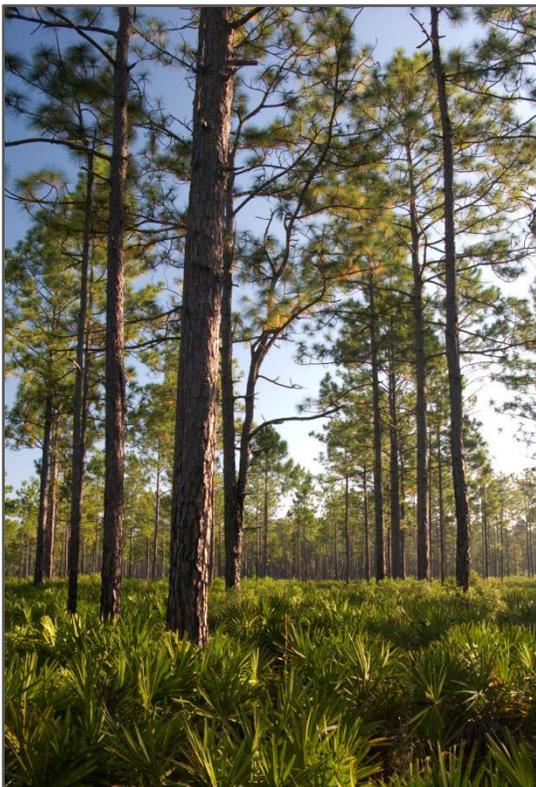# Longleaf Pine Ecosystem Geodatabase v.4 Final Report

September 2018

A cooperative project between the Florida Forest Service and Florida Natural Areas Inventory

EXECUTIVE SUMMARY

Florida Forest Service (FFS) and Florida Natural Areas Inventory (FNAI) partnered to develop the Longleaf Pine Ecosystem Geodatabase (LPEGDB), a project to design and populate a spatial database that will serve as the central repository for data on the distribution and condition of Longleaf Pine Ecosystems (LPE) in Florida. The LPEGDB is part of a larger effort by the FFS to conduct a Longleaf Pine Forest Conservation Assessment to inform conservation, protection, management and enhancement of LPEs on public and private lands in Florida. Version 4 of the LPEGDB, completed in August 2018, represents a 6-year effort by FFS, FNAI, and many agency partners to comprehensively map and assess condition of longleaf pine ecosystems in Florida.

Across its range, longleaf pine has declined from approximately 90 million acres to an estimated 3.4 million acres in 2009. Recent recovery progress puts the estimate at 4.7 million acres in 2017. America's Longleaf Restoration Initiative (2009) identified specific goals to conserve and improve what is left and to increase the extent of longleaf pine forests across the southeast to 8 million acres. At the state level, Florida's Forest Action Plan outlines specific inventory and assessment objectives toward meeting this goal. The LPEGDB helps fulfill these objectives.

The database includes longleaf pine occurrence information from many sources. High accuracy land cover polygons from the Florida Cooperative Land Cover Map (CLC) provided the foundation for identifying potential longleaf pine ecosystems. Two decades of FNAI ecological assessment and natural community mapping on more than 2 million acres of state and federal conservation lands provided a strong start for longleaf pine location and condition data. Many agencies and organizations provided forest stand data. Additional longleaf pine locations were mined from rare species surveys, management plans, landowner assistance records, and other sources.

A major accomplishment of the project was the collection of new occurrence and condition data for previously unknown longleaf pine sites. FNAI and FFS designed a rapid assessment protocol that included concise metrics for canopy, midstory, and ground cover, and trained FFS County Foresters in the use of the protocol. The survey design involved field visits to polygons, identified through GIS, as having potential for longleaf pine. In 2013, FFS County Foresters used the first iteration of the protocol to assess 840,000 acres of previously unknown longleaf in Florida, primarily on private lands and with a focus on natural longleaf stands.

In the second phase of data collection for Florida, the focus was on filling knowledge gaps for planted pine. In 2015 and 2016, the rapid assessment protocol was revised to be more aligned with the Southern Open Pine protocol developed by NatureServe, USFWS, and other partners, to help meet the objective for a more consistent, vetted range-wide methodology. In 2017, FFS County Foresters assessed an additional 1.16 million acres of potential longleaf stands and submitted a remarkable 74,000 data points from the field. In this latest effort, most areas were confirmed as forest types other than longleaf although another 200,000 acres were assessed as longleaf pine.

The rapid assessment results and data provided by many partners are incorporated into the LPEGDB v.4 which contains approximately 2.36 million acres of confirmed longleaf pine in Florida, most of which (72%) has been at least partially assessed for condition. Private lands account for 42% of the longleaf acreage. The data are available for download and as an interactive web map for query and display of longleaf occurrence and condition. The LPEGDB will serve to inform longleaf restoration planning in the state and represents a major step toward fulfilling both inventory and assessment objectives of Florida's Forest Action Plan and the America's Longleaf 2009 Range-wide Conservation Plan for Longleaf Pine.

ACKNOWLEDGEMENTS

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INTRODUCTION

The Florida Longleaf Pine Ecosystem Geodatabase (LPEGDB) represents a partnership between The Florida Forest Service (FFS) and Florida Natural Areas Inventory (FNAI) to develop a central source for information on the distribution and ecological condition of longleaf pine ecosystems (LPE) in Florida. This project derives from and fulfills objectives described in the Florida Forest Action Plan, also known as Florida Resources – 2010 Florida's Statewide Strategies (FFS 2010). In this document, there is a stated goal of having reliable and accurate inventories and assessments of LPE on public and private land in accessible databases.

Longleaf pine is an integral part of numerous natural vegetative plant communities across the southeastern U.S., collectively referred to in this document as LPE. The importance and decline of this iconic tree and its associated ecosystems and species have been described in many reports and publications. Once dominating the Southeastern Coastal Plain, longleaf pine forests and savannas have been reduced from an estimated 90 million acres to around 3.4 million as of 2009 (Oswalt 2012; ALRI 2009). There is significant interest, regionally and state-wide, to restore longleaf pine ecosystems on public and private lands. The LPEGDB helps to inform longleaf restoration planning in Florida and represents a major step toward fulfilling both inventory and assessment objectives of Florida's Forest Action Plan. This project provides baseline data to support the America's Longleaf Restoration Initiative (ALRI) range-wide goal of conserving and improving existing stands, and increasing the extent of longleaf pine forests across the south to 8 million acres within 15 years (ALRI 2009). The LPEGDB includes the ALRI framework for categorizing longleaf pine ecosystem condition in terms of three management levels: maintain, improve and restore. The ALRI also includes a goal of 3 million acres in or moving toward maintenance condition in 15 years. The most recent ALRI accomplishment report indicates progress in longleaf recovery with 4.7 million acres of longleaf pine now estimated range-wide (ALRI 2017). Assessing ecological condition is critical for measuring progress toward these goals and for restoration and management planning at multiple scales.

In the first phase of the project (2012 – 2015) FNAI and FFS worked with partners throughout the state to gather location and condition information primarily for natural longleaf pine stands. Much of the initial project focused on collecting existing data on public lands such as forest stand data from state and federal agencies and from FNAI ecological inventories. In addition, a major effort in 2013 by FFS County Foresters resulted in new field assessment of more than 800,000 acres of longleaf largely on private lands. The September 2015 LPEGDB (version 3) documented approximately 2.15 million acres of longleaf pine in Florida, with 39% on private lands. This acreage included not only longleaf pine dominant and co-dominant sites, but also sites where longleaf pine was a minor component. A timeline and summary of previous versions of the LPEGDB are described in Table 1.

Although the initial (2012-2015) LPEGDB effort was successful in documenting most of the natural longleaf sites in Florida, the scope precluded full assessment of pine plantation, of which approximately 4 million acres remained unevaluated. Discussion with state and regional partners demonstrated a broad consensus to include planted longleaf in the LPEGDB to accurately reflect ongoing longleaf conservation and restoration efforts as well as identify improvement needs.

Table 1. Development timeline during the first phase of the project, from 2012 through 2015.

LPEGDB Version	Publication Date	Summary
1	June 2014	Developed the initial database. Compiled and prioritized potential LPEs. Extensively mined and incorporated existing assessment data, primarily on public lands. FFS County Foresters conducted Rapid Assessment field surveys of more than 800,000 acres of LPEs.
2	October 2014	Filled many data gaps for occurrence and condition of LPEs on managed conservation lands. Included updates for lands managed by Florida Forest Service, Eglin AFB, U. S. Forest Service, St. Johns River WMD, as well as several non-NRCS-funded longleaf plantings on private lands.
3	September 2015	Contained updates based on FNAI Field projects and several partner data sources. Added attributes and summaries for conservation lands and land cover to the database and revised the database format. Updated the Rapid Assessment Data Collection model.

The objective of the current project phase (2016 – 2018), was to fill remaining knowledge gaps in the LPEGDB, with an emphasis on private lands where most recent gains in longleaf pine planting have occurred. The approach for filling this gap largely followed the previous rapid assessment protocol, but with revisions based on experience and recommendations from longleaf partners. As in the previous phase, FFS County Foresters carried out the assessments. We also conducted landowner outreach and continued to mine new existing data and data updates from agencies and organizations.

METHODS

The project was divided into four major tasks conducted from February 2016 through August 2018:

1. Collection of field data via Rapid Assessment of potential longleaf stands;
2. Outreach and data request to private landowners;
3. Mining of existing longleaf pine data from agencies, organizations, and FNAI survey data;
4. Integration of new data sources with existing database, including revised crosswalk of ecological condition into management classes.

Rapid Assessment of LPE Conditions

As with the previous rapid assessment conducted by FFS County Foresters in 2013, the approach consisted of identifying data gaps and prioritizing a set of polygons for field assessment; designing a field protocol including metrics and data collection tools; conducting training workshops for County Foresters; collecting new field data; and processing of field data.

Assessment Polygons

FNAI coordinated with FFS to develop criteria for a spatial prioritization of remaining potential longleaf sites for further assessment. Stands were first filtered by three primary factors: 1) we excluded stands that had already been designated as pinelands other than longleaf and stands of confirmed longleaf that already had been assessed for condition; 2) we removed conservation lands that had previously been the focus of data collection efforts, e.g. lands managed by USFS, DOD, FFS, FWC, NWFWMD, SJRWMD; and 3) we then estimated areas of large corporate timberlands from property appraiser parcel data and filtered these out of the prioritization, with the intent of requesting information directly from the companies, as described in the Landowner Outreach section below.

We identified remaining stands within 30 m of each other as a single patch. We then assigned a size class to the patches, which was transferred to the stands within the patch. The final priority class was based on the patch size class, where larger patches were higher priority (Table 2). We also assigned all stands with non-pine land cover types to the lowest priority class (0).

After filtering, the total acreage remaining for assessment was 3,300,229 acres, 68% of the acreage identified as unknown or without condition data in the LPEGDB v.3.

Table 2. Criteria for prioritizing assessment polygons based on patch size and land cover type.

Priority Class	Patch Acreage Range or Land cover	Total Acres
0	<50 OR land cover was non-pine	215,707
1	50-299	380,450
2	300-999	362,938
3	>=1000	2,341,134

Assessment Design

FNAI coordinated with FFS to design a field protocol for Rapid Assessment of ecological condition that was used for field data collection in 2013 (LPEGDB v.1). A set of attributes was chosen for canopy, midstory, and ground layer conditions in Florida that could readily be discerned from a roadside view of the site. In 2015 and 2016, FNAI worked with FFS to revise the original LPE Rapid Assessment Protocol to include additional metrics, enhance compatibility with regional efforts, and promote similar assessments range-wide. FNAI coordinated closely with regional partners and considered input from four primary sources:

1) Recommendations from the August 2014 Longleaf Partners Meeting (FNAI 2014).

2) The Condition Metrics for Southern Open Pine Ecosystems project (Nordman et al. 2016; Nordman and White 2016), a collaboration between NatureServe and USFWS to develop a series of metrics for a rapid assessment of longleaf pine systems throughout the Southeast. FNAI participated in a project meeting in March 2015 that was attended by forestry and wildlife professionals from Mississippi to South Carolina. The metrics discussion included the desired ranges of values for a core set of wildlife species and general ecological health. FNAI also consulted a set of draft metrics developed by the project team after the meeting.

3) Draft longleaf pine assessment metrics from The Nature Conservancy (TNC) in North Carolina. FNAI participated in a conference call and email exchange with TNC-NC and NatureServe to compare and discuss consistency of our respective assessment designs. NatureServe and TNC-NC also reviewed and provided feedback on proposed revisions to the LPE Rapid Assessment.

4) Longleaf Pine Maintenance Condition Class Definitions published by America's Longleaf Restoration Initiative (ALRI) in October 2014. These definitions are the standard adopted by ALRI and are expected to help guide implementation of the Range-wide Conservation Plan for Longleaf Pine (ALRI 2009).

Data collection fields for the Rapid Assessment were revised as follows (note that some of these revisions were also documented in the LPEGDB v.3 Summary Report (2015):

- "LLP Maturity" was changed to "LLP Dominance" to more accurately reflect the definition of the metric; the field values remained the same.

- "Older-mature Characteristics" was added to indicate the presence of flat-topped trees within the stand.

- "LLP Early Regeneration" and "LLP Advanced Regeneration" were added. Regeneration is an indicator of the potential sustainability of the stand. It may also indicate the need for planting or active management of the stand such as burning and thinning to encourage seed germination. Advanced regeneration is an indicator of the immediate sustainability and health of the stand. Trees in this category are less susceptible to scorch during prescribed fire and can quickly replace the canopy following thinning or larger-scale cutting. Values in this field were chosen to be consistent with ALRI's Longleaf Pine Maintenance Condition Class Definitions.

- "LLP Basal Area" field values were changed to integers to the nearest 10 rather than large classes in order to facilitate crosswalk into other systems.

- "Turkey Oak and Sand Post Oak Cover" was changed to "Fire Tolerant Hardwood Cover" to reflect a greater number of characteristic and desirable hardwood species.

- "Shrub Cover" was split into two metrics – "Tall Shrub Cover" and "Short Shrub Cover". This better reflects the ALRI Longleaf Pine Maintenance Condition Class Definition "Shrub Cover" metric which specifies shrubs <3 feet tall for maintenance condition.

- We considered adding a field to capture soil disturbance, but decided that it was too complex and subjective to be applied consistently in a rapid assessment.

- "Invasive Plant Distribution" was replaced with "Invasive Plant Cover" in order to assess a stand using ALRI criteria.

- "Natural Community Type" was replaced with "Soil Hydrology" because assessors previously had difficulty assigning the natural community type. Values for "Soil Hydrology" will help to classify the historic or current natural community, which is useful for species habitat mapping and land use planning.

- "Stand Type" was added to indicate if a stand was naturally regenerated or if manually planted by hand or machine. These numbers will help evaluate agency goals.

- "Pasture Grass Cover" was added to capture bahiagrass, and other non-native forage grasses that would either not be captured in or hidden in other groundcover attributes. This came up during the County Forester training which included a pine plantation assessment.

- Fire frequency was removed because it cannot be collected consistently; ecological condition is better reflected with other metrics.

Field definitions also were revised as follows:

- "Other Pine" was changed to be strictly a canopy class; it was previously included in midstory.

- "Hardwood Cover" was changed from 'Other Hardwood Cover' and to be strictly a canopy class. Previously this followed fire tolerant hardwoods and both were for canopy and midstory.

- "Midstory Fire Tolerant Hardwood Cover" was changed from a midstory-canopy field to just midstory. The rationale is that hardwood midstory cover is an important metric for overall condition of LPEs and that it is important to distinguish between strata (i.e. know in which strata the hardwoods are located.

A summary of the rapid assessment metrics is provided in Table 3; complete definitions, field values, and rationale are described in Appendix A.

In addition to the metrics revisions, the rapid assessment data collection method was changed from a polygon-based to a point-based model. Assessors were still provided with polygons to assess but the location of data collection was indicated by a GPS or plotted point that was later linked to the intended polygon. This eliminates the need for editing polygons in the field (or post field work) while providing the specific location where data were collected. This greatly reduced the training needed to complete a rapid assessment and will facilitate transfer of the data collection model to other potential users.

Table 3. Ecological condition data collected for v.4 Rapid Assessment of longleaf pine ecosystems in Florida.

Field	Field Description
Longleaf Pine in Canopy	CANOPY: Presence and dominance of longleaf pine in the canopy.
Longleaf Pine Age Structure	CANOPY: Age structure of longleaf pine in the canopy and subcanopy.
Older Mature Characteristics	CANOPY: Indicates presence of flat-topped trees (more than one) within the stand.
Longleaf Pine Basal Area	CANOPY: Estimated basal area in square ft per acre of longleaf pine for the entire polygon.
Other Pine Cover	CANOPY: Percent cover of pine species >16 ft tall other than longleaf pine.
Hardwood Cover	CANOPY: Percent cover of hardwood species >16 ft tall.
Midstory Cover	MIDSTORY: Percent cover of woody-stemmed plants from 10 ft to bottom of the canopy.
Fire Tolerant Hardwood Cover	MIDSTORY: Percentage cover of fire tolerant hardwood trees from 10 ft to bottom of the canopy (see Appendix A for species list).
Tall Shrub Cover	MIDSTORY: Percent cover of woody plants, other than longleaf pine, 3 to 10 ft tall.
Short Shrub Cover	MIDSTORY: Percent cover of woody plants, other than longleaf pine, less than 3 ft tall.
Longleaf Early Regeneration	MIDSTORY: Estimated cover of longleaf pine regeneration including planted trees <6 ft tall.
Longleaf Advanced Regeneration	MIDSTORY: Estimated cover of longleaf pine regeneration including planted trees 6-16 ft tall.
Herbaceous Cover	GROUND: Percent cover of all native non-woody, soft-tissued plants regardless of height, including non-woody vines, legumes, and graminoids (grasses, sedges, rushes); does not include non-native pasture grasses.
Pyrogenic Grass Cover	GROUND: Percent cover of native perennial graminoids that are maintained by periodic fire (see Appendix A for species list).
Pasture Grass Cover	GROUND: Percent cover of non-native grasses typically planted for forage (see Appendix A for species list).
Invasive Plant Cover	Describes the extent of invasive exotic plants within the polygon; includes only FLPPC category I and II listed species.
Condition Rank	Ecological condition relative to a natural system (natural vegetative plant community).

Assessment Training

The training materials were revised to be consistent with the improvements to the data collection model. This included the summary of navigating the LPEGDB template provided for the rapid assessment, the general

procedure for taking field points, the Rapid Assessment Data Field Descriptions Overview and the Rapid Assessment Data Check-out, Field Data Collection, and Check-in Process. These training modules were combined into one document that was used for the training sessions and provided as a reference document for later use (Appendix B). The check-out and check-in procedures described in this document were updated and designed for using ArcPad 10.2. The updated rapid assessment file geodatabase included a template point feature class and domains that enabled automatic creation of a data collection form in ArcPad. The full data collection model including geodatabase and documentation is available for distribution.

The Rapid Assessment training materials were developed by FNAI and presented in a two-day seminar for the County Foresters on May 24th and 25th, 2016 as part of a week-long event conducted at the Withlacoochee Training Center in Citrus County. The seminar included lab and field instruction describing the revised procedures for conducting the Rapid Assessment. The lab session included instruction on the various components of the LPEGDB, a review of the definitions of the data fields and attribute domains (drop-down menu choices), and hands-on practice preparing for a field assessment. The field portion of the training included instruction on completing the electronic form using ArcPad on handheld computers. Several field sites were visited to discuss the choices for each of the attributes describing the stand (polygon). A complete rapid assessment was completed for at least 3 stands. This practice helped clarify field interpretation of attributes to help ensure consistent data collection. Following the field session, the training participants were instructed on procedures for downloading field data and updating their individual LPEGDB files.

County Foresters were instructed to evaluate each polygon in their assessment file and determine whether to assess it or exclude it from the assessment. Valid reasons for exclusion were inaccessibility or determination that the site was not a functioning LPE. The protocol required County Foresters to indicate if a polygon was excluded in the survey status field and give a reason in the comments field. In order to reduce fieldwork and improve efficiency, County Foresters were allowed to conduct initial desktop assessments to exclude polygons if certain they were not longleaf. The County Foresters were also instructed to add new LPE sites if an area identified during field work was not already delineated in the LPEGDB. Details of the training including GIS procedures for working with the ArcPad Data Manager extension are described in Appendix B. After the training, a few changes were made to the protocol to improve data collection efficiency, to clarify field definitions, and to improve consistency with ongoing longleaf assessment protocols being developed across the range of longleaf pine. County Foresters were provided the updated materials prior to initiating their field assessments in October 2016. The training document presented in Appendix B includes all changes up to that point.

Rapid Assessment Data Collection

FFS County Foresters began collecting field data in November 2016 and were required to upload their individual databases at interim check-in dates (Feb 10, Apr 7, May 26) to gauge progress and make adjustments if needed. Because of an active wildfire season with many County Foresters being asked to assist with wildfires or sent on assignment, the project deadline was extended to allow more time for completion. One extra check-in date of July 21 was added with a final submission date of August 31, 2017.

FFS reports that County Foresters logged 7,594 hours on the LPEGDB project between December 1, 2016 and August 2017. Thirty-nine FFS County Foresters conducted rapid field assessments in 58 counties, and submitted 74,906 point features, with 81% of points containing survey data, i.e. at least indicating longleaf or not longleaf, and 19% indicating no access (Table 4; Fig. 1). Eighty-nine percent of the polygons deployed for assessment could be associated with a submitted point. Approximately 2.94 million acres were associated with points that

contained survey data (i.e. confirmed longleaf or not longleaf). This includes points for 191,000 acres that were additional to the polygons deployed for assessment.

Table 4. Points submitted by FFS County Foresters for the LPEGDB longleaf pine rapid assessment.

Survey status	Number of points	
longleaf pine - condition assessed	6,601	9%
longleaf pine - confirmed, not assessed	130	<1%
excluded - not longleaf pine	53,881	72%
no access or unknown	14,294	19%

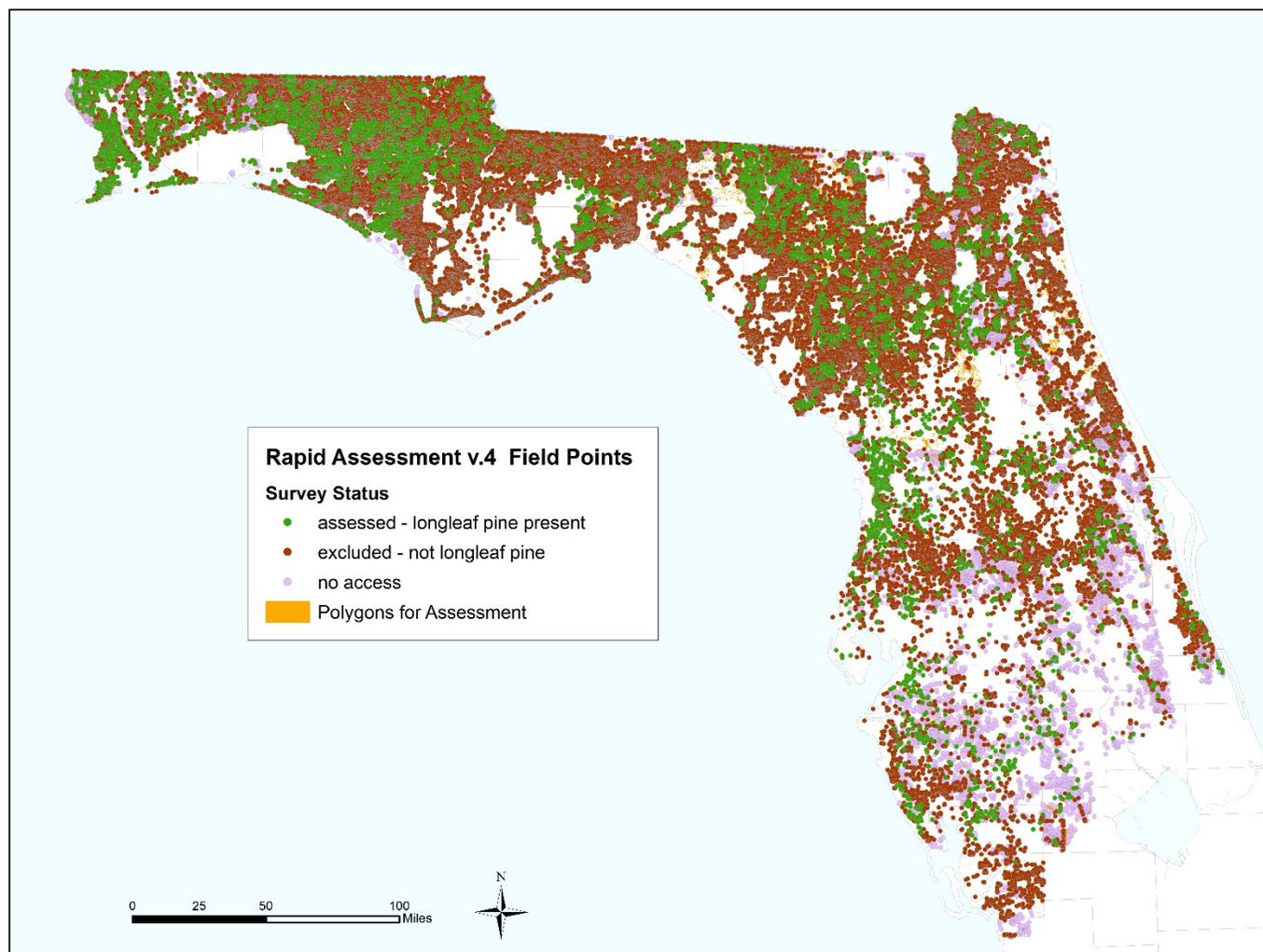Figure 1. Distribution of rapid assessment field points submitted by FFS County Foresters in 2017

Assignment of RA Points to Polygons

Substantial effort was spent performing QA/QC of submitted points and assigning points to appropriate polygons. The primary tasks were as follows:

- Evaluated and eliminated blank or duplicate data points

- Corrected erroneous 'Survey Status' by reviewing attributes, i.e. changed 'excluded – not longleaf' to 'assessed – LLP' if assessment data indicates longleaf occurrence

- Identified and moved points that did not occur within an assessment polygon nor indicate addition of a new polygon

    o Automated snapping of points to polygons if point to polygon distance was < 10 m

    o Reviewed and manually adjusted points that were > 10 m from a polygon

- Added new polygons where indicated by points, either in Comments field or based on aerial photo review

- Adjusted points that occurred on (i.e. snapped to) shared boundary between polygons to avoid erroneous assignment during spatial join process

    o Moved points <5 m into appropriate polygon based on assessment fields and aerial photo review

    o If a point appeared to apply to both polygons, it was duplicated and one point was moved into each polygon

- Evaluated and split polygons containing >1 point, where point data differed. Examples:

    o a polygon with 2 points assessed as longleaf was split based on differing assessment data and aerial photo signature

    o a polygon with a combination of points indicating different survey statuses, e.g. assessed as longleaf, excluded as not longleaf, and/or no access, was split based on aerial photo signature

    o a single polygon with multiple points indicating 'not longleaf' was not split because information contained in the points was the same for all areas of the polygon. The same was true if all points in a polygon indicated 'no access'

- Reviewed large polygons with only a single point indicating assessed as longleaf

    o Split polygon if non-uniform (e.g. multiple aerial photo signatures), or other indication that assessment was limited to one part of the polygon

    o After split, portions of polygon no longer contained a point and reverted to their pre-assessment status

- Contacted individual County Foresters to resolve questions

A spatial join operation was run in GIS to assign the cleaned point data to polygons in the LPEGDB. Further QA/QC of the database after integration of all data sources (described below) resulted in additional, mostly minor revisions to the rapid assessment polygons. Examples include deletion of some polygons identified as 'not

longleaf' (roads, wetlands, etc); and replacement of 2017 rapid assessment data with more current or precise assessment data from another source.

