



CATALOGING, MONITORING AND MANAGING INVASIVE SPECIES ON POST LANDS

PSU Geog596A – Capstone Proposal

Dale Jantzen

Dec 17, 2015

PROJECT OUTLINE AND PURPOSE

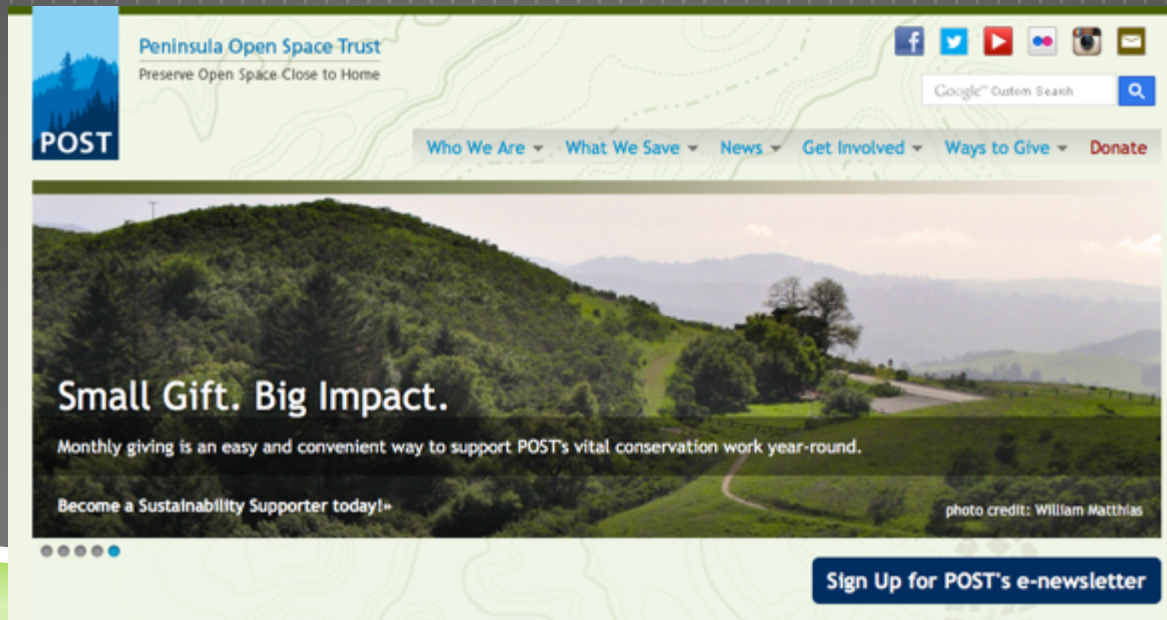
- ▶ Define a particular need within a non-profit land trust
- ▶ Design and implement a GIS solution
 - ▶ Database, mobile gathering, online viewing and desktop analysis
- ▶ Document and handoff the system
- ▶ Goals
 - ▶ Add operational value to the land trust's normal processes
 - ▶ Add ecological value to the land trust's properties
 - ▶ Provide this narrow test case as a model for ongoing best practices and future projects

AGENDA

- ▶ POST
 - ▶ Overview
 - ▶ GIS capacity vs needs
 - ▶ How can a capstone project help?
 - ▶ Stewardship
 - ▶ Invasive Plant Management
 - ▶ San Vicente Redwoods
- ▶ GIS to Support Invasive Plant Management Efforts
 - ▶ Project description
 - ▶ Requirements
 - ▶ Current status and test screens
 - ▶ Schedule
- ▶ Sources and Resources
- ▶ Questions?

