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GIS Analysis of Placer Gold Mining Potential in the Yuba River Watershed, California

Abstract

Can a Geographic Information System (GIS) be used to analyze and locate precise geographic locations along rivers and creeks that have high potential for placer gold extraction in the Sierra Nevada Mountains, California?

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GIS Analysis of Placer Gold Mining Potential in the Yuba River Watershed, California

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Purpose

Can a Geographic Information System (GIS) be used to analyze and locate precise geographic locations along rivers and creeks that have high potential for placer gold extraction in the Sierra Nevada Mountains, California?

Study Area

- The study area is centered on the town of Downieville, California, in the northern Sierra Nevada Mountains, California, and encompasses the Yuba River watershed.

- Much of the watershed falls within the bounds of the Tahoe National Forest.

Introduction

- In January 1848, James Wilson Marshall discovered gold along the American River northeast of present-day Sacramento, CA.

- The location of Marshall's discovery was in the present day city of Coloma, California which is a small town nestled in the Sierra Nevada foothills).
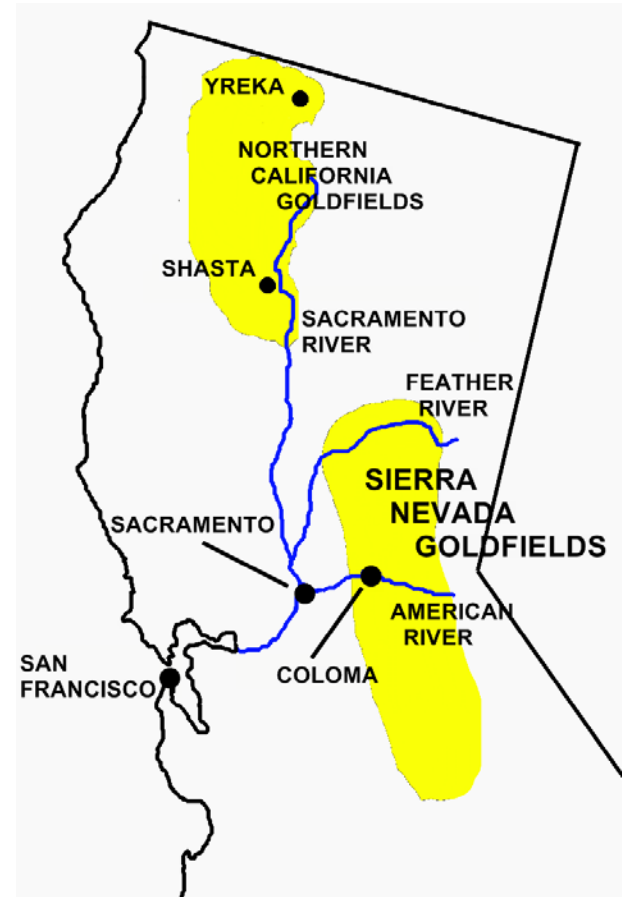
Background

• Placer gold deposits represent the most attractive targets for small-scale prospectors.

• Placer mining is the mining of alluvial deposits of sand and gravel in modern or ancient stream beds.

• There are many different methods used to extract gold. Panning, sluicing, and dredging are the most popular.

• These methods involve using water to sort the gold from other materials. Gold is much more dense than rock so its settles to the bottom of

B a c k g r o u n d

Primary lode deposits

Water

Hot Molten Rock

Secondary placer deposits

Gold in quartz veins is liberated by weathering and eroded into streams

'Mother lode' veins

Heavy gold grains settle out of water when it slows down over rough areas in the stream bottom and as it goes around bends

