ARPS/CALTOPO
WHERE ON EARTH IS AMATEUR RADIO?

Timothy S. Takeuchi

W6TST

OBJECTIVES/LEVEL SET

- Inspire ham radio operators to tinker with and explore APRS & CalTopo
- I don't pretend to be a total expert or know everything
- I do believe we will all know more as we share experiences and explore features
- My focus has been on how APRS & CalTopo is essential for ARES/RACES

WHY APRS?

- Collect data and communication with digital methods over ham radio frequencies
  - Location – current and past
  - Weather
  - Messages
  - Broadcast Messages
  - Etc….

WHAT IS APRS?

- **APRS** stands for Automatic Packet Reporting System (although it is frequently also called Automatic Position Reporting System.)

- **APRS** was developed in the early 1990's by Bob Bruninga, WB4APR, for tracking and digital communications with mobile **GPS equipped** stations utilizing Amateur two-way radio

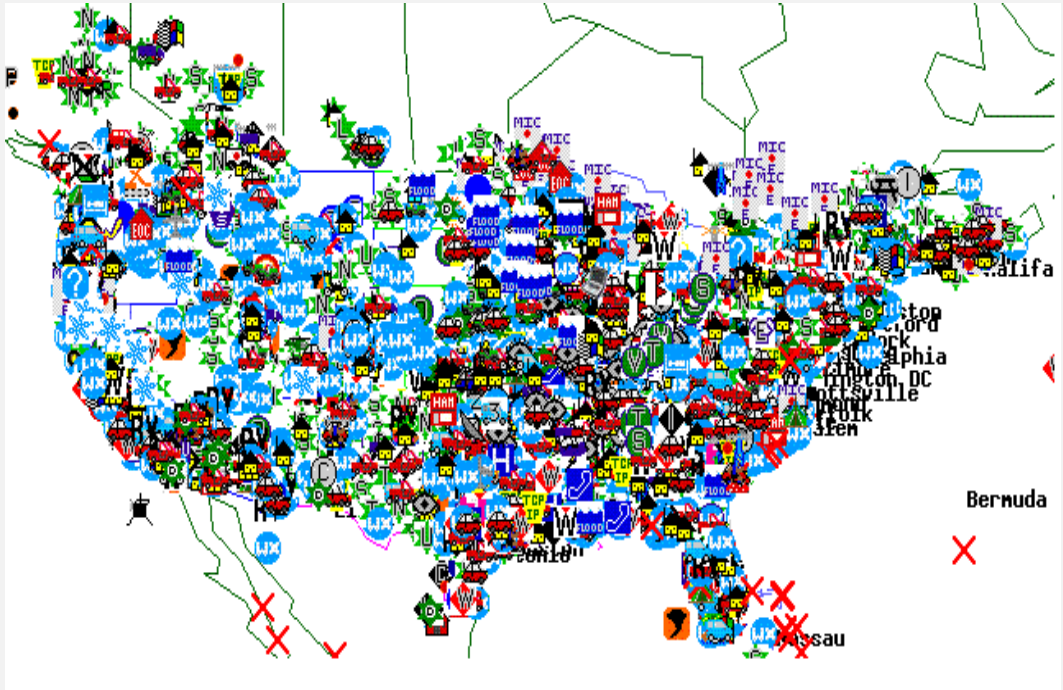
BOB BRUNINGA – "FATHER OF APRS"

- His first experimental protocol was run on a VIC-20 program in 1984 to report the position and status of horses in a cross country endurance run for AMRAD

- He developed the current APRS protocol as part of his research for the US Navy while an Instructor at the Naval Academy in Annapolis, MD. to assist in tracking boats in races on the local waterways.

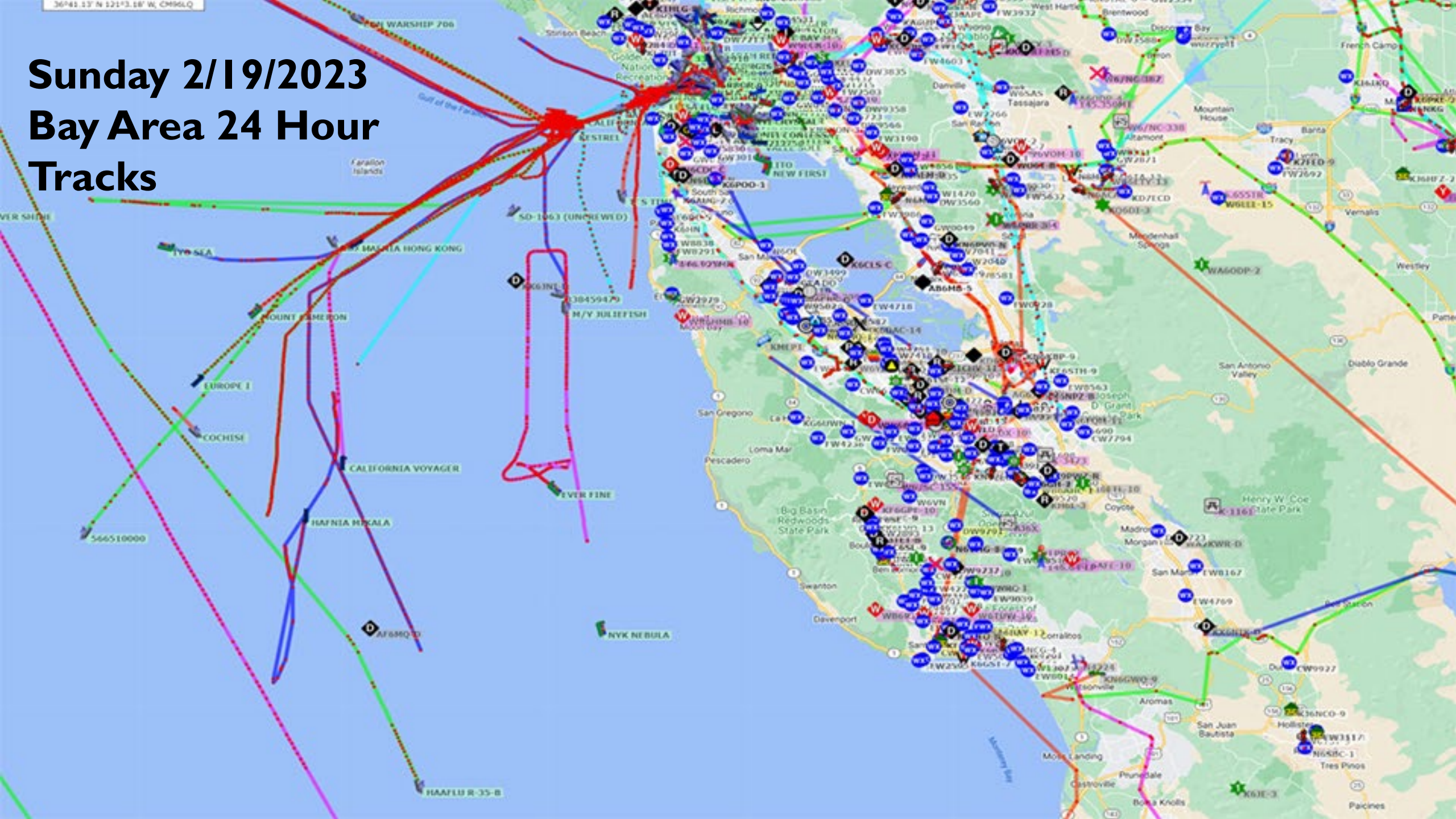
SCOPE OF APRS

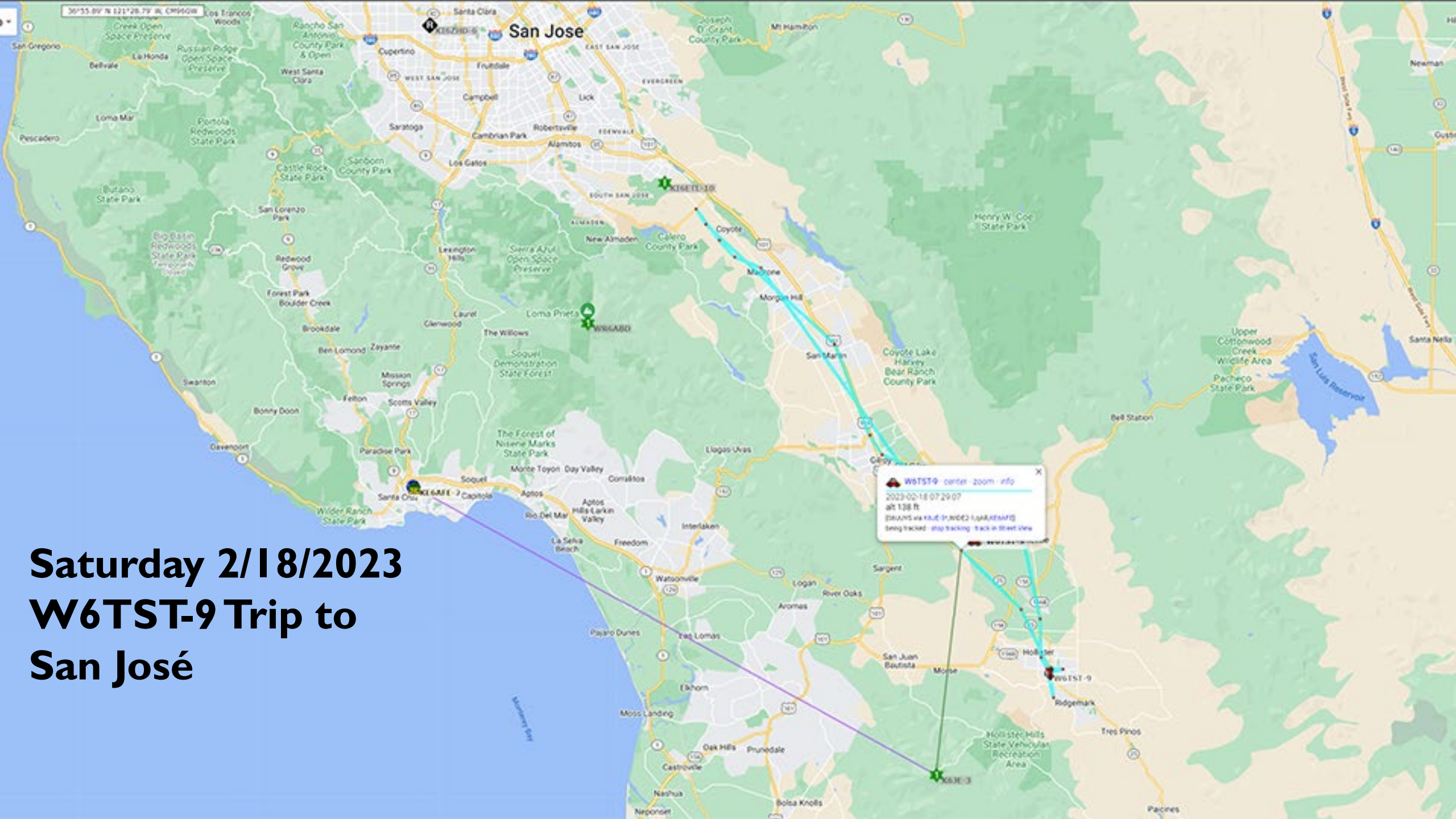
- Over 40,000 users worldwide.
- RELAYS every 20-30 mi called “digipeaters.”
- All linked by home station Igates
- Global links by Amateur Satellites
- Thousands of Weather stations (ham radio and internet connected)
- Telemetry and data everywhere



