# **1.62 EnviroAtlas**

**Project Number & Title**

1.62 - EnviroAtlas

**Project Lead and Deputy**

Project Lead: Anne Neale – ORD, NERL, ESD

Deputy Project Lead: Laura Jackson – ORD, NHEERL, EPHD

Deputy Project Lead: Megan Mehaffey – ORD, NERL, ESD

**Project Period**

FY16 – FY19

**Project Summary**

Project 1.62, EnviroAtlas, is being developed as a web-based collection of tools and resources that allows users to explore the many benefits people receive from nature, often referred to as ecosystem goods and services. EnviroAtlas allows users to interact with geospatial data at multiple scales, thus providing information that can be used to inform decisions at multiple levels of governance. Until very recently, the types of data that are available in the Atlas were only available to expert users with Geographical Information Systems (GIS) skills and access to powerful computing resources. EnviroAtlas, through research and incorporation of the latest geospatial technology and analyses, allows users with no more than an internet browser to access a wealth of spatially explicit data and analysis tools. Taken in isolation, each piece of information developed by EnviroAtlas can help answer important questions related to the use of resources in a decision-making, policy, and regulatory context. Linked together in an easy-to-use tool, EnviroAtlas creates a powerful means to enable more of a systems approach to inform decision making.

The first release of EnviroAtlas successfully took place in May 2014, but there are still additional data to develop and functionality to add for future releases. Enhancements to EnviroAtlas through research in project 1.62 include: 1) addition of use case studies that will guide the user through real-world decision-making efforts to showcase applicability of EnviroAtlas data and tools to on-the-ground decisions by practitioners; 2) a crosswalk with the Final Ecosystem Goods and Services Classification System (FEGS-CS) that will facilitate linking ecosystem services and associated benefits directly to beneficiaries and improve our ability to account for the value of these services under decision alternatives; 3) new national and community-scale metrics that will allow local- to national-scale comparative analyses to inform decision making; 4) a new analysis tool that will allow insights into the implications of climate change for individual communities; and, 5) new spatial data layers that represent ecosystem service demand, which is crucial to assigning value and evaluating future vulnerabilities.

EnviroAtlas is making data available to users through multiple avenues, maximizing interoperability and data usefulness to a wide group of users. The data are available to EnviroAtlas users via the following: 1) within the EnviroAtlas Interactive Map tool, 2) through the EPA GeoPlatform where they can be streamed interoperably through a published web service (i.e., user has only to type in the web address of the map and will be able to use the map in their own desktop or online application) and 3) via direct download for desktop access. Having the ability to use the data as a web service through the GeoPlatform is rather unprecedented and takes advantage of advanced technology. Through this technology, data are also available through data.gov whereby reaching an even wider range of users.

**Project Description**

Problem and Decision Context

Communities are under pressure from issues relating to population growth and decline, economic challenges, public health, environmental justice, climate change, disasters, environmental regulations, and others. Communities are impacted by decisions made within their boundaries as well as by policy and decisions made at every level of governance. With a growing urgency to help communities, decision-makers at every level of governance need access to better data and tools in an easily consumable format with relatively low cost to the users.

The use of advanced information technology, web development, GIS, remotely sensed data, landscape ecology science, eco-health science, and geospatial analyses, have enabled the potential for incorporating quantitative and qualitative spatial information into every day decision-making. Simultaneously, ecosystem services as a framework for decision making and as an approach for incorporating economic valuation into environmental decision-making has emerged.

The EnviroAtlas project capitalizes on the above needs and emerging science and technology to provide a publicly accessible web-based tool which allows users to access, view, and analyze diverse information focusing on the benefits that humans receive from their environment and how these benefits affect human health and well-being.

