



Shale Network: Making Knowledge from Numbers

Impoundment of water for hydrofracturing
in the Pennsylvania landscape



Hydrodesktop Demo 5-20-13

Shale Network Team with special thanks to
**Cesar A. Simon, Paul Grieve, Sina Arjmand,
Maggie Peacock, Jon Pollak (CUAHSI),
Patryk Soika, Dave Yoxtheimer,
Radisav Vidic,
Jorge D. Abad**

www.hydrodesktop.org

Where can I get HydroDesktop when I go back home?

- It can be downloaded from
<http://www.hydrodesktop.org/> (click on the "Download" tab and download the latest version of Hydrodesktop and install it on a Windows machine.)
- There is no Mac version; however, this version works on a Mac running the Windows operating system.

What we'll do today

- Open HydroDesktop
- Discuss the overall approach
- Run searches together:
 - Search the metadata catalog for the data we want
 - Download data of interest
 - Use built-in tools to do simple analysis
- Just learning HD: 1) compare Br and Ba in different PA counties
- More advanced HD: (1) and (2) compare Br along river reaches in southwest PA

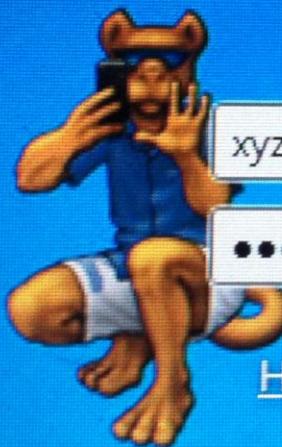
If your computer is not turned on, go ahead and turn it on by moving the mouse or touching a key...



Press CTRL + ALT + DELETE to log on



Type in the info
we gave you to
go online to the
Penn State
system



xyz123

.....

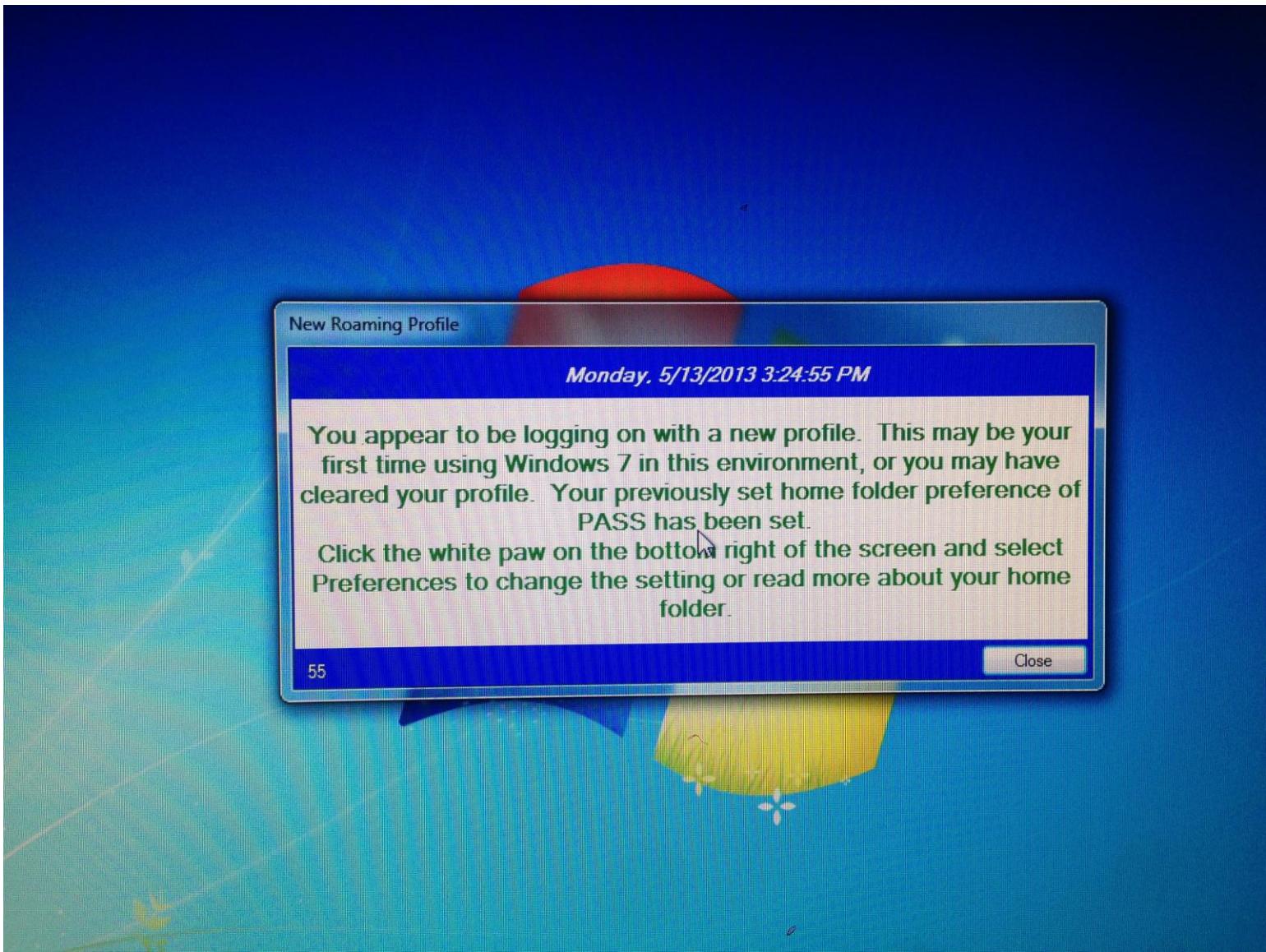


Log on to: dce.psu.edu

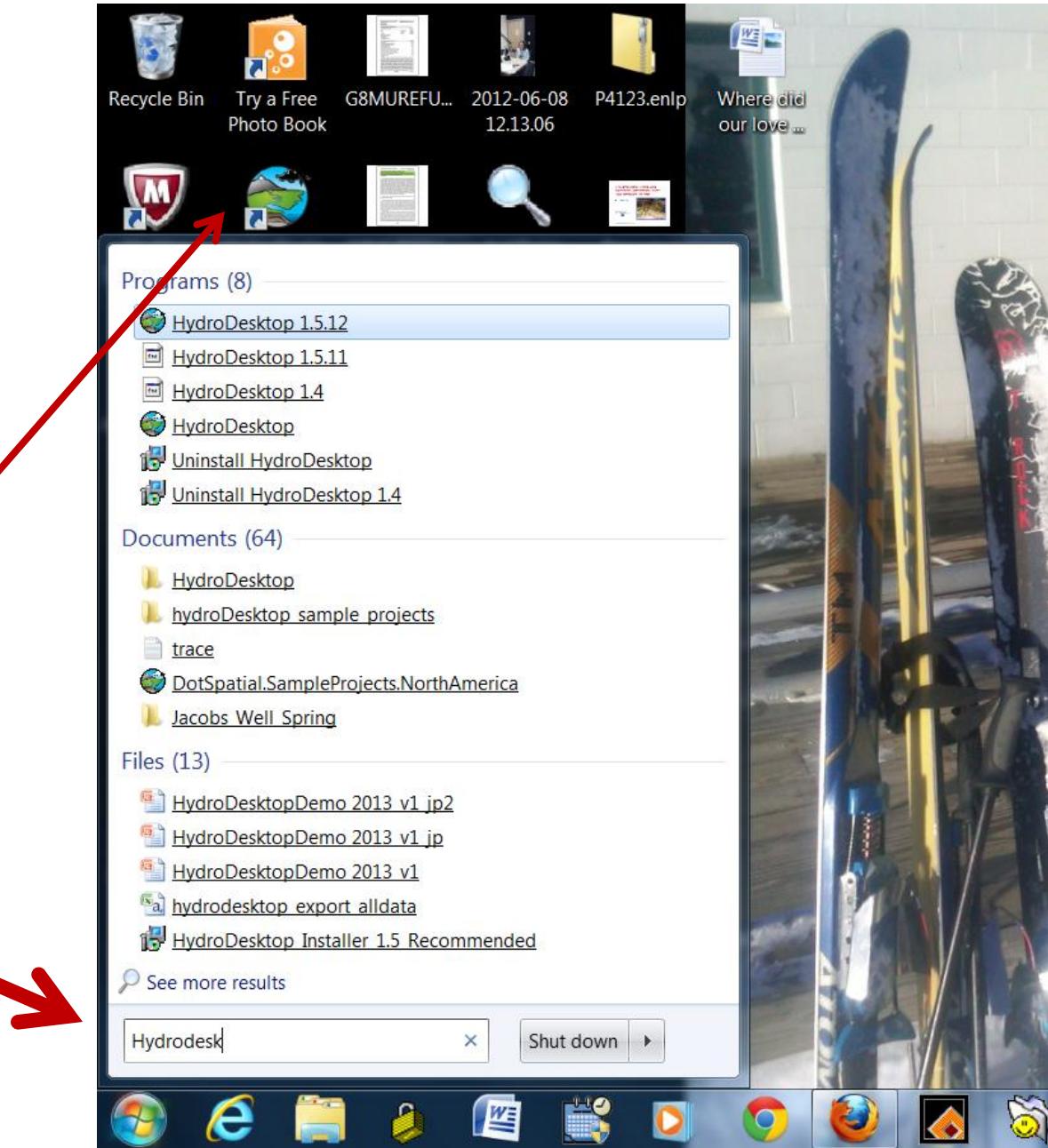
How do I log on to another domain?

Cancel

If you get this screen, hit Enter

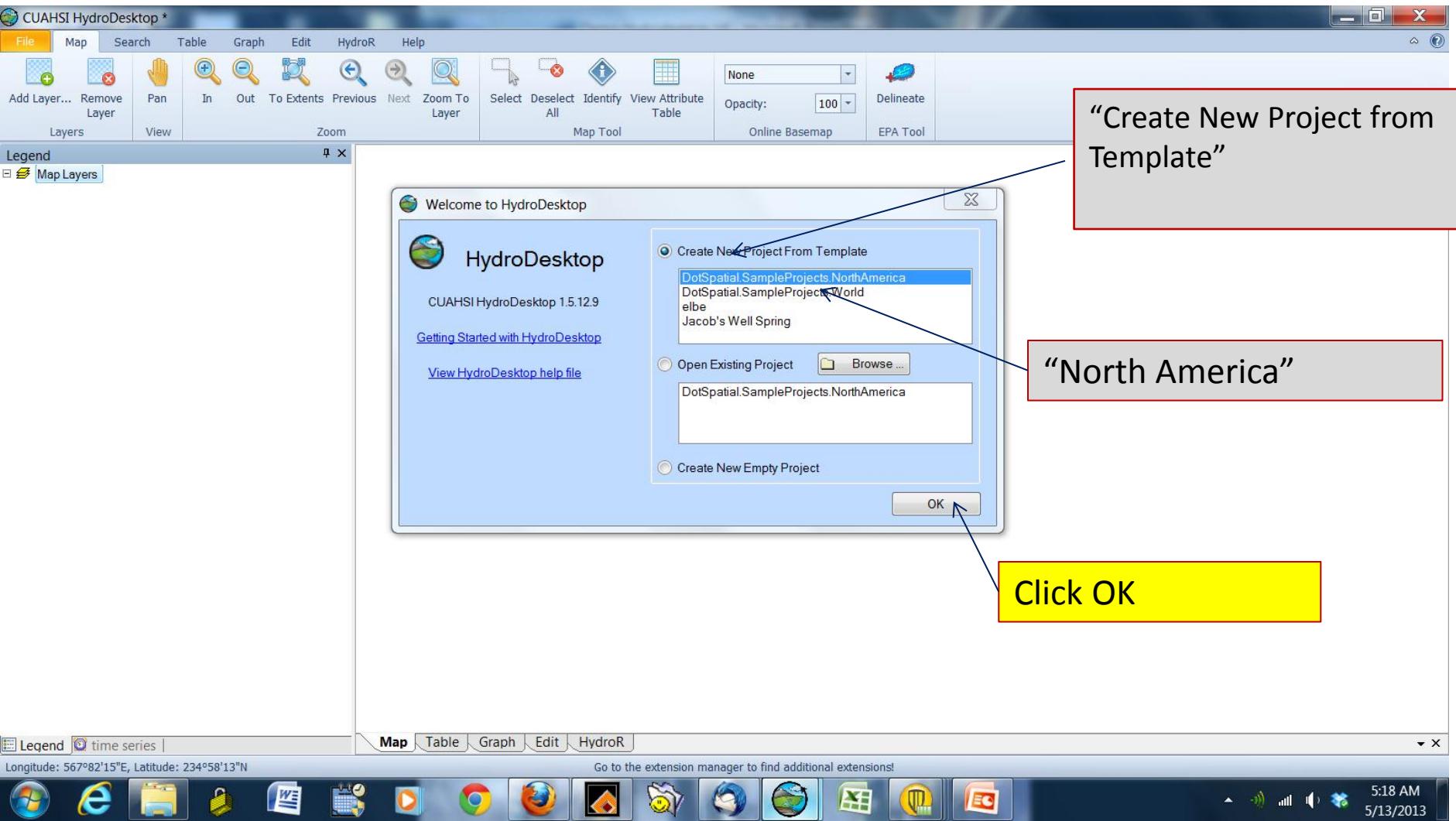


Find HydroDesk-top by clicking on the **Start Button** (**FourSquare-Globe thing**) in the lower left corner, or by typing HydroDesktop into the blank, or by finding the HydroDesktop icon on the desktop and clicking on it...



It opens slowly!

When HydroDesktop opens this is the screen you see...hit **OK**....then wait (it is slow to open)



Every member of Shale Network or Penn State --

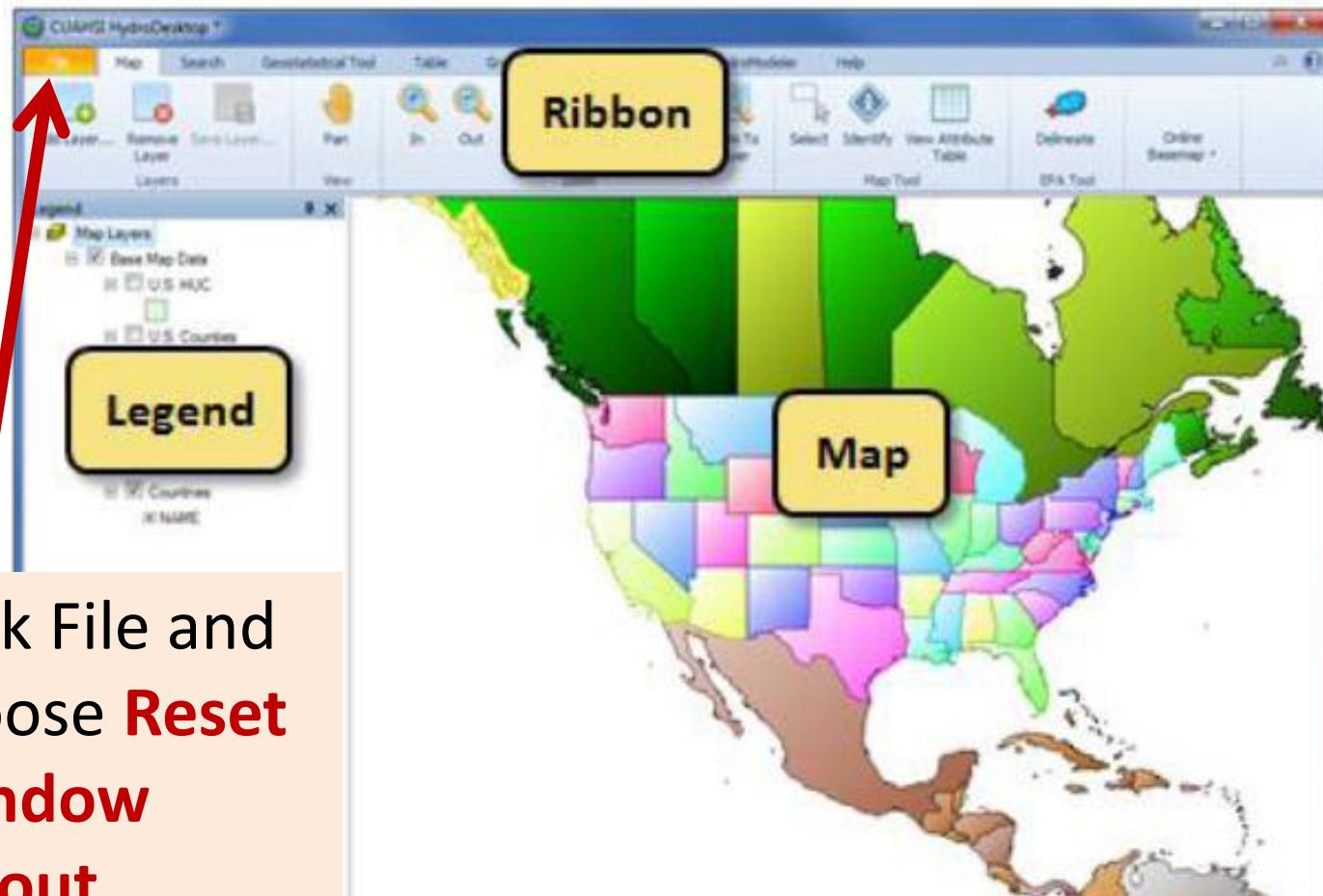
Please raise your hand.. please ask for help from any of these folks for help before you get lost! If you fear you will need lots of help, please stand up and we will move a Penn Stater or Shale Networker right next to you

First screen you see: Map Interface



Each “thing” listed in the legend is a **layer** and corresponds to a shape file –the file that has the info that is plotted on the map

If you ever lose this layout...

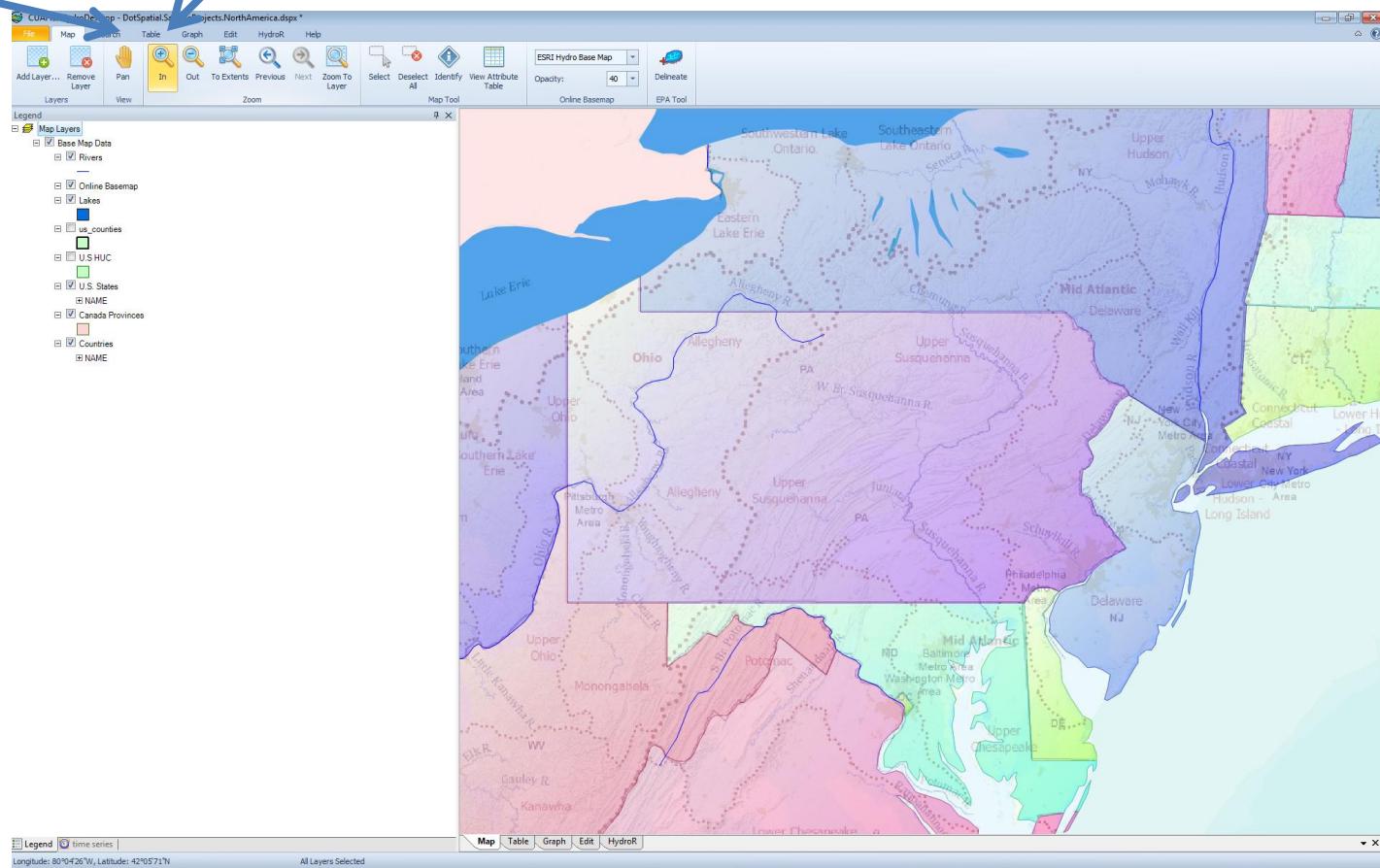


Click File and
choose **Reset
Window
Layout**

This is an amazing piece of software and it is under active development by scientists around the country. This is a collaborative effort. Unfortunately, there are glitches and you will most likely discover some of them.

To play, you can choose the Pan “Hand” and move to PA, and choose (Magnifying glass +) to expand (it works like Google Maps)

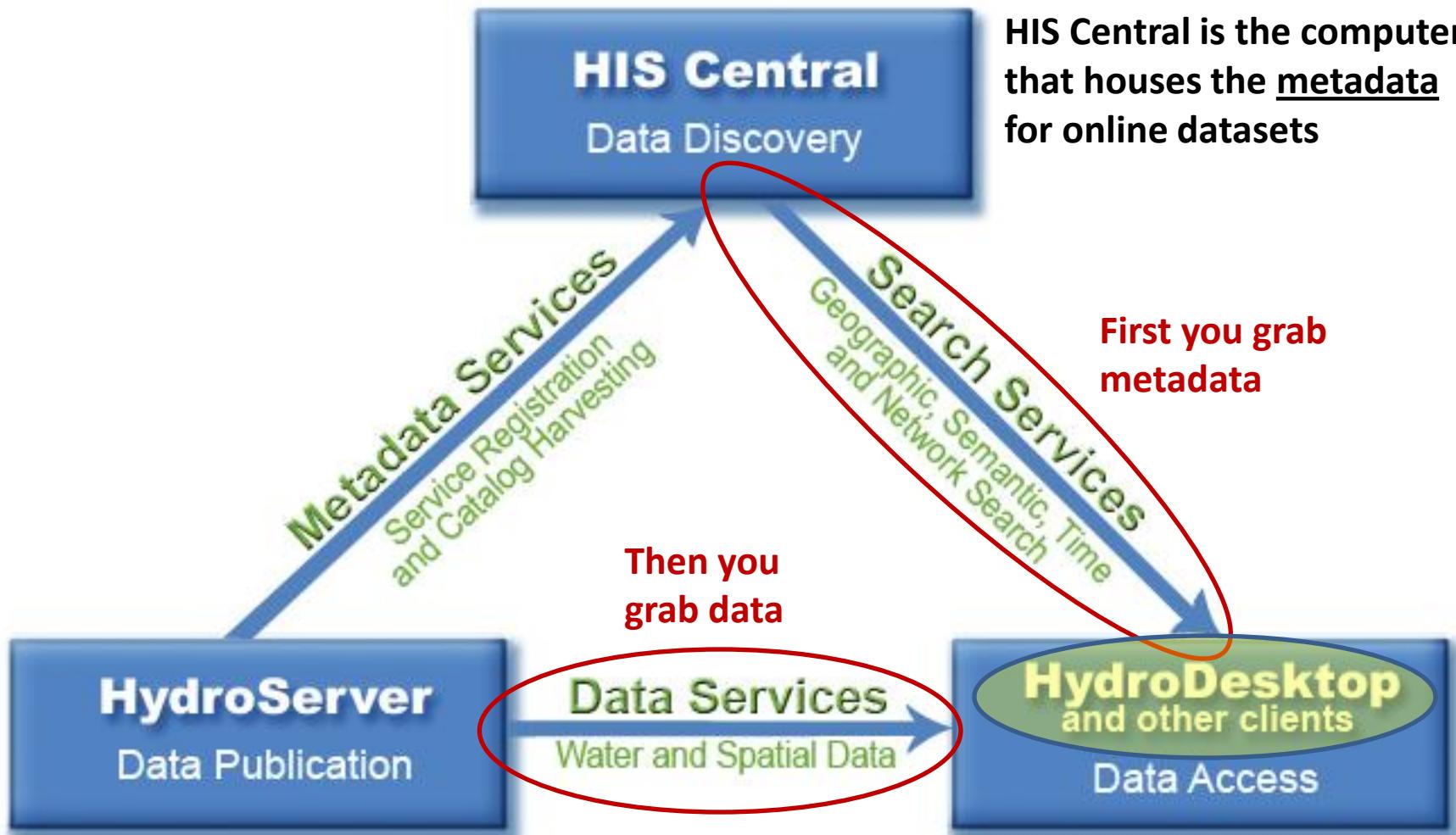
Use the Pan and Zoom tools, located on the map ribbon, to navigate to Pennsylvania.



We will try one or two different searches (or more in Advanced room?)

- (1) Each person in the room will pick a different county in PA or WV (your choice) and we will look at Br, then Ba, in the surface waters in that county...We will ask, **do we see differences?** We will write the high values for each county on board
- (2) Each person will look at Br in rivers in southwestern PA to assess variations in Br concentrations along the reach, and as a function of discharge

What is the Hydrologic Information System?