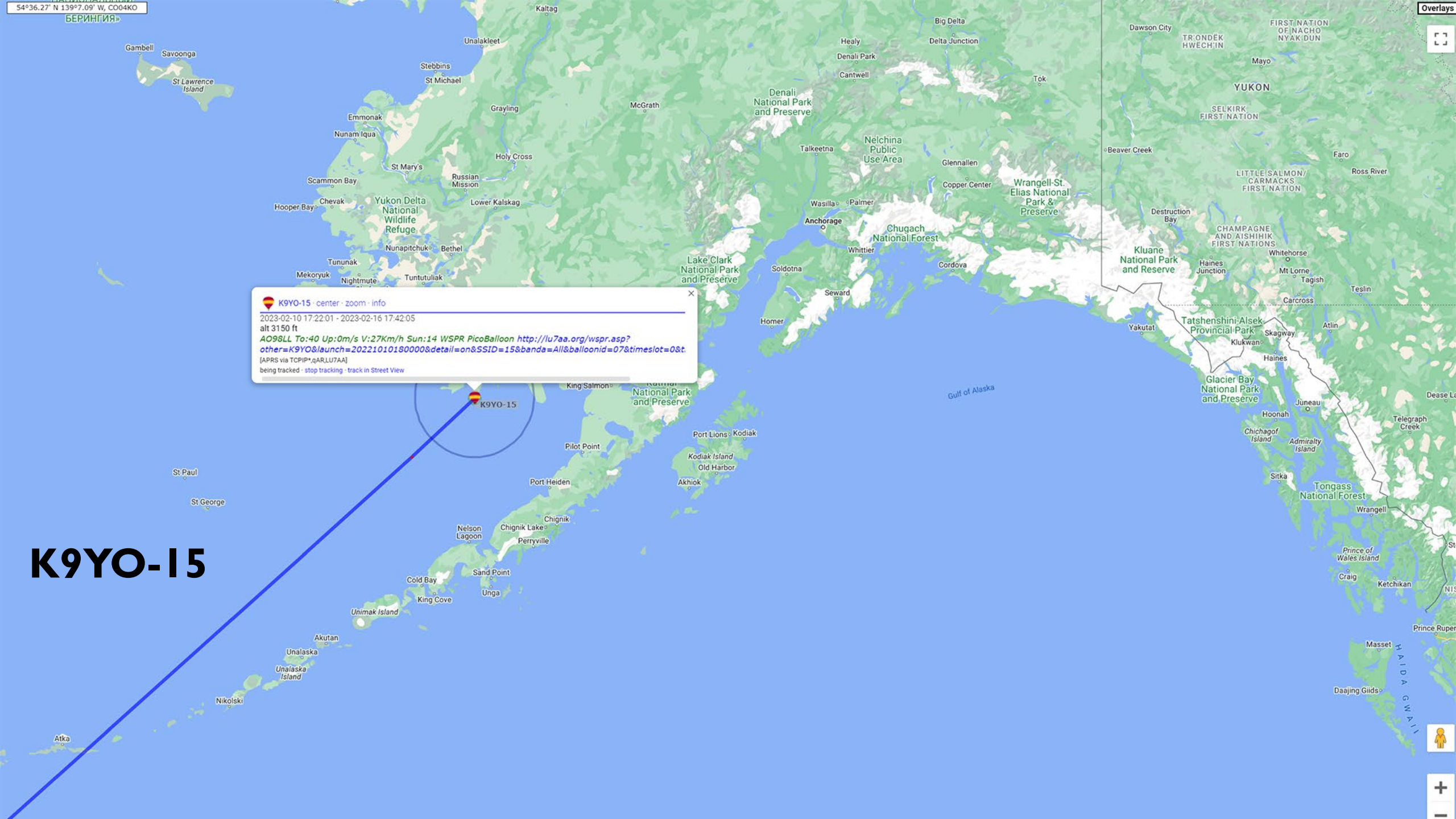
But, only 2% of ham radio users

APRS is a registered trademark Bob Bruninga, WB4APR


Sunday 2/19/2023
Bay Area 24 Hour
Tracks



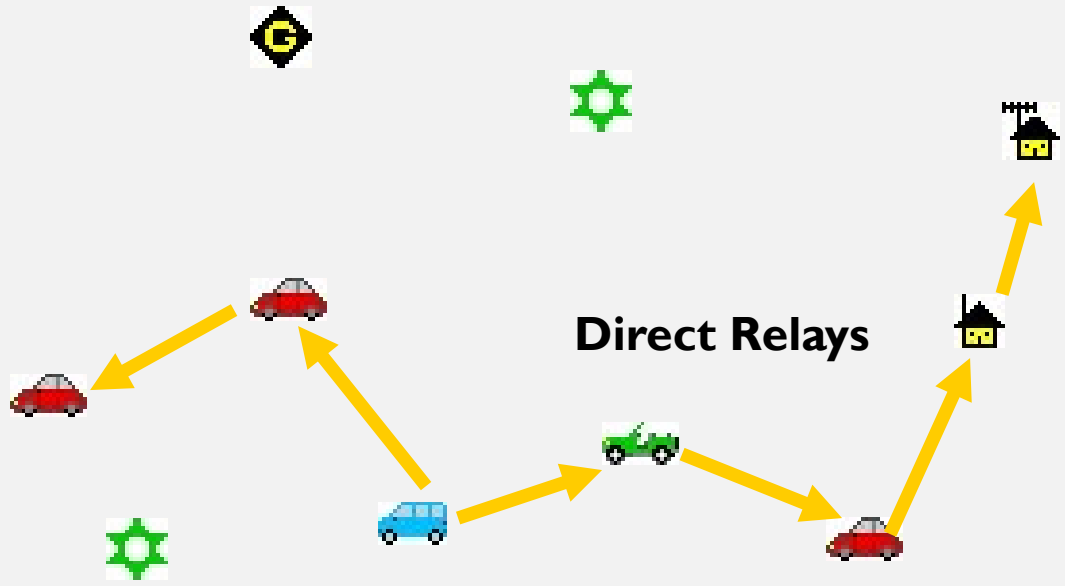
Saturday 2/18/2023
W6TST-9 Trip to San José


54°36.27' N 139°7.09' W, CO04KO
Overlays
K9YO-15 · center · zoom · info
2023-02-10 17:22:01 - 2023-02-16 17:42:05
alt 3150 ft
AO98LL To:40 Up:0m/s V:27Km/h Sun:14 WSPR PicoBalloon http://lu7aa.org/wspr.asp?other=K9YO&launch=20221010180000&detail=on&SSID=15&banda=All&balloonid=07&timeslot=0&t.
[APRS via TCPIP*,qAR,LU7AA]
being tracked · stop tracking · track in Street View
K9YO-15
Gulf of Alaska
Kaltag
Unalakleet
Stebbins
St Michael
Gambell
Savoonga
St Lawrence Island
Grayling
Emmonak
Nunam Iqua
McGrath
Holy Cross
St Mary's
Russian Mission
Scammon Bay
Hooper Bay
Chevak
Yukon Delta National Wildlife Refuge
Lower Kalskag
Nunapitchuk
Bethel
Tununak
Mekoryuk
Nightmute
Tuntutuliak
Healy
Denali Park
Cantwell
Big Delta
Delta Junction
Tok
Denali National Park and Preserve
Talkeetna
Nelchina Public Use Area
Glennallen
Copper Center
Wrangell-St. Elias National Park & Preserve
Wasilla
Palmer
Anchorage
Chugach National Forest
Whittier
Lake Clark National Park and Preserve
Soldotna
Seward
Homer
Cordova
King Salmon
Pilot Point
Port Heiden
Port Lions
Kodiak
Kodiak Island
Old Harbor
Akhiok
St Paul
St George
Chignik
Chignik Lake
Nelson Lagoon
Perryville
Sand Point
Cold Bay
King Cove
Unga
Unimak Island
Akutan
Unalaska
Unalaska Island
Nikolski
Atka
Dawson City
TR'ONDËK HWËCH'IN
FIRST NATION OF NACHO NYAK DUN
Mayo
YUKON
SELKIRK FIRST NATION
Beaver Creek
Faro
Ross River
LITTLE SALMON/ CARMACKS FIRST NATION
Destruction Bay
CHAMPAGNE AND AISHIHIK FIRST NATIONS
Kluane National Park and Reserve
Haines Junction
Whitehorse
Mt Lorne
Tagish
Teslin
Carcross
Yakutat
Tatshenshini-Alsek Provincial Park
Atlin
Skagway
Klukwan
Haines
Glacier Bay National Park and Preserve
Juneau
Hoonah
Chichagof Island
Admiralty Island
Telegraph Creek
Sitka
Tongass National Forest
Wrangell
Prince of Wales Island
Craig
Ketchikan
Masset
Daajing Giids
HAIDA GWAII
Prince Rupert
K9YO-15

WHY HAM RADIO?

