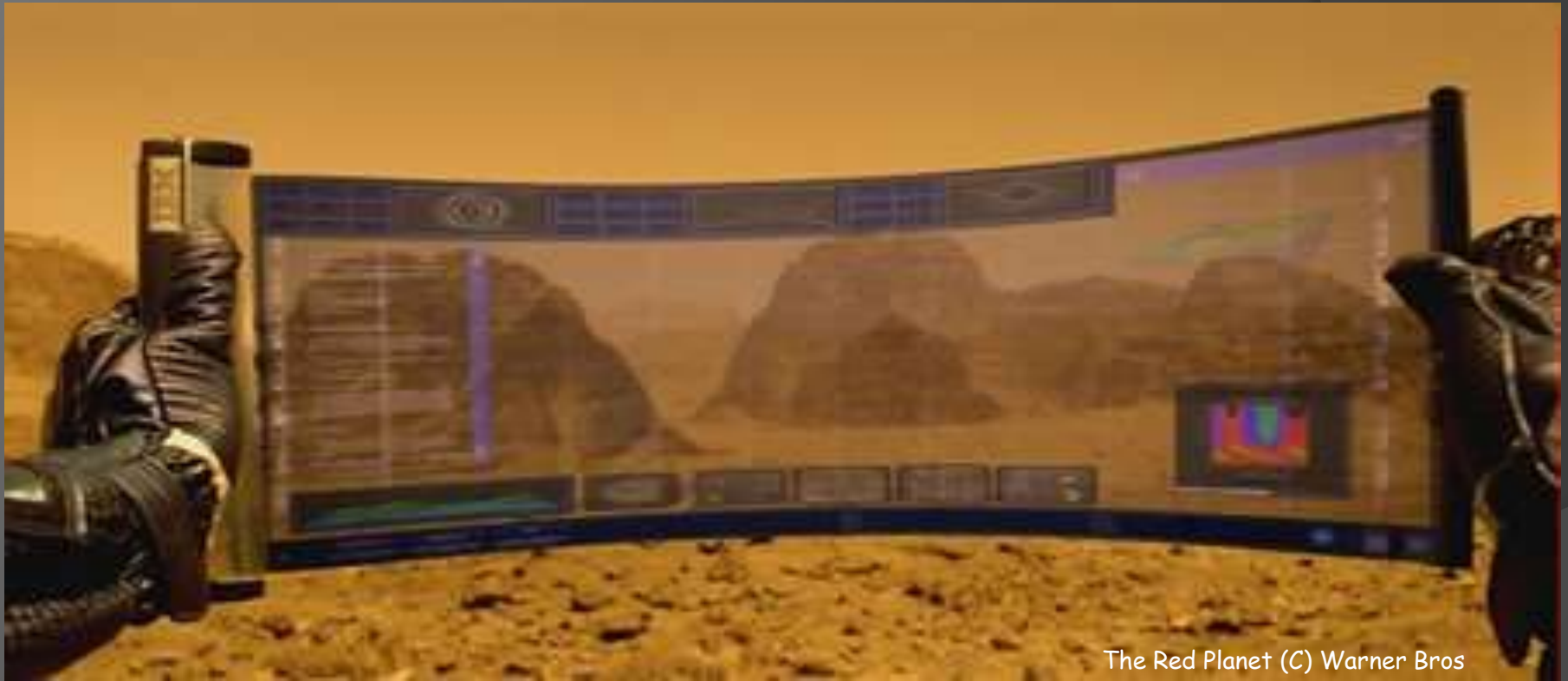


GPS : The Digital Map

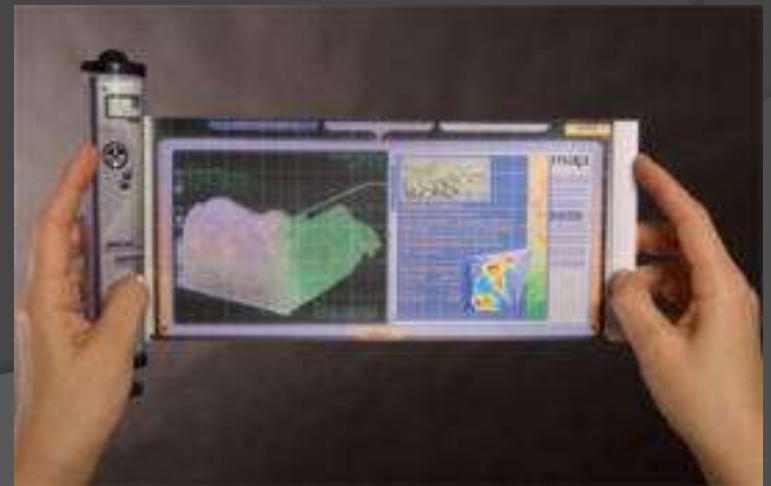
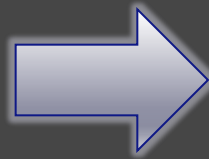


Luca Chiarabini

lucach@gmail.com

What is G.P.S.?

- Global Positioning System
- 24 satellites 20,200 km high orbit
- Developed and maintained by US Dep Of Defense
- GPS (US), GLONASS (Russia), GALILEO (EU)



GPS Signal



- Free
- Precise
- Reliable
- All weather (fog, night)
- Anytime & Anywhere
- Unlimited user capacity

Almost!

GPS Receiver (aka GPS)



- Automotive
- Outdoors**
- Fitness
- Marine
- Scientific
- Military
- Commercial
- Etc.

What GPS should you get?



- Capable: High Sensitivity
- Useful: Can Display Maps
- Durable: Waterproof/Shockproof
- Dependable: Long battery life
- Easy-to-use: Touch Screen
- Extras: Compass, Altimeter
- Cheap: Cost < \$200, free maps
- Garmin GPSs are most popular
- Any Smartphones is a GPS!

