The National Hydrography Dataset

Introducing the NHDinARC

About this Document

"Introducing the NHDinARC" provides a technical description of the National Hydrography Dataset (NHD) as implemented in ARC/INFO.[1] It is part of a series of NHD user documentation that includes "NHD Concepts and Contents" and "NHDinARC QuickStart." Visit the NHD Web site at http://nhd.usgs.gov to obtain other documentation, tools, training materials, and technical support.

Introducing the NHDinARC

The National Hydrography Dataset is distributed as ARC/INFO tarred and compressed workspaces. This format is referred to as NHDinARC. (See the NHD Web site for the NHDinARC schematic diagram.) Each workspace contains the data for one 8-digit Hydrologic Unit, also known as a cataloging unit. Within the workspace, the NHD is implemented in three ARC/INFO coverages and several related INFO tables. There is also a folder containing a series of text files for the metadata.

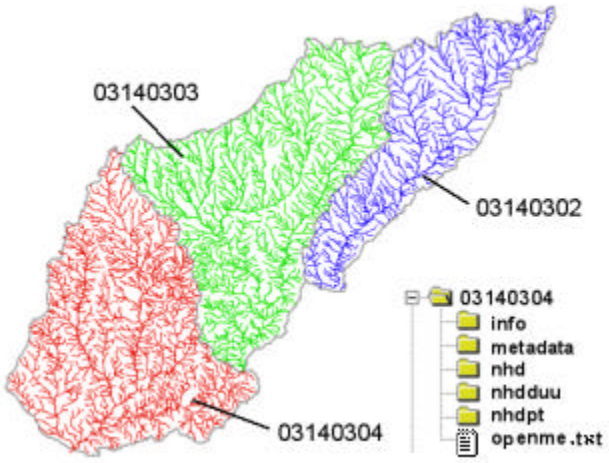

Figure 1. Example NHD data for three cataloging units.

The spatial elements of the NHD have been grouped and stored in ARC/INFO according to classes of features.[2] All line and polygon feature classes are stored together in the coverage named **NHD**. The **NHD** coverage has line, node, and polygon topology, a combination known as

[1] Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

[2] The term *feature* is also used to describe the hydrographic entities defined within the NHD such as stream/rivers, lake/ponds, and so on.

network topology. In this manner, shared geometry, such as between the network element theme and the transport/coastline reach theme, is maintained as a single set of spatial elements. This organization allows the geometry of features to be shared and edited simultaneously in ARC/INFO.

Because the ARC/INFO data model does not allow point features to exist in the same coverage as polygon features, point features are stored in the coverage named **NHDPT**. NHD underpass features are stored as nodes in the NHD coverage.

A third coverage, **NHDDUU**, contains metadata information documenting the sources and methods used in production of the NHD data.

The NHD is implemented in ARC/INFO as a georelational model consisting of two types of entities-those that contain a spatial component (called themes) and those that contain no spatial component (called tables). The NHD spatial themes consist of routes, regions, nodes, and points that are composed of selected spatial elements from the **NHD** or **NHDPT** coverages. Routes and regions uniquely identify and manage groups of lines and polygons, respectively, as single entities. The route, region, and node NHD spatial themes are subsets of the spatial elements in the **NHD** coverage. For example, the **DRAIN** route contains stream/rivers, artificial paths, and other NHD linear features from the **NHD** coverage that make up the surface water drainage network.

The NHDinARC coverages and tables within each cataloging unit workspace are organized as follows:

Table 1. Spatial data organization

Spatial Data Set	Contents	Feature Attribute Table
Coverage: **NHD**		
Route **DRAIN**	Network Element Theme	**NHD.RATDRAIN**
Route **RCH**	Transport and Coastline Reach Theme	**NHD.RATRCH**
Route **LM**	Line Landmark Theme	**NHD.RATLM**
Region **WB**	Waterbody Theme	**NHD.PATWB**
Region **RCH**	Waterbody Reach Theme	**NHD.PATRCH**
Region **LM**	Area Landmark Theme	**NHD.PATLM**
Nodes	NHD underpass features exist on some nodes	**NHD.NAT**
Coverage: **NHDPT**		
Points	Point Landmark Theme	**NHDPT.PAT**
Coverage**: NHDDUU**		
Region.dom	Digital Update Unit Theme	**NHDDUU.PATDOM**

Table 2. Supporting related tables

Table	Contents
NHD.RFLOW	Reach Flow Table
NHD.FCODE	Feature Code Table
NHD.RXP	Polygon-region Cross-reference Table
NHD.RCL	Reach Cross-reference Table
NHD.FREL	Feature Relationship Table
NHD.Status	Status Table
NHD.DUU2FEA	Feature/Reach - Digital Update Unit Association Table
NHD.REL	Relates available with NHDinARC

There are three ARC/INFO section tables in the NHD coverage. These tables link the NHD features within the route themes to the arcs that compose the features. **NHD.SECRCH** links the reach routes in **NHD.RATRCH** to their arcs in **NHD.AAT**. **NHD.SECDRAIN** links the network element routes in **NHD.RATDRAIN** to their arcs in **NHD.AAT**. **NHD.SECLM** links the landmark routes in **NHD.RATLM** to their arcs in **NHD.AAT**. In addition to section tables, other data files are maintained by ARC/INFO, such as **NHD.TIC, NHD.BND**, **NHD.PAT**, and **NHD.AAT**. These files contain standard ARC/INFO data constructions and they are not specifically documented here.

Each of the spatial themes and tables is described in the following sections. In the tables that follow, standard ARC/INFO fields are shown in *italics*. The remaining fields are specific to the NHDinARC.

