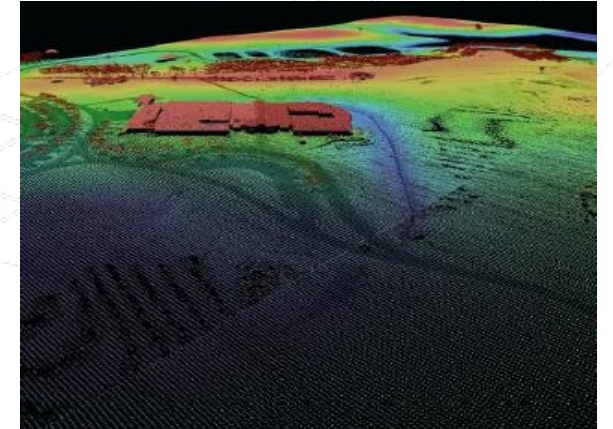
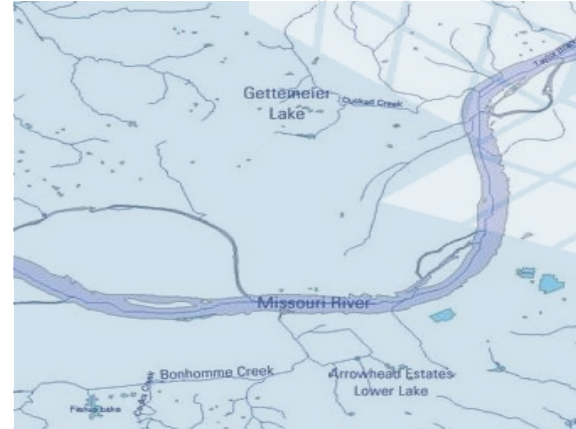
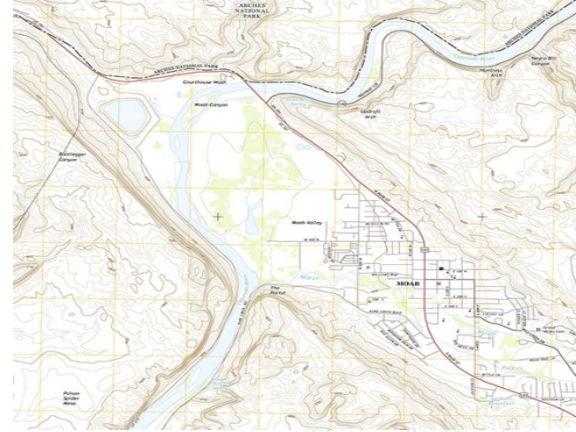




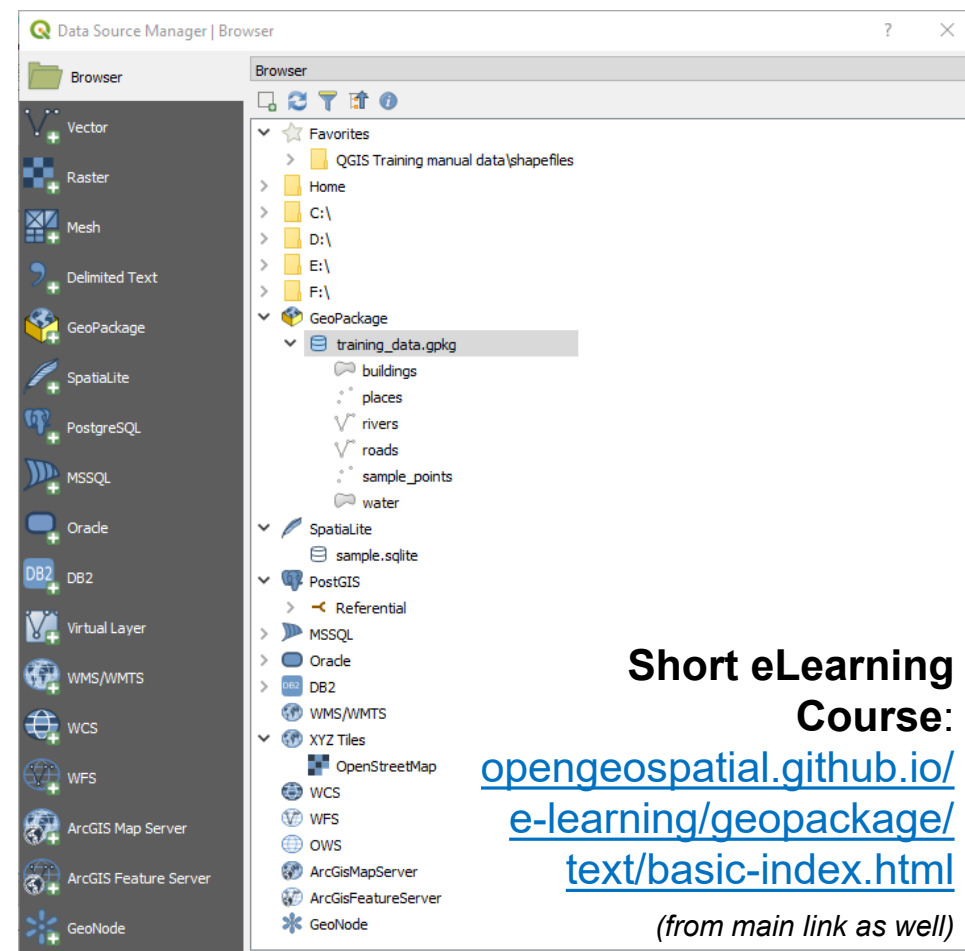
NHDPlus HR Downloadable Data GeoPackage Format



What Is GeoPackage?

www.geopackage.org

- *GeoPackage is an open, standards-based, platform-independent, portable, self-describing, compact format for transferring geospatial information.*
- A single file *.gpkg, as a open source SQLite database schema.
- It enables data sharing without information loss between GIS.
- GeoPackage is used for storing and accessing:
 - Vector features with attributes
 - Imagery tile matrix sets
 - Raster map tile matrix sets
 - Non-spatial tabular data
 - Metadata that describes stored data, and has schema constraints
- Suitable for desktop, network servers and mobile applications.
- Maximum size of **~140 Tb**.
- It can also be extended with... extensions (community & registered/ 'official'; the former can become the later) .
- Since is a database container, it supports direct use & can therefore be accessed and updated in a 'native' storage format **without** intermediate format translations / transactions.






