MyGeoHub: A Collaborative Geospatial Research and Education Platform

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Abstract

Scientific research is increasingly collaborative and globally distributed; research groups now rely on web- based scientific tools and data management systems to simplify their day-to-day collaborative workflows. However, such tools often lack seamless interfaces, requiring researchers to contend with manual data transfers, annotation and sharing. MyGeoHub is a web platform that supports out-of-the-box, seamless workflows involving data ingestion, metadata extraction, analysis, sharing and publication. MyGeoHub is built on the HUBzero cyberinfrastructure platform and adds general-purpose software building blocks (GABBs), for geospatial data management, visualization and analysis. A data management building block iData, processes geospatial files, extracting metadata for keyword and map-based search while enabling quick previews. iData is pervasive, allowing access through a web interface, scientific tools on MyGeoHub or even mobile field devices via a data service API. GABBs includes a Python map library as well as map widgets that in a few lines of code, generate complete geospatial visualization web interfaces for scientific tools. GABBs also includes powerful tools that can be used with no programming effort. The GeoBuilder tool provides an intuitive wizard for importing multi-variable, geo-located time series data (typical of sensor readings, GPS trackers) to build visualizations supporting data filtering and plotting. MyGeoHub has been used in tutorials at scientific conferences and educational activities for K-12 students. MyGeoHub is also constantly evolving; the recent addition of Jupyter and R Shiny notebook environments enable reproducible, richly interactive geospatial analyses and applications ranging from simple pre- processing to published tools. MyGeoHub is not a monolithic geospatial science gateway, instead it supports diverse needs ranging from just a feature-rich data management system, to complex scientific tools and workflows.

MyGeoHub : A Collaborative Geospatial Research and Education Platform

https://mygeohub.org

PURDUE UNIVERSITY®

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Shared Research Project Hosting

GLASS
Global to local analysis of systems sustainability to meet the Sustainability Development Goals on a changing planet with limited land and water resources.

Global Food Security

Water hub
Water HUB is an open platform for connecting hydrologists through sharing of hydrologic information, data, models and simulation tools, connecting researchers and students to high-performance computation and data resources, and connecting science and people through shared knowledge and decision making tools and information.

Hydrology

Useful to Usable (U2U)
Transforming Climate Variability and Change Information for Cereal Crop Producers, is an integrated research and extension project working to improve farm resilience and profitability in the North Central Region by transforming existing climate information into usable knowledge for the agricultural community.
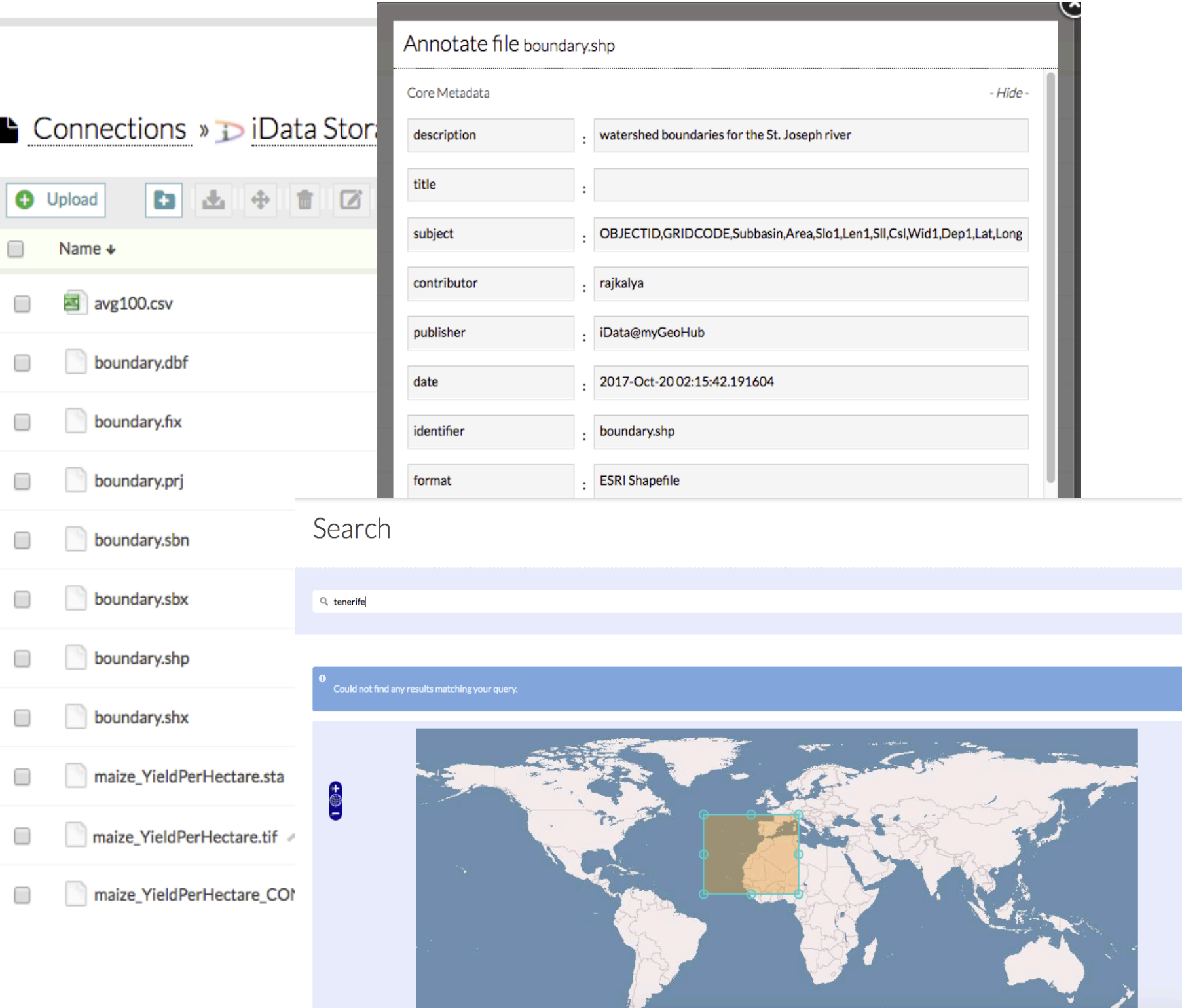
Crop, Climate Research

