Organizing a Volunteer-Based GIS Committee for Conservation

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Abstract

The Sierra Club's Angeles Chapter has in the past used consultants to produce its conservation maps. In 2005 the Chapter did a pilot project to produce a comprehensive map of all open-space parcels in the Verdugo Mountains of Los Angeles. Sierra Club volunteers did most of the GIS work using ArcInfo software provided by ESRI through its conservation grants program. Consultants provided some basemap data, technical support and cartographic assistance. The result was a high-quality product at less than half the cost.

This project served as a template for future projects. The chapter has now recruited 20 volunteer members for its GIS committee and provided them with ArcView software, obtained through another conservation grant from ESRI. They are working on a wide range of projects, including vision maps of Santa Clarita, Orange County, and the proposed Los Angeles Coastal Recreation Area.

Background

The Angeles Chapter Conservation Committee has recently set up a Geographic Information Systems Committee as one of its subcommittees. The purpose of the GIS Committee is to provide mapping and other GIS services to conservation entities.

The series of events leading up to this started with the proposed Canyon Hills housing development in the Verdugo Mountains, which the Sierra Club and other organizations opposed. The process consumed many thousands of dollars and many hundreds of activist hours. During the fight, other land parcels in the Verdugos with almost as much acreage as Canyon Hills were quietly set aside as permanent open space by the City of Los Angeles and the Fond Charitable Trust. The contrast made us realize that we could use our time and money more efficiently to preserve open space with a positive vision, instead of fighting each housing development as it's proposed.

The result was the "Verdugo Mountains and San Rafael Hills Open Space Map," which is now in its third revision. It's a 36" X 60" wall map showing the open space in these mountains, with colors indicating private or public ownership. Open-space land parcels are identified on the map with numbers that refer to a separate gazetteer containing Assessor Parcel Number and ownership information. The map is being used to drive a Los Angeles City-led task force to increase public ownership of open space in the Verdugos. The task force includes representatives from the local City Neighborhood Councils, LA City Parks and Recreation, LA County, State and Federal Parks, Trust for the Public Land.

The Angeles Chapter previously produced several other maps of this sort, with volunteers providing data by marking up hardcopy maps. GreenInfo Network, a

conservation GIS consultant, input the GIS data, and designed and printed the maps. These projects produced good results, but tended to go over budget.

For the Verdugos Open Space Map we decided to try a new approach where Sierra Club volunteers would do most of the GIS computer work. We applied to ESRI, the developer of the ArcGIS software used by GreenInfo Network, and received a license for the software as a grant. We hired GreenInfo Network to supply us with some basic data and serve as our GIS mentor. We then contacted cities and public agencies to get GIS data describing public and private open space in the Verdugos and San Rafael Hills. We imported this data into ArcGIS and edited it, and emailed the draft map files to GreenInfo, who improved their visual appearance and printed them out. The result was that we got to the first-draft stage for the initial map for about half the cost of previous maps, and we developed GIS expertise within the Chapter that will reduce the cost of future maps even further.

The Chapter GIS Committee was set up to replicate this model on a larger scale. We publicized the committee, mostly through two articles in the Chapter newsletter. The result was a committee of 25 volunteers, most of them new conservation activists, most of them younger and more tech-savvy than our average conservation activist. About half of the committee members are inactive, either because their interest wasn't sustained after their initial burst of enthusiasm, or because their role was to serve as a mentor and resource to other committee members, not to actively do GIS work for the Chapter. There is also about a fifty-fifty mix of experienced GIS practitioners and novices. The experienced committee members feel proud that they can use their expertise to benefit our conservation efforts, and the novices are glad to learn this new technology.

Now we've realized that we're running the largest in-house GIS operation in the Sierra Club, and that our committee can serve as a model for other chapters.

Overview

The **ingredients** of our successful Chapter GIS program are:
- A chair who is (or becomes) knowledgeable about GIS and who is a strong recruiter and organizer
- GIS software
- GIS data
- A way to print maps
- GIS expertise, mentoring and training
- Conservation mapping projects to work on

The **sequence of events** that worked well in the Angeles Chapter was:
- Obtain the ingredients
- Choose the proper initial project, and do it with a small team, including the GIS Chair
- Publicize the committee to:
  - Recruit new committee members
  - Find new GIS projects to work on

Typical GIS Projects are:
- Full-size maps like the 36" X 50" Verdugo Mountains Open Space Map
- Smaller maps for brochures, Web pages
- Locator maps for press releases, etc.
- Interactive Web maps that provide a map-based index to data such as trailheads and trails, conservation projects in an area, superfund sites, etc.

Funding

The Angeles Chapter has a conservation grants program which has contributed $10,000 to our GIS efforts to date in two grants: $6,000 for the initial Verdugo Mountains Open Space map, and another $4,000 to fund the general activities of the GIS Committee.

We spent $1,000 of this on ESRI software – in our initial grant request from them we got ArcInfo software in exchange for $1,000.

Most of the rest of the grant money has gone to GreenInfo Network, our GIS consultant, who have provided mentoring, GIS data, map printing, and have helped make some of our bigger maps look much nicer, visually. For us it was money well spent.

