

EXERCISE 8

Preparing an NHD Template for GeoConflation

[illegible]

Introduction

Hydrographic data that have been aligned with NHD topologic requirements and are intended to update the NHD must first be migrated into the formal NHD data schema before they can be used within the USGS GeoConflation workflow. The migration of data into the NHD data model generally involves loading features into an empty NHD data template on the basis of Feature Code (FCode) values. Within the template, the data for update must also be accompanied by any existing NHD content in the corresponding spatial extent. Also, the attribute tables for each of the required layers within the template has to be formatted according to NHD requirements. In this exercise, users will learn how to load data into an NHD template and how to populate required attribute values in the NHD data model.

Objectives

- Learn how to populate an NHD template with data that will be used to update the NHD.
- Learn how to apply the required attribute codes to data that will be used to update the NHD.

Required Data

- **USFS_Streams_Subset.gdb** – file geodatabase that contains a number of features created in the previous exercise, as well as the primary featureclass that will be modified over the course of this exercise. The featureclasses contained within the geodatabase include the following:

- **Streams_Subset** – featureclass depicting stream features that were compiled by USFS staff on the Plumas National Forest for use in updating the NHD.
- **HU10_AOI** – featureclass that contains a bounding polygon from the Watershed Boundary Dataset (WBD) and serves as the bounding extent for the area of interest for this exercise. Dataset was created during Exercise 2 of this series.
- **NHDArea_Subset** – this featureclass contains a subset of polygons representing areal hydrographic landmark features that were extracted from the NHD. Any feature in this dataset intersects the HU10_AOI dataset and was created during Exercise 2 of this series.
- **NHDFlowline_Subset** – this featureclass contains a subset of polylines representing 1D routes that make up a linear surface water drainage network and were extracted from the NHD. Any feature in this dataset intersects the HU10_AOI dataset and was created during Exercise 2 of this series.
- **NHDPoint_Subset** – this featureclass contains a subset of points representing NHD hydrographic landmark features that were extracted from the NHD. Any feature in this dataset intersects the HU10_AOI dataset and was created during Exercise 2 of this series.
- **NHDWaterbody_Subset** – this featureclass contains a subset of polygons representing areal NHD hydrographic waterbody features that were extracted from the NHD. Any feature in this dataset intersects the HU10_AOI dataset and was created during Exercise 2 of this series.
- **NHDArea_Waterbody_Combined** – featureclass containing the combined content of the NHDArea_Subset and NHDWaterbody_Subset layers described above.
- **Intersection_Points** – this featureclass contains point features depicting the location of intersections between the Streams_Subset, NHDArea_Subset, and NHDWaterbody_Subset layers described above.
- **Streams_Subset_Split** – primary featureclass for this exercise. The features within this dataset are a subset of data that were compiled by USFS staff on the Plumas National Forest for use in updating the NHD and have been modified to accommodate boundary intersections with existing NHD polygons (see Exercise 3 in this series).

Note: *not all of the datasets listed above will be used within this exercise, but they comprise the full list of content within the USFS_Streams_Subset geodatabase that users will encounter. Some of these datasets were used in previous exercises, while some will be used in this exercise.*

- **NHDWBD221_L48_ALBERS_EQAREA.gdb** – file geodatabase that serves as template for loading data into the NHD schema and will be eventually be used to update the NHD. There are a number of currently empty featureclasses contained within the geodatabase, however only a subset of the content will be used during this exercise include the following:
 - **NHDArea** – this featureclass contains polygon/areal hydrographic landmark features such as two-dimensional rivers and saltwater polygons.
 - **NHDFlowline** – this featureclass contains one-dimensional polyline routes that make up a linear surface water drainage network.



- **NHDLine** – this featureclass contains one-dimensional linear NHD hydrographic landmark features used for cartographic representation.
- **NHDPoint** – this featureclass contains points that represent NHD hydrographic landmark features.
- **NHDWaterbody** – this featureclass contains polygons that represent two-dimensional areal NHD hydrographic waterbody features such as lakes, estuaries and glaciers.

Note: the above database description does not list all of the content contained in the NHD data model/template. For a full description of the elements contained in the NHD data model, please reference the NHD Feature Catalog available at:

https://nhd.usgs.gov/userGuide/Robohelpfiles/NHD_User_Guide/Feature_Catalog/NHD_Feature_Catalog.htm

Prerequisites

- ESRI ArcGIS Desktop v10.5.1 (or newer) is installed on the user's computer
 - "Standard" or "Advanced" level ArcGIS Desktop license required – exercise will not work with "Basic" level ArcGIS Desktop license.
- User has a basic level of experience with the ArcMap interface.





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Part 1: Loading new features into an NHD Template

Now that the stream data used throughout the previous exercises have been aligned to general NHD requirements, those features can be loaded into an empty NHD template and undergo further attribute formatting. Loading data into the NHD data model is done on the basis of FCode attribute values within a GIS. Subsequent NHD attribution requirements are then enforced by using a field calculator to code mandatory attributes. In this portion of the exercise users will take the stream data that used in the previous exercises and load that data into an NHD data template, as well as code any required attributes per NHD standards.

