**Assessment of Gulf Coast NHD**  27 May 2010

**Background:**

Several natural and manmade disasters have occurred in the Gulf coastal area over the past several years, dramatically changing the landscape in the coastal area and highlighting the need to update the National Hydrography Dataset (NHD) in the Gulf coast region. This document will assess the NHD in the Gulf of Mexico coastal area in order to better determine the ability of users to accurately use the NHD for mapping and modeling purposes.

**Subregions and Subbasins Evaluated:**

Four (4) subregions in the Gulf coastal area were evaluated. See Figure 1, page 16 for graphic showing locations.

1. **0317 – Pascagoula** (Mississippi/Alabama)
2. **0318 – Pearl** (Mississippi)
3. **0808 – Louisiana Coastal** (Louisiana)
4. **0809 – Lower Mississippi** (Louisiana)

These above subregions are further subdivided into subbasins. The following will list each subbasin evaluated:

1. **0317 – Pascagoula**
2. 03170001 – Chunky-Okatibbee, Mississippi
3. 03170002 – Upper Chickasawhay, Alabama, Mississippi
4. 03170003 – Lower Chickasawhay, Alabama, Mississippi
5. 03170004 – Upper Leaf, Mississippi
6. 03170005 – Lower Leaf, Mississippi
7. 03170006 – Pascagoula, Mississippi
8. 03170007 – Black, Mississippi
9. 03170008 – Escatawpa, Alabama, Mississippi
10. 03170009 – Mississippi Coastal, Alabama, Mississippi
11. **0318 – Pearl**
12. 03180001 – Upper Pearl, Mississippi
13. 03180002 – Middle Pearl – Strong, Mississippi
14. 03180003 – Middle Pearl – Silver, Mississippi
15. 03180004 – Lower Pearl, Louisiana, Mississippi
16. 03180005 – Bogue Chitto, Louisiana, Mississippi
17. **0808 – Louisiana Coastal**
18. 08080101 – Atchafalaya, Louisiana
19. 08080102 – Bayou Teche, Louisiana
20. 08080103 – Vermillion, Louisiana
21. 08080201 – Mermentau Headwaters, Louisiana
22. 08080202 – Mermentau, Louisiana
23. 08080203 – Upper Calcasieu, Louisiana
24. 08080204 – Whiskey Chitto, Louisiana
25. 08080205 – West Fork Calcasieu, Louisiana
26. 08080206 – Lower Calcasieu, Louisiana
27. **0809 – Lower Mississippi**
28. 08090100 – Lower Mississippi – New Orleans, Louisiana
29. 08090201 – Liberty Bayou – Tchefuncta, Louisiana
30. 08090202 – Lake Pontchartrain, Louisiana
31. 08090203 – Eastern Lousiana Coastal, Lousiana
32. 08090301 – East Central Louisiana Coastal, Louisiana
33. 08090302 – West Central Louisiana Coastal, Louisiana

**General NHD Information:**

To completely understand the NHD in this area, each subregion will be broken down into individual feature classes. This list will provide information on each NHDFlowline and NHDWaterbody feature class and each feature in that feature class. Notice the percentage of features based on feature class.

1. **0317 – Pascagoula**

NHDFlowline – total of 90,467 NHDFlowline features

Artificial Path CanalDitch Coastline Connector Pipeline StreamRiver

22,053 937 1,364 264 1 65,848

24% 1% 1.5% .3% .001% 73%

NHDWaterbody – total of 43,356 NHDWaterbody features

Estuary IceMass LakePond Playa Reservoir SwampMarsh

0 0 37,233 1 250 5,872

0% 0% 86% .002% .6% 14%

1. **0318 – Pearl**

NHDFlowline – total of 63,389 NHDFlowline features

Artificial Path CanalDitch Coastline Connector Pipeline StreamRiver

15,902 455 17 173 0 46,842

25% .7% .02% .3% 0% 74%

NHDWaterbody – total of 47,710 NHDWaterbody features

Estuary IceMass LakePond Playa Reservoir SwampMarsh

0 0 44,329 0 517 2,864

0% 0% 93% 0% 1% 6%

1. **0808 – Louisiana Coastal**

NHDFlowline – total of 141,114 NHDFlowline features

Artificial Path CanalDitch Coastline Connector Pipeline StreamRiver

49,556 26,102 692 2122 421 62,221

35% 18% .5% 1.5% .3% 44%

NHDWaterbody – total of 51,791 NHDWaterbody features

Estuary IceMass LakePond Playa Reservoir SwampMarsh

0 0 39,195 0 680 11,916

0% 0% 76% 0% 1.3% 23%

1. **0809 – Lower Mississippi**

NHDFlowline – total of 134,939 NHDFlowline features

Artificial Path CanalDitch Coastline Connector Pipeline StreamRiver

74,507 10,745 10,242 401 26 39,018

55% 8% 7.6% .3% .02% 29%

NHDWaterbody – total of 83,141 NHDWaterbody features

Estuary IceMass LakePond Playa Reservoir SwampMarsh

0 0 50,875 0 327 31,939

0% 0% 61% 0% .4% 38%

**Coastline Analysis by Subregion and Subbasin:**

The coastline is a difficult feature to maintain in the NHD. In the Gulf coast area, every hurricane that blows through the area rearranges the coastline, sometimes dramatically! In addition, most of the coastline in the NHD has not been updated to newer imagery, rather most coastlines in the NHD are represented as shown on the older topographic maps. In some cases this information may be 20 – 25 years old.

