Urban Forest Strike Team

ArcMap, ArcCatalog, ArcToolbox, ArcGIS Pro and ArcGIS Online

Setup, Processing, and Reporting

Urban Forestry South
USDA Forest Service
Southern Research Station – S&PF CF Region 8
320 Green Street
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Examples in this document are based on initial data collected by the Texas A&M Forest Service in Rockport, Texas following Hurricane Harvey (DR-4332 23Aug17) and Urban Forestry South AGOL setup for Hurricane Irma (DR-4337 04Sep17) in Florida.

Technical Support and Review for this Document

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Table of Contents

How to use this manual…

This manual outlines steps needed for the setup, processing, and reporting of Urban Forest Strike Team (UFST) data collected through *ESRI Collector* and *ArcGIS Online*. It is intended for individuals with intermediate *ArcGIS* skills, but could be used by novice *ArcGIS* users that can follow step-by-step instructions. Intermediate *ArcGIS* experience should include: *ArcMap* or *ArcGIS Pro*, *ArcCatalog*, *ArcGIS Online (AGOL)*, and *Collector.*

Users without a basic knowledge of the UFST protocol should probably read the manual in its entirety, or refer to the resources section that includes current UFST objectives, status, procedures, and data dictionary. For all others, this manual will provide chapters of varying length that address specific topics of interest (e.g. installing from USDA FS, processing, FEMA documentation, or reporting).

Some screen captures are faint when the document is printed, so it may be best used by viewing on-screen.

Survey123 is not discussed in the manual, but could be substituted for *Collector* with appropriate changes to the *AGOL* publication process and data management.

Symbols and Notations:

[RC] OR ↑↓ INDICATES A **RIGHT-CLICK** ON THE MOUSE

➔ OR ↓↑ INDICATES A **LEFT-CLICK** ON THE MOUSE

A procedure or task that progresses through successive menus. For example:

ARCTOOLBOX ➔ *DATA MANAGEMENT* ➔ *DOMAINS* ➔ *TABLE TO DOMAIN*

MEANS: OPEN **ARCTOOLBOX**, CLICK **DATA MANAGEMENT**, CLICK **DOMAINS**, AND CLICK **TABLE TO DOMAIN**

FGDB FOLDER [RC] ➔ *NEW* ➔ *FILE GEODA*tabase

MEANS: RIGHT-CLICK ON **THE FGDB FOLDER**, CLICK **NEW**, AND THEN CLICK **FILE GEODATABASE**

The formatting **BOLD, UC/LC, SMALL CAPS** (e.g. **HOME FOLDER**) will usually refer to a dialog keyword prompt, key word in *ArcGIS*, or menu selection item.

Abbreviations and Short Definitions:

AGOL	*ArcGIS Online*
ArcCatalog	*ArcGIS* resource organization and management application
ArcGIS	ESRI's desktop and online GIS components
ArcGIS Pro	ESRI's desktop GIS with integrated *AGOL* connection
ArcMap	ESRI's desktop GIS that communicates with *AGOL*
ArcToolbox	*ArcGIS* geoprocessing tools
FEMA	Federal Emergency Management Agency
FGDB	*ArcGIS* File Geodatabase
NAASF	Northeastern Area Association of State Foresters
PA	FEMA Public Assistance (Category A Debris Management)
PAPPG	FEMA Public Assistance Program and Policy Guide (April 2017)
Python	Programming language with *ArcPy* interface to *ArcGIS* components
SGSF	Southern Group of State Forester
State agency	Refers to state forestry agencies, SGSF, and NAASF
TOC	**MAP DOCUMENT** Table of Contents
UCF or U&CF	Urban and Community Forestry
UFST	Urban Forest Strike Team
USDA FS	US Department of Agriculture, Forest Service
USNG	US National Grid

A Short Introduction

Urban Forest Strike Teams (UFST) are a disaster response and recovery project initiated by the Urban & Community Forestry (U&CF) programs in USDA Forest Service Region 8 (Southeastern US) and supported by the Southern Group of State Foresters (SGSF). UFST has adopted ANSI A300 Part 9 and the International Society of Arboriculture (ISA) BMP for Tree Risk assessment, provides ISA's TRAQ training for Team Leaders, and supports an ISA designated TRAQ instructor.

UFST is developing and uses an ArcGIS Online data collection system for all deployments.

A deployment may be any of the following events sponsored or co-sponsored by the Region 8 UFST Advisory Group or participating state forestry agencies:

- intrastate or interstate deployments,
  - ✓ federally declared disaster response or recovery
  - ✓ state or local disaster response or recovery
- disaster exercises,
- training workshops

The UFST Interstate Smartdevice Network (ISDN) consists of smart devices and accessories distributed throughout the region that support the SGSF's Urban Forest Strike Team initiative and the current ArcGIS Online (*AGOL*) data collection protocol for deployments. ISDN is operated as a bring your own device (BYOD) system to ensure operational status and availability of equipment for disaster recovery deployments.

UFST's *AGOL* system was developed by the Georgia Forestry Commission at a Savannah USFT training workshop (2014) and was moved to the USDA Forest Service *AGOL* organizational account and is managed by Urban Forestry South with support from state forestry agency GIS Specialists in the region. Both Georgia Forestry Commission and Texas Forest Service have the UFST data collection installed on their agency *AGOL* organizational accounts. The SGSF *AGOL* organizational account will also be used to support UFST by mid-2018.

This document outlines the steps needed to move the USDA Forest Service implementation of UFST to other organizational accounts as states have a need and are able to support UFST deployments. It also includes suggestions and sample code and procedures for QC, data processing, and reporting.

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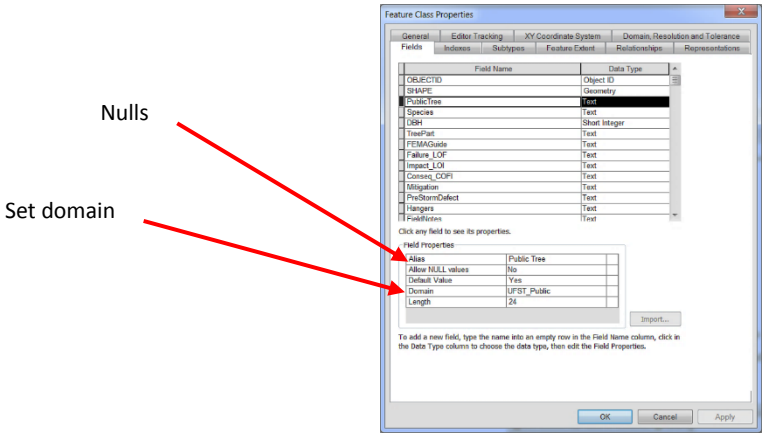
UFST File Geodatabase (FGDB) with Tables & Domains

Principal Components of the UFST System (With a little bit of detail)

- File Geodatabase *ArcCatalog*
  - ✓ Tables to support domain creation (*ArcTools* ➔ *Data Management* ➔ *Domains* ➔ *Table to Domain*)
  - ✓ Local deployment species table
    - UFST template FGDB has several species domains and tables
  - ✓ Point feature class for trees[1] (current UFST data dictionary)
    - Use domains for all attributes except DBH and Field Notes *ArcCatalog*
      - Domains become the drop-down menus in *Collector*
    - *Allow NULL values* set to No except DBH and Field Notes *ArcCatalog*
      - If DBH is set to NULL = Yes, the data form in *Collector* will be populated with a zero (0), and UFST ISDNs will have to erase it to enter the actual DBH



  - ✓ Other feature classes as needed for hosted feature publication to *AGOL* for each specific deployment
    - City boundaries
    - Parks
    - Trails
    - Points of Interest
  - ✓ **Deployment data**
    - Incremental (daily) and/or cumulative tree assessment data
- Map document(s) *ArcMap or ArcGIS Pro*
  - ✓ Use either 1 map document with 2 (or more) dataframes
    - Dataframe for **Publishing** the trees (point feature class)
    - Dataframe for **Publishing** supporting feature classes
      - Emergency Operations Center (EOC)
      - Medical Facilities (hospitals and urgent care)
      - Boundaries
      - Trails
      - Parks
      - Hotel
      - etc.
    - Activate and publish each individual dataframe

[1] This hosted feature layer is the only layer that needs to be editable.

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- Dataframe for processing data from the hosted layer
- Dataframe for processing and reporting daily "snapshots" of the *AGOL* data

✓ Or create a separate map document for trees and supporting feature classes
- Map document for the trees (only one feature class in this document)
- Map document for auxiliary feature classes (e.g. city boundary, trails, parks, etc.)
- Publish each map document (feature layer(s)) needed for *Collector*

✓ **Deployment products**
- Incremental (daily) and cumulative tree assessment maps and datasets

- Group — *ArcGIS Online (AGOL)*
- Folder (optional) — *AGOL*

✓ Other deployment products
- Exported data
- Reports and lists

- Hosted Feature Layer(s) — *AGOL*
- Web Map — *AGOL*
- Web Map App (optional) — *AGOL*
- Operations Dashboard (optional, but is a good Crew daily briefing tool) — *AGOL*
- ESRI Collector — *Smartdevices*
- Organizational User Names (1 for each data collection device) — *AGOL*

The USDA Forest Service in a national "partnership" support program has designated *AGOL* usernames on their organizational account for use with *AGOL* and ESRI *Collector*. These consist in a series of usernames for UFST Task Specialists, UFST Team Leaders, state U&CF Coordinators, and a GIS administrator. This series includes: UFST_Crew01_Partner through UFST_Crew10_Partner, UFST_GIS01_Partner (Admin), UFST_Team01_Partner, USFT_Team02_Partner, and UFST_UCF01_Partner.

In addition, there is a separate series of usernames to support the Interstate Smartdevice Network (ISDN). This series includes: UFST_ISDN01_Partner through UFST_ISDN20_Partner.

State agency *AGOL* usernames can be easily incorporated (i.e. shared within the deployment group) into the UFST *AGOL* data collection system on the USDA FS organizational account. And, UFST installed on state agency organizational accounts can easily incorporate USDA FS usernames via shared groups.

