# Cook Agronomy Farm LTAR site: Knowledge-intensive precision agroecology

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## A national LTAR Network is born

In 2011, the Washington State University R. J. Cook Agronomy Farm (CAF), near Pullman, WA, was designated by the U.S. Department of Agriculture (USDA) as one of ten locations to initiate a national Long-Term Agroecosystem Research (LTAR) Network. Establishment of the LTAR Network was a response to a "call for action" voiced by many in agriculture who recognized that certain questions require a long-term, systems perspective to adequately assess the trade-offs and consequences of different agricultural strategies. In 2014, eight more locations were added to the national network, and the initial ten locations received base (annual) funding to carry out long-term research goals (Figure 1). The selection of CAF as part of the LTAR Network was an outgrowth of the REACCH project and other long-term regional partnerships among universities, growers, agribusiness, state agencies, and the USDA.

Currently, agriculture faces tremendous challenges in meeting multiple, diverse societal goals, including (1) providing a safe and plentiful food supply; (2) adapting to and mitigating climate change; (3) supplying sources of bioenergy; (4) improving water, air, and soil quality; and (5) maintaining biodiversity. An overall goal of the national LTAR Network is to enable long-term, transdisciplinary science across farm resource regions to address the following four priority areas of concern: (1) agroecosystem productivity, (2) climate variability and change, (3) conservation and environmental quality, and (4) socioeconomic viability and opportunities. A key expectation of the LTAR Network is that research results will help address critical challenges facing agriculture.

## The R. J. Cook LTAR Site

Drowning in data and starving for knowledge, agricultural decision makers require evidence-based information to enlighten sustainable intensification. The agroecological footprint of the CAF LTAR site is embedded within 23 million acres of land with diverse uses, primarily cropland (7.2 million acres) and rangeland (13 million acres) that span a wide annual precipitation gradient (6 inches through 55 inches) with diverse social and natural capital (Figure 2). Sustainable intensification hinges on the development and adoption of precision agroecological practices that rely on meaningful spatiotemporal data relevant to land use decisions at within-field to regional scales. Specifically, the CAF LTAR site will contribute to a scientific foundation (socioeconomic and biophysical) that will enhance decision support for precision and

### IMPACT

Long-term, transdisciplinary agricultural research is essential if agriculture is to meet multiple, diverse societal goals, including food supply, climate change adaptation and mitigation, bioenergy, water/air/soil quality, and biodiversity. In 2011, the Washington State University R. J. Cook Agronomy Farm (CAF) was designated by the U.S. Department of Agriculture as one of ten sites within a national Long-Term Agroecosystem Research (LTAR) Network, and in 2014 CAF received annual base funding for this effort. The CAF site of the LTAR Network is regional in scope, following in the footsteps of REACCH with a focus on supporting long-term research into cropping systems and precision agricultural systems through building of research capacity and support for graduate education and outreach efforts. This funded, long-term effort will provide a cornerstone for supporting transdisciplinary research partnerships and will increase the region's competitive capacity to pursue a rich, grower-oriented research portfolio.

