User Guide

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Watershed Rapid Assessment Program

One Water Solutions Institute

Colorado State University

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EXECUTIVE MESSAGE

Catena Analytics offers powerful platforms for building accessible and scalable analytical tools and simulation models that can be accessed via desktop or mobile devices. Our team has spent that last decade developing the Environmental Resource Assessment and Management System (eRAMS), an open source technology that provides cloud-based geospatially-enabled software solutions as online services and a platform for collaboration, development, and deployment of online tools. Our services are used to assist with strategic and tactical decision making for sustainable management of land, water and energy resources. Thank you for choosing Catena Analytics and the eRAMS platform to meet your data, modeling, analysis and geospatial needs.

WHO SHOULD USE THIS GUIDE

This guide is a tutorial to get you started using eRAMS and the Watershed Rapid Assessment Program. The guide provides instructions for commonly performed tasks and uses of the tool. This tool is intended for use by urban planners and water managers, academic groups, regulatory officials, consultants as well as state, local and federal agencies planning for the future of water resources.

NEED HELP?

After reviewing the guide if you need additional assistance we are here to help! This guide is designed to provide instruction on commonly performed operations and answers to many frequently asked questions. If you find any aspect of the tool challenging or missing information from this guide, please engage an eRAMS expert to guide you through any hurdles. Contact us at: eramsinfo@gmail.com

INTRODUCTION
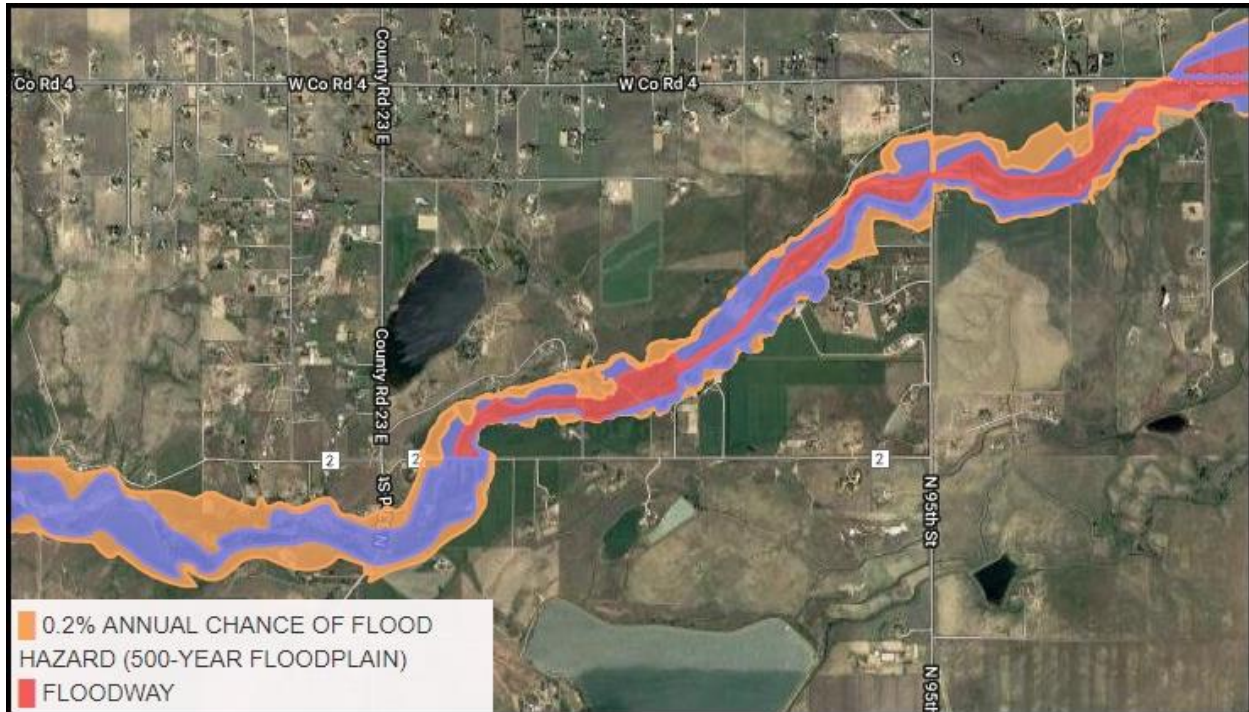
PURPOSE

WRAP is intended to facilitate comparison of different watersheds and allows users to conduct a variety of analyses ranging from simple watershed summaries to more complex analyses such as TMDL planning and implementation.

