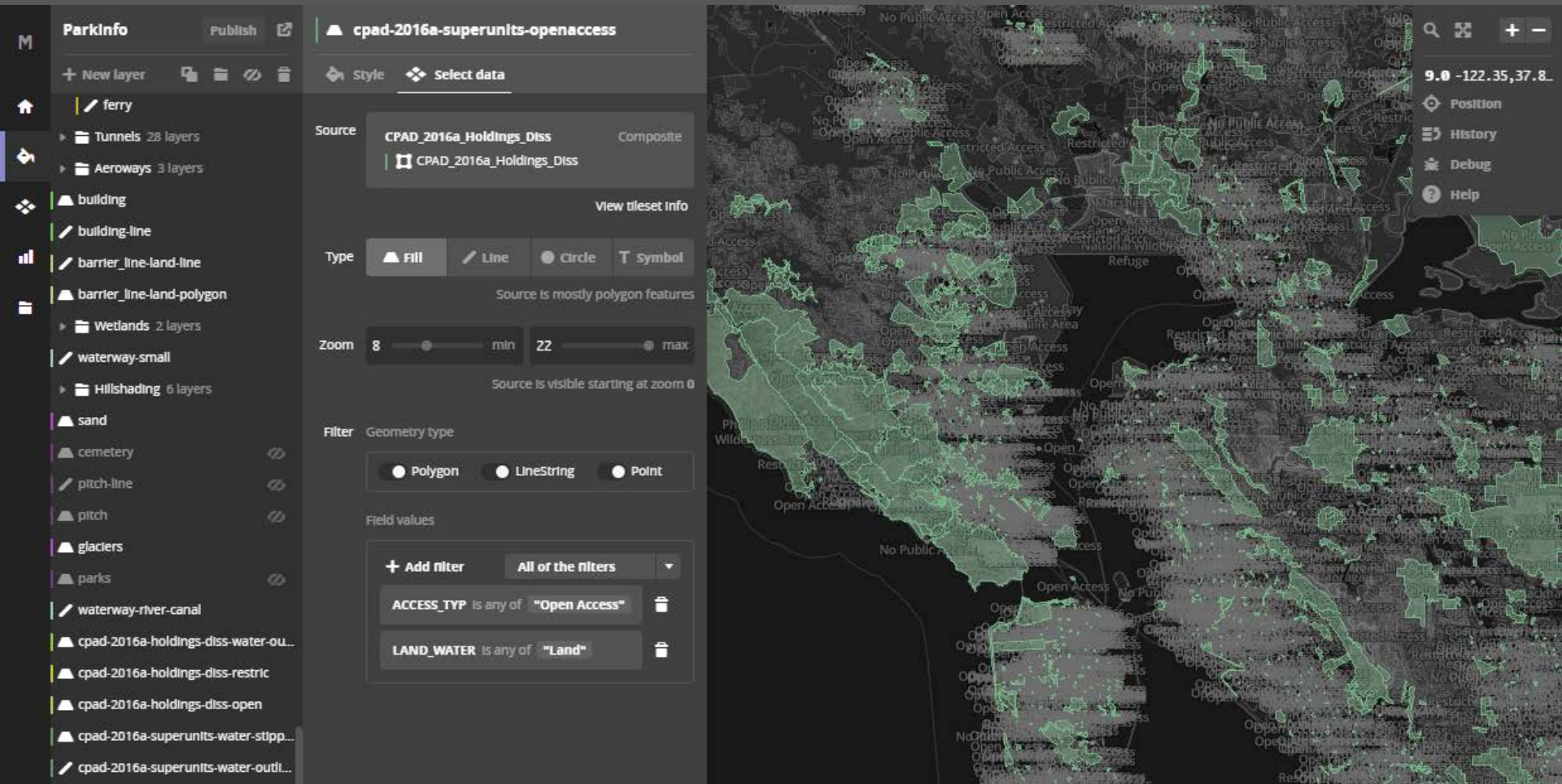
Web – (Extending My Maps applications…)