The following calculations were generated using ArcMap version 9.3, service pack 1. NHD data was downloaded from the USGS High Resolution FTP download site (ftp://nhdftp.usgs.gov/SubRegions/High/). The NHD data was loaded into a new ArcMap session, the NHDFlowline table was opened, and a query was built searching for every feature representing a coastline. The selected features were then queried through a field named ‘LengthKM’ to determine the total length of the coast in each subregion and in each subbasin. Subbasins that did not contain any coastline features are not listed. The conversion factors used: 1.609 km/statue mile and .6214 statute mile/km.

In all cases, a Geographic project in North American Datum (NAD) 1983 was used to calculate all distances and areas. This is the native projection/datum for NHD.

1. **0317 – Pascagoula**

Coastline features LengthKM Statute Miles

1,364 1,050.041 km 652.495 miles

**03170006**

Coastline features LengthKM Statute Miles

32 25.2 km 15.659 miles

**03170009**

Coastline features LengthKM Statute Miles

1,332 1,024.841 km 636.836 miles

1. **0318 – Pearl**

Coastline features LengthKM Statute Miles

17 15.778 km 9.804 miles

**03180004**

Coastline features LengthKM Statute Miles

17 15.778 km 9.804 miles

1. **0808 – Louisiana Coastal**

Coastline features LengthKM Statute Miles

692 841.417 km 522.856 miles

**08080101**

Coastline features LengthKM Statute Miles

142 154.723 km 96.145 miles

**08080102**

Coastline features LengthKM Statute Miles

128 65.276 km 40.563 miles

**08080103**

Coastline features LengthKM Statute Miles

384 446.043 km 277.171

**08080202**

Coastline features LengthKM Statute Miles

31 112.639 km 69.994 miles

**08080206**

Coastline features LengthKM Statute Miles

7 62.736 km 38.984 miles

1. **0809 – Lower Mississippi**

Coastline features LengthKM Statute Miles

10,242 9,445.049 km 5,869.153 miles

**08090100**

Coastline features LengthKM Statute Miles

4,237 2,428.191 km 1,508.878 miles

**08090203**

Coastline features LengthKM Statute Miles

2,828 3,627.396 km 2,254.064 miles

**08090301**

Coastline features LengthKM Statute Miles

2,730 2,710.297 km 1,684.179 miles

**08090302**

Coastline features LengthKM Statute Miles

447 679.165 km 422.033 miles

**SwampMarsh Analysis by Subregion and Subbasin:**

As with coastline, SwampMarsh features change rapidly and are difficult to maintain accurately. SwampMarsh features are polygon features in the NHDWaterbody feature class.

To analyze SwampMarsh features, the ‘Select by Location’ function in ArcMap was used to clip features from the NHDWaterbody feature class using the subbasin boundary as the clip polygon. This created a selected set of features containing all NHDWaterbody features that reside in a particular subbasin area. Then a query was built searching for only SwampMarsh features. Only coastal subbasins are listed.

The conversion factors used: 2.590 square km/square mile and .3861 square mile/square km. Again, a Geographic project in North American Datum (NAD) 1983 was used to calculate all areas.

