



- CATAWBA -

LANDS CONSERVANCY

LAND | WATER | FARMS | NATURE

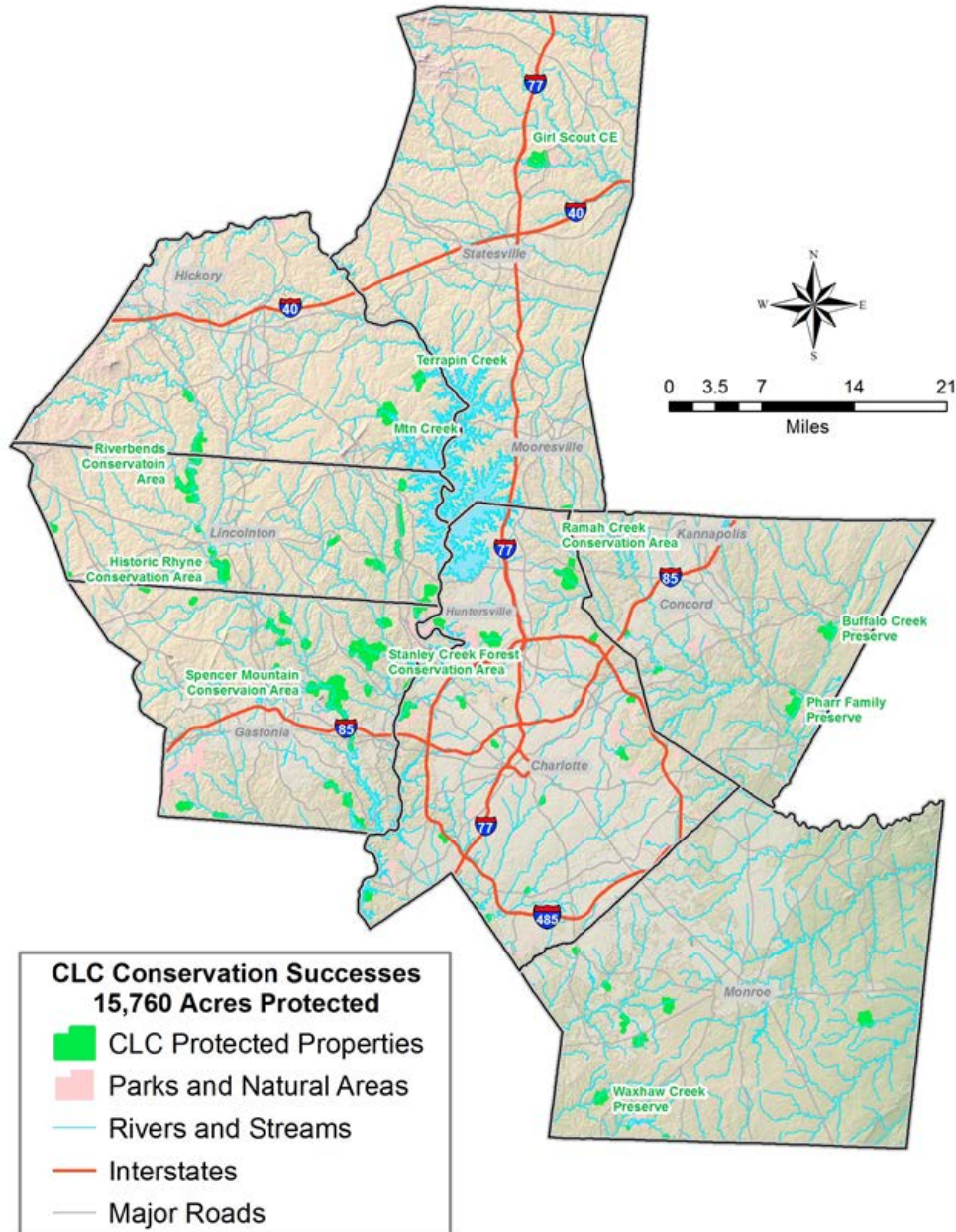


Moving from Pen & Paper to Mobile Mapping Solutions





Who is the Catawba Lands Conservancy

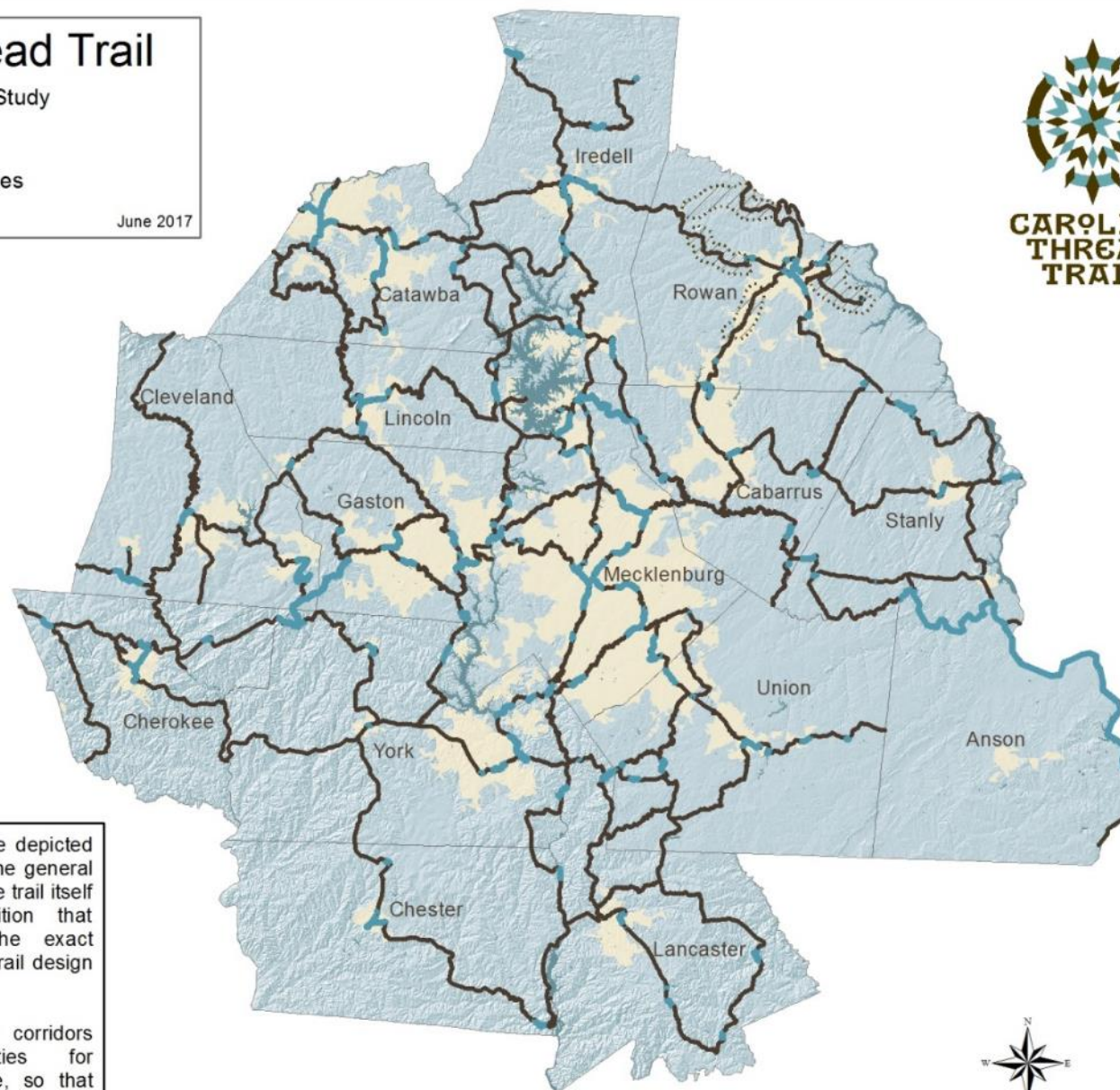
- ▶ Charlotte area's local land conservation non-profit since 1996
- ▶ Focused on protected land for:
 - ▶ Clean Water
 - ▶ Wildlife Habitat
 - ▶ Farmland Conservation
 - ▶ Connections to Nature
- ▶ 16,632 acres conserved in 8 counties



Carolina Thread Trail

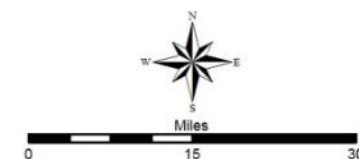
-  Area Requires Further Study
-  Completed Segments
-  Adopted Trail: 1,600 Miles

June 2017



The trail corridors in this plan are depicted with $\frac{1}{4}$ mile wide lines to show the general location of the intended route. The trail itself will be narrower, in recognition that communities will determine the exact location of their segments upon trail design and development.

The broadly defined greenway corridors present multiple opportunities for adjustments for a defined route, so that landowners can continue to be involved in fine tuning and defining the location of trails and amenities.

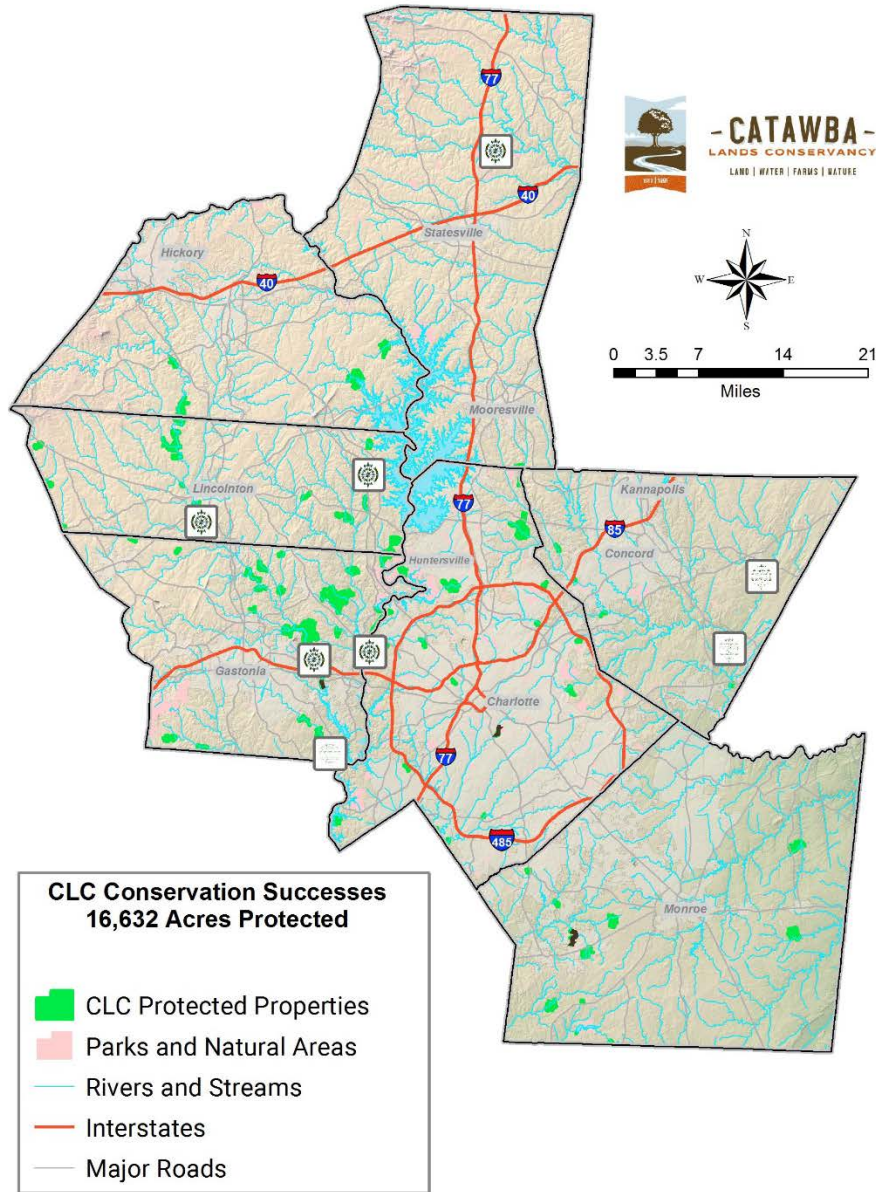


SB





Catawba Lands Conservancy Public Trails



- Maintains 17 miles of natural surface trails over 5 counties
- Operates three river access points on two blueways



Making the Change

Motivation to Change

Old Data Collection Method

Interim Step

New Data Collection Method

Obstacles to Change



“This is how we’ve always done it”

- Equipment failure and lost data
- Lack of efficiency

Maintain control to protect data’s integrity

- Does not capitalize on staff’s GIS Experience
- Does not empower staff to make decisions

Change is Challenging

- ESRI’s support made it easier

Baby Steps



Pen, Paper, and GPS



Avenza and SharePoint



Story Maps



ArcGIS Online Tools



What's Next?