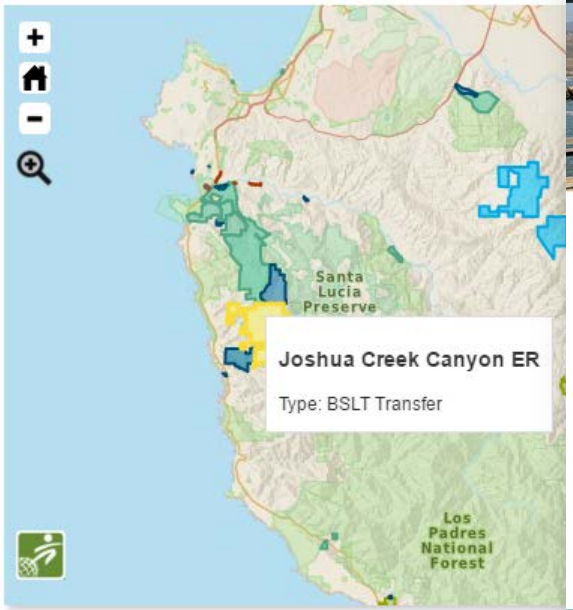




Web – Beyond a Street Map and Pushpins



Web – Open Source Property Finder

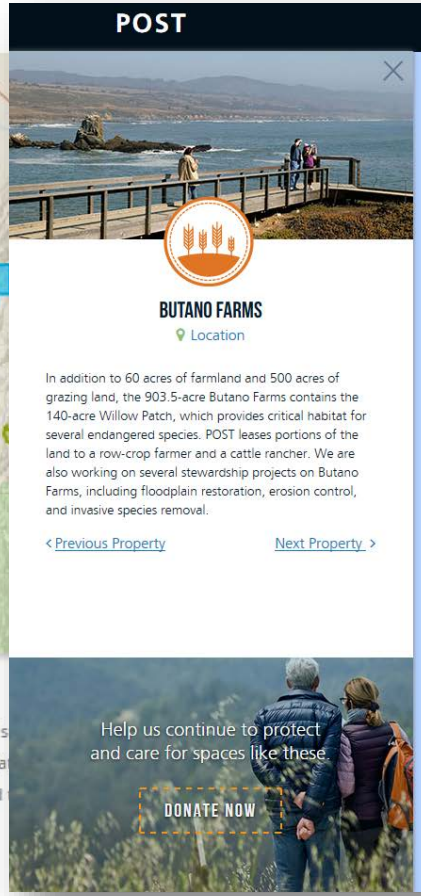


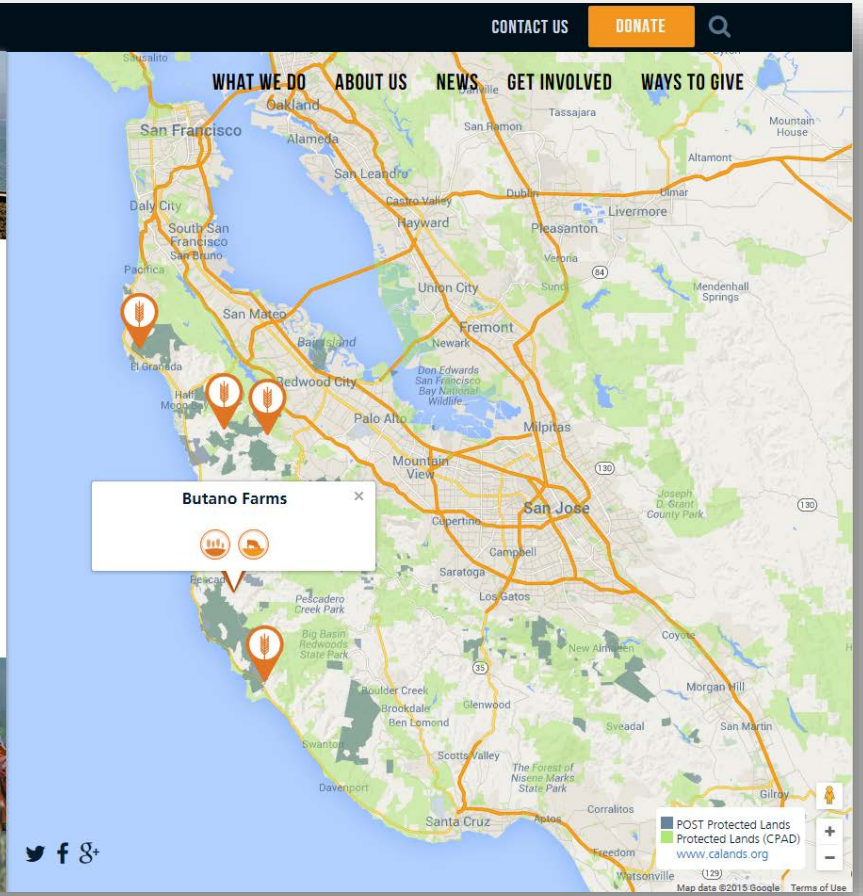
