Automated Landscape Classification

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1 Introduction
This document explains how the ASU Cloud Innovation Center (CIC) in collaboration with the City of Scottsdale, Arizona developed an automated landscape classification script for water conservation using eCognition software and provides the code for use as open-source.

The Landscape Classification script can be used for automated identification of four key features essential for water conservation - trees, bushes, grass and water features.

Using the tool saves significant time for water conservation teams allowing them to focus on the programmatic activity of conservation by quickly identifying those parcels with the highest likelihood for water use reduction.

2 Base Software - eCognition
The ASU CIC is vendor and technology neutral. The CIC team evaluated several software programs for the water conservation challenge and selected eCognition.

There are a number of software solutions that could be used to achieve a similar outcome. The team determined that using eCognition was the fastest solution to achieve a high level of accuracy and would be the easiest for less technical staff to use ongoing.

eCognition uses a segmentation and classification process and renders knowledge in a semantic network. The technology examines pixels/points in context, as opposed to in isolation. It builds up a picture iteratively, recognizing groups of pixels as objects. All of this means it was able to quickly learn the desired landscape classifications and then recognize them in the rest of the project area.

One identified limitation to using eCognition is ease of replication across different landscape types. While the script provided will learn how to identify the four landscape classifications in one area quickly, it will need to be adjusted for different types of landscapes.

eCognition is a Trimble product and you can learn more about it here www.ecognition.com.

3 What is needed to run the script?
The following things are needed to run the script in eCognition.

1. Red Green Blue (RGB) image
2. LIDAR Data (Light Detection and Ranging) (See appendix for point clouds)
3. Infrared

Load the following datasets into eCognition and run the script. It will output the surface area of the different types of landscapes.

4 Results from running the script
This shows an example output from a randomly ingested dataset.
4.1 Showing Lakes
4.2 Showing Vegetation

4.3 Shows Pools
5  eCognition Script

Please click on the following picture to get the eCognition script. This contains 4,450 lines of code to create an automated repeatable identification process.

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          </ChnlProxy>
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            <LastAssignment Chnl="1" MapName="main"></LastAssignment>
          </ChnlProxy>
        </Layers>
      </ChnlProxyCntnr>
    </ImgLayers>
  </ObjectDependencies>
</eCog.Proc>
```
6 Appendix

Starting with a rasterized point cloud you will have to convert it into a 2D raster layer for the script to work. You can do this by performing the steps listed below. It should be noted that Layer 5 in the image below is the unhandled LIDAR data. The below process takes the raw .las file and outputs an nDSM layer.