Streamlined Watershed Modeling with the Kentucky Watershed Modeling Information Portal (KWMIP)

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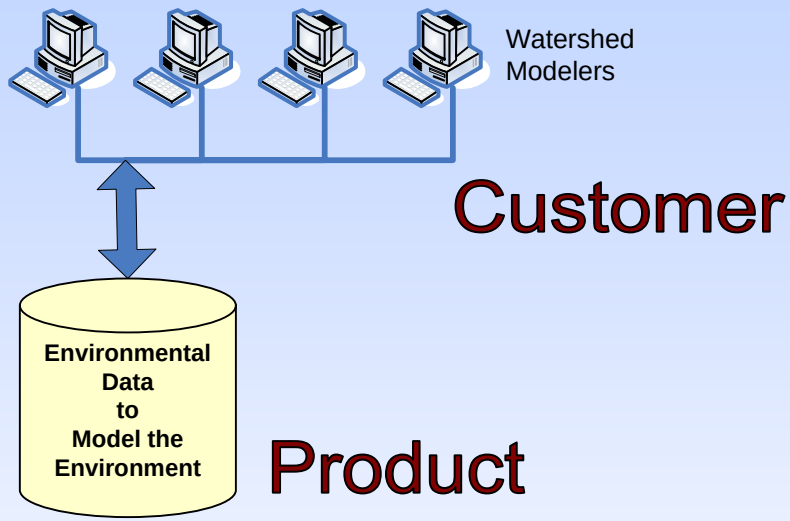
KWMIP Project Vision

Enable better environmental decisions

- Improve ease of analyses
- Increase the value of existing datasets
- Make it easy to get that data to the people who need it
- Apply open standards to allow future expansion—no stovepipe!



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KWMIP Project Goals & Objectives

- Increase Model Use
  - TMDLs needed for 2,000 impaired pollutant/waterbodies in KY
- Improve Modeling Efficiency
  - KWMIP requests and packages many model datasets
- Improve Model Consistency
  - Model precipitation and temperature statewide
- Train Water Resource Managers
  - Models as Decision Support Tools
- Train Modelers
  - KWMIP and new datasets

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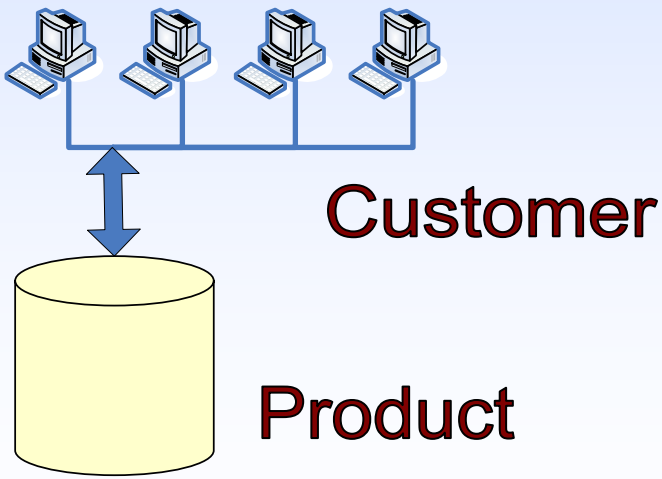
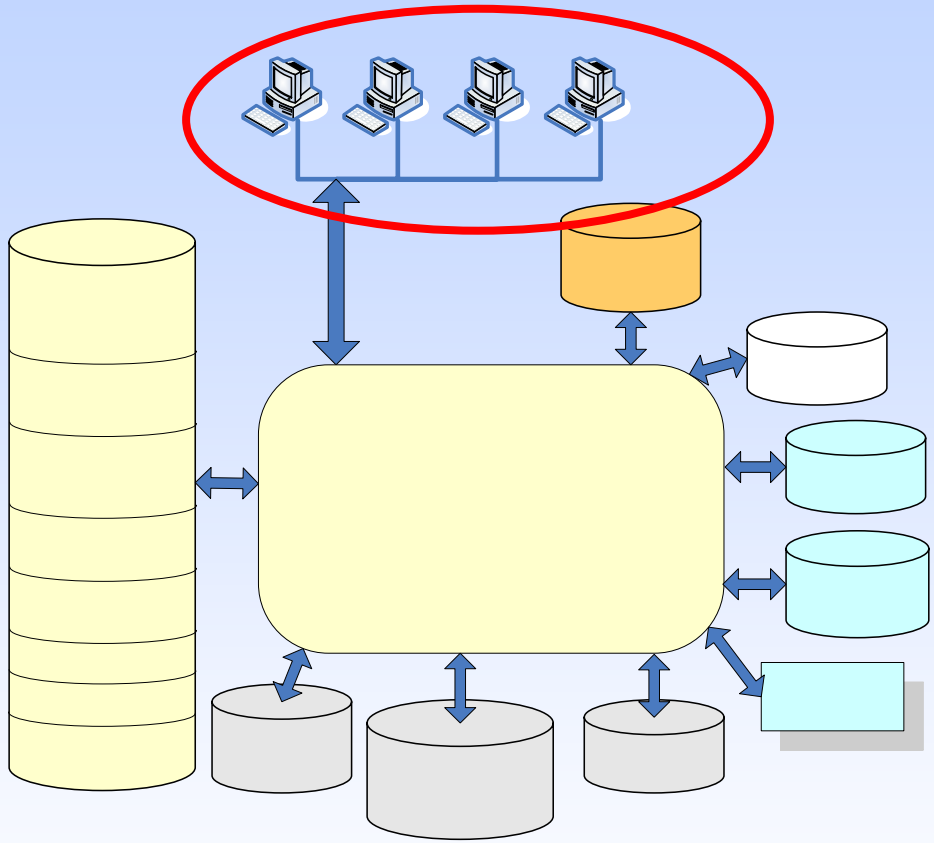
KWMIP Project Background

- EPA Environmental Information Exchange Network Challenge Grant
- Interface with Federal and State level spatial and spatially-related tabular data sources
- Support watershed modeling and watershed-based assessments





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KWMIP Partners

U.S. EPA Grantor

Demetrio Zourarakis, PhD (DGI) Principal Investigator

Mark Ayers, USGS
Co-awardee
Precipitation & temperature modeling

Sam Bacharach, Open GeoSpatial Consortium (OGC) *Co-awardee*

User Needs Assessment, Portal Development, Testing, Installation

Bill Caldwell
Lee Colten
(KY DEP) *Co-awardee*
Project input and review

Technical Advisory Group (TAG)

~80 representatives from academia, government, agencies, consultants

OGC Sub-Contractors

Karen Schaffer, FMSM
Project Coordination
Andrew Brenner, Sanborn Solutions
Web-Enable EPA GeoBook
Portal Build Team