Origin of Placer Gold Deposits
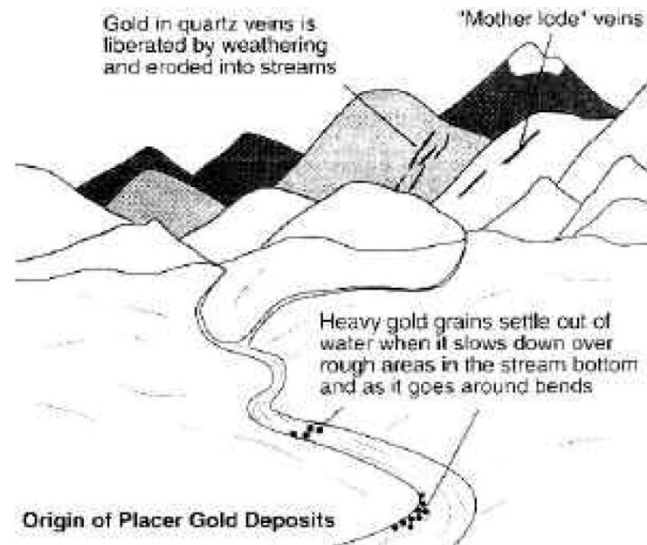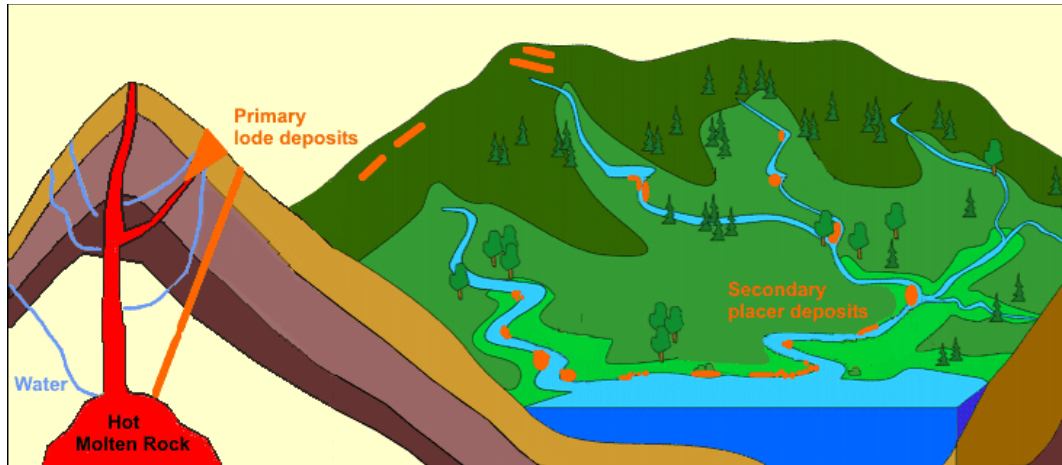
M e t h o d s

• T h e   p r i m a r y   d e p o s i t s   u s u a l l y   c o n s i s t   o f   g o l d - q u a r t z   v e i n s   i n   m e t a m o r p h i c   r o c k s   a n d   a r e   a s s o c i a t e d   w i t h   t h e   i n t r u s i o n   o f   t h e   S i e r r a   N e v a d a   b a t h o l i t h .

• A   g e o l o g i c   c o m p i l a t i o n   p o l y g o n   d a t a s e t   w a s   o b t a i n e d .

• T h e   g e o l o g i c   u n i t   a n d   r o c k   t y p e   " G r a n o d i o r i t e - Q u a r t z   M o n z o n i t e "   w a s   s e l e c t e d   f r o m   t h e   g e o l o g y   c o m p i l a t i o n   l a y e r .

