



Riparian Buffer Delineation Model

RBDM v5.x Data Preparation

Step by Step Guide

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Basics



- All feature classes and standalone raster's require the same **projected coordinate system and datum**. The model does not utilize geographic coordinates.
- Projected coordinate system should have a **linear unit = meter (1.000000)**.
- No spaces, reserved or special characters in folder or file names. Names can't begin with a number.
- Keep path names as short as possible.
- No spaces, reserved or special characters in watershed feature class names. Names can't begin with a number.
- The GDB must be set up as a **File Geodatabase**.
- Delete any watersheds with a no overlapping streams network.
- Run **Check Geometry** tool after finishing the initial preparation of the vector data. It is critical that the File Geodatabase and its content are formatted correctly in totality.



Data



Input Data	Sources	Type
Streams Watersheds	USGS National Hydrography Dataset (NHD) http://nhd.usgs.gov/ The National Map https://viewer.nationalmap.gov/basic/#startUp	Required
Lakes	USGS National Hydrography Dataset (NHD) http://nhd.usgs.gov/ The National Map https://viewer.nationalmap.gov/basic/#startUp	Optional
National Wetlands Inventory	National Wetlands Inventory (NWI) http://www.fws.gov/wetlands/Data/Data-Download.html	Optional
gSSURGO	Natural Resources Conservation Service (NRCS) http://soildatamart.nrcs.usda.gov/ or http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm	Optional
Elevation 1m, 2m, 3m, & 10m DEMs	The National Map https://viewer.nationalmap.gov/basic/#startUp	Required
Land Cover	National Land Cover Database http://www.mrlc.gov/ Cropland Data Layer https://nassgeodata.gmu.edu/CropScape/	Optional
50-Year Flood Height	50-year flood height value is calculated using Mason's (2007) approach utilizing available USGS water gauges at: https://maps.waterdata.usgs.gov/mapper/index.html	Required

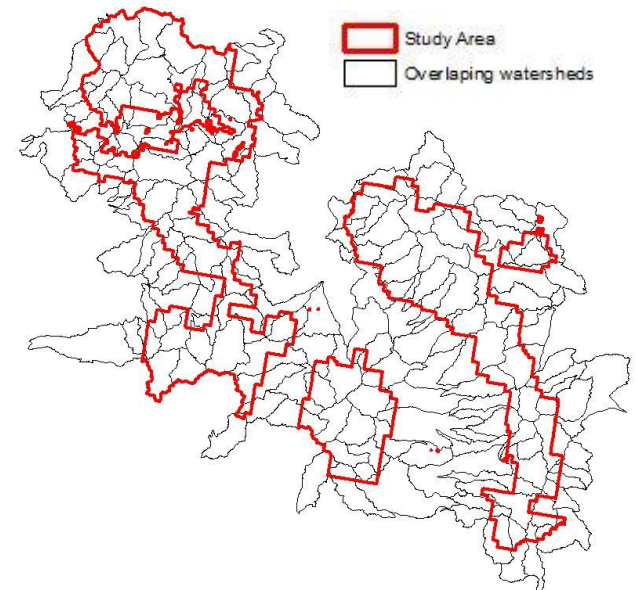


Watershed Data



Disclaimer: For this data preparation illustration, the watershed data is from the National Hydrography Dataset Data (NHD) (best available resolution). If you have watershed layers from a different source, the data must be setup in the same GDB feature class format. Otherwise the model will not execute. Divide the study area into USGS HUC-12 watersheds as shown below. HUC-12 watershed feature classes are found inside the downloaded NHD database in the Hydrography feature dataset.

- Include all watersheds that overlap with available streams. Delete watersheds which do not have streams running through them.
- Prepare watersheds names. Remove spaces and/or special characters in watersheds names. Names cannot start with a number.