TAG
(Technical Advisory Group)

American Public Works Association
CDP Engineers
City of Bowling Green
Cumberland Environmental Group
Eastern Kentucky University
EPA – various units
FEMA
FMSM Engineers
GRW
Kentucky Department of Environmental Protection
Kentucky Division of Water
Kentucky Geological Survey
Kentucky Pride
Kentucky Society of Professional Engineers
Kentucky Waterways Alliance
Khafra Engineering Consultants
Lexington Fayette County Urban Government
Limno-Tech
Louisville Metro Sewer District
Morehead State University
Murray State University
National Weather Service Ohio River Forecast Center
Northern Kentucky University
ORSANCO
PlanGraphics
Tennessee Valley Authority
Tetra Tech
The Nature Conservancy
Third Rock
University of Kentucky - various units
University of Louisville - Stream Restoration Institute
USACE
USDA-NRCS
USGS – various disciplines/regions
Western Kentucky University

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Use Case: KWMIP Models & Tools

- **Surface Water Quality Models**
  - Load Duration Curves
  - **QUAL2K**
  - **LSPC**
  - HSPF
  - **SWMM**
  - **WASP**
- **Groundwater Model**
  - MODFLOW
- **Hydrologic Models**
  - **EFDC**
  - HEC
- **Tools (Leverage)**
  - BASINS
  - **WCS**
  - **MetAdapt**

*** Included in USEPA Region IV Modeling Toolbox**

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Use Case: Major KWMIP Data Layers

Geospatial Data

- Digital Ortho Quads
- Geology
- Land Cover
- Elevation
- Hydrography
- Karst features
- Water & Wastewater Infrastructure
- Population
- Soils

Tabular Data (spatially related)

- Stream Water Quality (STORET, NWIS, COMPASS)
- Stream Flow (NWIS)
- Groundwater & Spring Quality
- Effluent Flow & Quality (PCS)
- Impoundment Stage
- KY Climate Data Generator

KY GeoNet already provides access to many of these data layers! **http://kygeonet.ky.gov/**

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Building KWMIP – Key Concepts

- Datasets from State and Federal systems retrieved from one interface
- Build upon what exists—minimize new software and systems
  - Apply standards-based COTS software for the interface
  - Proxy requests for data through existing web-enabled interfaces using an open-standard service protocol
- Defining what is now called the Web Feature Service Simple (WFSS) protocol

COTS – commercial off-the-shelf software

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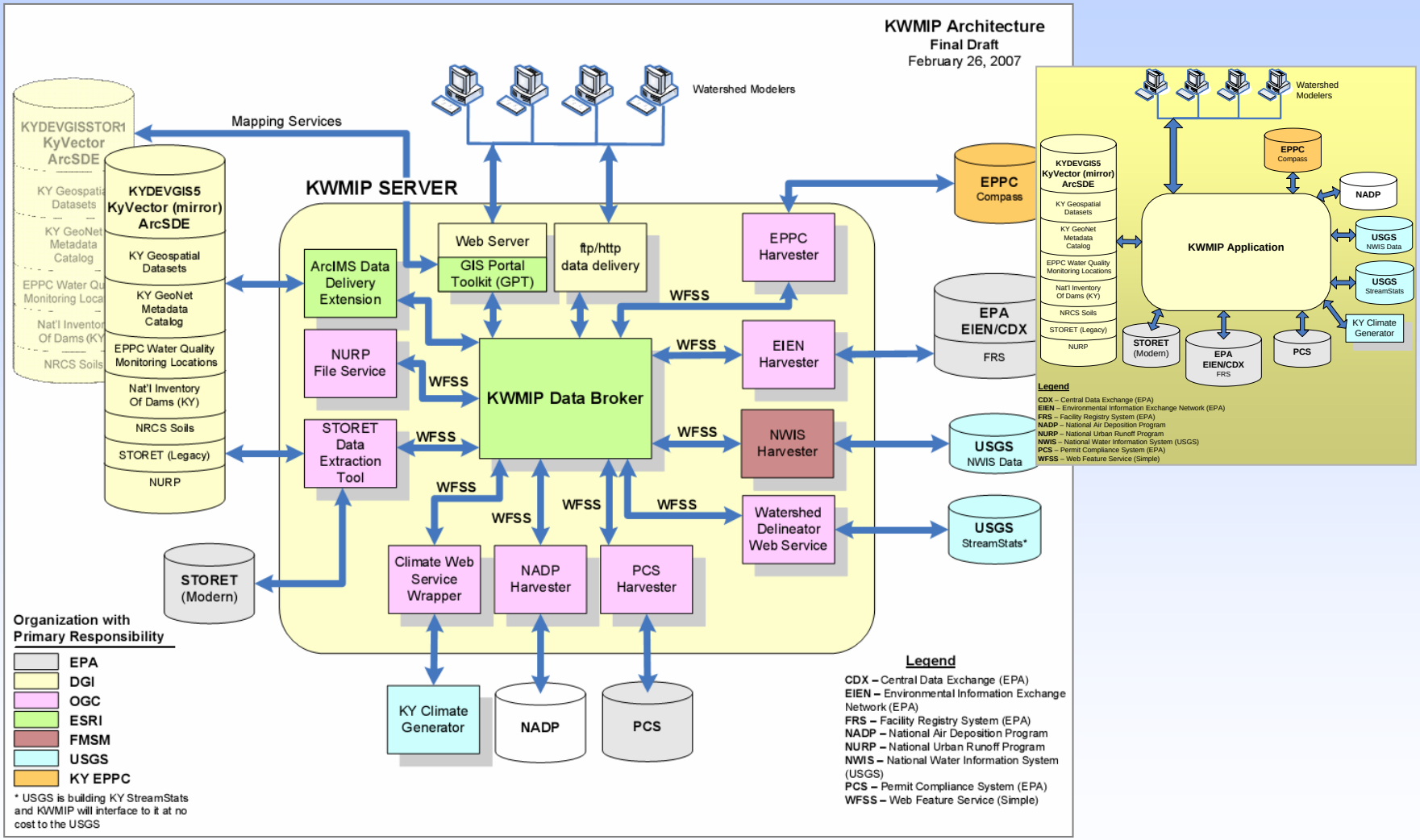
KWMIP Architecture



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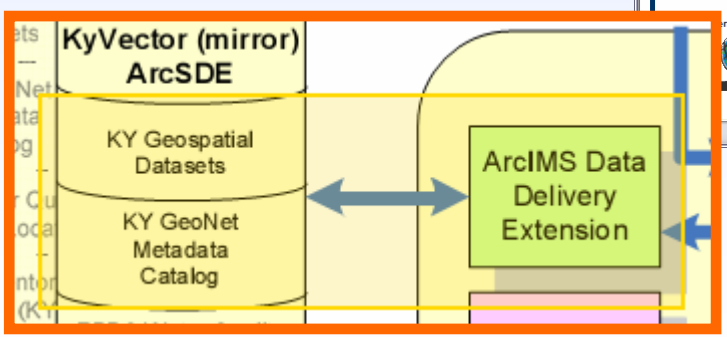
Kentucky Geography Network