The v.4 Rapid Assessment confirmed an additional 247,000 acres of longleaf pine, 96% of which was assessed for ecological condition.

Landowner Outreach

We anticipated needing to contact private landowners to help fill remaining information gaps. FNAI and FFS hosted a meeting with longleaf partners on August 30, 2016 to discuss mechanisms for private land owner (PLO) outreach and participation in landscape-scale data collection on longleaf pine stands. The intent of this meeting was to develop a plan for contacting PLOs, both commercial and private individuals, to request spatial data for their longleaf stands and potentially to access their lands for field assessment. Participants provided input on strategies such as how to address land owner concerns and promote the benefits of participation, how to leverage existing relationships with land owners and PLO organizations, and how to prioritize data collection.

Following recommendations from the meeting we developed several outreach tools aimed at PLOs:

- FNAI worked with FFS to prepare a project fact sheet with frequently asked questions to assist County Foresters in communicating about the project. The document was intended as a tool to provide answers to common questions that were anticipated to be asked by private landowners. County Foresters were encouraged to distribute the fact sheet to private landowners or at public events, as a way to increase awareness of the project and provide information about how landowners could participate in data collection if interested.
- FFS developed a data request flyer that was published in the Fall/Winter 2016 edition of Florida Forests, the magazine of the Florida Forestry Association.
- FNAI developed the Longleaf Pine Online Rapid Assessment Geoform, an ESRI application that enables users to provide stand location information on a map and fill out a rapid assessment form about the occurrence and condition of longleaf pine in the stand. The Geoform tool was made accessible online via the FNAI and FFS longleaf pine web pages.
- FNAI and FFS published an article in the Winter-Spring 2018 edition of the Florida Land Steward Newsletter. The article described the project and provided a link to the online Geoform.

By far the most successful PLO outreach was through the County Foresters. Comments associated with data collection points indicated some of the assessment information came directly from speaking with landowners or consulting foresters. The Geoform resulted in very few submissions since its publication in March 2018 until the project completion in August 2018. The Geoform will remain active through at least the end of 2019.

We also conducted a spatial analysis to identify the top 10 industry owners with remaining gaps in the LPEGDB. During the outreach strategy meeting our partners advised that obtaining data from industry lands would be difficult. We corresponded with one of the companies but were not successful in obtaining spatial information for longleaf pine occurrence. Subsequently we decided to focus effort on filling gaps for other lands and by other means described in this report.

Mining Existing Data Sources

During the first phase of work on the LPEGDB we were successful in obtaining longleaf stand locations directly from many state and federal agencies. There were, however, still some known gaps, especially for Florida's Water Management Districts. We also were aware of updates to some of the stand databases that previously had been

incorporated into the LPEGDB in 2014. FNAI also has continued new field data collection for numerous datasets included in earlier versions of the LPEGDB. In addition, we acquired research-grade, high precision occurrences of longleaf pine from two sources included within the USGS BISON database: INaturalist and Carolina Vegetation Survey plots. New and updated data sources obtained for inclusion in LPEGDB v.4 are listed in Table 5. Descriptions of all source datasets and the crosswalk of attributes into the LPEGDB are described in Appendix C.

After most data sources, including the Rapid Assessment, had been integrated into a draft of the database, we worked to fill gaps for remaining large polygons with high likelihood of longleaf pine occurrence. Polygons that were at least 200 acres and adjacent to existing longleaf polygons were reviewed. We contacted knowledgeable individuals, e.g. state park biologists, reviewed management plans, and consulted various other sources to obtain information about the occurrence of longleaf on selected sites. We also conducted limited field surveys to fill several gaps.

Table 5. Status of longleaf pine data sources obtained for inclusion in LPEGDB v.4

Source	Dataset	Status in LPEGDB v.4
Florida Forest Service	State Forest Stands Database 2017	Update
	Community Forestry Assistance Database 2017	Update
U. S. Forest Service	National Forest Stands Database 2018	Update
St. Johns River WMD	SJRWMD Forest Stands 2018	Update
Suwannee River WMD	SRWMD Longleaf Planting Areas 2012-2018	New
Northwest Florida WMD	Longleaf Pine Dominant Stands 2018	New
FNAI	Natural Community Mapping Points	Update
	Objective-Based Vegetation Management – Monitoring Points	Update
	FNAI Element Occurrence Database	Update
	FNAI Other Survey Data (Florida Forever Project Evaluations, Conservation Easement Monitoring, etc)	Update
U.S. Geological Survey (compiled from INaturalist and Carolina Vegetation Survey plots)	Biodiversity Information Serving Our Nation (BISON) – compiled data (downloaded Aug 2018)	New

Integration of Data Sources into the LPEGDB

We updated the LPEGDB with the 2016-17 Rapid Assessment data, and the new and updated data sources described above. The overall database was also updated to include the latest conservation land boundaries. We also calculated area of intersection with the latest Cooperative Land Cover Map (v3.2.5) to update the Major Land Cover field for each polygon. Integration required quality assurance and control procedures for polygon spatial geometry and attributes. The primary task and challenge with integrating datasets from multiple sources is the crosswalk of ecological condition attributes which vary between sources. Although a crosswalk for condition had been developed and applied in previous versions of the database, revisions to the crosswalk and assessment fields required re-processing of all existing condition data in the database.

Quality Assurance and Control

Polygon integrity

Small polygons and slivers are inadvertently created during GIS overlay operations to update polygon boundaries. The FNAI Conservation Lands database is continually improved such that managed area boundaries often shift in alignment, which results in slivers as these are integrated in the LPEGDB. Other geometry problems were introduced during integration of new data sources, including the deployed assessment polygons some of which had been modified to align with ownership boundaries during the prioritization process. All polygons < 0.5 acres were deleted to conform to the LPEGDB minimum mapping unit. Slivers >0.5 acres were detected by calculating a thinness ratio and also by visual inspection. Although many slivers were removed with this method, not all could be automatically selected without also selecting valid LPE polygons. Removal of slivers often left small gaps between polygons, especially along conservation land boundaries. We also removed small isolated polygons that were <3 acres and at least 50 m from any other polygon. Occurrences of overlapping polygons were resolved.

Data sources

The sources of all data were recorded in the Data_Source field of the database. Conflicts between data sources were reviewed and resolved. In many cases the source was attributed to more than one agency or dataset. For example, a data source entry of "FFS State Lands Inventory v4; FNAI Field Survey v4" can indicate that the stand boundary and stand-level attributes came from FFS, but that other attributes were derived from an FNAI survey. A summary of data sources is provided in Appendix C.

Confidence tiers

Confidence Tier is intended to reflect the strength of evidence for occurrence of longleaf pine. Its primary use is to help target priorities for future surveys but also to enable informative summaries of current knowledge. Confidence Tier was updated simultaneously with the addition of new data sources and the update of land cover, which provides the primary distinction between Confidence Tiers 3 and 4 (Table 6). In LPEGDB v.4 we added a new tier – 0A – to identify stands that were assessed during field surveys as longleaf pine, but where assessment data indicated that longleaf pine occurred only as a remnant.

Table 6. Tiers assigned to LPEGDB polygons to describe confidence in LPE occurrence based on existing data.

Tier	Description
1A	Longleaf pine was observed and condition data are available for at least 3 assessment fields. These areas do not need further assessment.
1	Longleaf pine was observed; we have high confidence that this is a longleaf pine site; existence of condition data are not confirmed.
2	Longleaf pine was observed but the observation may not reflect current conditions, or longleaf pine is assumed from red-cockaded woodpecker records but not directly observed. We have some reasonable indication of longleaf but there is some uncertainty because of the year of observation or indirect confirmation.
3	The CLC polygon is classified as sandhill, upland pine, or upland mixed woodland; longleaf pine has not been confirmed; or longleaf pine was observed but the spatial accuracy of corroborating source is low. Confidence is based solely on the natural community type. Sandhill, upland pine and upland mixed woodland identified from an aerial photo signature are expected to have a longleaf pine canopy.
4	The CLC polygon is classified as mesic, wet or scrubby flatwoods, upland coniferous, coniferous plantation, or other type if primary source of the polygon was not CLC. Confidence is based solely on the natural community type or stand source. We are uncertain of the current presence of longleaf pine in these landcover types.
0	A data source indicates that longleaf pine is absent in the stand; site is not considered a longleaf pine ecosystem.
0A	The polygon was assessed and assesment data indicate that longleaf pine occurs only as a remnant; site is not considered a longleaf pine ecosystem.

Land cover review

The polygons in the LPEGDB are intended to represent longleaf pine sites and other current pinelands that potentially could be (or could have been) longleaf pine. A major source in the original database, and that still remains, are pinelands from an earlier version of land cover. Over time some of these have become out of sync with current land cover. Also, many stand-based data sources do not align well with land cover.

To minimize inclusion of non-pineland sites, polygons with major land cover type other than Upland Coniferous, Upland Pine, Sandhill, Mesic Flatwoods, Scrubby Flatwoods, Coniferous Plantations, Wet Flatwoods, and Wet Coniferous Plantations were reviewed with aerial photography to determine if the entire class or a subset could be removed from the database. Classes with few polygons were comprehensively reviewed; classes with many polygons (>100) were partially reviewed to help inform a decision about the class as a whole. For large classes we also focused on polygons where longleaf was indicated, to improve accuracy of that set. Deletions were applied conservatively, especially to forested hardwood classes where confusion between classes is common, and to open grassland classes such as pasture and dry prairie which often can be sparsely treed mesic flatwoods. Most deletions corresponded to high intensity development, roads, and some wetlands. A comprehensive review was not performed.

LPE Ecological Conditions Crosswalk

The main challenge with integrating datasets from multiple sources is the crosswalk of ecological condition attributes which vary between data sources. Condition data from multiple sources, including the two Rapid Assessment datasets (2013 and 2017), were crosswalked into three management levels described in the Range-wide Conservation Plan for Longleaf Pine (America's Longleaf 2009): acres to maintain, acres to improve, and acres to restore.

The crosswalk of attributes to management levels originally described in the LPEGDB v.1 Final Report (FNAI and FFS 2014), was updated to include the revised rapid assessment metrics and to reflect more recent efforts to quantify desired condition. Several groups have drafted criteria for canopy, midstory, and ground layer conditions designed to represent these management levels, especially the 2014 ALRI Longleaf Pine Maintenance Condition Class Definitions and NatureServe's Field Manual for Rapid Assessment Metrics for Wildlife and Biodiversity in Southern Open Pine Ecosystems ([SOP]; Nordman and White 2016). We attempted to follow the ALRI metrics where feasible but criteria from other schemes were also used to complete the crosswalk (Table 7).

In some cases, the assessment class break values did not exactly correspond to the management class criteria values and a 'best fit' approach was used to crosswalk actual assessment attributes into management classes. For example, the recommended desired condition for herbaceous cover is >40% (LMWG 2011) but the closest herbaceous cover class assessment range was 36 – 45%. All areas within this range or greater (i.e. >35%) were crosswalked as acres to maintain.

Table 7. Management class criteria assigned to LPEGDB ecological condition attributes.

Attribute	Management Class			Source*
	Maintain	Improve	Restore	
Longleaf Pine Canopy	Dominant	Codominant to Occasional-Rare	Absent	LMWG, FNAI
Longleaf Pine Age Structure	Multiple (2+) age classes	One age class	Absent from canopy	ALRI
Older Mature Characteristics[a]	Yes	Not Evident		ALRI
Longleaf Pine Regeneration[a]	>1%	<1%	Not evident	SOP
Longleaf Pine Basal Area[b]	30 - 80	10-20 or >80	Absent	FNAI
Other Pine Cover	<15%	15 - 45%	>45%	FNAI
Canopy Hardwood Cover	<5%	5 - 35%	>35%	ALRI, FNAI
Midstory Cover[b]	<15%; OR <25% if Fire Tolerant Hardwoods 5-15%; OR <35% if Fire Tolerant Hardwoods 15-25%	15 - 45%	>45%	FNAI
Fire Tolerant Hardwoods Cover[b,d]	<25%	25 - 45%	>45%	FNAI
Tall Shrub Cover[a]	<15%	15 - 45%	>45%	FNAI, SOP
Short Shrub Cover[a]	<30%	30 - 50%	>50%	ALRI, SOP, FNAI
Shrub Cover[c]	<30%	30 - 50%	>50%	ALRI, SOP, FNAI
Herbaceous Cover	>40%	10 - 40%	<10%	LMWG, SOP, FNAI
Pyrogenic Grass Cover	>20%	1 - 20%	<1%	ALRI, FNAI
Pasture Grass Cover	<1%	1 – 15%	>15%	FNAI
Invasive Plant Cover	<1%	1 – 3%, or few patches, or present along perimeter only	>3%, or many patches within	FNAI, SOP
Condition Rank	Excellent to good	Fair	Poor	FNAI

*Crosswalk criteria source: ALRI = America's Longleaf Restoration Initiative 2014; LMWG = Longleaf Measures Work Group Draft 2011; SOP = Southern Open Pine, from Field Manual for Rapid Assessment Metrics for Wildlife and Biodiversity in southern Open Pine Ecosystems (Nordman and White 2016).

[a]Metric added in LPEGDB v.4

[b]Management class crosswalk modified in v.4

[c]Metric carried over from LPEGDB v.3, but not collected in v.4 rapid assessment

[d]Metric definition changed from a canopy metric in v.3 to a midstory metric in v.4

RESULTS

LPEGDB Version 4

Statewide LPE Occurrence and Distribution

The LPEGDB v.4 contains confirmed locations of approximately 2.36 million acres of longleaf pine ecosystems in Florida, with most (72%) having some level of ecological condition data (Table 8; Fig. 2).

A primary objective of this phase of the project was to fill the remaining data gap of approximately 4.9 million acres, mostly pine plantation, where the occurrence of longleaf pine forests was uncertain. The v.4 Rapid Assessment confirmed the absence of longleaf on almost 2.7 million acres that were previously identified as

potential for occurrence of longleaf. The remaining gap has now been reduced to about 2.3 million acres, with a majority occurring on industry lands.

Table 8. Status of LPE occurrence on managed conservation lands and private lands as determined by Rapid Assessment and other data sources in the LPEGDB. The sum of the first two rows in the Total Acres column equals the rounded 2.36 million acres of LPEs confirmed by this project.

LPE Occurrence	Managed Conservation Lands	Permanent Conservation Easements	Other Private Lands	Total Acres
LPE Confirmed: ecological data available	817,322	50,332	827,747	1,695,400
LPE Confirmed: ecological condition undetermined	580,890	21,171	67,010	669,071
LPE Assumed: sandhill, upland pine, upland mixed woodland	26,847	3,803	23,436	54,086
LPE Unknown: mesic, wet, and scrubby flatwoods	112,318	26,873	260,914	400,105
LPE Unknown: pine plantation and other land cover classes	133,153	101,302	1,631,749	1,866,203
LPE Does Not Occur	1,070,330	71,924	2,911,498	4,053,752
Total	2,740,859	275,405	5,722,353	8,738,617
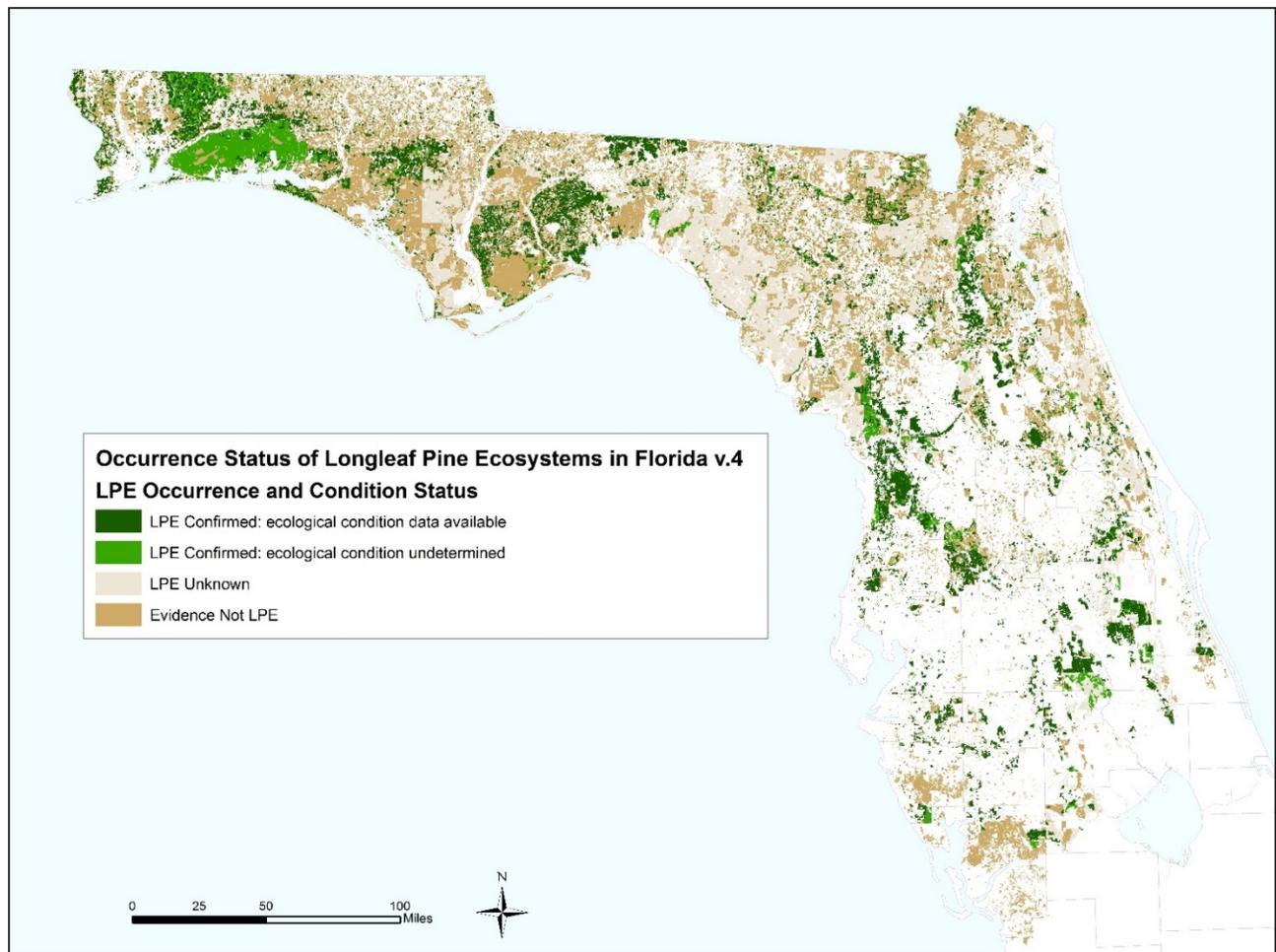
Figure 2. Occurrence status of longleaf pine ecosystem sites in the LPEGDB v.4.

According to America's Longleaf 2013 Range-Wide Accomplishment Report, longleaf pine dominant ecosystems total 4.28 million acres in the U.S. In Florida, longleaf dominant sites make up at least 1.26 million (53%) of the total longleaf acreage; we also assume some portion of those confirmed longleaf sites that currently lack additional information, will also be longleaf dominant. Moreover, the 3% of acreage in which longleaf occurs only outside the canopy, are largely young longleaf pine plantations with potential to become canopy longleaf in the future (Fig. 3).

Sites where longleaf pine is co-dominant or a minor component of the system may indicate sites with restoration potential. America's Longleaf Restoration Initiative recognizes that these could become longleaf-dominant stands through the application of appropriate management and that identification and restoration of these stands will play an important role in attaining the ALRI range-wide goal of eight-million acres of longleaf by 2025 (ALRI 2017).

Longleaf Pine in Canopy
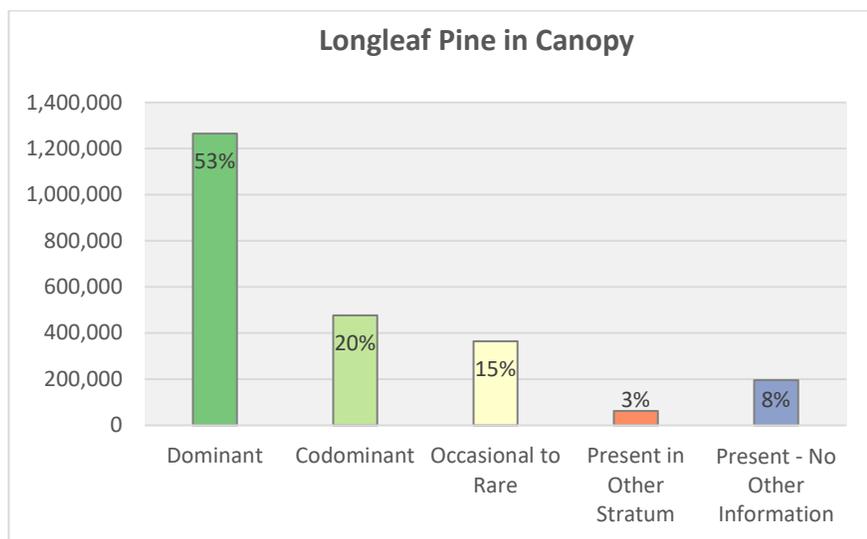
Figure 3. Acreage (vertical axis) longleaf assessed by dominance in the canopy

Patch Size
The Rapid Assessment field metrics for canopy, midstory, and ground cover are designed to provide a ground-level view of ecological condition. Assessment at a landscape scale also provides information about the integrity of the ecosystem, and it can often be evaluated in the absence of ground-truth data, using remote-sensing techniques. Larger patches of longleaf pine are more likely to serve great ecosystem functions such as water purification, aquifer recharge, carbon storage, wildlife habitat, and rare species conservation. These stands are also more likely to be managed to maintain these functions.

To assess patch size, we defined a longleaf pine 'patch' as a single polygon >30 m from any other longleaf polygon, or a set of longleaf polygons that occur within 30 m of each other. The 30-m distance was chosen to allow polygons separated by small roads to count as a single unit. Longleaf sites were then assigned to a patch size class, which was also recorded for each longleaf polygon within the database. The top four size classes follow those proposed by NatureServe in a 2018 draft update of their Southern Open Pine metrics. We added a lowest class for '<40 acres' because 40 acres was the threshold applied to the polygons deployed for rapid assessment (Table 8).

Inclusion of patch size classes in the LPEGDB should also facilitate comparison of longleaf pine acreage with other reporting systems. Table 9 shows the distribution of acreage for longleaf pine dominant or codominant sites plus sites where longleaf pine was confirmed but no additional information was available. More than 70% make up patches of at least 500 acres.

Table 9. Distribution of acreage within patch size classes for sites with longleaf dominant or co-dominant in the canopy and sites where longleaf was confirmed but without additional information.