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Creating Desktop Folder and File Structure for UFST (An example)

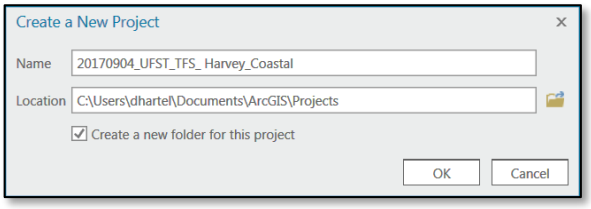
Adopt a folder and file structure to support ArcGIS Online publication and reporting of UFST data. The folder and file naming standards should support the typical UFST data collection and processing workflow:

- ArcGIS Desktop (*ArcMap* or *ArcGIS Pro*) ➔ *ArcGIS Online (AGOL)*
- ESRI *Collector* on smartdevices
- *ArcGIS Online (AGOL)* ➔ ArcGIS Desktop (*ArcMap* or *ArcGIS Pro*) - Post-processing, reporting, and archiving

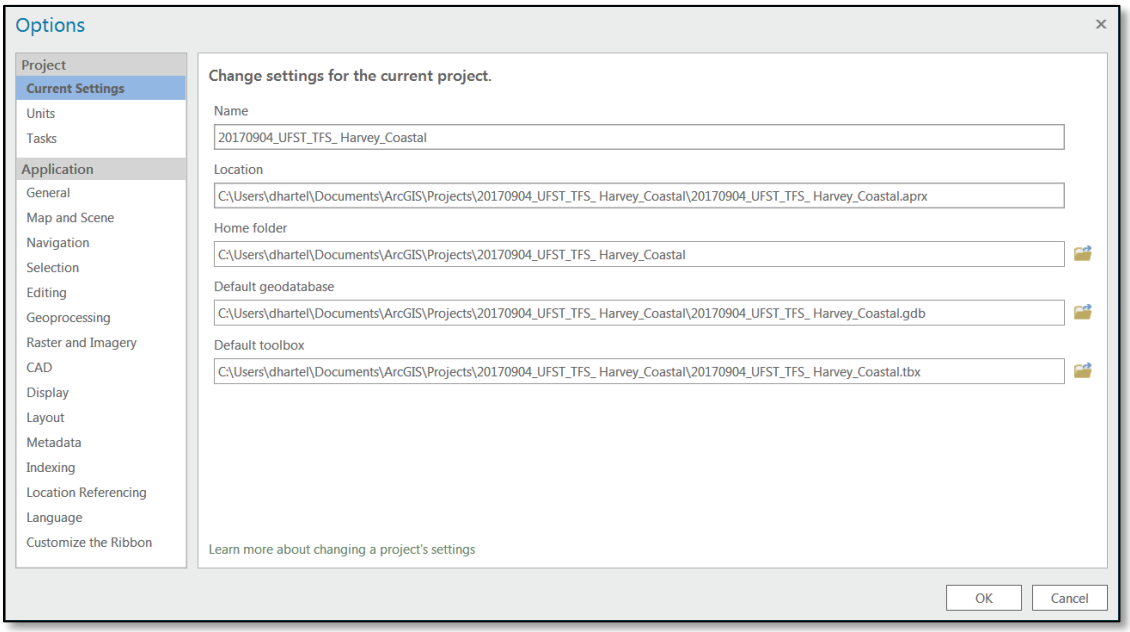
ArcGIS Pro v1.5

"The ArcGIS Pro application allows you to assemble all the resources required to complete a project in one place. A project contains maps, layouts, tasks, and connections to servers, databases, Toolboxes, folders, styles, and so on. It can also incorporate content from your organization's portal or ArcGIS Online. Projects can be created on your local file system, and shared online as a project package. Online projects can be downloaded to complete work locally on any computer." This describes the general workflow needed for UFST.

In *ArcGIS Pro*, your project will create a default set of folders at your "Location" directory level identified when creating a new project.



When the project is opened, the file and folder structure can be seen in *PROJECT* ➔ *OPTION* ➔ *CURRENT SETTINGS*.



The project, home folder, geodatabase, and Toolbox are all created based on the project name specified. Additional folders may be created as needed under the **HOME FOLDER**. *ArcGIS Pro* **TASKS** may be useful for semi-automation of processing and reporting steps that follow.

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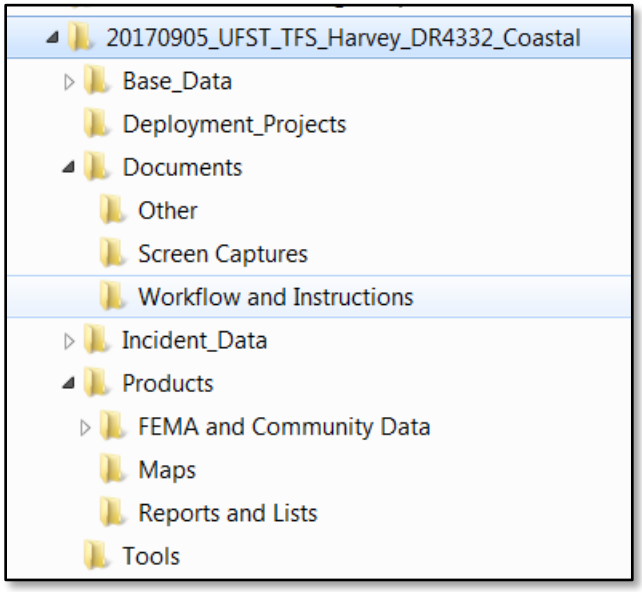
ArcMap v10.3.1

In *ArcMap* the user must create all folders, map documents, and geodatabases manually. An example similar to the *ArcGIS Pro* might look like this:

Folder for the project:	C:\Users\dhartel\Documents\GIS Projects\	
Project Home Folder:	20170904_UFST_TFS_Harvey_Coastal\	
Sub-folders[2]:	Base_Data	[Holds imagery, vector files, TPKs]
	Deployment_Projects	[Map documents]
	Documents	[Misc. project documents like the species list]
	Incident_Data	[Holds cumulative data collected and processed; FGDB]
	FGDB	*20170823_UFST_TFS_HARVEY_DR-4332[3]_COASTAL.GDB*
	Products	[Maps, reports, and exported data (FEMA documentation)]
	Tools	[Python scripts]

An example UFST folder structure created at: **C:\USERS\DHARTEL\DOCUMENTS\GIS PROJECTS**



ModelBuilder may be useful for semi-automation of processing and reporting steps that follow.

[2] Based on 2014 GSTOP Template for *ArcMap* until the *ArcGIS Pro* & *AGOL* template is available.
[3] The "DR" designation is the FEMA Federal Declaration umber for the disaster (e.g. DR-4332). Should be in FGDB Name and/or all levels of metadata (i.e. Projects (*ArcGIS Pro*), **MAP DOCUMENTS**, **Dataframes**, **FEATURE LAYERS** (all in *ArcMap*), and **FEATURE CLASSES** in *ArcCatalog*)

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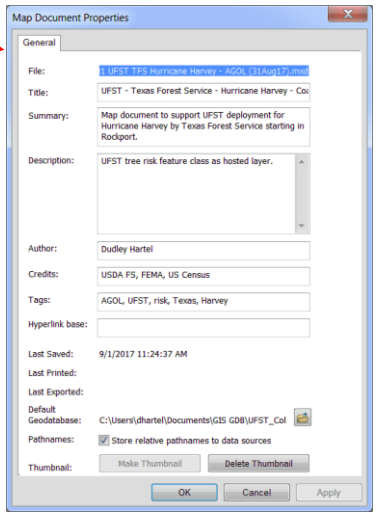
Steps for Transferring UFST from USDA FS Organizational Account

Once a folder structure has been created, proceed with building the current UFST file geodatabase from the current XML export and map document (or project in *ArcGIS Pro*).

1. Create a new FGDB for this deployment (or as an initial template) *ArcCatalog*
   a. *FGDB FOLDER [RC]* ➔ *NEW* ➔ *FILE GEODA*tabase
   b. Use a FGDB naming convention required for your organization, follow NWCG GISS standards for folder and file naming, or create a descriptive FGDB name
      i. e.g. *20170823_UFST_TFS_HURRICANE_HARVEY_DR-4332.GDB*
2. Import the UFST workspace *ArcCatalog*
   a. Provided as an XML file (20170905_UFST_COLLECTOR_TEMPLATE.xml)
   b. *FGDB NAME [RC]* ➔ *IMPORT* ➔ *XML WORKSPACE DOCUMENT*
3. Verify and set the dpesies domain
4. Create a map document *ArcMap or ArcGIS Pro*
   a. Follow all standard *AcrGIS Online* publishing standards (metadata) for you organization
      i. **MAP DOCUMENT** properties
         1. Title
         2. Summary
         3. Description
         4. Author
         5. Credits
         6. Tags
         7. ☑ Store relative pathnames
         8. After you build the map, you can come back and create a thumbnail



      ii. For all dataframes (properties)
         1. Coordinate: *WGS_1984_WEB_MERCATOR_AUXILIARY_SPHERE*
         2. Set extent
         3. Set reference scale (try 1:xx,xxx)
      iii. For all feature classes (properties)
         1. Set scale range (try 1:xx,xxx)
   b. In the "event" dataframe[4]
      i. Add the point feature class from the FGDB (trees)
      ii. Currently: *UFST_Tree_Risk_CommonName_NoNulls_NoAttach_Event* or… *UFST_Tree_Risk_CommonName_NoNulls_WithAttach_Event*
      iii. Symbolize
      iv. Add a basemap to set the extent for your deployment
      v. Remove the basemap before publishing to *AGOL*
   c. In the "base or auxiliary data" dataframe[4]
      i. Add all additional feature classes to support field data collection
5. Sign in to your *AGOL* username (*FILE* ➔ *SIGN IN*) *ArcMap*
6. Activate each dataframe (*DATAFRAME [RC]* ➔ *ACTIVATE*) *ArcMap or ArcGIS Pro*
   a. Publish the map dataframe (*FILE* ➔ *SHARE AS* ➔ *SERVICE*)
      i. **PUBLISH A SERVICE** or **OVERWRITE AN EXISTING SERVICE**
         1. Overwriting will delete all existing data on *AGOL* in that hosted feature layer!
         2. Got backups?

[4] Or separate Map Document if not using multiple dataframes in a single Map Document.

