

# Comparison of Two Models for Identifying Low Gradient, Unconfined Streams and Valley Bottom Extent

## In Support of Stream Temperature Modeling Associated with Fire Effects

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### Introduction

Wildland fire can have the effect of increasing stream water temperature if riparian canopy vegetation is removed. Many other variables also influence stream temperature and must be understood in order to successfully model water temperature. Valley confinement is one physical landscape characteristic that may influence stream temperature. Unconfined stream channels in low gradient valleys generally flow through alluvial deposits, which have a higher rate of hyparheic flow than more confined, bedrock controlled channels. In order to test the influence of valley confinement on stream temperature, we developed an in-house algorithm to delineate wide, flat valley bottoms using DEM data as input. We tested our results against another algorithm, developed by the Forest Service, Remote Sensing Applications Center (RSAC). The two models were developed independently and use different approaches.



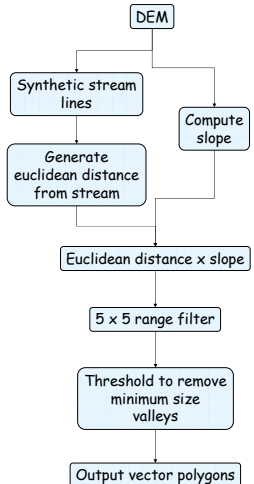
Unconfined Stream Channel



Confined Stream Channel

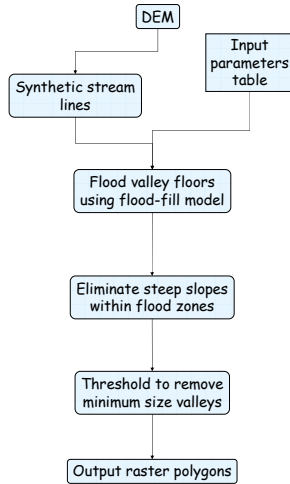
### Boise Lab Model

The Boise Lab model uses a slope based approach to delineate valley bottom. The valley edge is identified using a "range" filter to find the maximum distance x slope difference within a 5 x 5 array.



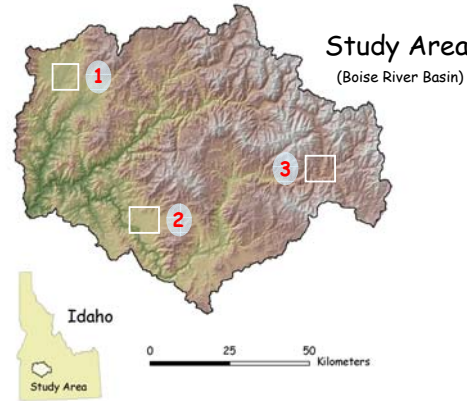
### RSAC Model

The RSAC model uses a flood model approach to delineate valley bottom. A terrain based flood-fill program is called to flood the valley bottom extent. User input parameters control flood depth and valley width.

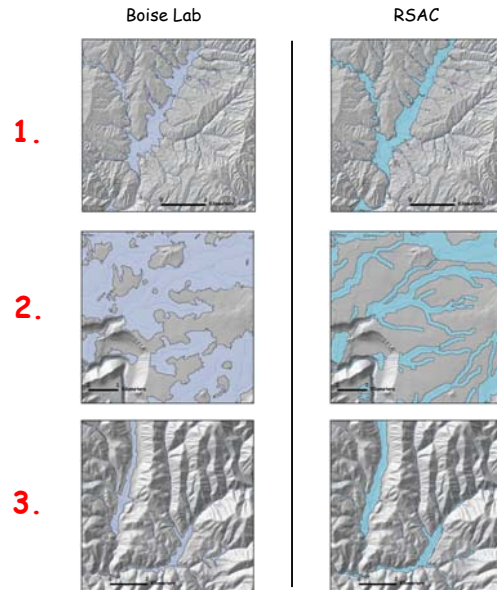


Note: Flow charts are greatly simplified versions of the full models

### Results



### Model Comparisons



### Discussion

1.

Comparison area 1 is a landscape with moderate relief and a relatively wide stream valley. The two algorithms appear to provide similar results, however the RSAC algorithm captures a wider valley extent. Also, the Boise Lab model seems to be less sensitive to smaller valleys.

2.

Comparison area 2 is a flat plateau drained by multiple streams. The RSAC algorithm clips the valley extent along the stream lines by using a buffer threshold, which is set by user input parameters. The Boise Lab algorithm ranges outward from the stream channel seeking a natural slope break, but stretches beyond the actual stream valley.

3.

Comparison area 3 contains steeper terrain and here the models produce somewhat similar results. As with comparison area one, the RSAC model identifies a slightly wider valley extent. The Boise Lab model tends to creep higher up some of the first order drainages.

### Statistics

	Percent Valley Bottom Identified for Entire Study Area	Total Valley Bottom (Hectares)	Average Slope Within Valley Bottom Extent
Boise Lab	3.63%	25280	3.85%
RSAC	3.11%	21655	3.93%

### Conclusion

Both models performed well upon initial evaluation.\* Between the two models; results will be similar for landscape scale analyses, however identification of individual valley bottom polygons will vary by stream reach, especially for smaller, more confined valleys. Results of this analysis will be used to help improve the Boise Lab model. Field data should be collected to help tune the algorithm before further programming is completed.

Author's note: Review from RSAC noted that the "default" input parameters used on the Boise River Basin came from a watershed in northern Georgia. Generating an output that conforms to the landscape usually requires refining the parameters and running the flood-fill algorithm more than once.

### References

Gallant, J., and Dowling, T., 2003. A Multiresolution Index of Valley Bottom Flatness for Mapping Depositional Areas. *Water Resources Research*, Vol. 39, No. 12, 1347.  
 Waltherman, M., Fisk, H., Lachowski H., Maus P., (RSAC) Stephens, R., Breenen C., and Rightmyer, D., (RB). Mapping Valley Bottoms for Resource Management. RSAC-B1-TIP1. August, 2006.  
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