

SE FireMap Scoping Report

October 15, 2020

Executive Summary:

Tall Timbers Research, Inc. is pleased to present the October 15th Interim Report for the scoping agreement of the SE FireMap to the U.S. Endowment for Forestry and Communities and the USDA Natural Resources Conservation Service. The overall purpose of the scoping phase is to develop an improved, cohesive system to track both prescribed fire and wildfire on public and private lands. The development of a comprehensive spatially explicit map of fire occurrence remains one of the most critical needs for conservation in the Southeastern US. Knowledge of recent fire history is a key consideration for land management decisions supporting fire dependent communities. As more sophisticated models and tools for prescribed fire planning and fire risk analysis become available, the more important it is that current landscape conditions are accurately portrayed in these models. The SE FireMap will provide baseline information to ensure land management decisions are based on the most current information available. Fire occurrence on public and private lands in the SE is currently tracked by approximate location through various permitting systems or burn unit mapping that is done by some federal, state, and limited private ownerships. In the case of permitting, these systems do not record perimeter data or include assessments regarding which burns are actually completed. Relying solely on these system results in documented data gaps when estimating the size, location and effectiveness of managed fires on a regional scale. Prescribed fires and wildfires mapped by either permit data or agency burn records

miss the majority of burned areas on private lands which represent 87% of the land ownership in the Southeastern US.

Tall Timbers Research, Inc., as part of the scoping phase for the SE FireMap is addressing these needs by assessment of advanced remote sensing techniques in order to make recommendations to track both prescribed fire and wildfire on both public and private lands.

Glossary of Terms and Concepts

Broadcast Burn an open burn that is done for agricultural, silvicultural, or land clearing purposes and is not a pile

CONUS The Continental United States; this reference excludes Alaska and Hawaii.

Florida Forest Service (FFS) Agency whose mission is to protect and manage forest resources in Florida.

Fire Information for Resource Management System (FIRMS) distributes Near Real-Time (NRT) active fire data within 3 hours of satellite observation from both the Moderate Resolution Imaging Spectroradiometer (MODIS) and the Visible Infrared Imaging Radiometer Suite (VIIRS).

Fire Mapping Information System (FMIS) integrated set of applications that handle data input, processing and reporting needs for the Florida Division of Forestry (DOF).

Global Fire Emissions Database (GFED) Database combining satellite information on fire activity and vegetation productivity to estimate gridded monthly burned area and fire emissions.

GOES-16 previously known as GOES-R, is part of the Geostationary Operational Environmental Satellite (GOES) system operated by the U.S. National Oceanic and Atmospheric Administration and is the first spacecraft in NOAA's next-generation of geostationary satellites. The GOES-R series satellites will provide advanced imaging with increased spatial resolution and faster coverage, improving the detection of environmental phenomena.

GOES-17 (formerly **GOES-S**) is the second of the current generation of weather satellites operated by the National Oceanic and Atmospheric Administration (NOAA). The four satellites of the series (GOES-16, -17, -T, and -U) will extend the availability of the GOES (Geostationary Operational Environmental Satellite system) until 2036

Google Earth Engine (GEE) a cloud-based platform for planetary-scale environmental data analysis

Hazard Mapping Systems (HMS) NOAA product suite that provides both fire and smoke analysis products. It is an interactive processing system that allows analysts to manually integrate data from automated fire detection algorithms using GOES and polar (Advanced Very High Resolution Radiometer (AVHRR) and Moderate Resolution Imaging Spectroradiometer (MODIS)) images. The result is a quality controlled display of the locations of fires and significant smoke plumes detected by meteorological satellites.

Interagency Fire Occurrence Reporting Modules (InFORM) provides a single, nationwide system of record for both federal and state agencies to report wildfires. InFORM will eliminate redundant data entry, improve the quality and completeness of fire data, and make it easier to access.

Interagency Fuel Treatment Decision Support System (IFTDSS) is a web-based software and data integration framework that organizes fire and fuels software applications to make fuels treatment planning and analysis more efficient. The effort was initiated by Joint Fire Science Program and the NWCG Fuels Management Committee in 2007.

Integrated Reporting of Wildland-Fire Information (IRWIN) This service is a Wildland Fire Information and Technology (WFIT) affiliated investment intended to provide an “end-to-end” fire reporting capability. IRWIN is tasked with providing data exchange capabilities between existing applications used to manage data related to wildland fire incidents.

LANDFIRE (LF) Landscape Fire and Resource Management Planning Tools, is a shared program between the wildland fire management programs of the U.S. Department of Agriculture Forest Service and U.S. Department of the Interior, providing landscape scale geo-spatial products to support cross-boundary planning, management, and operations.

LANDFIRE Disturbance products are developed to help inform updates to LANDFIRE (LF) data to reflect change on the landscape caused by management activities and natural disturbance including both vegetation and fuel.

LANDSAT The LANDSAT Program is a series of Earth-observing satellite missions jointly managed by NASA and the U.S. Geological Survey. Imagery is available since 1972 from six satellites in the LANDSAT series. These satellites have been a major component of NASA’s Earth observation program.

LANDSAT Burned Area product is designed to identify burned areas across all ecosystems (e.g. forests, shrublands, and grasslands) for Landsat 4-8 data. The Landsat Burned Area

product contains two acquisition-based raster data products that represent burn classification and burn probability. Landsat Burned Area is generated from U.S. Landsat Analysis Ready Data (ARD) Surface Reflectance and Top of Atmosphere Brightness Temperature data. The Landsat Burned Area product is processed to 30-meter spatial resolution in Albers Equal Area (AEA) projection using the World Geodetic System 1984 (WGS84) datum and gridded to a common tiling scheme.

Moderate Resolution Imaging Spectroradiometer (MODIS) is a key instrument aboard the Terra and Aqua satellites. The instruments capture data in 36 spectral bands ranging in wavelength from 0.4 μm to 14.4 μm and at varying spatial resolutions (2 bands at 250 m, 5 bands at 500 m and 29 bands at 1 km). Together the instruments image the entire Earth every 1 to 2 days. They are designed to provide measurements in large-scale global dynamics including changes in Earth's cloud cover, radiation budget and processes occurring in the oceans, on land, and in the lower atmosphere.

MODIS Burned Area Product contains burning and quality information on a per-pixel basis. Produced from both the Terra and Aqua MODIS-derived daily surface reflectance inputs, the algorithm analyzes the daily surface reflectance dynamics to locate rapid changes, and uses that information to detect the approximate date of burning, mapping the spatial extent of recent fires only. It provides varied quality assessment information and a single summary quality assessment score for each pixel. The algorithm improves on previous methods by using a BRDF model-based change detection approach to handle angular variations in the data and uses a statistical measure to identify change probability from a previously observed state.

Monitoring Trends in Burn Severity (MTBS) is an interagency program whose goal is to consistently map the burn severity and extent of large fires across all lands of the United States from 1984 to present. This includes all fires 1,000 acres or greater in the western United States and 500 acres or greater in the eastern United States. The extent of coverage includes the continental U.S., Alaska, Hawaii and Puerto Rico.

NatureServe Prescribed Fire Geodatabase developed in partnership with South Atlantic Landscape Conservation cooperative this database contains contributions from over 12 managing agencies totaling more than 1600 records with standard attribute fields.

Risk Management Assistance (RMS) Dashboard a series of links to products to help line officers, agency administrators, fire managers, incident management teams, area commands, geographic area coordination centers, and multi-agency coordination groups make more risk-informed decisions.

Sentinel-2 the Copernicus Sentinel-2 mission comprises a constellation of two polar-orbiting satellites placed in the same sun-synchronous orbit, phased at 180° to each other. It aims at monitoring variability in land surface conditions, and its wide swath width (290 km) and high revisit time (10 days at the equator with one satellite, and 5 days with 2 satellites under

cloud-free conditions which results in 2-3 days at mid-latitudes) will support monitoring of Earth's surface changes. The coverage limits are from between latitudes 56° south and 84° north.

Sentinel-3 the main objective of the Sentinel-3 mission is to measure sea surface topography, sea and land surface temperature, and ocean and land surface color with high accuracy and reliability to support ocean forecasting systems, environmental monitoring and climate monitoring. The Sentinel-3 Mission Guide provides a high-level description of the mission objectives, satellite description and ground segment. It also covers an introduction to heritage missions, thematic areas and services, orbit characteristics and coverage, instrument payloads and data products.

Sea and Land Surface Temperature Radiometer (SLSTR) is a key instrument onboard the Sentinel-3 satellites. The sensor measures in nine spectral channels and two additional bands optimized for fire monitoring. The first six spectral bands cover the visible and near-infrared (VNIR) spectrum as well as the short-wave infrared (SWIR) spectrum; VNIR for bands 1 to 3, and SWIR for bands 4 to 6.^[14] These 6 bands have a spatial resolution of 500 m (1,600 ft), while bands 7 to 9 as well as the two additional bands have a spatial resolution of 1 km (0.6 mi).

Visible Infrared Imaging Radiometer Suite (VIIRS) is an instrument onboard the Suomi National Polar-Orbiting Partnership (S-NPP) and NOAA-20 satellites. The VIIRS instrument follows the legacy of, and improves upon, the measurements made by the NOAA AVHRR and the MODIS instruments on Aqua and Terra. VIIRS observes Earth's entire surface twice each day. The VIIRS instrument collects imagery of the land, atmosphere, oceans, and cryosphere across 22 spectral bands, ranging in wavelengths from 0.41 to 12.5 microns, and at two native spatial resolutions: 375m (I-bands) and 750m (M-bands).

Wildland Fire Management Application (WFMAP) web based application that allows users an Army DOD installations to input and analyze fire data.

Background:

For over a decade, resource managers across the SE have recognized the importance of tracking and monitoring the use of prescribed fire. Many species in the SE are dependent on fire for maintenance of appropriate habitat conditions. Measurements, such as seasonality and time since last burn are important components in assessing the condition of these fire-maintained systems. For many species that are dependent on these systems, managing an appropriate fire return interval is critical. Differentiating those areas that have an appropriate fire return interval from those areas without an appropriate fire return interval would allow managers to focus resources on areas most in need of management actions, as well as serve as a means to measure and quantify the success of conservation and

restoration efforts. Cost effective and efficient management of conservation lands requires up to date detailed resource maps.

There are numerous sources for detailed landcover, species, and habitat suitability datasets for the Southeast. However, there is a critical missing component for all of these datasets - qualitative attributes regarding fire. One key qualitative attribute that has long been identified as a critical data gap pertains to prescribed fire. Addition of qualitative attributes based on fire regime characteristics, such as fire return interval, would increase the effectiveness of informing acquisition of conservation lands, supporting land and fire management, and tracking success and failure of conservation efforts. Assessment of the success of management actions will provide a valuable feedback loop to inform future management actions on conservation lands, both public and private.

Currently, a spatial database that tracks prescribed and wildfire *extents* regionally does not exist, which means that there is not a comprehensive knowledgebase about fire regimes across the SE. Managers recognized this data gap more than a decade ago. In 2006, they noted "...methods for monitoring the use of fire on public lands may be one of the greatest unmet needs in comprehensive wildlife management..." (*Monitoring Prescribed Burning on Public Lands in Florida, 2006*).

Summary:

Outline and Deliverable Update:

Response to Key Deliverables:

1. Up to 8 meetings, workshops, webinars or conference calls to convene partners and experts to discuss broadly the current data collection, technologies and/or mapping being conducted in the Southeast and elsewhere, with at least two such **events focused outside the Southeast:** Host an initial planning web-meeting with project leaders and the Technical Oversight Team. Partner with Southern Fire Exchange to conduct 2-3 online web-meetings focused on updating and expanding the assessment done by the Southeast Regional Partnership for Planning & Sustainability (SERPPAS) Good Map committee in 2018. Conduct 2 meetings in western states focused on existing and proposed fire mapping efforts. These efforts would focus on federal partners at USGS and NIFC. Additional meeting with Western partners if needed to refine assessment of national mapping effort. Conduct wrap-up workshop at location to be determined to discuss findings.

