NGA Disparate Data Challenge

PYXIS DISCRETE GLOBAL GRID SYSTEM

Disparate Geospatial Data Integration On-Demand

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Summary

In the PYXIS Studio data values from many distributed and disparate types of any geospatial sources are assembled on a discrete global grid system on-demand. The DGGS allows for the aggregation and decomposition of data values from multiple sources and the formation of collection of these values – called GeoPackets - that hold calculated statistics and distribution (histogram or frequency) that characterize the data values and thereby characterize phenomenon.

The data can be acquired from conventional GIS data sources (vector features and raster coverages) and other data that has geospatial reference. The processing of data values into the DGGS can be completed prior to the request or in some cases efficiently processed into the DGGS after the request.

(do not count words)


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pjpeterson
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The Breakthrough in Geospatial Data Integration

The PYXIS DGGS serves as an optimized digital framework for combining and analyzing geospatial information on-demand.

The PYXIS innovation has developed a fully functional Discrete Global Grid System (DGGS). Discrete Global Grid Systems are spatial references systems that use a hierarchical tessellation of equal-area cells to partition and address the entire globe. A DGGS differs from conventional geographic coordinate reference systems; **DGGS are designed to be an information grid, not a navigation grid.**

The PYXIS DGGS is fundamentally a data integration platform with the specific analytical ability to perform "what is here?" and "where is it?" queries over disparate variable geospatial data.

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Simple Questions…

Where is It?

What is Here?

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The Breakthrough in Geospatial Data Integration

In a DGGS, cells are the fundamental unit of geographic location. Each cell is addressed with a unique index.

A DGGS is data agnostic. Mechanisms are provided to sample and quantize data values from conventionally referenced geospatial information sources into the discrete cell structure of the DGGS. Data values, assigned to cells, are aligned to the DGGS tiling structure, integrated and fused; they are independent of spatial reference system, spatial scale, or data type. Operations built on the DGGS index allow Earth data to be efficiently accessed, related, aggregated, and transformed. Information in a DGGS can be portrayed and analysed at any spatial datum including **WGS-84**. PYXIS has worked with the **Open Geospatial Consortium** to make DGGS an international standard.

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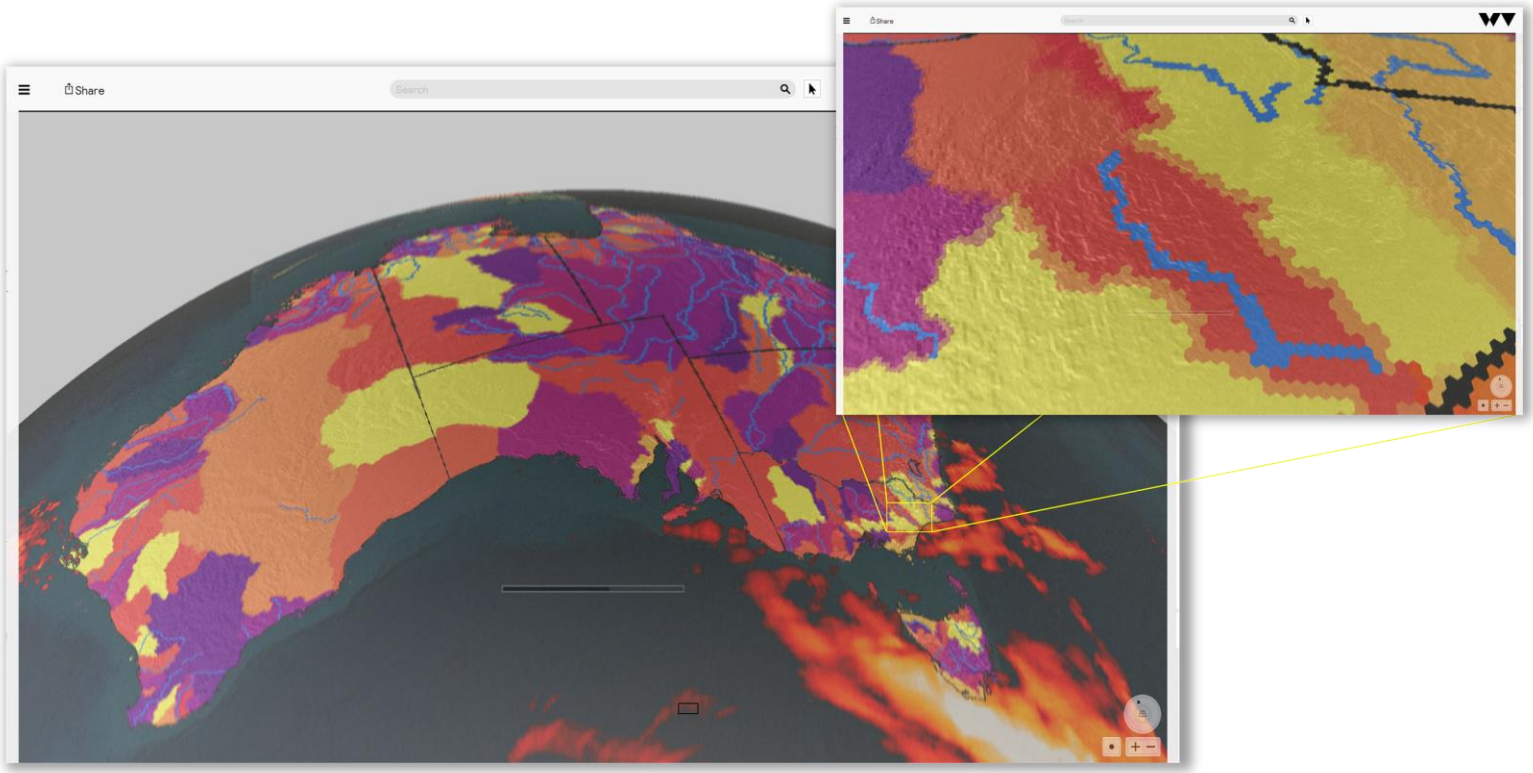
Data Values are Stored in Infinitesimal Cells



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The Breakthrough in Geospatial Data Integration

ANY geospatially referenced information can be used to populated data values in a DGGS cell.

PYXIS Studio uses any data available from within the Geospatial Data Abstraction Library (GDAL) to read GDAL raster and OGR vector formats including all those listed in the Data Challenge Data Depot:

- **Services** – OGC WMS, WFS, and WCS, Esri Rest, Published APIs, GeoJSON, OpenDAP
- **Conventional GIS Formats** – NITF GeoData, Geotiff, NetCDF, ADF, GRID, GML, KML, Shapefiles, GDB, CSV

DGGS is a Recognized OGC Standard

http://www.opengeospatial.org/projects/groups/dggsswg

OGC®
Making location count.

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So simple a child can use it…

The PYXIS DGGS is exposed as a simple to use web interface called the PYXIS Studio that can be easily customized with Java Script.