Patch Size Class in Acres	Total Acres within Size Class	
>=10,000	580,852	30%
2,000 - 9,999	408,145	21%
500 - 1,999	373,931	19%
40 - 499	489,666	25%
<40	85,023	4%
Total	1,937,620	100%

Ecological Condition

The viability of Florida longleaf pine ecosystems depends on maintaining structure and composition necessary to minimize competition for light, water, and nutrients as well as encourage recruitment. Range-wide goals put forth by ALRI include acreage targets for restoring, improving, and moving stands into maintenance condition. Assessing ecological condition is critical for measuring progress toward these goals and for restoration and management planning at multiple scales. Figures 4 through 6 summarize data within the LPEGDB describing various aspects of structure and composition. Note that the total acres evaluated for each metric varies because data sources differ in which metrics were recorded. The statewide snapshot of condition shows that less than half of LPE acreage is at the maintain level for three condition indicators: hardwood in canopy (27% of acres), herbaceous cover (22% of acres), and pyrogenic grass cover (34% of acres).
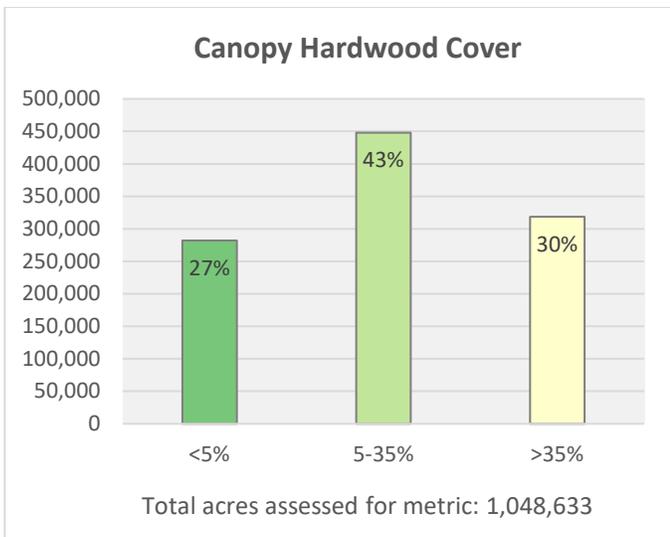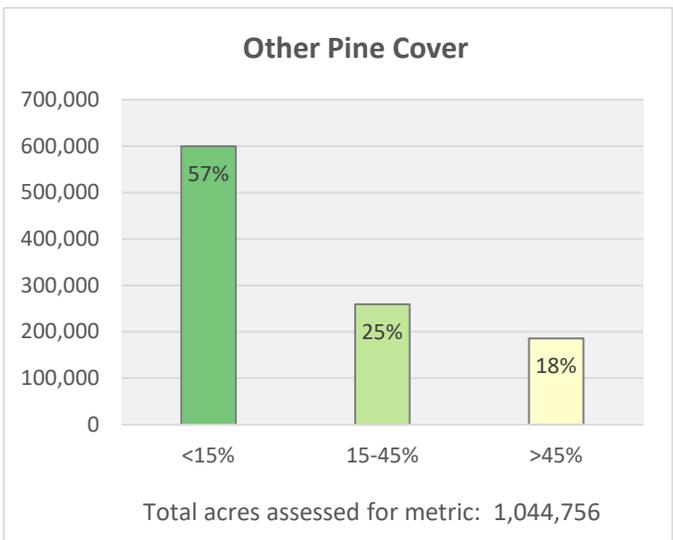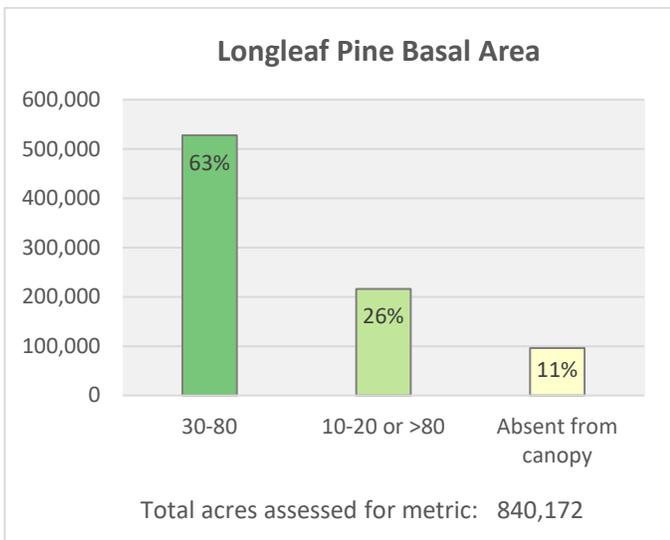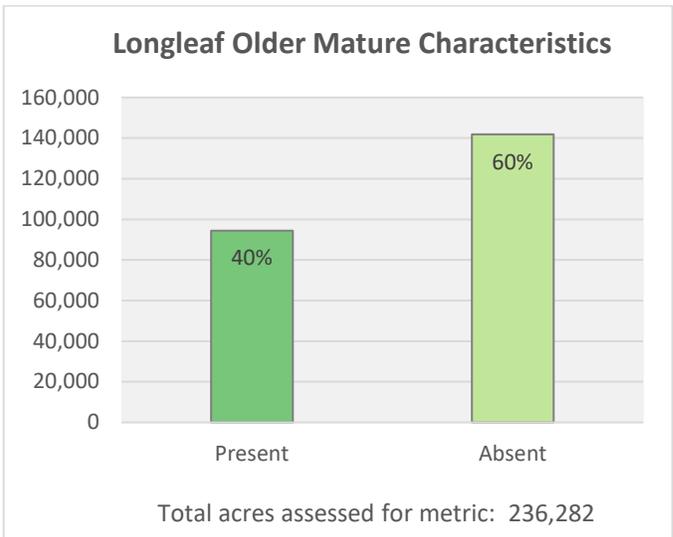
Longleaf Pine Age Structure

Total acres assessed for metric: 1,425,710

- Multiple (2+) age classes: 65%
- One age class: 33%
- Absent from canopy: 2%

Longleaf Older Mature Characteristics

Total acres assessed for metric: 236,282

- Present: 40%
- Absent: 60%

Longleaf Pine Basal Area

Total acres assessed for metric: 840,172

- 30-80: 63%
- 10-20 or >80: 26%
- Absent from canopy: 11%

Other Pine Cover

Total acres assessed for metric: 1,044,756

- <15%: 57%
- 15-45%: 25%
- >45%: 18%

Canopy Hardwood Cover

Total acres assessed for metric: 1,048,633

- <5%: 27%
- 5-35%: 43%
- >35%: 30%

Legend

- Maintain
- Improve
- Restore

Figure 4. Acreage (vertical axis) within canopy metric thresholds (horizontal axes) assigned to management classes of maintain, improve or restore. Percent of total acres assessed is shown within data bars. See Table 5 for crosswalk of conditions to management classes.
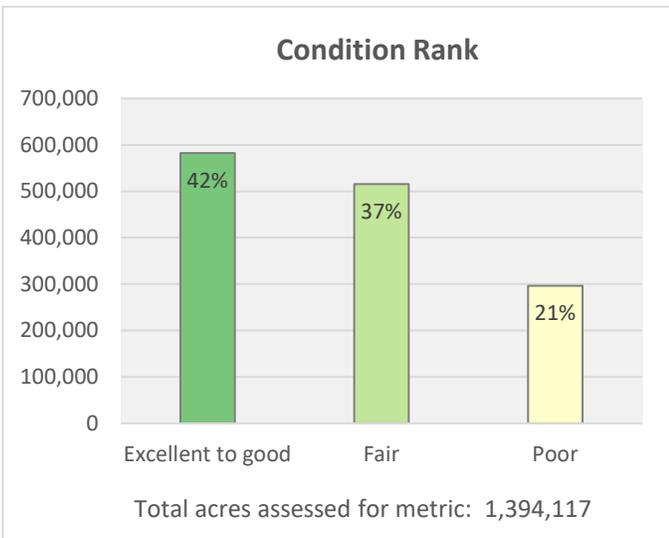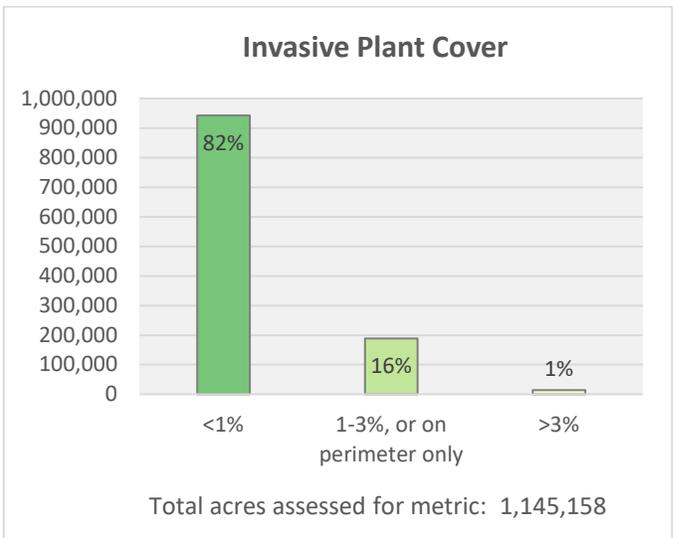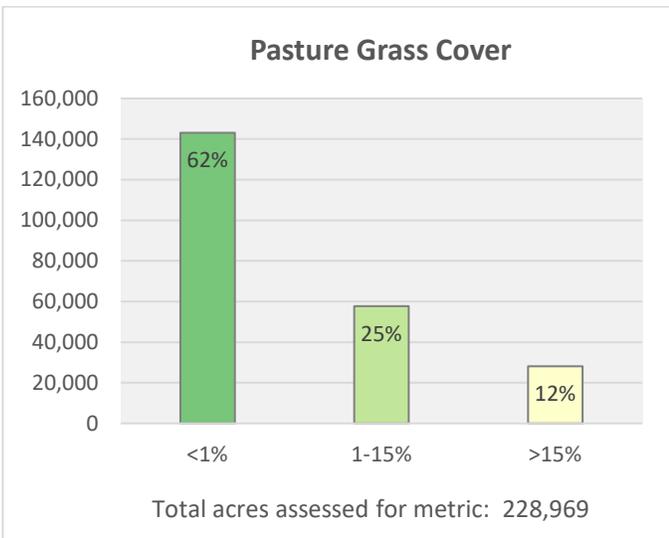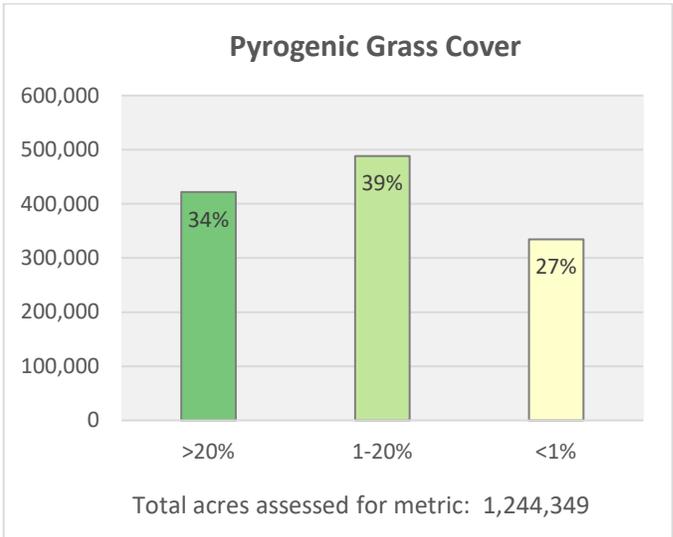
Midstory Cover

Total acres assessed for metric: 1,281,178

61% — <15%*
35% — 15-45%
3% — >45%

Fire Tolerant Hardwood Cover

Total acres assessed for metric: 945,678

80% — <25%
18% — 25-45%
2% — >45%

Tall Shrub Cover

Total acres assessed for metric: 452,403

69% — <15%
22% — 15-45%
9% — >45%

Short Shrub Cover

Total acres assessed for metric: 459,087

61% — <30%
13% — 30-50%
25% — >50%

Shrub Cover

Total acres assessed for metric: 805,070

60% — <30%
16% — 30-50%
24% — >50%

Legend
- Maintain
- Improve
- Restore

Figure 5. Acreage (vertical axis) within midstory and shrub metric cover class thresholds (horizontal axes) assigned to management classes of maintain, improve or restore. Percent of total acres assessed is shown within data bars. See Table 5 for crosswalk of conditions to management classes.

Herbaceous Cover

Total acres assessed for metric: 1,220,953

Pyrogenic Grass Cover

Total acres assessed for metric: 1,244,349

Pasture Grass Cover

Total acres assessed for metric: 228,969

Invasive Plant Cover

Total acres assessed for metric: 1,145,158

Condition Rank

Total acres assessed for metric: 1,394,117

Legend
- Maintain
- Improve
- Restore
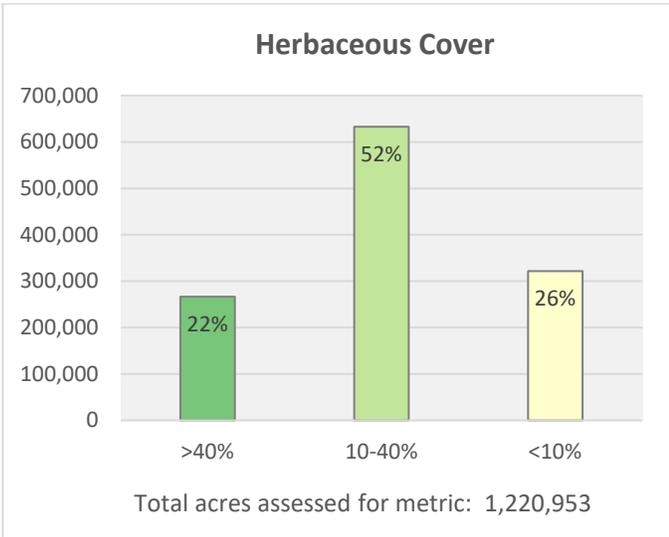
Figure 6. Acreage (vertical axis) within ground layer metric and overall condition rank thresholds (horizontal axes) assigned to management classes of maintain, improve or restore. Percent of total acres assessed is shown within data bars. See Table 5 for crosswalk of conditions to management classes.

Limitations

To make best use of these data users should be aware of the following limitations:

1. The Rapid Assessments conducted by FFS County Foresters largely represent a roadside view of stands and may not accurately capture conditions within all stands. Also, although training facilitated consistent data collection, interpretations differed among the more than 40 individuals who participated.
2. Polygons within the database vary in how they were delineated. In some cases, a polygon represents the extent of a natural community or land cover class which may contain a mosaic of habitat conditions. In other cases, polygons were derived from forest stands, which varied in interpretation among sources. Ideally, each polygon would represent a uniform set of conditions, but even this is subject to interpretation depending on the scale of analysis.
3. All longleaf pine sites in the database do not fit a standard definition of a longleaf pine ecosystem. We allowed this definition to be flexible to accommodate sites with restoration potential. For example, we included assessment of pine plantation which in some cases lacks the composition and structure adequate to be considered functioning LPEs. The same may be true of assessed sites that were dominated by hardwoods and without other apparent indicators of LPEs. The assessment data within the LPEGDB may be used to parse sites based on ecological condition.
4. Steps were taken to assure data quality as described in the methods, but error within the database was not quantified. The large number of records in the database precludes a detailed review of every polygon. Some error associated with assignment of point-based field data to polygons is expected. Errors also were found in some original source data and corrected where possible.
5. The database contains information from many different sources. Methods used to assess ecological condition varied from the Rapid Assessment described here, to stand inventories, to detailed vegetation monitoring. It is also important to recognize that condition information derived from multiple sources spans a large time frame.
6. In order to display condition data from multiple sources, we crosswalked detailed information into more general management classes proposed by ALRI. The thresholds applied here for Maintain, Improve, and Restore represent a reasonable estimate for Florida given the variability in both data and types of longleaf pine ecosystems. However, this crosswalk has not been widely vetted and should only be used to provide a general picture of condition.
7. The location of longleaf pine on many corporate lands remains a data gap in the LPEGDB. Although longleaf stands are not the majority, they are increasing as a component of these lands and important to represent in a statewide view of longleaf pine.   We hope to include these in a future iteration of the database if information and funding become available.

Data Products and Summaries

A recommendation from the August 2014 Longleaf Partners Meeting was for user-friendly formats for displaying, searching, and summarizing LPE data. Several products have been developed to address the needs of both GIS users and those with limited or no GIS experience.

Geodatabase Format and User Guide

Beginning with LPEGDB v.3, the public geodatabase was streamlined to include only two feature classes: 1) LPE_Occurrence_Status which allows users to view and query all potential longleaf sites based on longleaf occurrence status, i.e. whether confirmed, unknown, or absent; 2) LPE_Condition_by_Management_Class which

includes all confirmed longleaf pine sites along with ecological condition data where it exists. Sites that have not been confirmed as longleaf are excluded. Additional fields related to conservation lands, owner type, stand type, land cover, and patch size class (new in v.4) are included within the attribute tables of both datasets to facilitate access to this information. A template for field data collection is also provided as an empty point feature dataset with fields and domains based on the revised Rapid Assessment data collection model.

A revised user guide explains the contents of the database and how to make use of the associated layer files within the ESRI ArcMap environment. See Appendix E.

Web Map Viewer

A web map viewer for LPEGDB v.3 was developed using ESRI Web Application Builder for ArcGIS Online. The map services are hosted and maintained by FNAI. In the current design, users are able to toggle map displays for longleaf occurrence status and ecological condition by management class. Background layers for counties and Conservation Lands are also available for display. The Longleaf Pine Map Viewer was updated to display data from LPEGDB v.4.

Data Summaries

At the August 2014 Longleaf Partners meeting, users requested specific types of data summaries. In response, acreage summaries with accompanying maps have been prepared for attributes related to land manager type, land cover, and counties.

Table 10 summarizes the acreage of confirmed longleaf by Manager Type with a breakdown by managing agency for federal and state conservation lands. Both GIS and web map users will have the ability to search and display longleaf sites by managing agency or manager group (Fig. 7). Note that Conservation Easements, although privately owned and managed, are typically monitored by the easement holder which may be federal, state, local, or private. In the FNAI Conservation Lands database, the managing agency for conservation easements is listed as the easement monitor. For the LPEGDB, easements appear as a separate subset within the Manager Group attribute. Table 10 shows that almost half of existing longleaf pine in Florida is managed by US Dept. of Defense, US Forest Service, and Florida Forest Service, and over one-third is managed by private individuals or entities.

Figure 8 summarizes and displays acreage of confirmed longleaf by land cover types that have been grouped into categories for Sandhill/Upland Pine, Flatwoods (includes Scrubby, Dry, Mesic, and Wet Flatwoods), Coniferous Plantations (includes upland and wet plantation), and Other land cover types. The Other category is largely composed of (59%) 'Upland Coniferous', 'Mixed Hardwood Coniferous' and 'Rural' land cover types, all of which tend to have aerial photo signatures with semi-natural components. Sandhill and Upland Pine represent the largest portion of known longleaf. Both GIS and web map users have the ability to search and display by land cover type.

Table 11 summarizes acreage per county for both confirmed longleaf sites and potential longleaf sites where occurrence is unknown. Okaloosa and Santa Rosa Counties have the largest acreages of longleaf pine with most occurring on Eglin Air Force Base and Blackwater River State Forest. Taylor County has the largest remaining unknown acreage, with most occurring as large areas of corporate pinelands.

Table 10. Acres of confirmed longleaf pine ecosystems by manager type.

Manager Type		Acres
Federal Conservation Lands		**629,459**
US Dept. of Defense	342,033	
US Fish and Wildlife Service	20,758	
US Forest Service	265,795	
Federal Conservation Lands- Other	873	
State Conservation Lands		**711,723**
FL DEP, Florida Coastal Office	1,166	
FL Fish and Wildlife Conservation Commission	80,331	
Florida Forest Service	392,842	
Florida Park Service	74,368	
Northwest Florida Water Management District	24,725	
South Florida Water Management District	1,599	
Southwest Florida Water Management District	56,817	
St. Johns River Water Management District	23,873	
Suwannee River Water Management District	17,404	
State Conservation Lands- Other	38,598	
Local Conservation Lands		**41,414**
Private Conservation Lands		**15,616**
Conservation Easements & Mitigation Banks		**71,503**
Other Private Lands		**894,757**
Total		**2,364,472**
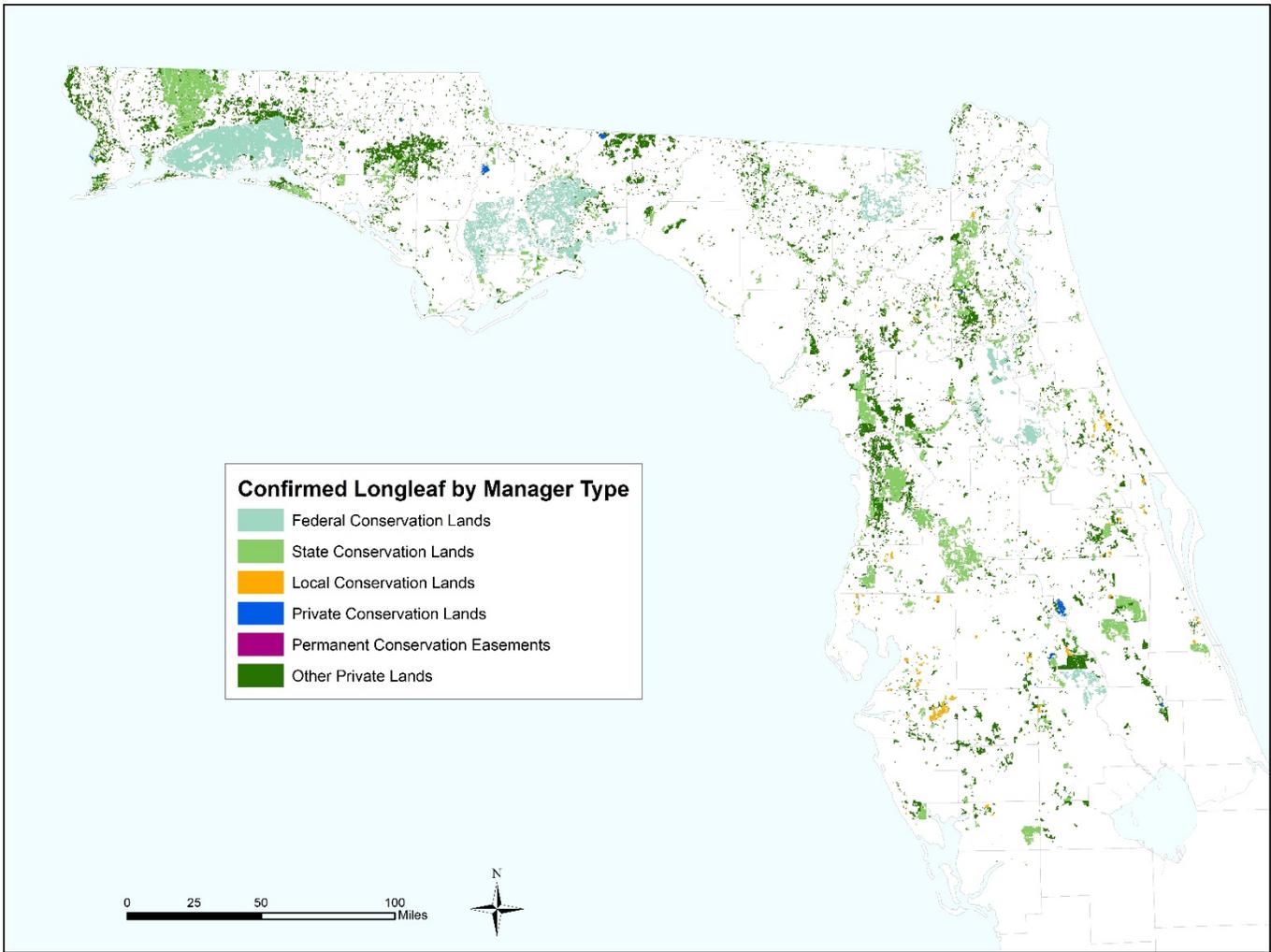
Figure 7. Occurrence of confirmed longleaf pine ecosystem sites in LPEGDB v.4 by manager type
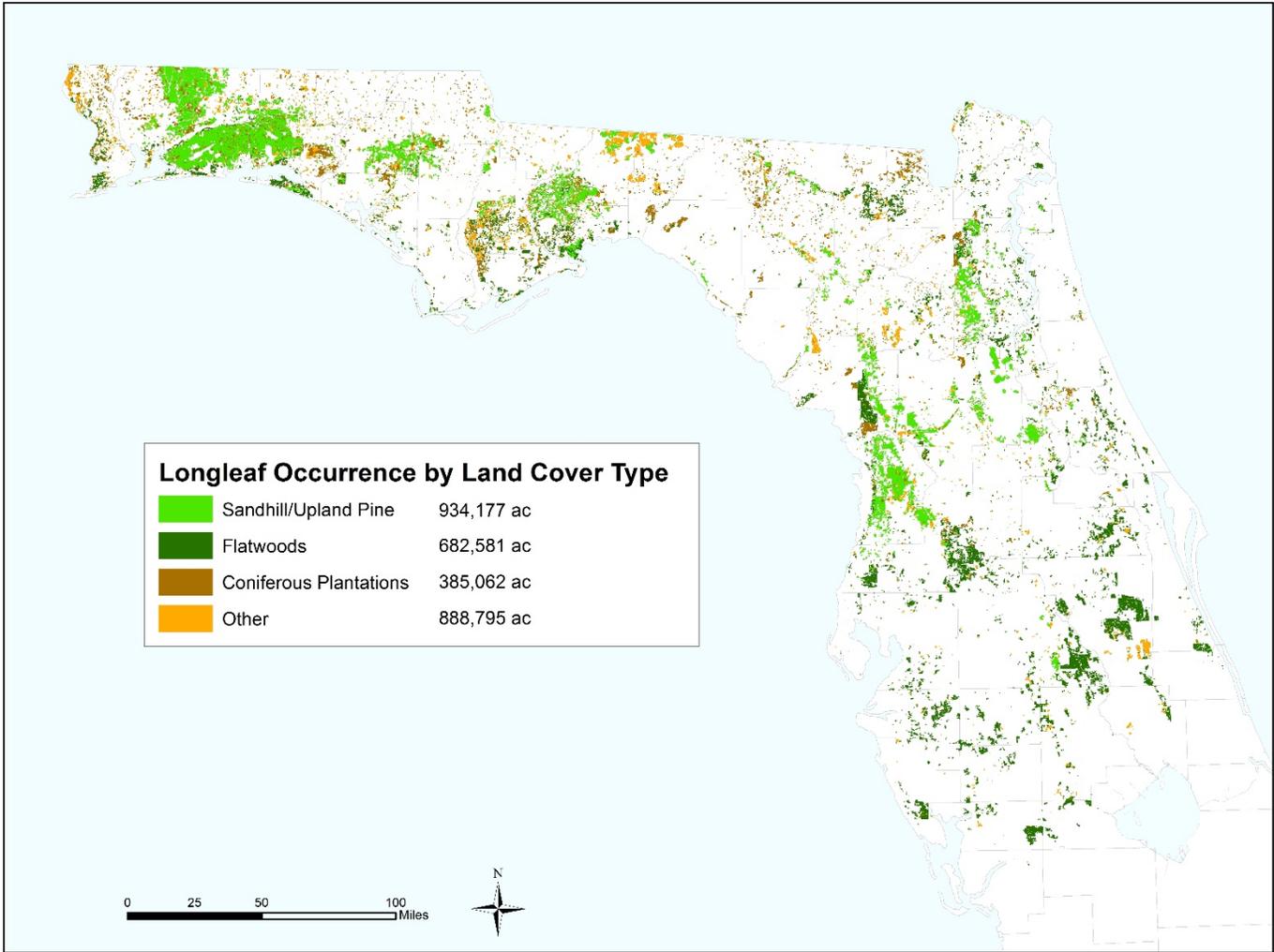
Figure 8. Occurrence of confirmed longleaf pine ecosystem sites in LPEGDB v.4 by land cover type.

Table 11. Acres by county for confirmed longleaf pine sites and sites where longleaf occurrence is potential but unknown.

COUNTY	Longleaf Pine Confirmed	Longleaf Pine Unknown	COUNTY	Longleaf Pine Confirmed	Longleaf Pine Unknown
ALACHUA	36,619	41,917	JEFFERSON	40,895	20,853
BAKER	27,961	76,293	LAFAYETTE	5,285	64,966
BAY	36,824	47,679	LAKE	36,604	7,293
BRADFORD	3,692	37,188	LEE	168	5,337
BREVARD	14,814	22,347	LEON	93,626	36,259
CALHOUN	11,154	143,891	LEVY	81,962	80,501
CHARLOTTE	19,275	7,801	LIBERTY	82,126	32,145
CITRUS	89,309	6,007	MADISON	20,498	67,346
CLAY	69,991	49,792	MANATEE	22,813	15,311
COLUMBIA	31,333	59,437	NASSAU	15,486	69,220
DESOTO	10,699	11,007	OKALOOSA	249,145	49,747
DIXIE	3,404	134,785	OKEECHOBEE	7,555	4,262
DUVAL	12,901	36,836	ORANGE	38,569	27,245
ESCAMBIA	58,088	29,967	OSCEOLA	80,330	46,112
FLAGLER	1,809	67,415	PASCO	34,043	3,817
FRANKLIN	25,493	14,552	PINELLAS	1,352	499
GADSDEN	9,550	18,984	POLK	93,144	52,874
GILCHRIST	11,518	28,169	PUTNAM	62,099	55,720
GLADES	8,594	32,356	SANTA ROSA	198,573	36,923
GULF	6,374	106,843	SARASOTA	13,821	4,187
HAMILTON	14,554	44,327	SEMINOLE	3,895	2,880
HARDEE	18,877	11,153	ST. JOHNS	3,751	49,892
HERNANDO	56,666	3,038	SUWANNEE	29,423	29,922
HIGHLANDS	24,742	36,493	TAYLOR	13,241	230,970
HILLSBOROUGH	14,764	6,691	UNION	2,732	41,468
HOLMES	5,958	16,987	VOLUSIA	38,559	59,873
INDIAN RIVER	779	8,457	WAKULLA	73,725	9,701
JACKSON	34,974	25,444	WALTON	182,548	19,681
			WASHINGTON	53,285	12,537

SUMMARY AND RECOMMENDED USES

The LPEGDB project goal to collect comprehensive information on condition and distribution of longleaf pine forests throughout Florida was ambitious and largely successful, with 2.36 million acres of longleaf pine confirmed on public and private lands. Although there is not a formal update plan for the Florida database, we anticipate being able to publish minor updates on an annual basis. The Geoform will remain active for the foreseeable future as a tool for landowners, managers, and others to provide information. FNAI is now building on this work to develop a similar database for longleaf pine in the Southeast with the support of ALRI, NRCS, and other partners.