Things to Know About Working with the NHD in ARC/INFO

Coordinates for the NHD are stored in decimal degrees using floating point numbers with seven digits to the right of the decimal place (for example, 1234567). This level of precision in decimal degrees equates to between approximately .02 meter and 1 meter in projected coordinate units on the ground (depending on the latitude of the coordinate). As a general rule, users should operate on NHDinARC data as if the absolute coordinate precision is .02 meter in projected units. The use of a fuzzy tolerance in ARC/INFO analysis operations (for example, CLEAN or UNION) that is greater than .02 meter has the potential to coalesce coordinates. The reason some pairs of coordinates may be closer than the original precision of the DLG-3 data (2.54 meters) is because many of the arcs making up artificial paths in areal features (for example, lake/ponds and stream/rivers) were generated using a raster-based system and subsequently snapped into the

DLG-3 data. This process caused situations where pairs of coordinates on different arcs or within a single arc may be as close as .02 meter apart. Therefore, users should not use clean tolerances larger than .02 meter when using ARC/INFO commands that accept a fuzzy tolerance argument. If a tolerance larger than .02 meter is used, the possibility exists that alterations in coordinate locations could cause entire lines or polygons (and their associated NHD features) to be removed or snapped together inappropriately. Such an occurrence could affect the use of the NHDinARC data for spatial analysis, topological and (or) analytical path routing, and maintenance.

NHD Coverage

Network Element Theme

This theme consists of *routes* that make up a linear surface water drainage network. The routes represent NHD features, such as stream/rivers, canal/ditches, and pipelines, portrayed as single lines, or the artificial paths through open waters, such as lake/ponds, swamp/marshes, wide stream/rivers, playas, and so on.

The network elements are routes rather than simple arcs because single NHD network element features may be composed of multiple arcs in the ARC/INFO data model. For example, figure 2 shows a pipeline crossing several stream/rivers. Because the intersection of the pipeline and the stream/rivers does not indicate a "decision" of "merge" point along the network, the network elements are not broken at the intersections. The pipeline labeled D in figure 2 is composed of four arcs. The stream/rivers labeled A, B, and C are composed of two arcs each.

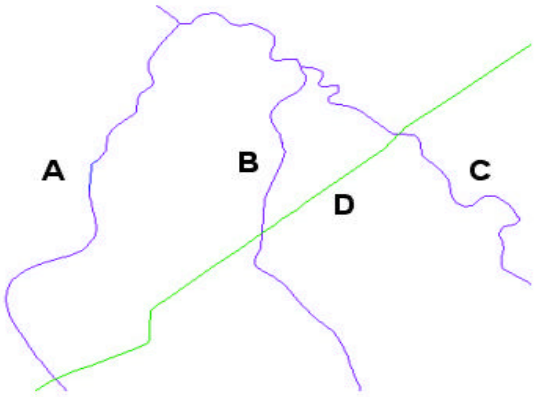

Figure 2. Network elements as routes.

Network elements do not have names.

The network element theme consists of routes built on the arcs stored in the ARC/INFO coverage named **NHD**. The route subclass is named **DRAIN**. Because these routes are employed simply as

a mechanism for managing multiple arcs as a single entity, the measures associated with them are assigned randomly and serve no useful purpose.

Table 3. Network Element Theme: **NHD.RATDRAIN** Field Definitions

Attribute Field	**Field Type**	**Values**
DRAIN#	*4,5,B*	*ARC/INFO internal sequence number of each DRAIN route.*
DRAIN-ID	*4,5,B*	*ARC/INFO feature ID for each DRAIN route.*
COM_ID	4,10,B	Unique identifier of the NHD feature or reach.
RCH_COM_ID	4,10, B	Unique identifier of the transport reach and coastline reach in the **NHD.RATRCH** table of which the network element is part.
WB_COM_ID	4,10,B	Unique identifier of the waterbody in the **NHD.PATWB** table that the network element (artificial path only) flows through. Records in this table may be related to the COM_ID field in the **NHD.PATWB** region attribute table. In the initial release of the NHD, this value is not populated and the value is –9998 (unspecified). Network elements that are not artificial paths through waterbodies will have values of –9999 (not applicable) for WB_COM_ID.
FTYPE	24,24,C	Type of NHD network element. NHD feature types included in this table are: Artificial Path Canal/Ditch (1-dimensional) Connector Pipeline Stream/River (1-dimensional)
FCODE	5,5,I	Numeric value that encodes the type and values for a set of characteristics for an NHD feature. This five-digit code has two parts: the first three digits encode the feature type; the last two digits encode values for a set of characteristics associated with the feature. (See **NHD.FCODE** table.)
METERS	4,12,F,0	Length of the NHD feature, in meters. (Reference “NHD Concepts and Contents” for projection and coordinate system information.)

Transport and Coastline Reach Theme

This theme represents transport and coastline reaches as *routes*. A reach is a significant piece of surface water generally, but not always, between two confluences. (Reference "NHD Concepts and Contents" for a more complete discussion of reach concepts.)

A single transport or coastline reach route may be composed of one or more network element routes. For example, network element B in figure 3 is an intermittent stream/river that changes to a perennial stream/river. Network elements B and C, however, make up the single transport reach labeled 2.

