

# Water Resources Apps

The State of the Art

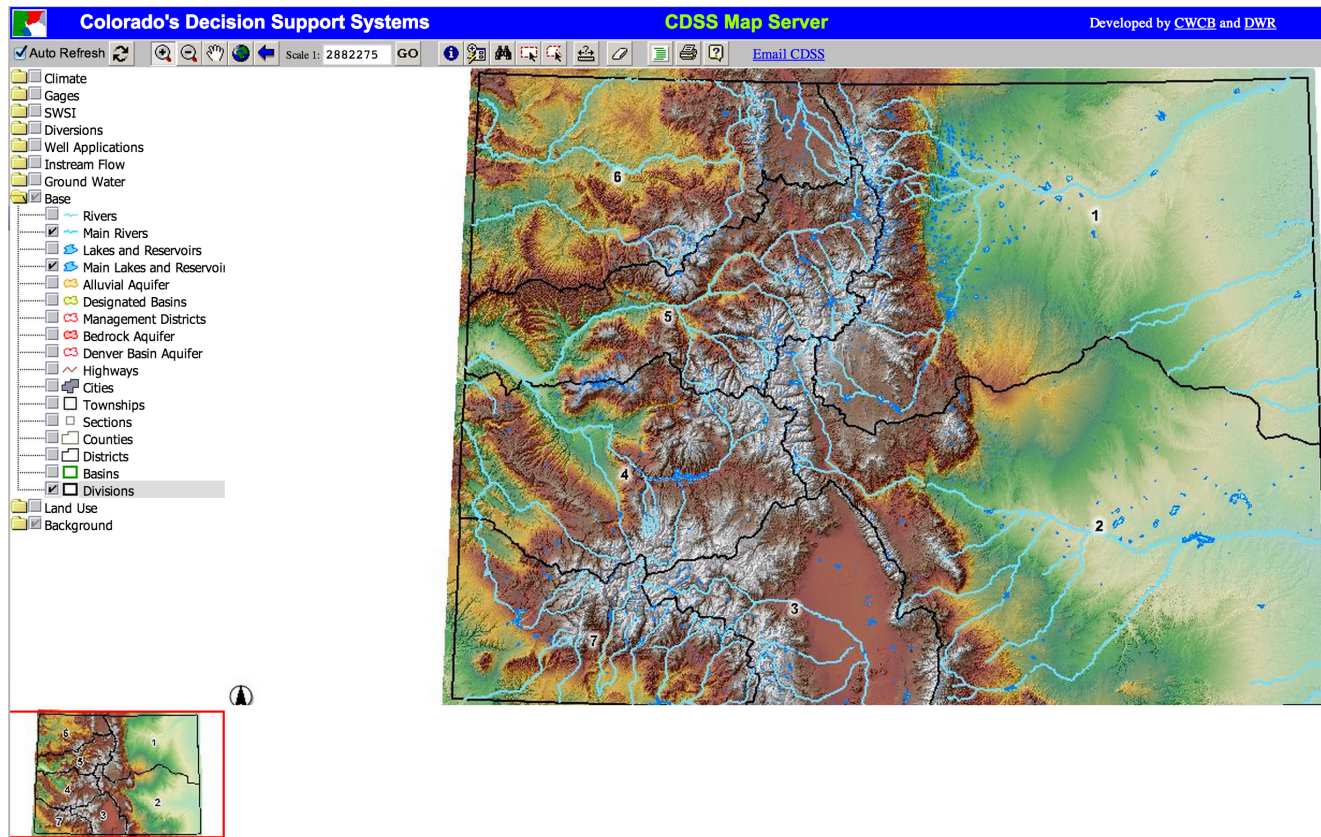
Nathan Swain





Live Demos

# Colorado Decision Support System



<http://cdss.state.co.us/onlineTools/Pages/MapView.aspx>

# INSPIRE GeoPortal

## Welcome to the INSPIRE geoportal

The INSPIRE Directive requires the Commission to establish a community geo-portal and the Member States shall provide access to their infrastructures through the geo-portal as well as through any access points they themselves decide to operate.

[More...](#)

## Discovery / Viewer

Search, discover and access geographic information provided by European governmental, commercial, and non-commercial organizations.

[More ...](#)



## Validator

The purpose of the INSPIRE Metadata Validator is to test the compliancy of INSPIRE metadata with the INSPIRE Metadata Regulation.

[More ...](#)

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Invalid Element  
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## Metadata Editor

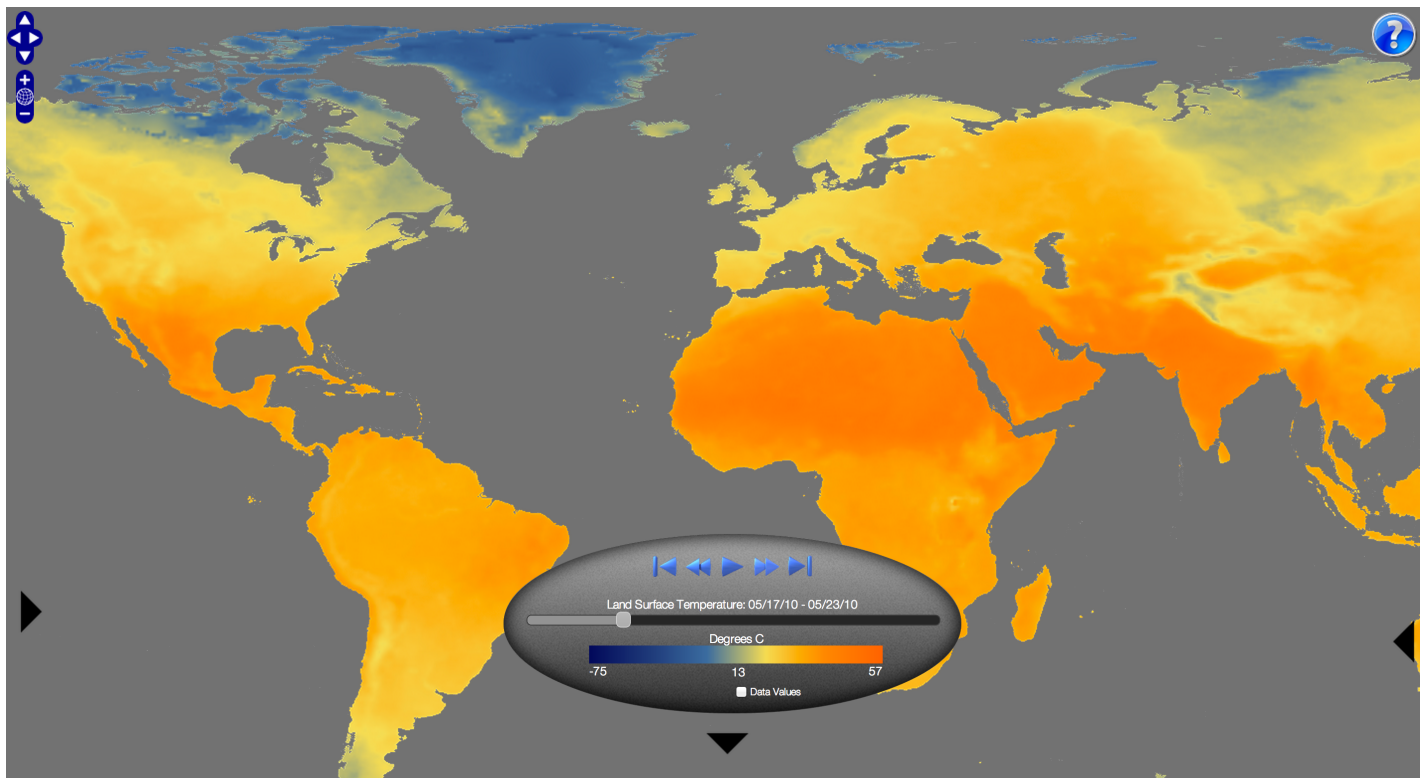
Create metadata according to the INSPIRE implementing rules.