- KYGEONET
- Started in 2002
- 150+ spatial datasets
- Day-to-day resource for the public and private sector
- 7.56 million hits in August 2006
- Data provider to the USGS National Map



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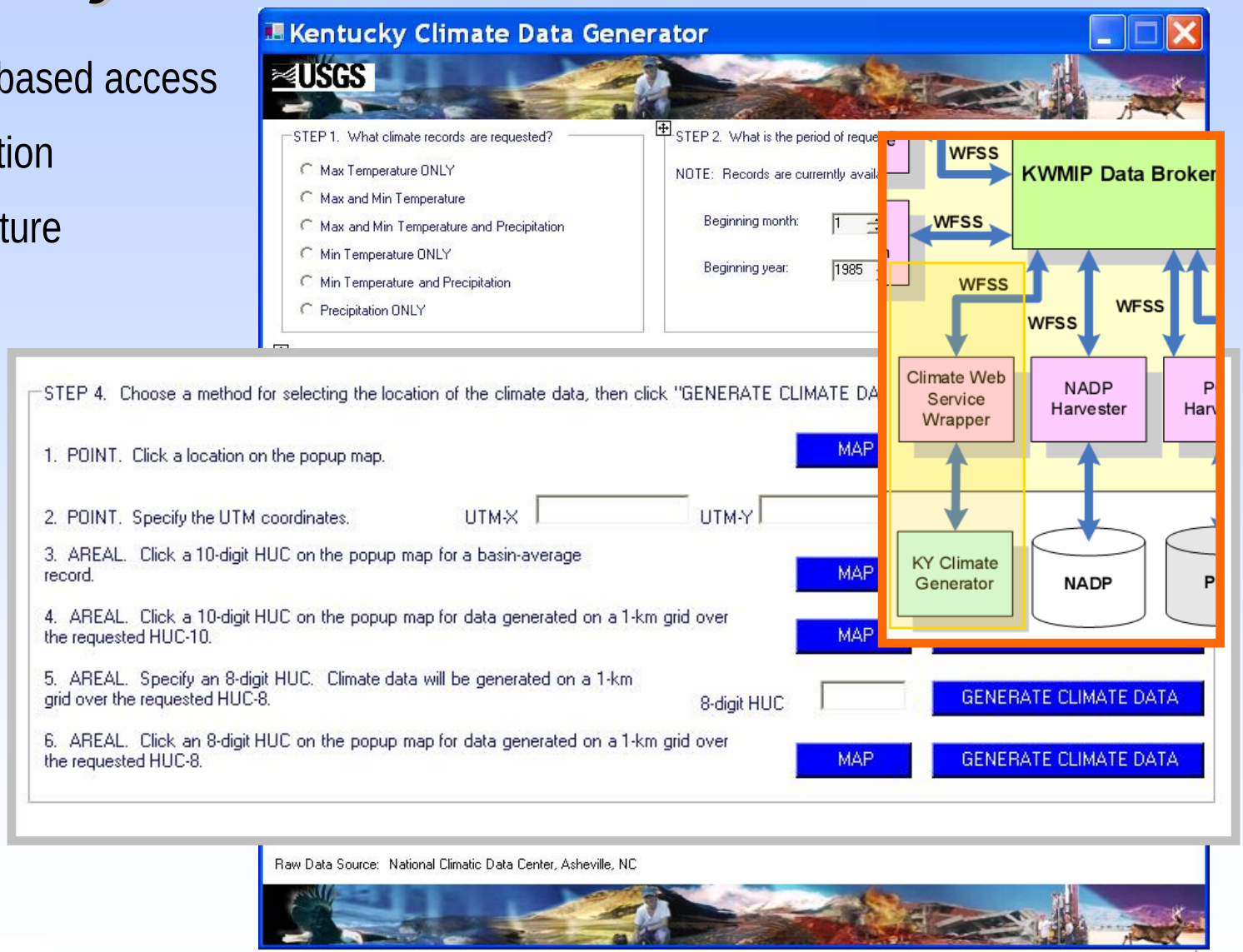
Kentucky Climate Data Generator

Watershed based access

- Precipitation
- Temperature



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KWMIP

KWMIP - Main Page

Access KWMIP → Search for Data → View Available Data → Refine Data Selection → Download Packaged Data

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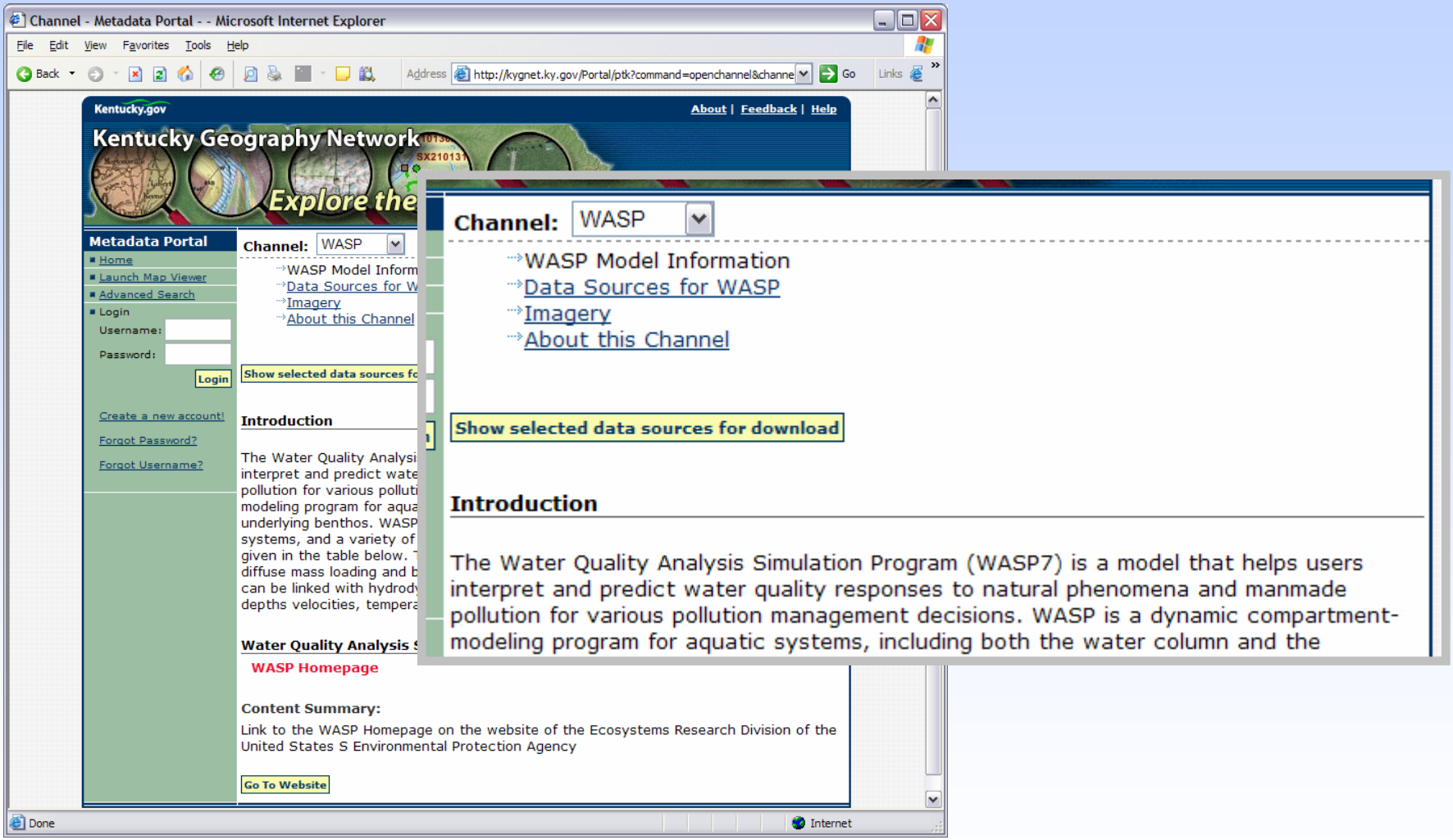
Model (info) Channel Page