GPS Smartphone Accessories

Battery



Waterproof



Do you need a GPS? Probably not...



GPS is useful only if

- Self-guided
- Off trail
- Complex
- Exploratory
- Remote
- Critical Nav

Let's plan an adventure...

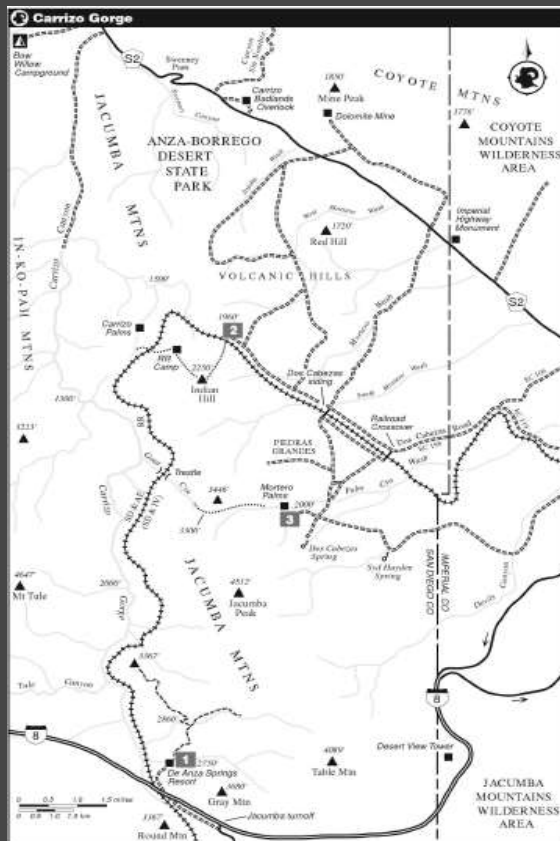
1. Research Destinations: What, Where, Why
2. Get a Map: Roads, Trails, Terrain
3. Define Itinerary: Waypoints & Routes

How to plan?

- a) Paper and Pen
- b) Computer + Printer
- c) **Computer + GPS**
- d) **Smartphone w Apps**



1. Research Destinations



Hiking Books

Afoot&Afield in San Diego
Afoot&Afield in Orange County
Afoot&Afield in Inland Empire



Hiking Websites

www.sdreader.com/news/roam-o-rama
www.dankat.com/swhikes/content.htm
www.birdandhike.com



Crowdsourcing

www.everytrail.com
www.alltrails.com
www.wikiloc.com
www.ropewiki.com

What is Geocaching?



It's a modern day treasure hunt!

Cache contents may not be very interesting

But some locations are spectacular ($TR \geq 4$)

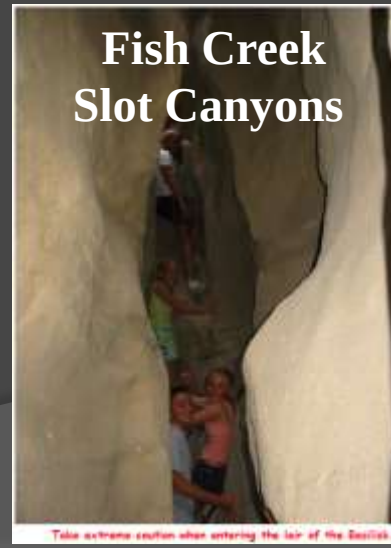
www.geocaching.com
www.navicache.com
www.terracaching.com

Worldwide!

Afton Canyon



Fish Creek
Slot Canyons



Lake Hodges
Flume



2. Get a Map



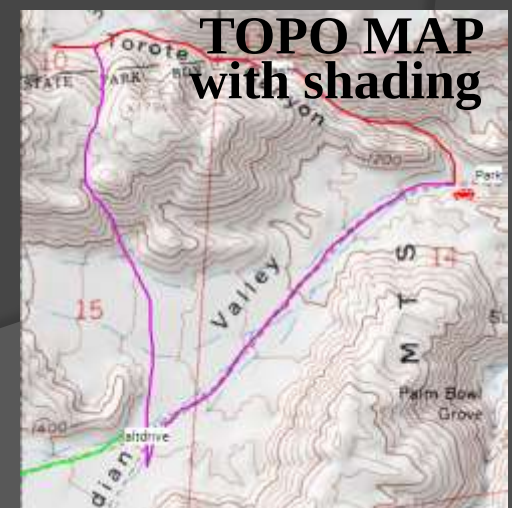
Map Type:

- Basic: Streets & Roads
- Aerial: Satellite Imagery
- **Terrain/Topo: Contour Lines**

Map Format:

- Raster: image/paper scan
- Vector: routable, smaller size
- Online vs Offline: Inet?

What is a TOPO Map?



3. Define Itinerary



GPS Data Types:

-  Waypoints: point
 -  Routes: p2p
 -  Tracks: smooth p2p
- Tracks ⇔ Routes**

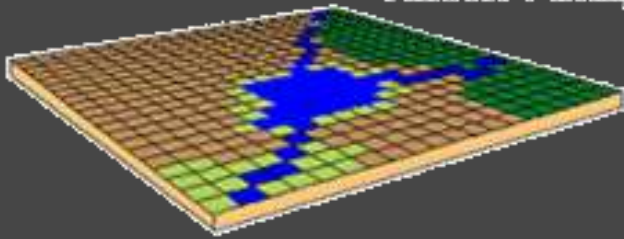
GPS Data Formats:

- .GPX : wpt,routes&tracks
- **.KML : wpt&tracks**
- .KMZ : compressed KML

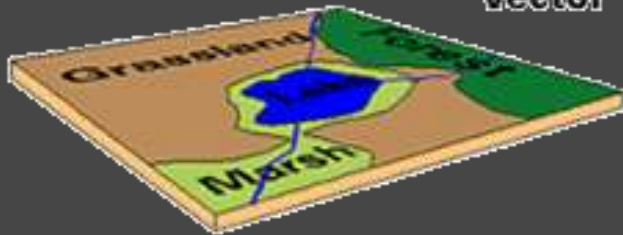
Free converter: GPSTabel

Mapping Tools

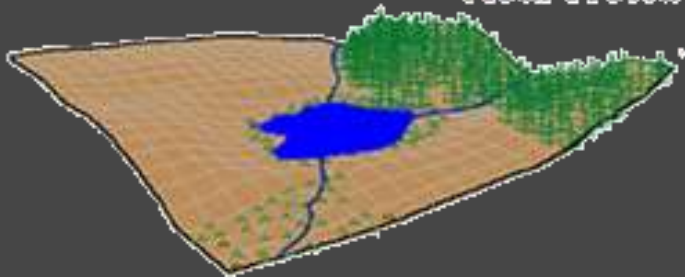
Raster / Image



Vector



Real World



PC/Mac/Web

Caltopo.com

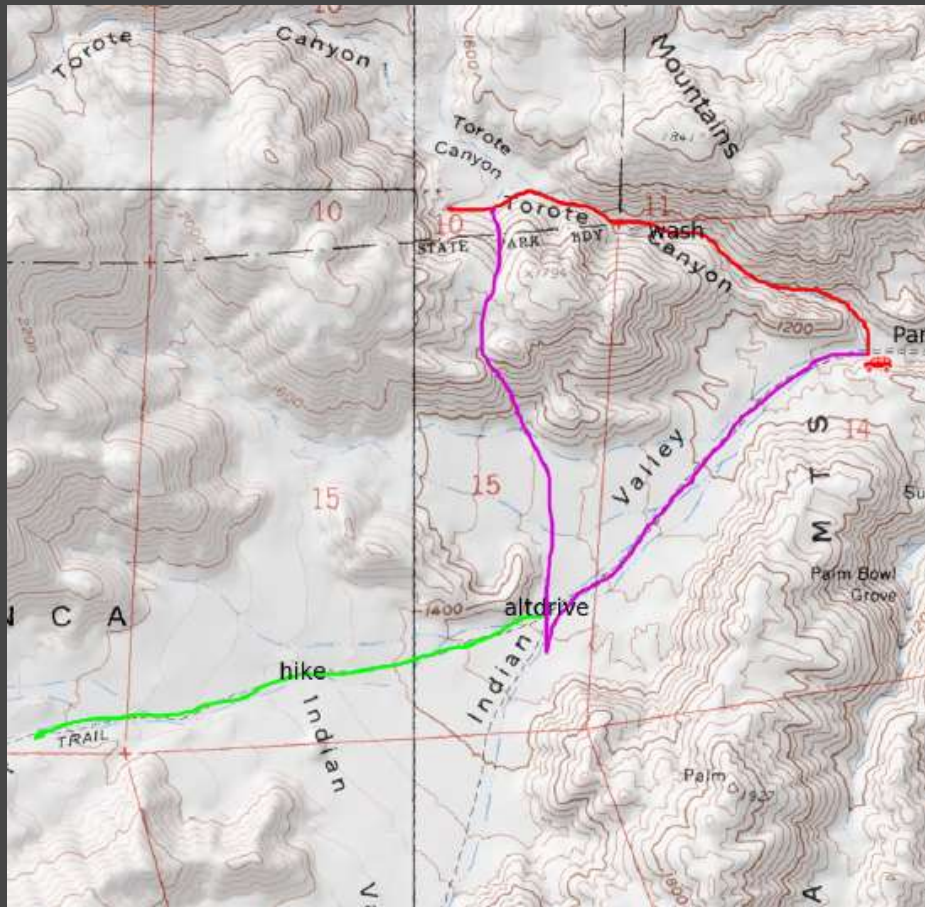
Google Earth

Garmin Basecamp
etc.

Smartphone Apps

Locus Maps, Backcountry Navigator,
Gaia GPS, Topo Maps, etc. etc. etc.

Caltopo.com (Free / Pro \$)

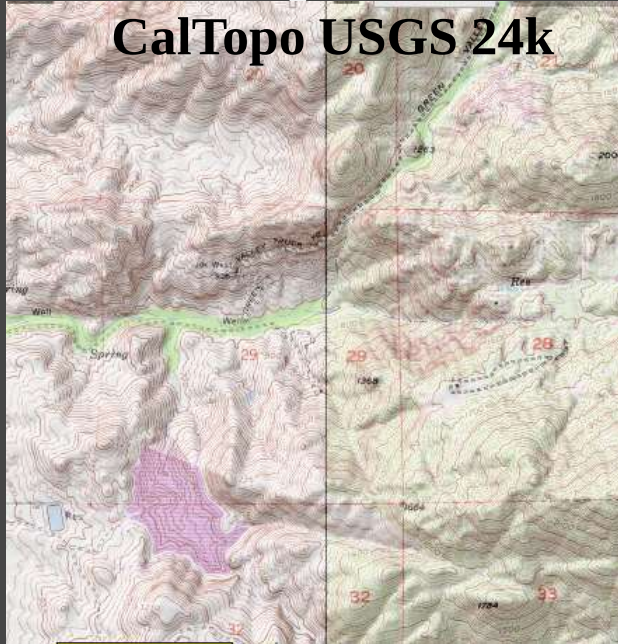


Create wpt/tracks
Import/Export .gpx .kml Garmin
USGS RASTER 24k Maps
Excellent Printing / PDF
Excellent video tutorials (About)
Multiple map sources (free)
Extras: Weather, Snotel, Gauges
<http://caltopo.com>

