Wetlands Data Verification Toolset

Installation Instructions and User Information

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Introduction

The Wetlands Data Verification Toolset is designed to automate the quality control functions necessary to ensure the accuracy of the data in the wetlands geodatabase. It has been designed to address geospatial errors, digital anomalies, and logic checks. In addition, it has the option to build a cumulative history table of identified errors to track the progress of corrections.

This toolset was created using Environmental Systems Research Institute's (ESRI) ModelBuilder and is compatible with ESRI ArcDesktop 10.6.1 software suite as well as ArcGIS Pro 2.3. It will only work on file geodatabases and replaces previous versions of custom wetlands verification tools.

Folder Contents

The verification toolset and associated files are contained in a folder called 'NWI_QAQC_Tool' (Figure 1). This folder can be stored in any location on your machine and contains:

- Readme.txt
- Wetlands Data Verification Toolset Installation and User Information.pdf
- Workspace folder
  - NWI_Wetland_Codes.gdb
  - Wetlands_Database_Schema.gdb
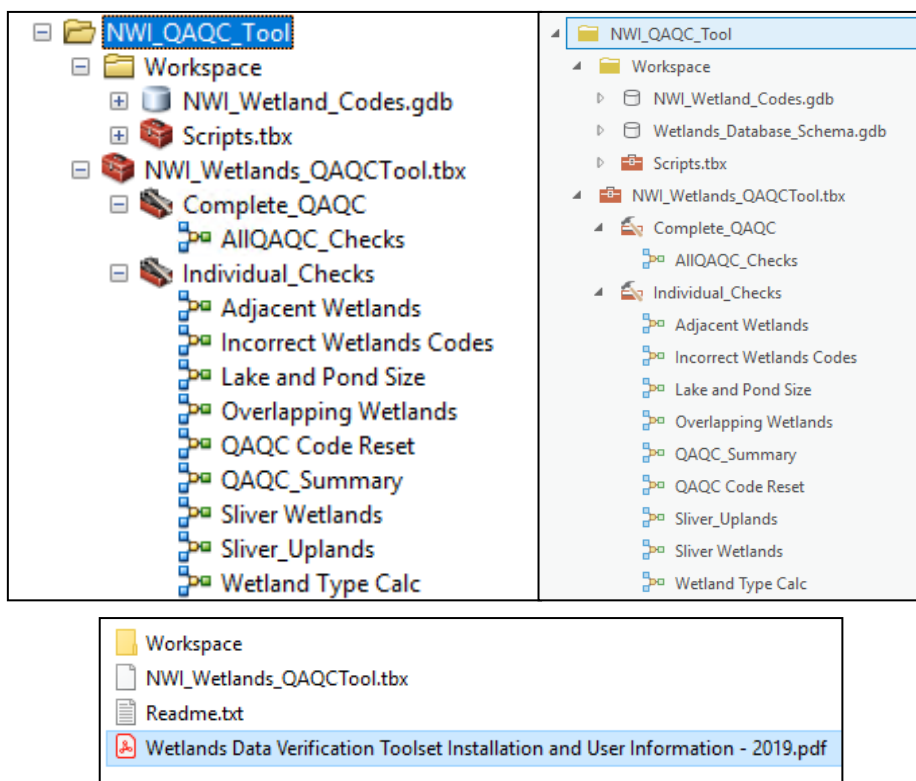 - Scripts.tbx
- NWI_QAQC_Tool.tbx

Figure 1. NWI_QAQC_Tool view in ArcCatalog (left), ArcGIS Pro (right), and Windows Explorer (bottom).

1. **Readme.txt** provides a general description of the contents and purpose of the folder.

2. The **Wetlands Data Verification Toolset Installation and User Information** document provides descriptions and procedures on the use of the verification models.

3. The **NWI wetland codes geodatabase** within the workspace folder serves as a reference for the code portion of the tool and must remain in the same directory as the toolbox.

4. The **wetlands database schema** organizes feature classes in the format used by the verification tool. Users can import data into respective feature classes and use it as the tool input.

5. The **Scripts toolbox** contains tools referenced by the complete QAQC tool. These are not standalone tools and should not be run individually.

6. The **NWI_QAQC_Tool.tbx** is the ArcToolbox that contains the Wetlands QAQC models, compatible with ArcDesktop 10.6.1 and ArcGIS Pro 2.3.