DESCRIPTION

Watershed protection programs aim to maintain or restore the physical, chemical, and biological integrity of waterbodies. The development and implementation of these watershed plans require analysis of watershed conditions which are both spatially and temporally variable. Therefore, assessment of current and historic data and information is vital for continuously updating management plans in response to changing land use, climate, and watershed conditions.

The Watershed Rapid Assessment Program (WRAP) is a summary tool that extracts, organizes, and analyzes data and information at various watershed scales, including HUC 12, HUC 10, and HUC8 levels. Utilizing the extracted data, the WRAP tool calculates a number of watershed health indicators to create an overall summary of the watershed condition.

This tool summarizes readily available geospatial characteristics including land use, land cover, soils, climate, stream discharge, and water quality from various data resources including:

- Multivariate Adaptive Constructed Analogs (MACA) Statistical Downscaling Method
- National Oceanic and Atmospheric Administration (NOAA) Daily Global Historical Climatology Network (GHCN-Daily)
- Snow Telemetry (SNOTEL)
- Parameter-elevation Regressions on Independent Slopes Model (PRISM)
- USGS National Water Information System (NWIS)
- US. EPA STORET
- US. EPA 303d
- US. EPA 305b
- USDA National Agricultural Statistical Service (NASS)
- USGS National Land Cover Dataset (NLCD)
- Colorado-specific data for:
    - Water Quality Standards
    - Water Rights
    - Confined Animal Feeding Operations
    - Wastewater Treatment Monitoring
    - Wetlands & Riparian Zones

The tool summarizes various time series and spatial data in a consistent format to facilitate watershed comparisons. The information is summarized in multiple graphs displaying time series data such as precipitation, temperature, snowpack, stream flow, water quality, and more. Additionally, interactive maps produced by the WRAP tool allow users to examine spatial data including land use, aquifer extent, soil drainage classification, impervious surface, and more. The raw data (time series, raster maps) are also available for download

Software Availability

Domain

http://www.erams.com/wrap

Documentation URL

https://erams.com/catena/tools/colorado-collaborative/watershed-assessment/

Publication/Citation

Arabi, M, T. Wible, and M. Smith. 2015. Watershed Rapid Assessment Program (WRAP) Presentation. 2015 Colorado Watershed Assembly Conference.

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GETTING STARTED

QUICK START

WRAP is intended to facilitate comparison of different watersheds. WRAP allows users to conduct a variety of analyses ranging from simple watershed summaries to more complex analyses such as TMDL planning and implementation.

Follow the simple workflow below to get started:

1. Define Watershed
2. Extract Data
3. Generate Report

SYSTEM REQUIREMENTS

A modern web-browser is required to connect and run the WRAP. Browser options include: Google Chrome v.69, Mozilla Firefox v.62, Safari v.11.1, and Microsoft Edge v.17.

USING THE TOOL

Access the tool

Public Access

WRAP can be accessed without registering an eRAMS account. In the public-facing version the data and analysis will only be available for the duration of the browser session. Once the browser is closed the project will no longer be available (i.e. users cannot save their work or share their project).

If a user prefers to save their project, share it with collaborators or revisit their analysis, an account is required. Follow the instructions below to create your free account and save your projects or visit our website to get started: https://erams.com/account/

Create an eRAMS Account

1. From the eRAMS Registration page, enter a username, password, your first and last name, and your email address. Click on the "Create Account"
   - eRAMS will display a popup box alerting you that an email confirmation has been sent to the provided email address
2. Open the email account provided in the registration form from either a new browser window or from your local email application.
   - Search for an email from eRAMS with the subject line "eRAMS Email Check"
3. Open this email and click on the provided link to confirm your email address.
   - ***Note***: *If you do not see the confirmation email appear in your email inbox immediately, check your spam or junk email folder to ensure that the confirmation message wasn't automatically discarded. You may also need to wait a few moments to ensure the email is delivered successfully.*
4. Once you click on the provided email link, you should be redirected to eRAMS, where you'll be automatically logged in