Outputs

• 2016 - Applications of EnviroAtlas to Community Based Decisions (1.62.1)

• 2016 - Crosswalk between Ecosystem Services mapped in EnviroAtlas with those in the FEGS-CS (1.62.2)

• 2017 - Community Metrics for EnviroAtlas (1.62.3)

• 2017 - Climate Change Implication Tools and Data Layers for EnviroAtlas (1.62.4)

• 2018 - Demand for Ecosystem Services Data Layers for EnviroAtlas (1.62.5)

Focus Areas

*Focus Area #1: Improved Functionality and Case Studies -* One aspect of this research will be to develop a crosswalk to allow users to see how mapped ecosystem service indicators and indices from EnviroAtlas crosswalk to the EPA FEGS-CS and the National Ecosystem Services Classification System (NESCS). The use of an ecosystem services classification system is a valuable step in systematically identifying the supply of ecosystem services available in a location over time.

Research in this focus area will lead to a well-developed section in EnviroAtlas showing real-world applications that demonstrate how EnviroAtlas data and tools can be applied to a common high priority decision affecting community well-being with respect to maintaining or promoting good environmental quality, environmental public health and well-being, and community-level preparation for adaptation to climate change.

Case studies or real world applications of EnviroAtlas will be fully developed into guided analyses that allow users to understand what metrics and analytics can be used to support a decision and guides them through the steps needed to complete the analysis. The incorporation of “use cases” or “case studies” will help inform potential users how the data and tools can be used in a real world example. EnviroAtlas users will help develop these use cases, thus allowing applications to be shared amongst communities. Types of decisions that EnviroAtlas data and tools can help inform include identifying priority areas for protection; addressing an impairment; locating infrastructure, restoration, or resource use; identifying sources of impairments; identifying areas for tree planting to maximize benefits, identifying the coarse pathway of a spill, identifying regional patterns, etc.

This focus area will also include improving overall functionality of EnviroAtlas, including recoding from a Flex to a JavaScript front end, which will keep EnviroAtlas at the forefront of online geospatial functionality, allow for more interoperability, and optimize EnviroAtlas for use on mobile devices.

*Focus Area #2: New Tools and Data Layers -* New data layers for the national and the community scale metrics included in EnviroAtlas are derived as the results of research projects. Methods developed will be published as such. This focus area will include the development of nationally-consistent data layers that allow for tracking of local to national conditions and will provide information to inform decision making at local, state, regional, and national scales. This focus area includes the development of data for the community scale metrics contained within EnviroAtlas as well as the national scale metrics. It will include developing metrics based on research investigating the relationships between ecosystem health and human health. Research will be conducted to develop data representing demand for ecosystem services (including ecosystem service-related employment/revenues and recreation demand), and additional indicators of ecosystem production, drivers of change, and beneficiaries. Data layers that have already been developed for EnviroAtlas can be reviewed on the EnviroAtlas web site (http://enviroatlas.epa.gov/enviroatlas/Data/currentdata.pdf). Data yet to be developed have been included as an appendix to this document.

In addition to current condition data, EnviroAtlas will incorporate tools and data layers that will allow users to visualize the implications of climate change on community sustainability. By doing this, EnviroAtlas will move in the direction of incorporating Intergovernmental Panel on Climate Change (IPCC) scenarios of changes in land use, temperature and precipitation and toward creating a tool to allow users to view the implications of these alternative scenarios on various ecosystems services, such as changes in water supply, and mitigation of heat-related health impacts and sea-level rise.

New data and tools for EnviroAtlas will be developed from within the EnviroAtlas team as well as by other projects within ORD that will be contributing to EnviroAtlas. All data and tools to be published within EnviroAtlas will be developed according to a set of criteria. These draft criteria will be finalized in early 2015, and include the following general criteria. In general, all data to be included in EnviroAtlas will be required to meet the following criteria:

• Include all required documentation and adhere to data submission guidelines

• Demonstrate enough of a gradient to be useful and meaningful

• Relate to at least one of the ecosystem services benefit categories

• Interpretable to a general audience once explained

• Data to be included in the “ecosystem services and biodiversity” section must be aggregated to one of the EnviroAtlas spatial units of choice (currently 12 digit HUCs for national and census block groups for community)

• Data to be included in the National “ecosystem services and biodiversity” section must be available for the entire nation (or relevant parts of the nation) and for the appropriate reporting unit.

