# Water Supply Stress Index Model (WaSSI)

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Forest ecosystems provide many benefits and services, including clean water essential for both ecosystem and human use. Water controls plant growth and carbon storage to help regulate climate, as well as the variety of plant and animal species that exist in an ecosystem. Water availability and carbon sequestration are closely related ecosystem services that are influenced by human and environmental factors such as climate change, land cover, and water withdrawals. To evaluate the balances and tradeoffs between these ecosystem services, scientists from the USDA Forest Service **Eastern Forest Environmental Threat Assessment Center** have developed a web-based planning tool known as the **Water Supply Stress Index (WaSSI)** model.
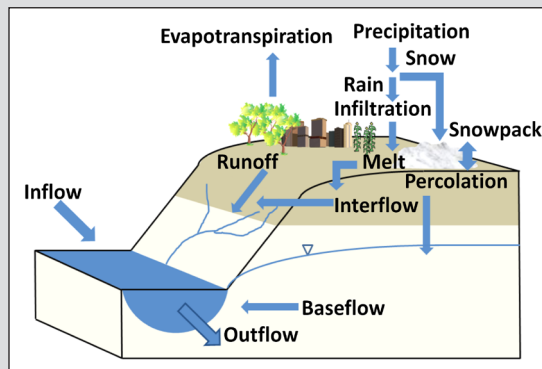
WaSSI simulates water cycles in watersheds across the lower 48 United States and Mexico.

WaSSI predicts the availability of water and other ecosystem services at local and national scales.

An altered future climate, coupled with increasing human population and changing land cover resulting from land use decisions, will likely impact ecosystem water and carbon cycles.

WaSSI predicts how these factors may impact water availability and carbon sequestration at the watershed level (about the size of a county) across the lower 48 United States and Mexico.

WaSSI uses field observations, such as data collected by instruments on this tower, to calculate water and carbon exchange between various ecosystem types and the atmosphere.

WaSSI supports informed decision making in a changing world.

WaSSI generates useful information for natural resource planners and managers who must make informed decisions about water supplies and related ecosystem services in light of climatic, economic, and demographic change. Educators, researchers, and non-governmental organizations can also use WaSSI to gain insight into the effects of global change on water and carbon. WaSSI users can select from a variety of future climate scenarios, and adjust temperature, precipitation, land cover, and water use factors to simulate an unlimited number of global change scenarios for any timeframe from 1961 through the year 2100. Simulation results are available as downloadable graphs, maps, and data files that users can save and apply to their unique information and project needs.
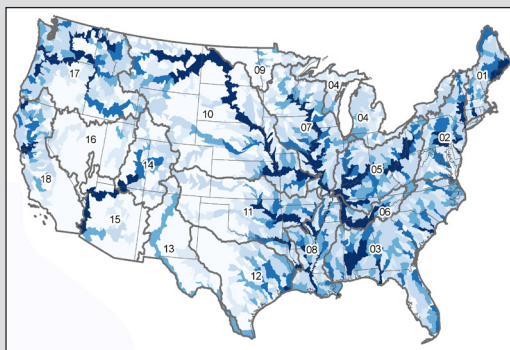
WaSSI results are helping people through a variety of research projects and conservation activities.

WaSSI users are addressing a range of natural resource questions in the United States and abroad. Forest Service research and planning efforts—including the Southern and Northern Forest Futures projects and Climate Change Adaptation and Mitigation Management Options project—use information generated by WaSSI to help land managers develop responses to climate change issues impacting forest products and ecosystem services. Eastern Threat Center scientists are actively collaborating with other federal agencies, universities, and non-governmental organizations to study emerging issues such as irrigation and energy development impacts on U.S. water and other natural resources.

WaSSI predicted the average annual surface water supply under historical climate conditions. Darker areas have higher water supply available to meet water demands while lighter areas have less.

WaSSI predicted the average annual rates at which ecosystems could potentially store carbon, shown in shades of green on this map. The orange areas may release carbon, if present.
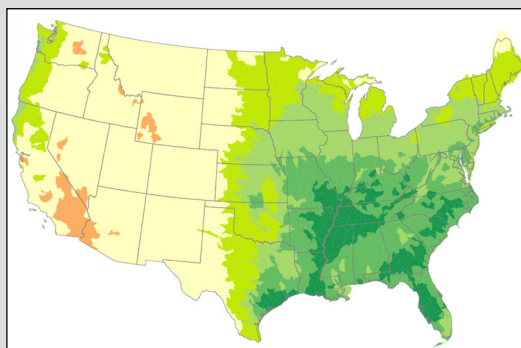

WaSSI is helping international organizations develop conservation strategies in African countries where population growth, weather extremes, and poor farming methods often impact water resources.

Scientists are also working with international organizations to aid development of resource conservation strategies. They are applying WaSSI in eastern and southern African countries to measure the potential impacts of land use practices on water quantity and in Inner Mongolian, Mongolian, and Chinese forest ecosystems to examine water and carbon interactions and their effects on regional biodiversity. Eastern Threat Center scientists have also conducted workshops in Mexico City to introduce land managers and researchers to WaSSI and demonstrate how the model could be implemented to address natural resource challenges in Mexico. These efforts not only support short- and long-term natural resource decision making; they also provide valuable data and information used to validate and enhance the WaSSI model.

WaSSI training and assistance are available.

To request demonstration and training sessions, please contact **Ge Sun**, Eastern Threat Center research hydrologist, at gesun@fs.fed.us or (919) 515-9498.

For additional information:

Visit http://www.forestthreats.org/wassi to learn more and begin exploring WaSSI.

Scan to learn more about WaSSI.