[More ...](#)

```
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<-DOOC  
<xsd:el  
/ ADI
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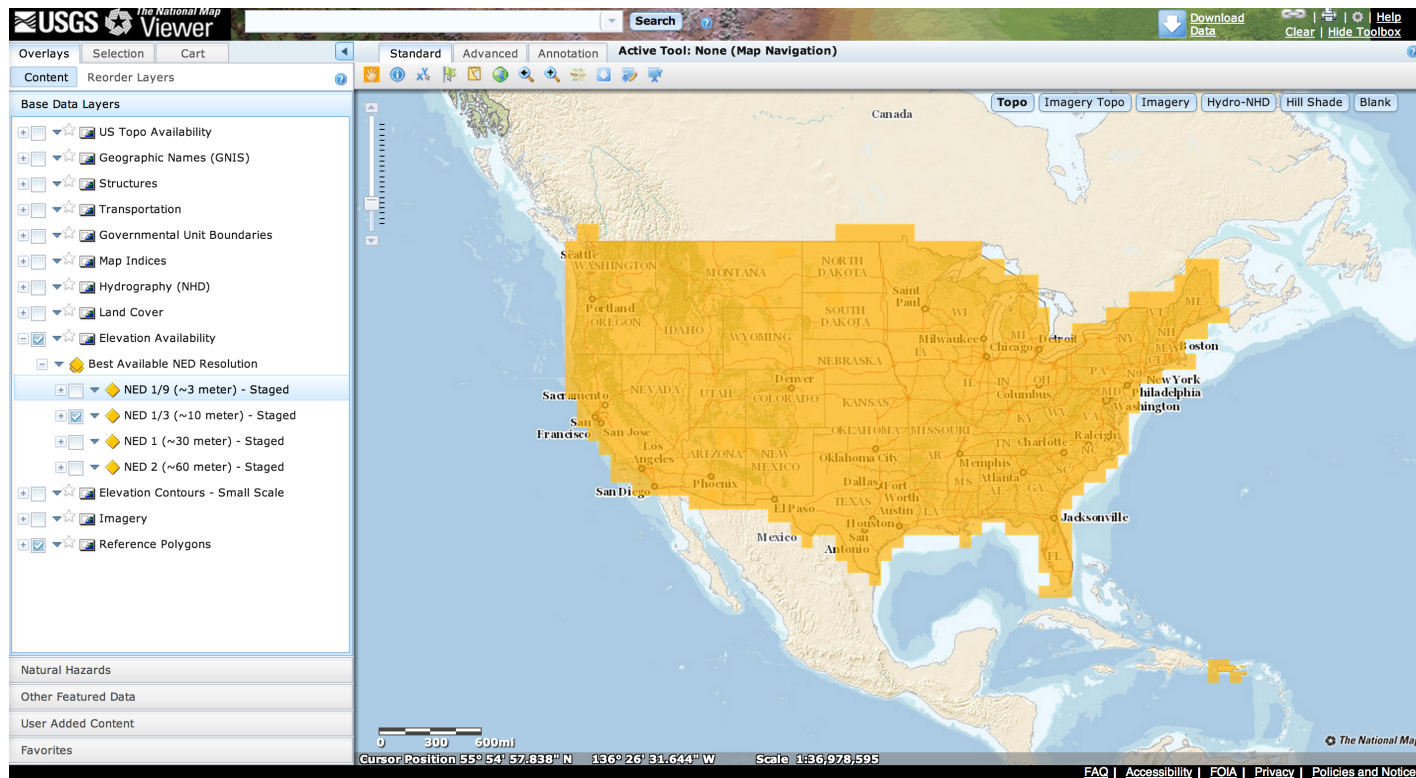
<http://inspire-geoportal.ec.europa.eu/>

# NOAA View



<http://www.nnvl.noaa.gov/view/>

# USGS National Map Viewer



<http://viewer.nationalmap.gov/viewer/>

# USGS Geo Data Portal

The screenshot displays the USGS Geo Data Portal interface. At the top left is the USGS logo with the tagline "science for a changing world". To the right of the logo is a banner image featuring a polar bear, a person with a camera, and a herd of animals in a snowy landscape. Further right are links for "USGS Home", "Contact USGS", and "Search USGS". Below the banner is a navigation bar with "Geo Data Portal" on the left and "Show Geo Data Portal Info" on the right. The main area is a map of the United States with a large orange rectangle highlighting a region in the western United States, primarily covering Utah and parts of Colorado and Nevada. On the left side of the map is a vertical scale bar and a compass rose. Below the map is a "Back" button and a "Configure / Submit" button. Underneath these buttons are configuration options: "Choose an algorithm:" with a dropdown menu set to "Categorical Coverage Fraction" and buttons for "Documentation" and "Configure"; and "Select Datatype:" with a dropdown menu showing a list of datatypes: "Land\_Cover\_2006\_1", "Impervious\_Surface\_2006\_2", "Land\_Cover\_2001\_AK\_3", "Land\_Cover\_2001\_HI\_4", and "Land\_Cover\_2001\_PR\_5".

<http://cida.usgs.gov/gdp/>

# CyberGIS Apps

The screenshot displays the CyberGIS Gateway web application interface. At the top, there is a navigation menu with links for Home, Apps, Visualization, Community, Support, About, and Feedback. A user profile section on the right shows 'Logout' and 'swainn20's Profile'. The main content area is divided into several panels:

- App: Viewshed Analysis:** A sidebar panel containing a 'My Analysis' section with buttons for 'New', 'Load', 'Delete', and 'Refresh'. Below this is a table with columns for 'Name', 'Time created', and 'Status'. One entry is visible: 'MyViewshed' created on '2014/2/10 11:50:46'.
- Data and Parameters:** A panel with a '+' icon.
- Results:** A panel with a '+' icon.
- Map:** A central world map showing continents labeled 'NORTH AMERICA', 'SOUTH AMERICA', 'EUROPE', and 'AFRICA'. A scale bar at the bottom left indicates 2000 km and 1000 mi. The current location is indicated as 'LonLat: -110.03906, 61.43877'.

At the bottom of the page, there is a footer with the following text: 'Copyright © 2010-2013 CIGI. CyberGIS Gateway, powered by GISolve, Open Topography. CyberGIS Gateway is based upon work supported by the National Science Foundation under Grant No. OCI-1047916. Any opinions, findings, and conclusions or recommendations expressed in the Gateway are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.' Logos for GISolve and Open Topography are also present.

<http://sandbox.cigi.illinois.edu/home/>



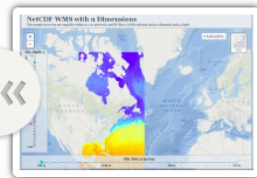
# Esri GEO Portal

HOME GALLERY MAP GROUPS

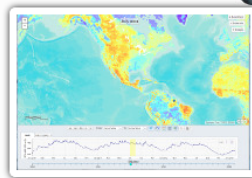
SIGN IN



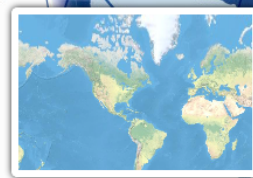
## Esri GEO Portal



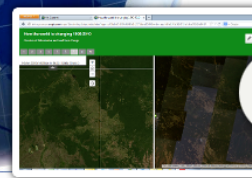
**Multi-dimensional NetCDF WMS Viewer**



**Soil Moisture Seasonal Patterns**



**Madagascar Locust Invasion Map Tour**



**How the World is Changing**

GEOSS seeks to address 9 societal benefit areas for Earth observations to address: disasters, health, energy, climate, agriculture, ecosystems, biodiversity, water, and weather. As governments and their partners continue to monitor the face of the Earth, the collection, storage, analysis, and sharing of these observations remain fragmented, incomplete, or redundant. Major observational gaps also remain (particularly as we seek to look *beneath* the surface of the land and the water). As such, GEO's credo is that "decision makers need a global, coordinated, comprehensive, and sustained system of observing systems."