Note: NHD FCodes are five-digit integer values comprised of the NHD feature type and the combinations of characteristics and values. Via the NHD FCode attribute field (every geospatial feature within the NHD is assigned an FCode value), features can be categorized on the basis of their physical form and function. A full listing of the NHD FCodes is available here - <https://bit.ly/2slzeXW>

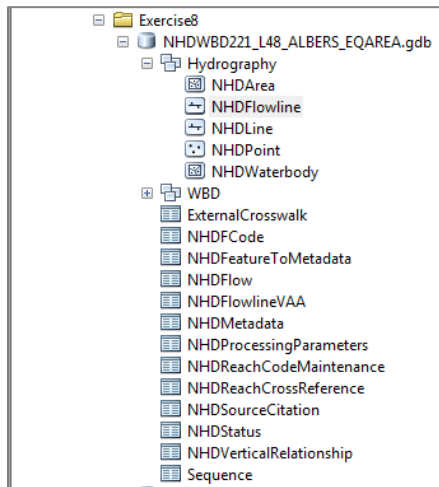
A. Loading new features into an NHD template

1. Launch ArcMap from the start menu by clicking **Start, Programs, ArcGIS, ArcMap 10.5**.
2. Click the **Add Data** button and navigate to where you placed the course material. Within the Exercise8 directory, open the **NHDWBD221_L48_ALBERS_EQAREA** file geodatabase, then select the underlying **Hydrography** feature dataset and click **Add**. This adds five featureclasses (**NHDArea**, **NHDFlowline**, **NHDLine**, **NHDPPoint** and **NHDWaterbody**) to ArcMap.

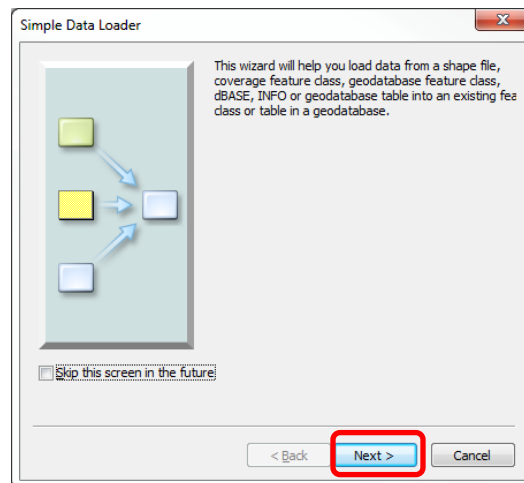
Note: the USGS naming convention used for the NHD data template reveals the following – “NHDWBD221” indicates that the data model pertains to the NHD and WBD data model v2.2.1; “L48” indicates the version of the template is specific to the Lower 48 states and excludes provisions for Alaska; and “ALBERS_EQAREA” indicates that the projection system used within the template is North America Albers Equal Area Conic NAD 1983.

Also note: the USGS data templates can be obtained from one of the contacts listed on the public facing USGS Interactive Map of Hydrography Points of Contact, Liaisons, and Stewards - <https://nhd.usgs.gov/stewardship.html#.Wzulm9VKhhE>

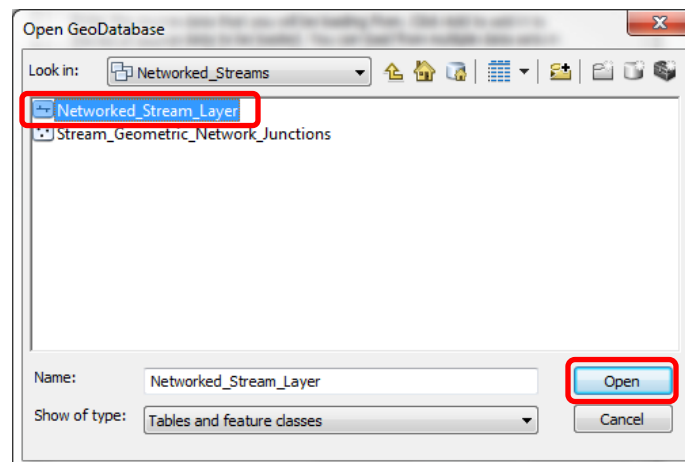
3. Once those 5 layers have been added to the TOC, users do not need to turn on or change the symbology of the layers (we’ll do that after some content has been loaded into the featureclasses).
4. Click the **ArcCatalog** icon on the standard toolbar to open the ArcCatalog window within ArcMap. In the ArcCatalog window, navigate to the directory containing the **NHDWBD221_L48_ALBERS_EQAREA** file geodatabase. Open the geodatabase and then the Hydrography feature dataset until you see the 5 featureclasses stored there as shown below.



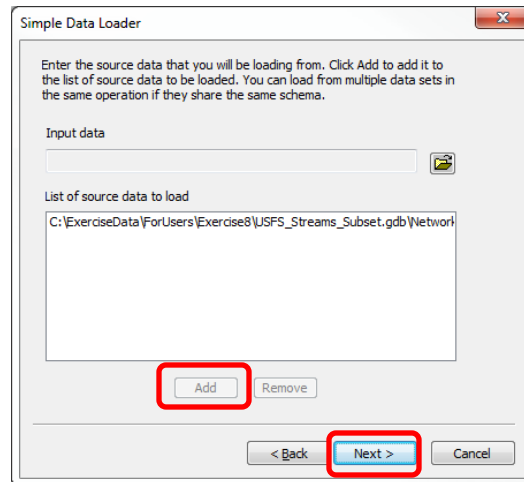
- Right click on the **NHDFlowline** featureclass, select **Load** and click **Load Data**. When the following Simple Data Loader window opens, click **Next**.