We also spent some money on GIS data that we couldn't obtain free of charge.

The GIS Chair

I turned out to be a good GIS Chair because I have always been very interested in maps, have a good technical background (I'm a software architect by profession) and am a strong leader and good manager of volunteers. These are all important components of the GIS Committee leadership.

GIS Software

ESRI is the leading developer of GIS software; they have a conservation grants program that has given us 14 copies of the ArcGIS Desktop software for our committee members to install on their own PCs. The software requires a fairly high-end Windows PC; there is no Mac or linux version available. The other members of our GIS Committee have their own copies of the ArcGIS software or can access it at work or school.

The ArcGIS product line is very complicated; they have several levels of desktop software and many "extensions" to these products, some of which were developed by third parties. Their product line also includes server products such as Internet map servers (ArcIMS) and spatial database servers (ArcSDE). We have not used these products in our chapter, but we might be able to get grants to install these products on a couple of servers collocated with the national Web site at some point. ArcSDE would allow remote collaboration on the same GIS datasets, and ArcIMS would allow us to develop interactive custom Internet mapping applications. ESRI also has some mapping-related Web Services (see www.arcwebservices.com).

In the Angeles Chapter we have standardized on the ArcGIS desktop software.

- **First Level:** My policy has been to send a 180-day free demo version of the product (which comes with a nice tutorial book) to new committee members. I do a little phone screen when they volunteer and send them the book/software combination. ESRI has given us copies of this product, which is also available from Amazon.com for under $40 (*Getting to Know ArcGIS Desktop, Second Edition Updated for ArcGIS 9*).
- **Second Level:** When the 180-day license is about to expire, if a committee member is still active, I send a copy of the basic ArcView software. I require the committee member to sign a short letter agreement, which says that the software is the property of the Sierra Club, must not be used for commercial purposes, and must be uninstalled and returned upon request. Because the Spatial Analyst extension is so useful, I usually request it with ArcView licenses.

Google Earth & Google Maps are much easier to jump in and use than ArcGIS. There are two modes of Google Earth:
- The downloadable-client version (earth.google.com). This is an amazing application. The easiest way to generate custom content for it is to generate a .kml file and have the user download it and open it using the Google Earth application installed on the user's PC. Points, paths, areas and views may be defined in the kml file. A description of KML capabilities is online at http://earth.google.com/kml/kml_intro.html.
- The Web-based version. This makes it fairly easy to create Web pages with custom maps showing marked points. These can have pop-up windows attached to them that explain the points and contain links to other contents. I did a mock-up demo of the top level of a Verdugo Mountains Trail Guide at http://www.angelesgis.org/maps/verdugotrails.html. The Web pages are created using javascript that calls a javascript library developed by Google. It's documented at http://www.google.com/apis/maps/. This is the quickest way to do an interactive map Web page. It's pretty easy to use ArcGIS software to generate the latitude & longitude data for the map points.

A wide range of **open-source GIS software** is available free of charge for Windows and linux. A lot of it is described in *Web Mapping Illustrated* by Tyler Mitchell, published by O'Reilly:
- PostGIS, a GIS-enabled database appears to be a reasonable alternative to ESRI's ArcSDE. It's available at http://postgis.refractions.net.
- MapServer, an Internet map server, appears to be a reasonable alternative to ESRI's ArcIMS. It's available from http://mapserver.gis.umn.edu/.
- FWTools is a collection of GIS utilities for viewing, projecting, reading GIS data. It's available at http://fwtools.maptools.org/.

GIS Data

GIS data is also a necessity, and a lot of it will be specific to the particular region and project. There are, broadly speaking, two types of data:

- **Basemap data**, which will portray standard features of maps' geographical areas, including (for example): aerial photos, elevation coloring and shaded relief, highways, roads and streets, cities, counties and other political boundaries, zipcode areas, rivers and lakes, etc. Basemap data is fairly easy to come by.
- **Data specific to particular projects**. This depends heavily on the map's purpose, but it can include land parcel data, wildlife sightings and corridors, land cover such as vegetation, land-use data, parks, political (e.g. congressional) districts, etc.

Here are some potential sources:

- The ESRI ArcView software (the permanently-licensed version, not the 180-day demo version) comes with a fairly comprehensive collection of international and national-level basemap data, including states, counties, populated places, zip codes, roads and highways, lakes and rivers, etc. It also includes low-resolution aerial photos and digital elevation models. I have an extra copy of this package which I'd be glad to send to you.
- GreenInfo Network has supplied us with a lot of data. They or other GIS consultants can often supply data or provide information on data sources.
- Counties: They have a lot of GIS data available, especially land-parcel (cadastral) data. A recent opinion of the California State Attorney General declared that they are obligated, under the California Public Records Law, to provide this data to the public in exchange for the cost of making the physical copy. Los Angeles County has just complied by sending us a shape file with 2.4 million land parcels. We're working on getting Orange Countie to comply.
- Public agencies and other environmental non-profits. There's a lot of data available from the USGS on the Internet, and many other government agencies at all levels as well as environmental non-profits have GIS departments that are willing to share data. Building a network of such sources has been one of the goals of our committee.