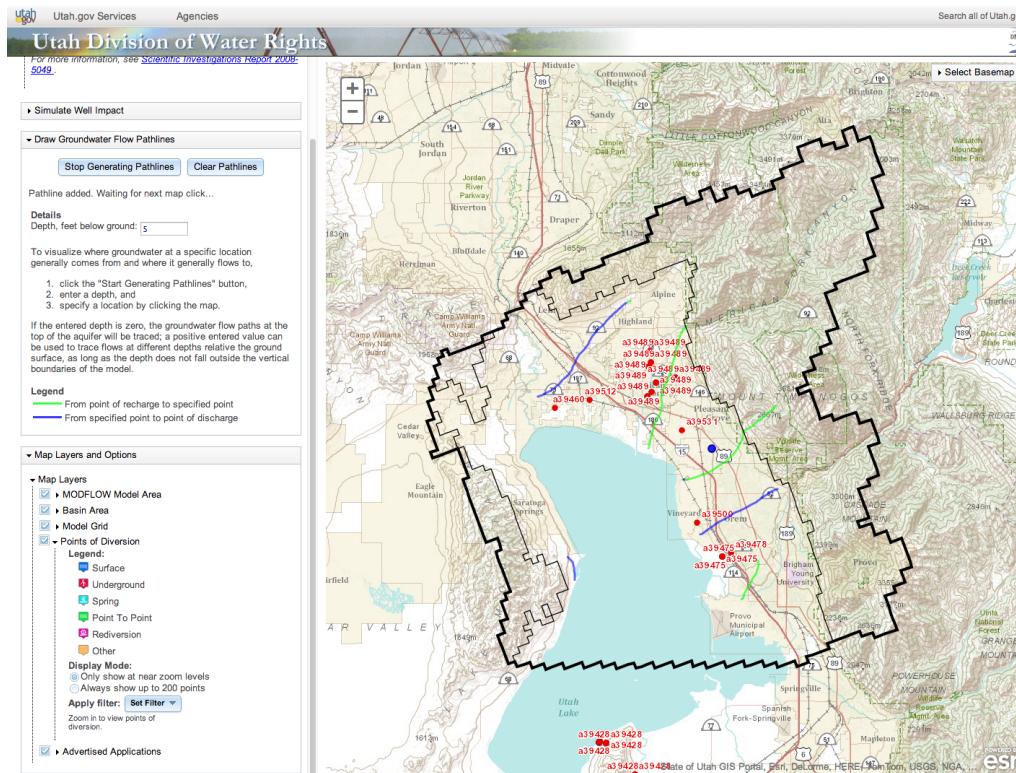
<http://geoss.maps.arcgis.com/home/index.html>

# Open Topography

The screenshot displays the Open Topography website. At the top left is the logo, a stylized green and yellow mountain peak, followed by the text "Open Topography" and the tagline "A Portal to High-Resolution Topography Data and Tools". To the right of the logo is a "[Login]" link and a "myOpenTopo" user profile. Below this is a search bar with a "Search" button and radio buttons for "Data", "Tools", and "Site". A navigation menu includes "Home", "About", "Data", "Tools", "Education", "Community", and "Support". A secondary menu lists "LIDAR Point Cloud & Processing", "Raster", "Google Earth Files", "Metadata", "Contribute", and "myOpenTopo". The main content area is titled "Find LiDAR Topography Data" and includes an "Instructions" link. The central feature is a map of Idaho with a red grid overlay. The map shows major cities like Boise, Idaho Falls, Pocatello, Logan, Brigham City, Ogden, Layton, Bountiful, Salt Lake City, Provo, and Springville. A "SELECT A REGION" button is visible on the left side of the map. On the right, there is a "Map" and "Satellite" toggle, a "DATA" dropdown menu, and a legend for "OpenTopography" and "Community Contributed" data sources. The bottom of the map includes "Map data ©2014 Google, INEGI" and "Terms of Use | Report a map error".

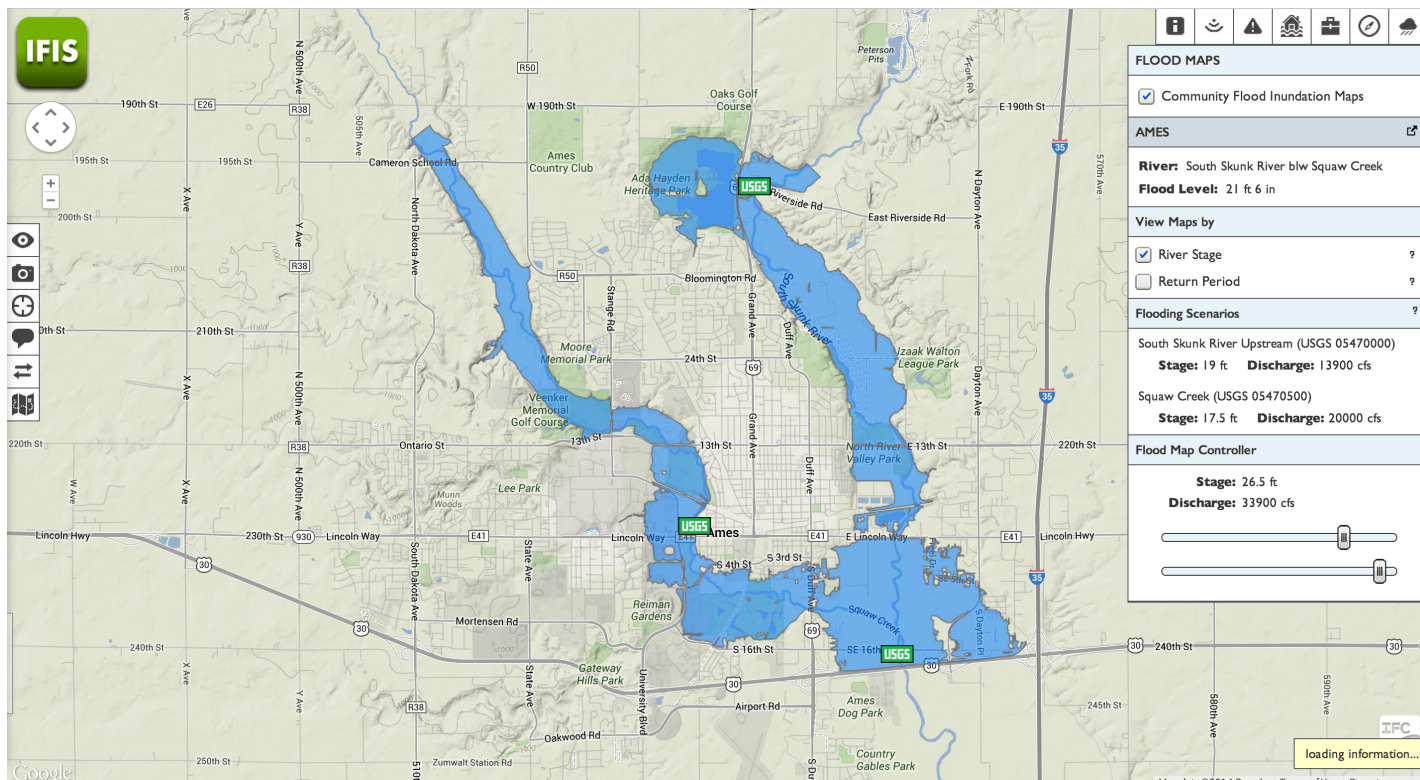
<http://opentopo.sdsc.edu/gridsphere/gridsphere>

# Utah Division of Water Rights



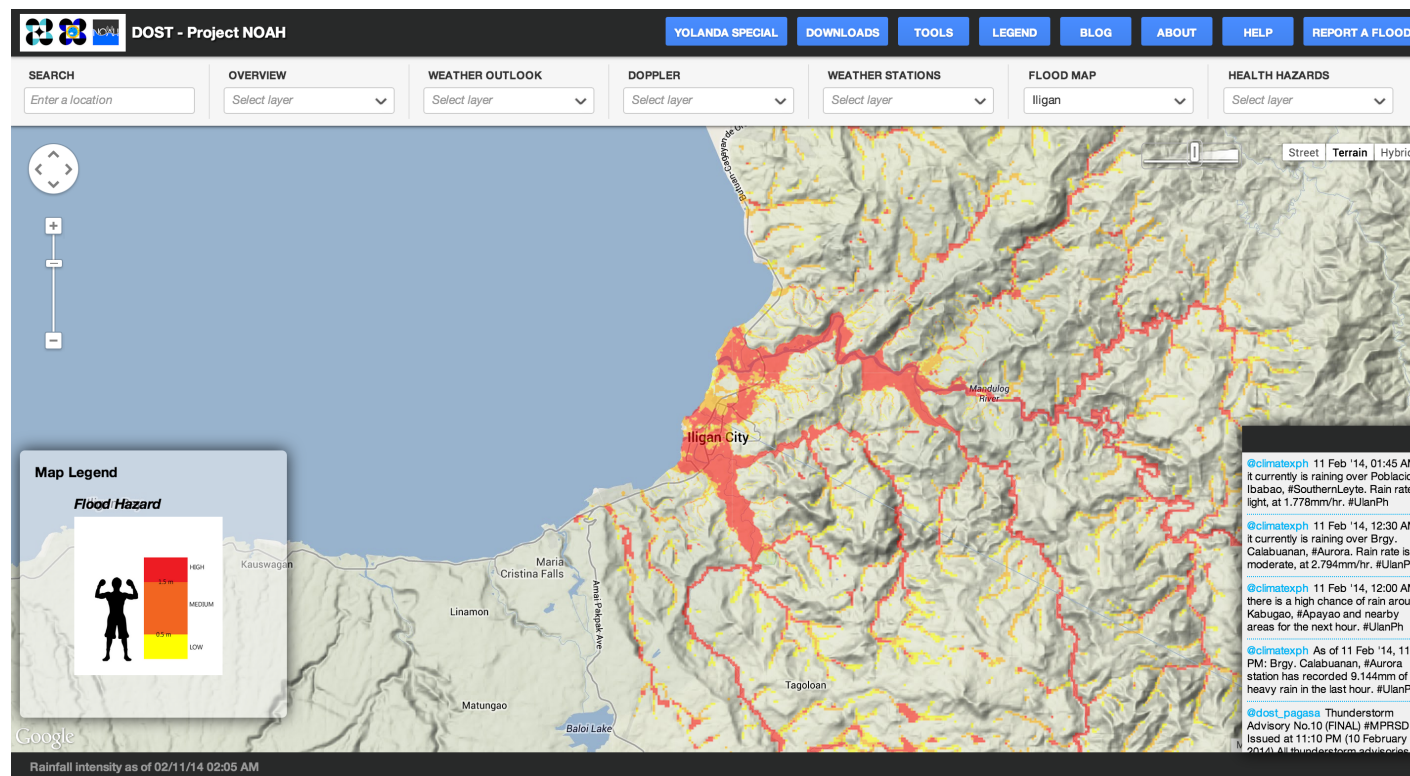
[http://gis.waterrights.utah.gov/gwmodels/\\_new/RunModel2.asp](http://gis.waterrights.utah.gov/gwmodels/_new/RunModel2.asp)

# Iowa Flood Information System (IFIS)



<http://ifis.iowafloodcenter.org/ifis/main/?v=b>