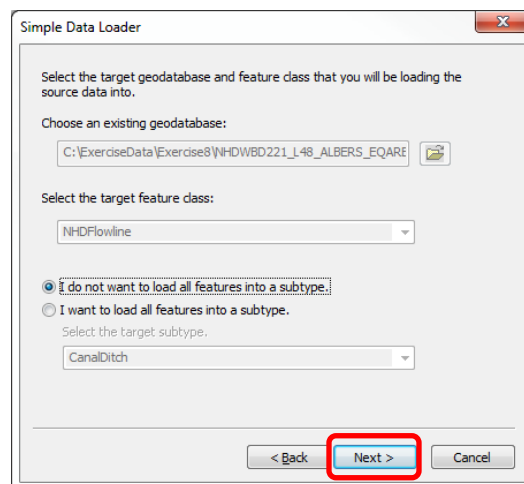
- On the subsequent screen, click the folder icon and navigate to the USFS_Streams_Subset geodatabase in the exercise 8 directory. Open the Networked_Streams feature dataset and then select the **Networked_Stream_Layer** featureclass. Click **Open**.



7. After selecting the **Networked_Stream_Layer** featureclass as the input, click on the **Add** button. Then click **Next** as shown below.



8. On the subsequent screen, leave the default settings and click **Next**.



9. On the next screen, scroll down and make sure that the **FCode** attribute is matched between the **Target Field** column (i.e. in the **NHDFlowline** featureclass) and the **Matching Source Field** column (i.e. in the **Networked_Stream_Layer** featureclass) as shown below. Once confirmed, click **Next**.

Simple Data Loader

For each target field, select the source field that should be loaded into it.

Target Field	Matching Source Field
LengthKM [double]	<None>
ReachCode [string]	<None>
FlowDir [int]	<None>
WBArea_Permanent_Identifier [string]	<None>
FType [int]	<None>
FCode [int]	FCode [int]
MainPatn [int]	<None>
InNetwork [int]	<None>
VisibilityFilter [int]	<None>

Reset

< Back **Next >** Cancel

10. On the subsequent screen, choose “Load all of the source data” and click **Next**.

Simple Data Loader

You can load all of the features from your source data into the target feature class or you can limit what is loaded by defining an attribute query.

☒ **Load all of the source data**

☐ Load only the features that satisfy a query

Query Builder...

< Back **Next >** Cancel

11. On the summary screen, click **Finish**. Upon clicking Finish, all of the features from the Networked_Stream_Layer featureclass will be loaded into the NHDFlowline featureclass.

Simple Data Loader

Summary

Summary for data load operation

Source data: C:\ExerciseData\ForUsers\Exercise8\USFS_Streams_Subset.gdb\Networked_Streams\Networked_Stream_Layer

Target geodatabase: C:\ExerciseData\Exercise8\NHDFlowline\NHDFlowline.gdb

Target feature class: NHDFlowline

Query:

< Back **Finish** Cancel



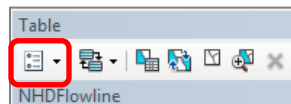
12. In the TOC, turn on the NHDFlowline layer. Then right click **NHDFlowline** in the TOC and select **Zoom to Layer**.

B. Formatting the attributes of new features in an NHD template

1. Open the **NHDFlowline** attribute table and scroll to the right until both the FTYPE and FCode attribute columns are visible as shown below.

LengthKM	ReachCode	FlowDir	WBArea_Permanent_Identifier	FType	FCode	MainPath	InNetwork	VisibilityFilter	Shape_Length
<Null>	<Null>	Uninitialized	<Null>		46003	Unspecified	<Null>	Unspecified	2.33131
<Null>	<Null>	Uninitialized	<Null>		46007	Unspecified	<Null>	Unspecified	2.47755
<Null>	<Null>	Uninitialized	<Null>		46006	Unspecified	<Null>	Unspecified	2.59216
<Null>	<Null>	Uninitialized	<Null>		46003	Unspecified	<Null>	Unspecified	3.90841
<Null>	<Null>	Uninitialized	<Null>		46003	Unspecified	<Null>	Unspecified	4.02450
<Null>	<Null>	Uninitialized	<Null>		46006	Unspecified	<Null>	Unspecified	4.42970
<Null>	<Null>	Uninitialized	<Null>		46006	Unspecified	<Null>	Unspecified	5.44401
<Null>	<Null>	Uninitialized	<Null>		46006	Unspecified	<Null>	Unspecified	5.84666
<Null>	<Null>	Uninitialized	<Null>		46006	Unspecified	<Null>	Unspecified	5.89358
<Null>	<Null>	Uninitialized	<Null>		46006	Unspecified	<Null>	Unspecified	6.08941
<Null>	<Null>	Uninitialized	<Null>		55800	Unspecified	<Null>	Unspecified	6.10472
<Null>	<Null>	Uninitialized	<Null>		55800	Unspecified	<Null>	Unspecified	7.22113
<Null>	<Null>	Uninitialized	<Null>		55800	Unspecified	<Null>	Unspecified	7.43559
<Null>	<Null>	Uninitialized	<Null>		55800	Unspecified	<Null>	Unspecified	7.79337
<Null>	<Null>	Uninitialized	<Null>		46003	Unspecified	<Null>	Unspecified	7.95532
<Null>	<Null>	Uninitialized	<Null>		55800	Unspecified	<Null>	Unspecified	8.19977
<Null>	<Null>	Uninitialized	<Null>		55800	Unspecified	<Null>	Unspecified	8.40544
<Null>	<Null>	Uninitialized	<Null>		55800	Unspecified	<Null>	Unspecified	8.81711
<Null>	<Null>	Uninitialized	<Null>		55800	Unspecified	<Null>	Unspecified	8.9425

2. Notice that the FType values are currently blank and the FCode values are showing as numeric values rather than text values/physical descriptions. On the upper left corner of the attribute table, click the **Table Options** button and choose **Select by Attributes**.



