

Participate or Spectate Participator Prep

Download the Avenza Maps App on your device

If cell service is weak, connect to wifi

Hilton Honors Meeting

Bristol2019!

Workshop resources:
<https://s.uconn.edu/avenza>

GPS Mapping Using the Avenza Maps App

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Adelheid Koepfer

Center for Land Use Education and Research (CLEAR)
UConn CT Trails Program

Relevant Updates



- **CT ECO** <https://cteco.uconn.edu>

- **CT State GIS Office**

- 5 people including Geographic Information Officer (GIO)
- Advisory Council
- New state GeoData Portal <https://geodata.ct.gov/>

- **2023 Data Acquisition**

- 3 inch, 4 band aerial imagery
- High res lidar points (min 15pt/sq m)
- 0.5m digital elevation model (DEM)
- 1 foot contours
- Building footprints, 3D buildings
- More

First deliveries early in the new year,

Final deliveries by May

Up on CT ECO (rasters) and the GeoData Portal ASAP

UConn CT Trails Program

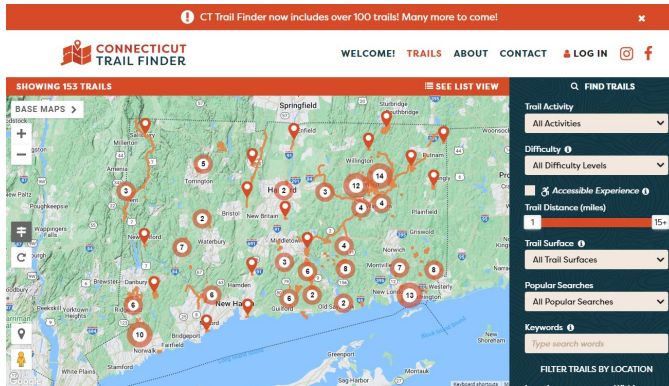
<https://cttrails.uconn.edu/>



CT Trail Census



CT Trail Finder



cttrailfinder.com



Active Living (PATHS)

People Active on Trails for Health & Sustainability

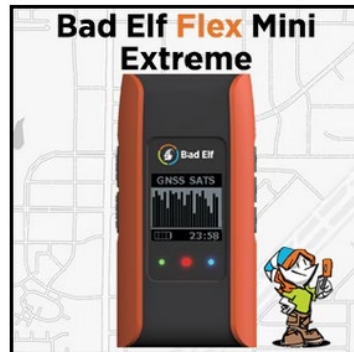


Workshop Agenda

Topic/Activity
Introduction (today's topics, GPS)
Avenza Maps App Overview and Demo
Optional Field Activity – Collecting Geographic Data with Avenza Maps
Plot Photos, Export Data
From GPS to Map: email/send, Google Earth, Google Maps, QGIS
Wrap Up and Q&A

How Accurate is your Smartphone GPS?

- 2 - 5 meters on average
- Assisted GPS (A-GPS)
 - GPS satellites + cellular base stations
- Bluetooth to External GPS receivers
 - Improve to sub-meter + accuracy



1.5 m, \$500

Sub-meter, \$1500

How Accurate is your Smartphone, Visualized

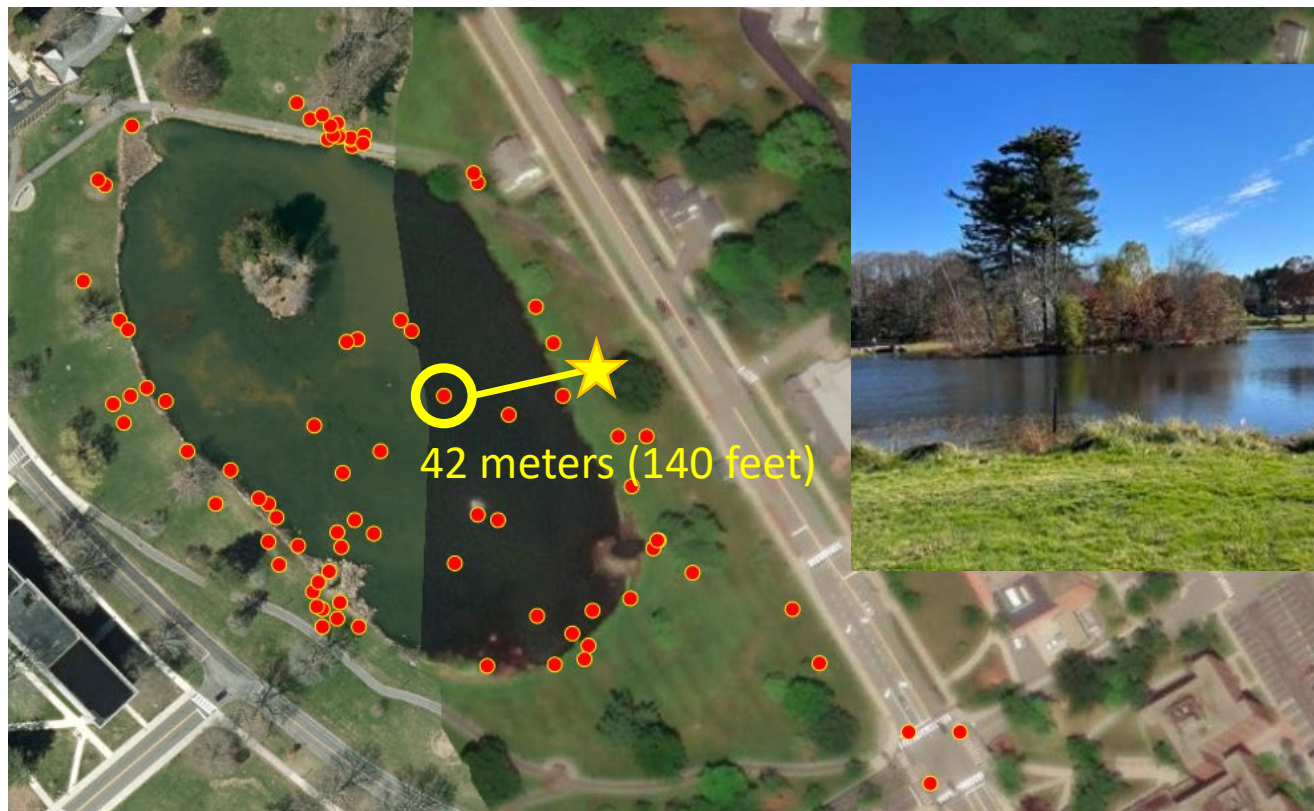


Photo Mapping Activity at UConn's Mirror Lake, November 2023



Why we like the Avenza Maps app for GPS Mapping



AVENZA MAPS

- Simple interface
- Collects placemarks, tracks, and areas* at the same time (*paid version)
- Import/export to standard GPS formats (.gpx, .kml, .csv, .shp*)
- Free for iOS and Android devices

RECREATIONAL ONLY		COMMERCIAL, PROFESSIONAL, GOVERNMENT, ACADEMIC	
<p>FREE</p> <p>\$0</p> <p>--</p> <p>For recreational use by people who love to travel or enjoy outdoor activities in remote locations.</p> <p>Join for Free</p> <p>Download the App</p>	<p>PLUS</p> <p>\$32.99/year</p> <p>USD per device</p> <p>For enthusiasts with specialized maps for travel, camping, hiking, and other non-commercial uses.</p> <p>Get the App</p> <p>Upgrade subscription in-app</p>	<p>PRO</p> <p>\$152.99/year</p> <p>USD per device</p> <p>For using the app for commercial or academic purposes, or in any professional capacity.</p> <p>Get Started</p> <p>Purchase a subscription</p>	<p>ENTERPRISE</p> <p>Team Pricing</p> <p>Special pricing</p> <p>For organizations deploying Avenza Maps to teams of people, on 3 or more devices and device types.</p> <p>Pricing Breakdown</p> <p>View cost per device</p>

Why we like the Avenza Maps app for GPS Mapping



AVENZA MAPS

- Offline data collection
- Can connect to external GPS receivers for improved accuracy
- Geolocate photo feature
- Navigation, basic tools
- Map Store for finding basemaps
- Fantastic tech support, reference docs, user community
- Regular updates

CACIWC

Spectate

or

Participate

Today

- Use the free version of the Avenza Maps app to collect GPS data (lines and points)
- For export

Not Today

- Avenza maps for hiker/user
- Avenza maps for land manager (provide geopdf, basemap)
- Avenza maps for navigating
- All the other stuff that Avenza can do

Goal

- Show you what is possible
- Generate ideas
- Where to learn more

Avenza Maps Overview

(but first, a disclaimer...)



Apps and software change ALL the time



Avenza App Housekeeping

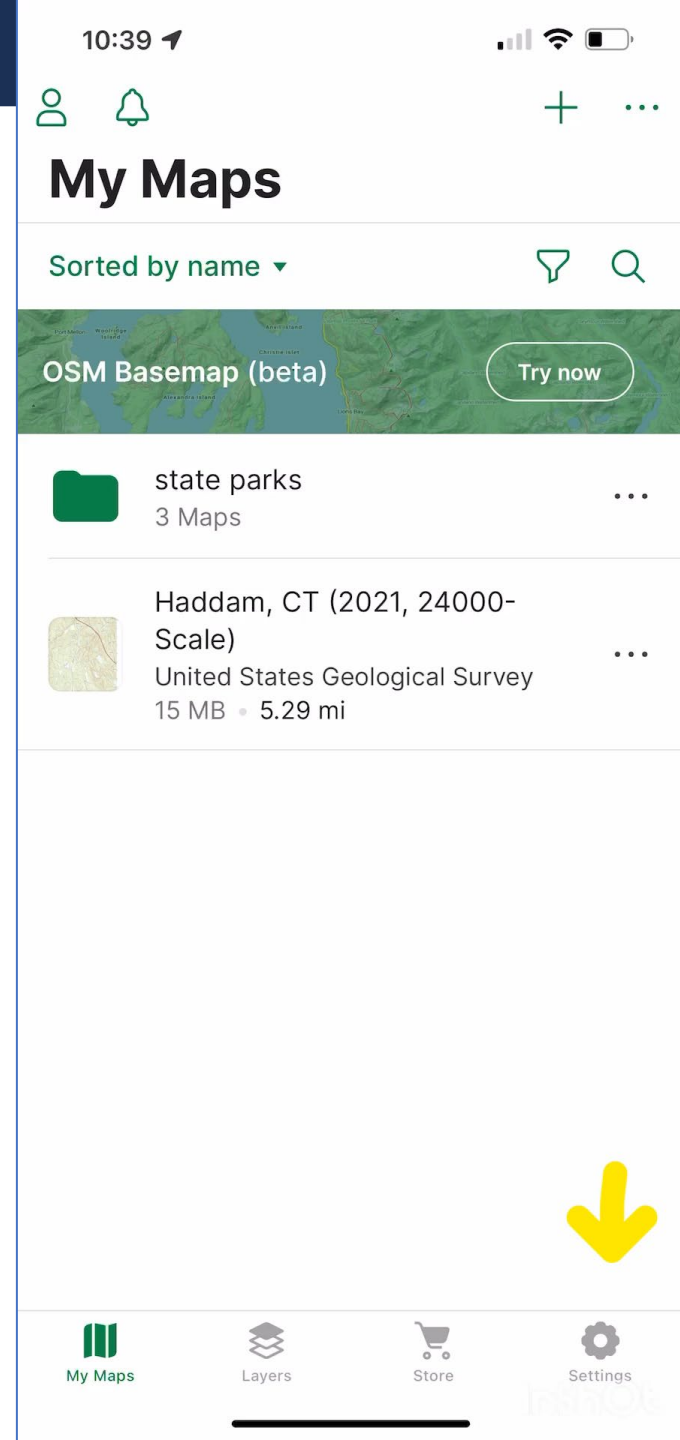
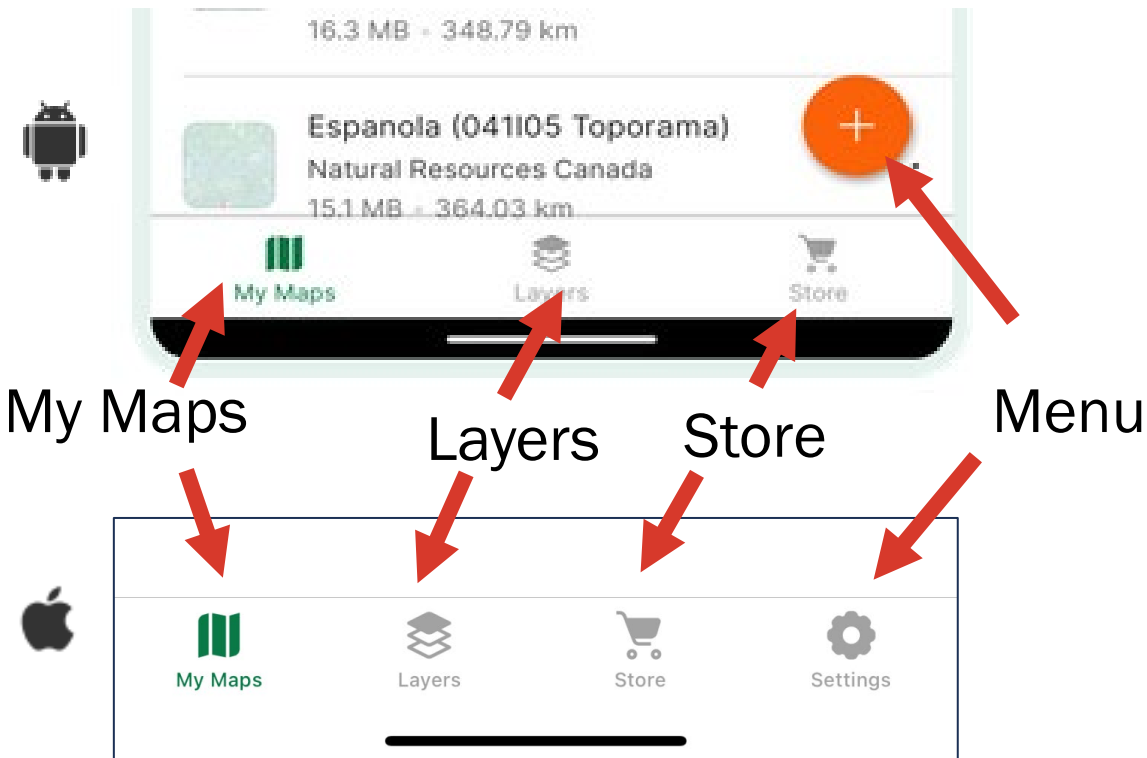
- First time, you will need to give the app permission to use location, access your camera, etc.
- Allow location (Android – Allow all the time)
- Phone battery – plan ahead!
- Offline mapping – it's a thing!
 - Download map from map store
 - Head out to the field
- Photo album
 - On your phone, create a new album for Avenza.
 - In the Avenza settings, set the album to be the default for the app.

