

## WAMBAF Tool Box

### Creation of Beaver Impact Maps

#### ***Beaver dams***

For existing beaver dams, we created an impoundment index in Whitebox Geospatial AnalysisTools. For the modelling, we used a dam width of 25 m. To simulate different scenarios of beaver sensivity, we randomly added additional potential beaver along forested streams using the tool “Create random points” in ArcGIS, and snapped these to the existing impoundment raster with a snapping distance of 100 m. In the further analyses, we only included dams of realistic size, i.e., dams with an area  $>0.01$  ha ( $100\text{ m}^2$ ) and  $\leq 10$  ha. In addition, we only kept beaver dams with catchment size that supports waterflow in the streams/ditches, i.e., we excluded dams with a catchment  $<5$  ha.

#### ***Catchment areas***

We calculated the catchment areas of the beaver dams with the tool Unnest basins in Whitebox Geospatial Analysis Tools based on a hydrologically corrected (Breach depressions, D8 pointer file, D8 flow accumulation) digital elevation model (DEM). The resolution of the DEM was 2 m in Sweden and 1 m in Lithuania. The Pour Points in the modelling were represented by the existing and randomly added beaver dams and were snapped at maximum to the flow accumulation raster with a snapping distance of 25 m.

#### ***Downstream stream stretches***

For each beaver dam (Pour Point), we created a D8 pointer file for a buffer zone of 1 km. Based on the corrected DEM we calculated trace downslope flowpath in Whitebox Geospatial Analysis Tools for each beaver dam. Resulting raster files for each dam, we converted to shape files (line objects) and merged all objects to one file. We created a buffer of 3 m along every line object.

#### ***Spatial effect of beaver dams***

We assumed that the methylmercury effect of a beaver dam decreases downstream with increased distance from the dam. For each dam, we therefore created a point downstream along the created stream lines at 1 km distance of the dams and these points, we attributed an effect size of 1. We then interpolated background values for methylmercury in batch mode between beaver dams and downstream points within the created buffers with the tool Spline with barriers.

The effect size values, we interpolated with the tool Trace downslope flowpaths within the buffer zones along the entire stream network of the respective catchments. We did this separately for all existing dams and for the existing combined with the randomly added dams.

The background methylmercury concentrations, we then interpolated with the Spline with barriers tool.

#### ***Calculation of methylmercury concentrations***

As a final step performed in the ArcGIS Raster calculator, we multiplied the raster with the methylmercury background concentrations with the raster of the effect size of the respective dams.