

METHODS

Fluvial gravels stranded by capture were located using the methods of topographic analysis and field reconnaissance described in Prince et al. (2010). These methods focus on identifying channels which have lost headwaters to capture events, leaving beheaded channels downstream of the capture point and driving rapid incision above the capture point. This rapid incision rapidly dissects the captured basin and obscures the appearance of the former drainage network, complicating identification of beheaded channel. Beheaded channels and their associated gravels must thus be identified by their topographic signature, consisting of atypically linear longitudinal profiles, excessive valley size with respect to drainage area, and little or no topographic expression of the drainage divide at the headwaters. As the drainage would have flowed through a valley prior to capture, these altered headwaters will occur at topographic lows along the asymmetric divide. These parameters are the physical manifestation of truncation of a concave-up longitudinal profile expected of a stream which has achieved some degree of energetic balance with its host substrate (e.g. Hack, 1960). While slope-area relationships can potentially quantify headwaters loss, topographic and longitudinal profile analysis can qualitatively identify its effects to guide field reconnaissance for stranded gravels. The tools and methods applied in this study are reviewed below.

Longitudinal profiles of streams rising at the divide and draining to the New River were constructed using 1:24,000 scale topographic maps. Streams with anomalously linear profiles are noted for field inspection, as this profile shape indicates truncation as well as preservation of the remnant channel. Analysis of hillshade maps produced from 10 m DEM data (www.seamless.usgs.gov) were also used to identify low-relief areas along the crest of the divide. Valleys ending in wind gaps are excellent candidates, but any low-relief zone along the divide is of interest. The use of the hillshade effect highlights topographic contrast and accentuates topographically muted low-relief headwaters occurring along the divide. Hillshade images also reduce the distraction produced by roads, towns, and land use notations on 1:24,000 scale topographic maps.

Once potential beheaded streams were identified, the locations were checked against a 1:24,000 scale topographic map to determine if they occurred at low elevation with respect to the crest of the divide at large. Lineament patterns in the study area were also considered, as joints and fracture traces exert considerable control over the Appalachian drainage network. Areas along the divide which exhibited low relief, low elevation, and alignment with a topographic lineament intersecting the divide were

selected as starting points for field reconnaissance. This method increases the efficiency of field work by focusing reconnaissance on starting locations. The results of Prince et al. (2010) indicate stranded gravel deposits are localized to beheaded channels, and random field inspection along the trace of the divide could easily continue for days without locating gravel. Once deposits have been identified, however, field time can be allotted to mapping the extent of gravels and determining where no gravel is preserved.

As the unconsolidated deposits are preserved in low-relief areas, outcrop may not be readily apparent. Field inspection should focus on roadcuts, as the wind gap settings are frequently exploited by roads and railroads crossing the divide topography. Agricultural disturbance may also expose gravel, but will likely obliterate any primary depositional features. Where no human disturbance has exposed soil, tree throw (floroturbation) typically exposes clasts. Once gravels are identified, field reconnaissance is conducted along the divide between deposits. Gravels are, however, expected to be localized based on the drainage density within the study area. Divide migration should occasionally “overtake” pre-existing subordinate divides, such that not every stream with headwaters on the main regional divide would be beheaded.

The well-preserved relict reach of stream 2 (Fig. 1) was loosely projected along probable structurally-controlled flow paths to intersect with the Crab Creek deposit. This rudimentary projection method reflects the elevation distance between the knickpoint lip and the Crab Creek deposit as well as the distance between the two features along the hypothesized flow path. Projection of the relict reach of stream 2 is only intended to indicate that the knickpoint lip remains at a higher elevation than the preserved downstream reach of its former channel. The elevation difference along the likely flow path is such that a gradient consistent with, or slightly less than, the gradient immediately above the knickpoint lip in stream 2 would be possible in a channel formerly connecting the relict reach to Crab Creek. The projection thus functions as a general proxy for preservation of the relict features within the transient portions of the Roanoke basin.