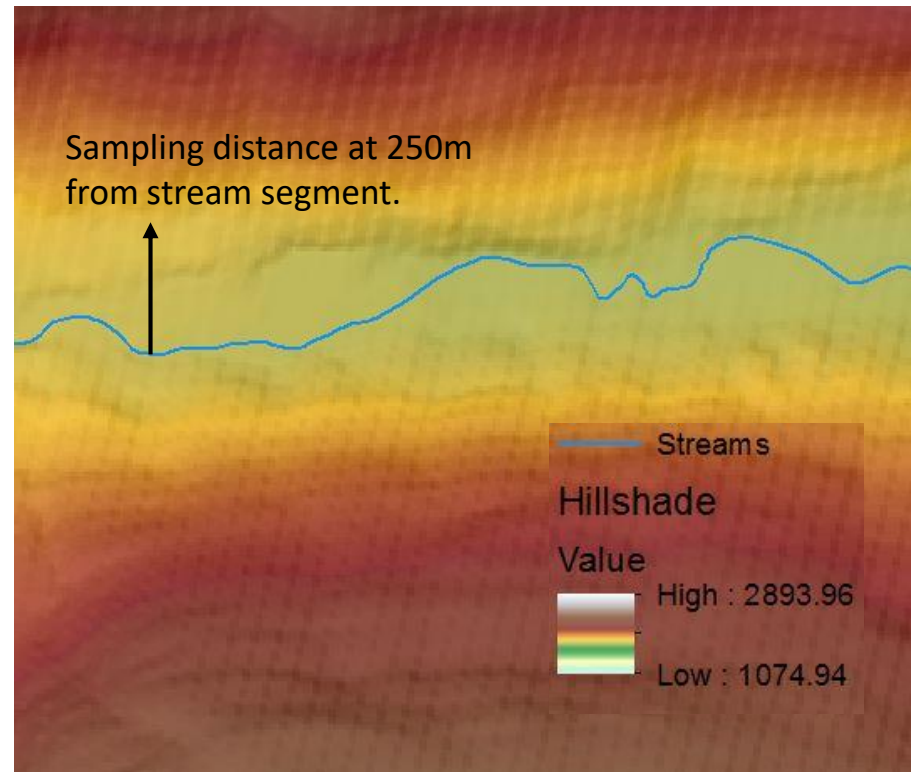
Watershed Data



- Add a new field (Name= sample distance (meters), Type = long) to the watersheds attribute table. Sampling distance is the distance away from stream segment (see illustration below). This is the maximum search radius the model looks for a riparian boundary away from stream.

The default sampling distance is 250m. Maximum sampling distance is 3,000m.

User can specify one sampling distance for all watersheds, or different sampling distances for each watershed depending on the geomorphological floodplain width.





Watershed Data



- Correctly formatted attribute table for the edited watershed feature class must look like the one shown below.

No spaces or special characters in watershed names.

Name	SampleDistance
AmericanBarGulchMissouriRiver	250
AnacondaCreekBlackfootRiver	250
ArrastraCreek	250
AvalancheCreek	250
BeanCanyonSixteenmileCreek	250
BeaverCreek1	500
BeaverCreek2	500
BigBirchCreek	250
BigLogGulch	250
BlackCanyon	250
BlacktailCreekSmithRiver	250
BuffaloCanyon	250
BuffaloGulch	250
CabinGulch	250
CanyonFerryLakeBilkGulch	250

User specified sampling distances (meters) for different watersheds.



50-year Flood Height



- Go to www.riparian.solutions. Click on **Hydrological Estimation** tab.
- Use **Step by Step Guide to Hydrological Estimation** to calculate the 50-year flood heights for each stream order utilizing USGS Water Data for the Nation (<https://waterdata.usgs.gov/nwis>).





Streams Data



Disclaimer: For this data preparation illustration, the streams data is from the National Hydrography Dataset (NHD) (best available resolution). If you have stream layers from a different source, the data must be setup in the same GDB feature class format. Otherwise the model will not execute.

- Remove unwanted streams such as Pipeline, Canal/ditch etc. this can be done using NHD **FType** and **FCode** fields. Check NHD user guide for more information regarding streams/rivers code.
- Check and edit any stream positional inaccuracies. For more accurate riparian areas delineation all streams should be in their correct location, the stream bed.
- NHD stream attribute tables have **StreamLevel** and **StreamOrder** fields that represent stream order. The **StreamLevel** field ranks streams according to **SHREVE's** stream ordering algorithm. The **StreamOrder** field orders streams according to **STRAHLER's** algorithm. Check ArcGIS Help for more information regarding stream ordering algorithms and how they work.