Registered User Access

1. Login to your eRAMS account here: https://erams.com/account/
2. Select the "Projects" tab from the left panel
   - ***Hint****: You must be logged into your eRAMS account*
3. Select "Create Project" from the top toolbar
4. Enter a Project Name
   - Alternatively, select a project from the list to access previous projects
5. Select "Watershed Rapid Assessment Program" from the Project Type drop down
   - Optional: Select layers from previously saved project under the "Include Layers from Project" drop down
6. Click "OK"
7. Locate the name of the project you have created in the project list, click the link
   - The link will redirect you to the WRAP interface where you can conduct analysis and save work to your account
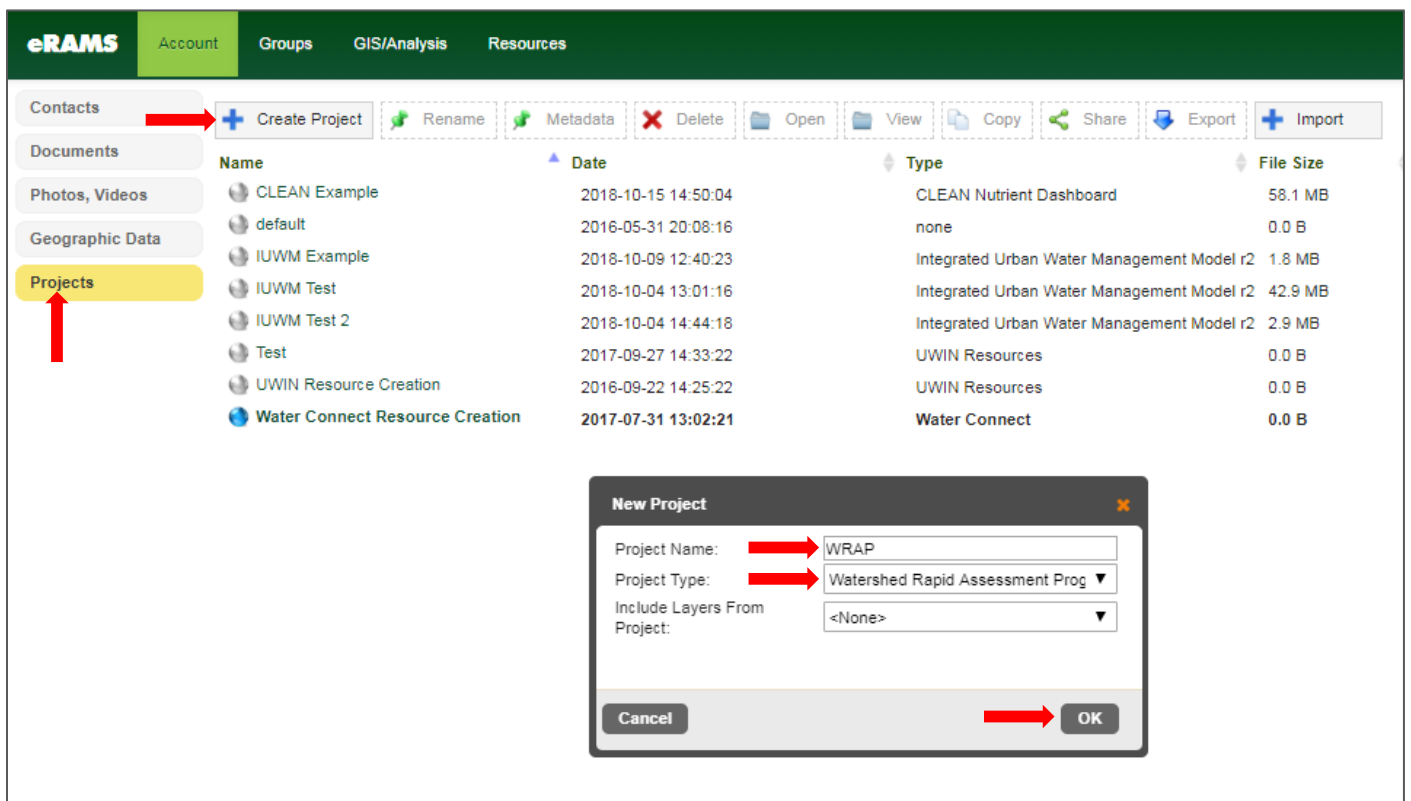