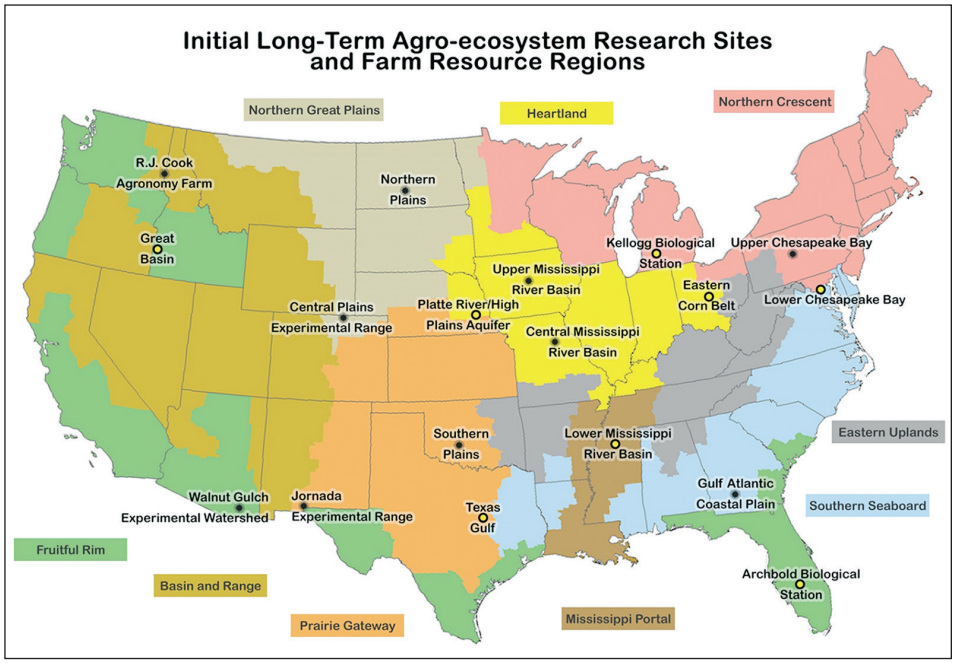


**Figure 1.** *Locations of the Long-Term Agroecosystem Research Network sites (2014).*

conservation agriculture and synergistic cropping system intensification and diversification. Long- and short-term perspectives that recognize and assess the trade-offs inherent in any land use decision will be considered so as to promote the development of more sustainable agricultural systems.

## Precision agriculture

Research into precision agriculture (PA) will be led by efforts at the CAF and Wilke Farm (Davenport, WA) experiment stations, as well as at cooperating on-farm watershed locations. The research will augment past and current PA studies and will include assessing long-term cropping system cycles and flows of nutrients, water, carbon, and other biotic and abiotic factors, using a suite of PA technologies, including remote and proximal sensing coupled with crop- and soil-based mass-balance approaches. The research will emphasize evaluation criteria and metrics associated with long-term agroecosystem provisioning, supporting, and regulating services.

## Conservation agriculture

Comparisons of greenhouse gas (GHG) fluxes associated with conventional and no-tillage agriculture, including eddy-covariance flux towers coupled with automated static chambers initiated by REACCH, will be continued. Long-term monitoring and characterization of soil health and water quality at the CAF site and other sites will also continue, contributing to our understanding of the long-term impacts of agricultural practices on natural resources. On-farm evaluations will involve select farms and ranches throughout the CAF LTAR footprint that will allow researchers to assess conservation agriculture (CA) and PA, following design guidelines for on-farm research.

Opportunities for flex cropping that include cropping system diversification and intensification options will be assessed at long-term sites within major dryland agroecological zones, including locations in northeastern OR, eastern WA and northern ID (Figure 3). Regional infrastructure (e.g., agweathernet) will be augmented and combined with process-oriented crop modeling and economic evaluation to aid flex-cropping decisions and assessment. Cropping system assessment will emphasize agroecosystem provisioning, supporting, and regulating services using transdisciplinary approaches.