# Nationwide Operational Assessment of Hazards (NOAH)

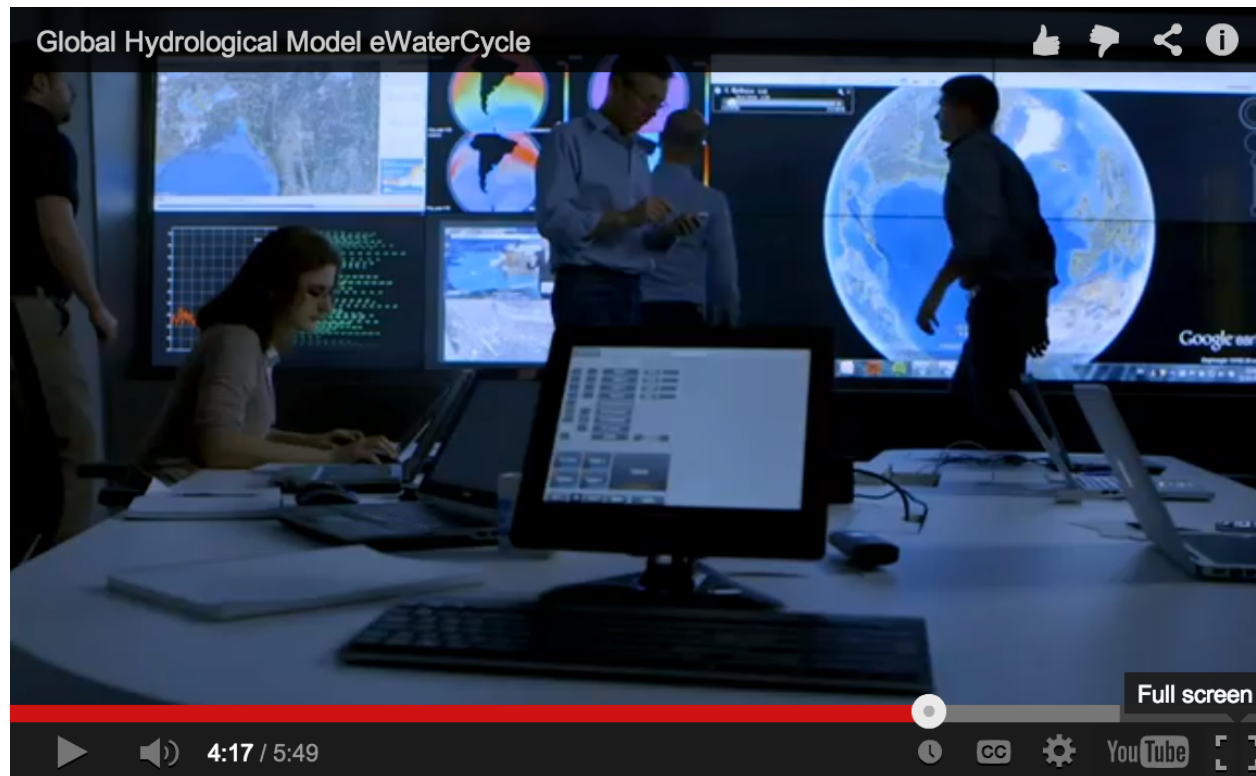


<http://noah.dost.gov.ph/>



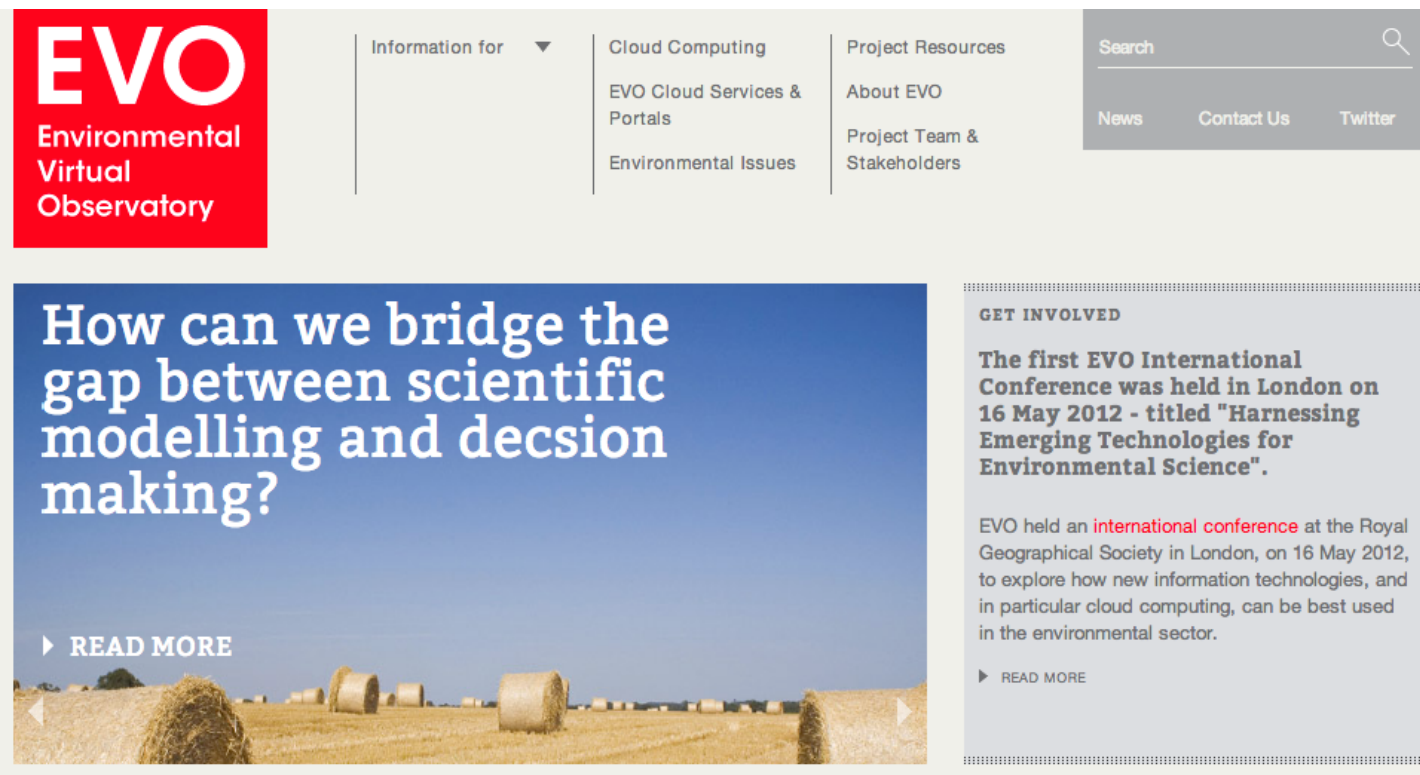
Future

# eWaterCycle



<http://www.ewatercycle.nl/>

# Environmental Virtual Observatory



The screenshot shows the homepage of the Environmental Virtual Observatory (EVO). At the top left is the EVO logo, which consists of the letters 'EVO' in white on a red square, with the text 'Environmental Virtual Observatory' below it. To the right of the logo is a navigation menu with three columns: 'Information for' with a dropdown arrow, 'Cloud Computing' with sub-items 'EVO Cloud Services & Portals' and 'Environmental Issues', and 'Project Resources' with sub-items 'About EVO' and 'Project Team & Stakeholders'. Further right is a search bar with a magnifying glass icon and three links: 'News', 'Contact Us', and 'Twitter'. Below the navigation is a large blue banner with the text 'How can we bridge the gap between scientific modelling and decision making?' and a 'READ MORE' link. To the right of the banner is a 'GET INVOLVED' section with a headline about a conference in London on 16 May 2012, followed by a paragraph of text and another 'READ MORE' link. The background of the banner and the 'GET INVOLVED' section is a photograph of a field with hay bales under a blue sky.

**EVO**  
Environmental  
Virtual  
Observatory

Information for ▾

Cloud Computing

EVO Cloud Services & Portals

Environmental Issues

Project Resources

About EVO

Project Team & Stakeholders

Search

News Contact Us Twitter

**How can we bridge the gap between scientific modelling and decision making?**

▶ READ MORE

**GET INVOLVED**

**The first EVO International Conference was held in London on 16 May 2012 - titled "Harnessing Emerging Technologies for Environmental Science".**

EVO held an **international conference** at the Royal Geographical Society in London, on 16 May 2012, to explore how new information technologies, and in particular cloud computing, can be best used in the environmental sector.