- Current debate asking if FT-8 is Ham Radio or destroying Ham Radio
  - If your purpose of Ham Radio is to have discussions with people around the world – maybe not.
  - If your purpose of Ham Radio is to experiment, gather data, and play with radio technology, then YES!
- Ham Radio can help by finding ways to find answers outside of ordinary methods

HOW DOES THE SIGNAL TRAVEL?



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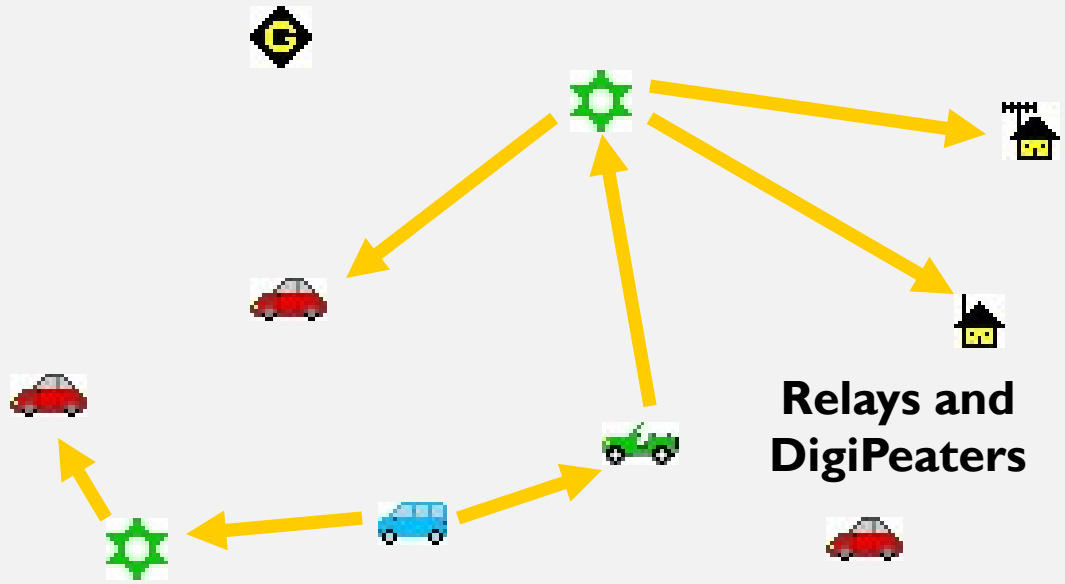

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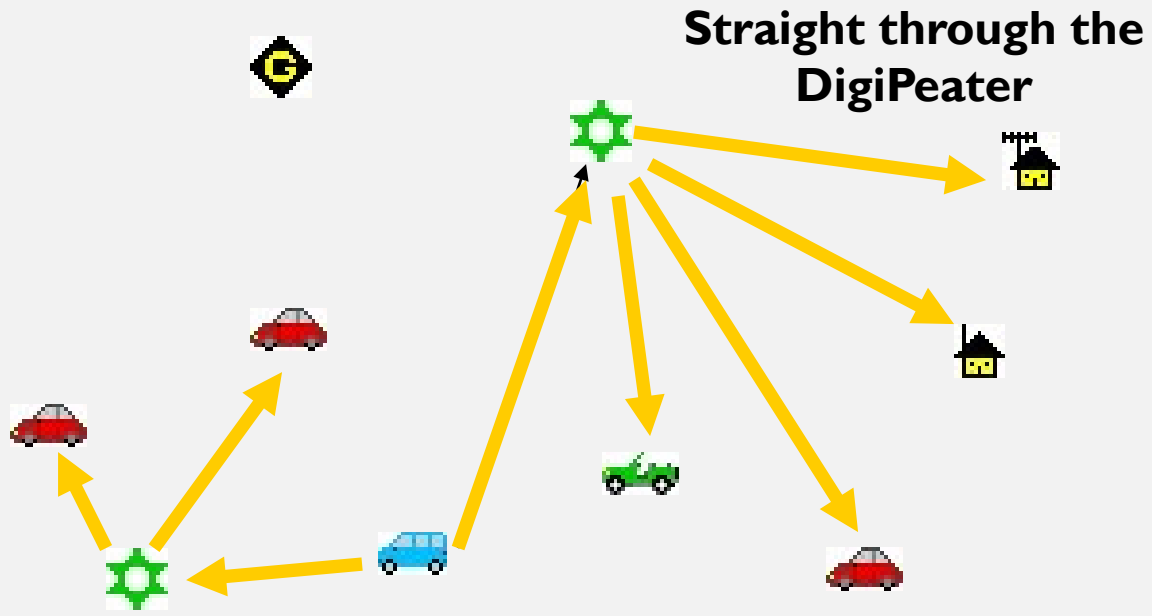

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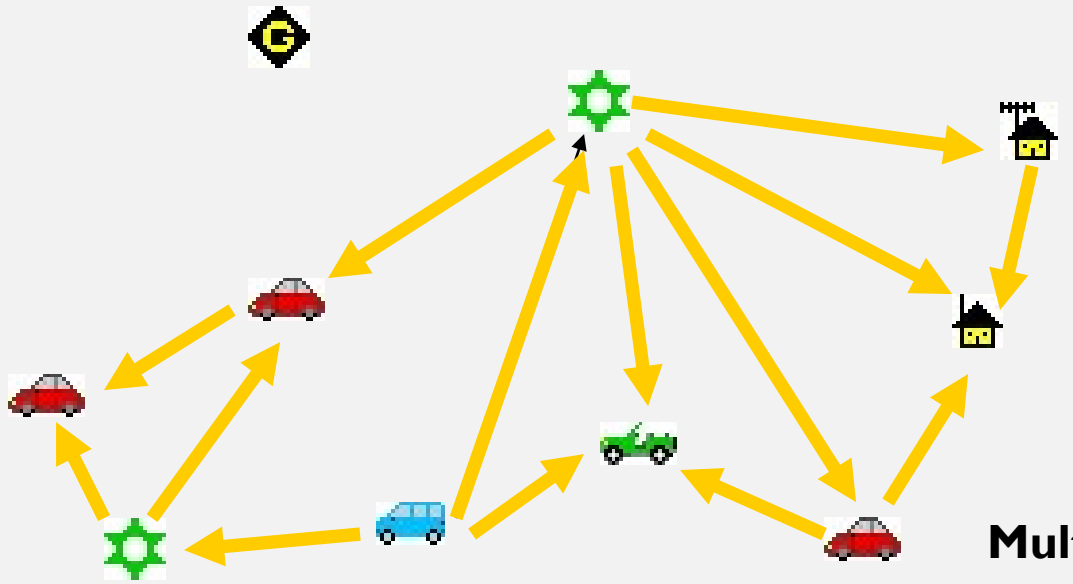
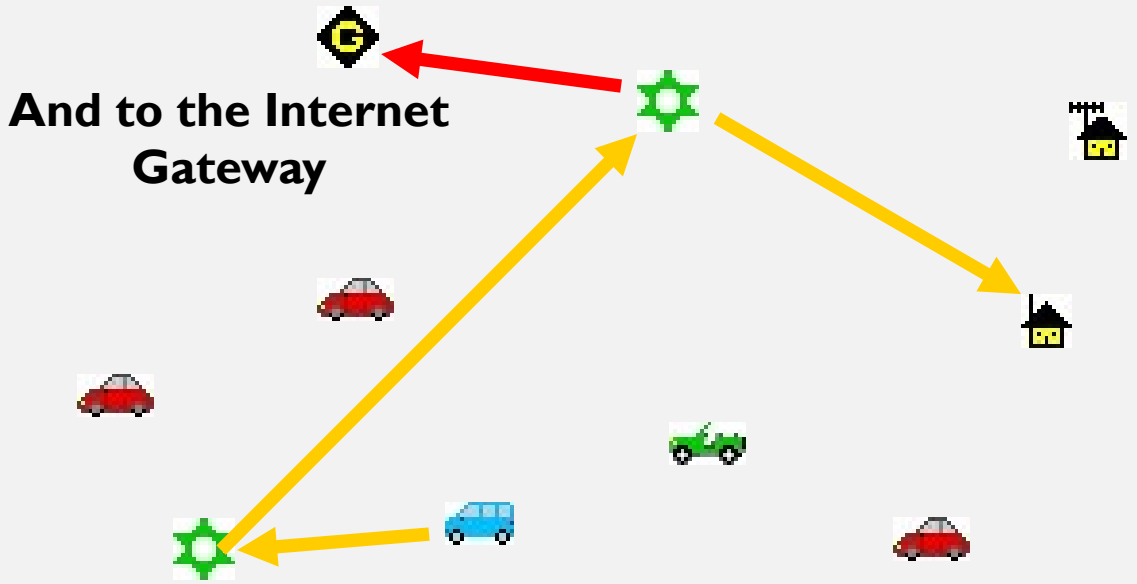


Multiple Hops

HOW DOES THE SIGNAL TRAVEL?