Figure 1: Registered user process for creating an WRAP project in eRAMS

STEP 1 – DEFINE WATERSHED

Select Base Layer

With the WRAP interface open, click the "Map" tab on the left dashboard

1. Select the "Base Layers" drop-down
2. Select the desired base layer
    - Options include: None , Google, Bing or USGS National Map

Define Watershed Boundary

With the WRAP interface open, click the "WRAP" tab on the left dashboard. Define your watershed boundary by performing one of the following operations:

Draw Boundary

The options for manual selection of the geographic region of interest include the area within a desired radius of a point (point buffer); area within a buffer of a line; area within a rectangle; or area within a free-hand polygon.

1. Select boundary type
    - Enter desired buffer radius (point or line)
2. Place point(s) on desired map location
3. Name the watershed

Select Known Boundary

Users can select a region from known boundaries such as states, counties, or hydrological unit codes (HUCs).

1. Select "Known Boundary"
2. Select predefined boundary from drop down list(s)

Upload Boundary Layer

Users can upload a layer (shapefile) by performing the following operations:

1. Select "Upload a Boundary"
2. Select a shapefile for upload from your device
    - All files associated with a shapefile can be zipped into a ZIP archive (*.zip) then uploaded, or multiple files can be uploaded at the same time outside of a ZIP archive
    - Depending on the size of your file(s), it may take a few minutes to process

Upload Layers

Users can upload files (Fig. 2) and add their own information under the "Map" tab:

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(i) Geospatial Layers – Public facing access for uploading files

(ii) Project Layers – Registered user access, these files correspond to the current project and will be available to any members of the project (i.e. used within a project). Check out the eRAMS Grouping capabilities for more information about sharing projects.

(iii) User Layers – Registered user access, these files are associated with your user account and can be accessed from any project (i.e. used across projects)
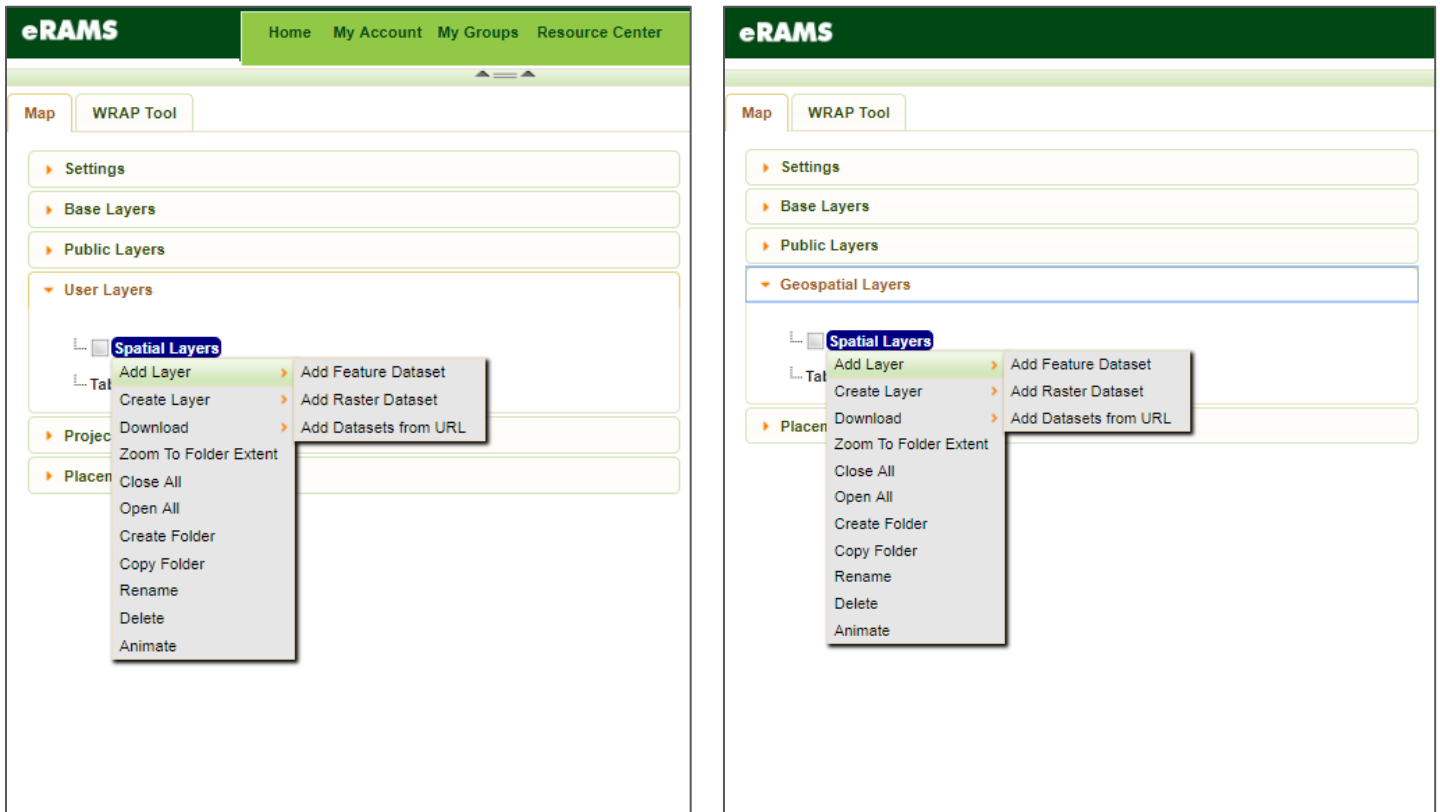