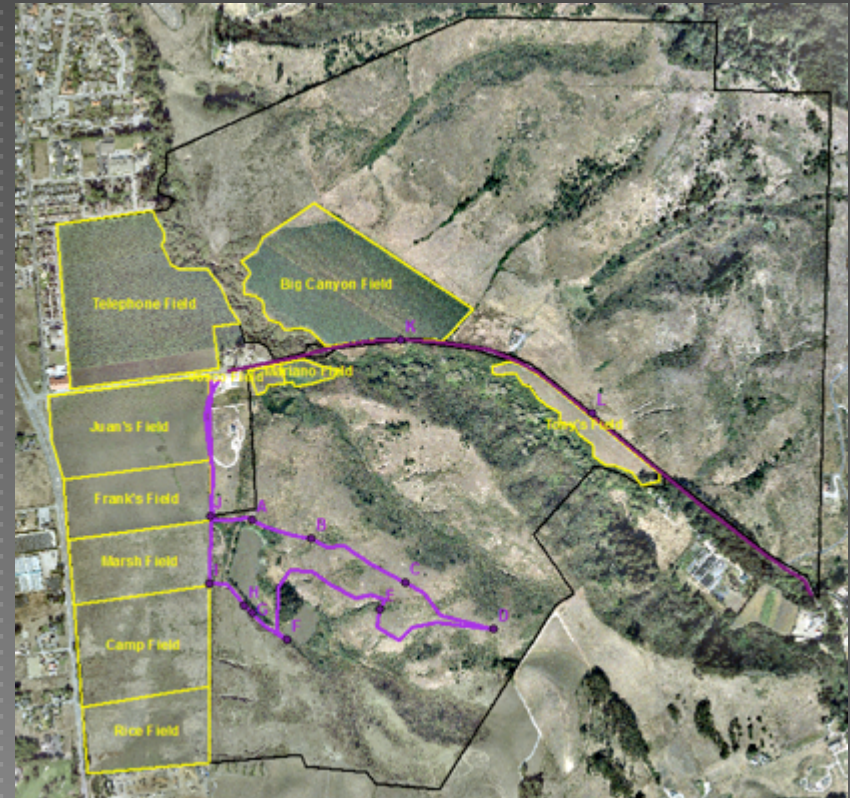
POST OVERVIEW

- ▶ Peninsula Open Space Trust (POST)
- ▶ Not for profit land trust founded 1977
- ▶ Has permanently protected over 75,000 acres around Silicon Valley
- ▶ Open Space, Farmland and Parkland
- ▶ Property ownership, transfers and conservation easements
- ▶ <http://www.openspacetrust.org/>



LAND TRUST GIS APPLICATIONS

- ▶ Property descriptions and cadastral needs
- ▶ Map plant communities, wildlife habitat, wetlands and streams
- ▶ Outbound communications
 - ▶ Success and scale to donors and the public
 - ▶ Support handoff to permanent protection agencies
 - ▶ Share data with partners, contractors and volunteers
- ▶ Support monitoring of conservation easements
 - ▶ Boundaries, structures, features, photo points
 - ▶ Annual monitoring and recording visits
 - ▶ Contractual obligations
- ▶ Support stewardship on owned properties
 - ▶ Preservation, restoration and economics

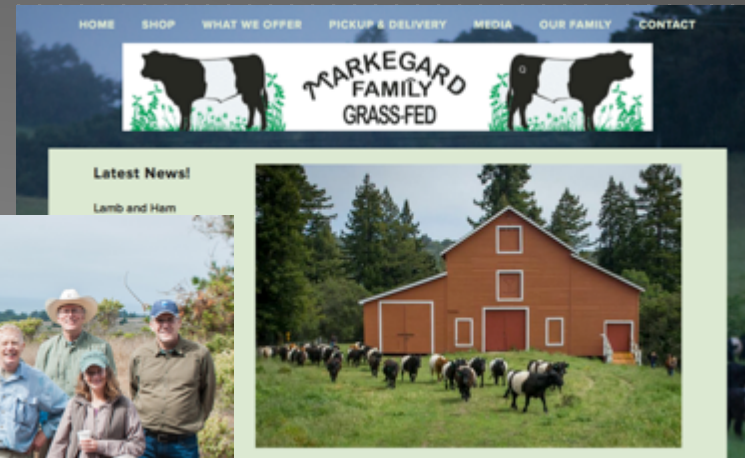


POST GIS CAPACITY

- ▶ **POST GIS Capabilities**
 - ▶ One recent full time plus PMs
 - ▶ ESRI non-profit customer
 - ▶ Five ArcGIS seats
- ▶ **Additional GIS Capacity**
 - ▶ SVR contract PM
 - ▶ Volunteer(s)
- ▶ **Project Budget**
 - ▶ Budget for incremental projects is TBD (but small)
 - ▶ Perhaps a few thousand dollars annually
 - ▶ ESRI seats (non-profit at \$500 annual each)
 - ▶ Other service fees (CalFlora at \$2,400 annual)
 - ▶ Mobile devices

POST STEWARDSHIP

- ▶ Invasive Exotic Plant Control
- ▶ Easement Monitoring
- ▶ Conservation Grazing, Forestry
- ▶ Erosion Control
- ▶ Prescribed Fire
- ▶ Planning and Implementation
- ▶ POST Staff
- ▶ Partners
- ▶ Contractors
- ▶ Volunteers