PROGRAMMING YOUR RADIO

- Call Sign w/ Suffix
- Digipeater Path
- Group ID (Digital DMR – BM APRS 310999)

-0 Your primary station usually fixed and message capable -1 generic additional station, digi, mobile, wx, etc -2 generic additional station, digi, mobile, wx, etc -3 generic additional station, digi, mobile, wx, etc -4 generic

CALLSIGN W/ SUFFIX

- Suffix (Suggestion):
- 0 – Primary Station? (not supported on some equipment)
- 1 – 4, 15 – Additional station, mobile, weather, etc.
- 5 – Other Networks
- 6 – Special Activity – Satellite
- 7 – Walkie Talkie
- 8 – Boats, Sailboats, RV or secondary mobile
- 9 – Primary mobile

-0 Your primary station usually fixed and message capable -1 generic additional station, digi, mobile, wx, etc -2 generic additional station, digi, mobile, wx, etc -3 generic additional station, digi, mobile, wx, etc -4 generic

CALLSIGN W/ SUFFIX

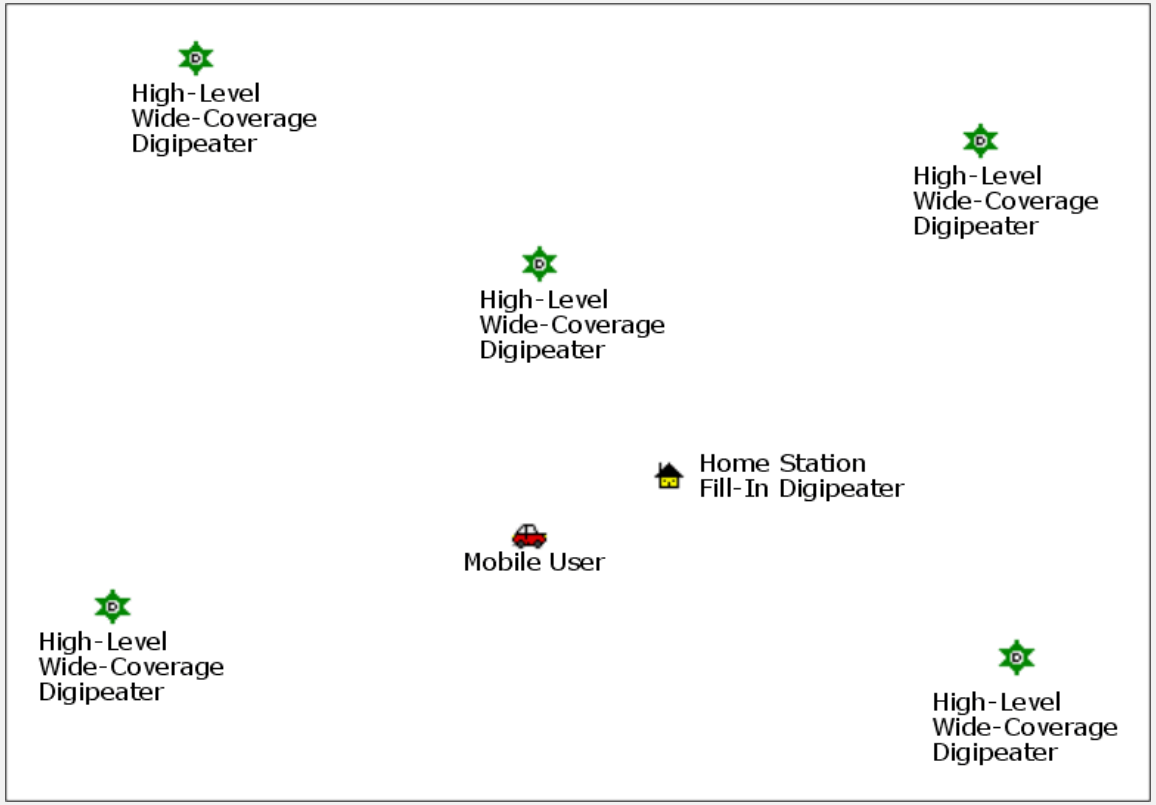
- Suffix (Suggestion):
- 10 – Internet, Igates, Echolink, Winlink, AVRS, APRN, etc
- 11 – Balloons, aircraft, spacecraft, etc
- 12 – APRStt, DTMF, RFID, devices, one-way trackers
- 13 – Weather stations
- 14 – Truckers or generally full time drivers
- Examples:
  - N6SBC-12 APRS Tracker
  - W6TST-9 Tim's vehicle

-0 Your primary station usually fixed and message capable -1 generic additional station, digi, mobile, wx, etc -2 generic additional station, digi, mobile, wx, etc -3 generic additional station, digi, mobile, wx, etc -4 generic

DIGIPEATER PATH

- Suggestion:
- WIDE1-1,WIDE2-1
  - Wide1-1 uses a fill in digipeater if applicable
  - Wide2-1 says send to a digipeater and consider this message done afterwards

APRS BACKGROUND



WHY CALTOPO?

- Tracking APRS signals
- Planning a event (Sea Otter Classic, Discovery Classic, Parades, etc)
- Planning a field event (SOTA, POTA, etc)
- Understanding signal paths

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CALTOPO/SARTOPO BACKGROUND

- Matt Jacobs started SARTopo in 2010 to solve problems with his SAR background.
- CalTopo was launched in 2011 for recreational purposes
- CalTopo started full time for Matt Jacobs expanding with other employees in 2017
- CalTopo & SARTopo merged into one product with different emphasis options 2020-2022

WHY DID WE SWITCH TO SARTOPO?

- We previously used another program for SAR purposes
- I saw SARTopo in a technical track at SAREX 2017
- September 2017 RACES got called out to help with a search. We tried to use the existing SAR program and the map wasn't helpful and we needed to render a map that was more useful, but doing so never processed completely because of limited internet coverage.
- I tried SARTopo and with the limited internet coverage was up and operational in minutes.
- We've used it ever since for SAR and event usage (Sea Otter & Discovery)

PREVIOUS VS NOW

- Previously, we would use the standard SAR mapping program
- Take tracks from a APRS program (none of them were as good) and try to transfer the track into the map
- Cross reference outside maps (i.e. Hollister Hills or Ford Ord trail maps)

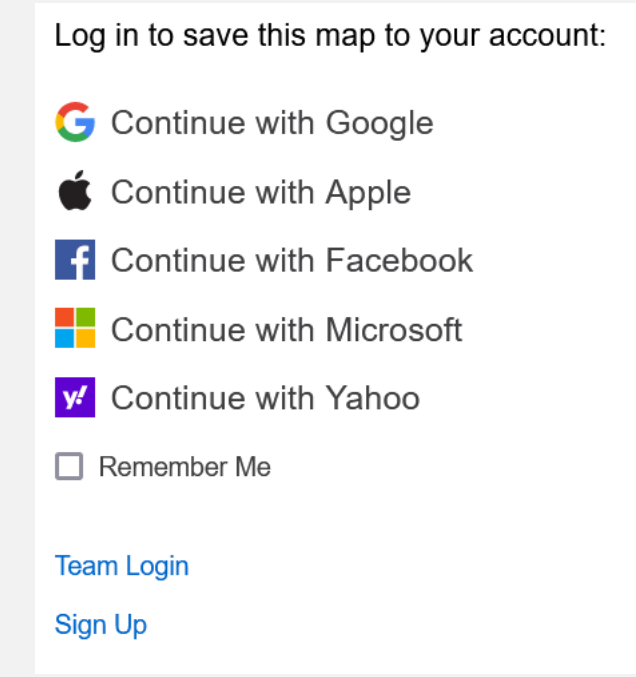
- CalTopo allows all of this in one place with different parts selectable as well as multiple shifts

HOW CAN I GET IN ON SBC RACES CALTOPO?

