The National Extension Web-mapping Tool: From Data Exploration and Discovery to Decision Making

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Abstract

The University of New Hampshire (UNH), Virginia Tech (VT), and Texas A&M University collaborated to envision and plan (all) and then create (UNH and VT) the National Extension Web-mapping Tool (NEWT) to increase the use of spatial data in planning and programming decision making throughout Extension. With NEWT, Extension professionals can access and use national Extension-relevant spatial data sets available at varied scales (county, Extension district, state) and in varied formats (maps, tables), without needing mapping experience or associated technical skills. NEWT encourages users to look past state borders and traditional administrative boundaries to discover opportunities for collaboration.

Keywords: geospatial technologies, web mapping, Census data, strategic planning

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The Use of Data in Extension Decision Making

State Extension organizations should strive to make decisions about planning and programming using the best available data related to demographics and natural resources, agriculture, economic development, and other foci (Preston, 1982). The availability, in a functional sense, of such data varies widely across the country. Much key information is available through public sources. However, Extension professionals may have difficulty efficiently acquiring such information in a usable form when data are

- stored and disseminated by different sources,

- available only for a constrained geographic area,

- supplied in different formats, or

- difficult to visualize or to compare across county, Extension district, and state boundaries.

These challenges make it difficult for Extension employees to acquire the more holistic perspective required to facilitate planning and appropriately target programming efforts.

Virginia Cooperative Extension's unit profiles are one representation of a systematic approach to making relevant data available for Extension decision making. These profiles provide relevant data for Extension offices across Virginia and include demographic, business, agriculture, health, and educational information about each administrative unit (Virginia Cooperative Extension, 2013). These reports enable Extension staff in Virginia to explore trends at a county level to support long-range planning. However, this approach does not encourage dynamic comparisons across traditional administrative boundaries. In addition, the approach is labor intensive.

Providing Access to Spatial Data to Everyone in Extension

What if there existed an online resource in which the type of information contained in the Virginia unit profiles was available nationwide to anyone in Extension? And what if this online resource provided, in addition to data tables, dynamic maps and graphs of the information? Would it not make sense for all of Extension to have access to a common set of Extension-relevant data layers without each state's Extension professionals' having to spend time searching and compiling statistics? With this type of web application, any Extension staff member or administrator would have easy access to the information necessary for making strategic planning and programming decisions, thus helping ensure that spatial data are used to inform the strategic direction of the organization as a whole.

With the goal of developing such a web application, a team comprising members from the University of New Hampshire, Virginia Tech, and Texas A&M University received eXtension Innovation grant funding (https://www.extension.org/2016-innovation-projects/) to create a web mapper to support decision making. To ensure that the web mapper would be useful to the widest possible cross section of Extension staff and administrators, the project team, of which we were members, collected input from Extensionists in New Hampshire, Virginia, and Texas via interviews (12 people), focus group sessions (30 people), and an online survey (22 people). The Extension personnel providing input included administrators, specialists, and county staff from a variety of program areas. Priorities identified through the process were as follows:

- data that are relevant to supporting Extension programming and planning,

- data that are presented in visually provocative and useful formats (tables, graphs, maps),

- access to a user-friendly interface,

- the use of cloud-based applications (i.e., no software or data download required),

- data sets that are available on a national scale,

- automated reporting according to user-defined areas (county, state, Extension district), and

- the flexibility to grow and expand the system as needed.

Although the ultimate goal of the project was to produce a tool that would be useful for people across Extension, our team prioritized the design of a fully functional tool over an overwhelming list of data layers. We did not consider desktop geographic information system (GIS) programs due to the sharp learning curves and resource-intensive overhead associated with their use (Huff, 2014). To ensure that appropriate data layers were included in the beta version of the web mapper, our team acquired valuable feedback from Extension focus groups in New Hampshire, Virginia, and Texas.

From Concept to Reality

Using the guiding principles described above, Virginia Cooperative Extension and University of New Hampshire Cooperative Extension worked with the Virginia Tech Center for Geospatial Information Technology to develop the National Extension Web-mapping Tool (NEWT) (https://newt.cgit.vt.edu) (Figure 1). This system allows the user to select a topic area (Figure 2), a geographic area (Figure 3), and specific topics (Figure 4). Results are generated in a map format (Figure 5) and as a table (Figure 6).

