

# Emerald Ash Borer

Rustin Stephens

City Forester  
City of Fort Worth  
Park & Recreation Department



## Borer Background

- Native to northeast Asia
- Only affects *Fraxinus* and *Chionanthus* genera
- Asian ash is typically more resistant with natural controls
- Discovered in Michigan in 2002
- 33 states have confirmed populations of EAB







United States  
Department of  
Agriculture

## Cooperative Emerald Ash Borer Project

Federal EAB Quarantine  
& Authorized Transit

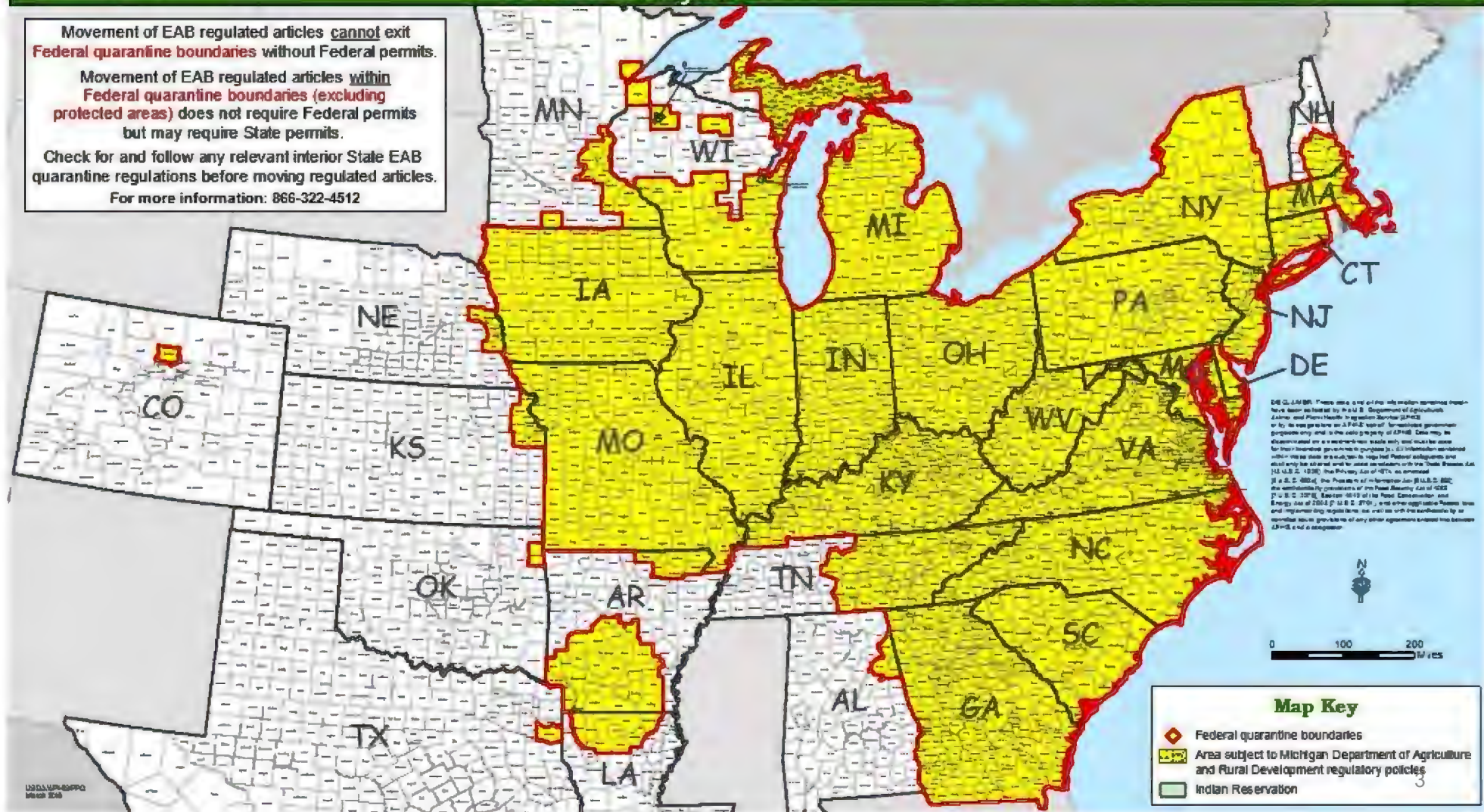
March 1, 2018

Movement of EAB regulated articles cannot exit  
Federal quarantine boundaries without Federal permits.

Movement of EAB regulated articles within  
Federal quarantine boundaries (excluding  
protected areas) does not require Federal permits  
but may require State permits.

Check for and follow any relevant interior State EAB  
quarantine regulations before moving regulated articles.

For more information: 866-322-4512



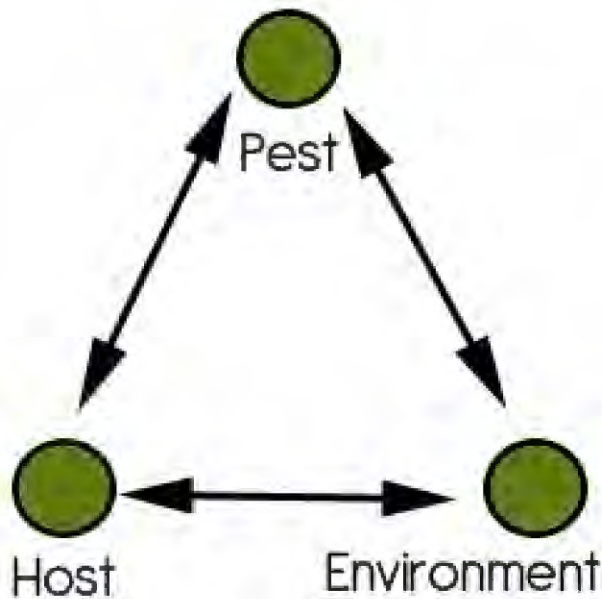
## What Does EAB Do?