- Apply for a log in by emailing w6tst@arrl.net
- Once set up, you can log in with your existing email
-

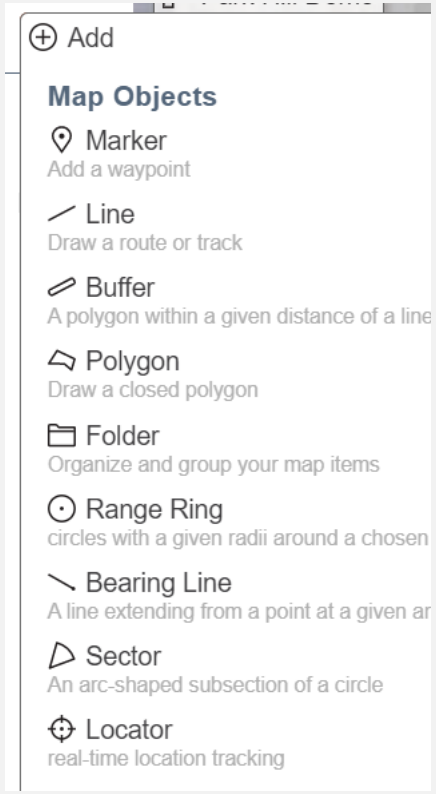
San Benito County RACES

Read-only access

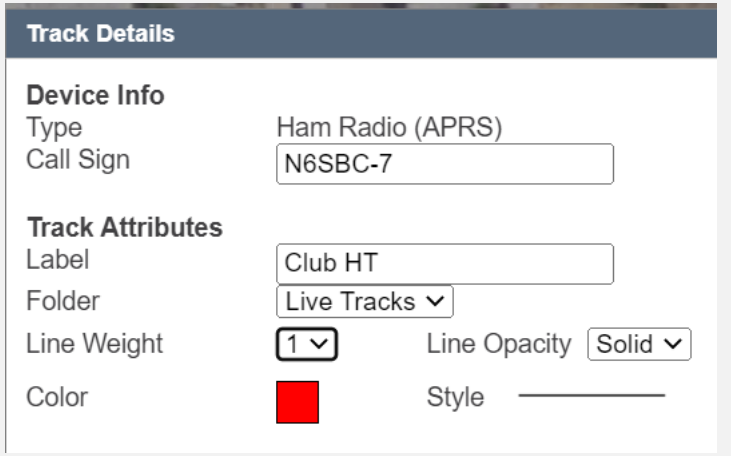


ADD YOUR APRS TO CALTOPO

- On a SAVED map, click on "ADD" and then "Locator"

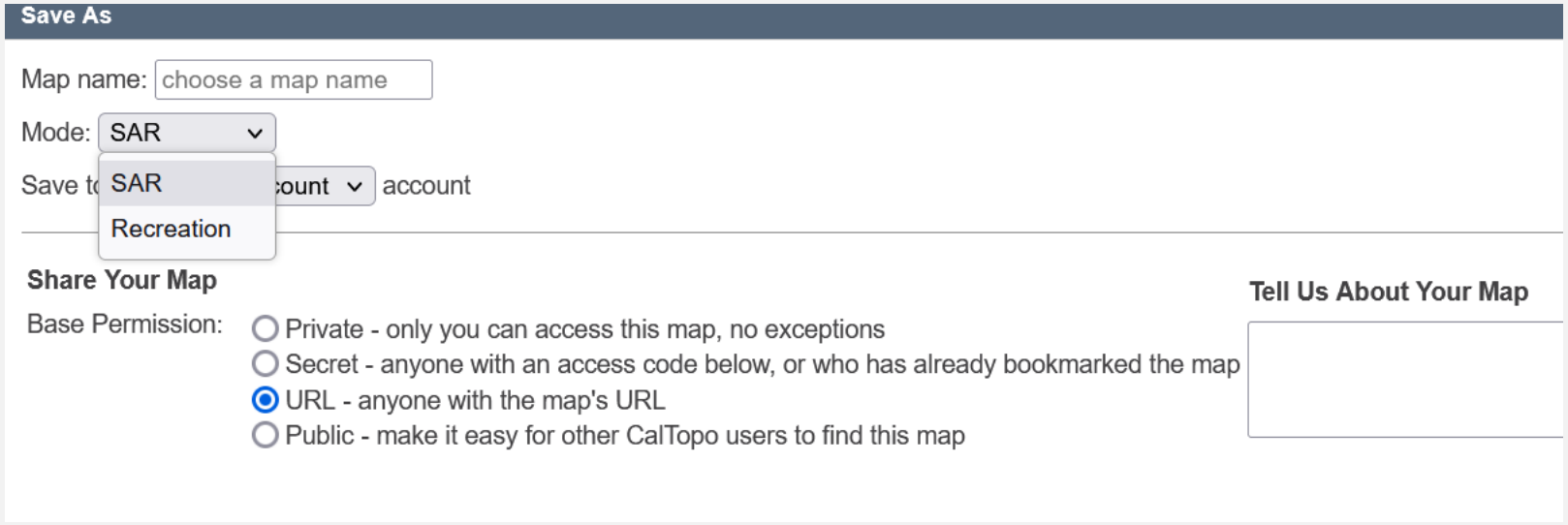


- Click on "Live Track - Ham Radio (APRS)"



HOW TO DEVELOP A MAP

- Early in setting up data on your map, you'll be asked to name your map, set the mode (SAR or Recreation) and save it to your individual account or the team account



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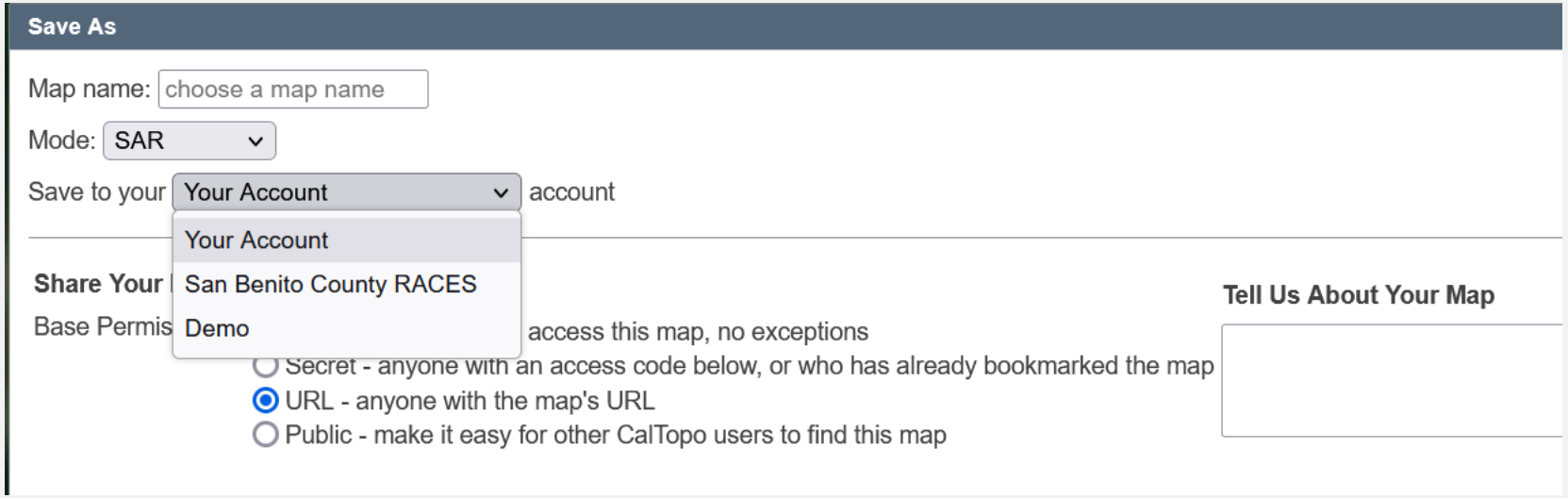
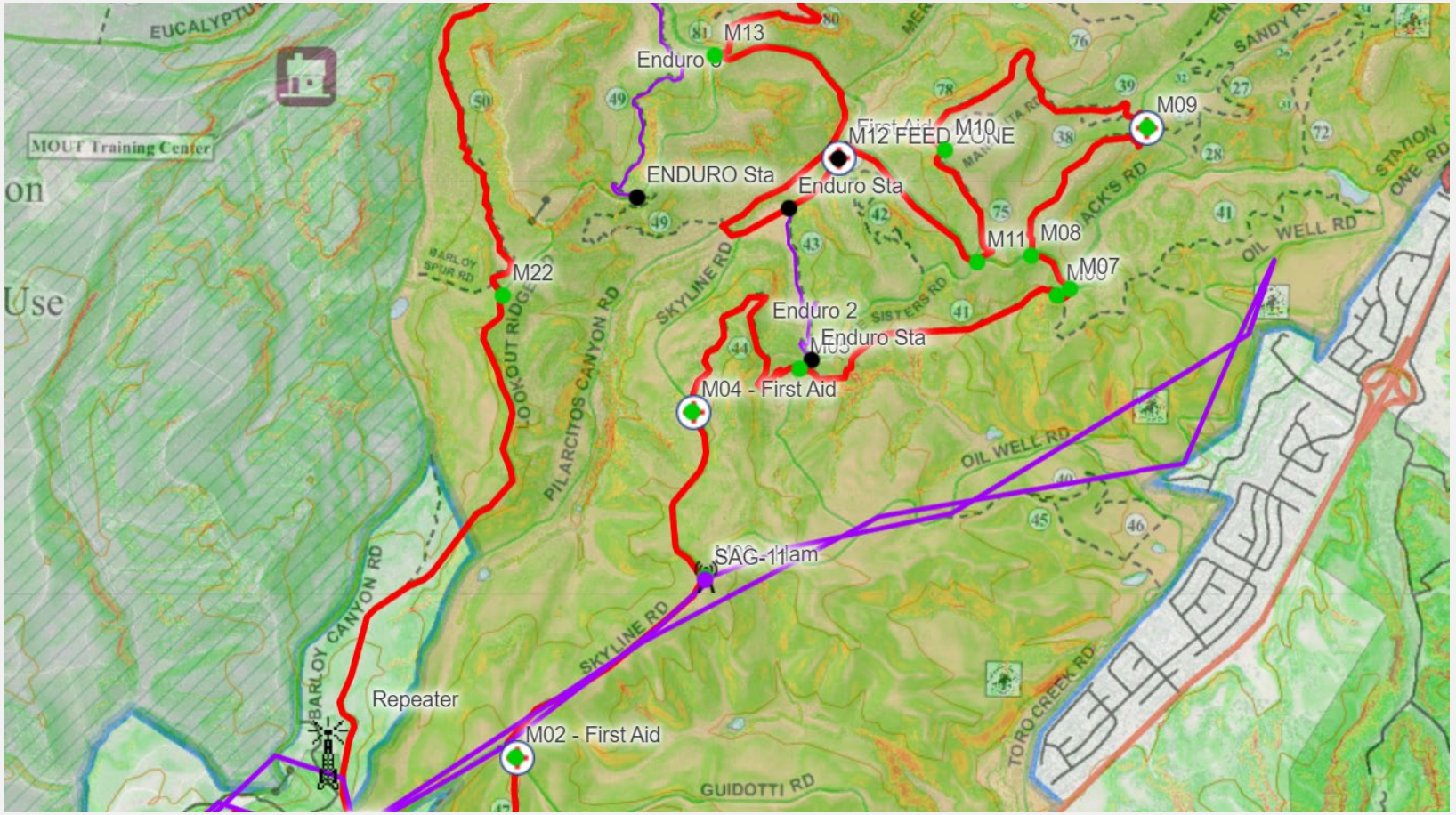
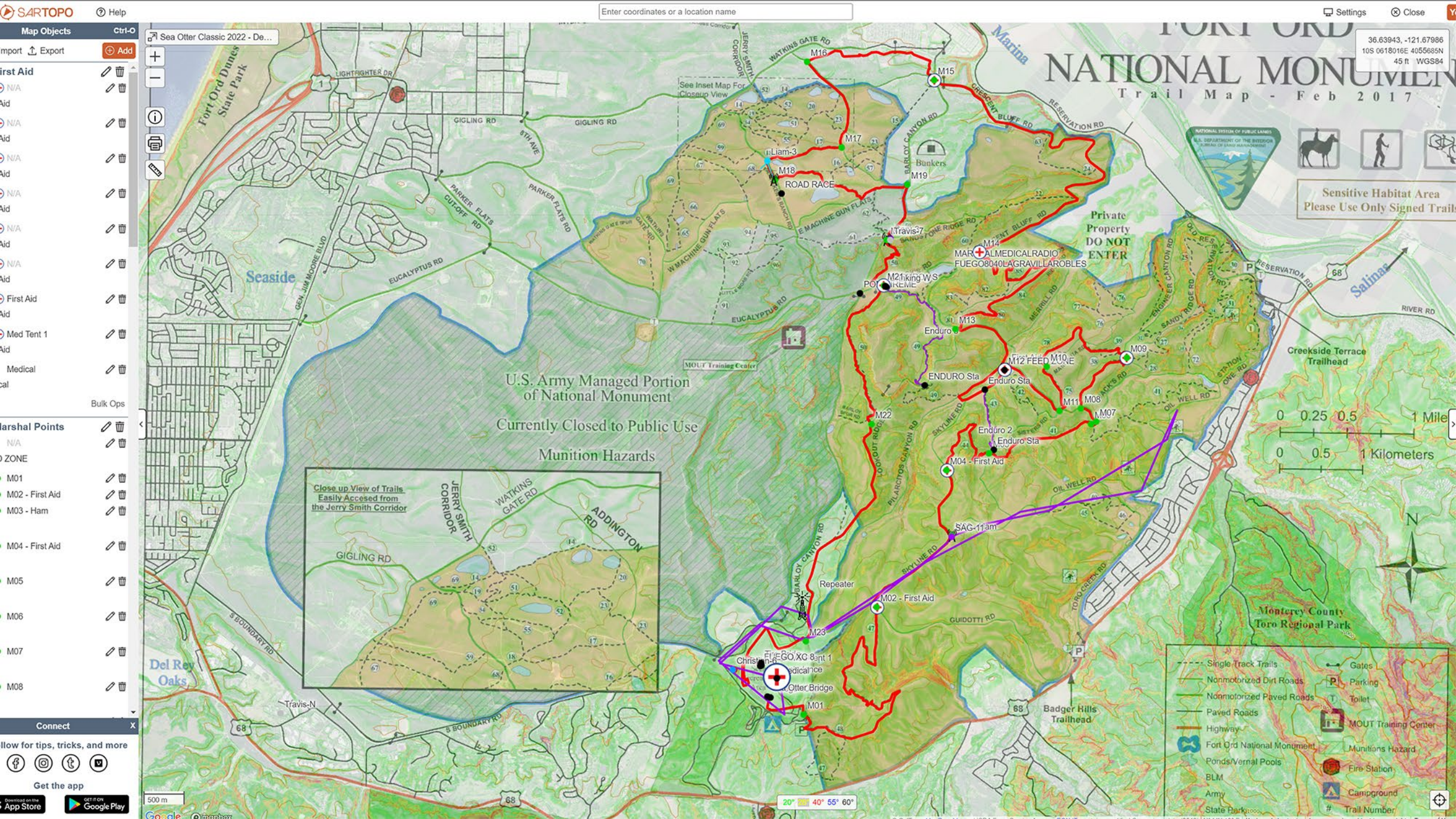