1. **0317 – Pascagoula**

SwampMarsh features SquareKM Square Miles

5,872 780.292 sq km 301.271 sq mile

**03170006**

SwampMarsh features SquareKM Square Miles

787 135.749 sq km 52.413 sq miles

**03170008** (not a coastal subbasin, but within 4 miles of the coast)

SwampMarsh features SquareKM Square Miles

1,143 163.103 sq km 62.974 sq miles

**03170009**

SwampMarsh features SquareKM Square Miles

2,397 324.156 sq km 125.157 sq miles

1. **0318 – Pearl**

SwampMarsh features SquareKM Square Miles

2,864 405.631 sq km 156.614 sq miles

**03180004**

SwampMarsh features SquareKM Square Miles

1,397 253.993 sq km 98.067 sq miles

**03180005** (Not a coastal subbasin, but within 37 miles of the coast)

SwampMarsh features SquareKM Square Miles

252 11.747 sq km 4.536 sq miles

1. **0808 – Louisiana Coastal**

SwampMarsh features SquareKM Square Miles

11,916 6,855.714 sq km 2646.991 sq miles

**08080101**

SwampMarsh features SquareKM Square Miles

2,900 1,696.239 sq km 654.918 sq miles

**08080102**

SwampMarsh features SquareKM Square Miles

1,540 337.922 sq km 130.472 sq miles

**08080103**

SwampMarsh features SquareKM Square Miles

1,125 834.607 sq km 322.242 sq miles

**08080202**

SwampMarsh features SquareKM Square Miles

3,334 2,021.789 sq km 780.613 sq miles

**08080206**

SwampMarsh features SquareKM Square Miles

1,873 607.962 sq km 234.734 sq miles

1. **0809 – Lower Mississippi**

SwampMarsh features SquareKM Square Miles

31,939 8,656.772 sq km 3,342.380 sq miles

**08090100**

SwampMarsh features SquareKM Square Miles

4,708 276.340 sq km 106.695 sq miles

**08090203**

SwampMarsh features SquareKM Square Miles

7,305 1,596.827 sq km 616.535 sq miles

**08090301**

SwampMarsh features SquareKM Square Miles

10,250 2,815.326 sq km 1,086.997 sq miles

**08090302**

SwampMarsh features SquareKM Square Miles

8,825 3,341.148 sq km 1,290.017 sq miles

**LakePond Analysis by Subregion and Subbasin:**

To analyze LakePond features, two (2) methods were used. Method 1 involved building a query that looked for LakePond features with a specific ReachCode range (FType = 390 (LakePond) AND ReachCode LIKE ‘<8-digit HUC>\*’). This query found all LakePond features with a specific 8-digit HUC. Method 2 involved completing a ‘Select by Location’ based on subbasin boundary files that found all NHDWaterbody features in a specific subregion, then building a query to find all LakePond features within the selected set.

The conversion factors used: 2.590 square km/square mile and .3861 square mile/square km. Again, a Geographic project in North American Datum (NAD) 1983 was used to calculate all areas.