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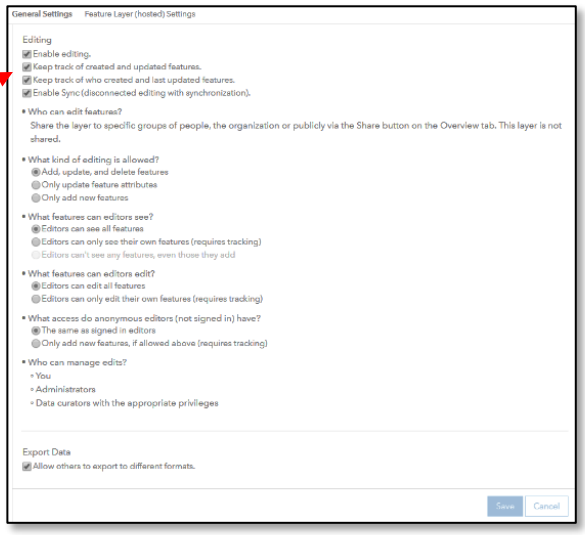
ii. Set parameters as needed
iii. Add metadata

7. Move all published feature layers to appropriate folder (if used) *AGOL*
8. In feature layer details, set parameters *AGOL*
    a. Capture creator and editor
        i. These will be the usernames at sign in on each smart device

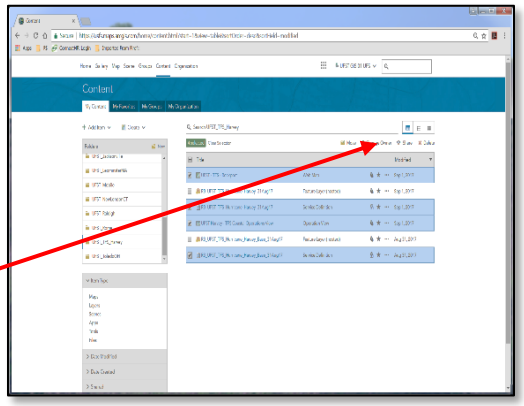
Creator and editors checked

Export data by group



    b. Probably set export by anyone in group
9. Create a Web Map *AGOL*
    a. Add the hosted feature layers needed
    b. Adjust symbols if necessary
        i. Once all *AGOL* users have entered at least 1 tree record the symbolization for the map can be set to display UFST ISDN (i.e. username) if desired – Also see item 12a, Testing
    c. Set visible range
    d. Set pop-ups and labels
10. Create Operations Dashboard(s) as needed *Desktop Operations Dashboard*
11. Create Web Map App(s) as needed *AGOL*
12. Share all maps, feature layers, web map apps, and dashboards to the group *AGOL*

Share in group content



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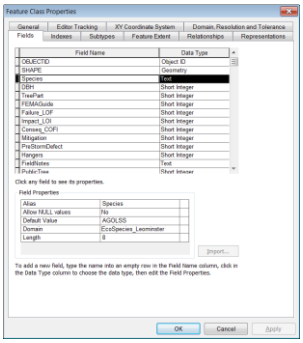
13. Open *Collector* on a smartdevice, sign in and test the data collection app *Smartdevice*
    a. If each anticipated *AGOL* username can be tested then the symbolization for the map can be set to display UFST ISDN (i.e. username); test data should be deleted at the end of the first day or once all users have collected some data

Steps for Using Excel to Create a New Species Domain

1) In Excel, create your species list with a code and description attribute
   a. Code can be short integer or text
   b. Use text (length 8) if using i-Tree Eco species codes
2) In *ArcMap*
   a. Create a **MAP DOCUMENT** for the project (or a temporary one for this step)
   b. Set the default FGDB
   c. Set coordinate system to Mercator Auxiliary (*AGOL*)
   d. Enter metadata
3) In *ArcToolbox*
   a. *Conversion Tools* ➔ *Excel* ➔ *Excel to Table*
   b. Place table into **MAP DOCUMENT**
4) In *XTools Pro*
   a. Restructure[5] the table to correct attribute data type as necessary
   b. *Table Operations* ➔ *Table Restructure*
   c. Code
      i. If using Eco species codes set to Text 8
      ii. If using integers (i.e. 0 … n) set to Short Integer
   d. Description
      i. Set to text 32 (usually more than enough for common or Latin)
5) In *ArcToolbox*
   a. *Data Management Tools* ➔ *Domains* ➔ *Table to Domain*
      i. Table must be in the map document TOC
   b. Optionally in ArcCatalog
      i. *Right-click* ➔ *Domain Manager (XTools Pro)* ➔ *Import*
6) In *ArcCatalog*
   a. UFST point *Feature Class [RC]* ➔ *Properties* ➔ *Fields*



   b. Change the species domain to your new species domain

[5] Excel conversion will set all text attributes to 255 character and all numeric to real.

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Generalized Workflow for Managing Data for Reporting

The *AGOL* system of Web Map, Web Map Apps, and Operational Dashboards provide a cursory reporting system for the UFST Team Leader(s), U&CF Coordinator, community liaison (e.g. City Arborist), local Emergency Management.

However, once field data collection starts, the GIS manager can capture "snap shots" of that data for post-processing and interim reports and datasets to support specific users and cooperators (e.g. FEMA Field Debris Representative). Post-processing for UFST includes (when using *Collector*) calculation of the risk rating from the three components (LOF, LOI, COFI), joining the species code to the table of common and Latin genus and species names, and conversion of the Mercator coordinate system to the US National Grid for FEMA documentation and other optional processing.

The general data workflow for downloading, processing, and reporting includes:

1. Open the hosted feature layer into *ArcGIS* Desktop and export a copy — *AGOL*
2. Processing — *ArcMap, Toolbox[6], Field Calculator, and Python Window[7]*
    a. Add processing attributes needed and make calculations
        i. MapID — *Field Calculator*
        ii. RiskRating — *Toolbox or Python Window*
        iii. xDD_Longitude — *Calculate Geometry*
        iv. yDD_Latitude — *Calculate Geometry*
        v. Calculate USNG — *Convert Coordinate Notation*
        vi. Area_Identifier (e.g. county, city) — *Identity*
        vii. Subarea_Identifier (e.g. park, facility) — *Identity*
3. Selection by location (community) and attributes — *ArcMap*
4. Export data (Excel or CSV)
5. Generate lists and reports

Suggested Data Processing to Support Communities

Adding Additional Feature Layer Attributes Needed for Reporting

Python code[8] like this can be used in the *ArcMap* Python window to create any new attributes needed for reporting (use "cut & paste"). **<UFST TREES>** would be replaced with the feature class name or feature layer alias like **"UFST_TREE_RISK_HARVEY_DAY01"**

```
arcpy.AddField_management("<UFST_TREES>[9]","MapID", "LONG", "", "", "", "", "", "", "")
arcpy.AddField_management("<UFST_TREES>","RiskRating", "TEXT", "", "",9, "", "", "", "")
arcpy.AddField_management("<UFST_TREES>","xDD_Longitude", "DOUBLE", "", "", "", "", "", "", "")
arcpy.AddField_management("<UFST_TREES>","yDD_Latitude", "DOUBLE", "", "", "", "", "", "", "")
arcpy.AddField_management("<UFST_TREES>","Area_Identifier", "TEXT", "", "",32, "", "", "", "")
arcpy.AddField_management("<UFST_TREES>","SubArea_Identifier", "TEXT", "", "",32, "", "", "", "")
arcpy.AddField_management("<UFST_TREES>","Street_Block", "TEXT", "", "",10, "", "", "", "")
```

[6] In development is a UFST Toolbox that accomplishes all of these processing tasks.
[7] http://pro.arcgis.com/en/pro-app/arcpy/get-started/python-window.htm
[8] Python code is case sensitive and also must follow indentation requirements.
[9] Where **<UFST_TREES>** is the feature layer in *ArcMap*.

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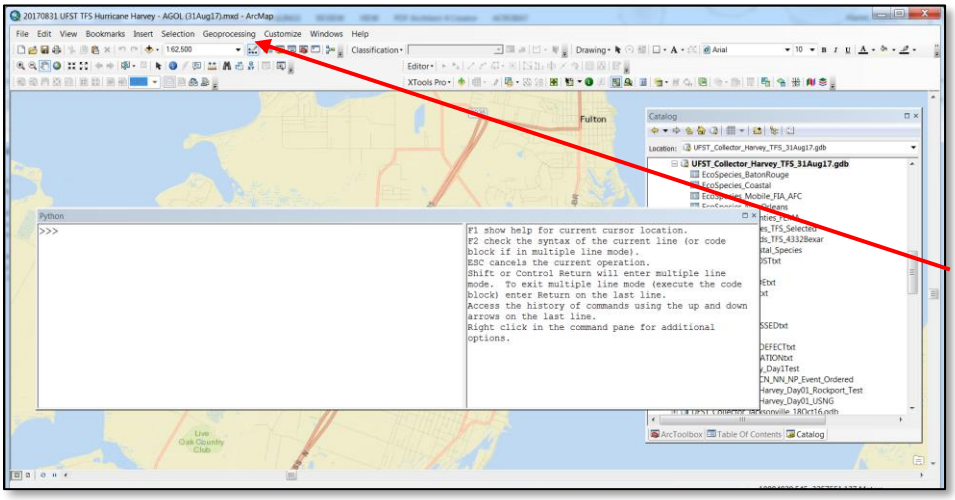
The Python Window

In *ArcMap* (and *ArcGIS Pro*) the Python window is opened with *Geoprocessing* ➔ *Python.*



Joining Species Latin and Common Names[10]

The species domain has been created with i-Tree Eco species codes Latin and common names (see species table). While screen display of the species common name is handled by the domain, when data is exported as a shapefile or is used in a report, the species code will be used. To get either Latin or common names for reporting and data export to Excel, CSV, or shapefile a **JOIN** must be made to the species table in the FGDB prior to your processing operation.

FEATURE LAYER IN TOC [RC] ➔ *JOINS AND RELATES* ➔ *JOIN*

Field:.....Species

Table:.....< Species Table Used >

Field in Table: .....SpCode (or usually some form like this)

In feature classes provided with two attributes that have similar name (e.g. SpCode and SpCodeX), use the attribute with the "X" appended to the attribute name. Merely means that some attribute type transformation was made.

[10] Performing this step **AFTER** the USNG process eliminates a conversion problem in the Change Notation process.

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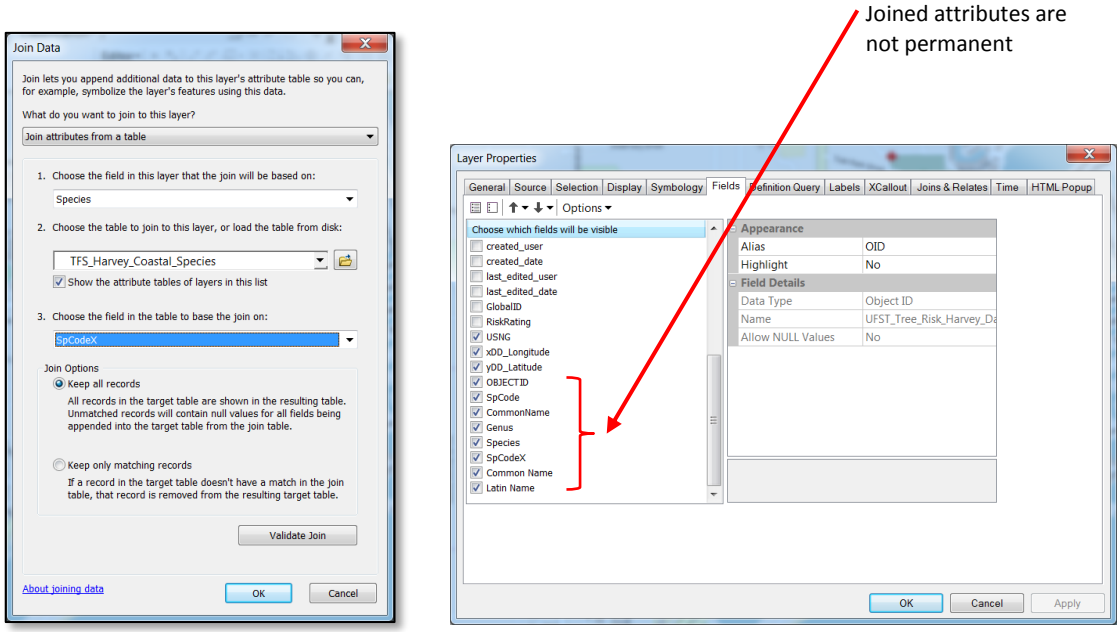

After the join, the feature layer has additional attributes from the joined table available for reporting and exporting. In this example: Genus, Common Name and Latin Name (and others) are available for processing and reporting.