driNET
driNET is a research environment for collecting and disseminating local to regional scale drought information from several sources including the drought monitor, precipitation, soil moisture and more. The site also provides access to models such as the HMM (probabilistic method) Analysis tool and the Drought Impact Viewer.
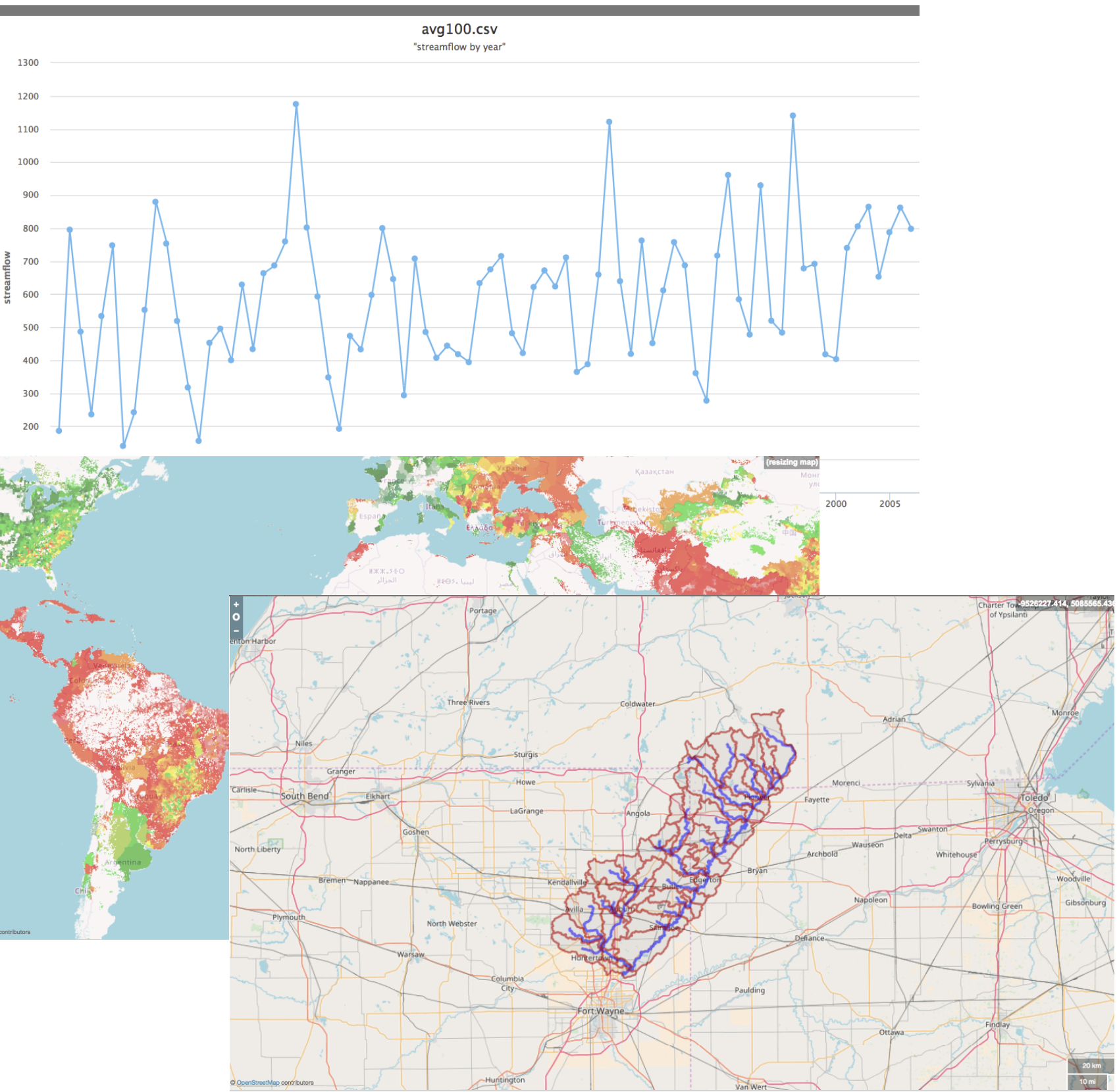
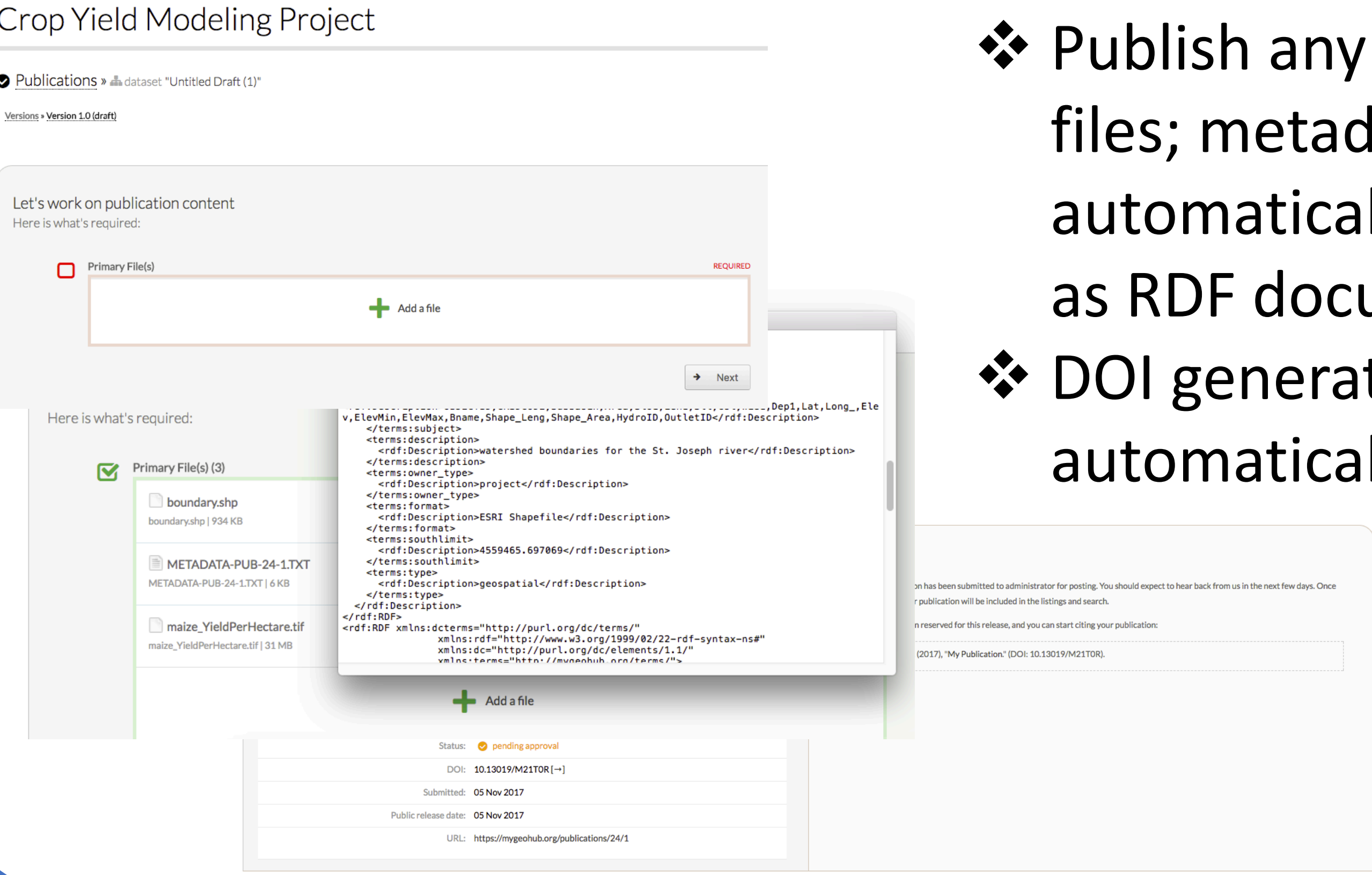### Drought Research