Download the app
<https://store.avenza.com/>

Avenza App Layout

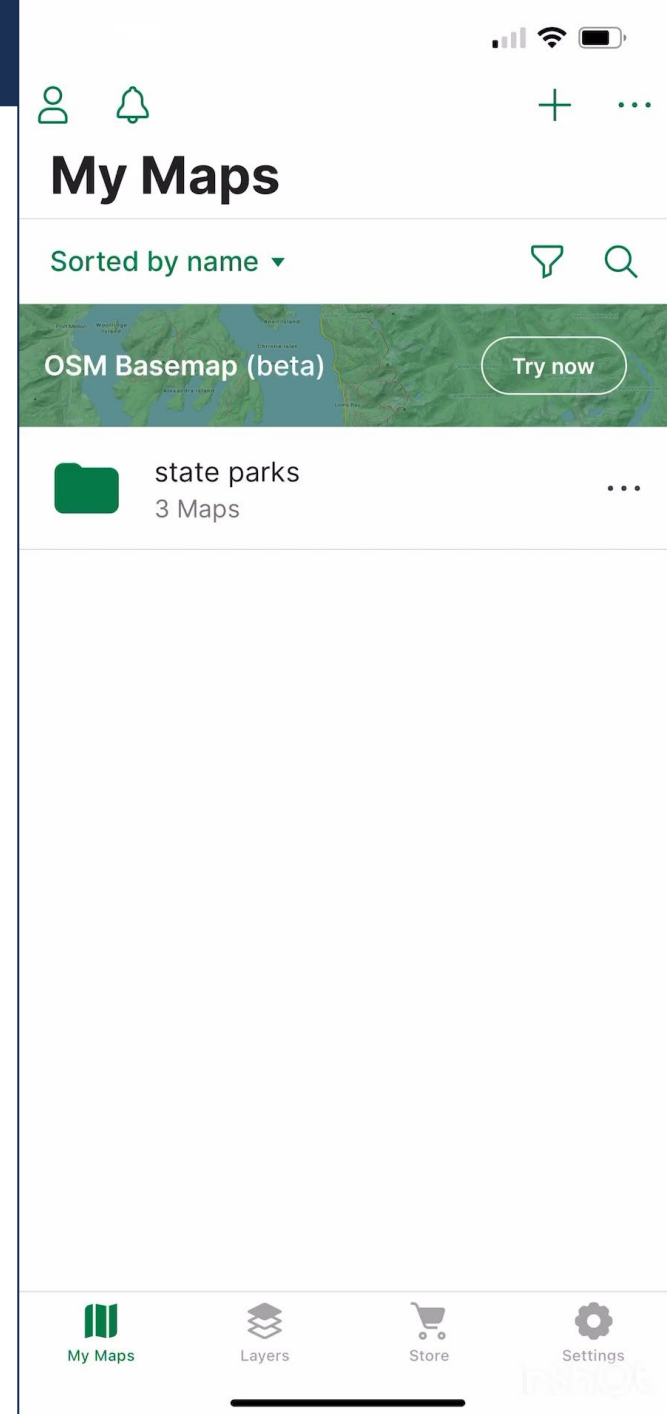
Bottom toolbar:

locate, add placemark, map layers, menu



Avenza Basemaps

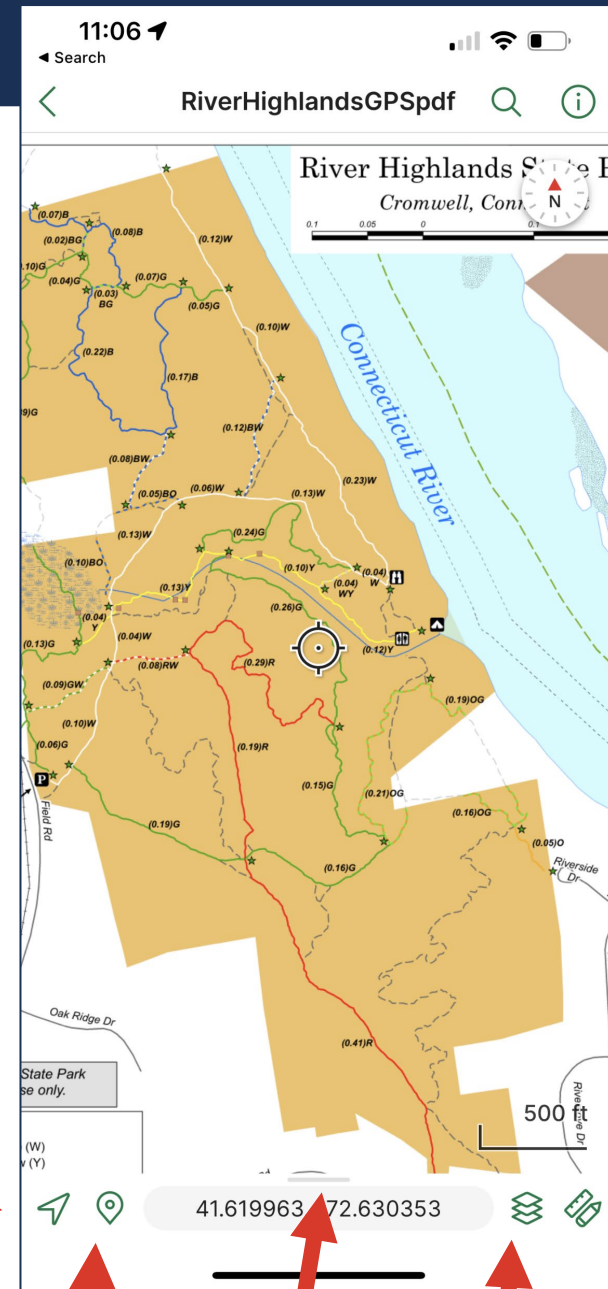
- **Avenza Maps utilizes georeferenced maps**
GeoPDFs, GeoTIFFs, (beta Open Street Maps service)
- **Avenza Map Store**
 - Free and not free
 - Search for maps by location, type, activity, cost
 - Search by publisher
 - Purchased maps are saved to user account and can be shared across 5 separate devices
- **Import your own**
from device, cloud location, URL, QR code



Avenza Map Layout

Free accounts can have up to three “active” maps at a time.

- Bottom toolbar: locate, add placemark, map layers, menu
- Swipe up: Location, Tracking, Navigation



Phone's location →

← Menu

↑ Add Placemark

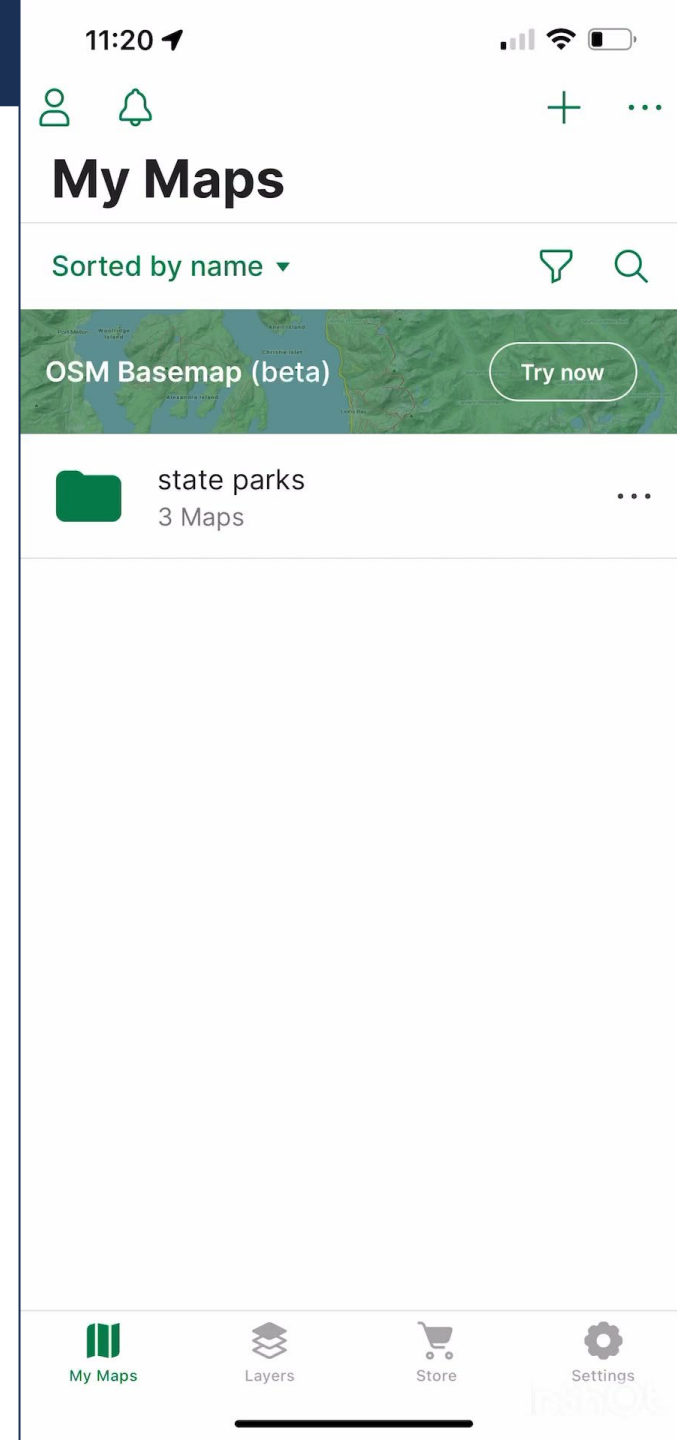
Swipe Up

↑ Map Layers

Avenza Map Layout

Free accounts can have up to three “active” maps at a time.