Figure 1.
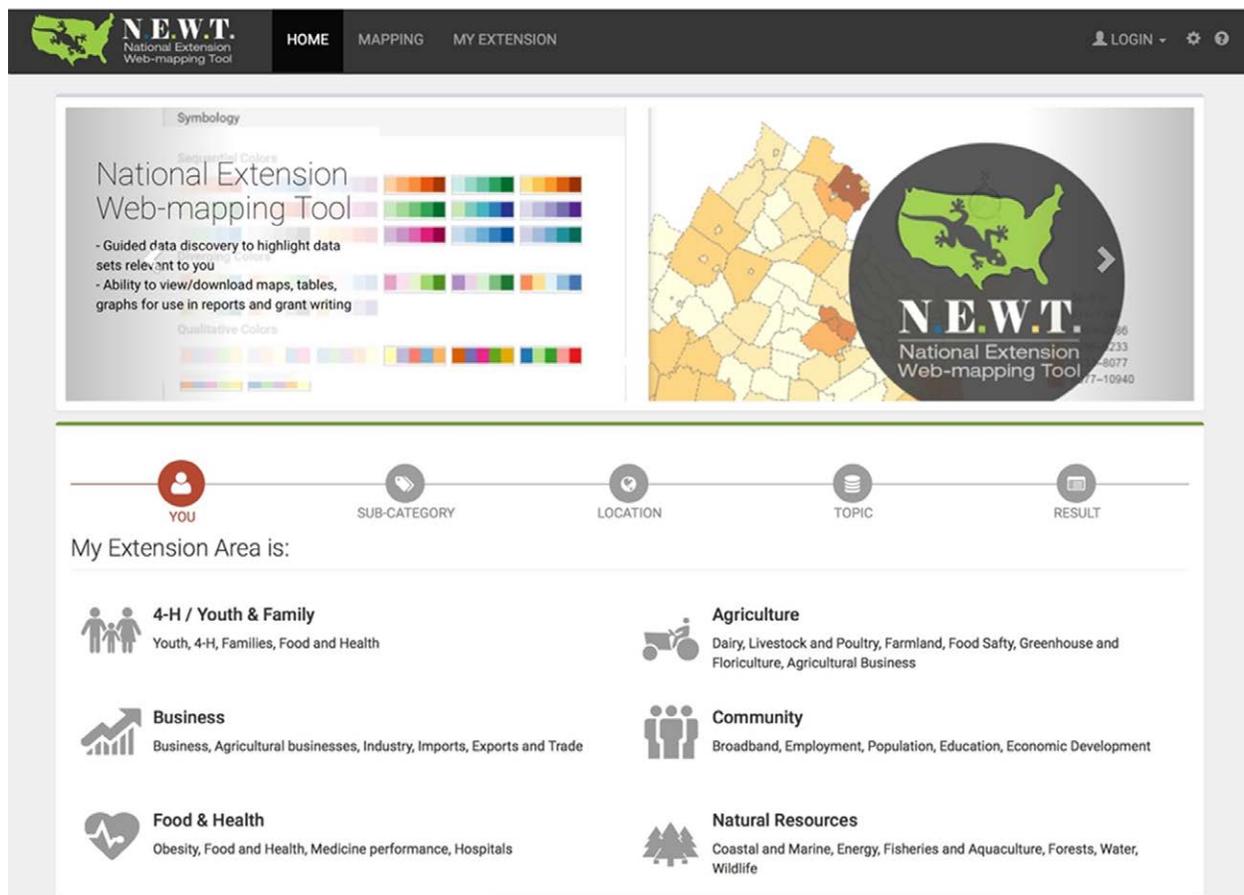
National Extension Web-mapping Tool (NEWT) Home Page

Figure 2.