Geospatial Data Act (GDA) 2018

The Federal Geospatial Data Act of 2018 (GDA) was signed into law on October 5, 2018. The GDA is intended to codify the previous executive actions and give Congress a clearer oversight role for federal geospatial data expenditures.

fgdc.gov/gda





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GEOSPATIAL DATA ACT OF 2018

Home / Geospatial Data Act 2018

The Geospatial Data Act of 2018 (GDA) was signed into law by the President on October 5, 2018. The GDA was included as a component of the FAA Reauthorization Act (H.R. 302, P.L. 115-254). The GDA is now in [U.S. Code, Title 43 – Public Lands, Chapter 46: GEOSPATIAL DATA](#). See the section cross-reference table below for a quick section mapping between the H.R. and U.S.C. versions. Note that documents provided here prior to September 2020 contained the HR section references. Resources, updates, and information about the GDA will be posted on this page as we work with partners to implement the Act.

- Geospatial Data Act of 2018 - U.S. Code (pdf)
- Geospatial Data Act of 2018 - H.R. 302 Final Text (pdf)
- Geospatial Data Act of 2018 - H.R. 302 Final Text Web/Online Version
- GDA Section-by-Section Summary (pdf)

Resources

- GDA Plans
- GDA Reports
- GDA Fact Sheet - May 2019 (pdf)
- FGDC Statement on Passage of the Geospatial Data Act of 2018
- Congressional Research Service Report on the Geospatial Data Act of 2018 (pdf)
- GDA Tiger Team
- NSDI Strategic Plan

National Geospatial Advisory Committee (NGAC) Activities

- NGAC Initial Comments on GDA Implementation (May 2019) (pdf)
- 5-8-2019 NGAC Meeting - FGDC Update Presentation on GDA (pdf)

Section cross-walk between H.R. and U.S.C versions of GDA

43 USC Ch. 46	Section Title	H.R. 302, PL 115-254
2801	Short Title; Findings	751
2801	Definitions	752
2802	Federal Geographic Data Committee	753
2803	National Geospatial Advisory Committee	754
2804	National Spatial Data Infrastructure	755
2805	National Geospatial Data Asset Data Themes	756
2806	Geospatial Data Standards	757
2807	GeoPlatform	758
2808	Covered Agency Responsibilities	759
2809	Limitation On Use of Federal Funds	759A
2810	Savings Provision	759B
2811	Private Sector	759C

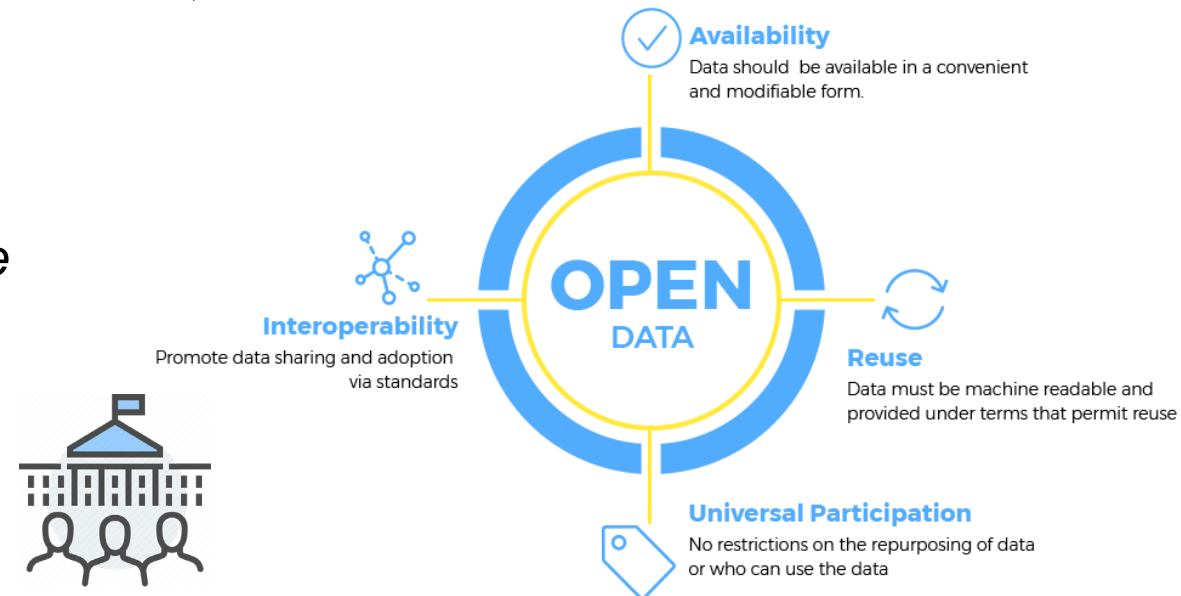
OPEN Data Act 2018

The Open, Public, Electronic, and Necessary (OPEN) Government Data Act was signed into law on January 4th, 2019.

www.cio.gov/handbook/it-laws/ogda/

It calls on all agencies that serve National Geospatial Data Assets (NGDA) - the priority national data layers - to expand standards-based open access (aka standardized, non-proprietary formats.)

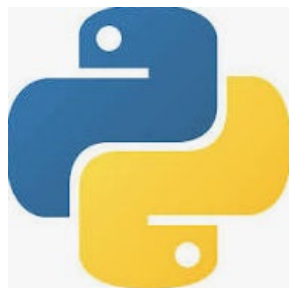
The overriding intent is to foster greater public and private sector use of federal data to encourage innovation and data-driven decision-making.



+ What Changes Will Users Notice?

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- Geodatabase and shapefile data are still available for download.
- GeoPackage is an ***additional format*** and will not affect geodatabase and shapefile data.
- GeoPackage is compatible with ArcMap, ArcPro, QGIS, Global Mapper, python, R, and others.



