

Proposal for a National Guidance on Delineation of Watershed and Subwatersheds for the United States

**PROJECT TITLE:** Federal Standards for Delineation of Hydrologic Unit Boundaries

**DATE OF PROPOSAL:** July 31, 2001

**TYPE OF STANDARD:** Data process standard - describe how to do something, procedures to follow, methodologies to apply

Types of Process Standards that apply include:

Data Collection - methods and processes for the collection of new data.

Data Analyzing Procedures - the methods for computing,, assembling a data set for a specified product.

Data Integration - Data integration procedures are the methods for combining various data sets into a unified, geographically harmonious data set

Quality Control and Quality Assurance - Quality control and quality assurance processes are respectively the methods followed to achieve a specified quality and the methods to check the quality of an existing data set.

**SUBMITTING ORGANIZATION:** Subcommittee for Spatial Water Data.

**POINT OF CONTACT:** Robert R. Pierce, Chairman, email: [rrpierce@usgs.gov](mailto:rrpierce@usgs.gov).

**OBJECTIVES:** provide guidelines for the development of a nationally consistent set of watersheds and subwatersheds (hydrologic units) using an extension of existing standard codes for identification of hydrologic units in the United States, the U.S. Caribbean and Pacific island territories.

To create watershed (level 5, 10-digit) and subwatershed (level 6, 12-digit) hydrologic units as defined by an interagency standard. The new watershed and subwatershed hydrologic units developed using scientific hydrologic and mapping principles through one standard will be the foundation for creating a national Watershed Boundary Dataset (WBD).

**SCOPE:** The interagency standard will set forth terminology, definitions, and guidelines to ensure the uniform development of hydrologic unit boundaries by the agencies, tribes and organizations that develop, manage, archive, exchange, and analyze data by hydrologic features. The standard will enable a variety of users from different agencies and programs to contribute to an overall coordinated watershed management approach, efficiently share information and resources, and assure the geospatial database is usable with other related Geographic Information System (GIS) databases.

The criteria and methods for hydrologic unit selection and boundary delineation will permit standardized hydrologic units to be used by a diverse group of users serving multi-agency programs. Some examples of these programs include watershed management, water quality initiatives, watershed modeling, resource inventory and assessment, and establishing total maximum daily loads. The utility of hydrologic units of various size and complexity based primarily on natural surface water flow and topographic landforms cannot be underestimated for the potential valuable analytical and statistical purposes and applications at hydrological and ecosystem scales.

**JUSTIFICATION:** A standardized hydrologic unit system, referred to as the Hydrologic Unit Code system, was developed in the mid-1970's by the U.S. Geological Survey (USGS) under the sponsorship of the Water Resources Council. This system divided the country into 21 Regions, 222 Sub-regions, 352 Accounting, and 2,149 Cataloging Units based on surface features. A hierarchical hydrologic unit code containing 2 digits for each of the four levels was assigned to identify the hydrologic units; these four levels are the basis for the 8-digit hydrologic unit code. The underlying concept is a topographically defined set of drainage areas organized in a nested hierarchy by size.

The standardized 8-digit USGS hydrologic units (Levels 1,2,3 and 4) are broadly used; however, the geographical area of the units are too large to adequately serve many water-resource investigations, resource analysis and management needs. For example, the focus of many water resource issues is based upon pollutant loading and land-surface processes, and the cumulative effects of pollution over space and time. Management of these issues requires working with hydrologic units in smaller sizes than those defined by the 8-digit hydrologic units. Examples of programs requiring smaller hydrologic units include State River Basin Management Plans, the United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) conservation and watershed programs, USDA Forest Service land management planning and watershed management programs, and various programs in the Environmental Protection Agency, Office of Water.

**BENEFITS:** The interagency standard will benefit Federal, State, local and Tribal governments and other participants with a nationally consistent set of guidelines for developing a single, seamless, nationally consistent, and accurate geospatial database of hydrologic units based on scientific hydrologic and mapping principles. The standards will be designed for use in all states and island territories.