The Studio is so simple that children as young as 10 are using it to learn Earth Sciences and Geospatial Statistics - https://vimeo.com/117639516 (1.5 minute video) but provides unique data integration capabilities that make it desirable for advanced data analytics. The UN-GGIM has just adopted its use in their forthcoming Global Statistical Geospatial Framework. NASA, NRCan, USGS, and others have been testing and running pilots with the PYXIS Studio this year.

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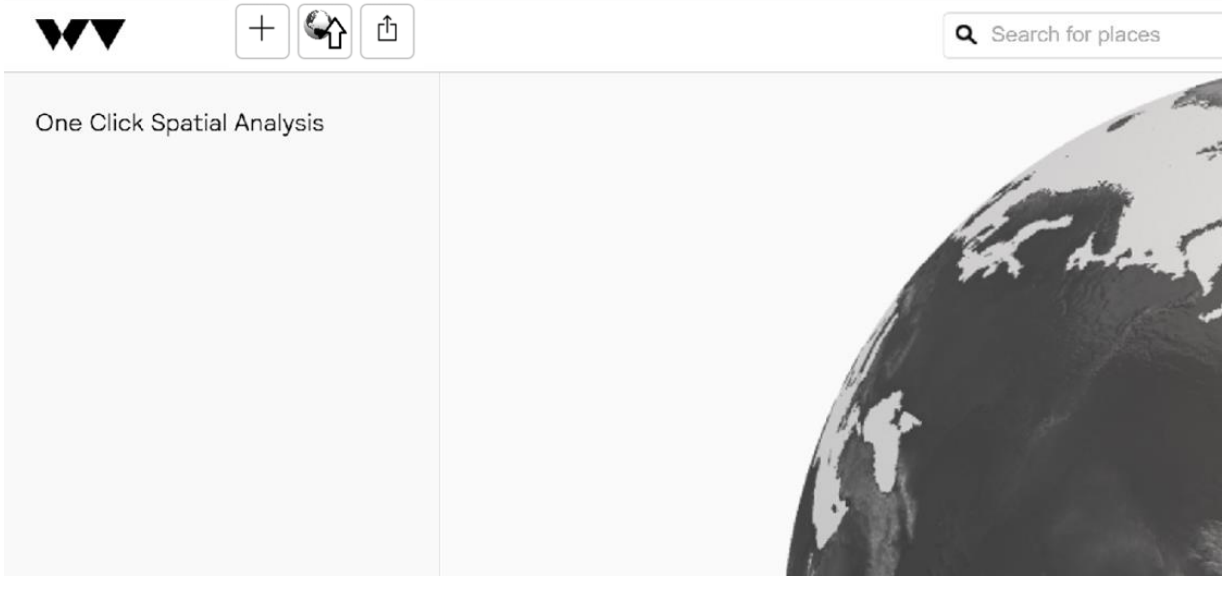
Instructions for Accessing and Using PYXIS Studio

The PYXIS Studio is a web based interface that simplifies Spatial Analysis into a Three Buttons Workflow...

The PYXIS Studio DGGS Interface

https://worldview.gallery/view/new

The interface is an intuitive Globe. It works the same everywhere at any scale providing equal area anlysis anywhere on the planet.



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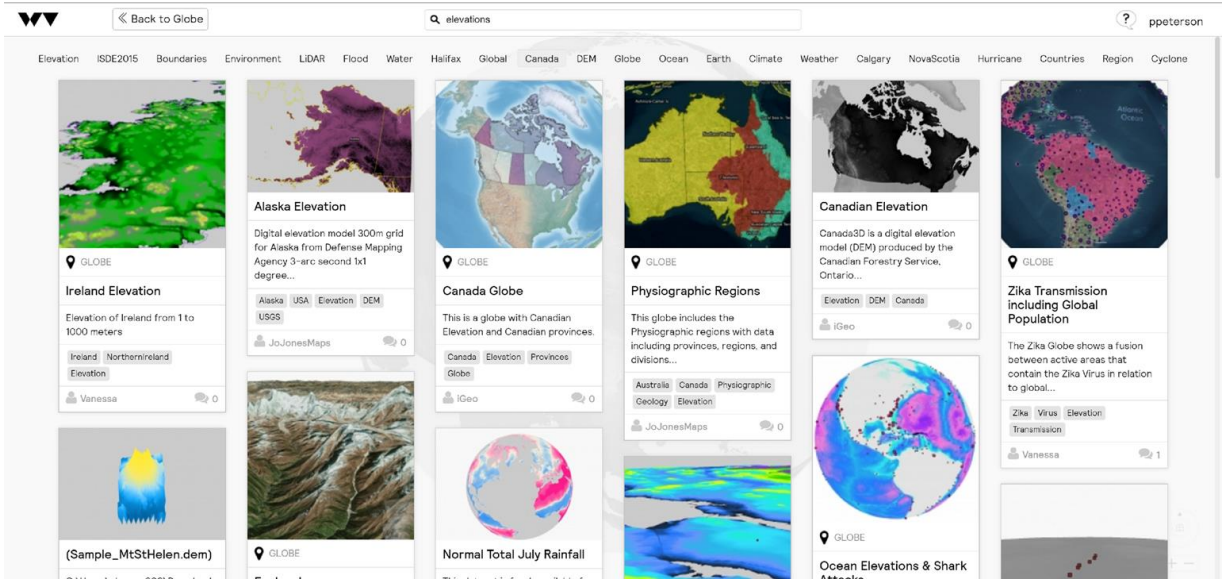
Data Assembly: Search Network for Content

A network of data collections of geospatial Data Values is harvested into the DGGS and recorded in a searchable catalog. The catalog contains information that allows the character of the source data to be searched by keywords, metadata, attributes, attribute values, location and spatial extents, etc. The catalog is populated manually with local GIS content, by harvesting a URL, and crawling open web services - e.g. OGC, Esri REST, openDAP, public APIs, etc

