

Invasive Carp eDNA Program Database Management and Map Creation Standard Operating Procedure

IC eDNA Monitoring Program



U.S. Fish and Wildlife Service, Midwest and Northeast Regions

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1.0 Data Back and Archive

- 1) Make sure to set up your folder structure as follows:
 - A folder to store eDNA result tables (steward reports) from the Whitney Genetics Laboratory (WGL) for each case
 - A folder to store the eDNA results with field data, the merged summary table for each case e-mailed to the eDNA Coordinator
 - A folder to store all the exported eDNA result maps for each case
 - A folder to store all the ArcGIS Pro projects for each eDNA case
 - A folder with a shapefile of the U.S. States Boundaries (current U.S. Census Bureau layer for state boundaries) to use for the Inset Map
 - A file geodatabase with a feature dataset for each Basin to organize the field data and the field data joined with the WGL eDNA result data by the water basin the samples were collected in
 - All the above sub-folders are stored in a folder with the name of the program and the year in which the sampling is occurring
- 2) The working database for data storage and map creation is on the G drive on the Midwest Fisheries Center Server:
T:\Invasive_Carp_eDNA_Data_and_Projects_Backup\2025\Invasive Carp 2023 eDNA Work and Projects
- 3) Back up the current eDNA Sampling Data Folder in at least two places. First backup location is on the FWS Geospatial Enterprise Data Warehouse in the eDNA project folder. The folder path is:
\\fws.doi.net\fwsgis\Projects\FY19\R3_FAC_FY19_169
- 4) The final data set where everything will be archived is in the project folder on the GIS Enterprise Data Warehouse, folder path listed above.
- 5) Each individual FWCO office should be maintaining a copy of their data at their station as per the QAPP
- 6) Once a week, export a copy of the invasive carp eDNA feature layer being used for data collection (FWS Region 3 Fisheries eDNA Sampling) to the current file geodatabase being used to manage the current year eDNA data. This backup is used in case anything happens with the feature layer.
- 7) Per the QAPP, the eDNA lead for each office has 10 business days to QA/QC the data unless they reach out to the eDNA coordinator and eDNA database manager with a different time frame
- 8) To remove QA/QC'ed data from the online map, zoom to the extent of the data points in the Fisheries eDNA Sampling Map using ArcGIS Pro (Pro). Note: You can add the Fisheries eDNA Sampling Map from ArcGIS Online to ArcGIS Pro using the Catalog Pane, Selecting the Portal option, and then search for the Fisheries eDNA Sampling Map and add and open the map to your Pro project
- 9) Once only the points that need to be removed are within the current map extent, navigate to the offline group in the map ribbon. Select Download Map, leave the Include basemap & tile layers unchecked. The offline layer is ready when the Sync and Remove options are no longer greyed out

- 10) Open the attribute table of the feature layer and ensure **only the records** that need to be removed are in the table. If not, select the remove option in the Offline group and try again
- 11) Check the data for any missing values and look for any incorrect values in the RUID, FWCO ID, State, Basin, Waterbody and Collect date fields. Other fields should be looked over for missing values and outlier values
- 12) Right click on the feature layer in the contents panel and select Data then Export Features. Save the feature layer using the following naming convention (waterbody name_Case Number), ex: Sandusky_River_70000
- 13) Save the feature layer to a feature dataset within a file geodatabase organized by basin or field office to keep the cases organized
- 14) Once the feature layer has been exported and saved. Double check to make sure the feature layer exported correctly, and all the data is present in the attribute table
- 15) Next, open the attribute table of the offline ArcGIS online feature layer, use the switch selection option under the selection group in the attribute table to highlight all the records
- 16) Select delete selection in the selection group in the attribute table to delete the records in the offline feature layer
- 17) Save the Edits, Note: Make sure all the points that needed to be removed have been deleted. Once edits are saved the points **can not** be recovered
- 18) Use the Sync option in the Offline group in the map ribbon to remove the points from the map. Then select remove to remove the offline feature layer downloaded from your device, you can choose to sync and remove to sync the edits again
- 19) Check the map to ensure all the selected points were removed