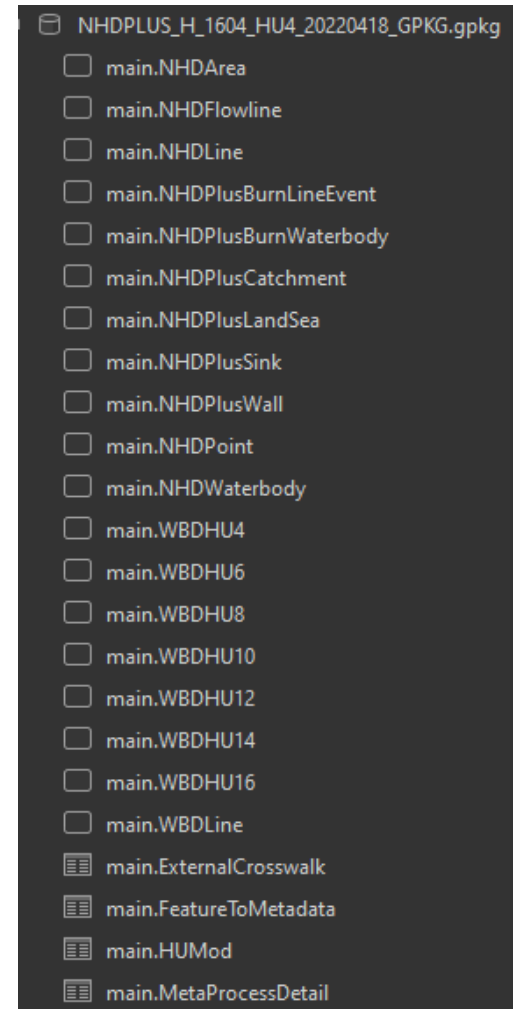
Geodatabase Versus GeoPackage Comparison

<i>Entity</i>	<i>File Geodatabase</i>	<i>GeoPackage</i>
Feature Class	Supported	Supported
Feature Dataset	Supported	Not Supported
Table	Supported	Supported
Relationship Classes	Supported	Not Supported
Coded Value Domains	Supported	Not Supported
Geometric Network	Supported	Not Supported

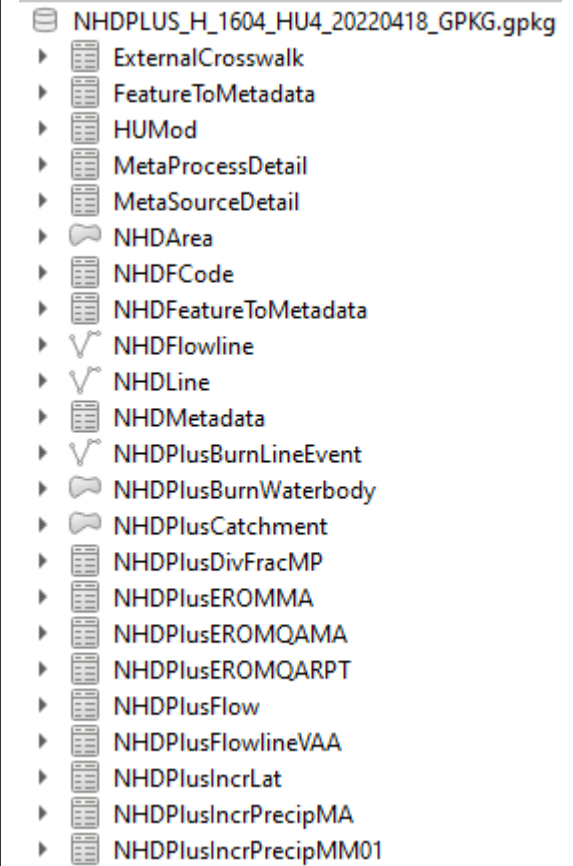
Feature Class/Table Names Look Different

- GeoPackage tables and feature classes will display as *main.featureclass* or *main.table* when loaded into ESRI products.
- [How to use OGC GeoPackages in ArcGIS Pro](#)
- This is an ESRI construct and will not affect the usability of the product.
- They will display normally in other software packages.

ArcMap



QGIS

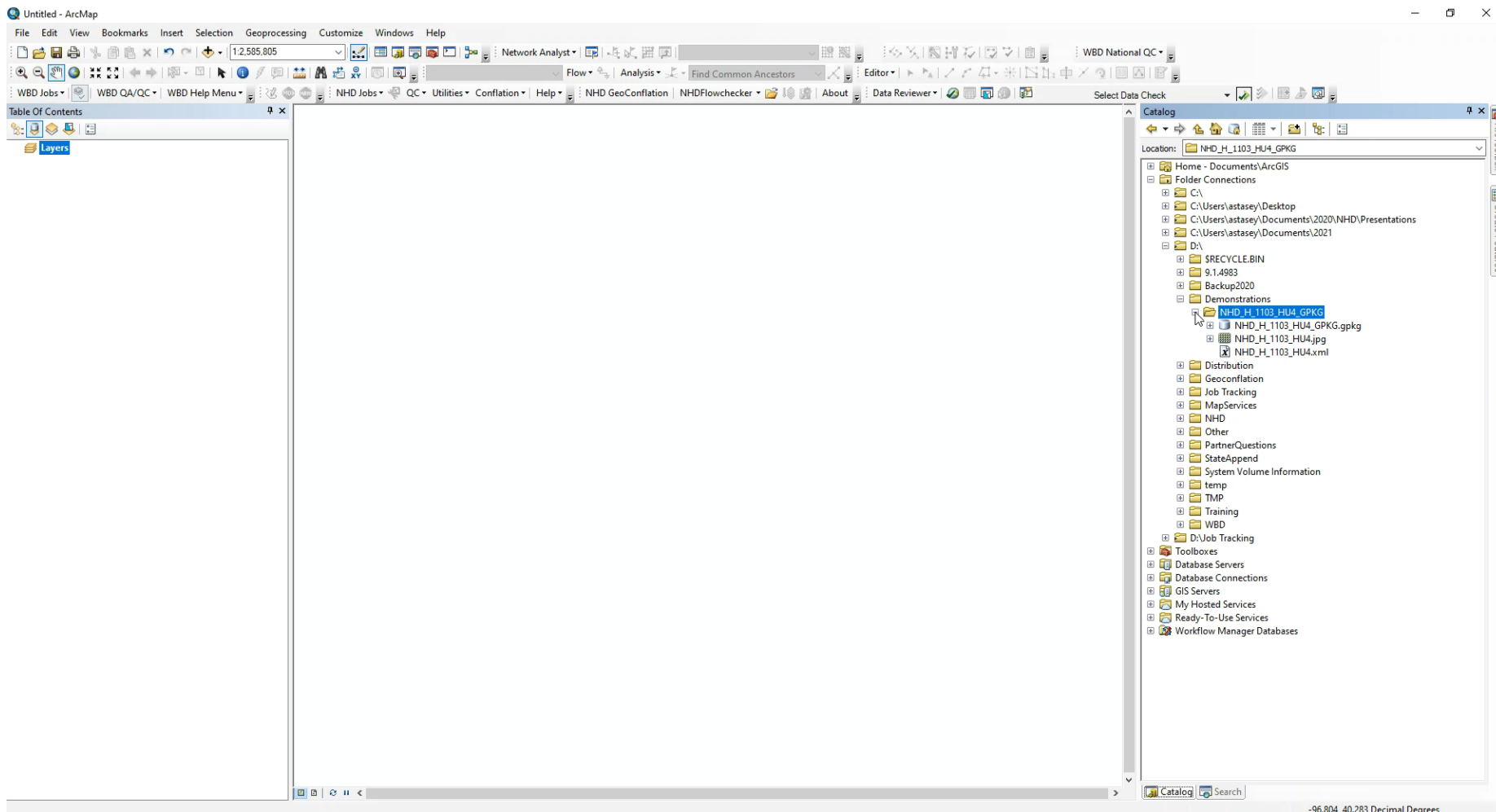
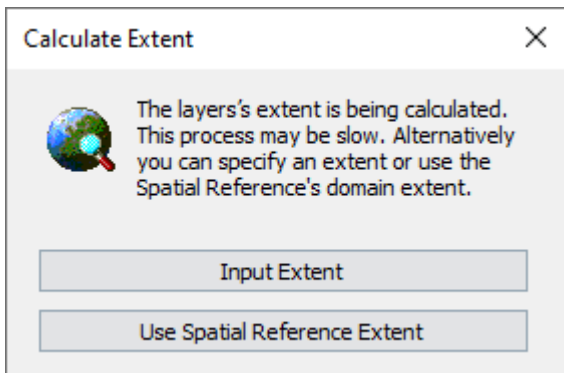