1. **0317 – Pascagoula**

LakePond features SquareKM Square Miles

37,233 240.764 sq km 92.959 sq mile Method 1

**03170006**

LakePond features SquareKM Square Miles

1,214 13.602 sq km 5.252 sq miles Method 1

1,236 13.634 sq km 5.264 sq miles Method 2

**03170008** (not a coastal subbasin, but within 4 miles of the coast)

LakePond features SquareKM Square Miles

1,882 29.252 sq km 11.294 sq miles Method 1

1,809 24.208 sq km 9.347 sq miles Method 2

**03170009**

LakePond features SquareKM Square Miles

4,584 33.945 sq km 13.106 sq miles Method 1

4,543 33.731 sq km 13.024 sq miles Method 2

1. **0318 – Pearl**

LakePond features SquareKM Square Miles

44,329 273.906 sq km 105.755 sq miles Method 1

**03180004**

LakePond features SquareKM Square Miles

8,711 50.615 sq km 19.542 sq miles Method 1

8,628 48.821 sq km 18.850 sq miles Method 2

**03180005** (Not a coastal subbasin, but within 37 miles of the coast)

LakePond features SquareKM Square Miles

8,011 23.620 sq km 9.120 sq miles Method 1

7,897 23.353 sq km 9.017 sq miles Method 2

1. **0808 – Louisiana Coastal**

LakePond features SquareKM Square Miles

39,195 1,814.942 sq km 700.749 sq miles Method 1

**08080101**

LakePond features SquareKM Square Miles

4,460 191.083 sq km 73.777 sq miles Method 1

4,376 137.735 sq km 53.179 sq miles Method 2

**08080102**

LakePond features SquareKM Square Miles

5,209 161.712 sq km 62.437 sq miles Method 1

5,116 96.961 sq km 37.437 sq miles Method 2

**08080103**

LakePond features SquareKM Square Miles

6,465 102.222 sq km 39.468 sq miles Method 1

6,264 97.080 sq km 37.483 sq miles Method 2

**08080202**

LakePond features SquareKM Square Miles

12,211 737.904 sq km 284.905 sq miles Method 1

12,328 717.935 sq km 277.195 sq miles Method 2

**08080206**

LakePond features SquareKM Square Miles

3,419 561.414 sq km 216.762 sq miles Method 1

3,414 518.534 sq km 200.206 sq miles Method 2

1. **0809 – Lower Mississippi**

LakePond features SquareKM Square Miles

50,875 5,070.075 sq km 1,957.556 sq miles Method 1

**08090100**

LakePond features SquareKM Square Miles

1,436 131.982 sq km 50.958 sq miles Method 1

1,451 131.673 sq km 50.839 sq miles Method 2

**08090203**

LakePond features SquareKM Square Miles

19,339 498.062 sq km 192.302 sq miles Method 1

19,309 488.576 sq km 188.639 sq miles Method 2

**08090301**

LakePond features SquareKM Square Miles

12,697 1,003.920 sq km 387.614 sq miles Method 1

12,645 954.805 sq km 368.650 sq miles Method 2

**08090302**

LakePond features SquareKM Square Miles

13,830 1,756.204 sq km 678.070 sq miles Method 1

13,795 1,724.404 sq km 665.792 sq miles Method 2

The above results indicate a rather pronounced issue concerning ReachCodes. Each ReachCode is related to the subbasin the features reside. It is apparent many ReachCodes are incorrect, or the result from Method 1 and 2 should be more similar. It should be noted that the above analysis was conducted on subbasins using the older subbasin boundaries, as opposed to the newer 1:24,000-scale 8-digit HUC boundaries. Once the new 8-digit HUC boundaries are included in the NHD, a Reach Migration should take place, which should correct a majority of the ReachCode issues noted in this report. This Reach Migration will be conducted by the USGS in the very near future.

**Major GNIS Name Errors by Subregion:**

Geographic Names Information System (GNIS) provides approved names for geographic features found on USGS topographic map and in the NHD. GNIS names are particularly important for mapping application. If the correct name for a feature is to appear properly on a graphic map, then the name must be correct in the digital source used to represent the map features. For a feature name to appear in the NHD, the feature name must be approved by GNIS. There is a procedure that must be followed to introduce a new name to the approved GNIS list.

The methods used to evaluate NHD features for correct GNIS names included a) reviewing GNIS names found in each feature class table (including NHDFlowline, NHDArea, and NHDWaterbody), querying a selected group of names and reviewing the results, b) selecting all named features in the subregion feature class and scanning through the subregion looking for issues, and c) running ‘Gapped and Branched Attribute Check’ (an ArcToolBox tool) on the field ‘GNIS\_Name’ to determine gaps or branches in all named features in the NHDFlowline feature class.

This evaluation reviewed named features in the NHD for the listed subregions. Potential issues will be listed under the subregion where the name issue was found.

1. **0317 – Pascagoula**

There are 20,466 named features out of 90,467 features present in the NHDFlowline feature class. 23% of the NHDFlowline features in this subregion are named features.

All major river features (from the NHDFlowline feature class) reviewed had the correct name throughout the entire feature.

Gapped and Branched Attribute Check indicated 68 potential branched errors and 149 potential gapped errors in the GNIS named NHDFlowline features. A minimum of these errors are legitimate gapped names (two streams with the same name, but unique GNIS ID numbers), but the vast majority of the errors are actual issues that need to be resolved. Typically, these issues involved a 1) duplicate artificial path through a LakePond, or StreamRiver features, or 2) branched artificial paths through smaller LakePonds. In most cases, running the subbasins/subregion through the NHD Maintenance process will find this type of error.

A major name error exists in the NHDArea feature class. There are only two (2) named polygon features in this subregion, and both are named incorrectly. Both are labeled as ‘Atlantic Ocean’, when they actual represent the ‘Gulf of Mexico’. There are a total of 469 features in the NHDArea feature class. Less than 1% of the NHDArea features are named features.

6 features in the NHDArea feature class are labeled as ‘SeaOcean’, 2 have the incorrect name of ‘Atlantic Ocean’, while the remaining 4 have no name included. All should be labeled ‘Gulf of Mexico’.

The NHDWaterbody feature class has a total of 43,356 features, of which 336 are named features, less than 1%. Thirteen (13) polygons represent SwampMarsh, with the remaining 323 representing LakePonds. There are no features labels as ‘Estuary’ in subregion 0317.

Four (4) lakes (1.081 to 2.209 Sq km) and many large SwampMarsh areas were found with no name. This is probably not an issue.

1. **0318 – Pearl**

There are 14,347 (23%) named features out of a total of 63,389 features in the NHDFlowline feature class.

All major river features (from the NHDFlowline feature class) reviewed had the correct name throughout the entire feature.

Gapped and Branched Attribute Check indicated 5 potential branched errors and 82 potential gapped errors in the GNIS named NHDFlowline features. Many of these errors are legitimate gapped names (two streams with the same name, but unique GNIS ID numbers), but some of the errors are actual issues that need to be resolved. Typically, these issues involved a 1) duplicate artificial path through a LakePond, or StreamRiver features, or 2) branched artificial paths through LakePonds. In most cases, running the subbasins/subregion through the NHD Maintenance process will find this type of error.

There are three (1.3%) named features out of a total of 233 features in the NHDArea feature class (two locks and one stabilization Dam).

2 features in the NHDArea feature class are labeled as ‘SeaOcean’, neither have a GNIS name included.

There are 218 (4.6%) named features out of a total of 47,710 features in the NHDWaterbody feature class. Twelve (12) polygons represent SwampMarsh, with the remaining 206 represent LakePond features. There are no features labeled as ‘Estuary’ in subregion 0318.

Several lakes (less than 1 sq km) and many large SwampMarsh polygons did not have names attached, probably not an issue.

1. **0808 – Louisiana Coastal**

There are 14,996 (10.6%) named features out of a total of 141,114 features in the NHDFlowline feature class.