▶ READ MORE

<http://www.evo-uk.org/>





Literature



# Li, S.-m. et al. 2007

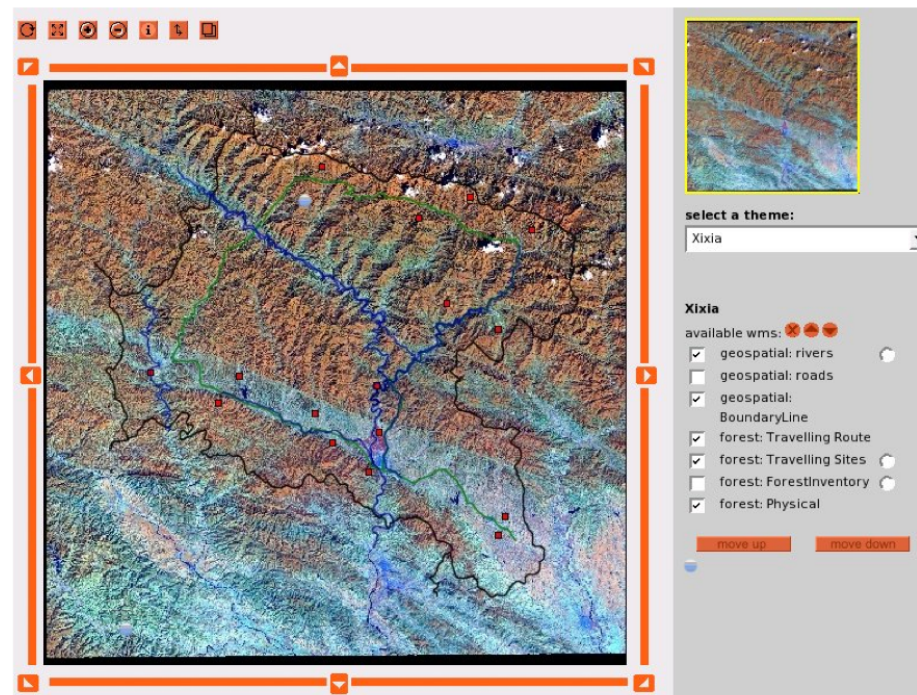


Fig. 4 The interface of the prototype system

Li, S.-m., Saborowski, J., Nieschulze, J., Li, Z.-y., Lu, Y.-c., & Chen, E.-x. (2007). Web service based spatial forest information system using an open source software approach. *Journal of Forestry Research*, 18(2), 85-90. doi: 10.1007/s11676-007-0017-9

# Rao, M. et al. 2007 (CRP-DSS)

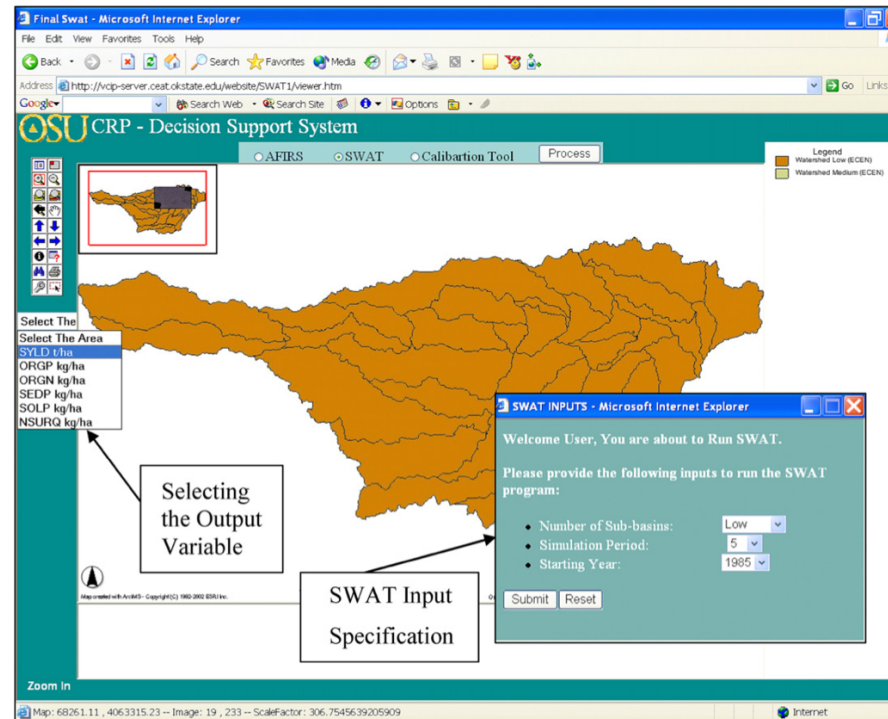
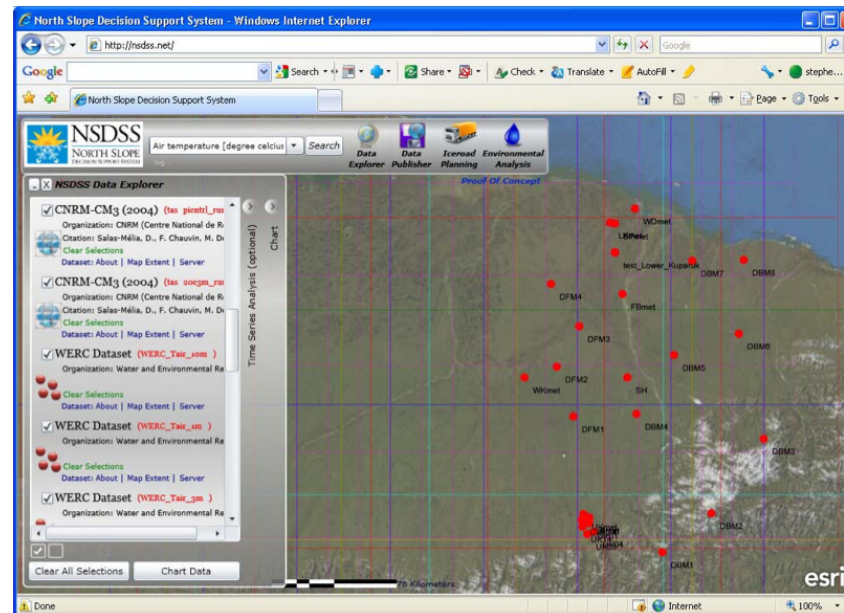


Fig. 8. SWAT input and output variable selection within the SWAT module of CRP-DSS.

Rao, M., Fan, G., Thomas, J., Cherian, G., Chudiwale, V., & Awawdeh, M. (2007). A web-based GIS Decision Support System for managing and planning USDA's Conservation Reserve Program (CRP). *Environmental Modelling & Software*, 22(9), 1270-1280.

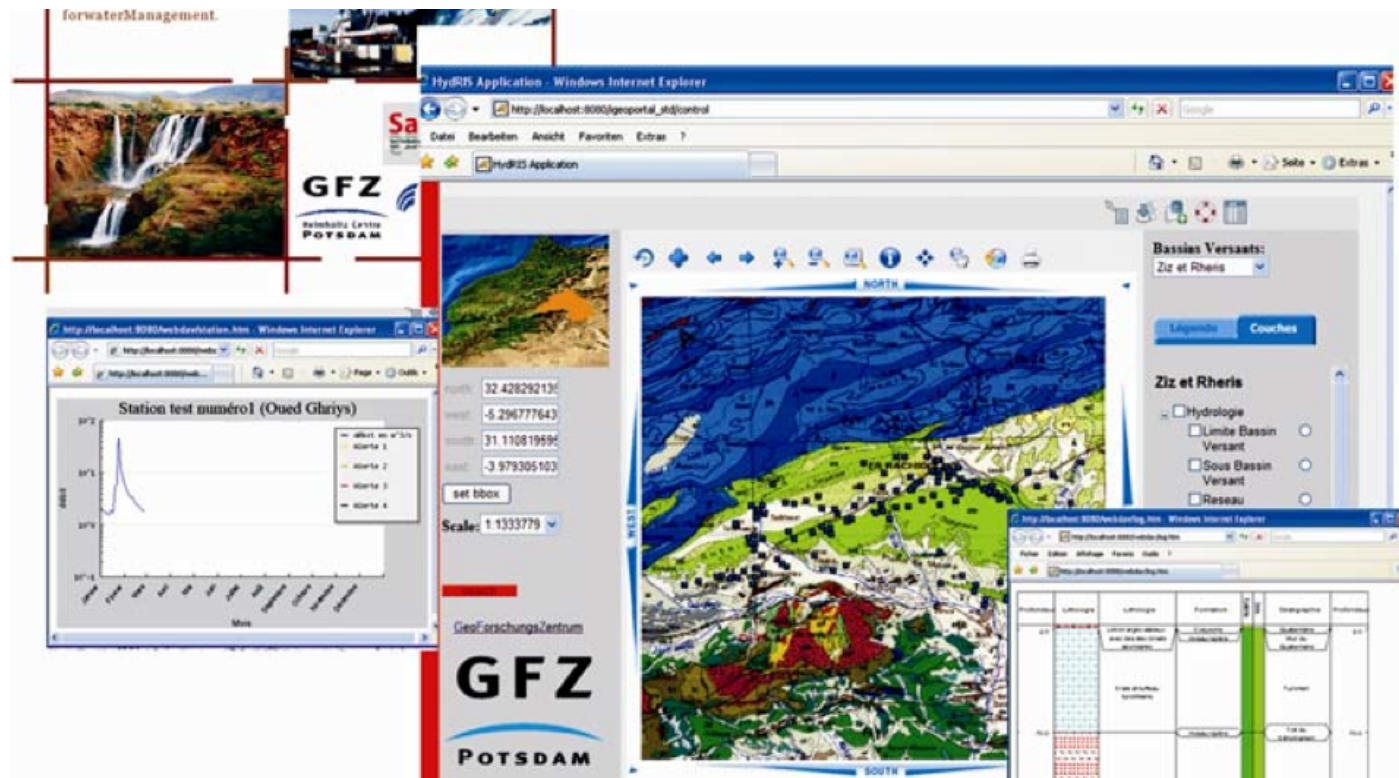
# Bourne, S. et al. 2011 (NSDSS)



**Fig. 2.** NSDSS.net's Data Exploration module. Search for the desired data in the NSDSS search box at the top of the screen. The data module present all data within the system that matches the search term. In this figure, the result for a search for "air temperature" shows that data is available both in NetCDF files and at field observation sites.

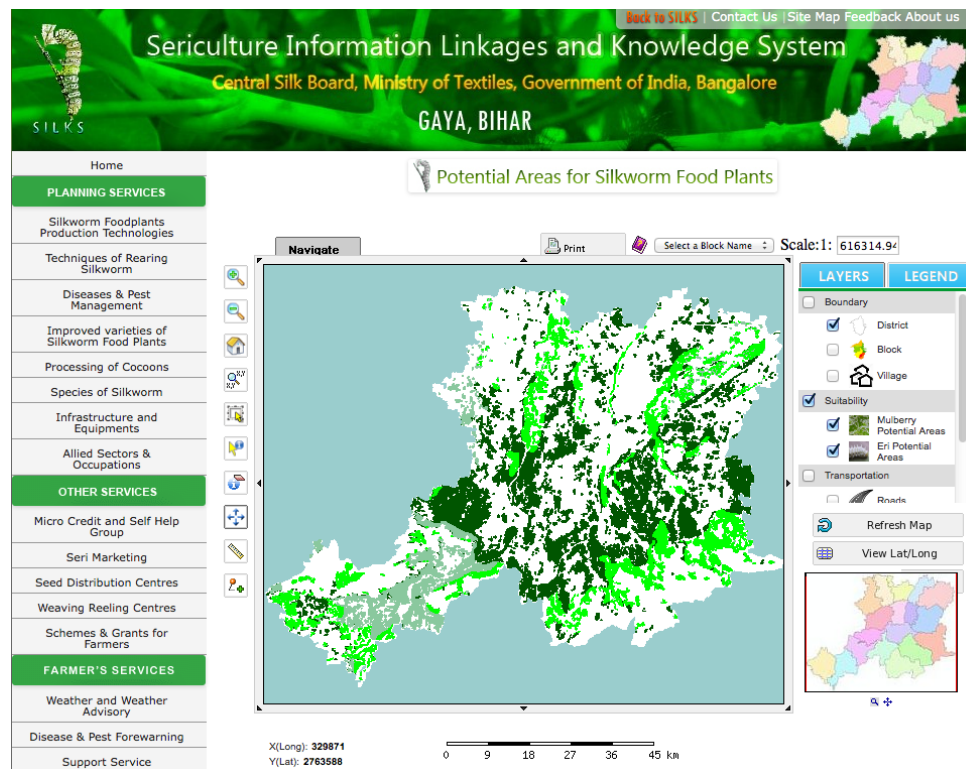
Bourne, S., Haleblan, J., Tidwell, A., Schnabel, W., & Brumbelow, K. (2011). *Implementation of Cyberinfrastructure and Multiple Technology Platforms for Water Resources Management: The North Slope Decision Support System*. Paper presented at the Reston, VA: ASCE [at] cProceedings of the 2011 World Environmental and Water Resources Congress; May 22. 26, 2011, Palm Springs, California | d 20110000.

# Oulidi, H. J. et al. 2012 (HydriS)



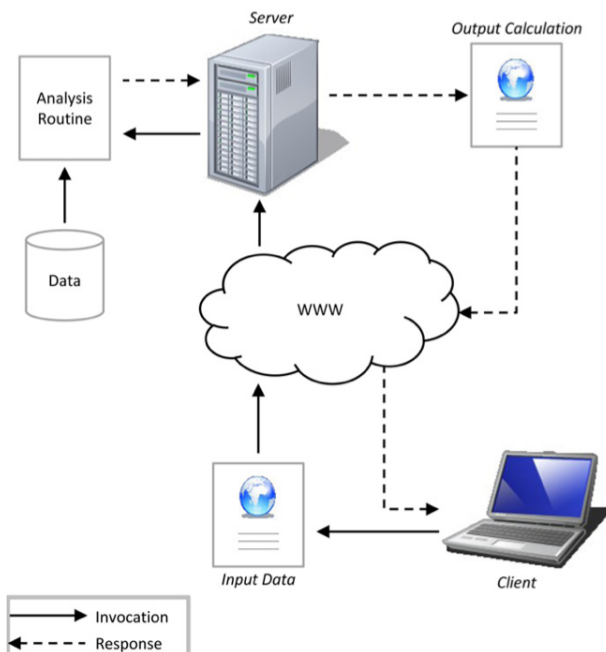
