



# Rockingham County Stream Exclusion Pilot Study – March 31, 2020

## Purpose

The Department of Conservation and Recreation (DCR) sought to quantify the proportion of livestock operations that have successfully excluded livestock from perennial (a stream or river (channel) that has continuous flow in parts of its stream bed all year round during years of normal rainfall) streams in Rockingham County within the Chesapeake Bay Watershed. The Rockingham County Stream Exclusion Pilot Study was conducted to evaluate a proposed methodology for the development of a spatial dataset that could help achieve this goal. The resulting dataset identifies all parcels located in Rockingham County which contain pasture within 200 feet of a perennial stream and classifies these parcels based on the presence of: 1) evidence that a perennial stream is flowing through the pasture, 2) evidence that livestock are present on that pasture, and 3) evidence that livestock are being successfully excluded from all areas within 35 feet of a perennial stream.

## Source Data

The data development process combined the following source datasets:

- Rockingham County Parcel Data (Rockingham County 2019)
- Virginia Statewide Land Cover (VGIN 2016)
- Virginia LiDAR Dataset (VGIN 2011-2015)
- Virginia Base Mapping Program Hydrography Dataset (VGIN 2002)
- USGS National Hydrography Dataset (NHD)
- Soil Survey Geographic Database (SSURGO)

## Project Execution

Initially the study area was defined consisting of all parcels containing pasture within 200 feet of a perennial stream within Rockingham County. LiDAR data was used to create a stream network with higher resolution and accuracy than is available from the NHD. The VBMP Hydrography Dataset was used in areas where LiDAR was not available. This stream network was then classified as either perennial or intermittent by comparing it to the SSURGO, VBMP Hydrography and NHD reference datasets. Any streams where two out of these reference datasets indicated perenniality were defined as perennial. Next, a spatial analysis of the parcel data was conducted against the stream networks and land cover to identify all parcels that contain pasture land within 200 feet of a perennial stream to define the study area.

Once the study area was defined, these parcels were manually reviewed against four sets of Virginia Base Mapping Program imagery collected between 2002 and 2018 and one set of National Agriculture

Imagery Program (NAIP) imagery collected in 2018. Each parcel was analyzed against each set of imagery for evidence of livestock presence within 35 feet of a perennial stream.

Grazing livestock are often visible as small, dark dots with their paths discernable in the same area. If the livestock are not visible in the imagery, their paths may still be present. Animal paths or spots are pale, meandering lines or circles in the grassland that form as a consequence of erosion caused by animal footfall traffic. A parcel was only identified as supporting grazing livestock if there were signs of grazing in the imagery.

Fencing was sometimes visible in the imagery itself or was evident due to a change in ground color along the length of the barrier. Because it was not possible to determine whether fencing exists within dense trees, tree lines were not used as evidence for exclusion fencing.

Where the presence of livestock was evident and evidence of exclusion fencing was not present the conclusion was drawn that livestock are not being successfully excluded from the stream. Where there was evidence of livestock and an exclusion barrier was evident the conclusion was drawn that livestock are being successfully excluded from the stream and an approximation of the location of fencing was digitized for reference only.

Finally, the parcel dataset underwent a QA/QC process and was found to be over 90% accurate.

### Results Summary

The result of this pilot study was both a validated workflow that is both repeatable and scalable, and, quantitative results represented in the table below. As expected due to the investment in stream exclusion BMPs by the Commonwealth of Virginia the percentage of stream exclusion increased in each successive year reviewed.

<b>Imagery Reviewed</b>	<b>Number of Parcels with Livestock</b>	<b>Number of Parcels with Livestock Excluded</b>	<b>Number of Parcels with Livestock Not Excluded</b>	<b>Percent Livestock Excluded</b>
2002 VBMP	1163	281	882	24.2%
2007 VBMP	1215	334	881	27.5%
2011 VBMP	1238	384	854	31.0%
2018 VBMP	1206	465	741	38.6%
2018 NAIP	1023	419	604	41.0%

Lessons learned from this project will be incorporated into future studies to achieve even more accurate and useful results as DCR evaluates past progress and looks to the road ahead in achieving Virginia's pollution reduction goals in the Chesapeake Bay.