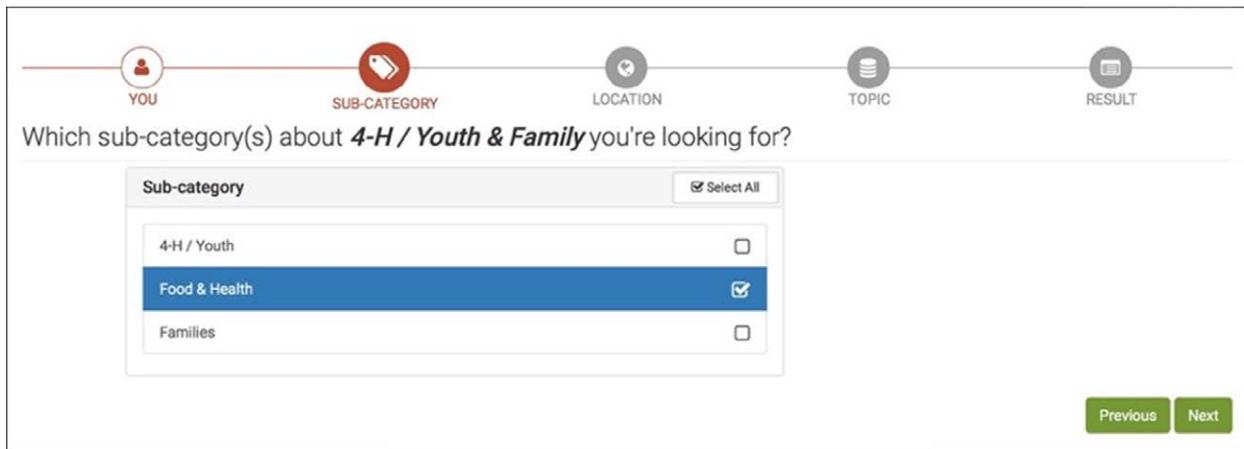Selection of Topic Areas to Explore

Figure 3.

Selection of Geographic Area of Interest by County, Extension District, or State
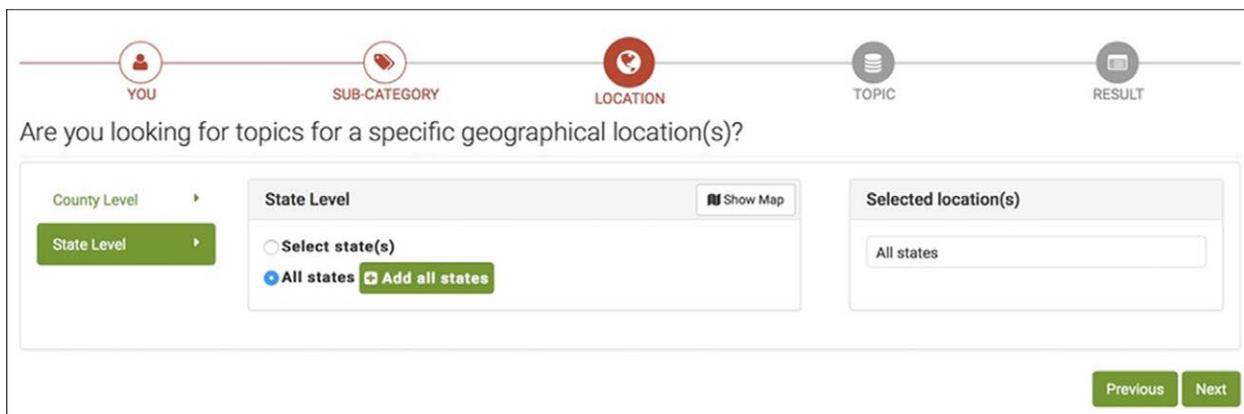

Figure 4.