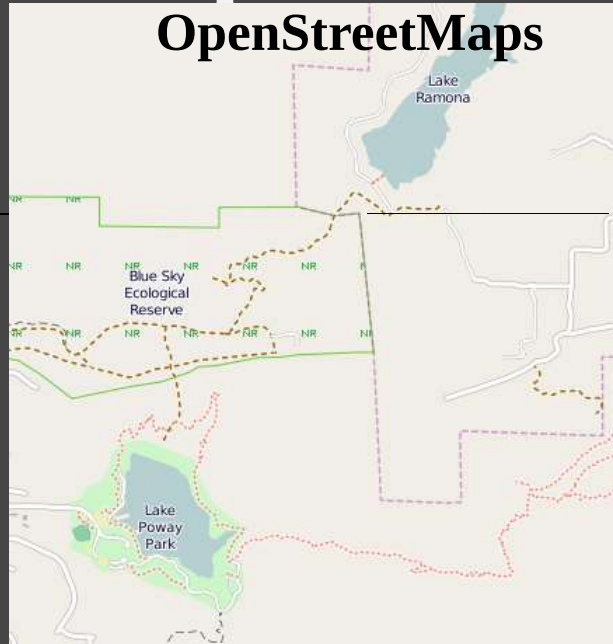


Caltopo.com Map Sources

CalTopo USGS 24k



OpenStreetMaps



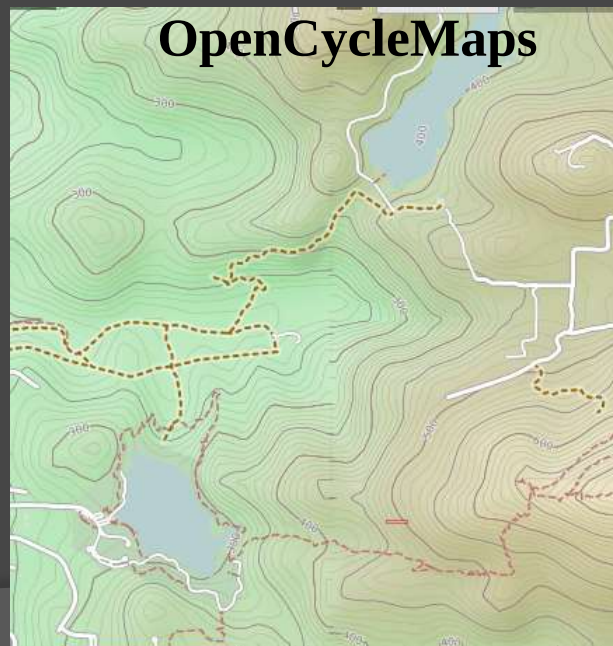
Google Terrain



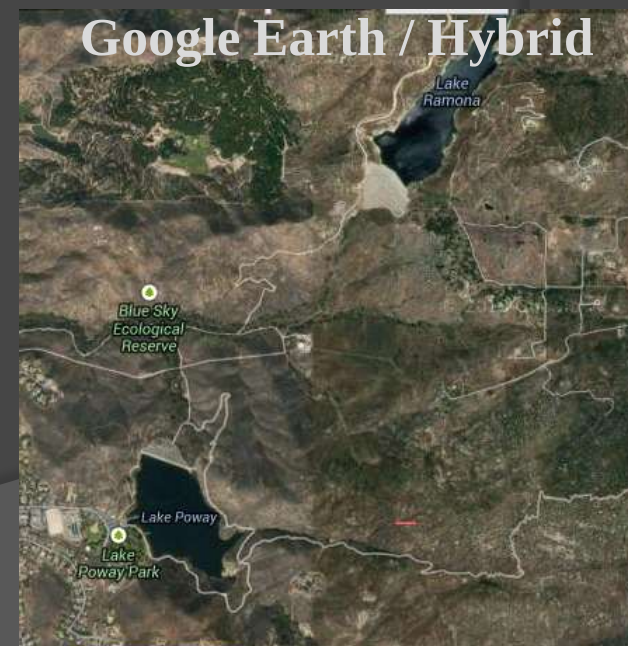
NatGeo/ArcGis USGS 24k



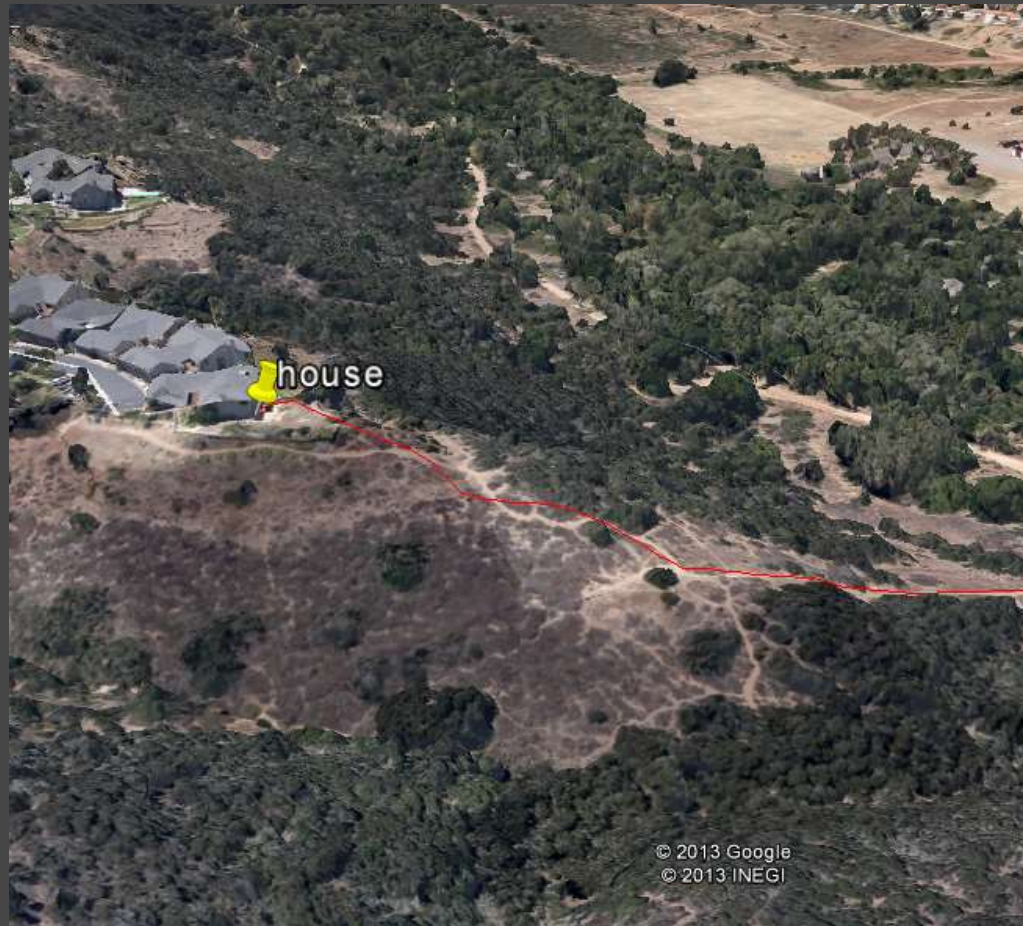
OpenCycleMaps



Google Earth / Hybrid



Google Earth (free)



- **Create wpt/tracks in 3D**
- **Import/Export .kml**
- **Excellent 3D View**
- **Excellent Aerial maps**
- **Extra optional layers**
- **Topo Maps and more**
http://ropewiki.com/Ropewiki_Explorer
- **Display hiking routes**
http://ropewiki.com/Google_Earth
- **MUST have internet**

Smartphone with Apps



GPS Apps: GPS + Map

- GaiaGPS: Easy, iOS/Android, \$\$
- BackcountryNav: vector maps, basic
- Locus Maps: vector maps, advanced
- MANY more, try them out!



Hiking Apps: GPS + Map + Info + Tracks

- WikiLocs: Hiking, Biking, 4x4, etc.
- AllTrails: Mostly only hiking
- Trimble: Mostly only hiking
- MANY more, try them out!

Using a GPS: At Home



0. Update App/Firmware (once in a while)