All major river features (from the NHDFlowline feature class) reviewed had the correct name throughout the entire feature.

Gapped and Branched Attribute Check indicated 7 potential branched errors and 127 potential gapped errors in the GNIS named NHDFlowline features. Most of these errors are legitimate gapped names (two streams with the same name, but unique GNIS ID numbers), but some of the errors are actual issues that need to be resolved. Typically, these issues involved a 1) duplicate artificial path through a LakePond, or StreamRiver features, or 2) branched artificial paths through LakePonds. In most cases, running the subbasins/subregion through the NHD Maintenance process will find this type of error.

There are 6 (less than 1%) named features out of a total of 1,801 features in the NHDArea feature class. 4 are legitimate locks, while 2 are major errors. Again, these 2 features are labels ‘Atlantic Ocean’ while the correct name should be ‘Gulf of Mexico’.

8 features in the NHDArea feature class are labeled as ‘SeaOcean’, 2 contain the incorrect name, while the remaining 6 have no GNIS name included.

There are 344 (less than 1%) named features out of a total of 51,791 features in the NHDWaterbody feature class. 65 polygons represent SwampMarsh, 1 polygon represents a named Reservoir, with the remaining 278 polygons representing LakePond features. There are no features labeled as ‘Estuary’ in subregion 0808.

There are 3 unnamed lakes (11.5 to 18.4 sq km), and 28 unnamed lakes (2.0 to 10.0 sq km) present. Many unnamed SwampMarsh feature exist.

1. **0809 – Lower Mississippi**

There are 5,576 (4.1%) named features out of a total of 134,939 features in the NHDFlowline feature class.

All major river features (from the NHDFlowline feature class) reviewed had the correct name throughout the entire feature.

Gapped and Branched Attribute Check indicated 0 potential branched errors and 34 potential gapped errors in the GNIS named NHDFlowline features. Most of these errors are legitimate gapped names (two streams with the same name, but unique GNIS ID numbers), but a few of the errors are actual issues that need to be resolved. These errors can be easily resolved in the NHD Maintenance process.

Two (2) small LakePonds have a shoreline labels ‘Gulf of Mexico’. These features appear in the NHDFlowline feature class table. This is an error.

There are 4 (less than 1%) named features out of a total of 3,026 features in the NHDArea feature class. 3 are locks, while one is a SeaOcean. 1 large polygon (412.99 sq km) representing a SeaOcean is labeled correctly as the ‘Gulf of Mexico’.

7 features in the NHDArea feature class are labeled as ‘SeaOcean’, 1 contain the correct name of ‘Gulf of Mexico’, while the remaining 6 have no GNIS name included.

There are 540 (less than 1%) named features out of a total of 83,141 features in the NHDWaterbody feature class. 333 polygons represent SwampMarsh features, while the remaining 207 polygons represent LakePonds. There are no features labeled as ‘Estuary’ in subregion 0809.

There are 10 unnamed lakes (11.567 to 43.296 sq km) and 38 unnamed lakes (3.0 to 10.0 sq km) present. Many SwampMarsh features exist with no names.

**Network Analysis by Subregion:**

The network is a critical element in the NHD. This function is what allows the modeling capabilities built into the NHD. A network is nothing more than connectivity. In other words, for a feature to participate in the network, it must be connected to other features with a similar flow direction. If a gap exists between two features, the connectivity is broken and network cannot ‘trace’ through the gap. In addition, a particular field in the NHDFlowline feature class named ‘FlowDir” will contain one of two attributes. ‘WithDigitized’ implies the feature will participate in the network, while the attribute ‘UnInitialized’ will preclude a feature from participating in the network.

Simple network trace functions built into ArcMap were used to evaluate the network in the listed subregions. Network trace allows a user to select a particular point on any NHDflowline, and ‘trace’ ‘upstream’ or ‘downstream’. It is easy to visually recognize a break in the network.

1. **0317 – Pascagoula**

The network trace indicated many issues in subregion 0317. The major problem appears to be gaps in the data, or duplicate features, typically artificial paths. In addition, there appear to be many incorrect flow directions that need to be corrected. It will take some time to repair the network in 0317. These edits will typically be resolved during the NHD Maintenance process. 1,068 (1.2%) of the features in the NHDFlowline feature class were labeled ‘Uninitiated’ and will not participate in a network until changed to ‘WithDigitized’. These ‘Uninitialized’ features in the NHDFlowline feature class include: Connector, CanalDitch, Pipeline, StreamRiver, ArtificialPath, and 1 Coastline feature.

1. **0318 – Pearl**

The network in subregion 0318 is excellent. A simple network trace upstream traced the entire subregion, with the exception of several legitimate isolated networks. Little, if any work will be required to correct the network for 03018. 806 (1.3%) of the features in the NHDFlowline feature class were labeled ‘Uninitialized’ and will not participate in the network until changed to ‘WithDigitized’. These ‘Uninitialized’ features in the NHDFlowline feature class include: Connector, CanlDitch, StreamRiver, and ArtificialPath.