Old Data Collection Method



- ▶ Pen and paper
- ▶ Garmin GPS Units
- ▶ Digital Cameras
- ▶ Emails and text messages



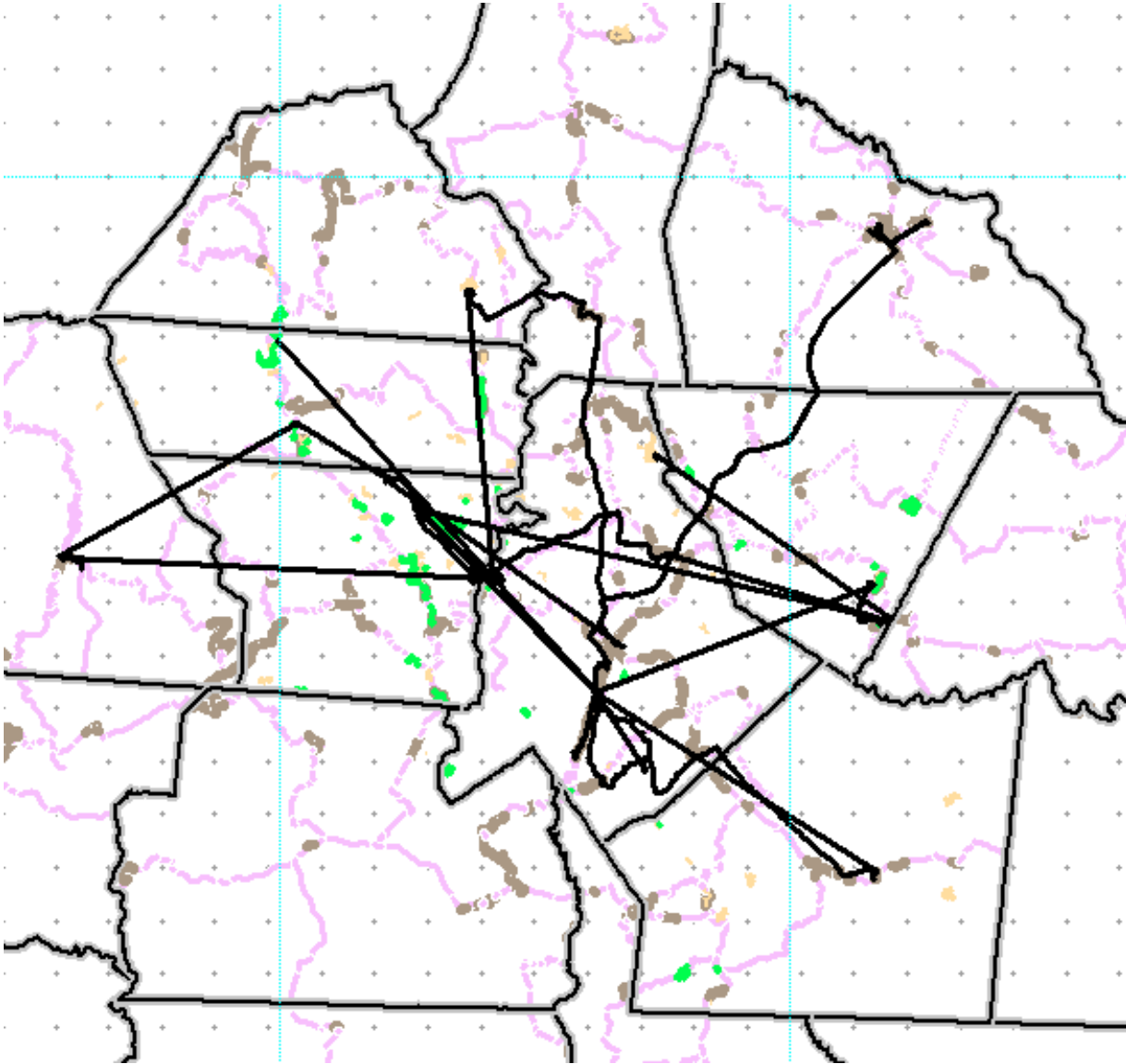


Mapping Trail Alignments

- Relied on GPS units and hand written notes
- One unit; many users
- Multi-step process to utilize data
- Lost notes and data
- No backup



Mapping Trail Alignments



Sun, Aug 11, 10:01 AM

3" tree Cross trail just after first opening. 1 5 ft 1.5 inches. .5 clearance center. I took photo. New phone not know how attach.

Sun, Aug 11, 6:04 PM

Thanks for letting me know we'll get it soon

From: [REDACTED]
Sent: Tuesday, July 25, 2017 9:06 AM
To: Home
Subject: 7 Oaks preserve trail

100 steps past real mud spot and S curve trail starting from trailhead

[REDACTED]
Sent from Samsung Mobile

From: [REDACTED]
Sent: Thursday, July 27, 2017 12:06 PM
To: Sean Bloom <sean@catawbalands.org>
Subject: Re: 7 Oaks preserve trail - tree fall across trail - diagonal - higher on right side, fell toward downward slope

From main trailhead next to barn s. New Hope rd.
Past first "beach" on left where used to be a big tree that fell and was suspended above ground horizontally and where someone once had that teepee kinda thing built.
Hope that helps.
[REDACTED]

Trail Issues and repairs

- Emails and text messages
- Hard to track progress on corrections
- No geographic data / only cryptic directions



Interim Step

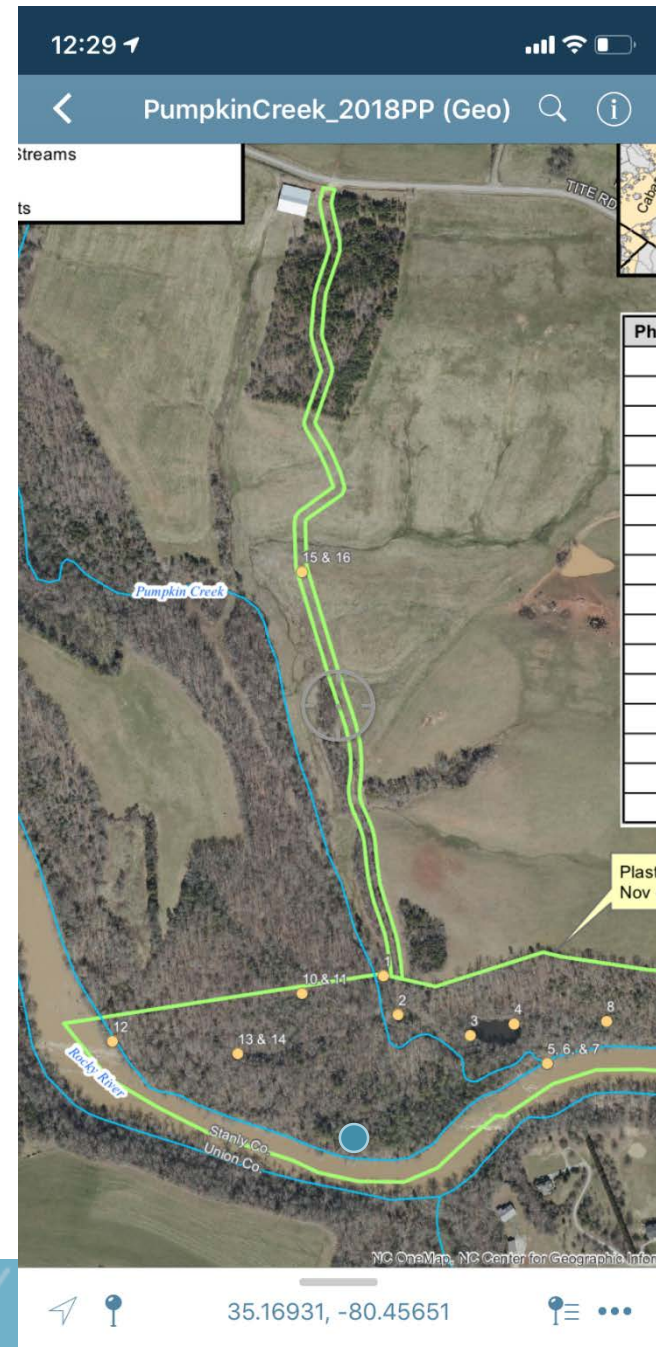


- ▶ Avenza Maps and Smart Phones
 - ▶ SharePoint
 - ▶ Google Earth



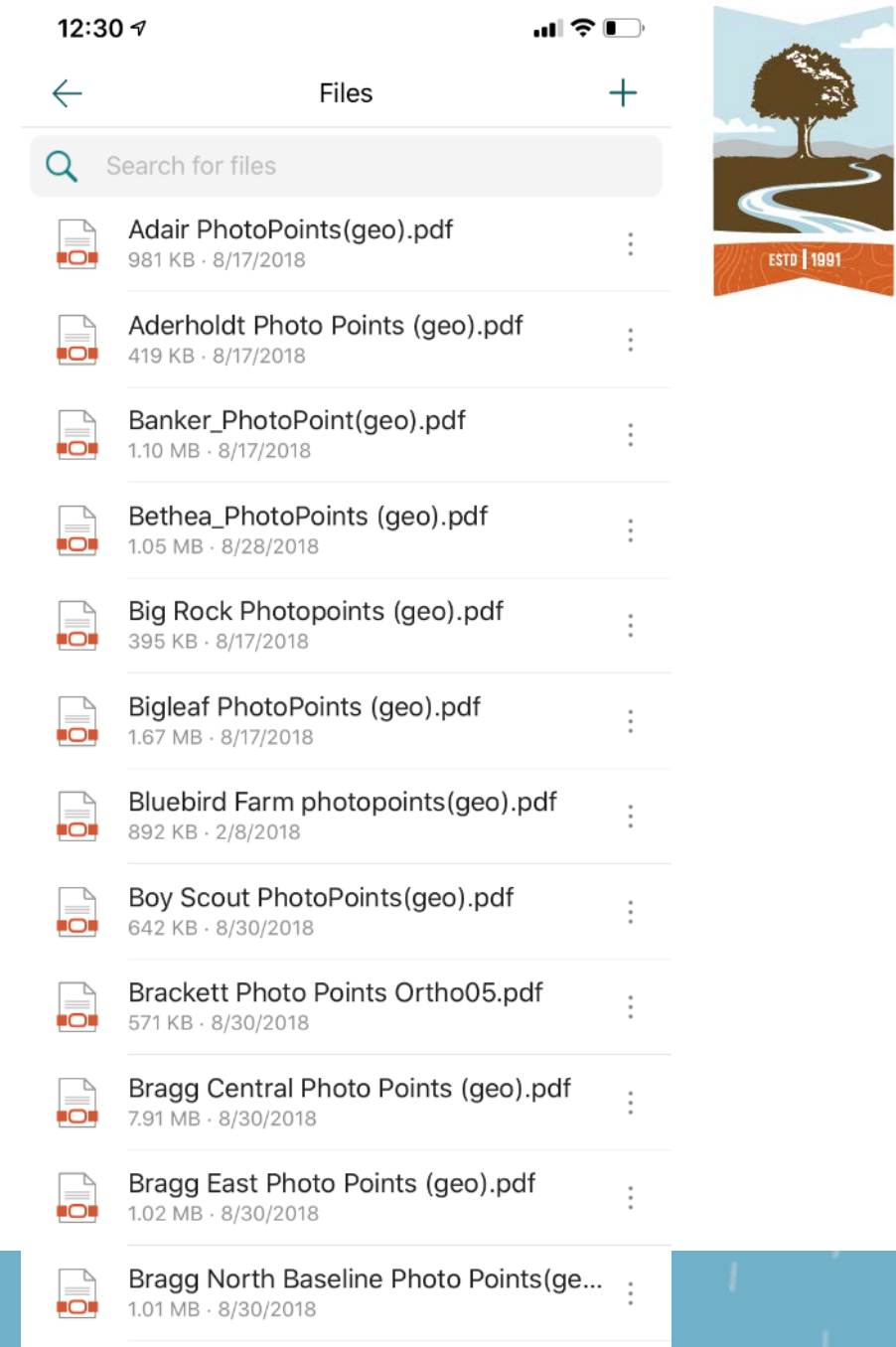
Avenza GPS and Smartphones

- ▶ Easy first step to implement
- ▶ Utilizes native GPS in phone
- ▶ Capable of collecting data in field
 - ▶ Data stored locally on phone
 - ▶ Must export and email KML file