1. **Create/Import Wpt/Tracks data**
Use DropBox, Google Drive, Resilio Sync to => Smartphone
2. **Download map offline (raster or vector)**
3. Print map, bring paper map & compass.
Otherwise bring 2 smartphones.

Using a GPS: At Trailhead



1. Calibrate: compass & altimeter (if needed)
2. **Power Saving**: set display off after 15s, adjust screen brightness to min/max
Smartphones: Airplane mode ON, GPS ON
3. **Orient the map**: 3D view OFF, North Up ON
4. **Mark Starting Waypoint** (ie: CAR)
5. **Record Track** (if not automatic)

Using a GPS: During Trip



Basic operations:

- a) **Mark Waypoint:** record location
- b) **Record Track:** record breadcrumbs
- c) **Map:** view my location, pan & zoom
- d) **Set Destination: Guiding / Routing**
- e) **Trip Computer:** distance, time, speed
- f) **Extras:** Sunset/Sunrise, Weather, etc

Garmin Oregon 450: During Trip

Main Menu



Set Destination: Waypoint



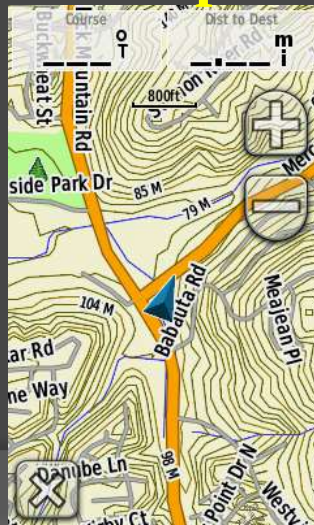
Track



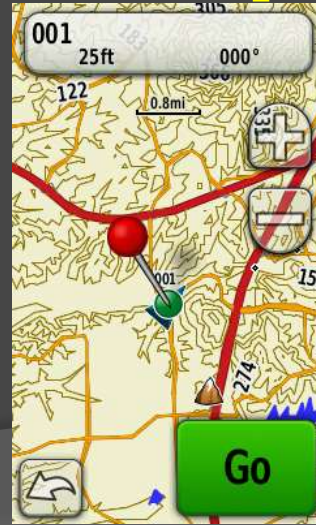
Route



Map



Mark Wpt



Guiding



Trip Comp.