- Larvae feed on the trees' living tissue disrupting flow
- Populates quickly
- Kills infested trees in 2-4 years
- 99.8% mortality rate for infected trees
- Leaves tree extremely brittle
- Can relocate itself up to ten miles





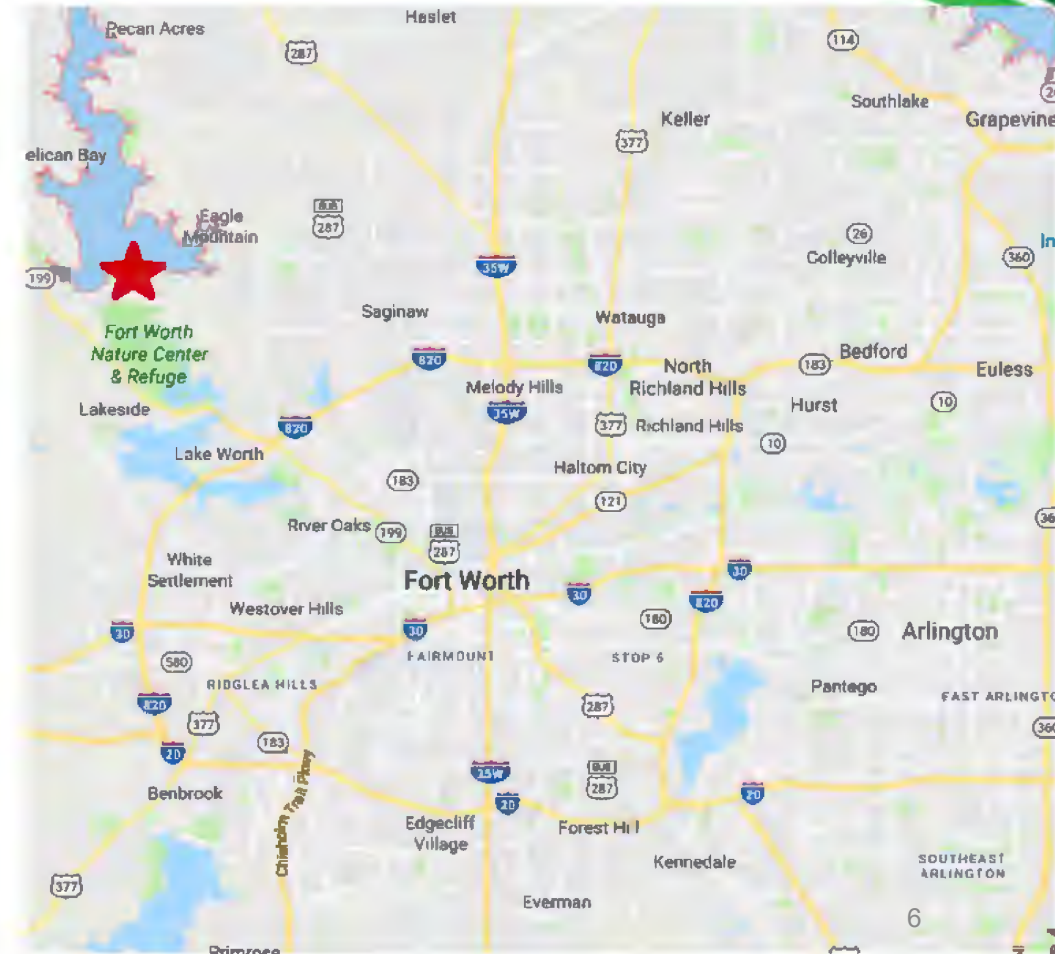
## Life Cycle (Michigan)



- Eggs laid in the bark from June to August
- Larvae feed on phloem (galleries)
- In September (sometimes longer), larvae mature and overwinter under the bark
- Emerge in late May to feed, mate and start the process over

## Arrival in Fort Worth

- Suspicious picture posted on iNaturalist
- Texas A&M Forest Service investigated probable trees
- Confirmed by larvae identification December, 2018
- Heavy trapping in the “hot zone”



# Implications for Fort Worth



- About 4% of street trees are ash, not including parks
  - Large areas of predominately ash
- Quarantine for Tarrant County
- Opportunities for research due to geographical location
- Insects dependent on ash

# Symptom Identification

- D shaped exit holes
- Larval galleries
- Tree dieback
- Water sprouts
- Leaf notches
- Pattern of mortality





## Treatment Options to Consider



- Just remove all the ash trees
- Native parasitoids from Asia
- Imidacloprid (Merit insecticide)
- Emamectin benzoate (Tree-age insecticide)

# Treatment Considerations

- Treat within 15 miles from known activity
- Environmental sensitivity
- Retreatment intervals
- Number of retreatments
  - Data from the Midwest suggests 25 years





## Successes

- ArborJet Inc. donated treatments for two regional champions
- About 1/3 of street segments surveyed
- Provide solid information to Fort Worth residents





# Ash Surveys

- Provide data to make decisions on treatment
  - How many
  - How long
  - What kind of rotation interval
- Estimate removal costs in the coming years
- Importance of proper identification

# Ash Tree Identification

- Diamond shaped furrows (X shaped)
- Compound leaf
- Opposite branching (MAD Buck and VIBrant CAT)
- Samara clusters
- Flower clusters



## Green Ash

- Deep furrows
- Tolerates wet soils
- Obvious root flare in native soil





# White Ash

- Pale, soft bark
- C shaped bud scars



© 2012 Katy Chayka

## Texas Ash

- Short and wide canopy
- Site specific
- More rounded leaves





## Arizona Ash

- Smaller leaf
- Very U shaped bud scar
- Prone to breakage
- Typical of the times