• Data to be included in the “Supplemental Data” section do not need to be aggregated to a specific spatial unit but will not be available for use in forthcoming analytical tools.

All outputs listed in the previous section along with the improvements to the tool discussed in section c.1 and c.2 will be incorporated into releases of EnviroAtlas. The major peer-reviewed releases of EnviroAtlas will occur in 2016, 2018, and 2020, with annual content updates in 2015, 2017, and 2019. Each release will contain improvements over the previous release, including the following: improved functionality, new tools, updates to current tools, including an updated Eco-Health Relationship Browser tool (http://enviroatlas.epa.gov/enviroatlas/Tools/EcoHealth\_RelationshipBrowser/introduction.html), data, use cases, supportive publications in the peer-reviewed literature, and overall improvement of the user experience

*Focus Area #3: Outreach and Communication -* As the target audience for EnviroAtlas is extremely broad, with a goal of providing information for a large number of decision-makers, educators, and researchers, outreach and communication efforts are imperative to the success of EnviroAtlas. This focus area includes developing web materials that will appeal to a wide group of users, including both technical and non-technical audiences. It also includes developing outreach materials for conferences and stakeholder groups, and conducting stakeholder outreach. It includes soliciting feedback, developing training materials, developing explanatory fact sheets, and conducting demonstrations.

EnviroAtlas will strive to incorporate elements of social networking and citizen science into EnviroAtlas by the 2019 release. New functionality and data will be driven by EPA Program Office (PO) and Regional needs as well as by user community feedback.

**Nature of the Work**

Approximately thirty percent of the work will be done with in-house resources to conduct program management, metric development research, ecosystem and sustainability research, publications, contracts and interagency agreement management, tools and widget development, land cover classification, quality assurance, and communications and outreach.

Seventy percent of the work will be done through extramural support. Extramural resources support interagency agreements, software development, student services contracts and fellows, communication and outreach, and “turning the crank” contracts for metric calculation and landcover classification. Typically, EnviroAtlas data and tools are conceived by EPA staff and research fellows, the methods are then developed through research, and metrics are churned out through contract support. Approximately 15% of the EnviroAtlas budget directly supports the development of the National Land Cover Data (NLCD) used widely throughout EPA and other agencies. Approximately 20% of the EnviroAtlas budget supports software development and data management for EnviroAtlas.

**Collaboration**

The EnviroAtlas team will continue to work closely with projects across SHC and other ORD Programs. The research described in this EnviroAtlas Charter could potentially contribute to multiple Projects across SHC and ORD. Likewise, multiple projects across ORD could offer significant contributions to EnviroAtlas. One of the first steps that will be taken to encourage collaboration is to finalize a set of criteria and define a process for data and tool inclusion in EnviroAtlas. EnviroAtlas already successfully includes data that have been provided by collaborative efforts across ORD, but we would like to encourage additional participation. Listing the entirety of all of the potential collaborations and linkages is beyond the scope of this Project Charter, but some of the critical linkages are discussed below.

Project 1.61: Decision Science and Support Tools - EnviroAtlas is a decision tool and it is obviously important that it is developed in collaboration with Project 1.61. Guidance developed in Project 1.61 will be helpful for EnviroAtlas. EnviroAtlas can benefit from IT innovation in the project, especially related to inclusion of citizen science and social networking. EnviroAtlas may contribute to Project 1.61 by providing a platform to display results of citizen science.

Project 2.61: Ecosystem Goods and Services - A key near-term output requires close collaboration with Project 2.61, the crosswalk of FEGS-CS with EnviroAtlas metrics. Data layers contained within EnviroAtlas can be used in Project 2.61 research efforts. Data layers and tools for EnviroAtlas could and should be developed collaboratively between these two Projects. An important goal of 2.61 is the application of FEGS-CS, production functions, and models for spatial display in EnviroAtlas (1.62); thus collaboration between these projects is essential. FEGS-CS should be mutually beneficial, representing high priority research in 2.61 and filling important gaps for achieving EnviroAtlas goals. There is potential benefit for 2.61 Outputs through co-development of metrics, models and tools that identify and map demands (beneficiaries) for FEGS-CS.