DEMO – SEA OTTER CLASSIC




SARTOPO
Help
Enter coordinates or a location name
Settings
Close
Map Objects
Ctrl-O
Import
Export
Add
First Aid
N/A
Aid
First Aid
Med Tent 1
Medical
Bulk Ops
Marshal Points
ZONE
M01
M02 - First Aid
M03 - Ham
M04 - First Aid
M05
M06
M07
M08
Connect
Allow for tips, tricks, and more
Get the app
App Store
Google Play
Sea Otter Classic 2022 - De...
36.63943, -121.67986
10S 0618016E 4055685N
45 ft WGS84
FORT ORD
NATIONAL MONUMENT
Trail Map - Feb 2017
Sensitive Habitat Area
Please Use Only Signed Trails
Private Property
DO NOT ENTER
U.S. Army Managed Portion of National Monument
Currently Closed to Public Use
Munition Hazards
Close up View of Trails Easily Accesed from the Jerry Smith Corridor
JERRY SMITH CORRIDOR
WATKINS GATE RD
ADDINGTON RD
GIGLING RD
Fort Ord Dunes State Park
Seaside
Del Rey Oaks
Marina
Salinas
Bunkers
See Inset Map For Closeup View
MOUT Training Center
Creekside Terrace Trailhead
Badger Hills Trailhead
Monterey County Toro Regional Park
Repeater
ROAD RACE
Liam-3
Travis-7
Enduro
ENDURO Sta
Enduro Sta
Enduro 2
M04 - First Aid
M02 - First Aid
SAG-11am
M01
M02
M03
M04
M05
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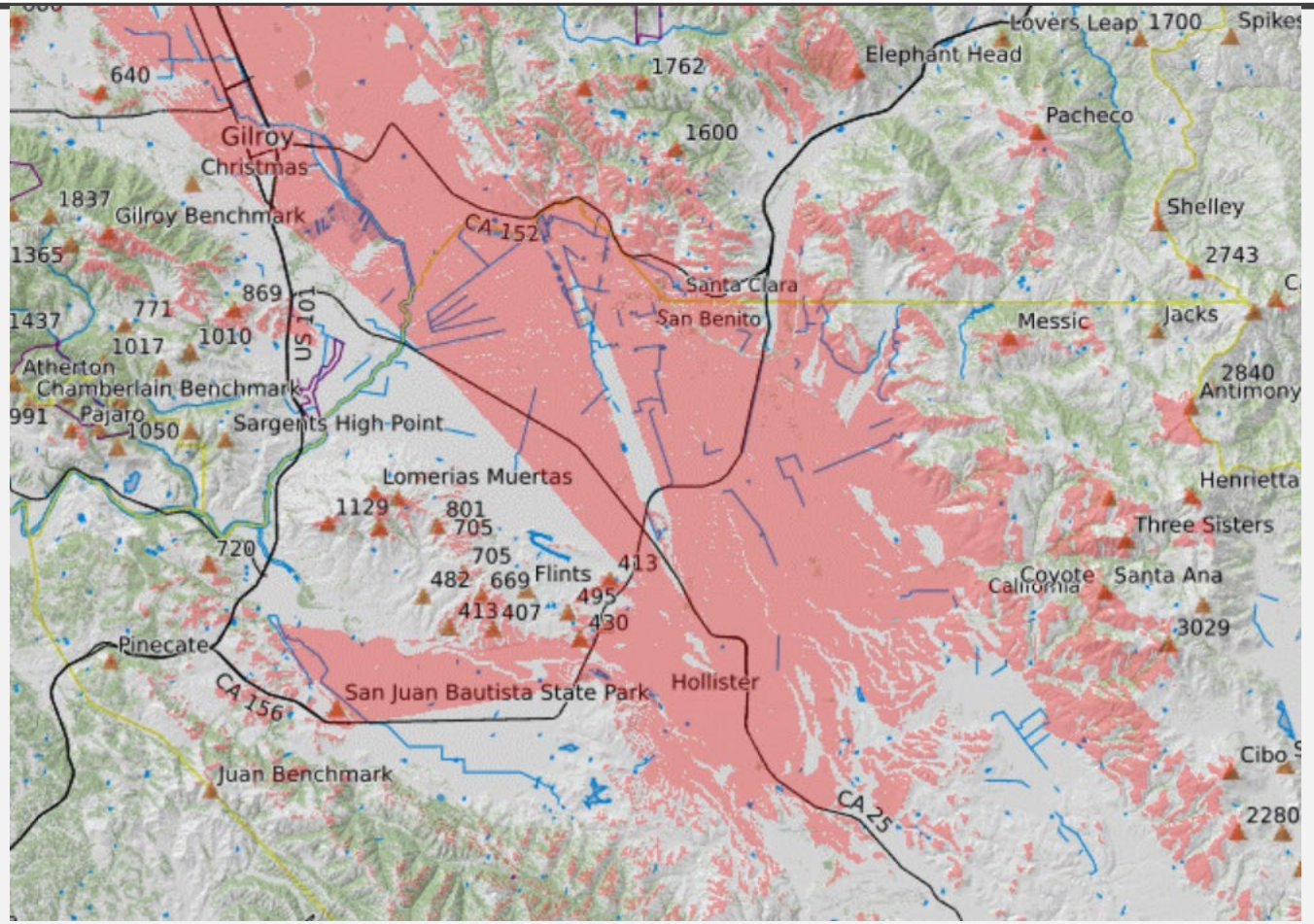