• A   1 0   m e t e r   D i g i t a l   E l e v a t i o n   M o d e l   (D E M)
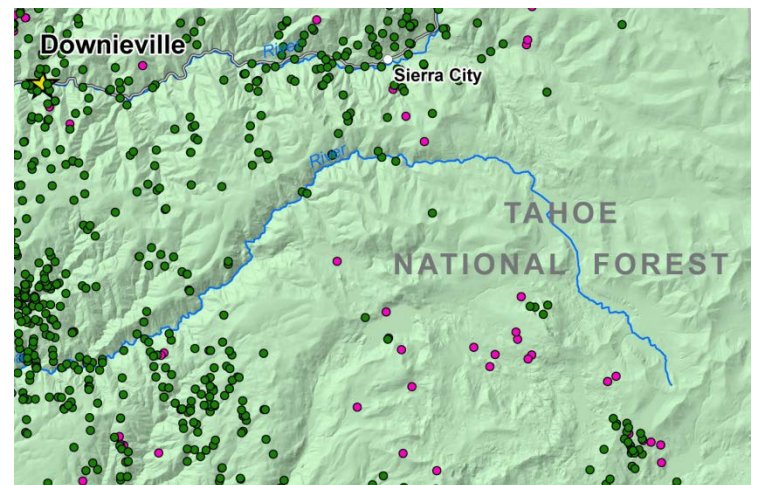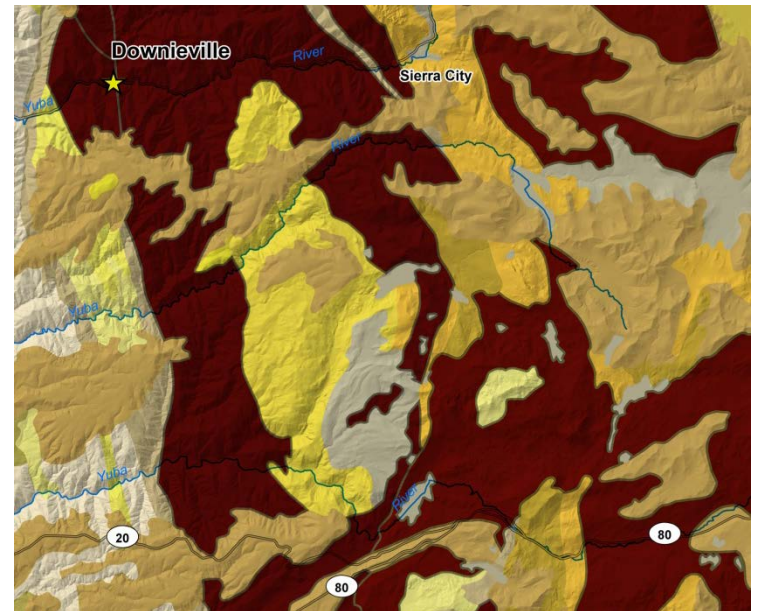
Methods

• The ArcGIS Inverse Distance Weighted geoprocessing function was used to create a statistical raster GRID surface from the MRDS point location dataset.

• Segments of the Yuba River were clipped to Quartz polygons and converted to points and Z-values were obtained for the point data segments of the Yuba River.