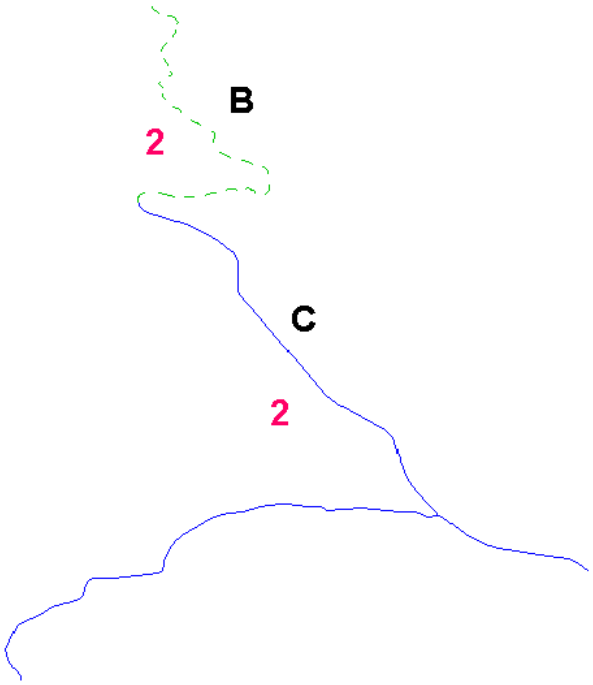

Figure 3. Transport reach (2) composed of two network elements (B and C).

Transport and coastline reaches have names (when available).

The transport and coastline reach theme consists of routes built on the arcs stored in the ARC/INFO coverage named **NHD**. The route subclass is named **RCH**. These routes and their associated measures form the foundation of the NHD's linear referencing system. Measures for coastline reaches run from 0-100 in the opposite direction of the coordinates, which are oriented so that the water is to the right and the land is to the left. Measures for transport reaches run from 0-100 in the opposite direction of the coordinates, which are oriented upstream to downstream when flow direction is known. The exceptions to this rule are measures for branched path transport reaches which are composed of the artificial paths in large areal features such as lake/ponds. (Reference "NHD Concepts and Contents" for a more complete discussion of branched path transport reaches.) If the main path within a branched reach can be determined from surrounding level and flow attributes, the artificial paths that comprise the main path will have measures from 0-100 and all remaining artificial paths within the branched reach will have measures between 100-200. These remaining artificial paths are assigned measures in the range 100-200 on a prorated basis considering their individual lengths relative to the total of their lengths. If the main path cannot be determined, all artificial paths comprising the branched reach are assigned measures in the range 100-200 on a prorated basis considering their individual lengths relative to the total of their lengths.

The section measures on these routes were established while the underlying arc coverage was in an Albers projection with arc lengths expressed in meters (reference "NHD Concepts and Contents" for a more complete discussion of the parameters). Because NHDinARC formatted data is delivered in geographic decimal degrees, the arc lengths are expressed in decimal degrees. Computing measures using the lengths in decimal degrees will produce slightly different section measures than the ones computed using meters.

Table 4. Transport and Coastline Reach Theme: **NHD.RATRCH** Field Definitions

Attribute Field	**Field Type**	**Values**
RCH#	*4,5,B*	*ARC/INFO internal sequence number of each RCH route.*
RCH-ID	*4,5,B*	*ARC/INFO feature ID for each RCH route.*
COM_ID	4,10,B	Unique identifier of the NHD feature or reach.
RCH_CODE	14,14,C	A numeric code that uniquely identifies a reach. This 14-digit code has 2 parts: the first 8 digits are the hydrologic unit code for the cataloging unit in which the reach is located; the last 6 digits are a sequentially ordered, arbitrarily assigned number.
RCH_DATE	8,8,C	Date that the RCH_CODE was assigned. Display format: YYYYMMDD.
LEVEL	5,5,I	Stream level. Has a value range of 1 to 99 and the value -9998 for "unspecified". (Reference “NHD Concepts and Contents” for a more complete discussion of stream level.)

METERS	4,12,F,0	Length of the reach, in meters. (Reference “NHD Concepts and Contents” for projection and coordinate system information.)
GNIS_ID	8,8,C	GNIS identifier of the reach name. A "blank" means that the name is not populated.
NAME	99,99,C	Text of the reach name. A "blank" means that the name is not populated. (Reference “NHD Concepts and Contents” Appendix A for name information by NHD feature type.)

Line Landmark Theme

This theme contains *routes* representing linear NHD hydrographic landmark features.

The line landmark theme consists of routes built on the arcs stored in the ARC/INFO coverage named **NHD**. The route subclass is named **LM**. Because these routes are employed simply as a mechanism for managing multiple arcs as a single entity, the measures associated with them are assigned randomly and serve no useful purpose.

Table 5. Line Landmark Theme: **NHD.RATLM** Field Definitions

Attribute Field	Field Type	Values
LM#	*4,5,B*	*ARC/INFO internal sequence number of each LM route.*
LM-ID	*4,5,B*	*ARC/INFO feature ID for each LM route.*
COM_ID	4,10,B	Unique identifier of the NHD feature or reach.
FTYPE	24,24,C	Type of NHD landmark features. NHD feature types included in this table are: Bridge (1-dimensional) Dam/Weir (1-dimensional) Gate (1-dimensional) Lock Chamber (1-dimensional) Nonearthen Shore Rapids (1-dimensional) Reef Sounding Datum Line Special Use Zone Limit Tunnel Wall Waterfall (1-dimensional)
FCODE	5,5,I	Numeric value that encodes the type and values for a set of characteristics for an NHD feature. This five-digit code has two parts: the first three digits encode the feature type; the last two digits encode values for a set of characteristics associated with the feature. (See **NHD.FCODE** table.)
METERS	4,12,F,0	Length of the NHD feature, in meters. (Reference “NHD Concepts and Contents” for projection and coordinate system information.)
GNIS_ID	8,8,C	GNIS identifier of the landmark name. A "blank" means that the name is not populated.
NAME	99,99,C	Text of the landmark name. A "blank" means that the name is not populated. (Reference “NHD Concepts and Contents” Appendix A for name information by NHD feature type.)

