Methods for Assessing Land Use Acreages within Buffer Zones of Chesapeake Bay Watershed Streams, Rivers, and Tidal Waters

Description:

This document describes the estimation of land use within buffer zones of streams, rivers, and tidal waters in the Chesapeake Bay watershed. Estimates of land use acreages within the buffer zones provide information relevant to the functionality of riparian buffers (i.e., forested buffers are more beneficial than turf grass buffers).

Data Used:

- Land use & water layer: 10-meter resolution final Phase 6 Land Use datasets developed by Chesapeake Bay Program Office.

Methods:

1. Three unique buffer zones were created by expanding the surface water layer by one 10-m cell, three 10-m cells, and five 10-m cells respectively. The buffer was applied to all stream and tidal water cells that contained at least 1% water (see Figures 1 & 2).
2. The surface water layer was overlaid on the land use data to estimate the acreages of all land uses within the buffer zones. These statistics were then aggregated by desired spatial scale.

Use Limitations:

The three buffer widths (perpendicular to streams and waterbodies) are not exactly 10m, 30m, and 50m because water cells representing streams may include less than 100% water (i.e., they are mixed with land) (Figure 1). For example, if a stream is 20m wide, it could be represented by three 10m cells: a central cell with 100% water bracketed by two 10m cells with 50% water (Fig. 2). Buffering the outer most water cells by 10m creates a buffer zone that includes one cell with 100% land adjacent to another cell with 50% land and 50% water. In this case, the land buffer created by expanding all water cells by 10m is really 15m wide. In other parts of the landscape, the same stream might be represented by just two cells, each with 100% water. In those locations, the 10m buffer would be just 10m wide. Buffer width accuracies as a fraction of total buffer width are highest in the widest buffer (35m +/- 5m vs 15m +/- 5).

Potential streams and rivers were created by hydrologically conditioning a 10m Digital Elevation Model at 60-acres minimum drainage area (roughly corresponding to the headwater drainage threshold of 1:24000-scale National Hydrography Dataset). This dataset was created to better align with the final Phase 6 land use data and to more fully represent the extent of the stream network in the Bay watershed.

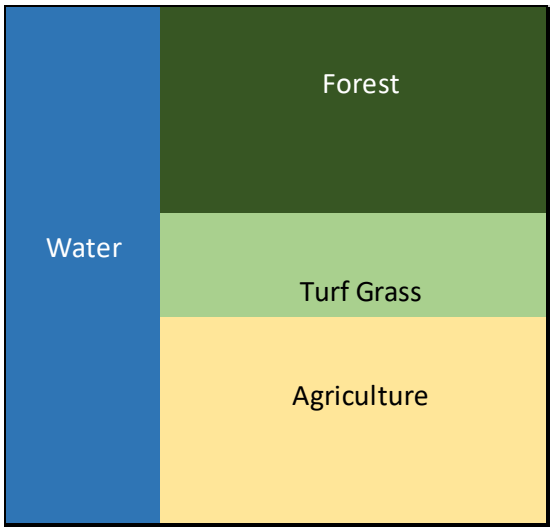

Figure 1: Sample 10-meter pixel in draft final Phase 6 land use dataset. Pixel is comprised of 30% water, 28% forest, 28% agriculture, and 14% turf grass.

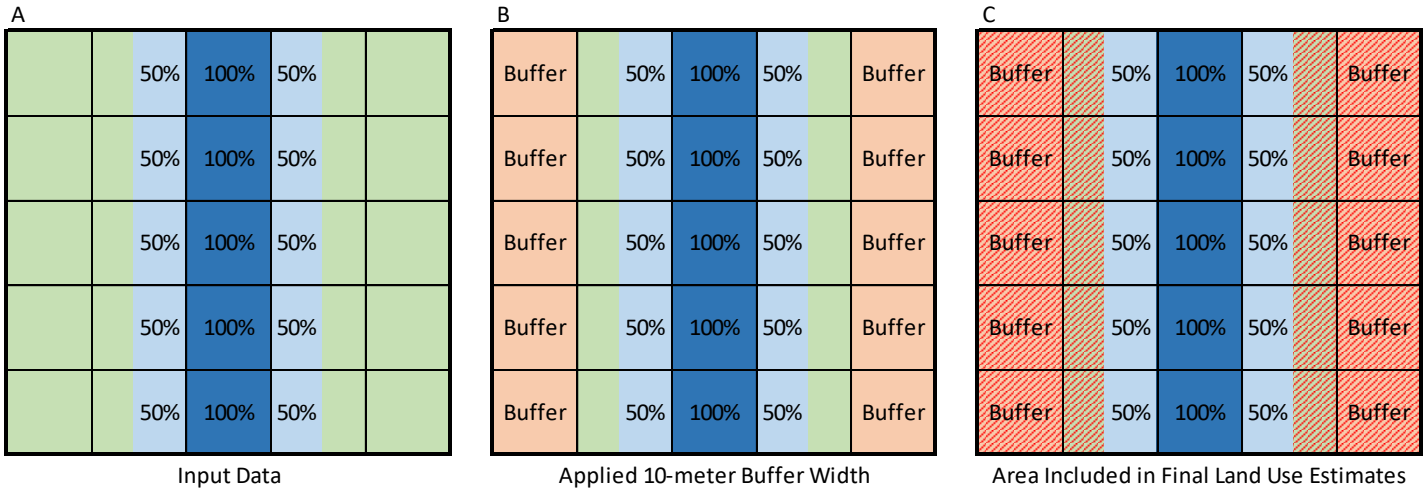

Figure 2: Tabulated land use area estimates for the 10-meter, 30-meter, and 50-meter buffers account for areas within 10-20 meters, 30-40 meters, and 50-60 meters respectively on either side of the surface water layer. The buffer is applied to input data (A) for areas adjacent to a pixel in the surface water layer that has at least 1% water. Each cell in the above diagrams represents one 10-meter pixel. Graphic B depicts a 10-meter buffer applied next to pixels with 50% water coverage. Red-hatched areas in Graphic C represent the total area presented in the tabulated land use estimates within the "10-meter buffer". In this example, the land use estimates cover a width of 15-meters on either side of the surface water layer.