Hydroservers are computers around world that post online data



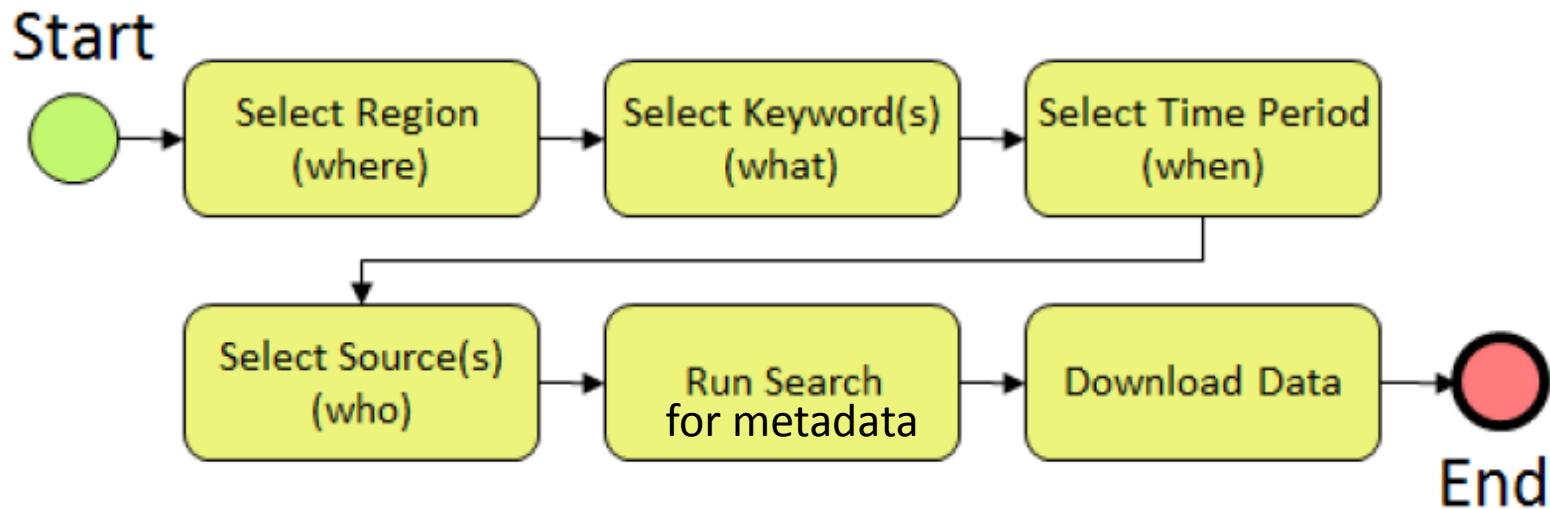
HydroDesktop is the computer program that helps you pull the metadata and data onto your home computer

I can't remember the difference between **data** and **metadata**

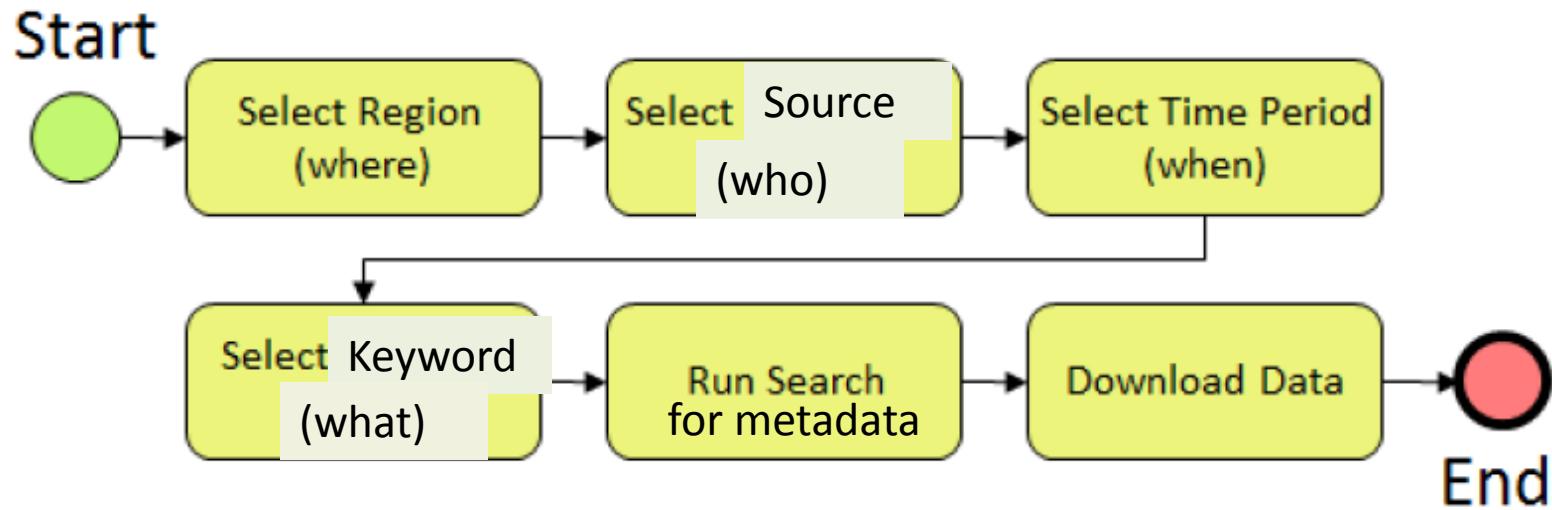
- The **data** is the number that was measured (concentration, flow rate, etc.)
- **Metadata** is all the other stuff you need to know to understand how to think about that number (how the sample was taken, what type sensor was used, where measurement was made, units, time, quality information, analytical technique, etc.)
- Metadata answers all the questions, **Who? What? Where? When? How?**
- Metadata is why this data system seems so complicated – if we just stored the data values alone, that would not be so hard



This is the standard approach to finding data

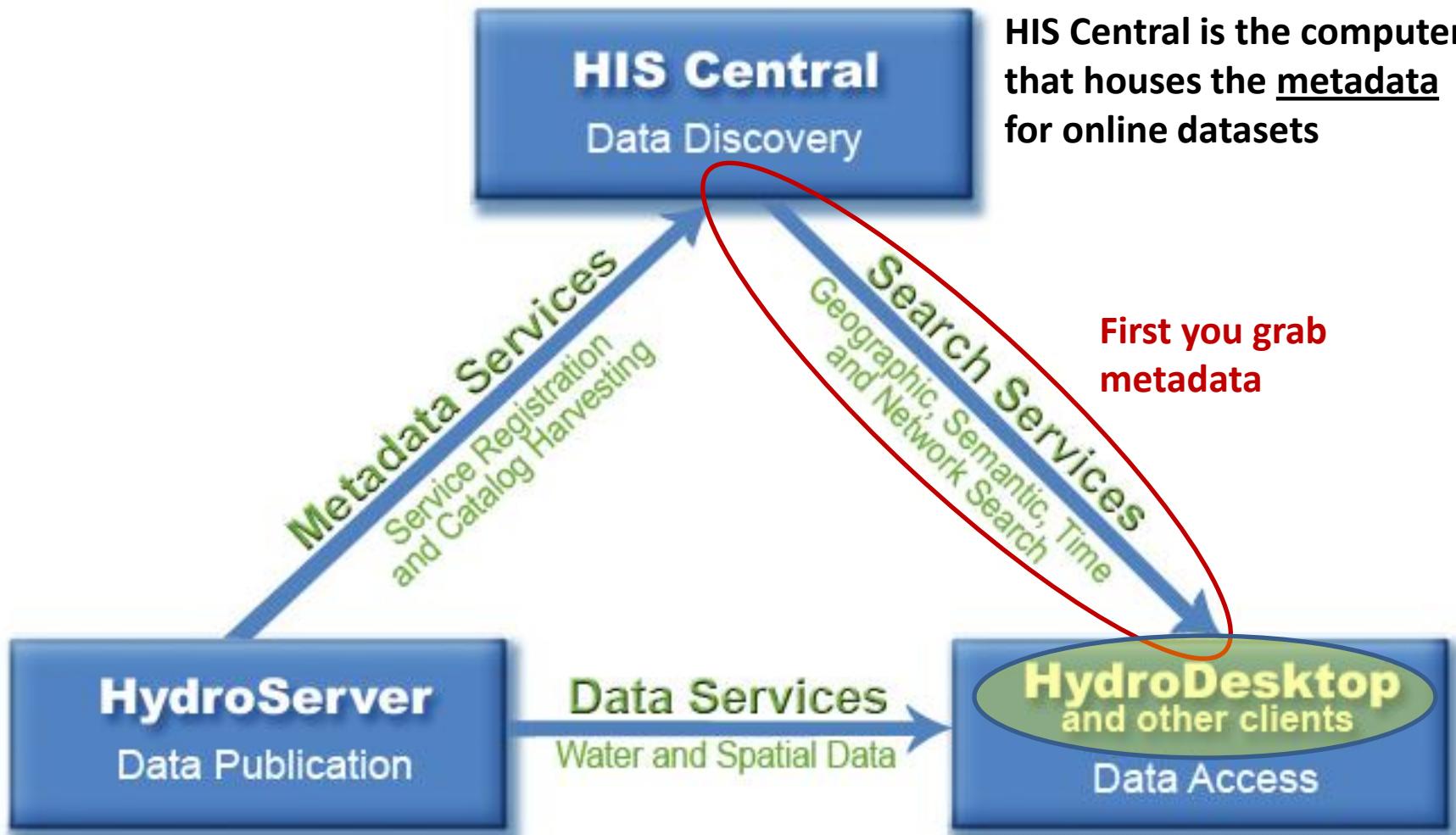


To avoid a glitch, this is how we will proceed



This is an amazing piece of software and it is under active development by scientists around the country. This is a collaborative effort. Unfortunately, there are glitches and you will most likely discover some of them.

What is the Hydrologic Information System?

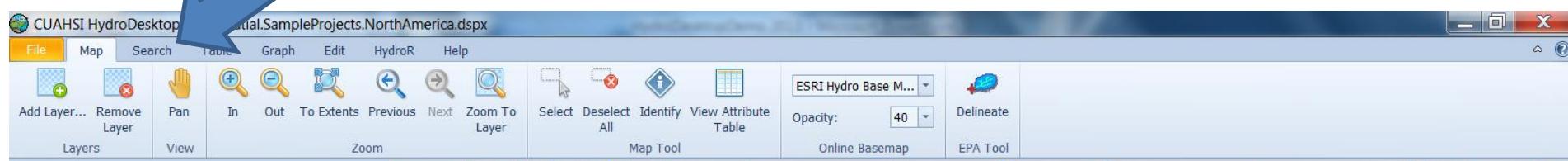
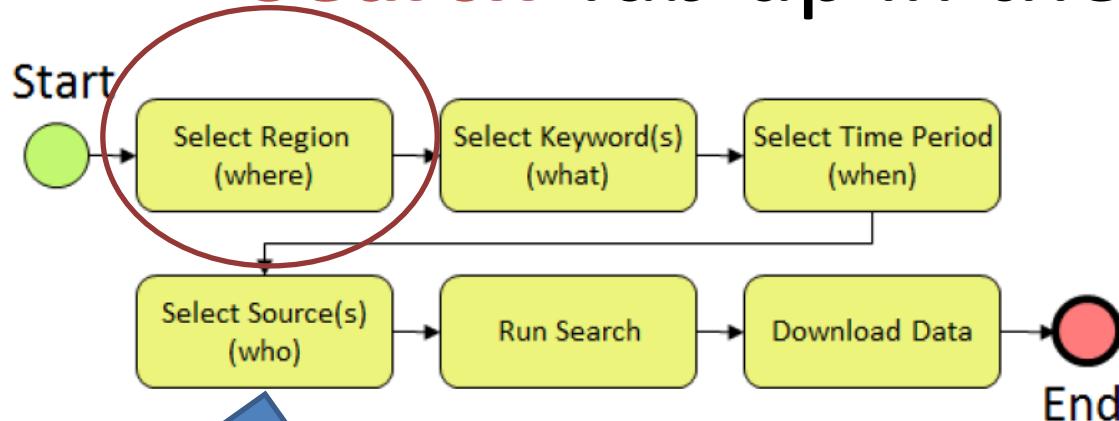


Hydroservers are computers around world that post online data



HydroDesktop is the computer program that helps you pull the metadata and data onto your home computer

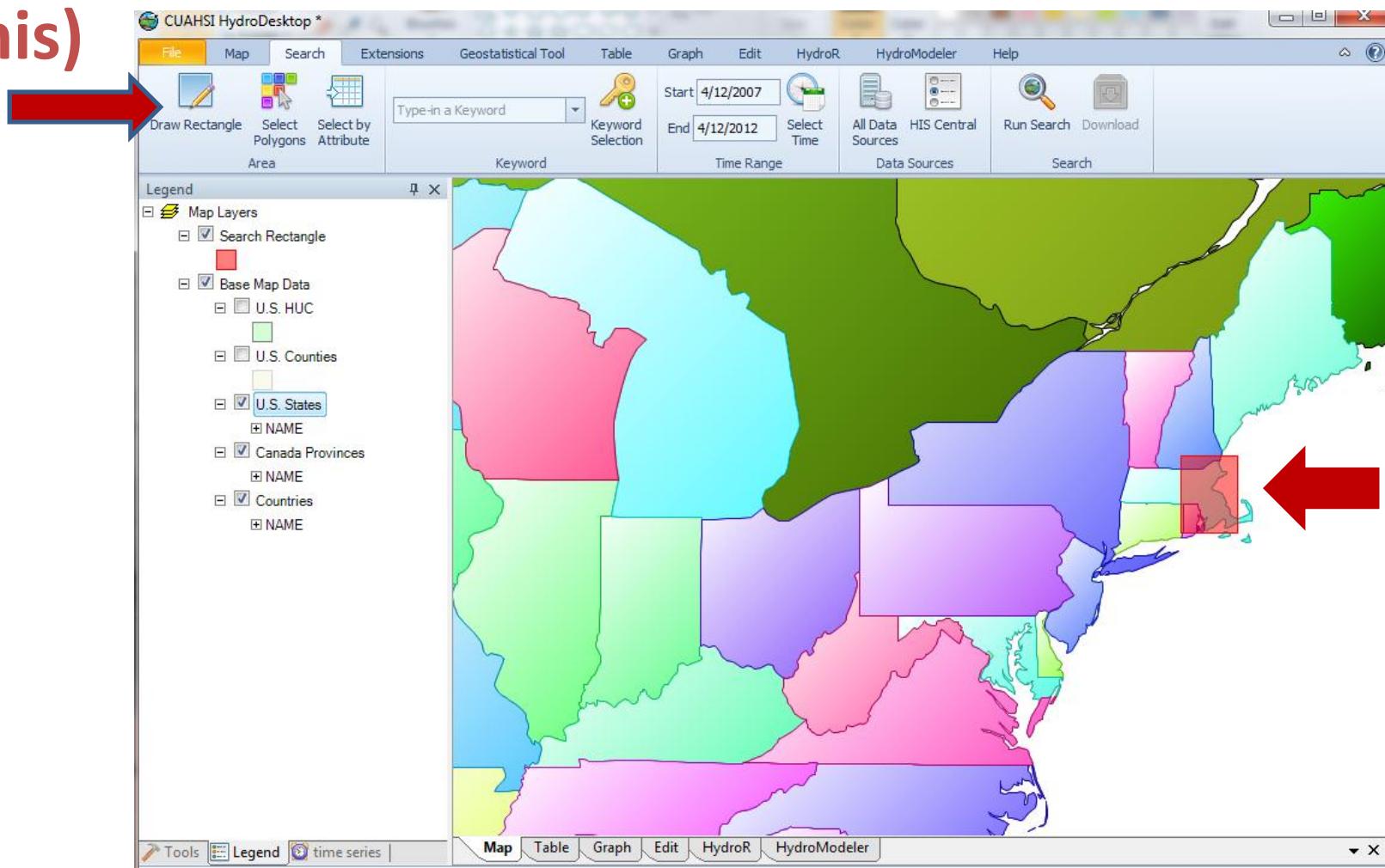
To start the search for Data...Open Search Tab up in the Ribbon



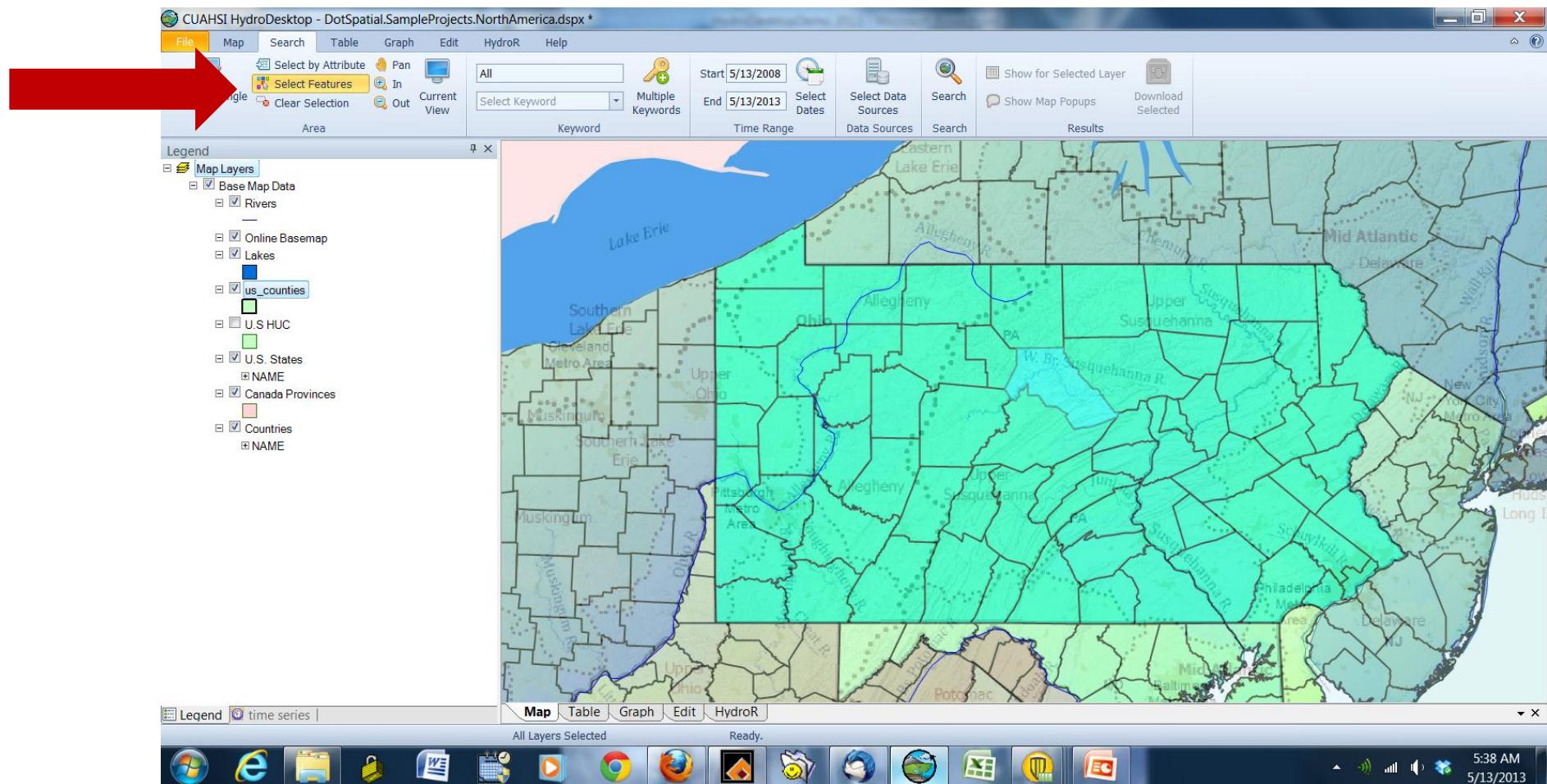
There are four ways to set the region to search

The first way (**don't do this**) to set a region under the Search Tab:

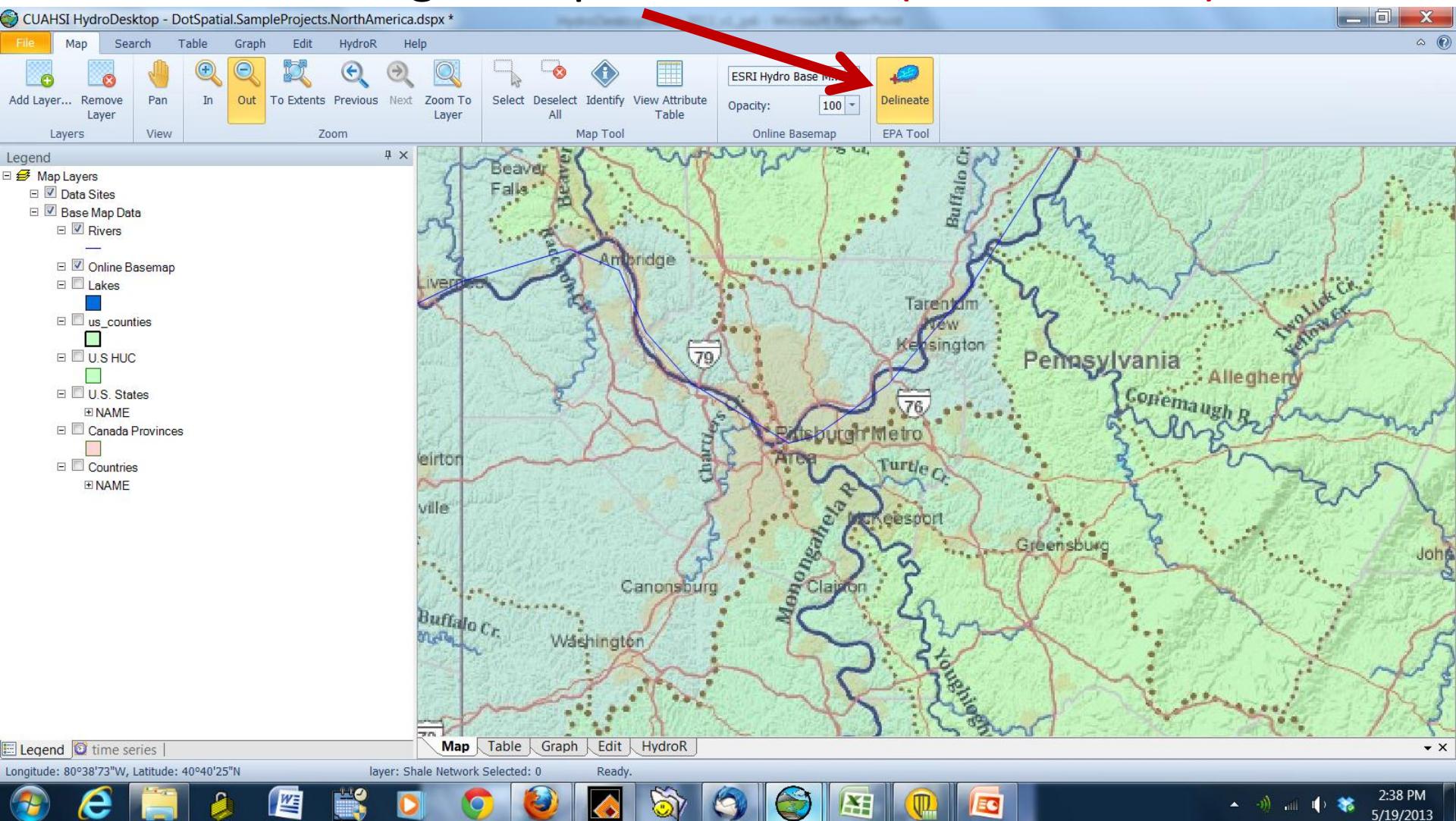
- Draw Rectangle to define a search (**don't do this**)



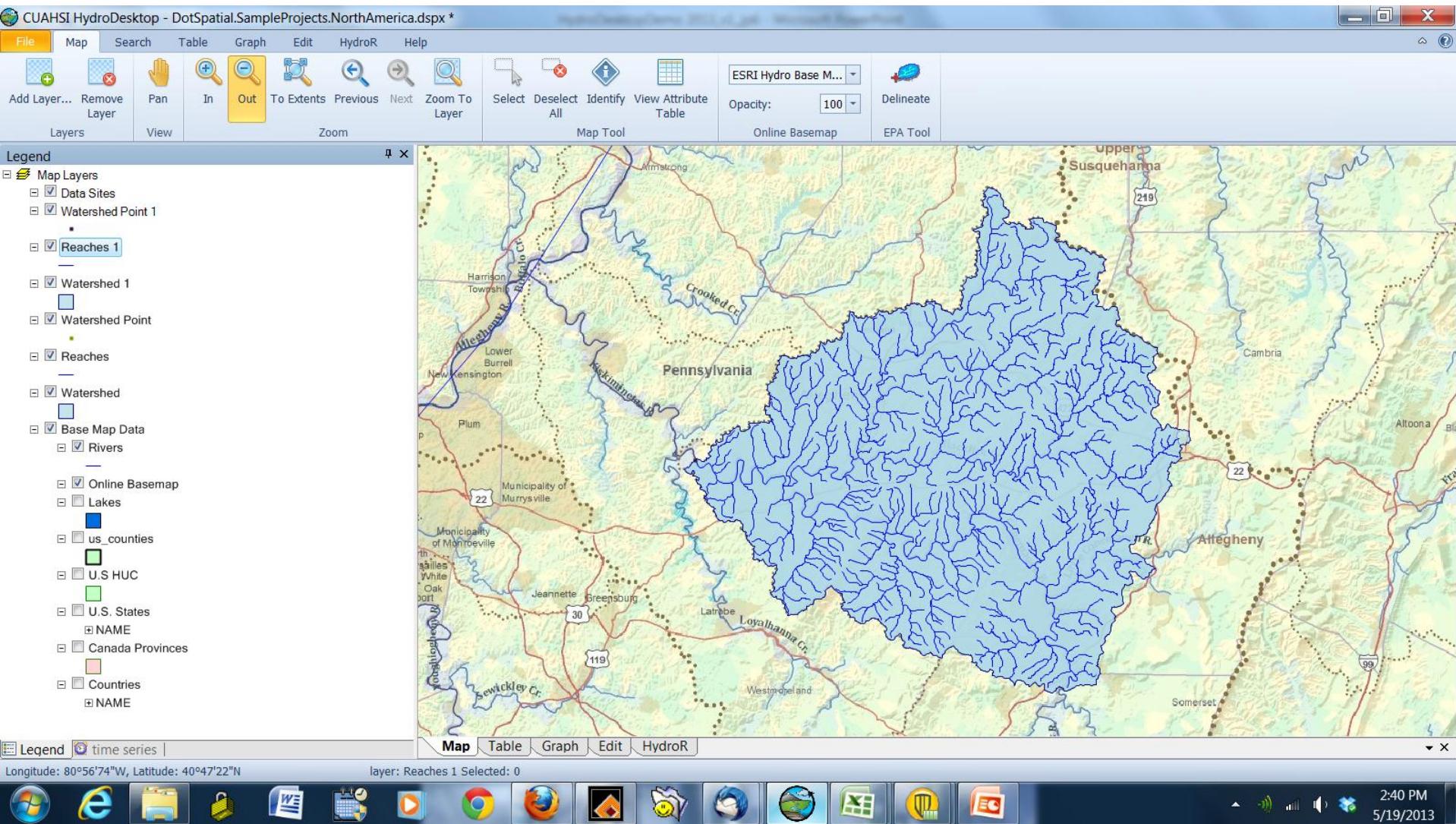
The second way (**don't do this**) to delineate a region under the **Search Tab: Select Features** and click on a polygon on the map



The 3rd way to do this is to choose a watershed using the delineate tool by clicking **Delineate** and then touching one spot on a river (**don't do this**)

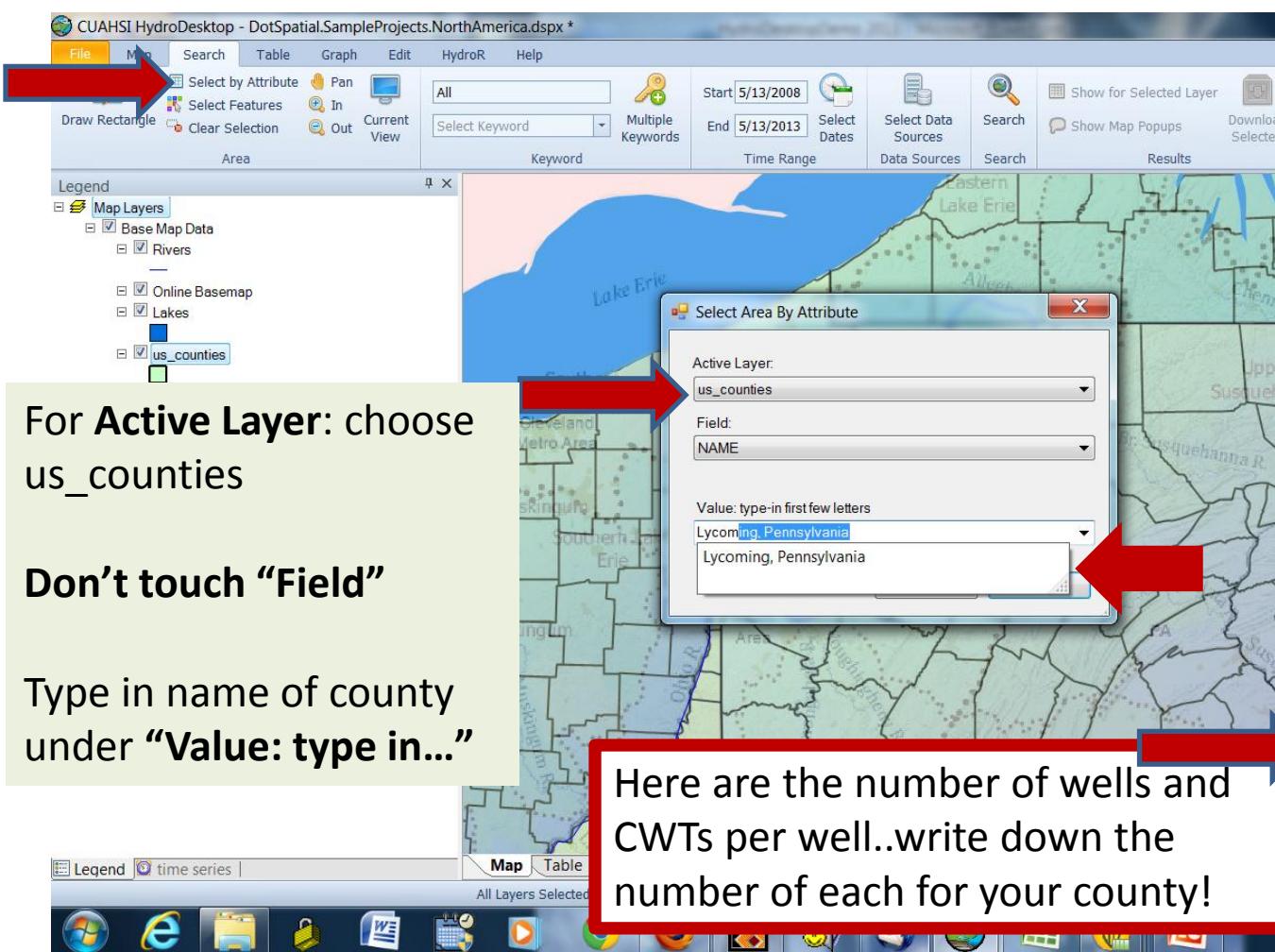


Delineating the upper part of the Conemaugh River watershed



The 4th way to delineate a region under the Search Tab: Please do this!