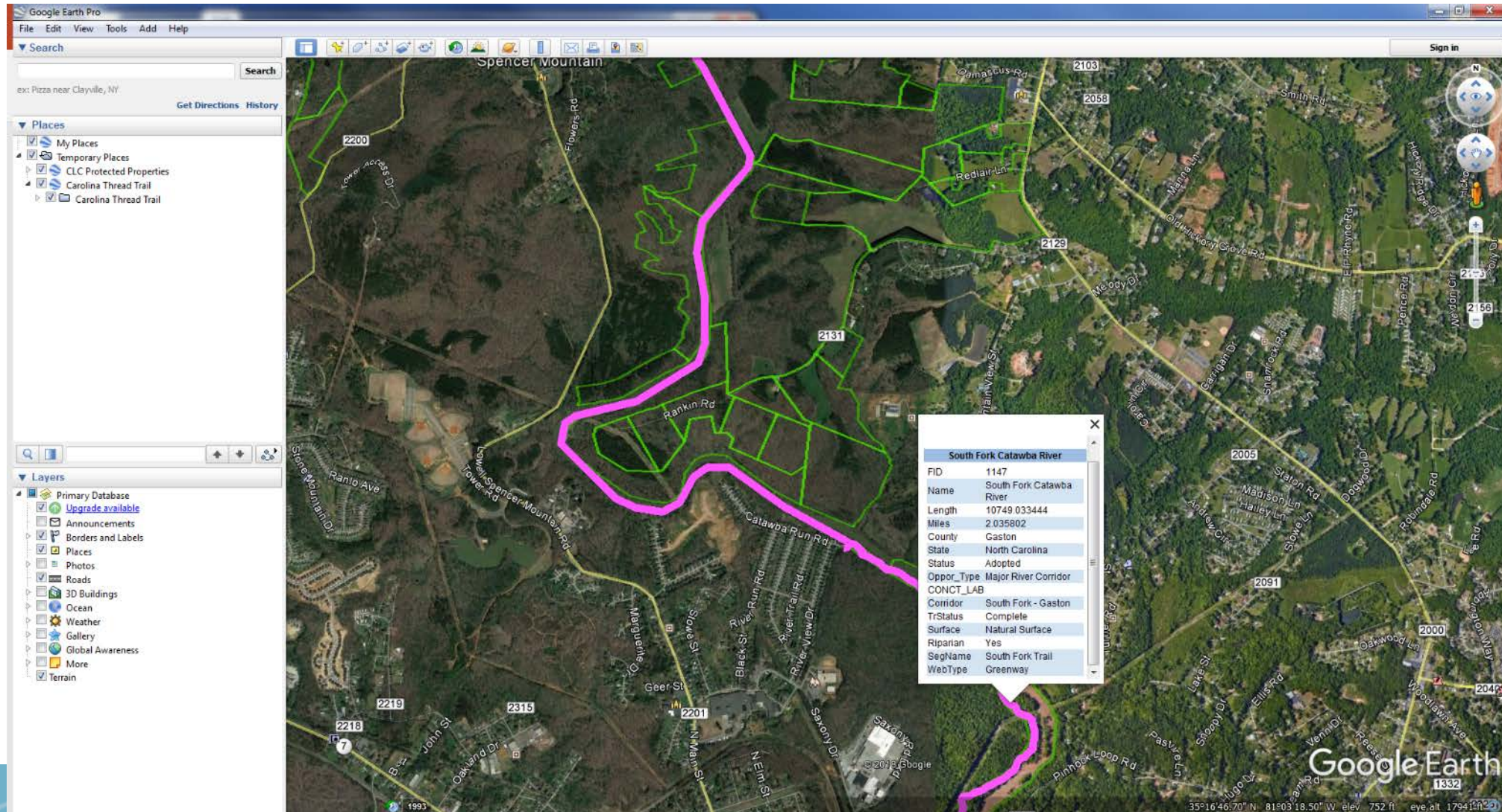


SharePoint or Dropbox

- Cloud based storage of pdf Maps
- Easy first step to implement
- Utilizes native GPS in phone
- Does not require mobile data
- Free version available
 - Only able to keep 3 maps loaded at a time
- Capable of collecting data in field
 - Data stored locally on phone
 - Must export and email KML file



Google Earth and KMLs



New Data Collection Method



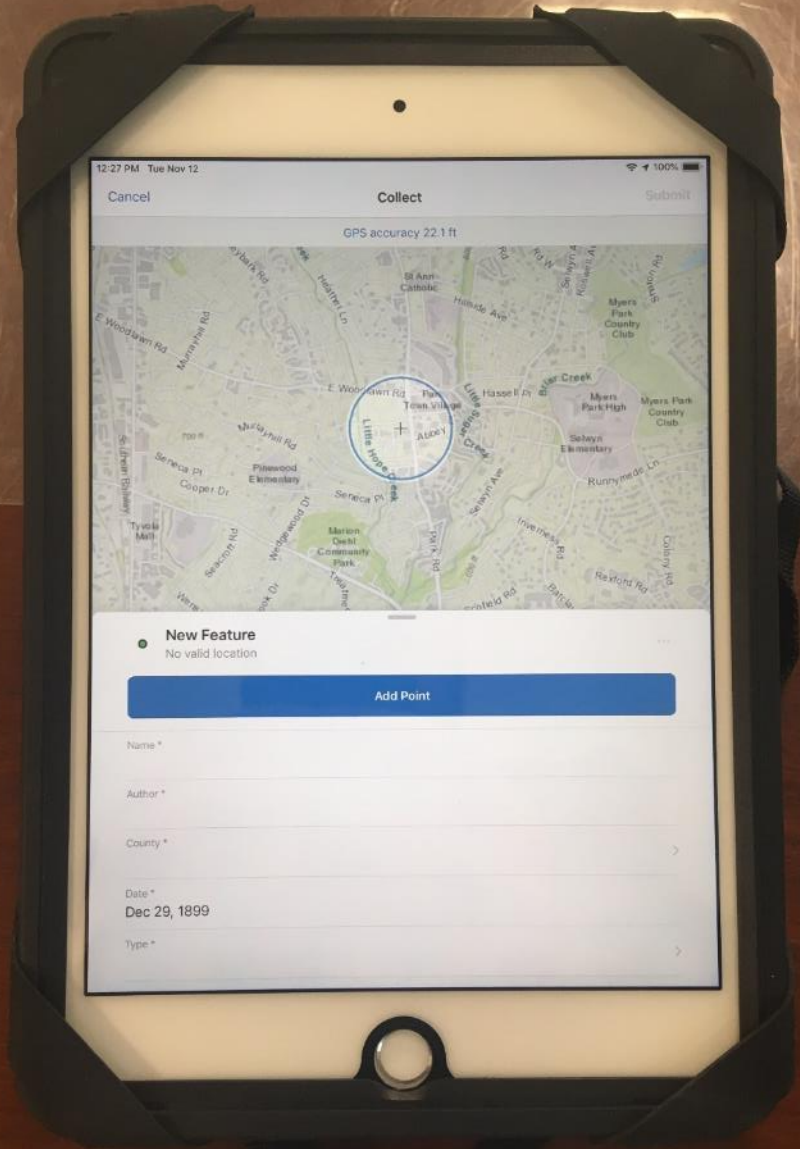
- Collector
- Survey 123
- Dashboards
- Tablets & Smartphones



Collector: Trail Mapping



- ▶ Easy to use
- ▶ Use on tablet or smartphone
- ▶ “Copy and Paste” data into master files
- ▶ Will be integrating Bad Elf hardware to increase accuracy



Trail Master Name*

Your name

Trail Name*

Select the trail this report is for.

-Please Select-

Date*

11/9/19

Overall Conditions of Trail

To report a specific issue at a particular location, please use [link](#).

	No upkeep or repairs needed	Minor upkeep or repairs needed	Major upkeep or repairs needed	Urgent / Safety Issue	N/A
Trail Surface (erosion, berms, rutting, low muddy areas)*	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Signage (vandalism, fading, wear)*	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Structures (bridges, benches, boat launch, observation deck: rotting, loose hardware,	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Survey 123: Trail conditions



► Web-based survey to report trail conditions

► Easy to send out to volunteers

► Eliminated Survey Monkey

► Saved \$1,000

CTT Specific Issue Report

This form is used by Trail Masters to report specific issues found at particular locations found on public access trails overseen by the Catawba Lands Conservancy / Carolina Thread Trail.

Trail Master Name*

Your name


Name of Trail


Select the trail this report is for.


Report Date*


Trail Issue Location*


Where is the trail issue?