GeoPackage Extents Must Be Calculated in ArcMap

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When loaded into ArcMap, a warning message will be displayed about calculating the extent.



GeoPackage Uses Lowercase Attribute Names

- No attribute aliases from file geodatabase products will be included.
 - Attribute names will be lowercase.

GDB

Permanent_Identifier	FDate	Resolution	GNIS_ID	GNIS_Name
117811143	2/18/2012 1:45:24 AM	High	<Null>	<Null>
117801325	9/16/2015	High	<Null>	<Null>
117799721	2/18/2012 1:45:27 AM	High	<Null>	<Null>
117793477	9/16/2015	High	<Null>	<Null>

Choose which fields will be visible

- ☒ OBJECTID
- ☒ Shape
- ☒ Permanent_Identifier
- ☒ FDate
- ☒ Resolution
- ☒ GNIS_ID
- ☒ GNIS_Name
- ☒ LengthKm
- ☒ ReachCode

Appearance

Alias	Permanent_Identifier
Highlight	No
Read-Only	No

Field Details

Data Type	Text
Length	40
Name	permanent_identifier
Allow NULL Values	No

GPKG

permanent_identifier	fdate	resolution	gnis_id	gnis_name
117811143	2/18/2012 1:45:23 AM	2	<Null>	<Null>
117801325	9/16/2015	2	<Null>	<Null>
117799721	2/18/2012 1:45:26 AM	2	<Null>	<Null>
117793477	9/16/2015	2	<Null>	<Null>
117795033	2/18/2012 1:45:23 AM	2	<Null>	<Null>

Choose which fields will be visible

- ☒ OBJECTID
- ☒ SHAPE
- ☒ permanent_identifier
- ☒ fdate
- ☒ resolution
- ☒ gnis_id
- ☒ gnis_name
- ☒ lengthkm
- ☒ reachcode

Appearance

Alias	permanent_identifier
Highlight	No
Read-Only	No

Field Details

Data Type	Text
Length	40
Name	permanent_identifier
Allow NULL Values	No

+Unique Identifiers Must be Selected in ArcMap for GeoPackage

When a GeoPackage table is loaded into ArcMap, users will be asked to select the Unique Identifier Field for the layer.

Note – users will not be prompted to select a Unique Identifier in ArcPro.

New Query Layer

Unique Identifier Field(s):

	Name	Type	Nullable
<input checked="" type="checkbox"/>	OBJECTID	Long Integer	No
<input type="checkbox"/>	permanent_identifier	Text	No
<input type="checkbox"/>	reachcode	Text	No
<input type="checkbox"/>	reachsmdate	Date	Yes
<input type="checkbox"/>	resolution	Long Integer	No
<input type="checkbox"/>	gnis_id	Text	Yes
<input type="checkbox"/>	gnis_name	Text	Yes

Spatial Properties

☐ Coordinates include M values. Used to store route data.

☐ Coordinates include Z values. Used to store 3D data.

Geometry Type:

Spatial Reference: UNKNOWN Change

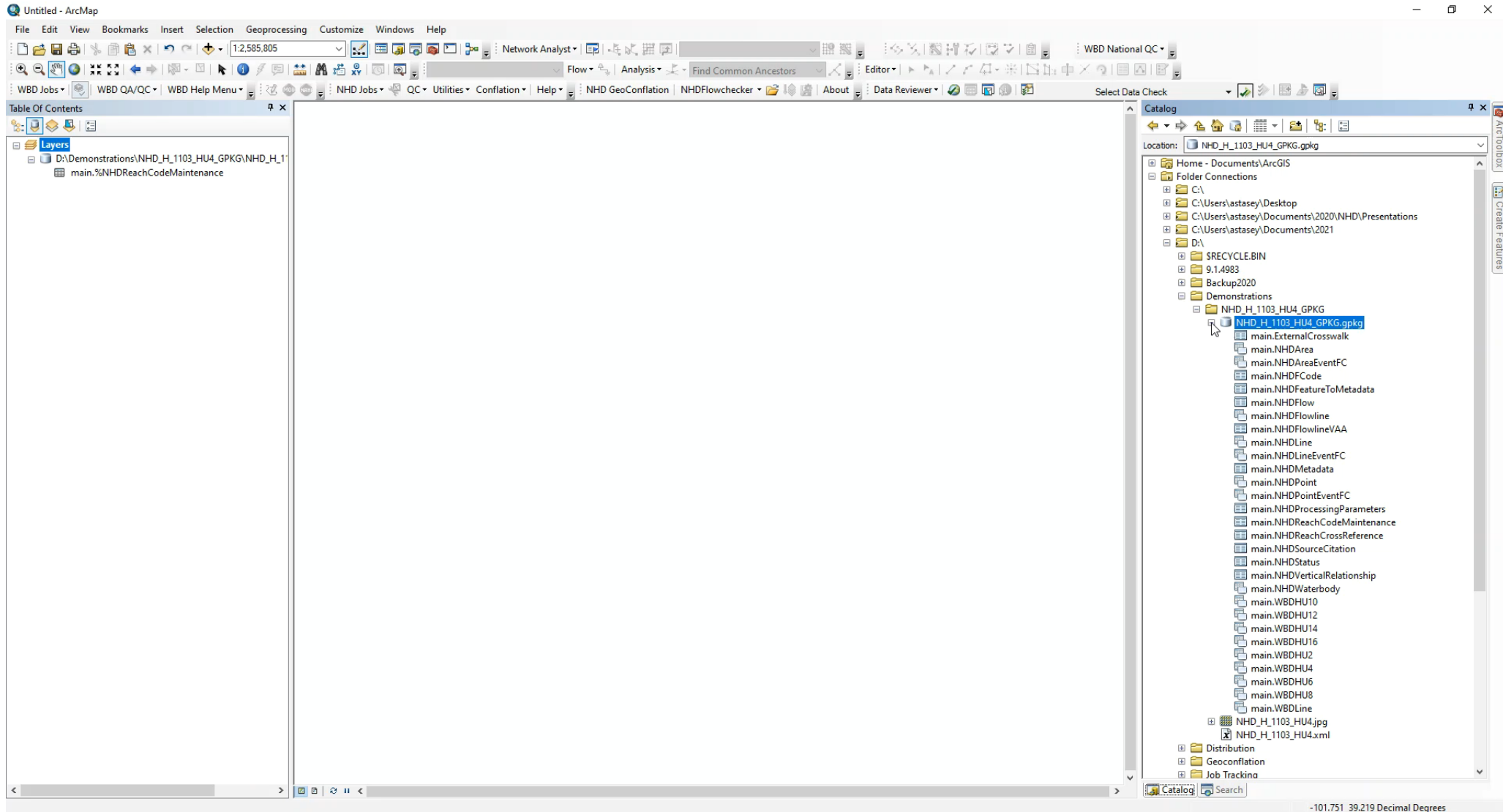
SRID:

Finish Cancel



Unique Identifiers Must be Selected in ArcMap

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Coded Value Domains are Not Supported in GeoPackage

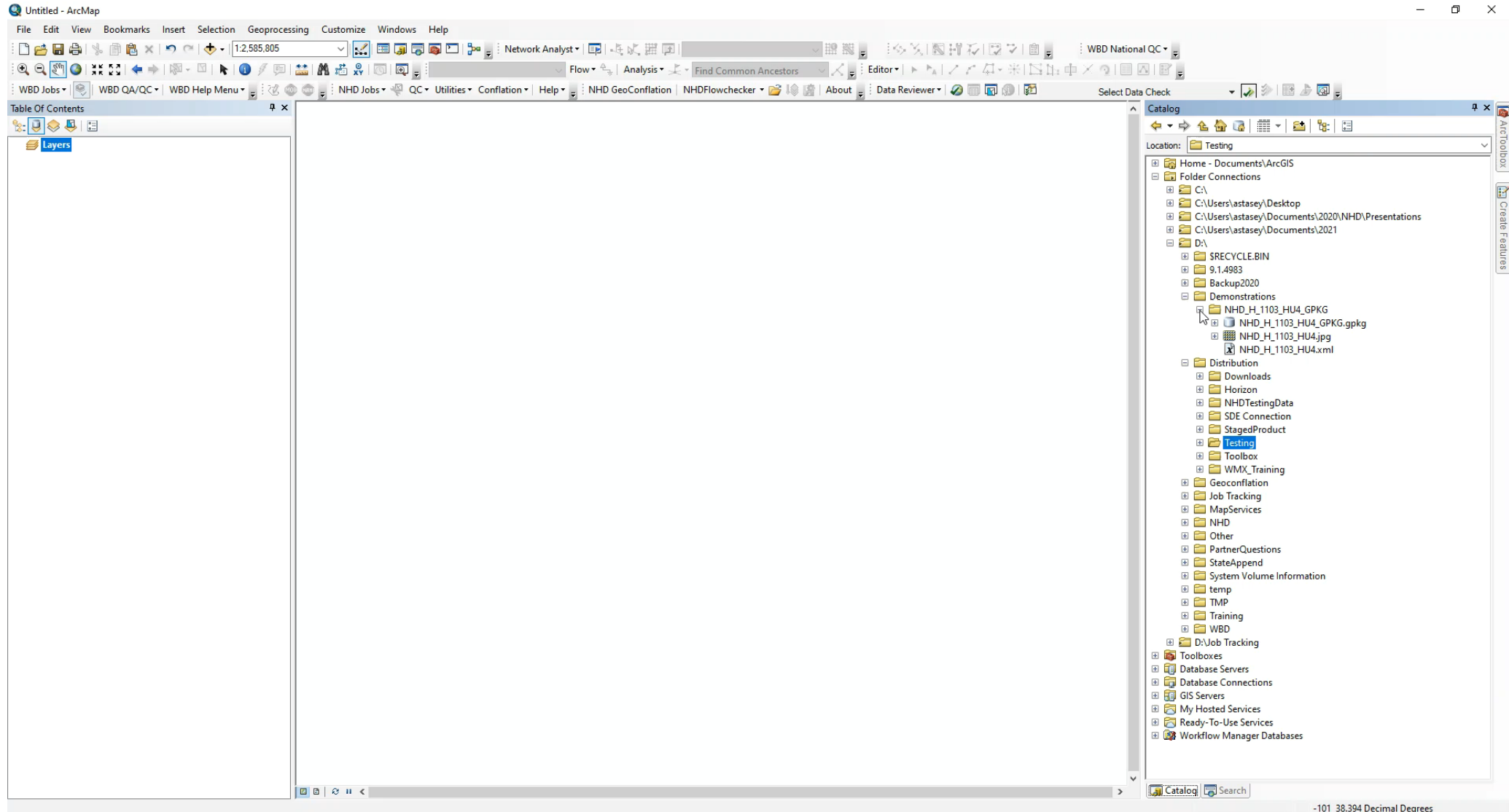
- All attributes with coded value domains will have a new attribute added. The new attribute will be the name of the attribute plus “**_description**”.
 - The existing attribute will contain the integer value (the coded value).
 - The new attribute will contain the domain description text from the coded value domain.

