INTRODUCTION

Changes in water regimes due to natural and anthropogenic disturbances, including utility-scale solar energy development, impact various natural resources. Knowledge about ephemeral streams will advance our understanding of the hydrologic cycle, local ecosystems, and water availability for human use. Because of complex channel networks, lack of water, and small topographic gradient, existing remote sensing methods are inadequate for accurately mapping ephemeral stream channels and their properties.

Objective: Develop a novel remote sensing method for mapping ephemeral stream networks in desert regions that includes: (1) mapping ephemeral stream beds, (2) delineating channel networks, and (3) calculating channel geometry.

STUDY AREA

• Palo Verde mesa (eastern Riverside County, California)
• Land Use: Solar energy development approved (Riverside East Solar Energy Zone)
• Vegetation: Sparse cover, microphyll tree (ironwood, blue palo verde), desert scrub (creosotebush), annual herbs
• Surface: Silt, sandy soil, desert pavement, biological soil crust

METHODS

The new algorithm incorporates knowledge about desert landscape that is associated with surface hydrologic features using spectral transformations and spatial statistical operations.

RESULTS

The new algorithm detected ~900% more ephemeral stream channels across diverse channel forms than the National Hydrography Dataset (NHD) (USGS 2008).

SUMMARY

The new algorithm is capable of reliably extracting ephemeral stream channels in desert landscape across various channel sizes and forms. This algorithm provides a means of obtaining detailed information about surface hydrologic features in arid regions and could significantly contribute to improving hydrological modeling in drylands. The integration of the algorithm and hydrological models would facilitate the development of cost-effective monitoring strategies for water resources and aid sustainable development in arid regions. This algorithm is applicable for other physiognomically comparable arid environments.

CURRENT EFFORT & FUTURE STUDIES

• Test robustness of the algorithm using new datasets.
• Integrate height information derived from a aerial triangulation technique to extract channel width and cross section.
• Develop an integrated algorithm for assessing multiple natural resources (water, vegetation, and soil) by applying the ephemeral channel extraction algorithm.

REFERENCES


DATA

Very High Resolution (VHR) Multispectral Imagery

• BGR & NIR bands
• 15-cm resolution
• November 2012
• Fix-winged aircraft
• 1,350 m above ground