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Standard Operating Procedure
Implementation of Federal Standards for use of Hydrologic Unit Code
Watershed Boundary GIS Datasets

Kentucky Energy and Environment Cabinet
Department for Environmental Protection
Division of Water

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List of Acronyms:

DEM: Digital Elevation Model
DOW: Division of Water
EEC: Energy and Environment Cabinet
GIS: Geographic Information System
HUC: Hydrologic Unit Code
KYGEONET: Kentucky Geography Network
NMAS: National Map Accuracy Standards
SOP: Standard Operating Procedures
USDA: United States Department of Agriculture
USGS: United States Geological Survey
WBD: Watershed Boundary Dataset

Purpose:

The purpose of this SOP is to ensure DOW utilizes the WBD that was developed by a Federal Interagency workgroup (Federal Standards for Delineation of Hydrologic Unit Boundaries, last revised 1 October 2004). As watershed boundary GIS layers are completed, statewide and national data layers will be made available via the [Geospatial Data Gateway](http://datagateway.nrcs.usda.gov/) (<http://datagateway.nrcs.usda.gov/>) by the USDA to everyone, including federal, state, local government agencies, researchers, private companies, utilities, environmental groups, and concerned citizens.

Applicability / Scope:

Any use of a watershed boundary in programs will use the standard 8, 10 and 12 Digit HUC as delineated by the layer file on the EEC Portal. If a smaller watershed boundary is required, reference to the 12 digit HUC will be included in the data/metadata for continuity/consistency.

Summary of Procedure:

When referring to a watershed location, include information to show in which HUC the area is located. This should include the HUC_8, 10 or 12 digit number and corresponding name if appropriate.



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Definitions:

The six different standardized levels of hydrologic units and their size characteristics are given below.

| Name | Hydrologic Unit Level | # of Digits In code | Average size in square miles (acres) |
|--------------|-----------------------|---------------------|--------------------------------------|
| Region | 1 | 2 | 177,560 |
| Subregion | 2 | 4 | 16,800 |
| Basin | 3 | 6 | 10,596 |
| Subbasin | 4 | 8 | 700 |
| Watershed | 5 | 10 | 227 (40,000-250,000 acres) |
| Subwatershed | 6 | 12 | 40 (10,000-40,000 acres) |

- a. **Watershed boundaries** define the aerial extent of surface water drainage to a point. The intent of defining hydrologic units for the WBD is to establish a base-line drainage boundary framework, accounting for all land and surface areas. The selection and delineation of hydrologic boundaries are determined solely upon science-based hydrologic principles, not favoring any administrative or special projects nor particular program or agency. At a minimum, they are delineated and georeferenced to the USGS 1:24,000 scale topographic base map meeting NMAS. (<http://www.ncgc.nrcs.usda.gov/products/datasets/watershed/datainfo.html>)

- b. A **hydrologic unit** has a single flow outlet except in coastal or lakefront areas. As stated by the Federal Standard for Delineation of Hydrologic Unit Boundaries (version 2.0, last revised 10/1/2004),
 "A hydrologic unit is a drainage area delineated to nest in a multi-level, hierarchical drainage system. Its boundaries are defined by hydrographic and topographic criteria that delineate an area of land upstream from a specific point on a river, stream or similar surface waters. A hydrologic unit can accept surface water directly from upstream drainage areas, and indirectly from associated surface areas such as remnant, non-contributing, and diversions to form a drainage area with single or multiple outlet points. Hydrologic units are only synonymous with classic watersheds when their boundaries include all the source area contributing surface water to a single defined outlet point."