Map Printing

GreenInfo Network prints our large maps for $20 apiece (for a map up to 3' X 5'). This is a much better price than is offered by the local FedEx/Kinko's, which charges $10/square foot or $150 for a 3' X 5' map. GreenInfo gets better quality by using ESRI's direct printing software instead of printing from a .pdf which is exported from ArcMap.

Smaller maps can be printed on a standard color inkjet or laser printer. It's possible to tile-print maps, but this is too labor intensive for maps larger than 11" X 17".

GIS Expertise, Mentoring and Training

The ***Getting to Know ArcGIS Desktop* book** that comes with the 180-day demo version of the ESRI software is a good tutorial, but it's fairly long and doesn't focus on the subset of ArcGIS features that are needed for creating conservation maps.

The ESRI ArcGIS Desktop software has many features and is extremely powerful, which makes it difficult to learn. The biggest problems I had as a new user were figuring out what subset of features I needed, and deciding on data formats (shape files vs. geodatabases, which projection?). A two-hour session with GreenInfo Network started me out on the right path. I have, in turn, worked in front of a computer with some members of the Angeles Chapter GIS Committee, showing them the subset of ArcGIS features they would need in order to start on their projects. We now have enough GIS experts on our committee that we could provide this mentoring without outside resources. One way or another, having a **local mentor** is essential.

Some of the grants I've gotten from ESRI have covered free Web training. ESRI also does hands-on training in Redlands, for which they will give grants. See http://campus.esri.com.

The First Mapping Project

We picked a fairly complicated first mapping project: a map that shows all the parcels of open space in the Verdugo Mountains, color-coded as to their ownership (green for public, pink for private). It also shows trails, highways, aerials, elevation, rivers and lakes, cities, and watersheds. This worked out OK because we had a volunteer (me) who was driven to get it done. An image of the map is available on our Angeles Chapter GIS Committee library page: http://www.angeles.sierraclub.org/gis/lib/index.html.

Most conservation organizations will want to start with a simpler project. It should be one that will provide immediate value, but which is within reach, given the level of GIS skill available.

Recruiting GIS Committee Members

We recruited committee members partly through personal contact (e.g. making presentations about the committee at group meetings), and partly by running stories about the committee in the chapter newsletter. Over a period of several months we have recruited 25 members. Half of these are inactive, and a few others provide mentoring only – they don't work on our projects. The committee members we've recruited are mostly new conservation activists, and they're a decade younger, on average, than our other conservation activists. Some of them are becoming interested in doing conservation work in addition to GIS work.

A key for recruiting is to emphasize the opportunity to learn GIS skills, or to use existing GIS skills for conservation purposes. In general, volunteers would rather do volunteer tasks that require their expertise than general volunteer work. GIS training is fairly common among younger graduates of environmental or geographical college programs.

Organization

We are on the lookout for new conservation GIS mapping projects that will benefit our chapter. We almost always have a "client" for them – a conservation activist who needs a map for a particular project. A list of our current projects is available at http://angeles.SierraClub.org/gis.

We originally planned to install a copy of the ArcGIS software on a computer in our chapter office, but we took a straw poll at one GIS Committee meeting and discovered that no one was interested in traveling to the central office to do GIS work for us, since we could easily get enough copies of the software to let everyone install it on computers at home. It's possible that other organizations might want to set up a central GIS computer, if the travel distances are shorter, or if some committee members don't have the high-end Windows machines required to run ArcGIS.

When a new project is proposed, it is evaluated by me or by our committee's Vice Chair (Lisa Skillett, who has a GIS certificate and a Master's degree in landscape architecture). If it seems practical and we have someone on the committee interested in working on it, we set up a meeting with that person, the client and Lisa or me. At that meeting we work out the scope of the effort and determine what additional resources (data or printing, for example) will be required. After the meeting, the GIS committee member works directly with the client.

We have a committee meeting quarterly to introduce new members to the committee and to go over all the projects.

Later Mapping Projects

After the first mapping project was completed successfully and we had organized the committee, we started on a wide range of other conservation mapping projects:

- Update of Santa Clarita Greenmap
- Update of Orange County "Open Spaces Wild Places" campaign map
- Map of Parks in the City of Los Angeles
- Map of proposed Los Angeles Coastal Recreation Area
- Los Angeles County Wildlife Corridor Map
- Angeles Chapter Political Boundary Maps
- Montebello Hills Vision Map
- Pasadena Eco-Sensitive Areas Map
- Griffith Park Master Plan Vision Map

We are also working with the Sierra Club's Inner City Outings Program, which provides hikes and nature trips for disadvantaged schoolchildren, to develop ways that students can learn and use GIS for conservation projects.

Club-Wide Rollout

The Angeles Chapter's GIS has been successful enough that it caught the attention of Lisa Renstrom, the Sierra Club's President. With her help we're working to roll out our program to other chapters (the Sierra Club has 64 of them), starting with the Loma Prieta Chapter, which covers Silicon Valley.

Acknowledgements

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