Waterbody Theme

This theme contains *regions* representing areal NHD hydrographic waterbody features. Many NHD area features in this theme will contain one or more corresponding lines in the surface water drainage network, coded as artificial paths.

The NHD waterbody features are implemented as regions rather than simple polygons, because single waterbody features may be composed of multiple polygons in the ARC/INFO data model. For example, figure 4 shows some artificial paths in a lake/pond. The lake/pond is a single NHD feature but is composed of six separate polygons.

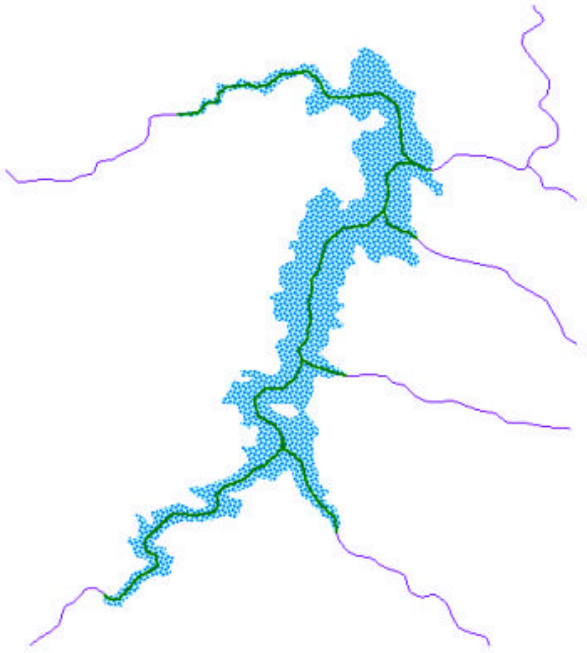

Figure 4. Single lake/pond region divided by artificial paths into six polygons.

The waterbody theme consists of regions composed of polygons stored in the ARC/INFO coverage named **NHD**. The region subclass is named **WB**.

Table 6. Waterbody Theme: **NHD.PATWB** Field Definitions		
Attribute Field	**Field Type**	**Values**
AREA	*8,18,F,5*	*ARC/INFO-calculated area of each WB region, in units of square degrees (not a useful measurement).*
PERIMETER	*8,18,F,5*	*ARC/INFO-calculated perimeter of each WB region, in units of degrees (not a useful measurement).*
WB#	*4,5,B*	*ARC/INFO internal sequence number of each WB region.*
WB-ID	*4,5,B*	*ARC/INFO feature ID for each WB region.*
COM_ID	4,10,B	Unique identifier of the NHD feature or reach. This field also has an alternate name: WB_COM_ID, and it relates to the WB_COM_ID field in the **NHD.RATDRAIN** route attribute table.
RCH_COM_ID	4,10,B	Unique identifier of the waterbody reach in the **NHD.PATRCH** table of which the waterbody is part. In the initial release of the NHD, only lake/pond features are reaches. All other waterbody feature types have a value of –9998 (unspecified). Not all NHD lake/pond features become reaches and a value of –9998 will exist in these cases.
FTYPE	24,24,C	Type of NHD waterbody feature. NHD feature types included in this table are: Area of Complex Channels Canal/Ditch (2-dimensional) Estuary Ice Mass Lake/Pond Reservoir Sea/Ocean Swamp/Marsh Stream/River (2-dimensional) Playa Wash
FCODE	5,5,I	Numeric value that encodes the type and values for a set of characteristics for an NHD feature. This five-digit code has two parts: the first three digits encode the feature type; the last two digits encode values for a set of characteristics associated with the feature. (See **NHD.FCODE** table.)

ELEV	4,12,F,1	Elevation of the waterbody, in meters above the vertical datum. In the initial release of the NHD, only canal/ditch, lake/pond, reservoir, and stream/river in the waterbody theme can have elevations. Most of these features do not have a value for elevation, so -9998 (unspecified) is the most common value. For all other NHD feature types, the value for elevation is –9999 (not applicable).
STAGE	24,24,C	Height of the water surface that is the basis for the elevation. Possible values are: Average Water Elevation Date of Photography High Water Elevation Normal Pool Spillway Elevation
SQ_KM	8,18,F,3	Area of the NHD feature, in square kilometers. (Reference “NHD Concepts and Contents” for projection and coordinate system information.)
GNIS_ID	8,8,C	GNIS identifier of the waterbody name. A “blank” means that the name is not populated.
NAME	99,99,C	Text of the waterbody name. A “blank” means that the name is not populated. (Reference “NHD Concepts and Contents” Appendix A for name information by NHD feature type.)

Waterbody Reach Theme

This theme contains *regions* representing waterbody reaches. Waterbody reach regions consist of one or more waterbody regions.

A waterbody reach provides a handle for linking (relating) additional descriptive information to a waterbody. In the initial release of the NHD, waterbody reaches will only exist on NHD lake/pond waterbody features (except in Washington State, where other NHD waterbody features may be waterbody reaches). It is possible that some NHD lake/pond features will not have a waterbody reach in the initial release of the NHD. Waterbody reaches can exist for head, terminal, in-line, and isolated waterbodies. NHD lake/pond features associated with a drainage network (head, terminal, and in-line lake/ponds) may contain both a waterbody reach and a transport reach on their areal and linear (artificial path) representations, respectively. The NHD feature ID's (COM_ID) for these two types of reaches will be different. The RCH_CODE also will be different for the waterbody reach and a transport reach running through it. Lake/ponds that are isolated from a surface-water drainage network may contain a waterbody reach but not a transport reach because they are not associated with a drainage network.