- c. **The layers** for Kentucky are found on the EEC GIS Portal in the "waterresources" folder and also on the KYGEONET (<http://kygeonet.ky.gov/>) where they are available to the public.
 - a. 10 Digit Hydrologic Units.lyr
 - b. 8 Digit Hydrologic Units.lyr



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- c. 8 10 12 Digit Hydrologic Units.lyr (defaults to the 12 digit boundaries but has all three datasets in the table).
 - d. 6 Digit Hydrologic Units.lyr
- d. Also on the portal there are 2 *other layer files that do not use or meet the federal standards*; 11 Digit Hydrologic Units.lyr and 14 Digit Hydrologic Units.lyr. These were developed before the federal interagency workgroup set standards. Many programs in DOW have used these and they will continue to be available on the portal until they are phased out of use. The 12 Digit layer is a suitable replacement for anyone using the 11 Digit layer. It follows most of the 11 digit boundaries or subdivides the watersheds more consistently. The 14 Digit layer was built from the 11 Digit layer so the numbering is not consistent with the federal standards. Also no size consistency was established for these boundary divisions and it will not stand up to the rigors of compatibility under development in the federal standards.
- e. Another option for small drainage polygons is the *Kentucky Stream Reach Drainage Polygons* layer, also available on the portal in the “waterresources” folder and KYGEONET. This was created by the USGS Kentucky Water Science Center and has various statistics related to each drainage basin and accumulated statistics for the entire upstream drainage area. These polygons are more subdivided than the 14 Digit layer and appear to match up well with the 12 Digit layer. The layer appears to be incomplete in karst areas so use with caution.

Personnel Responsibilities:

It is the responsibility of those using this SOP to review and report discrepancies, anomalies or mistakes. Management should review this SOP for relevance. The GIS and Data Analysis Section will update the SOP as necessary and keep the layer files up to date on the portal and the KYGeoNet.

Procedure:

Including watershed (HUC 10) or subwatershed (HUC12) information in DOW work provides a useful delineation for sorting datasets in an endless variety of applications.

- If the program or project has never used hydrologic boundaries:
 1. Access the Portal and choose the appropriate layer according to the table in the definition section
 2. If further delineation of the watershed is needed, see below
- If the program or project has only used the 11 and 14 digit hydrologic boundaries:
 1. The HUC 12 layer should be used in place of the HUC 11
 2. If further delineation of the watershed is needed, see below
- If the program or project needs delineation of a watershed beyond the HUC 12 boundaries (i.e. a watershed smaller than 10,000 acres):



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1. Currently many of the DOW programs or projects use a smaller (HUC 14) subdivision, due to the large size of the (HUC 12) subwatersheds. The HUC 14 layer was the only one available on the EEC portal and many DOW programs and applications are based on this information. Therefore, the HUC 14 will still be available until a suitable replacement is created. Programs such as the watershed delineation toolbox or hydrology tools from ArcGIS can also be used to further delineate a watershed. The Kentucky Stream Reach Drainage Area layer may also be used. Both are available on the portal in the “waterresources” folder and KYGEONET.

Citations for using the above programs:

Acceptable DOW Data Citation: This data is distributed by the Commonwealth of Kentucky, Division of Geographic Information (DGI), located in Frankfort, KY. This data is available at <http://kygeonet.ky.gov>. (List layer name[s]).

Recommended Data Citation from the Federal Interagency workgroup (do not use for the HUC 14 layer):

Watershed Boundary Dataset for {county, state, or HUC#}, State [Online WWW].
Available URL: "http://datagateway.nrcs.usda.gov" [Accessed DD/MM/YYYY].

Quality Control and Quality Assurance:

The QA officer should review this SOP for consistency and uniformity.

References:

Kentucky Geography Network: <http://kygeonet.ky.gov/>

Natural Resources Conservation Service (NRCS) – Watershed Boundary Dataset:
<http://www.ncgc.nrcs.usda.gov/products/datasets/watershed/>

Federal Standards for Delineation of Hydrologic Unit Boundaries (version 2.0, last revised 10/1/2004):
<ftp://ftp-fc.sc.egov.usda.gov/NCGC/products/watershed/hu-standards.pdf>

WBD State Coordinators for Kentucky:
Hugh Nelson (USGS – Louisville office)
Steve Crabtree (NRCS)

What is WBD? <http://www.ncgc.nrcs.usda.gov/products/datasets/watershed/datainfo.html>



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U.S. Geological Survey and U.S. Department of Agriculture, Natural Resources Conservation Service, 2009, Federal guidelines, requirements, and procedures for the national Watershed Boundary Dataset: U.S. Geological Survey Techniques and Methods 11-A3, 55 p.