To make these attributes a permanent part of the feature class, use *Feature Layer [RC]* ➔ *Data* ➔ *Export Data…* to save a new feature layer without the join.

In *ArcCatalog* you can delete attributes that are not needed from this join and export.

Set MapID

Using **Field Calculator** (or a *ArcToolbox* tool) set the **MapID** value:

MapID = 10000 + ObjectID (for example)

Python Processing for Risk Rating

The risk rating attribute is assigned with the following Python code in ***Field Calculator***[11]:

```
def ClassRisk(LOF,LOI,COFI):

  nLOF = int(LOF[0])
  nLOI = int(LOI[0])
  nCOFI = int(COFI[0])

  if (nLOF == 0 or nLOI == 0 or nCOFI == 0):
    return "Not Rated"

  M1 = nLOF * nLOI
```

[11] The file ***RiskRatingCalculationHarvey.cal*** can be loaded into Field Calculator. File ***RiskRatingCalculationHarvey.py*** is commented.

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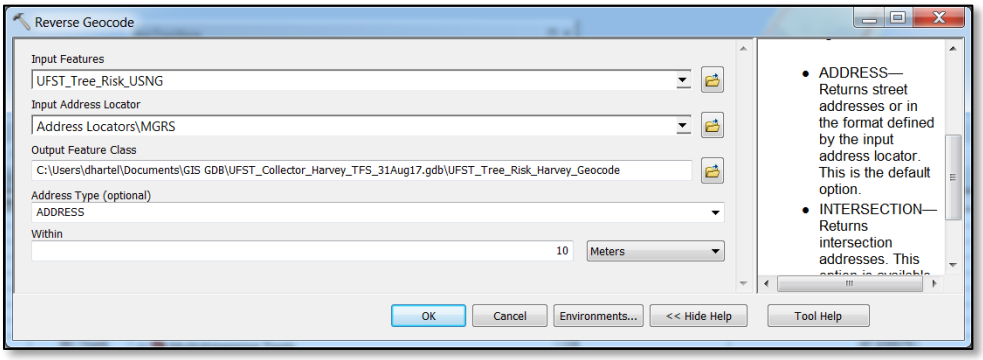
```
        if (M1 <= 6):
            M1 = 1
        elif (M1 >= 8 and M1 <=9):
            M1 = 2
        elif (M1 == 12):
            M1 = 3
        elif (M1 == 16):
            M1 = 4

        M2 = M1 * nCOFI

        if (M2 <= 4):
            return "Low"
        elif (M2 >= 6 and M2 <=8):
            return "Moderate"
        elif (M2 >= 9 and M2 <=12):
            return "High"
        elif (M2 == 16):
            return "Extreme"
```

The function call is:

ClassRisk (!Failure_LOF!, !Impact_LOI!, !Conseq_COFI!)

Geocoding Tree Locations

If tree lists will be provided by street and block, then the tree feature layer should be reverse geocoded. Use *ArcToolbox* ➔ *Geocoding Tool* ➔ *Reverse Geocode*.



This should add a street name and an address (to determine block) for producing tree lists by street and block.

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320 US. National Grid (USNG Location)

321 In the ESRI *Collector* and *ArcGIS Online* (*AGOL*) the hosted feature layer is typically set to:

322 Coordinate system: Mercator_Auxiliary_Sphere

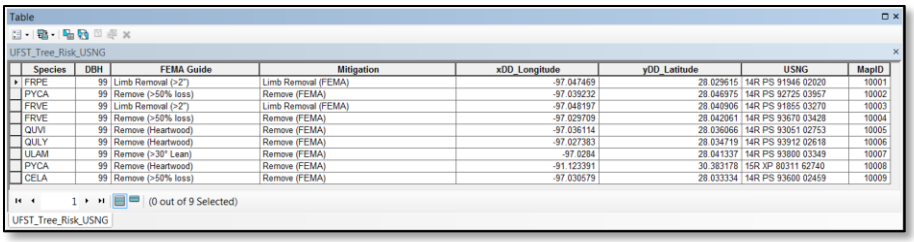
323 Datum: WGS84

324 Linear Units: Meter

325 This is set either in *ArcCatalog* in the feature class properties, or at the Map document or dataframe
326 properties dialogs. *PROPERTIES ➔ COORDINATE SYSTEM TAB ➔ PROJECTED COORDINATE SYSTEMS ➔ WORLD ➔*
327 *WGS 1984 WEB MERCATOR (AUXILIARY SPHERE)*.

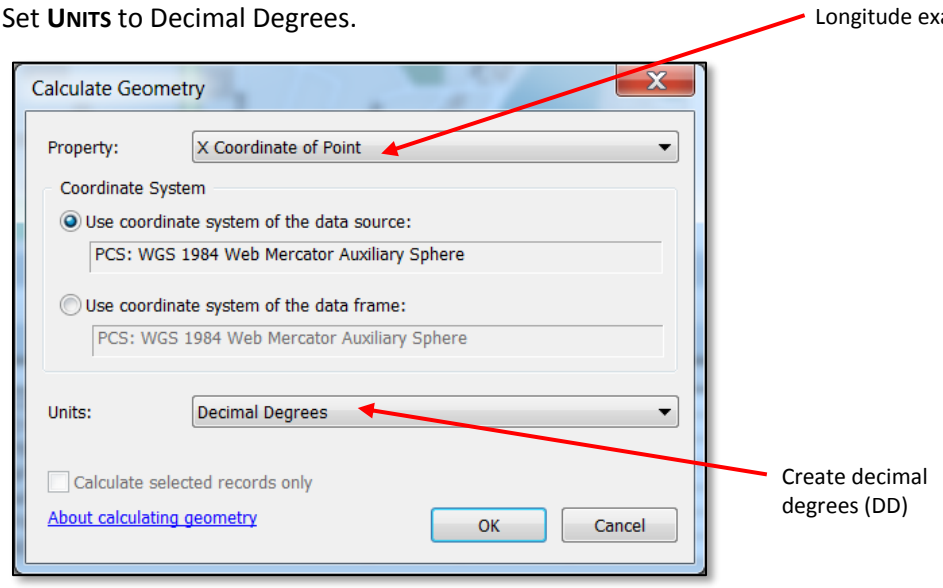
328 Start by creating an X (Longitude) and Y (Latitude) attribute in the feature class (see Python above).
329 Then calculate Mercator decimal degrees (DD) into the yDD_Latitude and xDD_Longitude fields.

330 Open the attribute table and right-click on **BOTH** XY attributes and select *CALCULATE GEOMETRY*…



331 Set **PROPERTY:** to either X coordinate Point or Y Coordinate Point.

332 Set **UNITS** to Decimal Degrees.



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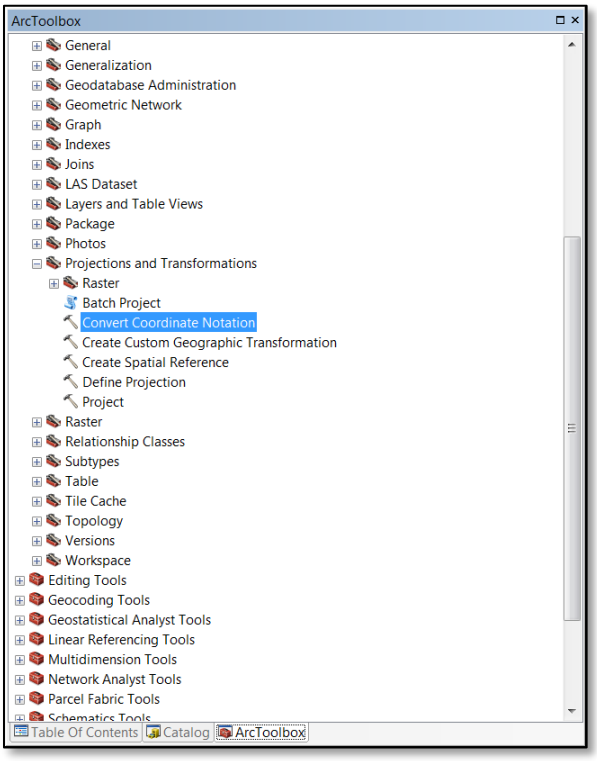
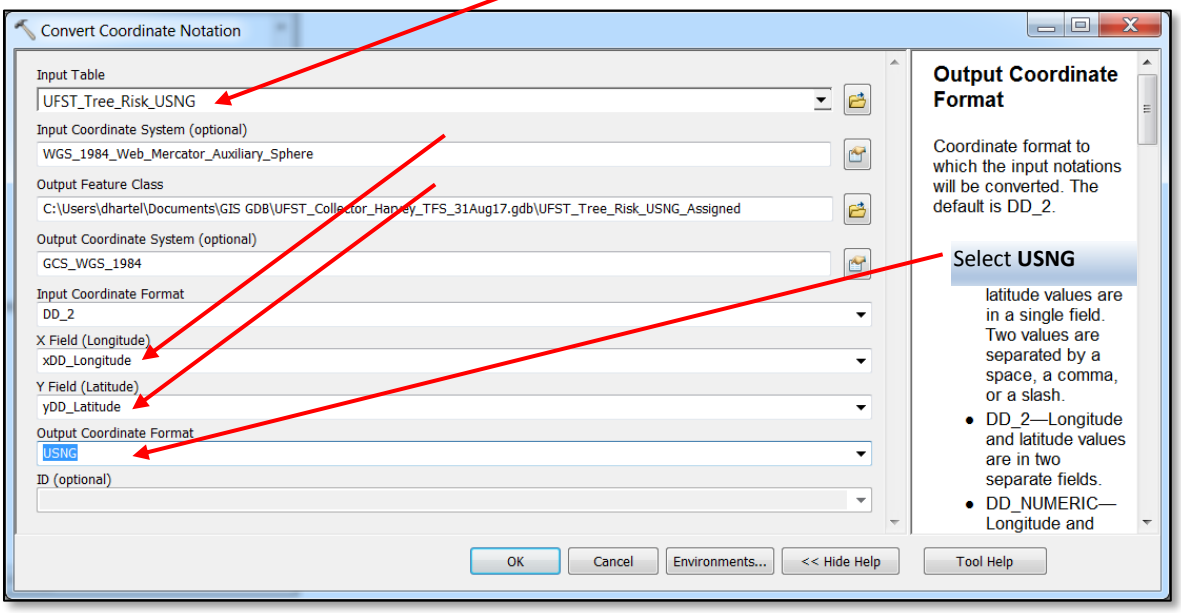
Once the DD attributes are created and calculated, the conversion to USNG uses the *ArcToolbox* ➔ *Data Management Tools* ➔ *Projections and Transformation* ➔ *Convert Coordinate Notation* tool.