Workflow and Discussion:

4/16/2020	Initial planning web-meeting with project leads and TOT
4/23/2020	Meeting updates to TOT
4/23/2020	Interim Report #1 submitted
4/23/2020	Survey developed by TT and SFE to gain focus for future meetings
5/08/2020	TOT Meeting – Landscape Portal Intro & Scoping Review
5/28/2020	Webinar Meeting #1 (Carl Nordman, NatureServe and Andy Beavers CEMML)
6/30/2020	Webinar Meeting #2 (Todd Hawbaker, USGS/Beth Stys, FFWC and Josh Picotte, USGS)
7/15/2020	Interim Report #2 submitted
8/07/2020	Interim Report #2 Q/A presentation to TOT
10/06/2020	Webinar Meeting #3 presentation of InFORM, IFTDSS and Southern Fire Risk Assessment (Kim Ernstrom, USFS/Andrew Kirsch, NPS/Curt Stripling, SouthWRAP)
In Process:	SE FireMap Scoping Survey
In Process:	Proposed modification to scoping award

The first two webinars intent is to update and expand the assessment done by the SERPPAS Good Map committee in 2018. Monitoring Trends in Burn Severity (MTBS) was included in the second webinar due to interest expressed by TOT in discussions and survey. Mapping Fire in Florida and the FFWS Fire Map were presented as a case study in how remote sensing and burned area mapping can be used to track fire on private lands where previous mapping

has occurred. Webinar three focused on analysis and data delivery platforms that were identified by the Technical Oversight Team as important additions.

Direction Forward:

In the primary phase of the scoping process, Tall Timbers is focused on evaluating relevant fire mapping and analysis efforts as well options for managing those data through a web interface that supports queries, reports and downloads. Since the primary focus of fire mapping is on private lands where spatial fire occurrence records are lacking, remote sensing solutions will be the focus. The goal of the webinar series is to bring relevant efforts to the attention of the TOT in order to frame the larger discussion of what is required for a successful SE FireMap. Much of the analysis of individual sensors and mapping efforts will be done by analysts at Tall Timbers and presented by written report to the TOT and discussed in monthly TOT as requested.

Summary reports on all three of the webinar series have been submitted for review to the TOT. As we move into the recommendation phase of the scoping process, feedback on those applications is critical to understanding what functionality should be included in the SE FireMap end user interface.

3. **A list with moderate detail describing the existing relevant mapping efforts, data collection and/or technologies reviewed as part of this Scoping Phase, including a brief assessment of their strengths and weaknesses as it pertains to the end-user (scale, coverage, accessibility, format, interface, etc.), and a contact person for each:** We will perform a standard assessment of all evaluated mapping efforts, this will include all data aggregations and fire detection remote sensing products currently in use. Assessment will focus on existing products as well as new technology approaches including but not limited to those using AI, Google Earth Engine and cloud computing. This assessment of both existing data collection efforts as well as remote sensing efforts and delivered in Excel spreadsheet. Minimum attributes for these data sets would include data source, type, spatial

and temporal characteristics, period of record, type fire, format, accessibility and contact. In addition, our team will make a qualitative assessment of the efforts assessed.

Workflow and Discussion:

Tall Timbers has completed the assessment of the following data aggregations and fire detection remote sensing products:

Data Aggregation and Analysis Products:

- NatureServe Prescribed Fire Geodatabase
- Wildland Fire Management Application WFMAP
- Interagency Fuel Treatment Decision Support System (IFTDSS)
- Integrated Reporting of Wildland-Fire Information (IRWIN)
- Summary RxFire Permitting (various states)
- LANDFIRE Disturbance
- InFORM
- Risk Management Assistance (RMA) Dashboard
- Southern Integrated Prescribed Fire Information System (SIPFIS)

Fire Detection Products:

- Hazard Mapping Systems (HMS)
- Global Fire Emissions Database (GFED)
- Monitoring Trends in Burn Severity (MTBS)
- GOES-16
- GOES-17
- MODIS Active Fire
- MODIS Burned Area 500m
- MODIS Burned Area 250m
- VIIRS M-Band AF
- VIIRS I-Band/NOAA-20 AF

- LANDSAT BA (BA v2)
- Sentinel 2 Burned Area
- Sentinel 3A AF
- Sentinel 3B AF
- Himawari-8 AF
- Meteosat-10/11

Workflow and Discussion:

Tall Timbers provided an in-depth analysis of both Burned Area (BA) and Active Fire (AF) detection products in the July 15th interim report. The current focus is preparation of initial recommendations and processing platforms. We have developed several applications in the Google Earth Engine environment detailed in the Workflow and Discussion Section 1: Google Earth Engine Review and Application Development.

Tall Timbers has also developed an enhanced version of the Longleaf Legacy Landscape Viewer which is meant to serve as an example end user interface. This end user interface should serve to stimulate discussion on how the final SE FireMap datasets could be represented. The user guide that was developed for this report and the link to the viewer are detailed in Workflow and Discussion Section 2: Fire Mapping Viewer Example – Longleaf Legacy Web Mapping Application.

4. Clear, detailed recommendations for building a scalable SEFireMap database that depicts fire occurrences in the Southeastern U.S. at various landscape scales through a web interface that supports simple queries, reports and downloads as either Excel spreadsheets, pdf(s) or shapefile(s). Recommendations will include

how to expand the SEFireMap to help ensure seamless fire planning at larger geographies of the U.S. (especially Western states, if there is interest in doing so):

Recommendation for a SEFireMap application will be broken down into the logical components of mapping products, database structure, web interface, query and reporting and update schedule. Several mapping products may be used to create the best spatial representation of fire on both public and private lands with the goal of using standardized methods. The Technical Oversight Team should provide continuing direction with regards to query and reporting needs as it will dictate database/end user application design. Understanding these requirements will be critical in the scoping phase as existing databases are evaluated with clear criteria in mind.

Workflow and Discussion:

Recommendation will be made based on those data aggregation and analysis products examined during the scoping process. Emphasis will be given to recommendation from the TOT as to what type of query and reporting needs will be required to meet the needs of the SE FireMap. Many of the webinars and TOT presentations are focused on this end user interface as it should remain somewhat constant over time regardless of the remotely sensed fire datasets and traditional fire polygon records it may consume. It is expected that data inputs will change and improve as new technology becomes available but the database/end user application design should be designed in a manner to accommodate those changes.

As we move into the recommendation phase of the scoping process, feedback on those applications is critical to understanding what functionality should be included in the SE FireMap end user interface.

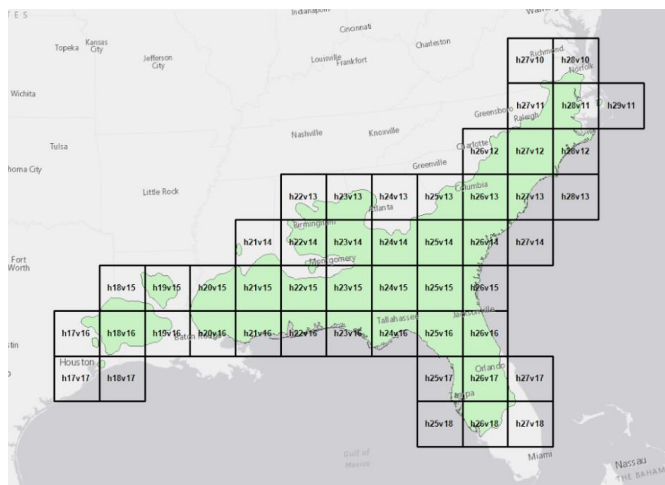
In an effort to stimulate discussion and recommendations for both the SE FireMap data products and end user interface, Tall Timbers has proposed to expand the Mapping Fires Across Florida project to the Southeast as a prototype product. That proposal has been submitted with budget as an attachment to this report.

Summary of Tasks Proposed in Scoping Modification.

Modification to Work Plan:

1. Tall Timbers will add processing infrastructure and produce fire history metrics based on Landsat Burned Area (BA) USGS products. Fire history metrics (FHM) will include Fire Frequency (FFQ), Longest Fire Free Interval (LFFI), Time Since Previous Fire (TSPF), and Year Last Burned (YLB). Processing extent will be 49 ARD tiles as shown below.

2. All products will be quality checked and packaged in both vector and raster format and include detailed metadata.
 3. Tall Timbers will prepare and conduct a product delivery workshop for NRCS and partners.
 4. Tall Timbers will provide a Google Earth Engine viewer for FHM which will serve as prototype for future SE FireMap product delivery.
 5. Tall Timbers will process 2020 FHM when burn probability data received from USGS for calendar year 2020.
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6. 2020 FHM datasets will be quality checked and packaged in both vector and raster format and include detailed metadata.



5. An approximate cost range for developing the SEFireMap as described above:
 An approximate cost range will be developed for building the SEFireMap as recommended: Understanding that there may be multiple contractors who are recommended for specific tasks, the cost estimate will be based on information provided by those contractors.

Workflow and Discussion:

Tall Timbers has produced fire history maps and metrics for the entire state of Florida 1994-2019 as well as the Long Leaf Legacy Landscape which includes portions of southern Georgia and Alabama. For the Mapping Fires across Florida, Tall Timbers provided a rewrite of the USAF Wildland Fire Database from Oracle to SQL Server to include all events, domains, queries updated for

FWC partners. For the Longleaf Legacy Landscape, Tall Timbers has produced ESRI Web Mapping Applications that allow for viewing, query and reporting of fire history metrics.

Accurate cost estimation is dependent on detailed needs assessment which we hope to gain through feedback and recommendations from NRCS and the TOT throughout the process.

Deliverables Due to Endowment:

4/23/2020 Interim Report

7/15/2020 Interim Report

10/15/2020 Interim Report

11/30/2020 Final Report

Workflow and Discussion Section 1: Google Earth Engine Review and Application Development

We investigated a novel image processing platform called Google Earth Engine (GEE) to determine if operational fire mapping techniques could be automated in a more efficient and user-friendly way. GEE is a web-based integrated development environment that combines a multi-petabyte catalog of satellite imagery and geospatial datasets with planetary-scale analysis capabilities and makes it available for researchers to detect changes, map trends, and quantify differences on the Earth's surface. By acquiring imagery and applying processing techniques in a cloud environment, users can perform entire workflows quickly and easily without having to download any data. Some proficiency in coding (i.e. JavaScript, Python) is required to use the platform. Processes to call imagery and run geospatial

analyses are executed through a command line, however ample documentation is provided (<https://developers.google.com/earth-engine>).

Google Earth Engine Application Development

Tall Timbers Geospatial Center

Sample Applications and Scripts Developed

- Landsat and Sentinel Imagery Explorers
 - Interactive Fire Frequency Viewer (derived from USGS Landsat BA v2)
 - Fire Free Interval Calculations (derived from USGS Landsat BA v2)
 - Rapid Burn Severity Mapping and Classification
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Landsat/Sentinel Imagery Explorers

- Leveraging Google's servers to access the entire time series of Landsat and Sentinel imagery through a customized web application (other imagery collections available)
- Ability to easily filter image collections to specific spatial/temporal extents
- Ability to code in pre-defined image visualization parameters based on end-user needs

Earth Engine Apps Experimental

Landsat 8 Explorer

This app allows you to filter and export images from the Landsat 8 collection.