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Geospatial Research Data Management

❖ Web manage, share geospatial data
❖ Annotate, extend automatically extracted metadata
❖ Keyword + geospatial bounds search
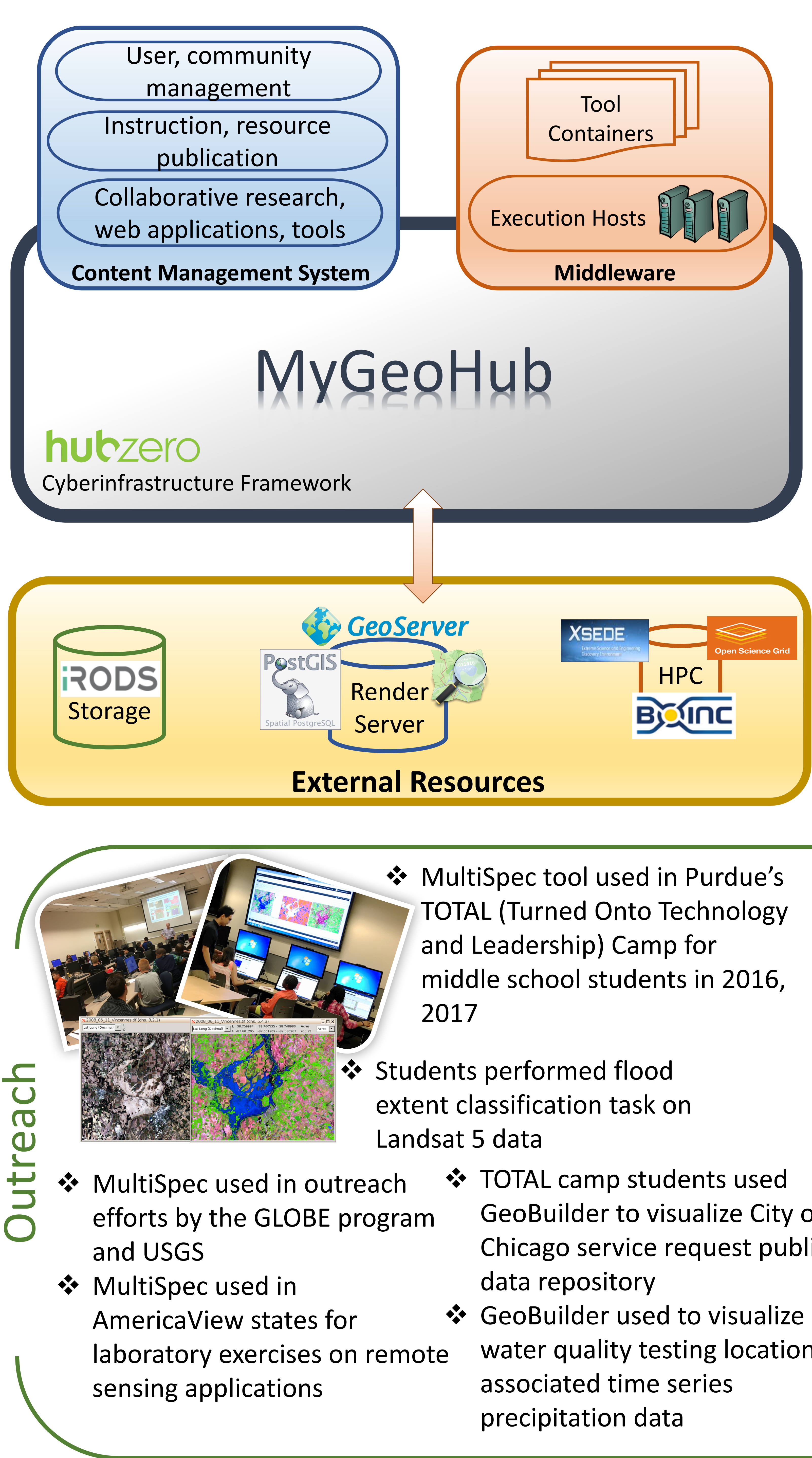
❖ Web preview of spreadsheet, geospatial (raster, vector) data
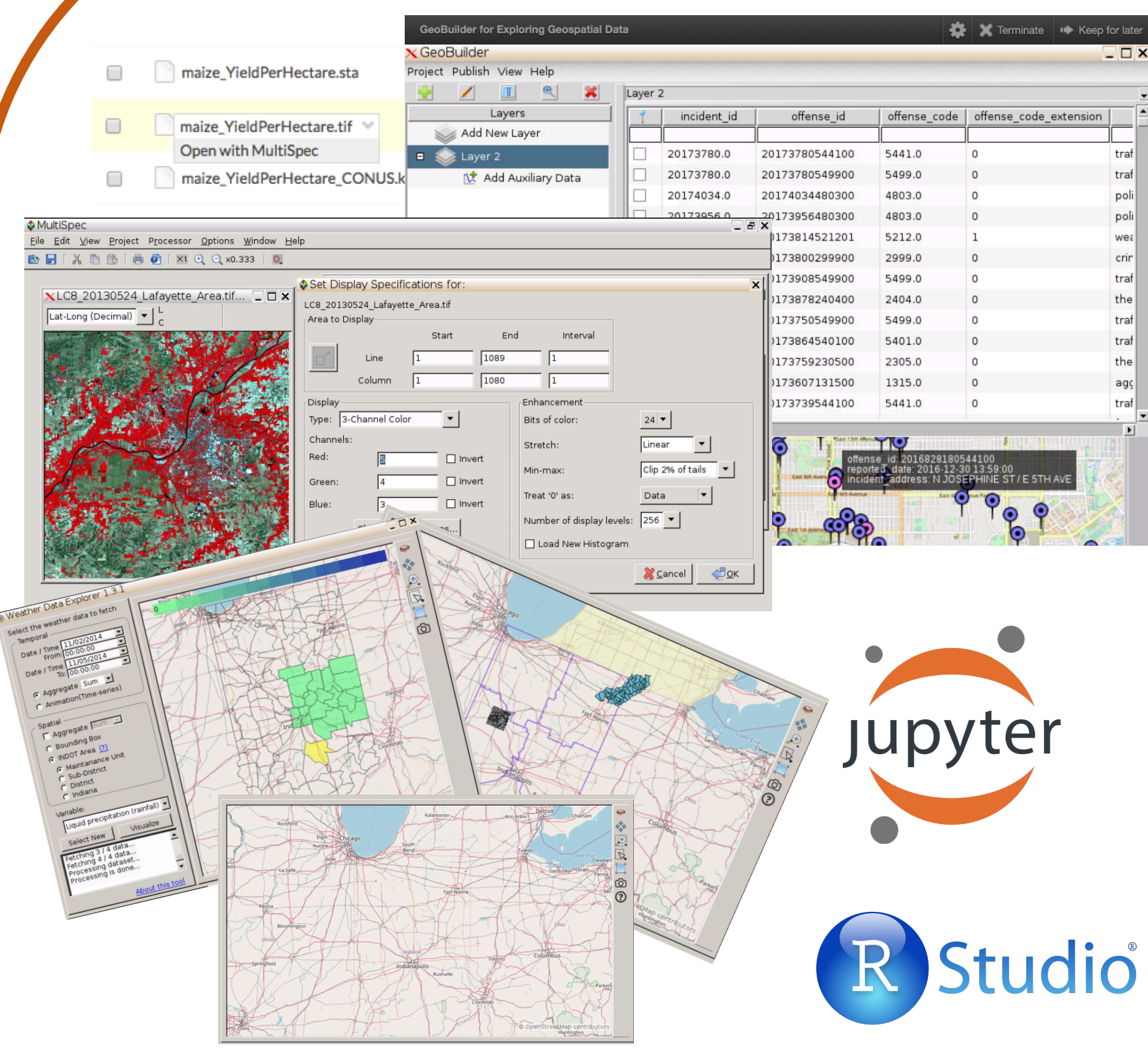❖ Support for point data exploration, multiple base maps
❖ Files processed on-demand