INVASIVE EXOTIC PLANT CONTROL

- ▶ Prevention
- ▶ Detection (Survey)
- ▶ Management
- ▶ Restoration
- ▶ Monitor (Survey)



SAN VICENTE REDWOODS

- ▶ History – CEMEX, forestry
- ▶ >8,500 acres
- ▶ POST plus
- ▶ Management Plan
 - ▶ Ecological health
 - ▶ Access
 - ▶ Economic viability
- ▶ Preservation Reserves, Restoration Reserves, Working Forest



SAN VICENTE REDWOODS



MEMORANDUM

DATE July 31, 2014
TO Bryan Largay
Land Trust of Santa Cruz County
FROM Isby Swick Fleischmann
SUBJECT Draft Concept Plan and Management Structure

Plan goals and the Draft Concept Plan for San Vicente Redwoods are listed below. The Public Access Plan is being developed based on this memorandum.

GOALS

Preliminary Goals are identified below.

PUBLIC ACCESS (GENERAL)

- » Goal 1: Provide sustainable access consistent with the county's public access plan.
- » Goal 2: Provide safe public access.
- » Goal 3: Engage a variety of partners in public access management.
- » Goal 4: Minimize the impact on the security, privacy, and aesthetics of the property, while achieving the other goals of the plan.

RECREATION

- » Goal 5: Provide opportunities for passive recreation.
- » Goal 6: Provide for public staging/parking.
- » Goal 7: Provide a trail network that supports multiple uses.
- » Goal 8: Promote regional trail connections.
- » Goal 9: Provide amenities that support passive recreation.

RESEARCH AND EDUCATION

- » Goal 10: Provide the opportunity for partners to conduct research and activities at San Vicente Redwoods, establish a research station.
- » Goal 11: Utilize research as a management tool.
- » Goal 12: Promote collaborative research.



PROJECT DESCRIPTION

- ▶ Cataloging, Monitoring and Managing Invasive Plant Species
- ▶ Document the process for replication
- ▶ Scope
 - ▶ First property San Vicente Redwoods
 - ▶ Initial species subset
 - ▶ Broom, Pampas Grass, Clematis
- ▶ Existing data sets
 - ▶ Property boundaries and features
 - ▶ Streams, roads, gates, quarries, tunnels
 - ▶ Infestations (shape files)
 - ▶ Base map, DEM, photography
 - ▶ Treatment history

PROJECT DESCRIPTION

▶ Phase One

- ▶ Requirements gathering
- ▶ Search and trial
- ▶ Architecture selection

▶ Phase Two

- ▶ DB design and implementation
- ▶ Toolset integration
- ▶ Initialization with existing and test data
- ▶ Sample analytics

▶ Phase Three

- ▶ Functional testing
- ▶ Process docs, User Guides, training
- ▶ Handoff and feedback



FUNCTIONAL REQUIREMENTS

- ▶ Flexible but controlled data sharing
 - ▶ Scale to multiple properties
 - ▶ Multiple users including partners
 - ▶ In-field observations (mobile data collection device)
 - ▶ Identify infested areas with species, spatial and temporal data
 - ▶ Record treatment/management efforts
 - ▶ Upload data
 - ▶ Test, verify and edit data
 - ▶ Sort and view data spatially
- 

FUNCTIONAL REQUIREMENTS

- ▶ Data analysis
- ▶ Export data as required
- ▶ Sample reports
 - ▶ Map by specific species
 - ▶ Map species by specific location, area
 - ▶ Map treatment areas, effort and supplies
 - ▶ Map infestation(s) over time
- ▶ Future extensions
 - ▶ Add native plants of interest
 - ▶ Add pristine areas, restoration areas, working forest areas
 - ▶ Automate prioritization process