1.0 Map and Summary Data Generation

- 1) Import the current IC eDNA ArcGIS Pro Map Template
- 2) Save the new map to the ArcGIS Pro Document Folder under the current IC eDNA year folder. Save As your ArcGIS Pro Project and use the following naming convention (IC eDNA waterbody name Case Number), ex: IC eDNA Sandusky River 70000
- 3) Rename Inserted Maps and Layouts to reflect the waterbody name of the case
- 4) Use the Catalog Pane to insert the csv data steward report file with the Whitney Genetics Lab Summary detection results (note: The csv file is generated using R by the lab in a format ArcGIS can read, please see the eDNA fields table in the QAPP to read what each data field represents).
- 5) The Regional Unique ID (RUID) is in text format in the feature layer due to an arcade script to auto-populate the case number. Add a new field as data type Long and use the calculate field to populate the RUID's to use for the join to the

lab data. Use RUID_Integer as the field name and RUID Integer as the Field Alias.

- 6) Use the Join tool in ArcGIS Pro to join the Summary detection table from the Whitney Genetics Lab to the feature layer of the matching case using the RUID Integer from the feature layer and the Unique ID from the summary table as the join fields. When data is backed up from ArcGIS Online, the data is separated into feature layers for each case organized under Basin feature datasets to keep data organized by basin location. Before you complete the join, make sure to validate the join to check for any issues. Sometimes a record can be missing from the feature layer or the validate join can find any formatting issues in the table.
- 7) Once the validate join verifies the records in the table exactly match the records in the feature layer with no errors, select ok in the tool to complete the join.
- 8) Once the join is complete, use the export data tool for the joined feature layer to create a permanent copy of the feature layer with the eDNA detection summary information from the Whitney Genetics Lab. Rename the feature layer as: waterbody name_Case Number_Results, ex: Sandusky_River_70000_Results. This way you can distinguish between the feature layers with just field data from the layers with the field data paired with the eDNA detection information.
- 9) Use the result feature layer and the eDNA_Detection_Status field to symbolize the map with eDNA detection results. Please see the .stylx file (ArcGIS_Pro_Invasive_Carp_eDNA_Detection_Map_Symbols) to incorporate the standard map symbols into your Pro document.
- 10) Use the bookmarks tool to define the different map areas that will be used in the map book pages to highlight the different areas sampled in a larger scale. **Note:** In cases where the sampling area is small, map pages may not be needed. Please see past year's map books as references.
- 11) Make sure any new bookmarks defined are added to the map pages by navigating to the map series under Layout Properties and adding the new bookmarks.
- 12) Make sure the overview map of the entire sampling area displays where the sampling area connects to a major lake or river
- 13) Use the hybrid reference layer in the aerial imagery basemap to identify key cities, highways, or waterbodies to highlight in the static map. Use the graphics and text group under the insert tab in the layout view to insert the labels for cities, highways, or waterbodies to highlight so the viewer understands where the samples were collected. Please see old static maps for reference.
- 14) Only add labels to the overview map. The map book pages only contain the map area label which uses the dynamic text for pages to identify the map area being viewed. Use the graphics and text group in layout to insert bolded black rectangles around the areas that will be highlighted as map pages and label each area according to where the map will fall in the map book in the overview map.

For example, Map 1 will appear on the page directly after the overview map. Map 2 will appear after Map 1, etc.