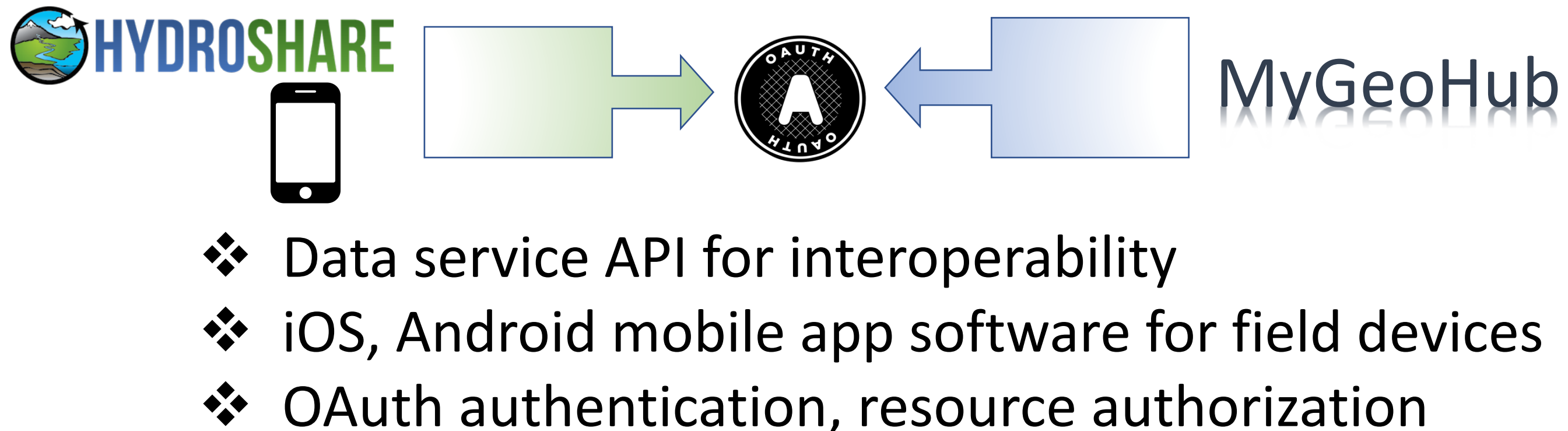❖ Publish any set of files; metadata automatically bundled as RDF document
❖ DOI generated automatically