Project 2.62: Community Public Health and Well-Being - Research on the role of community “green infrastructure” in specific public health issues will be coordinated and exchanged between EnviroAtlas and Project 2.62. There is a high potential for complementary research and visibility in the SHC Program. Ongoing collaboration with the Community- Focused Exposure Risk Screening Tool (C-FERST) and the Tribal-Focused Environmental Risk and Sustainability Tool (T-FERST) will continue.

Project 2.63: Assessing Environmental Health Disparities and Vulnerable Populations - Research on the role of community “green infrastructure” in specific public health issues in regards to health disparities and vulnerable populations will be coordinated and exchanged between EnviroAtlas and Project 2.63. There is a high potential for complementary research and visibility in the SHC Program. Areas of collaboration could include greenspace, access to recreation, children’s health issues, and reduction of roadway pollution.

Project 2.64: Indicators, Indices, and Report on the Environment - Interaction is needed between EnviroAtlas, Project 2.61 and Project 2.64 to maximize the type and quality of indicators and indices relevant to all Projects. Coordination is necessary to reduce the possibilities of duplication of efforts and to ensue appropriate scale is employed. Report on the Environment (ROE) and EnviroAtlas should explore the possibility of using EnviroAtlas as the mapping display driver for ROE.

Projects 3.61, 3.62 and 3.63: TBD

Projects 4.61: Systems-Based Assessments and Application of Systems-Based Assessments for Achieving Sustainability - EnviroAtlas maps and data are expected to contribute significantly to Projects 4.61, involving system-level accounting methods; these will be useful to evaluate ecosystem services supply and threats under alternative community decisions. Project 4.61 is essentially a stakeholder of EnviroAtlas and can provide feedback on how EnviroAtlas data are being used. The feedback can be used by the EnviroAtlas team to develop “use cases” so that examples of how to use EnviroAtlas data can be shared with the user community.

The EnviroAtlas team will continue to collaborate with researchers in the Safe and Sustainable Waters Research Program (SSW) and the Air, Climate, and Energy Research Program (ACE), both to support SSW and ACE research and to incorporate the results into EnviroAtlas. ACE researchers modeling reductions in near-road pollution due to roadside vegetation are exploring the high-resolution landcover available in EnviroAtlas for local site selection and model validation. Plans include hosting the near-road vegetation model on the EnviroAtlas platform for community use. EnviroAtlas researchers are working with ACE researchers to develop climate scenario information. SSW Project 1.1 is using EnviroAtlas watershed data to model the performance of green infrastructure and to downscale regional and state aquatic resource condition estimates, from EPA’s National Aquatic Resources Survey, to 12-digit hydrologic unit codes (HUCs). As the aquatic condition estimates inform ecosystem goods and services production and will align with EnviroAtlas mapping units, they represent important future additions to EnviroAtlas. Additional SSW research slated for collaboration include modeling river floodplains, creating a stream flashiness index, modeling invasive species, and investigating the benefits to water quality and quantity of green infrastructure. SSW researchers are also developing Estuary Mapper, which will contribute to the EnviroAtlas toolboxes its public platform and contribute to the EnviroAtlas toolbox.

A new partnership with the Homeland Security Research Program is evolving. The EnviroAtlas team also collaborates with EPA Office of Water (OW) and Office of Air and Radiation (OAR), U.S. Geological Survey (USGS), U.S. Forest Service (USFS), Landscope America, Natural Resources Conservation Service (NRCS), Duke University, New Mexico State University, Department of Transportation (DOT) and othersEnviroAtlas has multiple collaborators outside of Agency, and continues to develop new collaborative working partnerships.