BSLT Lands - Conserved lands owned by BSLT

BSLT Assists - Conserved lands acquired by other entities with BSLT s

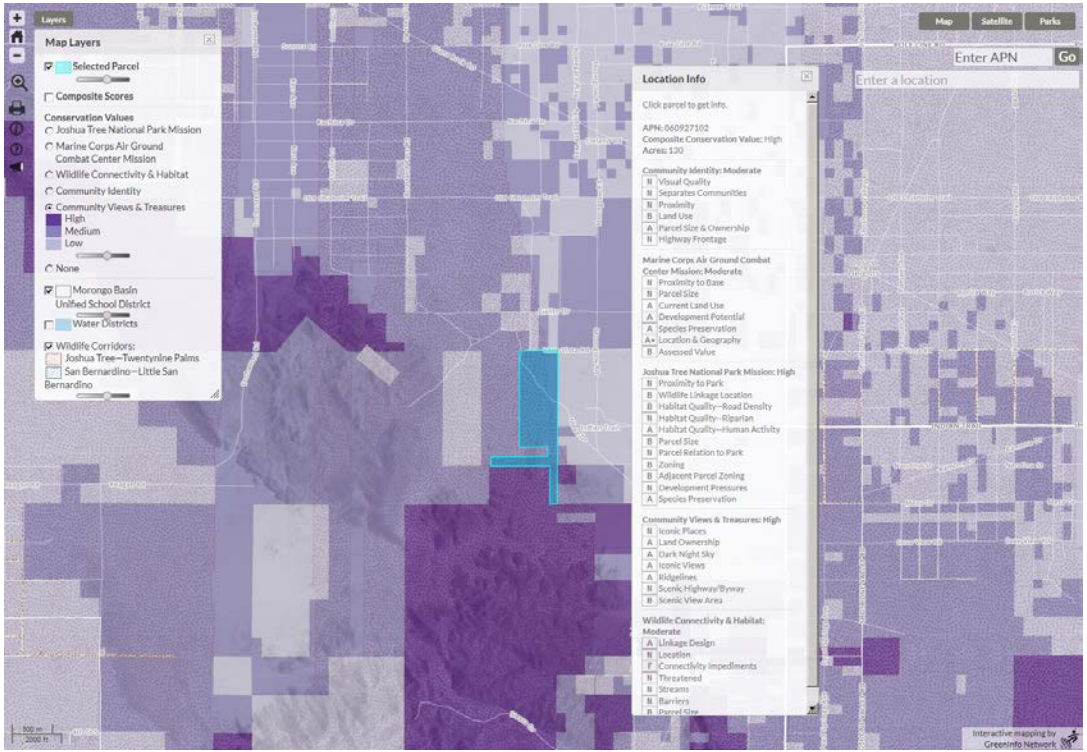
Conservation Easements - Private lands conserved through conserva