3. When the **Select by Attributes** window opens, use the following query statement to select all NHD Stream/River type features within the NHDFlowline layer as shown below: **FCode = 46003 OR FCode = 46006 OR FCode = 46007**. Then click **Apply**.

Select by Attributes

Enter a WHERE clause to select records in the table window.

Method: Create a new selection

ReachCode
FlowDir
WBArea_Permanent_Identifier
FType
FCode

= < > Like
> > = And
< < = Or
% () Not
In Is Null (Get Unique Values) Go To

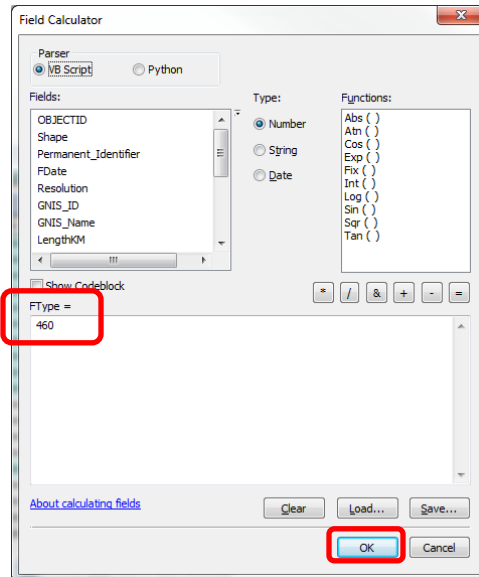
33600 - Canal Ditch
46003 - Stream/River: Hydrographic Category
46006 - Stream/River: Hydrographic Category
46007 - Stream/River: Hydrographic Category
55800 - Artificial Path

SELECT * FROM NHDFlowline WHERE:
FCode = 46003 OR FCode = 46006 OR FCode = 46007

Clear Verify Help Load... Save... Apply Close



4. We will use the resulting selection to set the FType values for each of the selected features, as well as update the FCode values within the NHDFlowline layer. Make sure the attribute table shows **3217 out of 3286** features are currently selected, then right click the field name **FType** in the attribute table and select the **Field Calculator**.
5. When the Field Calculator opens, type **460** into the dialog box, as shown below, and click **OK**.



Note: FType values are included within FCode values as the first three digits within an FCode value. For instance, the FCode value for an Artificial Path feature is 55800, so the corresponding FType value is 558. Where features have different FCode values but share the same FType value, they can be all be processed together (as above) when calculation FType values.

6. Once the Field Calculator closes, notice how the FType and FCode values have been updated in the attribute table. Expand the FType and FCode columns within the table so that you can see the full text value within each. Even though we only updated the FType values with the Field Calculator, that change triggered a domain to subtype relationship within the NHD data model that updates the FCode values on the basis of their exiting numeric codes (see below).

ReachCode	FlowDir	WBArea_Permanent_Identifier	FType	FCode	MainPath	InNetwork	Visib
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Intermittent	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Ephemeral	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Perennial	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Intermittent	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Intermittent	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Perennial	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Perennial	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Perennial	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Perennial	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Perennial	Unspecified	<Null>	
<Null>	Uninitialized	<Null>			55800	Unspecified	<Null>
<Null>	Uninitialized	<Null>			55800	Unspecified	<Null>
<Null>	Uninitialized	<Null>			55800	Unspecified	<Null>
<Null>	Uninitialized	<Null>			55800	Unspecified	<Null>
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Intermittent	Unspecified	<Null>	
<Null>	Uninitialized	<Null>			55800	Unspecified	<Null>
<Null>	Uninitialized	<Null>			55800	Unspecified	<Null>
<Null>	Uninitialized	<Null>			55800	Unspecified	<Null>
<Null>	Uninitialized	<Null>			55800	Unspecified	<Null>

- We will now repeat the above process for each of the remaining FCode values (i.e. 336 – Canal Ditch and 55800 – Artificial Path) in the NHDFlowline dataset. Select all of the features where “FCode = 33600” and then calculate the corresponding FType values to **336**. Next, select all of the features where “FCode = 55800” and then calculate the corresponding FType values to **558**. The results should look similar to below – note the graphic below shows the five different types of FType and FCode values that occur within the current NHDFlowline dataset.

ReachCode	FlowDir	WBArea_Permanent_Identifier	FType	FCode	MainPath	InNetwork	Visib
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Intermittent	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Ephemeral	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Perennial	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Perennial	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Ephemeral	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Ephemeral	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Perennial	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Intermittent	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Intermittent	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	CanalDitch	Canal Ditch	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Ephemeral	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Intermittent	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Ephemeral	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Ephemeral	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Ephemeral	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	ArtificialPath	Artificial Path	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Ephemeral	Unspecified	<Null>	
<Null>	Uninitialized	<Null>	StreamRiver	StreamRiver: Hydrographic Category = Ephemeral	Unspecified	<Null>	

- When finished updating the FType and FCode values, we then need to modify each of the remaining required attribute fields in the NHD schema. Scroll to the left of the attribute table until the FDate column is visible. Right click the column titled **FDate** and select **Field Calculator**. Make sure that no features in the dataset are currently selected and then clear any text from the dialog box in the field calculator. Set the radio button for the Type parameter to **Date** and then double click on **Date ()** in the Functions parameter as shown below. Click **OK**.

