ACPF Version 7 Release Notes – June 2025

The ACPF National Hub would like to introduce to you the ACPF Version 7 Toolbox and the ACPF 2025 spatial data framework. At this release, we are adding a suite of new tools and tool modifications to identify opportunities for phosphorus removal structures, or P-Traps, that address dissolved reactive phosphorus (DRP) in agricultural landscapes. Our tools are based on long-term research of Dr. Chad Penn, USDA ARS National Soil Erosion Research Laboratory, supported in part by the USDA NRCS Conservation Effects Assessment project (CEAP) and the USDA ARS Long-Term Agroecosystem Research (LTAR) network. His research has resulted in the recent addition of the NRCS national conservation practice standard 624 – Phosphorus Removal System. A system "*to remove dissolved phosphorus from surface runoff, subsurface drain, or ditch flows using a phosphorus sorption media within a containment structure.*"

In the ACPF Toolbox, three new tools and a tool modification have been developed in support of this new practice standard; see their descriptions below.

Also in Version 7, the ACPF National Hub is supporting a near-national scale of ACPF use. To accomplish this, a national field boundary collection has been assembled and made available through a web feature service. These services allow a user to access the field boundary collection on a HUC12 basis and begin the creation of an ACPF file-geodatabase (FileGDB). By using the Utilities tools u1–u4, the user can create an ACPF core database in file-geodatabase format for one of over 50,000 agricultural HUC12 watersheds in the U.S. The process is as follows:

- ✓ ***u1. Initialize ACPF Core data*** – Creates a new ACPF FileGDB, adds the HUC12 boundary (bnd), downloads the field boundaries (FB), and buffers their Union by 1,000 m to create the buffered boundary (buf).
- ✓ ***u2. Get ACPF Soils data*** – Using the buffered boundary feature class, extract the ACPF soils raster and attribute tables to the FileGDB.
- ✓ ***u3. Get NASS CDL by Year(s)*** - Using the buffered boundary feature class, extract NASS Cropland Data Layer rasters for multiple years to the FileGDB.
- ✓ ***u4. Update Edited Field Boundaries*** – The u1 tool will deliver the field boundary feature class with an '_edit' extension. The user should carefully examine and edit this feature class (_edit) to ensure the data are as good as necessary for their intended use, **and then** run this tool.

We recognize that by expanding the spatial extent of the ACPF data, we will be entering agricultural landscapes where we have had limited opportunities to work. While challenging, we view this as an opportunity to collaborate with new users, conservation specialists, and scientists to explore innovative solutions to address their resource concerns. The ACPF National Hub Team is eager to open conversations with you to support your agricultural conservation planning efforts. Visit the ACPF Home Page (acpf4watersheds.org) to begin your journey.

Tool Modifications

4a. Depression Identification: Updated to include the mean percentage potential wetland soil of each depression. The user can optionally limit depressions if their mean percent potential wetland soil is less than a user-defined threshold. The default is 75%. This change will help identify blind inlet P-Traps in tile-drained fields.

4g. Edge-of-field Bioreactors: The approach for bioreactor siting was altered significantly to align with the approach for the new subsurface phosphorus trap tool. All locations between 20 and 100 acres where flow exits a tile-drained field are now considered potential sites, rather than just the single point of highest flow accumulation between 20 and 100 acres. Points are excluded from consideration if they are not within 50 meters of the stream reach or a road. Unique identifier for bioreactors has been changed from “SiteID” to “BioreacID”. Bioreactor drainage areas are now included as a tool output.

Tool Additions

4h. Add Sub-surface P-Trap Suitability (SPTS) Index. Assigns a risk (value from 0 to 20) for DRP loss through tile-drainage for each agricultural field (IsAg >= 1). Five conditions (four soils, one topographic) that have been shown to increase the risk of DRP loss through tile drains are examined within each field. Attributes are added to the ACPF “DrainageTable”, and, therefore, no new outputs are created. The **SPTS** Index should be used to help prioritize fields for subsurface phosphorus removal structures.

4i. P Traps – Subsurface Filter: Identifies opportunities for subsurface phosphorus removal structures at the edge of tile-drained fields. Locations are excluded from consideration if they are not within 50 meters of the stream reach or a road. Remaining sites are ranked by the amount of upstream agricultural land they intercept. The **SPTS** Index should be used to guide where subsurface filters will be most effective. Information on DRP levels in tile water or soil test phosphorus (STP) levels should be incorporated where available.