Geospatial Research Data Management

Content Management System
- User, community management
- Instruction, resource publication
- Collaborative research, web applications, tools

Middleware
- Tool Containers
- Execution Hosts

MyGeoHub

hubzero
Cyberinfrastructure Framework

External Resources
- iRODS Storage
- PostGIS Spatial PostgreSQL
- GeoServer
- Render Server
- XSEDE / Open Science Grid
- HPC
- BOINC

Geospatial Processing & Visualization Tools

❖ Launch tools from data management interface
❖ Uniformly accessible data storage
❖ **MultiSpec:** Visualize, process multi, hyperspectral geospatial data
❖ **GeoBuilder:** Explore, visualize, filter geo-located spreadsheet data
❖ Source agnostic metadata processing

❖ Reusable map & geospatial visualization, toolkits
❖ Interactive computing platforms

HYDROSHARE → **MyGeoHub**

❖ Data service API for interoperability
❖ iOS, Android mobile app software for field devices
❖ OAuth authentication, resource authorization

Interoperability

❖ MultiSpec tool used in Purdue's TOTAL (Turned Onto Technology and Leadership) Camp for middle school students in 2016, 2017
❖ Students performed flood extent classification task on Landsat 5 data

❖ MultiSpec used in outreach efforts by the GLOBE program and USGS
❖ MultiSpec used in AmericaView states for laboratory exercises on remote sensing applications

❖ TOTAL camp students used GeoBuilder to visualize City of Chicago service request public data repository
❖ GeoBuilder used to visualize water quality testing locations, associated time series precipitation data

Outreach

❖ Self-paced courses using MyGeoHub tools and applications
❖ Rapid tool development using MyGeoHub geospatial toolkits

❖ Jupyter, RStudio ideal for follow-along courses, tutorials
❖ Inline visualization provides instant feedback

Education