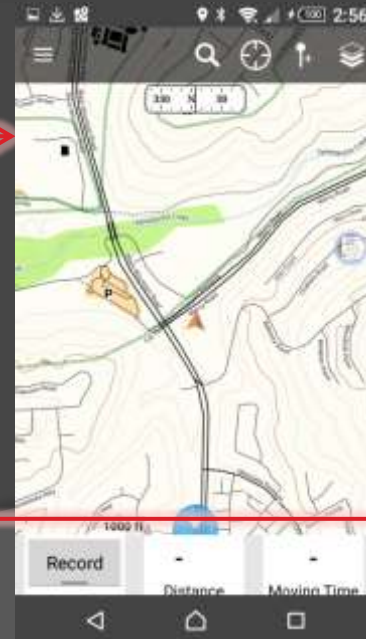
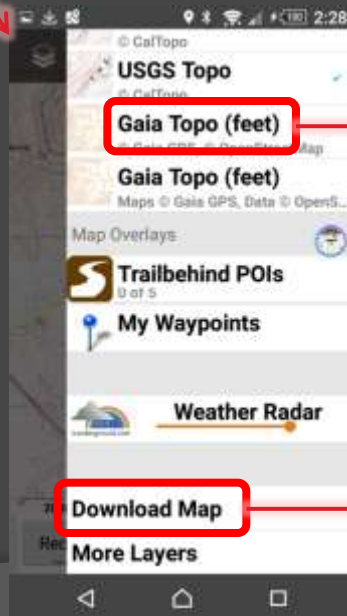


GaiaGps: At Home Map

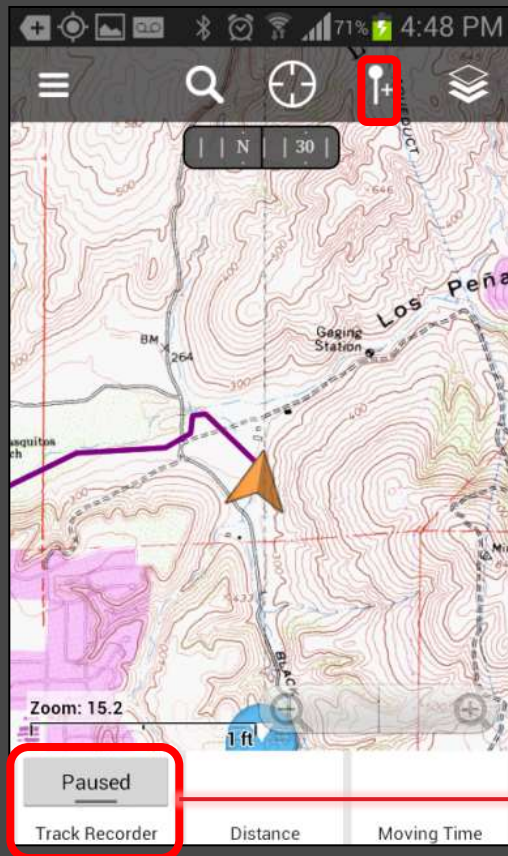
**Import
Wpt/Tracks**



**Switch Map
Download Map**



GaiaGps: At Trailhead



Record Waypoint

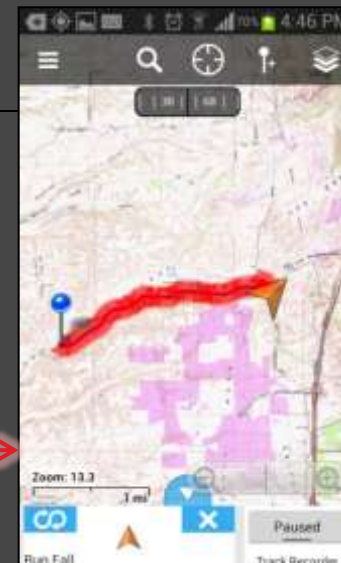
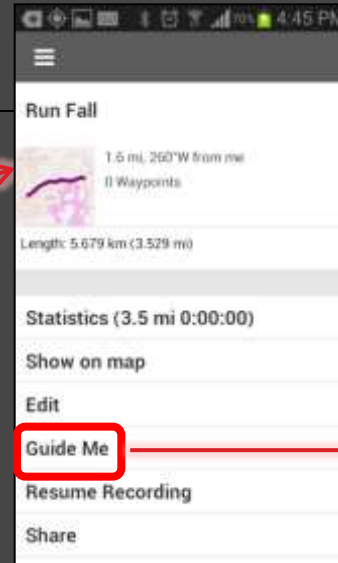
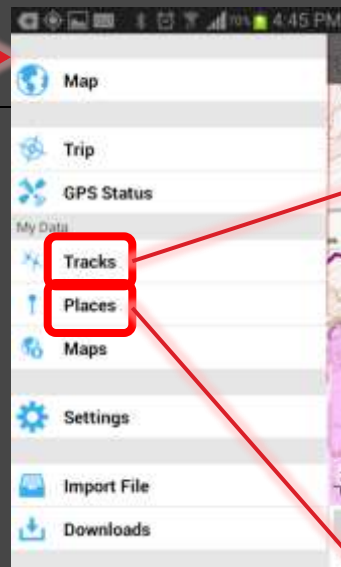
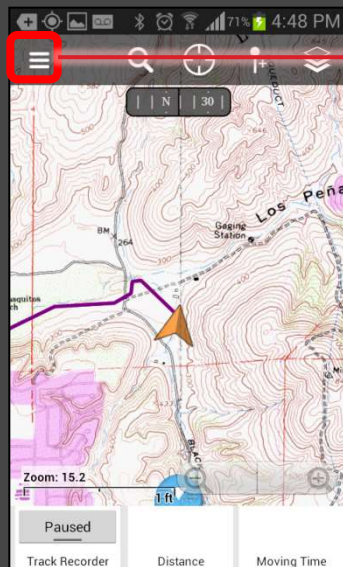
Record Track



GaiaGps: During Trip

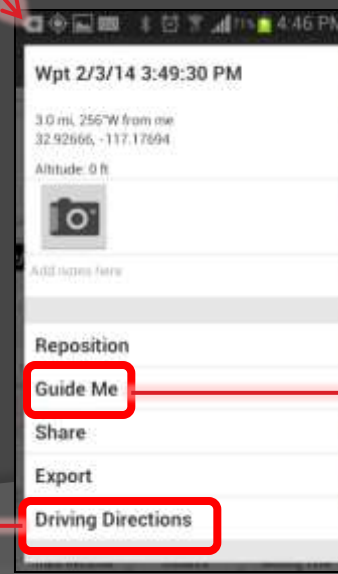
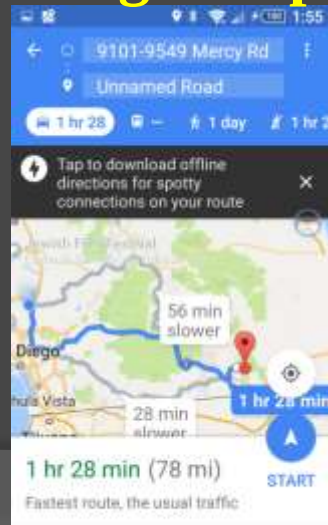
Set Destination: Track