4j. P Traps – Surface Filter: Identifies locations within primary ditches as well as areas of surface flow convergence that possess enough depth and curvature to serve as a potential site for a surface phosphorus removal structure. Sites are filtered and ranked by the amount of upstream agricultural land they intercept. Information on DRP levels in waterway or soil test phosphorus (STP) levels should be incorporated where available.

Utilities>u1. Initialize ACPF Core data: This tool initializes the ACPF FileGDB in the selected folder, downloads the HUC12 watershed boundary to the FileGDB, selects, downloads, and adds those fields that have their center in the HUC12 boundary (bnd), then buffers the Union of these two feature classes to create the buffered boundary. The buffered boundary (buf) is used in the follow-on tools, *u2. Get ACPF Soils data* and *u3. Get NASS CDL by Year(s),* to populate the remainder of the ACPF core database.

Select the HUC12 for running this tool by visiting the Core Data Availability page. Use this map to search or navigate to the HUC12 of interest and use the identify tool to open the explorer window and copy the HUC12 ID. The Batch Tool documentation is available at acpfsupport@iastate.edu.

Several states publish their own field boundary feature classes. We have made every attempt to identify these and include their data in our national collection. To date, we have assimilated field boundary features from CA, CO, NM, and WA. In three of these states (CA, CO, WA), ancillary data is published with the features. If available, these ancillary data will be extracted for each field where applicable and placed in the output FileGDB. California and Washington actively manage their field boundary collections, which reduces the potential for follow-on editing. Each of these has its metadata page.

Minor modifications

Runoff Risk
Minor change to modern assignment using first instance, not last;
Slope20Value = arcpy.da.SearchCursor(Field20, ("Slope75Pct",)).next()[0]

Calculate SVI For All Components
At v7, gSSURGO soils and SVI data gSSURGOversion fields must match, and add a trap. The gSSURGOversion match ensures mukey match.

Update Edited Field Boundaries
At v7, add support for the UniqueID field, which is the unique identifier in ancillary data tables published by states, currently used by CA. CO, WA. This modification joins the original UniqueIDs to the output of the edited FB feature classes. Testing is ongoing.

D8 Terrain Processing & Pit Fill/Hole Punch
Add a warning to use a cm Int-Z DEM to enhance throughput.

Basic Steps to Creating an ACPF File Geodatabase

These basic steps, when followed, will result in a single HUC12 watershed that conforms to the described ACPF database structure and naming conventions and will be compatible with the ACPF Toolbox.

1) Use the **Utilities > u1. Initialize the ACPF Core Data** tool to establish the ACPF File Geodatabase (FileGDB) and download boundary data.
   - The inputs for this tool are a valid HUC12 ID in the ACPF Core Data Availability collection and a destination folder that will hold the ACPF FileGDB. A valid HUC12 ID is a 12-digit Hydrologic Unit Code assigned to a subwatershed with 10 or more agricultural fields (e.g., 070802020103).
   - The tool will extract the watershed boundary feature class from the US National HUC12 collection housed at the ACPF National Hub. It will apply the ACPF naming convention for a HUC12 watershed (e.g., bnd070802020103).
   - Using the watershed boundary feature class, the tool will extract the field boundary features from the ACPF national field boundary collection housed at the ACPF National Hub. Fields will be selected that have their center (or centroid) in the watershed boundary feature class.
   - These features will be saved to the ACPF FileGDB with the following naming convention example: 'FB070802020103_edit'.
   - The tool will use the Union Tool to combine the watershed boundary and field boundaries feature classes to create one feature class that will be used to create the buffered watershed boundary using the Buffer tool. The buffered watershed boundary is established 1,000 meters from the Unioned border.
   - The output will be saved to the ACPF FileGDB using the naming convention: buf070802020103.
   - The buffered watershed boundary is established 1000 meters from the watershed boundary and the field boundaries to ensure that the land use, soils, and elevation fully capture the watershed's extent. Invariably, the DEM's watershed boundary will differ from the original watershed boundary.

2) Download the ACPF Soils data
   - Use the **Utilities > u2. Get ACPF Soils Data** tool to download the soils data.
   - The input to the tool is the buffered watershed boundary feature class, e.g., buf070802020103.
   - The tool will extract the gSSURGO raster and create the soils attribute tables: soil profile, surface horizon, and surface texture. These data will not be added directly to the ArcGIS Pro session; check for them in the FileGDB in the Catalog pane.