A single waterbody reach region may be composed of one or more polygons. For example, figure 5 shows a waterbody reach. The reach region is composed of six polygons, separated by artificial paths.

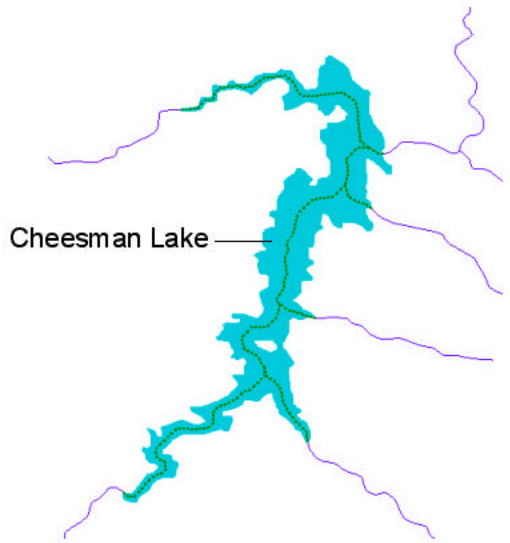

Figure 5. Multiple polygons composing a single waterbody reach region.

Waterbody reaches have names (when available).

The waterbody reach theme consists of regions composed of polygons stored in the ARC/INFO coverage named **NHD**. The region subclass is named **RCH**.

Table 7. Waterbody Reach Theme: **NHD.PATRCH** Field Definitions

Attribute Field	**Field Type**	**Values**
AREA	*8,18,F,5*	*ARC/INFO-calculated area of each RCH region, in units of square degrees (not a useful measurement).*
PERIMETER	*8,18,F,5*	*ARC/INFO-calculated perimeter of each RCH region, in units of degrees (not a useful measurement).*
RCH#	*4,5,B*	*ARC/INFO internal sequence number of each RCH region.*
RCH-ID	*4,5,B*	*ARC/INFO feature ID for each RCH region.*
COM_ID	4,10,B	Unique identifier of the NHD feature or reach.
RCH_CODE	14,14,C	A numeric code that uniquely identifies a reach. This 14-digit code has 2 parts: the first 8 digits are the hydrologic unit code for the cataloging unit in which the reach is located; the last 6 digits are a sequentially ordered, arbitrarily assigned number.
RCH_DATE	8,8,C	Date that the RCH_CODE was assigned. Display format: YYYYMMDD.
SQ_KM	8,18,F,3	Area of the waterbody region, in square kilometers. (Reference “NHD Concepts and Contents” for projection and coordinate system information.)
GNIS_ID	8,8,C	GNIS identifier of the waterbody reach name. A “blank” means that the name is not populated.
NAME	99,99,C	Text of the waterbody reach name. A “blank” means that the name is not populated. (Reference “NHD Concepts and Contents” Appendix A for name information by NHD feature type.)

Area Landmark Theme

This theme contains *regions* representing areal NHD hydrographic landmark features.

The area landmark theme consists of regions composed of polygons stored in the ARC/INFO coverage named **NHD**. The region subclass is named **LM**.

Table 8. Area Landmark Theme: **NHD.PATLM** Field Definitions

Attribute Field	Field Type	Values
AREA	*8,18,F,5*	*ARC/INFO-calculated area of each LM region, in units of square degrees (not a useful measurement).*
PERIMETER	*8,18,F,5*	*ARC/INFO-calculated perimeter of each LM region, in units of degrees (not a useful measurement).*
LM#	*4,5,B*	*ARC/INFO internal sequence number of each LM region.*
LM-ID	*4,5,B*	*ARC/INFO feature ID for each LM region.*
COM_ID	4,10,B	Unique identifier of the NHD feature or reach.
FTYPE	24,24,C	Type of NHD areal landmark feature. NHD feature types included in this table are: Area To Be Submerged Bay/Inlet Bridge (2-dimensional) Dam/Weir (2-dimensional) Foreshore Hazard Zone Inundation Area Lock Chamber (2-dimensional) Special Use Zone Submerged Stream Spillway Rapids (2-dimensional)
FCODE	5,5,I	Numeric value that encodes the type and values for a set of characteristics for an NHD feature. This five-digit code has two parts: the first three digits encode the feature type; the last two digits encode values for a set of characteristics associated with the feature. (See **NHD.FCODE** table.)
ELEV	4,12,F,1	Elevation of the NHD landmark feature, in meters above the vertical datum. In the initial release of the NHD, only area to be submerged and inundation area in the area landmark theme may have elevations. Most of these features do not have a value for elevation, so -9998 (unspecified) is the most common value. For all other feature types, the value for elevation is –9999 (not applicable).

STAGE	24,24,C	Height of the water surface that is the basis for the elevation. Possible values are as follows: Average Water Elevation Date of Photography High Water Elevation Normal Pool Spillway Elevation
SQ_KM	8,18,F,3	Area of the NHD feature, in square kilometers. (Reference “NHD Concepts and Contents” for projection and coordinate system information.)
GNIS_ID	8,8,C	GNIS identifier of the area landmark name. A “blank” means that the name is not populated.
NAME	99,99,C	Text of the area landmark name. A “blank” means that the name is not populated. (Reference “NHD Concepts and Contents” Appendix A for name information by NHD feature type.)