Dataset Compatibility

This toolset was designed to work on **file geodatabases** extracted from the FWS wetlands database and will only work on data following that schema. Specifically, it requires the feature class CONUS_wet_poly in a CONUS_wetlands feature dataset, and CONUS_wet_projects in a CONUS_projects feature dataset (substitute AK, HI, PRVI or PacTrust for CONUS in other mapping areas). The CONUS_wet_projects feature class must contain a polygon that completely covers the area where wetland mapping was conducted. Sample file geodatabases matching these schemas are provided with this tool in the workspace folder. A sample file geodatabase can be copied and loaded with wetlands data or used as a reference to build file geodatabases with the correct schema. Use of this toolbox on other data formats or schemas will likely fail and is not recommended.

Running the models

To run any of the QAQC models:

1. Navigate in Catalog to the ⊟ 🟫 NWI_QAQC_Tool toolbox located in the NWI_QAQC_Tool folder.

2. Open the toolbox, open either the ⊟ 🗇 Complete_QAQC toolset or the ⊟ 🗇 Individual_Checks toolset, and double-click on 'AllQAQC_Checks' or any of the individual models. A window will appear similar to the one in Figure 2, which will allow the user to select input data and provides a description of the tool on the right pane, if the [Show Help >>] button is selected.

3. Identify the mapping area (CONUS, AK, HI, PRVI, or PacTrust)

4. Click the browse button 📂 next to the Geodatabase text box and browse to the wetlands file geodatabase on which to conduct verification and then press 'OK' (Figure 2).
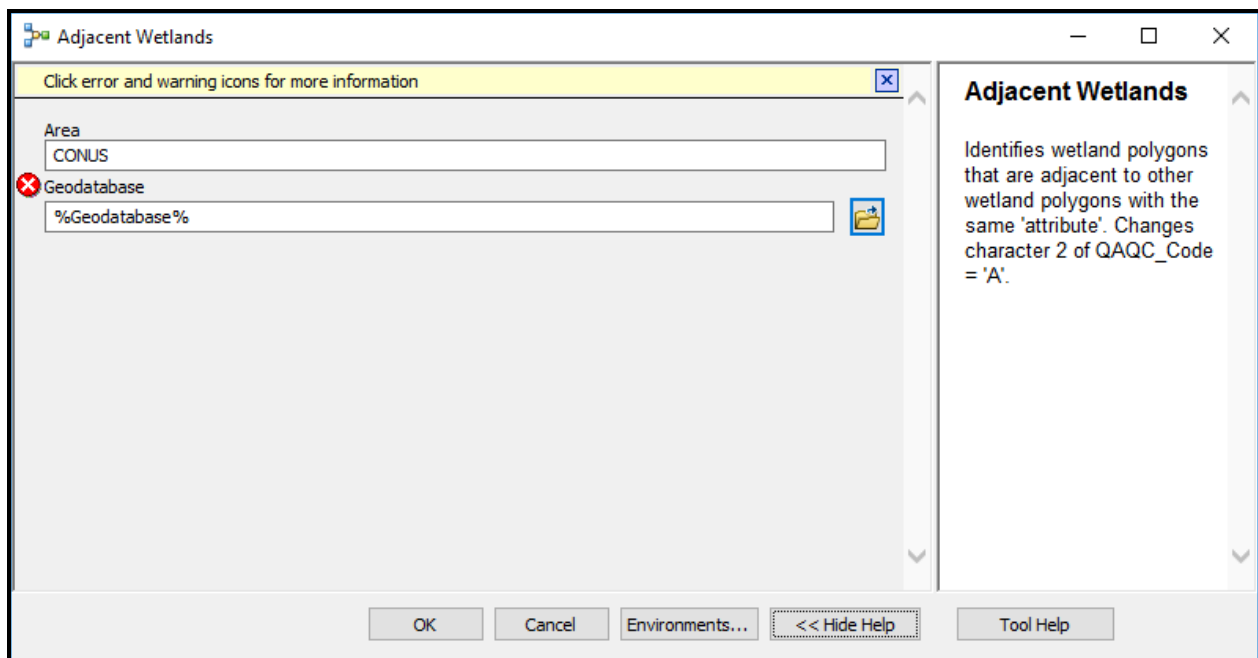

Figure 2. Example of a model user interface. Verify the mapping area and browse to the file geodatabase on which to conduct verification. Clicking 'Tool Help' shows a description of the selected tool.

Explanations of Verification Models

Complete QAQC

All QAQC Checks

This model performs complete data verification by running each individual model and then summarizing the results in a summary table. It includes the QAQC Code Reset, Incorrect Wetland Codes, Adjacent Wetlands, Sliver Wetlands, Sliver Uplands, Lake and Pond Size, Overlapping Wetlands, Wetland Type Calculation, and QAQC Summary models.