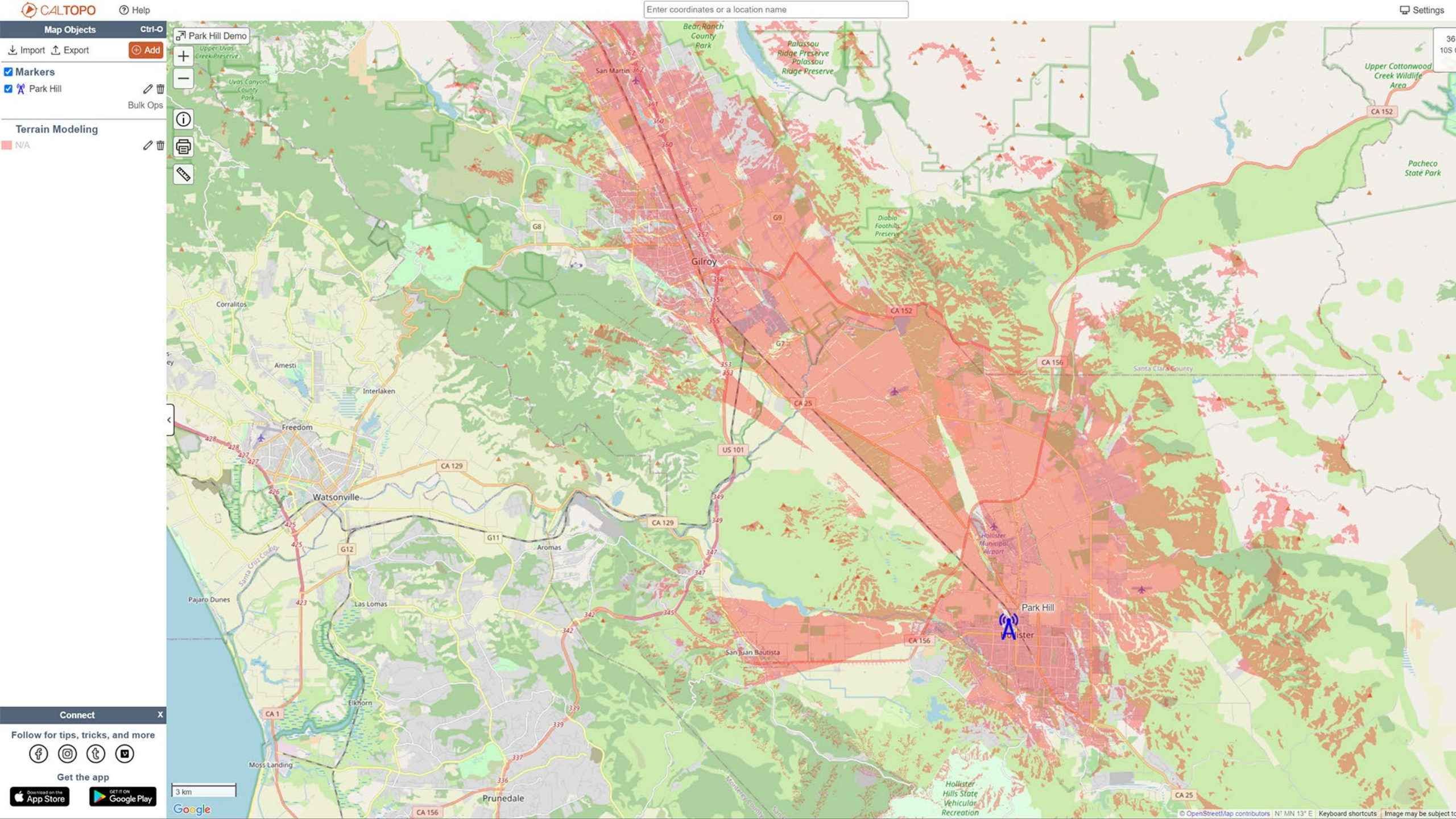
M07
M08
M09
M10
M11
M12 FEED ZONE
M13
M14
M15
M16
M17
M18
M19
M21
M22
M23
Single Track Trails
Nonmotorized Dirt Roads
Nonmotorized Paved Roads
Paved Roads
Highway
Fort Ord National Monument
Ponds/Vernal Pools
BLM
Army
State Park
Gates
Parking
Toilet
MOUT Training Center
Munitions Hazard
Fire Station
Campground
Trail Number
0 0.25 0.5 1 Mile
0 0.5 1 Kilometers
N
500 m
20° 40° 55° 60°

DEMO – PARK HILL REPEATER




CALTOPO
Help
Enter coordinates or a location name
Settings
Map Objects
Ctrl-O
Import
Export
Add
Markers
Park Hill
Bulk Ops
Terrain Modeling
N/A
Park Hill Demo
Bear Ranch County Park
Palassou Ridge Preserve
Upper Cottonwood Creek Wildlife Area
Pacheco State Park
Diablo Foothills Preserve
San Martin
Gilroy
Corralitos
Amesti
Interlaken
Freedom
Watsonville
Aromas
Las Lomas
Pajaro Dunes
Elkhorn
Moss Landing
Prunedale
San Juan Bautista
Hollister Municipal Airport
Park Hill
Hollister Hills State Vehicular Recreation
Santa Clara County
Santa Cruz County
CA 152
CA 156
CA 25
CA 129
CA 1
US 101
G7
G8
G9
G11
G12
3 km
Google
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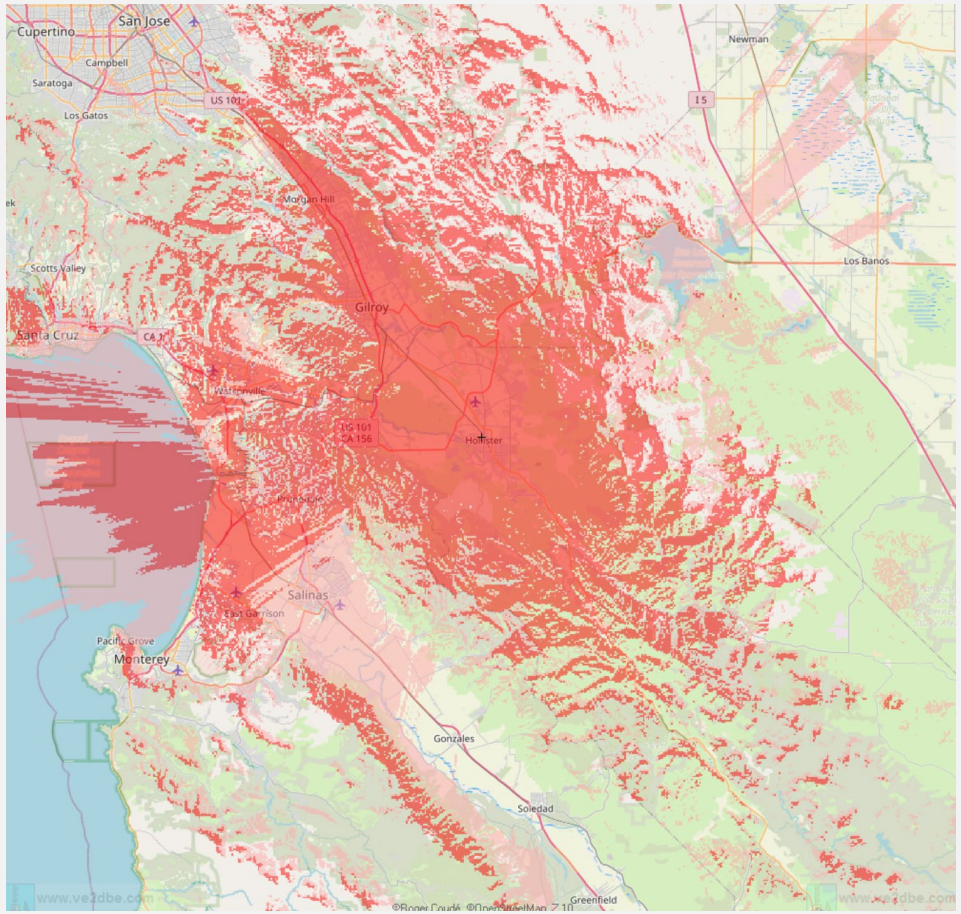
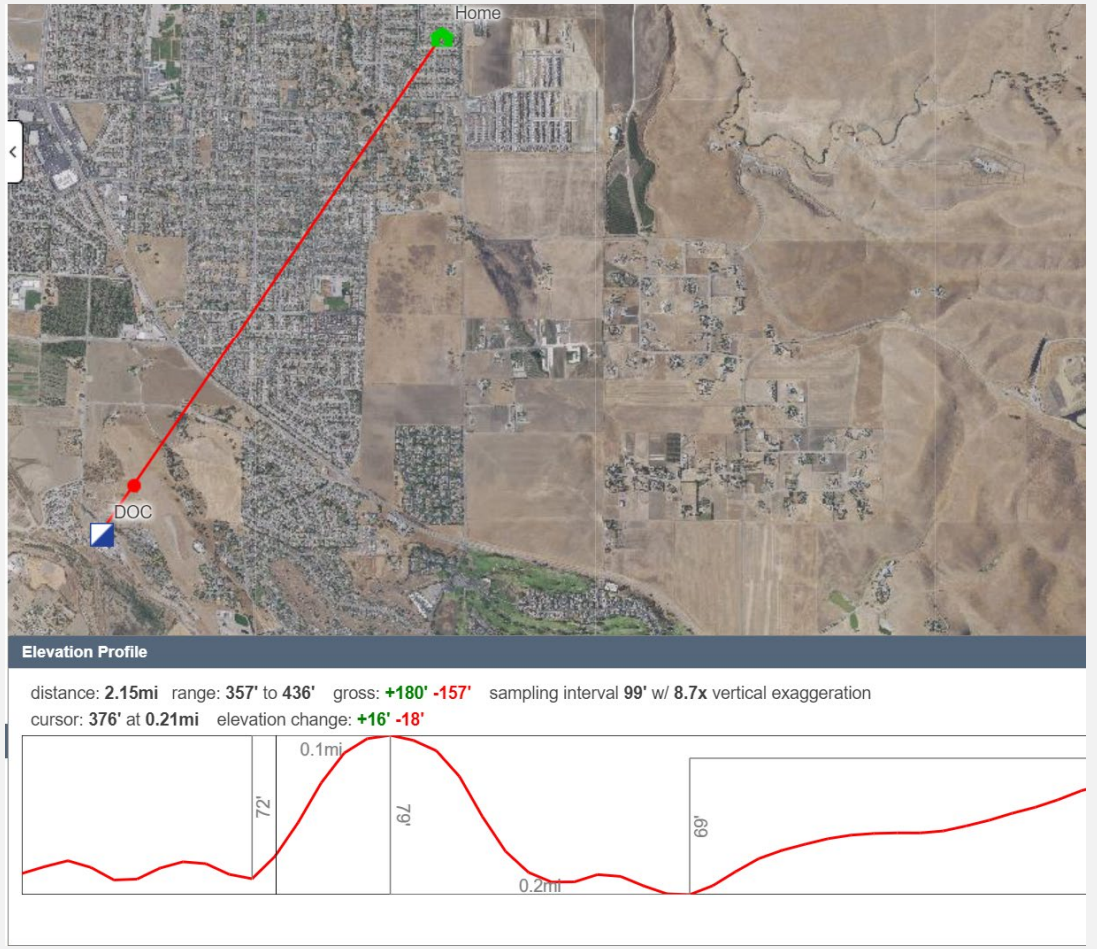
DEMO – VE2DBE.COM