- Select by **Attribute** (i.e. County)..this is how you will choose your county. Please choose your home county or a favorite county with unconventional gas wells



	wells	CWTs
ALLEGHENY	22	
ARMSTRONG	145	1
BEAVER	23	
BEDFORD	1	
BLAIR	6	
BRADFORD	1107	
BUTLER	174	
CAMBRIA	5	
CAMERON	14	
CENTRE	63	
CLARION	29	
CLEARFIELD	149	
CLINTON	84	
COLUMBIA	2	
CRAWFORD	2	
ELK	59	
ERIE	1	
FAYETTE	231	1
FOREST	18	
GREENE	517	
HUNTINGDON	1	
INDIANA	42	1
JEFFERSON	40	
LACKAWANNA	1	
LANCASTER	0	1
LAWRENCE	19	1
LYCOMING	659	3
MCKEAN	59	2
MERCER	3	
POTTER	65	
SOMERSET	20	
SULLIVAN	68	
SUSQUEHANNA	642	1
TIOGA	808	1
VENANGO	4	
WARREN	4	
WASHINGTON	725	
WAYNE	5	
WESTMORELAND	228	
WYOMING	110	
	6155	1

Waterways impacted by larger spills

2008 to 2011, spills > 400 gallons

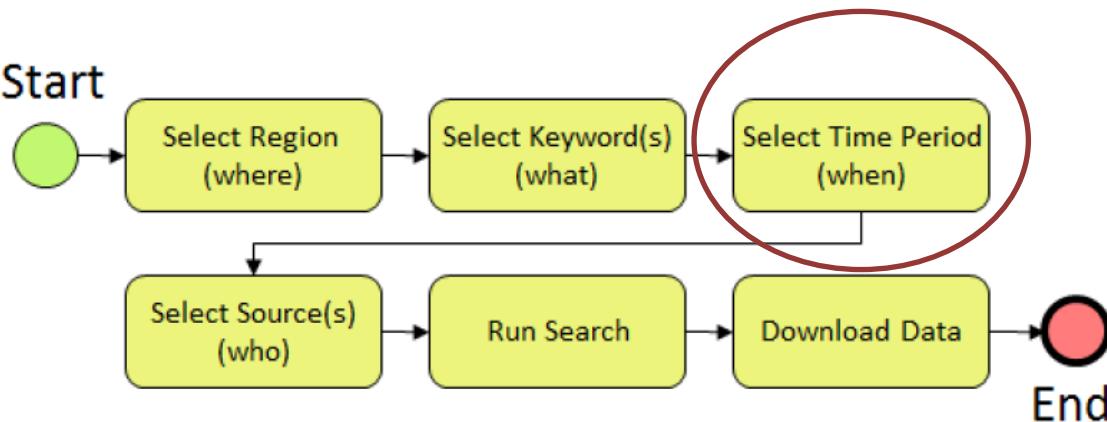
- Pine creek (Lycoming, Airfoam)
- Stevens creek (Susquehanna, flowback)
- Brush run (Washington, flowback)
- Little Laurel creek (Clearfield, flowback)
- Dunkle creek (Hopewell, frack fluid)
- Towanda creek (flowback)
- Ten mile creek tributary (Washington, mud)

Sept 2012-March 2013 (all < 400 gallons)

- Harts Run (Sullivan, bentonite)
- Jacobs creek (Westmoreland, drilling mud)
- Mill creek (Sullivan, sediment)
- Black Water run (Sullivan, turbid discharge)
- Slack run tributary (Lycoming, sediment)
- Blacklick creek (Indiana, bentonite)
- Muncy creek (Lycoming, sediment)
- Thorn creek (Butler, drilling fluids)
- Wellmans creek, Salt Lick creek (Sullivan, discharge)
- Brion creek (Lycoming, hydrostatic test water and sediment)
- Big Bottom run (Sullivan, sediment)

Search for Data by setting Time Range

Start



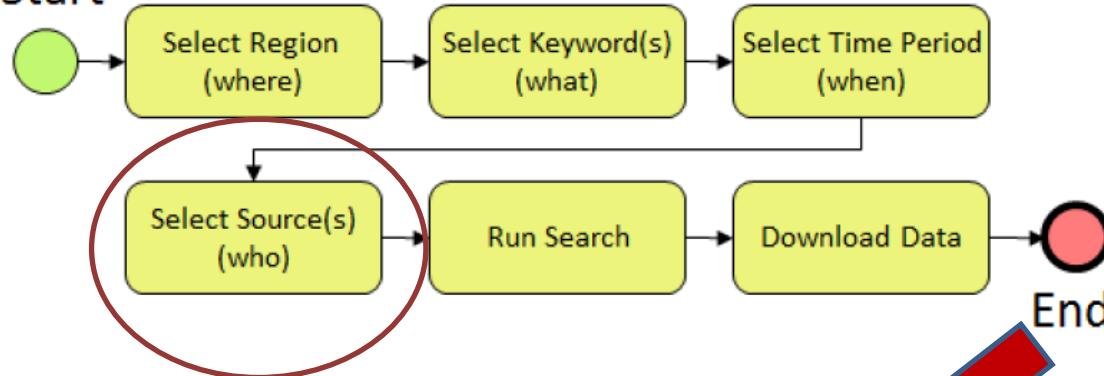
End



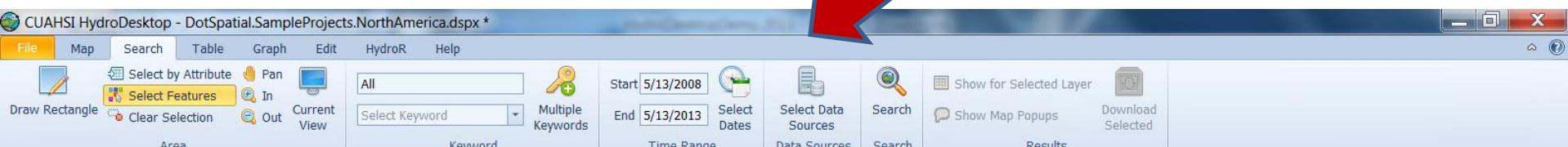
Use the default value or type in a
different range of interest..we suggest
1/1/1960 to today

Search for Data Source...click on Select Data Sources

Start

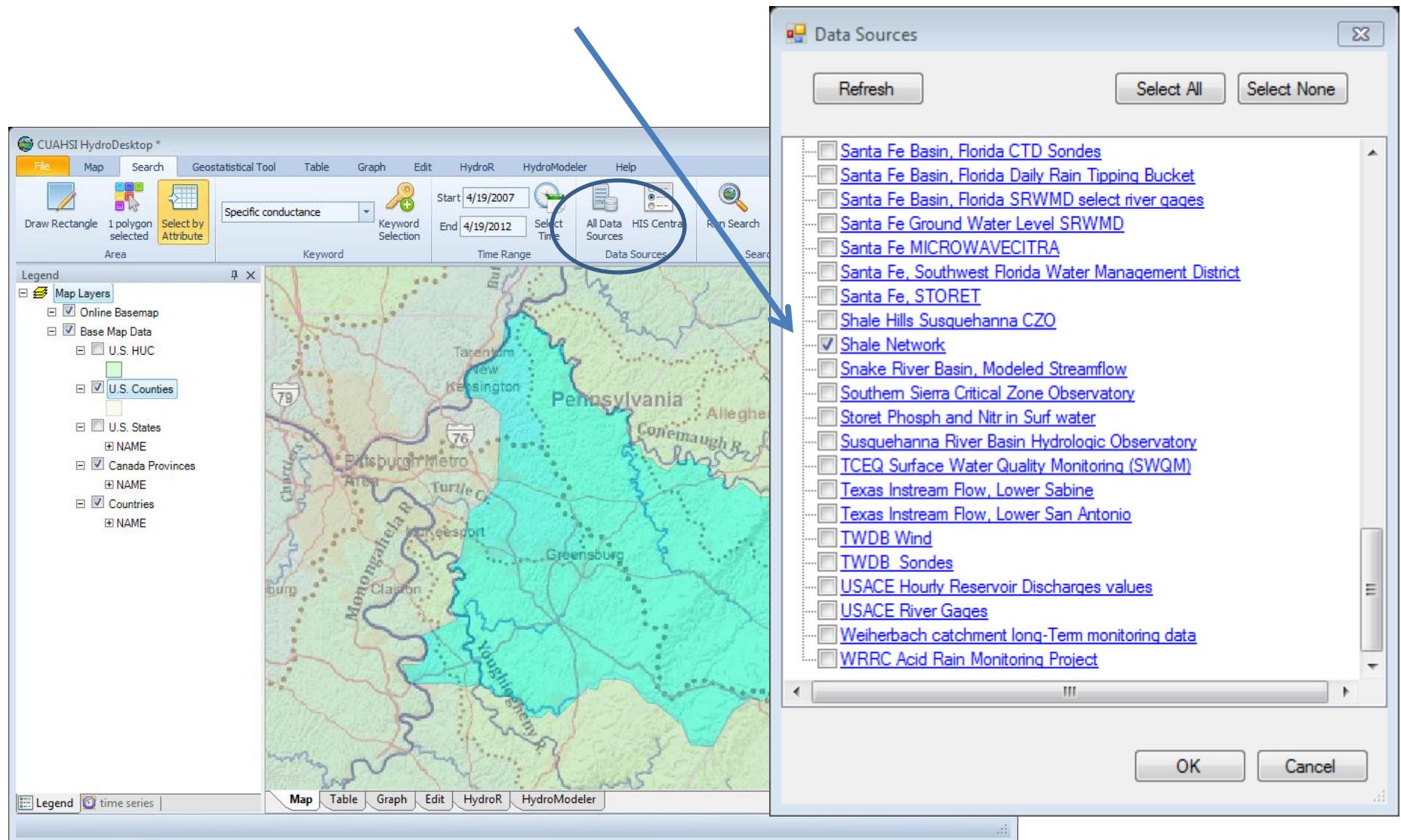


End

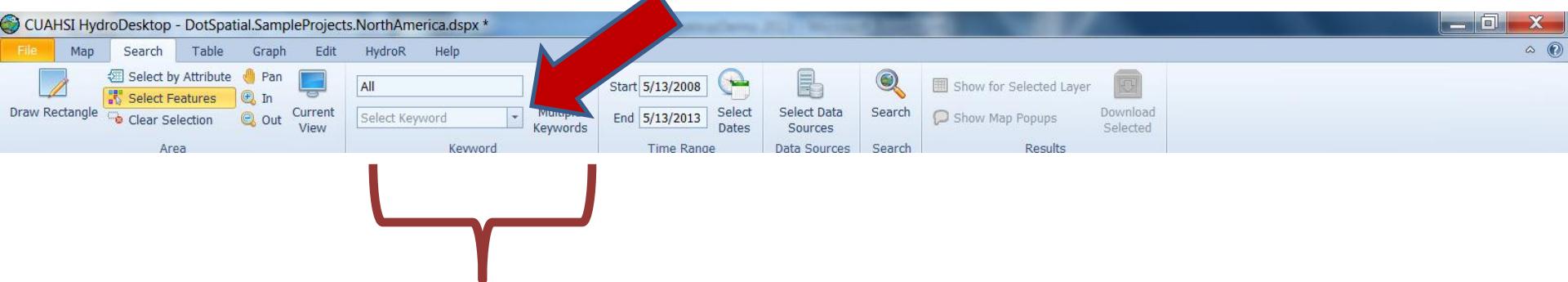
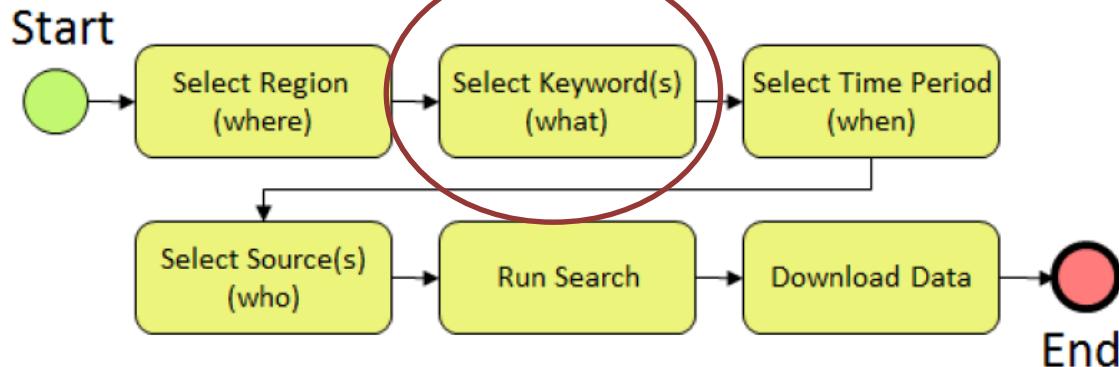


This is where you choose
what computer around
the country you will
search for Data

After clicking “Select Data Sources” in the Search ribbon, you get a pop up window: choose **Select None** ... then check **Shale Network** and Ok



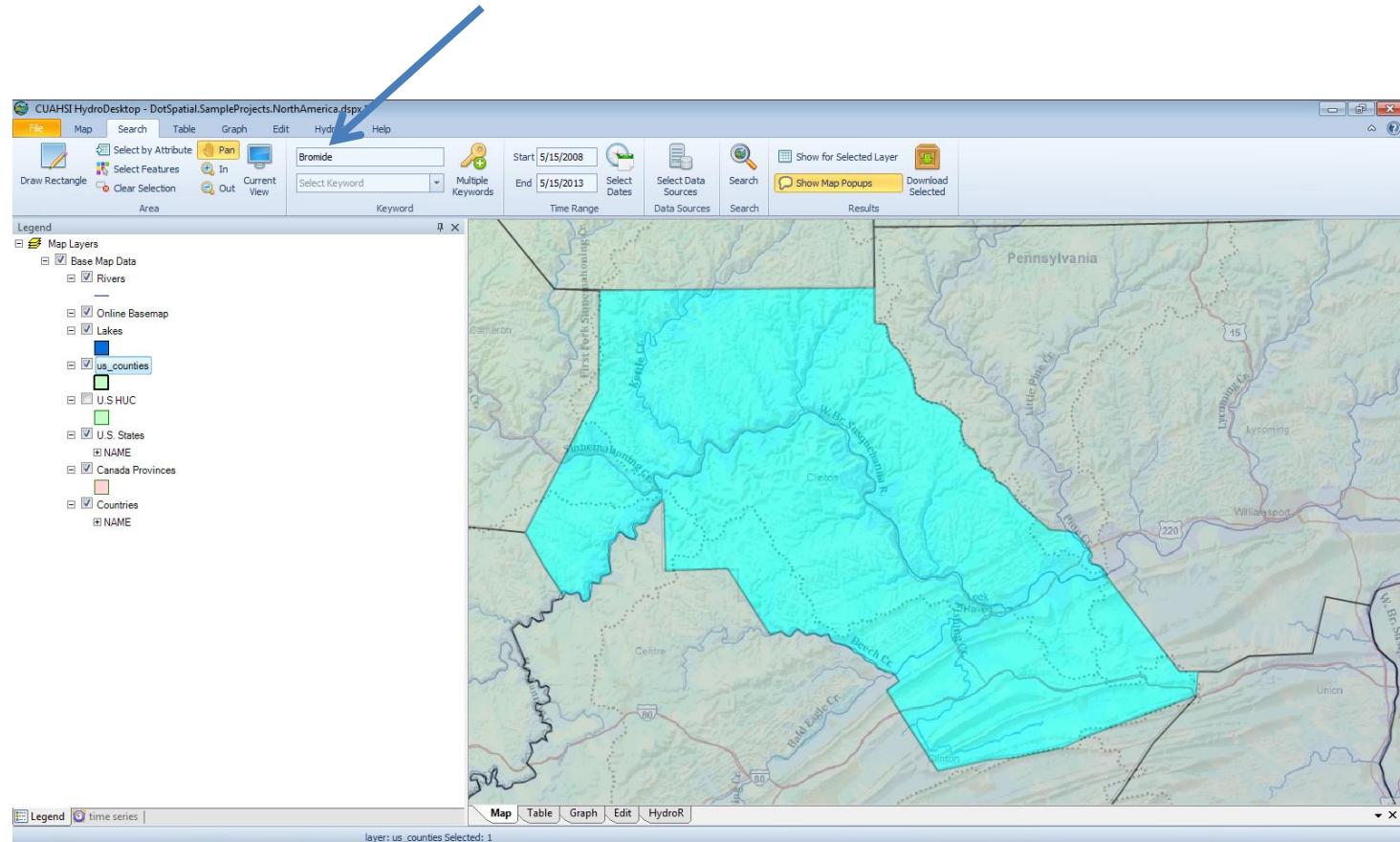
NEXT Search for the Parameter of Interest (Keyword)



If you don't know how to describe an analyte (keyword) you can use the drop down menu to find parameters that have been measured that you are interested in

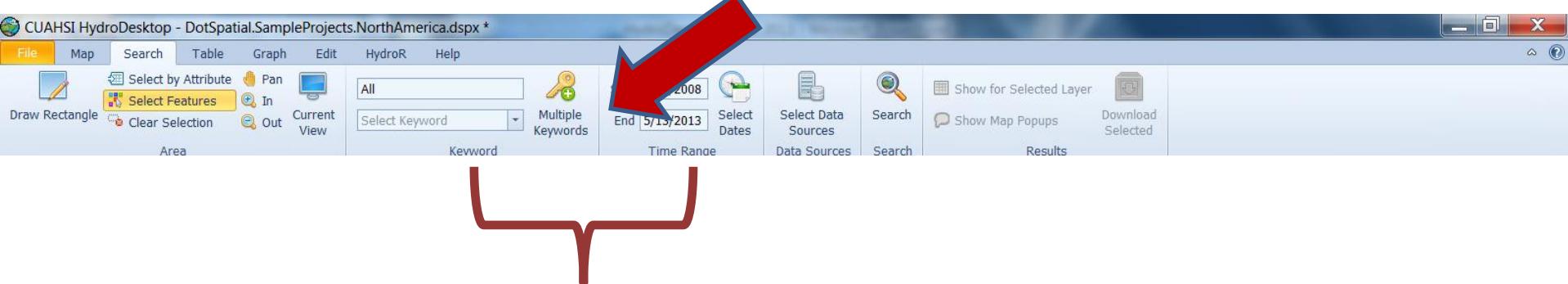
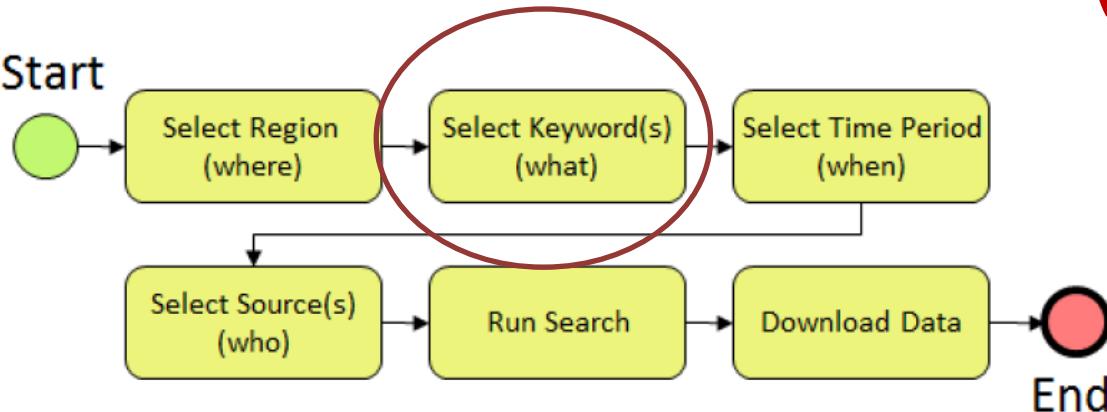
Type “Bromide” in the top search box.

Please note that before running any search, always check the keyword...I find that Keyword resets sometimes to “All.” If you search on All, you look for all analytes for the region and time of interest



Another way to search for the Parameter of Interest (Keyword)

Start

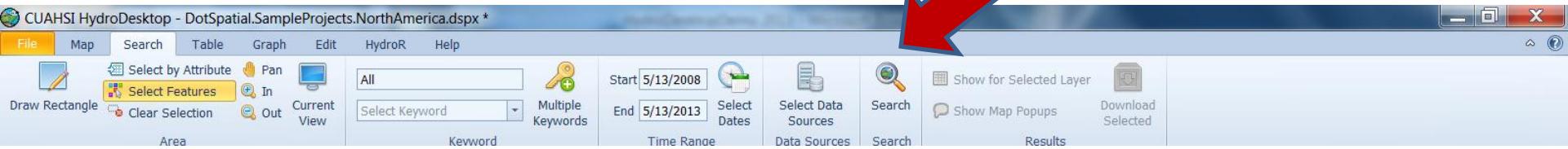
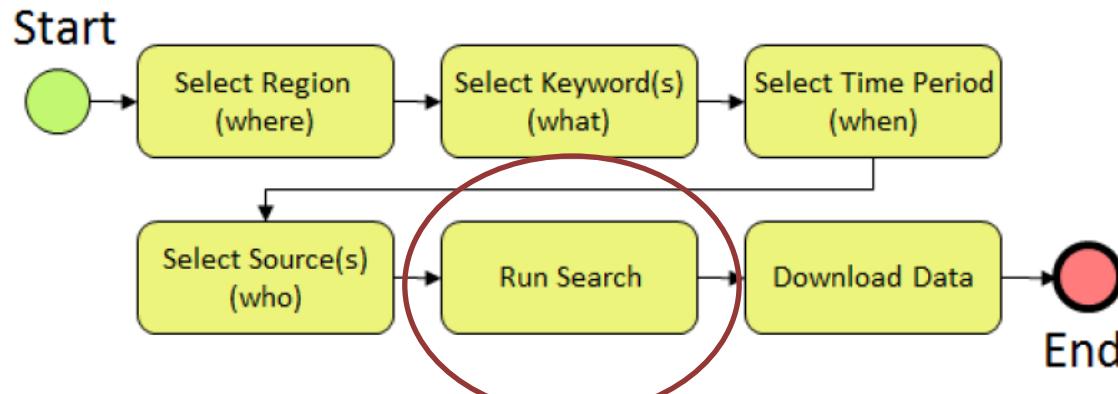


Later (not now) when you get better at it, use the multiple keywords pull down menu, and type in your variable choice. In the pull-down you can see all the different types of data

Before you run Search, check back
to see that you only have **Bromide**
checked!