1. **0808 – Louisiana Coastal**

The network in subregion 0808 is very good. A network trace upstream traced the vast majority of the network, with the exception of many legitimate isolated networks. There appear to be many CanalDitch features that did not trace even though the ‘FlowDir’ attribute was set to ‘WithDigitized’, a function of incorrect flow direction. 6,224 (4.4%) of the features in the NHDFlowline feature class were labeled as ‘Uninitialized’ and will not participate in the network until changed to ‘WithDigitized’. These ‘Uninitialized’ features in the NHDFlowline feature class include: Connector, CanlDitch, Pipeline, StreamRiver, and ArtificialPath. Some minor effort will be required to correct the network for subregion 0808.

1. **0809 – Lower Mississippi**

The network trace for subregion 0809 again is good. There appears to be one major break in a coastline, but other than one issue, the network is good. 6,154 (4.5%) of the features in the NHDFlowline feature class were labeled ‘Uninitiated’ and will not participate in a network until changed to ‘WithDigitized’. These ‘uninitialized’ features in the NHDFlowline features class include: Connector, and many CanalDitch features. This subregion could easily been corrected with little effort.

**NHD Coastline Accuracy by Subregion:**

Much comment has been made concerning accuracy of NHD features in the coastal area of Louisiana. In fact, NHD features were created from various digital source files including: USGS Digital Line Graph (DLG) files, US Forest Service Cartographic Feature Files (CFF), and other local data, when available. Generally, USGS DLG files were used to create the NHD. DLGs were compiled directly from the USGS 1:24,000-scale, 7.5-minute quadrangle topographic maps. A limited review of dates of topographic maps for subbasins 08090301 and 08090203 indicates over 50% of the maps are 15 years old or older, in some cases over 25 year old. Since limited map revision has taken place in this area, and limited NHD editing has taken place over this area, it can be concluded that the information represented by the NHD in this area may be 15 years old or older.

The above is critical to note, and worth repeating. Since the NHD was created from information portrayed on the 1:24,000-scale topographic paper maps, and there has been little, if any, graphic map revision in this area, and limited editing of the NHD in this area, most information portrayed in the NHD in Louisiana could be 15 years old, or older.

The following graphic indicates the age of USGS 7.5-minute Quad Maps in Louisiana as of January 2010.



From the above graphic, it is easy to conclude the source used to create the NHD in Louisiana is generally 15 – 19 year old or older.

To complete this analysis of the selected subregions, imagery was placed under the current NHD vectors, and a visual inspection was conducted comparing the location of the NHD coastline feature with respect to the imagery. NAIP imagery from 2007 and 2009 was used as source to compare the NHD. The above was completed on a subregion basis.

In all cases, a Geographic project in North American Datum (NAD) 1983 was used to calculate all distances.

1. **0317 – Pascagoula**

Subregion 0317 has approximately 650 miles of coastline. Generally speaking, the NHD vectors representing the coastline in subregion 0317 is in fair to poor condition. The existing Coastline vectors are more generalized when zoomed in close. On the western portion of the subregion, the coastline is generally SwampMarsh and very coarse. The NHD vectors representing the coastline are generally off shore, typically in the 150 – 360 feet range. In some areas, the vectors are up to 1,000 feet off shore from the image. In the central area of the subregion, the coastline is generally sand beaches forming the coastline which are relatively smooth. The NHD vectors are generally on the shore, typically 50 – 70 feet inland from the image. In some cases, the vectors representing the coastline were within a few feet of the image, but generally, the vectors are inland approximately 50 – 70 feet from the image. The eastern portion of the subregion again appears to be mainly SwampMarsh and very coarse. The coastline vectors generally follows the image, but varies inland and offshore, typically in the 40 – 50 feet range, although on the far eastern edge of the subregion the coastline vector s are offshore in the 100 – 300 feet range. Again, this area is mainly SwampMarsh and very coarse. The real issue appears to be the islands in the eastern portion of the subregion. The coastline vectors and the image are dramatically different. The actual coastline from the imagery is very coarse, and obviously has changed dramatically.

Imagery for subregion 0317 in Alabama was not available at the time of this evaluation. Approximately 15 – 20 % of the coastline for subregion 0317 is in Alabama. It is assumed the coastline in western Alabama is very similar the coastline in far eastern Mississippi.

1. **0318 – Pearl**

Subregion 0318 has less than 10 miles of coastline. Generally speaking, the NHD vectors representing the coastline in subregion 0318 are in fair to poor condition. On the western portion of subregion 0318, the coastline is mainly SwampMarsh and very coarse. The NHD vectors representing the coastline are generally offshore, typically in the 120 – 300 feet range. In some areas, the coastline vectors are up to 500 feet off shore from the image. In the central portion of the subregion, there is a sandy beach covering approximately .6 miles. This coastline beach is relatively smooth. The vectors representing the NHD coastline are generally offshore, typically in the 40 – 200 feet range. The eastern portion of subregion 0318 is again mainly SwampMarsh and is very coarse. The coastline vectors typically are offshore, in the 110 – 550 feet range.