# Common Confusions

- Boxelder
- Chittamwood
- Hickory



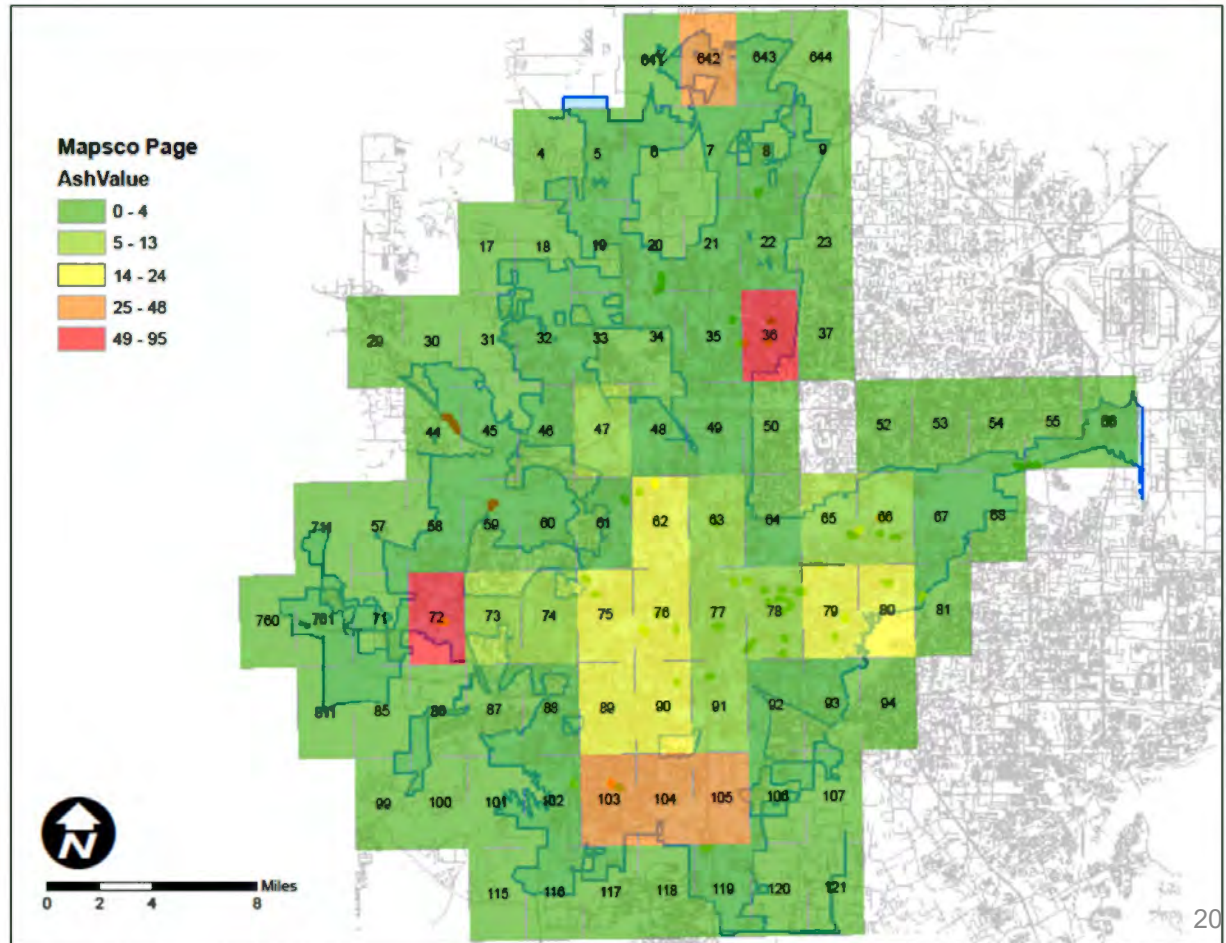
## Relevance for CFW

- Forestry Section responsible for streets and parks
- Fort Worth encompasses 349.2 square miles
- Over 4,000 miles of streets
- 4% street tree population was ash as of 2011 inventory
  - Drought (2011-2015)
  - 8 years of rapid growth
- 276,000 street trees x 4% population = more than 11,000 ash trees
- 290+ parks totaling over 12,000 acres



# Ash concentrations

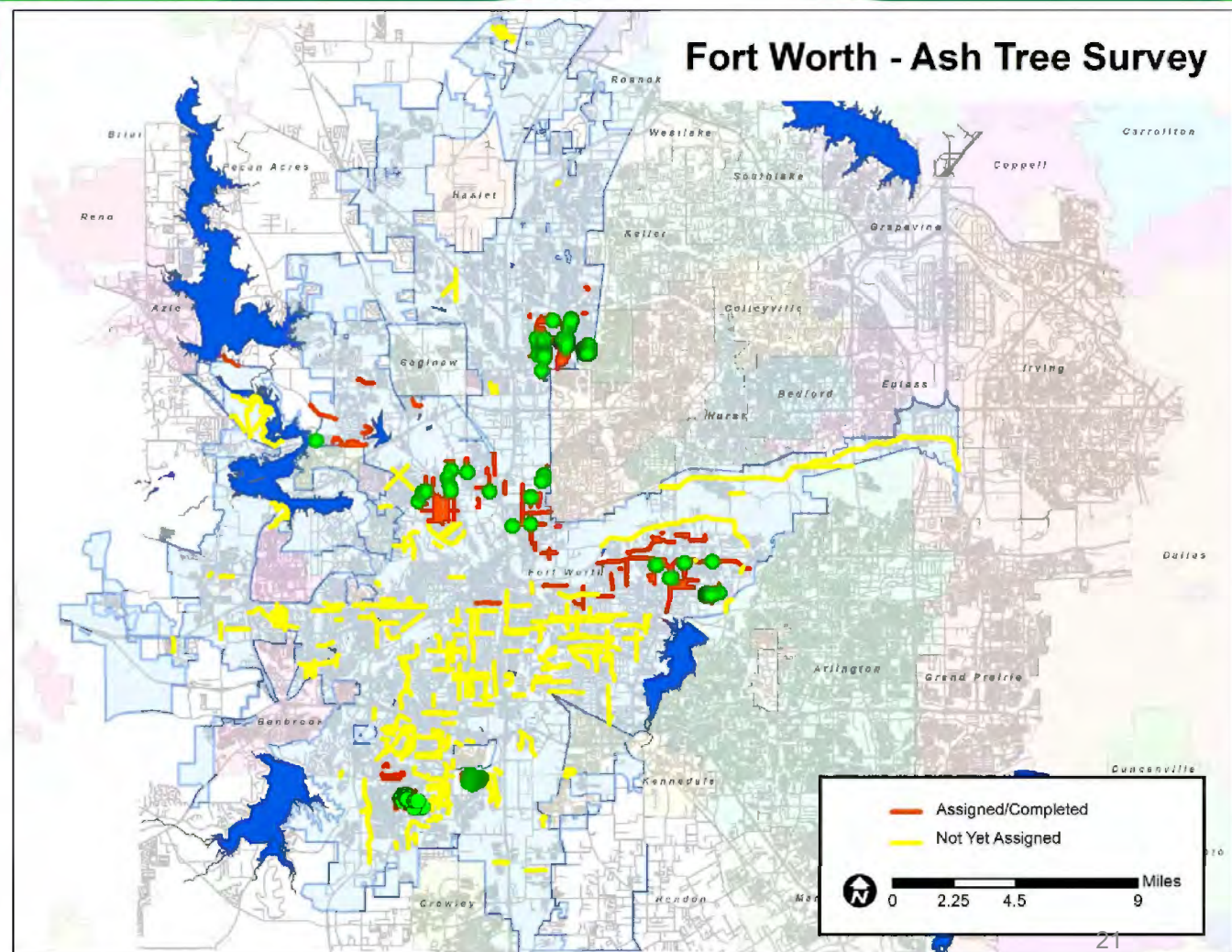
- Utilize years of location data from work order system, street tree inventory (2011), staff experience