main.NHDFlowline											
Field: Add Calculate Selection: Select By Attributes Zoom To Switch Clear Delete Copy											
	fcode	fcode_description	mainpath	mainpath_description	innetwork	innetwork_description	visibilityfilter	visibilityfilter_description	SHAPE_Length	Enabled	Enabled_description
	55800	Artificial Path	0	Unspecified	1	Yes	250000	Approximately 1:250,000...	0.000459	1	True
	46003	Stream/River: Hydrogr...	0	Unspecified	1	Yes	250000	Approximately 1:250,000...	0.002694	1	True
	46007	Stream/River: Hydrogr...	0	Unspecified	1	Yes	0	Unspecified	0.001138	1	True
	46003	Stream/River: Hydrogr...	0	Unspecified	1	Yes	0	Unspecified	0.00244	1	True
	46003	Stream/River: Hydrogr...	0	Unspecified	1	Yes	0	Unspecified	0.004409	1	True
	46006	Stream/River: Hydrogr...	0	Unspecified	1	Yes	500000	Approximately 1:500,000...	0.000501	1	True



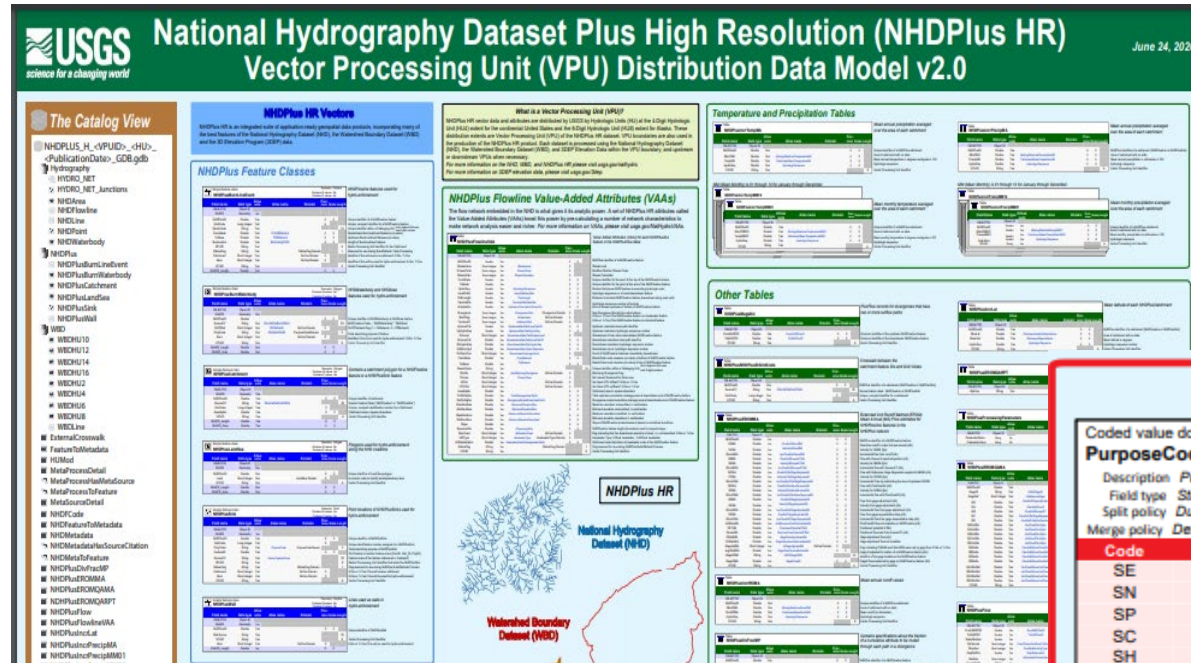
Coded Value Domains are Not Supported

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NHDPlus HR v2.0 Model Poster Coded Value Domains

- Coded value domains are listed on the NHD v 2.3 and NHDPlus HR Model v2.0 Posters



NHDPlus HR Coded-value Domains

Coded value domain	
PurposeCode Domain	
Description	PurposeCode Domain
Field type	String
Split policy	Duplicate
Merge policy	Default value
Code	Description
SE	Network End
SN	BurnLineEvent non-spatial connection
SP	NHDWaterbody plays
SC	NHDWaterbody closed lake
SH	HUC12 polygon min point or centroid
SK	Karst sinkhole
SD	Togographic depression
SO	Other sink
AC	Coastline from adj VPU
AF	Added feature from adj VPU (non-upstream)
AU	Added feature from adj VPU (upstream)
AI	Inflow connecting feature from upstream VPU
AO	Outflow NHDFlowlines to elevation clip boundary
UF	Unused feature (FCODE or by feature)
DO	Digitized outflow path
DC	Digitized connector NHDFlowline
OC	NHDWaterbody sea, bay, estuary
WB	NHDWaterbody (other)

Coded value domain	
LandSea Domain	
Description	LandSea Domain
Field type	Short integer
Split policy	Duplicate
Merge policy	Default value
Code	Description
0	Estuary
1	Land
2	Sea

Coded value domain	
NoYes Domain	
Description	NoYes Domain
Field type	Short integer
Split policy	Duplicate
Merge policy	Default value
Code	Description
0	No
1	Yes

Coded value domain	
HeadwaterType Domain	
Description	HeadwaterType Domain
Field type	Short integer
Split policy	Duplicate
Merge policy	Default value
Code	Description
1	Artificial Heawater
0	Real Headwater

Coded value domain	
StatusFlag Domain	
Description	StatusFlag Domain
Field type	String
Split policy	Duplicate
Merge policy	Default value
Code	Description
A	Add
C	Change
D	Delete
N	Not Set