Streams Data



- Stream attribute tables must have a **StreamLevel** or a **StreamOrder** field.
- All streams must have a **stream order** value. There can be no NULL values in the field
- Add a new field named Flood_Data (Type = double).
- Populate flood data field with the calculated flood heights (meters) for each stream order.



Streams Data



- The formatted stream attribute table should look like the example below. Required attribute fields are FType field, a stream order field, and flood data field.

FType & **Fcode** fields provide detailed NHD streams classification.

FType	FCode	StreamLeve	StreamOrde	FloodData
460	46003	5	4	1.3
460	46003	5	4	1.3
460	46006	6	3	1.1
460	46003	8	1	0.7
460	46003	3	6	1.7
460	46003	5	4	1.3
460	46006	5	4	1.3
460	46006	5	4	1.3
460	46003	7	2	0.9
460	46003	6	3	1.1
460	46003	6	3	1.1
460	46003	5	4	1.3
558	55800	5	4	1.3
460	46003	4	5	1.5
460	46003	7	2	0.9
460	46003	7	2	0.9
460	46003	5	4	1.3
460	46003	7	2	0.9
558	55800	5	4	1.3
460	46003	7	2	0.9
558	55800	5	4	1.3

Order values are different due to different stream ordering algorithms.

Calculated flood height data (meters) for each stream order.



Lakes Data



Disclaimer: For this data preparation illustration, the lakes data is from the National Hydrography Dataset (NHD) (best available resolution). If you have lakes layers from a different source, the data must be setup in the same GDB feature class format. Otherwise the model will not execute.

- Remove unwanted lakes or other water bodies. This is done using attribute selections queries with the NHD **FType** and **FCode** fields.

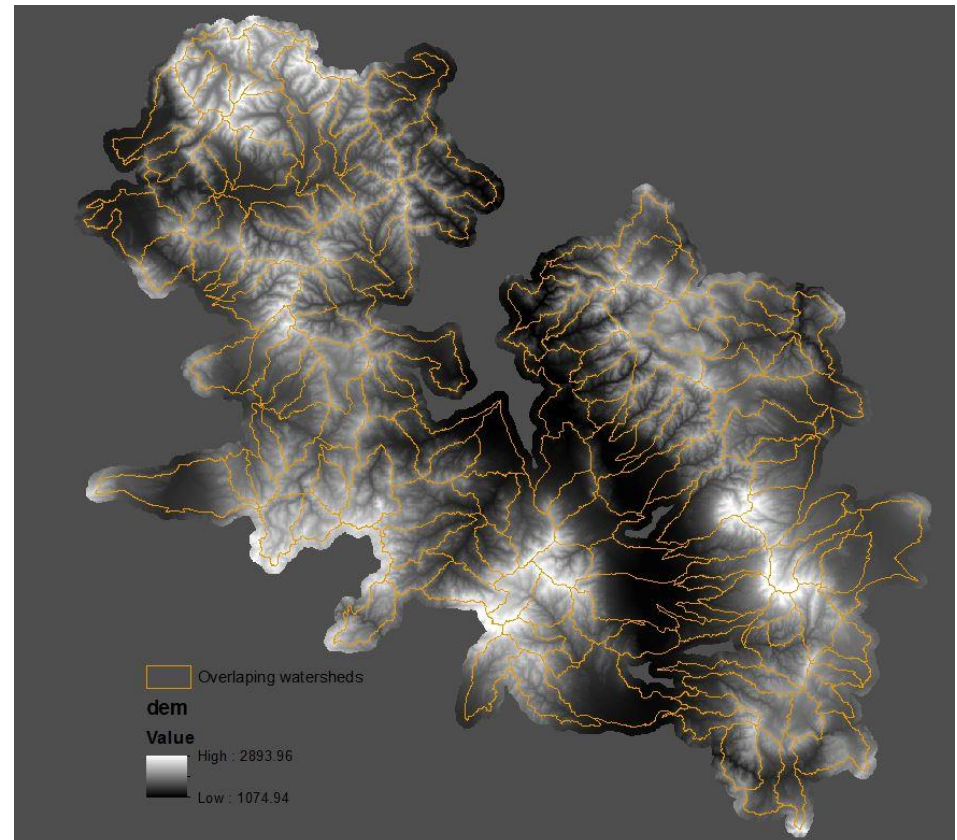
Check NHD user guide for more information regarding waterbodies codes.