- Bottom toolbar:
 - locate, add placemark, map layers, menu
- Swipe up:
 - Location, Tracking, Navigation



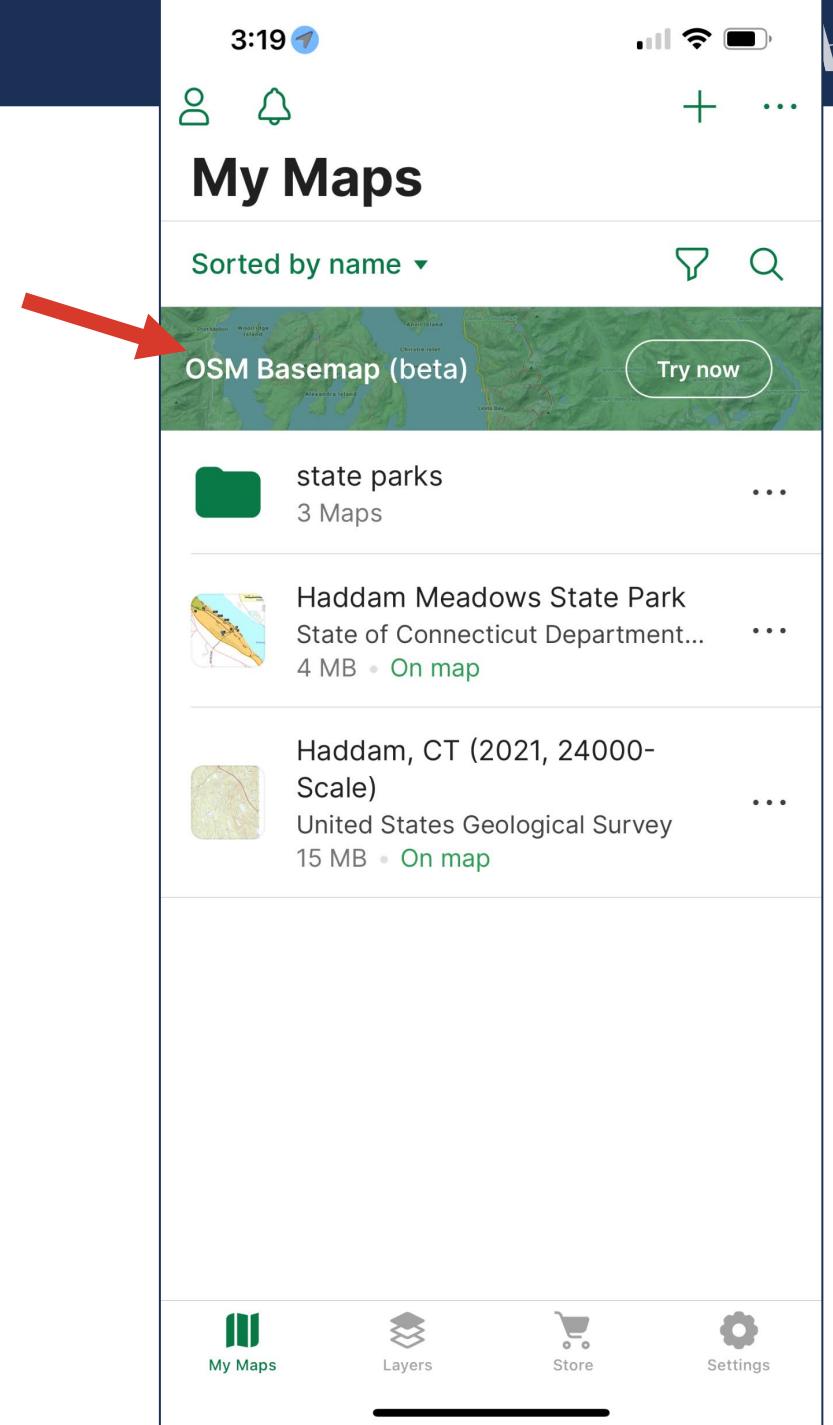
DEMO

Avenza Maps Basemap

Today

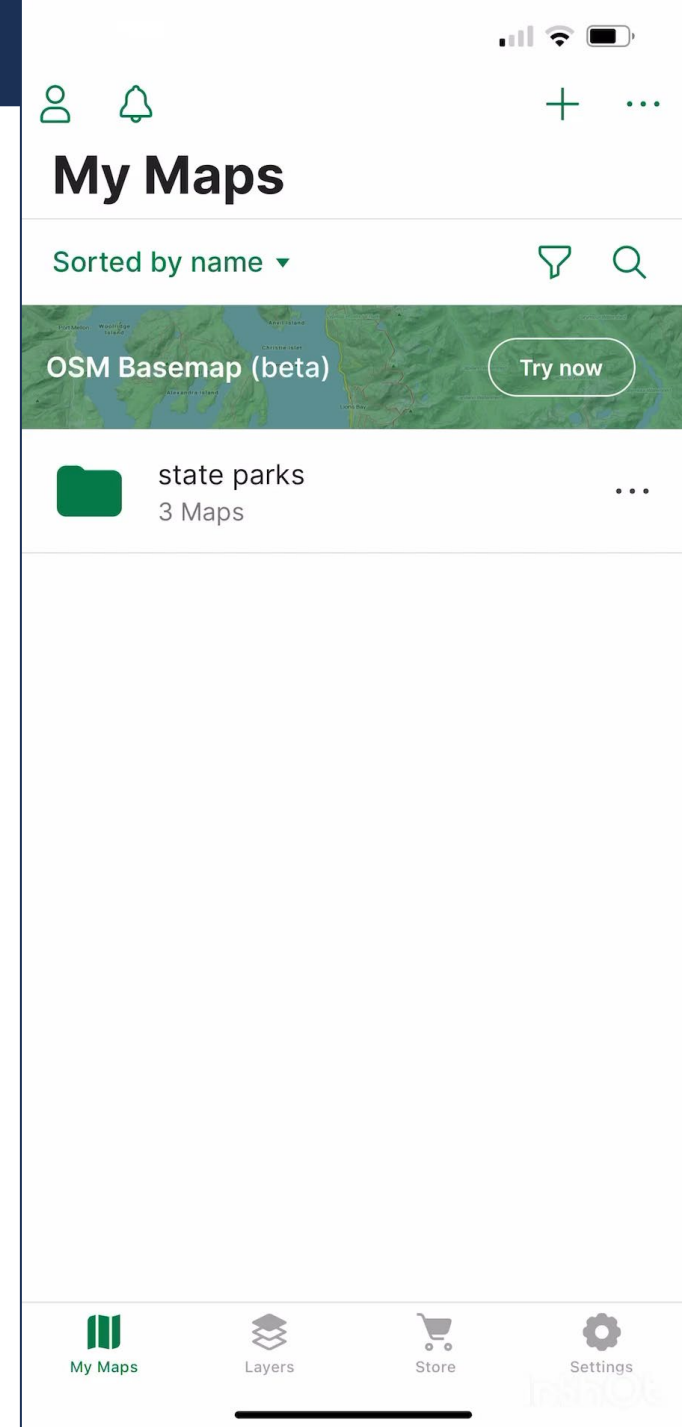
- Use Open Street Maps (OSM) service
 - PRO - full coverage
 - CON - crowd-sourced and therefore not always accurate. USE WITH CAUTION

Basemap doesn't really matter for data collection, you just need something as a frame of reference



How to Collect GPS Data

- Get yourself to the starting point
- Swipe up:
 - Location, Tracking, Navigation
- Walk
- Take photos and/or placemarks
- Keeping walking
- Stop
- Come back in



Hands-On Activity

Option 1: Try it out!

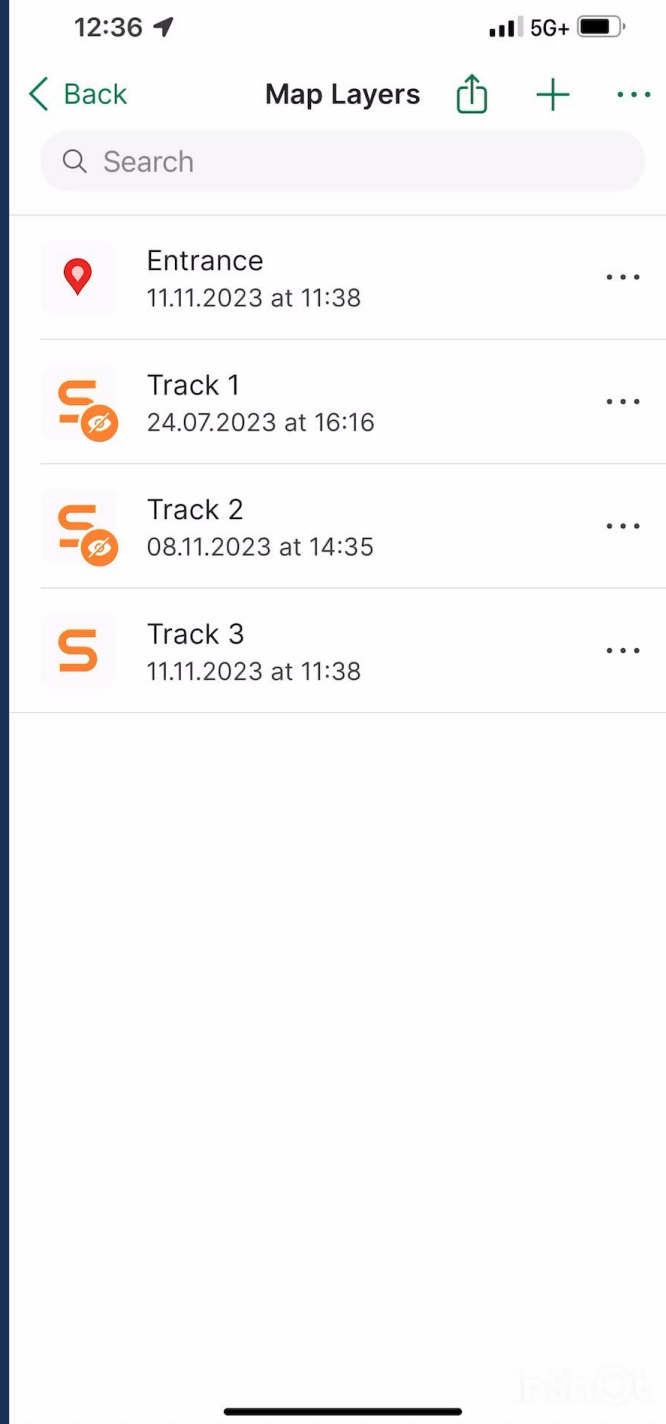
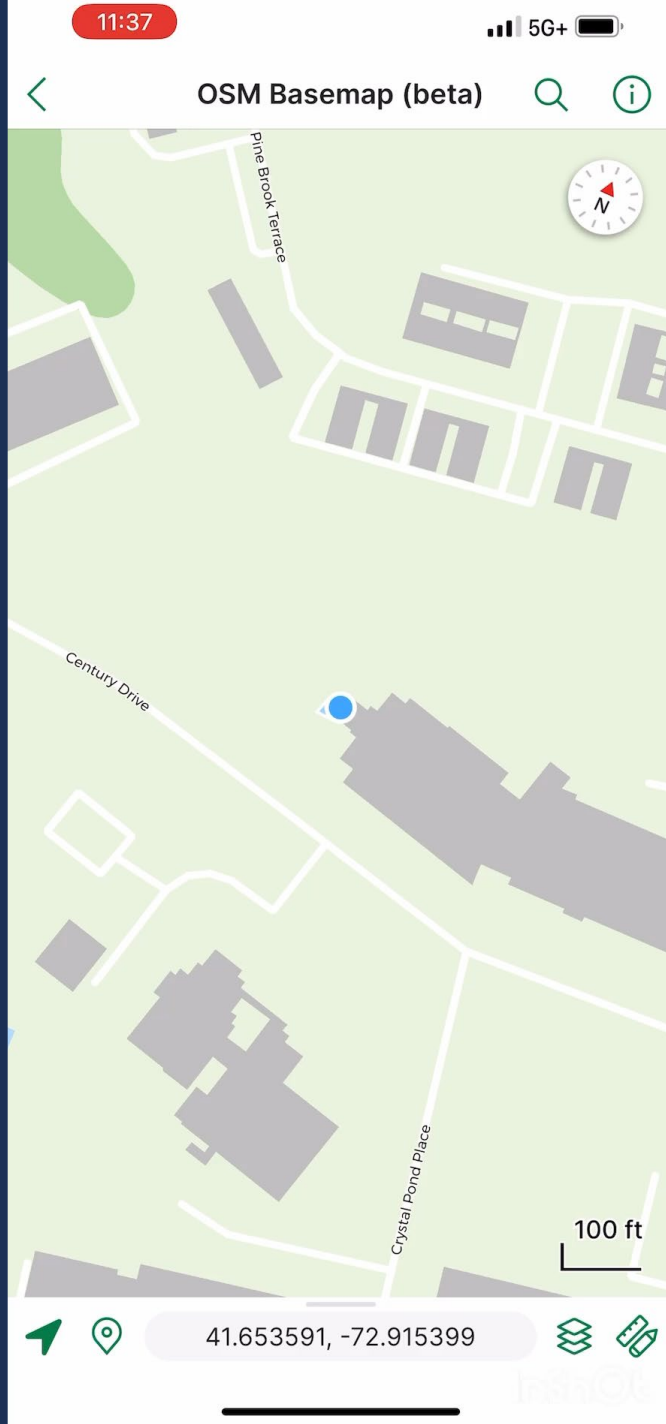
- Open Avenza Maps app
- Go outside
- Collect some GPS data and photos