1) Select filters

Start date

End date

Filter to map center

2) Select an image

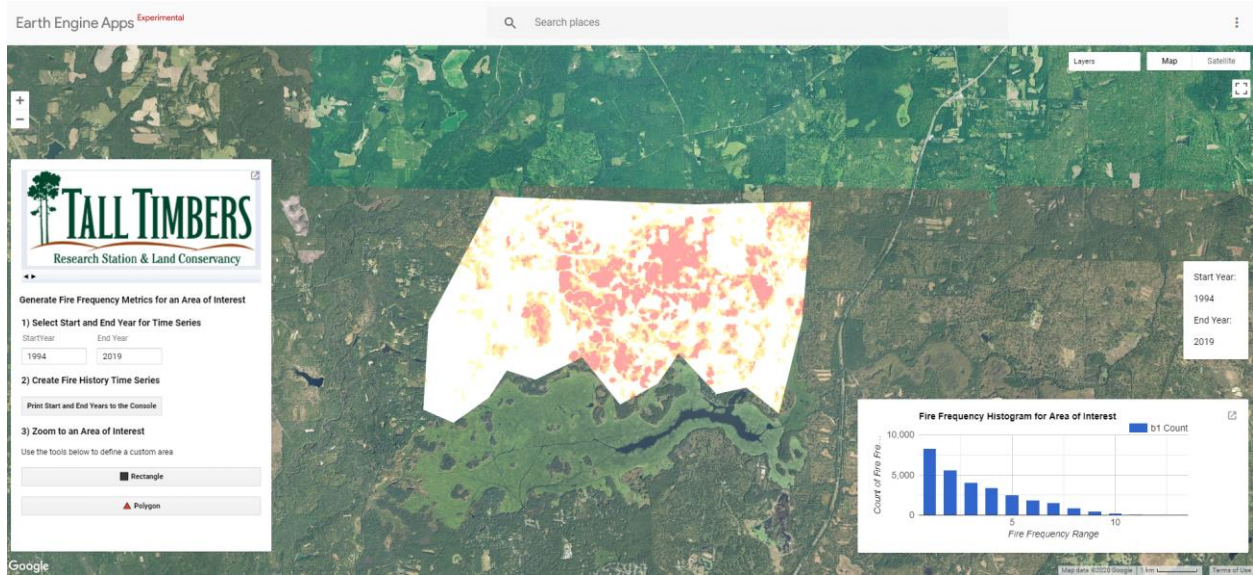
3) Select a visualization

Used in Fire Detection, Burns Scars Appear Dark Red/Brown.

4) Start an export

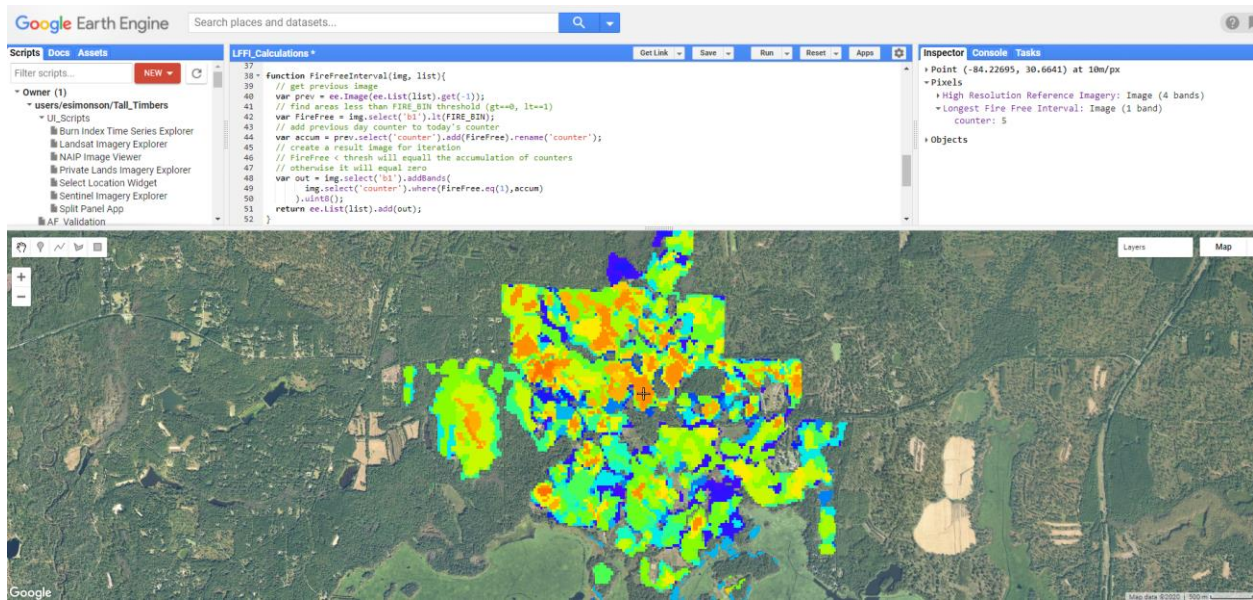
Interactive Fire Frequency Viewer

- Generate fire frequency outputs based on user-defined spatial and temporal inputs
 - Draw your own area of interest and specify a time period of interest
- Render a fire frequency map derived from the USGS Landsat BA v2 product
- Render a histogram which shows the fire frequency distribution within the area of interest
- Ability to incorporate additional fire history metrics into this type of application
 - Time Since Previous Fire, Longest Fire Free Interval, etc..



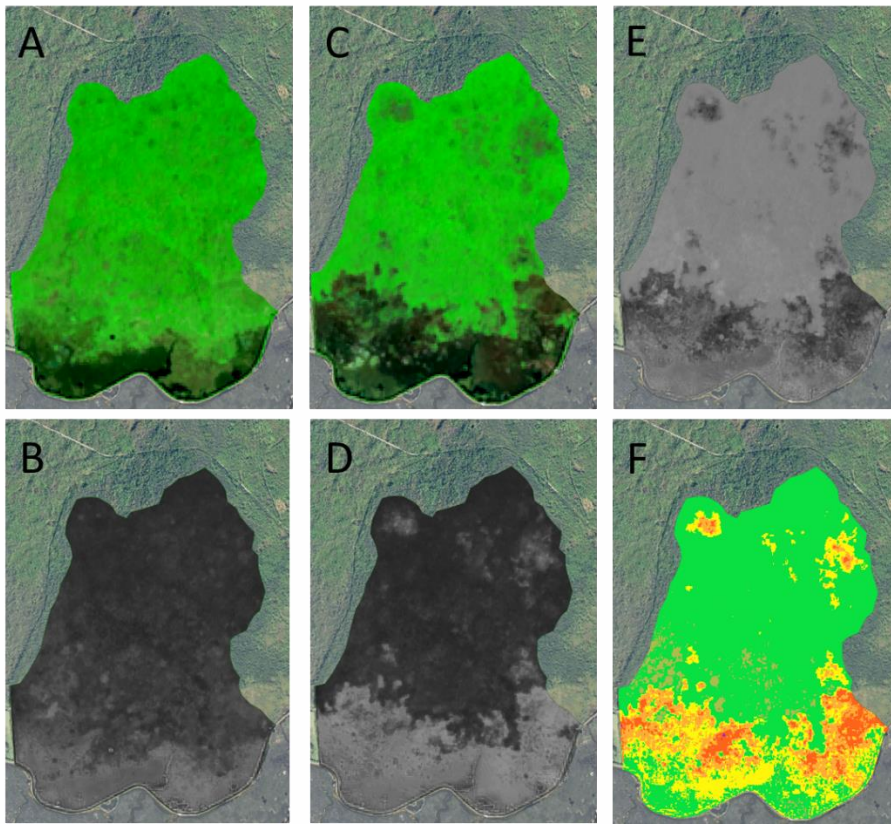
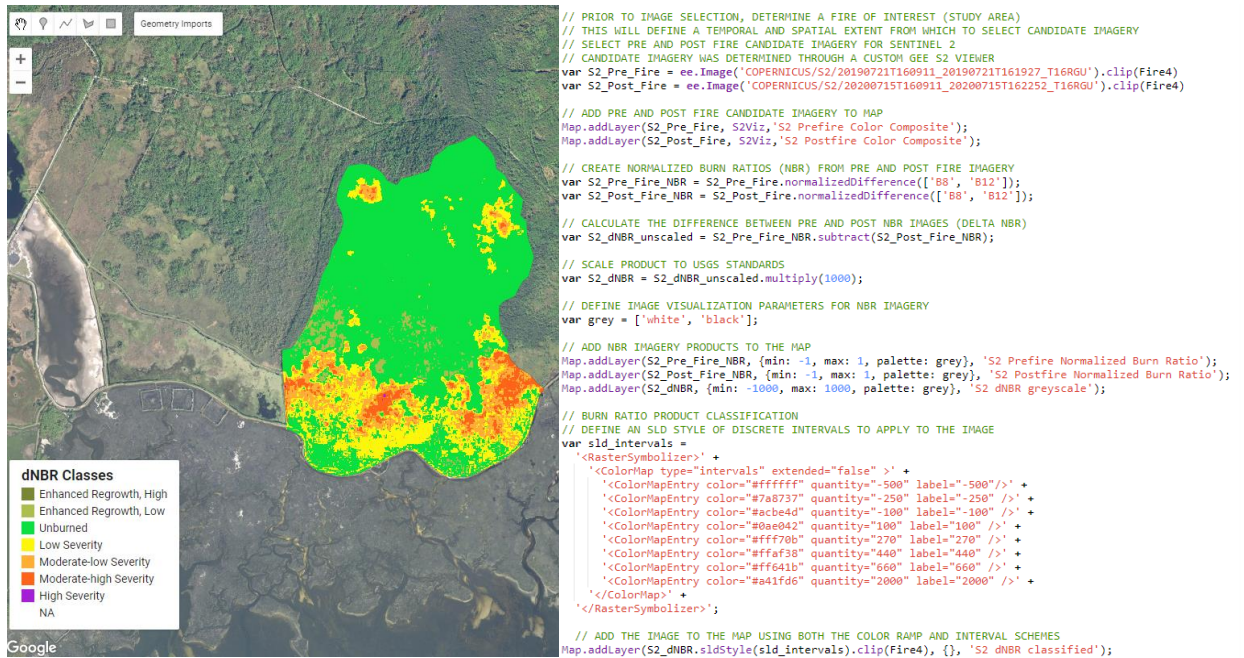
Fire Free Interval Calculations

- Stand-alone script that can be used to calculate the longest fire free interval using annual binary (burned area presence/absence) raster layers derived from USGS Landsat BA v2
- Ability to incorporate this script into interactive applications



Rapid Burn Severity Mapping and Classification

- Call in pre/post fire candidate imagery, calculate normalized burn ratio products, and apply a standardized classification scheme with just a few lines of code
- Easily replicable for other fires with varying spatial and temporal extents



A – Pre fire image
 B – Pre fire NBR
 C – Post fire image
 D – Post fire NBR
 E – delta NBR
 F – classified dNBR

Working with USGS Landsat BA v2 in GEE

- Uploaded each annual binary (burned area presence/absence) raster layer into GEE
 - Layers were pre-processed in a desktop environment

- Assigned each layer a temporal attribute (start and end date)
 - Ex. 2006: start date = 01/01/2006 and end date = 12/31/2006
- Created a custom image collection by combining all of these layers into one variable
- Can now call the image collection from my assets into any script for further processing and application development

The screenshot shows the Google Earth Engine interface. On the left, the 'Assets' panel is expanded to show a folder named 'users/esimonson' containing a sub-folder 'FireHistory'. This folder contains a list of assets from 'LLL_Fire_1994' to 'LLL_Fire_2019', plus 'LLL_Landsat_BA'. On the right, the details for the selected asset 'Image: LLL_Fire_2006' are displayed. It includes a world map with a red dot indicating the location, a large blue satellite image of the landmass, and the following metadata:

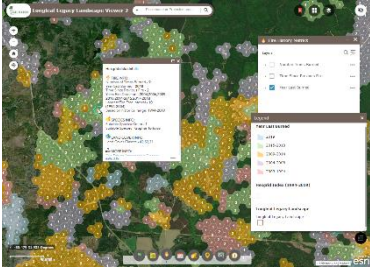
- Image ID**: `users/esimonson/FireHistory/LLL_Fire_2006`
- Date**:
 - Start date: 2006-01-01 UTC
 - End date: 2006-12-31 UTC
- File Size**: 1.64MB
- Number of Bands**: 1

Workflow and Discussion Section 2:

Fire Mapping Viewer Example – Longleaf Legacy Landscape Web Mapping Application

- The login and password is included in the user guide, please do not share these credentials beyond the TOT without letting us know. We are happy to grant access, however the viewer is currently being served from a development platform.