1. **0808 – Louisiana Coastal**

Subregion 0808 has approximately 525 miles of coastline. Generally speaking, the NHD vectors representing the coastline are in fair to poor condition. On the western portion of subregion 0808, the coastline is mainly sandy beach and fairly smooth. The NHD vectors representing the coastline are inland on the extreme western edge, typically in the 140 – 260 feet range for approximately 7 miles. From that point east, the vectors representing the coastline are offshore, typically in the 230 – 600 feet range. In some cases the vectors are approximately 1,000 feet offshore from the image. The central portion of subregion 0808 is mainly sandy beach and fairly smooth. The NHD vectors representing the coastline are generally offshore, typically in the 1,200 – 1,600 feet range. In some cases the vectors are almost 4,000 feet offshore from the image. The eastern portion of subregion 0808 is mainly forested, SwampMarsh and very coarse. The NHD vectors representing the coastline are generally offshore, typically in the 200 – 1,000 feet range. There are many areas where the NHD vectors are more than 1,000 feet offshore from the image. The real issue will be at the mouth of the large rivers entering the Gulf, where many delta islands have formed.

1. **0809 – Lower Mississippi**

Subregion 0809 has over 5,850 miles of coastline. Generally speaking, the NHD vectors representing the coastline are in very poor condition. Almost the entire subregion coastal area is made up of mainly SwampMarsh, which is very coarse. To complicate matters, the Mississippi delta area on the eastern portion of subregion 0809 has dramatically changed. This area is a mess! There are hundreds of SwampMarsh islands that form the barrier islands, as well as thousands of interior SwampMarsh polygons that form the delta area. Generally, the NHD vectors representing the coastline are offshore from the image, typically in the 200 – 600 feet range. There are many areas where the coastline vectors are over 1,000 feet offshore from the image. In some areas, it appears a vector was simply compiled from barrier island to barrier island. The actual shoreline is approximately 5 miles inland from the existing location of the NHD vector. This subregion will be very difficult to make current and keep current.

Generally speaking, at 1:100,000-scale, the vectors representing the NHD coastline line up with the image fairly well. Naturally, there are some differences, but generally speaking the NHD vector matches or closely matches the imagery.

At 1:24,000-scale, the NHD vectors representing the coastline generally follow the image, although it can clearly be seen that the NHD Coastline vectors are offshore from the image. The vectors generally follow the image, but they are offset and somewhat misshaped. It is very apparent at this scale the NHD coastline vectors do not match the image.

At 1:10,000-scale, the differences can clearly be seen. The coarse detail of the coastline from the image is very apparent and shows the difference between the more generalized NHD coastline vectors. The offset and the smoothness of the NHD Coastline vectors compared to the imagery are very obvious.

**NHD Coastline Accuracy by Subbasin:**

This paragraph will attempt to quantify the amount (length) of coastline based on coastline condition (good, fair, poor) by subbasin. This is an attempt to assist in providing actual number that may be used to determine how much time/resource must be dedicated to make the NHD more accurately represent the actual coastline. This is simply a general number of miles and condition based on visual observations comparing the NHD vector representing the coastline to the 2009 NAIP imagery.

This visual observation was made at 1:10,000-scale. At this scale, the coarseness of the actual coastline can easily be distinguished.

National Map Accuracy Standards were used to determine the health of the NHD Coastline. If the NHDFlowline feature representing the coastline is offset over 80 feet from the imagery, the feature is marked as poor. If the feature is offset 60 – 80 feet, the feature is marked as fair. If the NHDFlowline feature representing the coastline is within 60 feet of the imagery, the feature is marked as good.

Again, a Geographic project in North American Datum (NAD) 1983 was used to calculate all distances.

**Subbasin Total Miles Miles Good Miles Fair Miles Poor**

03170006 15.659 9.3 (59%) 3.4 (22%) 3.0 (19.0%)

03170009 636.839 56.7 (8.9%) 52.7 (8.3%) 527.4 (82.8%)

03180004 9.804 0.9 (9.2%) 0.2 (2.0%) 8.7 (88.8%)

08080101 96.145 1.2 (1.2%) 0.8 (0.8%) 94.1 (98%)

08080102 40.563 5.6 (13.8%) 1.0 (2.5%) 34.0 (83.7%)

08080103 277.171 6.3 (2.3%) 7.3 (2.6%) 263.6 (95.1%)

08080202 69.994 0.8 (1.1%) 1.2 (1.7%) 68.0 (97.1%)

08080206 38.984 3.2 (8.2%) 3.5 (9.0%) 32.3 (82.8%)