# Citywide Status Update (9/1/19)

- 458 street segments
- 183 assigned or completed (40%)
- Parks still pending

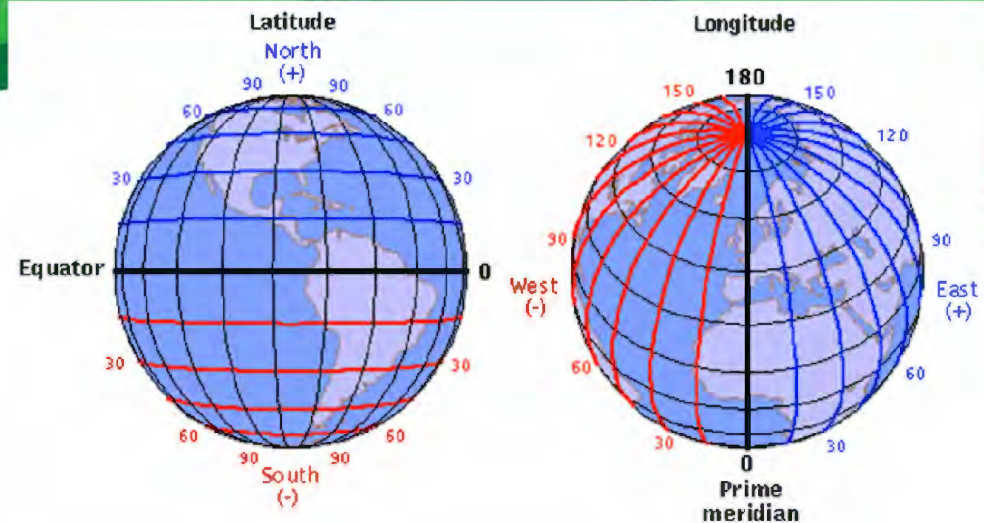


## Collection Data for Ash Survey

- Physical tree details
  - Site details
  - GPS location of tree – latitude/longitude captured in app
- } collected on Google form

# Latitude & Longitude

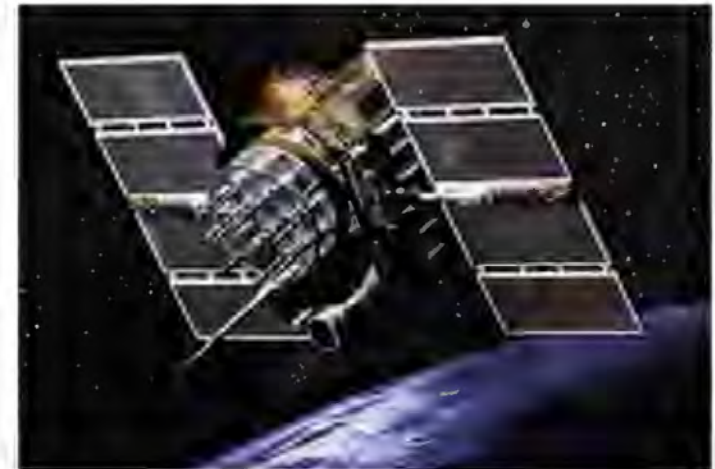
- Latitude runs “flat” and measures north and south
- The equator is the 0° of latitude
- Longitude is arranged vertically, measuring east and west
- The Prime Meridian, the 0° of longitude, running through Greenwich England (home of the Royal Observatory) was set in 1884
- Measurements may be in DMS (degrees, minutes, seconds), DDM (degrees, decimal minutes) or DD (decimal degrees)
  - 32°40'24.8736"N, 97°18'29.0304"W // 32°40.4146'N, 97°18.4838'W // 32.673576, -97.308064





# GPS Basics

- GPS = Global Positioning System (United States)
  - Constellation of 31 (originally 24) satellites provide position and time
  - 6 orbital planes with a minimum of 4 satellites each
  - 12,000 feet above Earth, passing twice daily
  - Maintained by U.S. Air Force
  - 4 satellites required for position\*
- Other countries/regions have their own systems (BDS, Galileo, GLONASS, QZSS, NavIC)
- Sputnik-1 launched October 4, 1957
- 4,987 *items* in orbit around Earth (Jan 2019)
- Cell technology (A-GPS)
  - Uses cell towers to improve speed and location
  - **Best accuracy typically limited to 16 feet**
- Reception Issues



# Accuracy & Precision

Accurate & Precise      Precise not Accurate      Accurate not Precise      You used your iPhone

**iPhones**

Open GPX Tracker  
No ads, no in-app purchases  
★★★★☆ 21

AT&T LTE      10:19 AM

Open GPX Tracker      (32.675155, -97.293340) · altitude: 200.33m

GPS ±16.00...      00:00  
0.00 km/h  
0m  
0m

**Androids**

GPS Essentials  
mictale.com  
Contains ads

WAYPOINT    CARDS    CATEGORY    TRAC

14 satellites visible, 14 used  
from gp: δ=3.52yd

N32°40.522' W097°17.623'  
559ft



# Collected Points

- Points projected in map
- Each point is rectified to fine tune the location
- .gpx or .kml file formats
- Each street or park should have own file