The Longleaf Legacy Landscape Viewer 2 (LLLV2) This map contains a fire history dataset that was derived from the USGS Burned Area (v2) Products (Hawbaker et al. 2020) and represents years between 1994-2019. Processing by Tall Timbers resulted in annual rasters and vectors indicating burn presence (with 90-100% probability) for groups of pixels greater than ~2.24 acres (e.g., 10 30m pixels, in any arrangement). For landscape utility, fire history metrics are summarized within an 10-acre hexagon in this viewer. The fire history dataset, the latest National Land Cover Database (2016) and selected species habitat data were processed to create the generalized hexagon (hexgrid) layer displayed in the map. The species data included within (Crawford, B.A., Maerz, J.C., and Moore, C.T., 2020) represent suitable habitats for five at-risk species (gopher tortoise, southern hognose snake, Florida pine snake, gopher frog and striped newt) found within the longleaf system. This map was created by Tall Timbers Research, Inc. Maps are for graphical purposes only. Tall Timbers Research, Inc. assumes no liability for any errors or omissions in the data. No warranty, expressed or implied, nor does distribution constitute such a warranty. Users of these datasets are solely responsible for interpretations made from these products.



Tall Timbers Longleaf Legacy Landscape Viewer 2 (LLLV2 v1) User Guide

Background – The Longleaf Legacy Landscape Viewer 2 (LLLV2) is a map viewer showcasing broad potential uses for the Longleaf Legacy database built by Tall Timbers as an extension of the Mapping Fires in Florida project. The map viewer provides fire history, species habitat and land cover data generalized to a 10-acre hexgrid covering the tri-state Longleaf Legacy Landscape area. The data is best used at large scales for display and query purposes. The LLLV2 includes updated fire history data and fire history metrics for years between 1994-2019. The viewer also includes additional functionality not present in the earlier LLLV map viewer.

Purpose – Provide access to fire history data and fire history metrics focused on the Longleaf Legacy Landscape for general landscape-scale planning and natural resource management tasks.

Audience - The viewer is intended for natural resources policy makers and managers; prescribed fire scientists, managers and crew members; and, natural resources outreach/education staff.

Technology – The LLLV2 is a map viewer app configured using ESRI’s ArcGIS Web AppBuilder, a component within its ArcGIS Enterprise software (v10.7.1). The map includes data hosted internally, as well as, external public map services. The app has been downloaded from the internal Portal within Enterprise and is accessible via a secured built-in Portal account on Tall Timber’s public webserver.

Requirements –

- Tall Timbers’ Longleaf Viewer Portal address: <https://ttrsmaps.org/projects/lllv2/> - password (longleaf_partner/pyrophyticSE30!)
- Supported web browser (Google Chrome, Mozilla Firefox, Microsoft Internet Explorer 11 and Microsoft Edge)

Guide Contents - This guide focuses on how to use the LLLV2. The guide is arranged in the following sections:

- [Data](#), p. 2
- [Map Viewer Interface Tour](#), p. 3-5
- [Configured Widgets](#), p. 6-
- [Resources](#), p. 11

Data

The map contains 39 layers: the generalized Hexgrid layer, 36 additional layers derived from the Hexgrid and 3 reference layers. Short layer descriptions are provided in the table below.

Hexgrid Index (1994-2019)

Longleaf Legacy Landscape 10-acre Hexgrid containing generalized fire history data, species habitat and land cover data updated from: the Florida Fire History Database for fires from 1994-2019 (burned area polygons, fire history metrics – FRQ, YLB, TSPF, LFFI); Habitat Suitability; and the National Land Cover Database (NLCD) 2016.

Fire History Metrics

Number Times Burned – layer symbolized on FRQ, using values 1, 2-4, 5-15 and 15+.

Time Since Previous Fire – layer symbolized on TSPF, using values 1, 2- 4, 5-10, 11-15 and 15+.

Year Last Burned – layer symbolized on YLB, using values 2019, 2015-2018, 2009-2014, 2004-2008, and 2003-1994.

Burn Years (1994-2019)

Individual Burn Years (1994-2019) – 26 individual layers (Burned YYYY) symbolized on BYYYY showing the hexgrid cells burned for one year in the time range. The layers are organized into a single grouped map layer.

Suitable Species (1994-2019)

Suitable Species - 5 Individual species layers (Gopher Tortoise, Southern Hognose Snake, Gopher Frog, Striped Newt and Florida Pine Snake) organized as a one grouped map layer.

Number Suitable Species – layer symbolized on SPP_COUNT, using values 1, 2, 3, 4, and 5.

Label Layers

30 layers containing labels for the fire history metrics, individual burn years and number of suitable species layers.

Reference Layers

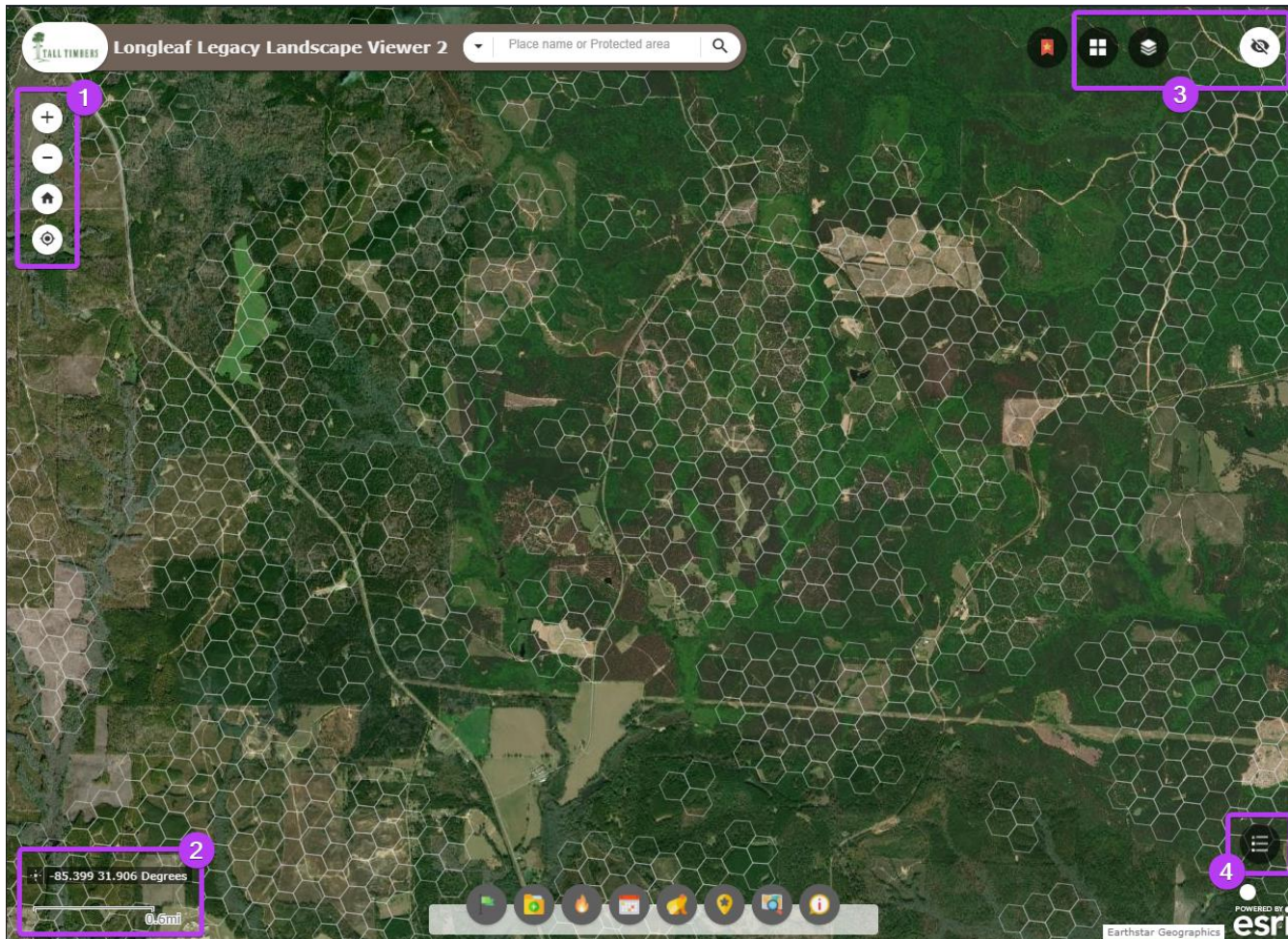
Longleaf Legacy Landscape – layer delineating the Longleaf Legacy Landscape boundary.

USGS Protected Areas Database of the United States (PAD-US) 2.0 – Feature layer for Manager Type.

NLCD 2016 – WMS map service of the National Land Cover Database (CONUS) 2016.

Map Viewer Interface Tour –

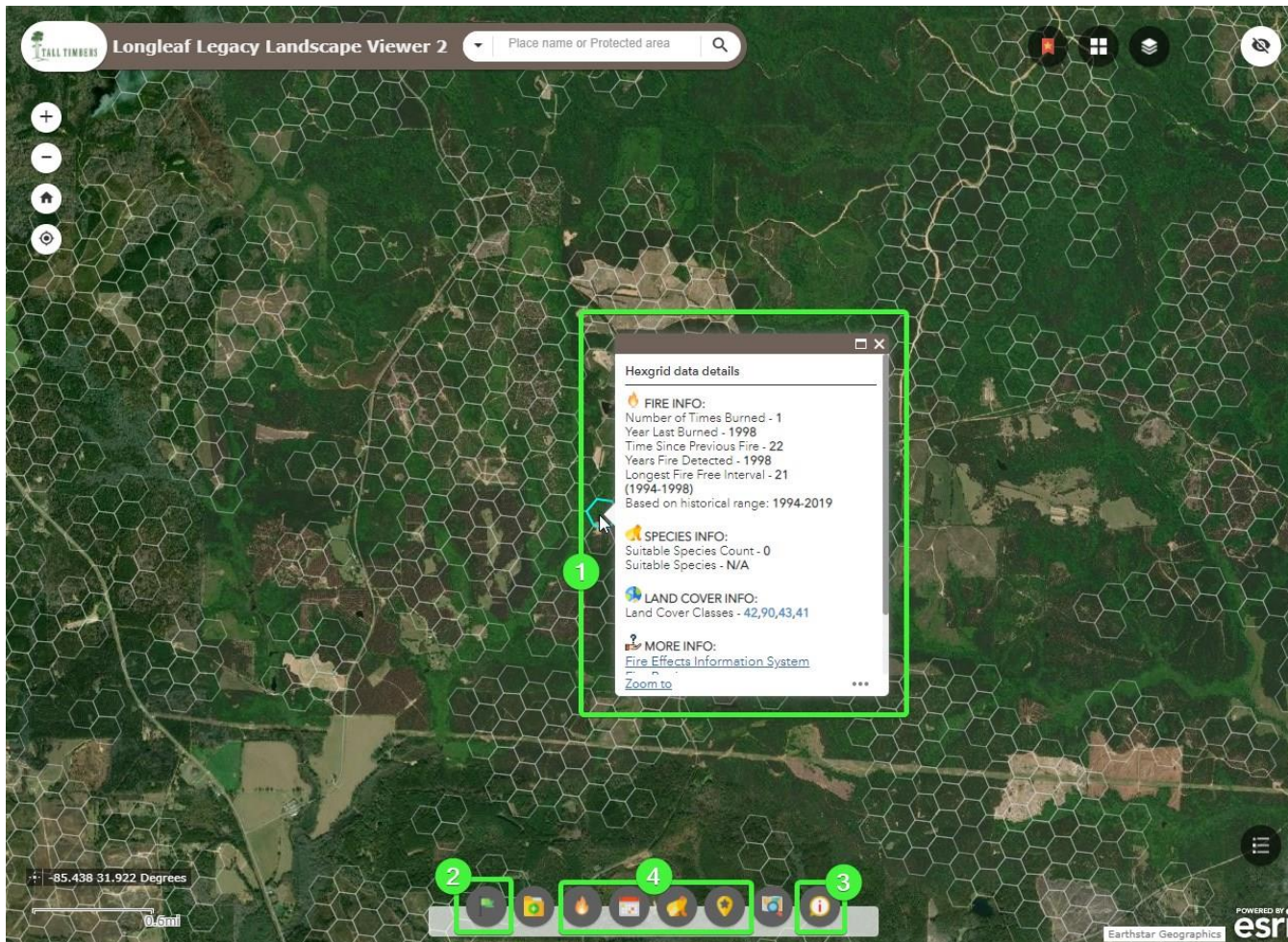
The LLLV2 consists of a map viewer accessed via a web browser, **basic viewer widgets** (tools) that allow interaction with the map, such as zoom in, layer lists, map legend, etc., and **configured widgets** that are focused on interaction with the fire history data and metrics. Brief descriptions and a screen showing the location of the widgets follow.