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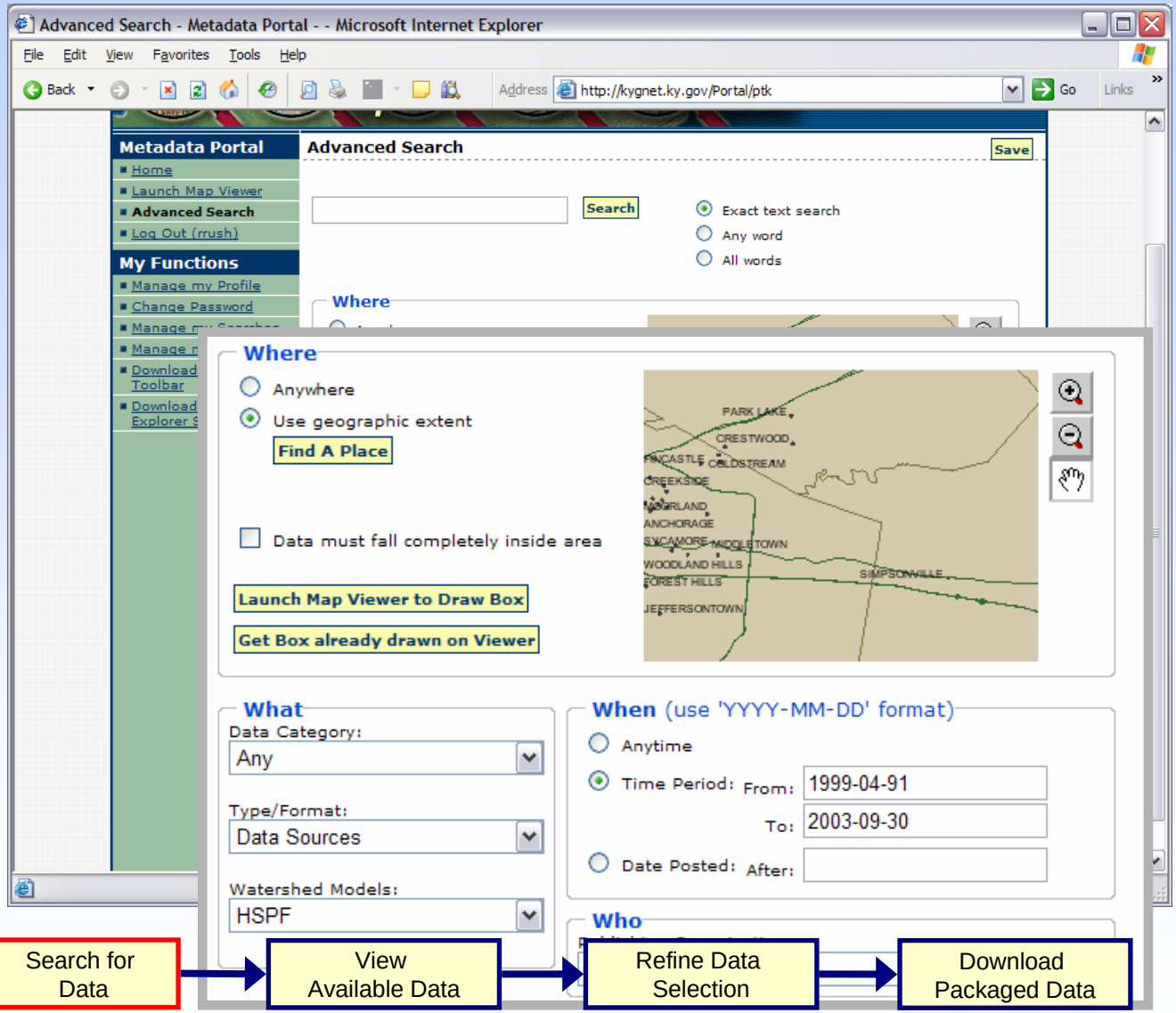
Model-Based Search Criteria

Where?

When?

What?