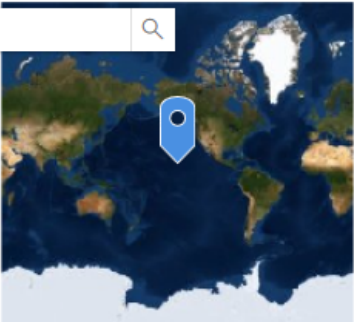













Earthstar Geographics | Esri

Powered by Esri

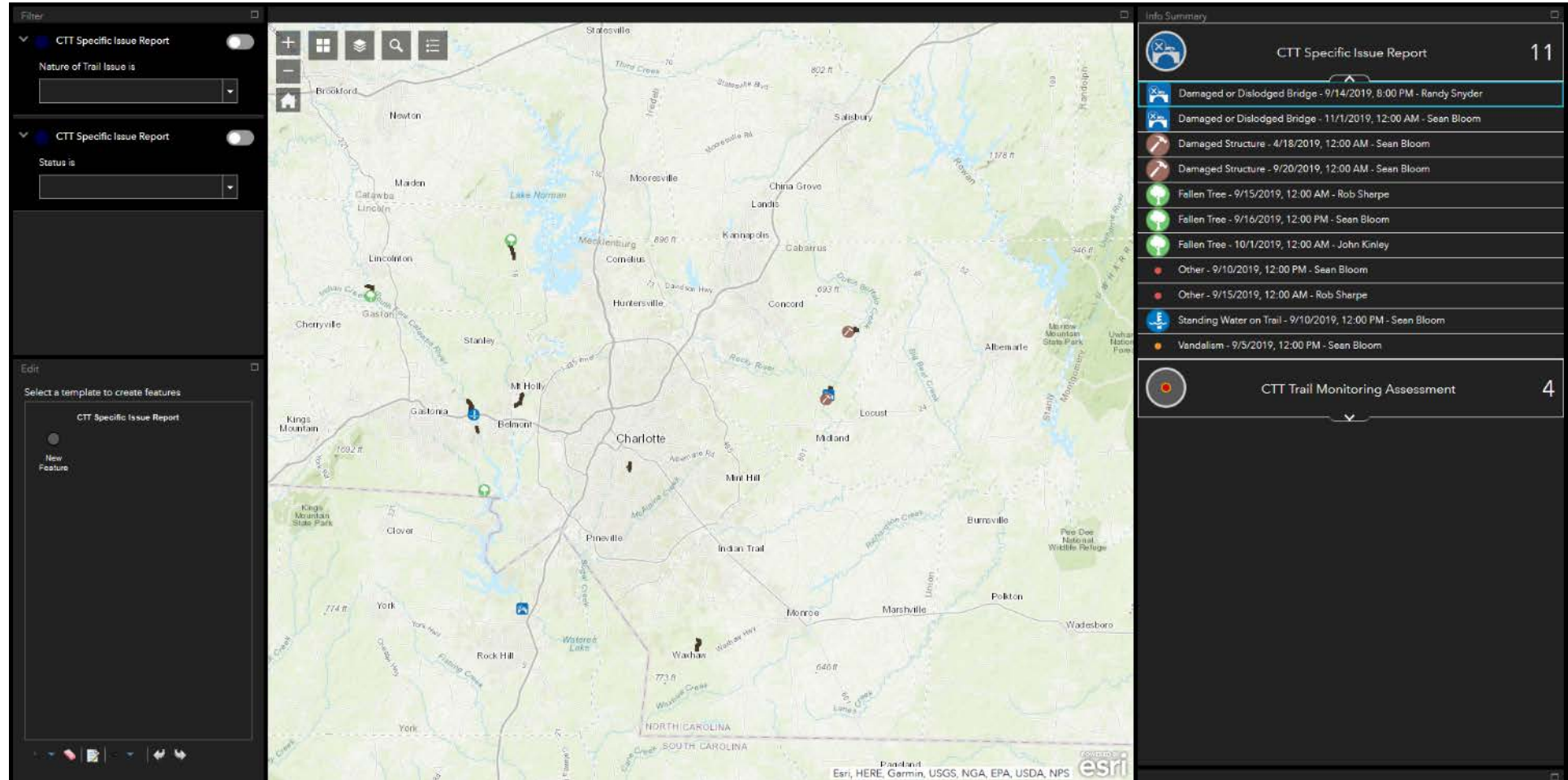
 Lat: 13.9234 Lon: -143.4375

Survey 123: Trail Issues

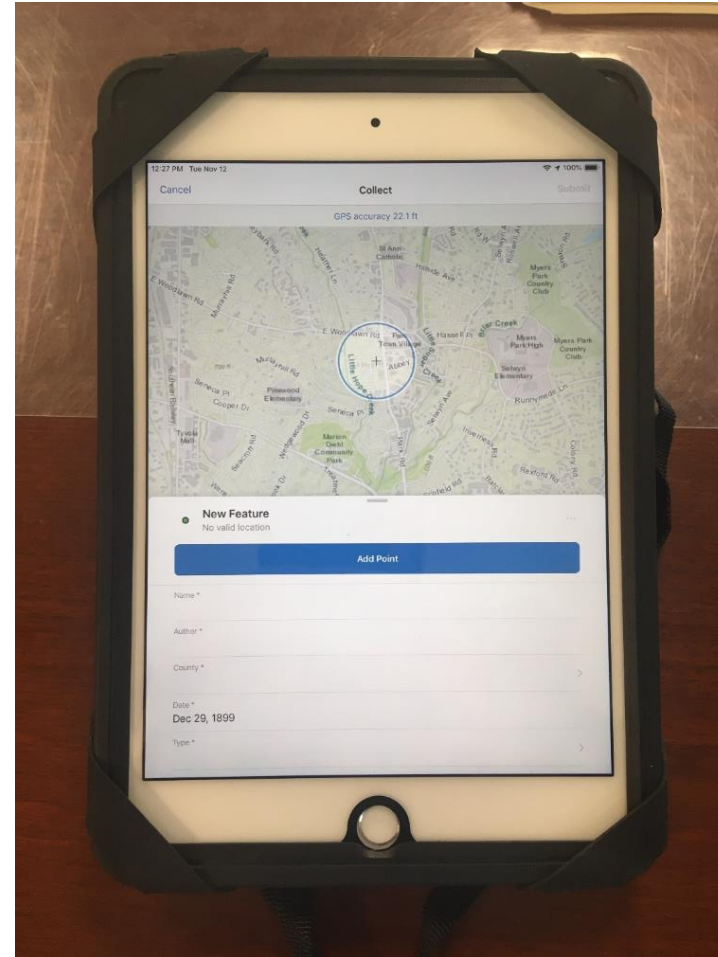


- ▶ Allows trailmasters and other volunteers to report on trail issues
- ▶ Allows for photos and geographic location information
- ▶ Similar to ESRI's Citizens Problem Reporter

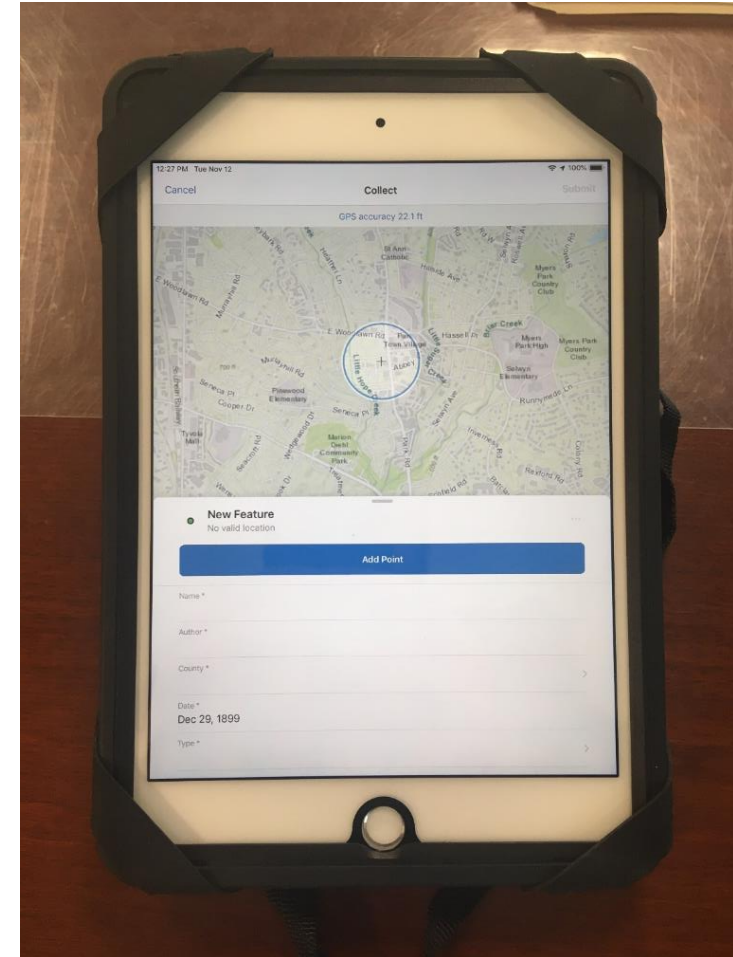
Trail Issues Tracking



Hardware: Computers



Hardware: GPS Receivers



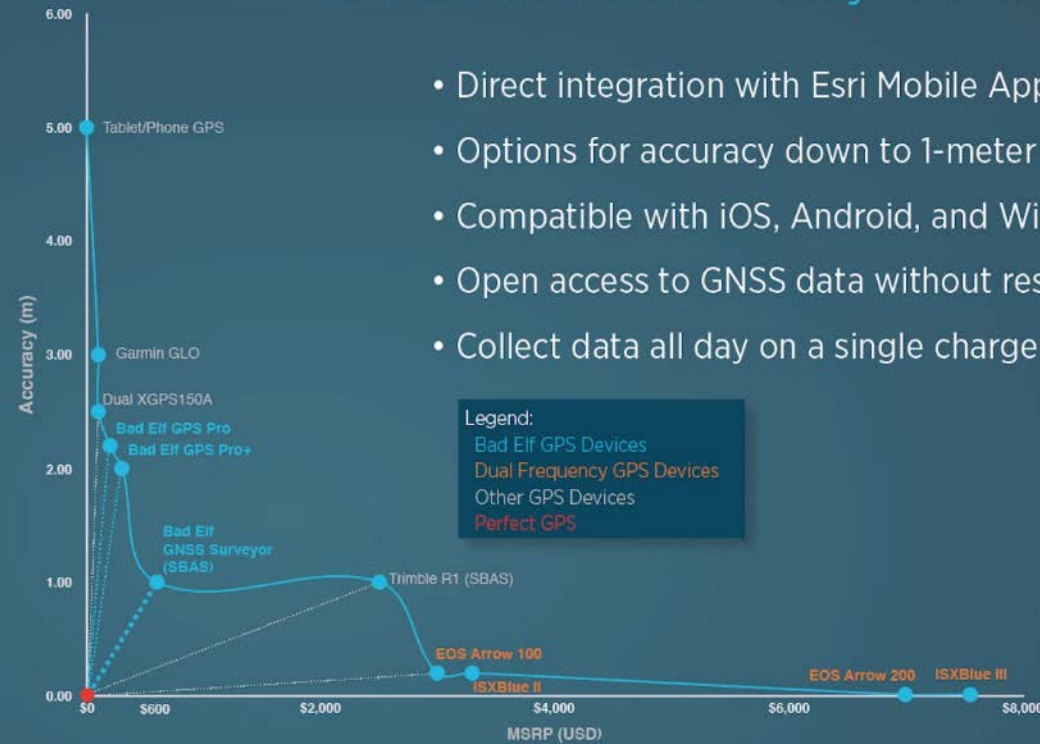
GPS UNITS



Bad Elf GNSS Receivers

Affordable. Portable. Easy to Use.

- Direct integration with Esri Mobile Apps
- Options for accuracy down to 1-meter
- Compatible with iOS, Android, and Windows
- Open access to GNSS data without restrictions
- Collect data all day on a single charge