BSLT Transfers - Conserved lands acquired by BSLT, sold or donated





Web – Open Source data explorer, customizations



- Layer selection
- Transparency adjustment
- (Tool tips for more info)
- Popup (modal)
- Base maps
- Link sharing

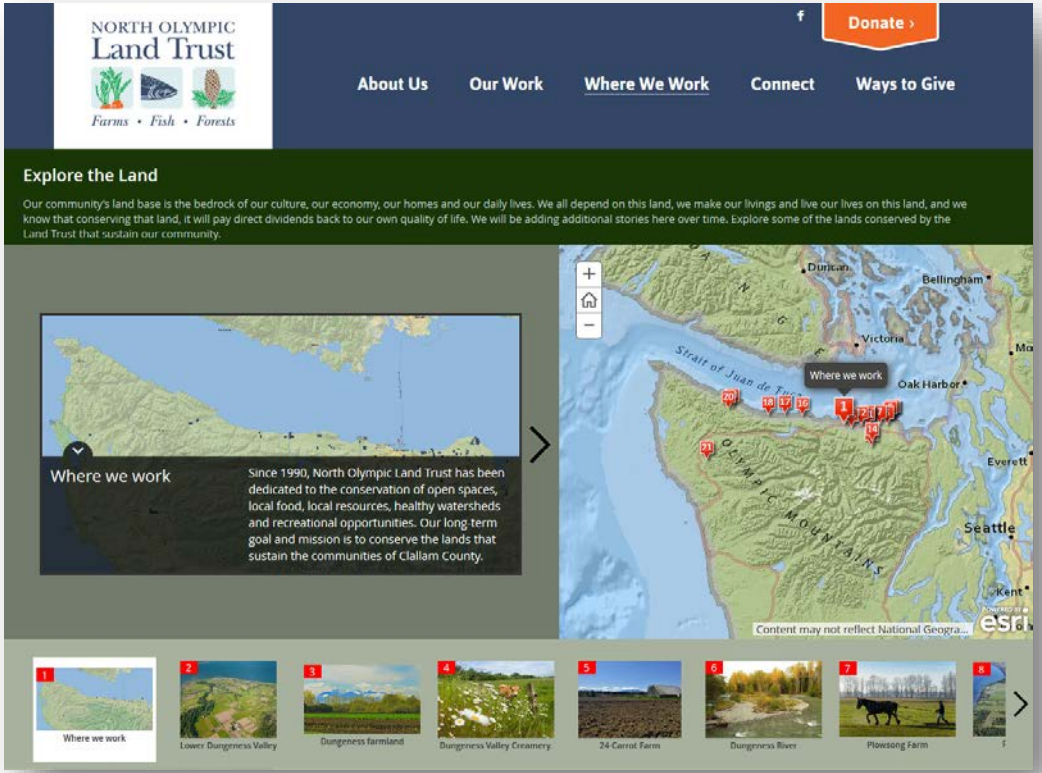
PLUS:

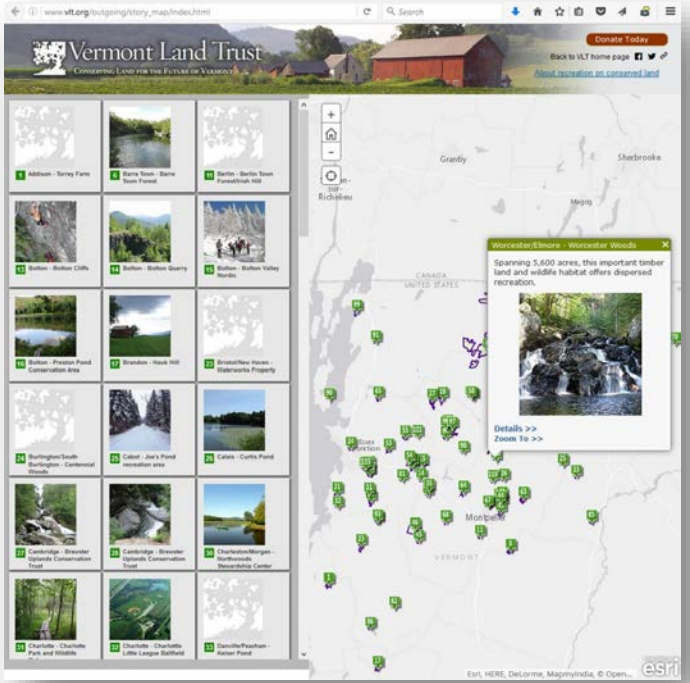
- Search for location
- Select elements to display
- Birds eye/street views

PLUS+:

- Add data (point, line, area, image)
- Place notes

Web – Story Maps (storymaps.esri.com)