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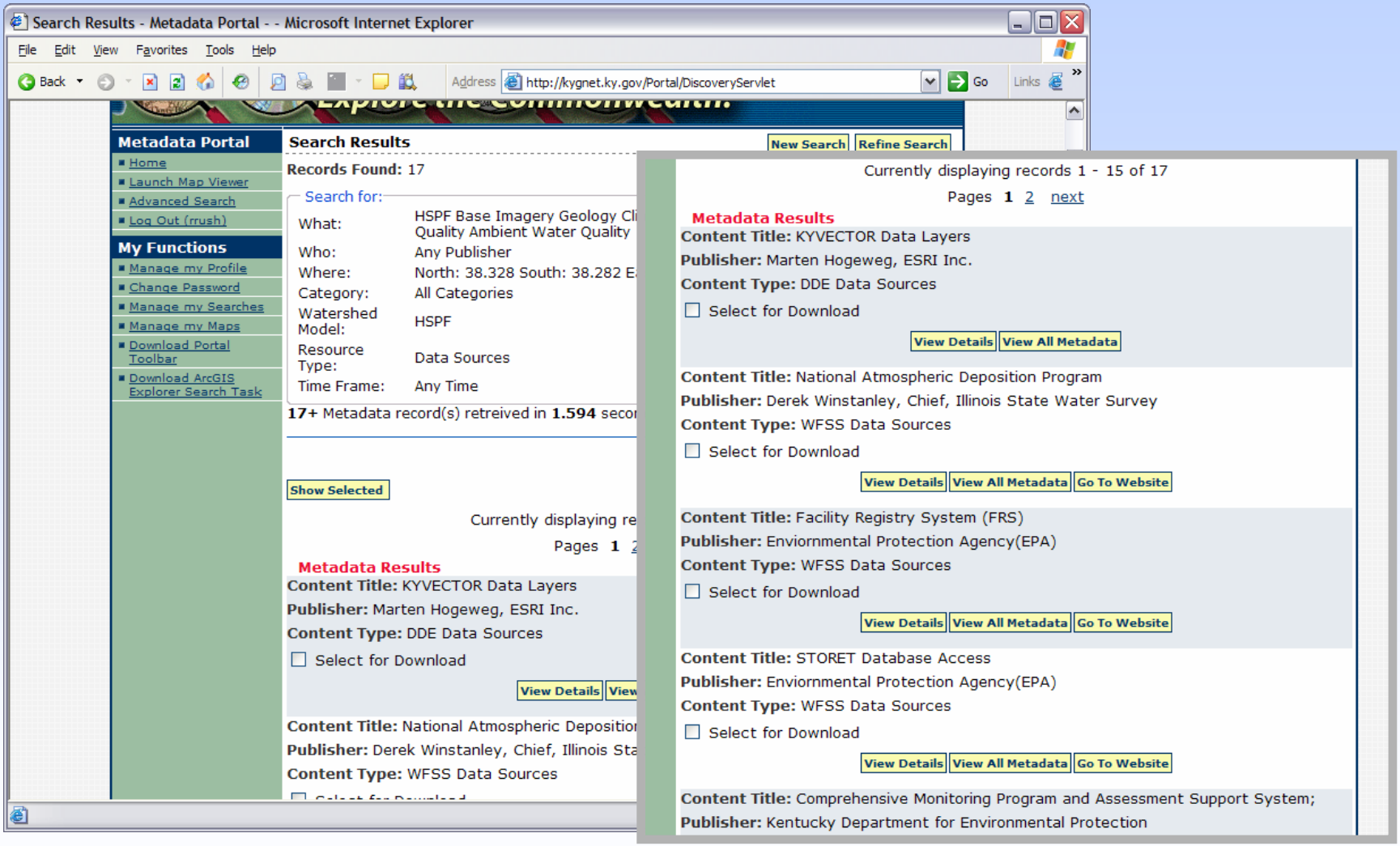
Model-Based Search Results



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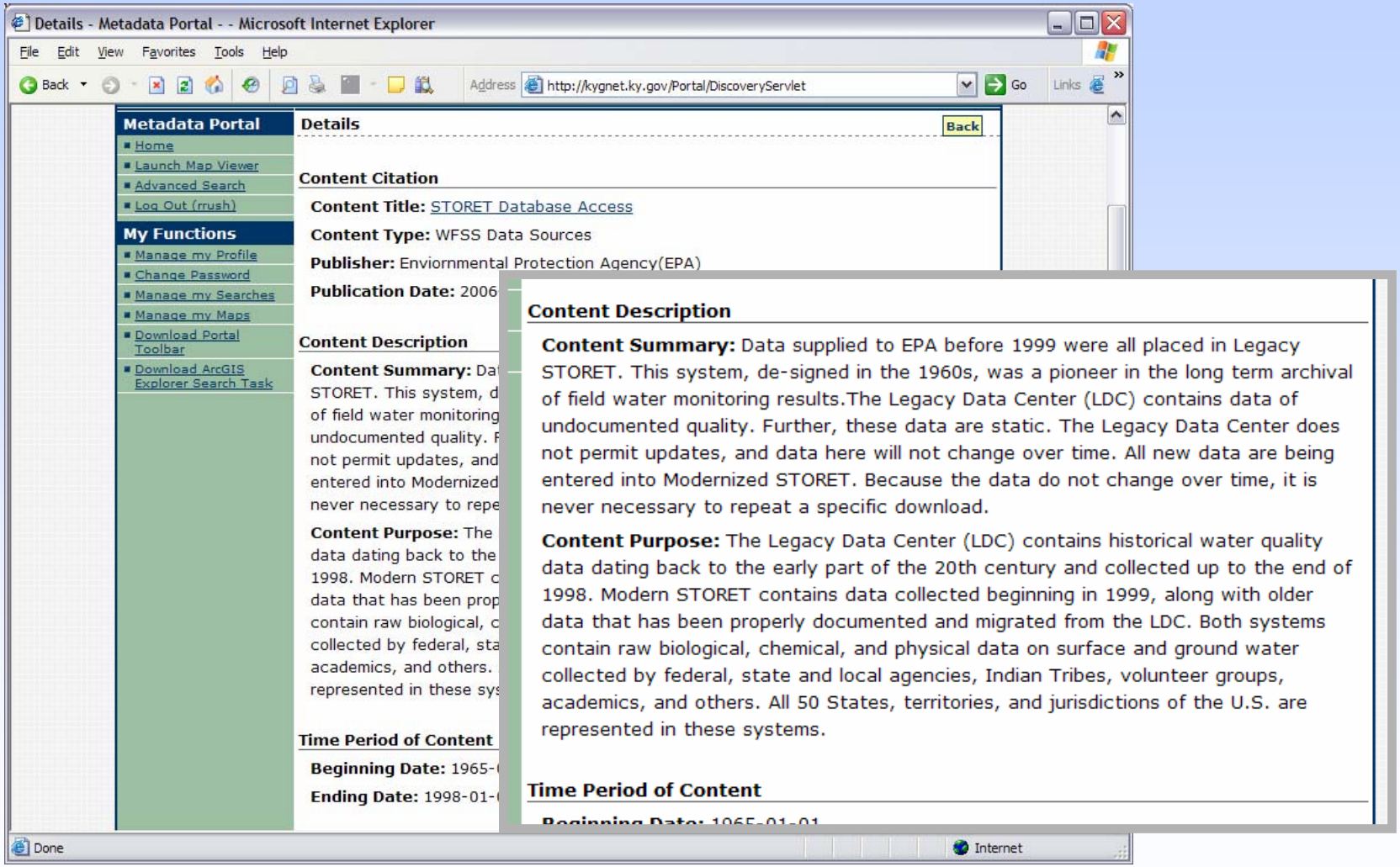
Review Metadata