Significant collaborators for the community component include the following:

* USDA Forest Service, with Davey Tree Expert Company

Description: Run *i-Tree* and BenMAP models using EnviroAtlas community landcover data to create block-group level metrics of hazard buffering by tree cover, with selected health benefits and dollar values. *Interagency Agreement*

* USDA Forest Service, with University of Vermont

Description: Collaborate on high-resolution landcover classification for large urban areas; facilitate stakeholder outreach and cost-sharing. *Interagency Agreement (under development)*

* University of Michigan School of Public Health, with Duke University

Description: Collaborate on eco-epidemiology research: urban ecosystem services indicators and birth weight in Durham-Chapel Hill, NC. *Official agreement:* *University of Michigan Institutional Review Board and NCER Human Studies Official approvals for EnviroAtlas ASPPH Fellow to participate in human studies research*

* Harvard Medical School / School of Public Health, with Brigham and Women’s Hospital

Description: Collaborate on eco-epidemiology research: urban ecosystem services indicators and multiple health measures from the Harvard Nurses’ Study, across EnviroAtlas communities. *Official agreement: Harvard University Institutional Review Board and NCER Human Studies Official approvals for EnviroAtlas ASPPH Fellows to participate in human studies research (under development)*

* University of Wisconsin, with Medical College of Wisconsin

Description: Collaborate on eco-epidemiology research: urban ecosystem services indicators and multiple health measures from the Survey of the Health of Wisconsin (SHOW), in Milwaukee and Green Bay. *Official agreement: University of Wisconsin Institutional Review Board and NCER Human Studies Official approvals for EnviroAtlas ASPPH Fellows to participate in human studies research (under development)*

* City of Durham, NC

Description: Collaborate to apply EnviroAtlas data and information to local decisions. *No official agreement*

Significant collaborators for the national component include the following:

* USGS, Earth Resources and Observation Science Center (EROS)

Description: Creating gridded soils layers from NRCS Soil Survey Geographic Database (SSURGO) data. *Interagency agreement*

* USGS, Gap Analysis Program (GAP)

Description: Developing biodiversity metrics for a suite of vertebrate species. *Interagency agreement*

* Fish and Wildlife Service (FWS), South Atlantic Land Conservation Cooperative (SALCC) Description: SALCC is creating a blueprint for the southeast for adaption to change and are including data from EnviroAtlas in their efforts.  Interested in recreational demand modeling and species data created by EnviroAtlas. SALCC is also helping EnviroAtlas on cultural and aesthetic value metrics. *No official agreement*
* National Aeronautics and Space Administration (NASA)

Description: NASA is working to create potential evapotranspiration (PET) layers from the Coupled Model Intercomparison Project Phase 5 (CMIP5) climate information that will be included in EnviroAtlas and will also be served on the NASA website for others to use.  *No official agreement*

* Forest Trends Initiative (FTI)

Description: FTI is interested in linking web-services from there mapping application with EnviroAtlas. *No official agreement*

* NRCS

Description: Soils data development from ecosystem services perspective

* USDA, Office of the Chief Economist

Description: Bringing ecosystem services markets data into EnviroAtlas. Agreement under development

* FWS

Description: Using EnviroAtlas to inform prioritization for the purchasing of FWS protected lands. Collaboration under development

The EnviroAtlas Team will strive to collaborate with EPA Program Offices including Office of Solid Waste and Emergency Response (OSWER), OAR, OW, and EPA Regions where opportunities exist and to ensure EnviroAtlas will meet PO/Regional needs. Examples of ongoing collaborative efforts include the Smart Location Data (SLD) with Office of Sustainable Communities (OSC), Recovery Potential work and NHDPlus attributes with OW, and incorporating data from the National Health Index (from the National Minority Quality Forum) in conjunction with Office of Air Quality Planning and Standards (OAQPS), and partnering with OAQPS to link the Environmental Benefits Mapping and Analysis Program (BenMAP) and EnviroAtlas. Numerous additional collaborative efforts with Regions and Program Offices are ongoing and are too numerous to list.