Underpass Features

An underpass and two relations (above and below) represent places where features cross at different elevations. For example, a canal/ditch may cross a stream/river in a flume, but there is no physical connection and no flow between the two features. These situations are modeled by building node topology using ARC/INFO and adding attribute fields to the node attribute table.

Underpasses do not have names.

Table 9. Underpass Features: **NHD.NAT** Field Definitions

Attribute Field	**Field Type**	**Values**
ARC#	*4,5,B*	*ARC/INFO internal sequence number of one of the arcs (randomly selected) connected to that node.*
NHD#	*4,5,B*	*ARC/INFO internal sequence number of each node.*
NHD-ID	*4,5,B*	*ARC/INFO feature ID for each node.*
COM_ID	4,10,B	Unique identifier of the NHD feature or reach. This will have a value –9998 (unspecified) if no NHD underpass relationship is defined for the node.
FTYPE	24,24,C	Type of NHD feature. NHD feature type is "Underpass" for nodes having an underpass relationship. A “blank” indicates nodes at which no NHD underpass relationship is defined.
ABOVE_ID	4,10,B	Unique identifier of the NHD feature that passes over the other. (Relates to the network element COM_ID field in **NHD.RATDRAIN**.) Value will be –9999 (not applicable) for nodes at which no NHD underpass relationship is defined.
BELOW_ID	4,10,B	Unique identifier of the NHD feature that passes under the other. (Relates to the network element COM_ID field in **NHD.RATDRAIN**.) Value will be –9999 (not applicable) for nodes at which no NHD underpass relationship is defined.

NHDPT Coverage

Point Landmark Theme

This theme contains points representing NHD hydrographic landmark features.

The point landmark theme contains points that are stored in the ARC/INFO coverage named **NHDPT**.

Table 10. Point Landmark Theme: **NHDPT.PAT** Field Definitions

Attribute Field	Field Type	Values
AREA	*8,18,F,5*	*ARC/INFO-calculated area of each point. Always 0.00000*
PERIMETER	*8,18,F,5*	*ARC/INFO-calculated perimeter of each point. Always 0.00000*
NHDPT#	*4,5,B*	*ARC/INFO internal sequence number of each point.*
NHDPT-ID	*4,5,B*	*ARC/INFO feature ID for each point.*
COM_ID	4,10,B	Unique identifier of the NHD feature or reach.
FTYPE	24,24,C	Type of NHD point landmark feature. NHD feature types included in this table are as follows: Fumarole Gaging Station Gate (0-dimensional) Geyser Lock Chamber (0-dimensional) Mudpot Rapids (0-dimensional) Rock Spring/Seep Waterfall (0-dimensional) Well
FCODE	5,5,I	Numeric value that encodes the type and values for a set of characteristics for an NHD feature. This five-digit code has two parts: the first three digits encode the feature type; the last two digits encode values for a set of characteristics associated with the feature. (See **NHD.FCODE** table.)
GNIS_ID	8,8,C	GNIS identifier of the point landmark name. A “blank” means that the name is not populated.
NAME	99,99,C	Text of the point landmark name. A “blank” means that the name is not populated. (Reference “NHD Concepts and Contents” Appendix A for name information by NHD feature type.)

NHDDUU Coverage

Digital Update Unit Theme

This theme contains *regions* representing the domains of the digital update units.

Table 11. Digital Update Unit Theme: **NHDDUU.PATDOM** Field Definitions

Attribute Field	Field Type	Values
AREA	*8,18,F,5*	*ARC/INFO-calculated area of each DOM region, in units of square degrees (not a useful measurement).*
PERIMETER	*8,18,F,5*	*ARC/INFO-calculated perimeter of each DOM region, in units of degrees (not a useful measurement).*
DOM#	*4,5,B*	*ARC/INFO internal sequence number of each DOM region.*
DOM-ID	*4,5,B*	*ARC/INFO feature ID for each DOM region.*
DUU_ID	4,10,B	Unique identifier of the digital update unit.
DUU_NAME	40,40,C	Name of the digital update unit and the name of the ".met" file that contains the metadata entries for the digital update unit. For the cataloging unit, the DUU_Name is the 8-digit CU identifier; for the 1:100,000-scale quadrangle, the DUU_Name is the 3-digit abbreviation for the 100K quadrangle.
DUU_DATE	8,8,C	Date the DUU was created. Display format: YYYYMMDD.

Related INFO Tables

Reach Flow Table

This table models the flow relationships between reaches. There is a row in this table for each reach-to-reach flow relationship. Reach flow relations are described in more detail in "NHD Concepts and Contents."

Table 12. Reach Flow Table: **NHD.RFLOW** Field Definitions

Attribute Field	Field Type	Values
REL_COM_ID	4,10,B	Unique identifier of the NHD relationship.
COM_ID_1	4,10,B	The first reach of the flow relationship. Relates to COM_ID in **NHD.RATRCH** table. Has value of "0" if DIR_TEXT is "Network Start".
COM_ID_2	4,10,B	The second reach of the flow relationship. Relates to COM_ID in **NHD.RATRCH** table. Has value of "0" if DIR_TEXT is "Network End".
SEQUENCE	3,3,I	This attribute is used to order the inflows and outflows along the interior of the second reach. When sequence is 0, the first and second reaches touch end-to-end. (Reference "NHD Concepts and Contents" for a more complete discussion of sequencing flow relations.)
DIRECTION	5,5,I	Integer code for the direction of flow. (Reference "NHD Concepts and Contents" for a more complete discussion of flow relations.) Has the following values: 709 – In 710 – Out 711 – Bidirectional 712 – Network Start 713 - Network End 714 - Non-flowing Connection (Coastline connection)
DIR_TEXT	24,24,C	This attribute encodes the corresponding DIRECTION value in words. (Reference "NHD Concepts and Contents" for a more complete discussion of flow relations.) Has the following values: In Out Bidirectional Network Start Network End Non-flowing Connection
DELTA_LVL	5,5,I	The difference in level from the first reach to the second reach (LEVEL of first reach minus LEVEL of second reach). The value will be –9999 (not applicable) when the value of the from reach or the to reach is –9998 (unspecified). The value will be –9999 (not applicable) when the direction is "network start", "network end", or "non-flowing connection".