DEM Raster Data



- The RBDM v5.x can utilize DEMs with different spatial resolutions. 10m DEMs produce accurate riparian areas delineations within a reasonable processing time. If higher resolution DEMs are used, processing time increases and additional RAM may be required.
- Spatial extent of the DEM must extend past the spatial extent of the overlapping watersheds. See illustration on the right.





Wetlands Data



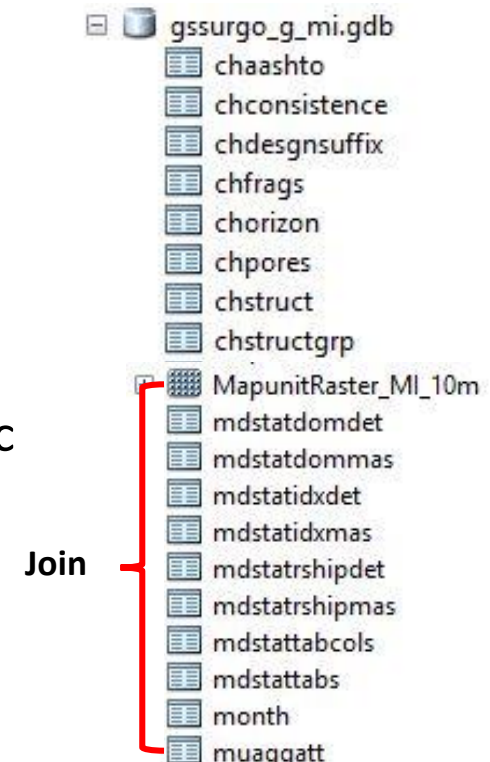
- Widely used source for wetlands data is the National Wetlands Inventory (NWI) maintained by the U.S. Fish & Wildlife Service, Ecological Services (<https://www.fws.gov/wetlands/>).
- Data may be downloaded by State or HUC 8 Watershed Boundary.
- Data is in Albers Equal Area Projection and must be re-projected.
- It is recommended the data be downloaded in Geodatabase format. The wetlands polygon data can be directly imported into the riparian geodatabase.



Soils Data - Approach 1



- **Gridded Soil Survey Geographic (gSSURGO)** consists of a file geodatabase with a soils polygon raster layer (10m spatial resolution) and the many associated attribute tables. See below right.
- Download the gSSURGO data from the GeoSpatial Data Gateway (<https://datagateway.nrcs.usda.gov/>).
- In ArcMap, **JOIN** the **muaggatt** table to **MapunitRaster_<state_name>_10m** using **MUKey** attribute field.
- Use **Prepare Riparian Soil** tool (RBDM v5.x_Uilities toolbox) to extract riparian soil according to a specific riparian soil criteria.





Soils Data - Approach 1



- Riparian soil criteria is based on Palik *et al.* (2004) recommendations.
- Riparian soils have four components; Hydric Rating, Drainage Class, Hydrologic Soil Group, and Flood Frequency.
- The following attribute query will select the appropriate soil polygons.
“hydclprs >= '90' AND drclassdcd = 'Poorly drained' OR drclassdcd = 'Somewhat poorly drained' OR drclassdcd = 'Very poorly drained' AND hydgrpdc = 'D' OR hydgrpdc = 'C' OR hydgrpdc = 'C/D' OR hydgrpdc = 'B/D' OR hydgrpdc = 'A/D' AND flodfreqdcd = 'Frequent' OR flodfreqdcd = 'Occasional' “

Output are vector format polygons (feature class) representing riparian soil map units.