Option 2: Demos and Q&A

Spectators

- Demo – start track, collect placemark, add photo, start
- Watch data collect video
- Link layer toto topo instead

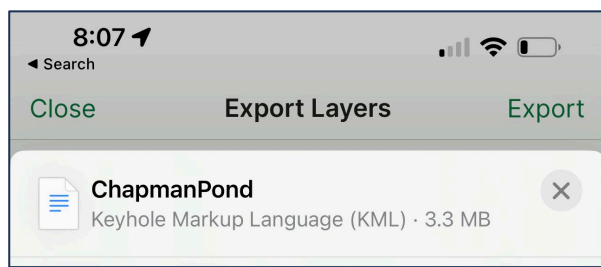
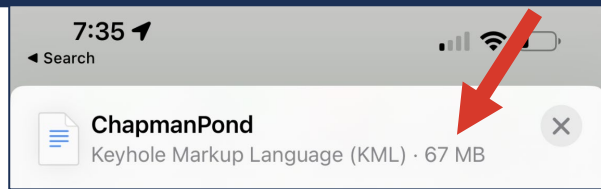
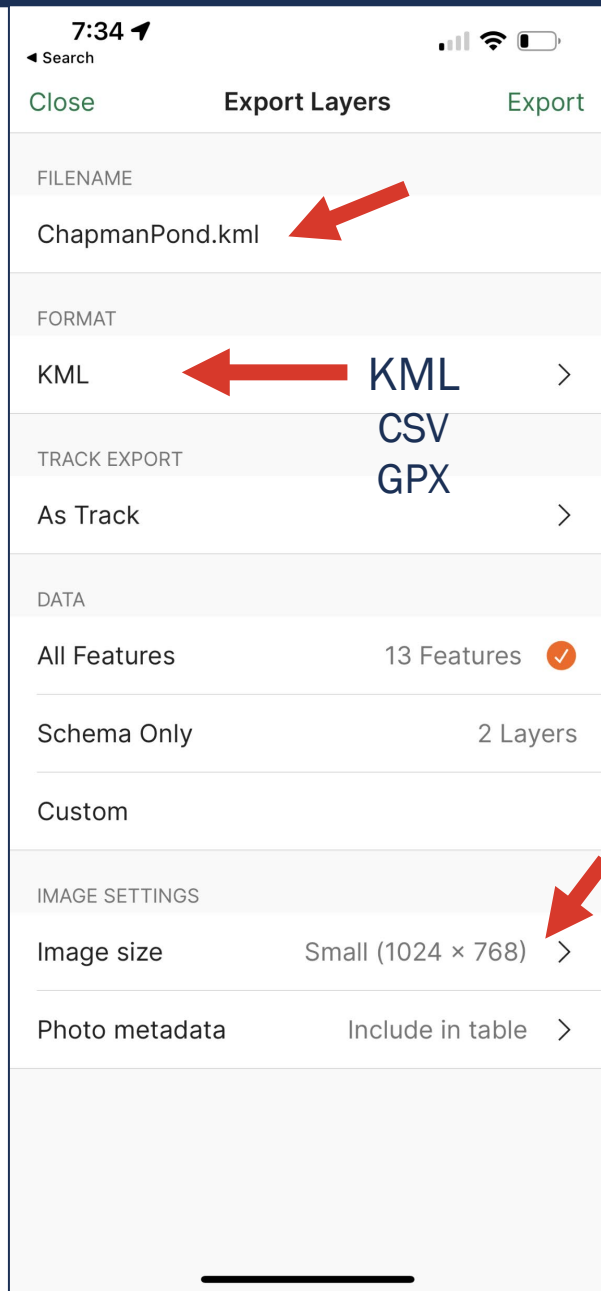
Data collection example



Plot Photos and Export

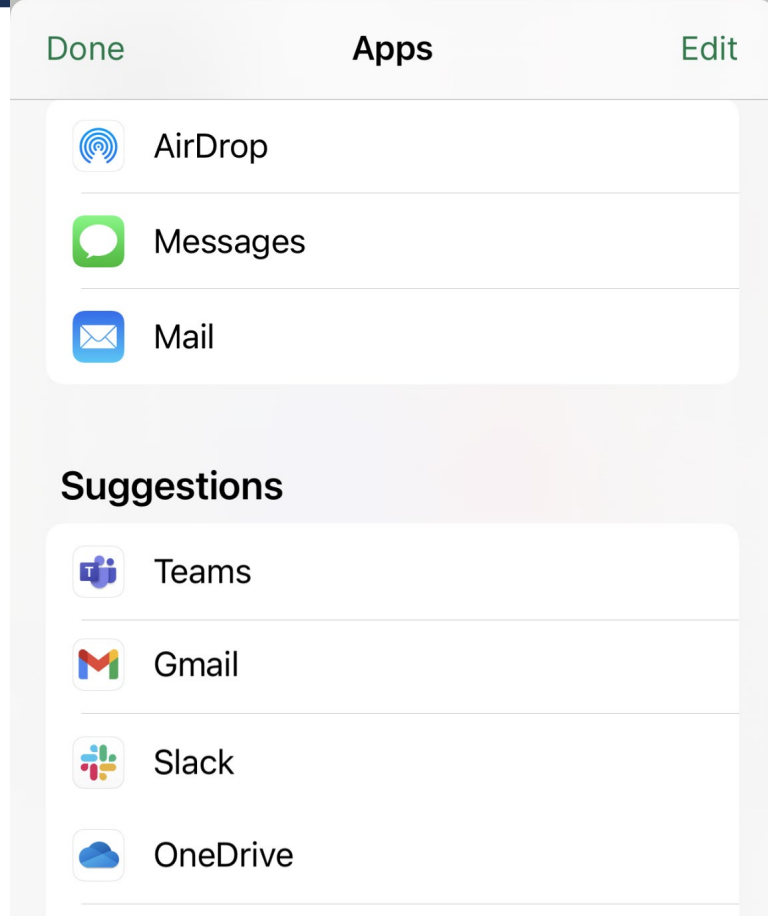
Plot Photos and Export

- Track line
- Take photos
- Plot photos
- Optional: add details
- Export (email, save to drive, etc.)



11 photos

Small	3.3 Mb
Medium	6.6 Mb
Large	67.0 Mb



Email to or share with GIS person or someone else who wants it.

UConn CLEAR Geospatial Training




[Geospatial Training Program](#) / Geospatial Classes

Geospatial Classes

[GTP Home](#) [About GTP](#) [Training](#) [Tutorials](#) [ARIAL \(Drones\)](#) [Resources](#) [Geospatial Contact](#)

CLEAR's Geospatial Educators participate in a variety of custom workshops, courses, seminars and training programs at UConn and with outside collaborators. Visit the [Schedule & Registration](#) page for dates and details and the [Tutorials](#) page for access to our workshop materials and additional training resources.



Introduction to GPS Mapping with Avenza Maps

New! This half-day in-person workshop will introduce participants to the free [Avenza Maps](#) app on their Apple iOS or Android device. This workshop will focus on how to use the app for data collection. Participants will be introduced to the capabilities and the layout of the app and will learn how to collect GPS data including tracks, placemarks, and geolocated photographs using their device. The workshop will also cover data formats and standardization strategies including the use of data schemas. Additionally, the workshop will touch on uses for GPS data, including contributing to the [Connecticut Trail Finder](#), sharing with others, and strategies for using it in mapping applications including Google Maps, QGIS, and ArcGIS.

Please Note: This is a BYOD (bring your own devices - iPhone or Android AND laptop) training. Loaner laptops will be available by request. Be sure to indicate this in the registration form.

[MORE INFO](#)

<https://clear.uconn.edu/geospatial/workshops/>

From GPS to Maps

- Email it! (Trail Finder)
- Google Earth
- Google Maps
- QGIS
- There are more!

CT Trail Finder

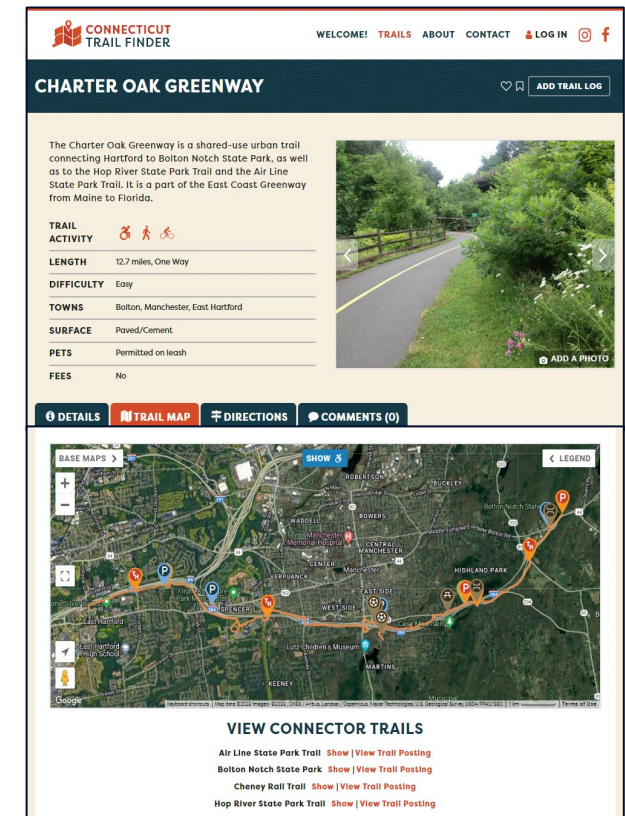
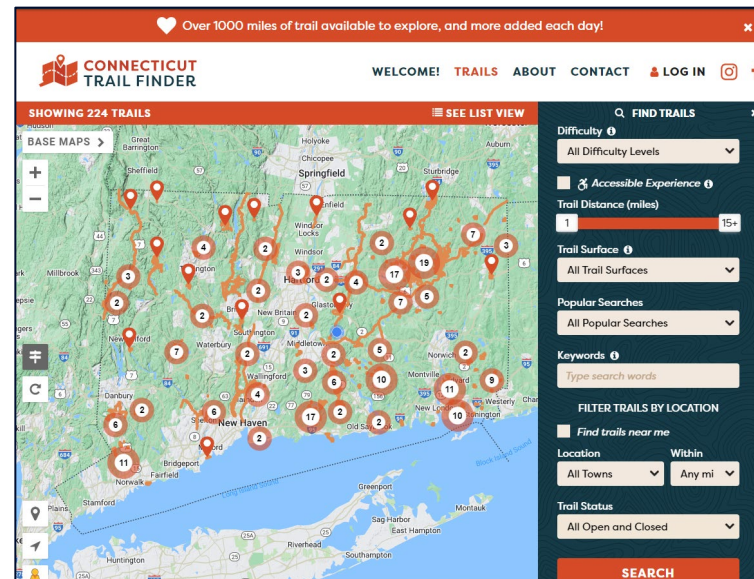
Free, interactive website designed to help people find all kinds of trails across the state.