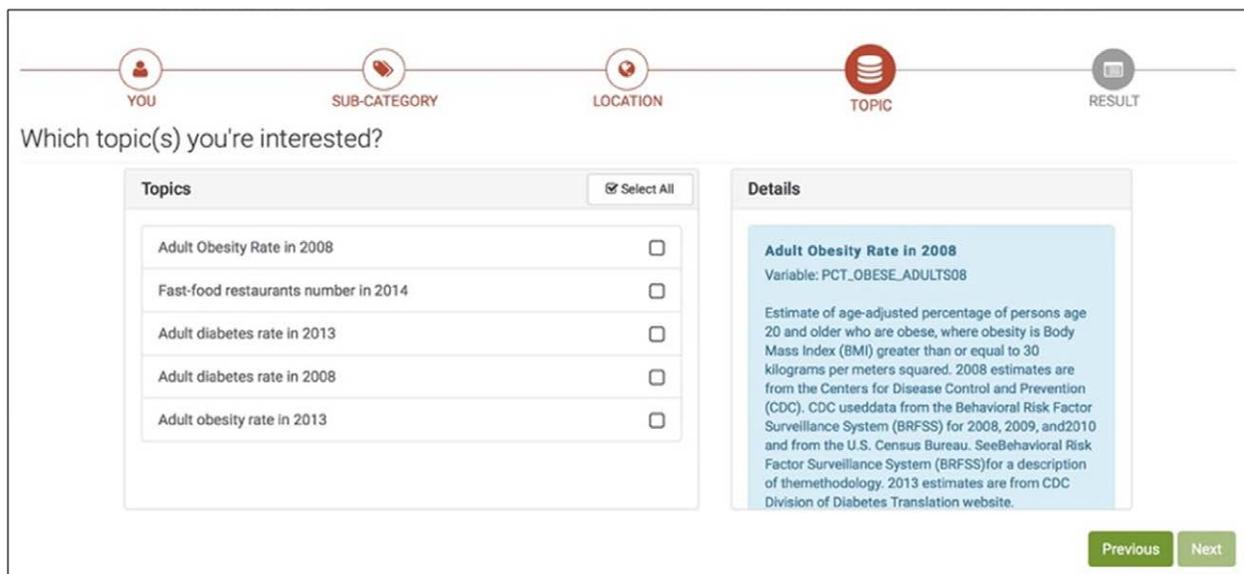Selection of Specific Data Layers to Be Viewed

Figure 5.

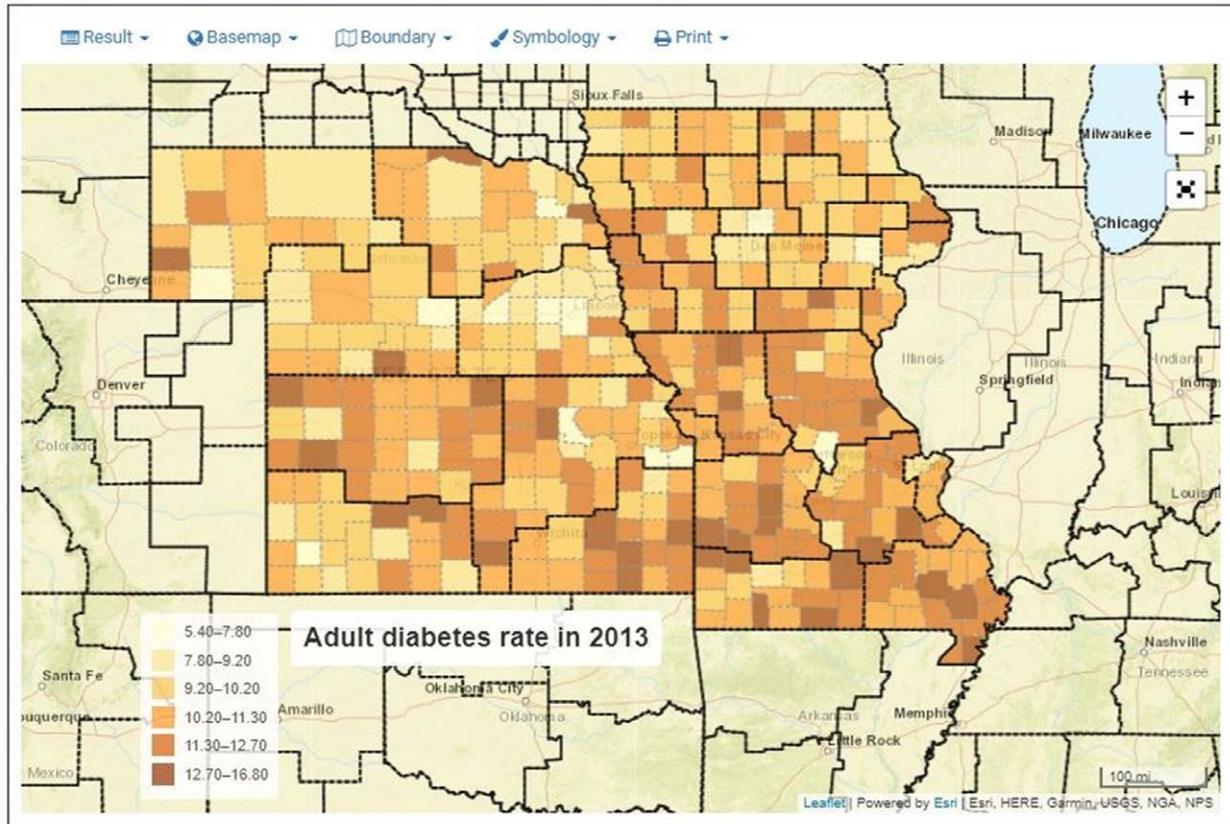Exploration and Visualization of Data Layers via a Mapping Interface