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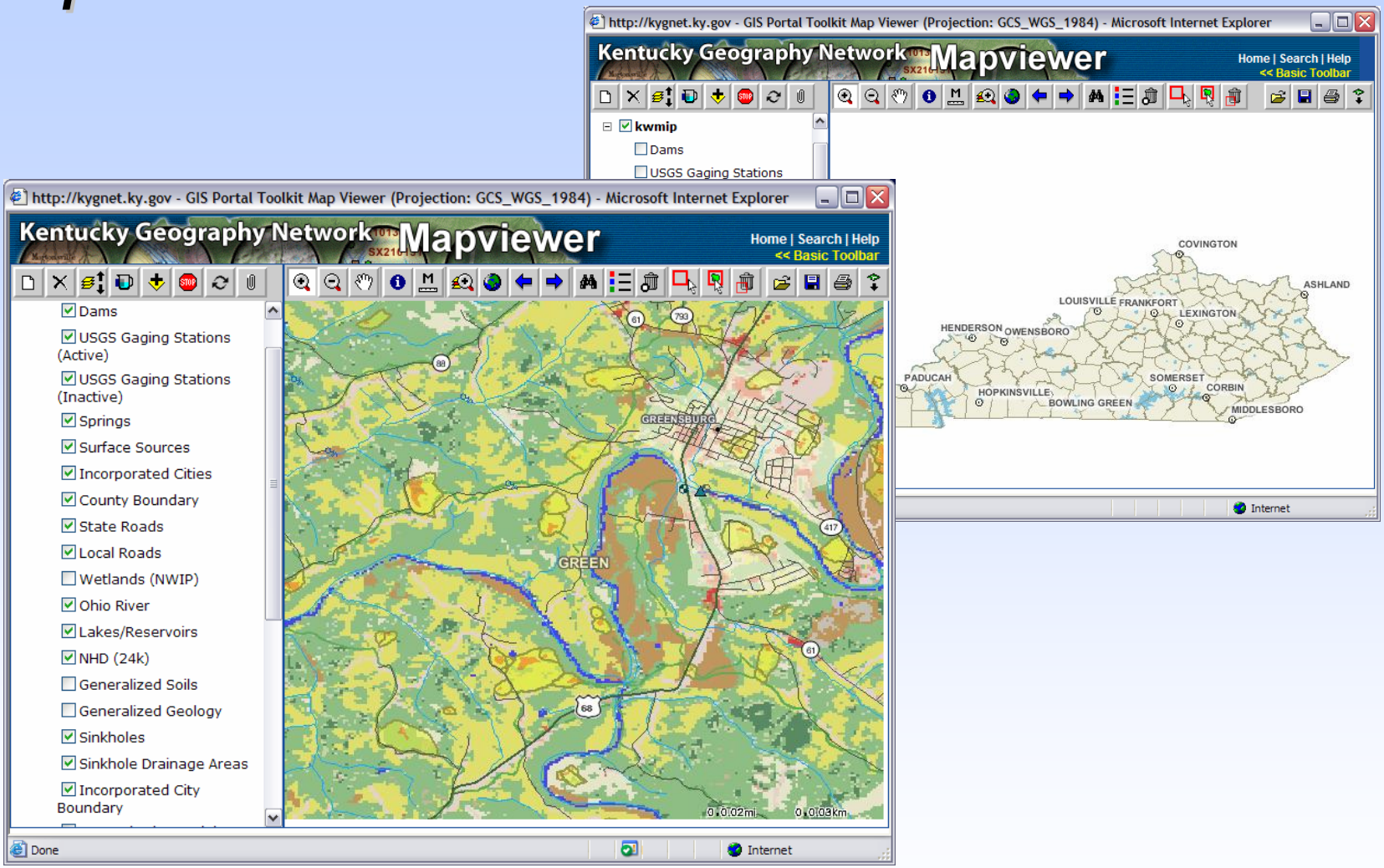
Map Viewer



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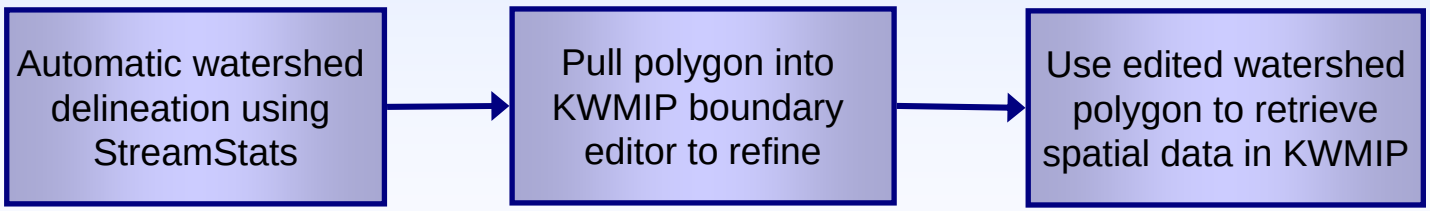
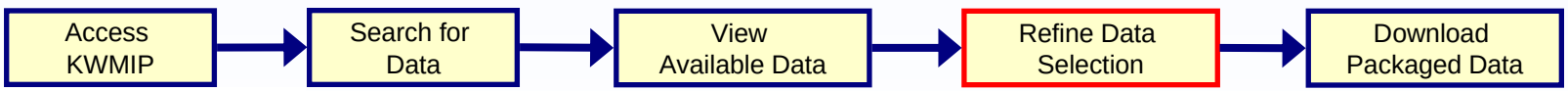
Creating a Spatial Selection

- Use existing system USGS StreamStats to automatically generate watersheds
- Provide the modeler with an interface to refine their watershed boundary polygon prior to submitting data requests
- Bounding box polygon is used to retrieve spatially-related tabular data