- 15) Label each map area (map page) on the overview map with the waterbody name in addition to the Map 1, Map 2, etc. label if possible
- 16) If needed, check to make sure the legend on each map book page only reflects the map symbols currently being displayed in the map. If this is not the case, right click on the legend in the Layout view and select properties. Under the Legend Panel under the Legend Items group, select Show Properties. Under the Legend Items Panel, find the Feature Display Options group and check the box next to the Only show features visible in the map extent option.
- 17) Make sure to change the text in the overview map caption to reflect the correct waterbody, sampling period, and number of samples collected. For the map book pages, use dynamic text for the number of samples collected as table statistics count text so the number of samples collected will align with what is currently being viewed within the map extent.
- 18) Create or update the alternate text for the main map image and the inset map by right clicking on each map frame under the drawing order in the layout view and navigating to properties. Under the properties panel, expand the accessibility option, enter or update the alt text for the map frame in the alt text dialog box.
- 19) For the Map book cover, to generate the summary table use the summary statistics tool on the results feature layer. Label the output table with **waterbody name_Summary_Table_UniqueID**, ex: **Sandusky_River_Summary_Table_70000**. Define the Statistics field as eDNA_Detection_Status and the Statistic Type as Count. Next, set the Case Field to eDNA_Detection_Status. Make sure to save the output table to the eDNA file geodatabase where the rest of the eDNA feature layers are being stored and select run to generate the table.
- 20) In the newly generated summary table, add a row to the table, under the eDNA_Detection_Status field add "Total Number of Samples" and in the Frequency field add the total number of samples collected for the case. Next, hide the Count_eDNA_Detection_Status field and rename the field alias for eDNA_Detection_Status field to eDNA Detection Status.
- 21) On the Map book cover, make sure to change the table caption text to match the waterbody and sampling period. For the table, right click on the table frame and select properties to set the table option to the new summary table generated under the options tab select the summary table under the table option dropdown. Next, use the display tab to add a black 1 pt. cell vertical lines to divide the table.
- 22) Export all the layout maps as PDF documents. See the Exporting ArcGIS Pro Map to PDF section.
- 23) Use the Table to Excel tool to export the result feature layer information into a summary table to accompany the exported map book. Select the Use field alias as column header option and Use domain and subtype description option then save the excel file to the eDNA results sample tables merged folder in your

eDNA folder structure. For the excel file name, use the case number to initially save the file and then re-name the file using the following naming convention: USFWS_Region #_Office_Watershed_Waterbody_Case #_SummaryTable.xls, ex: USFWS_R3_GB_LM_Milwaukee_Estuary_23005_SummaryTable.xls

- 24) Open the excel file with the result feature layer information and delete the following fields: OBJECTID_1, GlobalID, Wind Direction, TEMP_F, DEPTH_FT, HABITAT, Collection Time, Processing Time, PROCESSOR, COMMENTS, Case_Number, Sample_Number, Unique_ID, Any_Detection, ACTM_Assay, BHTM_Assay, SCTM_Assay, eDNA_Detection_Summary, and ObjectID.

2.0 Exporting ArcGIS Pro Map to PDF

- 1) Make sure the drawing order under the Map layout is set to the appropriate reading order, item text or map element that should be read before another item text or map element. Make sure any map text labels are put ahead of the map frame in the **drawing order list** or the map frame will cover up the map text labels.
- 2) Double check each picture and map frame in the map layout and ensure each picture and map frame has **alternate text**.
- 3) Export Layout of Map by using the Share tab and click Export Layout
- 4) Navigate to the Accessibility panel under Export Layout and check the box next to include **accessibility tags** and enter in the map title, subject, author, and keywords, see the PDF alt text document for examples
- 5) Navigate back to the Properties panel
- 6) Set File Type to **Vector PDF**
- 7) Set Vector Resolution to **500 DPI**, Leave the rest of the settings to the default settings
- 8) Export the map