Data Assembly: Select Multiple Geospatial Data Sources



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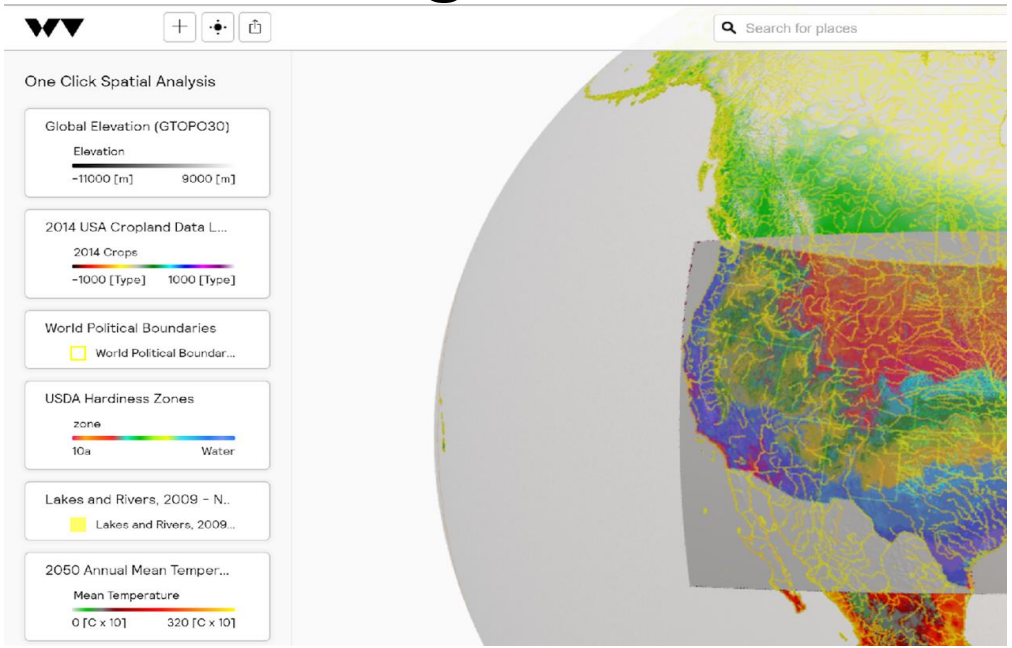
Data Assembly: The Legend connects content to the globe

The Studio Legend contains a graphic symbolizing the geometry of the phenomena that is represented by the data sources. Data values that describe the geometry, also called attributes, are used to style the Legend symbol.



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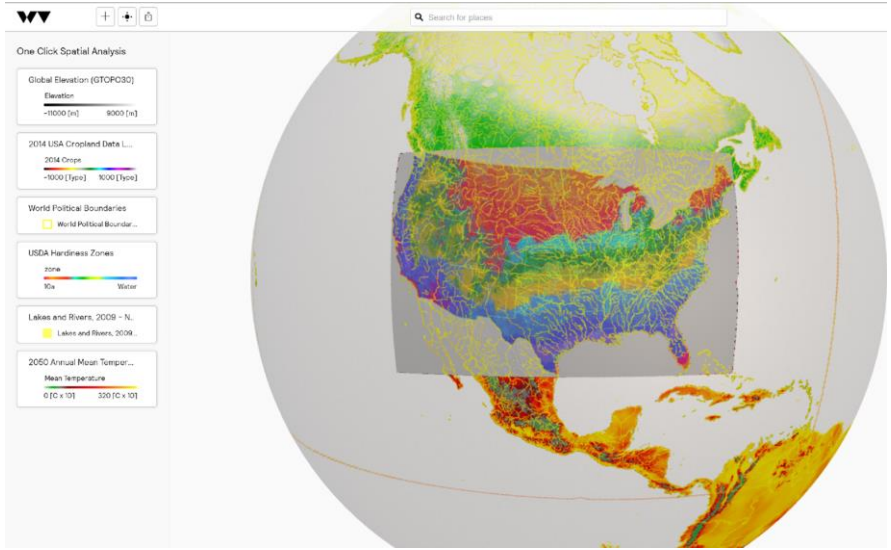
Data Assembly: Displays representation of phenomena on DGGS and in Legend

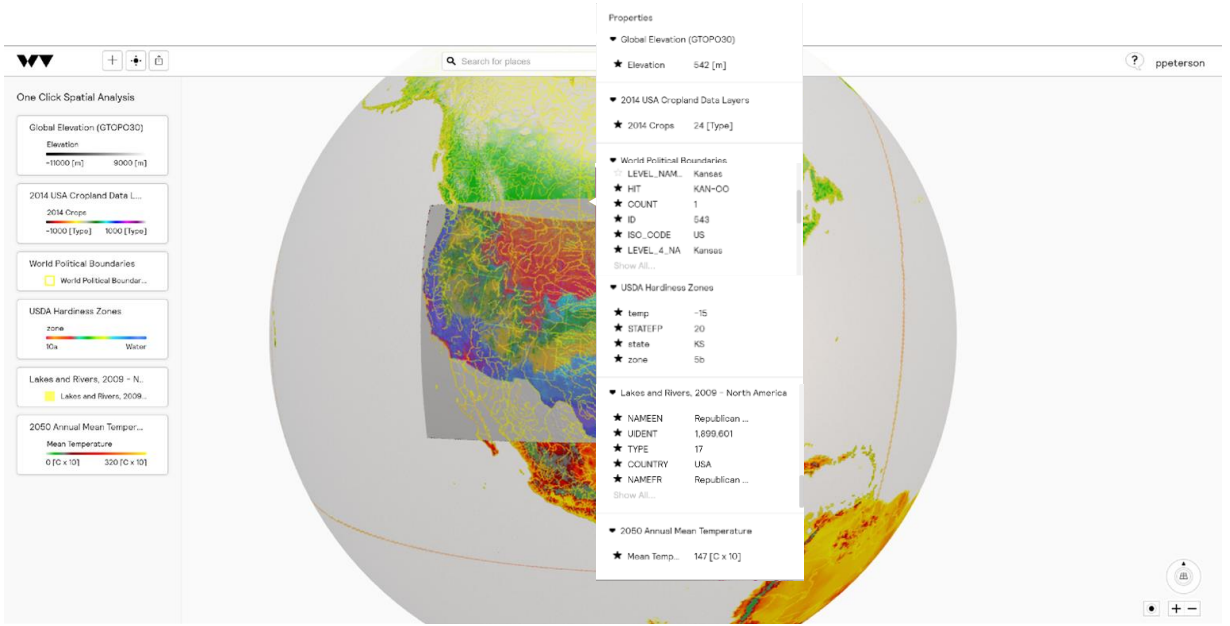
Where is the Kansas River Waterbasin? What is the population of people living in the Watershed? How much rain is falling this very moment on corn fields in the Kansas River Waterbasin that are between 400m and 1400m geodetic? What is the average annual temperature on these fields? What will be the likely average annual temperature if carbon dioxide emissions are not reduced? ON-DEMAND!!!



Try this globe out here - https://www.pyxisglobe.com/view/b73af68a-53b6-4e6c-812e-9d212d002603

Data Assembly: Individual Data Values are stored in a DGGS Cell

Data values held in DGGS cells and can be accessed directly by the user by picking a location on the Earth.

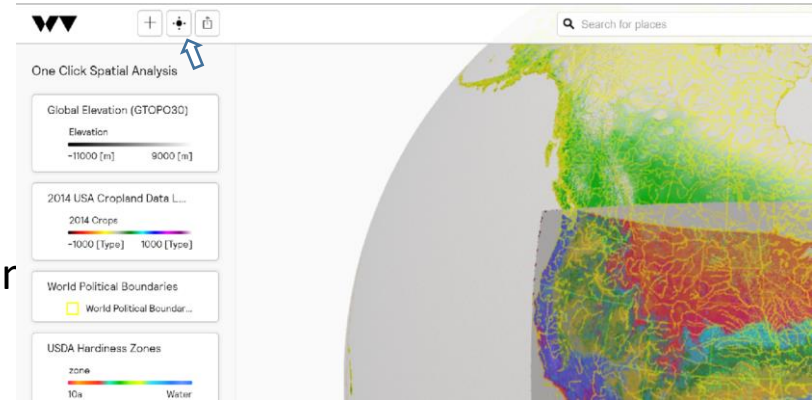


One Click Spatial Analysis: Select place of interest

Using the cursor the user selects/picks an area of interest with one click of the mouse (or to define a more complex selection several points).