- All trail postings are manager-approved ensuring accurate information for authorized users
- Trail connections by location
- For ALL audiences

Requires trail GIS lines.
Smartphone GPS! 💡



**CONNECTICUT
TRAIL FINDER**



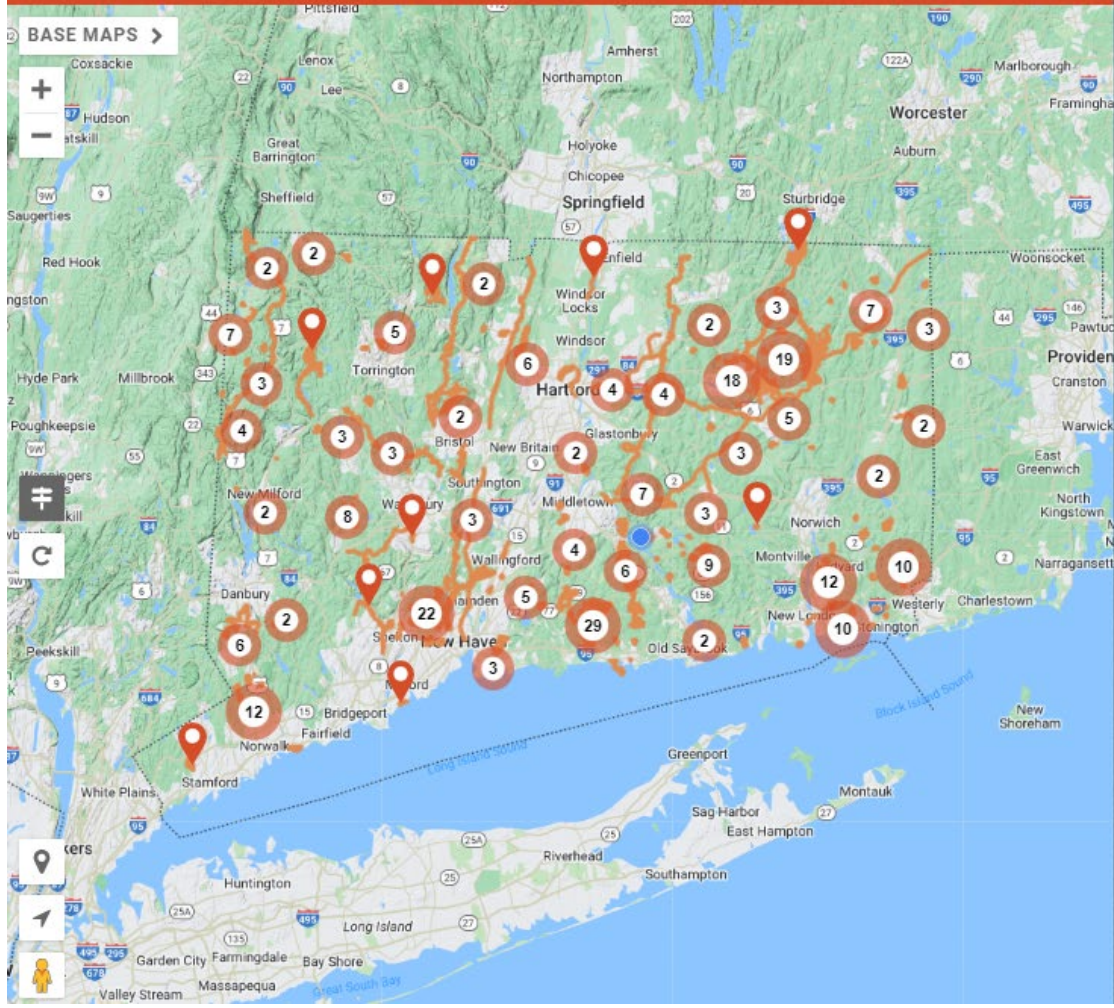
Over 1000 miles of trail available to explore, and more added each day!



WELCOME! TRAILS ABOUT CONTACT LOG IN

SHOWING 277 TRAILS

SEE LIST VIEW



FIND TRAILS

Trail Activity: All Activities

Difficulty: All Difficulty Levels

Accessible Experience

Trail Distance (miles): 1 to 15+

Trail Surface: All Trail Surfaces

Popular Searches: All Popular Searches

Keywords: Type search words

FILTER TRAILS BY LOCATION

Find trails near me: Location: All Towns, Within: Any mi

Trail Status: All Open and Closed

SEARCH

RESET SEARCH

Trail Post Process

- Outreach
- Data Gathering
 - - Narrative
 - - Geographic Data
- Website Trail Posting Development
- Trail Manager Review & Approval
- Publish Posting
- Follow-up, Advisory Notifications, Updates



WELCOME! [TRAILS](#) [ABOUT](#) [CONTACT](#) [LOG IN](#)

CHATFIELD HOLLOW STATE PARK

♡ 📄 ADD TRAIL LOG

Hike trails in search of Native American caves, explore the jagged rocky ledges and recesses, relax by the cooling waters, or picnic in the soft pine woods at Chatfield Hollow State Park.

TRAIL ACTIVITY	
LENGTH	10.1 miles, Network
DIFFICULTY	Easy, Moderate, Advanced
TOWN	Killingworth
SURFACE	Packed Earth/Dirt, Gravel/Crushed Stone, Boardwalk, Paved/Cement, Lake/Pond, Wetland
PETS	Permitted on leash
FEES	Yes (Out-of-state Residents)

ADD A PHOTO

📄 **DETAILS**

📄 **TRAIL MAP**

📍 **DIRECTIONS**

💬 **COMMENTS (0)**

🔔 **TRAIL ALERTS**

DESCRIPTION

Families, hikers, mountain bikers, horseback riders, and cross-country skiers will enjoy approximately four and half miles of trails on gently rolling terrain. Trails lead to Little and Big Falls, as well as the giant Mountain Laurel. A 1.5 mile hike or park nearby to view scenic Wadsworth Falls as it cascades over a twenty foot drop on the Caginchaug River.

The majority of trails within the park are wide, easy walking carriage roads established by Clarence Wadsworth. This includes the 1.5 mile one way walk to the Big Falls from the main park area. Hikers should follow the Orange trail to its terminus at Cherry Hill Road, then turn right on Cherry Hill Road to cross the active train tracks and reach the Big Falls area. The Yellow trail in the northeast corner is a moderate singletrack trail that parallels the Laurel Grove Brook. The Blue Trail located west of the Orange trail is an advanced trail that leads down into

CURRENT WEATHER

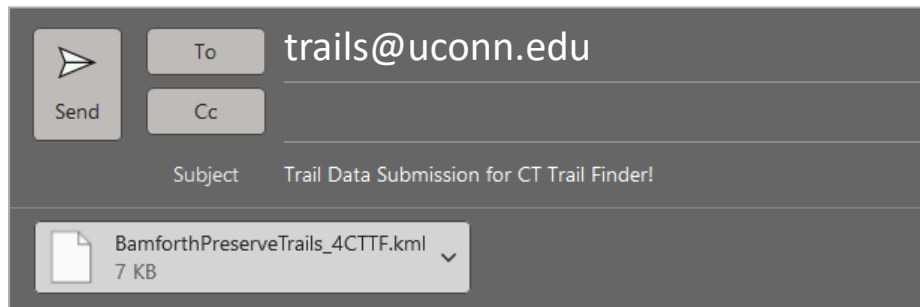
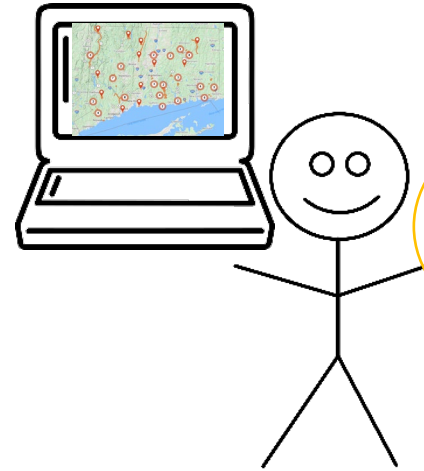
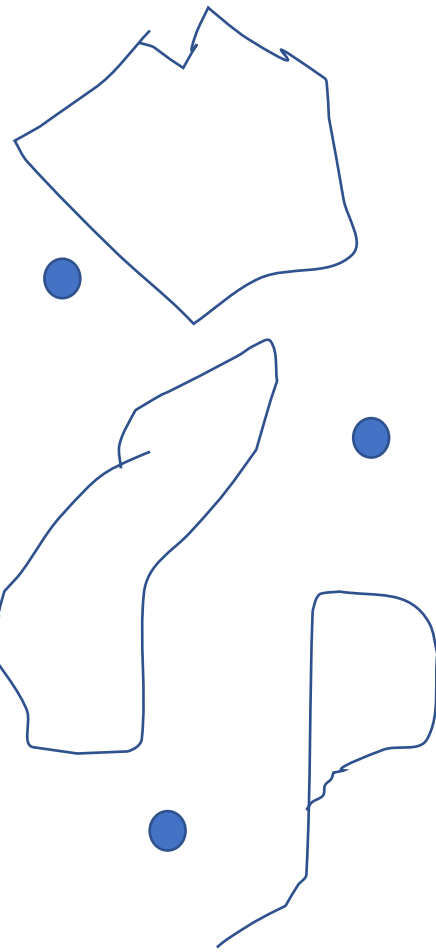
OCTOBER 04, 2021