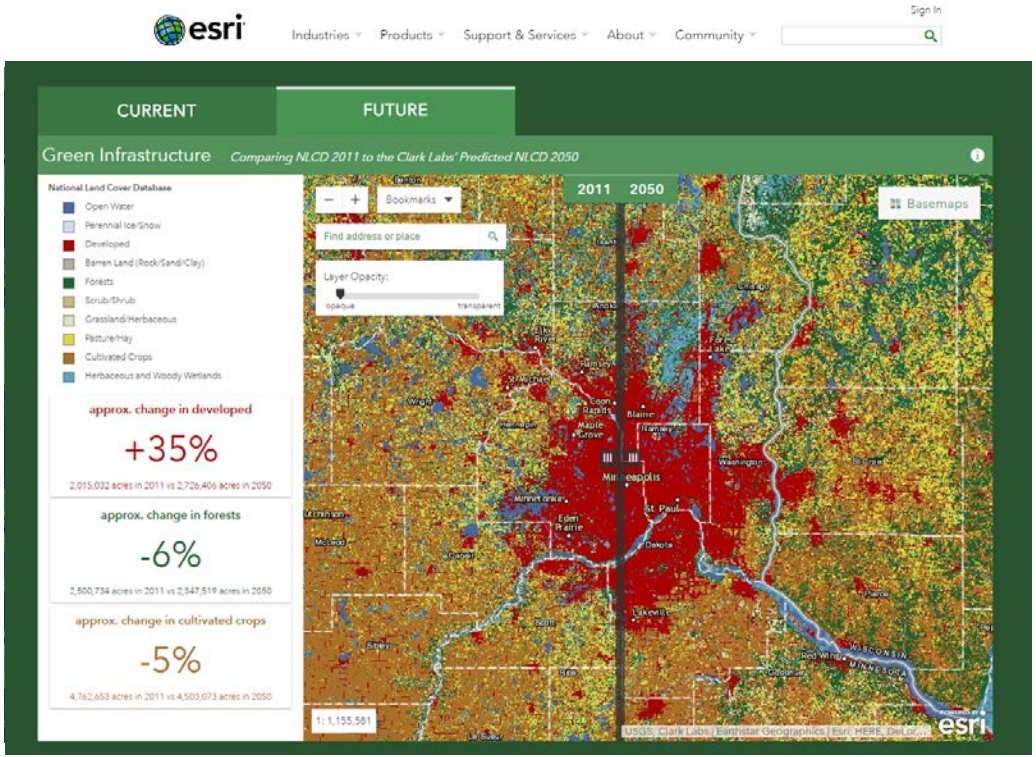


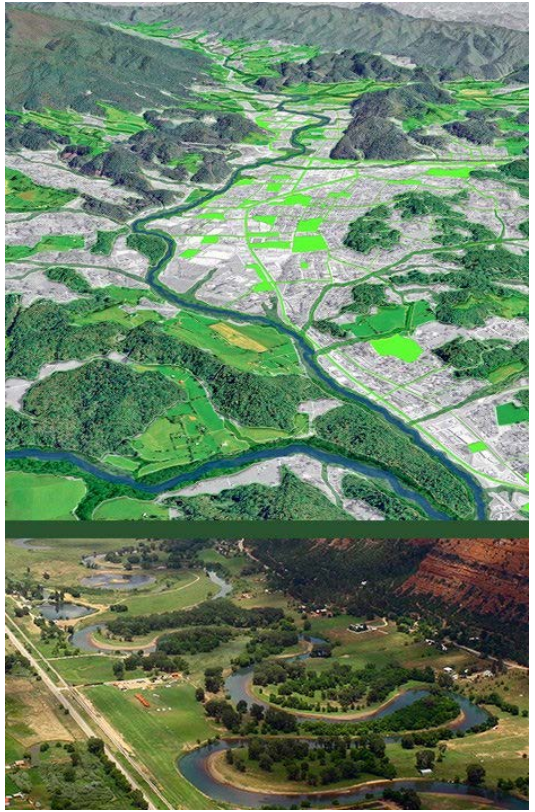


Esri Green Infrastructure project

http://arcg.is/21282GO

- www.esri.com/about-esri/greeninfrastructure