We are trying to avoid the glitch
where HD reverts back to “All”

Click the **Search** button...this grabs the metadata

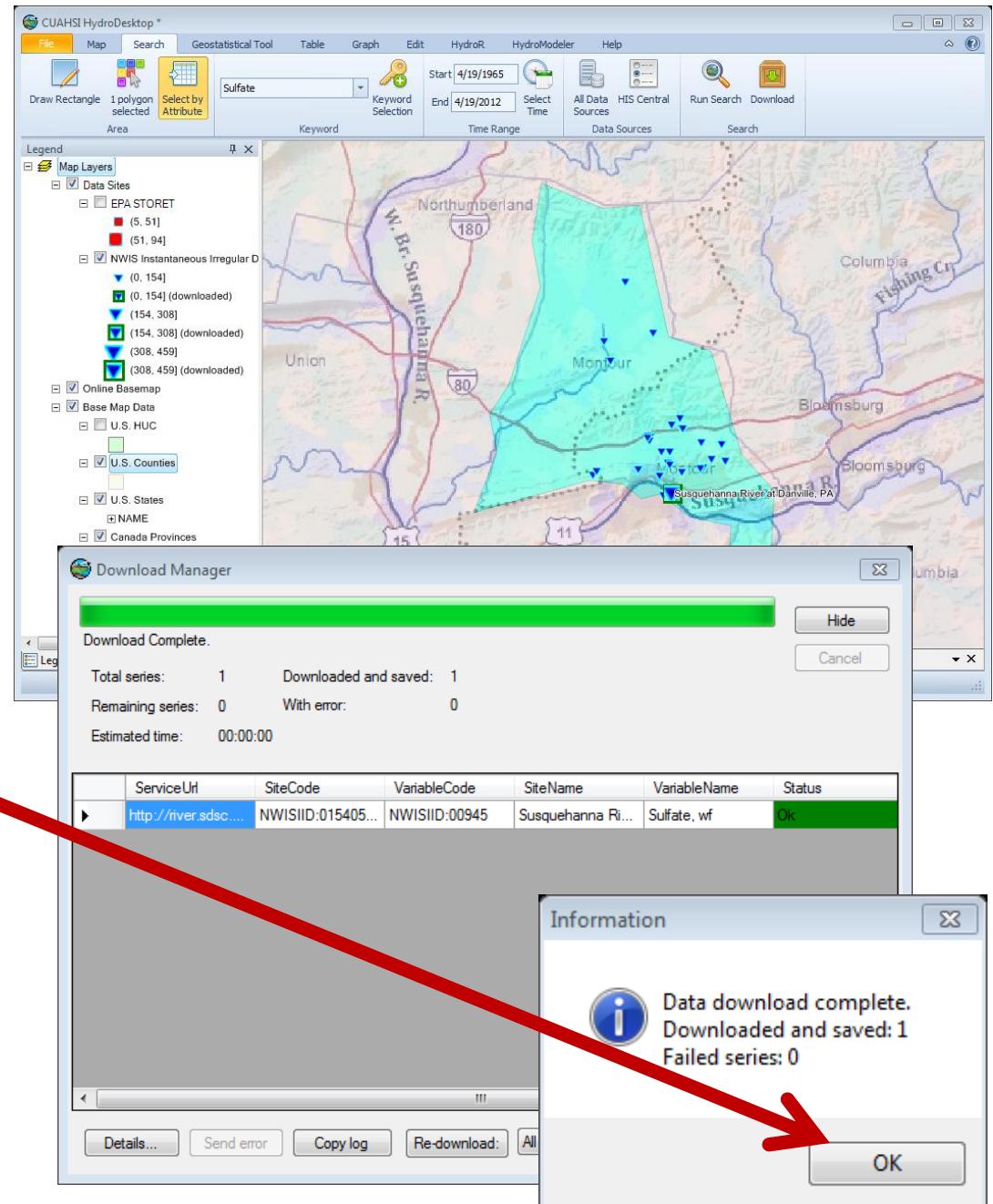


Beware: if you try to download too much metadata in this classroom the program might get hung up. That is why we suggest you search for Bromide in a single county

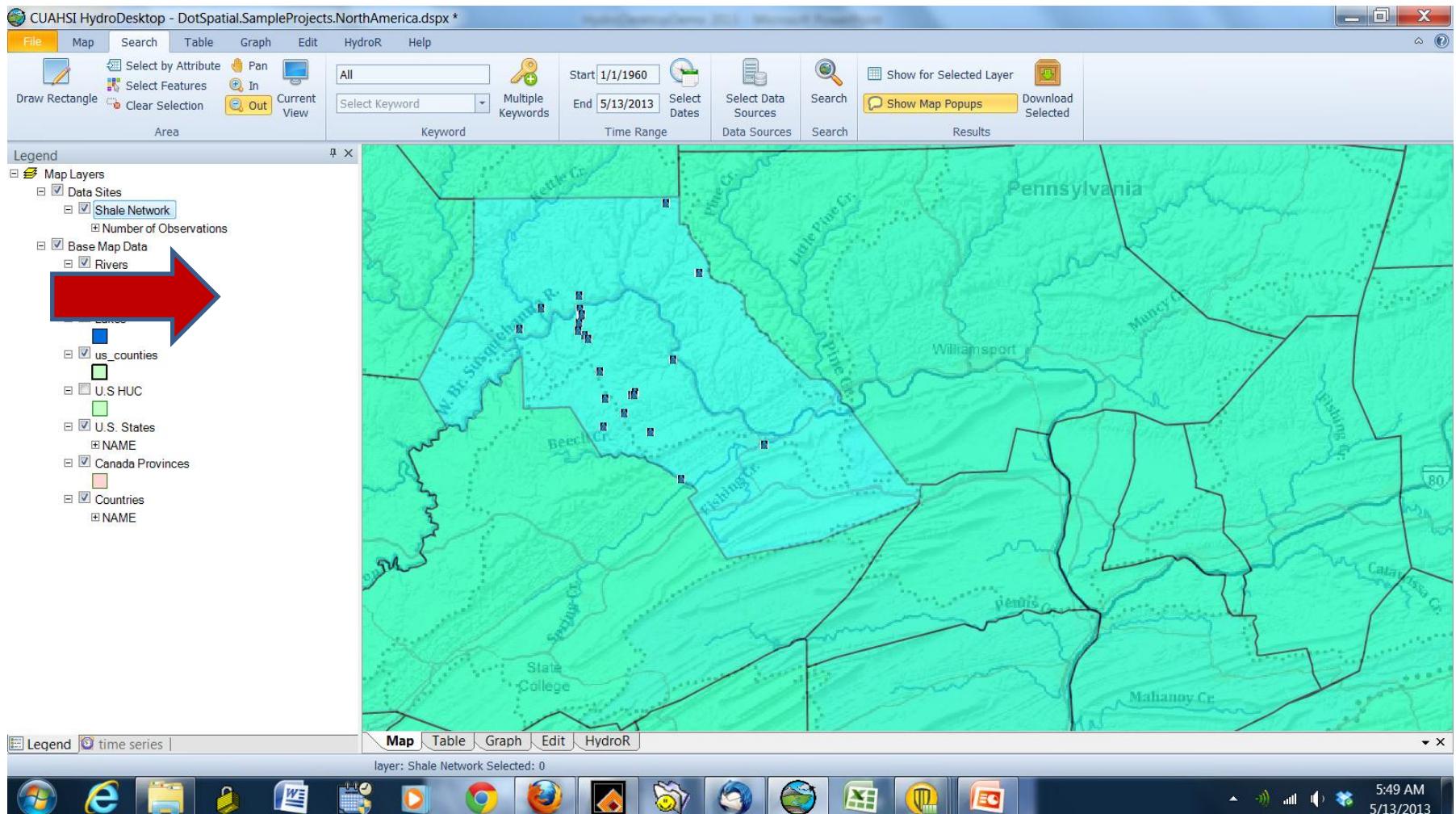
Screenshot from
downloading the
data...

Click **OK**

and then click
Hide to hide the
Download window (you
may get a few errors,
don't worry). If you get
all errors, try it again.

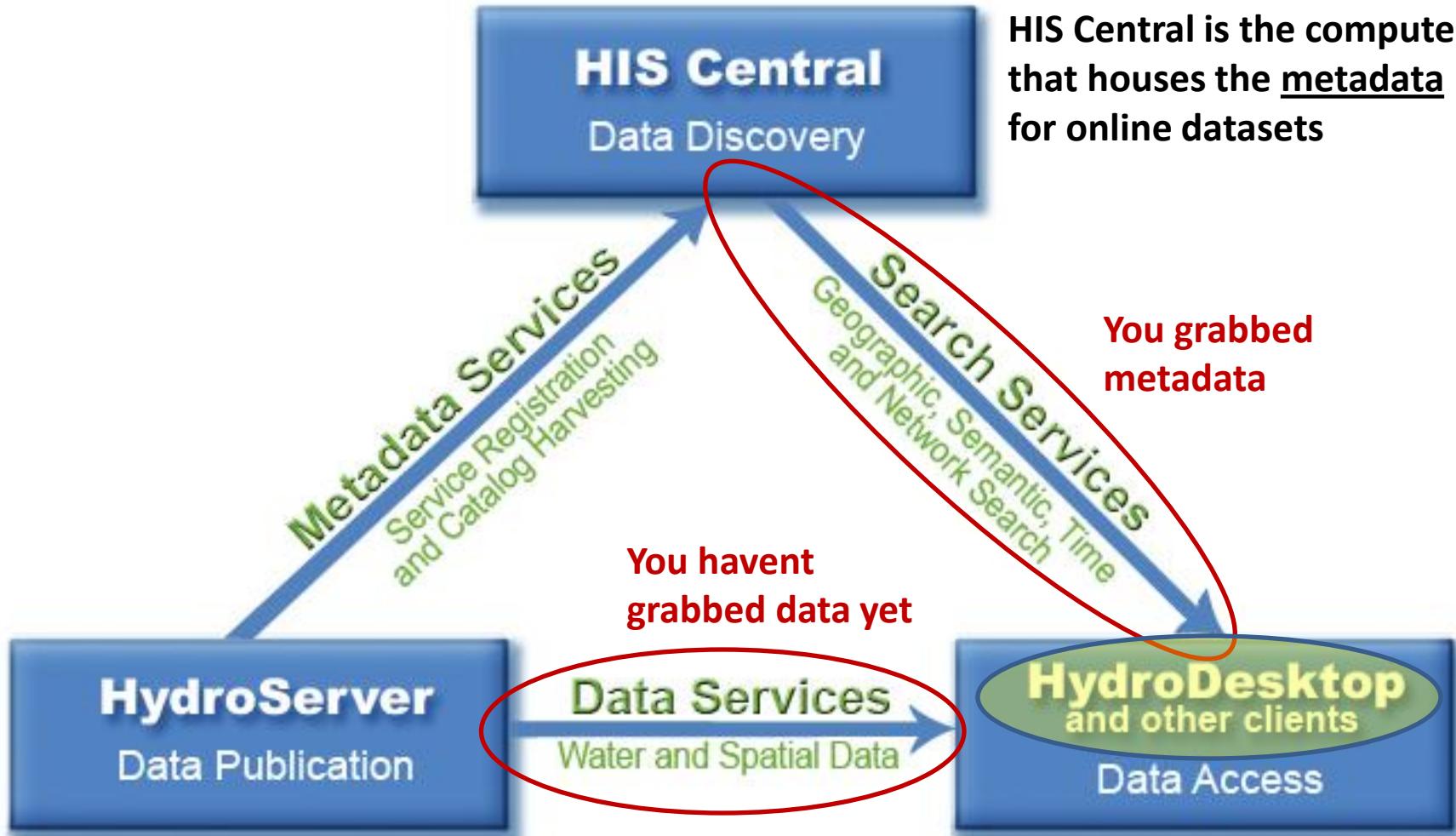


What Did You Find? Here: Clinton County



The program has returned the metadata (not the data) to your computer! The map shows you where data are available matching your search

You just went out to other computers and grabbed metadata



Hydroservers are computers around world that post online data

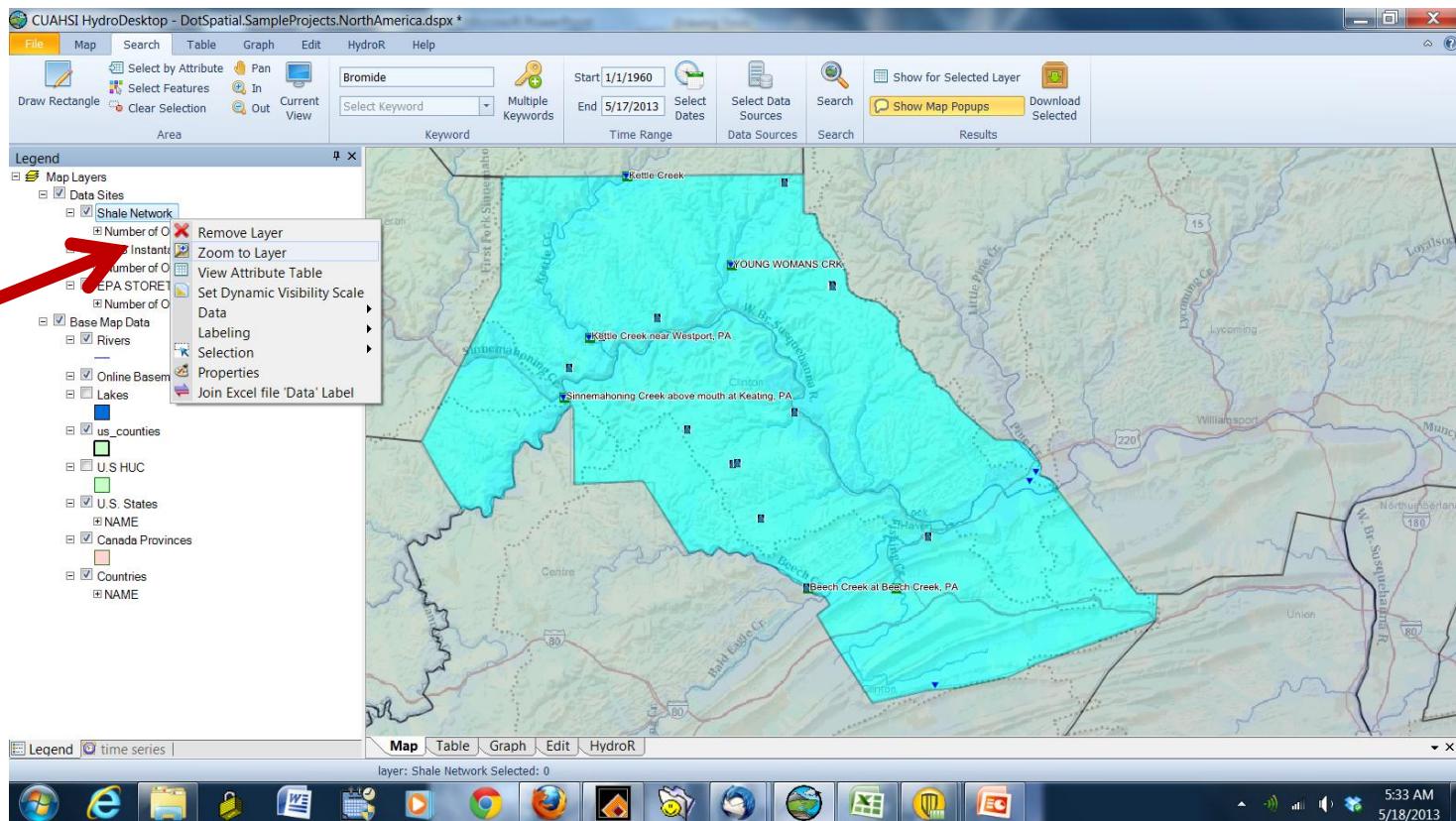


HydroDesktop is the computer program that helps you pull the metadata and data onto your home computer

You might need to re-center your map

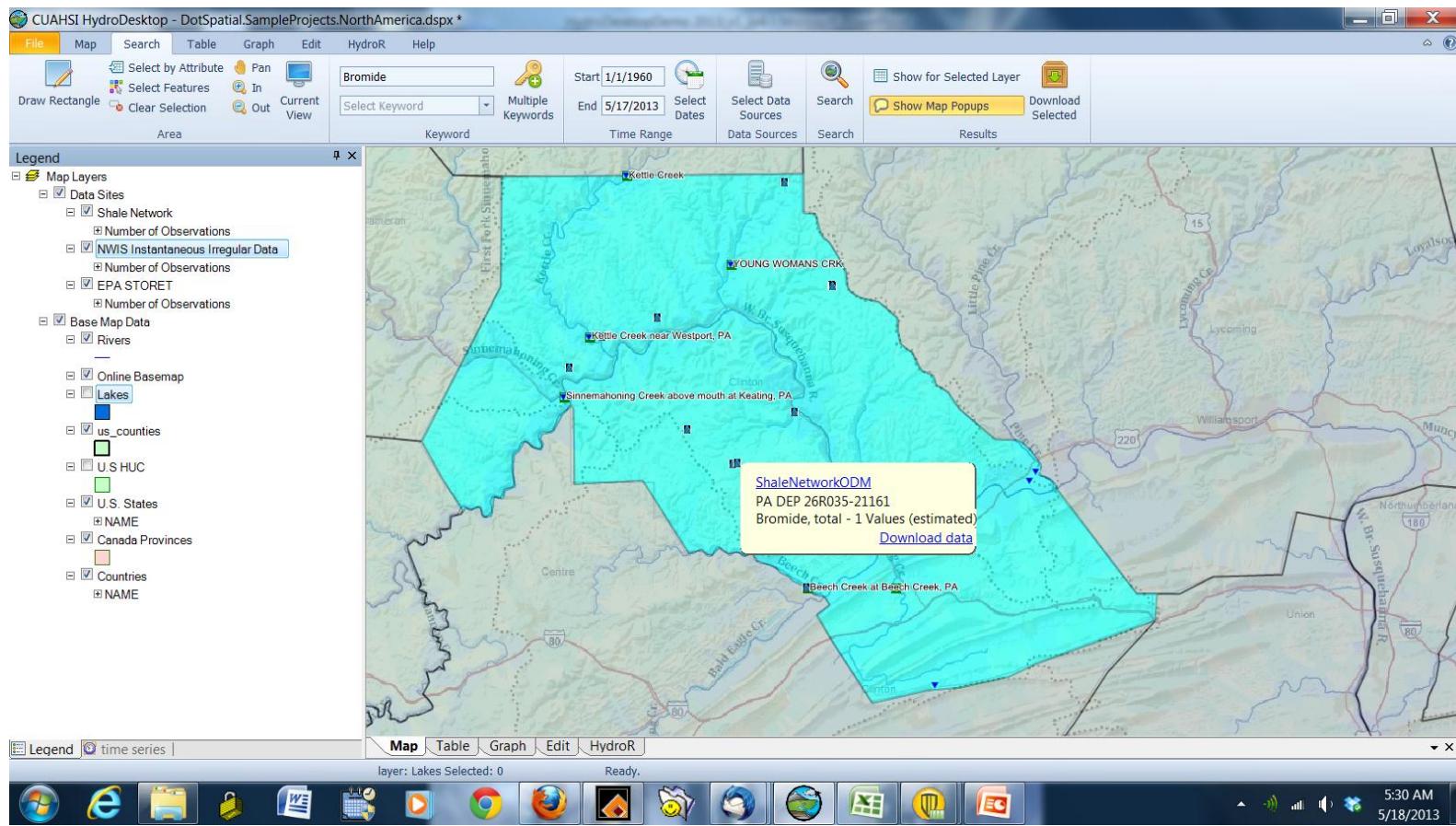
Right click on
Shale Network
in Legend and
choose

“Zoom to
Layer”



But before downloading data, let's hover over data sites and look at metadata a bit. Point mouse to a symbol and hover...

You can
hover over a
site location
and a popup
will tell you
about that
data point.
You could
even
download
data for that
point, but
we won't do
this because
it is tedious
to do all
data points
this way

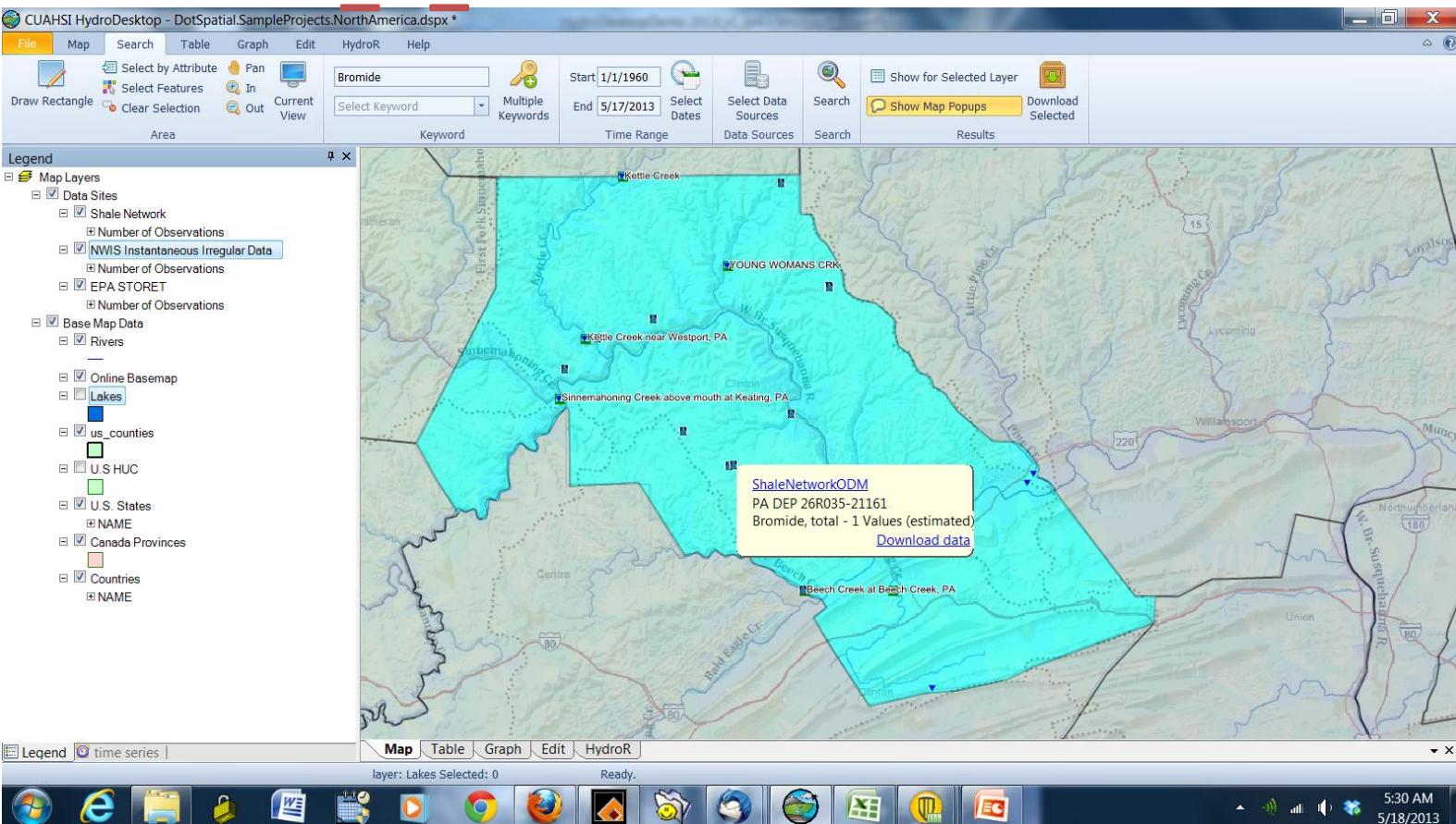


You might see metadata in the popup that looks like this

- ShaleNetwork:PA_DEP_26R...these are data that Carl Kirby and students harvested from PA DEP 26R forms. THIS IS FLOWBACK/PRODUCTION WATER DATA
- ShaleNetwork: ALLARM_xxx..these are data collected by ALLARM volunteers
- ShaleNetwork: DEP_SAC046_"name"...these are data from the PA DEP using their SAC 46 analyses
- ShaleNetwork:SRBC...data from SRBC
- ShaleNetwork:LHU...data from Dr. K and the Senior Environmental Corps
- ShaleNetwork:COP Tract 653 101H_Well...data from Haluszczak 2011 THIS IS FLOWBACK/PRODUCTION WATERDATA
- ShaleNetwork:Tioga County P1 Gas Well Production water...THIS IS PRODUCTION WATER

Can you find a location with production/flowback water chem... i.e. one that has “PADEP 26Rxxx” or ...COP Tract 653 xxx.xx

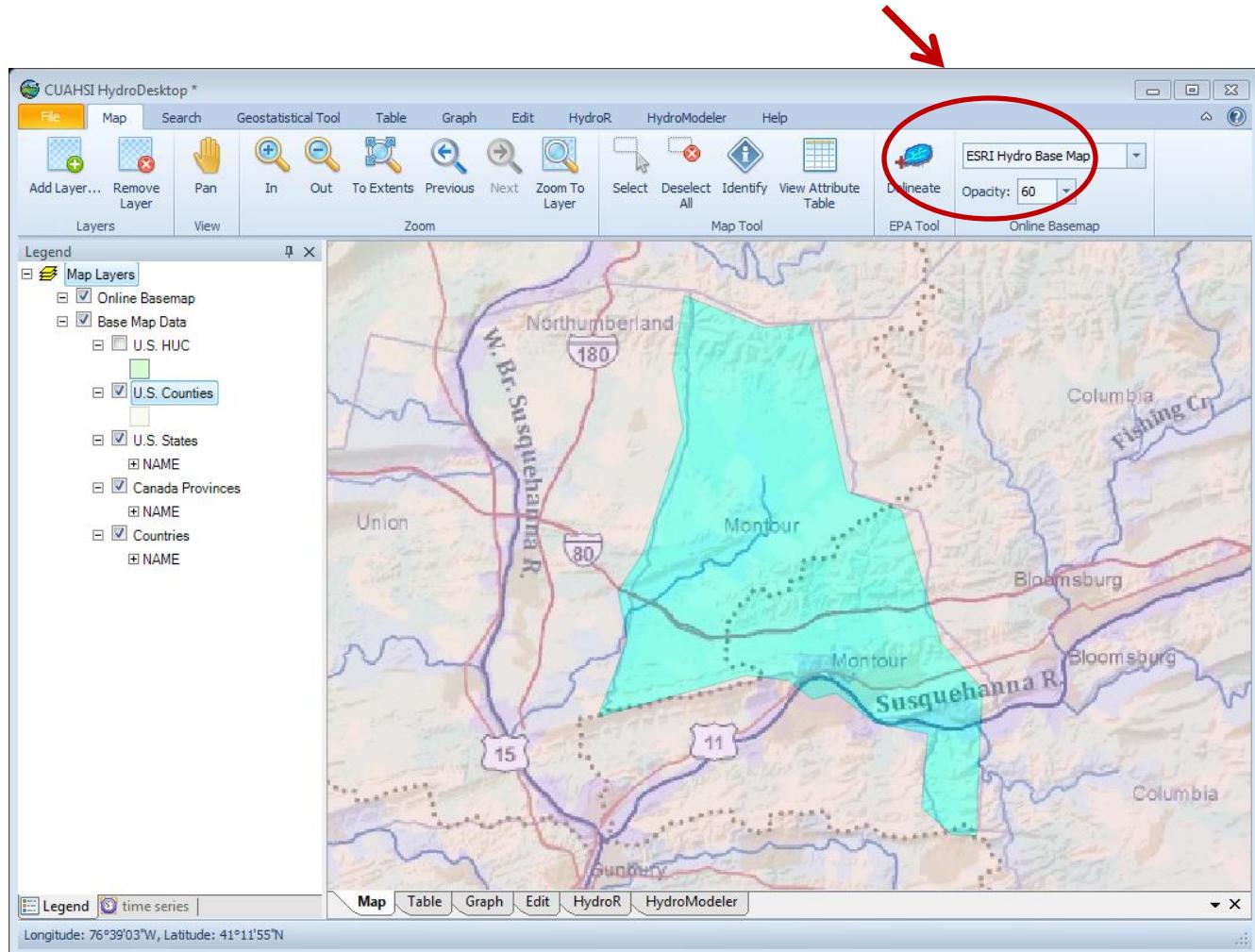
...or...Br_D_fw or ...Location I...