The LPEGDB is intended to provide a snapshot of current conditions. We encourage use of the data for mapping and summarizing longleaf pine information, with an understanding of the limitations described above. The database is structured to facilitate reporting for longleaf occurrence or for various longleaf condition metrics, by the following categories:

- Managing Agency

- Owner Type (private vs public)

- County

- Stand Type

- Land Cover Type

- Size

By integrating multiple sources into a single system for ecological condition data, the LPEGDB enables users to evaluate quality for different purposes and at multiple scales. Recommended uses include the following:

- Identify existing high quality sites. It is most efficient to maintain existing high quality sites rather than lose them and attempt to restore.

- At a local scale, assist land managers in measuring progress toward ecological goals for stands and forests.

- At State or Local Implementation Team scales, assist in measuring progress toward forest management and conservation planning goals.

- At a regional scale, assist America's Longleaf partners in understanding progress toward target of 3.4 million acres in "maintenance class" by 2025.

We welcome suggestions on ways to improve user experience, including additional reporting needs. Users are encouraged to submit new information, corrections, and other feedback to FNAI and FFS.

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Appendix A.
Longleaf Pine Ecosystem Rapid Assessment Field Descriptions, December 2016

Field Name: Survey Date

Field Abbreviation: SURVEYDATE

Definition: Date of the field assessment

Field values: yyyy/mm/dd

Rationale: Enables assessment of data age

_____

Field Name: LLP Dominance

Field Abbreviation: LLP_DOM

Definition: Indicates the presence and dominance of LLP in the canopy. Field values are defined as follows:

Dominant:	LLP occupies the highest percentage of area of the canopy species
Codominant:	LLP occupies approximately the same percentage as other canopy species
Occasional-rare:	LLP present in the canopy but a low percentage relative to other species
Absent:	LLP not present in the canopy

Field values:
- Dominant
- Codominant
- Occasional-Rare
- Absent

Rationale: Documentation of the presence and dominance of LLP in the canopy helps to determine if that stand qualifies as a LLP site and if restoration is required for the stand.

_____

Field Name: LLP Age Structure

Field Abbreviation: LLP_AGE

Definition: Indicates the age structure of LLP in the canopy AND sub-canopy

Field values:
- at least 3 age classes
- 2 age classes
- 1 age class
- absent from canopy

Rationale: Knowledge of the age structure of the stand help determine if improvements are indicated. Natural stands tend to have multiple age classes which contribute to structural diversity in the stand which provides habitat for a variety of wildlife and plant species. It generally indicates that sunlight is reaching the ground which is beneficial to the groundcover and the plants and animal species that comprise LLP systems. It also indicates that the stand does not require additional planting for the continuance of LLP.

_____

Field Name: Older-mature Characteristics

Field Abbreviation: OLDER_LLP

Definition: Indicates the presence of flat-topped trees (more than one) within the stand.

Field values:

- yes
- not evident

Rationale: Older-mature trees are potential red-cockaded woodpecker cavity trees and are an indication of structural diversity of the stand.

_____

Field Name: LLP Early Regeneration

Field Abbreviation: LLP_EARLY

Definition: Estimated cover of LLP regeneration that is <6' tall.

Field values:

- not evident
- < 1%
- 1 - 5%
- 5 - 15%
- >15%

Rationale: Regeneration is an indicator of the potential sustainability of the stand. It may also indicate the need for planting or active management of the stand such as burning and thinning to encourage seed germination. Values in this field were chosen to be consistent with Americas Longleaf Restoration Initiative

_____

Field Name: LLP Advanced Regeneration

Field Abbreviation: LLP_ADVANC

Definition: Estimated cover of LLP regeneration that is 6-16' tall

Field values:

- not evident
- < 1%
- 1 - 5%
- 5 - 15%
- > 15%

Rationale: Advanced regeneration is an indicator of the immediate sustainability and health of the stand. Trees in this category are less susceptible to scorch during prescribed fire and can quickly replace the canopy following thinning or larger-scale cutting. Presence of these trees may eliminate or reduce the need for site-preparation for planting which can be detrimental to groundcover plants.

_____

Field Name: LLP Basal Area:

Field Abbreviation: LLP_BA

Definition: Estimated basal area in square feet per acre of LLP for the entire stand rounded to the nearest ten.

Field values: 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, >120

Rationale: Although traditionally used as a measure of volume of timber, basal area is a widely used measure of the dominance of tree species. It is repeatable using a 10x or 5x basal area prism or gauge. Basal area values are used in recommendations for various wildlife species habitat including red-cockaded woodpecker and northern bobwhite.

_____

Field Name: Hardwood Cover

Field Abbreviation: HW_COV

Definition: Percentage of the ground within the stand covered by the general extent of hardwood species within the canopy; typical species are laurel oak, water oak, sweetgum, live oak, sand live oak. **Spaces between leaves and stems count as cover.**

Field Values:

Code	Description
1	< 1%
3	1 - 5%
10	6 - 15%
20	16 - 25%
30	26 - 35%
40	36- 45%
50	46 - 55%
60	55 - 65%
70	66 - 75%
80	76 - 85%
90	86 - 95%
98	96 - 100%

Rationale: High levels of hardwood in the canopy are generally detrimental to LLP systems because they shade groundcover. Reduced groundcover means less fuel to carry fire and less cover for wildlife species. Leaf litter from hardwood trees is less flammable than native groundcover further reducing the effectiveness of prescribed fires and allowing continued invasion by hardwood species.

_____

Field Name: Other Pine Cover

Field Abbreviation: OTHPINE_COV

Definition: Percentage of the ground within the stand covered by the general extent of pine species other than LLP within the canopy (any stem greater than 16 feet tall); **Spaces between leaves and stems count as cover.**

Field values: see HW_COV above

Rationale: Other pine cover is included to help fulfil one of the attributes in America's Longleaf Restoration Initiative as well as to get a full picture of the pine composition of the site.

Field Name: Midstory Cover
Field Abbreviation: MIDSTORYCOV

Definition: Percentage of the ground within the plot covered by the general extent of woody plants other than LLP from 10 feet tall to bottom of the canopy; **spaces between leaves and stems count as cover**.

Field values: see HW_COV above

Rationale: High levels of hardwood midstory are generally detrimental to LLP systems because they shade groundcover that is important for fuel to carry fire and cover for wildlife species. Leaf litter from hardwood trees is less flammable than native groundcover further reducing the effectiveness of prescribed fires. Cover of midstory woody species is an indicator of longleaf ecosystem condition.

Field Name: Fire Tolerant Hardwood Cover

Field Abbreviation: FIREHW_COV

Definition: Percentage of the ground within the stand covered by the general extent of turkey oak, sand post oak, bluejack oak, blackjack oak, southern red oak, and dogwood within the midstory (any stem greater than 10 feet tall to the bottom of the canopy); **spaces between leaves and stems count as cover.**

Field values: see HW_COV above

Rationale: High levels of hardwood midstory are generally detrimental to LLP systems because they shade groundcover that is important for fuel to carry fire and cover for wildlife species. Leaf litter from hardwood trees is less flammable than native groundcover further reducing the effectiveness of prescribed fires. However, certain hardwood species are somewhat fire tolerant and are naturally part of several of LLP systems. In order to determine the extent of hardwood species that invade these systems as a result of infrequent fire it is important to record the cover of the fire-tolerant hardwood species.

_____

Field Name: Tall Shrub Cover

Field Abbreviation: TSHRUB_COV

Definition: Percentage of the ground within the plot covered by the general extent of woody plants other than LLP from 3 – 10 feet tall; **spaces between leaves and stems count as cover.**

Field values: see HW_COV above

Rationale: Shrub density and height can affect the suitability of the stand for many wildlife species. A dense tall shrub layer shades the ground, inhibiting longleaf pine regeneration and growth of pyrogenic grasses needed to carry fire.

_____

Field Name: Short Shrub Cover

Field Abbreviation: SSHRUB_COV

Definition: Percentage of the ground within the plot covered by the general extent of woody plants other than LLP <3 feet tall; **spaces between leaves and stems count as cover.**

Field values: see HW_COV above

Rationale: The abundance of short shrubs is an indicator of longleaf pine system condition. Consistent with America's Longleaf Maintenance Condition Metrics and NatureServe Southern Open Pine Metrics V 1.9.

_____

Field Name: Pyrogenic Grass Cover

Field Abbreviation: PYROGR_COV

Definition: Percent cover of native perennial graminoids that are maintained by periodic fire; includes wiregrass (*Aristida stricta*), pineywoods dropseed (*Sporobolus junceus*), Florida dropseed (*Sporobolus floridanus*)*,* Chapman's beaksedge (*Rhynchospora chapmanii*), cutover muhly (*Muhlenbergia capillaris* var. *trichopodes*), toothache grass *(Ctenium aromaticum)*, little bluestem (*Schizachyrum scoparium*) and Florida toothache grass *(Ctenium floridanum*). Does not include switchgrass (*Panicum virgatum*) or *Andropogon virginicus.*

Field values: see HW_COV above

Rationale: Pyrogenic grasses, along with pine needle cast, provide the primary fine fuel in LLP systems. Many of these species are eliminated and slow to recover following ground disturbance.

_____

Field Name: Herbaceous Cover

Field Abbreviation: HERB_COV

Definition: Percent cover of all native non-woody, soft-tissued plants regardless of height, including non-woody vines, legumes, and graminoids (grasses, sedges, rushes); does not include non-native pasture grasses.

Field values: see HW_COV above

Rationale: Herbaceous cover is a general indicator of the amount of light reaching the ground. Although not as important for fuel as the specific subset of pyrogenic grasses, herbaceous cover indicates the ability of the site to carry a fire and is important for many wildlife species.

_____

Field Name: Pasture Grass Cover

Field Abbreviation: PASTGR_COV

Definition: Percent cover of non-native grasses typically planted for forage; includes bahiagrass, centipede grass, carpet grass, digitgrass, bermudagrass, limpograss, etc.

Field values: see HW_COV above

Rationale: This metric was added to capture bahiagrass, etc that would either not be captured in or hidden in other groundcover attributes. Pasture grass outcompetes native ground cover and is indicative of poor ground cover condition. Presence of these grasses also increase the difficulty of native ground cover restoration.

_____

Field Name: Invasive Plant Cover

Field Abbreviation: INVPL_COV

Definition: Percent cover of invasive exotic plants within the stand; includes only FLEPPC Category I and II listed species

Field values: not evident; <1%; 1 - 3%; 4 - 10%; >10%

Rationale: Invasive exotic plant species are a major threat to biological integrity of vegetative plant communities, including LLP systems. These species can out compete the native species, thus altering ecological function and contributing to decline in ecological integrity. The Florida Exotic Pest Plant Council reviews and updates a list of invasive exotic plants every two years.

_____

Field Name: Condition Rank

Field Abbreviation: COND_RANK

Definition: Describes the ecological condition relative to a natural system (natural vegetative plant community). Values are defined as follows:

excellent   Community species composition/abundance and structure are characteristic of conditions prevalent under historic fire regime.

good   Community species composition/abundance and structure are only partially characteristic of conditions previously prevalent under historic fire regime.

fair   Retains some components and/or structure characteristic under historic fire regime. Components of original pyrogenic groundcover are sparse or suppressed so as to be functionally irrelevant.

poor   May retain little of the original community species components and/or structural characteristics. Components of original pyrogenic groundcover are not evident.

Field values:

- excellent
- good
- fair
- poor

Rationale: The condition rank provides an additional tool for evaluating the site that is not necessarily tied to the other variables in the rapid assessment. The field gives the evaluator to convey his general judgement of the site. This field is particularly useful for sites that are ecologically intact but are structurally deficient. This field was favored in the FNAI longleaf pine partners meeting.

_____

Field Name: Soil Hydrology

Field Abbreviation: SOIL_HYDRO

Definition: Soil Hydrology describes how fast water drains through the soil:

xeric: deep, well drained to excessively drained sands or gravelly sands; typical of sandhills.

sub-mesic: moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture; typical of upland pine (clay hills).

mesic: somewhat poorly drained soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture; typical of mesic flatwoods.

hydric: poorly drained soils that have a high water table, soils that have a clay layer or other impervious material at or near the surface; typical of wet flatwoods

Field values:
- xeric
- sub-mesic
- mesic
- hydric

Rationale: Structure and composition of LLP systems is directly related to soil hydrology. Values for this field will help to classify the historic or current natural community, which is useful for species habitat mapping and land use planning.

_____

Field Name: Stand Type

Field Abbreviation: STAND_TYPE

Definition: describes if the stand was naturally regenerated or if manually planted by hand or machine. If unknown based on the field visit, record as natural.

Field values:
- natural
- planted

Rationale: It may be important to know how much longleaf pine has been planted and the extent of natural LLP systems. These numbers will help evaluate agency goals.

_____

Field Name: Comments

Field Abbreviation: COMMENTS

Definition: Comments provides additional, optional information about the site (stand)

Rationale: Allows the field evaluator to provide any additional comments that describe things not covered by the other fields.

Appendix B.

LPEGDB Rapid Assessment Training 3.1

Revised Dec 2016
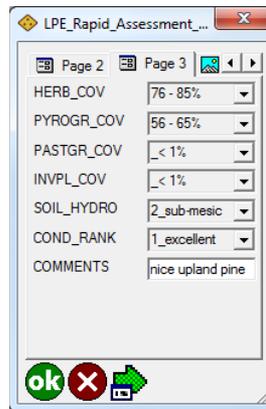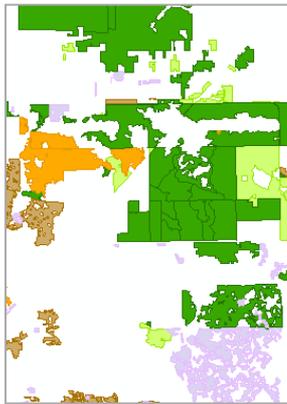
Prepared by Florida Natural Areas Inventory in cooperation with Florida Forest Service

Note:

The following document is an update of the training material provided and presented during May, 2016. The definition for a few of the attributes have changed and a couple of new attributes were added to the rapid assessment. Please read the definitions carefully. Thanks for helping with this endeavor.
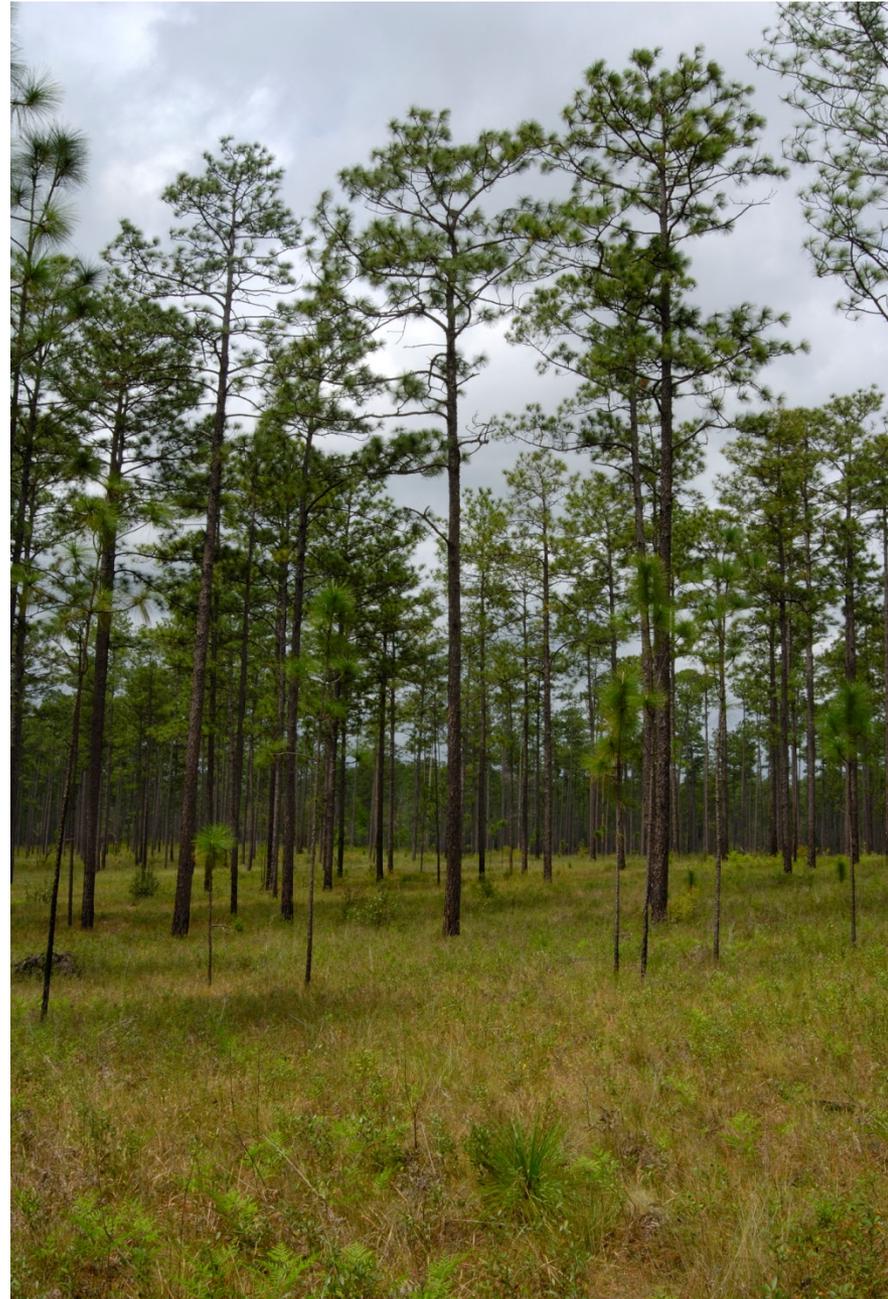
LPEGDB Data Collection v3.1 Overview

- Continue to fill gaps in distribution and ecological condition of longleaf pine ecosystems

- Next phase to include pine plantation

- Data to be collected as a point within a longleaf stand

- The point should be representative of the entire longleaf stand, to the degree possible

- Longleaf stands will still be provided as polygons so you can see what has already been assessed vs still needs to be assessed

Obtaining the LPEGDB for Data Collection

- Obtain a copy of the LPEGDB_RA folder. FFS will make this available.

- Copy this folder to your computer.

- Open the LPEGDB_DataCollection_v3.mxd in ArcMap. The mxd is located within the LPEGDB_RA folder.

- You may add standard background layers such as county boundaries, imagery, etc to this mxd and save it to a known location.
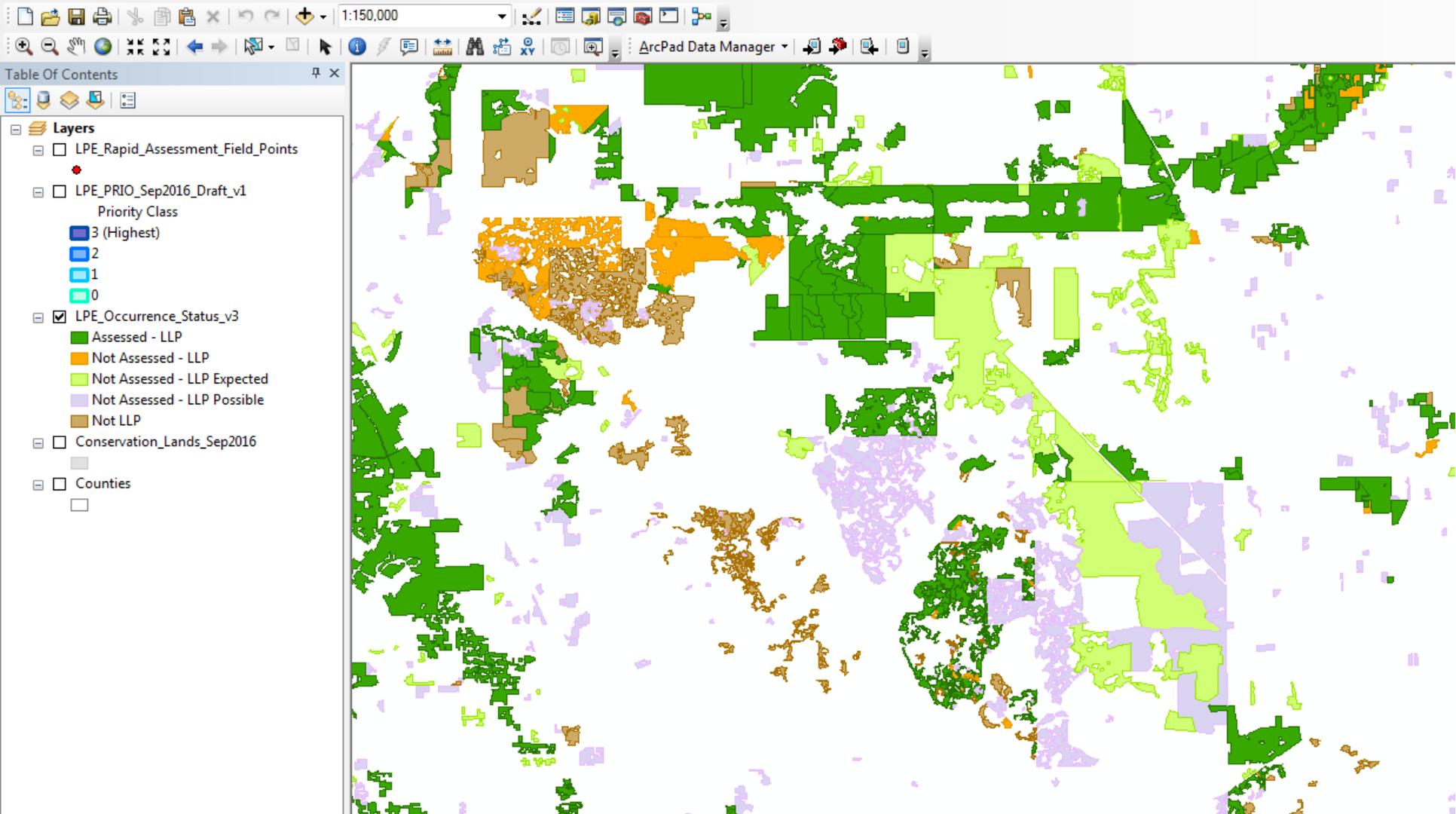
This is what the mxd will look like. You will have an empty point feature class to start for field data collection.   And also the set of polygons, color-coded to indicate what needs to be assessed.

The data displayed in the map is located in the LPEGDB_RA folder you copied to your computer.

Layers

☐ LPE_Rapid_Assessment_Field_Points

Empty point feature class you will check out for collecting data with ArcPad

☑ LPE_PRIO_Sep2016_Draft_v1

Priority Class
- 3 (Highest)
- 2
- 1
- 0

LPEGDB polygons Prioritized for Assessment

This is a subset of all polygons that need assessment. It should be used as a general guide for locations to target for assessment.

It is intended to highlight large areas where we can possibly maximize acreage per effort. It excludes industrial timberlands based on a GIS estimate and may inadvertently be missing areas that need assessment. You will need to use judgment and also view in conjunction with the LPE_Occurrence_Status_v3 layer.

☐ LPE_Occurrence_Status_v3

LPEGDB polygons by Assessment Status

- Assessed - LLP

Longleaf stands already assessed – **DO NOT ASSESS**

- Not Assessed - LLP
- Not Assessed - LLP Expected
- Not Assessed - LLP Possible

Information needed – **ASSESS**

- Not LLP

Determined to be pinelands other than LLP – **DO NOT ASSESS**

☐ Conservation_Lands_Sep2016

☐ Counties

B-6
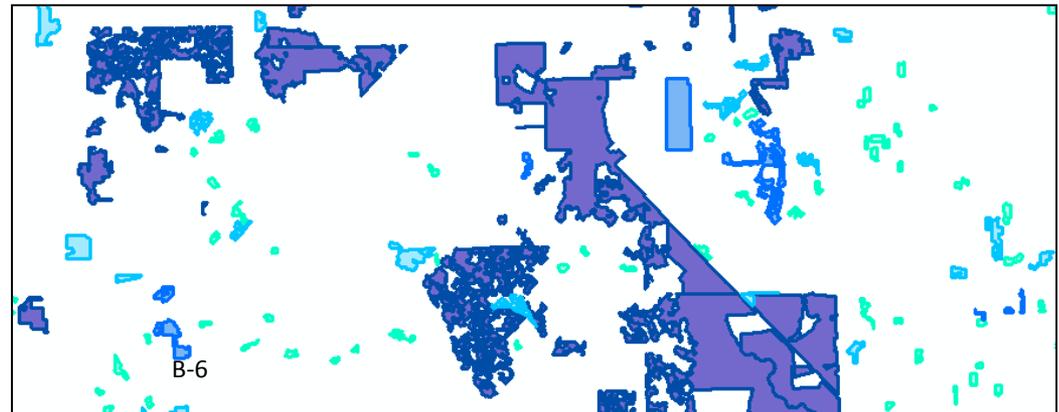
Using Assessment Polygons

You will need to display the existing set of LPEGDB polygons to know which have already been assessed vs still need assessment. You may also wish to edit or add polygons if stands are not adequately represented in the LPEGDB. Use the full set of assessment polygons in conjunction with the Prioritized subset.

Viewing Polygons

Polygons may be checked out as background data through ArcPad procedure and viewed on the Flint;

viewed for reference on a field laptop;

viewed in the LPEGDB Data Collection Web Map at this link: http://arcg.is/1qnkB2f

Relating Points to Polygons

STANDARD PROCEDURE

Collect a GPS point within the polygon to be assessed, at a location that is 'typical' of the polygon/stand.   Complete assessment based on what you can see. Choose POINT_TYPE = GPS.

IF YOU CANNOT STAND WITHIN POLYGON TO BE ASSESSED

Position yourself as near as possible to the polygon to be assessed, at a location where you can view a 'typical' area. Plot the point near your position but within the boundary. Complete assessment based on what you can see within the polygon. Choose POINT_TYPE = plotted.

IF POLYGON IS NOT A LONGLEAF PINE ECOSYSTEM OR IS NOT ACCESSIBLE

In this case it is not necessary to GPS a point. Plot the point within the boundary and fill out the SURVEYSTAT and SURVEYDATE. If not a LPE, it would be helpful to describe why not in COMMENTS.

Relating Points to Polygons

IF POLYGON IS NOT A UNIFORM STAND

Ideally polygons will conform to stand boundaries, i.e. relatively uniform composition/structure/condition. However, many existing polygons are based on land cover type and may contain a mix of conditions. If this mix occurs as a matrix that varies throughout the polygon, then you may still evaluate the stand as a whole, using best judgment about what is typical.

Options if you observe two or more distinct conditions :

1. Collect more than one point in each of the distinct areas. The distinction should be apparent on aerial photos. If not, please describe the distinction in COMMENTS. After data submission, if any existing v.3 polygon is found to have >1 point, we will edit the polygons to match.

2. You may export and edit a subset of polygons and submit them with your data collection points. After data submission we will update the LPEGDB polygons based on your edits. If you do this please also make sure you have a point for each polygon.