Basic Viewer Widgets

1. **Zoom in, Zoom out, Home Extent and my Location** – allows basic map navigation, return to initial map extent and navigate to local location.
2. **Display Mouse Coordinates and Scalebar** – show DMS via mouse move or click and display current map scale.
3. **Basemap Gallery and All Layers List** – provides option to change basemap and view all layers in the map to change visibility.
4. **Map Legend** – view symbology for currently displayed map layers.

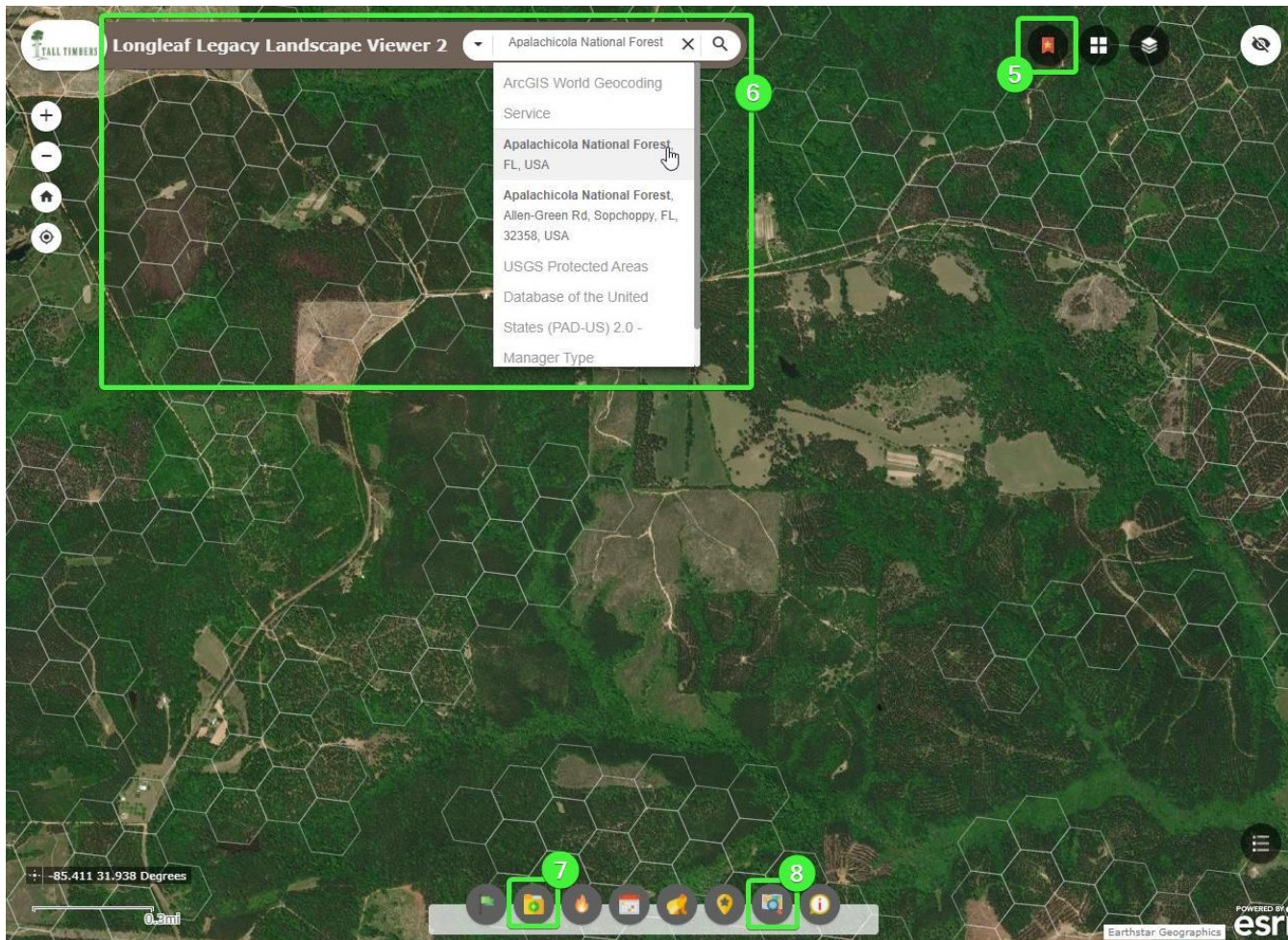
Map Viewer Interface Tour, continued.



Configured Viewer Widgets

1. **Customized Popup** – displays generalized fire history metrics, suitable species information, and NLCD land cover information for the clicked hexgrid cell. When the map viewer loads, Hexgrid layer is already visible and available for displaying popups.
2. **Quick Tips** – information panel providing viewer tips.
3. **About the Viewer** – information panel providing general viewer information and resources.
4. **Layer List Widgets (4)** organized to show specific layers by category: **Fire History Metrics; Individual Burn Years; Suitable Species; and Labels**. Details are provided on each of these Layer List Widgets in the following **Configured Viewer Widgets** section.

Map Viewer Interface Tour, continued.



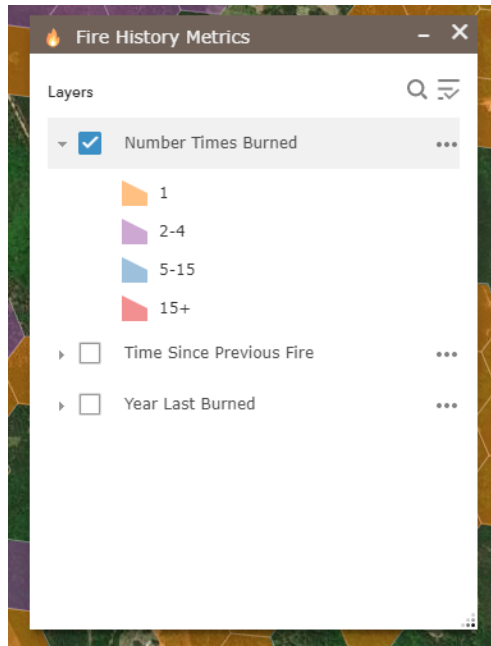
Configured Viewer Widgets, continued.

5. **Bookmarks** – ability to save a map location for later referral
6. **Customized Search** – displays generalized fire history metrics, suitable species information, and NLCD land cover information for the clicked hexgrid cell.
7. **Add Data** – allows several different formats of data to be added to the map for display and query.
8. **Queries** – allows queries against the Hexgrid layer using user-specified values from the fire history, land cover and species information.

Details on the **Customized Search**, **Add Data** and **Queries** widgets are provided in the following **Configured Viewer Widgets** section.

Configured Viewer Widgets

The configured viewer widgets within the LLLV2 provide more direct interaction with the fire history data and additional resource information contained within the map. The configured viewer widgets include four customized Layer List Widgets (4), a customized Search Bar; an Add Data widget and a Query widget. Details about the widgets follow below.



Display Fire History Metrics 🔥

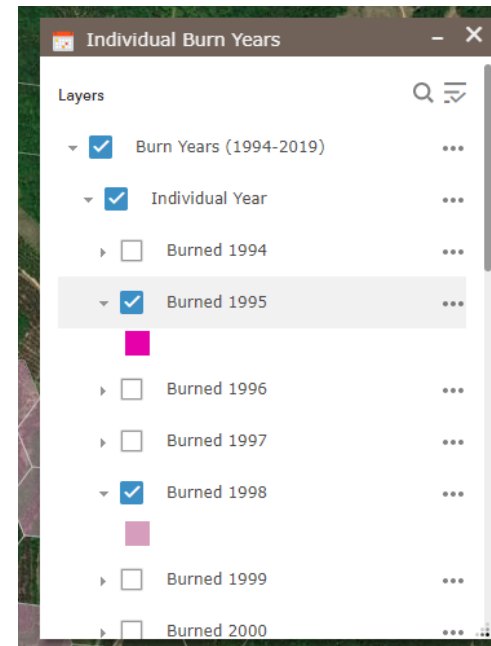


This layer list widget provides access to the three individual fire history metrics layers: Number Times Burned (FRQ); Time Since Previous Fire (TSPF) and Year Last Burned (YLB). The layer list provides options to change layer visibility, view layer legends, show item details and change visibility.

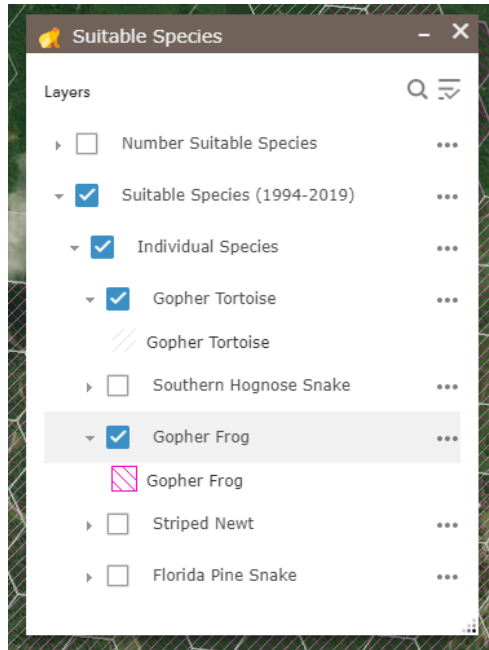
Display Individual Burn Years 📅



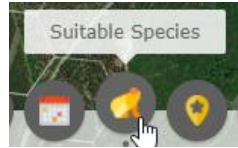
This layer list widget provides access to a grouped layer of all 26 individual burn years within the time range 1929-2019. Each individual burn year can be toggled on or off. The layer list also provides options to view layer legends, show item details and change visibility.



Configured Viewer Widgets, continued.