Figure 2: Adding Layers - public access pictured left, registered user access pictured right

STEP 2 – EXTRACT DATA

Select Datasets

The eRAMS platform retrieves live data for the prepopulated categories listed below. Thus, the processing time may take a few minutes after you have selected "Generate" to complete the extraction. Inline help and links to the data sources are available in the WRAP interface and described below.   The direct link, source and/or citation information for each dataset is included in the generated report.

Climate and Snowpack

Gridded Datasets

Parameter-elevation Regressions on Independent Slopes Model (PRISM) is a set of gridded data products for average, minimum, and maximum temperature and average precipitation. For more information please see the PRISM Climate group's data page. **Coverage:** Conterminous United States (Lower 48 States).

Observed Historic/Current Climate

Applied Climate Information System (ACIS) weather stations are extracted for the provided area of interest. These different records are then combined into a single aggregate record for the area of interest using an inverse-distance weighting (IDW) method. For more information please see the ACIS climate data home page. **Coverage:** United States.

Snow Telemetry (SNOTEL) stations within the provided area of interest are also extracted from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service database. The precipitation data for these stations are summarized separately from the GHCN-Daily data. For more information please see the SNOTEL data page. **Coverage:** Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, South Dakota, Utah, Washington, and Wyoming.

Projections
There are numerous climate projections in atmospheric sciences, this climate projection data is from the **Multivariate Adaptive Constructed Analogs (MACA) Statistical Downscaling Method**. For more information please see the MACA Data home page. **Coverage:** United States.

Environmental Resources

Wetlands and Riparian Zones
Colorado Natural Heritage Program (CNHP) has performed a state-level wetlands assessment including potential conservation areas and networks of conservation areas. For more information please see the CNHP data page. **Coverage:** Colorado.

Hydrology and Streams

FEMA Flood Plain Maps
Federal Emergency Agency (FEMA) National Flood Hazard Layer (NFHL) dataset (S_Fld_Haz_Ar) are used by FEMA to designate the Special Flood Hazard Area (SFHA) and for insurance rating

purposes. These data are the regulatory flood zones designated by FEMA. For more information, please see the FEMA page for their Flood Insurance Rate MAP (FIRM) Database Technical Reference. **Coverage:** United States.

Historical/Current Stream Discharge

The U.S. Geological Survey (USGS) National Water Information System (NWIS) database of stream monitoring locations (average daily discharge) within the provided area of interest will be extracted. For more information please see the USGS NWIS home page. **Coverage:** United States.