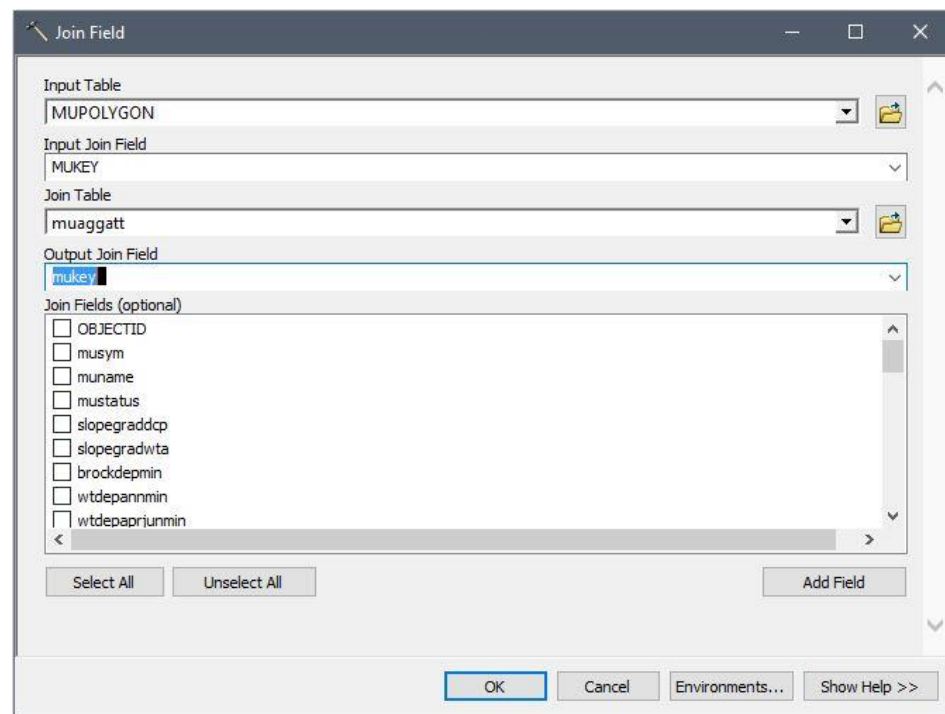
Citation: *Estimating riparian area extent and land use in the Midwest*. (2004). B. J. Palik, S.M.Tang, Q. Chavez. Gen. Tech. Rep. NC-248. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 28 p. DOI: <https://doi.org/10.2737/NC-GTR-248>



Soils Data - Approach 2



- User can create riparian soils feature class manually using soil map unit polygon feature class inside gSSURGO FGDBS.
- Once again, JOIN **muggatt** attribute table to **MUPOLYGON** using Join **Field** tool and specifying MUKEY as the join attribute.
- Add new field (**Hydric, Type = Long**) and use **Field Calculator** to copy values from **Hydric Classification** field to **Hydric** field.

