Managing future forests for water

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Forested watersheds supply clean water to communities across the United States. Credit: USDA Forest Service

Forest Service Southern Research Station (SRS) scientists recently used long-term data from the Coweeta Hydrological Laboratory (Coweeta) in Western North Carolina to examine the feasibility of managing forests for water supply under the changing weather conditions forecast for the future.

Published in the September issue of the journal Ecological Applications, the analysis examines the interactions among changing weather

conditions, forest management, and streamflow using long-term data from paired watershed studies at Coweeta, a 5,600-acre research facility and Forest Service Experimental Forest.

"Long-term data from experimental forests are truly the foundation of Forest Service research," says SRS Research Ecologist and lead author Chelcy Ford. "For this study we took one of the longest continuous records of climate and hydrology and coupled it with data from the long-term forest management experiments on the paired watersheds to look at both precipitation patterns and the feasibility of using forest management to sustain water supply."

The data analysis revealed that precipitation patterns are changing and becoming more extreme, in line with what climate models predict for the area. "We found significant increases in temperature and in the frequency of extreme wet and dry years since the 1980s," says Ford. "These findings tied with those on management and streamflow have implications for managers in any area where changes in precipitation patterns could occur."

Management approaches used in Coweeta watershed studies include conventional thinning strategies as well as more intensive approaches such as converting hardwood stands to pines. Partly because pines keep their needles year-round, conversion from hardwoods to pines decreases streamflow. For this study, Coweeta researchers asked whether vegetation on managed watersheds responded differently to extreme dry and wet years than vegetation on unmanaged watersheds.

"The answer in almost all cases was yes," says Ford. "But from a streamflow perspective, the extreme case of converting hardwood forest to pine produced the largest effect on available surface water. Though it might be a good option for mitigating climate change under future scenarios of increased precipitation, species conversion from hardwood

forest to pine would be a poor choice under drier scenarios where it could worsen water shortages by reducing the amount of available water in streams."

Land managers and policy makers are looking to forests for options to offset the effects of climate change, and to forest management as a way to create ecosystems more resilient to the weather effects of a changing climate, but Ford and her fellow authors advise managers to look closely at the risks and vulnerabilities involved in managing for climate change, especially in relation to water supply.

"Managers need to carefully weigh the risks of adopting one strategy over another," says Ford. "They also need to realize that any strategies they consider will have to address these risks at the regional or even more fine-scaled level, taking into account possible changes to local precipitation patterns."

More information: Full text of the article: www.srs.fs.usda.gov/pubs/38726

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