Hover over site locations and look at popup windows looking for a well with production water chemistry (we are just playing)

Let's change
the **base map**
to look at a
well. Put in
**Google
Satellite**
under Map
Tab (at the
right) and
look for wells

Change your base map layer here (it may take time)

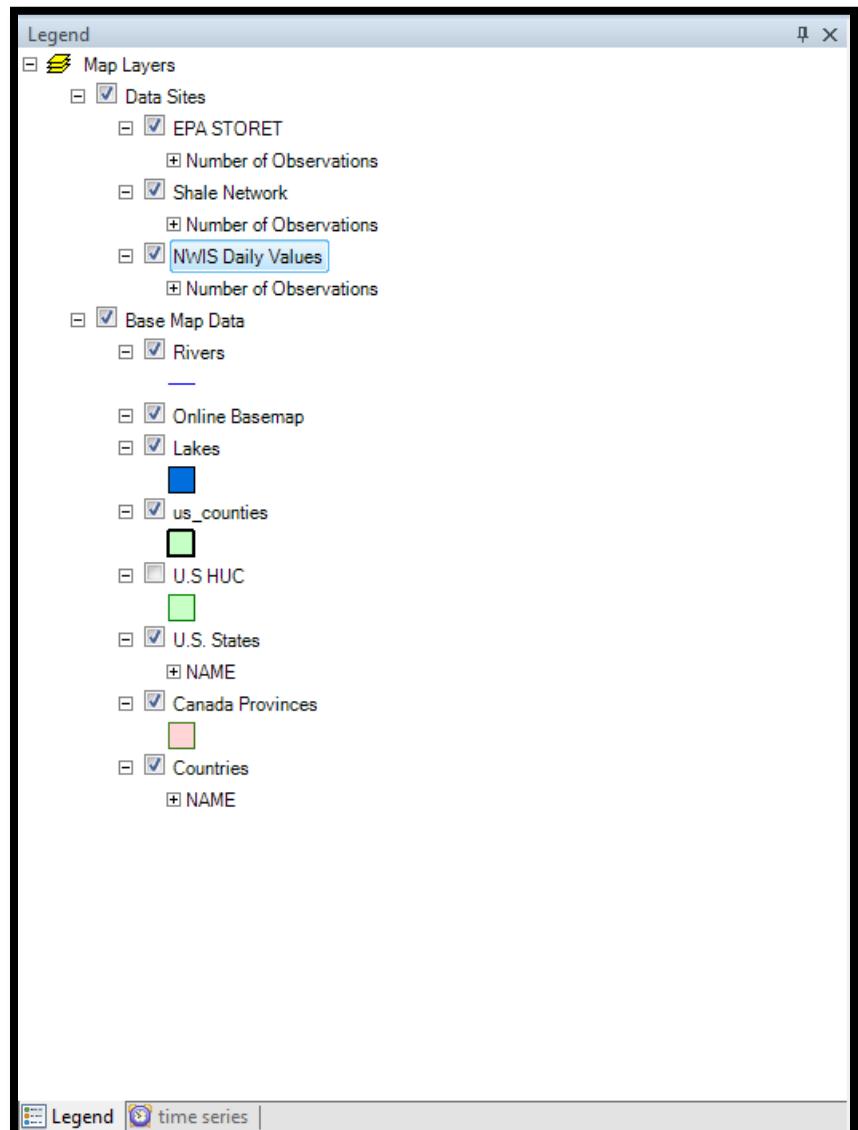


- ESRI Hydro Base Map
- ESRI Topo
- Street Map (Bing, Google, ESRI, Yahoo)
- Satellite Imagery (Bing, ESRI, Google, Yahoo)

If you change the base map but don't see anything...

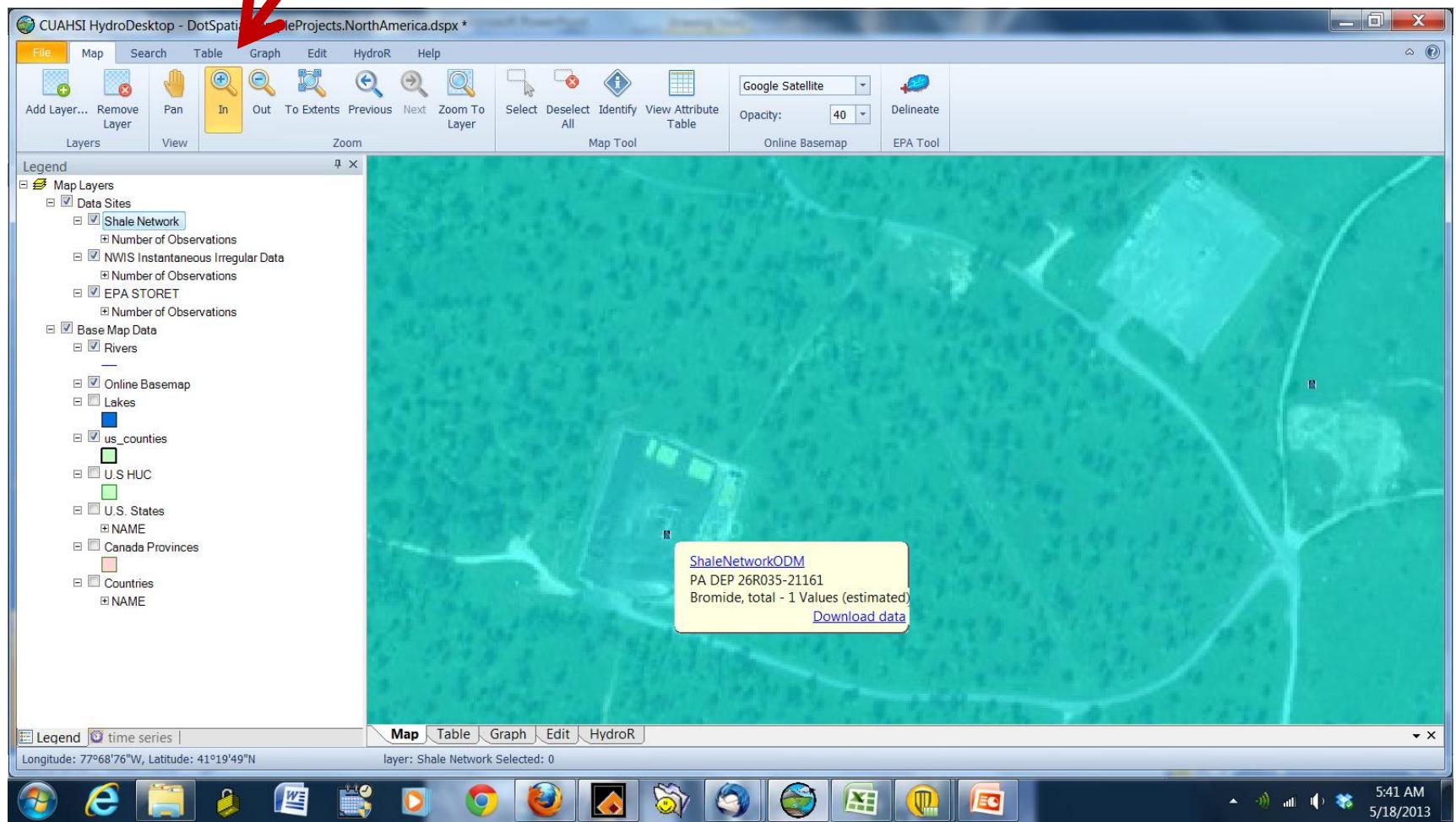
The Legend is a hierarchy. Whatever layer is listed on top in the Legend, will appear “on top” in the map. This means if a layer is opaque, it may be hiding layers underneath.

Try unclicking some of the layers (Countries; Canada Provinces; U.S. States;) and this may help you see the Google Satellite map



Zoom in and look at the well on Google Satellite!

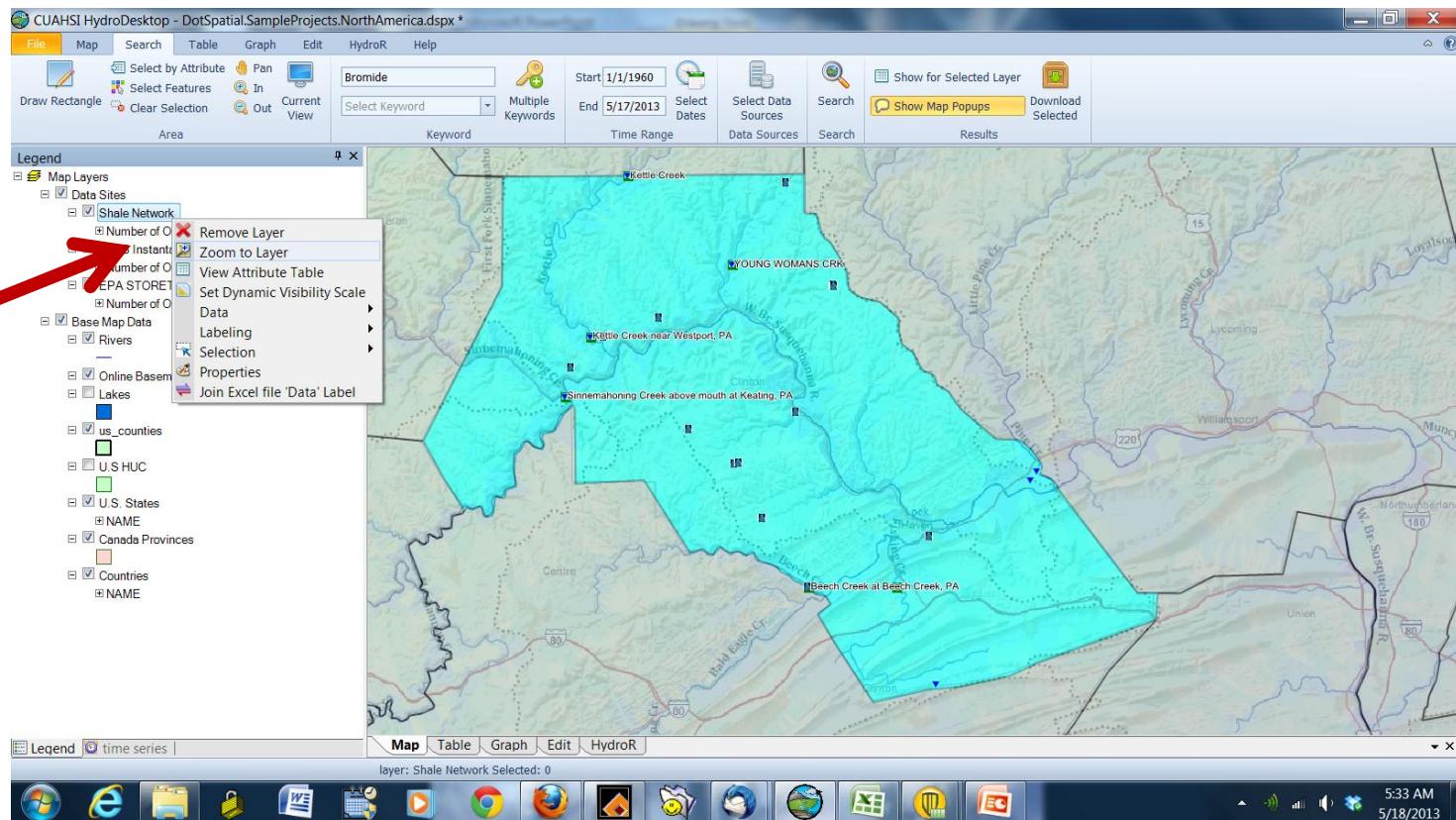
You can adjust opacity of base map on Map Ribbon



Re-center your map

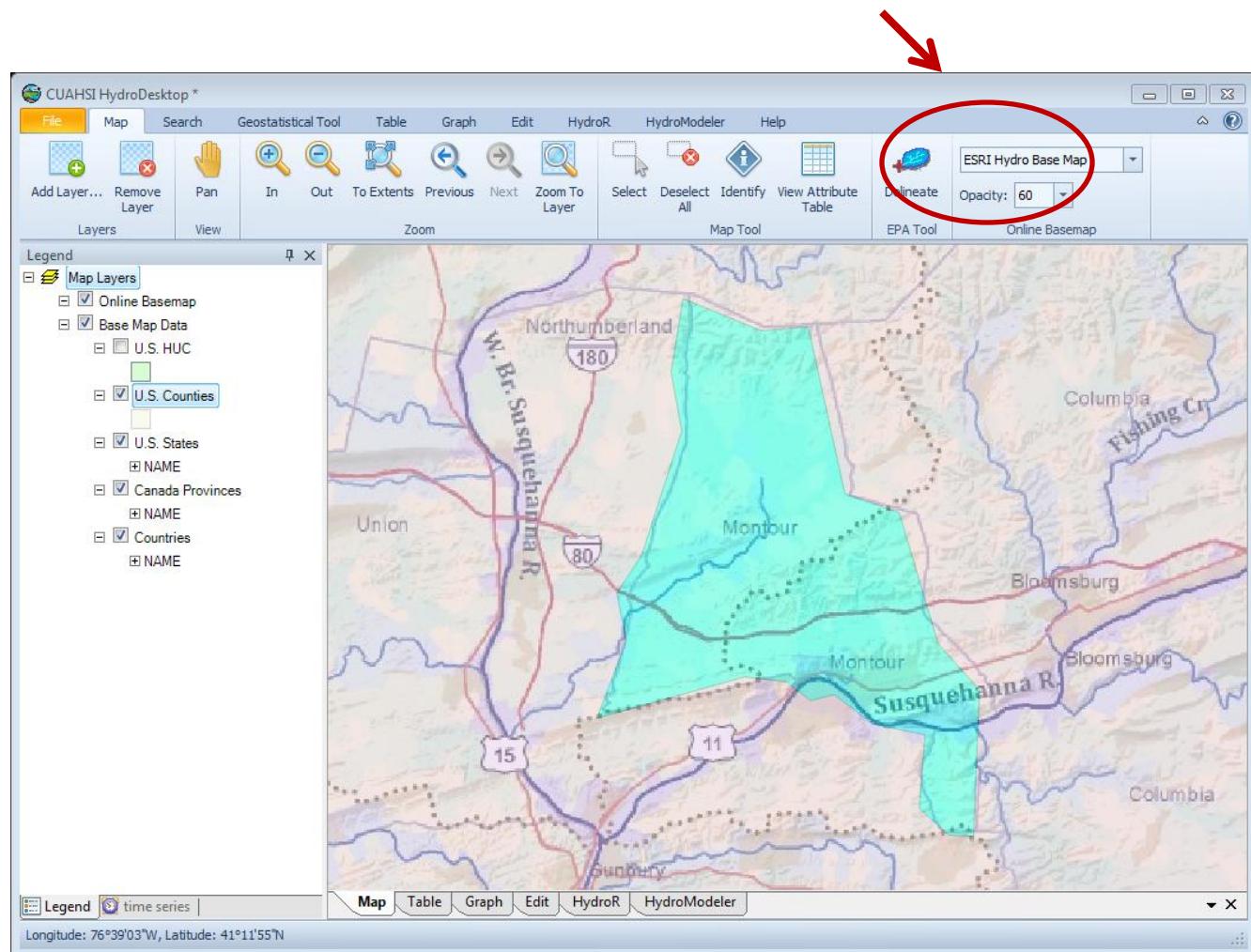
Right click on
Shale Network
in Legend and
choose

“Zoom to
Layer”



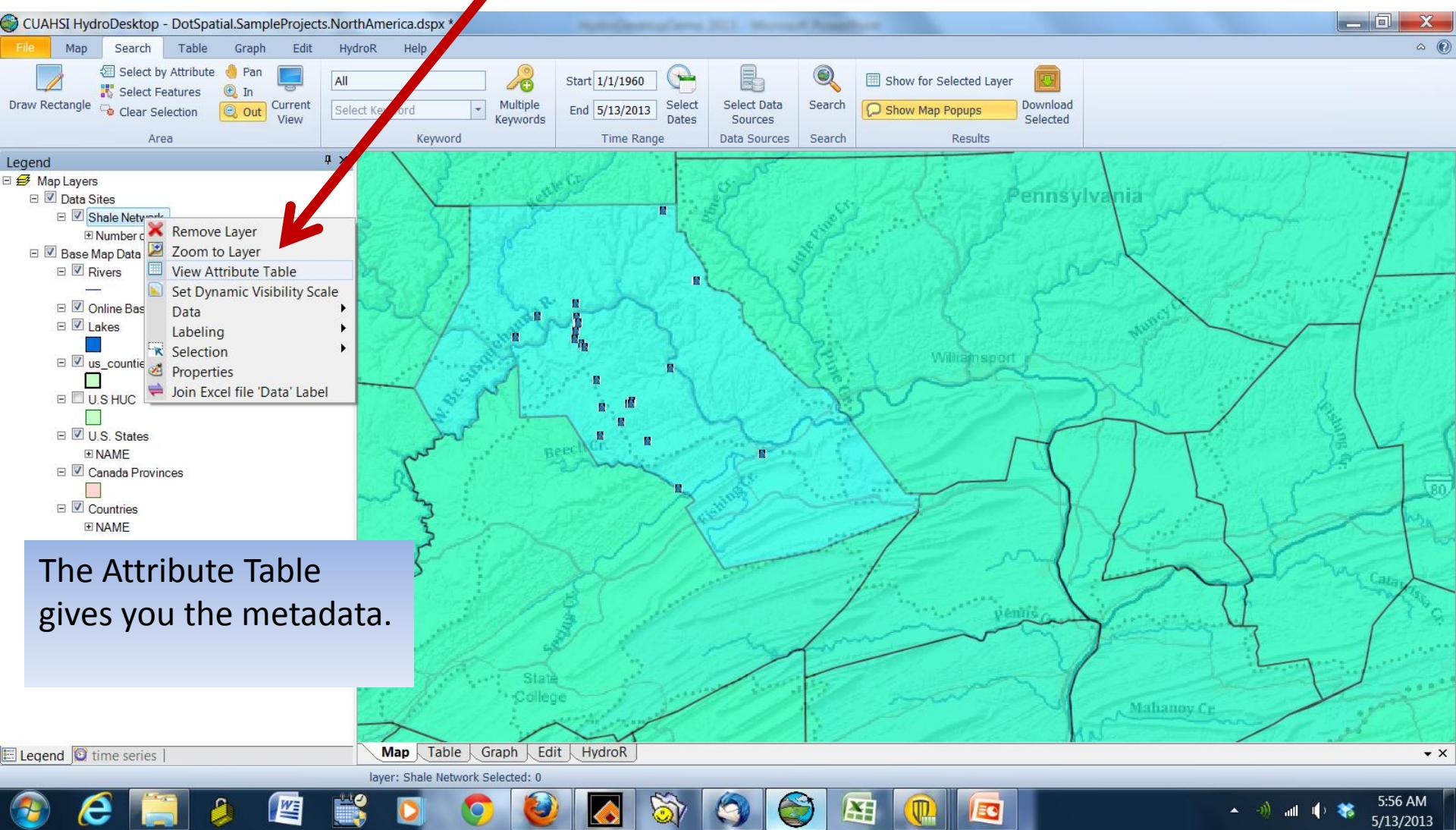
Let's change
the **base map**
now to ESRI
World Topo
under Map
Tab (at the
right)

Change your base map layer here (it may take time)



- ESRI Hydro Base Map
- ESRI Topo
- Street Map (Bing, Google, ESRI, Yahoo)
- Satellite Imagery (Bing, ESRI, Google, Yahoo)

Let's explore all your metadata.. right click on the data source of interest in the Legend (ShaleNetwork) and click **View Attribute Table** to explore the metadata



Example: Attribute table for all analytes in Clinton County

This screenshot shows the CUAHSI HydroDesktop interface. On the left, a legend panel lists various map layers, including 'Shale Network' which is currently selected. The main area displays a map of Clinton County, Pennsylvania, with several data points marked as blue squares. A red arrow points from a callout box to the right side of the screen, where an attribute table is displayed. The table has columns for 'Var Code', 'Keyword', and data entries. Another red arrow points from a callout box at the bottom left to the right side of the screen, indicating the scrollable nature of the attribute table.

This is all volunteer data collected by folks working with Dr K at Lock Haven University

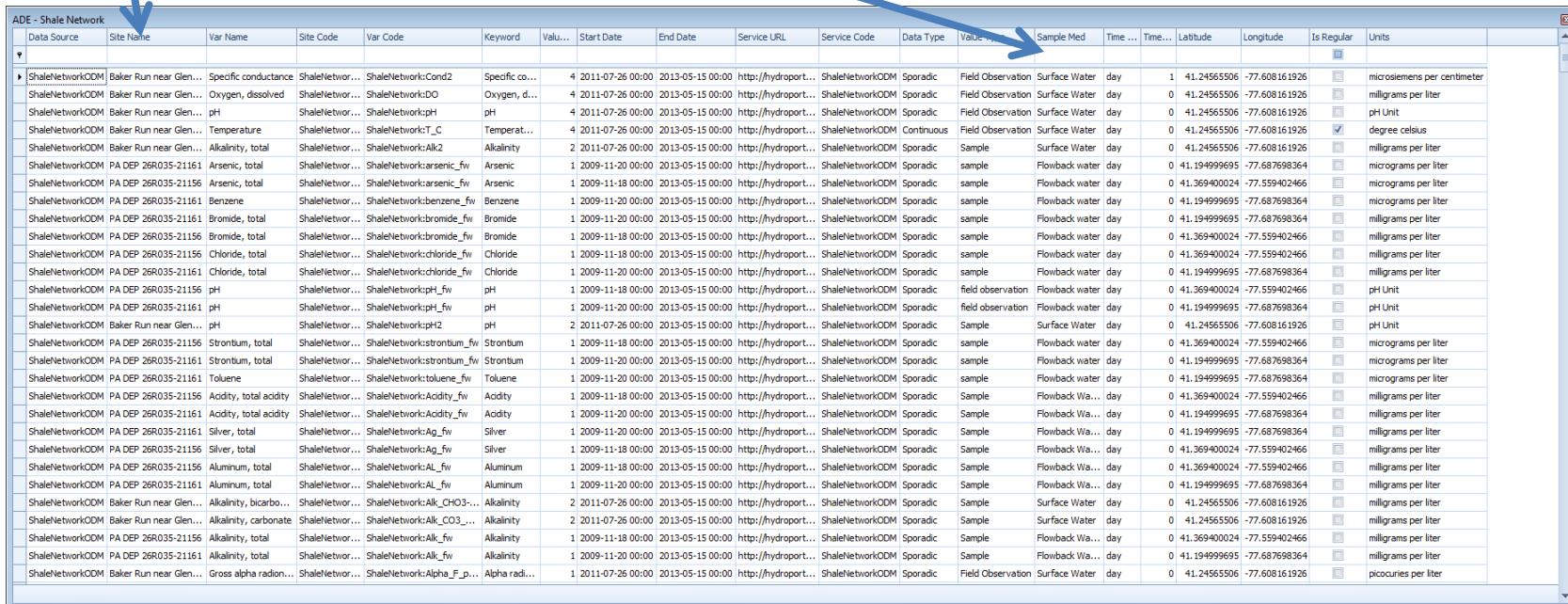
You can expand the table and contract the map here by hovering over the divider

Var Code	Keyword	Temperature
amondRockHo...	ShaleNetwork:LHU_T	Temperature
akeHollowRun...	ShaleNetwork:LHU_Ba	Barium
ShaleNetwork:LHU_DrakeHollowRun...	ShaleNetwork:LHU_Hard...	Hardness, ca
ShaleNetwork:LHU_DrakeHollowRun...	ShaleNetwork:LHU_pH	pH
ShaleNetwork:LHU_DrakeHollowRun...	ShaleNetwork:LHU_SO4	Sulfate
ShaleNetwork:LHU_DrakeHollowRun...	ShaleNetwork:LHU_T	Temperature
ShaleNetwork:LHU_E_Branch_up	ShaleNetwork:LHU_Ba	Barium
ShaleNetwork:LHU_SRenoReservoir	ShaleNetwork:LHU_Hard...	Hardness, ce
ShaleNetwork:LHU_HallRun_Headw...	ShaleNetwork:LHU_T	Temperature
ShaleNetwork:LHU_HallRunBurnesRd	ShaleNetwork:LHU_Ba	Barium
ShaleNetwork:LHU_HallRunBurnesRd	ShaleNetwork:LHU_Hard...	Hardness, ca
ShaleNetwork:LHU_HallRunBurnesRd	ShaleNetwork:LHU_pH	pH
ShaleNetwork:LHU_HallRunBurnesRd	ShaleNetwork:LHU_SO4	Sulfate
ShaleNetwork:LHU_HallRunBurnesRd	ShaleNetwork:LHU_T	Temperature
ShaleNetwork:LHU_SRenoWell	ShaleNetwork:LHU_Ba	Barium
ShaleNetwork:LHU_SRenoWell	ShaleNetwork:LHU_Hard...	Hardness, ce
ShaleNetwork:LHU_SRenoWell	ShaleNetwork:LHU_pH	pH
ShaleNetwork:LHU_SRenoWell	ShaleNetwork:LHU_SO4	Sulfate
ShaleNetwork:LHU_SRenoWell	ShaleNetwork:LHU_T	Temperature
ShaleNetwork:LHU_StinkHollow144	ShaleNetwork:LHU_Ba	Barium
ShaleNetwork:LHU_StinkHollow144	ShaleNetwork:LHU_Hard...	Hardness, ca
ShaleNetwork:LHU_StinkHollow144	ShaleNetw...	ShaleNetw...
ShaleNetwork:LHU_StinkHollow144	ShaleNetw...	ShaleNetw...
ShaleNetwork:LHU_HallRun_Headw...	ShaleNetwork:LHU_Cu	Copper
ShaleNetwork:LHU_HallRun_Headw...	ShaleNetwork:LHU_DO	Oxygen, diss
ShaleNetwork:LHU_HallRun_Headw...	ShaleNetwork:LHU_FG	Specific conductance

The attribute table displays numerous fields including Data Source, Site Name, Variable, Start and End Dates, Sample Medium, and Units.