Selection could also be made:

1. By other graphical method,
2. An algorithm, or
3. A search criteria or filter using a query strir
4. By processing natural language



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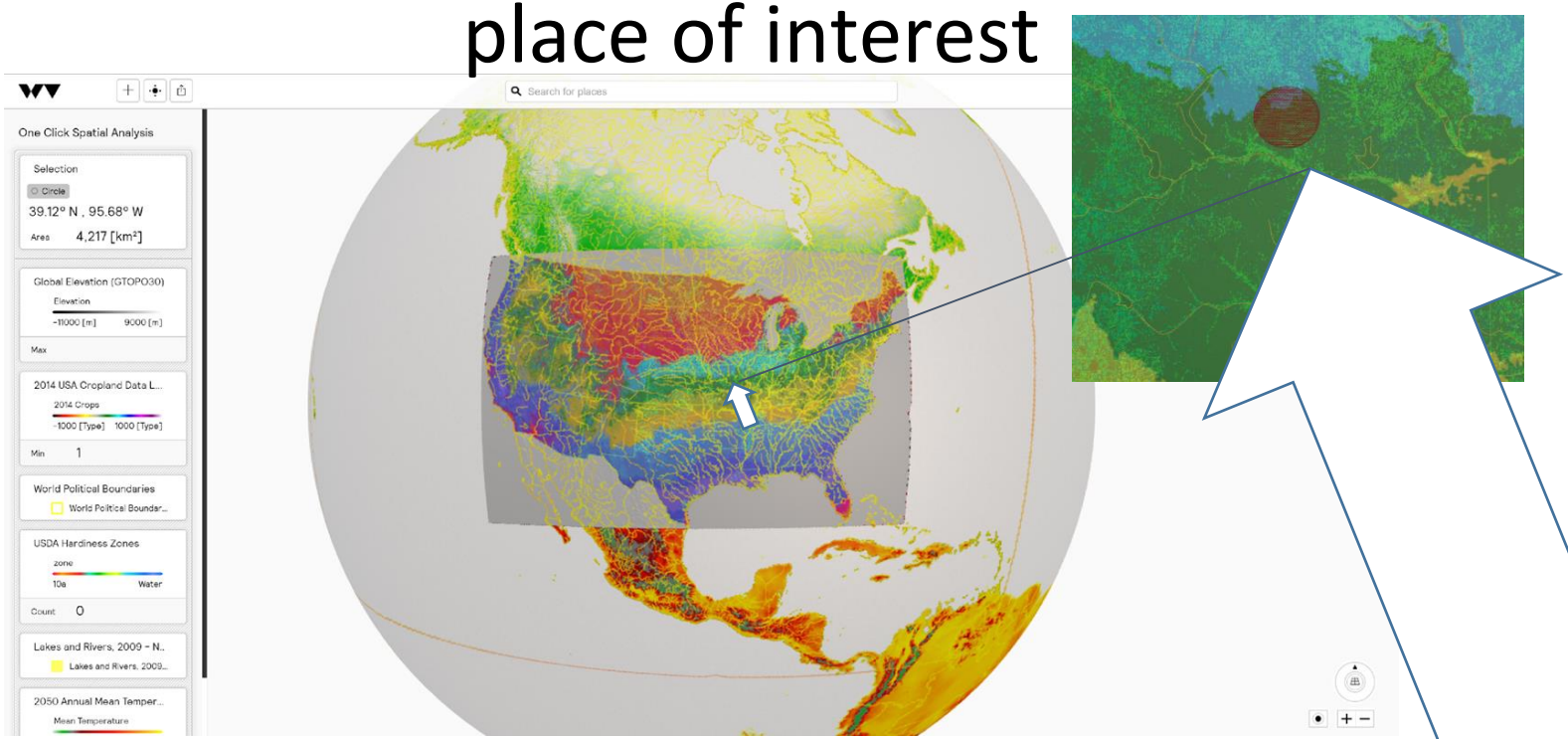
One Click Spatial Analysis: Select place of interest



One Click Spatial Analysis: data values, results of mathematical operations, statistics and models

The DGGS efficiently and automatically extracts the data values stored or represented in the cells of the DGGS

Then calculates, generates, and/or reports on:

- the actual data value or
- the result of mathematical operations between various data values or
- statistics on the aggregation of data values - exemplar: sum, mean, average, count, max, min.
- the result that use the values along with algorithms to compute or model a secondary phenomena

which is displayed within the Legend and related to the phenomena it represents.