3.0 508 Compliance for Maps

4.1 Creating Tags in PDF for Map Book

- 1) Use prepare form tool on Map Book cover PDF
- 2) Delete the form fields created in the summary results table
- 3) **Insert the text and date fields** by the three top fields on the Map Book Cover
- 4) Make sure under the text and date form fields properties to add text under the tooltip to **describe the field such as "Receiving entities field box"**, the tooltip text is what is used as the alternate text for a screen reader in PDF, also include a name to describe the form field.
- 5) Create three empty form field tags in the tags panel
- 6) Right click each tag and use the reading order panel to define each form fields as a form field tag separately in the PDF document on the Map Book Cover
- 7) Under the Tags panel, move the form field tags to follow the reading order of the PDF

- 8) Go under the Section tag down to the Table level tag and re-order the table rows (TR) so the header table row is moved to the top of the table list.
- 9) Ensure the individual items/paragraphs or image elements are in the correct reading order in the tags panel. Use the tag panel to re-order any items not in the correct reading order
- 10) Run the Accessibility Check under the Accessibility Tool to ensure the document is compliant, Logical reading order and color contrast will always show up as errors since those tasks require a manual check of the PDF. A lot of times the error such as tagged PDF and Tab order can be fixed by right clicking on the error message and clicking fix.
- 11) For the overview map or map page, change the tags for the map labels within the main map and the inset map to artifacts and delete any empty tags. Note: For map book pages, leave the Map 1, Map 2, etc. labels for reference.
- 12) Run the Accessibility Check tool to ensure document is compliant.
- 13) Use the **Organize Pages tool** within the Map Book Cover PDF to add the Overview map and map book pages to form the final map book. **Save as** the document as the final map book.
- 14) Run the Accessibility Check Tool. If no errors show up other than reading order and color contrast, the map book is complete.
- 15) **Use the following naming convention for the map book: USFWS_Region #_Office_Watershed_Waterbody_Case #_MapBook EX:**
USFWS_R3_GB_LM_Milwaukee_Estuary_23005_MapBook

4.0 Updating ArcGIS Online Feature Layer and Dashboard

- 1) Have an ArcGIS Pro project saved with the USFWS Midwest Region 3 Bighead and Silver Carp eDNA map from ArcGIS Online stored as a map in the project to make updating the feature layers easily accessible.
- 2) Add the eDNA data case layers to the map that need to be appended into the USFWS Midwest Region 3 Bighead and Silver Carp eDNA feature layer. Make sure to append the data to the hosted feature layer (All_eDNA_Sample_Point_Data) and not the hosted view layer (USFWS Midwest Region 3 Bighead and Silver Carp eDNA Data) which is used for the dashboard.
- 3) Make note of the total number of records within the hosted feature layer and compare the number of records after running the append tool to ensure all records were added.
- 4) Use the Append tool to input the datasets that need to be appended and set the Target data set to the hosted feature layer in ArcGIS Online. **Note:** (There is a hosted view layer associated with the hosted feature layer that is used to display the data in the web map and dashboard. This layer will automatically be updated when the hosted feature layer is updated.) Use the Field Matching type to: Use the field map to reconcile field differences. Go through each output field and fix any field matching issues between the input datasets and the hosted feature layer. All output fields except for Double_Sample, Global ID, and

PROCESSING_TIME should have a number next to the field name matching the number of datasets being appended to the feature layer. Double_Sample and Global ID do not need to be matched up. Use the Add New Source under each output field to match up fields if needed. PROCESS_TIME is the field to match to the PROCESSING_TIME field.

- 5) After appending the data, Use the Select by Attributes Tool on the Basin field to find all the records with a number for a Basin value. Once the records are highlighted in the attribute table, with the records still highlighted, run the Calculate Field tool on the Basin field by right clicking on the field in the attribute table and selecting Calculate Field. Next, set the expression type to Python 3 and in the value field below the Basin = statement, input the corresponding Basin code with quotes around the text, for example: "UMR" then **enable Undo** by selecting the toggle to green and then select apply. **Check** to make sure the correct records were changed and not all the records were changed, then save the edits.
- 6) After appending the data, the ArcGIS Map and Dashboard will be updated with the appended data, make sure to check the dashboard to ensure the newly added data is being displayed.