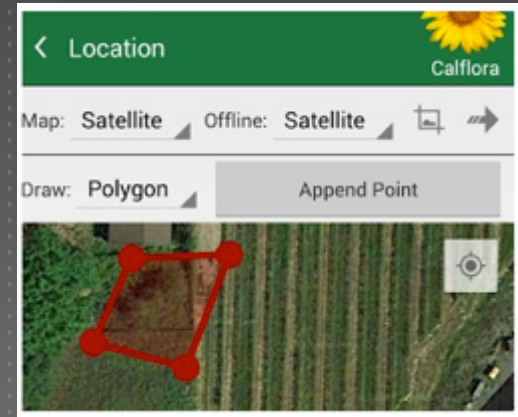
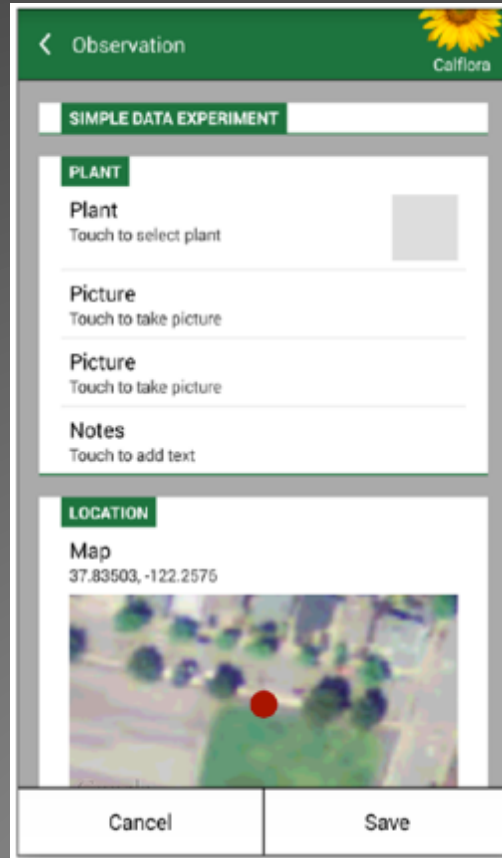
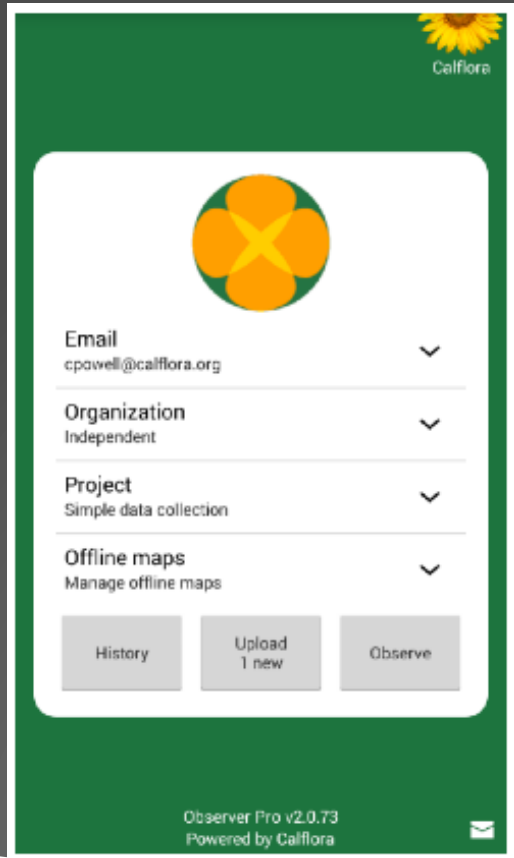
SUPPORT AND TECHNICAL REQUIREMENTS

- ▶ Fit into existing GIS environments and budget
- ▶ Utilize standards where possible
- ▶ Mobile, desktop and online environments
- ▶ Varied user experience (experts to neophytes)
- ▶ Varied user loyalties (POST, partners, individuals, systems)
- ▶ Training and documentation
- ▶ User problem resolution
- ▶ Ongoing development and enhancements

CURRENT STATUS

- ▶ Requirements gathering
 - ▶ Stakeholder engagement
 - ▶ Specification document in progress
- ▶ Literature search/industry search
- ▶ Architecture considerations
 - ▶ CalFlora Weed Manager field testing ongoing
 - ▶ Mobile data collection app
 - ▶ Large database of California invasive species
 - ▶ Online viewer, maps and tables
 - ▶ Data export for in-house analysis
 - ▶ ESRI ArcGIS and Collector field testing ongoing
 - ▶ ESRI Collector – build your own app
 - ▶ ArcGIS online for viewing
 - ▶ Seamless data export for desktop analysis

CALFLORA OBSERVER PRO SAMPLES



Images from the CalFlora
Observer Pro User Guide

CALFLORA VIEWER SAMPLE SCREEN

Calflora Observation Hotline

TOOLS Map MAP LAYERS

36.7500, -119.7800

Scientific Name anywhere

Plant Status Common Name in map area

Observer Plant List

Group

OTHER SOURCES records with photos

Columns Order by

ID	Plant	Photo	Observer	Source	Location Description	Date	County
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Image from the Calflora web page

