

Climate Change Observed

Climate changes are already evident in Appalachians. Assessments conducted at greater regional levels in the Northeast and Southeast U.S. indicate increasing temperature trends over the past several decades. The U.S. Global Change Research Program (<http://globalchange.gov/>) provides regional information on observed and expected climate influences, linked to an interactive map, and these include:

- longer growing seasons
- reduced number and duration of snow pack and ice-over events
- increasing frequency of days with extreme heat
- increasing water temperatures, and
- increased evapotranspiration by vegetation and in streams



The National Climatic Data Center (<http://www.ncdc.noaa.gov/>) provides interpretive maps that display temperature and precipitation trends. Temperature changes will set into motion a cascade of environmental changes such as increased stream temperatures (which can reduce oxygen availability and other water quality parameters), increased stress on all species during extreme heat waves, and lower ability of native flora and fauna to compete or combat non-native invasive species and diseases.



Annual mean precipitation has also changed, generally increasing by approximately 0.14% per year, but changes in precipitation can vary dramatically at the regional and local level as evidenced by the severe droughts in parts of the United States in 2009 and 2012. Changes observed for precipitation during summer months (June through August) were greater than the annual means (0.21% per year). These changes will result in changes to climate such as:

- increase in storms/heavy precipitation events
- earlier spring snowmelt resulting in higher peak flow periods
- changes to annual water budgets
- scouring effects of intense storms, which will increase erosion and sedimentation and alter the geomorphology of stream habitats including mussel beds
- periodic drought conditions or decreasing precipitation trends that could have extreme impacts on aquatic species dependent on specific instream flow regimes for feeding and survival, and

- reductions in instream flow will also further exacerbate sedimentation, nutrient, and chemical contaminants in the waterways

The National Oceanic and Atmospheric Administration (NOAA) is a leader in tracking weather and climate conditions and has excellent educational materials available to the public to explain global climate change impacts and potential adaptive responses (http://www.education.noaa.gov/Climate/Climate_Change_Impacts.html). Significant changes in precipitation intensity, duration, and timing will have profound effects on all species within the Appalachian LCC, including humans. Impacts will include changes in species distribution, abundance, and assemblages, or difficult-to-anticipate combinations of these. In addition, changing conditions will likely increase population fragmentation and species extinctions. Competition for increasingly scarce water resources will increase the risk for adversity between urban, agriculture, industry, and natural resource interests. These factors will combine to influence the future condition of biotic communities of the Appalachians.