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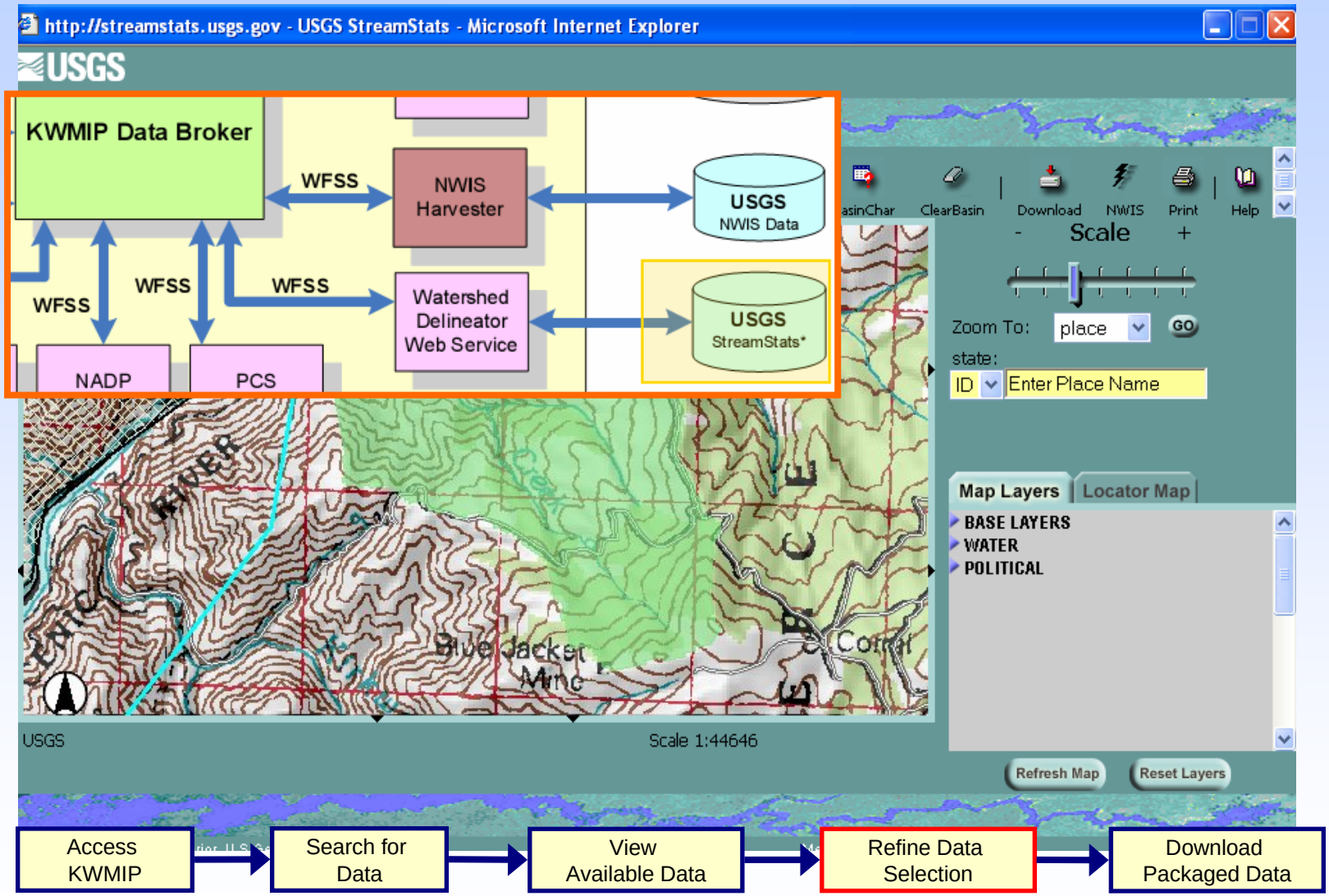
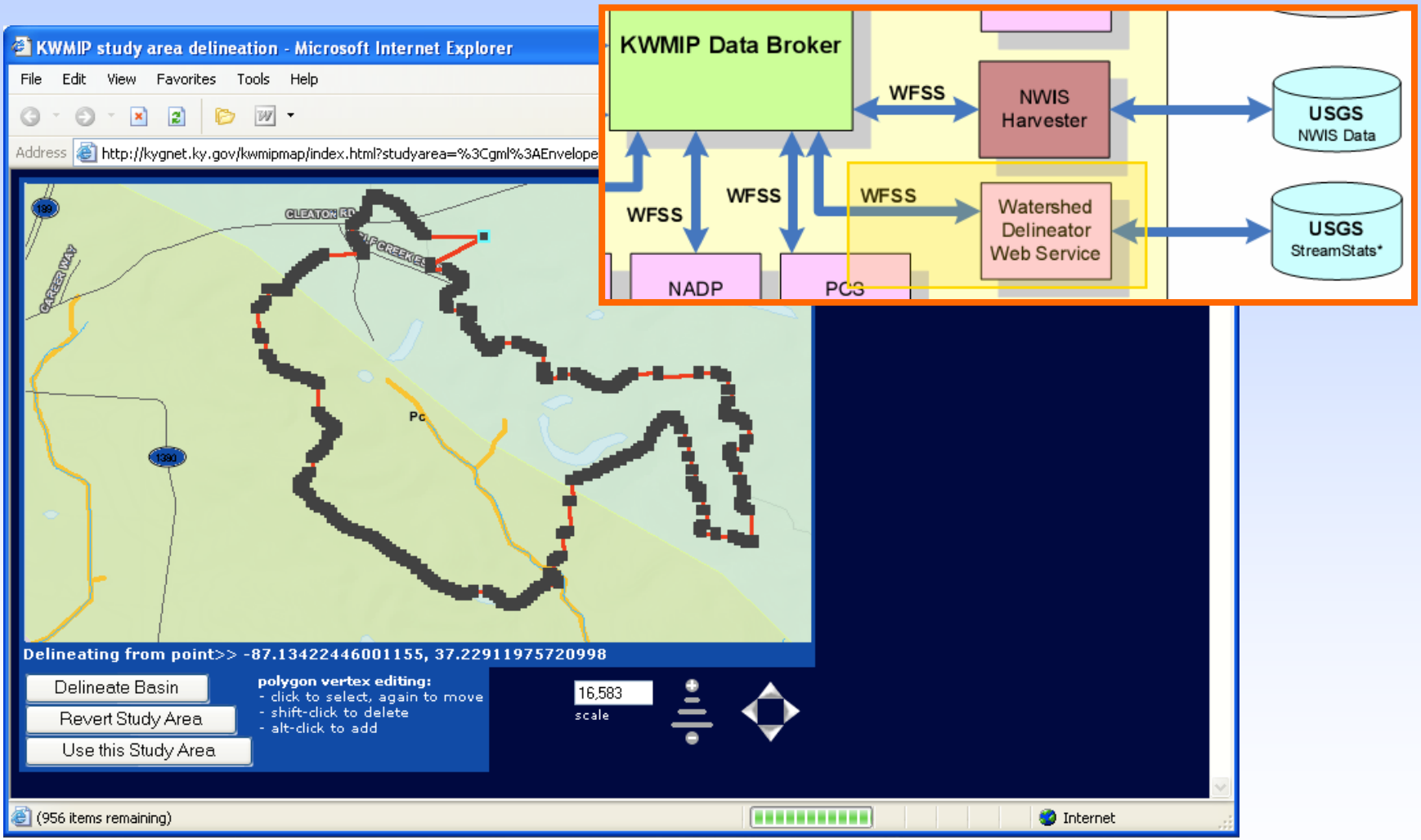
KWMIP Study Area Boundary Generator