58°F

Today's High: 62°F
Today's Low: 58°F
Outlook: Light Rain
Forecast: Moderate Rain

Data Gathering - Geographic

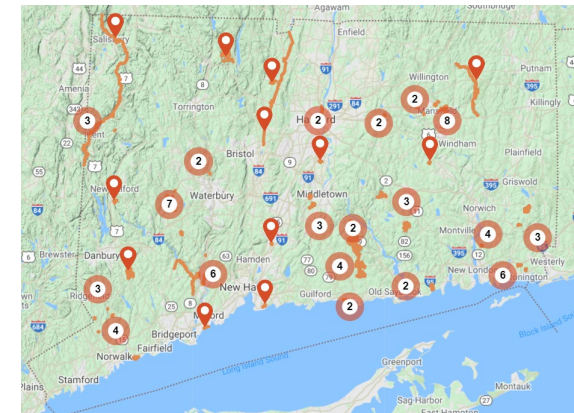
Points and Lines



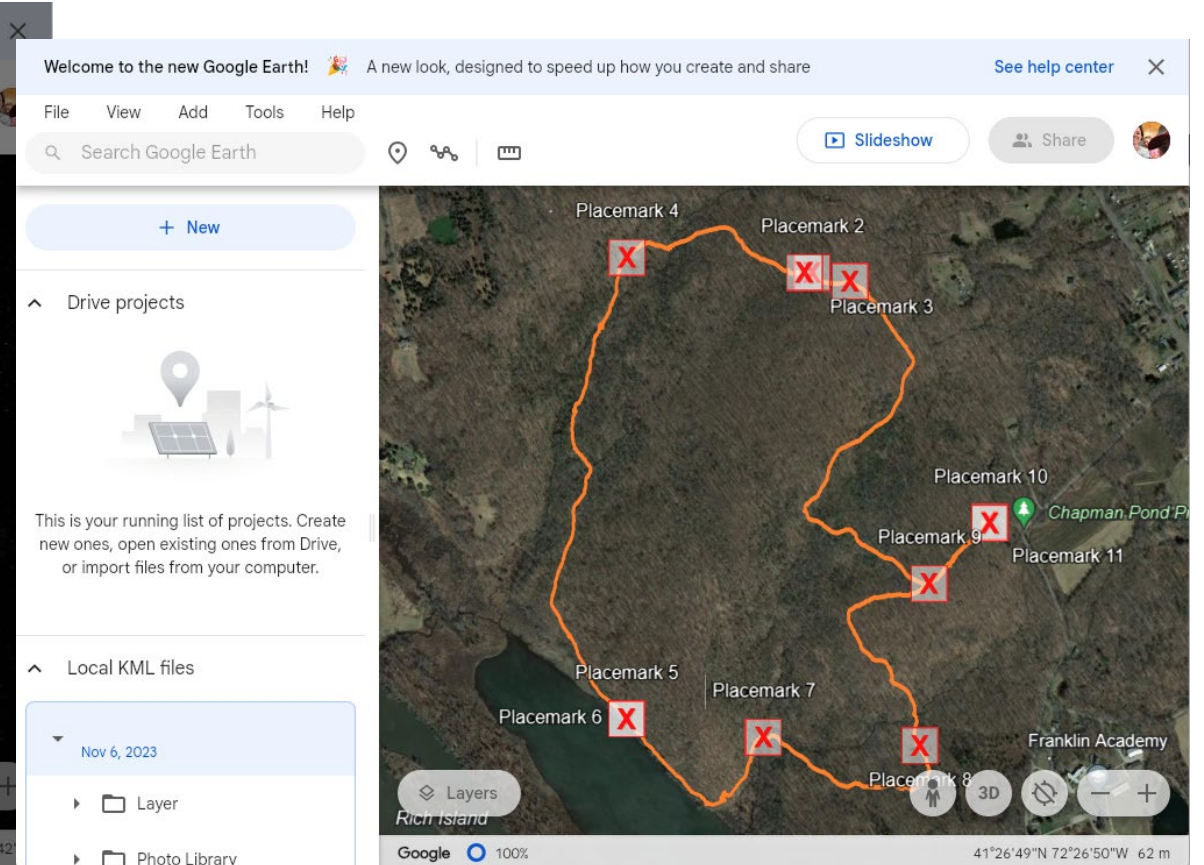
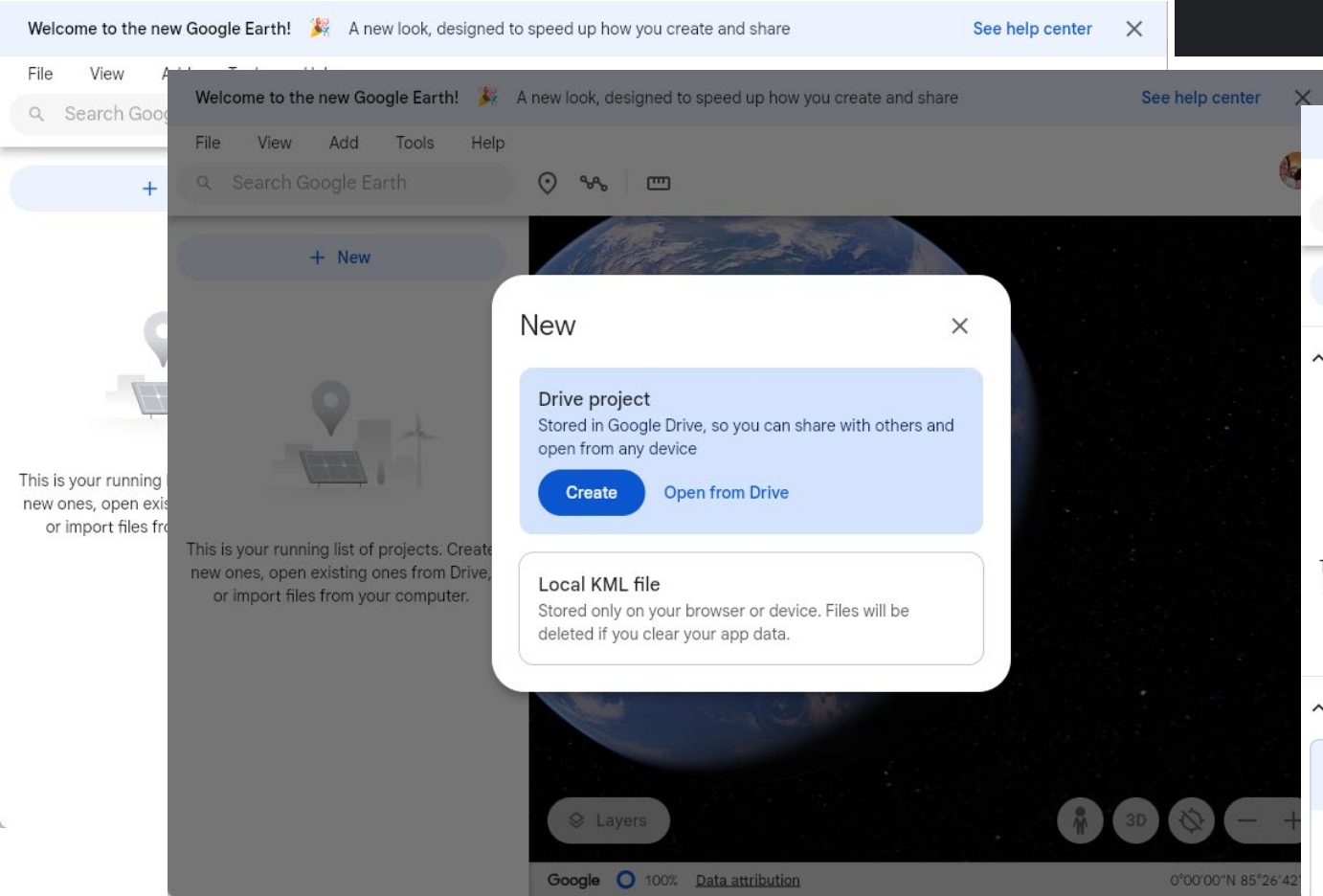
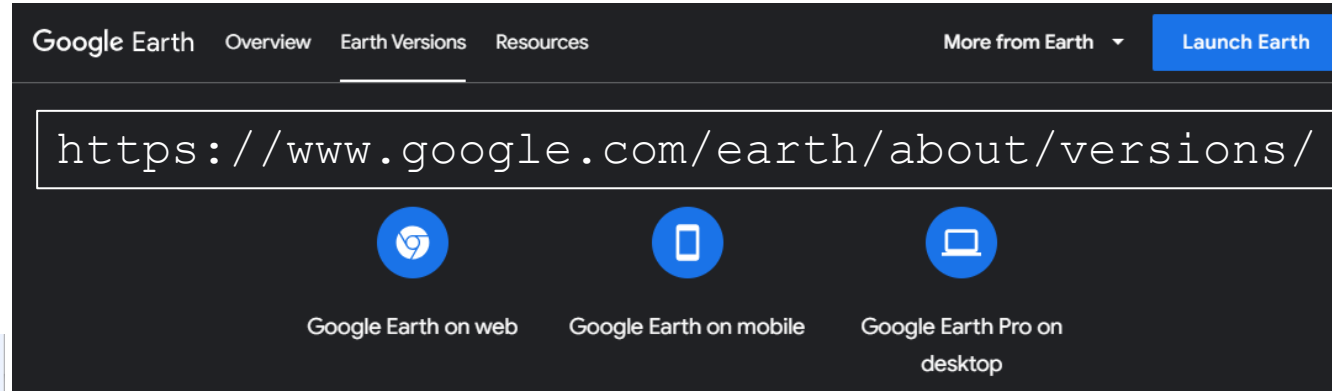
Hi CT Trail Finder Team,

Attached you will find the GPS data for the Bamforth Preserve Trails in Haddam. I will send over the additional trail documentation so that we can get these trails on the CT Trail Finder map ASAP!

Thanks,
Cary

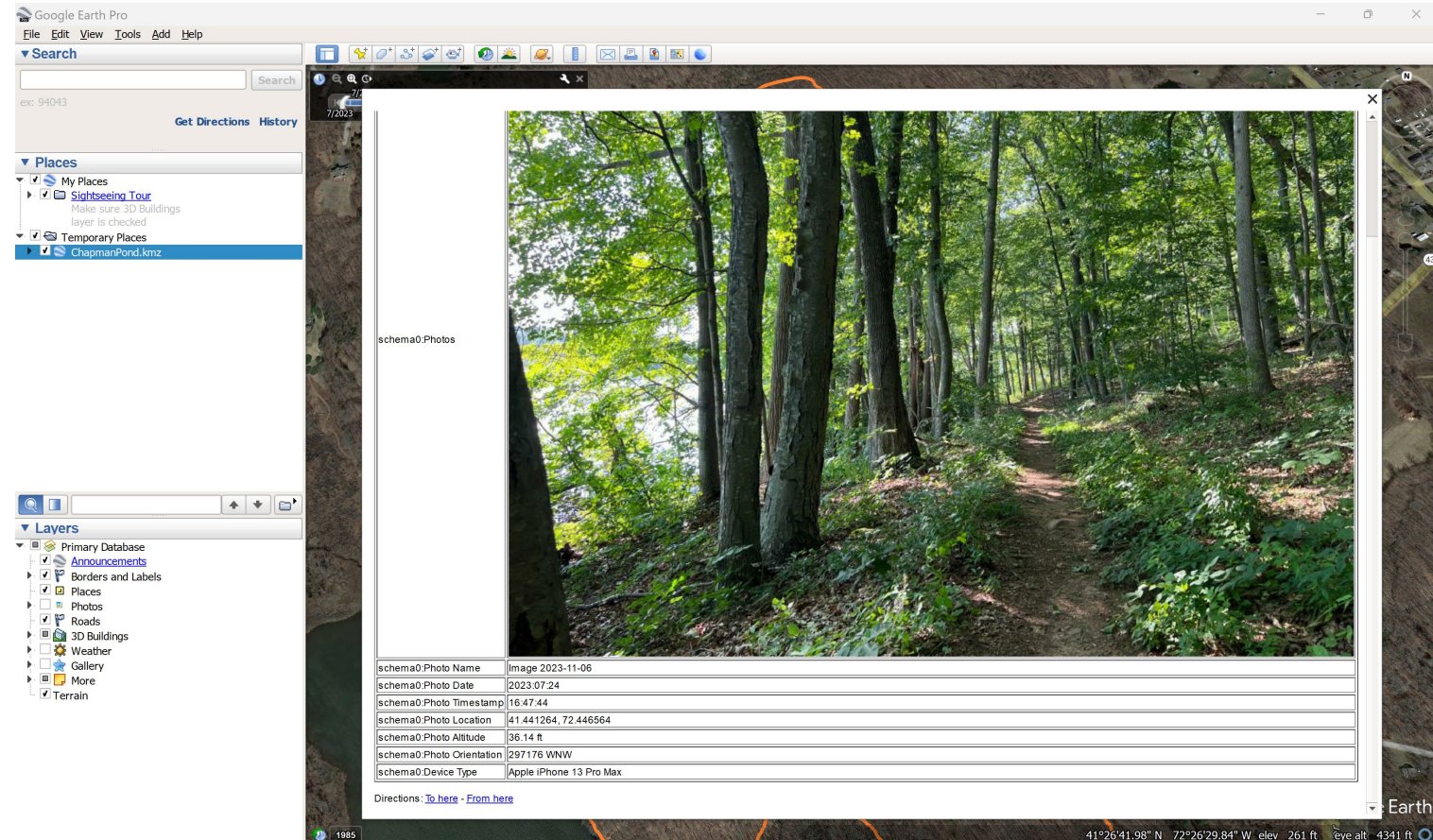
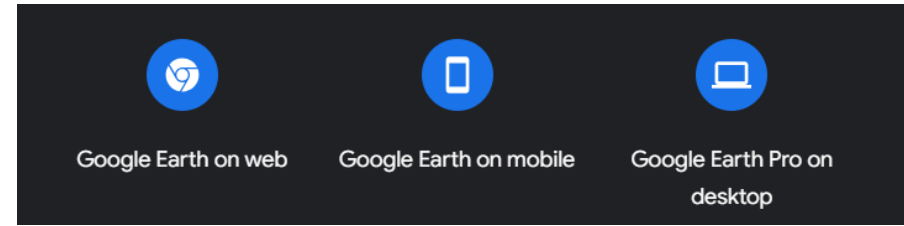