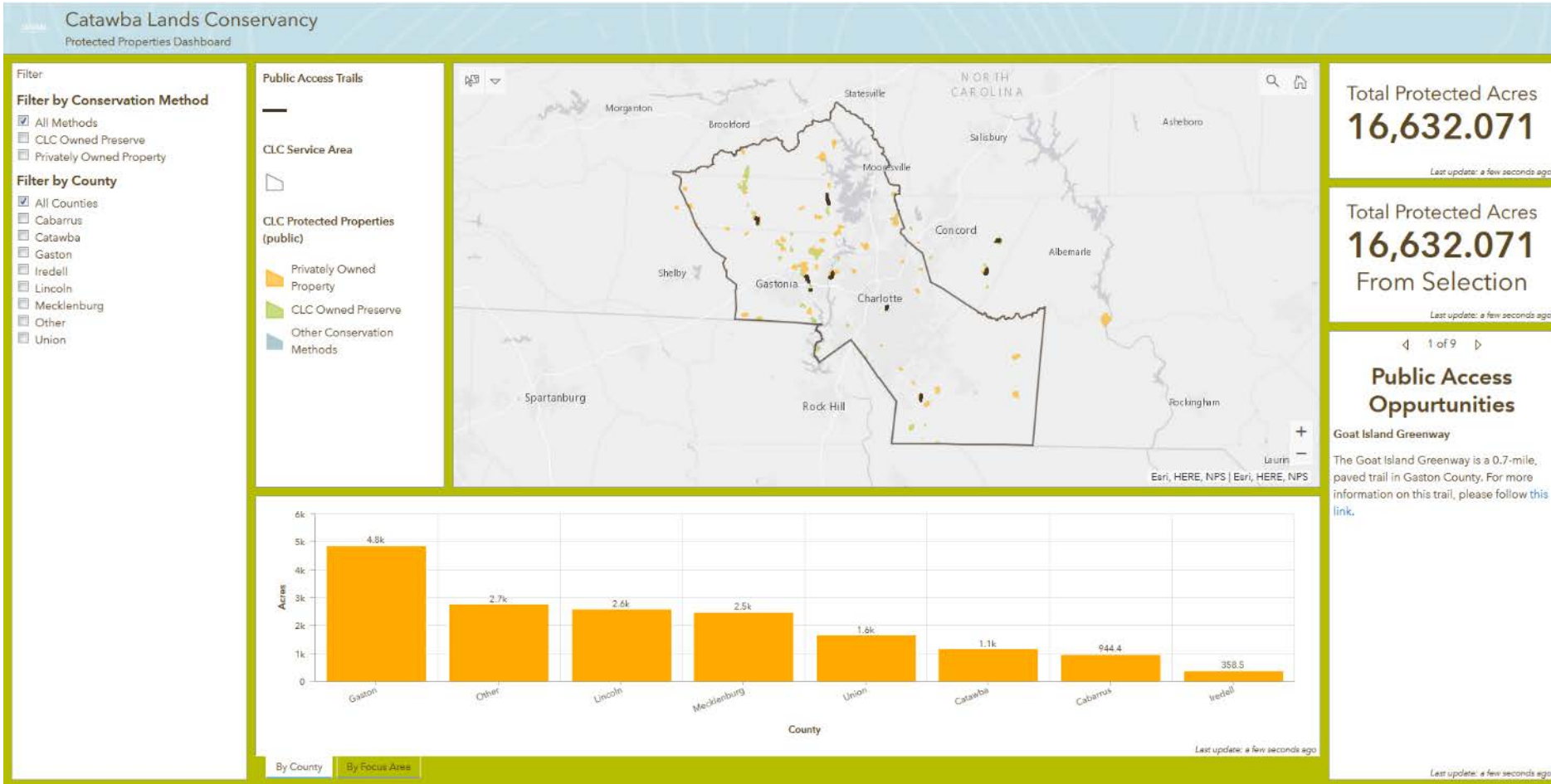


Telling Our Story

- Story Maps
- Dashboards



Catawba Lands Conservancy Dashboard

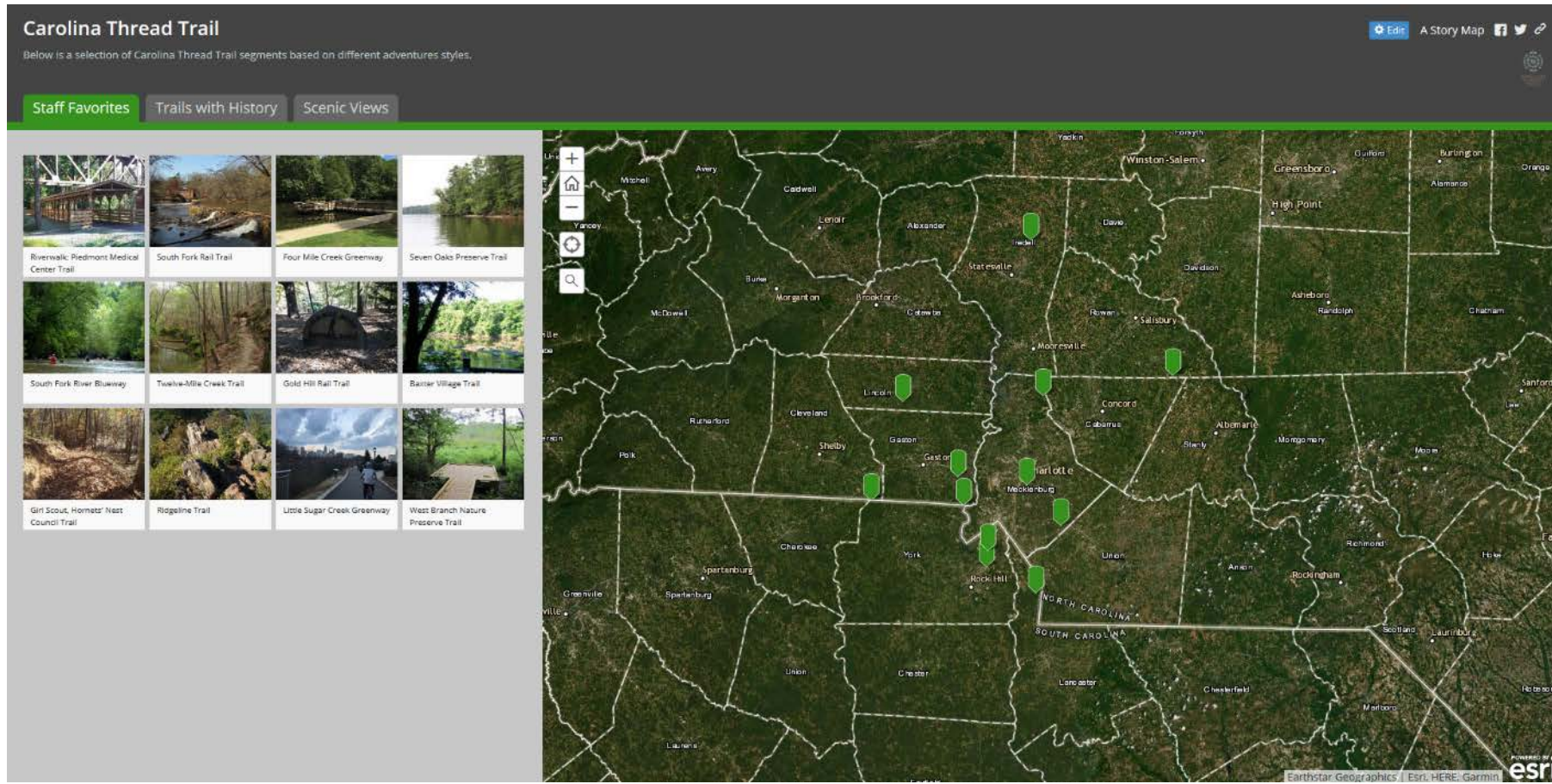


► Easy user interface

► Great way to empower public and staff with data

► Huge timesaver!

Carolina Thread Trail Storymap



- ▶ Shortlist style very easy to use
- ▶ No mapping experience necessary
- ▶ Just starting to understand storymap's capabilities



Other Quality Storymaps

- ▶ [Exploring the Fowey and Lerryn Estuaries](#)
- ▶ [Pennsylvania's Top Ten Trail Gaps](#)
- ▶ [Connecting Keys' Communities](#)
- ▶ [TNC: This Land is Your Land](#)

Setting Up the Workflow



- Create Feature Class
- Create Webmap
- Collect Data
- Use Apps and WebApp



Creating Feature Classes



WHAT IS A FEATURE CLASS?

- “Feature Classes are homogeneous collections of common features, each having the same spatial representation and a common set of attributes” – ESRI
- “Geographic data set”
- Common feature classes are shapefiles and geodatabases



Creating Feature Classes

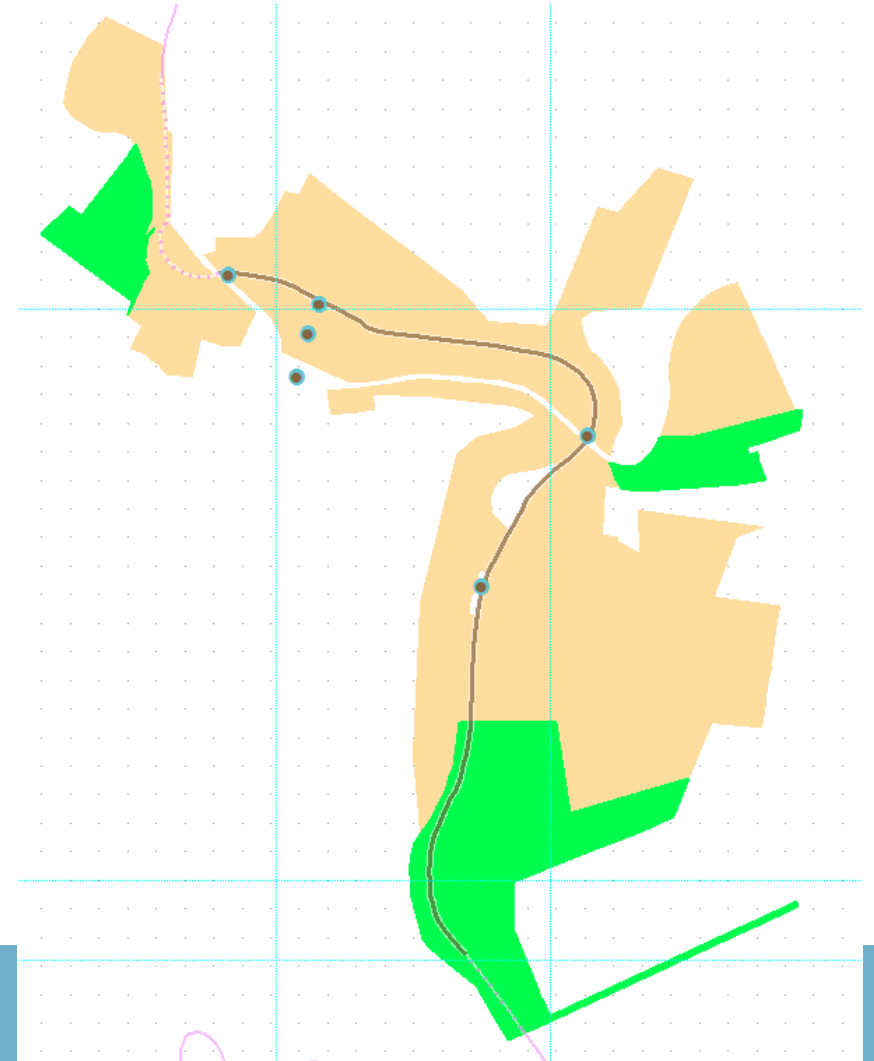


WHAT IS A FEATURE CLASS?

► “Feature Classes are homogeneous collections of common features, each having the **same spatial representation** and a common set of attributes” - ESRI

► Examples:

- Point: Trailheads or Bridges
- Polyline: Trail Alignment
- Polygon: Park Boundary



Creating Feature Classes



WHAT IS A FEATURE CLASS?

► “Feature Classes are homogeneous collections of common features, each having the same spatial representation and a **common set of attributes**” – ESRI

► “Attributes Table”

► Shapefile Feature Class: Simple but limited

► Geodatabase Feature Class: More complex but powerful

Table							
Parks and Natural Areas							
FID	Shape	MA_ID	ACRES	MA_NAME	OWNER	OWNER_TYPE	CATEGORY
0	Polygon	606	281172.28	Great Smoky Mountains National Park	US National Park Service	Federal	Fee
1	Polygon	75	276741.28	Great Smoky Mountains Registered Heritage Area	US National Park Service	Federal	Other
2	Polygon	9	245321.55	Nantahala National Forest - Nantahala Ranger District	US Forest Service	Federal	Fee
3	Polygon	563	196896.47	Pisgah National Forest - Grandfather Ranger District	US Forest Service	Federal	Fee
4	Polygon	395	162792.27	Pisgah National Forest - Pisgah Ranger District	US Forest Service	Federal	Fee
5	Polygon	669	161279.4	Croatan National Forest	US Forest Service	Federal	Fee
6	Polygon	227	159869.38	Nantahala National Forest - Tusquitee Ranger District	US Forest Service	Federal	Fee
7	Polygon	239	155627.82	Pisgah National Forest - Appalachian Ranger District	US Forest Service	Federal	Fee
8	Polygon	733	154569.26	Fort Bragg Military Reservation	US Department of Defense	Federal	Fee
9	Polygon	29	148493.69	Alligator River National Wildlife Refuge	US Fish and Wildlife Service	Federal	Fee
10	Polygon	2073	131627.8	Alligator River National Wildlife Refuge Registered Heritage Area	US Fish and Wildlife Service	Federal	Other
11	Polygon	702	126441.76	Camp Lejeune	US Department of Defense	Federal	Fee
12	Polygon	427	122003.59	Nantahala National Forest - Cheoah Ranger District	US Forest Service	Federal	Fee
13	Polygon	423	114779.33	Pocosin Lakes National Wildlife Refuge	US Fish and Wildlife Service	Federal	Fee
14	Polygon	1266	108364.14	NC Clean Water Management Trust Fund Easement	NC DNCR, Clean Water Management Trust Fund	State	Easement
15	Polygon	614	64394.81	Sandhills Game Land	NC Wildlife Resources Commission	State	Fee
16	Polygon	403	63653.86	Holly Shelter Game Land	NC Wildlife Resources Commission	State	Fee
17	Polygon	2082	61841.46	Safe Harbor Agreement	US Fish and Wildlife Service	Federal	Other
18	Polygon	2492	52725.19	NC Department of Transportation Mitigation Site	NC Department of Transportation	State	Other
19	Polygon	569	52453.67	Uwharrie National Forest	US Forest Service	Federal	Fee
20	Polygon	444	50915.67	Blue Ridge Parkway	US National Park Service	Federal	Fee
21	Polygon	810	50233.56	Wetland Reserve Program Easement	US Department of Agriculture, Natural Resources Conservation	Federal	Easement
22	Polygon	314	49840.92	Mattamuskeet National Wildlife Refuge	US Fish and Wildlife Service	Federal	Fee
23	Polygon	147	46234.89	Dare County Air Force Range	US Department of Defense	Federal	Fee
24	Polygon	2476	45369.67	B. Everett Jordan Dam and Lake	US Army Corps of Engineers	Federal	Fee
25	Polygon	244	43427.85	Mattamuskeet National Wildlife Refuge Registered Heritage Area	US Fish and Wildlife Service	Federal	Other
26	Polygon	775	37595.24	Falls Lake	US Army Corps of Engineers	Federal	Fee
27	Polygon	390	34484.26	Angels Bay Game Land	NC Wildlife Resources Commission	State	Fee
28	Polygon	682	33865.83	North Carolina Coastal Land Trust Easement	North Carolina Coastal Land Trust	Private	Easement
29	Polygon	1505	33534.06	Southern Appalachian Highlands Conservancy Easement	Southern Appalachian Highlands Conservancy	Private	Easement
30	Polygon	776	33072.3	Bladen Lakes State Forest	NC Department of Agriculture, Forest Service	State	Fee
31	Polygon	2670	32562.09	NC Division of Mitigation Services Easement	NC DEQ, Division of Mitigation Services	State	Easement
32	Polygon	600	31418.37	Conservation Trust for North Carolina Easement	Conservation Trust for North Carolina	Private	Easement

Leverage Power of Geodatabases



- ▶ More control over inputs
- ▶ Ability to set-up domains:
 - ▶ Limits inputs to a pre-defined table
 - ▶ Eliminates misspellings or multiple variations
 - ▶ Efficient data entry
- ▶ Requires a little more setup on the front end

Create Feature Class



PLAN AHEAD

- More upfront planning will give you a better product later
- What information do you need?
- How do you want to sort information?

