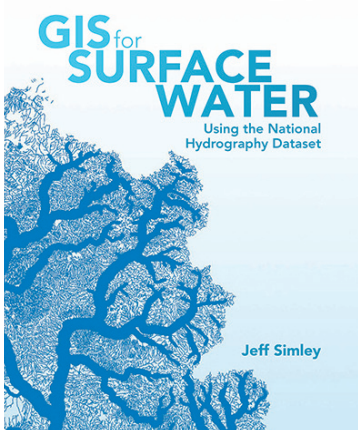


## GIS for Surface Water Using the National Hydrography Dataset

Jeff Simley

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This book introduces the audience to the National Hydrography Dataset (NHD). The book mainly targets those who study or map water features in Geographic Information Systems (GISs). It is intended to be used by users with some knowledge in both hydrography and GIS. This use of GIS in hydrography is referred to as "water GIS" by the author in his acknowledgments. The book consists of twelve chapters and is well-organized.

Chapter 1 addresses the critical role of water in civilization and what GIS is, and introduces the NHD and NHDPlus—an enhancement to the NHD. In this chapter, the author explains the major motivations behind the development of the NHD and educates the reader that the NHD is intended to be a work in progress and flexible, depending on the users' desired level of detail and available data. Chapter 2 covers the water cycle, water budgets, the nature of water, and various water entities defined in the NHD. The author explains how various water features in the NHD can be similar to or different from those in other data sources. Chapter 3 addresses how cartographers used different methods to observe and map water on a map, and describes why the United States Geological Survey (USGS) started developing the NHD, the Watershed Boundary Dataset (WBD), and the NHDPlus. In this chapter, the author stresses the importance of the NHD in the evolution of "water GIS." Chapter 4 discusses difficulties in identifying streams in different climates and how the NHD defines, classifies, and encodes streams and hydrology. The author summarizes different methods for classifying and coding stream networks. Also, in this chapter, he introduces Digital Flood Insurance Rate Maps (DFIRM) from the Federal Emergency Management Agency (FEMA) that the user can use as a companion dataset to the NHD to study or map floodplains inundated by extreme floods. Chapter 5 presents several hydrography datasets and looks at the issues and benefits of incorporating the datasets into the NHD.

After dedicating five chapters to addressing the basics of water and hydrography, and reviewing other datasets to better understand the needs of the users of non-NHD datasets, the book discusses the design decisions behind the NHD in Chapter 6. This chapter addresses scale issues, data accuracy and quality, and production costs. The author also discusses the role of the data model and presents the architectural concept of the NHD with its standard structure and topology that allow logical navigation and spatial interaction. Chapters 7 and 8 focus on the use of the NHD and NHDPlus in ArcGIS including how to obtain the dataset and what the data structure looks like. Chapter 7 provides an analysis exercise with step-by-step instructions that the reader can easily follow. Chapter 8 explains new capabilities in the NHDPlus such as stream order, level, and flow navigation and volume. Chapter 9 covers the use of the NHD and NHDPlus in web applications that do not require a desktop GIS or in-depth knowledge about data analytics. Chapter 10 shows how to use Light Detection and Ranging (lidar) data and Interferometric Synthetic Aperture Radar (IfSAR) to create and attribute hydrography vector data. This chapter describes the procedure for delineating and coding stream networks using lidar and IfSAR data. Chapter 11 presents eighteen user stories where users turn the NHD into more meaningful information to help decision makers. Lastly, Chapter 12 reviews what the NHD has accomplished and discusses what the future of hydrography and "water GIS" should look like from the author's and other researcher's perspectives.

The author can consider following suggestions. Chapter 7 uses ArcGIS for Desktop (a.k.a., ArcMap) for an exercise, but Esri's product line of ArcGIS for Desktop is set to enter an extended support status in 2020 and retire in 2024.[1] At the same time, Esri pushes ArcGIS Pro, which will eventually replace ArcMap.[2] I would have expected this exercise to use

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ArcGIS Pro rather than ArcMap because both industry and academia have already started adopting ArcGIS Pro or at least are planning to migrate to it. The NHD and NHDPlus are provided in Esri's proprietary geodatabase and shapefile formats, but that does not necessarily mean that these datasets cannot be used in non-Esri products. One of the important issue with this book is that it does not discuss how to use these datasets in Open Source GIS such as QGIS, which is the most popular non-commercial GIS.[3] The Geospatial Data Abstraction Library[4] provides the FileGDB[5] driver for read/write access to the geodatabase format and the OpenFileGDB[6] driver for read-only access, both of which can be used in QGIS to access this proprietary database format.[7] The author could have dedicated one subsection to the use of the NHD in an Open Source GIS for those without any access to Esri products.

Having said that, I still highly recommend this book to anyone who wants or needs to use the NHD to study not only hydrography but also hydrology in the United States. This book is very comprehensive and discusses many different aspects of the NHD including the history of hydrography in the United States, the structure and hierarchy of the NHD, WBD, and NHDPlus, data collection, and stream delineation and coding. The book also presents different case studies using the NHD. The material presented in this book is up to date and very useful in understanding how and why the NHD has been created. One thing I want to note is that this book is not intended to be a tutorial or user guide for NHD users. Instead, the book is more focused on introducing the NHD and educating the reader about what they can do with this dataset. It can be a good companion to the NHD User Guide published by USGS (2016).[8] I would say that this book is a must-have for those who have started using the NHD and want to understand the dataset better.



1 Esri. 2018a. ArcGIS for Desktop 10.6 Product Life Cycle. https://support.esri.com/en/Products/Desktop/arcgis-desktop/arcmap/10-6#product-support. Accessed on November 24, 2018.

2 Esri. 2018b, Migrating to ArcGIS Pro, Does ArcGIS Pro replace ArcMap? https://www.esri.com/en-us/arcgis/products/arcgis-pro/migrate. Accessed on November 24, 2018.

3 GISGeography.com. 2018. Mapping Out the GIS Software Landscape. https://gisgeography.com/mapping-out-gis-software-landscape/. Accessed on November 24, 2018.

4 GDAL. 2018a. Geospatial Data Abstraction Library. https://www.gdal.org/. Accessed on November 24 2018.

5 GDAL. 2018b. Esri File Geodatabase (FileGDB). https://www.gdal.org/drv_filegdb.html. Accessed on November 24, 2018.

6 GDAL. 2018c. Esri File Geodatabase (OpenFileGDB). https://www.gdal.org/drv_openfilegdb.html. Accessed on November 24, 2018.

7 Geospatial@UCLA, 2015. Working with File Geodatabases (.GDB) Using QGIS and GDAL. https://gis.ucla.edu/node/53. Accessed on November 24, 2018.

8 USGS. 2016. NHD User Guide., https://nhd.usgs.gov/userguide.html.Accessed on November 24, 2018.