Examples

250 ac polygon with evidence of longleaf, but not yet assessed for condition

LPE_Rapid_Assessment_Field_Points

☑ LONGLEAF PINE ECOSYSTEM OCCURRENCE STATUS

Assessed - LLP
Not Assessed - LLP
Not Assessed - LLP Expected
Not Assessed - LLP Possible
Not LLP

Appears to have 4 distinct 'stands' within it

B-12
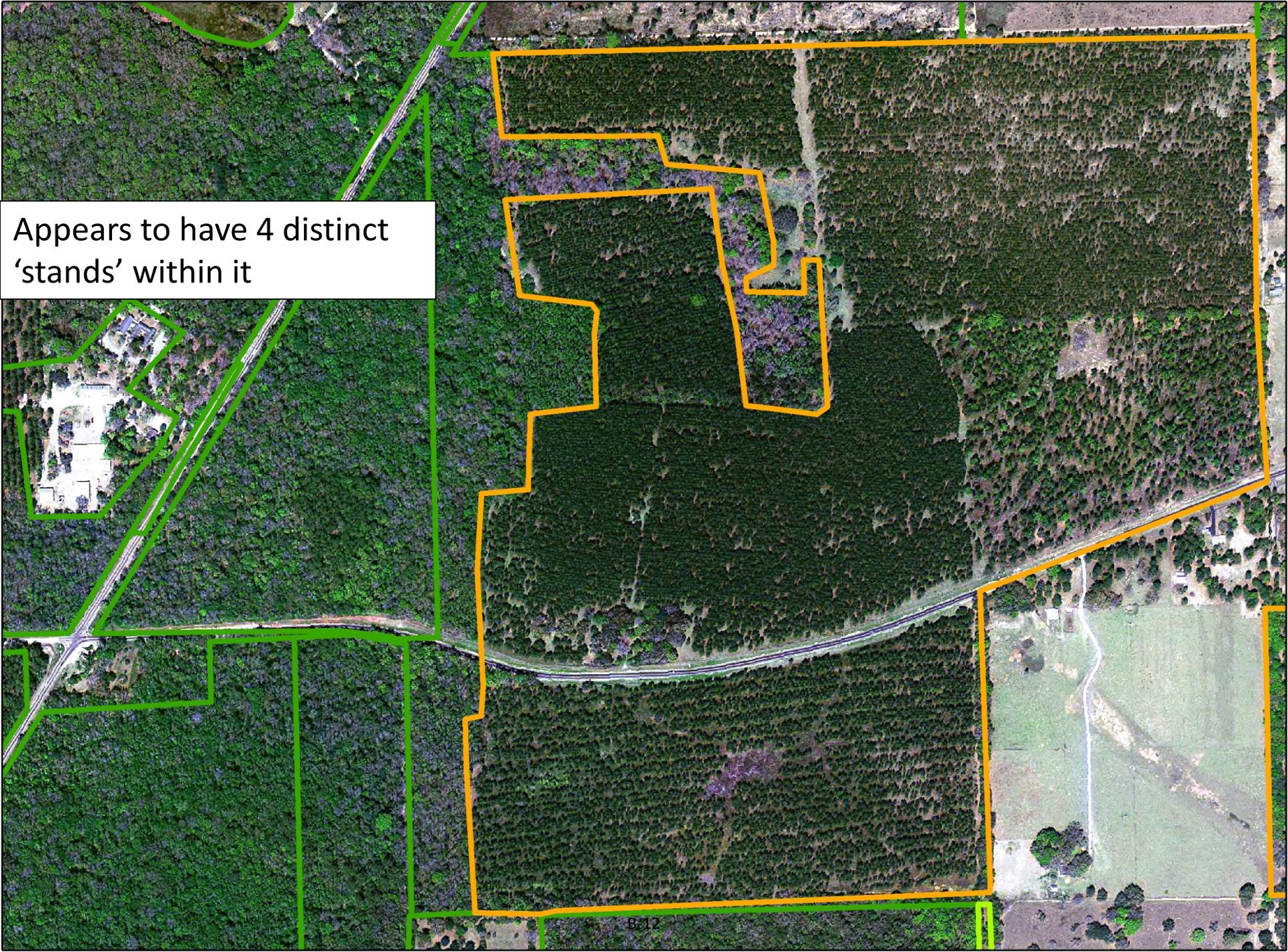
Take 4 data collection points
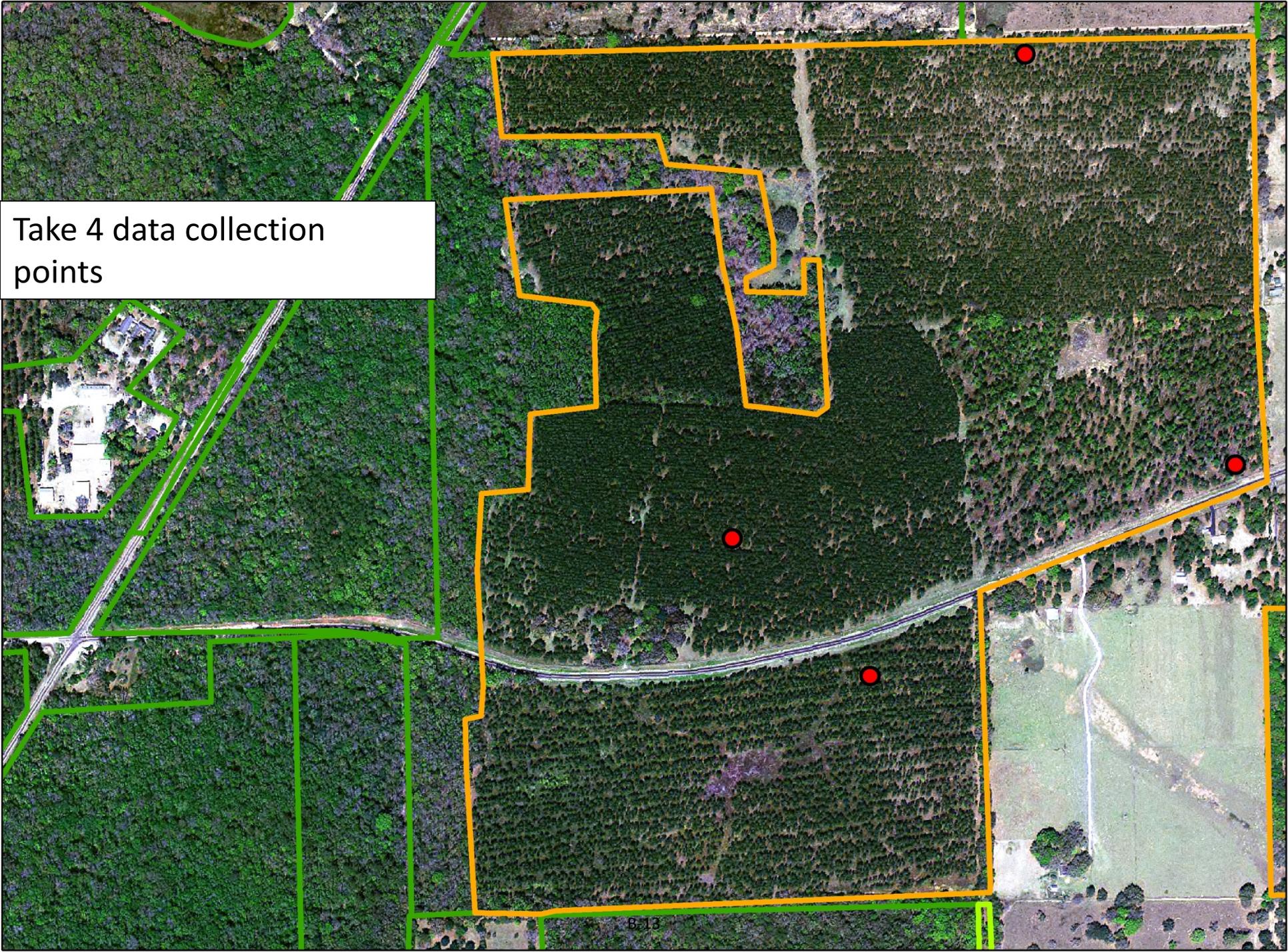
This will be enough for us to edit the polygon into 4 parts; OR you may do this.

Export a copy of the polygon(s) to be edited, and edit the copy. Submit only edited or newly added polygons with your points.

We will then apply point data to these polygons and update the LPEGDB.

In this example the points indicated that the NE polygons were assessed as LPEs, and that the SW polys were not LPEs.

assessed ●

assessed ●

excluded - not LPE ●

excluded - not LPE ●

☐ ☐ LPE_Rapid_Assessment_Field_Points
   ●
☐ ☑ LONGLEAF PINE ECOSYSTEM OCCURRENCE STATUS
   ■ Assessed - LLP
   ■ Not Assessed - LLP
   ■ Not Assessed - LLP Expected
   ■ Not Assessed - LLP Possible
   ■ Not LLP

B-15
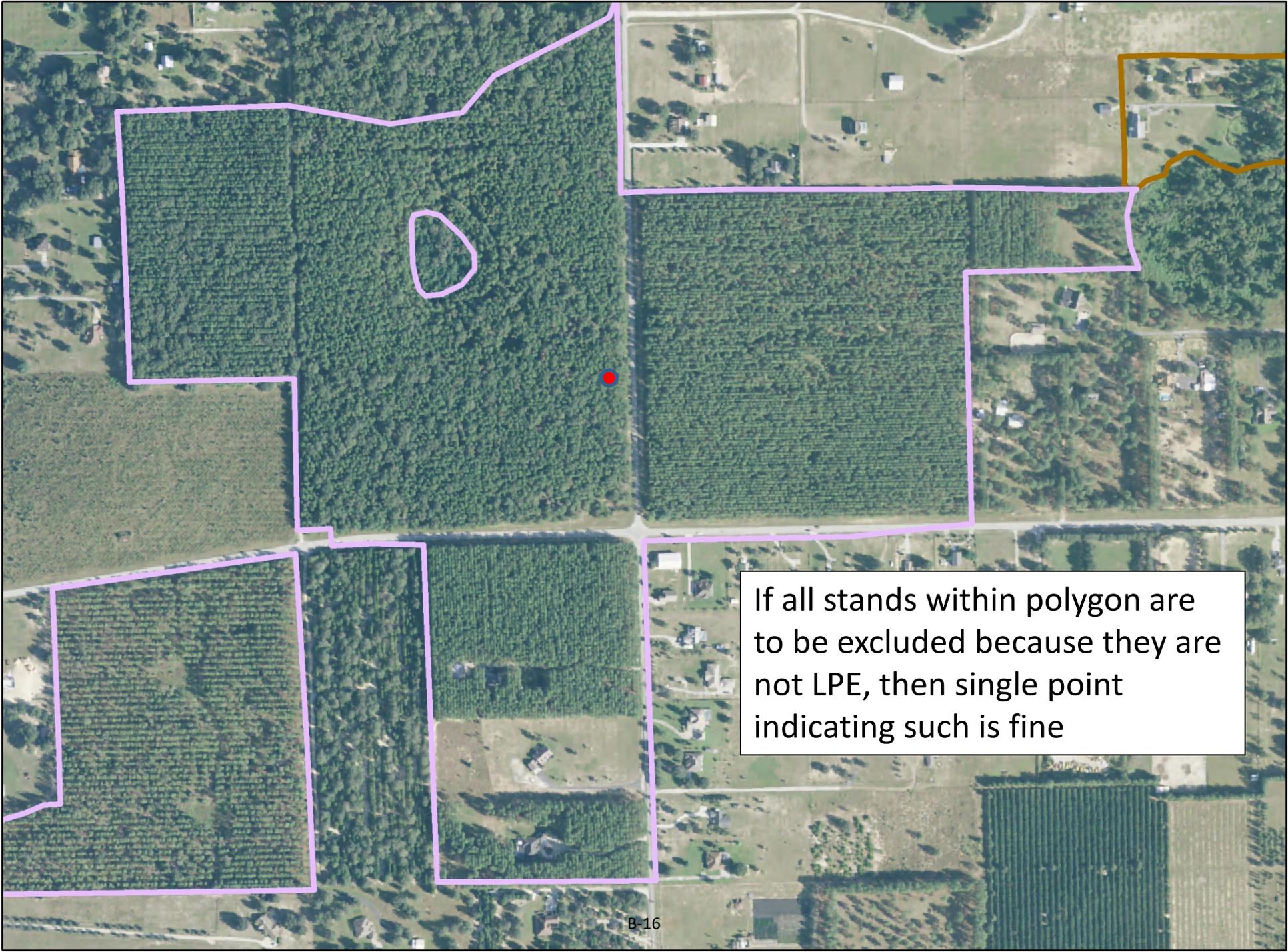
If all stands within polygon are to be excluded because they are not LPE, then single point indicating such is fine
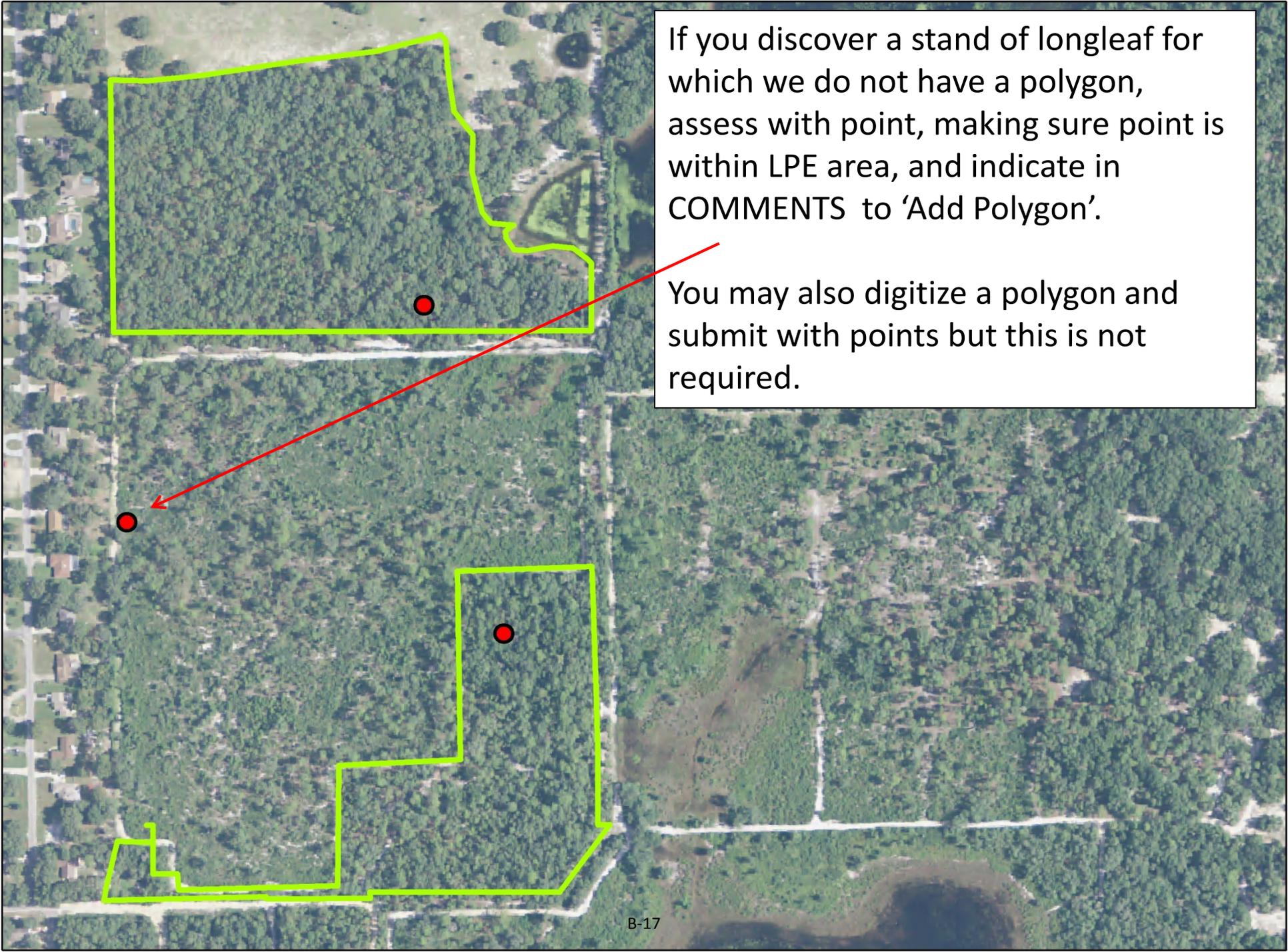
If you discover a stand of longleaf for which we do not have a polygon, assess with point, making sure point is within LPE area, and indicate in COMMENTS to 'Add Polygon'.

You may also digitize a polygon and submit with points but this is not required.

B-17

Relating Points to Polygons

IF ADJACENT POLYGONS ARE UNIFORM

This is rare. In this case you must either submit a data collection point for each polygon or submit a 'merged' polygon along with a single point.

B-18
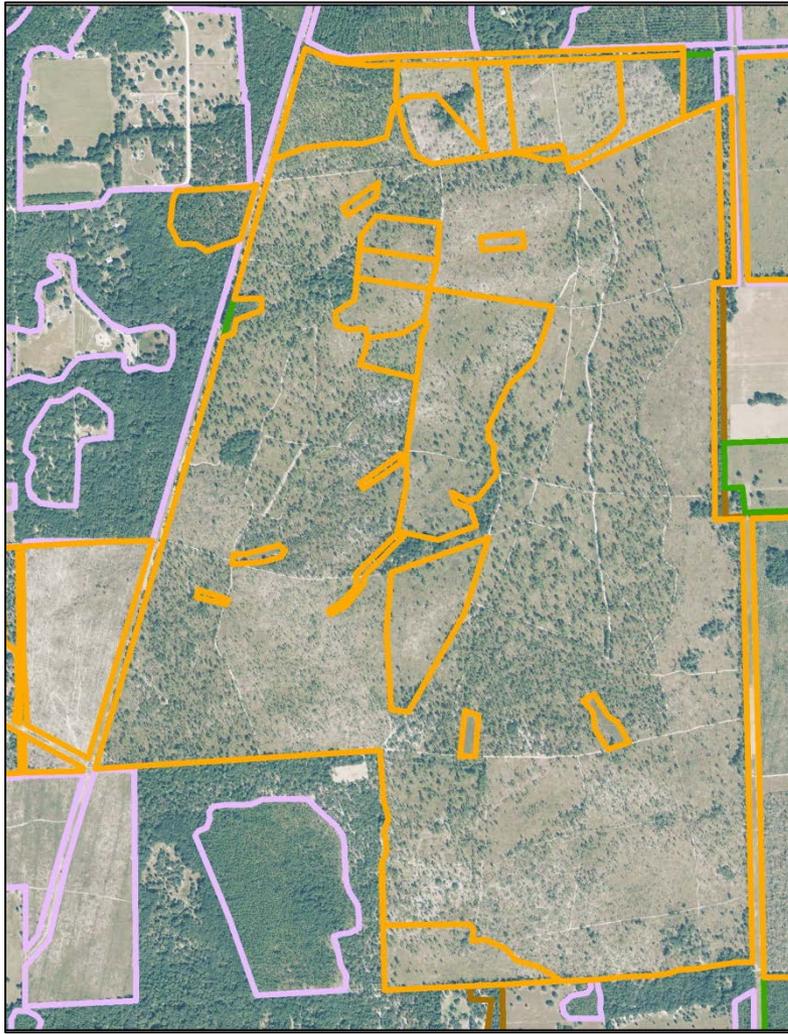
Longleaf Pine Ecosystem (LPE)
Rapid Assessment Data Fields Overview

Session Objectives:

1. Review each of the data fields and their definitions
2. Learn the abbreviated field name
3. Learn assignment of field values

Rapid Assessment Data Field Descriptions

Interpretive Guide		Geodatabase Guide		
Class	**Field Definition**	**Field Name**	**Field values**	
Survey Status	Indicates whether stand was assessed, excluded because not LLP, or inaccessible (not evaluated).	SURVEYSTAT	assessed no access excluded – not LLP	
Survey Date:	Date of the field assessment	SURVEYDATE	Check the box	
Point type	Indicates whether point was collected with GPS or plotted on-screen	POINT_TYPE	GPS Plotted	
Stand Type	Natural or Planted	STAND_TYPE	natural planted	
LLP Dominance:	Indicates the presence and dominance of LLP in the **canopy** **Dominant:** LLP occupies the highest percentage of area of the canopy species **Codominant:** LLP occupies approximately the same percentage as other canopy species **Occasional-rare:** LLP present in the canopy but a low percentage relative to other species **Absent:** LLP not present in the canopy	LLP_DOM	dominant codominant occasional-rare absent	
LLP Age Structure:	Indicates the age structure of LLP in the **canopy AND sub-canopy**	LLP_AGE	at least 3 age classes 2 age classes 1 age class absent from canopy	
Older-mature Characteristics	Indicates the presence of flat-topped trees (more than one) within the stand.	OLDER_LLP	yes not evident	
LLP Early Regeneration:	Estimated cover of LLP regeneration including planted trees that is <6' tall.	LLP_EARLY	not evident < 1% 1 - 5% 5 - 15% > 15%	
LLP Advanced Regeneration:	Estimated cover of LLP regeneration including planted trees that is 6-16' tall.	LLP_ADVANC	not evident < 1% 1 - 5% 5 - 15% > 15%	
LLP Basal Area:	Estimated basal area in square feet per acre of LLP for the entire stand rounded to the nearest ten.	LLP_BA	0 10 20 30 40 50 60	70 80 90 100 110 120 >120

			Code	Description
Other Pine Cover (Canopy):	Percentage of the ground within the stand covered by the general extent of pine species other than LLP within the canopy; **Spaces between leaves and stems count as cover.**	OTHPINE_COV	1	< 1%
			3	1 - 5%
			10	6 - 15%
			20	16 - 25%
			30	26 - 35%
			40	36- 45%
			50	46 - 55%
			60	55 - 65%
			70	66 - 75%
			80	76 - 85%
			90	86 - 95%
			98	96 - 100%
Hardwood Cover (Canopy):	Percentage of the ground within the stand covered by the general extent of hardwood species within the canopy. **Spaces between leaves and stems count as cover.**	HW_COV	(see OTHPINE_COV above)	
Midstory Cover	Percentage of the ground within the stand covered by the general extent of all woody plants other than LLP from 10 feet tall to bottom of canopy; **Spaces between leaves and stems count as cover.**	MIDST_COV	(see OTHPINE_COV above)	
Midstory Fire Tolerant Hardwood Cover:	Percentage of the ground within the stand covered by the general extent of turkey oak, sand post oak, bluejack oak, blackjack oak, southern red oak, mockernut hickory, and dogwood within the midstory (any stem greater than 10 feet tall to the bottom of the canopy); **Spaces between leaves and stems count as cover.**	FIREHW_COV	(see OTHPINE_COV above)	
Tall Shrub Cover:	Percentage of the ground within the stand covered by the general extent of woody plants other than LLP from 3-10 feet tall; **Spaces between leaves and stems count as cover.**	TSHRUB_COV	(see OTHPINE_COV above)	
Short Shrub Cover:	Percentage of the ground within the stand covered by the general extent of woody plants other than LLP <3 feet tall; **Spaces between leaves and stems count as cover.**	SSHRUB_COV	(see OTHPINE_COV above)	
Herbaceous Cover:	Percent cover of all native non-woody, soft-tissued plants regardless of height, including non-woody vines, legumes, and graminoids (grasses, sedges, rushes); does not include non-native pasture grasses.	HERB_COV	(see OTHPINE_COV above)	

Pyrogenic Grass Cover:	Percent cover of native perennial graminoids that are maintained by periodic fire; includes wiregrass (*Aristida stricta*), pineywoods dropseed (*Sporobolus junceus*), Florida dropseed (*Sporobolus floridanus*), Chapman's beaksedge (*Rhynchospora chapmanii*), cutover muhly (*Muhlenbergia capillaris* var. *trichopodes*), toothache grass (*Ctenium aromaticum*), little bluestem (*Schizachyrum scoparium*) and Florida toothache grass (*Ctenium floridanum*). Does not include switchgrass (*Panicum virgatum*) or broomsedge (*Andropogon virginicus*).	PYROGR_COV	(see OTHPINE_COV above)
Pasture Grass Cover:	Percent cover of non-native grasses typically planted for forage; includes bahiagrass, centipede grass, carpet grass, digitgrass, bermudagrass, limpograss, etc.	PASTGR_COV	(see OTHPINE_COV above)
Invasive Plant Cover:	Percent cover of invasive exotic plants within the stand; includes only FLEPPC category I and II listed species.	INVPL_COV	not evident < 1% 1 - 3% 4 - 10% > 10%
Soil Hydrology	xeric: deep, well drained to excessively drained sands or gravelly sands; typical of sandhills. sub-mesic: moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture; typical of upland pine (clay hills). mesic: somewhat poorly drained soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture; typical of mesic flatwoods. hydric: poorly drained soils that have a high water table, soils that have a clay layer or other impervious material at or near the surface; typical of wet flatwoods.	SOIL_HYDRO	xeric sub-mesic mesic hydric

Condition Rank:	Describes the ecological condition relative to a natural system (natural vegetative plant community) values:	COND_RANK	Code	Description
			excellent	Community species composition/abundance and structure are characteristic of conditions prevalent under historic fire regime.
			good	Community species composition/abundance and structure are only partially characteristic of conditions previously prevalent under historic fire regime.
			fair	Retains some components and/or structure characteristic under historic fire regime. Components of original pyrogenic groundcover are sparse or suppressed so as to be functionally irrelevant.
			poor	May retain little of the original community species components and/or structural characteristics. Components of original pyrogenic groundcover are not evident.
Comments:	Comments provides additional, optional information about the site (stand)	COMMENTS		

Survey Status

FieldName: **SURVEYSTAT**

Indicates whether the stand was assessed, excluded because not LLP, or inaccessible.

Field Values:

Assessed: Stand is longleaf pine and you assessed it in the field

No access: Stand is not accessible and remains unassessed.

Excluded – Not LLP: Stand does not contain longleaf pine.

Survey Date

FieldName: **SURVEYDATE**

Most field data collection software automatically give you the of option of the current date; In ArcPad, check the box to select the current date or manually enter a date.

Point Type
Field Name: **POINT_TYPE**

Field Values:
GPS: Point location is based on GPS
Plotted: Point location is plotted, i.e. digitized on-screen

Stand Type
Field Name: STAND_TYPE

Field Values:

- natural
- planted

LLP Dominance

Field Name: **LLP_Dom**
Indicates the presence and dominance of LLP in the **canopy**

Field Values:
- **Dominant:** LLP occupies the highest percentage of area of the canopy species
- **Codominant:** LLP occupies approximately the same percentage as other canopy species
- **Occasional-rare:** LLP present in the canopy but a low percentage relative to other species
- **Absent:** LLP not present in the canopy

Longleaf pine is Dominant

Longleaf pine is codominant

LLP Age Structure

Field Name: **LLP_Age**
Indicates the age structure of LLP in the **canopy**

Field Values:
- **at least 3 age classes**
- **2 age classes**
- **1 age class**
- **absent from canopy**

Trees in this stand appear to be 1 age class.

Older-mature Characteristics

Field Name: OLDER_LLP

Indicates the presence of flat-topped trees (more than one) within the stand.