Open in Google Earth



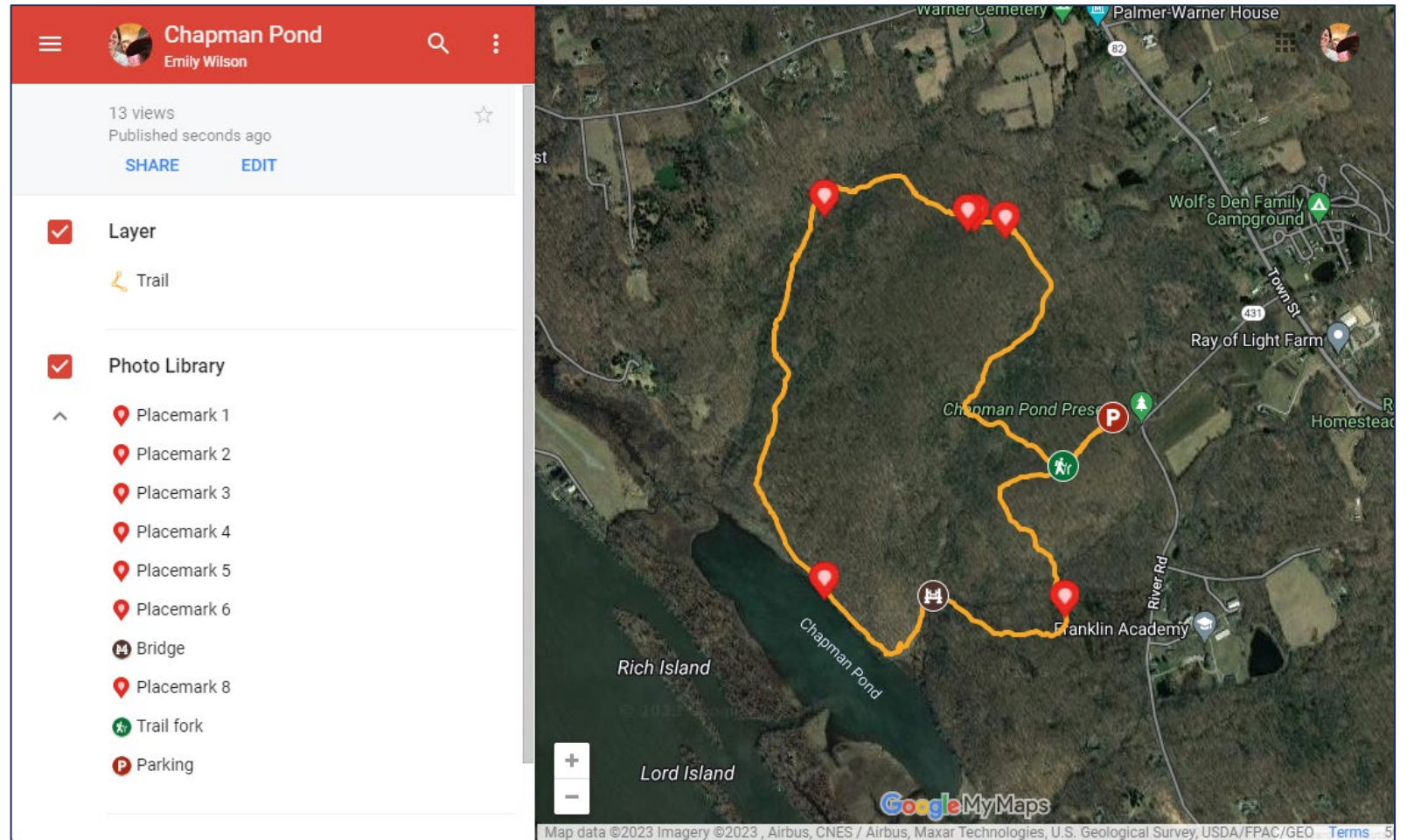
Open in Google Earth

- Download Google Earth Pro
- Double-click on KMZ



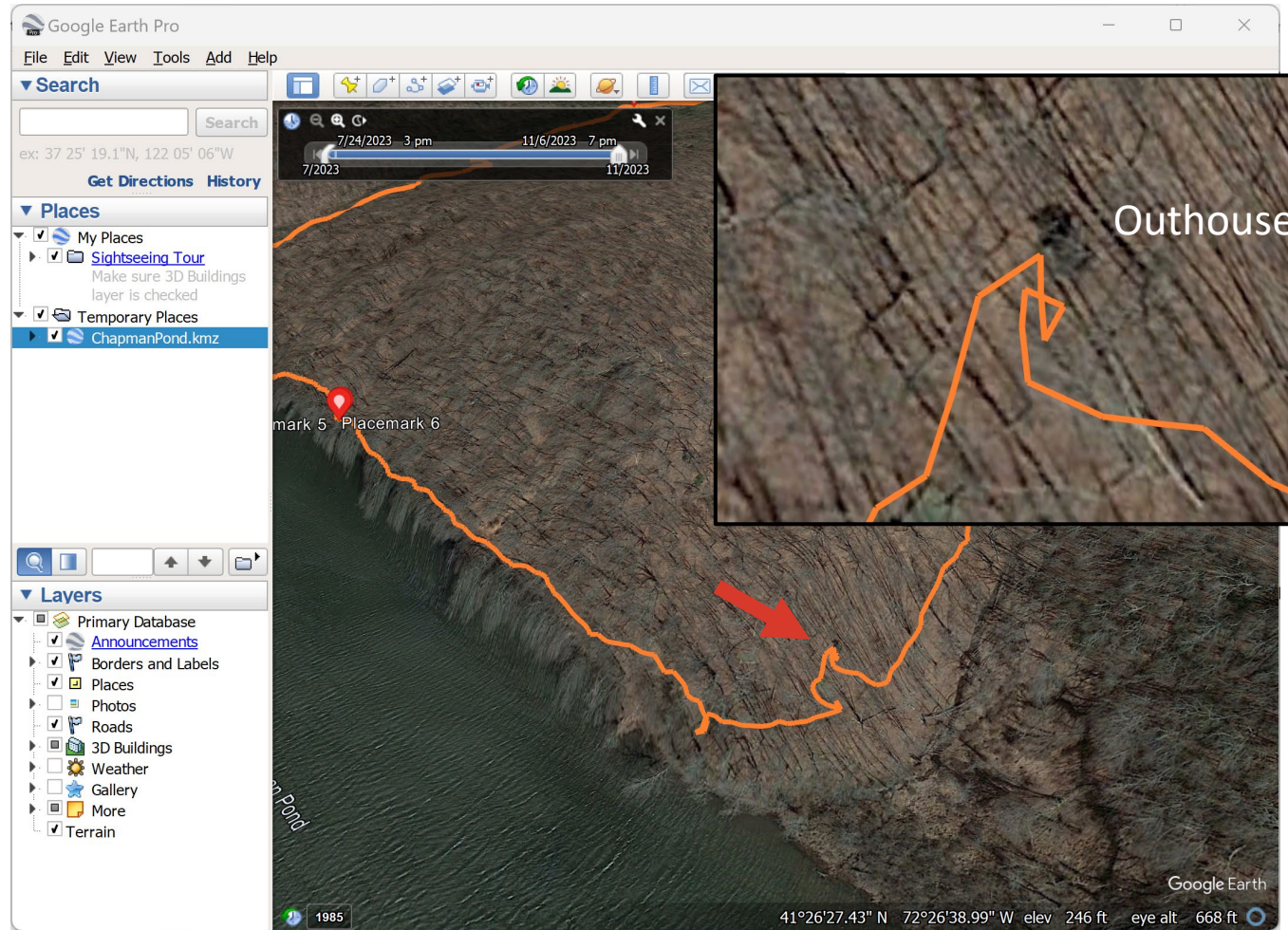
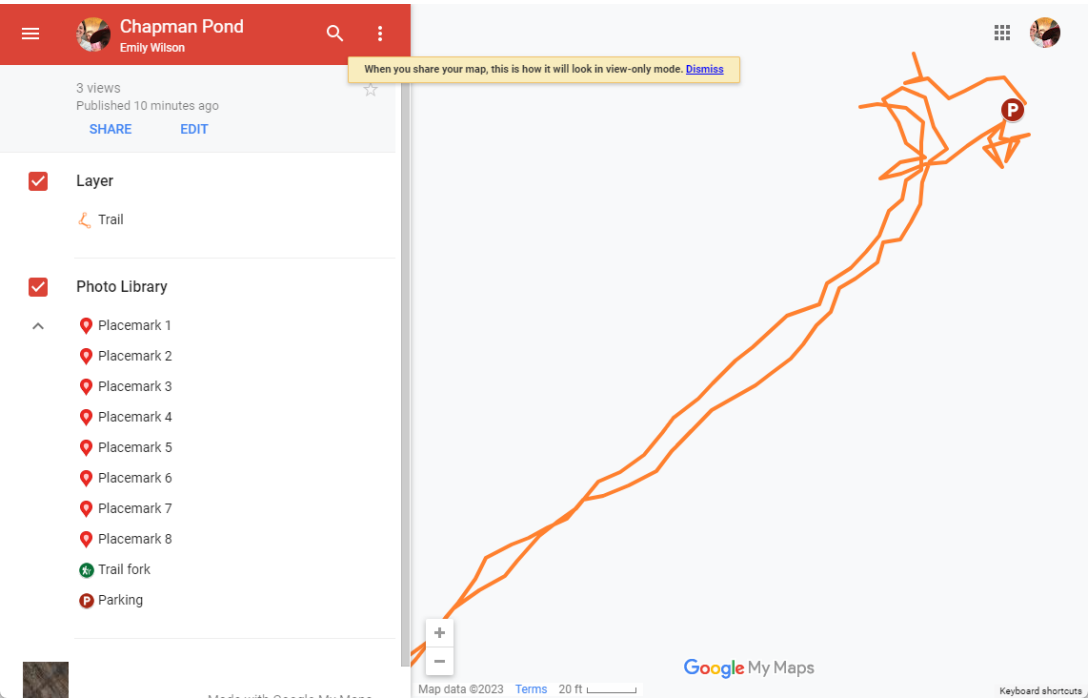
Open in Google Maps

- Open Google My Maps, create new
- Import KMZ
- Customize
- Share



DEMO

KMZ is exactly what you collected



Open in QGIS

- QGIS is a free and open source Geographic Information System (GIS)
- GIS is
 - how we work with geographic data (maps) using software on a computer.
 - GIS is also a tool and a profession.
- Requires some know-how
- Download



<https://qgis.org/en/site/>

QGIS

for Format Conversion

The screenshot shows the QGIS desktop environment. The main window is titled 'Untitled Project - QGIS'. The interface includes a menu bar (Project, Edit, View, Layer, Settings, Plugins, Vector, Raster, Database, Web, Mesh, Processing, Help), a toolbar, and several panels: Browser, Recent Projects, News, Layers, and Project Tree. The Browser panel shows a file tree with 'C:\(Windows)' expanded, and 'ChapmanPond.kmz' is highlighted. The Project Tree panel shows a 'New Empty Project' dialog with 'EPSG:4326 - WGS 84' selected. A dialog box titled 'Select Items to Add | ChapmanPond' is open, displaying a table of items to be added to the project.

Select Items to Add ChapmanPond	
C:\Users\ehw02002\Downloads\ChapmanPond.kmz	
Search...	
Item	Description
Layer	LineStringZ (2)
Photo Library	PointZ (11)

Buttons: Select All, Deselect All

Options

- Add layers to a group
- Show system and internal tables
- Show empty vector layers

Project Tree: New Empty Project, EPSG:4326 - WGS 84

Status Bar: New QGIS version available: Visit <https://download.qgis.org> to get your copy of version 3.28.12

Bottom Bar: Type to locate (Ctrl+K), Ready, Coordinate, Scale:74635728, Magnifier:100%, Rotation:0.0°, Render, EPSG:4326

QGIS

for Format Conversion

The screenshot shows the QGIS interface with the 'Save Vector Layer as...' dialog box open. The dialog box is titled 'Save Vector Layer as...' and has a close button (X) in the top right corner. It contains several sections:

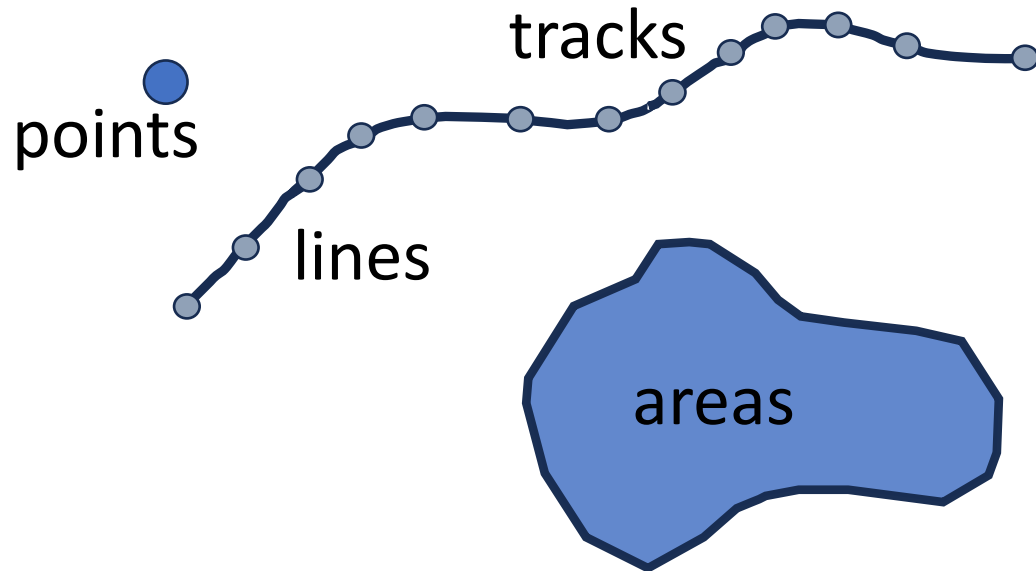
- Format:** A list of file formats with 'ESRI Shapefile' selected and highlighted in blue.
- File name:** '(Geo)Arrow'
- Layer name:** '(Geo)Parquet'
- CRS:** 'AutoCAD DXF'
- Encoding:** A list of encodings with 'GeoPackage' selected.
- Select file:** A section with a checked 'Persist layer' option.
- Geometry:** A section with 'Geometry type' set to 'INTERLIS 1' and 'Include attributes' checked.
- Layer Options:** A section with 'RESIZE' set to 'None' and 'SHPT' checked.

In the background, the QGIS interface is visible. The 'Layers' panel shows two layers: 'ChapmanPond — Layer' and 'ChapmanPond — Photo Library'. The 'Export' menu is open, and the 'Save Features As...' option is highlighted. Red arrows point from the 'Export' menu to the 'Save Features As...' option in the dialog box.

QGIS

for Format Conversion

- The shapefile is added to the Layer List
- You will need it for editing



Select Items to Add | Hartford North, CT (2021, 24000-Scale)

[C:\A\Trails\TrailsGIS\Keney Park\GPS_Avenza\Hartford North, CT \(2021, 24000-Scale\).gpx](C:\A\Trails\TrailsGIS\Keney Park\GPS_Avenza\Hartford North, CT (2021, 24000-Scale).gpx)

Search...