NOTE: Running the All QAQC Checks on projects that contain a high number of polygons or complex polygons may fail due to limitations in computer resources. It may be more efficient to run all the individual checks separately for these types of projects.

Optional Inputs

Verified By – Enter the individual or organization conducting the verification. This information will be output to the QAQC Summary table and QC History table (if option is selected).

Save History Table – This option will create a QAQC_History table and append subsequent iteration results of the QAQC_Summary table. Each group of errors appended from the QAQC_Summary table will be identified by a count iterator shown in the 'Run' field. The QAQC_History table will continue to grow with each iteration until it is manually deleted. This allows the user to track the progress of dataset edits between verification runs.

Individual Checks

QAQC Code Reset

This model calculates the QAQC_CODE = 'NNNNNN'. This erases all recorded errors in the dataset and properly attributes the field for use by all other models. Users should run this tool to reset error codes after each round of edits.

Incorrect Wetland Codes

This model cross-references the list of valid wetland codes and identifies wetland polygons with invalid codes, or null or blank values in the 'attribute' field. For identified code errors, this model changes the first character of the QAQC_CODE to 'C'.

To correct this error, users should change the attribute of the identified record to a valid wetland code.

Adjacent Wetlands

This model identifies wetland polygons that are adjacent to other wetland polygons with the same 'attribute', or multipart features. For identified errors, this model changes the second character of the QAQC_CODE to 'A'.

To correct this error, users should join adjacent polygons sharing the same attribute, change one of the attributes, or explode the multipart feature.

Sliver Wetlands

This model identifies wetland polygons less than 0.01 acres, which is smaller than the minimum mapping standard. For identified records, this model changes the third character of the QAQC_CODE to 'S'.

Genuine wetland features flagged as sliver wetlands can be justified as correct in the comments field of the QAQC_Summary table. Other features should be deleted or joined to adjacent polygons.

Sliver Uplands

Identifies upland islands or gaps in wetlands that are less than 0.01 acres. Because this model identifies gaps and missing areas, it changes the fourth character of the QAQC_CODE to 'U', in wetland polygons **adjacent** to the upland sliver. In addition, this tool creates a new sliver upland feature class in 'CONUS_wetlands' to assist in locating these small geographic features. This tool requires that 'CONUS_wet_projects' has a feature(s) that defines the wetland mapping project and completely covers all features in the 'CONUS_wet_poly' feature class.

Like sliver wetlands, these upland polygons may be genuine upland features and can be justified as such in the comments field of the 'QAQC_Summary' table. Otherwise, these areas can be copied from the generated feature class and merged with the appropriate adjacent polygon.

NOTE: This tool is among the most computationally intensive and may fail on geographically large project areas with many polygons. One possible remedy of this failure is to split a portion of 'CONUS_wet_poly' polygons into a new geodatabase, run the tool on each geodatabase, and then merge the resulting outputs to a single feature class.

Lake and Pond Size

This model identifies lake polygons that are less than 20 acres in size and ponds that are greater or equal to 20 acres in size. For identified records, it changes the fifth character of the QAQC_CODE to 'L' for small lakes or 'P' for large ponds. Generally, 20 acres is the threshold between classification of a pond and lake, but certain small lakes may be justified based on water depth as outlined in the wetlands mapping standards. In those cases, comments should be added to the QAQC_Summary table for flagged wetland features. Otherwise, codes should be changed as appropriate.

Overlapping Wetlands

This model identifies overlapping wetland polygons and changes the sixth character of the QAQC_CODE to 'O'. The overlapping portions of these polygons are stored in the CONUS_wetlands feature dataset as a new feature class to assist in locating these features. Overlapping polygons should be edited so that polygons are not concurrent.

Wetland Type Calculation

This model populates the 'WETLAND_TYPE' field based on the wetland code in the 'attribute' field. The 'wetland_type' field provides a general description of the wetland and is used in the cartographic representation of the different wetland types on the Wetlands Mapper.

QAQC Summary

This model summarizes the QAQC_CODE field into a 'QAQC_Summary' table in the wetlands file geodatabase. It also defines each error type and records the user conducting the data verification along with a date/time stamp. Records shown in the 'QAQC_Summary' represent polygon counts for each unique code combination. Comments can be added to the 'comments' field of the QAQC_Summary table to justify specific types of errors.