The whiteboard is divided into three main columns of handwritten notes:

- Left Column:**
 - Activities
 - Monitoring (Survey 123)
 - Boundary Marking
 - Invasive Control
 - Trail Maintenance
 - Trespassing
 - T/I record
- Middle Column:**
 - Line
 - Boundary
 - * Property Name
 - * Date
 - * Personnel
 - Picture of Sign
 - Map line (Condition)
 - Desc/Narrative
 - Sign Spray/Stamp
 - I.S. Control / ID (Veg)
 - Prop Name
 - Date
 - Personnel
 - Species
 - Map of Area
 - Method (Base, Backpack, Pylons)
 - Chemical
 - Concentration
 - Amount Used
 - T/E (?)
 - * The usual
 - * Sp Name
 - * Photo
- Right Column:**
 - Line
 - Trail Maintenance
 - "The usual" *
 - Map Section
 - Narrative
 - # of Vols
 - Type of workday
 - Maintenance Type
 - Permit
 - Debris
 - Veg maint
 - Tree maint
 - Trespassing
 - Pts.
 - "The usual"
 - Narrative
 - Map location
 - Official contacted?
 - Photos
 - Type of trespass
 - Hunting
 - Trash
 - Other
 - ATV
 - Encroachment

On the far right, there are additional notes and a diagram:

- Survey 123
- * Forms
- Collector
- * GIS Data Coll / Visualize
- Dev?
- A simple line drawing of a landscape with a tree and a river.

Create Feature Class



User Created

- Shapefile or Geodatabase
- Create attribute tables
- Set-up Domain
- Done with ArcGIS software or ArcGIS Online

Survey 123

- Feature is created from the survey
- Attribute table based on questions asked
- Created from XML File or Online Survey 123 Form

Living Atlas

- Curated collection of authoritative data
- Available through ArcGIS Online
- Good source for base data

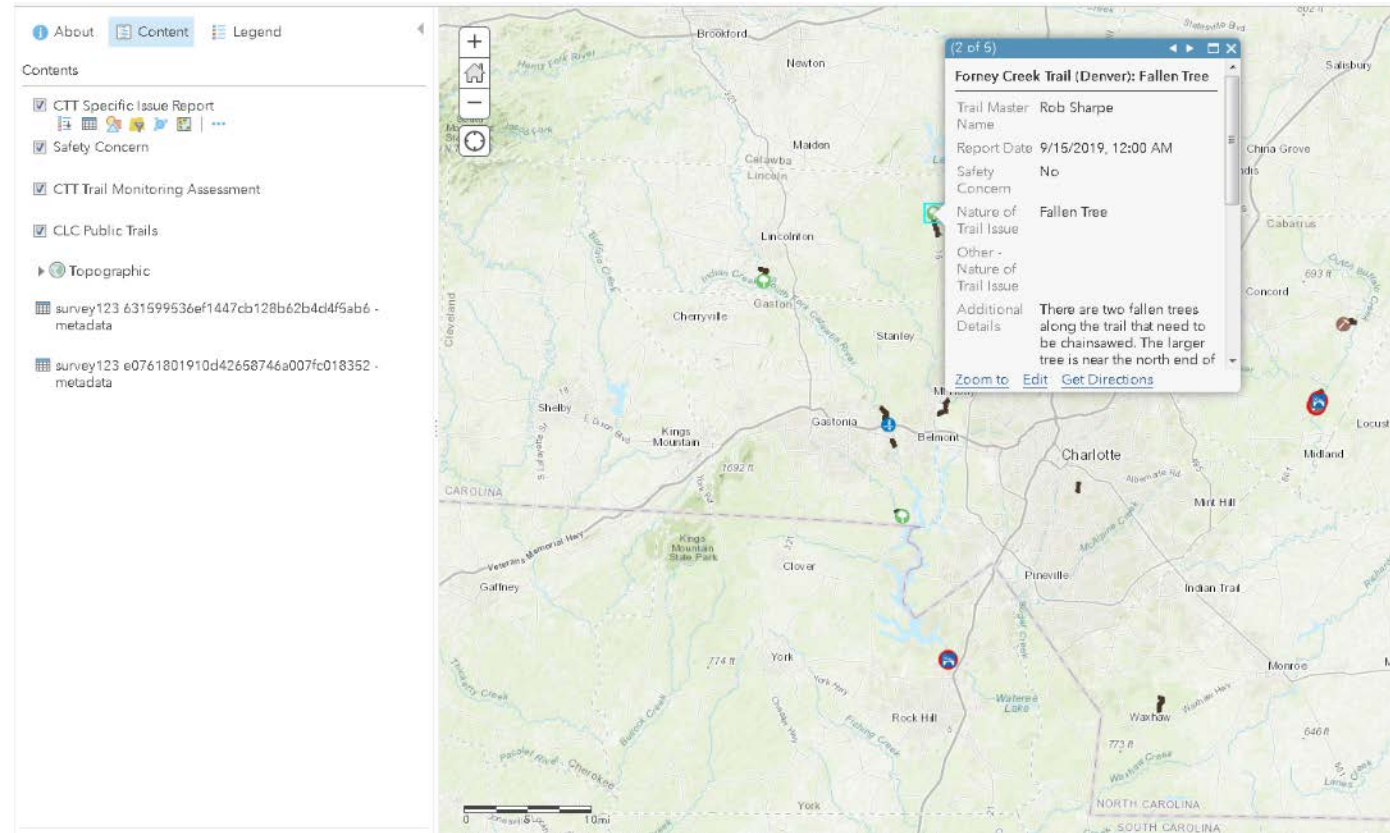
Create Webmap



- Webmaps are interactive displays used to graphically display geographic information to help empower and inform.

- Common Items:

- Basemap
- Features
- Symbology
- Popups
- Legend



Create Webmap



The screenshot displays a webmap application interface. The top navigation bar includes tabs for Details, Add, Edit, Basemap, and Analysis. The left sidebar contains a 'Contents' panel with a legend for various trail issues and safety concerns. The main map area shows a topographic view of the Charlotte, NC region, with several trail markers. A popup window titled '(1 of 3) Forney Creek Trail (Denver): Fallen Tree' is open, displaying the following information:

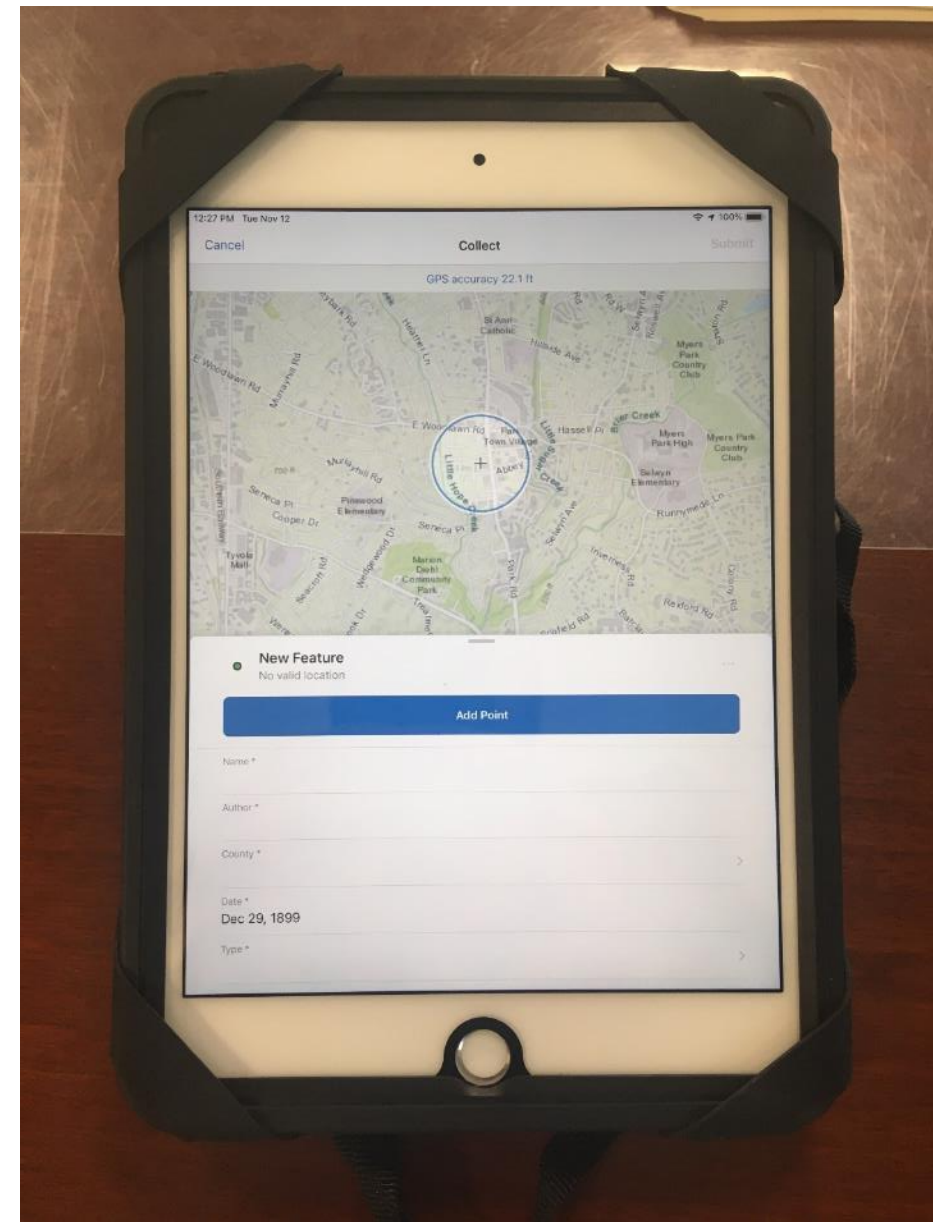
Forney Creek Trail (Denver): Fallen Tree	
Trail Master Name	Rob Sharpe
Report Date	9/15/2019, 12:00 AM
Safety Concern	No
Nature of Trail Issue	Fallen Tree
Other - Nature of Trail Issue	
Additional Details	There are two fallen trees along the trail that need to be chainsawed. The larger

Below the popup, there are links for [Zoom to](#), [Edit](#), and [Get Directions](#). The map interface also includes a search bar at the top right, a scale bar at the bottom left, and a north arrow.

Collect Data

ESRI COLLECTOR

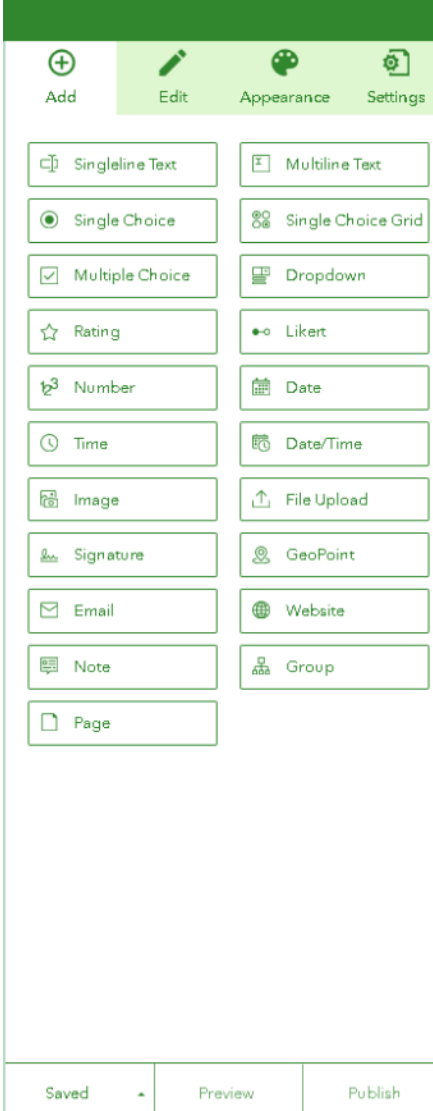
- Software for mobile phones and tablets.
- Allows user to add, remove, or update features directly from existing webmaps
- We use Collector for trail mapping



Collect Data

ESRI SURVEY 123

- ▶ Allows for creation of surveys
- ▶ Can be filled in using App or website
 - ▶ Drag and Drop
- ▶ Many types of questions possible
- ▶ We use it for trail inspections and incident reports

