NELSON CCR Center for Climatic Research

CLIMATE, PEOPLE, AND THE ENVIRONMENT PROGRAM SEMINAR SERIES

CPEP

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Climate change impacts on thermal habitat of Midwestern lakes

Lakes in the Midwest and around the world are getting warmer, with likely impacts on ecosystem processes. However, lake temperatures and warming rates vary among depths, lakes, seasons, and regions. Differences in temperatures across multiple scales are likely to influence how fish populations in different lake types respond to climate change. We aggregated millions of temperature observations and parameterized mechanistic lake temperature models for 10,000 lakes in Minnesota, Wisconsin, and Michigan to examine broad-scale lake warming trends and among-lake diversity in warming rates. Daily lake temperature profiles and ice-cover dynamics were simulated for 1979-2015 using the General Lake Model for all lakes. Future lake temperatures were estimated for the mid- and late 21st century by driving these lake models with downscaled climate drivers from six global circulation models and the RCP8.5 emissions scenario. Modeled temperature trends in the contemporary period show substantial variability in warming rate among lakes, depths, and seasons. Preliminary results suggest that by some metrics, inland lakes in close proximity to the Great Lakes are warming fastest, although the mechanism behind this pattern is unknown. Future simulations suggested that lake warming is expected to continue in the 21st century. Modeling scenarios and analysis of field data suggested that lake size, water clarity, and depth are strong controls on the sensitivity of lakes to climate change. Specifically, a 1% annual decrease in water clarity was sufficient to fully offset the effects of climate change on whole-lake temperatures for many lakes. Fish community dominance is affected by thermal habitat availability. In some lakes, shifts from coolwater walleye (Sander vitreus) to warmwater largemouth bass (Micropterus salmoides) dominance are expected as temperatures increase, while populations in other nearby waters are comparably resilient. Understanding heterogeneous lake and fish responses to climate warming could help managers connect lake-specific features with improved climate resilience, allowing prioritization of climate adaptation efforts.

Tuesday, May 2, 2017 1:00 pm

AOSS Building, Room 1039 **1225 W. Dayton St.**

Please join us for coffee at 12:45 in Room 1039