Feature Code Table

This table contains one record for each feature code used in the NHD. It provides the textual definition of the feature code (FCODE). This table also contains fields for individual feature characteristics. These fields may be used to determine which FCODE values correspond to particular feature characteristics. For example, this table may be used to find all FCODE values that include the hydrographic category characteristic value "perennial". This set of FCODE values could then be used to find all NHD features that have the hydrographic category characteristic value "perennial".

Table 13. Feature Code Table: **NHD.FCODE** Field Definitions

Attribute Field	**Field Type**	**Values (Reference "NHD Concepts and Contents" Appendix C for listing of all characteristics and values.)**
FCODE	5,5,I	Numeric value that encodes the type and values for a set of characteristics for an NHD feature. This five-digit code has two parts: the first three digits encode the feature type; the last two digits encode values for a set of characteristics associated with the feature.
FTYPE	24,24,C	Type of NHD feature. A complete list of NHD feature types is in "NHD Concepts and Contents" Appendix A.
DESCRIPT	130,130,C	Textual definition of the FCODE value.
ABW	32,32,C	Abovewater Portion
ANT	32,32,C	Anchorage Type
CDY	32,32,C	Canal/Ditch Type
CGC	32,32,C	Glaciation Category
COM	32,32,C	Construction Material
COS	32,32,C	Cover Status
FLO	32,32,C	Flow Status
GTT	32,32,C	Gate Type
HYC	32,32,C	Hydrographic Category
HZT	32,32,C	Hazard Zone Category
IAT	32,32,C	Inundation Area Type
ICS	32,32,C	Inundation Control Status

IMC	32,32,C	Ice Mass Category
OPS	32,32,C	Operational Status
PIT	32,32,C	Pipeline Type
POA	32,32,C	Positional Accuracy
POT	32,32,C	Post Type
PRD	32,32,C	Product
RET	32,32,C	Reservoir Type
RTS	32,32,C	Relationship to Surface
SOC	32,32,C	Sea/Ocean Category
STT	32,32,C	Snag/Stump Type
SZT	32,32,C	Special Use Zone Type
WAC	32,32,C	Water Characteristics
WAT	32,32,C	Wall Type
WIT	32,32,C	Water Intake/Outflow Type

Polygon-Region Cross-reference Table

The NHD.RXP table contains cross-reference information that links NHD features within region themes to the polygons that make up the individual NHD features. There are three region themes in the NHDinARC: NHD.PATWB, NHD.PATRCH, and NHD.PATLM. Each NHD feature within these themes is composed of one or more polygons. The RXP table associates each NHD feature with the polygons that make up that feature. A given polygon can belong to more than one NHD feature in a given region theme or to NHD features in more than one region theme. The RXP table can be used to find places where NHD features overlap. The RXP table contained in the NHDinARC coverages is a modified version of the standard RXP table created by ARC/INFO. In NHDinARC, redundant and unnecessary items have been removed.

Table 14. Polygon-Region Cross-reference Table: **NHD.RXP** Field Definitions

Attribute Field	**Field Type**	**Values**
SUBCLASS	13,13,C	Identifies the region to which SUBCLASS# belongs. “RCH” for NHD.PATRCH. “WB” for NHD.PATWB. “LM” for NHD.PATLM.
SUBCLASS#	4,5,B	ARC/INFO internal sequence number of a region in SUBCLASS.
POLY#	4,5,B	ARC/INFO internal sequence number of a polygon in NHD.PAT.

Reach Cross-reference Table

The NHD.RCL table contains cross-reference information that tracks changes, over time, to reach codes. In the initial release of the NHD, this table is empty. As the NHD is updated, this table will track reach codes for reaches that have been deleted, reach codes that have been added to create new reaches, and reach codes on existing reaches that have been redelineated. Cross-reference information that tracks the links between reach codes in the NHD and the EPA Reach File Version 3 has been maintained and is available from the EPA. Cross reference information that tracks the links between reach codes in the NHD and the Pacific Northwest River Reach File has been maintained and is available from the EPA.

Table 15. Reach Cross-reference Table: **NHD.RCL** Field Definitions

Attribute Field	Field Type	Values
OLD_RCHCDE	17,17,C	The reach code prior to the change.
OLD_RCHDTE	8,8,C	The reach code assignment date for OLD_RCHCDE.
NEW_RCHCDE	17,17,C	The reach code after the change.
NEW_RCHDTE	8,8,C	The reach code assignment date for NEW_RCHCDE.
OLD_UPMI	5,5,C	The upstream marker index for OLD_RCHCDE. Only used when OLD_RCHCDE is an RF3-Alpha reach.
NEW_UPMI	5,5,C	The upstream marker index for NEW_RCHCDE. Only used when NEW_RCHCDE is an RF3-Alpha reach.
CHG_CODE	4,4,C	The type of change that caused the reach code to change.
PROCESS	6,6,C	The name of the process in which the reach code changed.
RF_VER	10,10,C	The reach file or NHD version in which the reach code change is effective.