**APPROACH:** Federal agencies coordinating spatial water data have identified the development of a National Watershed Boundaries Dataset (WBD) of watershed and subwatersheds as a top priority for inclusion in the National Spatial Data Infrastructure (NSDI). The FGDC and ACWI sponsored Subcommittee on Spatial Water Data representing many Federal agencies and interested states led the development of this multi-agency guideline for developing the WBD based on an earlier guideline of NRCS.

Key characteristics of this dataset as described by the guideline, is that it be hydrologically based and that it be compatible with the National Hydrography Dataset and the National Elevation Dataset.

The proposed NSDI Watershed Boundaries Dataset will have the following key characteristics:

- Nationally consistent digital dataset
- Nested subdivisions of established Cataloging Units
- 5-15 Watersheds per Cataloging Unit
- Boundaries based on 1:24,000-scale topographic maps
- Hydrologically based watersheds, not political divisions
- 10-digit Hydrologic Unit Codes
- Formally established watershed names
- Attribute information to identify all upstream and downstream units

The Watershed Boundary Dataset includes the existing digital Hydrologic Unit Data and further refines it to include fifth and sixth level hydrologic units to be known as Watersheds and Subwatersheds. Continuing the logic of the Hydrologic Units, the Watersheds and Subwatersheds are nested within the Cataloging Units. The average size of the Watersheds is 40,000-250,000 acres and for Subwatersheds is 10,000-40,000 acres. The Watershed describes the area from a pour point on the stream uphill to the ridgeline separating one Watershed from the next. Each Cataloging Unit is subdivided into 5-15 Watersheds and each Watershed subdivided into 5-15 Subwatersheds. Watersheds are coded sequentially at the 10 and 12-digit level.

The Guideline has gone through a rigorous review by Subcommittee member agencies. Comments/suggestions have been incorporated into the existing Guideline. Additionally the Subcommittee has sponsored some 14 regional workshop reviewing the Guidelines with representatives from Federal, State, Local, Tribal, and Private sectors in each area of the country. Comments and suggestions were gathered and used to evolve the Guideline into its current version.

The Subcommittee's Guidelines Working Group will work closely with the FGDC Standards Working Group (SWG) to ensure the standard developed conforms to the FGDC Standards Process. Subcommittee members will be notified of the profile(s) development and encouraged to participate will be used when appropriate to ensure good committee participation and discussion. Presentations will continue to be made at major geospatial conferences to solicit participation and keep the United States geospatial community informed of this standards development project

#### **DEVELOPMENT AND COMPLETION SCHEDULE:**

Proposal approved: August 2001

First Draft: October 2001

Final Draft: December 2001

FGDC Endorsement: April 2002

**RESOURCES REQUIRED:** The Guidelines were written by the Subcommittee working groups and subcommittee members. The Guideline has undergone extensive review by the Subcommittee member agencies and by Subcommittee sponsored regional workshops held throughout the U.S.

**RELATED STANDARDS:** The following standards have been identified to date:

U.S. Geological Survey Data Standard, Codes for Identification of hydrologic units in the United States and the Caribbean Outlying areas, Geological Survey Circular 878-A

Federal Information Processing Standards Publication, FIPS PUB 103, Codes for Identification of hydrologic units in the United States and the Caribbean Outlying areas, U.S Department of Commerce/ National Bureau of Standards, 1983.

ANSI X3.145-1986 (R1997) Identification of Hydrologic Units in the United States and the Caribbean Outlying Areas, Codes for

**TARGET AUTHORIZATION BODY:** The FGDC will serve as the initial Target Authorization Body. The FGDC will strive to conform to the American National Standards Institute rules and guidelines to facilitate the possibility of any FGDC Profile being adopted as an American National Standard. NCITS L1 will be briefed on the FGDC activity so that they can consider the possibility of parallel select profiles as American National Standards.