Field Calculator

Parser: ☒ VB Script ☐ Python

Fields:

- OBJECTID
- Shape
- Permanent_Identifier
- FDate
- Resolution
- GNIS_ID
- GNIS_Name
- LengthKM

Type:

☐ Number

☐ String

☒ Date

Functions:

- Date ()
- DateAdd ()
- DateDiff ()
- DatePart ()
- Now ()

Show Codeblock

FDate =
Date ()

About calculating fields

Clear Load... Save... OK Cancel



9. Upon clicking OK, the FDate value for every feature in the NHDFlowline feature class will be populated with the current days date and should look similar to the screenshot below.

OBJECTID *	Shape	Permanent_Identifier	FDate	Resolution	GNIS_ID	GNIS_Name	LengthKM	ReachCode	FlowDir	WBArea
621	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
1346	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
2784	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
1734	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
204	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
2707	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
453	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
769	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
832	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
1868	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
3278	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
3282	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
3283	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
516	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
1044	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
3281	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
519	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
1863	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>
526	Polyline ZM		6/29/2018	0	<Null>	<Null>	<Null>	<Null>	Uninitialized	<Null>

10. Next, right click the column titled **Resolution** (to the immediate right of FDate) and select **Field Calculator**. Clear any former inputs from the calculator input and then type “2” as the new input value. Click **OK** as shown below.

Field Calculator

Parser: ☒ VB Script ☐ Python

Fields: OBJECTID, Shape, Permanent_Identifier, FDate, Resolution, GNIS_ID, GNIS_Name, LengthKM

Type: ☒ Number ☐ String ☐ Date

Functions: Abs(), Atn(), Cos(), Exp(), Fix(), Int(), Log(), Sin(), Sqr(), Tan()

Resolution = 2

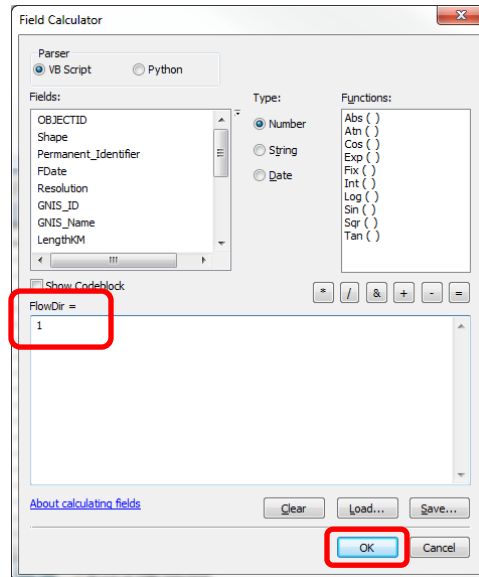
OK

Note: the Resolution attribute value is a domain controlled attribute within the database and serves to inform the USGS’s production SDE. The information in this attribute tells the SDE which instance of the NHD production database the features should be loaded into. For reference the values available within this attribute are as follows: 1 = Local, 2 = High, and 3 = Medium.

11. Notice that all of the **Resolution** values are now recorded as “**High**”, which is the prerequisite value for all features that will be used to update the NHD – this is because the “High” resolution NHD is the only production version of the NHD that can accept updates from editors or stewards.



12. Next, scroll further to the right within the attribute table and right click on the **FlowDir** attribute to select **Field Calculator**. Clear any former inputs from the calculator input and then type “1” as the new input value. Click **OK**, as shown below.



13. Notice that all of the **FlowDir** values have **changed from Uninitialized to WithDigitized**. This is a prerequisite value for most NHDFlowline features that will be used to update the NHD.

Note: Per USGS best practices and as noted in the USGS GeoConflation User Guide document, with the exception of Artificial Paths seaward of the coastline in Alaska and some Canals in the conterminous US, all NHDFlowline features should have FlowDir values set to WithDigitized.

14. To this point we have updated the following fields within the NHDFlowline featureclass: **FDate, Resolution, FlowDir, FType and FCode**. It is mandatory that each of these fields be populated and attributed correctly prior to attempting an NHD update via the GeoConflation workflow. By contrast, the following fields must be blank or NULL prior to attempting GeoConflation: **Permanent_Identifier, GNIS_ID, GNIS_Name, ReachCode, and WBArea_Permanent_Identifier**. These conditions should now be met within the NHDFlowline featureclass (see below) and the dataset is ready for the standard GeoConflation workflow.