Item	Description
route_points	PointZ (0)
routes	LineStringZ (0)
track_points	PointZ (1836)
tracks	MultiLineStringZ (1)
waypoints	PointZ (32)

Select All | Deselect All

Options

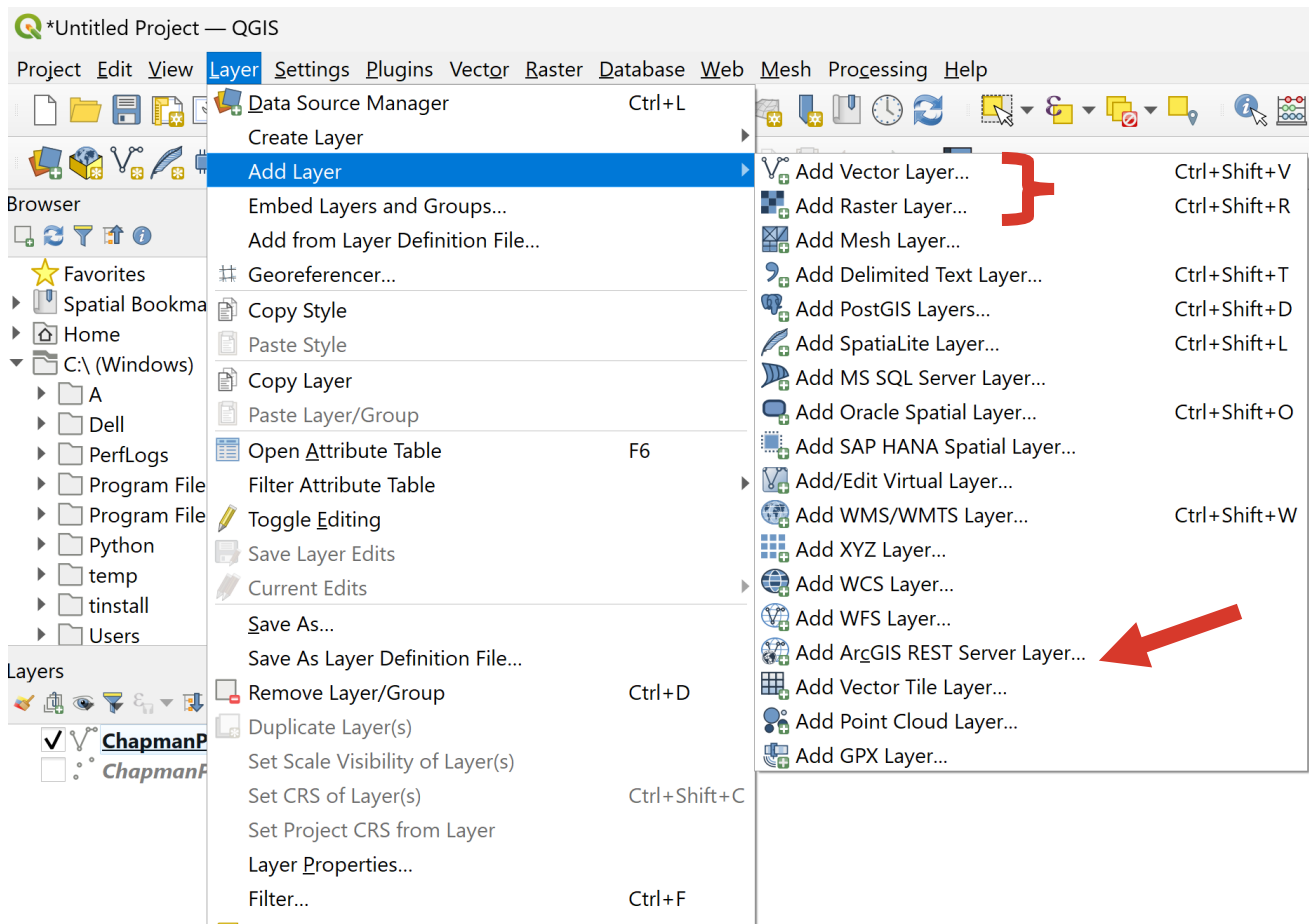
- Add layers to a group
- Show system and internal tables
- Show empty vector layers

GPX

QGIS

background and other layers

- If you know what these are and have them, add



- Use this option to connect to a service
 - Lots of options
 - No data download
 - Being provided by someone else

QGIS

background and other layers

CT ECO

The screenshot shows the CT ECO website interface. On the left, there is a sidebar with navigation links: Home, Maps, Data, Information, Featured, and News. The main content area is titled "Map and Image Services" and includes a description of the services and a list of categories: Base Maps, Bioscience, Built Environment, Coastal, and Geology. A modal window titled "Aerial Imagery" is open, displaying a list of imagery options for Spring Statewide. The selected option is "2016 Spring 4 band, 3Inch", which includes server URLs for dynamic and cached image services, a layer list, and a download link for metadata. Two small maps of Connecticut are shown at the bottom of the modal, one in red and one in green.

<https://maps.cteco.uconn.edu/map-services/>

CT GeoData Portal

The screenshot shows the CT GeoData Portal website. The header includes navigation links: About, Data Library, Partners, and News and Announcements. The main content area features a large banner with the text "CT Geodata Portal" and "Search or browse GIS data for Connecticut". Below the banner, there are links for "New & Noteworthy", "CT at a Glance", "Data Categories", and "Partners". A mission statement is provided: "The mission of the Geodata Portal is to provide high-quality geospatial data for Connecticut data practitioners across all sectors and industries. By hosting, aggregating, and sharing on a trusted and reliable GIS open data platform, our users can expect to easily find and access valuable and trusted data resources." At the bottom, there is a section titled "New & Noteworthy".

<https://geodata.ct.gov>

Data Source Manager | ArcGIS REST Server

Server Connections

Connect New Edit

Create a New ArcGIS REST Server Connection

Connection Details

Name CT ECO Raster

URL <https://cteco.uconn.edu/ctraster/rest/services/>

ArcGIS Portal Details

Community endpoint URL <https://mysite.com/portal/sharing/rest/com...>

Content endpoint URL <https://mysite.com/portal/sharing/rest/con...>

Authentication

Configurations Basic

Choose or create an authentication configuration

No Authenticator

Configurations store encrypted credentials in the QGIS authentication database.

HTTP Headers

Referer

Advanced

OK Cancel Help

Data Source Manager | ArcGIS REST Server

Server Connections

CT ECO Raster

Connect New Edit Remove Refresh

CT ECO Raster

- elevation
- images
- impervious
- landcover
- maps
- marshes
- newstorymap
- storymap
- UConn
- Utilities
- working

<https://cteco.uconn.edu/ctraster/rest/services/>

Data Source Manager — ArcGIS REST Server

Server Connections

CT ECO Raster

Connect New Edit Remove Refresh Load Save

Ortho_1990
Ortho_2004
Ortho_2004_Coast_Color
Ortho_2004_Coast_IR
Ortho_2005_Coast_IR
Ortho_2009_CRCOG
Ortho_2009_CRCOG_tiled
Ortho_2010_Coast
Ortho_2012
Ortho_2012_tiled
Ortho_2016
Ortho_2016_Coast
Ortho_2016_tiled
images/Ortho_2016_tiled
Ortho_2017_E_CTCoast
Ortho_2019
Ortho_2019_orig
Ortho_2019_tiled
impervious
landcover
maps
marshes
newstorymap

<https://cteco.ucc>

Only request features overlapping the current view extent

Image Encoding

J P P J B G T P

Coordinate Reference System

EPSG:3857

Add with Filter Close **Add** Help

*Untitled Project — QGIS

Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help

Browser

- Favorites
- Spatial Bookmarks
- Home
- C:\ (Windows)
 - A
 - Dell
 - PerfLogs
 - Program Files
 - Program Files (x86)
 - Python
 - temp
 - tinstall
 - Users

Layers

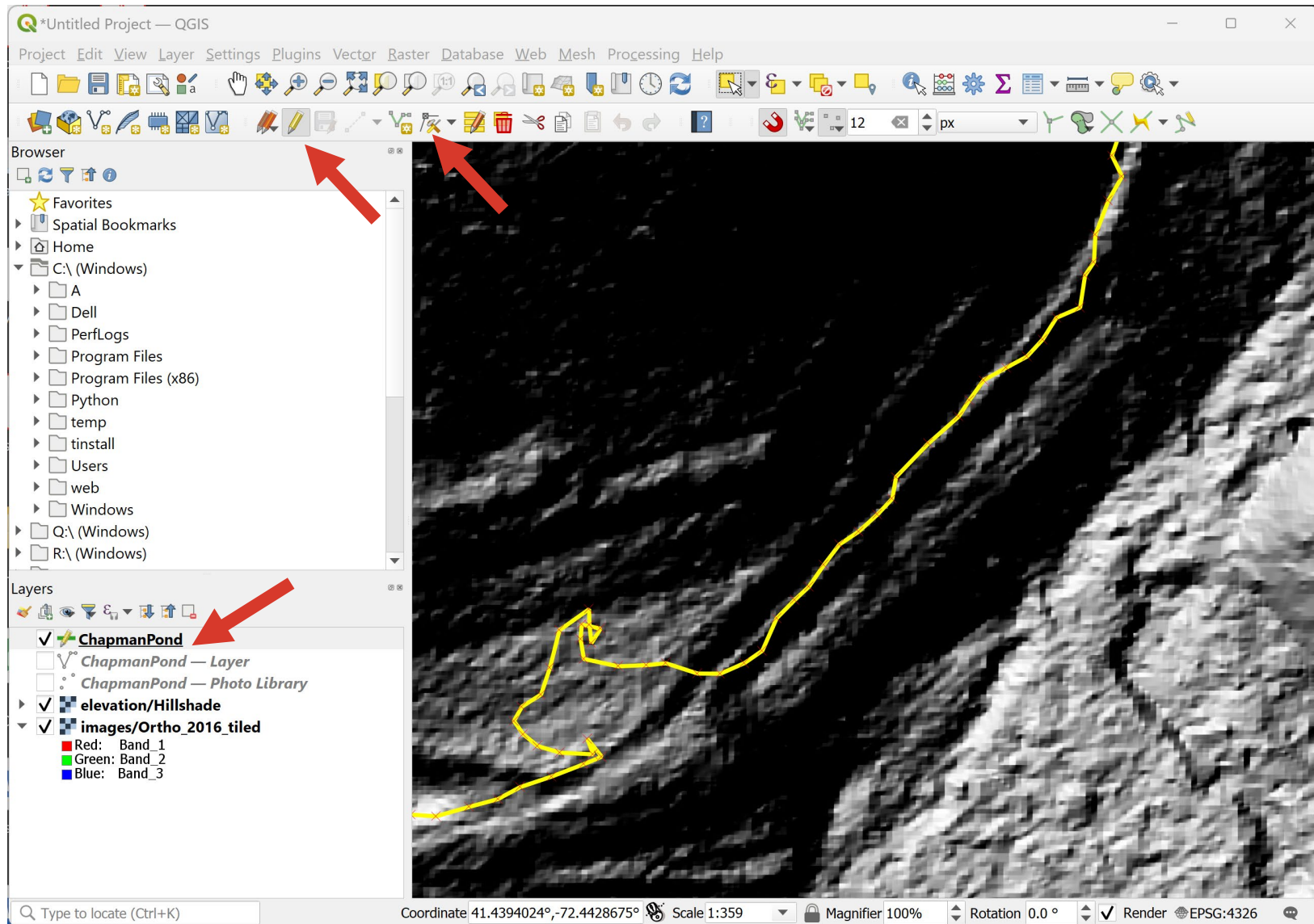
- ChapmanPond — Layer
- ChapmanPond — Photo Library
- images/Ortho_2016_tiled**
 - Red: Band_1
 - Green: Band_2
 - Blue: Band_3

Coordinate 41.45092°,-72.44993° Scale 1:5750 Magnifier 100% Rotation 0.0° Render EPSG:4326

Repeat for other layers of interest

QGIS for Editing

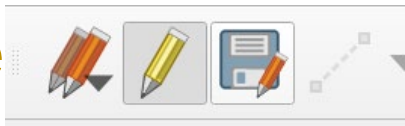
- Highlight layer in layerlist
- Editing Toolbar
- Toggle Editing tool
- Select Feature
- Vertex Tool
- Move vertex
 - Click on vertex
 - Click on correct location



QGIS

for Editing

- To delete vertex
 - Select
 - Delete key
- To add vertex
 - Shift key
 - Double-click on line
- Simplify
 - Vector menu
 - Geometry Tools
 - Simplify
- Save



The screenshot shows the QGIS interface with a map of a terrain. A yellow line with red circular vertices is drawn across the map. The Vertex Editor window is open, displaying a table of coordinates for the vertices.

	x	y	z
554	-72.44365651	41.43945090	9.98375988
555	-72.44367883	41.43944155	10.9693613
556	-72.44371857	41.43942623	11.00839520
557	-72.44375822	41.43941292	10.73558044
558	-72.44378554	41.43939811	10.88157749
559	-72.44382123	41.43938844	10.60965720

At the bottom of the interface, the status bar shows: Validation finished (42 Coordinate 41.4397535°,-72.4438485°), Scale 1:180, Magnifier 100%, Rotation 0.0°, Render EPSG:4326.

Today

- Relevant updates
- Avenza Maps app overview
- Avenza basemaps
- How to collect lines and points
- Plot photos
- Export
- Trail Finder example
- Google Earth
- Google Maps
- QGIS
 - Format conversion
 - Adding basemap
 - Editing



Thank You

Q&A

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