08090100 1,508.878 0.0 (0.0%) 0.0 (0.0%) 1,508.9 (100%)

08090203 2,254.064 0.0 (0.0%) 0.0 (0.0%) 2,254.1 (100%)

08090301 1,684.179 0.0 (0.0%) 0.0 (0.0%) 1,684.2 (100%)

08090302 422.033 0.0 (0.0%) 0.0 (0.0%) 422.0 (100%)

It appears the vast majority of the NHDFlowline features representing the coastline are out of position more than the National Map Accuracy Standard allowed 80 feet. Subregion 0809 is particularly perplexing. While a few portions of features were within tolerance, it was difficult to find one feature that matched the imagery in its entirety. 0809 should be considered a complete start from scratch. In addition, the 2009 NAIP imagery used to review the coast had large areas of cloud cover, and large areas that were very difficult to see the land/water interface. There were some shipping channels that were within NMAS tolerance in subregion 0809, but again, not the entire feature. It should be noted that a private contractor for the State of Louisiana has recollected all vector feature in subbasin 08090301, but unfortunately did not use the USGS NHD GeoEdit Tool and did not keep track of the edits. The State of Louisiana, the private contractor, and the USGS are in the process of discussing the best way to resolve this issue. One option being discussed is simply deleting all NHD features currently present in subbasin 08090301, and replacing all existing vectors with imported vectors from the private contractor revision effort.

**Conclusions:**

The NHD in the Gulf of Mexico area requires serious updating. While this is easy to say, it will be a Herculean task to complete these edits to make the NHD match any imagery. Then the question becomes, how to keep the Gulf of Mexico area NHD current. It appears there is enough change in Coastline features, SwampMarsh features, and the associated ArtificialPath features in the coastal area that once the NHD best matches some imagery, it will require much effort to match those same features to next year’s imagery. This could quickly become a money-pit. Before proceeding with the update of the NHD in the Gulf of Mexico area, many decisions must be made.

First, the decision on what imagery to use for any update will be critical. This is mentioned simply because once all NHD features are edited to match the current imagery, there will be discrepancies with any newer imagery. This is a function of the changes present in the Gulf area. In Louisiana, there are large areas in the State that are experiencing subsidence (areas where the existing ground is sinking), there are large areas in the Mississippi delta area where large islands are formed and change constantly due to build up of sediment moving downstream in the Mississippi River, and, there is the very real probability of future hurricanes rearranging the landscape.

 The 2009 NAIP imagery used for this evaluation will not be adequate to compile NHD features in many areas. This is a function of the cloud cover present in the 2009 NAIP imagery, and some areas of poor clarity in the 2009 NAIP imagery. It is very difficult to determine accurately the exact land/water interface in many areas of the NAIP 2009 imagery.

Any editing will be complicated by the many SwampMarsh polygon found throughout the coastal area. These SwampMarsh features constantly change. Since it is next to impossible to determine flow through these areas, the questions should be asked, is it worth the effort to attempt to keep these coastal SwampMarsh polygons updated? Perhaps a feature similar to the NHDArea feature ‘Area of Complex Channel’, used to represent braided streams in the NHD, could be developed for ‘Area of Complex SwampMarsh’, where only major shipping channels or major river outflows through the SwampMarsh polygons are collected. This would definitely be easier to maintain in the future.

In addition to the SwampMarsh features, there is a very complex network of NHD ArtificialPaths attempting to show flow through the SwampMarsh features. Since it is nearly impossible to determine actual flow through these areas, are all the ArtificialPaths required? Would it be possible to show ArtificialPaths representing flow through major shipping channels and large river features, but eliminate all others?

A decision will be required determining what scale the data should be collected. Whatever scale is decided, it should be used by all personnel involved in the collection process. This will assure continuity of the NHD throughout the Gulf Coast area.

The actual location of the coastline should be discussed. In some areas in the current NHD, the coastline is a random vector located offshore from the main coastline. Is it possible to eliminate collecting the coastline for every barrier island and every SwampMarsh polygon feature in the area? Is it possible to only collect one vector that best represents the actual coastline (land/water interface), thereby eliminating much complexity associated with the barrier islands and offshore SwampMarsh polygons? Louisiana and the USGS are in discussions to determine if data from the National Wetlands Inventory can be used to develop a coastline. Land/Water Interface data is currently being developed using LandSat imagery as source. This polygon vector data could easily be converted for use in the NHD to represent the Coastline.

Regardless of the above decisions, it must be noted that collecting the NHD in these rather complex SwampMarsh areas, and collecting the coastline, will be very difficult and time consuming. Even more time consuming will be the attempt to keep these vectors current, as compared to newer imagery. Everyone needs to understand the complexity of these coastal areas and should seriously consider attempting to resolve some of the complexity, if keeping the NHD current in coastal areas at a reasonable coast is the primary concern.

Figure 1: Gulf Coast with Subbasins in Subregions 0317, 0318, 0808, and 0809