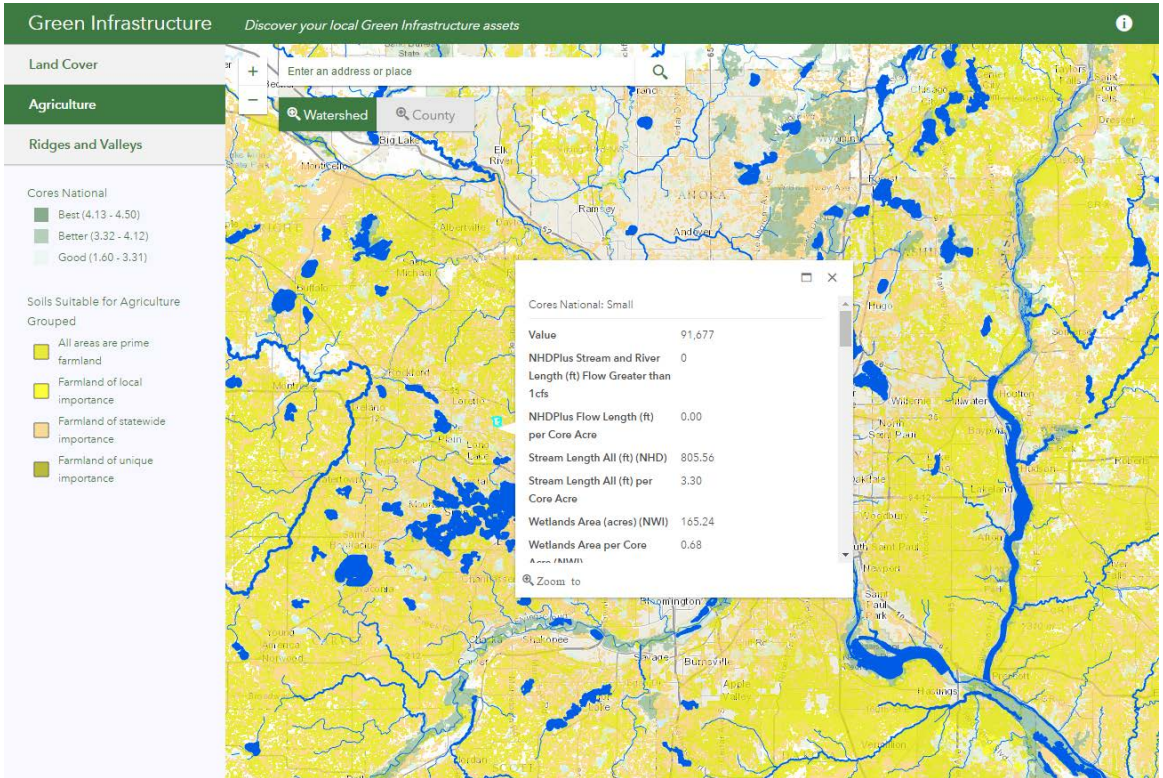




Esri Green Infrastructure project

http://arcg.is/21282GO

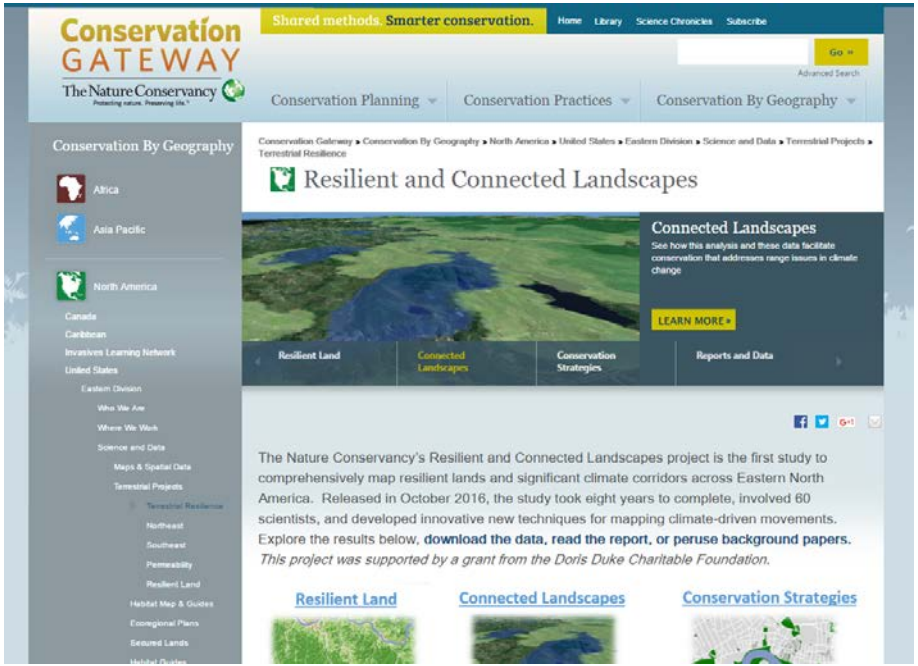
- https://green-infrastructure.esri.com/AssetFinder/index.html