DOC TO HOME


Home
DOC
Elevation Profile
distance: 2.15mi range: 357' to 436' gross: +180' -157' sampling interval 99' w/ 8.7x vertical exaggeration
cursor: 376' at 0.21mi elevation change: +16' -18'
0.1mi
72'
79'
0.2mi
69'

CALTOPO Help 3226 southside rd, hollister, ca Settings Clo

Map Objects Ctrl-O

Export Add

ers

C

ne

Bulk Ops

& Polygons

Bulk Ops

DOC to Home Demo

36.82464, -12
10S 0646601E 4
486 ft

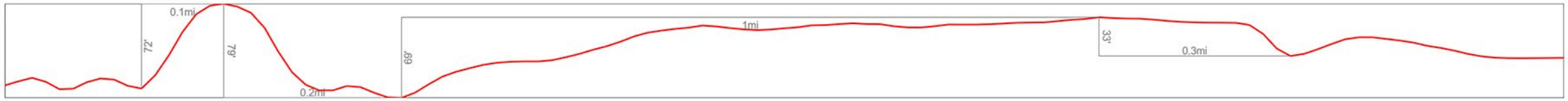
Home

DOC

Elevation Profile

distance: **2.15mi** range: **357'** to **436'** gross: **+180' -157'** sampling interval **99'** w/ **8.7x** vertical exaggeration

cursor:

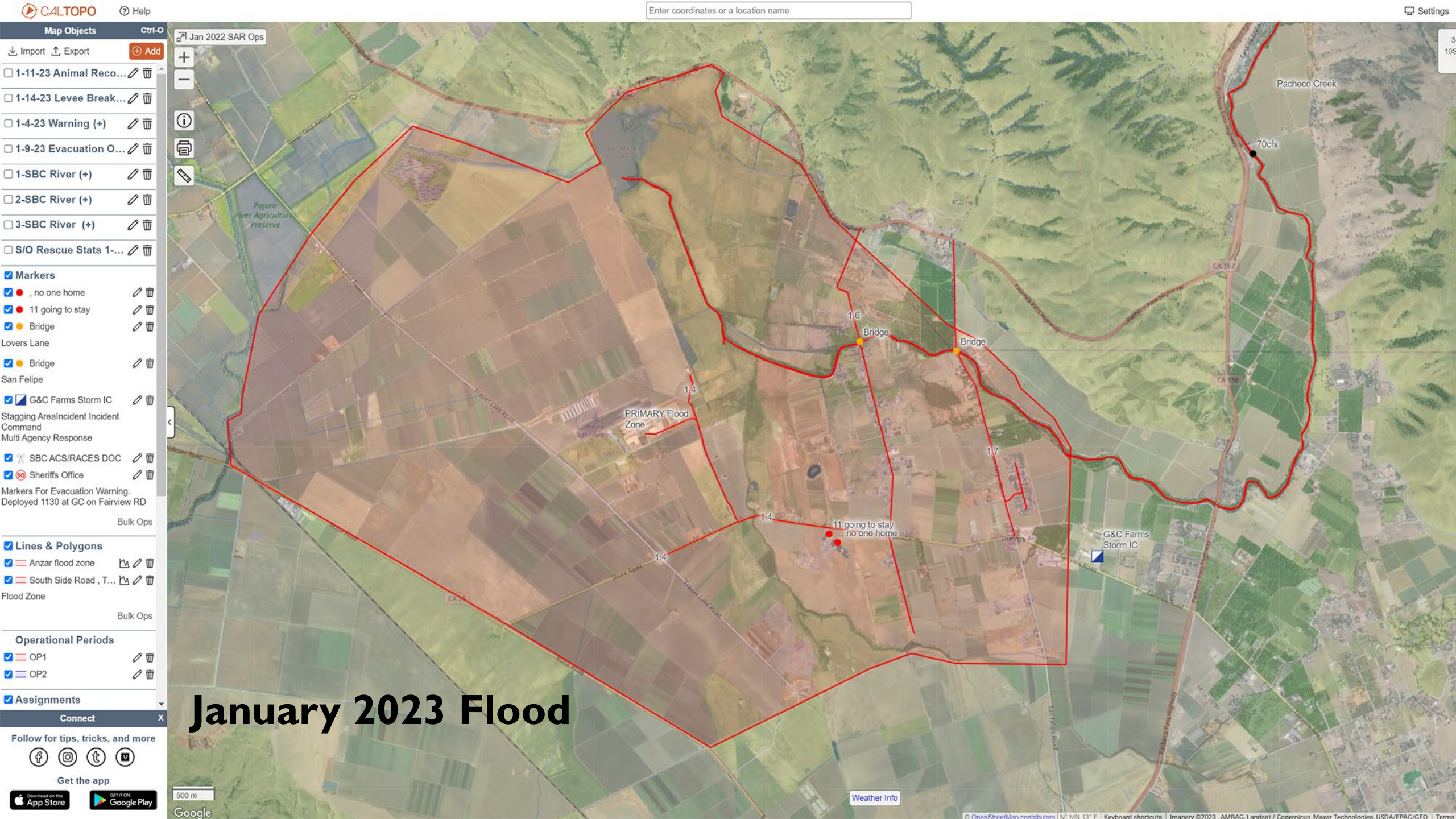


Connect X

for tips, tricks, and more

Get the app

Store Google Play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Ctrl-O
Import
Export
Add
1-11-23 Animal Reco...
1-14-23 Levee Break...
1-4-23 Warning (+)
1-9-23 Evacuation O...
1-SBC River (+)
2-SBC River (+)
3-SBC River (+)
S/O Rescue Stats 1-...
Markers
, no one home
11 going to stay
Bridge
Lovers Lane
Bridge
San Felipe
G&C Farms Storm IC
Stagging AreaIncident Incident Command
Multi Agency Response
SBC ACS/RACES DOC
Sheriffs Office
Markers For Evacuation Warning.
Deployed 1130 at GC on Fairview RD
Bulk Ops
Lines & Polygons
Anzar flood zone
South Side Road , T...
Flood Zone
Bulk Ops
Operational Periods
OP1
OP2
Assignments
Connect
Follow for tips, tricks, and more
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App Store
Google Play
Jan 2022 SAR Ops
Pacheco Creek
70cfs
Pajaro River Agricultural Preserve
Bridge
Bridge
1.6
1.4
1.7
1.4
1.4
PRIMARY Flood Zone
11 going to stay
, no one home
G&C Farms Storm IC
Weather Info
500 m
Google
January 2023 Flood

ACTION ITEMS - APRS

- If you have an APRS capable radio – try it!
- Check out aprs.fi and see what you can see
- If you want to tinker – there are APRS apps on iPhone and Android

ACTION ITEMS - CALTOPO

- Try it! Request a team account and explore feature and try stuff.
- Track your car, bicycle, etc on a map with a APRS tracker (radio or app)
- Training.CalTopo.com or…
- https://saracademy.thinkific.com/courses/caltopo free course on SAR Team Management

THANK YOU!

https://sbcara.org/forum