Guiding

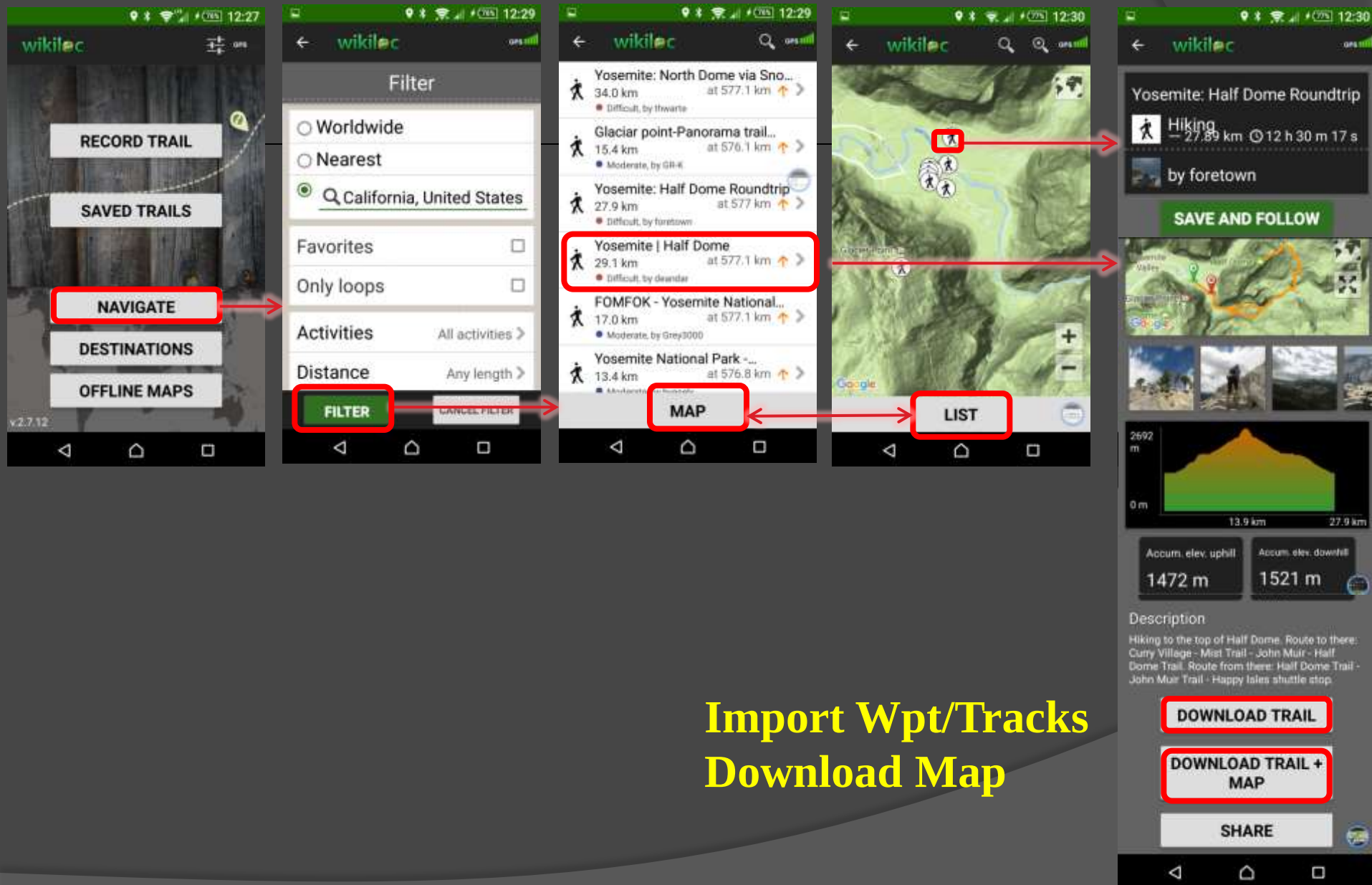


Set Destination: Waypoint

GoogleMaps

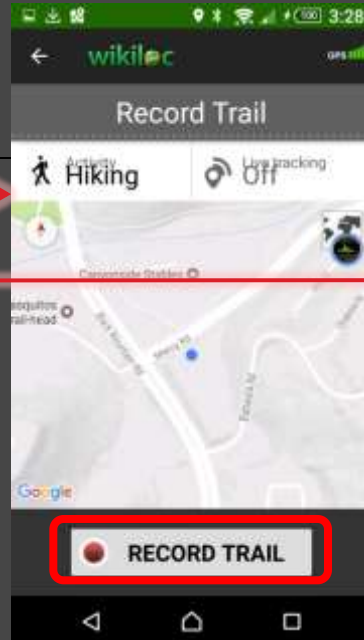
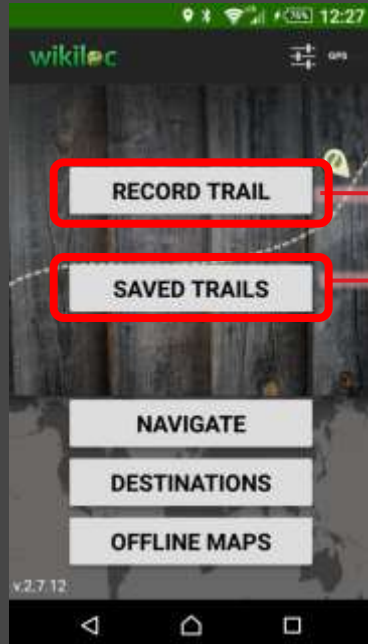