Cannot be a feature layer with any joins

Convert Coordinate Notation Dialog:



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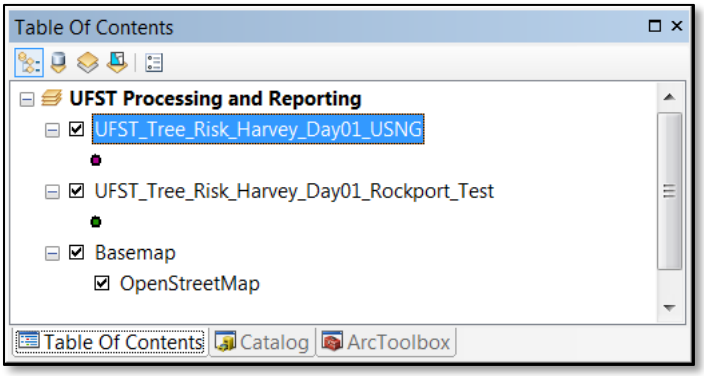
336 Creates the new feature class with USGN and adds to the **TOC**:



337 The new feature layer added to the **TOC** will have the attribute USNG (text) with the US National Grid
338 notation for FEMA.

Attribute added

Table

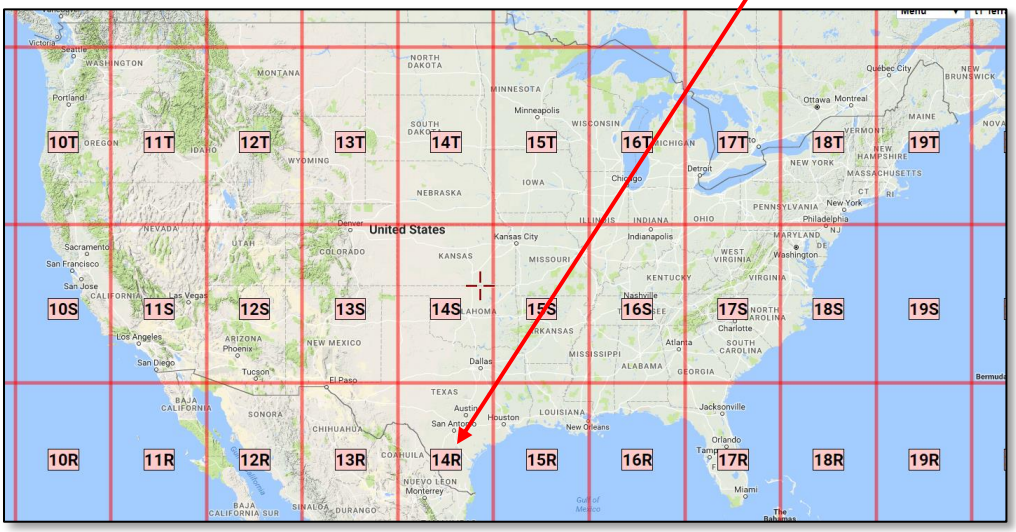
UFST_Tree_Risk_Harvey_Day01_USNG

Species	DBH	Mitigation	created_user	RiskRating	xDD_Longitude	yDD_Latitude	USNG
FRPE	99	Inspect (Non-FEMA)	ssrinivasan_tfsgis	Low	-97.047469	28.029615	14R PS 91946 02020
PYCA	99	Limb Removal (FEMA)	ssrinivasan_tfsgis	Low	-97.039232	28.046975	14R PS 92725 03957
FRVE	99	Remove (FEMA)	ssrinivasan_tfsgis	Low	-97.048197	28.040906	14R PS 91855 03270
FRVE	99	Restorative Prune (Non-FEMA)	ssrinivasan_tfsgis	Low	-97.029709	28.042061	14R PS 93670 03428
QUVI	99	Remove (FEMA)	dhartel_usfs	Low	-97.036114	28.036066	14R PS 93051 02753
QULY	99	Limb Removal (FEMA)	dhartel_usfs	Low	-97.027383	28.034719	14R PS 93912 02618
ULAM	99	Limb Removal (FEMA)	dhartel_usfs	Moderate	-97.0284	28.041337	14R PS 93800 03349
PYCA	99	Remove (FEMA)	dhartel_usfs	High	-91.123391	30.383178	15R XP 80311 62740
CELA	99	Remove (FEMA)	dhartel_usfs	Low	-97.030579	28.033334	14R PS 93600 02459

(0 out of 9 Selected)

UFST_Tree_Risk_Harvey_Day01_USNG

339 Basic US National Grid[12] for the Lower 48 States



[12] http://earth-info.nga.mil/GandG/coordsys/grids/1Sheet_USNGInstruct_v3.pdf

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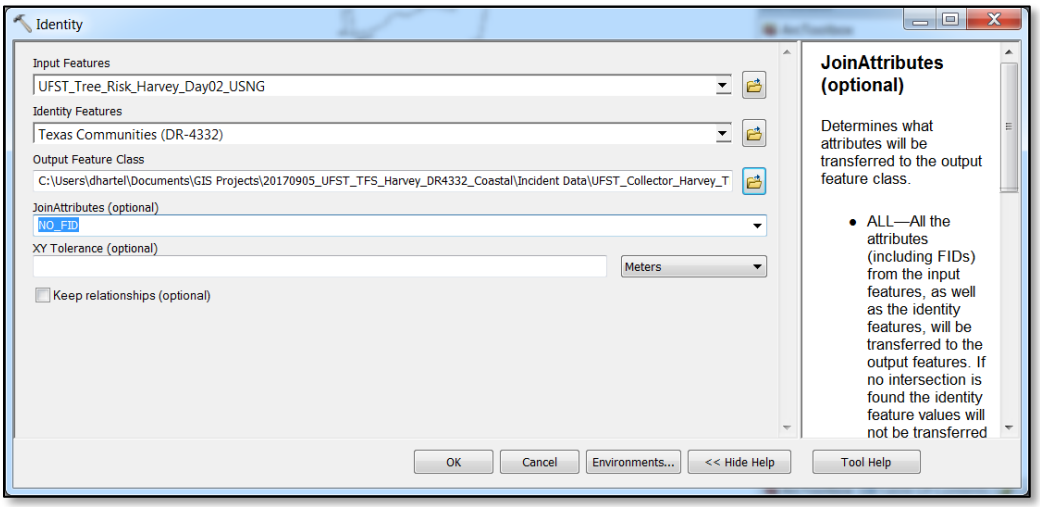
Assigning Area Names to the Tree Feature Class

When data is being collected for multiple communities into a common hosted feature layer the identity of those communities can be assigned to each tree record based on its location (latitude/longitude). This process can be repeated for multiple areas (e.g. park, city, county, and/or state) if desired.

Use *ArcToolbox* ➔ *Analysis Tools* ➔ *Overlay* ➔ *Identity*.



The identity information transferred uses the attribute names from the Identity Feature. If additional attributes were specifically added for area identification (e.g. **Area_Identifier**) then *Field Calculator* can be used to transfer those values and the Identity Feature attribute(s) can be deleted from your Output Feature Class.

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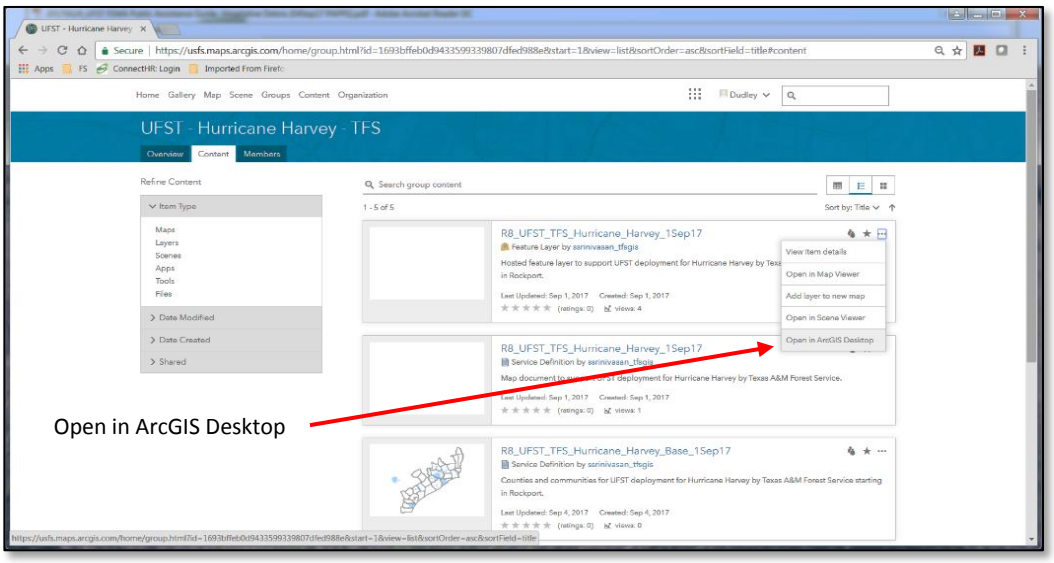
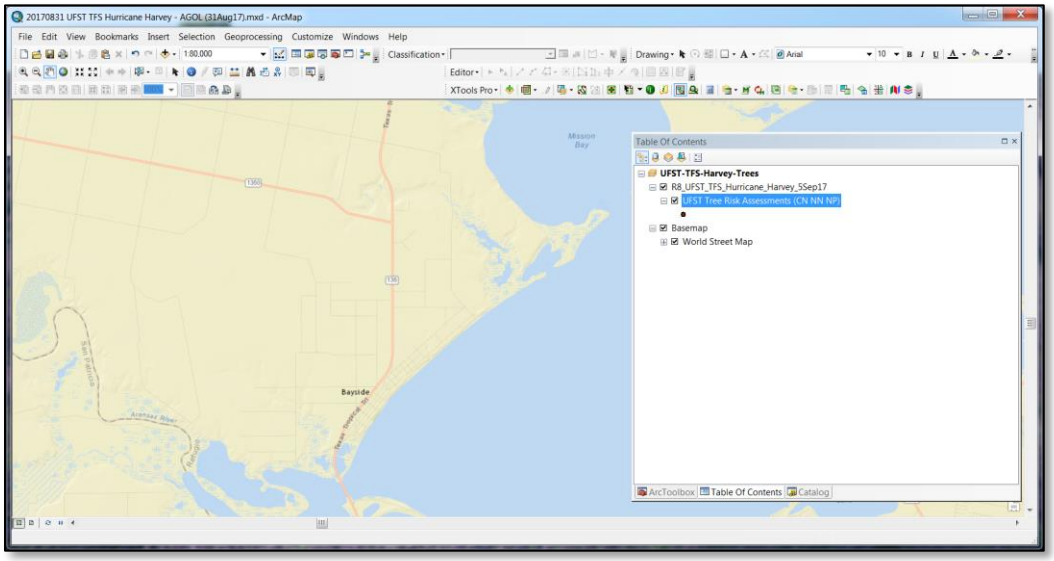
Hosted Feature Layer Processing Steps

There are two methods for opening hosted feature layer in *ArcGIS* Desktop (*ArcMap* or *ArcGIS Pro*).