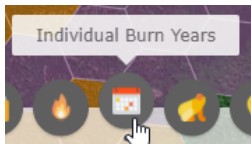


Display Suitable Species 📍

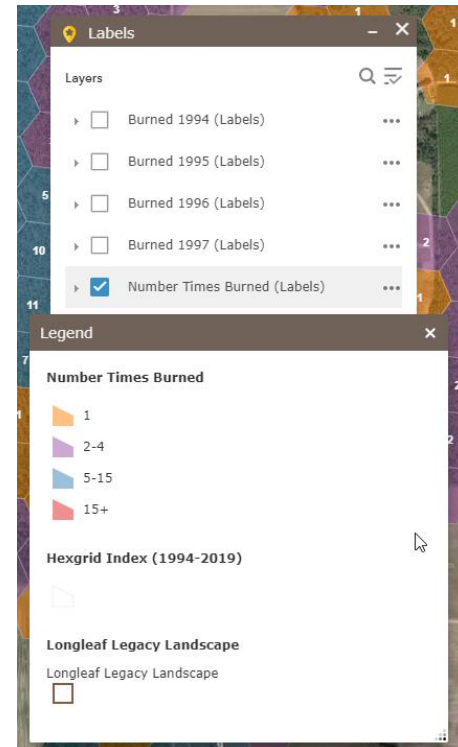


This layer list widget provides access to two layers focused on displaying suitable habitats for five at-risk species (gopher tortoise, southern hognose snake, Florida pine snake, gopher frog and striped newt) found within the longleaf system. The Number Suitable Species layer is symbolized on the individual species count and the Suitable Species (1994-2019) layer is symbolized by each of the five species.

Display Labels 📍



This layer list widget affords the ability to turn on labels for individual burn years, fire history and species layers to provide additional information. As with the other layer list widgets, options to show item details and change visibility is also available.

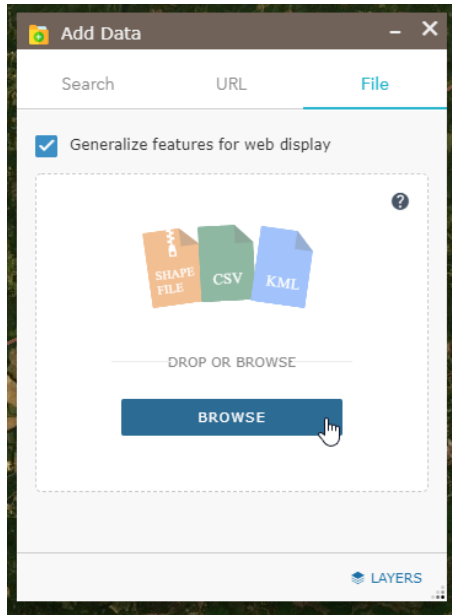


Configured Viewer Widgets, continued.

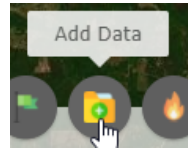
Customized Search



The Search bar at the top of the map viewer has been configured to use the Protected Areas Database of the United States (PAD-US) 2.0 Manager Type as an additional search source, besides the default ArcGIS World Geocoding Service. Typing in a protected area or a place name should return results in a drop-down menu. Clicking on one of the options in the returned list, will navigate the map to that selected location. If search results are not provided as expected for the place name or protected area, use the dropdown menu next to the Search text area to select one of the layers and then type in the name.



Add Data

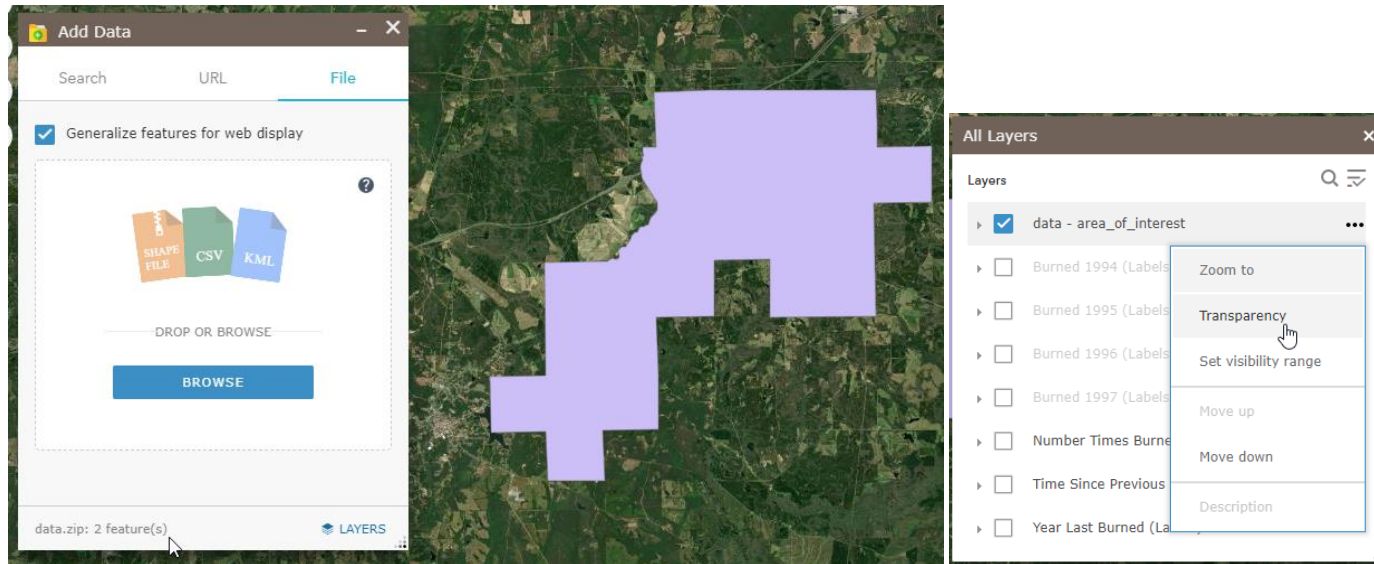


The Add Data widget provides the ability to incorporate additional data, such as zipped shapefiles, CSV files, KML files, map/feature services and others. After the data is added it is incorporated into the map and can be accessed via the All Layers List widget and the Queries widget.

Configured Viewer Widgets, continued.

As an example workflow, a zipped shapefile of an area of interest can be added to the map, by clicking the **File** menu, then clicking [**Browse**]. The data will appear as a layer in the map. Layer transparency and navigation to the layer are available from the All Layers List.

The data layer can then be used as a spatial filter to focus queries.



Configured Viewer Widgets, continued.

Queries



The Queries widget contains pre-set queries that interact with the Hexgrid layer and allow selection or input on values for land cover classes, fire history metrics and species information. After selecting specific query criteria, the results are displayed on the map and basic statistics can be reviewed. Spatial filters can be set to further refine the questions.

Continuing the example workflow from above, after the area of interest shapefile is added to the map. A query can be set to determine where there are areas with a fire frequency of less than five with Evergreen Forest land cover. A spatial filter can be set to use the added area of interest as an intersection layer and the resulting features will display on the map.

The image displays three sequential screenshots of the 'Queries' widget interface. The first screenshot shows the 'Tasks' tab with query criteria for Land Cover Classes, Year Last Burned, and Suitable Species. The second screenshot shows the 'Results' tab with a SQL query: '(frq < 5) AND (((UPPER(nlcd_layers) LIKE %EVERFOR%)))'. It also shows spatial filters set to 'intersect' with a related layer 'data - area_of_interest'. The third screenshot shows the 'Results' tab displaying 242/242 features and statistics: 'Years Fire Detected - 2008', 'Longest Fire Free Interval - 14 (1994-2008)', 'Suitable Species Count - 0', and 'Land Cover Classes - 42,43,41'.

Resources –

- ArcGIS Enterprise (Portal)
 - How to use the Add Data widget: https://enterprise.arcgis.com/en/portal/10.7/use/widget-add-data.htm#ESRI_SECTION1_32BCF64BC65245ADAE6D7EEE03A133B6
 - How to use the Query widget: https://enterprise.arcgis.com/en/portal/10.7/use/widget-query.htm#ESRI_SECTION1_93B7EEDFDDDB4389B1F994E7792FF6DA

- Reference Data
 - National Land Cover Database (2016):
https://www.mrlc.gov/downloads/sciweb1/shared/mrlc/metadata/NLCD_2016_Land_Cover_L48.xml
 - Protected Areas Database of the United States (PAD-USO 2.0 – Manager Type):
<https://www.sciencebase.gov/catalog/item/5b030c7ae4b0da30c1c1d6de>

Southeast FireMap Scoping Meeting #3

Meeting Report
October 6, 2020

Hosts: Joe Noble, Tall Timbers Research Station
David Godwin, Southern Fire Exchange / University of Florida
Lucas Furman, Longleaf Alliance
Mary Nell Armstrong, Southern Fire Exchange / Tall Timbers Research Station

Speakers: Kim Ernstrom, Wildland Fire Management RD&A, IFTDSS Project
Andrew Kirsch, NPS National Interagency Fire Center, INFORM
Curt Stripling, SouthWRAP

Web Meeting Agenda:

2:00 – 2:05 PM ET	Introduction, David Godwin
2:05 – 2:25 PM ET	Presentation #1: IFTDSS Project, Kim Ernstrom
2:25 – 2:30 PM ET	Presentation #1 5 min. Q/A with Kim Ernstrom
2:30 – 2:50 PM ET	Presentation #2: INFORM, Andrew Kirsch
2:50 – 2:55 PM ET	Presentation #2 5 min. Q/A with Andrew Kirsch
2:55 – 3:15 PM ET	Presentation #3: SouthWRAP, Curt Stripling
3:15 – 3:20 PM ET	Presentation #3 5 min. Q/A with Curt Stripling
3:20 – 3:30 PM ET	Open Q/A and Discussion with Speakers and TOT Members

Introduction

The purpose of the scoping phase is to provide recommendations to ultimately build out the Southeast (SE) FireMap through a future request for proposals funding opportunity. The intent of this meeting and forthcoming meetings is to get an idea of some existing fire mapping projects so that the final SE FireMap product can be built to best serve the various fire mapping and tracking needs of the region.

Presentation #1

Kim Ernstrom, Technical Lead for IFTDSS Project, Wildland Fire Management RD&A out of Boise, Idaho

Interagency Fuel Treatment Decision Support System (IFTDSS) Project

- IFTDSS.firenet.gov
 - Website has tools, webinars, help center, tutorials, walkthroughs, etc.