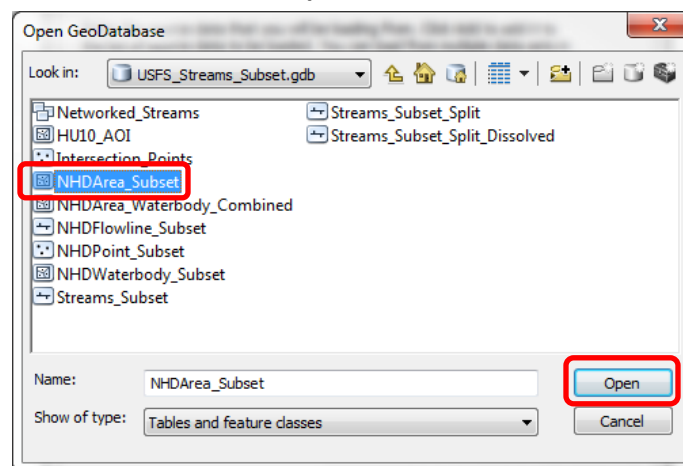
Permanent_Identifier	Fdate	Resolution	GNIS_ID	GNIS_Name	LengthKM	ReachCode	FlowDir	WBArea_Permanent_Identifier	FType	FCode
	6/29/2018	High	<Null>	<Null>	<Null>	<Null>	WithDigitized	<Null>	StreamRiver	Stream/River: Hydrographic Category = Intermittent
	6/29/2018	High	<Null>	<Null>	<Null>	<Null>	WithDigitized	<Null>	StreamRiver	Stream/River: Hydrographic Category = Ephemeral
	6/29/2018	High	<Null>	<Null>	<Null>	<Null>	WithDigitized	<Null>	StreamRiver	Stream/River: Hydrographic Category = Perennial
	6/29/2018	High	<Null>	<Null>	<Null>	<Null>	WithDigitized	<Null>	StreamRiver	Stream/River: Hydrographic Category = Intermittent
	6/29/2018	High	<Null>	<Null>	<Null>	<Null>	WithDigitized	<Null>	StreamRiver	Stream/River: Hydrographic Category = Intermittent
	6/29/2018	High	<Null>	<Null>	<Null>	<Null>	WithDigitized	<Null>	StreamRiver	Stream/River: Hydrographic Category = Perennial
	6/29/2018	High	<Null>	<Null>	<Null>	<Null>	WithDigitized	<Null>	StreamRiver	Stream/River: Hydrographic Category = Perennial
	6/29/2018	High	<Null>	<Null>	<Null>	<Null>	WithDigitized	<Null>	StreamRiver	Stream/River: Hydrographic Category = Perennial
	6/29/2018	High	<Null>	<Null>	<Null>	<Null>	WithDigitized	<Null>	StreamRiver	Stream/River: Hydrographic Category = Perennial
	6/29/2018	High	<Null>	<Null>	<Null>	<Null>	WithDigitized	<Null>	StreamRiver	Stream/River: Hydrographic Category = Perennial
	6/29/2018	High	<Null>	<Null>	<Null>	<Null>	WithDigitized	<Null>	ArtificialPath	Artificial Path
	6/29/2018	High	<Null>	<Null>	<Null>	<Null>	WithDigitized	<Null>	ArtificialPath	Artificial Path
	6/29/2018	High	<Null>	<Null>	<Null>	<Null>	WithDigitized	<Null>	ArtificialPath	Artificial Path
	6/29/2018	High	<Null>	<Null>	<Null>	<Null>	WithDigitized	<Null>	ArtificialPath	Artificial Path
	6/29/2018	High	<Null>	<Null>	<Null>	<Null>	WithDigitized	<Null>	StreamRiver	Stream/River: Hydrographic Category = Intermittent
	6/29/2018	High	<Null>	<Null>	<Null>	<Null>	WithDigitized	<Null>	ArtificialPath	Artificial Path

Part 2: Loading existing content into an NHD Template

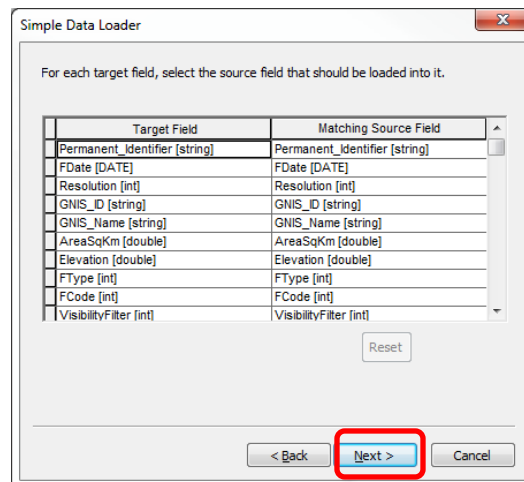
In exercise 2 of this series, users extracted the existing NHD content which corresponds to the extent of the stream data above. That NHD content included corresponding features from within the NHDArea, NHDPoint and NHDWaterbody featureclasses (*recall that NHDLine would normally be included, but there was no existing NHDLine content within out area of interest*). Even though the content from those layers will not be used to update the NHD in this particular instance, that data is still required within an NHD template that will be used to update the NHD. *If those corresponding data are not loaded into the template, the workflow will result in the empty featureclasses overwriting the existing content (effectively deleting it) within the NHD during the Update workflow.* In this section of the exercise, users will populate the NHDArea, NHDPoint and NHDWaterbody featureclasses using the previously saved data from exercise 2.

A. Loading existing NHD content into an NHD template

1. In the **ArcCatalog** window within ArcMap, navigate to the directory containing the **NHDWBD221_L48_ALBERS_EQAREA** file geodatabase. Open the geodatabase and then the Hydrography feature dataset and right click on the **NHDArea** featureclass. Select **Load** and click **Load Data**. When the Simple Data Loader window opens, click **Next**.
2. On the subsequent screen, click the folder icon and navigate to the USFS_Streams_Subset geodatabase in the exercise 8 directory. Within that geodatabase, select the **NHDArea_Subset** featureclass and click **Open**.



3. After selecting the **NHDArea_Subset** featureclass as the input, click on the **Add** button and then click **Next**.
4. On the subsequent screen, leave the default settings and click **Next**.
5. On the subsequent screen where the user is asked to match attribute fields, make sure that the attributes listed under the Target Field column is matched to corresponding attributes within the Matching Source Field column (as shown below) and click **Next**.