1. Start an *ArcGIS Desktop* program, sign in to *AGOL,*
   and open a new or existing **MAP DOCUMENT** *ArcGIS Desktop*
   a. Add basemap (for reference, optional) *ArcMap or ArcGIS Pro*
   b. Open the hosted feature layer details screen at *AGOL* *AGOL*
   c. Select *Open in ArcGIS Desktop* *AGOL*
      i. The hosted feature layer will be added to the **ACTIVE** dataframe *ArcMap or ArcGIS Pro*
   d. Export feature layer to the project FGDB *ArcMap or ArcGIS Pro*
   e. Open attribute table for review



Added hosted feature layer to *ArcGIS Desktop* (from details in *AGOL*)



Open the attribute table to check for expected record (tree) count.

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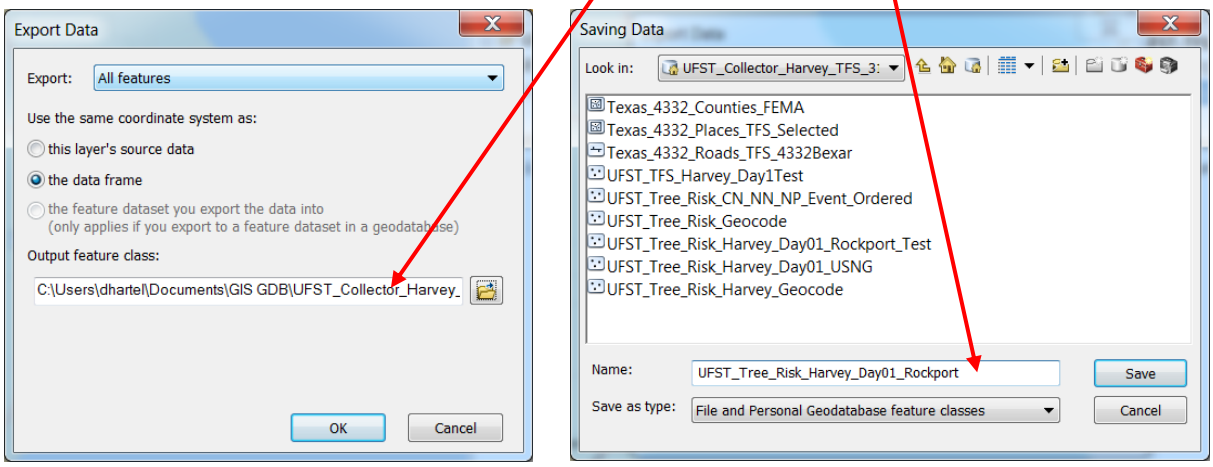
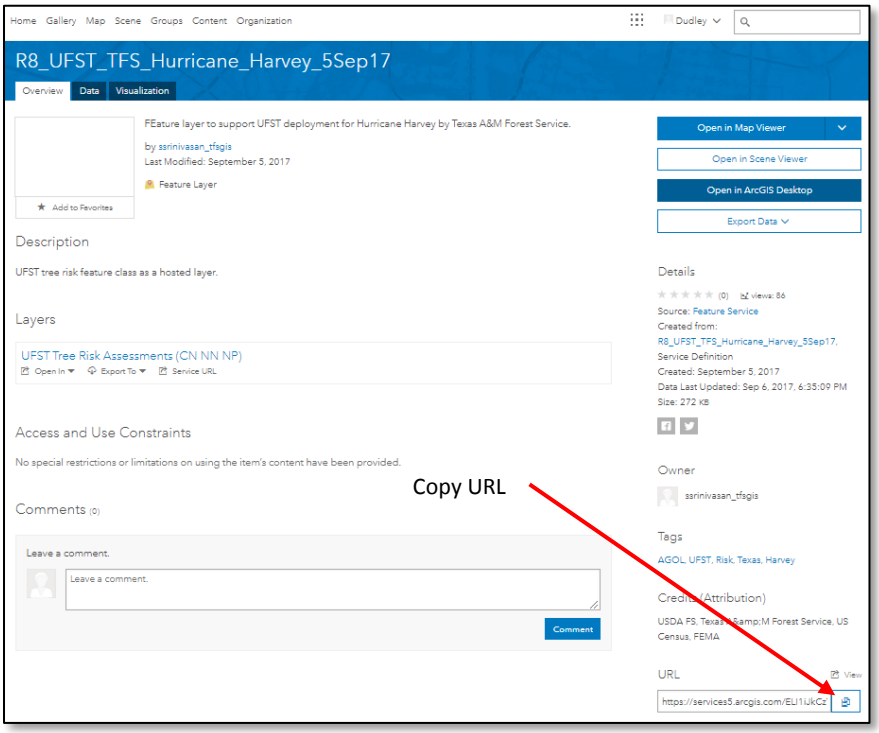
360 *FEATURE LAYER IN TOC [RC]* ➔ *DATA* ➔ *EXPORT DATA…*



Creates a desktop copy (today's "snapshot") of the linked hosted feature layer

Save it into your project file geodatabase (FGDB)

361 2. Or the URL of the hosted service can be copied for use in *ArcCatalog* (*ArcGIS Server*[13]).



362 The copied URL is used in *ArcCatalog*.

[13] Ownership and sharing level may make this method unavailable.

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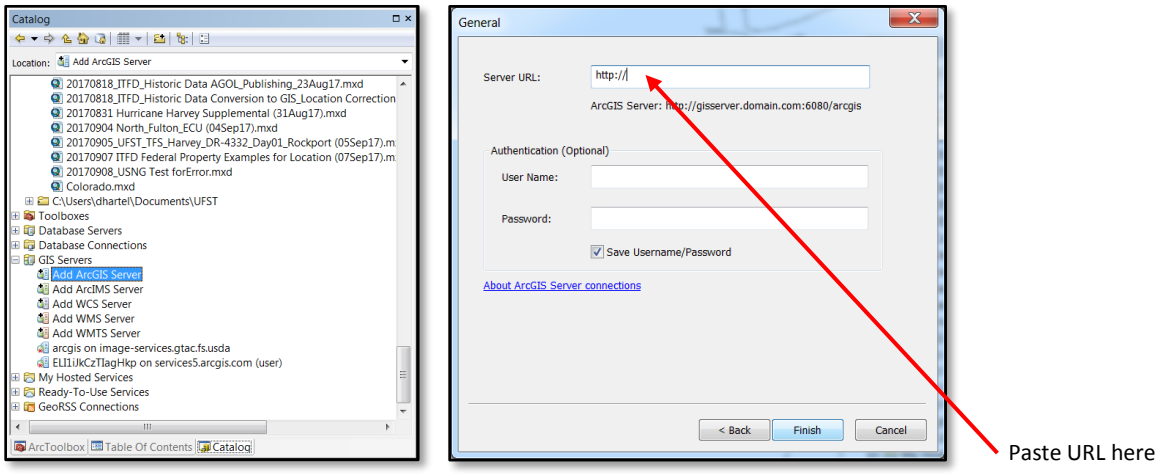
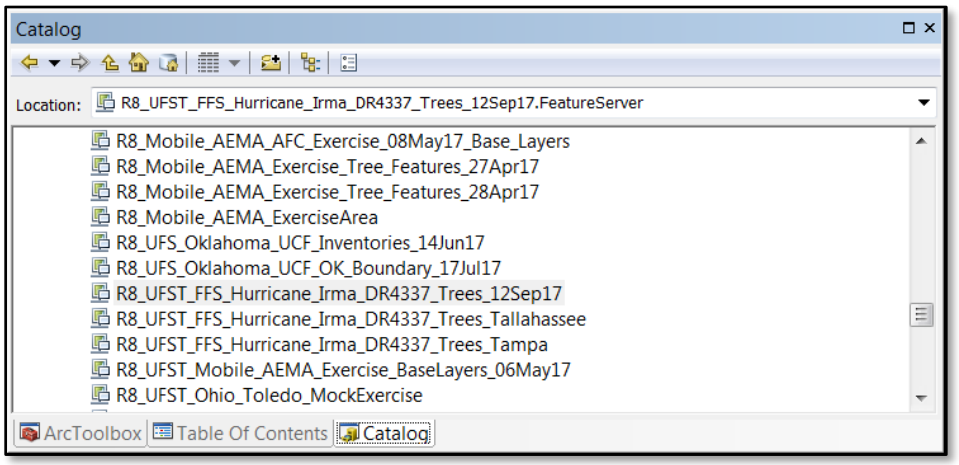
ArcCatalog ➔ *GIS Servers* ➔ *Add ArcGIS Server* ➔ *Use GIS services*



In *ArcCatalog* the *ArcGIS Server's* hosted feature layers are available. Hosted feature layers must be shared **PUBLIC** in order to show up in the *ArcGIS Server* URL link. The advantage of this method of hosted feature layer access is that it is a real-time link.



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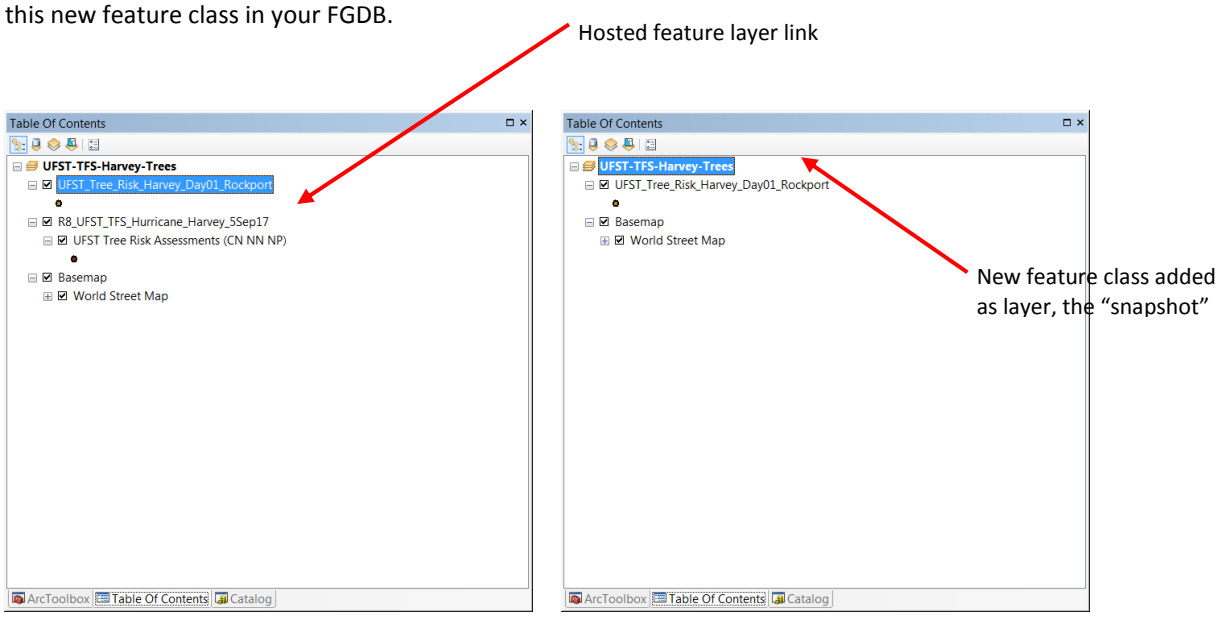
Regardless of how you link to the *AGOL* feature layer, export a "snapshot" of the cumulative data into your default FGDB. Remove the linked hosted feature layer (if you didn't use *ArcGIS Server* method) to leave only copies of the data in your desktop *ArcMap* map document. Processing and reporting will be on this new feature class in your FGDB.

