**NASA DEVELOP National Program**

**** Langley Research Center

**Summer 2015**

**Short Title: Colorado Water Resources II**

**Subtitle:** Utilizing NASA Earth Observations to Identify Location for Sedimentation Mitigation after the Colorado Floods of September 2013

**VPS Title:** Water We Drinking? Mapping Waterway Restoration Sites in Ralston Reservoir, Colorado

**Project Team & Partners**

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**Partner Organizations**

Denver Water, Municipal, POC: Linda Rosales (Water Quality Specialist)

   POC: Diego Portillo (GIS Specialist)

   POC: Sheila Pelczarksi (Remote Sensing Specialist)

**Project Details**

**Applied Sciences National Applications Addressed:**

Water Resources

**Study Area:** Ralston Creek Watershed (Near Denver, CO)

**Study Period:** Post September 15, 2013 to present (Data from multiple dates)

**Earth Observations & Parameters**

Landsat-7 EMT+

Landsat-8 OLI/TIRS

FEMA LiDAR derived

**Ancillary Datasets Utilized**

USGS National Land Cover Dataset

USDA National Agriculture Statistics Service - Cropland data

Locations of current sampling sites provided by partner

NOAA precipitation point data

Roads/Water features data from Colorado GIS Clearinghouse

**Models Utilized**

Michigan State University RUSLE Model

**Software Utilized**

ERDAS IMAGINE - land classification of Landsat imagery

ArcGIS - Raster Manipulation/Analysis, Image Enhancement & Map Creation of Landsat OLI, extensions (ArcHydro, ArcSWAT)

TerrSet - Land cover/land use change

ENVI - LiDAR manipulation

**Project Overview**

**80-100 Word Objectives Overview**

Denver Water supplies 1.3 million people with potable resources every year. After flooding destroyed watershed-wide infrastructure in September 2013, Denver Water reached out to NASA’s DEVELOP program. The team will geospatially locate areas within the Ralston Creek Watershed that would be prime for restoration efforts in order to decrease sedimentation in the watershed. The DEVELOP team will use NASA Earth Observation imagery to determine accessible restoration locations in the Ralston Creek Watershed.

**Abstract**

The September 2013 flooding in Denver, Colorado in conjunction with recent heavy rains and hail have raised concerns as to how much these natural disasters have altered the region. This project will combine information from various sensors, including Landsat-8 and LiDAR, to determine remediation sites within the Ralston Creek watershed. The RUSLE soil erosivity risk assessment model will be used to determine areas of highest soil erodibility which lead to the higher incidents of pollutant contamination in nearby water. This model combines rainfall, slope, land cover, and conservation practice to predict soil loss. Water quality sites will be decided based on RUSLE outputs as well as geographic accessibility using network analysis of the region.

Key words: pollutant, water, Denver, RUSLE, Landsat, LiDAR, slope

**Community Concerns**

* The Ralston Reservoir continuously has excessive sedimentary deposits. Denver Water would like to know where this sedimentation is coming from so they can potentially perform watershed mitigation.
* There is concern about the amount of nutrients and/or heavy metals in the water associated with the sedimentation. If the sedimentation continues then it could cause eutrophication in the ecosystem as well as compromise water potability down the line.

**Current Management Practices & Policies**

Denver Water currently samples water quality in several areas around the Ralston Creek Watershed 12-16 times a year. In these tests they measure nutrients, heavy metals with an emphasis on uranium, and turbidity. However, from these tests they have noticed that there is increased sedimentation in the waterways which could lead to decreased water quality and compromised environmental health. Denver Water wants to identify at-risk areas for above-normal sedimentation so they can implement remediation and mitigation practices in these areas. Denver Water is not currently employing infrastructure in the Ralston Creek Watershed to locate and reduce sedimentation.

**Decision Support Tools & Benefits**

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| --- | --- | --- |
| **End-Product** | **Earth Observations Used** | **Benefit & Impact** |
| Map identify extent of Ralston watershed  | FEMA Lidar | Better understanding areas of concern |
| Up to date land cover classification map/land cover loss and gain | Landsat-8 OLI/TIRSFEMA Lidar | Help to visualize changes in the land following the Sept. 2013 flood |
| Risk map based on RUSLE model | Landsat-8 OLI/TIRSFEMA Lidar | Map to identify prime locations for sedimentation mitigation and inform policymakers where to begin waterway mitigation |

**Project Imagery**

**[Insert image here]**

**Caption:** [Insert Caption Here. Max of 25 words.] Image Credit: [Insert project short title] Team.

**Image:** File Name (Please submit your image as a separate .jpeg as well as inserting it in this document)