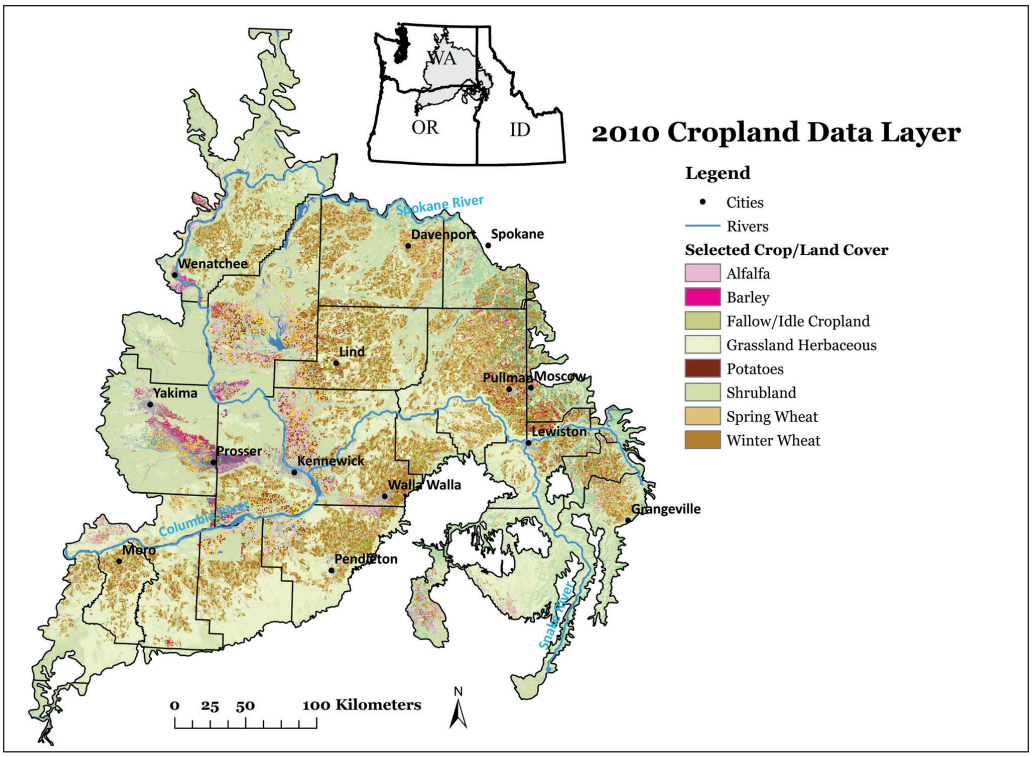


**Figure 2.** *Cropland data layer for the REACCH region (National Agricultural Statistics Service, 2010).*

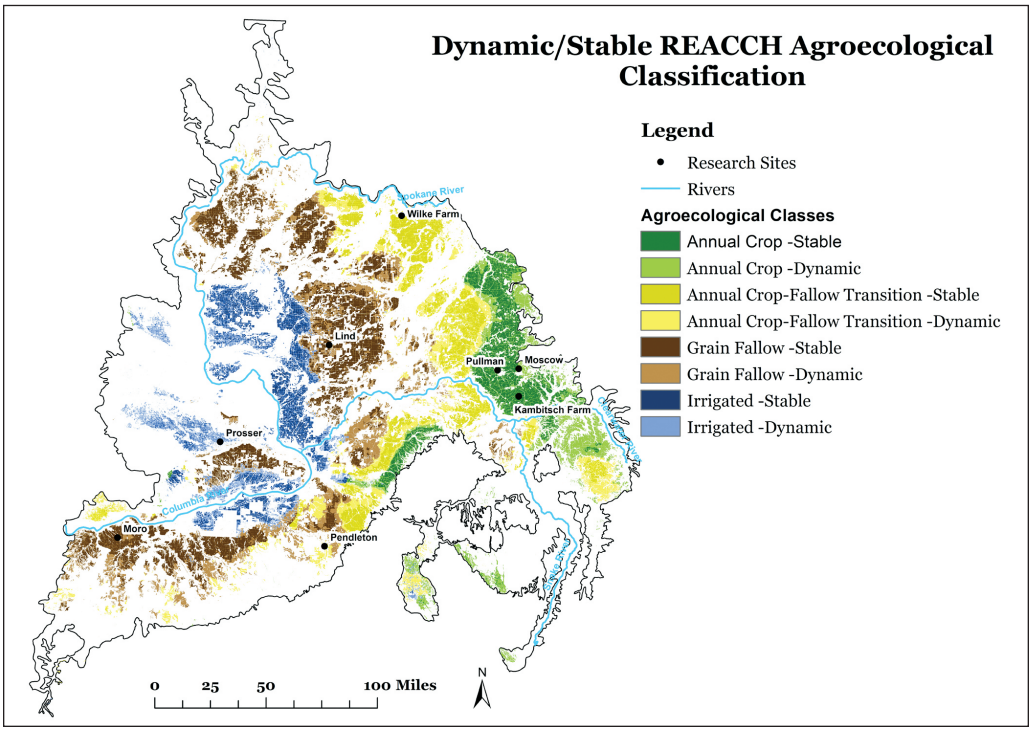


**Figure 3**. *Stable and dynamic agroecological classes (AECs) for the REACCH region based on 2007 through 2013 cropland data layers.*