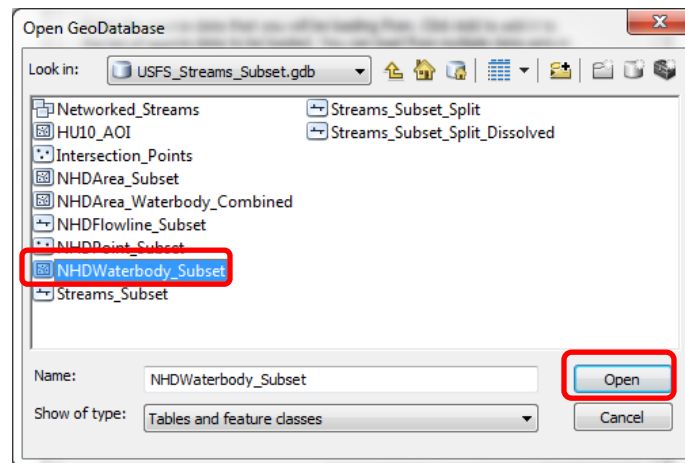
6. On the subsequent screen, choose “Load all of the source data” and click **Next**.
7. On the summary screen, click **Finish**. Upon clicking Finish, all of the features from the **NHDArea_Subset** featureclass will be loaded into the NHDArea featureclass.
8. Repeat steps 1 through 7 in Part 2 section A of this exercise (i.e. the previous 7 steps) by **loading the NHDPoint_Subset** featureclass (within the USFS_Streams_Subset geodatabase) **into the NHDPoint** featureclass (within the NHDWBD221_L48_ALBERS_EQAREA geodatabase).

Note: Recall from exercise 2 that there was no content within the NHDLine featureclass that corresponded with the extent of the stream data, so we don’t have any NHDLine content to load into this template. As a result, the NHD template that we’re preparing in this exercise will be devoid of NHDLine content. If there were existing NHDLine content, we would load that content into the template just the same as NHDArea and NHDPoint.

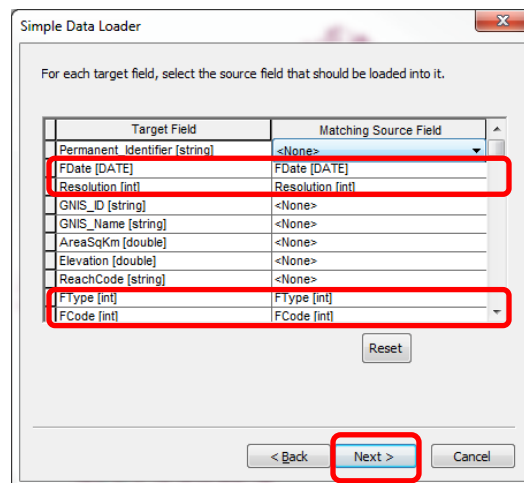
9. Once both the NHDArea and NHDPoint featureclasses have been populated with the content we captured in exercise 2, we can turn our attention to the remaining NHDWaterbody featureclass. The NHDWaterbody featureclass, much like the NHDFlowline featureclass has a unique set of attribute requirements particular to the GeoConflation workflow. In the ArcCatalog window, navigate to the **NHDWaterbody** featureclass within the NHD template geodatabase. **Right click** on NHDWaterbody, select **Load** and click **Load Data**. When the Simple Data Loader window opens, click **Next**.

Note: the GeoConflation tool only transacts values within the NHDFlowline and NHDWaterbody layers. As a result of GeoConflation requirements, the NHDFlowline and NHDWaterbody featureclasses have separate attribution requirements to the NHDArea, NHDLine and NHDPoint featureclasses.

10. On the subsequent screen, click the folder icon and navigate to the USFS_Streams_Subset geodatabase in the exercise 8 directory. Within that geodatabase, select the **NHDWaterbody_Subset** featureclass and click **Open**.



11. After selecting the **NHDWaterbody_Subset** featureclass as the input, click on the **Add** button and then click **Next**.
12. On the subsequent screen, leave the default settings and click **Next**.
13. On the subsequent screen where the user is asked to match attribute fields, a number or fields will be matched by default. However, because the GeoConflation tool acts on the NHDWaterbody dataset the same as it does the NHDFlowline dataset, a number of the attributes must be blank or null going into the GeoConflation workflow. The following fields should be matched between Target Field values and Matching Source Field values on this screen: **Fdate**, **Resolution**, **FType** and **FCode**. All the remaining fields should be set to **None** in the **Matching source Field** column (click field and select <None> from the dropdown list).
14. Click **Next** when matched as per below.



15. On the subsequent screen, choose “Load all of the source data” and click **Next**.
16. On the summary screen, click **Finish**. Upon clicking Finish, all of the features from the **NHDWaterbody_Subset** featureclass will be loaded into the NHDArea featureclass.

B. NHD template attribute review

When loading existing content into an NHD template, most, if not all, of the attribution info is normally handled during the load process. Only when existing content is changed should the related

attributes be modified. However, it is useful to look at the attribute tables of the newly loaded content and confirm that attribute values look as expected prior to the GeoConflation workflow.

1. In the TOC, **turn on** and **right click** the **NHDPPoint** layer to select **Open Attribute Table**. The resulting table should look similar to below.

OBJECTID *	Shape	Permanent_Identifier	FDate	Resolution	GNIS_ID	GNIS_Name	ReachCode	FType	FCode
1	Point Z	83093557	5/6/2003	High	<Null>	<Null>	<Null>	SpringSeep	Spring/Seep

2. There is one feature/record contained in the NHDPPoint featureclass. In this instance we can see that the **required attribute values FDate, Resolution, FType and FCode are all coded appropriately**. There is no action required by the user for this record.