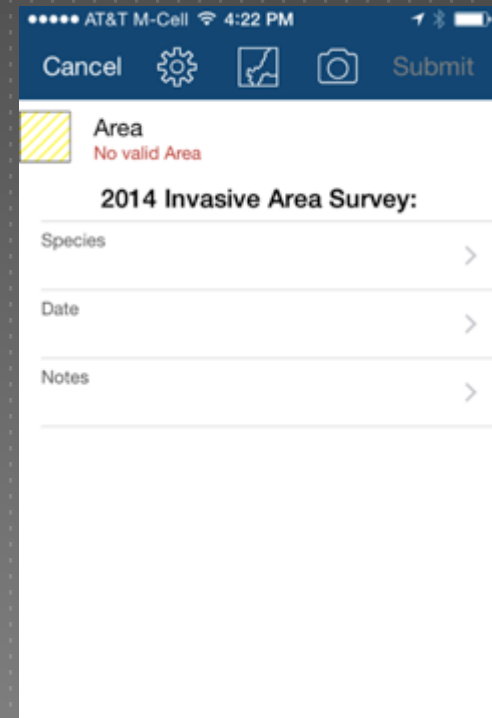
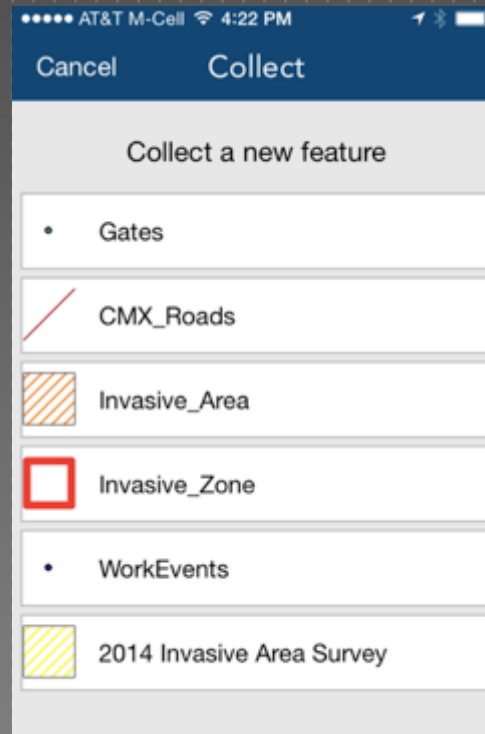
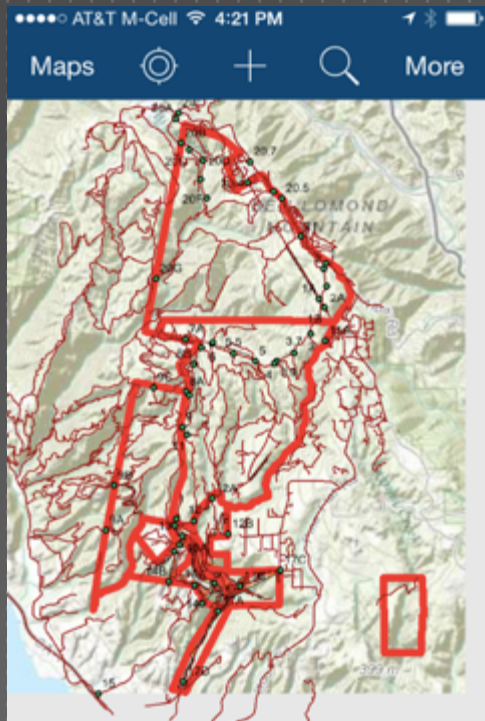
CALFLORA EXPORT SAMPLE

The screenshot displays the CalFlora Group Observations web interface. At the top, there is a navigation bar with the CalFlora logo, the text "Group Observations", and user information "Dale Jantzen" and "EDIT - LOGOUT". Below the navigation bar, there are search filters for "Scientific Name", "Plant Status" (set to "any"), "Common Name", "Plant List" (set to "none"), "Access by others" (set to "any"), "Date After", "Date Before", "Observer", and "Group" (set to "PLANT ID HELP"). There are also options for "Map Layers" (Map, Satellite) and "TOOLS". A "HELP" dropdown menu is open, showing "What Grows Here?", "DOWNLOAD RESULTS", "Format: Shapefile: polygon", and "SAVED SEARCHES". A map of California is visible on the right side of the interface. Below the filters, there is a "Column Set" (Basic Data) and "Order by" (Observation Date) section. A "SEARCH" button is present. Below the search section, there is a table with 43 records. The table has columns for ID, Access, Taxon, Common Name, Observer, Date, County, Region, Elevation meters, Location Description, Latitude, and Longitude. The first four records are shown in the table.