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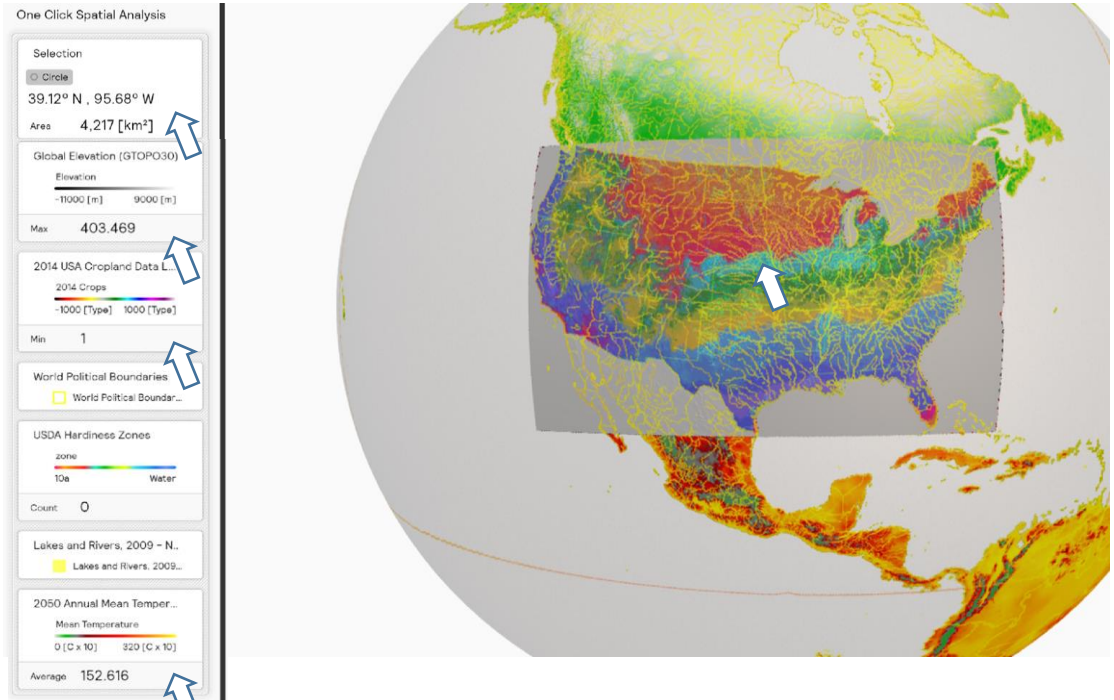
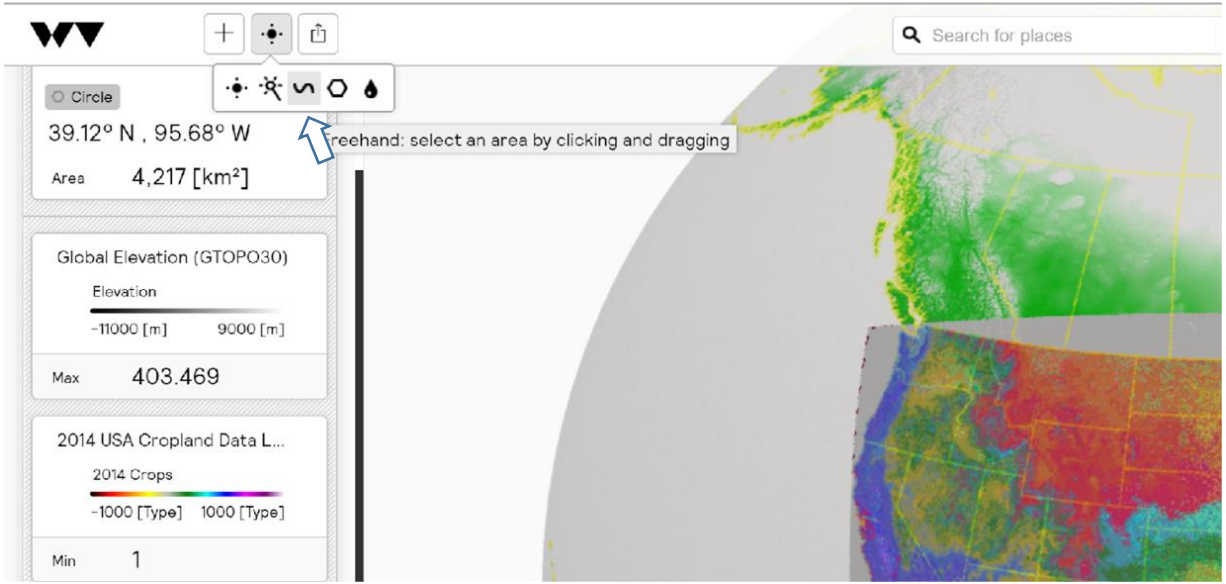
One Click Spatial Analysis: data values, results of mathematical operations, statistics and models



One Click Spatial Analysis: or to define a more complex selection several points



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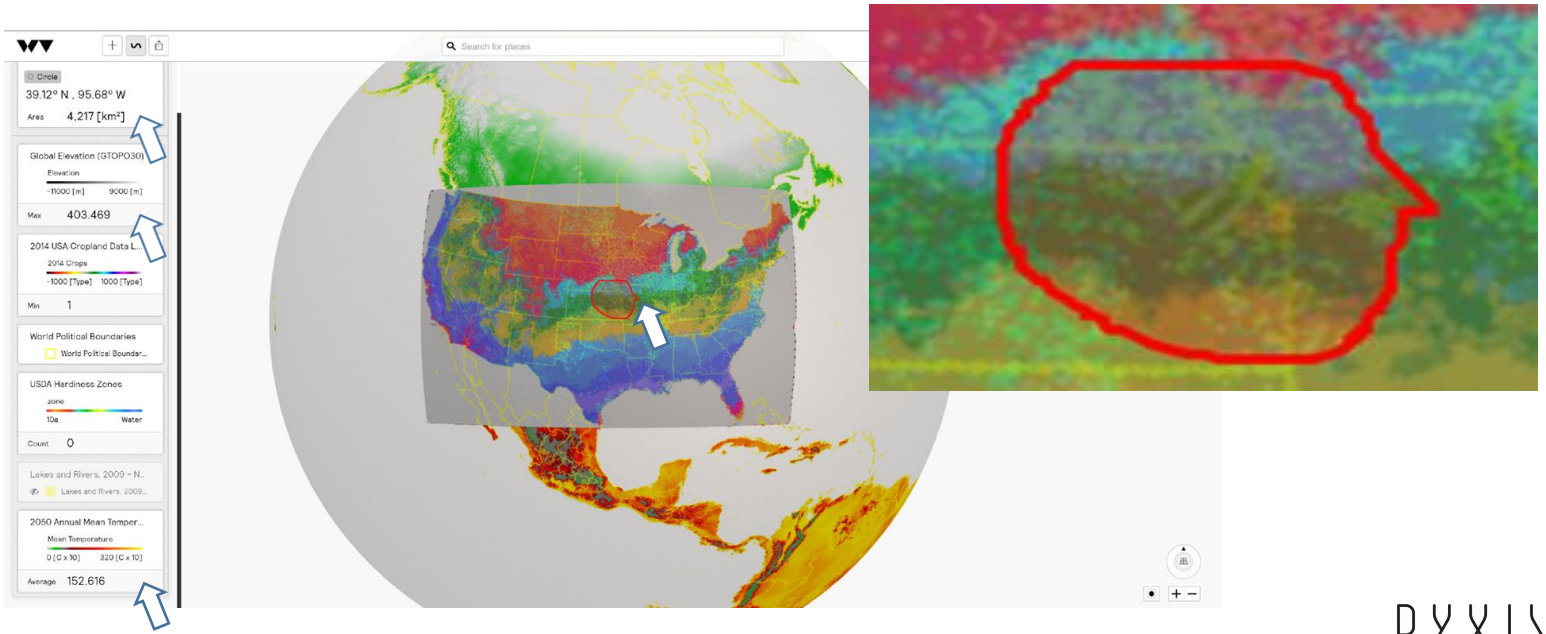