The U.S. EPA STORET database of stream monitoring locations (average daily discharge) within the provided area of interest will be extracted. For more information please see the STORET Central Warehouse data page. **Coverage:** United States.

The Colorado Division of Water Resources (CDWR) database of stream monitoring locations (average daily discharge) within the provided area of interest will be extracted. For more information please see the Colorado DWR data page. **Coverage:** Colorado.

The Colorado Data Sharing Network (CDSN) database of stream monitoring locations (average daily discharge) within the provided area of interest will be extracted. For more information please see the Colorado Data Sharing Network home page. **Coverage:** Colorado.

Historical/Current Water Quality

The U.S. Geological Survey (USGS) National Water Information System (NWIS) database of stream monitoring locations (water quality) within the provided area of interest will be extracted. For more information please see the USGS NWIS home page. **Coverage:** United States.

The U.S. EPA STORET database of stream monitoring locations (water quality) within the provided area of interest will be extracted. For more information please see the STORET Central Warehouse data page. **Coverage:** United States.

The Colorado Data Sharing Network (CDSN) database of stream monitoring locations (water quality) within the provided area of interest will be extracted. For more information please see the Colorado Data Sharing Network home page. **Coverage:** Colorado.

Hydrography

The U.S. Geological Survey (USGS) National Map Viewer's Hydrography Database of watershed boundaries (hydrologic unit codes, HUCs), flow lines, waterbodies, and more are provided in an interactive map (based on zoom level). For more information please see the USGS National Map Viewer help page. **Coverage:** United States.

Impaired and Use-Limited Waterbodies (EPA 303d)

The U.S. Environmental Protect Agency (EPA) Impaired and Use-Limited Waterbodies (2014) within the provided area of interest will be extracted and summarized. For more information please see the U.S. EPA Impaired Waters and TMDL home page. **Coverage:** United States.

Colorado Department of Public Health and Environment (CDPHE) Impaired and Use-Limited Waterbodies (2016) for areas in Colorado only will be extracted and summarized instead of the U.S. EPA data. For more information please see the CDPHE GIS Maps page. **Coverage:** Colorado.

Waterbody Classification (EPA 305b)
The U.S. Environmental Protect Agency (EPA) National Water Quality Inventory Report (2012) of streams and waterbodies and their designated uses within the provided area of interest will be extracted and summarized. For more information please see the U.S. EPA 305b home page. **Coverage:** United States.

Colorado Department of Public Health and Environment (CDPHE) Waterbodies (2016) for areas in Colorado only will be extracted and summarized instead of the U.S. EPA data. For more information please see the CDPHE GIS Maps page. **Coverage:** Colorado.

Water Rights

The Colorado Decision Support Systems (CDSS) HydroBase database of diversion structures and water rights are extracted and summarized for the provided area of interest. For more information please see the Colorado Decision Support Systems HydroBase data page. **Coverage:** Colorado.

Geology and Soils
Soil type and other attributes are extracted from the **Soil Survey Geographic (SSURGO)** database from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). For more information please see the USDA-NRCS Soil Data home page. **Coverage:** United States.

Groundwater

Principal Aquifer Extent
The U.S. Geological Survey (USGS) Groundwater Atlas of principal aquifer extent. For more information please see the USGS Aquifer home page. **Coverage:** United States.

Historical/Current Groundwater
The U.S. Geological Survey (USGS) National Water Information System (NWIS) database of groundwater monitoring locations (water table elevation) within the provided area of interest will be extracted. For more information please see the USGS NWIS home page. **Coverage:** United States.

Land Surface

Agriculture
Dry-land Irrigated Agriculture The dry-land agricultural field layer shown was developed by combining multi-year NLCD cultivated cropland data and intersecting it with public land survey units (PLSS), erasing out irrigated field coverage from the Colorado Decision Support System (CDSS) website. **Coverage:** Colorado.

Irrigated Agriculture is a set of irrigated field boundaries for the state of Colorado available from the Colorado Decision Support System (CDSS) website. **Coverage:** Colorado.