ID	Access	Taxon	Common Name	Observer	Date	County	Region	Elevation meters	Location Description	Latitude	Longitude
mg19636	published	Aesculus californica	Buckeye	Cynthia Powell	2015-11-11 09:42:36.0	Contra Costa			Tilden Park	37.9135928	-122.2700614
mg19538	unpublished	Washingtonia filifera	California fan palm	Erika Presley	2015-10-28 14:55:34.0	San Diego				32.7323486	-117.1486893
mg19522	unpublished	Chamaesyce maculata	Spotted spurge	Rick Austin	2015-10-28 14:51:07.0	San Diego				32.7318396	-117.1485031
mg18581	published	Salix lasiandra	Pacific willow	John Malpas	2015-09-13 09:26:06.0	Mendocino		8	Just off Little River beach	39.274516	-123.7937093

Image from the CalFlora web page

ESRI COLLECTOR SAMPLE SCREENS



ESRI COLLECTOR SERVICES

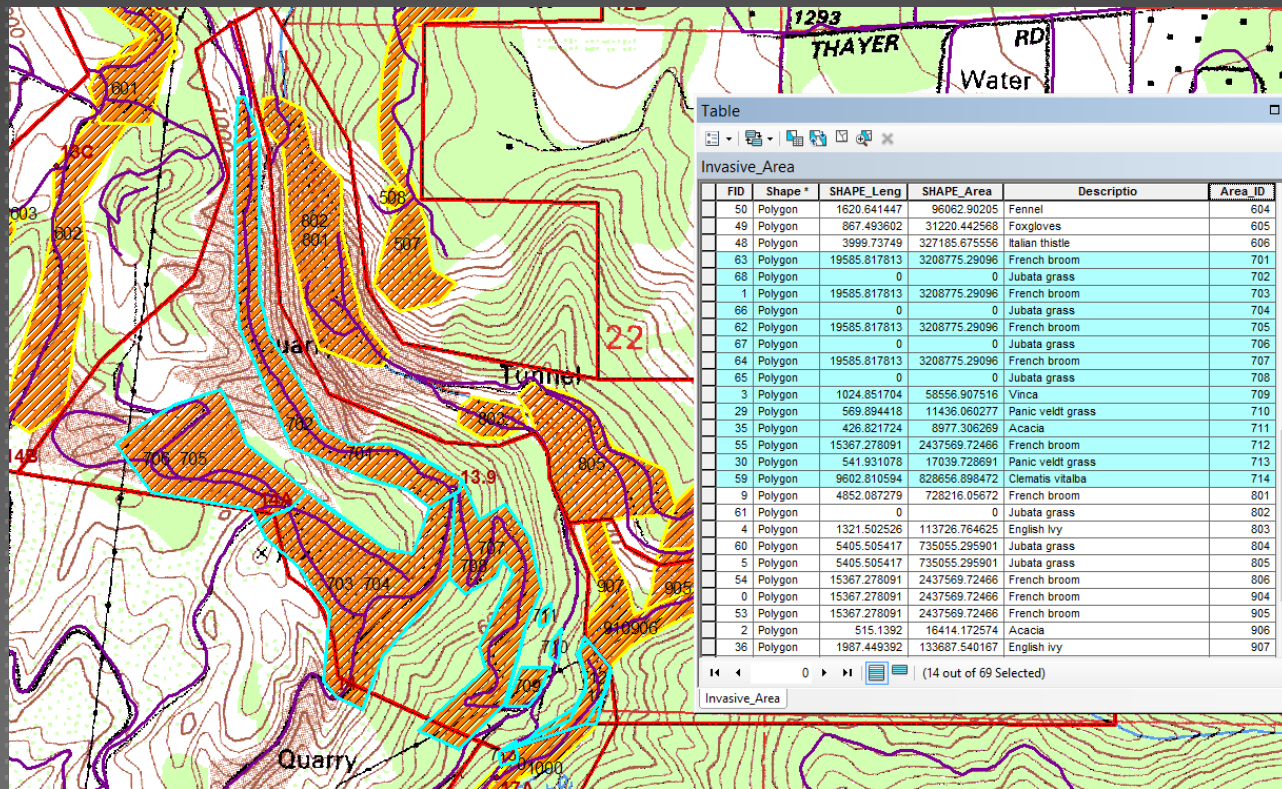
The screenshot displays the Esri Collector Services web interface for a map titled "SV_Collector_Map_Aug6". The interface includes a top navigation bar with options like "HOME", "NEW MAP", and "CREATE PRESENTATION". Below this is a toolbar with icons for "Details", "Add", "Edit", "Basemap", "Save", "Share", "Print", "Directions", "Measure", and "Bookmarks". A search bar is located on the right side of the toolbar.

