National Climate Change and Wildlife Science Center

2008 Inaugural Research Projects – Accomplishments

The Potential Influence of Changing Climate on the Persistence of "at Risk" Native Salmonids
USGS Northern Rocky Mountain Science Center

Understanding how climate change will influence habitat for interior species of native salmonids is critical for effective management and recovery of these species. DOI, USDA, state fisheries managers, and NGOs are increasingly challenged in attempting the recovery and restoration of native trout and salmon throughout their range. USGS scientists, in partnership with the US Forest Service and Trout Unlimited, completed a database including all existing species distributions and habitat information, and air and water temperature data for the interior West. Maps defining existing and projected future distributions of native salmonids, factoring in anticipated temperature, hydrology, and non-native impacts, alone and in combination, are in progress. Partnership workshops with natural resource managers are planned to share the information and to gather feedback on enhancements for direct adaptive management applications. A recent publication describes projected effects of climate change on cutthroat trout, with a broad-scaled risk assessment for native salmonids in the West soon to follow. Citation:

Williams, J.E., A.L. Haak, H.M. Neville, and W.T. Colyer. 2009. Potential consequences of climate change to persistence of cutthroat trout populations. North American Journal of Fisheries Management 29:533-548

Climate Change: A Challenge to Bird Conservation in Arid and Semi-arid Regions
USGS Fort Collins Science Center

Tens of millions of migratory birds are dependent on wetland and riparian stopovers in arid and semiarid regions of North America. Global climate change would superimpose even greater stress on these ecosystems as indicated by climate change model predictions of higher temperatures and less precipitation in the southwestern United States. In partnership with the University of Arizona, the Nebraska Cooperative Research Unit, and the NASA Goddard Space Flight Center, USGS scientists have investigated how climate change may alter the spacing and quality of critical wetland stopover habitats; the sensitivities of migrating songbirds to loss of riparian forests due to climate change and water-use patterns; and the relative sensitivity to climate change of guilds of wetland birds. An integrated avian database was developed with information from 30+ collaborators studying avian migration along four major river systems in the desert southwest (Rio Grande, San Pedro, Santa Cruz and Colorado Rivers). The database includes the timing of migration, avian diversity, and avian abundance, as well as measures of climate (e.g., winter/spring temperature, winter/spring/summer precipitation), water availability (e.g., river flow, width, depth), and elevation. A series of models that describe the major climatic factors influencing migration patterns along the four major river drainages resulted. A recent publication and another in press describe the projected effects of climate change on migratory and breeding locations. Citation:

Carlisle, J. D., S. K. Skagen, B. E. Kus, C. van Riper III, K. L. Paxton, and J. F. Kelly. In press. Landbird migration in the American West: recent progress and future research directions. The Condor 111(2):211-225.

Fate of Endangered Species in San Francisco Bay Tidal Marshes with Sea Level Rise
USGS Western Ecological Research Center

San Francisco Bay tidal salt marshes are critical habitat for endangered species; the loss of 80% of historic salt marshes has been a major factor in population declines. Costly restoration programs have been proposed for many sites within the estuary, yet their ecological benefits are now threatened by sea level rise. This study combined existing data to create elevation models and habitat suitability indices, and to develop a high resolution elevation model for evaluating inundation rates and to quantify habitat quality under varying scenarios. This type of tool is valuable for managers planning future restoration and land acquisitions, as well as for development of comprehensive conservation plans. The research was conducted in collaboration with the University of California and the US Fish and Wildlife Service, with additional support from the State Coastal Conservancy, South Bay Salt Pond Restoration Fellowship, Jastro Shields Research Grant 2009 University of California, Selma Herr Scholarship, and 2008 and 2009 USGS American Indian-Alaska Native Liaison Program Awards. Results from this study have been shared directly with the US Fish & Wildlife Service and CALFED for possible use in future refuge comprehensive conservation management plans.

Quantifying the Influence of Climate Change on Rocky Mountain Ungulates
USGS Wyoming Cooperative Research Unit

Many ungulate populations in the Rocky Mountains are predicted to respond to declining snow levels and increased drought. The research team is investigating how climate change may affect the abundance of Rocky Mountain ungulates, their migration patterns, the degree to which they transmit diseases to livestock, and their impact on aspen (*Populus tremuloides*). Working with the Wyoming Game and Fish Department, USGS researchers at the University of Wyoming Cooperative Research Unit, Humboldt University, and the USGS Earth Resources Observation and Science Center have compiled and integrated diverse ecological data to build four consistent databases, one each for elk (*Cervus elaphus)*, pronghorn, (*Antilocapra americana*), deer (*Odocoileus hemionus*), and moose (*Alces alces*). Strong annual correlations in recruitment have been noted that are indicative of strong climatic forcing, along with regional differences and long−term declines in recruitment for moose and deer in western Wyoming, and for pronghorn statewide. Many ungulate populations in the Rocky Mountains are predicted to respond to declining snow levels and increased drought. Strong correlations were also found between aspen growth and climatic factors, indicating that climate change will impact aspen growth. This work provides reason for concern about reduced aspen vigor due to climate change; however, it has shown that this reduction will vary across the landscape with growth at higher elevation sites more strongly impacted by snowpack, and the effect of temperature more important for southwest-facing sites.

Impact of Past and Future Stream Temperature and Flow Changes on Endangered Atlantic Salmon
USGS Maine Water Science Center and USGS Conte Anadromous Fish Laboratory

A team of scientists from the USGS, the Maine Cooperative Research Unit, NOAA, Maine Department of Marine Resources, the National Research Council and the University of Maine are investigating how changes in summer low streamflows and stream temperatures in the northeastern US affect endangered Atlantic salmon populations. Watershed-model climate projections indicate that a potential increase in streamflow resulting from increased precipitation is to a large degree offset by an increase in basin evapotranspiration. Projected changes in basin evapotranspiration estimates are driven by increases in basin temperature and the largest increases are forecast to occur during the spring and summer. While mean basin streamflow may remain relatively unchanged or increase slightly, the contribution of accumulated seasonal snowpack and melting of that snowpack to the amount and timing of streamflow are projected to change substantially. This advance in spring snowmelt runoff has been documented in the historical record over the 20th century and has been acknowledged as a sensitive variable driven by climate change. Given the link between Atlantic salmon emigration dynamics and the timing, duration, and magnitude of spring streamflows, it is possible that some adaptation has been taking place as limited emigration data indicate Atlantic salmon are emigrating earlier. A fact sheet describing the background, science questions, and proposed methods of study for this project has been published and is available in print and on the web at http://pubs.usgs.gov/fs/2008/3044/.