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Satellite Data

The National Land Cover Database (NLCD) of Percent Developed Imperviousness is an impervious surface summary by the U.S. Geological Survey (USGS). These assessments began in 2001 nationwide. For more information please see the USGS NLCD home page. **Coverage:** Conterminous United States (Lower 48 States).

The National Agricultural Statistical Service (NASS) is a land use summary by the U.S. Department of Agriculture (USDA) with an emphasis on crop type. These assessments began in 1997 at the state level with nationwide coverage by 2008. For more information please see the USDA NASS home page. **Coverage:** Conterminous United States (Lower 48 States).

The National Land Cover Database (NLCD) is a land use summary by the U.S. Geological Survey (USGS). These assessments began in 1992 nationwide. For more information please see the USGS NLCD home page. **Coverage:** Conterminous United States (Lower 48 States).

The land use trends analysis extracts a subset of land use cover layers from either NASS (2014, 2012, 2010, 2008) and NLCD (2011, 2006, 2001, 1992) and then displays them side by side for comparison. **Coverage:** Conterminous United States (Lower 48 States).

Other

U.S. 2010 and 2000 Census population for blocks or block groups (depending on the size of the area of interest) extracted and analyzed. **Coverage:** United States.

30-meter Digital Elevation Maps (DEMs) of topography are extracted from the **National Hydrography Dataset (NHDPlus Version 2)**. For more information please see the NHDPlus Version 2 home page. **Coverage:** Conterminous United States (Lower 48 States).

U.S. Forest Service Wildfire Hazard Potential (WHP) (270-m grid) dataset by the U.S. Department of Agriculture (USDA) will extract and summarize wildfire risk in the provided area of interest. There are two datasets, a continuous risk value and a categorized risk value. A dataset with categorized risk value was used for WHP. For more information, please see the Forest Service page for their continuous and categorized datasets. **Coverage:** Conterminous United States (Lower 48 States).

User Upload

Users can upload files and add their own spatial (shapefile, raster) or time series (csv) information by clicking the "upload" button and selecting accepted files.

Other

Abandoned Mine Lands

Colorado Abandoned Mine Land features from numerous agencies will be extracted and summarized. For more information please see the Colorado Abandoned Mine Lands Metadata page. **Coverage:** Colorado.

Atmospheric Deposition

National Atmospheric Deposition Program (NADP) National Trends Network atmospheric deposition monitoring stations are also extracted for the provided area of interest. Data for these stations are summarized separately from the GHCN-Daily data. For more information please see the NADP data page. **Coverage:** United States.

Canals and Ditches

Canals and Ditches from USGS National Map Viewer's Hydrography database of flow lines are provided for the area of interest. For more information please see the USGS National Map Viewer help page. **Coverage:** United States.

Confined Animal Feeding Operations (CAFOs)

A summary of the total number of animal units, by type of animal, is included for watersheds larger than 20 square miles. **Coverage:** Colorado.

Transbasin Diversions

Colorado transbasin (transmountain) diversions are important alterations to natural hydrography. Ditch and tunnel structures along with associated monitoring gages within the provided area of interest will be extracted and summarized. **Coverage:** Colorado.

Wastewater Treatment Plants

Colorado Department of Public Health and Environment (CDPHE) Regulation 85 nutrient management data for wastewater treatment plants within the provided area of interest will be extracted and summarized. For more information please see the CDPHE Regulation 85 nutrient home page. **Coverage:** Colorado.

National Pollution Discharge Elimination System (NPDES) permit program addresses water pollution by regulating point sources that discharge pollutants to waters of the United States NPDES home page. **Coverage:** United States.

STEP 3 – GENERATE REPORT

Once required dataset(s) is selected, select a report type from the dropdown under the Generate Report tab. A new tab will open and run the watershed data analysis summary for the area of interest.

Visualization & Graphing

WRAP is intended to facilitate comparison of different watersheds. The tool summarizes various time series and spatial data in a consistent format to facilitate these comparisons.

Each data category is summarized using interactive maps and graphs. The histograms (png, jpeg, pdf, svg) as well as the raw data including time series (xls, csv) and raster maps can be downloaded from the report. Additionally, these files can be imported directly into your eRAMS project library.

REFERENCES

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