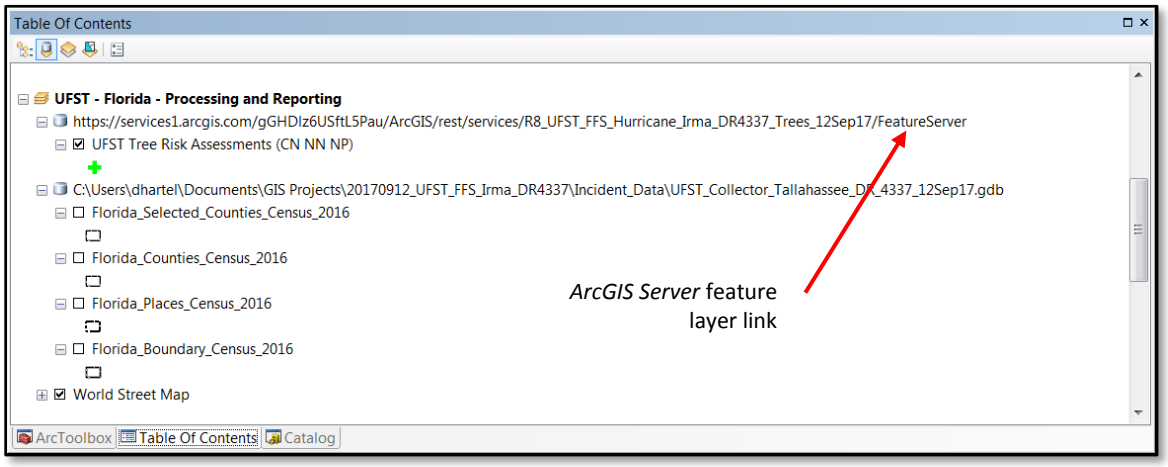


Remove the hosted service feature layer

Use the local "snapshot" for processing and reporting

These screen captures are showing the *OPEN IN ARCGIS DESKTOP* method of accessing *AGOL* hosted feature layer data.

An *ArcGIS Server* connection would look like this:



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Suggested Reporting to Communities to Support FEMA PA Application

Minimum Required Data for FEMA Public Assistance

The FEMA Public Assistance Program and Policy Guide (PAPPG) issued in April 2017 requires vegetative debris documentation for Public Assistance Category A that includes:

1.	Specifics of the immediate threat	***UFST FEMA Guide***	***UFST Mitigation***
	✓ Limb Removal (Broken >2")	*Limb removal (>2")*	*Limb Removal (FEMA)*
	✓ Tree Removal (Broken Canopy)	*Remove (>50% Loss)*	*Remove (FEMA)*
	✓ Tree Removal (Trunk Split)	*Remove (Heartwood)*	*Remove (FEMA)*
	✓ Tree Removal (>30° Lean)	*Remove (>30° Lean)*	*Remove (FEMA)*
	✓ Stump Removal	*Stump (Uprooted)*	*Stump (FEMA)*
	✓ Stump Flushcut	*Stump (Not Attached)*	*Stump (FEMA)*
2.	Diameter (at 4.5' for trees, 2' for stumps)		*UFST DBH*
3.	US. National Grid (USNG Location)		*UFST latitude/longitude in DD converted*

That's it! Just 3 pieces of information to document tree, limb, and stump removals. Plus photos.

Typically, to assist the community with the FEMA documentation, we also include:

- Unique Map ID — *Feature Class ObjectID*
- Species (as common name or species code) — *UFST Species*

When all data has been collected for a community, a paper (PDF) report that matches an export of the data collected might look like this:

Tree Removals[14]				
MapID	**Species**	**Diameter**	**Threat**[15]	**USNG**

Tree Removals (Leaning) with Attached Roots ≥50% Exposed as a Cost Unit				
MapID	**Species**	**Diameter**	**Threat**	**USNG**

Limb Removals				
MapID	**Species**	**Diameter**	**Threat**	**USNG**

Stump Removal and Fill (Uprooted ≥50%)				
MapID	**Species**	**Diameter**	**Threat**	**USNG**

Stump Flush Cut (Uprooted <50%)				
MapID	**Species**	**Diameter**	**Threat**	**USNG**

[14] Table header title reflects the UFST **MITIGATION** attribute.
[15] Threat is the USFT **FEMA GUIDE**.

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The Excel spreadsheet or CSV file provided would have the same attributes. FEMA doesn't need a map showing MapID's but that could be provided to the community.

Do NOT provide the following attributes to FEMA:

- Public Tree (the issue of public vs. private is imbedded into the FEMA guidelines)
- Tree Part
- Failure (LOF)
- Impact (LOI)
- Consequences (COFI)
- Residual Defect (or PreStorm Defect)
- Hangers (unless FEMA limb removal payment is based on number of limbs)
- Field Notes

Corrections to Domain Descriptions (Special Characters)

Special characters used in the **DOMAIN TABLES** and **DOMAINS** like degree (°) do not transfer properly when exported in Excel spreadsheets (either **DBF** or **CSV**).

Minor editing in the *Excel* spreadsheet should be completed before [proving the data to the community for FEMA PA documentation.

Data Selection for FEMA Documentation

The general SQL-like selection criteria for the five FEMA datasets and documentation:

Tree removals

Select * FROM ***<UFST_TREES>*** WHERE Mitigation = "Remove (FEMA)"

[Or an alternative that provides additional QC]

Select * FROM ***<UFST_TREES>*** WHERE (Mitigation = "Remove (FEMA)" and (FEMAGuide = "Remove (>50% Loss)" or FEMAGuide = "Remove (Heartwood)" or FEMAGUide = "Remove (>30° Lean)"))

Tree removals with attached roots (≥50% exposed) as a single cost unit as specified in PAPPG

These are leaning trees **WITH** roots >50% exposed that are defined "*For contracted removal of a tree with a root-ball, FEMA will not reimburse two separate unit costs to remove the tree and its root-ball. PAPPG April 2017*".

Select * FROM ***<UFST_TREES>*** WHERE FEMAGuide = "Remove (>30° Lean)" and Mitigation = "Remove (FEMA)"

Limb removals

Select * FROM ***<UFST_TREES>*** WHERE Mitigation = "Limb Removal (FEMA)"

Stump Removal (≥50% Uprooted)

Select * FROM ***<UFST_TREES>*** WHERE (Mitigation = "Stump (FEMA)" and FEMAGuide = "Stump (Uprooted)")

Stump Flush Cut (<50% Uprooted)

Select * FROM ***<UFST_TREES>*** WHERE (Mitigation = "Stump (FEMA)" and FEMAGuide = "Stump (Not Attached)")

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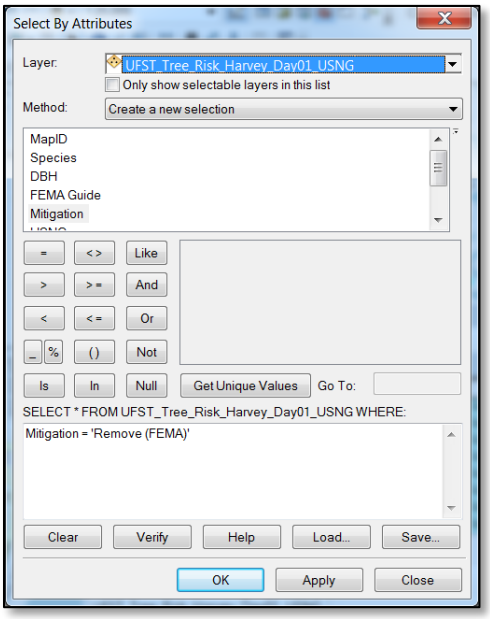
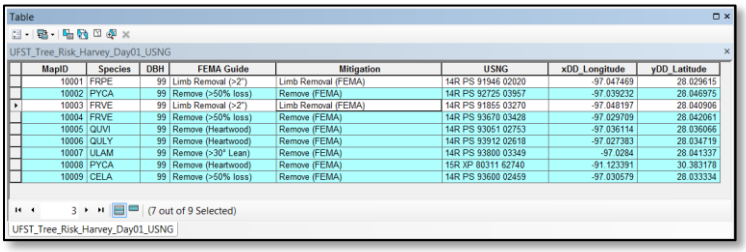
All stumps could be selected and exported to a DBF for use in Excel with this selection:

Select * FROM ***<UFST_TREES>*** WHERE (Mitigation = "Stump (FEMA)" and (FEMAGuide = "Stump (Not Attached OR FEMAGuide = "Stump (Uprooted)"

Use *SELECTION* ➔ *SELECT BY ATTRIBUTES…* or a *Toolbox* tool to select and export the data for FEMA documentation. Separate datasets may be created for tree removals and limb removals, or they can be combined.





A combined selection would use:

Select * FROM ***<UFST Trees>*** WHERE Mitigation = 'Remove (FEMA)' AND Mitigation = 'Limb Removal (FEMA)'

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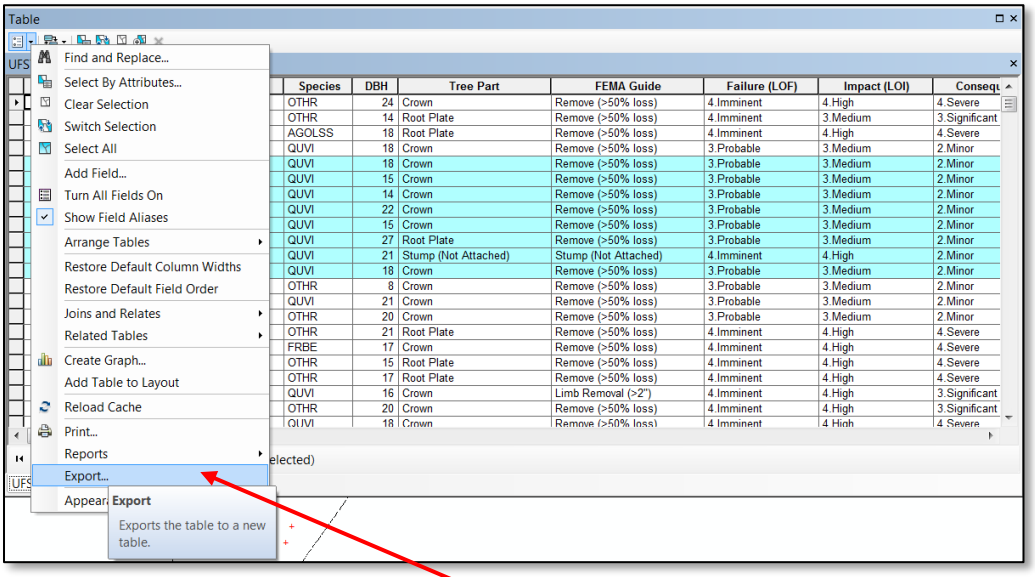
After selection, use *Attribute Table* ➔ *Export* to a DBF or text (CSV) file to assemble the needed FEMA documentation.



