WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2004NV67B

Title: Development of a Classification System for Natural Impervious Cover in the Lake Tahoe Basin

Project Type: Research

Focus Categories: Models, Water Quality, Geomorphological Processes

Keywords: Impervious cover, classification system, remote sensing, transport, loading, sediment, erosion

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Abstract

Impervious surfaces are believed to be a major factor contributing to the reduction of water quality/clarity of Lake Tahoe. Specifically, anthropogenic impervious cover has received attention in the past two years and DRI has just completed a basin-wide analysis of impervious surface (i.e., urban development). Preliminary and as yet unreleased estimates of impervious surface basin-wide indicate that very little of the basin actually has been developed. It could be argued that the estimates of impervious cover are so low that development could not be the sole or most significant contributor to Lake Tahoe's water quality and clarity issues. There exists a tremendous amount of natural impervious surface in the basin that is yet undocumented but which likely contributes to "background" sediment and nutrient loads into the lake. The physical attributes of natural impervious cover that determine its actual level of permeability or attenuation vary with environmental conditions and geographic location. Unlike anthropogenic impervious surface, natural impervious surfaces occur in ranges, or degrees, of imperviousness. Weather and other forces act upon these surfaces differently and as such similarly defined geologic surfaces may be characterized differently from an impervious perspective. The

nature of this research is to investigate and offer a solution to a potentially important piece of information, in the form of a classification scheme directly translatable into a data set that may advance or refine existing means for assessing water quality issues at Lake Tahoe. Knowledge of natural impervious surfaces will assist in developing and calibrating TMDL models and to establish "background" levels of runoff into the lake.

The idea of "soft impervious cover" has been put forth by TRPA. "Soft" cover, a subset of natural impervious cover, would include compacted areas that may not be entirely impermeable, but does not retain its natural permeability. Examples of soft cover would include gravel roads, gravel parking lots, compacted road base, and dirt roads. These cover types are comprised of a variety of materials, have different erosion potential, experience varying degrees of compaction, and also may or may not be or become completely impervious. These cover types are also different from hard natural rocks, loose DG over hard surfaces, or other surfaces that exist in the basin but are not used in the same manner as the above mentioned soft cover types. Nonetheless, both natural and soft impervious cover types clearly do not fall into the current classification employed in the basin. It is for this reason that a classification system, rather than a simple binary impervious/non-impervious schema, would be very useful.

The objectives of this research are to develop a classification system for natural impervious cover and determine the feasibility of generating a subsequent classified data set. This classification would be developed to be useful with existing models such as TMDL or other runoff process models in use or under development. The current classification system for impervious cover employed by TRPA is straightforward and includes only anthropogenic impermeable surfaces, not natural impervious surfaces such as granite or other rock surfaces, or compacted dirt or gravel surfaces. It is a binary classification. This project will accomplish two tasks. The first task is to develop a classification system for natural impervious cover for the Lake Tahoe Basin. The second task will be to determine the feasibility of delineating those categories spatially using existing 2002 Ikonos imagery. The result would be a classification system that can be used in TMDL modeling or other surface runoff process models and derived in part or in whole from existing high spatial resolution satellite imagery. The benefits of this data layer extend to all parties involved in research, management, and regulation in the basin.