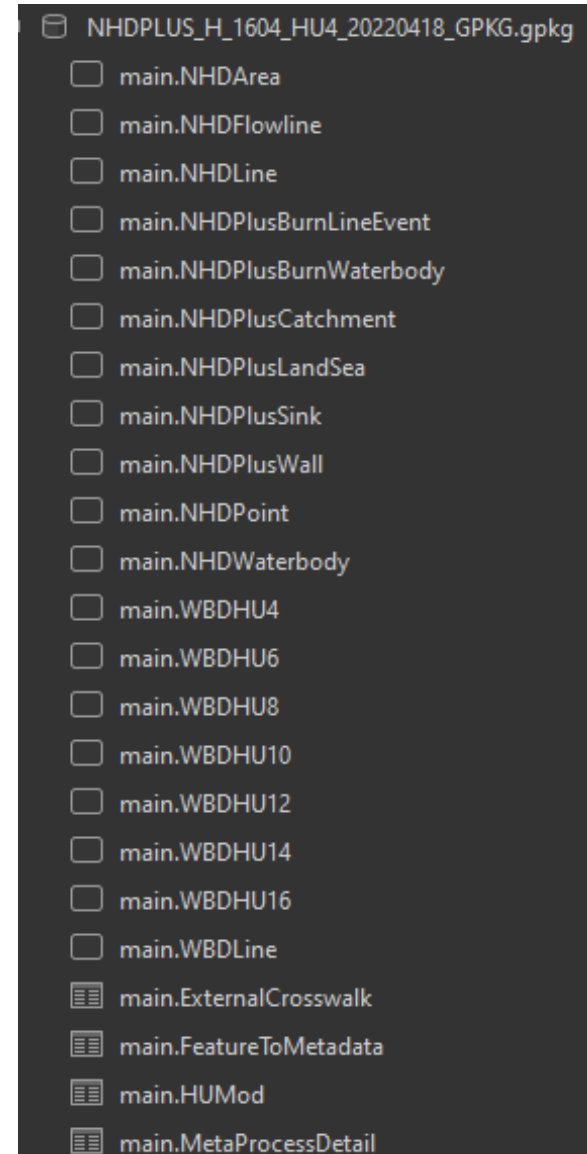
Coded value domain	
Divergence Domain	
Description	Divergence Domain
Field type	Long integer
Split policy	Duplicate
Merge policy	Default value
Code	Description
0	Feature is not part of a divergence
1	Feature is the main path of a divergence
2	Feature is a minor path of a divergence

https://d9-wret.s3.us-west-2.amazonaws.com/assets/palladium/production/s3fs-public/atoms/files/Poster_NHDPlus%20HR%20Model%20Draft%20-%20Vector%20Processing%20Unit%20-%2006242020_b.pdf

+ GeoPackage Will Not Have Geometric Networks

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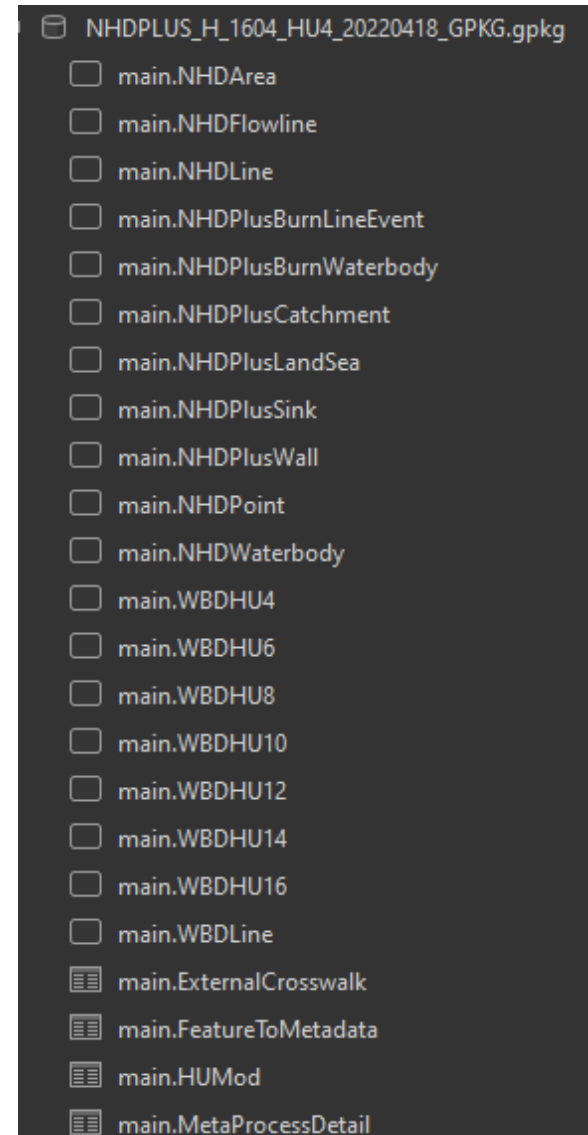
- **Geometric networks** will not exist on NHD HU4 or HU8 products available for download.



+ GeoPackage Will Not Have Relationship Classes

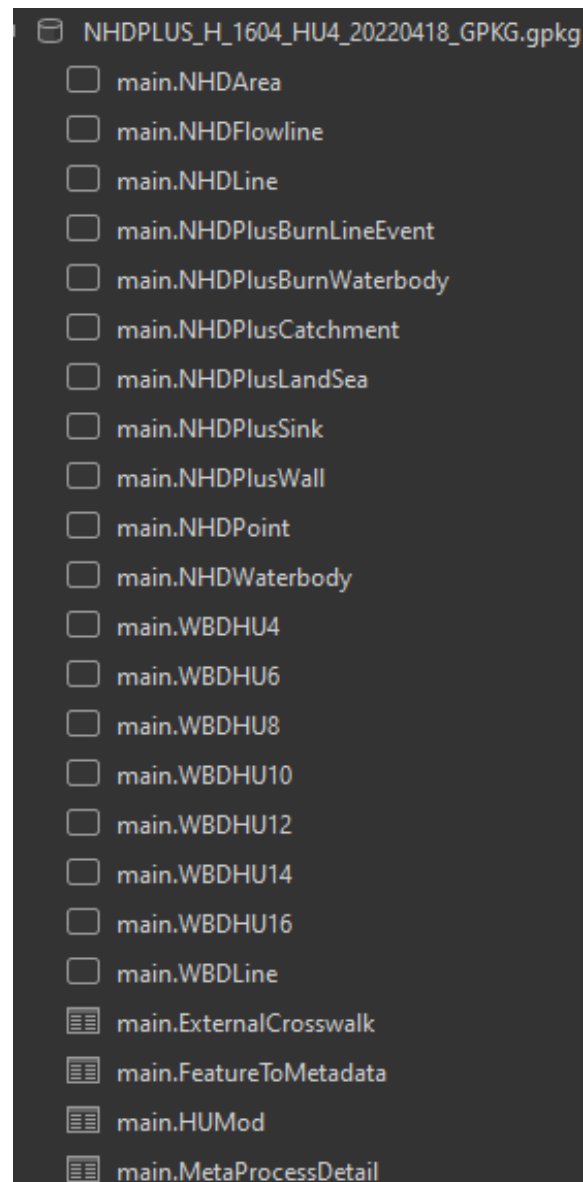
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- **Relationship classes** are not supported in the GeoPackage format - users can create these manually if they wish.