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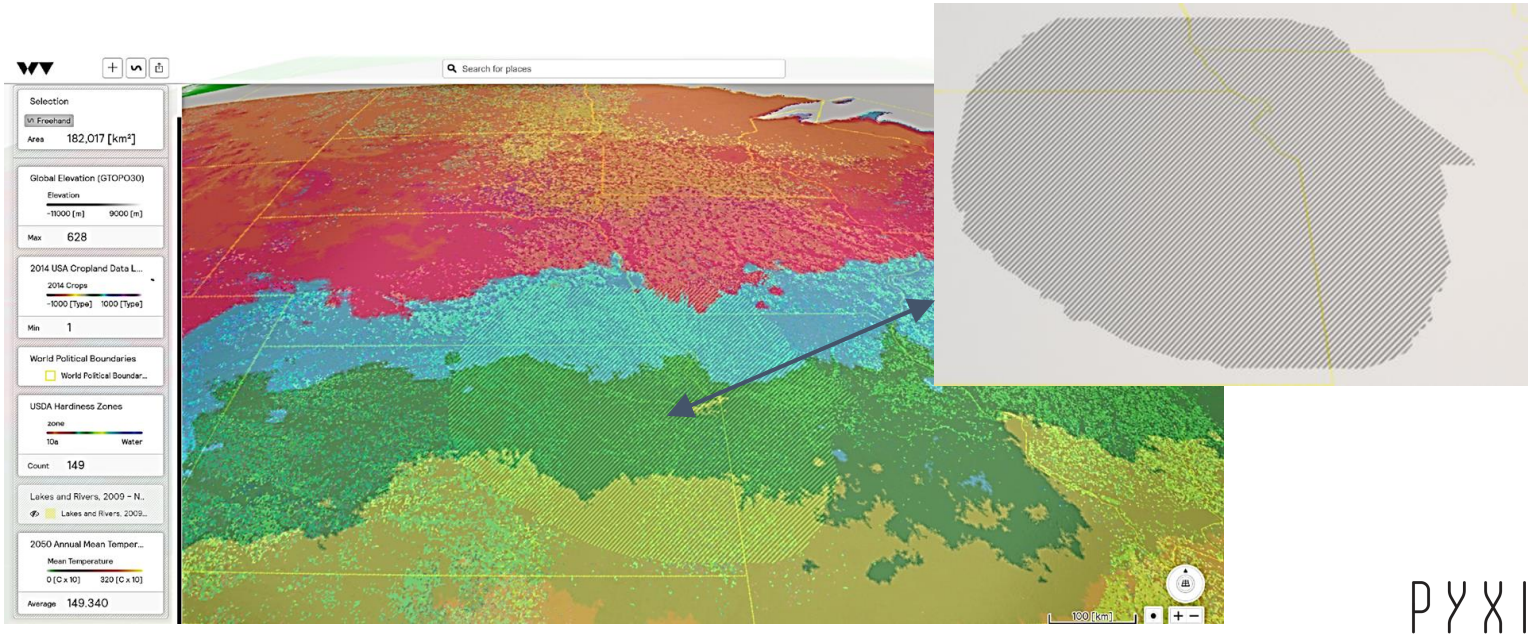

One Click Spatial Analysis: selection refinement

The selection can be refined by modifying the range of values contained within the selection.

As an example a selection of DGGS cells that contains values representing elevations could be refined by subselecting a range of values that would update the selection and thus recalculate, regenerate, and/or re-reports on the updated values as shown above. The refinement could also occur:

1. By graphical method,
2. An algorithm, or
3. A search criteria or filter using a query string or
4. By processing natural language

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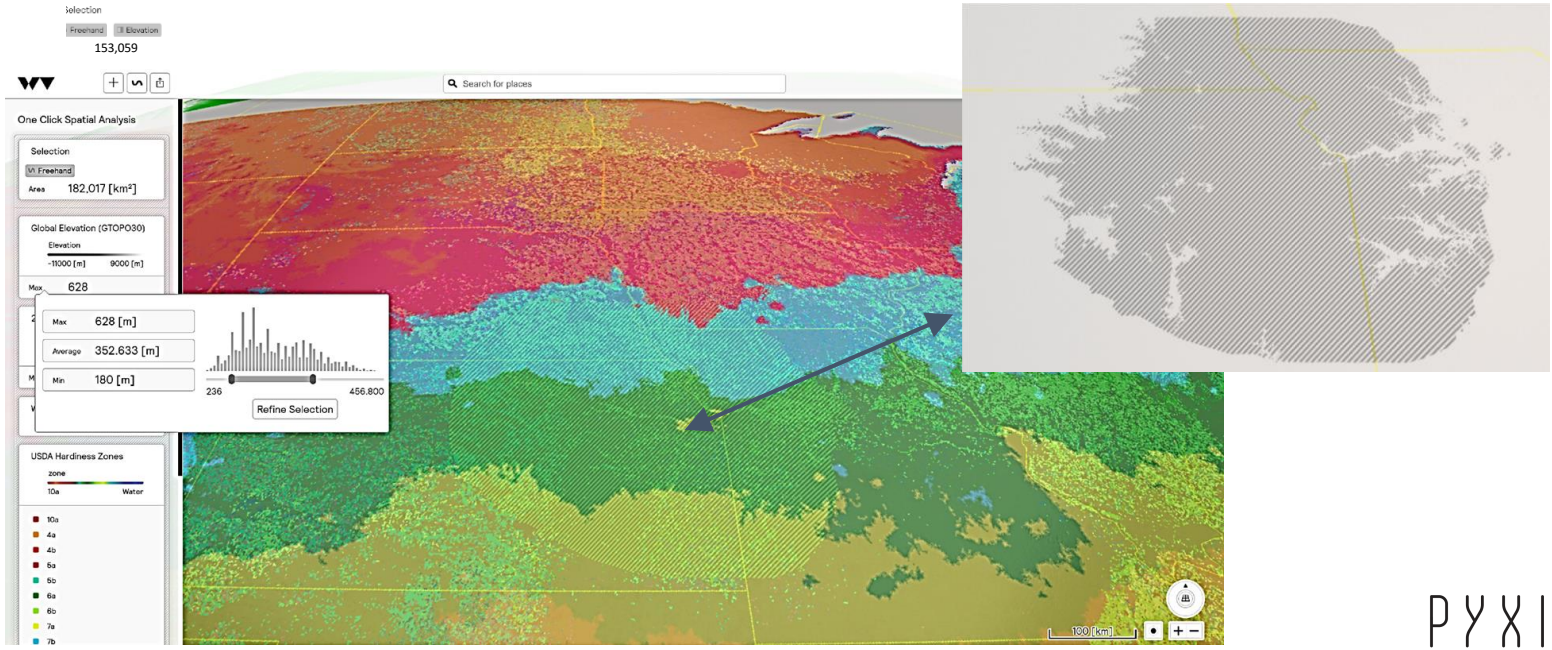
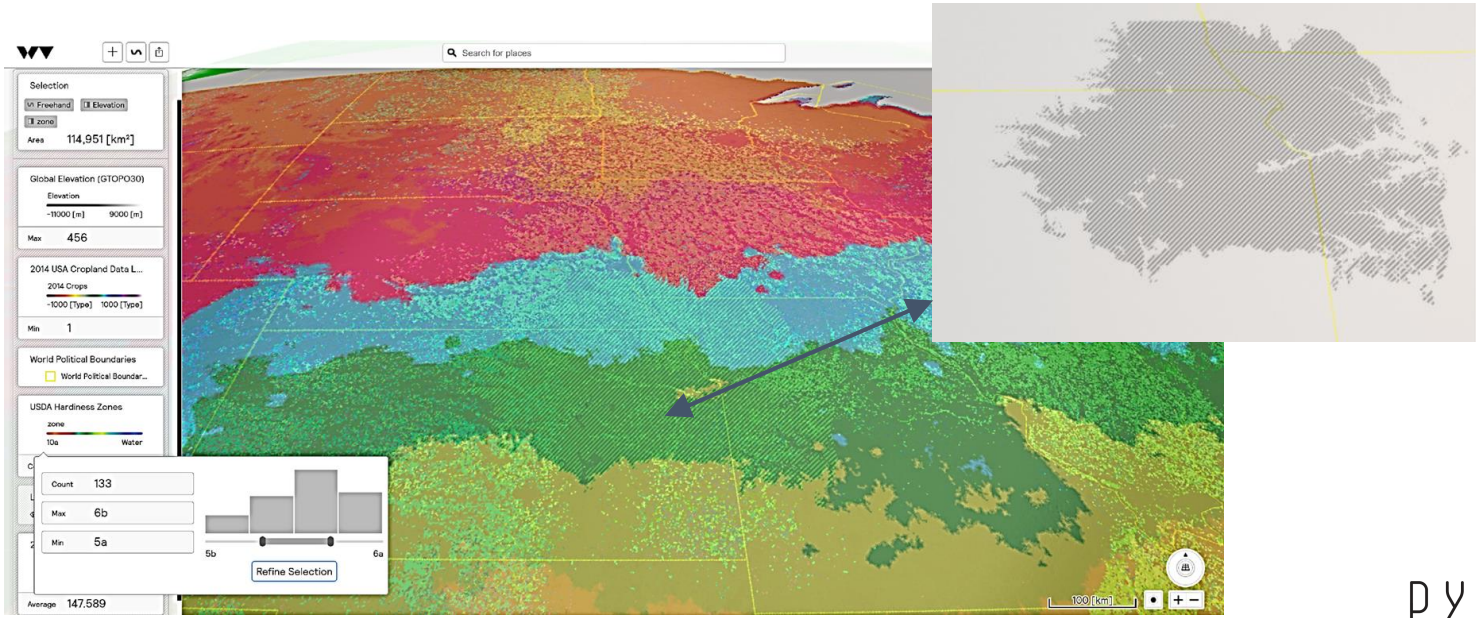
Refine Selection: modify the range of values contained within the selection.



