Comparative Analysis of Multiple Software Used In Aiding Geomorphic Reclamation

Kristin M. Brown, H.I.T
INTRODUCTION

- Kristin M. Brown, H.I.T
  - Hydrologist In Training Certification – American Institute of Hydrology
  - M.S. Hydrology – Colorado School of Mines
  - B.S. Geology – West Virginia University

- Currently Hydrologist with the Office of Surface Mining Reclamation and Enforcement (OSM)
Traditional Reclamation
- Frequently disturbs stability of existing natural landforms
- Hydrologic Functionality Altered – Streams are often removed or become armored ditches
- Additional expenses

Geomorphologic Reclamation
- Currently OSM Initiative
- Design stable streams and landforms that mimic the look and functionality of nature
Empirical vs. Theoretical Based Softwares

- Empirical
  - Input parameters based on data collected in the field
  - Field Scale

- Theoretical
  - Input parameters based on assumptions and data collected in the laboratory
  - Laboratory Scale e.g. data collected from flume studies
Software Considered

- Rivermorph
- Carlson Natural Regrade™
- RUSLE2

DISCLAIMER: OSM IS NOT PROMOTING ONE SOFTWARE OVER ANOTHER. THERE ARE ALSO ADDITIONAL SOFTWARES OUT THERE THAT MAY BE USED IN GEOMORPHIC RECLAMATION THAT ARE NOT CONSIDERED IN THIS ANALYSIS.
RUSLE2 – Developed by Dr. Terry Toy and the USDA. Used to estimate soil loss for erosion control planning – Theoretical Software

- Revised Universal Soil Loss Equation
Design in both Rivermorph and Natural Regrade are based on Empirical Data (Input Parameters) collected in the field or measured at the field scale.

- **Rivermorph**
  - Rosgen Method – www.wildandhydrology.com

- **Natural Regrade**
  - GeoFluv Method – www.geofluv.com
## Software Overview

<table>
<thead>
<tr>
<th>Software</th>
<th>Ease of Use</th>
<th>Software capability</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>RiverMorph</td>
<td>Need to be confident with Rosgen Method</td>
<td>2D Channel Design with Valley Type Consideration</td>
<td>$3500</td>
</tr>
<tr>
<td>Carlson Natural Regrade</td>
<td>Need to be confident with Geofluv Method and AutoCAD</td>
<td>3D Channel and Landform Design</td>
<td>$7000</td>
</tr>
<tr>
<td>RUSLE2</td>
<td>Familiar with Revised Universal Soil Loss Equation</td>
<td>Hortonian Overland Flow only – Used as a Guide for erosion control planning</td>
<td>FREE</td>
</tr>
<tr>
<td>Software</td>
<td>Input Parameters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| River Morph            | - Cross Section  
                        - Longitudinal profile  
                        - Wolmann Pebble Count  
                        - Geometry and Sketch Map |
| Carlson Natural        | - Local Base Elevation  
                        - Slope at local base level  
                        - Drainage density  
                        - Ridge to head of Channel  
                        - “A” Channel Reach Length |
| Regrade                |                                                                                  |
| RUSLE2                 | - Location/Climate  
                        - Soil Type  
                        - Length and Steepness of Overland Flow Path  
                        - Cover Management Practice  
                        - Support Practices |
EXAMPLES
Rivermorph
Rivermorph
Carlson Natural Regrade
Carlson Natural Regrade Design
Future Work

- Select Site
- Collect Site Specific Input Parameters
- Use all software discussed to design Geomorphic Reclamation i.e. real world application
SUMMARY AND CONCLUSIONS

- Know your input parameters and where they came from.
- All software has its usefulness, time and place.
- Geomorphic Reclamation software should be used in conjunction with each other to provide optimal design and cost effectiveness.
Thank You!

kbrown2@omsre.gov
303-293-5048