On the left side, there is a "Contents" panel with a list of layers, all of which are checked:

- SV Collector Service Aug6 - Gates
- SV Collector Service Aug6 - CMX Roads
- SV Collector Service Aug6 - Invasive Area
- SV Collector Service Aug6 - Invasive Zone
- SV Collector Service Aug6 - WorkEvents
- SV Collector Service Aug6 - 2014 Invasive Area Survey
- Topographic

The main map area shows a network of roads, with a prominent red line representing a collector service route. Several points are marked on the map with labels 12, 13, and 13B. A scale bar at the bottom left indicates distances up to 200 feet. The Esri logo and copyright information are visible in the bottom right corner.

EXISTING INFESTATION DATA



EXISTING TREATMENT DATA

Property/Location	Work Event ID	Work Date	Volunteer /Staff Name	GPS Location (UTM)	Location Qualifier	Gate Number	Nadia Area Number	2014 Zone Number	2014 Area Number	Invasive or Activity	Field Hours Worked	Roundup Gallons	Non-Field Hours Worked	Methods	Percent Complete	Pass
San Vicente Redwoods	6	5/18/12		10 S 0572446 4103627		11		3	303	French Broom	3.00	0		pull		
San Vicente Redwoods	7	5/30/12		10 S 0572697 4101831		11.1		3	NONE	French Broom	6.00	0		pull		
San Vicente Redwoods	8	5/30/12		10 S 0572649 4102224		11.2		3	NONE	French Broom	6.00	6		pull/spray		
San Vicente Redwoods	9	5/30/12		10 S 0572679 4102304		11.3		3	NONE	Jubata Grass	0.90	2		spray		
San Vicente Redwoods	10	5/30/12		10 S 0572679 4102304		11.3		3	NONE	French Broom	2.00	0		pull		
San Vicente Redwoods	11	5/30/12		10 S 0572679 4102506		11.4		3	NONE	French Broom	0.50	4		spray		
San Vicente Redwoods	12	5/30/12		10 S 0572636 4101662		11.5		3	NONE	French Broom	14.00	30		spray		
San Vicente Redwoods	13	5/30/12				12	16	5	501	French Broom	7.00	26		spray		
San Vicente Redwoods	14	6/6/12		10 S 0572260 4101612		12.75		6	NONE	French broom	12.00	13		pull/spray		
San Vicente Redwoods	15	6/6/12		10 S 0572260 4101612		12.75		6	NONE	Jubata Grass	0.50	2		spray		
San Vicente Redwoods	16	6/6/12		10 S 0572370 4101202		13		6	601	French broom	8.75	0		pull		
San Vicente Redwoods	17	6/6/12		10 S 0572371 4101319		13.1		6	NONE	French broom	8.75	0		pull		
San Vicente Redwoods	18	6/22/12		10 S 0572636 4101662		11.5		3	NONE	French Broom	37.25	12.5		pull/spray		
San Vicente Redwoods	19	6/22/12		10 S 0572636 4101662		11.5		3	NONE	Jubata Grass	0.90	1.5		spray		
San Vicente Redwoods	20	6/22/12		10 S 0572530 4101535		12.5		3	NONE	Thistle	0.75	4		spray		
San Vicente Redwoods	21	6/22/12		10 S 0572530 4101535		12.5		3	NONE	French Broom	3.50	0		pull		
San Vicente Redwoods	22	6/22/12		10 S 0572260 4101612		12.75		3	NONE	French Broom	5.50	6		pull/spray		
San Vicente Redwoods	23	6/22/12		10 S 0572260 4101612		12.75		3	NONE	Jubata Grass	0.50	1.5		spray		
San Vicente Redwoods	24	6/27/12				11		3	303???	French Broom	15.00	18.00		pull/spray		
San Vicente Redwoods	25	6/27/12		10 S 0572631 4100953		13.2		7	NONE	Thistle	1.00	2.00		spray		
San Vicente Redwoods	26	6/27/12		10 S 0572631 4100953		13.2		7	701	French Broom	6.50	20.00		spray		
San Vicente Redwoods	27	6/27/12		10 S 0572631 4100953		13.2		7	702	Jubata Grass	6.50	12.00		spray		
San Vicente Redwoods	28	6/27/12		10 S 0572631 4100953		13.2		7	NONE	Fennel	1.00	2.00		spray		
San Vicente Redwoods	29	7/6/12				11.5		3	304???	French Broom	25.00	30.00		pull/spray		
San Vicente Redwoods	30	7/11/12				14	3	7	703	French broom	30.80	118.00		spray		
San Vicente Redwoods	31	7/11/12				14	3	7	704	Jubata Grass	7.70	29.00		spray		
San Vicente Redwoods	32	7/27/12				14C	3	7	705	French Broom	33.60	180.00		spray		
San Vicente Redwoods	33	7/27/12				14C	3	7	706	Jubata Grass	6.60	26.00		spray		
San Vicente Redwoods	34	7/27/12				14C	3	7	NONE	Thistle	0.30	1.00		spray		
San Vicente Redwoods	35	7/28/12		10 S 0572752 4109609		20B		2	NONE	French Broom	2.00	0.00		pull		
San Vicente Redwoods	36	7/28/12		10 S 0572263 4107831		20E	19	2	NONE	Thistle	2.50	8.50		spray		
San Vicente Redwoods	37	9/29/12				14C	3	7	706	Jubata Grass	24.60	140.00		spray		
San Vicente Redwoods	38	9/29/12				14C	3	7	705	French Broom	6.20	35.00		spray		
San Vicente Redwoods	39	11/7/12				13C	23			French Broom	8.00	62.00		spray		
San Vicente Redwoods	40	11/7/12				14	3			French Broom	4.00	30.00		spray		
San Vicente Redwoods	41	11/7/12				13C	23			Jubata Grass	0.50	4.00		spray		
San Vicente Redwoods	42	2/22/13				14A	3			French Broom	9.50	48.00		spray		