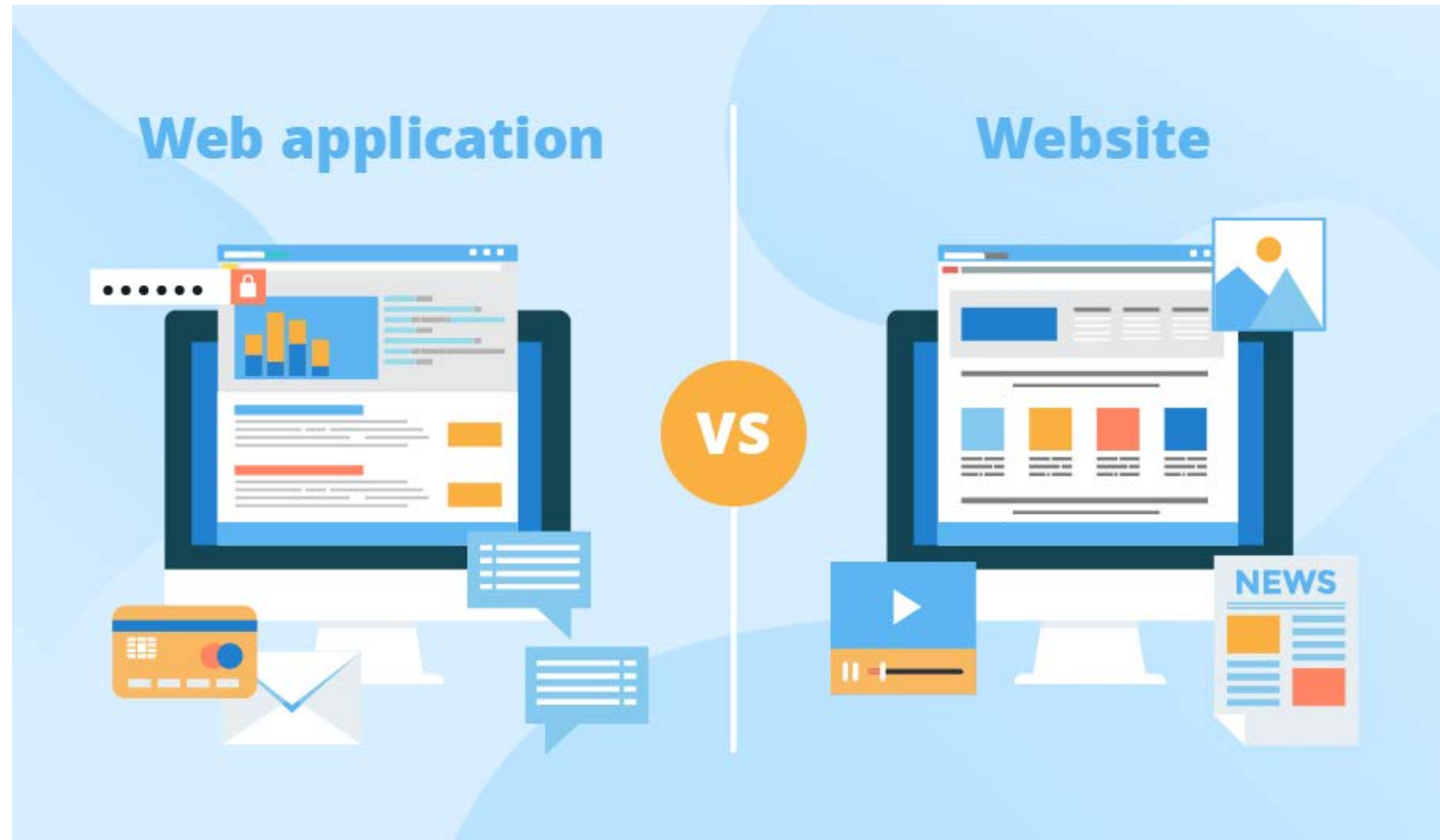


The screenshot displays the ESRI Survey123 interface. At the top, there is a green header bar with four tabs: 'Add' (with a plus icon), 'Edit' (with a pencil icon), 'Appearance' (with a paint palette icon), and 'Settings' (with a gear icon). Below the header, a grid of question type buttons is visible. The buttons are arranged in two columns and include: 'Singleline Text', 'Multiline Text', 'Single Choice', 'Single Choice Grid', 'Multiple Choice', 'Dropdown', 'Rating', 'Likert', 'Number', 'Date', 'Time', 'Date/Time', 'Image', 'File Upload', 'Signature', 'GeoPoint', 'Email', 'Website', 'Note', 'Group', and 'Page'. At the bottom of the interface, there is a navigation bar with three buttons: 'Saved' (with a left arrow), 'Preview', and 'Publish'.



Webapps

- **Website Application**
- Mimics a program or application
- Responsive to user
- Email, Online Banking, Bill Pay, ArcGIS



Webapps: Templates



Home Gallery Map Scene Groups Content Organization

Sean Bloom
CLC_smbloom

CTT Trail Issues

Overview Usage Settings

Edit Thumbnail

Add to Favorites

Description

Add an in-depth description of this item.

Layers

CTT Specific Issue Report

Safety Concern

CLC Public Trails

CTT Trail Monitoring Assessment

Topographic

Topographic

Tables

survey123_e0761801910d42658746a007fc018352 - metadata

survey123_631599536ef1447cb128b62b4d4f5ab6 - metadata

Create a web app

What do you want to do?

- Show All
- Build a Story Map
- Collect/Edit Data
- Compare Maps/Layers
- Explore/Summarize Data
- Interpret Imagery
- Map Social Media
- Provide Local Information
- Route/Get Directions
- Showcase a Map

Select a configurable app. ?

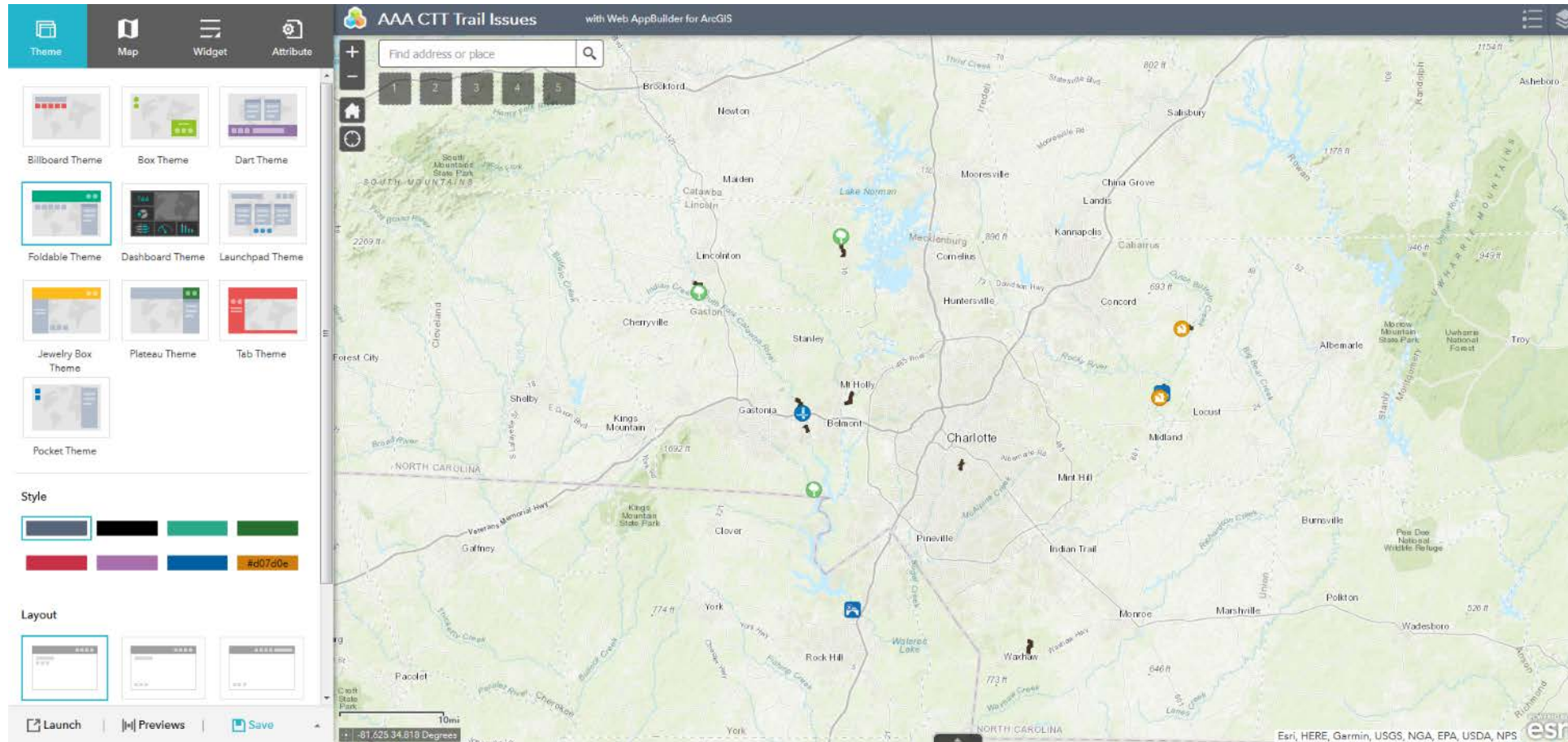
Search

Highlight information about resources or events at a location

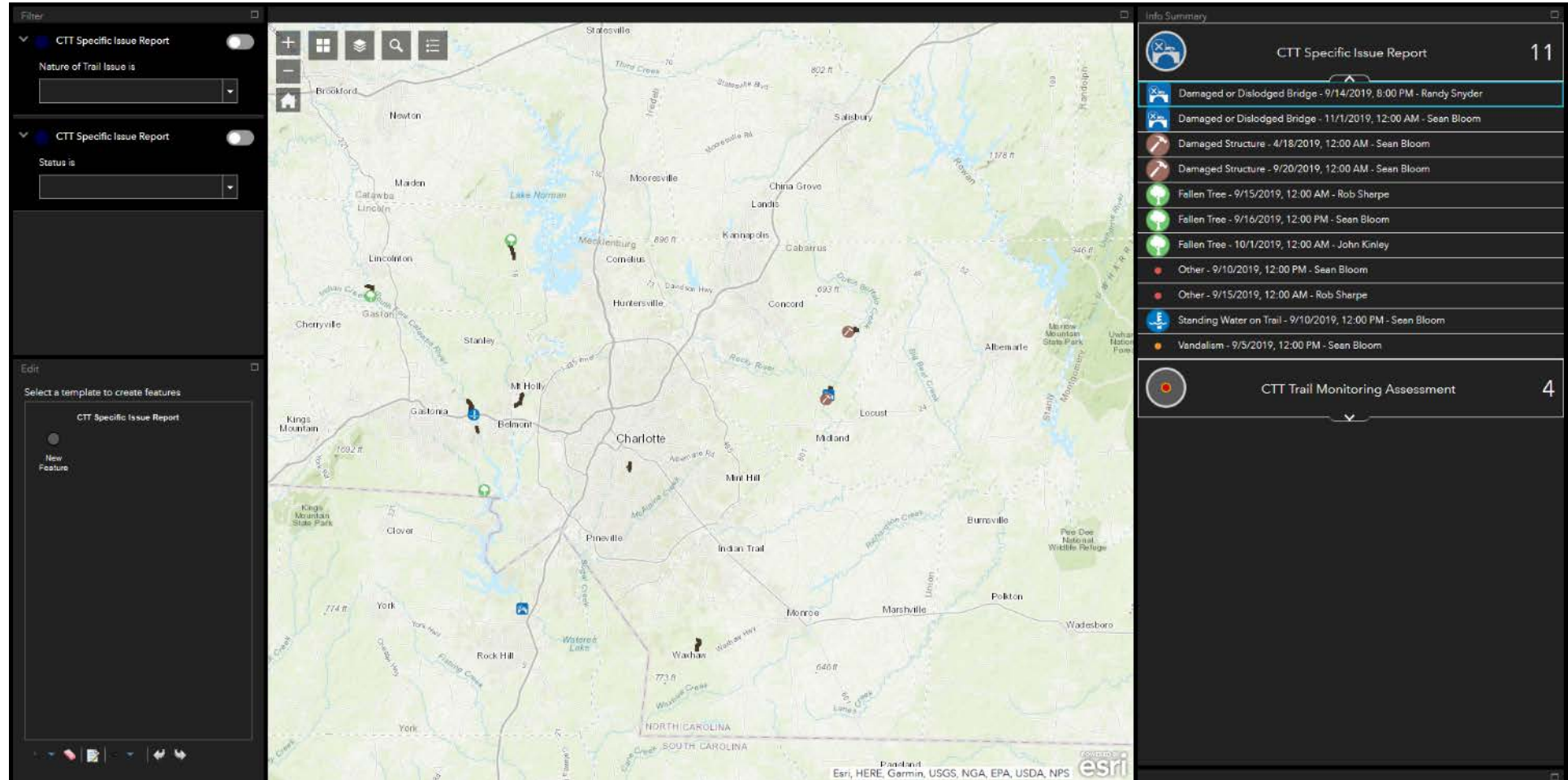
- Crowdsourcing Polling
- Impact Summary
- Information Lookup
- Live Maps (beta)
- Local Perspective
- Nearby