Site Name

Sample medium



Data Source	Site Name	Var Name	Site Code	Var Code	Keyword	Value	Start Date	End Date	Service URL	Service Code	Data Type	Value	Sample Med	Time ...	Time...	Latitude	Longitude	Is Regular	Units
ShaleNetworkODM	Baker run near Glen...	Specific conductance	ShaleNetwork...	ShaleNetwork:Cond2	Specific co...	4	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Field Observation	Surface Water	day	1	41.24565506	-77.608161926	<input type="checkbox"/>	microsiemens per centimeter
ShaleNetworkODM	Baker run near Glen...	Oxygen, dissolved	ShaleNetwork...	ShaleNetwork:DO	Oxygen, d...	4	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Field Observation	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	milligrams per liter
ShaleNetworkODM	Baker run near Glen...	pH	ShaleNetwork...	ShaleNetwork:pH	pH	4	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Field Observation	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	pH Unit
ShaleNetworkODM	Baker run near Glen...	Temperature	ShaleNetwork...	ShaleNetwork:T_C	Temperat...	4	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Continuous	Field Observation	Surface Water	day	0	41.24565506	-77.608161926	<input checked="" type="checkbox"/>	degree celsius
ShaleNetworkODM	Baker run near Glen...	Alkalinity, total	ShaleNetwork...	ShaleNetwork:Alk2	Alkalinity	2	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	milligrams per liter
ShaleNetworkODM	PA DEP 26R035-21161	Arsenic, total	ShaleNetwork...	ShaleNetwork:arsenic_fv	Arsenic	1	2009-11-10 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687598364	<input type="checkbox"/>	micrograms per liter
ShaleNetworkODM	PA DEP 26R035-21156	Arsenic, total	ShaleNetwork...	ShaleNetwork:arsenic_fv	Arsenic	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	micrograms per liter
ShaleNetworkODM	PA DEP 26R035-21161	Benzene	ShaleNetwork...	ShaleNetwork:benzene_fv	Benzene	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687598364	<input type="checkbox"/>	micrograms per liter
ShaleNetworkODM	PA DEP 26R035-21161	Bromide, total	ShaleNetwork...	ShaleNetwork:bromide_fv	Bromide	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687598364	<input type="checkbox"/>	milligrams per liter
ShaleNetworkODM	PA DEP 26R035-21156	Bromide, total	ShaleNetwork...	ShaleNetwork:bromide_fv	Bromide	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter
ShaleNetworkODM	PA DEP 26R035-21156	Chloride, total	ShaleNetwork...	ShaleNetwork:chloride_fv	Chloride	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter
ShaleNetworkODM	PA DEP 26R035-21161	Chloride, total	ShaleNetwork...	ShaleNetwork:chloride_fv	Chloride	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687598364	<input type="checkbox"/>	milligrams per liter
ShaleNetworkODM	PA DEP 26R035-21156	pH	ShaleNetwork...	ShaleNetwork:pH_fv	pH	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	field observation	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	pH Unit
ShaleNetworkODM	PA DEP 26R035-21161	pH	ShaleNetwork...	ShaleNetwork:pH_fv	pH	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	field observation	Flowback water	day	0	41.194999695	-77.687598364	<input type="checkbox"/>	pH Unit
ShaleNetworkODM	Baker run near Glen...	pH	ShaleNetwork...	ShaleNetwork:pH2	pH	2	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	pH Unit
ShaleNetworkODM	PA DEP 26R035-21156	Strontium, total	ShaleNetwork...	ShaleNetwork:strontium_fv	Strontium	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	micrograms per liter
ShaleNetworkODM	PA DEP 26R035-21161	Strontium, total	ShaleNetwork...	ShaleNetwork:strontium_fv	Strontium	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687598364	<input type="checkbox"/>	micrograms per liter
ShaleNetworkODM	PA DEP 26R035-21161	Toluene	ShaleNetwork...	ShaleNetwork:toluene_fv	Toluene	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687598364	<input type="checkbox"/>	micrograms per liter
ShaleNetworkODM	PA DEP 26R035-21156	Acidity, total acidity	ShaleNetwork...	ShaleNetwork:Acidity_fv	Acidity	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Flowback Wa...	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter
ShaleNetworkODM	PA DEP 26R035-21161	Acidity, total acidity	ShaleNetwork...	ShaleNetwork:Acidity_fv	Acidity	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Flowback Wa...	day	0	41.194999695	-77.687598364	<input type="checkbox"/>	milligrams per liter
ShaleNetworkODM	PA DEP 26R035-21161	Silver, total	ShaleNetwork...	ShaleNetwork:Ag_fv	Silver	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Flowback Wa...	day	0	41.194999695	-77.687598364	<input type="checkbox"/>	milligrams per liter
ShaleNetworkODM	PA DEP 26R035-21156	Silver, total	ShaleNetwork...	ShaleNetwork:Ag_fv	Silver	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Flowback Wa...	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter
ShaleNetworkODM	PA DEP 26R035-21156	Aluminum, total	ShaleNetwork...	ShaleNetwork:Al_fv	Aluminum	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Flowback Wa...	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter
ShaleNetworkODM	PA DEP 26R035-21161	Aluminum, total	ShaleNetwork...	ShaleNetwork:Al_fv	Aluminum	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Flowback Wa...	day	0	41.194999695	-77.687598364	<input type="checkbox"/>	milligrams per liter
ShaleNetworkODM	Baker run near Glen...	Alkalinity, bicarbonate	ShaleNetwork...	ShaleNetwork:Alk_CH3O...	Alkalinity	2	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	milligrams per liter
ShaleNetworkODM	Baker run near Glen...	Alkalinity, carbonate	ShaleNetwork...	ShaleNetwork:Alk_CO3...	Alkalinity	2	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	milligrams per liter
ShaleNetworkODM	PA DEP 26R035-21156	Alkalinity, total	ShaleNetwork...	ShaleNetwork:Alk_fv	Alkalinity	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Flowback Wa...	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter
ShaleNetworkODM	PA DEP 26R035-21161	Alkalinity, total	ShaleNetwork...	ShaleNetwork:Alk_fv	Alkalinity	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Flowback Wa...	day	0	41.194999695	-77.687598364	<input type="checkbox"/>	milligrams per liter
ShaleNetworkODM	Baker run near Glen...	Gross alpha radion...	ShaleNetwork...	ShaleNetwork:Alpha_F_p...	Alpha radi...	1	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Field Observation	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	picocuries per liter

The Attribute Table is one way to explore the metadata

But...let's only select surface waters in the Attribute Table

Site Name

Type “Surface water” here under sample medium

Data Source	Site Name	Var Name	Site Code	Var Code	Keyword	Valu...	Start Date	End Date	Service URL	Service Code	Data Type	Value Type	Sample Med	Time ...	Time...	Latitude	Longitude	Is Regular	Units	
ShaleNetworkODM	Baker Run near Glen...	Specific conductanc...	ShaleNetworkCond2	Specific co...	4	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Field Observation	Surface Water	day	1	41.24565506	-77.608161926	<input type="checkbox"/>	microsiemens per centimeter		
ShaleNetworkODM	Baker Run near Glen...	Oxygen, dissolved	ShaleNetw...	ShaleNetworkDO	Oxygen, d...	4	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Field Observation	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	Baker Run near Glen...	pH	ShaleNetw...	ShaleNetworkpH	pH	4	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Field Observation	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	pH Unit	
ShaleNetworkODM	Baker Run near Glen...	Temperature	ShaleNetw...	ShaleNetworkT_C	Temperat...	4	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Continuous	Field Observation	Surface Water	day	0	41.24565506	-77.608161926	<input checked="" type="checkbox"/>	degree celsius	
ShaleNetworkODM	Baker Run near Glen...	Alkalinity, total	ShaleNetw...	ShaleNetworkAlk2	Alkalinity	2	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Arsenic, total	ShaleNetw...	ShaleNetworkarsenic_fv	Arsenic	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Arsenic, total	ShaleNetw...	ShaleNetworkarsenic_fv	Arsenic	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Benzene	ShaleNetw...	ShaleNetworkbenzene_fv	Benzene	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Bromide, total	ShaleNetw...	ShaleNetworkkbromide_fv	Bromide	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Bromide, total	ShaleNetw...	ShaleNetworkkbromide_fv	Bromide	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Chloride, total	ShaleNetw...	ShaleNetworkchloride_fv	Chloride	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Chloride, total	ShaleNetw...	ShaleNetworkchloride_fv	Chloride	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	pH	ShaleNetw...	ShaleNetworkpH_fv	pH	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	field observation	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	pH Unit	
ShaleNetworkODM	PA DEP 26R035-21161	pH	ShaleNetw...	ShaleNetworkpH_fv	pH	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	field observation	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	pH Unit	
ShaleNetworkODM	Baker Run near Glen...	pH	ShaleNetw...	ShaleNetworkpH2	pH	2	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	pH Unit	
ShaleNetworkODM	PA DEP 26R035-21161	Strontium, total	ShaleNetw...	ShaleNetworkstrontium_fv	Strontium	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Strontium, total	ShaleNetw...	ShaleNetworkstrontium_fv	Strontium	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Toluene	ShaleNetw...	ShaleNetworktoluene_fv	Toluene	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Acidity, total acidity	ShaleNetw...	ShaleNetworkAcidity_fv	Acidity	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback Water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Acidity, total acidity	ShaleNetw...	ShaleNetworkAcidity_fv	Acidity	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback Water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Silver, total	ShaleNetw...	ShaleNetworkAg_fv	Silver	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback Water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Silver, total	ShaleNetw...	ShaleNetworkAg_fv	Silver	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback Water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Aluminum, total	ShaleNetw...	ShaleNetworkAl_fv	Aluminum	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback Water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Aluminum, total	ShaleNetw...	ShaleNetworkAl_fv	Aluminum	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback Water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	Baker Run near Glen...	Alkalinity, bicarbo...	ShaleNetw...	ShaleNetworkAlk_CH03...	Alkalinity	2	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	Baker Run near Glen...	Alkalinity, carbonate	ShaleNetw...	ShaleNetworkAlk_CO3...	Alkalinity	2	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Alkalinity, total	ShaleNetw...	ShaleNetworkAlk_fv	Alkalinity	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback Water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Alkalinity, total	ShaleNetw...	ShaleNetworkAlk_fv	Alkalinity	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback Water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	Baker Run near Glen...	Gross alpha radion...	ShaleNetw...	ShaleNetworkAlpha_F_p...	Alpha radi...	1	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Field Observation	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	picocuries per liter	

When you type in **Surface Water** at the top, this filters out everything but surface water.
Select all surface waters: Now click on a line and drag your mouse down over all the lines.
All the surface water data should be highlighted.

Then in the Ribbon, click “Download Selected”

CUAHSI HydroDesktop *

File **Map** **Search** Geostatistical Tool Table Graph Edit HydroR HydroModeler Help

Draw Rectangle 1 polygon selected Select by Attribute

Gage height stream Keyword Selection Start 4/19/2007 End 4/19/2012 Select Time Shale Network HIS Central

Time Range Data Sources Run Search Download

Legend Map Layers

- Data Sites
 - Shale Network
 - (15580, 15581)
 - (15580, 15581) (downloaded)
- Online Basemap
- Base Map Data
 - U.S. HUC
 - U.S. Counties
- U.S. States
 - + NAME
- Canada Provinces
 - + NAME

Keyword

Start 4/19/2007 End 4/19/2012 Select Time Shale Network HIS Central

Time Range Data Sources Run Search Download

Search

Download Manager

Download Complete.

Total series: 1 Downloaded and saved: 1

Remaining series: 0 With error: 0

Estimated time: 00:00:00

ServiceUrl	SiteCode	VariableCode	SiteName	VariableName	Status
http://hydroportal...	ShaleNetwork:10...	ShaleNetwork:H...	Indian Creek He...	Water level	Ok

Close this window when it is complete (you might get a few errors – just ignore)

Details... Send error Copy log Re-download All series with errors Auto scroll

Download selected data

Explore the Data using the Table Tab

CUAHSI HydroDesktop - DotSpatial Projects.NorthAmerica.dspk *

File Map Search Table Graph Edit HydroR Help

Import Export Refresh Remove Change Sequence Parallel Options

Data Import Data Export Table Current Database Path

time series

Refres Check Uncheck Delete Option

Selection Tool ALL Simple Filter Complex Filter

Check	SeriesID	VariableName	SiteName
<input checked="" type="checkbox"/>	1	Barium, dissolved	DrakeHollowRt
<input checked="" type="checkbox"/>	3	Barium, dissolved	E_Branch_up
<input checked="" type="checkbox"/>	4	Barium, dissolved	HallRunBurney
<input checked="" type="checkbox"/>	2	Barium, dissolved	SRenovoWell

See individual time series, check units

DateTime Unit E_Branch_up DrakeHollowRt * 3 Barium, dissolved milligrams per liter HallRunBurney * 2 Barium, dissolved milligrams per liter SRenovoWell Barium, dissolved milligrams per liter

Date	Unit	E_Branch_up	DrakeHollowRt	HallRunBurney	SRenovoWell
12/13/2010	milligrams per liter	1	3	4	2
6/13/2011					
7/1/2011	1			0	0
7/28/2011	1			1	0
8/18/2011	1			1	0
9/1/2011	1			1	2
9/8/2011	1			1	

Scroll and explore

Check the downloaded data sets that you want to explore...also if you Right Click on a Data entry and choose Properties, you can look at the metadata

Map Table Graph Edit HydroR

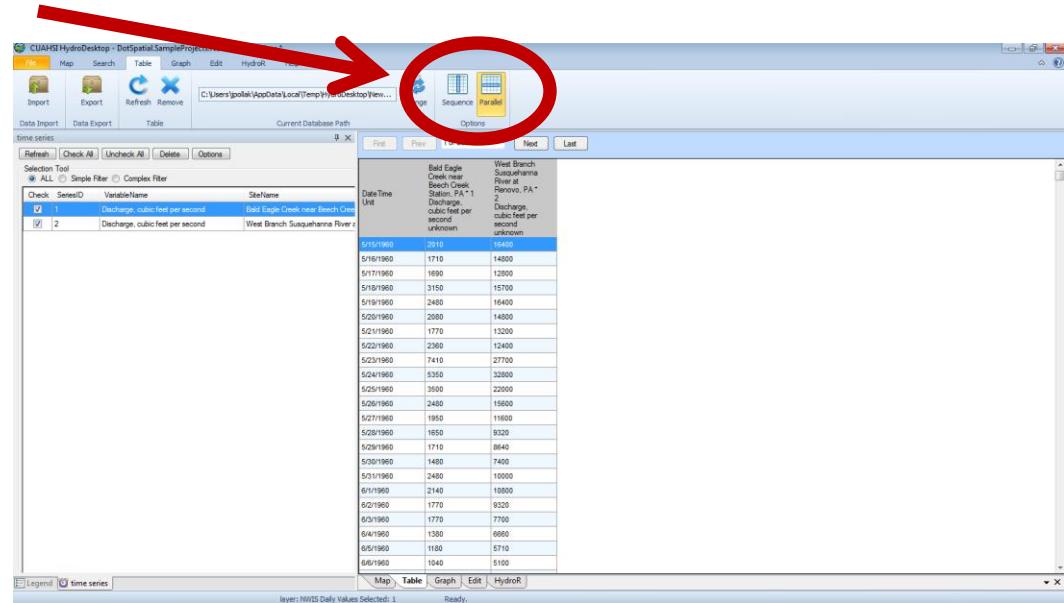
layer: Shale Network Selected: 4 Ready.

Legend time series

6:03 AM 5/13/2013

Sequence vs. Parallel

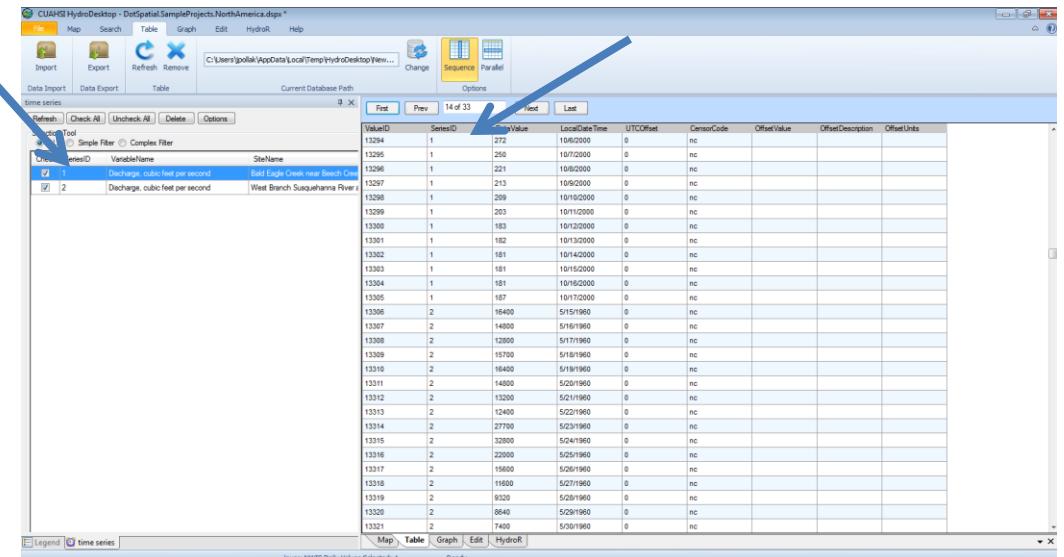
Parallel allows you to view multiple time series side by side



A screenshot of the CUHHSI HydroDesktop software interface. The title bar reads "CUAHSI HydroDesktop - DotSpatial SampleProjects.NorthAmerica.dspix". The main window shows a "time series" table with two rows of data. The first row is for "Bald Eagle Creek near Beach Creek Station, PA" and the second for "West Branch Susquehanna River". Both rows have "Discharge, cubic feet per second" as the variable name. A red arrow points from the text above to the "Parallel" button in the toolbar at the top right, which is highlighted with a red circle.

Date/Time	Unit	Bald Eagle Creek near Beach Creek Station, PA	West Branch Susquehanna River
5/15/1960	24hr	1648	1648
5/16/1960	1710	14000	
5/17/1960	1990	12000	
5/18/1960	3150	15700	
5/19/1960	2480	16400	
5/20/1960	2080	14000	
5/21/1960	1776	13200	
5/22/1960	2360	12400	
5/23/1960	7410	27700	
5/24/1960	5350	32800	
5/25/1960	3500	22000	
5/26/1960	2480	15600	
5/27/1960	1950	11600	
5/28/1960	1650	9320	
5/29/1960	1710	8640	
5/30/1960	1480	7400	
5/31/1960	2480	10000	
6/1/1960	2140	10800	
6/2/1960	1770	9320	
6/3/1960	1770	7700	
6/4/1960	1380	6680	
6/5/1960	1180	5710	
6/6/1960	1940	5100	

Sequence view shows all values of one time series followed by all values of the next time series. Note the SeriesID



A screenshot of the CUHHSI HydroDesktop software interface, similar to the one above but showing the "Sequence" view. The title bar reads "CUAHSI HydroDesktop - DotSpatial SampleProjects.NorthAmerica.dspix". The main window shows a "time series" table with two rows of data. The first row is for "Bald Eagle Creek near Beach Creek Station, PA" and the second for "West Branch Susquehanna River". Both rows have "Discharge, cubic feet per second" as the variable name. A blue arrow points from the text above to the "Sequence" button in the toolbar at the top right, which is highlighted with a blue circle.

ValueID	SeriesID	Value	LocalDateTime	UTCOffset	CensorCode	OffsetValue	OffsetDescription	OffsetUnits
13294	1	272	10/6/2000 0	0	nc			
13295	1	250	10/6/2000 0	0	nc			
13296	1	221	10/6/2000 0	0	nc			
13297	1	213	10/6/2000 0	0	nc			
13298	1	209	10/19/2000 0	0	nc			
13299	1	203	10/1/2000 0	0	nc			
13300	1	183	10/13/2000 0	0	nc			
13301	1	182	10/13/2000 0	0	nc			
13302	1	181	10/14/2000 0	0	nc			
13303	1	181	10/15/2000 0	0	nc			
13304	1	181	10/16/2000 0	0	nc			
13305	1	187	10/17/2000 0	0	nc			
13306	2	16400	5/15/1960 0	0	nc			
13307	2	14000	5/16/1960 0	0	nc			
13308	2	12800	5/17/1960 0	0	nc			
13309	2	15700	5/18/1960 0	0	nc			
13310	2	16400	5/19/1960 0	0	nc			
13311	2	14800	5/20/1960 0	0	nc			
13312	2	13200	5/21/1960 0	0	nc			
13313	2	12400	5/22/1960 0	0	nc			
13314	2	27700	5/23/1960 0	0	nc			
13315	2	32800	5/24/1960 0	0	nc			
13316	2	22000	5/25/1960 0	0	nc			
13317	2	15600	5/26/1960 0	0	nc			
13318	2	11600	5/27/1960 0	0	nc			
13319	2	9320	5/28/1960 0	0	nc			
13320	2	8640	5/29/1960 0	0	nc			
13321	2	7400	5/30/1960 0	0	nc			

Explore the Data using the Graph Tab

CUAHSI HydroDesktop - DotSpatial.SampleProjects.NorthAmerica.dspk *

File Map Search Table Graph Edit HydroR Help

TimeSeries Probability Histogram Box/Whisker Summary Plots

Plot Type Color Setting Show Legend TSA Probability Plot Options Date Time Start 12/13/... End 9/8/2011 Refresh Full Date Range

time series

Selection Tool ALL Simple Filter Complex Filter

Check	SeriesID	VariableName	SiteName
<input checked="" type="checkbox"/>	1	Barium, dissolved	DrakeHollowRd
<input checked="" type="checkbox"/>	3	Barium, dissolved	E_Branch_up
<input checked="" type="checkbox"/>	4	Barium, dissolved	HallRunBurney
<input checked="" type="checkbox"/>	2	Barium, dissolved	SRenovoWell

Barium, dissolved - milligrams per liter

Timeseries that are checked at left show up as graph (you can only do about 8)

Date and Time

Legend time series

Graph Edit HydroR

ADE - Shale Network

Var Name	Site Code	Var Code
Oxygen, dissolved	ShaleNetwork:LHU_HallRun_Headw...	ShaleNetwork:l
Electrical conductivity	ShaleNetwork:LHU_HallRun_Headw...	ShaleNetwork:l
Copper, dissolved	ShaleNetwork:LHU_DiamondRockHo...	ShaleNetwork:l
Oxygen, dissolved	ShaleNetwork:LHU_DiamondRockHo...	ShaleNetwork:l
Electrical conductivity	ShaleNetwork:LHU_DiamondRockHo...	ShaleNetwork:l
Solids, total dissolved	ShaleNetwork:LHU_DiamondRockHo...	ShaleNetwork:l
Carbon, total organic	ShaleNetwork:LHU_DiamondRockHo...	ShaleNetwork:l
Copper, dissolved	ShaleNetwork:LHU_DrakeHollowRun...	ShaleNetwork:l
Oxygen, dissolved	ShaleNetwork:LHU_DrakeHollowRun...	ShaleNetwork:l
Electrical conductivity	ShaleNetwork:LHU_DrakeHollowRun...	ShaleNetwork:l
Solids, total dissolved	ShaleNetwork:LHU_DrakeHollowRun...	ShaleNetwork:l
Carbon, total organic	ShaleNetwork:LHU_DrakeHollowRun...	ShaleNetwork:l
Copper, dissolved	ShaleNetwork:LHU_E_Branch_up	ShaleNetwork:l
Oxygen, dissolved	ShaleNetwork:LHU_E_Branch_up	ShaleNetwork:l
Electrical conductivity	ShaleNetwork:LHU_E_Branch_up	ShaleNetwork:l
Solids, total dissolved	ShaleNetwork:LHU_E_Branch_up	ShaleNetwork:l
Carbon, total organic	ShaleNetwork:LHU_SRenovoReservoir	ShaleNetwork:l
Solids, total dissolved	ShaleNetwork:LHU_HallRun_Headw...	ShaleNetwork:l
Carbon, total organic	ShaleNetwork:LHU_HallRun_Headw...	ShaleNetwork:l
Copper, dissolved	ShaleNetwork:LHU_HallRunBurneysRd	ShaleNetwork:l
Oxygen, dissolved	ShaleNetwork:LHU_HallRunBurneysRd	ShaleNetwork:l
Electrical conductivity	ShaleNetwork:LHU_HallRunBurneysRd	ShaleNetwork:l
Solids, total dissolved	ShaleNetwork:LHU_HallRunBurneysRd	ShaleNetwork:l
Carbon, total organic	ShaleNetwork:LHU_HallRunBurneysRd	ShaleNetwork:l
Copper, dissolved	ShaleNetwork:LHU_SRenovoWell	ShaleNetwork:l
Oxygen, dissolved	ShaleNetwork:LHU_SRenovoWell	ShaleNetwork:l

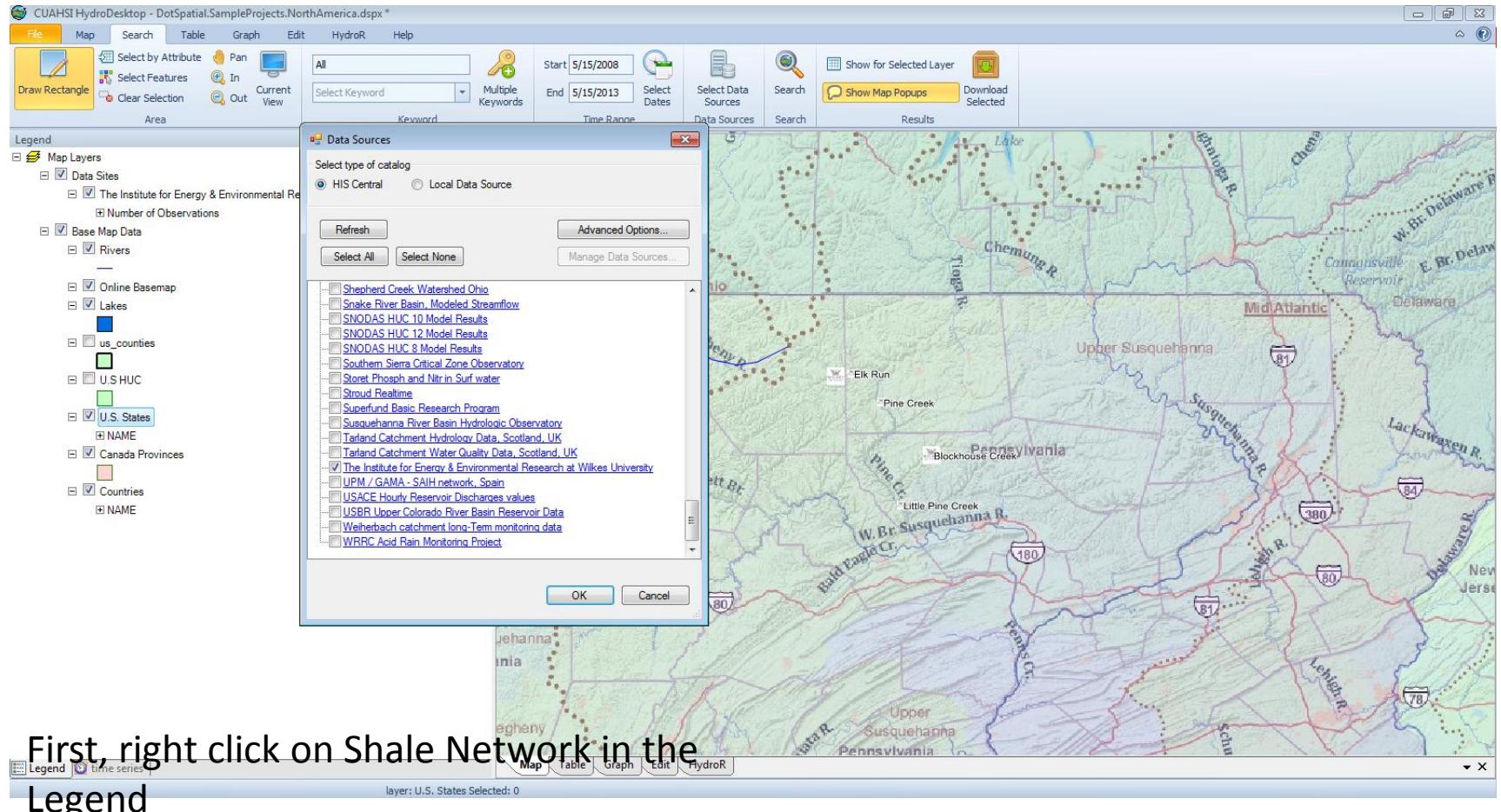
Legend time series

layer: Shale Network Selected: 4

Inbox - sxb7@psu.edu - Mozilla Thunderbird

6:05 AM 5/13/2013

Repeat...pull EPA Storet, NWIS Instantaneous Irregular Data. You can also pull data from The Institute for Energy & Environmental Research at Wilkes University (they have uploaded SRBC data)