Refine Selection: modify the range of values contained within the selection.



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Share it: Another node on the network

Each instance of a globe, including the Studio which is just a functionally special instance of a globe, is a node on a network that is connected and managed.

Data in the form of GeoPackets tiles are shared between these nodes. Once the mashup of data values and the analysis is complete, the resulting analysis can be shared back to the network as a collection of cells or geometry and related cell values where it can be discovered and used again. Network configuration is available as conventional secured client server, Gnutella 2 P2P, and stand alone with cloud based support for big data geoprocessing and datacube versions.

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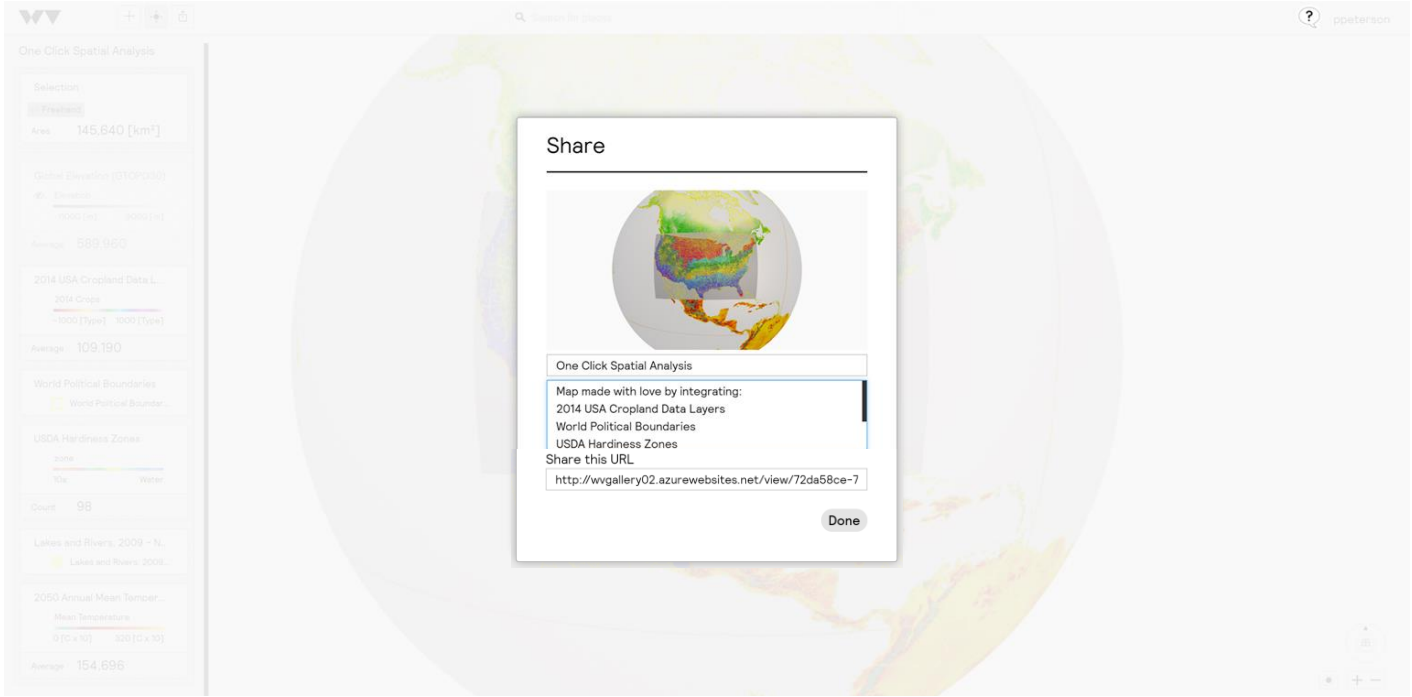
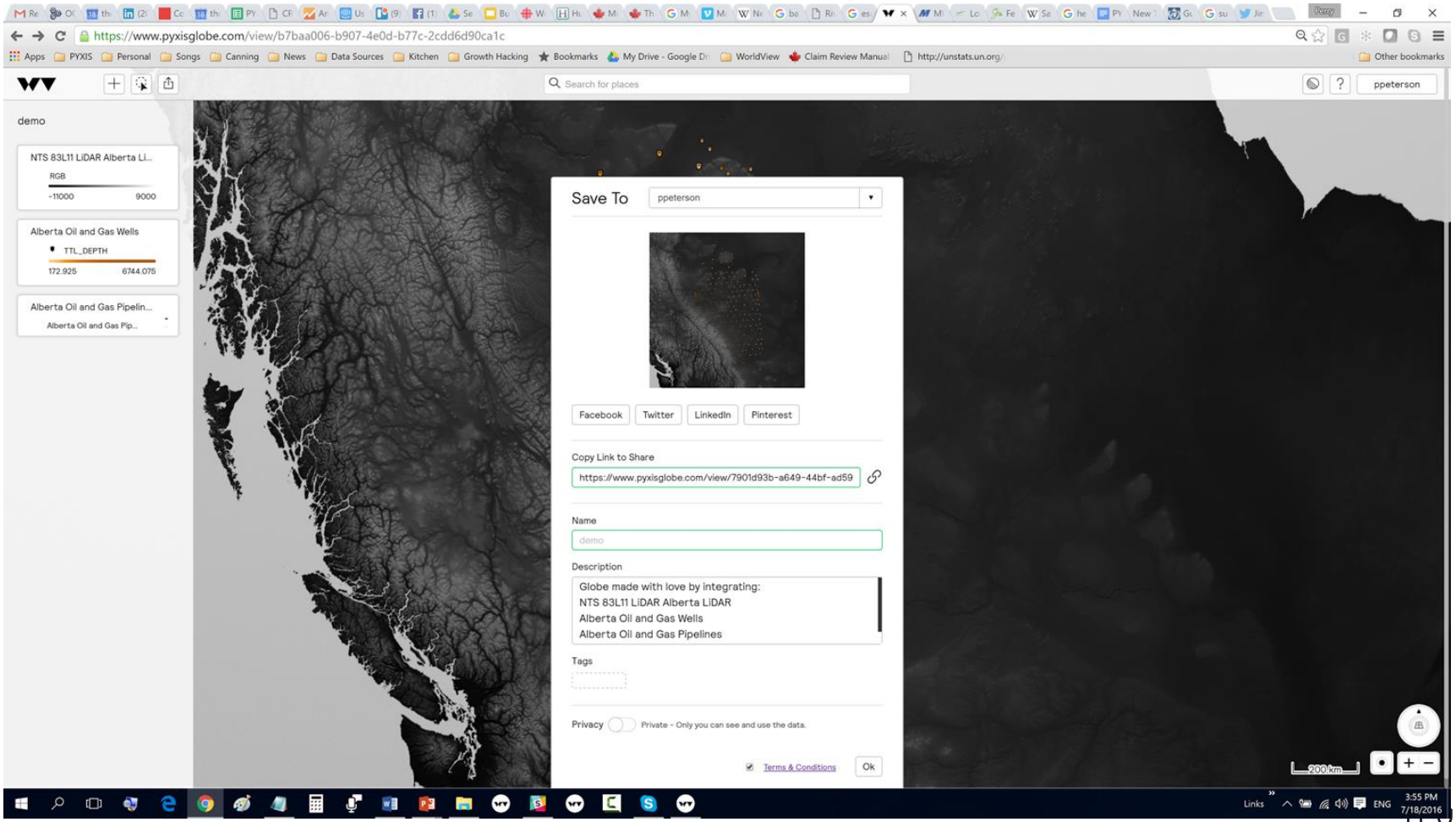
Share it: Another node on the network