• A DEM raster
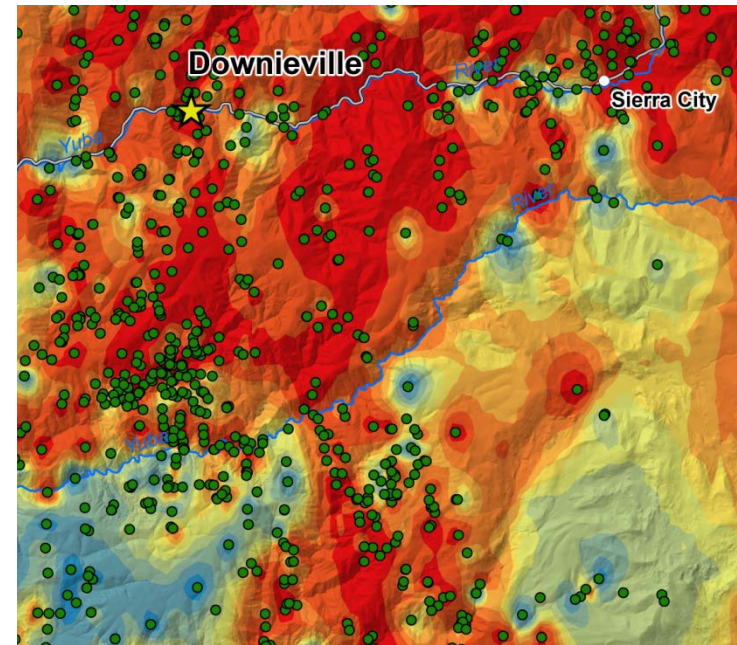
M e t h o d s

• O n ly t h o s e p ix e l v a lu e s g r e a t e r t h a n o r e q u a l to 2 0 d e g re e s a re sh o w n id e n t ify in g st e e p fa lls .

• T h e ra st e r c a lc u la to r to o l w a s u se d to id e n t ify p ix e ls fro m t h e ID W ra st e r su rfa c e w h e re t h e v a lu e w a s g re a t e r t h a n 2 .5 .

• P la c e r g o ld d e p o s its a re m o re fre q u e n t ly fo u n d a lo n g t h e in s id e o f sh a rp b e n d s in a riv e r w h e re sa n d b a rs m a y a c c u m u la t e o r b e lo w st e e p d ro p s a n d fa lls

**Raster Slope Pixel Greater Than 20 degrees**
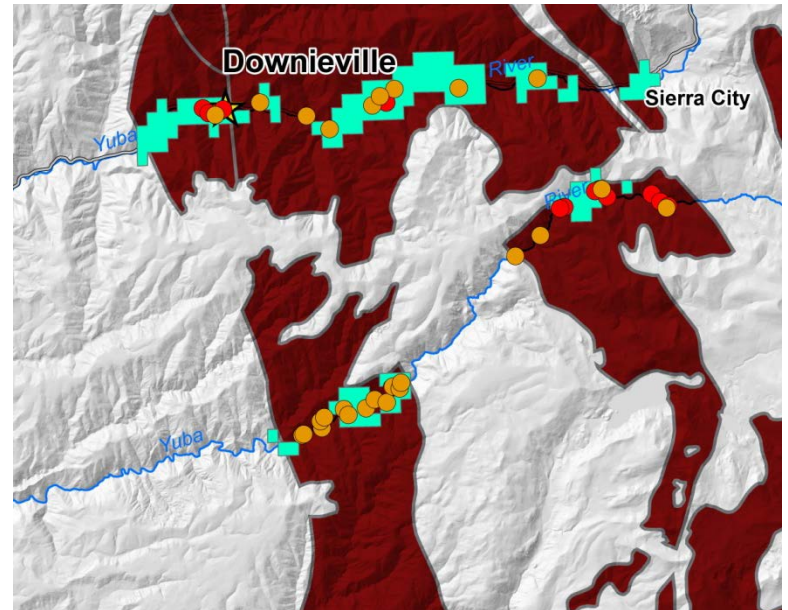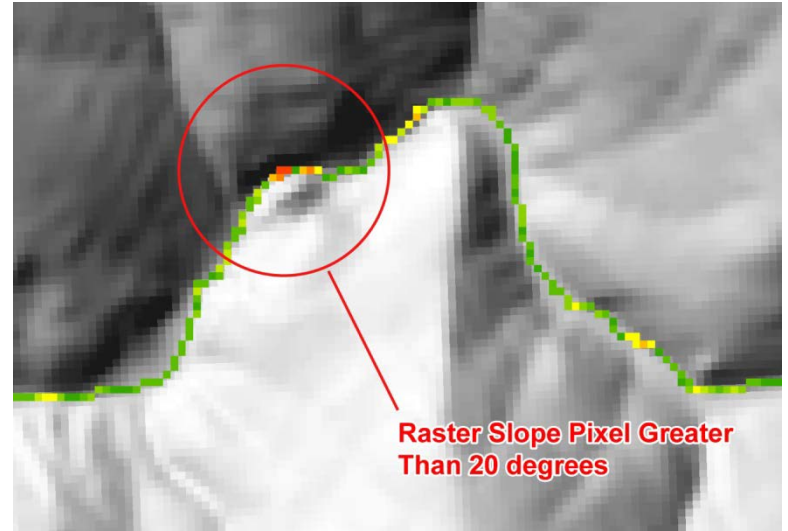
Results

• 40 point locations have the highest probability of success for placer gold extraction within the Yuba River watershed.