Note: If this were a new point feature that we loaded into the NHDPPoint layer, we would expect the following: the *Permanent_Identifier* value would be blank; the *FDate* value would report the date that the feature was loaded into the template; the *Resolution* value would be set to "High"; The *GNIS_ID* and *GNIS_Name* values would be NULL; The *ReachCode* value would be NULL; And the *FType* and *FCode* values would report the features classification type

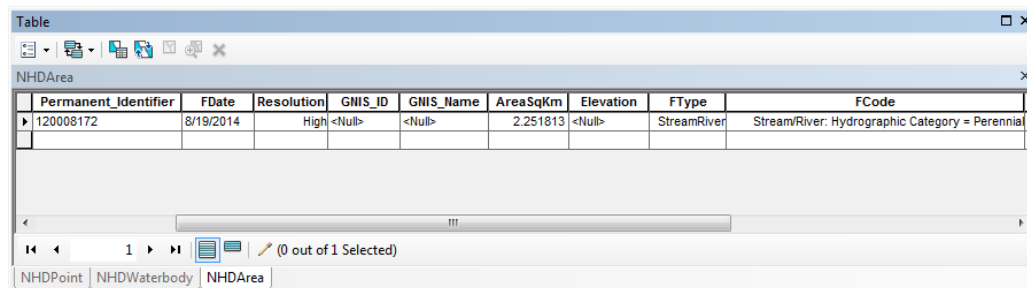
3. In the TOC, **turn on** and **right click** the **NHDWaterbody** layer to select **Open Attribute Table**. The resulting table should look similar to below.

Permanent_Identifier	FDate	Resolution	GNIS_ID	GNIS_Name	AreaSqKm	Elevation	ReachCode	FType	FCode
	5/6/2003	High	<Null>	<Null>	<Null>	<Null>	<Null>	LakePond	Lake/Pond: Hydrographic Category = Perennial
	5/6/2003	High	<Null>	<Null>	<Null>	<Null>	<Null>	LakePond	Lake/Pond: Hydrographic Category = Intermittent
	5/6/2003	High	<Null>	<Null>	<Null>	<Null>	<Null>	LakePond	Lake/Pond: Hydrographic Category = Perennial
	5/6/2003	High	<Null>	<Null>	<Null>	<Null>	<Null>	SwampMarsh	Swamp/Marsh
	5/6/2003	High	<Null>	<Null>	<Null>	<Null>	<Null>	LakePond	Lake/Pond: Hydrographic Category = Perennial
	5/6/2003	High	<Null>	<Null>	<Null>	<Null>	<Null>	LakePond	Lake/Pond: Hydrographic Category = Perennial
	5/6/2003	High	<Null>	<Null>	<Null>	<Null>	<Null>	SwampMarsh	Swamp/Marsh

4. There are 38 features/records contained in the NHDWaterbody featureclass. In this instance we can see that the **required attribute values FDate, Resolution, FType and FCode are all coded appropriately**.
5. However, we need to check that every **Permanent_Identifier** value is blank, as well as checking that every **GNIS_ID, GNIS_Name, AreaSqKm, Elevation and ReachCode** value is set to **NULL**. Right click on the each of the aforementioned field names within the attribute table and alternate between **Sort Ascending** and **Sort Descending** on each column name to confirm that there are no non-blank or non-null values occurring within any of the attribute columns.
6. If a user were to encounter any non-blank or non-null values in those attributes, they would utilize the Field Calculator to make any necessary changes. Since there are non-blank or non-null values contained in those attributes for this example, there is no action required by the user for this example of NHDWaterbody.

Note: even though the content within this example of NHDWaterbody is a duplicate of the existing NHD content, we largely treat the NHDWaterbody content as newly derived data. The exceptions to that rule are the FDate, Resolution, FType and FCode attribute values which were recycled from the existing NHD content. Even though the existing content has correctly attributed Permanent_Identifier, GNIS_ID, GNIS_Name, AreaSqKm, Elevation and ReachCode values, we can't transfer that information to the NHD template because each of those values will be freshly (re)assigned during the GeoConflation and NHD Update workflows.

1. In the TOC, **turn on** and **right click** the **NHDArea** layer to select **Open Attribute Table**. The resulting table should look similar to below.



Permanent_Identifier	FDate	Resolution	GNIS_ID	GNIS_Name	AreaSqKm	Elevation	FType	FCode
120008172	8/19/2014	High	<Null>	<Null>	2.251813	<Null>	StreamRiver	Stream/River: Hydrographic Category = Perennial

2. There is one feature/record contained in the NHDArea featureclass. In this instance we can see that the **required attribute values FDate, Resolution, FType and FCode are all coded appropriately**. There is no action required by the user for this record.

Note: If this were a new polygon feature that we loaded into the NHDArea layer, we would expect the following: The Permanent_Identifier value would be blank; The FDate value would report the date that the feature was loaded into the template; The Resolution value would be set to "High"; The GNIS_ID and GNIS_Name values would be NULL; The ReachCode value would be NULL; And the FType and FCode values would report the features classification type

3. In the TOC, make sure all of the layers are turned on. **Right click** on the **NHDFlowline** layer and select **Zoom to Layer**.
4. Click **File** and select **Save As**. Choose to save the map document in the exercise 8 folder with the title **"Pre-Conflation QC Ready"**.
5. Users may close the ArcMap software when complete.

Congratulations! You have successfully completed this exercise. You have now been introduced to the process for loading data into the NHD data model and the typical process for checking attributes within an NHD template that will be used to update the NHD. The data product at the end of this exercise is now a suitable input for the Pre-Conflation QC process described within the USGS GeoConflation User Guide document. In order to gain access to the NHD production-level tools, which includes the GCT, contact David Anderson (danderson@usgs.gov) to schedule an official training. Most documentation relating to the USGS stewardship process or workflows can be obtained from one of the contacts listed on the public facing USGS Interactive Map of Hydrography Points of Contact, Liaisons, and Stewards: <https://nhd.usgs.gov/stewardship.html#.Wzulm9VKhhE>.