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Additional Community Reports and Data

ArcGIS report templates can be used with ArcMap selections.

- Map(s) with MapID's
  - ✓ Tree Removals
  - ✓ Limb Removals
  - ✓ Stumps (by type)
- Shapefile or FGDB with feature class data (pre-processed)
  - ✓ If using shapefiles provide the species table from the FGDB
- A more detailed data listing with attributes NOT included with the FEMA PDF and Excel data or CSV
  - ✓ FEMA tree removal list – With detailed FEMA Guide and prioritized by Risk Rating
  - ✓ FEMA tree limb removal (pruning) list – Prioritized by Risk Rating
  - ✓ FEMA stumps – Uprooted and Attached
  - ✓ Mitigation that differs from the FEMA Guide classification
    - These represent viable trees retained (by species and risk rating)
    - FEMAGuide[0:5] = "Remove" AND Mitigation = "Limb Removal (FEMA)"
  - ✓ FEMA mitigation (debris management) by street and block – For the community or debris contractor
  - ✓ FEMA mitigation by area – Parks, trails, etc.
  - ✓ FEMA Guide or Mitigation frequency by Genus and/or Species
  - ✓ Remaining Trees (non-FEMA Remove) with residual defect – for post-recovery management
  - ✓ Restoration Pruning (non-FEMA) – for post-recovery management

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Mitigation that Differs from the FEMA Guide Classification

These will be mitigation of "Limb Removals" that have a FEMA Guide of "Remove".

MapID	Species	Diameter	Threat	Mitigation	Risk Rating	Crew	Notes	Date

Select * FROM ***<UFST Trees>*** WHERE FEMAGuide[0:5] = "Remove" AND Mitigation = "Limb Removal (FEMA)"[16]

FEMA Guide or Mitigation Frequency by Genus or Species

Create a table that can be opened in Excel or other analysis package. Sorted in descending order of percent.

Genus/Species	Mitigation	Number	Percent	Cumulative %

ArcToolbox ➔ *Analysis Tools* ➔ *Frequency*.

Trees with Residual Defect

Trees remaining that have pre-storm or residual defect identified.

MapID	Species	Diameter	Risk Rating	Residual	Notes	Crew	Date

Select * FROM ***<UFST Trees>*** WHERE Mitigation = "Limb Removal (FEMA)" AND (PreStormDefect <> "None Selected" AND PreStormDefect <> "NA/None")

[16] Reporting SQL statements that follow have not been tested.

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Quality Assurance and Quality Control (QA/QC)

Quality Assurance (QA)

UFST training workshops, disaster exercises, and ad hoc in-state deployment for data collection using the current UFST protocol.

Domains are created at the FDGB level and then can be used by attributes in any feature classes within that FDGB. Domains provide quality control in data collection by restricting the user to a set of values (for text or numeric fields) or a range (for numeric fields). When domains are created with a list of acceptable entries (i.e. "coded values") they become the dropdown menus in *Collector*.

Drop-down menus used for all but 2 attributes in the data dictionary

- ✓ DBH is integer entry
- ✓ Field Notes is 36 character freeform entry

Quality Control (QC)

When data is saved to the *ArcGIS Desktop* (*ArcMap* or *ArcGIS Pro*)

1. Look for *AGOLSS* in the species (SpCode) attribute – indicates that the attribute was not set – this is the default
    a. If correction is not possible and the number of these is small, enter OTHR (Other)
2. Look for 0 in DBH - indicates that the attribute was not set – this is the default
    a. If correction is not possible consider setting to 6", or if you know the species then the species average in that area of the city
3. Look for "None Selected" in all other attributes which is the default
    a. Leave "as-is", or select "None/NA" if that is an option
4. FEMA Guide (FEMAGuide) of "Stump (Uprooted)" or "Stump (Not Attached)" should have Mitigation of "Stump (FEMA)"
5. FEMA Guide (FEMAGuide) of "Limb Removal (>2")" should have Mitigation of "Limb Removal (FEMA)"

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CloudVault Downloads

Supporting code and documents for UFST setup, processing and reporting.

URL: https://www.cloudvault.usda.gov/index.php/s/8WET9lEbkvRWSzw

- RiskRatingCalculationHarvey.py (includes comments)
- RiskRatingCalculationHarvey.cal
- UFST_Processing_Attributes_Added.txt
- Identity for Assigning Area Name.txt
- 20170905_UFST_COLLECTOR_TEMPLATE.XML

For .CAL, .TXT, .PY files a good programmers editor is helpful.

NOTEPAD++ is a good free application available that will make it easier to maintain Python indentation requirements.

- Syntax Highlighting and Syntax Folding
- User Defined Syntax Highlighting and Folding
- PCRE (Perl Compatible Regular Expression) Search/Replace
- GUI entirely customizable: minimalist, tab with close button, multi-line tab, vertical tab and vertical document list
- Document Map
- Auto-completion: Word completion, Function completion and Function parameters hint
- Multi-Document (Tab interface)
- Multi-View
- WYSIWYG (Printing)
- Zoom in and zoom out
- Multi-Language environment supported
- Bookmark
- Macro recording and playback
- Launch with different arguments

Developer: https://notepad-plus-plus.org/ Version 7.5.1 is current and available for 32 and 64 bit Windows.

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515 **UFST Toolbox for *ArcGIS* and *ArcGIS Pro***

516 Under development.

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Other UFST Resources

General documents that describe details of the UFST protocol, procedures, and objectives.

- UFST Overview and Status (01Jun16).pdf
- UFST When UCF Coordinators Talk to Communities (10Sep17).pdf
- UFST Tree Risk Data Uses (30Aug17).pdf
- UFST GIS Layers for Response (05Sep17).pdf
- UFST Event_UCF_City_GIS_EMAC_Events and Workflow (02Sep16 v1.02).pdf
- UFST Data Dictionary - *AGOL* with Summary (10Octt17.pdf
- A300 Risk Rating Calculation Quick Guide (31Mar17).pdf
- UFST Setting Collector GPS Averaging (28Jul17).pdf
- UFST *AGOL* Partner Quick Guide (Unabridged iOS Android - v1.06m Mobile 10Feb17).pdf

These can all be found by searching www.UFST.org or www.UrbanForestrySouth.org

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Comments About Daily vs. Cumulative Data Processing

When the hosted feature layer (see page 16) is linked (*Open in ArcGIS Desktop* from *AGOL*) to *ArcMap* usually all cumulative data collected to-date will be in the feature layer (basically the default). Once in an *ArcMap* **Map Document** and exported to the FGDB, the GIS specialist can maintain the data for processing and reporting as a cumulative feature class, or keep incremental (e.g. daily) sets of data in the FGDB for processing and reporting.

There are advantages and disadvantages to both, and all disadvantages can be overcome with some additional process steps. Maintaining a cumulative vs. incremental feature layer in your processing and reporting **Map Document** is probably one of persona preference with proper precautions.

Daily		**Cumulative**	
Advantages	**Disadvantages**	**Advantages**	**Disadvantages**
Each incremental feature layer can be edited and those edits will be easy to maintain for the final cumulative feature layer for FEMA and community reporting.	As each export is made with *Open in ArcGIS Desktop* the previously exported data will need to be deleted so that only unique records (trees) remain in the incremental (daily) feature layer created. The CreationDate attribute can be used to make those determinations.	Cumulative and final reporting can be accomplished at any time without merges (not a big advantage).	If editing had been done in any previously exported data, then that editing would have to be applied to the most recent cumulative feature layer.
Daily summaries would be slightly easier (but not much since CreationData is available).	A separate "log" of beginning and ending CreationDate(s) would have to be maintained.		Daily processing will have to replace the most recent copy of cumulative data with any previously edited data. So each cumulative "Snapshot" always has final edits.
	An additional QC step may be warranted to look for CreationDate/Creator duplications that would represent double counting.		Daily summaries would be slightly more difficult but possible as long as CreationDate is in the attribute list.
	For final reporting to FEMA or community, the incremental feature layers will have to be merged.		

Some UFST tools are being designed to make this process and decision easier.

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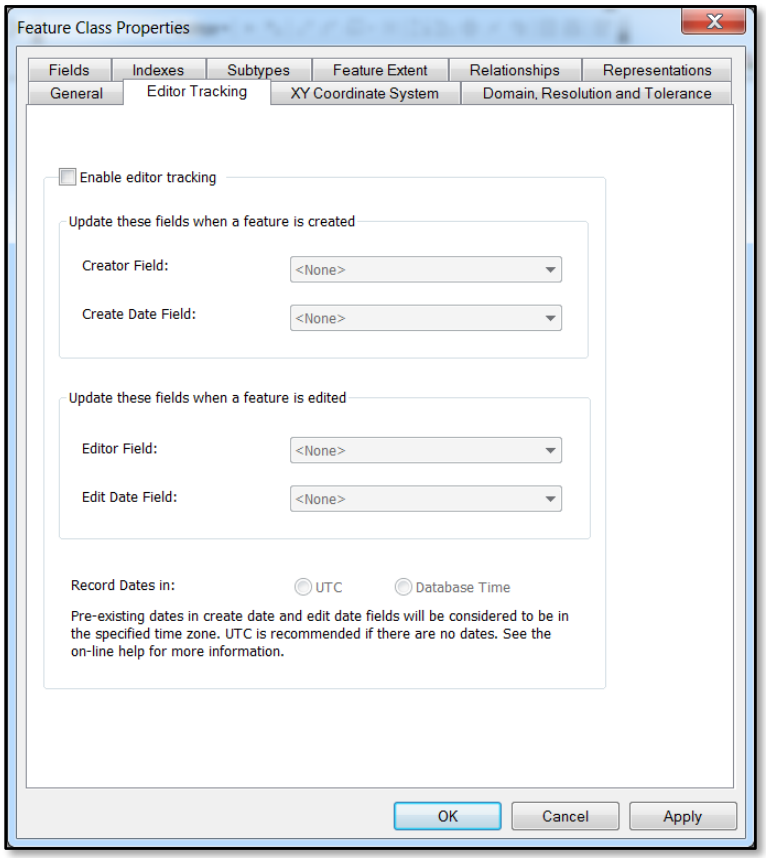
537 **Edit Tracking on Copies of Hosted Feature Layers**

538 ArcCatalog – Feature Class Properties – Consider (test) edit tracking on copies of downloaded hosted feature layers.



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