PROJECT OUTLINE AND PURPOSE

- ▶ Define a particular need within a non-profit land trust
 - ▶ Cataloging, managing and monitoring invasive plant species
 - ▶ San Vicente Redwoods
- ▶ Design and implement a GIS solution
 - ▶ Database, mobile gathering, online viewing and desktop analysis
 - ▶ CalFlora has many of the front end required attributes
 - ▶ CalFlora can export data for analysis with POST's ESRI systems
 - ▶ Create sample reports
- ▶ Document and handoff the system
 - ▶ User Guides

SCHEDULE

- ▶ Phase One
 - ▶ Ongoing – Dec 2016
- ▶ Phase Two
 - ▶ Jan – Feb 2016
- ▶ Phase Three
 - ▶ Mar – Apr 2016
- ▶ Presentation
 - ▶ Conference TBD



SOURCES AND RESOURCES

- ▶ Big Creek Lumber <http://www.big-creek.com/>
- ▶ CalFlora – Information on wild California plants for conservation, education and appreciation <http://www.calflora.org/>
- ▶ Markegard Family Grass Fed <http://www.markegardfamily.com/>
- ▶ Peninsula Open Space Trust – preserve open space close to home <http://www.openspacetrust.org/>
- ▶ Flieschmann, I. S. – Placeworks, July 31, 2014, *Summary of the San Vicente Redwoods Public Access Plan* http://www.landtrustsantacruz.org/downloads/140805_sanvicente-accessplan.pdf
- ▶ USDA – Forest Service, No Date, *A weed Managers Guide to Remote Sensing and GIS* http://www.fs.fed.us/eng/rsac/invasivespecies/learning_main.htm
- ▶ USDA – Forest Service, 2013, *National Strategic Framework for Invasive Species Management* <http://www.fs.fed.us/publications/invasive/invasive-framework-2013.pdf>
- ▶ USDA – Forest Service, No Date, *Forest Health Protection – Mapping and Reporting* <http://foresthealth.fs.usda.gov/portal>
- ▶ USDA – Forest Service, No Date, *Field Guide – Invasive Plant Inventory, Monitoring and Mapping Protocol* http://www.wilderness.net/toolboxes/documents/invasive/FS_Inventory%26Map_Guide.pdf

- ▶ Thanks so far to...
 - ▶ Stewardship Volunteers including KellyRunyan and John Chamberlan
 - ▶ SVR PM and RPF Nadia Hamey
 - ▶ POST Stewardship Staff Daniel Olstein, Neal Sharma and Kara Caselas
 - ▶ PSU guide Douglas Millar

THANKS. QUESTIONS?



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