# GIS-Rectified

Date:	Zone	Location ID #:	Tree #:	Address	Species:	DBH	Condition:	Visible Root Flare	S	T
6/23/2019	A	210	4	7105 Isle Royale	Mexican OR Arizona Ash	9	Poor (25-50% canopy; major dieback; problematic leaves; large trunk lesions/cavities)	Yes		
6/24/2019	A	219	1	4109 Juneberry	Green Ash OR White Ash	21.5	Good (90-100% full, symmetrical canopy; no twig dieback; no chlorosis)	Yes		
6/25/2019	B	224	1	7500 Kingsmill	Green Ash OR White Ash	17.5	Poor (25-50% canopy; major dieback; problematic leaves; large trunk lesions/cavities)	Yes		
					Green Ash OR White Ash		Fair (60-90% canopy; minor twig dieback; small			



# Challenges

- Single trees are relatively easy to rectify, entire streets of ash can be difficult
- Check your GPS accuracy
- Use accurate addresses (for street trees)





# Survey Form

- Accessed via smartphone or wireless device
- Resources linked at the top
- Quick, easy to answer questions
- 9 questions required for each tree

## Fort Worth-Ash Tree Survey

Ash ID Quick Reference: [https://drive.google.com/open?id=14wqTJ5hPW-XUKsomDjQQmynJDGWVc\\_2](https://drive.google.com/open?id=14wqTJ5hPW-XUKsomDjQQmynJDGWVc_2)

Tips on measuring DBH: [https://docs.google.com/document/d/1x\\_GuW78Bv2JNey5zQvPxQNmiNKn8eHGrc2gkkFXtqwc/edit?usp=sharing](https://docs.google.com/document/d/1x_GuW78Bv2JNey5zQvPxQNmiNKn8eHGrc2gkkFXtqwc/edit?usp=sharing)

GPX Tracker Instructions (iOS): <https://drive.google.com/open?id=11mUEIzp9QOkIObFALp8yAUeu7PG5n8gF>

GPS Essentials Instructions (Android): [https://drive.google.com/open?id=1XlILrC\\_ujdNOsmicfJE-QvAroBctnu4](https://drive.google.com/open?id=1XlILrC_ujdNOsmicfJE-QvAroBctnu4)

\* Required

Assessor Name(s):

Your answer

Date:

Date

mm/dd/yyyy

Zone (if applicable):

Your answer

Location ID #: \*



# Survey Form Data

- Names of data collectors
- Date
- Zone/area
- Location ID\* (street segment # or park ID)
- Tree #\* (sequential order: 1, 2, 3...)
- Species\* (green ash or white ash, Texas ash, Mexican or Arizona ash, other)
- DBH:\*
- Condition\* (good, fair, poor dead)
- Root flare\*
- Street tree\*
  - Address, if yes
- Targets\*
- Evidence of EAB\*

Species: \*

Green Ash OR White Ash

Texas Ash

Mexican OR Arizona Ash

Other: \_\_\_\_\_

DBH (only 6" or greater): \*

Your answer \_\_\_\_\_

Condition: \*

Good (90-100% full, symmetrical canopy; no twig dieback; no chlorosis)

Fair (60-90% canopy; minor twig dieback; small bark splits)

Poor (25-60% canopy; major dieback; problematic leaves; large trunk lesions/cavities)

Dead (<25% canopy)

Visible Root Flare (>= 50% of circumference): \*

Yes

No

# Survey Guide

- Only ash trees 6” DBH or larger are included
- People are curious-be friendly, but avoid going beyond the facts
- Report issues requiring immediate attention

## General Guidelines

- To help identify yourself, be sure to wear your Citizen Forester name badge. Wearing a safety vest is also strongly recommended, particularly when surveying street trees.
- There is a distinct possibility you may be approached while surveying trees, particularly those in front of someone’s home. Let them know that you’re a Citizen Forester volunteering with the City of Fort Worth’s Forestry Section to conduct a survey of ash trees. If they probe further, explain that EAB is an invasive pest new to our area that affects ash trees and you’re simply there to gather more information on the trees in our city and the potential effect the insect may have. Direct any deeper inquiries to Forestry at 817-392-5738. Avoid using charged words such as “hazardous” or “dangerous” and avoid any speculation on the actions Fort Worth may take, such as the likelihood of removing trees or treating trees. We’re simply on a fact-finding mission at this point.
- For your group to begin, we are asking you to schedule a date and time to meet with a staff member at your first location. We will observe to ensure the data collection goes smoothly and to gather final feedback. Once you’re cleared to proceed, you will receive batches of multiple sites to work through at your own pace. To schedule your first location, please contact: Rustin Stephens, [rustin.stephens@fortworthtexas.gov](mailto:rustin.stephens@fortworthtexas.gov), 817-392-5705; Melanie Migura, [melanie.migura@fortworthtexas.gov](mailto:melanie.migura@fortworthtexas.gov), 817-392-5739; Craig Fox, [craig.fox@fortworthtexas.gov](mailto:craig.fox@fortworthtexas.gov), 817-392-5729. Please leave a voicemail if we are not able to pick up the phone.

## Survey Info

- Only ash (*Fraxinus*) trees 6” and larger (DBH) on city-owned property within Fort Worth city limits are being considered for the survey.
- Measurements of trunk DBH should be recorded to the nearest ½ inch.



# Street Map Example









# Map Table Explanation



Location ID matches the map and is used on your survey form (Google form).

Street name info: Prefix or Suffix might be labels such as North, South, East or West.

Zone	Release	Map	Location ID	Low Range	High Range	Prefix	Street Name	Street Type	Suffix	IssueDt	
A	1	1	47	5400	5599		BIG BEND	DR		3/3/2019	
			89	5500	5599		CEDAR BREAKS	DR		3/3/2019	
			112	5500	5599		CRATER LAKE	DR		3/3/2019	
			210	7200	7299		ISLE ROYALE	DR		3/3/2019	
			278	7100	7389		MESA VERDE	TRL		3/3/2019	
			348	5400	5599		ROCKY MOUNTAIN	RD		3/3/2019	
			424	5300	5599		TULAROSA	DR		3/3/2019	
	2	2	2	26	5000	5289		ASH RIVER	RD		3/3/2019
				318	5400	5499		PLATTE	PL		3/3/2019
				355	7800	7899		RUSHMORE	CT		3/3/2019
				354	7900	8099		RUSHMORE	RD		3/3/2019
				360	8100	8199		SALT RIVER	RD		3/3/2019
				425	4850	8199		UNION LAKE	DR		3/3/2019

You may receive multiple maps with each release of streets to survey. This field shows on which map they map be found. Map names are created using: Zone, Release # and Map #.  
Ex: "A1.1" (found in your map legend) would be: zone A, release #1, map #1

Low Range refers to the lowest starting address for the selected street. High Range is the ending address. This could be helpful in locating streets to be surveyed.