Field Values:

- **yes**
- **not evident**

not evident

yes

Lonfleaf Pine early regeneration
Field Name: LLP_EARLY
Estimated cover of LLP regeneration including planted trees that is <6' tall.
Field Values:
- not evident
- < 1%
- 1 - 5%
- 5 - 15%
- > 15%

1 -5 %

not evident

Lonfleaf Pine advanced regeneration
Field Name: LLP_ADVANC
Estimated cover of LLP regeneration including planted trees that is 6-16' tall.
Field Values:

- not evident
- < 1%
- 1 - 5%
- 5 - 15%
- > 15%

5 - 15 %

1 -5 %

1 -5 %

LLP Basal Area   Field Name: **LLP_BA**

Estimated basal area in square feet per acre of LLP for the entire stand

Field Values: 0 to >120 in increments of 10

20 or 30

40 or 50

60 or 70

110 or 120 or > 120

Other Pine Cover   Field Name: **OTHPINE_COV**   Stratum: Canopy

Percentage of the ground within the polygon covered by the general extent of the canopy of pine species other than LLP; **Spaces between leaves and stems count as cover.** Canopy is defined as any stem greater than 16 feet tall.

Field Values
- < 1%
- 1 - 5%
- 6 - 15%
- 16 - 25%
- 26 - 35%
- 36- 45%
- 46 - 55%
- 55 - 65%
- 66 - 75%
- 76 - 85%
- 86 - 95%
- 96 - 100%

These same cover classes are used for all of the cover estimates

Hardwood Cover   Field Name: **HW_COV**   Stratum: Canopy

Percentage of the ground within the stand covered by the general extent of hardwood species within the canopy.

values: see OTHPINE_COV

Example Cover = 66 - 75% or 76 - 85%

Midstory Cover   Field Name: **MIDST_COV**   Stratum: Midstory

Percentage of the ground within the stand covered by the general extent of woody plants from 10 feet tall to bottom of canopy; **Spaces between leaves and stems count as cover.**

values: see OTHPINE_COV

Example Cover = 6 - 15%

Midstory Fire Tolerant Hardwood Cover   Stratum: Midstory
Field Name: **FIREHW_COV**

Percentage of the ground within the stand covered by the general extent of turkey oak, sand post oak, bluejack oak, blackjack oak, southern red oak, and dogwood within the midstory (any stem greater than 10 feet tall to the bottom of the canopy); **Spaces between leaves and stems count as cover.**

values: see OTHPINE_COV

Fire Tolerant Hardwood Cover (FIREHW_COV)

Example 1   Cover = 26 - 35%

Fire Tolerant Hardwood Cover (FIREHW_COV)

Example 2   Cover = 6 - 15%

Tall Shrub Cover   Field Name: **TSHRUB_COV**   Stratum: Shrub

Percentage of the ground within the plot covered by the general extent of woody plants from 3-10 feet tall; **Spaces between leaves and stems count as cover.**

values: see OTHPINE_COV

Example Cover = 6 - 15%

Short Shrub Cover   Field Name: **SSHRUB_COV**   Stratum: Shrub

Percentage of the ground within the plot covered by the general extent of woody plants <3 feet tall; **Spaces between leaves and stems count as cover.**

Field values: see OTHPINE_COV

Example value = 16 - 25% or 26 - 35%

Herbaceous Cover Field Name: **HERB_COV**   Stratum: Ground

Percent cover of all native non-woody, soft-tissued plants regardless of height,
including non-woody vines, legumes, and graminoids (grasses, sedges, rushes);
does not include non-native pasture grasses. values: see OTHPINE_COV

Example Cover = 86 - 95% or 96 – 100%

Herbaceous Cover   Field Name: **HERB_COV**

Note: Runner oaks, and woody vines such as greenbrier and yellow jessamine don't count in HERB_COV (they are included in shrub cover)

e

Pyrogenic Grass Cover   Field Name: **PYROGR_COV**   Stratum: Ground

Percent cover of native perennial graminoids that are maintained by periodic fire; includes wiregrass (*Aristida stricta*), pineywoods dropseed (*Sporobolus junceus*), Florida dropseed (Sporobolus floridanus)*,* Chapman's beaksedge (*Rhynchospora chapmanii*), cutover muhly (*Muhlenbergia capillaris* var. *trichopodes*), toothache grass *(Ctenium aromaticum*), little bluestem (*Schizachyrium scoparium*) and Florida toothache grass *(Ctenium floridanum*), **not** switchgrass (*Panicum virgatum).*

values: see OTHPINE_COV

Pyrogenic Grass Cover   Field Name: **PYROGR_COV**

Example Cover = 1 - 5%

Example Cover = 76 - 85%

Pasture Grass Cover   Field Name: **PASTGR_COV**   Stratum: Ground

Percent cover of non-native grasses typically planted for forage; includes bahiagrass, centipeded grass, carpet grass, digitgrass, bermudagrass, limpograss, etc.

 values: see OTHPINE_COV

Example Cover = 86 - 95% or
            96 – 100%

Invasive Plant Cover   Field Name: **INVPL_COV**

Percent cover of invasive exotic plants within the stand; includes only FLPPC category I and II listed species.

Field Values:

- not evident
- < 1%
- 1 - 3%
- 4 - 10%
- > 10%

Soil Hydrology
Field Name: SOIL_HYDRO

Field Values:

- xeric: deep, well drained to excessively drained sands or gravelly sands; typical of sandhills.

- sub-mesic: moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture; typical of upland pine (clay hills).

- mesic: somewhat poorly drained soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture; typical of mesic flatwoods.

- hydric: poorly drained soils that have a high water table, soils that have a clay layer or other impervious material at or near the surface; typical of wet flatwoods.

Condition Rank   Field Name: **COND_RANK**

Describes the ecological condition relative to a natural system (natural vegetative plant community). Consider the species composition/abundance and vegetative structure characteristic of conditions prevalent under historic fire regime.

Field Values:
- excellent
- good
- fair
- poor

excellent

Condition Rank Field Name: **COND_RANK**

Good (needs fire, but the components are there)

Condition Rank   Field Name: **COND_RANK**

Fair (evidence of ground disturbance; no recent fire, but still retains many of the characteristic components)

Condition Rank   Field Name: **COND_RANK**

Poor (well managed plantation, but lacks characteristics of the former natural vegetative community)

Comments

Field Name: **COMMENTS**

This is a text field that provides additional, **optional** information about the stand. Such as "this is an exceptional site". If you exclude a forested site because it is not an LPE, it would be helpful to add a brief comment, e.g. "slash pp"

LPE_Rapid_Assessment_...

| Page 1 | Page 2 | ◄ | ► |

SURVEYSTAT	assessed ▼
SURVEYDATE	5/17/201 ▼
LLP_Dominance	1_dominant ▼
LLP_AGE	at least 3 age ▼
OLDER_LLP	not evident ▼
LLP_EARLY	_< 1% ▼
LLP_ADVANC	_1 - 5% ▼
LLP_BA	__40 ▼

ok ✗

LPE_Rapid_Assessment_...

Page 2	Page 3	
LLP_ADVANC	_1 - 5%	▼
LLP_BA	__40	▼
OTHPINECOV	_< 1%	▼
HW_COV	_< 1%	▼
MIDST_COV	_< 1%	▼
FIREHW_COV	_< 1%	▼
TSHRUB_COV	_1 - 5%	▼
SSHRUB_COV	6 - 15%	▼

ok ✖ 🏠

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LPE_Rapid_Assessment_...

Page 2 Page 3

HERB_COV	76 - 85%
PYROGR_COV	56 - 65%
PASTGR_COV	_< 1%
INVPL_COV	_< 1%
SOIL_HYDRO	2_sub-mesic
COND_RANK	1_excellent
COMMENTS	nice upland pine

ok

LPE Rapid Assessment
Data Check-out, Field Data Collection, and Check-in Process
Using the ArcPad Data Manager Toolbar

Session Objectives:

1. Check-out data from a geodatabase for editing in the field using the ArcPad Data Manager Toolbar in ArcMap

2. Collect data in the field using ArcPad

3. Check-in field data and update a geodatabase using the ArcPad Data Manager Toolbar in ArcMap

Establishing a connection with your mobile device.

- When you plug in your field unit (datalogger) to your computer the Windows Mobile Device Center program should open. This program replaces ActiveSync for previous versions of Windows. If Windows Mobile Device Center does not open reboot your field unit.

- Click "Connect without setting up your device"
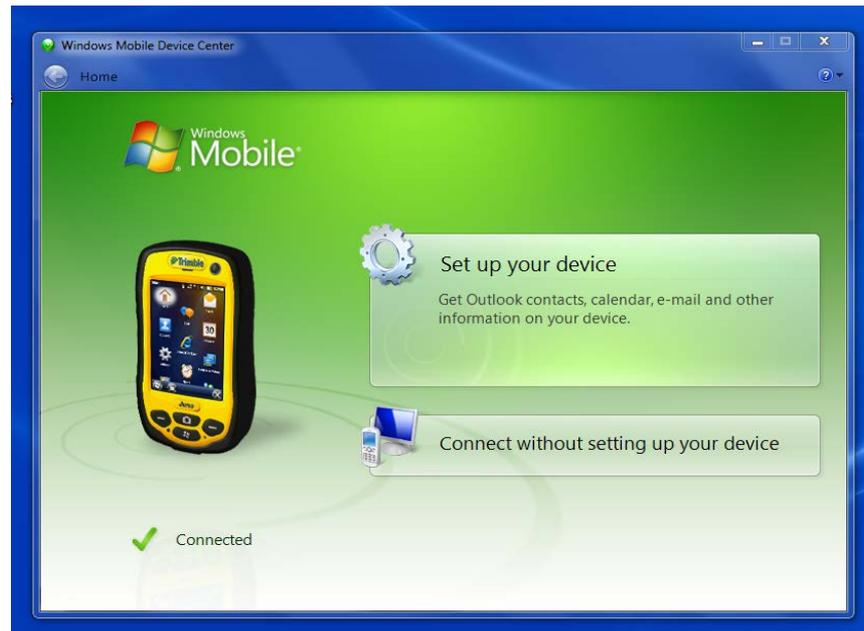
That is all that is necessary for the transfer of files to and from the datalogger.

- If you want to browse for files on your field unit, click "browse the contents of your device" under File Management. We will revisit File Management later.
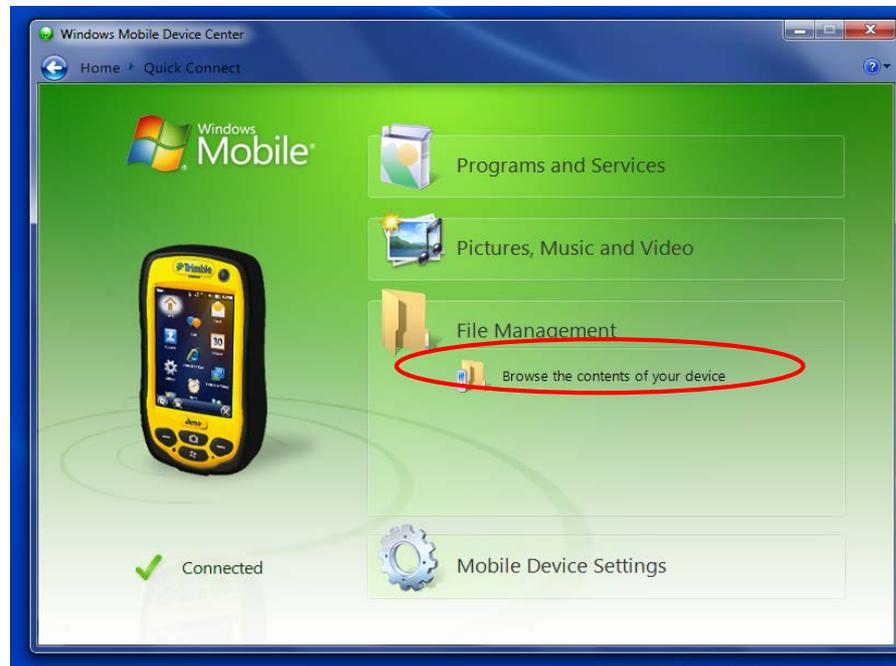
Using the ArcPad Data Manager Toobar to Check-out Data

Open the ArcMap project for working with the Longleaf pine rapid assessment data. You should start with template provided.

- Enable the ArcPad Data Manager (extension) by clicking "Customize", "Extensions" and checking the box for ArcPad Data Manager.

- Turn on the ArcPad Data Manager toolbar by by clicking "Customize", "Toolbars" and clicking in the box for ArcPad Data Manager. This will only be available if you have installed ArcPad on your computer.
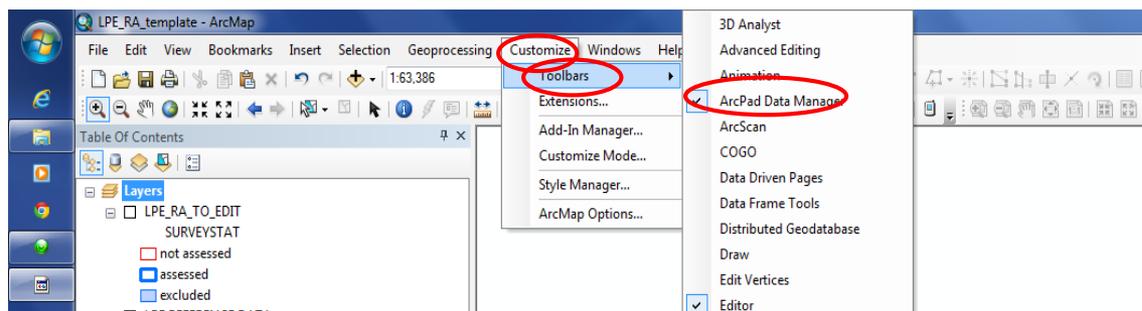
- Click the "Get Data for ArcPad" button on the ArcPad Data Manager toolbar (shown below).

- A welcome window will generally describe what "Get Data for ArcPad" does, which is packaging files for transfer to a mobile device running ArcPad—click Next.

- In this training you will check out a blank version of the LPE Rapid Assessment Field Points feature class to be added to in the field using ArcPad. Other layers including the polygons to be assessed also can be checked out at the same time and added to your ArcPad map.
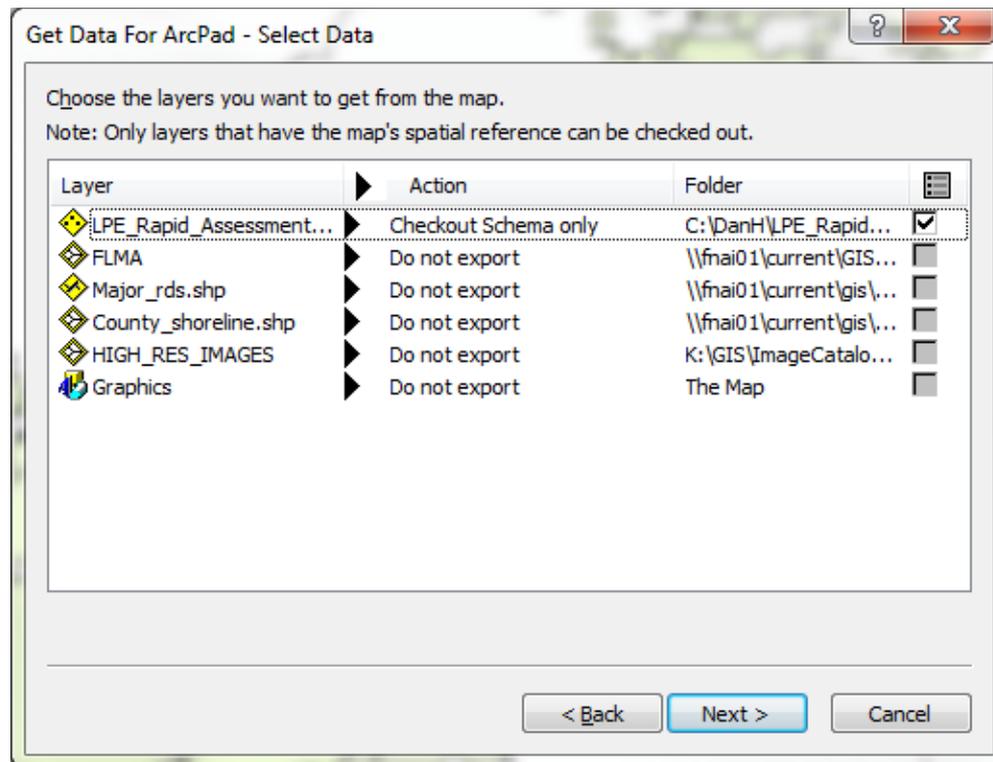
- Select an Action for each file you intend to export. LPE_Rapid_Assessment_Field_Points: select "Check Out for disconnected editing in ArcPad", then "Schema only (start with blank data set)".
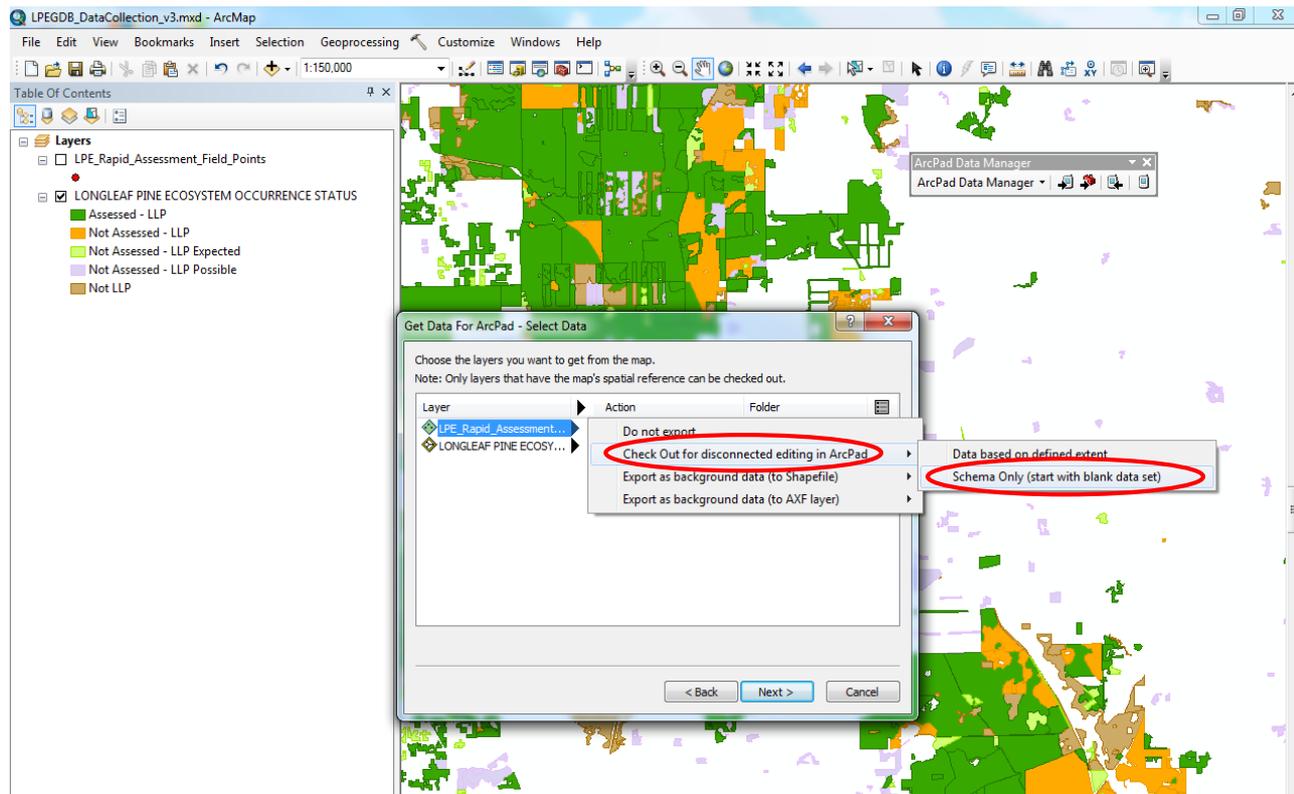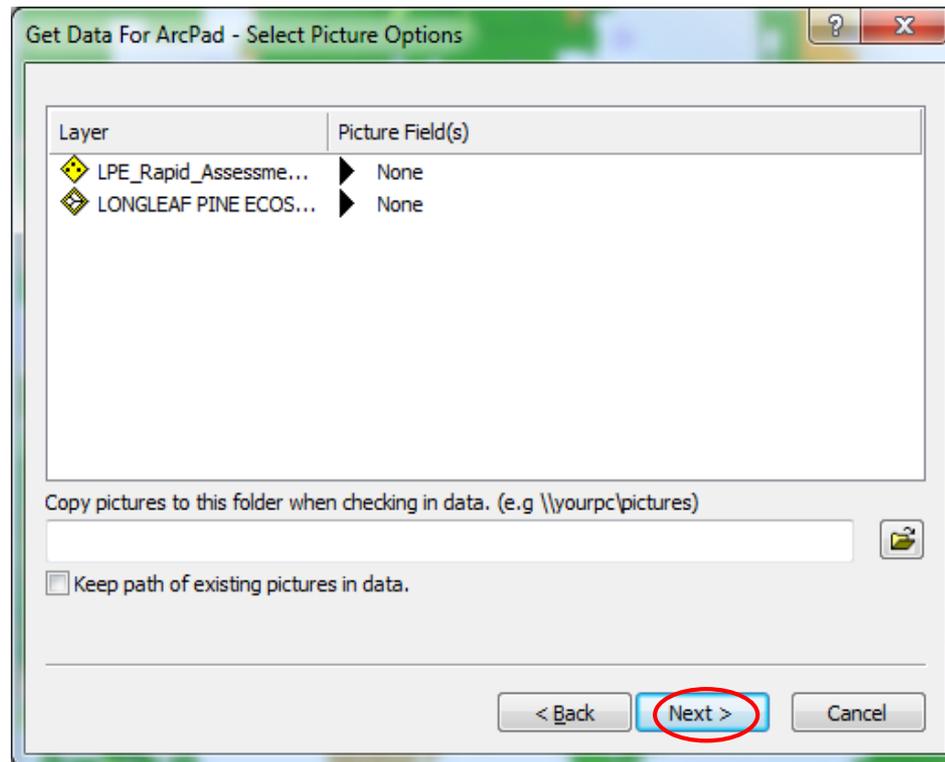
For the LPE polygon file select "Export as background data" and "Make Read Only"
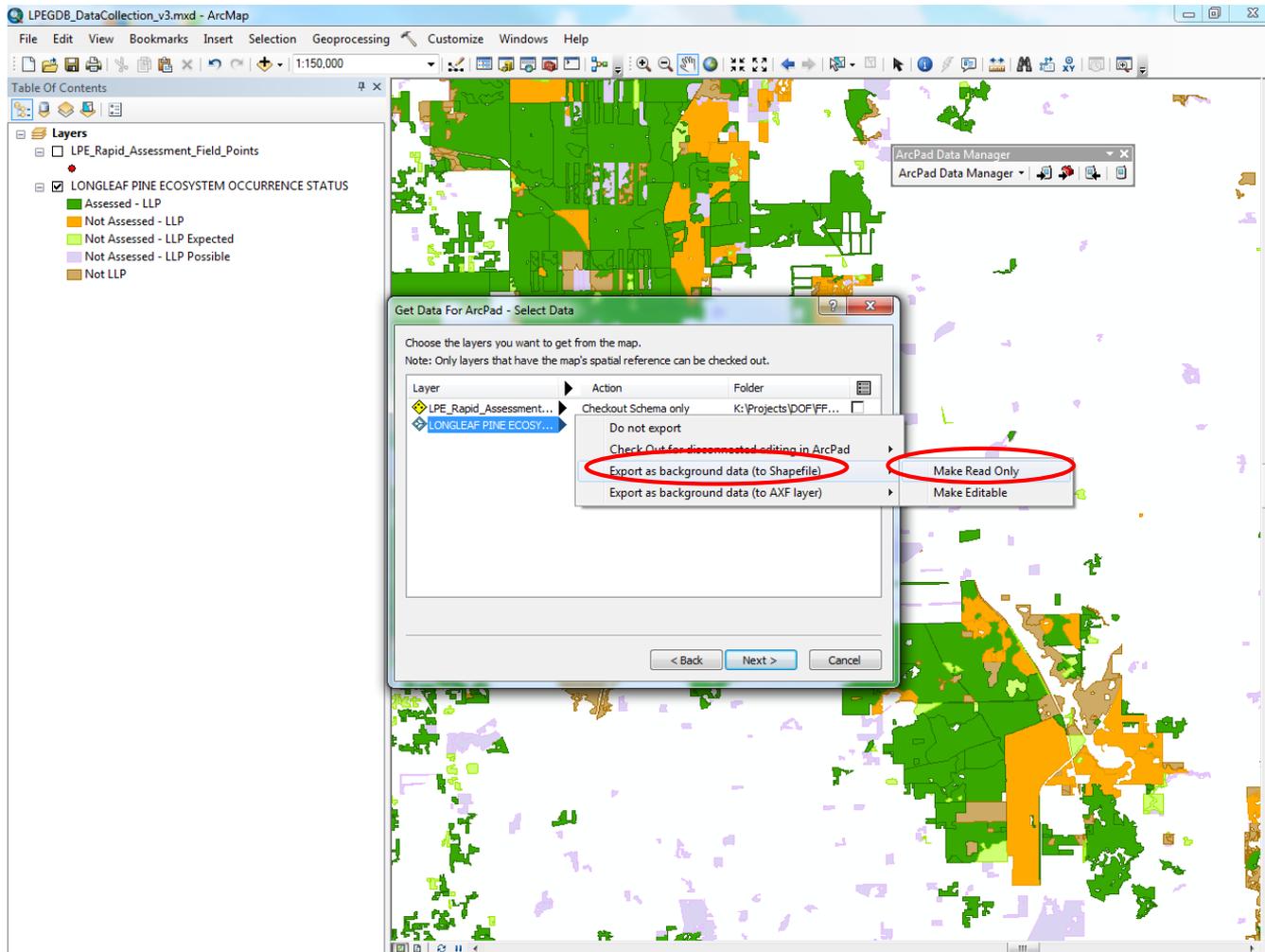
- If you have other layers in your project, change the rest of the actions to "Do not export".

- Click "Next" when finished selecting an action for each layer.
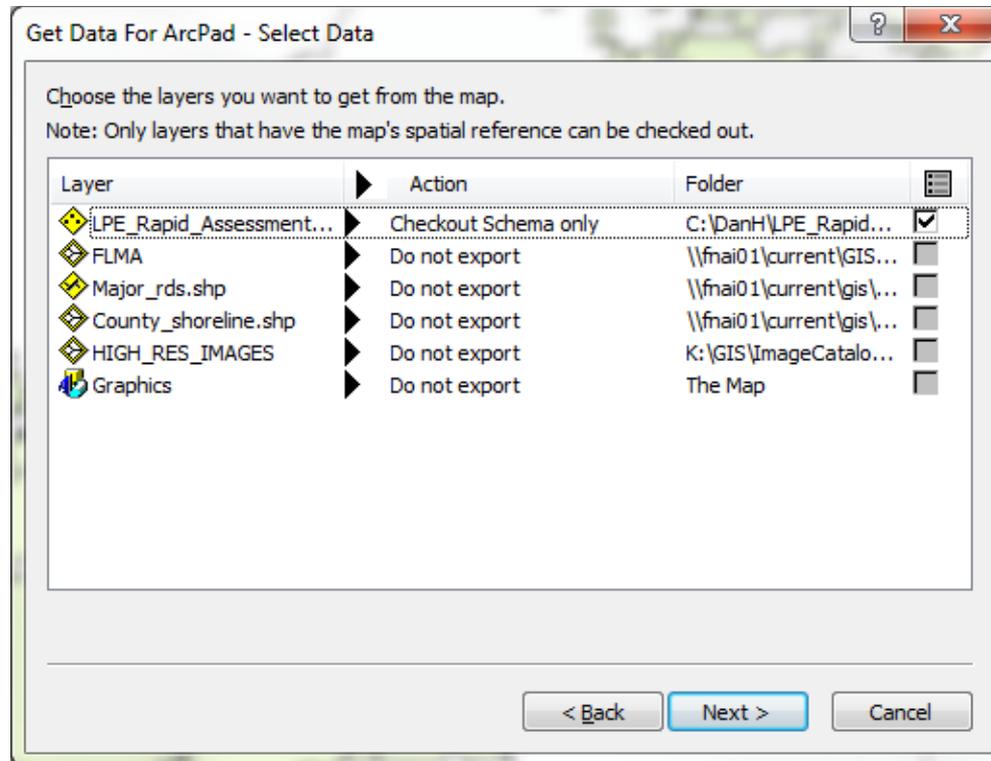
Select "Next" at the Select Picture Options screen; the default is "None"

In the following window specify that the data to be checked out is from the display extent only. This will check out only the polygons that you see on the screen rather than the entire file which may cause your field device to operate slowly. Your selections on this page will be the default setting until you change them.