Feature Relationship Table

This table contains the NHD feature-to-feature relationship information for the source data. All relationships in this table are also contained in the other data tables, except for the relationship identifiers. When data updates are provided to the NHD, information in this table is used to reassociate the common identifiers of feature-to-feature relationships with the data contained in the other tables.

Table 16. Feature Relationship Table: **NHD.FREL** Field Definitions		
Attribute Field	**Field Type**	**Values**
REL_COM_ID	4,10,B	Unique identifier of the NHD relationship.
COM_ID_1	4,10,B	Unique identifier of the first NHD feature in the relationship.
COM_ID_2	4,10,B	Unique identifier of the second NHD feature in the relationship.
REL_TYPE	99,99,C	Type of relationship. Has the following values: Feature Composition – In the NHD data model, reaches are composed of NHD features. In NHDinARC, these relationships are represented as native ARC/INFO feature classes. 1-D reaches (reach routes) are associated with their composite features through shared arcs and by inclusion of the reach identifier in the drain route feature attribute table. 2-D reaches (reach regions) are associated with their composite features through shared polygons and by inclusion of the reach identifier in the waterbody region feature attribute table. Vertically Relates – Vertical separation between drain routes (also in NHD.NAT table).

Status Table

This table contains status information on NHD feature and relationship updates. Rather than track changes in each feature attribute table, which is not feasible for deletions, you can track all changes to features and relationships can be tracked in this table.

Table 17. Status Table: **NHD.STATUS** Field Definitions

Attribute Field	Field Type	Values
COM_ID_1	4,10,B	Unique identifier of the first NHD feature. In a feature update, this is the only common identifier to be populated. In a relationship update, this is the common identifier of the first feature in the relationship.
COM_ID_2	4,10,B	In a feature update, this value is defaulted to "0". In a relationship update, this is the common identifier of the second feature in the relationship.
STATUS	2,2,C	Status of modification. Has the following values: A – Added (feature or relationship). D – Deleted (feature or relationship). MA – Modified attributes (feature or relationship). MS – Modified spatial elements (feature only). V – Validated.

Feature/Reach - Digital Update Unit Association Table

This table provides a linkage between each NHD feature or reach and its digital update unit.

Table 18. Feature/Reach - Digital Update Unit Association Table: **NHD.DUU2FEA** Field Definitions

Attribute Field	Field Type	Values
DUU_ID	4,10,B	Unique identifier of the digital update unit.
COM_ID	4,10,B	Unique identifier of the NHD feature or reach.

Metadata Files

Metadata are provided in **text files** associated with a data set (for the general NHD metadata) or with a digital update unit (for the "cataloging unit" and "quadrangle" metadata).

In the initial release of the National Hydrography Dataset, there are three sets of metadata:

1. A general set of metadata applies to the entire **NHD**.
2. "**Cataloging unit**" digital update units describe the lineage records for reaches.
3. "**Quadrangle**" digital update units that describe the lineage records for NHD features.

Available Relates

The NHD.REL table contains the characteristics for a set of predefined relates that support navigating the NHDinARC model. NHD.REL is a standard INFO table created by the RELATE SAVE command. The relates contained in the table can be restored by using the RELATE RESTORE NHD.REL command during any ARC/INFO session. Relates are only supported in ARC/INFO environments and not in ArcView.

Table 19. Relates Available with NHDinARC: **NHD.REL** Field Definitions

Attribute Field	**Field Type**	**Values**
RELATION	*8,8,C*	*Name of the relate.*
TABLE-ID	*128,128,C*	*Related table.*
DATABASE	*8,8,C*	*Name of database that stores table listed in Table-ID.*
ITEM	*16,16,C*	*Name of item from which relate originates.*
COLUMN	*32,32,C*	*Name of item to where relate is established.*
TYPE	*16,16,C*	*Type of relate performed.*
ACCESS	*4,4,C*	*Access rights to related table.*
ASDBASE#	*4,5,B*	*Reserved for ARCSTORM operations.*
ASLCKID#	*4,5,B*	*Reserved for ARCSTORM operations.*
WHERE	*320,320,C*	*SQL expression (not applied in NHDinARC).*

Table 20 shows the predefined relates and their intended application:

Table 20. Application of Predefined Relates	
Name Of Relate	**Application**
fat2fcod	Ordered relate from any feature attribute table that contains fcode to the NHD.FCODE table.
rch2fflw	Linear relate from transport or coastline reach in NHD.RATRCH to "from flow" reach (com_id_1) in NHD.RFLOW.
rch2tflw	Linear relate from transport or coastline reach in NHD.RATRCH to "to flow" reach (com_id_2) in NHD.RFLOW.
dr2rch	Linear relate from network element in NHD.RATDRAIN to its transport or coastline reach in NHD.RATRCH.
rch2dr	Linear relate from transport or coastline reach in NHD.RATRCH to the network element that underlies it in NHD.RATDRAIN.
wb2rch	Linear relate from waterbody feature in NHD.PATWB to its waterbody reach in NHD.PATRCH.
rch2wb	Linear relate from waterbody reach in NHD.PATRCH and its waterbody feature(s) that underlies it in NHD.PATWB.

Please note that the relate environment in ARC/INFO does not directly support one-to-many relates. One-to-many relates may exist between reaches and their flow, and between reaches and their composite drainage or waterbody features. Please refer to ARC/INFO technical documentation for information on working with one-to-many relates.