GeoPackage Will Not Have Feature Datasets

- **Feature datasets** will not exist on GeoPackage hydrography format products.





GeoPackage Will Be Larger than Geodatabases

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The GeoPackage products will be larger than the geodatabase product. This is due to the additional *_description* fields contained in the data.



Hydrography Downloadable Products

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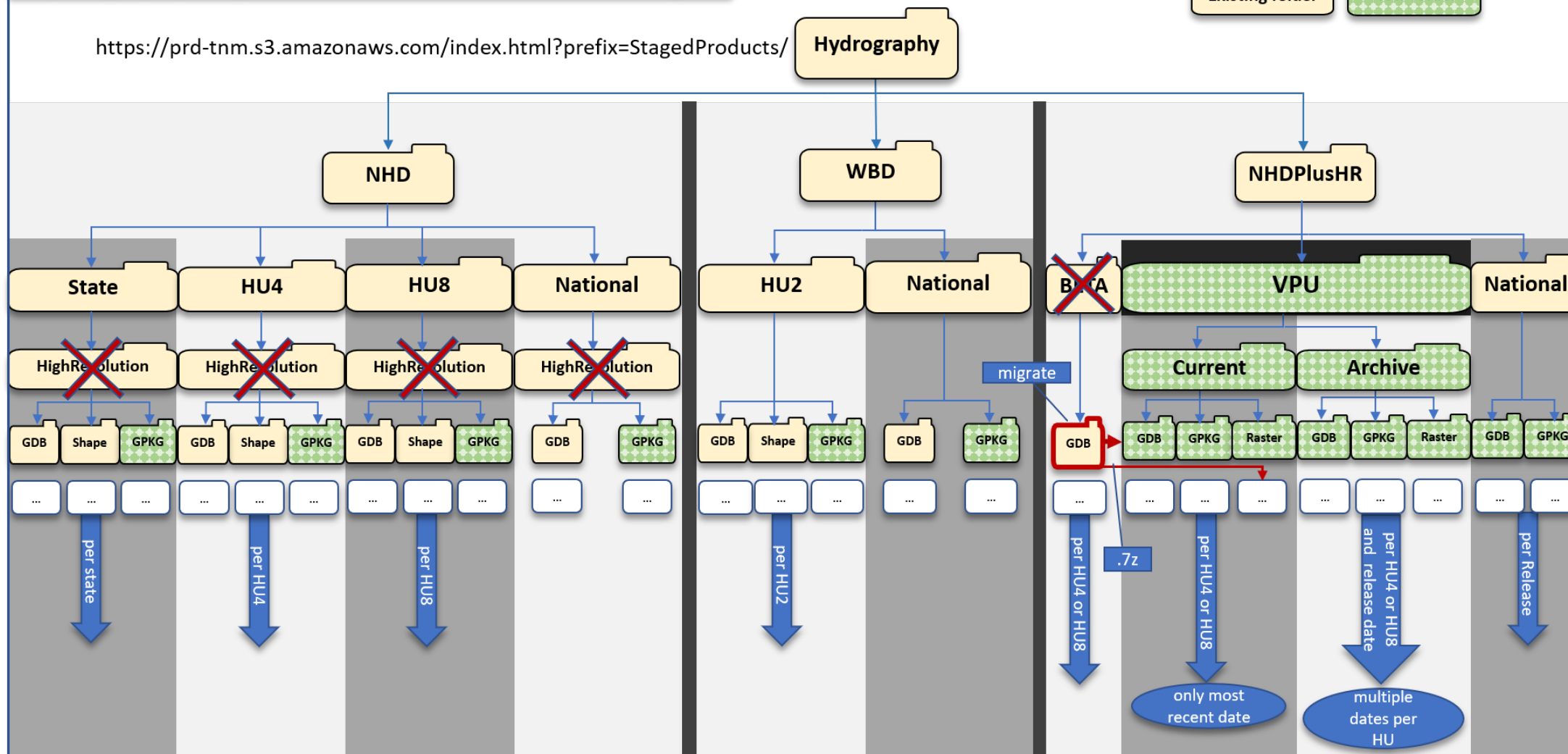
- GeoPackage products will be available from the Downloadable Products Directory, ScienceBase, and The National Map.

The screenshot displays the USGS The National Map website interface. The header features the USGS logo and the tagline 'science for a changing world'. Below the header, the 'Downloadable Products' directory is shown. On the left, a list of products is displayed with their 'Last Modified' dates. The main content area includes a search bar, a 'Map' section with checkboxes for 'US Topo' and 'Historical Topographic Maps', and a 'Data' section with checkboxes for various datasets. The 'Hydrography' dataset is selected. On the right, a map of the United States is shown with major cities labeled. The bottom of the page features the USGS logo and the tagline 'The National Map Your Source for Topographic Information'.

Model for the New Directory Structure

Hydrography Staged Products Folder Structure Changes

<https://prd-tnm.s3.amazonaws.com/index.html?prefix=StagedProducts/>



Benefits of the New Folder Structure

- This will lead to less confusion when downloading NHDPlus HR and NHD data.
- Easier to access NHD data.
- Adding a new non-proprietary GeoPackage format.
- Allows for new versions of NHDPlus HR data.

Summary of Differences in the GeoPackage

- All attributes with coded value domains will have a new attribute added. The new attribute will be the name of the attribute plus “_description”.
 - The existing attribute will contain the integer value (the coded value).
 - The new attribute will contain the domain description text from the coded-value domain.
- No attribute aliases from file geodatabase products will be included.
 - Attribute names will be lowercase.
- Geometric networks will not exist on NHD HU4 or HU8 products.
- Relationship classes are not supported in the GeoPackage format, users can create these manually if they wish.
- Feature datasets will not exist on GeoPackage hydrography format products.

+ Questions | Contact Details

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Hydrography Partner Support, NGTOC
astasey@usgs.gov