• 14 out 40 locations are significant steeps slopes or drops in the river and 26 of these locations represent sharp bends in the river geometry.

• All 40 point locations have a forest service road very close, within walking distance, for
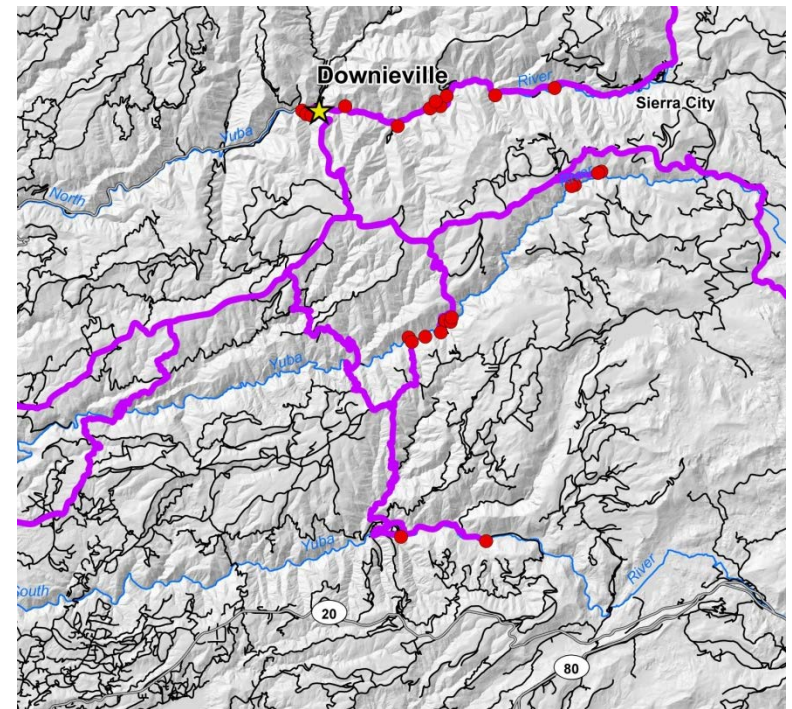
Conclusion

• All of the parameters for this analysis can and should be adjusted. GIS modeling using python scripting or model builder would be a great tool for running models with varying input parameters and variables.

• The resulting maps could be beneficial to the public or private small-scale mining companies.

• These maps can help to lessen the time spent randomly searching areas to mine for gold.

• GIS has the potential to be a valuable tool for the assessment of mineral extraction potential.

Works Cited

Champati, Ray P.K. *GIS in Geoscience: The recent trends.* February 13, 2010. http://www.gisdevelopment.net/application/geology/mineral/geom0012a.htm (accessed May 27, 2012).

Gold Mine. *Gold Mine.* June 13, 2012. http://www.irocks.com/California_Gold_Mine.html (accessed May 27, 2012).

Gold Rush. *Immigration to the United States.* May 27, 2012. http://ocp.hul.harvard.edu/immigration/goldrush.html (accessed May 27, 2012).

Museumca.org. *California Gold Mining.* December 13, 2009. http://www.museumca.org/picturethis/pictures/gold-mining-california (accessed May 27, 2012).

O'Donnell, R.J. and Partington, G.A. *Kenex.co.nz.* June 4, 2006. http://kenex.co.nz/documents/papers/AUSIMM_PaperRO2011.pdf (accessed May 27, 2012).

Sierra Foothill Magazine. *Early Gold Mining Methods.* April 4, 2011. http://www.sierrafoothillmagazine.com/goldmethods.html (accessed May 27, 2012).