Specify a name for the folder for this check-out session; "DataForArcPad1" is the default; the next time you check out the default will be "DataForArcPad2".

Choose a location to store the folder containing your check-out data and ArcPad map; this may be prescribed in another portion of your training. Remember this file name and location for the check-in procedure. Name the ArcPad map "LLP_RA".

Under deployment options, check the "Create ready to deploy .CAB file…" and select "Create the ArcPad data on this computer now", then finish.
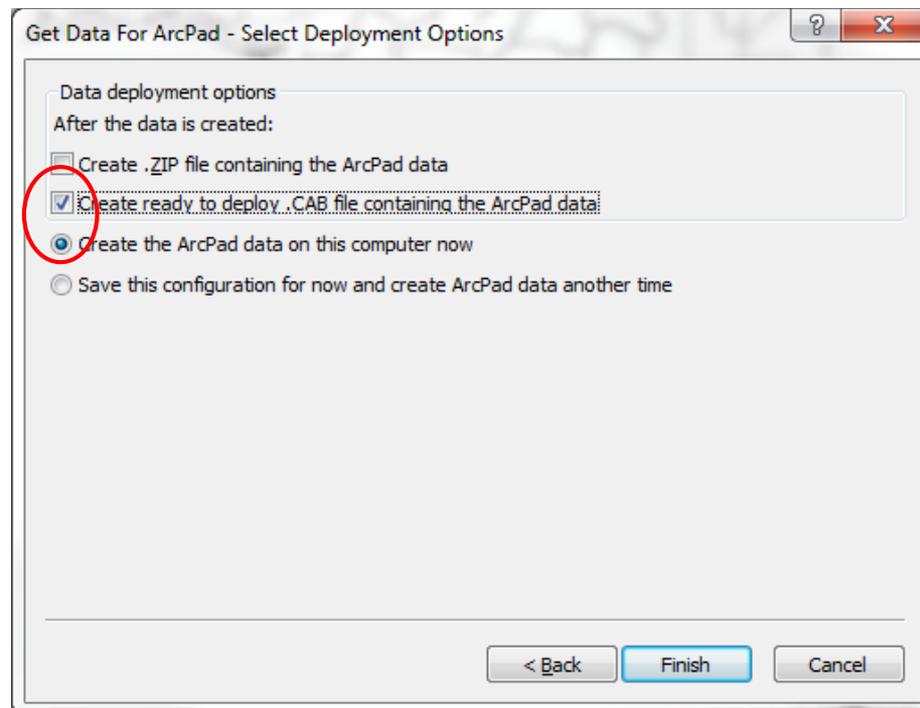
- You should then receive an "operation successful" message. Click "OK".
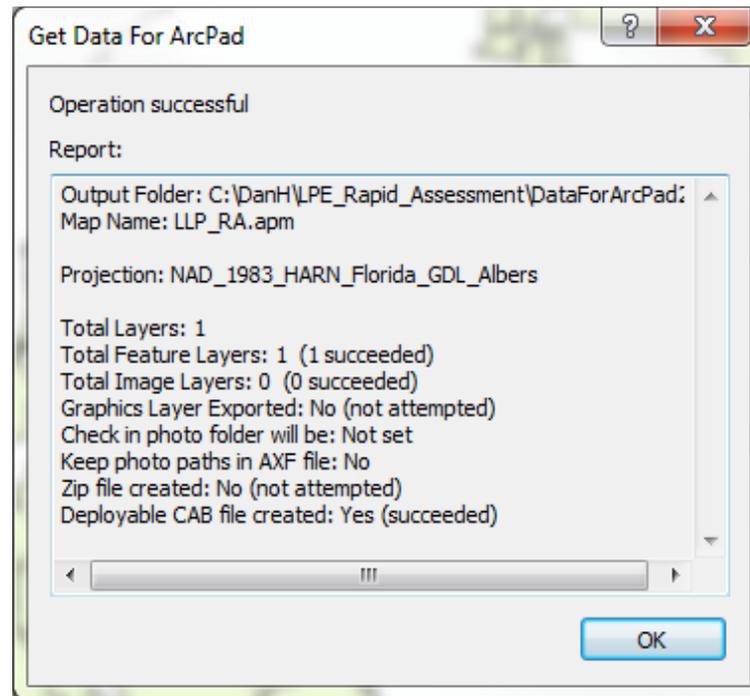
Note: If you have moved on to more advanced data checkout with additional files and receive an error message, you may have exceeded the 50 MB file size for background imagery. Zoom into a smaller area or do not include imagery in the check-out.

Deploy the data to your field unit (GPS Datalogger)

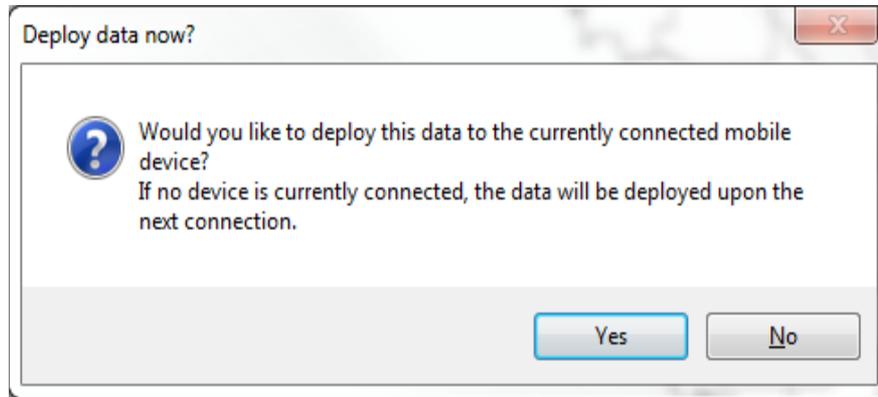**Deploy data now?**

Would you like to deploy this data to the currently connected mobile device?
If no device is currently connected, the data will be deployed upon the next connection.

Yes   No

If you've deployed data previously you will get this message:

Applications Already Installed

"ESRI DataForArcPad Data" is already installed. Do you want to proceed with the re-install/upgrade?

Yes   No
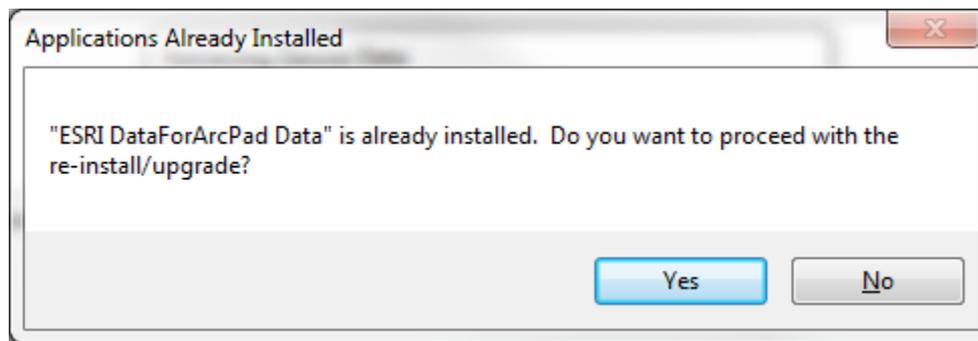
Click yes.

- The deploy process will take a minute or so; follow any on screen prompts on your field unit (Flint).

- It may ask for a location to install the "CAB file" or "DataForArcPad file"; choose "Device" rather than the Storage Card if you have one on your unit.

- Then click "Install" or "OK". It may state that the CAB file has been installed; click OK. Or, it may ask if you want to install the CAB file (replacing a former file) click yes.

- Your checked out data is now on your mobile device and included in an ArcPad map (project) on your field unit and ready for updating. This process should overwrite previously checked-out files; however, if you have deployed data during a previous session, make sure you are entering points in a new blank version of the data.

Manual Copying of ArcPad Project Folder

- If you have a problem deploying the files to your field unit you may manually copy the files using File Management in the Windows Mobile Device Center.

- Paste the entire folder created in Section 3 (page 6 of this procedure) into the My Documents folder on your field unit. If you are following the default naming it will be called "DataForArcPadx"

**Opening the Project on your field unit and data collection**

- Open ArcPad on your field unit.

- Select "Choose a map to open" in the Welcome to ArcPad menu.

- If the Welcome to ArcPad menu does not open automatically, click on the "Main Tools" icon that looks like a closed file folder at the top left. Then click the "open map" icon directly underneath it as depicted below.

- Then choose the ArcPad map (apm) file created for this field session (named during the check-out procedure). Then click ok at the bottom of the screen.
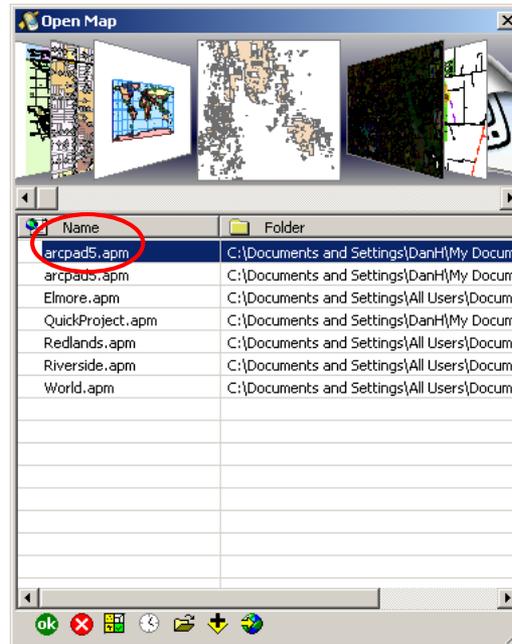
Note: the checkout procedure automatically creates a "picture" of your layout at the time of checkout. Even though you may not have selected some of the layers for export, they will show up in this picture that represents your ArcPad map (apm), which is shown at the top of your ArcPad screen.

- Activate your GPS (if not already activated) by clicking the dropdown menu under the satellite icon and select "activate GPS". You will find this under the main menu (folder icon). If you are inside and reviewing the procedure don't activate the GPS; a no position warning will interrupt your review.
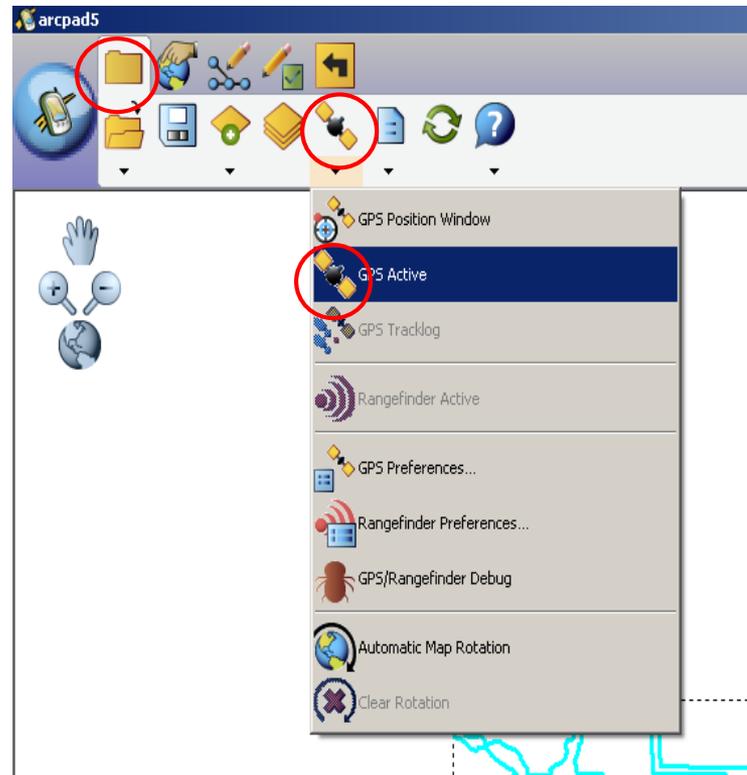
Open table of contents.

Then check the start editing box for the RA data (the box under the pencil).
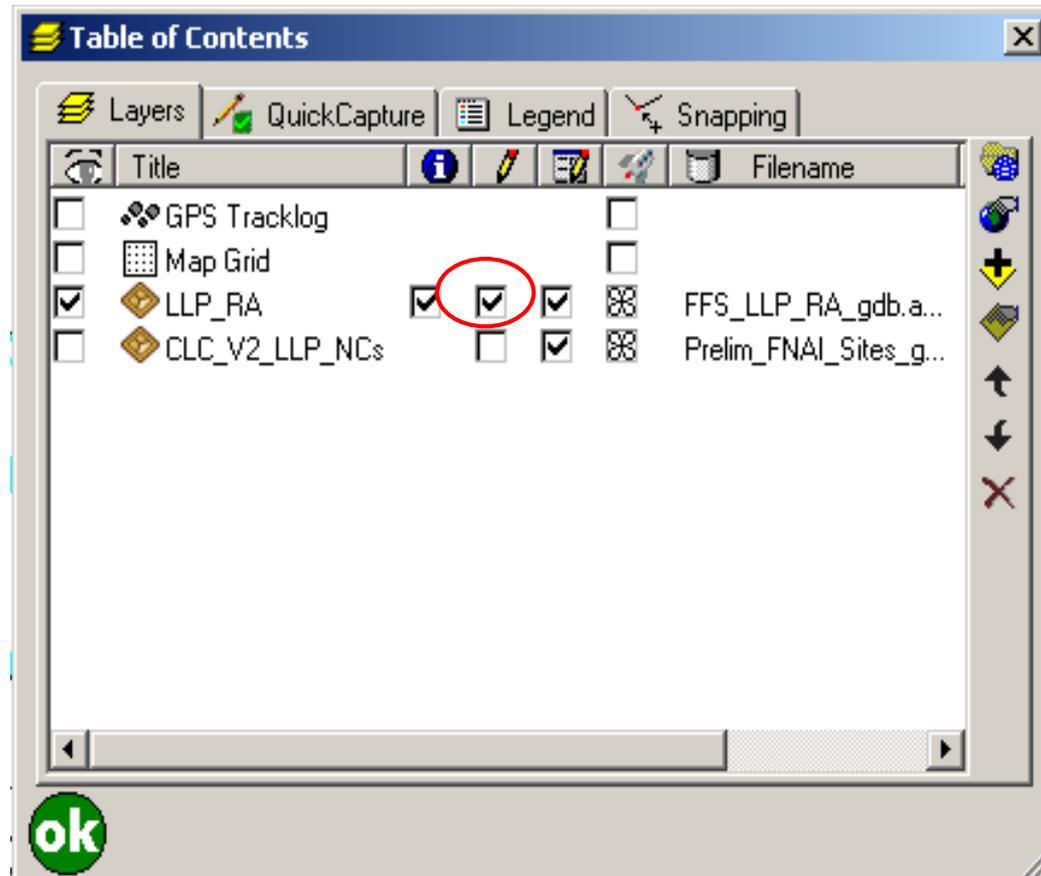
Then click OK.

- Once you click OK in the table of contents you may automatically be taken to the QuickCapture menu.
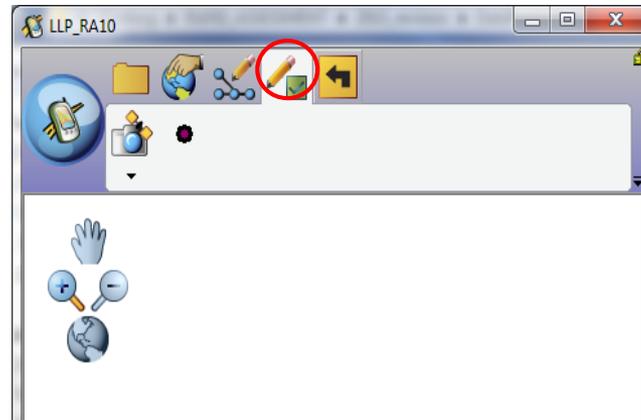
- If so click on the tab to the left called Drawing Tools for data collection.
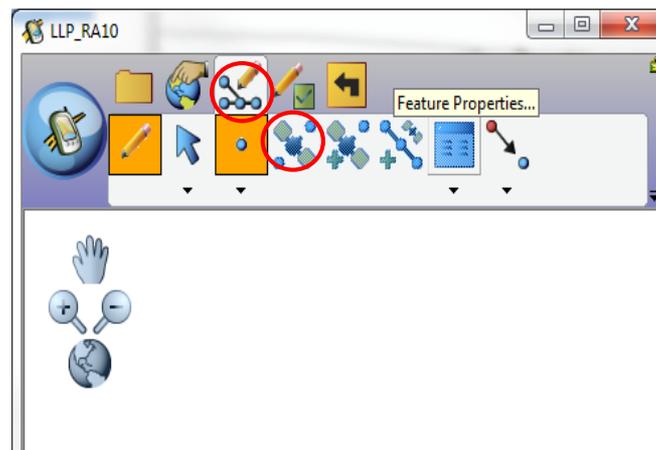
If your GPS is active you can then click on the Capture Point icon () to take a point where you stand and begin entering the rapid assessment data.

You also have the option of digitizing a point on the screen by clicking on the point button ()then clicking a location on the screen. You should only do this when you have background files that allow you to place the point at a known location.
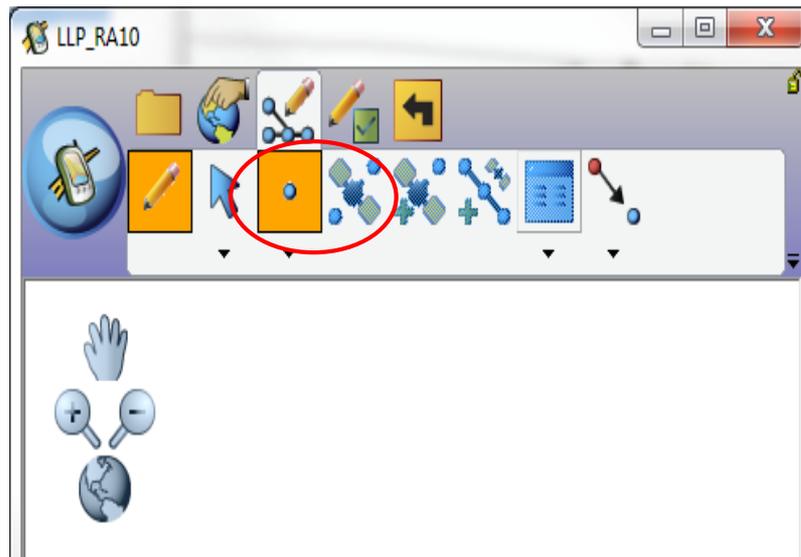
- If you need to add additional layers such as imagery, click the add layers button to browse to the location. You may want to store large imagery files on a micro SD card (located behind the battery on your Flint)

Once you've clicked the "capture point" icon or manually placed a point a data form will show on your screen.

Complete each page of the form by clicking on the drop-down menus then clicking on the next page.

There are 3 pages in the field form; please complete each page.

Click OK to store the data.
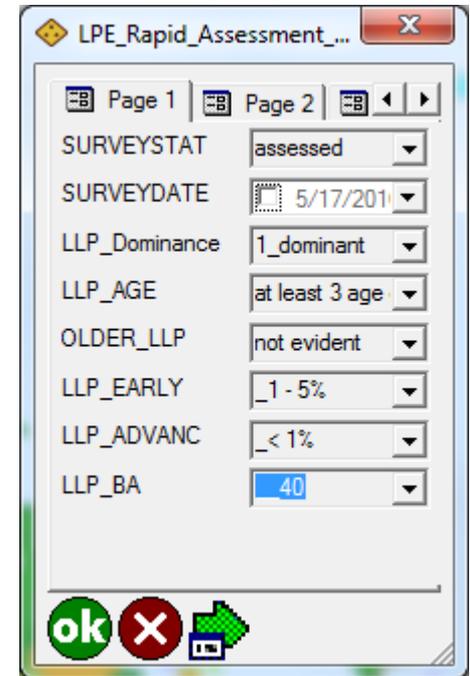
In ArcPad 7 and 8 the Repeat Attributes Tool was on the Edit Toolbar as default. It has moved to the Edit Form in ArcPad 10. You can still add the Repeat Attributes Tool to any Toolbar using the Toolbar Editor or add it to your Favorites Toolbar.   Be careful when using this tool; it is easy to repeat data accidentally.

After you have entered attribute data into the Edit Form for any layer, select (click) (Repeat Attributes; a white box highlights the arrow when selected) to enter the same data into subsequent features collected in that layer automatically. Click it again to turn it off. Repeat Attributes can be used on any editable feature type.
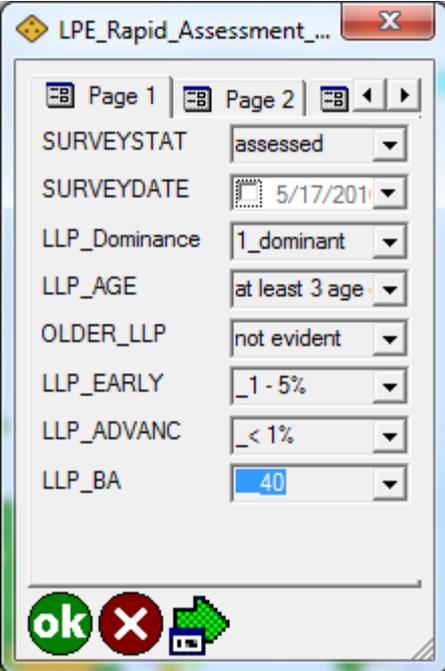
If you need to edit the data after closing the form select the point ( ) then click the feature properties ( ) icon under the drawing tools menu to re-open the form.

When the field session is complete, close ArcPad and follow the Check-in procedures to update your RA geodatabase.

Check-in field data
(updating your RA geodatabase with field data)

Connect your field unit to your computer. Copy the entire folder for your field session (located in My Documents\DataForArcPad on you mobile device) and paste it on your computer over the version created during the Check-out (page 6).

Alternatively you may paste it in another folder dedicated to Check-in, just remember the location for the following procedure.

Again, your folder will be in the My Documents folder on your field unit. The default name created during the CAB deployment is "DataForArcPad". You may copy the folder using windows explorer or the Mobile Device Center.