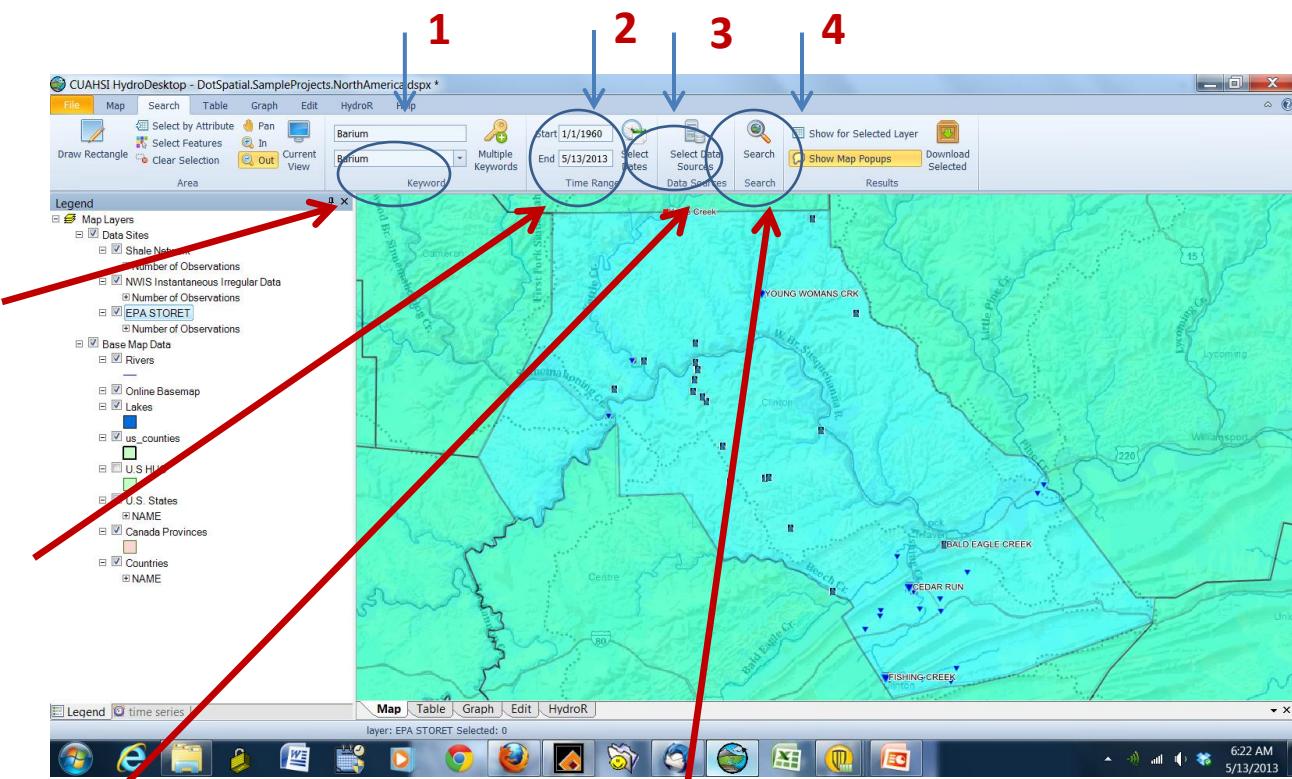


We want to repeat
the whole search

1. Chose keyword:
bromide

2. Started in **1960** and
ended in **2013**

3. We searched **Shale Network** (now we will
deselect SN and select
both EPA Storet and
NWIS Instantaneous
Irregular Values in
Data Services pop up)



4. Click Search
to find the
Metadata

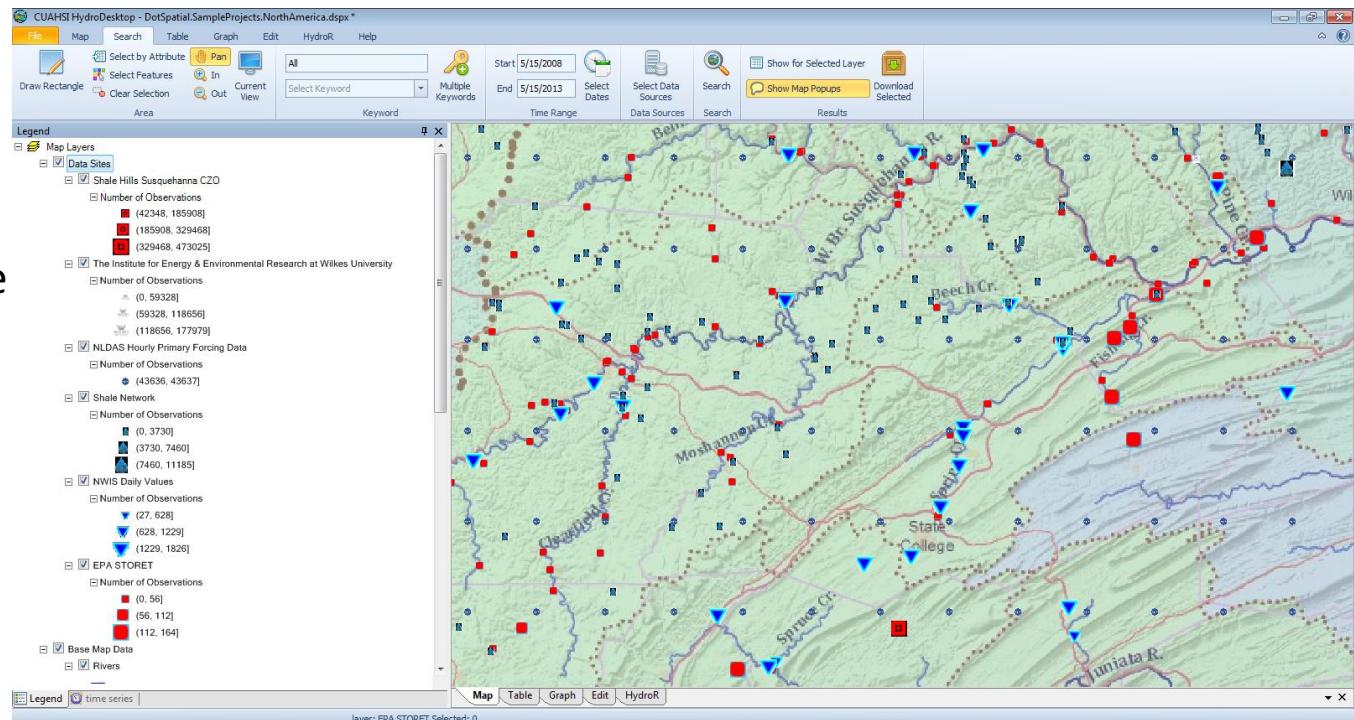
When you return metadata, you should get multiple symbols on the map this time

Symbols are provided by each data publisher. They are typically logos of the organization. The size of the symbol depends on the number of observations at an individual site.

EPA red square

USGS NWIS blue triangle

ShaleNetwork blue water drop
Base Map Data Rivers

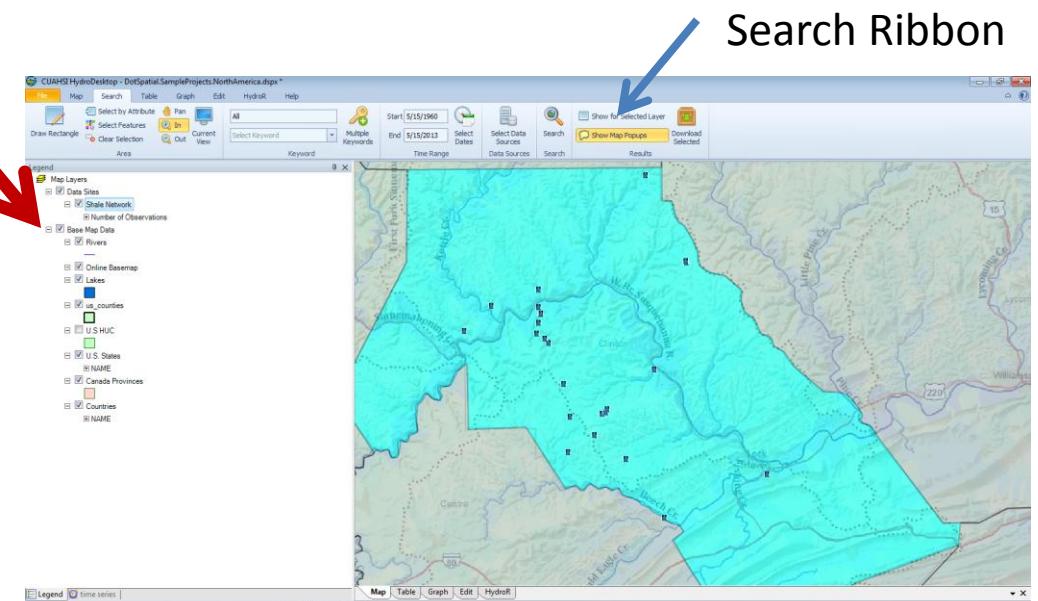
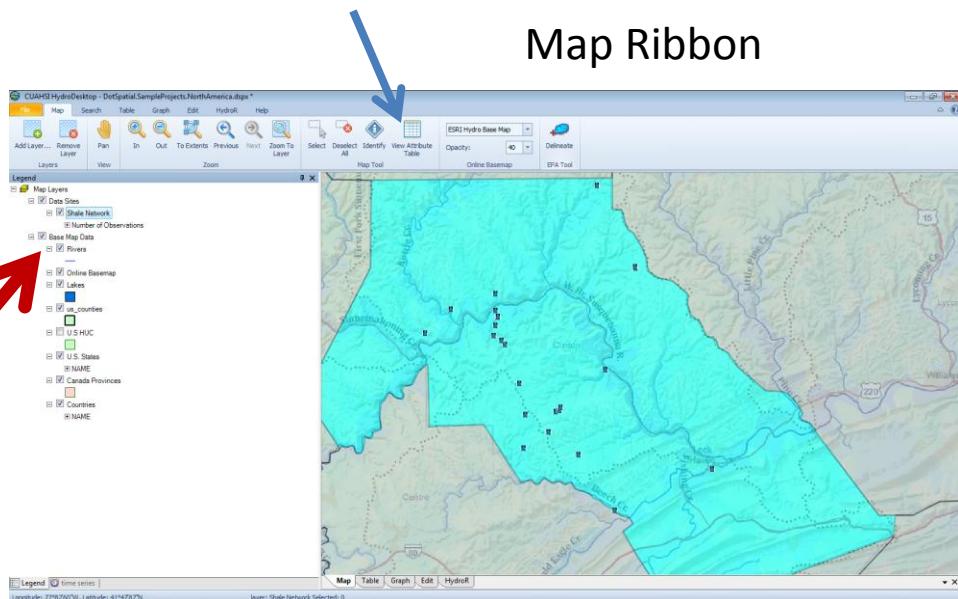


If you don't see all the data services, be sure that there is a check mark by the Data layer in the Legend. If you don't see any Data layers, look for the little boxes and toggle between – and +

You still need to get the data for each layer of data. To do this, right click the Data Service data layer in the Legend and get the Attribute Table

Or access the **Attribute Table** on the Map ribbon (**Show Attribute Table**) or on the Search ribbon (**Show for Selected Layer**).

Or alternately, right click on data layer in Legend, then choose **View Attribute Table** from popup



Please click and get the Attribute Table for EPA data first

ADE - Shale Network

Data Source	Site Name	Var Name	Site Code	Var Code	Keyword	Value	Start Date	End Date	Service URL	Service Code	Data Type	Value Type	Sample Med	Time ...	Time...	Latitude	Longitude	Is Regular	Units	
ShaleNetworkODM	Baker Run near Glen...	Specific conductance	ShaleNetwork...	ShaleNetwork:Cond2	Specific co...	4	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Field Observation	Surface Water	day	1	41.24565506	-77.608161926	<input type="checkbox"/>	microsiemens per centimeter	
ShaleNetworkODM	Baker Run near Glen...	Oxygen, dissolved	ShaleNetwork...	ShaleNetwork:DO	Oxygen, d...	4	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Field Observation	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	Baker Run near Glen...	pH	ShaleNetwork...	ShaleNetwork:pH	pH	4	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Field Observation	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	pH Unit	
ShaleNetworkODM	Baker Run near Glen...	Temperature	ShaleNetwork...	ShaleNetwork:T_C	Temperat...	4	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Continuous	Field Observation	Surface Water	day	0	41.24565506	-77.608161926	<input checked="" type="checkbox"/>	degree celsius	
ShaleNetworkODM	Baker Run near Glen...	Alkalinity, total	ShaleNetwork...	ShaleNetwork:Alk2	Alkalinity	2	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Arsenic, total	ShaleNetwork...	ShaleNetwork:arsenic_fvw	Arsenic	1	2009-11-10 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkODM	PA DEP 26R035-21156	Arsenic, total	ShaleNetwork...	ShaleNetwork:arsenic_fvw	Arsenic	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Benzene	ShaleNetwork...	ShaleNetwork:benzene_fvw	Benzene	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Bromide, total	ShaleNetwork...	ShaleNetwork:bromide_fvw	Bromide	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21156	Bromide, total	ShaleNetwork...	ShaleNetwork:bromide_fvw	Bromide	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21156	Chloride, total	ShaleNetwork...	ShaleNetwork:chloride_fvw	Chloride	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Chloride, total	ShaleNetwork...	ShaleNetwork:chloride_fvw	Chloride	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21156	pH	ShaleNetwork...	ShaleNetwork:pH_fvw	pH	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	field observation	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	pH Unit	
ShaleNetworkODM	PA DEP 26R035-21161	pH	ShaleNetwork...	ShaleNetwork:pH_fvw	pH	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	field observation	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	pH Unit	
ShaleNetworkODM	Baker Run near Glen...	pH	ShaleNetwork...	ShaleNetwork:pH2	pH	2	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	pH Unit	
ShaleNetworkODM	PA DEP 26R035-21156	Selenium, total	ShaleNetwork...	ShaleNetwork:selenium_fvw	Selenium	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Selenium, total	ShaleNetwork...	ShaleNetwork:selenium_fvw	Selenium	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Toluene	ShaleNetwork...	ShaleNetwork:toluene_fvw	Toluene	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkODM	PA DEP 26R035-21156	Acidity, total acidity	ShaleNetwork...	ShaleNetwork:Acidity_fvw	Acidity	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Flowback Wa...	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Acidity, total acidity	ShaleNetwork...	ShaleNetwork:Acidity_fvw	Acidity	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Flowback Wa...	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Silver, total	ShaleNetwork...	ShaleNetwork:Ag_fvw	Silver	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Flowback Wa...	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21156	Silver, total	ShaleNetwork...	ShaleNetwork:Ag_fvw	Silver	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Flowback Wa...	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21156	Aluminum, total	ShaleNetwork...	ShaleNetwork:Al_fvw	Aluminum	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Flowback Wa...	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Aluminum, total	ShaleNetwork...	ShaleNetwork:Al_fvw	Aluminum	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Flowback Wa...	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	Baker Run near Glen...	Alkalinity, bicarbonate	ShaleNetwork...	ShaleNetwork:Alk_CH3O...	Alkalinity	2	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	Baker Run near Glen...	Alkalinity, carbonate	ShaleNetwork...	ShaleNetwork:Alk_CO3...	Alkalinity	2	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21156	Alkalinity, total	ShaleNetwork...	ShaleNetwork:Alk_fvw	Alkalinity	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Flowback Wa...	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	PA DEP 26R035-21161	Alkalinity, total	ShaleNetwork...	ShaleNetwork:Alk_fvw	Alkalinity	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Sample	Flowback Wa...	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkODM	Baker Run near Glen...	Gross alpha radionuclides	ShaleNetwork...	ShaleNetwork:Alpha_F_p...	Alpha radi...	1	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkODM	Sporadic	Field Observation	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	picocuries per liter	

Choose all the EPA data (these data are all surface water)

To download EPA data, you must highlight the appropriate lines in the attribute table

Hold Shift and click all lines (or drag the mouse over all lines) to select all contiguous entries.

The screenshot shows the CUAHSI HydroDesktop interface. On the left, the Legend panel displays various map layers, with 'Shale Network' checked. The main map view shows a cyan-colored area representing the shale network, overlaid with a grid of small blue squares indicating sampling sites. To the right, the 'ADE - Shale Network' attribute table lists environmental parameters and their corresponding site codes. A large red arrow points from the text instructions at the top to the table, highlighting the 'Barium, dissolved' row. Another red arrow points to the 'ShaleNetwork:LHU_E_Branch_up' entry in the table.

Var Name	Site Code	Var Code
Temperature	ShaleNetwork:LHU_DiamondRockHo...	ShaleNetwork:l
Barium, dissolved	ShaleNetwork:LHU_DrakeHollowRun...	ShaleNetwork:l
Hardness, carbonate	ShaleNetwork:LHU_DrakeHollowRun...	ShaleNetwork:l
pH	ShaleNetwork:LHU_DrakeHollowRun...	ShaleNetwork:l
Sulfate, dissolved	ShaleNetwork:LHU_DrakeHollowRun...	ShaleNetwork:l
Temperature	ShaleNetwork:LHU_E_Branch_up	ShaleNetwork:l
Barium, dissolved	ShaleNetwork:LHU_E_Branch_up	ShaleNetwork:l
Hardness, carbonate	ShaleNetwork:LHU_SRenovoReservoir	ShaleNetwork:l
Temperature	ShaleNetwork:LHU_HallRun_Headw...	ShaleNetwork:l
Barium, dissolved	ShaleNetwork:LHU_HallRunBurneysRd	ShaleNetwork:l
Hardness, carbonate	ShaleNetwork:LHU_HallRunBurneysRd	ShaleNetwork:l
pH	ShaleNetwork:LHU_HallRunBurneysRd	ShaleNetwork:l
Sulfate, dissolved	ShaleNetwork:LHU_HallRunBurneysRd	ShaleNetwork:l
Temperature	ShaleNetwork:LHU_HallRunBurneysRd	ShaleNetwork:l
Barium, dissolved	ShaleNetwork:LHU_SRenovoWell	ShaleNetwork:l
Hardness, carbonate	ShaleNetwork:LHU_SRenovoWell	ShaleNetwork:l
pH	ShaleNetwork:LHU_SRenovoWell	ShaleNetwork:l
Sulfate, dissolved	ShaleNetwork:LHU_SRenovoWell	ShaleNetwork:l
Temperature	ShaleNetwork:LHU_SRenovoWell	ShaleNetwork:l
Barium, dissolved	ShaleNetwork:LHU_StinkHollow144	ShaleNetwork:l
Hardness, carbonate	ShaleNetwork:LHU_StinkHollow144	ShaleNetwork:l
pH	ShaleNetwork:LHU_StinkHollow144	ShaleNetwork:l
Sulfate, dissolved	ShaleNetwork:LHU_StinkHollow144	ShaleNetwork:l
Temperature	ShaleNetwork:LHU_StinkHollow144	ShaleNetwork:l
Copper, dissolved	ShaleNetwork:LHU_HallRun_Headw...	ShaleNetwork:l
Oxygen, dissolved	ShaleNetwork:LHU_HallRun_Headw...	ShaleNetwork:l
Electrical conductivity	ShaleNetwork:LHU_HallRun_Headw...	ShaleNetwork:l

CUAHSI HydroDesktop *

File **Map** **Search** **Geostatistical Tool** **Table** **Graph** **Edit** **HydroR** **HydroModeler** **Help**

Draw Rectangle **1 polygon selected** Select by Attribute

Gage height stream Keyword Selection

Start 4/19/2007 End 4/19/2012 Select Time

Shale Network HIS Central

Run Search Download

Legend

- Map Layers**
 - Data Sites
 - Shale Network
 - (15580, 15581)
 - (15580, 15581) (downloaded)
 - Online Basemap
 - Base Map Data
 - U.S. HUC
 - U.S. Counties
 - U.S. States
 - + NAME
 - Canada Provinces
 - + NAME

Download Manager

Download Complete.

Total series: 1 Downloaded and saved: 1

Remaining series: 0 With error: 0

Estimated time: 00:00:00

ServiceUrl	SiteCode	VariableCode	SiteName	VariableName	Status
http://hydroportal...	ShaleNetwork:10...	ShaleNetwork:H...	Indian Creek He...	Water level	Ok

Close this window when it is complete (you might get a few errors – just ignore)

Details... Send error Copy log Re-download All series with errors Auto scroll

Download selected data

Next get Attribute Table for NWIS data (right click NWIS on the Legend, choose “Show Attribute Table”)

Hold down the Control key and click on lines one by one. But please **check Site Name**..do not select any that say “Well” or HU xxx or LY xxx...these are boreholes in each County. Hold down Control key on keyboard and Click on every data line you want to include



ADE - Shale Network	DataSource	Site Name	Var Name	Site Code	Var Code	Keyword	Value...	Start Date	End Date	Service URL	Service Code	Data Type	Value Type	Sample Med	Time ...	Time...	Latitude	Longitude	Is Regular	Units
► ShaleNetworkCOM	Baker Run near Glen...	Specific conductance	ShaleNetwork:Cond2	ShaleNetwork:Cond2	Specific co...	4	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	Field Observation	Surface Water	day	1	41.24565506	-77.608161926	<input type="checkbox"/>	microsiemens per centimeter	
ShaleNetworkCOM	Baker Run near Glen...	Oxygen, dissolved	ShaleNetwork:DO	ShaleNetwork:DO	Oxygen, d...	4	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	Field Observation	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkKOM	Baker Run near Glen...	pH	ShaleNetwork:pH	ShaleNetwork:pH	pH	4	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	Field Observation	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	pH Unit	
ShaleNetworkCOM	Baker Run near Glen...	Temperature	ShaleNetwork:T_C	ShaleNetwork:T_C	Temperat...	4	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Continuous	Field Observation	Surface Water	day	0	41.24565506	-77.608161926	<input checked="" type="checkbox"/>	degree celsius	
ShaleNetworkCOM	Baker Run near Glen...	Alkalinity, total	ShaleNetwork:Alk2	ShaleNetwork:Alk2	Alkalinity	2	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	Sample	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkKOM	PA DEP 26R035-21161	Arsenic, total	ShaleNetwork:arsenic_fw	ShaleNetwork:arsenic_fw	Arsenic	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkCOM	PA DEP 26R035-21156	Arsenic, total	ShaleNetwork:arsenic_fw	ShaleNetwork:arsenic_fw	Arsenic	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	sample	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkCOM	PA DEP 26R035-21161	Benzene	ShaleNetwork:benzene_fw	ShaleNetwork:benzene_fw	Benzene	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkKOM	PA DEP 26R035-21161	Bromide, total	ShaleNetwork:bromide_fw	ShaleNetwork:bromide_fw	Bromide	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkCOM	PA DEP 26R035-21156	Bromide, total	ShaleNetwork:bromide_fw	ShaleNetwork:bromide_fw	Bromide	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	sample	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkCOM	PA DEP 26R035-21156	Chloride, total	ShaleNetwork:chloride_fw	ShaleNetwork:chloride_fw	Chloride	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	sample	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkKOM	PA DEP 26R035-21161	Chloride, total	ShaleNetwork:chloride_fw	ShaleNetwork:chloride_fw	Chloride	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkCOM	PA DEP 26R035-21156	pH	ShaleNetwork:pH_fw	ShaleNetwork:pH_fw	pH	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	field observation	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	pH Unit	
ShaleNetworkCOM	PA DEP 26R035-21161	pH	ShaleNetwork:pH_fw	ShaleNetwork:pH_fw	pH	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	field observation	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	pH Unit	
ShaleNetworkKOM	Baker Run near Glen...	pH	ShaleNetwork:pH	ShaleNetwork:pH	pH	2	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	Sample	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	pH Unit	
ShaleNetworkCOM	PA DEP 26R035-21156	Strontium, total	ShaleNetwork:strontium_fw	ShaleNetwork:strontium_fw	Strontium	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	sample	Flowback water	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkCOM	PA DEP 26R035-21161	Strontium, total	ShaleNetwork:strontium_fw	ShaleNetwork:strontium_fw	Strontium	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkKOM	PA DEP 26R035-21161	Toluene	ShaleNetwork:toluene_fw	ShaleNetwork:toluene_fw	Toluene	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	sample	Flowback water	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	micrograms per liter	
ShaleNetworkCOM	PA DEP 26R035-21156	Acidity, total acidity	ShaleNetwork:Acidity_fw	ShaleNetwork:Acidity_fw	Acidity	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	sample	Flowback Wa...	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkCOM	PA DEP 26R035-21161	Acidity, total acidity	ShaleNetwork:Acidity_fw	ShaleNetwork:Acidity_fw	Acidity	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	sample	Flowback Wa...	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkKOM	PA DEP 26R035-21161	Silver, total	ShaleNetwork:Ag_fw	ShaleNetwork:Ag_fw	Silver	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	sample	Flowback Wa...	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkCOM	PA DEP 26R035-21156	Silver, total	ShaleNetwork:Ag_fw	ShaleNetwork:Ag_fw	Silver	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	sample	Flowback Wa...	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkCOM	PA DEP 26R035-21156	Aluminum, total	ShaleNetwork:Al_fw	ShaleNetwork:Al_fw	Aluminum	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	sample	Flowback Wa...	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkKOM	PA DEP 26R035-21161	Aluminum, total	ShaleNetwork:Al_fw	ShaleNetwork:Al_fw	Aluminum	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	sample	Flowback Wa...	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkCOM	Baker Run near Glen...	Alkalinity, bicarbonate	ShaleNetwork:Alk_CH3O3...	ShaleNetwork:Alk_CH3O3...	Alkalinity	2	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	Sample	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkCOM	Baker Run near Glen...	Alkalinity, carbonate	ShaleNetwork:Alk_CO3...	ShaleNetwork:Alk_CO3...	Alkalinity	2	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	Sample	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkKOM	PA DEP 26R035-21156	Alkalinity, total	ShaleNetwork:Alk_fw	ShaleNetwork:Alk_fw	Alkalinity	1	2009-11-18 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	Sample	Flowback Wa...	day	0	41.36940024	-77.559402466	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkCOM	PA DEP 26R035-21161	Alkalinity, total	ShaleNetwork:Alk_fw	ShaleNetwork:Alk_fw	Alkalinity	1	2009-11-20 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	Sample	Flowback Wa...	day	0	41.194999695	-77.687698364	<input type="checkbox"/>	milligrams per liter	
ShaleNetworkCOM	Baker Run near Glen...	Gross alpha radon...	ShaleNetwork:Alpha_F_p...	ShaleNetwork:Alpha_F_p...	Alpha radi...	1	2011-07-26 00:00	2013-05-15 00:00	http://hydroport...	ShaleNetworkKOM	Sporadic	Field Observation	Surface Water	day	0	41.24565506	-77.608161926	<input type="checkbox"/>	picocuries per liter	

NWIS data that starts with two letters (HU, CE, LY for example) and followed by three numbers are observation wells. The two letters are the first two letters of the county. Do not choose these data lines.