Delineate Basins for Study Boundaries



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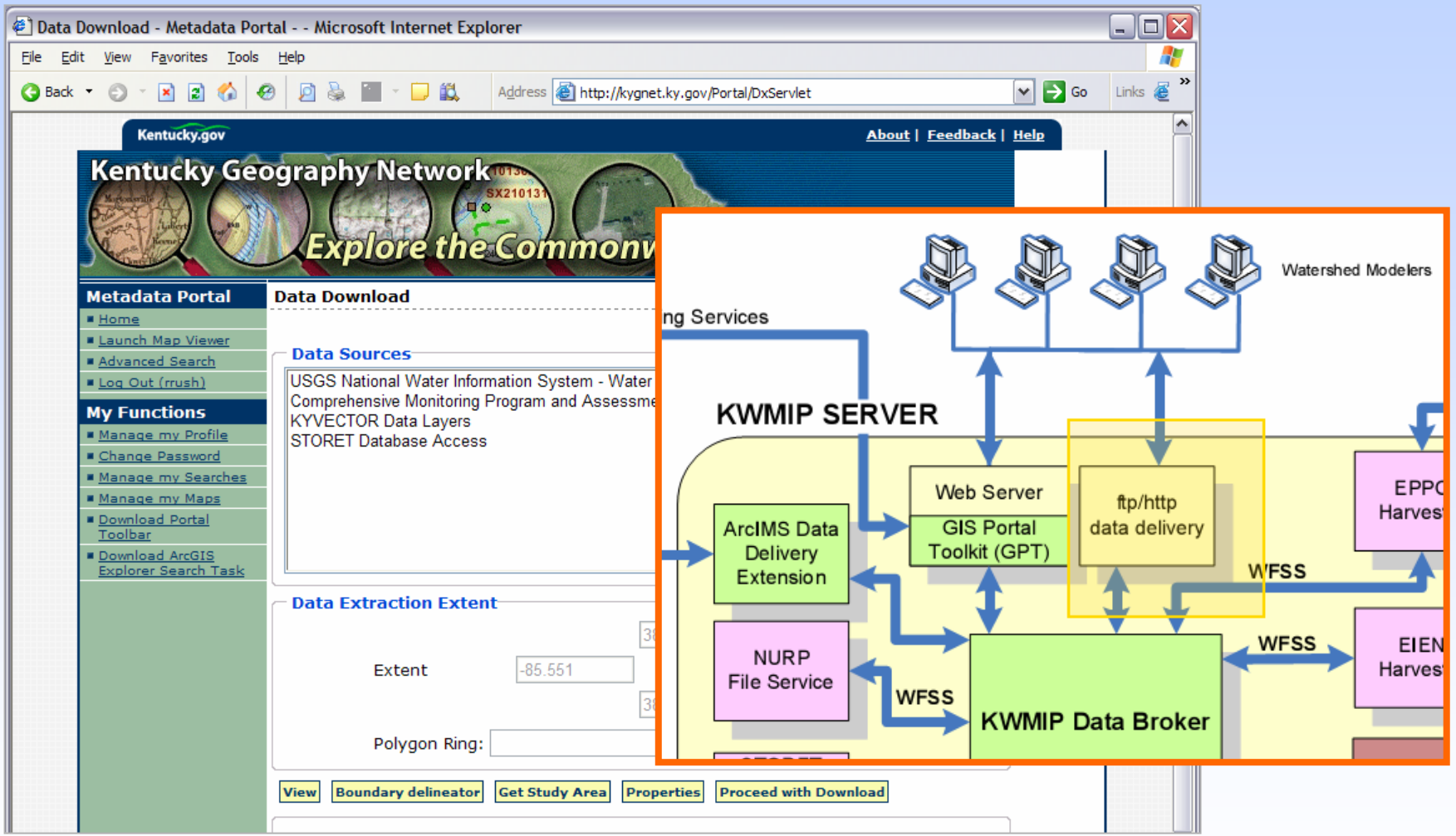
Prepare to Download Data



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Reviewing the Project Vision

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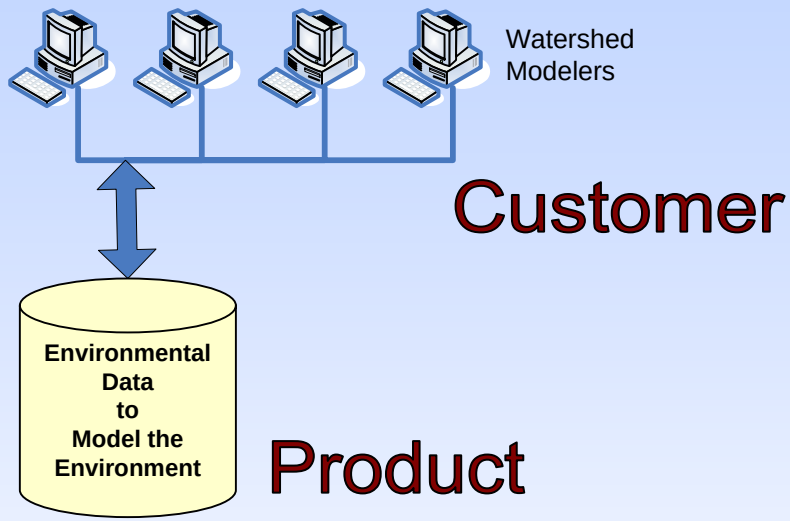

Open Standards Make it Possible!

- Created a platform to build upon by using a service oriented architecture (SOA) – inception of WFS Simple protocol
- Data simply shows up from one request with spatial and temporal parameters to potentially 70 spatial and spatially-related web services
- A better project by:
  - Integrating a pre-built open standard package with project specific solutions
  - Collaboration between a geographically distributed team

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Questions and Contacts

Grant Link: http://www.epa.gov/Networkg/

Exchange Network Link: http://www.exchangenetwork.net/index.htm

KWMIP Website URL: http://kwmip.ky.gov

Build Team

Open Geospatial Consortium Technical Lead: Raj Singh, Ph.D. *rsingh@opengeospatial.org*

FMSM Development Lead: Ray Rush, P.E. *rrush@fmsm.com*

ESRI Development Lead: Marten Hogeweg *mhogeweg@esri.com*

Project Team

Principal Investigator: Demetrio Zourarakis, Ph.D. *demetrio.zourarakis@ky.gov*

Project Coordinator: Karen Schaffer, FMSM Engineers, *kschaffer@fmsm.com*

Open Geospatial Consortium Planning Lead: Sam Bacharach *sbacharach@opengeospatial.org*

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