Figure 6.

Viewing and Exporting of Data Layers as a Formatted Table

Adult diabetes rate in 2013

Estimates of age-adjusted percentage of persons age 20 and older with diabetes (gestational diabetes excluded) in 2009. Estimates are from Centers for Disease Control and Prevention (CDC).CDC used data from the Behavioral Risk Factor Surveillance System (BRFSS) for 2008, 2009, and 2010 and from the U.S. Census Bureau. The methodology is described on the CDC County Estimates page.

State ID	FIPS Code	Extension District ID	Division ID	Region ID	Name	Data Value
31	31173	230	4	2	Thurston County, NE	16.8
29	29153	224	4	2	Ozark County, MO	15.1
20	20125	153	4	2	Montgomery County, KS	14.3
20	20027	151	4	2	Clay County, KS	14.1
29	29221	220	4	2	Washington County, MO	14.1
29	29011	224	4	2	Barton County, MO	13.9
29	29015	226	4	2	Benton County, MO	13.9
31	31015	230	4	2	Boyd County, NE	13.9
20	20023	152	4	2	Cheyenne County, KS	13.7
20	20083	154	4	2	Hodgeman County, KS	13.7
20	20205	153	4	2	Wilson County, KS	13.6
29	29065	220	4	2	Dent County, MO	13.6
29	29207	223	4	2	Stoddard County, MO	13.6
29	29223	223	4	2	Wayne County, MO	13.6
20	20095	151	4	2	Kingman County, KS	13.5
20	20109	152	4	2	Logan County, KS	13.5
29	29510	225	4	2	St. Louis city, MO	13.5

When the beta version of NEWT was released in late 2017, nearly all the priorities outlined by our team were met:

- No GIS skills or software are necessary to use NEWT.

- Data layers are discovered through an intuitive guided process.

- Selected layers can be viewed in the form a map or a table and exported.

- Data can be selected by single or multiple counties, states, or Extension districts.

- Data layers were chosen based on needs expressed by Extension staff.

NEWT is changing the way Extension professionals approach data discovery to support program planning efforts. By shifting from the use of traditional tabular data (tables, spreadsheets) to visual map displays, Extension personnel can easily identify spatial trends that transcend traditional administrative boundaries. Extensionists also benefit from engaging with a user interface, Extension-related data, and mapping tools that are nationally oriented versus state-centric. Also, NEWT was designed to be flexible and expandable to support emerging issues in Extension.

The Future of NEWT

Although even the current beta version of NEWT is ready for Extension staff to use today, the tool has the potential to become even more powerful. Several features planned for NEWT have not yet been fully developed; these include graphing and charting capabilities that will enable additional options for visual data exploration and

a "My Extension" log-in that will enable users to establish and save their mapping preferences. As our team has begun telling Extension staff about NEWT, ideas for other useful features have emerged, including a method for comparing demographic and agricultural data over time, the inclusion of additional data sets for specific Extension programs, and the option to display data down to the Census-tract and block-group levels. These newly identified features of interest are enhancements we hope to incorporate into future versions of NEWT.

We encourage everyone in Extension to try NEWT and provide feedback (http://tinyurl.com/NEWT2018) on how NEWT can be enhanced to better support their work. To keep up with the latest news, visit the NEWT page on the MapASyst website, https://www.mapasyst.org/newt/.

Acknowledgments

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