Let's compare Br values county by county

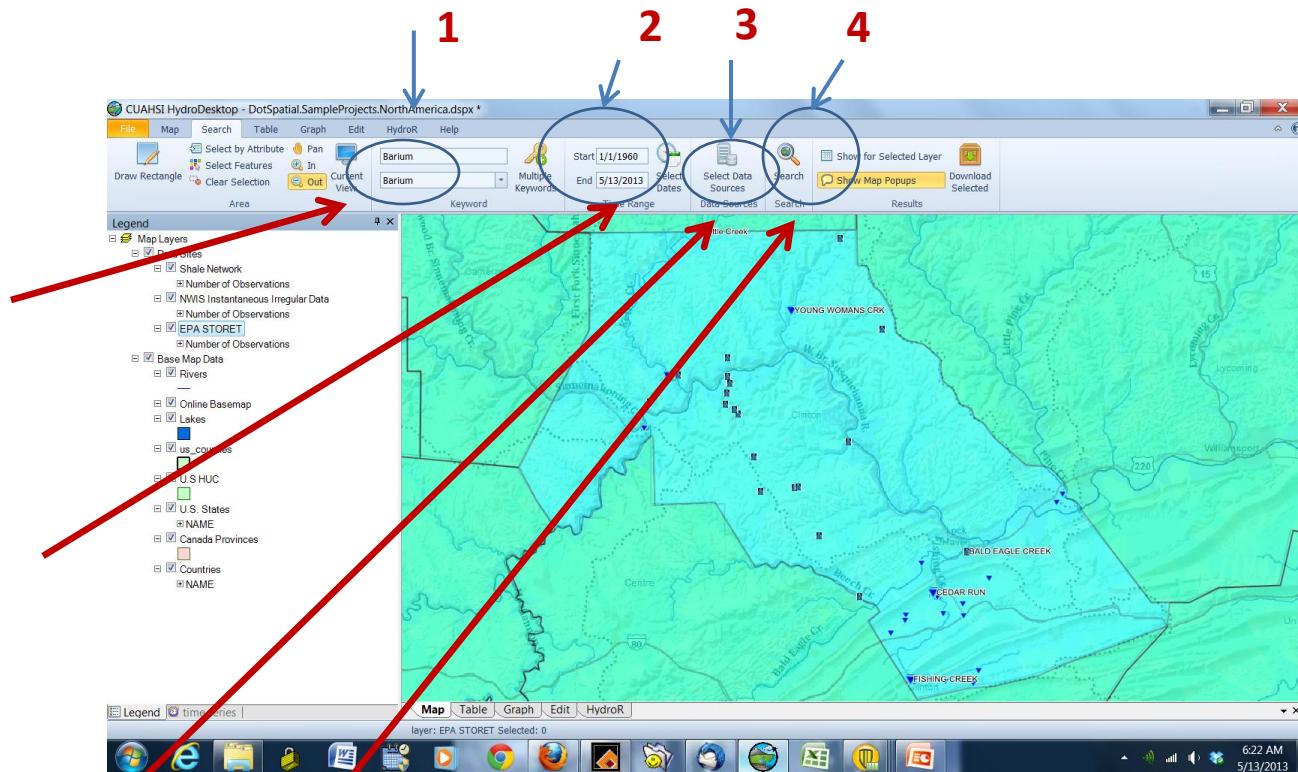
	wells	CWTs
ALLEGHENY	22	
ARMSTRONG	145	1
BEAVER	23	
BEDFORD	1	
BLAIR	6	
BRADFORD	1107	
BUTLER	174	
CAMBRIA	5	
CAMERON	14	
CENTRE	63	
CLARION	29	1
CLEARFIELD	149	
CLINTON	84	
COLUMBIA	2	
CRAWFORD	2	
ELK	59	
ERIE	1	
FAYETTE	231	1
FOREST	18	
GREENE	517	
HUNTINGDON	1	
INDIANA	42	1
JEFFERSON	40	
LACKAWANNA	1	
LANCASTER	0	1
LAWRENCE	19	1
LYCOMING	659	3
MCKEAN	59	2
MERCER	3	
POTTER	65	
SOMERSET	20	
SULLIVAN	68	
SUSQUEHANNA	642	1
TIOGA	808	1
VENANGO	4	
WARREN	4	
WASHINGTON	725	
WAYNE	5	
WESTMORELAND	228	
WYOMING	110	
	6155	

- Please take some notes about the range of highest values you see for Bromide in SURFACE WATER for your county. We will compare the high values by writing them on the board for each county.
- Units are different for different Data Services. **We will compare everything in parts per million -- written as ppm (= mg/L= µg/mL). If data is presented as µg/L, divide it by 1000 to report it in ppm.**
- Rather look at data in Excel? From **Table Tab, Choose Export → Select a Delimiter (Tab) → Specify Output File (Browse → Desktop → any name for a file you want)**
- Most natural PA samples are in range of 0.01 mg/L and lower. Most analytical labs only can detect to 0.2-0.6 mg/L. EPA recommendation is 6 mg/L but there is no MCL. If you see much higher values, are you sure it is Surface water? What is it? Censored data means that the measured value was less than detection
- **Do we see higher Br concentrations in counties with wells or with counties with Commercial Water Treatment (CWT) plants that are permitted to discharge waste from conventional Oil and Gas wells?**

Let's now do the same thing for Ba...first get rid of Br data

- Go back to **Search** tab
- Under **Legend/Map Layers/Shale Network..right click on Shale Network and choose Remove layers.** Wait until layer is gone. If symbols remain on map, zoom in and then zoom out and the symbols should disappear.
- Under **Table** tab, click the **Check** button (to check all downloaded time series) and select **Delete**. Or delete them one at a time.
- If things get messed up (glitch), you may have to close down HydroDesktop and start it up again

**1. Choose keyword:
Barium**



**2. Start in 1960 and
end today**

**3. Search Shale
Network, EPA Storet
and NWIS Daily
Irregular Values**

4. Click Run Search

Explore Barium data

- Right click on each Data service in Legend and choose “Show Attribute Table”
- In Attribute Table depress Control key and click on metadata lines that are surface waters (for Shale Network you might go to Sample Medium and type in Surface water in field at the top; for NWIS data avoid boreholes and anything like CE 242, HU 333, etc.; get all EPA data)
- After highlighting data for a Data Service, click Download Selected...you have to download data separately for each Data Service layer
- Explore data in Table tab
- Units are different for different Data Services. **We will compare everything in parts per million -- written as ppm (= mg/L= µg/mL). If data is presented as µg/L, divide it by 1000 to report it in ppm.**
- Maximum contaminant level (MCL) for Ba is 2 mg/L (ppm).
- What is the range of Ba in your county?

Olmstead et al., 2013

Concern has been raised in the scientific literature about the environmental implications of extracting natural gas from deep shale formations, and published studies suggest that shale gas development may affect local groundwater quality. The potential for surface water quality degradation has been discussed in prior work, although no empirical analysis of this issue has been published. The potential for large-scale surface water quality degradation has affected regulatory approaches to shale gas development in some US states, despite the dearth of evidence. This paper conducts a large-scale examination of the extent to which shale gas development activities affect surface water quality. Focusing on the Marcellus Shale in Pennsylvania, we estimate the effect of shale gas wells and the release of treated shale gas waste by permitted treatment facilities on observed downstream concentrations of chloride (Cl^-) and total suspended solids (TSS), controlling for other factors. Results suggest that (i) the treatment of shale gas waste by treatment plants in a watershed raises downstream Cl^- concentrations but not TSS concentrations, and (ii) the presence of shale gas wells in a watershed raises downstream TSS concentrations but not Cl^- concentrations. These results can inform future voluntary measures taken by shale gas operators and policy approaches taken by regulators to protect surface water quality as the scale of this economically important activity increases.

Example 2. Let's look at one analyte in one river

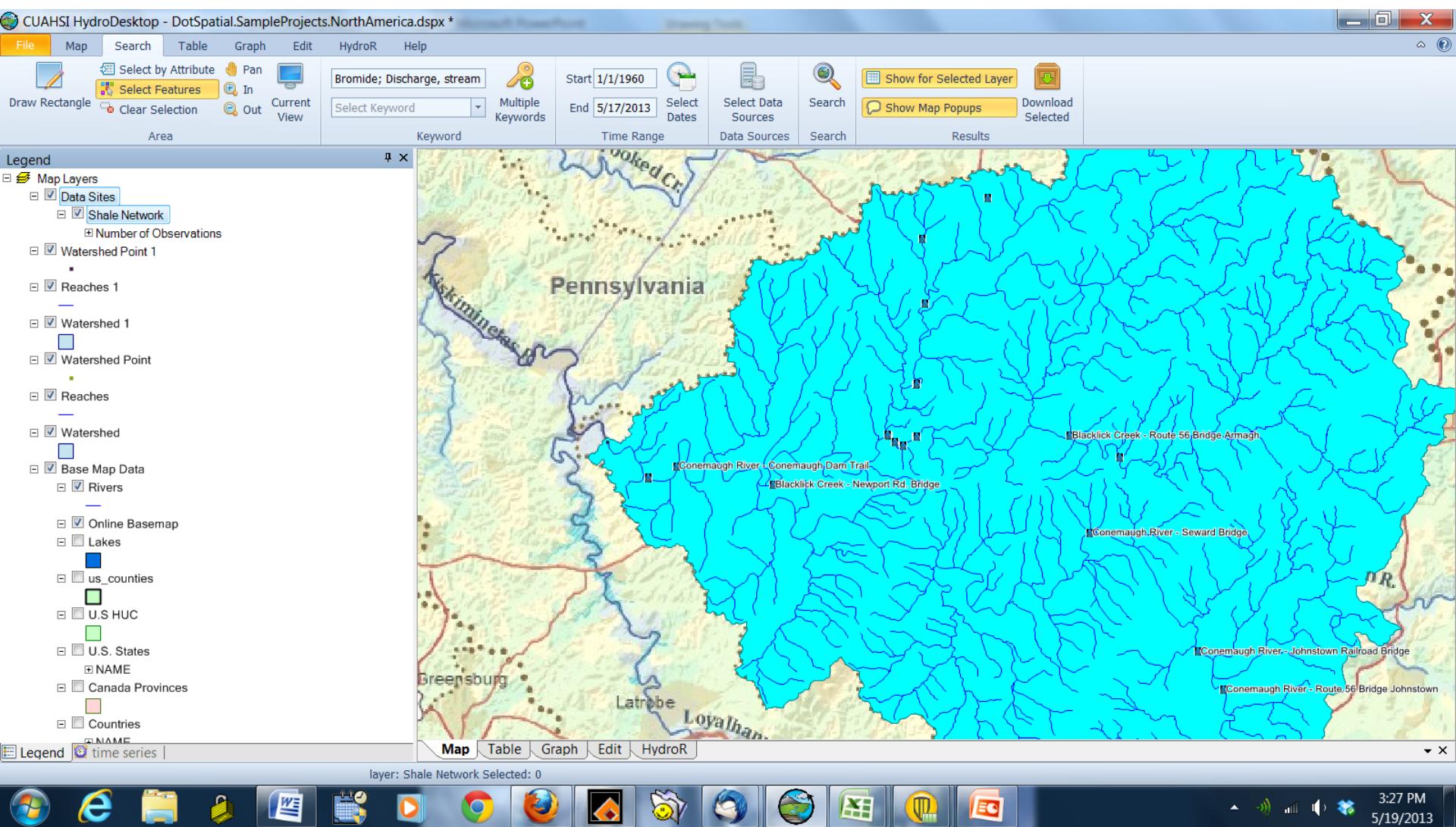
First get rid of Br data for your chosen county

- Go back to **Search** tab
- Under **Legend/Map Layers/Shale Network**..right click on **Shale Network** and choose **Remove layers** (sometimes it is slow)
- Under **Table** tab, click the **Check** button and then **Delete** to delete the downloaded time series.

De-select the county you had been looking at

- Go to **Search tab**
- Choose **Clear Selection**
- Zoom to southwest PA (or wherever you want to look)
- **Change base map to ESRI Hydro Base Map (unclick other layers and change opacity as necessary)**
- **Under map choose Draw Rectangle and draw rectangle around a small part of southwest PA, focussing on one river...set Bromide (or analyte of choice), Streamflow and pull data. You may want to limit to data since 2005**
- You can also search using the **Delineate Watershed Tool** from the Map ribbon. This tool will delineate a watershed polygon for any point you choose, which you can then select using **Select Features** from the **Search Ribbon** to define your search area as you would any other layer in HydroDesktop

For example...you could explore upper Conemaugh River (contains Blacklick Creek)



Waterways impacted by larger spills

2008 to 2011, spills > 400 gallons

- Pine creek (Lycoming, Airfoam)
- Stevens creek (Susquehanna, flowback)
- Brush run (Washington, flowback)
- Little Laurel creek (Clearfield, flowback)
- Dunkle creek (Hopewell, frack fluid)
- Towanda creek (flowback)
- Ten mile creek tributary (Washington, mud)

Sept 2012-March 2013 (all < 400 gallons)

- Harts Run (Sullivan, bentonite)
- Jacobs creek (Westmoreland, drilling mud)
- Mill creek (Sullivan, sediment)
- Black Water run (Sullivan, turbid discharge)
- Slack run tributary (Lycoming, sediment)
- Blacklick creek (Indiana, bentonite)
- Muncy creek (Lycoming, sediment)
- Thorn creek (Butler, drilling fluids)
- Wellmans creek, Salt Lick creek (Sullivan, discharge)
- Brion creek (Lycoming, hydrostatic test water and sediment)
- Big Bottom run (Sullivan, sediment)

	wells	CWTs
ALLEGHENY	22	
ARMSTRONG	145	1
BEAVER	23	
BEDFORD	1	
BLAIR	6	
BRADFORD	1107	
BUTLER	174	
CAMBRIA	5	
CAMERON	14	
CENTRE	63	
CLARION	29	1
CLEARFIELD	149	
CLINTON	84	
COLUMBIA	2	
CRAWFORD	2	
ELK	59	
ERIE	1	
FAYETTE	231	1
FOREST	18	
GREENE	517	
HUNTINGDON	1	
INDIANA	42	1
JEFFERSON	40	
LACKAWANNA	1	
LANCASTER	0	1
LAWRENCE	19	1
LYCOMING	659	3
MCKEAN	59	2
MERCER	3	
POTTER	65	
SOMERSET	20	
SULLIVAN	68	
SUSQUEHANNA	642	1
TIoga	808	1
VENANGO	4	
WARREN	4	
WASHINGTON	725	
WAYNE	5	
WESTMORELAND	228	1
WYOMING	110	
		6155

Wells in each
county, CWTs in
each county

Find bromide data and discharge data for points on the river

- Use the attribute table to distinguish/browse for each variable. If you highlight a time series in the attribute table, the corresponding site will be highlighted on the map.
- Hover your cursor over the Data sites on the map and find a site that has observations for both variables or 2 sites measuring one variable each to download data
- Explore data in Table and Graph tabs

Select the **Table** tab in the ribbon to view the data in tabular format.

Make
sure
you
check
the
series
box

The screenshot shows the CUAHSI HydroDesktop interface. The ribbon at the top has tabs for File, Map, Search, Geostatistical Tools, Table (which is highlighted in yellow), Graph, Edit, HydroR, HydroModeler, and Help. Below the ribbon is a toolbar with icons for Export, Manage, Add, Refresh, Delete, and a sequence icon (highlighted with a red circle). A status bar at the bottom shows 'Ready.'.

The main area displays a table titled 'time series' with 24 rows. The columns are: ValueID, SeriesID, DataValue, LocalDateTime, UTCTimeOffset, and CensorCode. The data shows values ranging from 208.83 to 212.83, with LocalDateTime from 3/25/2011 4:00 PM to 3/25/2011 9:15 PM and UTCTimeOffset from -5 to -5. The CensorCode column is all 'nc'.

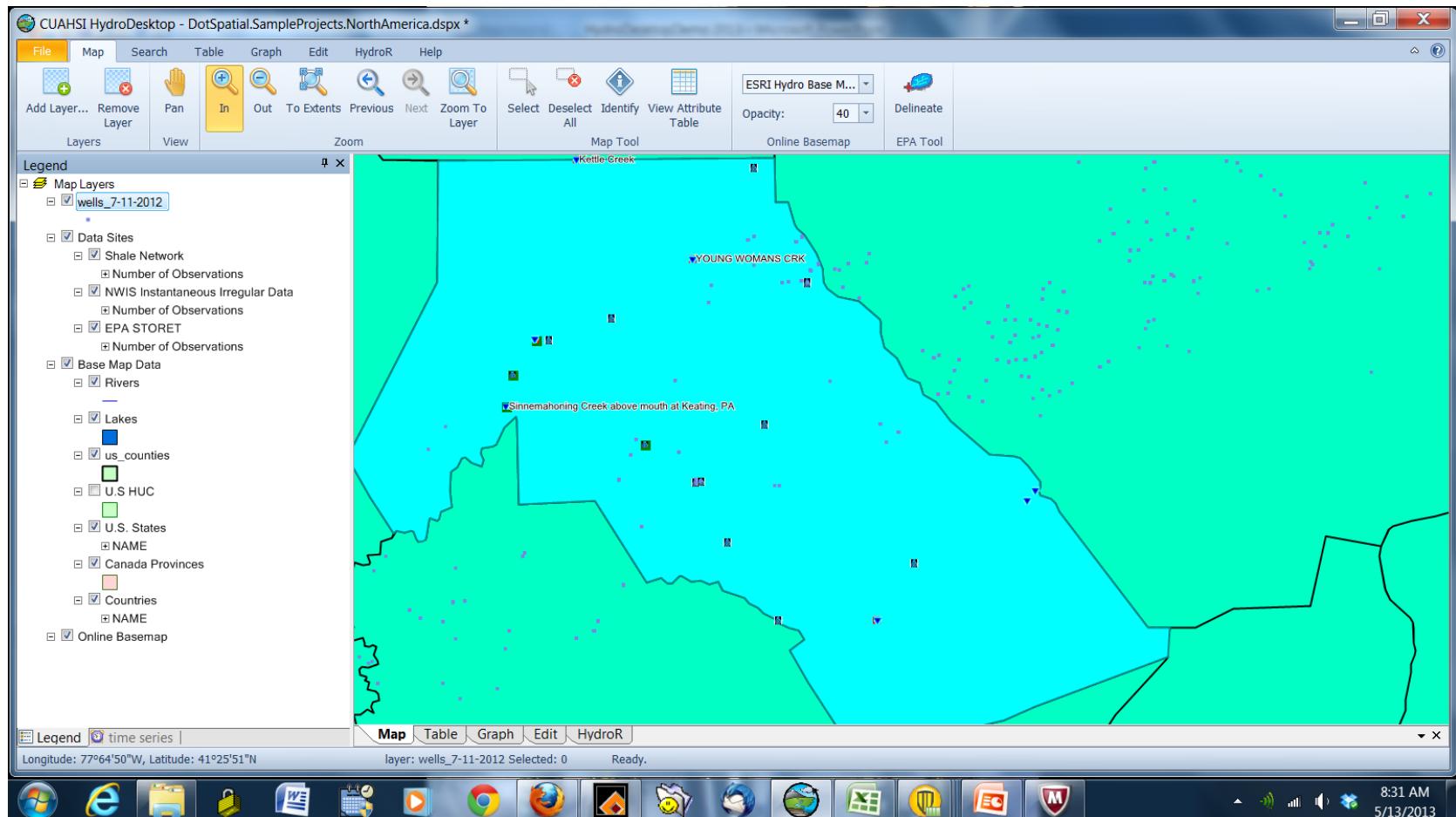
A legend at the bottom left indicates 'time series'. The ribbon at the bottom also has tabs for Map, Table (highlighted in blue), Graph, Edit, HydroR, and HydroModeler.

Annotations in red text and arrows:

- An arrow points to the 'Table' tab in the ribbon.
- An arrow points to the 'Sequence' icon in the toolbar.
- Text on the right says: "Remember to click the Parallel option if you want to see the data with units".
- An arrow points to the 'Series' checkbox in the 'Selection Tool' dropdown menu.

Advanced Topics

Advanced topic: Show the gas wells on top of the sample sites



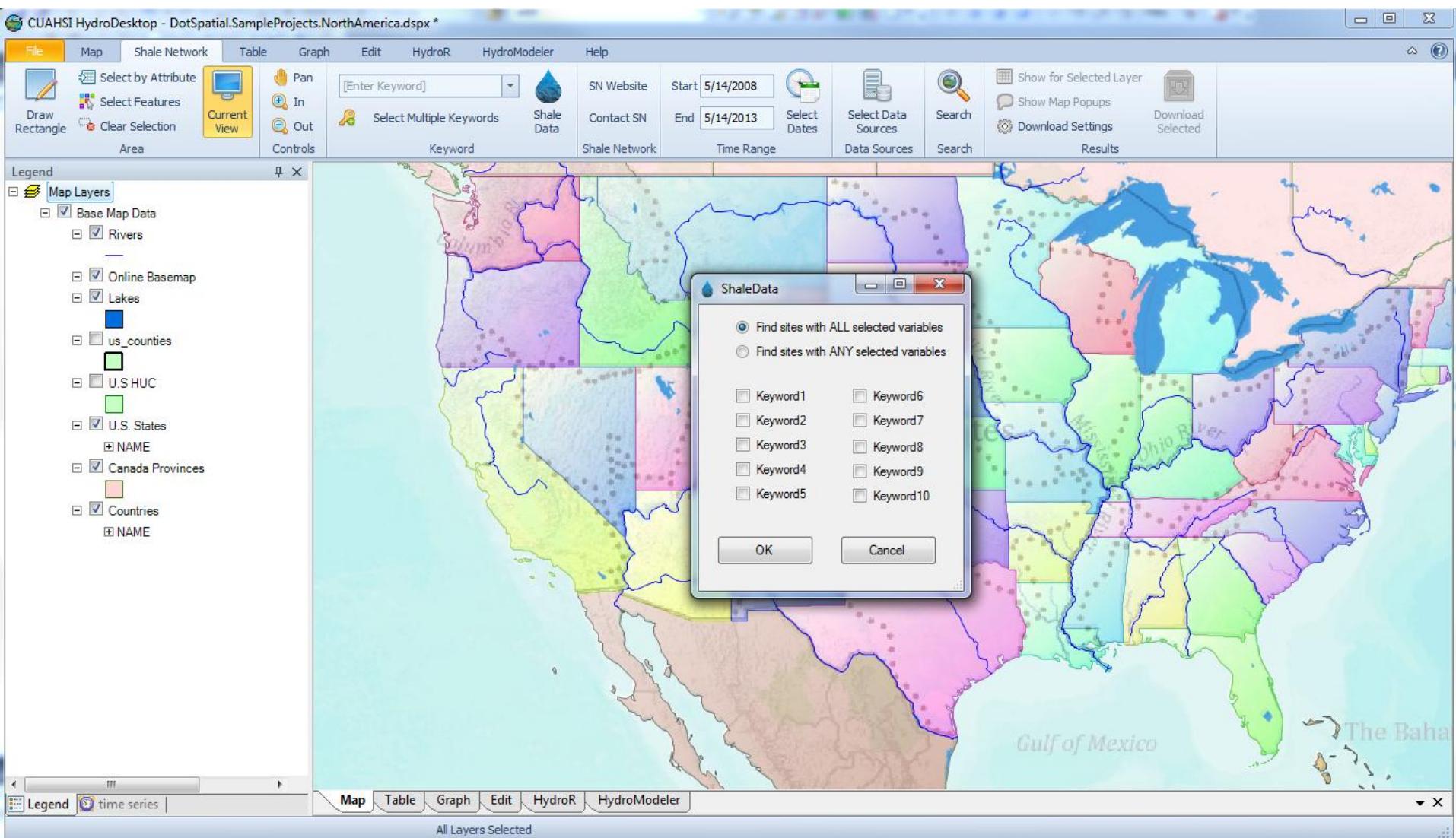
Upload the shape file for wells

- Hover over a site with ShaleNetwork data
- Click on ShaleNetwork in pop up window...this takes you to www.cuahsi.org
- Click on ShaleNetwork...this takes you to www.shalenetwork.org
- Click on **Databases** then **Hydrodesktop**. At this site there is a version of HydroDesktop with the well shape file
- You can either run this version of HydroDesktop or extract the shape file and add it to your current version of HydroDesktop by choosing **Add layer** under **Map tab**

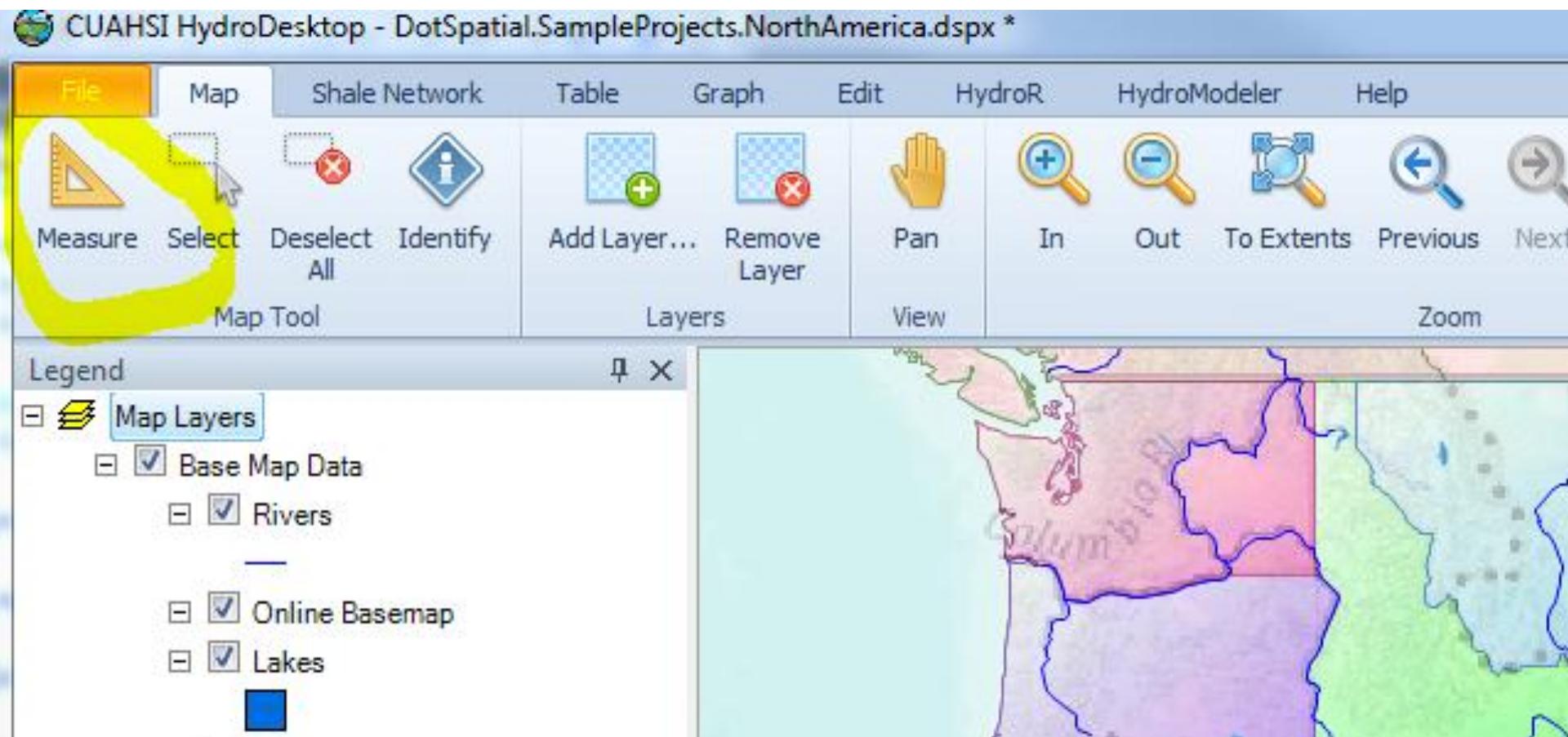
Jon Pollak and Dan Ames are building a customized HD for Shale Network

- The Shale Data Search tool (for searching “any/or” of specific keywords like discharge, bromide, strontium, etc.)
- Buttons added for links to: shalenetwork.org and shalenetwork.org/contact
- Measuring tool for both distance and area
- Shape files for maps of wells, mines, CWTs, NOVs

Searching for data, using and/or



Measuring lengths or areas



Lunch is at 12 30 back at Atherton
Hotel

See you back there!