Cancel

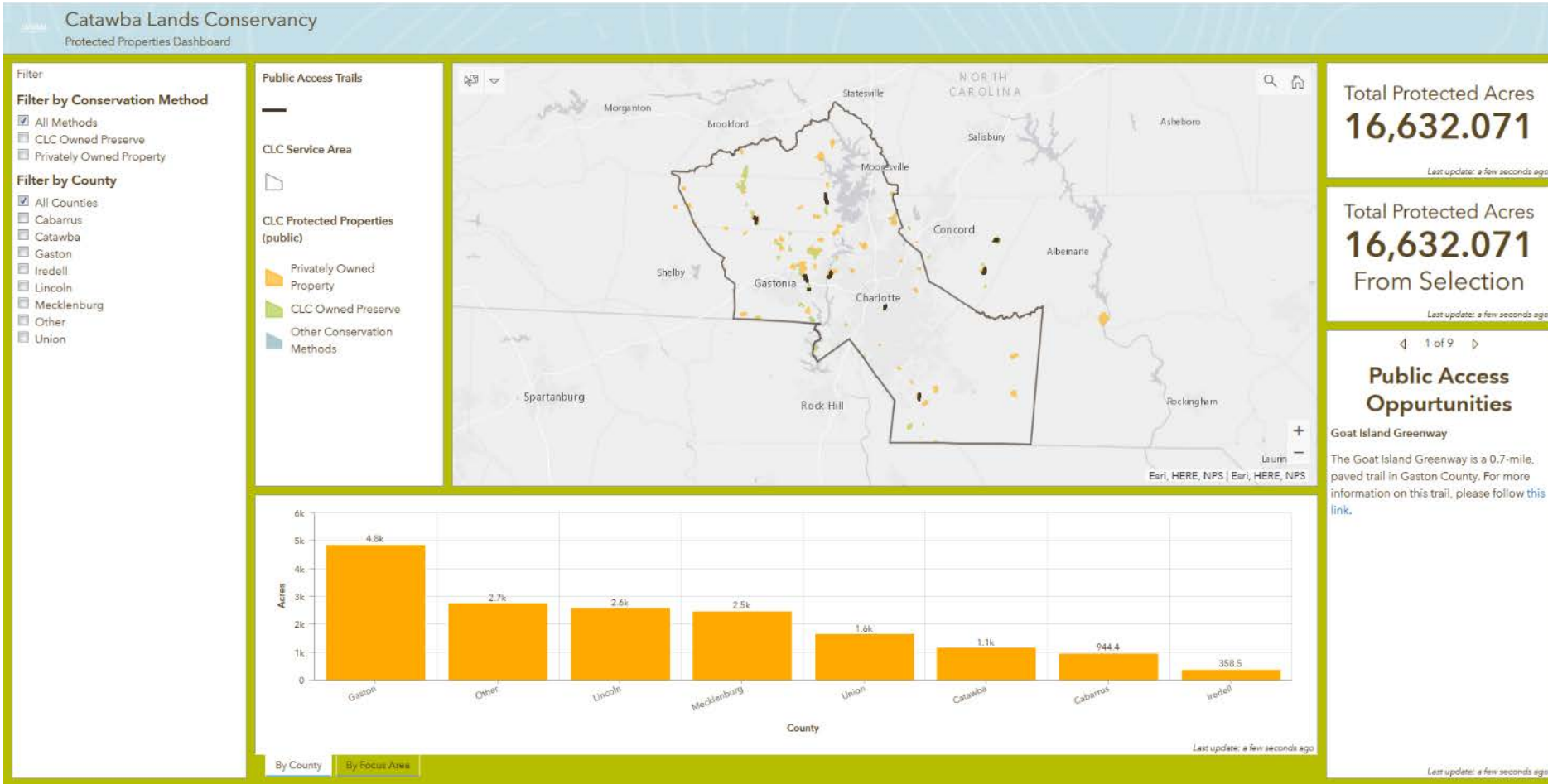
Webapps: User Made



Trail Issues Tracking

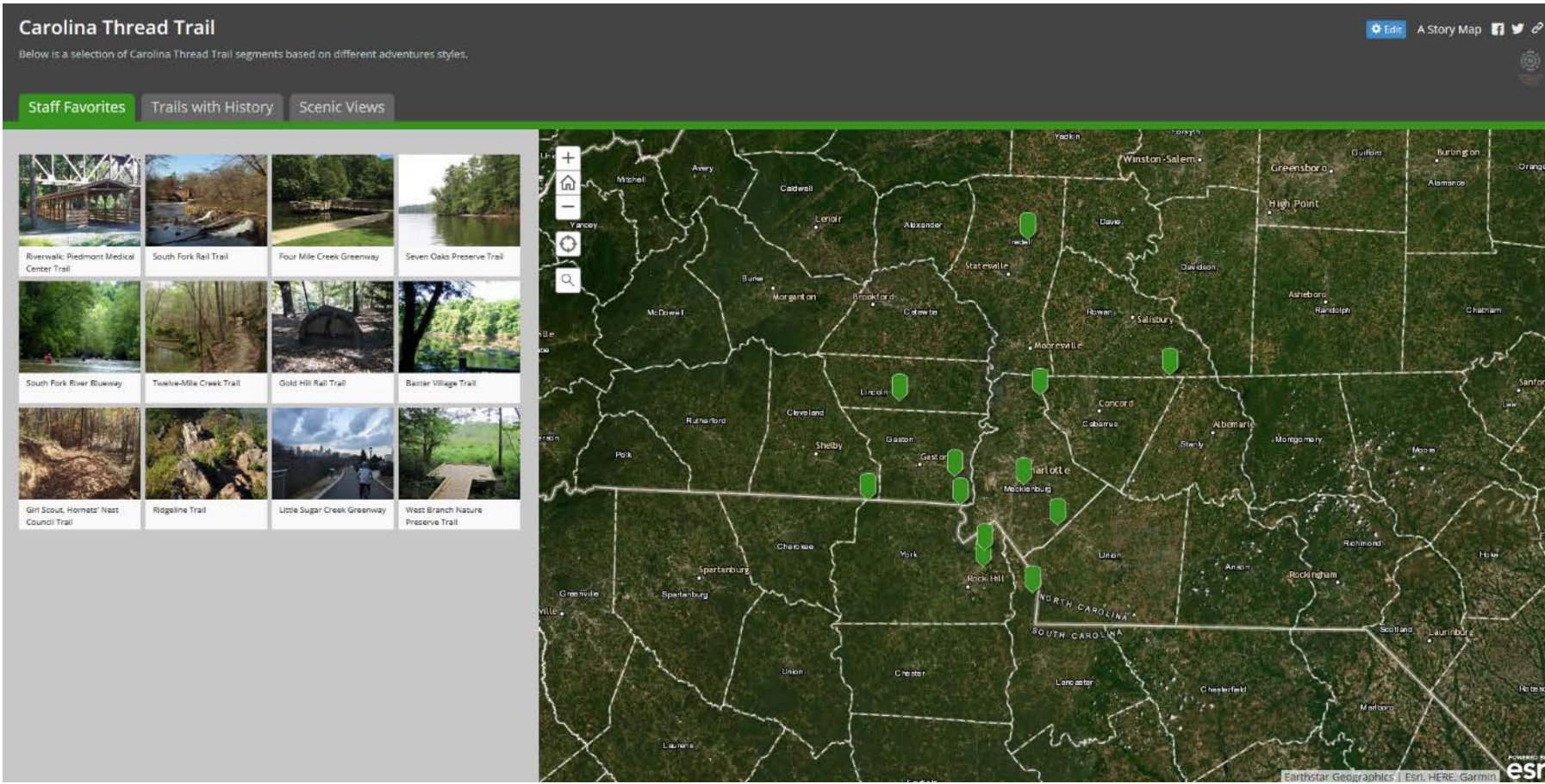


Catawba Lands Conservancy Dashboard



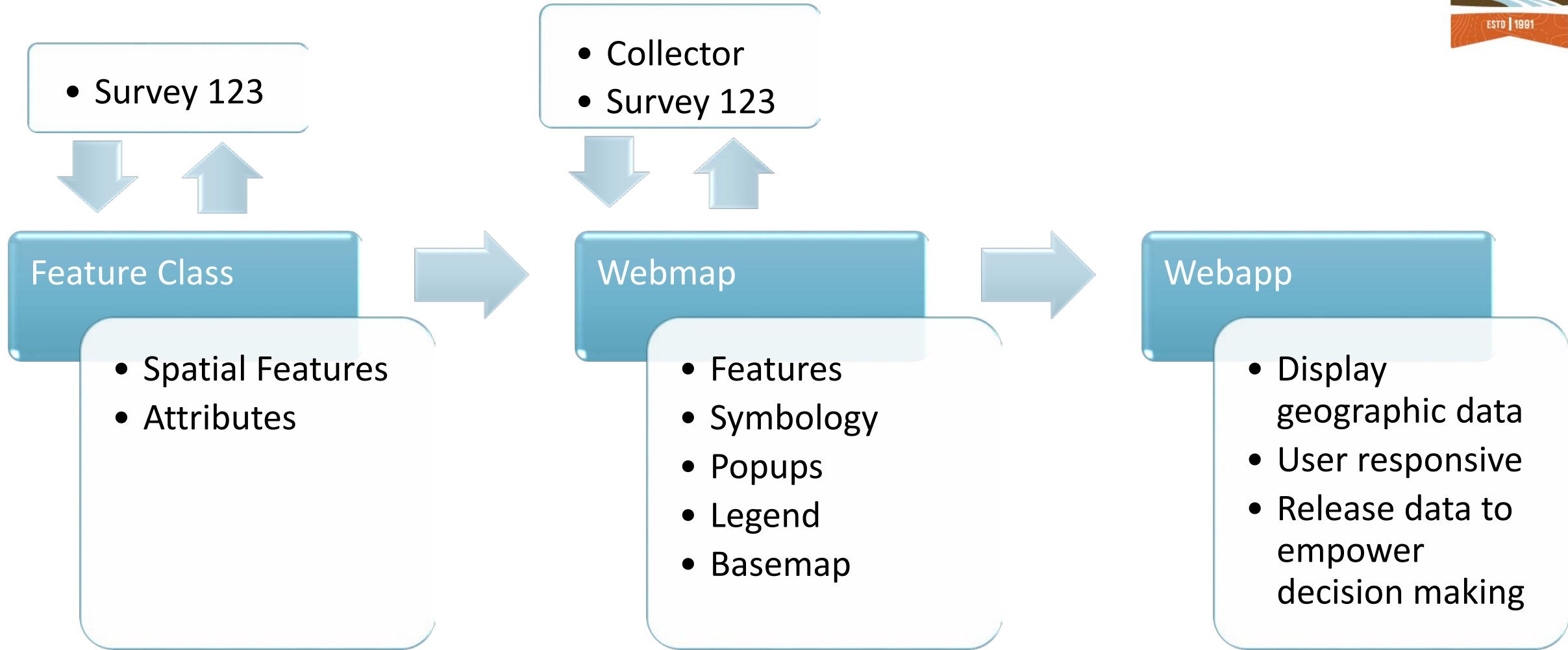
- Easy user interface
- Great way to share data
- Allows non-GIS users to query and visualize data
- Huge timesaver!
- [Link to Dashboard](#)

Thread Trail Storymap



- ▶ Shortlist style very easy to use
- ▶ No mapping experience necessary
- ▶ Just starting to understand storymap's capabilities
- ▶ [Link to Storymap](#)

Review of Workflow



Try it Out





THANK YOU!

Sean Bloom, Biologist and GIS Director
Catawba Lands Conservancy

sean@catawbalands.org

704-342-3330 x204