Wikiloc: At Home

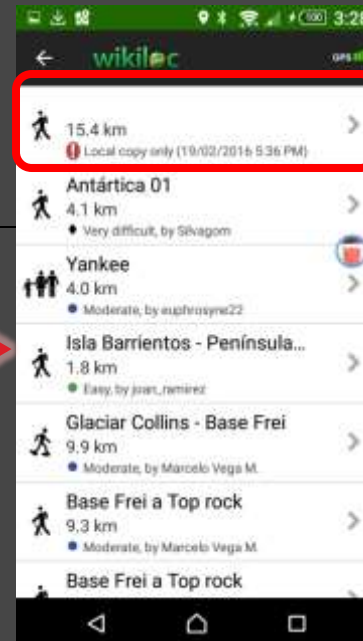


Wikiloc: At Trailhead

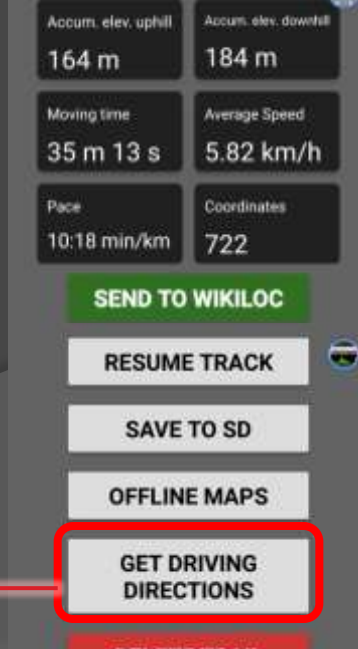
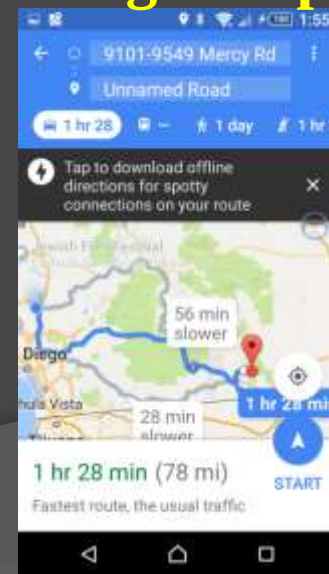
Record Track



Set Destination: Track

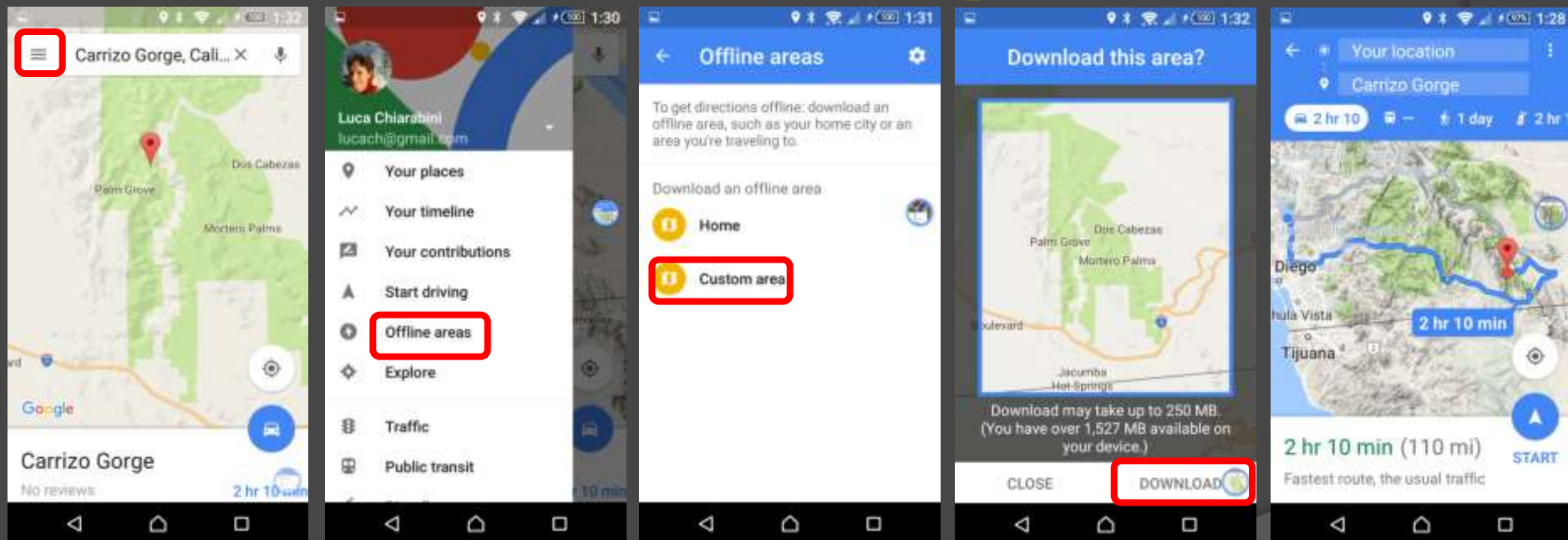


GoogleMaps



Google Maps: At Home

Download Map



Alternatively use MAPS.ME (has most hiking trails)

GPS : The Digital Map



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More information: http://ropewiki.com/Smartphone_apps