Streets will be provided in batches, or releases, generally about 10 at a time. This will help us monitor progress.



# Park Collection

- Only maintained areas, or trees with canopies over maintained areas count
- Keep track of your progress
  - Break the map into manageable pieces
  - Chalk trunks, if necessary
- Be aware of wild things
- Be aware of your surroundings
  - Trinity Trails have mile markers for 911
  - Some cyclists are very territorial
- Have fun!





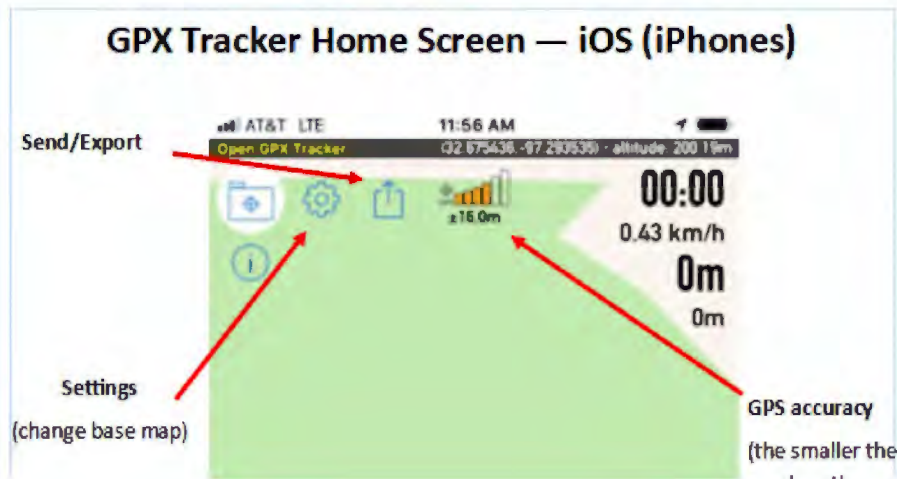
# Mapping Apps

- Separate handout (use the one for your phone type and app)

iPhones



**Open GPX Tracker**  
No ads, no in-app purchases  
★★★★☆ 21

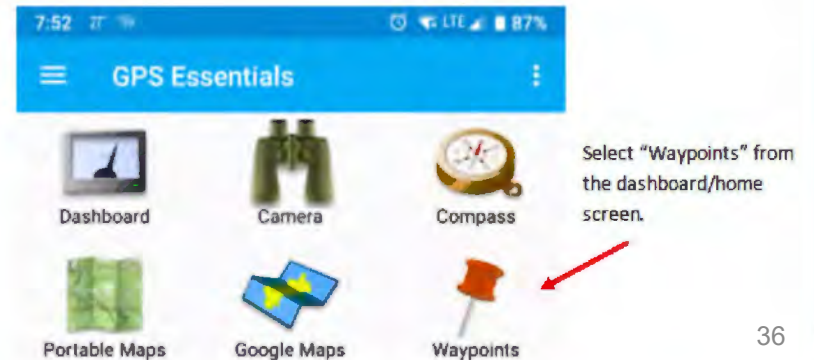


Androids



**GPS Essentials**  
mictale.com  
Contains ads

GPS Essentials Home Screen — Android Phones



# Placing Waypoints

The accuracy info is displayed here. It may not appear for 1-2 seconds. Waiting 3-4 seconds usually allows the GPS to lock in to a reasonable accuracy. The lower the number, the better the accuracy (try to obtain a figure under 16 meters).

Press the waypoint button to drop a pin at your current location.

*“Long press” on the screen if you wish to drop a point elsewhere (placed where you press).*

Tap the arrow if you need to quickly center the map to your current location.



*When entering waypoints for the first time, or if previously used waypoints have been cleared, this screen will appear.*

Tap the plus button at the bottom.

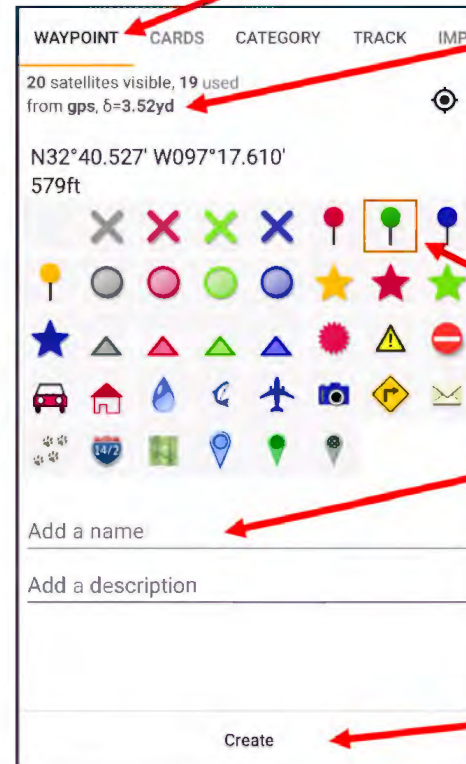
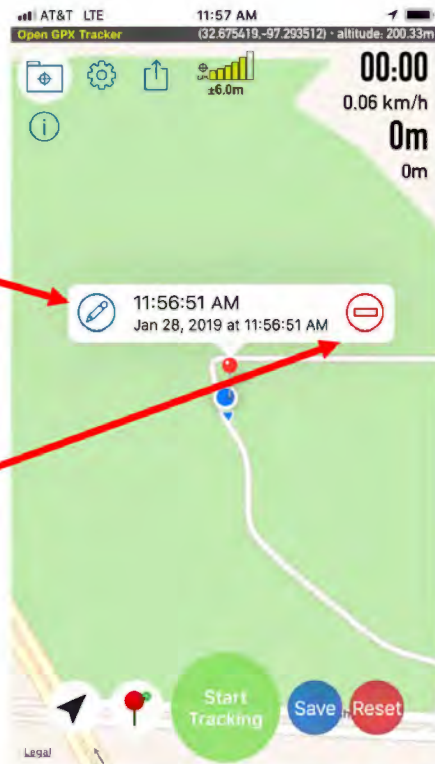
# Editing / Placing Waypoints

Touch a point to edit it.