Oulidi, H. J., Löwner, R., Benaabidate, L., & Wächter, J. (2012). HydriS: An open source GIS decision support system for groundwater management (Morocco). *Geo-spatial Information Science*, 12(3), 212-216.

# Singh, P. S. et al. 2012 (SILKS)



Singh, P. S., Chutia, D., & Sudhakar, S. (2012). Development of a Web Based GIS Application for Spatial Natural Resources Information System Using Effective Open Source Software and Standards. *Journal of Geographic Information System*, 4(3), 261-266. doi: 10.4236/jgis.2012.43031

# Castronova, A. M. et al. 2013



**Fig. 1.** Communication between the client and server where an analysis routine is run on a server and called by a client application using a web service interface. Data can be transferred from the client to the server as input, and from the server and the client as output.

Castronova, A. M., Goodall, J. L., & Elag, M. M. (2013). Models as web services using the Open Geospatial Consortium (OGC) Web Processing Service (WPS) standard. *Environmental Modelling & Software*, 41, 72-83. doi: Doi 10.1016/J.Envsoft.2012.11.010

# D. Gkatzoflias et al. 2013

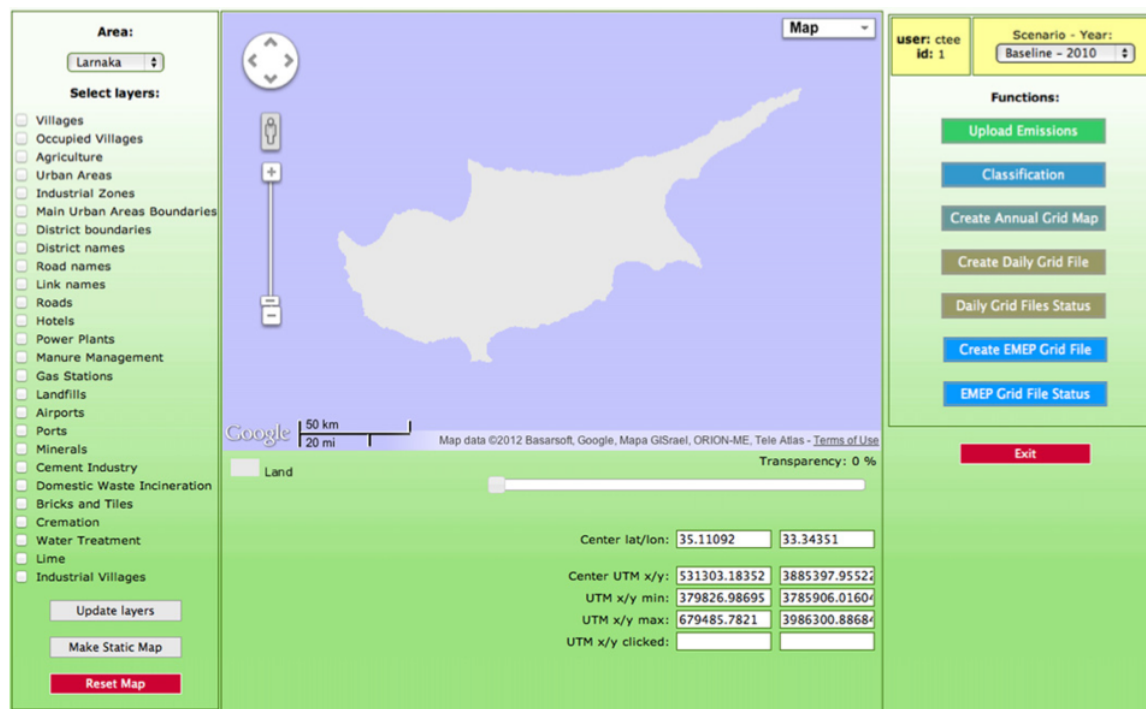


Fig. 9. WebGIS main screen.

Gkatzoflias, D., Mellios, G., & Samaras, Z. (2013). Development of a web GIS application for emissions inventory spatial allocation based on open source software tools. *Computers & Geosciences*, 52(0), 21-33. doi: <http://dx.doi.org/10.1016/j.cageo.2012.10.011>



# Sun, A. 2013

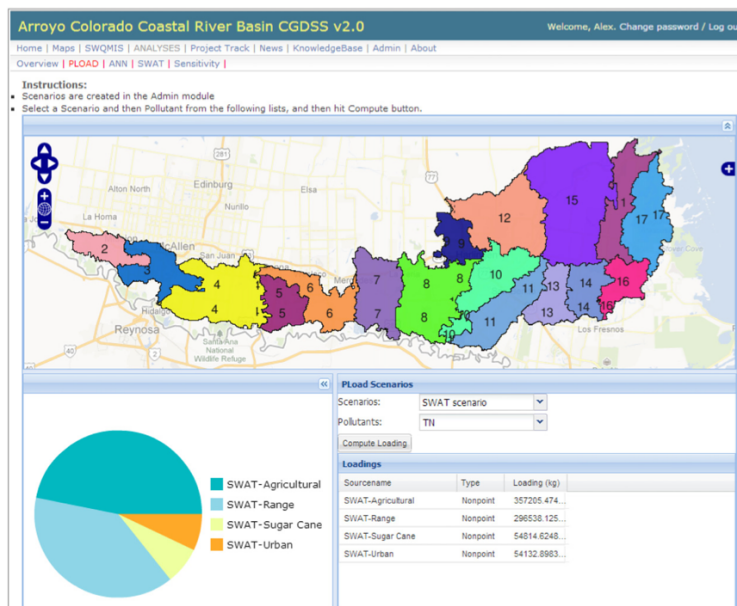


Fig. 2. Screenshot of PLOAD v1 user interface. All loading scenarios can be created and managed via the Django admin interface.

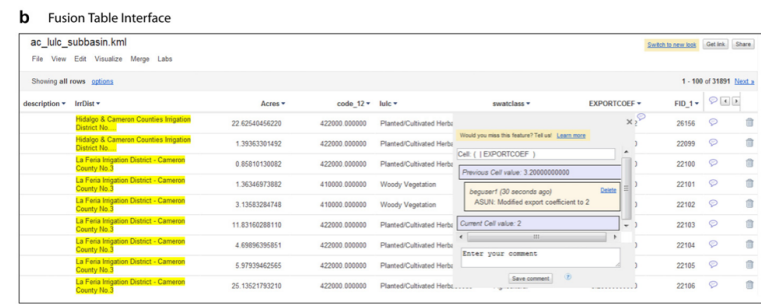
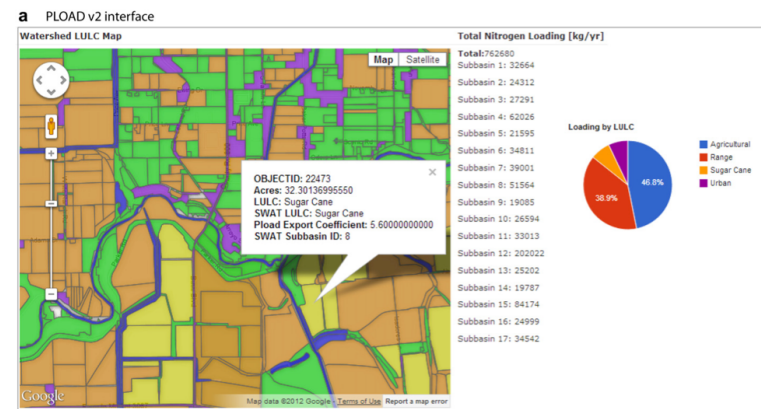
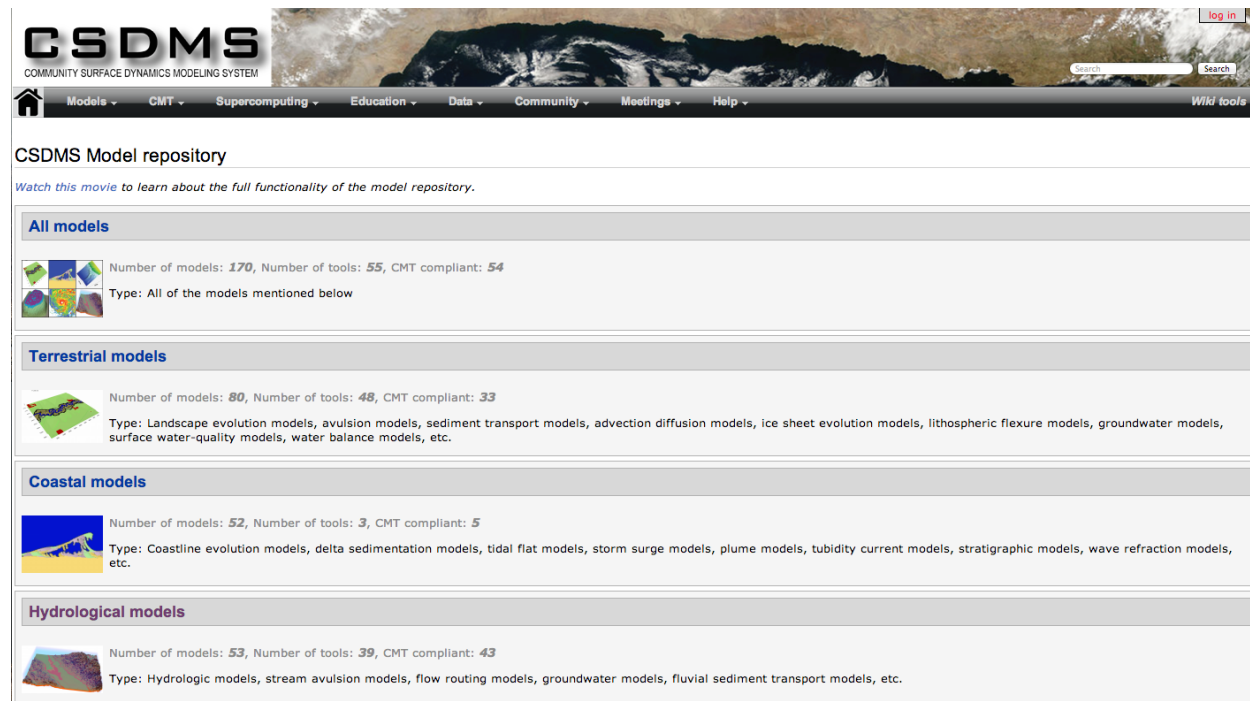


Fig. 3. Screenshot of (a) PLOAD v2 user interface and (b) Google Fusion Table editing interface.

Sun, A. (2013). Enabling collaborative decision-making in watershed management using cloud-computing services. *Environmental Modelling & Software*, 41, 93-97.

