

Science

BRIEFING

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ESTIMATING VALLEY CONFINEMENT

BACKGROUND

Valley confinement is the degree to which topographic features, such as hillslopes, alluvial fans, glacial moraines, and river terraces, limit the lateral extent of the valley floor and the floodplain along a river. Unconfined valleys are generally less extensive than confined valleys in montane environments, but host a diverse array of terrestrial and aquatic organisms and provide disproportionately important ecosystem functions (e.g., hyporheic exchange, pool-riffle channel morphology, suitable grain sizes for spawning, riparian habitat). Confined valley bottoms exhibit different geomorphic features and thus serve different roles in the landscape.

RESEARCH

Research Activity: Researchers at RMRS developed the Valley Confinement Algorithm (VCA), an ArcGIS program which delineates confined and unconfined valleys. The algorithm uses nationally available geospatial data (USGS NHDPlus stream hydrography layer and 10-30 m digital elevation models) to generate subbasin scale results. Parameters can be tailored to specific landscapes and applications (i.e. hydrology, geomorphology, aquatic biology, and riparian studies). Field measurements and office validations using topographic maps and aerial photography were used to test the accuracy of the VCA and to document channel characteristics in confined and unconfined valleys mapped by the algorithm. Results showed that the VCA correctly identified unconfined valley bottoms with an accuracy of 78 - 94% at study sites in central Idaho.

Benefits to Resource Managers: With a growing body of research emphasizing the importance of valley bottom confinement for aquatic and riparian applications, mapping the locations and quantifying the abundance of confined and unconfined valleys is an important aspect of managing resources in riverine landscapes of mountain basins. The VCA is a powerful GIS tool for landscape scale analysis of valley form and is useful for meeting aquatic management goals.



Typical confined (top) and unconfined (bottom) valleys studied in central Idaho.



Example VCA output, where unconfined valleys are delineated (orange polygons) and all other valleys outside of the polygon and along stream channels are considered confined.

KEY POINTS

- Valleys can be classified as confined or unconfined, with corresponding differences in their appearance, vegetation, ground water exchange rates, topographic gradient, and stream characteristics.
- Valley confinement is an important landscape characteristic linked to fish species distributions, sediment transport, grain size, and debris flow conveyance.
- The Valley Confinement Algorithm (VCA) is a GIS program that uses readily available spatial data as input to digitally represent valley form and map the extent and shape of unconfined valley bottoms.

MORE INFORMATION

Supporting documentation is available at www.fs.usda.gov/rm/boise/AWAE/projects/valley_confinement.shtml. For additional information, please contact **David Nagel**, USFS Spatial Analyst, (208)373-4397 or dnagel@fs.fed.us.