- The original intent of IFTDSS was to be a one stop shop for fuels planning
 - A planning tool to input data, view results, make decisions, and then use some of the products, plans, and/or reports useful for end users
- Over 2,300 user accounts since launch in spring of 2017
 - ~70% Government, ~30% Non-government
- Open to everyone
 - Except for fuels treatment monitoring (more thoroughly described later in presentation)
- Used for
 - NEPA specialist reports
 - Prescribed fire plans
 - Community Wildfire Protection Plans
 - Portions (early stages) of Quantitative Risk Assessments
 - Multi-year fuels planning documents
 - Hazard analysis
 - Fuel treatment prioritization
 - Map interface in public meetings
 - Fuels and fire behavior training and education
- Scale
 - Built to address project and unit level scales
 - Project
 - Fuel treatment planning
 - Compare treatment alternatives
 - Assess/monitor fuel treatment effectiveness
 - Unit
 - Project planning and prioritization
 - Risk reduction (fuel treatment program effectiveness)
 - NOT built for regional or national scales (large scale funding allocation or risk reduction)
 - Designed for 100's-1,000's acres
 - Can have landscapes up to 3.5 million acres
- Navigating IFTDSS
 - It was built off of an adaptive planning cycle
 - Evaluate your landscape -> strategic planning -> implement -> model -> report
 - Not necessarily in that order
 - Not all pieces of planning cycle are built out yet
 - Strategic planning
 - Largest selection of uses
 - Includes risk assessment
 - Implementation planning

- Prescribed fire planning
 - Map Studio
 - Built off of an adapted version of Arc GIS
 - View geospatial data and products
 - IBM = contractor with GIS staff to customize the project
 - Intent of Map Studio was to provide a consistent reference database
 - Used for creating maps, or as masks for editing or area of interest for reporting
 - Fuel treatments, fire history, infrastructure, designated areas, jurisdictional boundaries, natural & cultural resources, etc.
 - Provides consistent, nationwide reference datasets
 - Can upload, save, and edit your own data & shapefiles
 - create maps for fire behavior, risk assessment, etc.
 - Always adding more; always trying to keep it updated
 - Workspace
 - Stores files
 - Reports, model output, datasets, shapefiles
 - Playground
 - Runs models (ex. basic landscape fire behavior model)
- Generate and edit landscapes using LANDFIRE data 2016 ReMap and earlier
 - Generate a landscape in the Map Studio
 - Run analyses
 - Edit/correct landscape data
 - Generate usable reports
 - Can use new or older LANDFIRE data
 - Can manipulate them with an editing tool using user defined rules (ex. change canopy cover to imitate a fuel treatment that isn't reflected in the data)
- 3 different ways to model fire behavior
 - 2 online at the moment, a third coming online in a month
 - 1) Basic FLAMMAP
 - Model landscape fire behavior
 - Pick landscape, add inputs for the fire behavior model, run fire behavior model, name and save it to the workspace, view outputs on map
 - 2) Landscape Burn Probability Model
 - Minimum travel time with random ignitions
 - Used for risk assessment
 - Variety of outputs
 - Actual burn probability

- Quantifies the likelihood of a fire occurring under a fixed set of weather and fuel moisture conditions
 - Conditional flame length
 - An estimate of the average flame length for all the fires that burn a given point on the landscape under a fixed set of weather and fuel moisture conditions
 - Integrated hazard
 - Burn probability and conditional flame length = single characteristic that can be mapped
- 3) Model Short term fire spread – FlamMap MTT
 - Coming out in November
 - Minimum travel times
 - Can enter inputs and run plan FlamMap model
- All models come with a report
 - Generate and Download reports summarizing fuels characteristics and any model output for entire landscapes or defined areas of interest
 - Download raw data into excel
 - Basic bar charts and pie graphs
 - Comparison report for fuel treatment alternatives
 - Thumbnail maps w/ inputs used for modeling
- Develop fuels treatment scenarios
 - Compare modeled outputs across alternatives
- Map values
 - Map Highly Valued Resources or Assets (HVRA's)
 - Tie into burn probability and integrated hazard assessment which ultimately becomes an exposure analysis / risk assessment
 - Can pull from national risk assessment
 - Can also upload your own HVRA
 - Can save dataset and use on other analyses
- Everything created is exportable
- Export landscape data and fire model outputs
 - Multi-band GeoTiffs
 - Original and/or edited landscapes
 - Fire model outputs
 - Use in other programs that need LCP's (FlamMap, FARSITE, etc.)
 - Bring into GID for further analysis
- Newest functionality – released in July
 - Complete a risk assessment
 - A Quantitative Wildfire Risk Assessment (QWRA) combines:
 - 1) how often a fire occurs (likelihood)
 - 2) the intensity when a fire occurs (intensity)

- 3) the effects of the fire on the things we care about (susceptibility)
 - A QWRA includes both losses and benefits associated with fire
 - = net benefit
 - Used to prioritize treatments, make decisions, maybe even on an active wildfire
 - Risk assessment:
 - Burn probability
 - Map values
 - Exposure analysis
 - Response functions
 - Relative importance
 - Conditional weighted net change outputs (net benefit, net threat)
- Fuels Treatment Effectiveness Monitoring (FTEM)
 - Replaced legacy system beginning fire season of 2018
 - Spatial FTEM helps users to easily find intersection of wildfires and fuels treatments in a map based system
 - Services with data: wildfire data from GEOMAC/IRWIN and fuels data from authoritative agency treatment databases FACTS and NFPORS
 - Role based access (only federal folks can get an account) – non reporting agency user base can get a viewer account
 - Data entry – dynamic map display and split screen
 - Provides field personnel automated wildfire/treatment interaction detection with data from authoritative sources (pre-populated color coded legend)
 - Tabular flow allows users to verify interaction, assess treatment effectiveness, generate reports, and upload attachments
 - Treatment Interaction Verification – add/remove/search; remove duplicates
 - Treatment Interaction Monitoring Data Entry; Required and optional fields; automated field pre-population where possible
- Learn more about IFTDSS
 - Help center
 - Forum (post questions; idea exchange)
 - Webinars

Post Presentation Discussion:

1. Curt – What kind of data can you ingest? Can it be map services or do you have to upload physical data?

- a. Right now you can only upload physical data as far as shapefiles go: points, polygons and lines. In the future, we want to be able to upload rasters, but we can't yet. Uploading is limited to basic vector files right now
2. Lucas Furman – In relation to SE FireMap and the objective of building a cohesive system with improved resolution for burned area footprint. The primary goal of that is developing a product that is most usable for a variety of primary, federal and state platforms. Looking at IFTDSS it seems like there are primary consumed datasets and develops functional models and projections with that. Thinking in the context of SE FireMap, would that be of interest or are there specific considerations that we should review as we build and plan, that might support IFTDSS?
 - a. What we would love to, that we don't have right now, is state data. To make fuel treatment effectiveness and monitoring most useful, we have to include non-federal agencies. If there is anything that could come out of SE FireMap that would encourage that, that would strengthen this data to make it most useful, especially for risk assessments. A big chunk of data that is missing here is across partner boundaries. We are interested in what FireMap comes up with that could populate some of this and encourage folks to use the risk assessment because not they have that non-federal data available.

Presentation #2

Andrew Kirsch, NPS NIFC out of Fairbanks AK, Federal Business Lead on INFORM

INFORM

- Project website
 - <https://in-form-nifc.hub.arcgis.com/>
- What is InFORM?
 - Interagency Fire Occurrence Reporting Modules
 - An interagency end-to-end fire reporting application
 - Launched January 1, 2020
 - Meant to replace, to some degree, the legacy reporting systems
 - Leverages IRWIN data exchange for near-real-time access into fire occurrence
 - Don't have their own database
 - Harvests data wherever they can find it
 - IRWIN has lots of different systems that are connected that can initiate a fire record or a fire occurrence
 - Looking at operational level data
 - Purpose is to minimize data entry

- Problem is that there is a lot of overlap in duplicates of fire reports across multiple systems, so even fundamental statistics are difficult to do (ex. end of year number of fires and acres burned)
 - Utilizes nation-wide spatial datasets to derive data for minimal data entry
 - Relies of “upstream” systems (ex. CADs)
 - Uses LANDFIRE, county boundaries - simple spatial information, landowner jurisdictional units, etc. to link up with spatial data
 - Thoroughly spatial from the start
 - The tabular data that they have historically collected for a fire report, they have linked up with spatial data
 - Every record has a spatial footprint
 - Federal fires – anything over 10 acres is required to have a perimeter
 - Can link up spatial data with tabular data
 - Goal: One fire, one report, one authoritative data source
 - Modules
 - 3 main modules for data collection and quality assurance
 - S123
 - ESRI off the shelf tool that people out in the field are using to collect data
 - To be used if no IRWIN-connected CAD in place
 - Used to capture perimeters
 - Collector
 - ESRI off the shelf tool that people out in the field are using to collect data
 - Used to capture perimeters
 - INSPECTOR
 - Custom application
 - Majority of development work is done in INSPECTOR
 - InFORM Roles
 - 3 roles that people can use
 - Viewer
 - Editor
 - Certifier
 - Certification
 - Lots of different sources for data, so the fire reporting business has changed from data entry to quality assurance of data that already exists
 - Certification – QA/QC step ideally completed by the FMO (or designee) of the Jurisdictional unit at the Point of Origin* that verifies that the record is complete and accurate

- *local units might have the FMO of the protecting unit certify the record. This can be determined locally. The requirement is that all wildfires that burn federal land will be certified
- Once certified, the data exchange stops and no other system is allowed to make edits
 - If other intel comes in later on, they can decertify the record and update as needed
- Certification is the indication to all other connected systems that the records are complete, fire is declared out, all the data is complete, and everything met the standard
- InFORM inspector demo (see screen share in recording)
 - Shows all fires in the SE that have been started this year (that they have access to)
 - Any fire that is in IRWIN, they have access to
 - Some states don't have CAD or a CAD that is connected to IRWIN
 - States upload fires through FDP process. Complied for NAFS
 - This year was the last year for the FDP process
 - Now, states should be using INFORM to upload state records
 - Should have access to all federal and state fire data and county and local fires that are reported through NAFS
 - Will create a very large dataset
 - Initially geared toward wildfires, but now also includes prescribed fires where they are reported
 - In map, circles are wildfires, squares are prescribed fires
 - Colors represent different states of the data
 - Grey = incomplete
 - Blue = complete and ready to certify
 - Green = certified
 - Orange = in conflict (multiple records are input for the same fire)
 - Different filters available (ex. certified records only)
 - Can build a custom factor (using any data from IRWIN)
 - Can filter out just the fires users are interested in at the local level
 - Help identify fires of interest or concern
 - Incident list
 - Can click on an individual fire
 - Information in the incident itself
 - Shows perimeter
 - Status (certified, etc.)
 - Point of origin
 - Size
 - Associated dates

- Shows all data from final fire report
 - If the record was not certified, other systems could update these data elements as needed
- Basic summaries and reports

Post Presentation Discussion:

1. Todd Hawbaker – 1) Do you store the intermediate fire perimeters as incidents progress 2) Do you have an entry from a state or state agency, or maybe a private landowner that we could look at?
 - a. 1) By default, we do keep changes of perimeters over time using National Incident Feature Service, that's hosted in GIS Online, which is nationwide and interagency as well. There is also an archive, so any change that is made to a perimeter is kept in the archive. We don't interact with it too much as the final reporting system, but we do have access to previous perimeters and edited perimeters that are in the archive
 - b. 2) ((Demo of state record)) There are a handful of states that have CADs connected to IRWIN including TX, WY, CA, etc. Types of information included in the record is state by state. Some states are planning on using INSPECTOR to certify records, some aren't, but we still have access to all the data there (state records).
2. Todd: How do you manage the varying level of quality that you might get from people certifying fires?
 - a. Different agencies will have different requirements for what makes a record complete. For all the state records, there is an agreed upon minimum for NASF. Forest Service might have a slightly different mix of what is required. If they are using INFORM, then the qualifications are consistent across records. If they aren't using INFORM to certify records, apart from the NASF's minimum requirements, the data quality might be mixed. We are hoping that making it visible in this format here will help and also make it easier to edit will improve the data quality.
 - b. Curt – We are using WIRES in TX, our plan is to push all our fire perimeters into this as well. Right now we aren't connected to the National Feature Service, we have our own. But for every initial attack fire and project fire that we go to, most of those fire perimeters are mapped. We will be pushing those up to IRWIN soon.
3. Lucas: Going back to the SE FireMAP and considering how this may support or how they may crosswalk, communicate, and inform one another. Data availability outside of state and federal agencies, is INFORM a product that could be used to help flesh out attributes on a remotely sensed burned area product? Fire footprints, for example, are incredibly valuable for imbedding and validating the

burned area accuracy and thinking of the openness, sharing availability of this data. Can you speak to that a little bit?