Select the pencil to change the name.

Select the red bar to delete the point.

*After the edit bubble appears, press and hold the point if you want to drag and drop it at a new location.*



“Waypoint” will be the default tab that appears on the screen.

The accuracy info is displayed here. It may not appear for 1-2 seconds. Waiting 3-4 seconds usually allows the GPS to lock in to a reasonable accuracy. The lower the number, the better the accuracy (try to obtain a figure under 10 yards).

The green pin marker is the default setting, but you can change your waypoint symbol, if you prefer.

Add your waypoint name/number. This is what you will use for “Tree #” on the survey form. No name is assigned by default, but can be added after creating the point (useful if you lose track of which number was used last).

Hit “Create”.



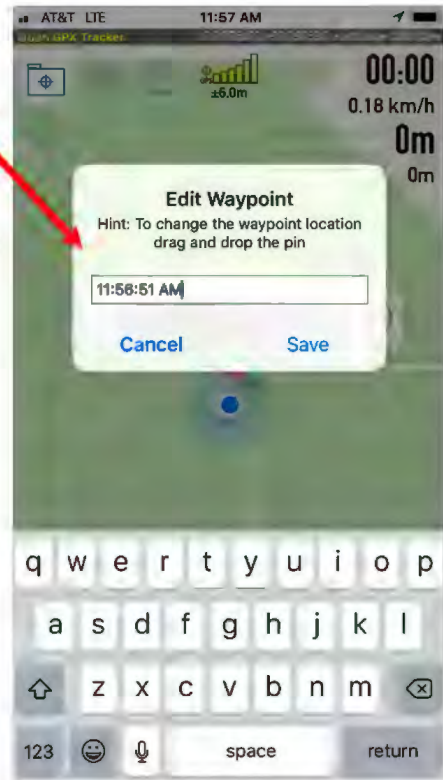
# Naming / Editing Waypoints

GPX Tracker automatically creates waypoint names using an hour/minute/second format (timestamp).

You may use the default name (timestamp) for the "Tree #" on your survey, but you will need to enter the full timestamp.

*Copy and paste could be helpful if using just one device for both the map and survey form and you want to use the timestamp as the tree #.*

To enter a new name for the waypoint, clear out the time and enter the desired number.



After tapping "Create", a new screen should appear with a localized map.

Your point should appear on the map and below the map in a list displayed by waypoint name, the coordinates, and the time captured.

Tap the plus sign when you're ready to create a new waypoint.

If you need to edit the waypoint name, tap the corresponding waypoint in the list. Make changes and tap the back arrow (in the app or on your phone). This list should now show the updated name.

# Deleting Waypoints

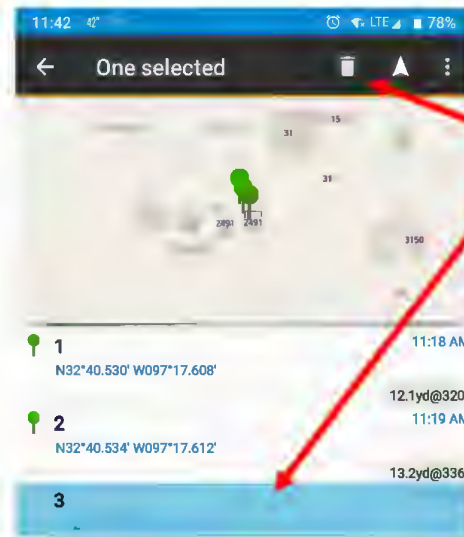
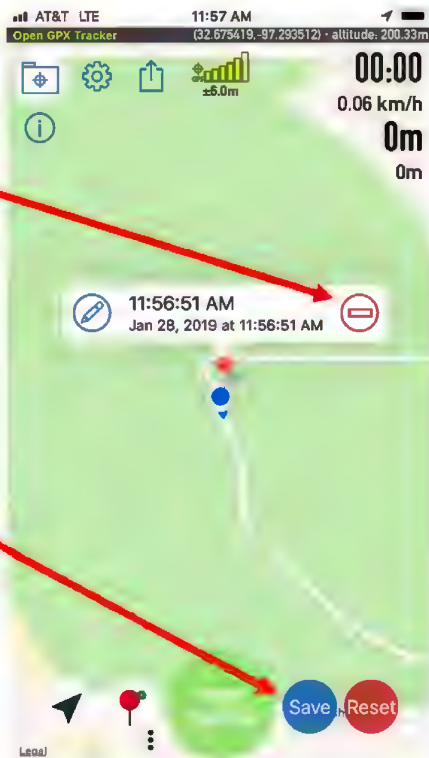
Touch a point to edit it.

Select the red bar to delete the point.

*After the edit bubble appears, press and hold the point if you want to drag and drop it at a new location.*

Tap the save button if you've made changes and when you're done entering your waypoints.

*Be careful: the reset button will clear ALL of your waypoints!*



If you need to delete a point, press and briefly hold the desired waypoint in the list. Once selected, it will appear highlighted and a menu bar should be visible with the trashcan icon at the top of the screen. Tap the trashcan to delete the point.

*To delete multiple waypoints, press and hold to highlight the first point, then tap each additional point desired. Tap the trashcan when you're done choosing points.*