**Assumptions/Constraints**

• Staff with advanced geospatial analysis skills

• An unencumbered IT infrastructure that allows the incorporation of “big data”

• Transdisciplinary strengths spanning sustainability, and the linkages between ecosystem health and human health

• High-powered computing resources and access to software

• Continued ability to procure student services contractors and research fellows – these individuals perform tasks that are key to EnviroAtlas success

• Continued participation of SHC staff members to conduct remote sensing, metric development, outreach and communication, contract management, etc. Continued leveraging of complementary efforts through interagency agreements with the USDA Forest Service and other agencies engaged in related research activities

• Continued ability to procure IT support. As we have no software engineers on staff, IT contract support is key to success

• Communications and outreach support

• Increased access to sub-county public health data in order to perform eco-epidemiology research; potential sources include CDC’s National Environmental Public Health Tracking System and the HHS National Minority Health Data Project.

**Project Charter Team Members**

ORD/NERL/ESD - Neale, Anne; Moore, Rose-Marie; Yuan, Yongping; Conlon, Michele; Christensen, Jay; Wickham, James; Pilant, Drew; Kilaru, Vasu; Mehaffey, Megan

ORD/NERL/AMAD - Schwede, Donna;

ORD/NERL/GED-Russell, Marc; Smith, LisaM; Harwell, Matthew; Summers, Kevin;

ORD/NERL/ERD - Mike Galvin; Parmar, Rajbir;

ORD/NERL/EERD - Darling, John; Bruins, Randall;

ORD/NERL/HEASD - Mintz, Bruce; Quackenboss, James; Tulve, Nicolle;

ORD/NERL/IO - Zartarian, Valerie; Kryak, DavidD; Gillespie, Andrew

ORD/NHEERL/AED - TenBrink, Marilyn; Detenbeck, Naomi;

ORD/NHEERL/WED - Landers, Dixon; Compton, Jana; Brookes, Allen;

ORD/NHEERL/EPHD - Wade, Tim; Jackson, Laura;

ORD/NHEERL/IO- Saterson, Kathryn;

ORD/NCEA/IO - Jarabek, Annie; Kadry,Abdel-Razak; Gwinn, Maureen;

ORD/NCER/HRFD - Payne-Sturges,Devon;

ORD/NRMRL/APPCD - Dodder, Rebecca; Thompson, Bob

ORD/NRMRL/LRPCD - Dyson, Brian; Parker, Randy; Tolaymat, Thabet; Conmy, Robyn; Kremer, Fran;

ORD/NRMRL/GWERD - Weaver, Jim; Tim Canfield

ORD/OAR/OSIM – Bhagya Subramanian, Ann Vega

OAR/OAQPS/HIED – Hubbell, Bryan; Davis, Christine;

ORD/NPD/SHC -Smith, Betsy; McCullough, Melissa;

ORD/NPD/SSWR - McDonald, Michael E.;

OEI/ OTOP- Richards, Tim.

***Appendix***

This appendix lists data layers anticipated to be including in EnviroAtlas in subsequent releases. This list is tentative with other metrics yet to be added.

Upcoming community layers (i.e., selected communities only) – year after data description indicates anticipated year of addition to EnviroAtlas:

* Number of National Historic Places -2014
* Percentage of working age population with paid employment - 2014
* Number of workers with commutes less than 30 minutes- 2014
* Number of workers with commutes between 30 and 90 minutes- 2014
* Number of workers with commutes greater than 90 minutes- 2014
* Number of federal, state, and local recreational lands within a 2-hour drive – 2015
* Area of federal, state, and local recreational lands within a 2-hour drive- 2015

Upcoming national layers– year after data description indicates anticipated year of addition to EnviroAtlas:

* Future land use scenarios - 2015
* Future population scenarios- 2015
* Future climate scenarios- 2015
* Future water use- 2015
* Fishing, hunting, and wildlife-watching recreation demand- 2015
* Summarized point discharges, nutrients, sediment, and toxics- 2015
* Blue carbon storage- 2016
* Soil organic carbon storage- 2015
* Percent headwater area- 2016
* Amount of agriculture not draining through natural buffer- 2015
* Nitrogen removal metrics - 2016
* Runoff indicators- 2015
* Number of National Historic Places- 2015
* Roads crossing streams- 2015
* Roads near streams- 2015
* Agriculture on steep slopes- 2015
* Superfund sites- 2015
* Wind power potential- 2015
* Biofuels- 2015
* Global Rank Species (G1, G2, G3, and T&E) - 2015
* Conservation GAP Species (Status 1 & 2) - 2016
* Migratory Bird Treaty Act species- 2016
* Grassland Obligate Vertebrate Species- 2016
* Riparian Obligate Vertebrate Species- 2016
* Climate vulnerable bird species- 2015
* Growing Season - average length
* Days over 90 degrees
* Days under 32 degrees
* Date of first & last hard freeze
* Days of sunshine
* Heat index
* Wind chill
* Solar radiation
* Percent calm days
* Atmospheric Particulate Matter (PM2.5) Concentrations
* Atmospheric ozone concentrations
* Cumulative Ozone Exposure for Vegetation
* Days exceeding primary ozone/PM standard
* Mean annual / seasonal visible range
* AQI
* Black carbon
* Base cation deposition
* Mean annual temperature
* Seasonal temperature
* 100-year precipitation return event
* 50-year precipitation return event
* Low flow events
* Ice-free days
* Hurricane tracks/landfall probabilities
* Nitrogen dioxide emissions
* Nitrogen oxide emissions
* Methane emissions
* Carbon dioxide emissions
* Urban area and agriculture in floodplain
* Elevation
* Slope Min/Mean/Max
* Percent steep slopes
* Stream and Lake Buffers >30m for urban lands
* Percent forest core and edge habitat
* Percent of lake and stream buffer that is protected
* Percent of lake and stream buffer that is rare ecosystem
* Erosivity
* Crop Productivity Index (NCCPI)
* Fertilizer application
* Humidity
* Frequency of wind gusts > 60 mph
* Lightning strikes
* Tornado frequency
* Evapotranspiration
* Groundwater recharge
* Number of fish passages and obstructions

Upcoming People and Built Spaces layers (from the Smart Location Database): to be added in 2015

* Population, 2010
* Population density, 2010
* Percent of population that is working aged, 2010
* Number of households that own zero automobiles, 2010
* Percent of zero-car households
* Number of households that own only one automobile, 2010
* Percent of one-car households
* Number of households that own two or more automobiles, 2010
* Percent of households with two or more automobiles, 2010
* Number of workers (home location), 2010
* Number of low wage workers (home location), 2010
* Number of middle-wage workers (home location), 2010
* Number of high-wage workers (home location), 2010
* Percent of all workers earning $1250/month or less (home location), 2010
* Total employment, 2010
* Employment density, 2010
* Retail jobs
* Office jobs
* Industrial jobs
* Service jobs
* Entertainment jobs
* Education jobs
* Health care jobs
* Public administration jobs
* Number of low wage workers (work location), 2010
* Number of middle-wage workers (work location), 2010
* Number of high-wage workers (work location), 2010
* Percent of all workers earning $1250/month or less (work location), 2010
* Total housing units, 2010
* Residential density, 2010
* Jobs-housing Balance
* Land use entropy
* High-speed road network density
* Street intersection density
* Multi-modal street network density
* Pedestrian-oriented street network density
* Multi-modal street intersection density
* Pedestrian-oriented street intersection density
* Peak pm transit service
* Transit service density
* Percentage of employment within ¼ mile of rail transit stop
* Percentage of employment within ½ mile of rail transit stop
* Jobs within a 45-minute transit commute, weighted
* Working-age population within a 45-minute transit commute, weighted
* Jobs within a 45 minute drive, weighted
* Working age population within a 45 minute drive, weighted
* Jobs within a 45-minute transit commute, weighted
* Working-age population within a 45-minute transit commute, weighted
* Regional centrality index – Automobile accessibility
* Regional centrality index – Transit accessibility