- a. Everything that we have is public data. At the end of the process, once the records are certified, the perimeters are public. At the end of the year or even real time, most of the perimeters that we have are public. We use data services almost exclusively, so we are not sitting on any data that's not either shared or could be shared very easily. We would definitely be a proponent of sharing our data and enduring that that is available to all interested parties.
4. Joe N.: Just a point of clarification to follow up on Todd and Lucas' question... So, the certifications are dependent on agency standards, correct? What I mean by that is – even within the USFS you may have some national forests that are reporting fire as applied to burn unit, where other forests are actually reporting the burnable area within that unit based on fuel models or some other vegetative coverage. So the onus does lie on the agency to certify that, is that correct?
- a. Yes. We leave it up to local units to certify. You could have a state employee certifying a federal record or vice versa, depending on local agreements.

Presentation #3

Curt Stripling, SouthWRAP (Wildfire Risk Assessment Portal)

SouthWRAP – Southern Group of State Foresters + Partners Southern Wildfire Risk Assessment Portal (SWRA)

- SouthWRAP
 - Sponsored by the Southern Group of State Foresters and federal partners
 - Texas A&M Forest Service is the manager of this project and the contractor is Timmons Group
- SWRA Milestones
 - 2001 – initial planning
 - 2003 – officially kicked off project
 - 2006 – produced first regional wildfire risk assessment in the nation
 - During program development realized that there wasn't good fire data for the state of TX, needed more weather stations, needed better fuels data
 - Following these realizations, began improving data, improving the risk assessment process
 - 2012- deployed TxWRAP using enhanced methods
 - 2014 – deployed SouthWRSP using enhanced methods
 - 2017 – deployed Community Assessor application for TxWRAP
 - 2018 – deployed Community Assessor application for SouthWRAP

- 2020 – Planning for next wave of enhancements and updates
 - Recently received funding for enhancements and updated and to integrate outside tools
- Risk Assessment was designed to answer two primary questions
 - Where is the risk?
 - Where do we start?
 - Go out, coordinate with local communities
 - Designed to answer these two main questions although there are many other benefits
- Product delivery
 - Customers aren't necessarily fire behavior experts – have to work on delivery to cater to audience
 - First delivery solution
 - Web mapping wasn't readily available yet
 - Used ArcMap and added an extension package and packaged that data on a hard drive
 - Set up training sessions across the Southeast for GIS
 - 75% of states that implemented it did not have the skills to implement this to its full potential
 - The other alternative was to task GIS specialists to do the work
 - Saw that the number of requests coming in from communities across the Southeast communities across Texas would make it overwhelming
 - Looked at whole design – how to deliver product and make it easy for all users
 - SouthWRAP was result
 - Web application used to deploy risk assessment application
 - Complexities and technical assets have been stripped out
- SouthWRAP
 - www.SouthernWildfireRisk.com
 - Public Viewer, Professional Viewer, File Explorer
 - Information that developers have generated from the best information available
 - Meant to inform and educate people, at the community level, of wildfire risk and the problems they face in their area
 - Community Assessor, Mitigation Activity Tracker, CWPP Writer
 - Only Community Assessor is built out at this point
 - Meant to be used at the local level, but use this information to feed back into regional system
- It's all about building relationships

- Working with communities and leaders in the communities to make sure that they are making community a safer place to live and reduce wildfire risk
 - Make it easy to use for communities,
- Professional Viewer
 - Purpose is to explore risk assessment results and generate a report that would go into a hazard mitigation plan or a CWPP or FEMA mitigations grant
 - Collaborate effort
 - At the state level and FEMA level, most plans are accepted because this process was done consistently. It's not biased from one city to another
 - Lots of communities across the state adopted this and are generating plans when they submit mitigation projects
- Community Assessor
 - Fairly new
 - Designed to assess communities for CWPPs and FireWise USA recognition throughout the South and throughout the state
 - Worked as a group to standardize database schema so that reporting and assessing information is the same across the South
 - Developed a mobile application to facilitate that
 - App is only used by state agencies, but local partners can be brought in as well
 - ex. work with fire departments or other neighborhood organizations to train them to do risk assessments and identify the communities. Then they go out and do the work of assessing the community and feed that data back into the database here
- Homepage of Southern Wildfire Risk Assessment has applications available (Public Viewer, Professional Viewer, and Community Assessor)
- TxWrap Professional Viewer demo
 - TXWrap is a mirror of SouthWRAP
 - It's all about exploring the data that the app contains
 - Try to keep a history of large fires
 - 16 years of fire history using LANDSAT
 - Can go back in time and look at large wildfires and compare to more recent fires to determine how things are changing
 - Can provide proof for problems (TX has wildfires that need to be addressed)
 - Layers
 - Wildfire Risk layers
 - Values Response Index
 - Pine Plantation Response Index

- Wildfire Ignition Density
- Wildfire Threat (aka burn probability)
- Where People Live
- WUI Response Index
 - Response measure of high flame lengths with higher nearby populations
- Wildland Urban Interface (WUI)
- Community Protection Zones
- Wildfire Behavior layers
 - Characteristic fire intensity scale – Based on fuel conditions and potential weather conditions, potential fire behavior for a certain location
 - Class 1 – firefighter can directly attack fire
 - Class 5 – go into evacuation mode
 - Characteristic Rate of Spread
 - Characteristic Flame Length
 - Fire Type – Extreme
- Landscape Characteristics layers
- Historical Fire Occurrence layers
- Basemaps
 - ESRI Light Gray
 - ESRI Topo
 - Bing Aerial
 - Bing Streets
- Reference
 - Community Risk Assessment
 - Fire Stations
 - Incorporated City Boundaries
 - County Boundaries
 - TFS Branches
 - TFS Regions
 - Predictive Service Areas
 - 2012-2015 Large Fire Perimeters
 - 2011 Large Fire Perimeters
- Professional Viewer
 - Helps create awareness that there is an issue
 - Can create projects (demo in screen capture recording)
 - Create project area (ex. by county boundary)
 - Can create buffer area
 - Can export data
 - Generate a report in 5-10 minutes (downloadable)

- Report summarizes information
 - Ex. total population, population in WUI
 - Local jurisdictions take this information, plug it into CWPP process or submit it for a hazard mitigation plan
 - ~5,000 reports have been generated since TXWrap launch
 - >2,000 professional users in TX alone
- Community Assessor demo
 - Can create a project for FireWise or a CWPP
 - Displays fire risk
 - Can upload / import a community into a project and look at its status
 - Were they assessed? Do they have boundary information?
 - You can digitize or import boundary information
 - Info about surrounding environment (editable)
 - Characteristics of predominant vegetation
 - Possible structure to structure ignition?
 - Defensible space
 - Slope
 - Area with history of high fire occurrence?
 - Saddles, box canyons or chimneys present?
 - Area exposed to Southern Plains Wildfire outbreak?
 - Can take photos and upload to web version
 - Submit
 - Based on selections that were made, specific mitigation strategies will be recommended to reduce risk
 - Generate and download report for each community and/or project area
 - Summarizes information with any photos you added
 - High level overview or community details
 - Recommended mitigation strategies
 - 2-3 pages long
- Would like to collect mitigation projects and pull those in to this application to get complete picture
 - SE FireMap could be a huge benefit to this project

Additional Resources

Overview of SouthWRAP Upgrades: <https://vimeo.com/301240208>

Introduction to Community Assessor: <https://vimeo.com/301199186>

Post Presentation Discussion:

1. Lucas: Thinking about the SE FireMap project, you mentioned mitigation and being able to ingest that into SouthWRAP to potentially improve mitigation strategies and to see where fire has already burned across the landscape on a temporal scale. 1) What would be the requirement as far as hosting to allow SouthWRAP to ingest? 2) Beyond burned area, part of where we are in the scoping process is considering what other attribution may be available to include or associate with those burned areas whether it's cross-walking other datasets, or thinking big picture, what specifically would be most valuable to SouthWRAP and how would it need to be hosted to allow for it to be ingested?
 - a. Curt: From the risk assessment perspective, we are always trying to keep up to date with what's happening on the landscape. As projects are implemented on the ground, users like to see the change in their risk on the map. So, if we could track that more or less in real-time it would allow us to make those updates easier and then users would be able to re-run their risk assessments for those areas. As far as the requirements, a simple map service with a standard database schema would be all that we really need. The question is- can that information be shared? Or- how can we share that information? If all of it's not publicly available permissions may be an issue. We don't patrol who gets information. If there are privacy requirements, that could be an issue. If the information was all public, then sharing would be pretty straightforward.
2. Todd: Question for all presenters - With SEFireMap, we are leaning pretty heavily towards using remote sensing products to map burned areas, especially in private lands where we may lack the certification we would get from federal, state, or other agency fires. What thoughts do you have on using a potentially imperfect remotely sensed product to map fire history? How might that product tie in to SouthWRAP, TXWrap, or IFTDSS? How would you deal with uncertainties in a burned area product that maps fires in private land?
 - a. Curt: I guess the biggest question is what fuel model was there prior to the burn, then based on severity, being able to crosswalk that to a reasonable fuel model. It would take some subject matter expertise or training over time to make sure that we're hitting the right mark there. That's probably the biggest unknown being private land, we don't have access to that. We don't know what fuel model was there to begin with to be able to crosswalk it to the right fuel model. So I think some assumptions would probably have to be made. Hopefully with training and validations over time, maybe we can make some improvements there if it's not perfect out of the box.
 - b. Todd: So your concern would be what effect that those remotely sensed fires might have on the underlying fuels and potential fire behavior and how that might feed back into the flame lengths you all use in your risk assessment.

- c. Curt: Yes.
- d. Justin to Todd: Quick clarification - your question was coming from a remote sensed image finding a new fire or we knew the fire occurred and we have a polygon or have some sort of rough area from a remotely sensed image? In other words, a known occurrence versus a potential occurrence using remote sensing?
- e. Todd: I'm thinking more of potential occurrences. For SE FireMap, we are going to try to come up with better fire histories for private lands that include things like prescribed fires, because there is little incentive for private landowners to map and report this stuff. Remote sensing provides the tool to do that, but to use remote sensing to map small fires over large spatial extents, you have to automate it in some way, so automated burned area products will never be perfect. They have uncertainties. There's two issues for SE FireMap 1) finding the fires 2) how to certify those fires and assign them a confidence level, whether they're mapped by multiple centers, where there's overlap between a remote sensing product and an agency entry. There will always be some sort of error that propagates through in these products. I'm wondering, if we have this mapping effort that is really trying to improve our understanding of fire in private land, but it's producing data with some uncertainties around them, how would they incorporate those uncertainties into their products like IFTDSS, INORM, or something like SouthWRAP?
- f. Curt & Kim - It would be an improvement on what we have now.
- g. Kim- We have been using monitoring trends in burn severity data for a long time. If it was treated with fire, that's what is important to us no matter what the cause. I know that there are reasons to say whether it was intentional or not, but at least for us, thinking about a risk assessment on a unit or neighboring private land or whatever the case may be, it provides an opportunity to meet your neighbor. My point is, I don't know if it matters. It probably does at the small scale, but if the planning is happening at a larger scale or you're trying to inform a coarse map for decision making, I don't know if it matters. It seems variable on intent of what you are after. Yes, it would be nice to know if it was a prescribed fire or a wildfire, but the fact of the matter is that it changed the fuel model. That's really what matters when it comes to the analysis piece.
- h. Andy: From a fire reporting perspective, we are willing to accept a lot of uncertainty, just looking at the historical data quality that we've had in the past. I would echo that anything is better than nothing. I would like to add, though, that even though there is no incentive for a private landowner to report their fire, if there are any public responders, whether local, county, state or federal, there is incentive for them to report their actions as far as

their response to that fire. That may not be the case for prescribed fire, but at least for wildfire, there is definitely some incentive to report. It would be interesting to cross-walk some of that remote sensed data with the known fire occurrence dataset that we have, taking out of IRWIN or INFORM, etc. We often have better point data than perimeter data for area burned, so especially at a local and county level. We do have quite a few fires started on private land in the known dataset right now.