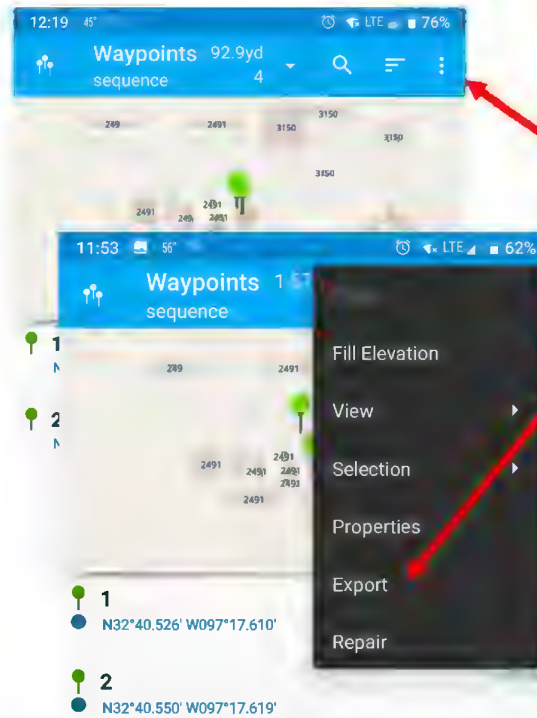
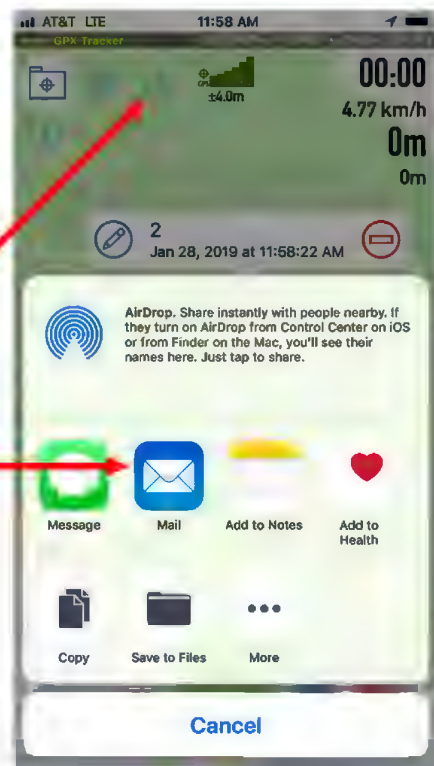
*Note: there is no "undo" option or a confirmation asking if you're sure you want to delete. Keep this in mind when you're deleting points.*

# Sending Waypoints

Once you have completed and saved the mapping portion for your location, you'll need to send the waypoints.

Tap the send/export icon to bring up your options (your phone may appear slightly different than as shown).

Select mail.

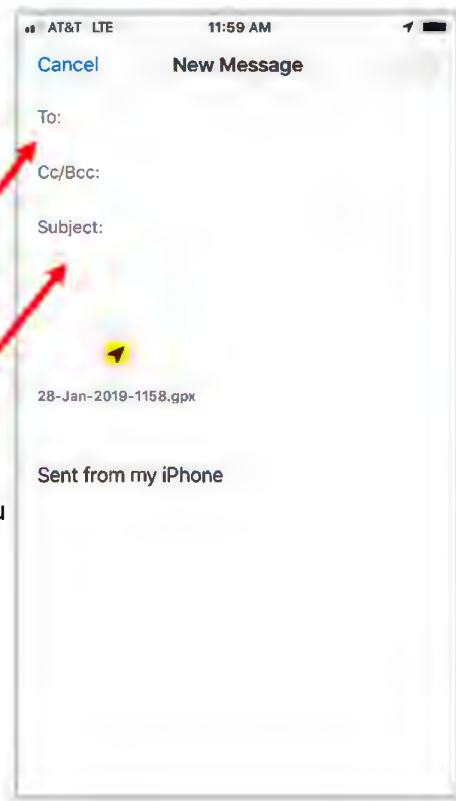


Once you've completed the mapping portion for your location, you'll need to send the waypoints.

From the map screen, tap the menu button (  $\vdots$  ) and select "Export".



# Sending Waypoints



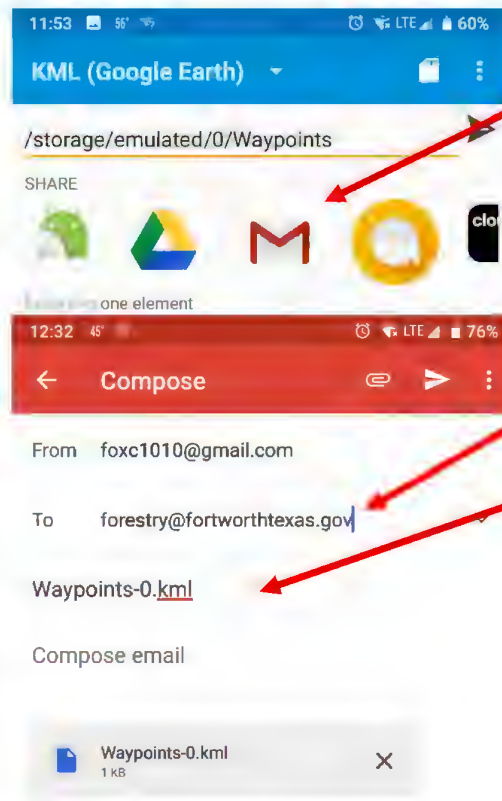
Your default email should appear with a blank message and the file already inserted.

Send the email to:  
**forestry@fortworthtexas.gov**

In the subject line, type the **location name and number**.

Enter any text in the body that you think may be helpful (none is required).

Hit send.



After selecting "Export", several options should appear. Choose your preferred email app (your phone may appear slightly different than as shown).

Your email should appear with a blank message and the file already inserted.

Send the email to:  
**forestry@fortworthtexas.gov**

In the subject line, replace the file name with the **location name and number**.

Enter any text in the body that you think may be helpful (none is required).

Hit send.

# Instructions

- Download the appropriate app for your phone
- Scan the QR code for the Google form

iPhones



Open GPX Tracker  
No ads, no in-app purchases  
★★★★☆

Androids



GPS Essentials  
mictale.com  
Contains ads

QR Code for  
Google Form



<https://forms.gle/damqSPXkRZcMjTPNA>



# Sycamore Park

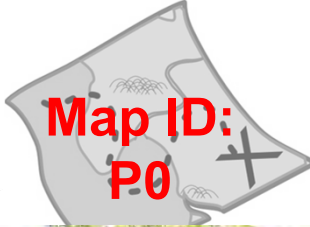
- DBH measuring rules
  - Measured at 4.5' from natural grade
  - Round to nearest ½"
  - Adjust for anomalies
  - Multi-trunk trees--full measurement of largest trunk, add half of all remaining





# Simulation

- Assessors Name(s)
- Date
- Zone
- Location ID#
- Tree #
- Species
- GPS Coordinates
- DBH
- Condition
- Visible Root Flare
- Street Tree
- Target w/in Striking Distance
- Evidence of EAB
- Comments





# Questions



FORT WORTH®