# Community Surface Dynamics Modeling System (CSDMS)



The screenshot shows the CSDMS website interface. At the top, there is a navigation bar with the CSDMS logo and the text 'COMMUNITY SURFACE DYNAMICS MODELING SYSTEM'. Below the navigation bar, the main content area is titled 'CSDMS Model repository'. A link is provided to watch a movie about the model repository's functionality. The repository is organized into four categories, each with a small icon and a list of statistics and types:

- All models:** Number of models: 170, Number of tools: 55, CMT compliant: 54. Type: All of the models mentioned below.
- Terrestrial models:** Number of models: 80, Number of tools: 48, CMT compliant: 33. Type: Landscape evolution models, avulsion models, sediment transport models, advection diffusion models, ice sheet evolution models, lithospheric flexure models, groundwater models, surface water-quality models, water balance models, etc.
- Coastal models:** Number of models: 52, Number of tools: 3, CMT compliant: 5. Type: Coastline evolution models, delta sedimentation models, tidal flat models, storm surge models, plume models, turbidity current models, stratigraphic models, wave refraction models, etc.
- Hydrological models:** Number of models: 53, Number of tools: 39, CMT compliant: 43. Type: Hydrologic models, stream avulsion models, flow routing models, groundwater models, fluvial sediment transport models, etc.

CSDMS. (2014). Community Surface Dynamics Modeling Community. Retrieved January 15, 2014, 2014, from <http://csdms.colorado.edu>

Peckham, S. D., Hutton, E. W., & Norris, B. (2013). A component-based approach to integrated modeling in the geosciences: the design of CSDMS. *Computers & Geosciences*, 53, 3-12.

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# Thank You

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ci-water.org

This material is based upon work supported by the National Science Foundation under Grant No. 1135482