OBJECTID	FREQUENCY	QAQC_CODE	Error_Type	Verified_By	Verification_Date	Verification_Comments	RUN
1	2	CNNNNN	Bad Code	Name	12/10/2018 4:48:18 PM	<Null>	1
2	3	NANNNN	Adjacent Polys	Name	12/10/2018 4:48:18 PM	<Null>	1
3	1	NANNPN	Adjacent Polys, Large Pond	Name	12/10/2018 4:48:18 PM	<Null>	1
4	3	NANUNN	Adjacent Polys, Sliver Upland	Name	12/10/2018 4:48:18 PM	<Null>	1
5	2	NANUNO	Adjacent Polys, Sliver Upland, Overlapping Wetland	Name	12/10/2018 4:48:18 PM	<Null>	1
6	3	NASNNN	Adjacent Polys, Sliver Wetland	Name	12/10/2018 4:48:18 PM	<Null>	1
7	1	NASNPN	Adjacent Polys, Sliver Wetland, Large Pond	Name	12/10/2018 4:48:18 PM	<Null>	1
8	1	NNNNLN	Small Lake	Name	12/10/2018 4:48:18 PM	Valid based on depth info.	1
9	27	NNNNNN	Passed Verification	Name	12/10/2018 4:48:18 PM	<Null>	1
10	2	NNNNNO	Overlapping Wetland	Name	12/10/2018 4:48:18 PM	<Null>	1
11	4	NNNUNN	Sliver Upland	Name	12/10/2018 4:48:18 PM	<Null>	1
12	4	NNNUNO	Sliver Upland, Overlapping Wetland	Name	12/10/2018 4:48:18 PM	<Null>	1
13	4	NNSNNN	Sliver Wetland	Name	12/10/2018 4:48:18 PM	<Null>	1
14	3	NNSNNO	Sliver Wetland, Overlapping Wetland	Name	12/10/2018 4:48:18 PM	<Null>	1
15	1	NNSUNO	Sliver Wetland, Sliver Upland, Overlapping Wetland	Name	12/10/2018 4:48:18 PM	<Null>	1

Figure 3. Because many polygons within a wetlands dataset will be flagged with multiple errors, the QAQC_Summary table shows the frequency of each unique combination of errors, and provides a comments field for justification.

Reviewing Verification Errors

To find specific instances of an error, in ArcMap or ArcGIS Pro, sort the 'CONUS_wet_poly' attribute table by QAQC_CODE and double-click the gray box associated with a given record on the far left side of the table (Figure 4). This will zoom the map display to that polygon.

Figure 4. The 'QAQC_CODE' field in the 'CONUS_wet_poly' attribute table can be used to sort and review error codes.

The 'Select by Attribute' function, shown in Figure 5, can also be used to select all records of a defined QAQC_CODE value. Example below:
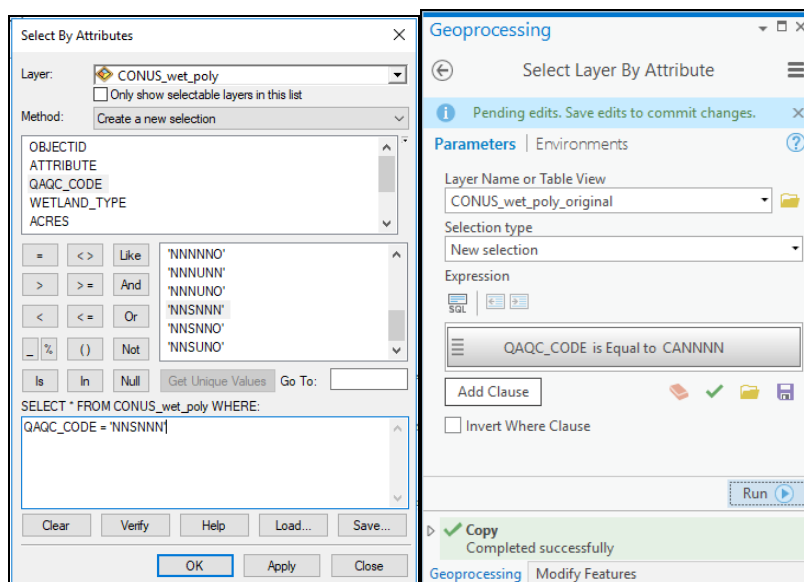

Figure 5. 'Select by Attributes', shown in ArcGIS 10.6 (left) and ArcGIS Pro (right) can help select and navigate to specific polygon errors.

To view the errors cartographically, create symbology rules on the CONUS_wet_poly feature class using the QAQC_CODE field. (e.g. QAQC_CODE = 'NNNNNN' symbolize green, all other values symbolize red).

For further information, assistance or questions contact: wetlands_team@fws.gov