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Once the file is on your computer open your RA ArcMap project and start editing your LPE rapid assessment geodatabase.
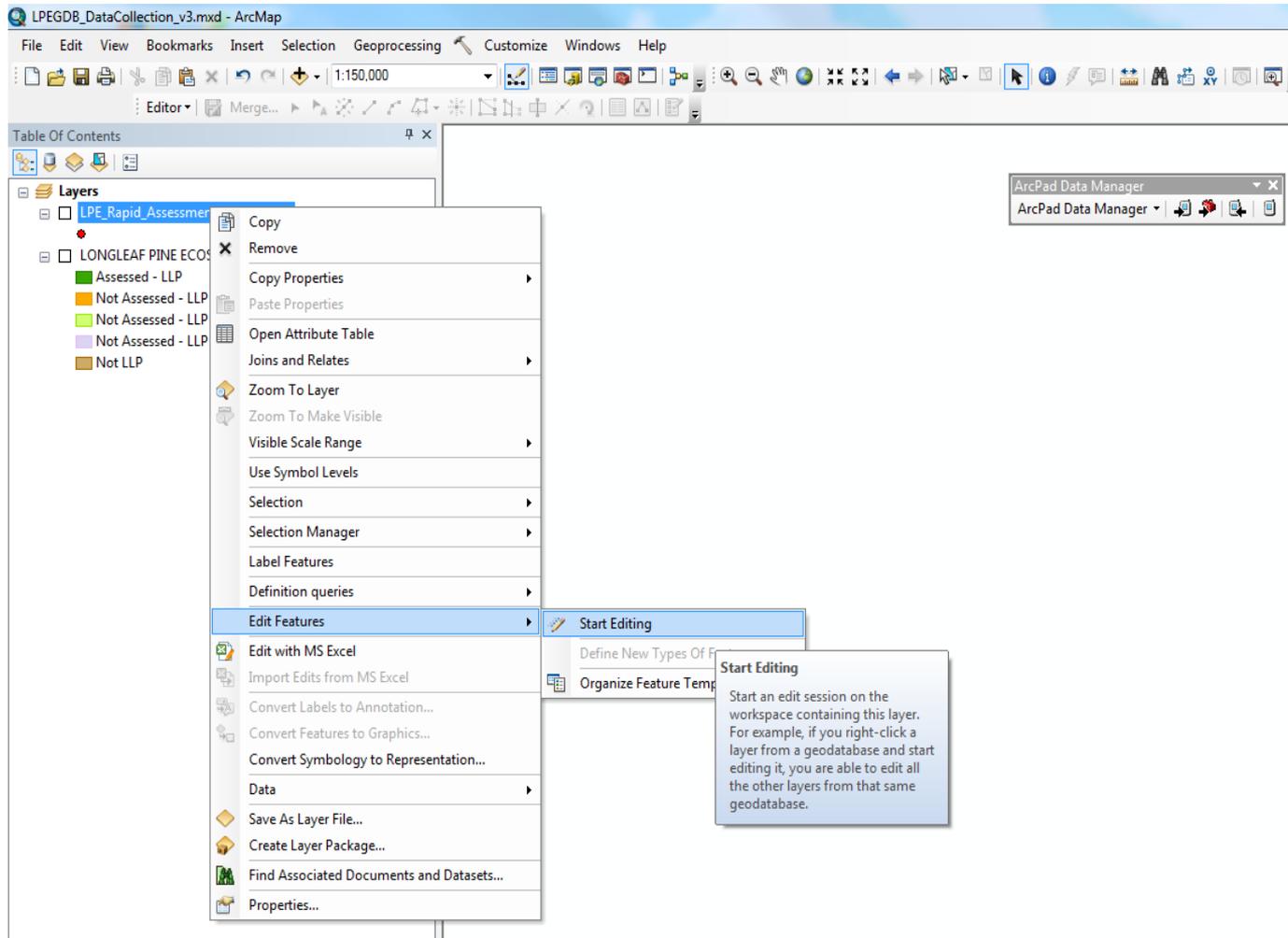
On the Arcpad Data Manager toolbar click
"Check In Edits From ArcPad"

Then click the browse for ArcPad files button
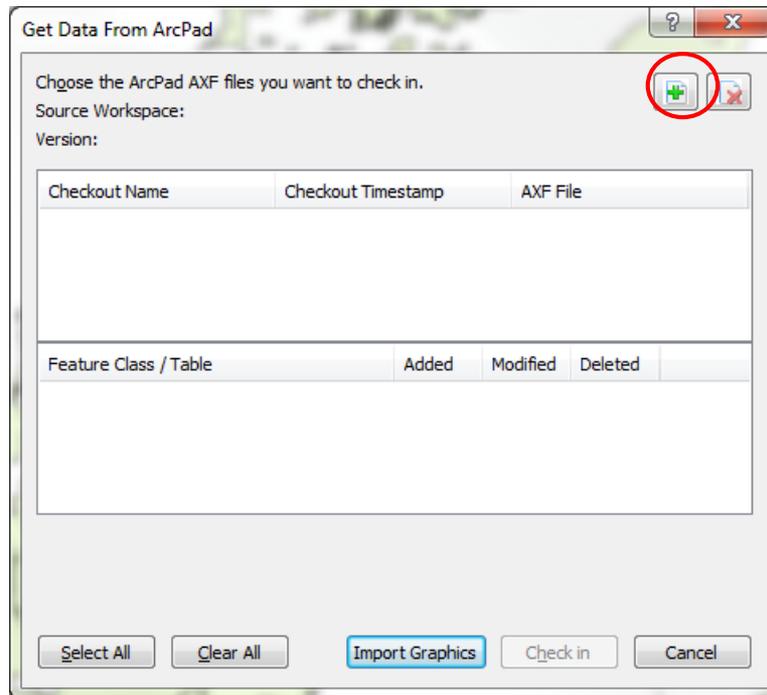
Browse to the location of the file you just copied from your field unit to your computer and click "Open"
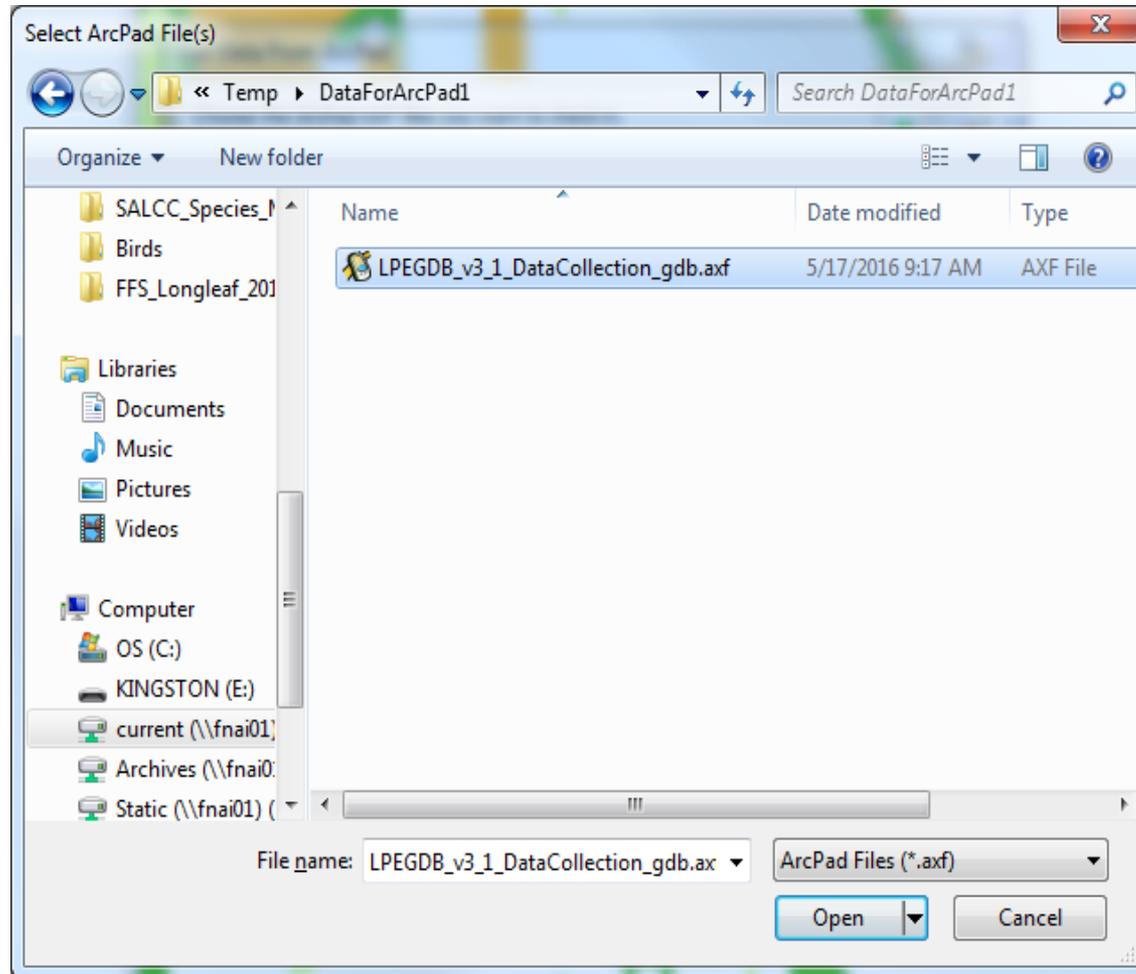
Check the box for your RA data and click "Check In".
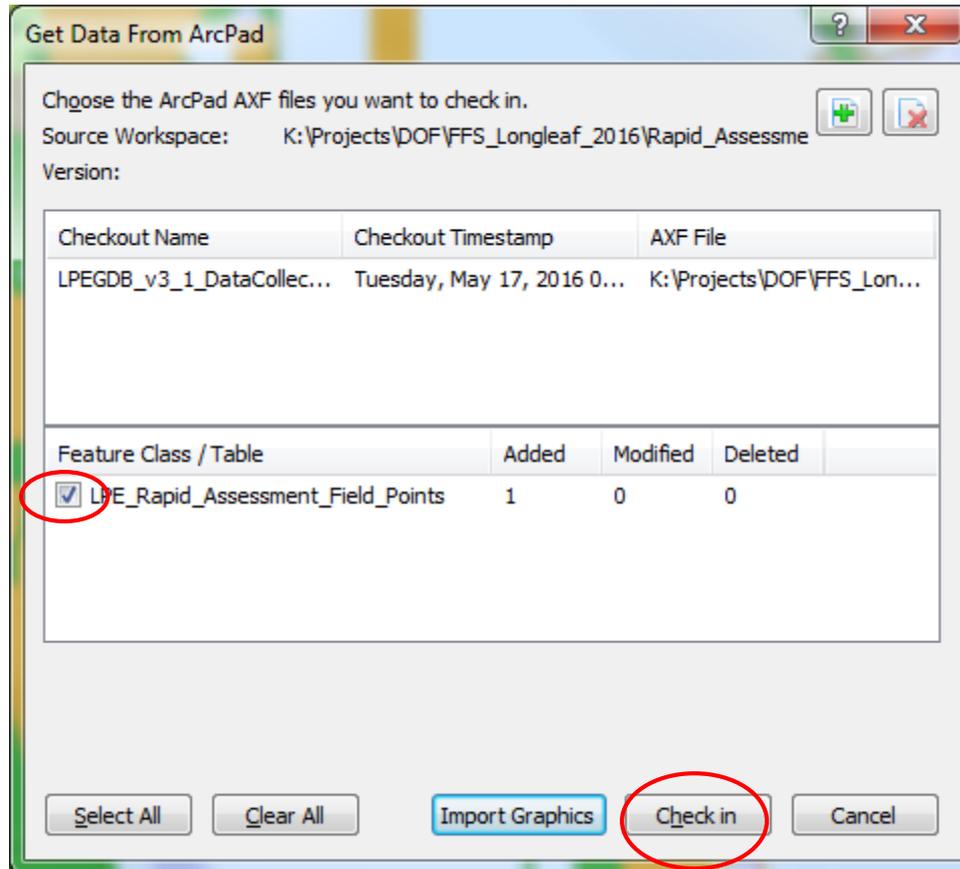
This will update your RA geodatabase with field data. Open your feature class to confirm your field edits, make a backup, then delete the folder on your field unit to complete the process.

Repeat the process from the start for your next field session. Your field session may be from one to several days. You should check-in your data at the end of each session to prevent loss of data and to allow you to review your data while the information is still fresh in your head.   You'll continue to add points to your geodatabase with each check-in. The geodatabase will be submitted to FNAI at a date to be determined.

Thanks for your contribution to this effort.

Appendix C. Data Sources Included in the LPEGDB

Data Source	Description	Original Source Format
BISON	Biodiversity Information Serving Our Nation' is a USGS database containing information compiled from many sources. Only the original source data, i.e. Inaturalist, Carolina Vegetation Survey, are recorded in the Data Source field of the LPEGDB v4	
Carolina Vegetation Survey Database	Longleaf pine locations mined from plot database; downloaded from BISON; data available for 2000-2003	Point
Cooperative Land Cover v.3x	Detailed land cover map for Florida with boundaries primarily delineated from aerial photos. Polygon sources vary from CLC v2.3 through v3.2.5	Polygon
DEP CE Monitoring Report 2016	Monitoring report for Conservation Easements held by the Florida Department of Environmental Protection with description of natural resources	Report
Eglin AFB v3	Eglin Air Force Base – Forest Stand Inventory Database	Polygon; Point
FFS Compiled Longleaf Stands	Florida Forest Service compiled stand data from existing land records (private lands, SRMWD, Tall Timbers, etc) in 2012; spatial data varied by source and precision	Polygon
FFS Cooperative Forestry Assistance Database	Database with locations and types of forestry assistance to landowners; includes records of longleaf planting	Polygon
FFS State Lands Inventory	Florida Forest Service Forest Stands, including stand statistics, from the Forestry Data Model geodatabase provided in 2014 and 2017	Polygon
Florida Park Service Management Plan	State Park management plan with description of natural resources on the park	Report
Florida Park Service v3	Natural community labels and boundaries for state parks	Polygon
FNAI Compiled Data	Includes a variety of data types compiled by FNAI, including Element Occurrence records and RCW cluster centers	Polygon; Point
FNAI Field Survey	Includes a variety of FNAI field surveys, including detailed natural community mapping on many state and federal conservation lands	Point

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Data Source	Description	Original Source Format
FNAI Review	Indicates that longleaf information is derived from expert knowledge by FNAI staff	N/A
Fox Lake Sanctuary Management Plan, Brevard Co	County management plan with natural resource information	Report
FWC Landowner Assistance Program (non-NRCS) v3	Non-NRCS Longleaf Plantings on LAP Management Units; Non-NRCS Sandhill Management Units	Polygon
FWC v3	Longleaf Plantings on Wildlife Management Areas	Polygon
Geoform v4	Online data collection tool for longleaf pine developed for the LPEGDB.	Point
INaturalist 2016	Citizen scientist database for species information; research-grade records downloaded from BISON	Point
LPEGDB Rapid Assessment 2013 v3	Assessment data collected by FFS county foresters in 2013	Polygon
LPEGDB Rapid Assessment 2017 v4	Assessment data collected by FFS county foresters in 2017	Point
Pasco Co.	Map of longleaf stands on lands managed by Pasco County	Report
NWFWMD LL Stands 2018	Northwest Florida Water Management District Longleaf Pine stands; includes stands where longleaf pine was >50% of canopy species	Polygon
Resource Management Service, LLC (RMS) v3	Longleaf polygons provided by RMRS within the Coastal Headwaters Longleaf Forest Florida Forever Project	Polygon
SJRWMD Stands v4	St. Johns River Water Management District Forest Stands (2014 and 2018); Inventory Plot Data and Fire Mangement Unit data were also provided in 2014	Polygon; Point
SRWMD Stands v4	Suwannee River Water Management District - Longleaf planting data	Polygon
RCW Data	RCW cavity tree records from Apalachicola National Forest, provided in 2015	Point
USFS ECM v3	Ecological Condition Model for 3 National Forests (2014)	Polygon
USFS Stands	National Forest Stands provided in 2014 and 2018	Polygon

Crosswalk of Forest Stand Data Sources into LPEGDB

Florida Forest Service

FFS provided updated GIS data layers associated with their Forestry Data Model.

Extent: All Florida State Forests

Polygon Source Boundaries: Forest Stands

Attribute Sources: Forest Stands polygons, Prescribed Burns polygons, Stand statistics table

Attributes Represented in LPEGDB v.2:

FFS Attribute	Crosswalk to LPEGDB v.2 Attributes	
Forest Type	LPE Occurrence	LLP Canopy Dominance
Age Structure	LLP Age	
Longleaf Basal Area	LLP BA	
Burn Year	Fire Evidence	

Summary: FFS Forest Type was used to make assumptions about the dominance of longleaf pine in the canopy that may not hold true in all cases. If Forest Type was exclusively Longleaf, or if Longleaf was listed first followed by Scrub Oak, Turkey Oak, or Southern Red Oak, then Longleaf was assumed dominant. For any other Forest Type combinations that included Longleaf (e.g. Longleaf/Slash Pine or Slash Pine/Longleaf), Longleaf was assumed co-dominant. Age Structure and Basal Area were crosswalked only for stands where longleaf was assumed dominant in the canopy.

U. S. Forest Service

USFS provided GIS data layers associated with Stands and Ecological Condition Models (ECM).

Extent: All National Forests in Florida

Polygon Source Boundaries: Forest Stands

Attribute Sources: Forest Stands polygons, ECM polygons, ECM plot data*

Attributes Represented in LPEGDB v.4:

USFS Attribute	Crosswalk to LPEGDB v.2 Attributes	
Forest Type	LPE Occurrence	LLP Canopy Dominance
ECM Tier	Condition Rank	

Summary: As with FFS data, Forest Type was used to make assumptions about the dominance of longleaf pine in the canopy that may not hold true in all cases. The Ecological Condition Model uses data about canopy, midstory, shrub and ground layers to assign overall quality tiers of excellent, good, fair, poor, and very poor relative to desired future condition. Because the tiers are modeled based on a summary of multiple condition attributes all longleaf stands with ECM tiers are represented as having ecological condition data (Confidence Tier '1A') in the LPEGDB v.4.

*ECM plot data were collected by FNAI and included in the FNAI ecological condition data which were included in LPEGDB v.1 and re-associated with updated polygons in LPEGDB v.2 and v.4. The ECM plot data inform most condition attributes, but only for a subset of stands.

Eglin Air Force Base

Eglin Air Force Base (AFB) provided GIS and tabular data layers associated with Stands, Timber Inventory Plots, and Trees.

Extent: Eglin AFB

Polygon Source Boundaries: Stands

Attribute Sources: Stands polygons, RCW Stands polygons, RCW Plots summary table, Tree table (linked to plots)

Attributes Represented in LPEGDB v.4:

Eglin AFB Attribute	Crosswalk to LPEGDB v.2 Attributes	
Forest Type (PType)	LPE Occurrence	LLP Canopy Dominance
Broad Type (BTYpe)	LPE Occurrence (with PType)	
Longleaf BA (LLBA)	LLP BA	
Longleaf Pine Trees Per Acre (LLPTPA)	LLP Canopy Dominance	
Cover Midstory (CvrMS)	Midstory Cover	
Herbaceous_GRDCV	Herbaceous Cover	
Tree - Species Name	LPE Occurrence	

Summary: PType was used to make assumptions about the dominance of longleaf pine in the canopy that may not hold true in all cases. For example, there were cases where PTYPE was 'Longleaf' but longleaf may have been recently planted and in the seedling or sapling stage. Additional information such as percentage of Longleaf TPA versus other pine TPA was used to refine the crosswalk where possible. Much of the data derives from timber inventory plot data which was not yet complete for the entire AFB at the time data were received. Midstory data occurred in 3 classes as Sparse, Moderate, and Dense which were crosswalked directly into management classes of Restore, Improve, and Maintain, respectively. Herbaceous ground cover was available for RCW stands inventoried in 2009-2010 only.

St. Johns River Water Management District

SJRWMD provided GIS and tabular data layers associated with Forest Stands, Timber Inventory Plots, and Fire Management Units (FMU).

Extent: Most lands owned and managed by SJRWMD

Polygon Source Boundaries: Stands and FMUs

Attribute Sources: Stands polygons, FMU polygons, Reforestation table (linked to stands), Tree table (linked to plots)

Attributes Represented in LPEGDB v.4:

SJRWMD Attribute	Crosswalk to LPEGDB v.2 Attributes	
Primary Stand Species	LPE Occurrence	LLP Canopy Dominance
Secondary Stand Species	LPE Occurrence (with Primary)	LLP Canopy Dominance
Density (BA Range)	LLP BA	
Size	LLP Canopy Dominance	
Broad Type (BType)		
Tree - Species Name	LPE Occurrence	
Reforestation - Species	LPE Occurrence	
FMU – Land Type	Confidence Tier	
FMU – Last Burn Date	Fire Evidence	
FMU - Land Type Comment	LPE Occurrence	
FMU – Condition Class	Condition Rank	

Summary: Primary and Secondary Species fields in conjunction with Size, which is a DBH range for the stand, were used to make assumptions about the dominance of longleaf pine in the canopy.   The overall extent of stand polygons and FMU polygons overlapped to a large degree but the polygon features within each were different. These were combined in GIS with a union function that splits polygons into non-overlapping features so that attributes from both Stands and FMUs could be integrated into the LPEGDB. The FMU Land Type described the broad natural community type; the sandhill Land Type was used to assign LPE potential (Confidence Tier 3) to areas with no other LPE evidence.

Appendix D. Crosswalk of Rapid Assessment Values into Management Classes

M= Maintain; I= Improve; R= Restore

LLP AGE	LLP AGE mc	LLP BA	LLP BA mc	OLDER LLP	OLDER LLP mc	HW COV	HW COV mc	OTHPINECOV	OTHPINECOV mc	LLP EARLY	LLP ADVANC	LLP REGEN mc
at least 3 age classes	M	0 - 30	<Null>	yes	M	1	M	1	M	not evident	not evident	R
2 age classes	M	31 - 60	M	not evident	I	3	M	3	M	<1%	<1%	I
1 age class	I	61 - 90	M			10	I	10	M	1 - 5%	1 - 5%	M
absent from canopy	R	> 90	I			20	I	20	I	5 - 15%	5 - 15%	M
		0	R			30	I	30	I	>15%	>15%	M
		10	I			40	R	40	I	yes	yes	M
		20	I			50	R	50	R			
		30	M			60	R	60	R			
		40	M			70	R	70	R			
		50	M			80	R	80	R			
		60	M			90	R	90	R			
		70	M			98	R	98	R			
		80	M									
		90	I									
		100	I									
		110	I									
		120	I									
		>120	I									

MIDST COV	MIDST COV mc	FIREHW COV	FIREHW COV mc	SHRUB COV	SHRUB COV mc	SSHRUB COV	SSHRUB COV mc	TSHRUB COV	TSHRUB COV mc	HERB COV	HERB COV mc
1	M	1	M	1	M	1	M	1	M	1	R
3	M	3	M	3	M	3	M	3	M	3	R
10	M	10	M	10	M	10	M	10	M	10	I
20	I	20	I	20	M	20	M	20	I	20	I
30	I	30	I	30	M	30	M	30	I	30	I
40	I	40	I	40	I	40	I	40	I	40	M
50	I	50	I	50	I	50	I	50	R	50	M
60	I	60	R	60	R	60	R	60	R	60	M
70	I	70	R	70	R	70	R	70	R	70	M
80	R	80	R	80	R	80	R	80	R	80	M
90	R	90	R	90	R	90	R	90	R	90	M
98	R	98	R	98	R	98	R	98	R	98	M

PYROGR COV	PYROGR COV mc	PASTGR COV	PASTGR COV mc	INVPL COV	INVPL COV mc	COND RANK	COND RANK mc
1	R	1	M	not evident	M	excellent	M
3	I	3	I	present along	I	good	M
10	I	10	I	1 to few patch	I	fair	I
20	M	20	R	many patches	R	poor	R
30	M	30	R	_<1%	M		
40	M	40	R	_1-3%	I		
50	M	50	R	_4-10%	R		
60	M	60	R	_>10%	R		
70	M	70	R				
80	M	80	R				
90	M	90	R				
98	M	98	R				

Key	
1	< 1%
3	1 - 5%
10	6 - 15%
20	16 - 25%
30	26 - 35%
40	36- 45%
50	46 - 55%
60	55 - 65%
70	66 - 75%
80	76 - 85%
90	86 - 95%
98	96 - 100%

Appendix E.
Longleaf Pine Ecosystem Geodatabase v.4 User Guide

Steps for Accessing Data

1. Fill out and return the [GIS Data License Agreement](#) to: Brian Camposano, State Forest Ecologist
   Brian.Camposano@FreshFromFlorida.com
   (850) 681-5890

2. You will receive a link via email to download a zip file: LPEGDB_v4_Sep2018.zip

3. Extract the zip. Contents will extract into a folder named LPEGDB_v4_Sep2018.

4. The folder contents are a Map Package: LPEGDB_v4_Map.mpk and pdf documents including LPEGDB reports.

5. Double-click the Map Package to open it. The map will automatically open in ArcMap to display LPEGDB layers (see next pg of this guide). The actual geodatabase will be extracted to your hard drive.   View the source of any LPE layer in ArcMap to determine the file path to the LPEGDB_v4.gdb.

The LPEGDB_v4.gdb is an ArcGIS 10.6 file geodatabase. Users are encouraged to refer to the metadata associated with each feature class and LPEGDB v.4 report for details about attributes.

For technical data questions please contact: Amy Knight, GIS Program Specialist
aknight@fnai.fsu.edu
(850) 224-8207 x214

LPEGDB_v4_Map

Double-clicking the map package – **LPEGDB_v4_Map.mpk** – will automatically open layers in ArcMap with the default view.

Layers occur in Groups:

LONGLEAF PINE ECOSYSTEM OCCURRENCE STATUS

Each layer within this group has a definition query on the LPE_Occurrence field of the *LPE_Occurrence_Status_v4* feature class.

ECOLOGICAL CONDITIONS

Expand this group to view layers based on 9 different condition attributes. Only polygons with confirmed longleaf are included in this group. All layers in this group are based on the *Condition_by_Mgmt_Class_v4* feature class.

OTHER LAYERS

Expand this group to view layers based on land cover type and managing agency. Only polygons with confirmed longleaf are included in this group. All layers in this group are based on the *Condition_by_Mgmt_Class_v4* feature class.

DATA COLLECTION TEMPLATE

This group contains an empty point feature class for use with ArcPad, or other ESRI mobile data collection tools. See separate Rapid Assessment Training Guides for use.

Default View
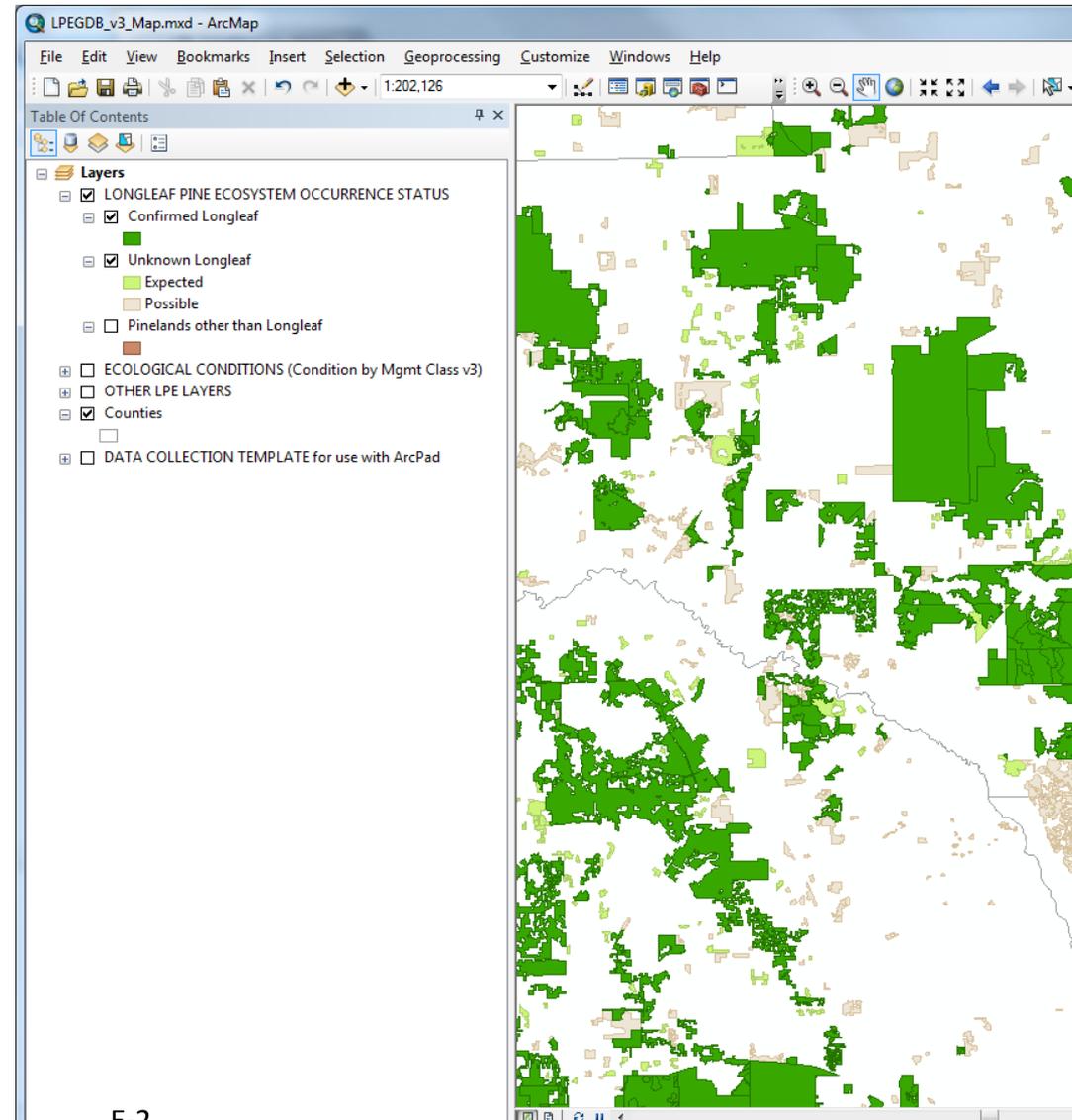
LPEGDB_v4.gdb

Click Source Tab in ArcMap to determine file path to unpackaged data. It should resemble path shown.

The many-digit code in folder name will differ for each user.

LPE_Occurrence_Status_v4 polygons

Includes confirmed longleaf pine sites, potential longleaf sites where occurrence status remains unknown, and remaining pinelands that are known not to be longleaf sites.

LPE_Condition_by_Mgmt_Class_v4 polygons

Includes confirmed longleaf sites with ecological condition attributes from multiple sources that have been crosswalked into management classes for Maintain, Improve, and Restore.

LPE_Rapid_Assessment_Field_Points

This is an empty feature class that serves as a template for ArcPad field data collection based on the Rapid Assessment v.4 data collection model. See Rapid Assessment Training Guides for instructions.

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