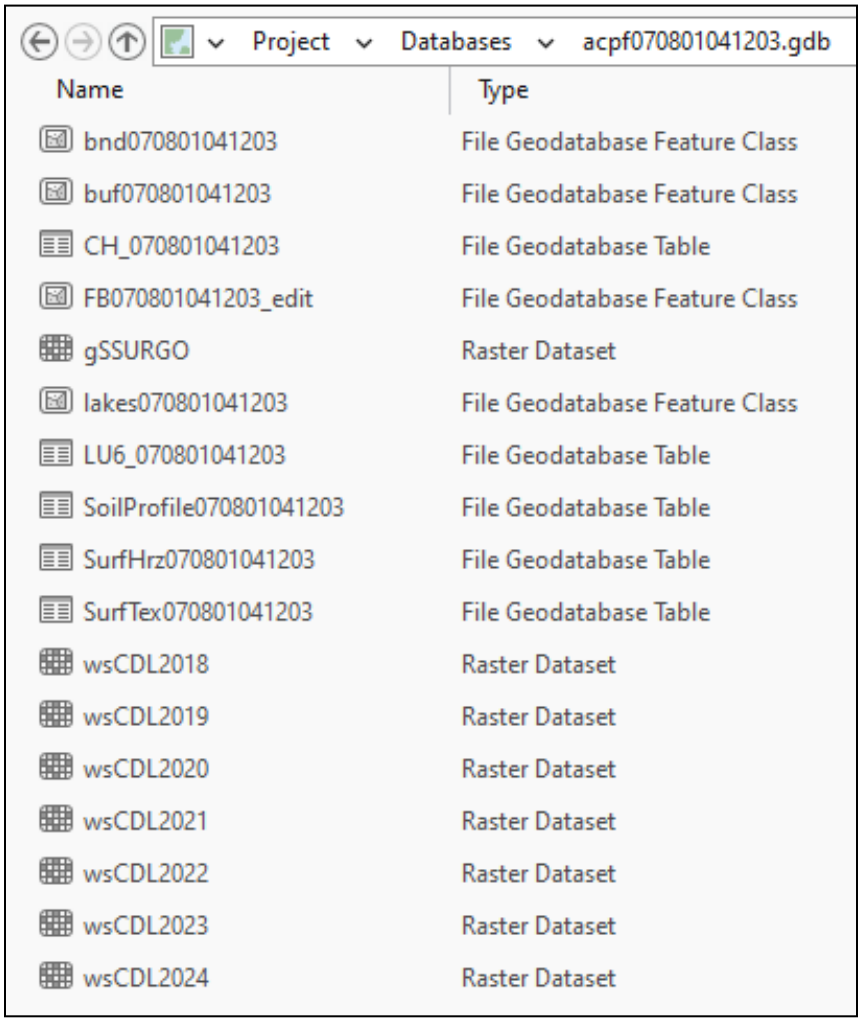
3) Download the ACPF Land Use data

- Use the **Utilities > u3. Get NASS CDL by Year(s)** tool to download multiple years of land use data.
- The inputs to the tool are the buffered watershed boundary feature class (e.g., buf070802020103) and the ACPF Land Use Lookup Table (ACPF_CDLlkup_2024.dbf). The Land Use Lookup Table can be found in the folder where the ACPF Toolbox is installed.
- Check the appropriate boxes for the years of land use data to download. There needs to be at least 6 years of data for the land use tools to run. The current online database contains data from 2001 to 2024.
- The tool will extract the land use rasters for each year selected and populate the attribute tables. These data will not be added directly to the ArcGIS Pro session; check for them in the FileGDB in the Catalog pane.

4) Create the final ACPF land use data

- Depending on the condition of the field boundary feature class (i.e., you may need to digitize or edit the field boundaries), creating the final land use data may be an iterative process.
- Use the **Utilities > u4. Update Edited Field Boundaries** tool using the field boundary polygon feature class (e.g., FB070802020103_edit) and the ACPF_CDLLkup_2024.dbf table as inputs.
- The outputs will include the field boundary feature class (e.g., FB070802020103), the crop history table (e.g., CH_070802020103), and a land use summary table (e.g., LU6_070802020103).
- To check the land use assignment, join the FB polygons with the crop history table using the FBndID field as the join field, then symbolize on the ‘pct24’ field. This attribute carries the percent of the field assigned to the dominant land use for each field.
- Examine those polygons whose ‘pct24’ is less than 75%. Use the NASS CDL data in your workspace and aerial photography to determine if the field boundaries should be edited.
- Once editing is complete, re-run the **Utilities > u4. Update Edited Field Boundaries** tool using the updated field boundary feature class. Once satisfied, delete all the intermediate FB, LU6, and CH datasets.

The final database should appear as:



Data layers inside each HUC12 File Geodatabase.

Questions: acpfsupport@iastate.edu