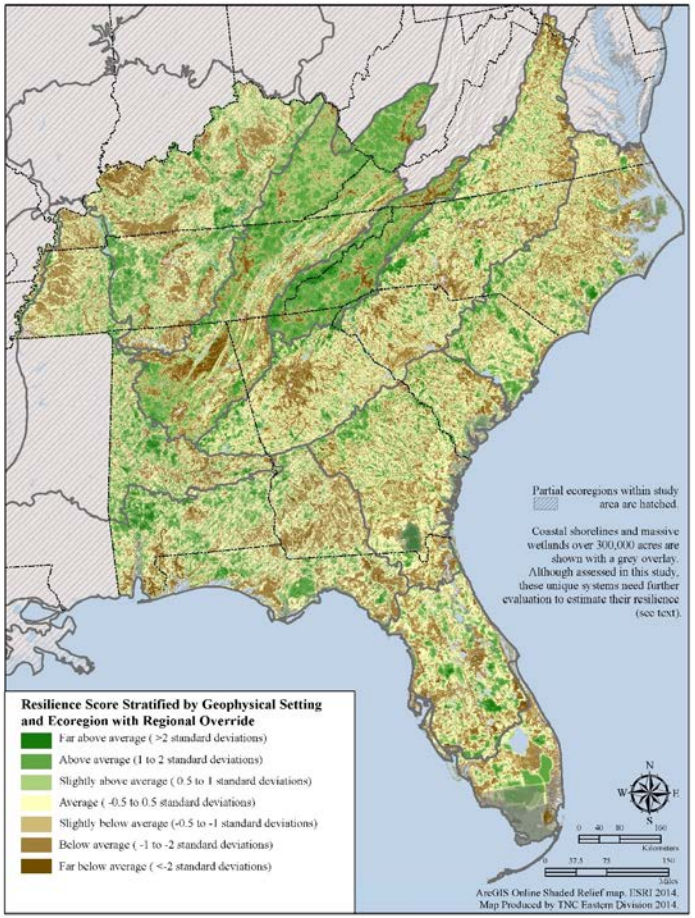


TNC Resilient Landscapes

http://arcg.is/2cEy8Qf

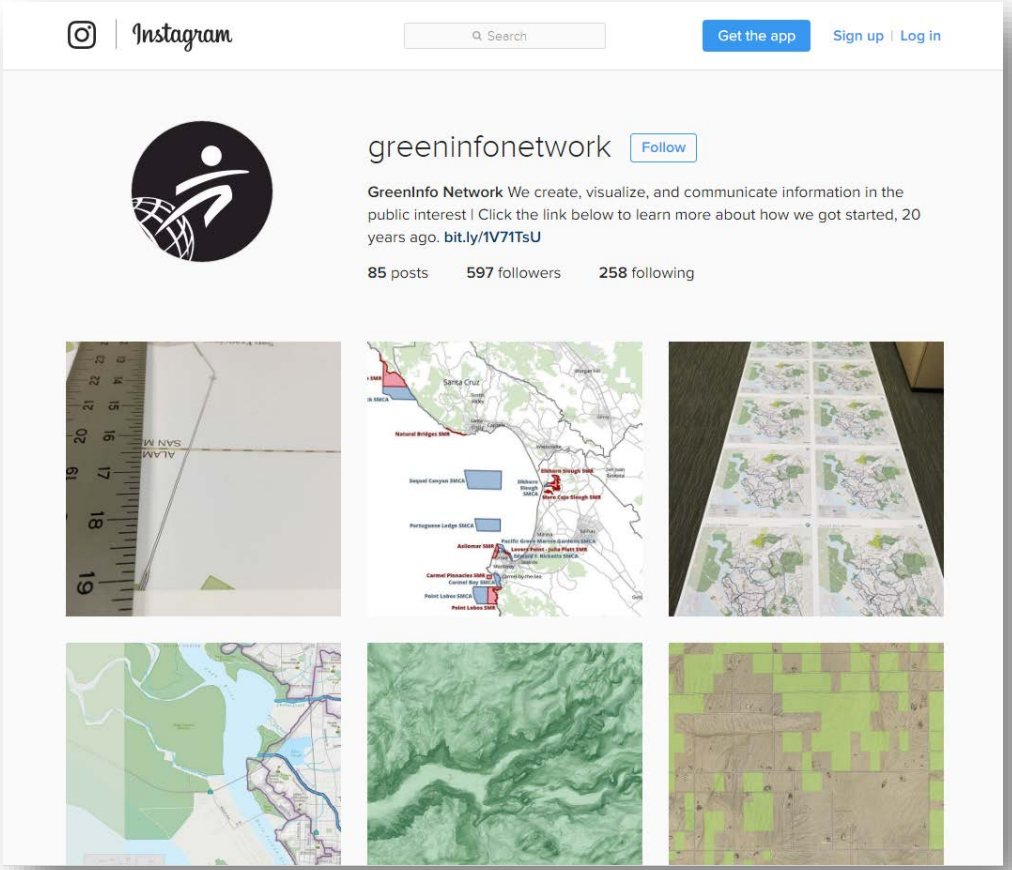
- ConservationGateway.org
- Rally presentation





GreenInfo Instagram for map lovers

www.instagram.com/greeninfonetwork/



6. Q&A

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