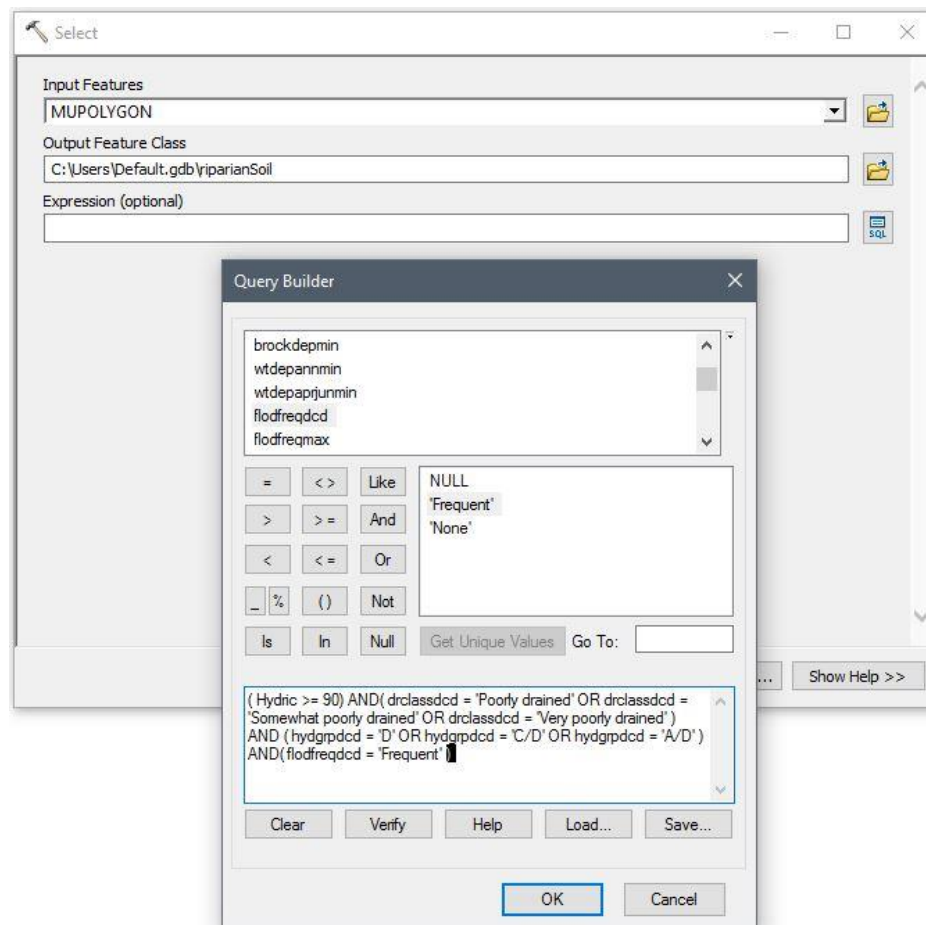




Soil Data-2



- Use **Select** tool to extract riparian soil attributes utilizing the query shown in slide 15 or a user defined riparian soil query.





Land Cover/Use Data



- NLCD (National Land Cover Data) and CDL (Cropland Data Layer) land cover have 30m spatial resolution. <http://www.mrlc.gov/>
NLCD is a comprehensive national land cover available for 1992, 2001, 2006, and 2011. Updates are completed approximately every 5 years.
- CDL is a comprehensive national land cover with an emphasis on agricultural land cover classes. CDL started in 1997 and is available nationally since 2008. <https://nassgeodata.gmu.edu/CropScape/>



Land Cover/Use Data



- **Reclassify** tool may be used to generalize the land cover classes if needed. Table below illustrates an example of a generalized riparian land cover classification.

Original Land Cover	New Land Cover
Corn, sorghum, soybeans, sunflower, barley, spring wheat, winter wheat, rye, oats, millet, speltz, alfalfa, other hay/non alfalfa, sugar beets, dry beans, potatoes, clover/wildflowers, sod/grass seed, fallow/idle cropland, cherries, apples, grass/pasture, and celery	Crops
Developed/ open space, developed/low intensity, developed/med intensity, and developed/high intensity	Developed & Roads
Deciduous Forest, Evergreen Forest, and Mixed Forest	Natural/Semi Natural (Forests)
Shrubland	Natural/Semi Natural (Shrubland)
Woody wetlands and herbaceous wetlands	Natural/Semi Natural (Wetlands)

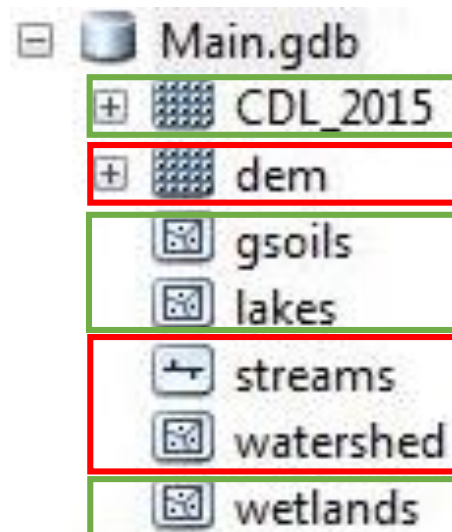


Project FGDB



- If a dedicated GDB has not already been created, export all prepared layers i.e. streams, lakes, DEM, etc. to a new GDB as shown below.

Required data to delineate variable width riparian areas are enclosed in red rectangles. Green rectangles represents optional data which may be utilized to achieve a comprehensive riparian areas delineation in a complex landscape.





www.riparian.solutions