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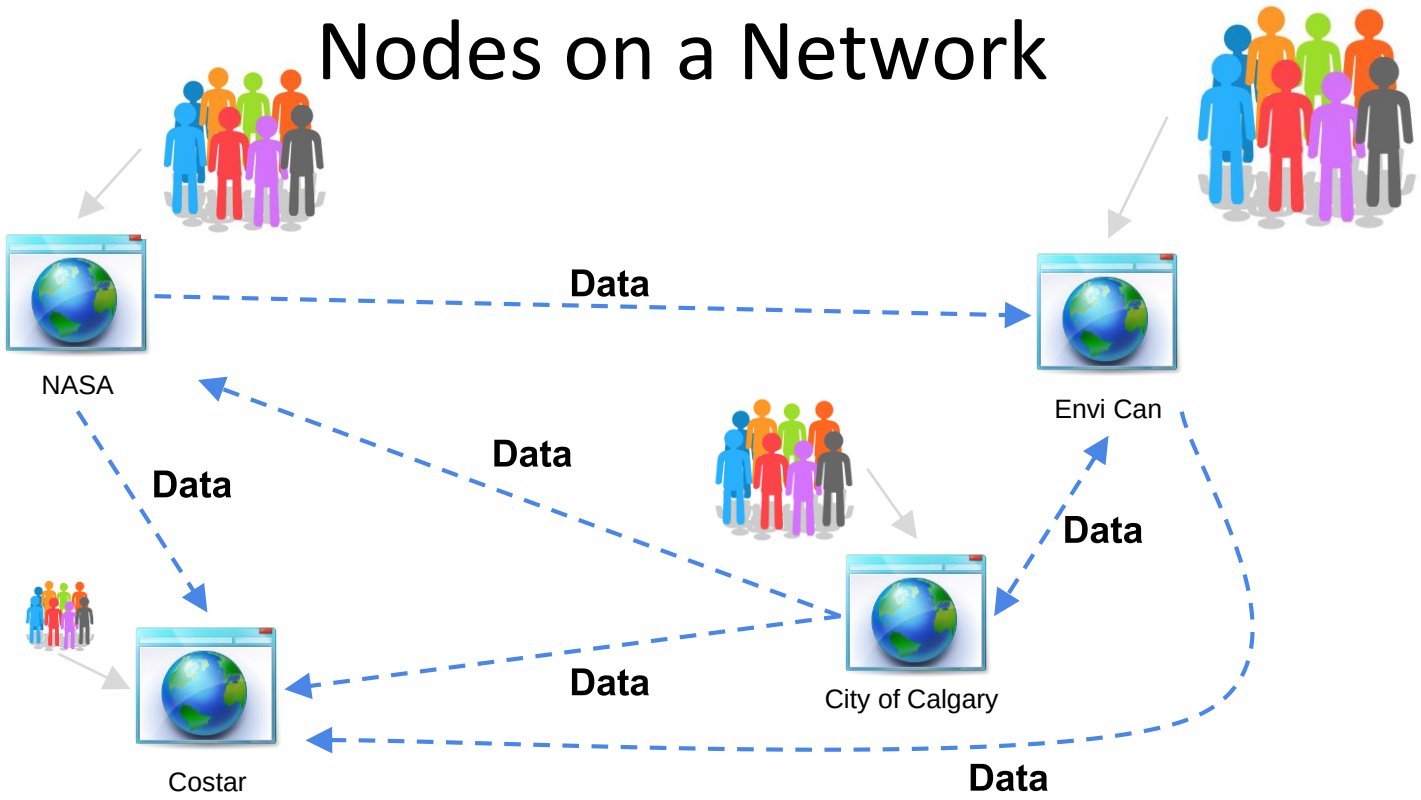
7/18/2016

Which now is another globe of data to be discovered

Build a Community: Where Maps are Data Nodes on a Network



You can learn more about PYXIS DGGS and the Studio application here:

Try it yourself - https://worldview.gallery/view/new

Learn More - http://sdk.pyxisinnovation.com/home

Watch Pilot Project and Testbed Videos - https://vimeo.com/54177885

Our Web Page – www.pyxisinnovation.com