

Kentucky River Area Development District

Summary

Climate change is expected to significantly increase rainfall and flooding across the Kentucky River Area Development District (KRADD), heightening the risk of damage to homes, infrastructure, and public safety.

In most counties across KRADD, what is currently considered a 100-year rainfall event is expected to occur as frequently as once every 20 years. In Owsley and Letcher Counties, the return period is slightly longer, with the 100-year event projected to occur once every 50 years.

The primary flood threat in KRADD is riverine flooding, which occurs when rivers overflow their banks due to excessive rainfall. This risk is most pronounced along the North, South, and Middle Forks of the Kentucky River. For example, in Hazard, KY, multiple structures along the North Fork are inundated during a present-day 100-year flood. Along Main Street in Hazard, floodwaters can reach depths of 3 to 4 meters (9.8-13.1 feet). Similarly, the cities of Campton and Hayden face severe flooding, with water from the Middle Fork Kentucky River and Rockhouse Creek reaching up to 11 meters (36.1 feet) along US Highway 421. Across the region, the average flood depth is projected to increase by 0.71 meters (approximately 2.3 feet) over the course of the 21st century, driven by rainfall increases of 2 to 5 inches.

To validate the extent of this growing threat, we compared our flood risk data with that of the Federal Emergency Management Agency (FEMA). Woodwell's models identified greater flood exposure than FEMA's maps, largely due to differences in methodology. Notably, FEMA data typically omits pluvial flooding—flooding caused by heavy rainfall that is not directly tied to river overflow—and does not account for rainfall across the entire landscape. As a result, FEMA maps often show no flood risk in areas not directly adjacent to rivers, whereas Woodwell's analysis identifies significant risks in these non-riverine zones.

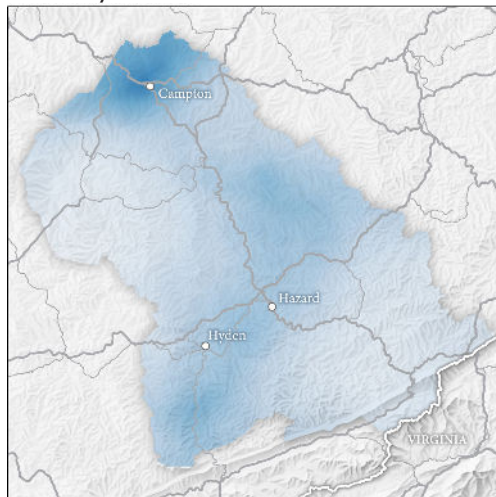
As climate change intensifies, KRADD faces increasing vulnerability. More people, buildings, and infrastructure will be exposed to heavier rainfall and deeper floods, exacerbating risks to public health, safety, and economic stability. Forward-looking planning and investment in flood resilience will be essential to protect communities across the region.

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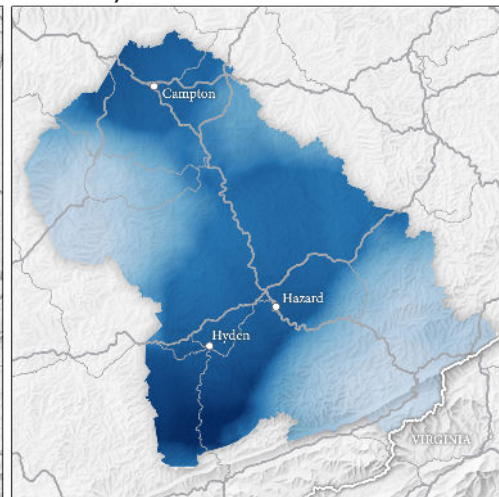
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Midcentury 2040–2060



Late Century 2070–2090



Precipitation
6 14 in

Figure 1. Mid- and late-21st century change in historical 100-year rainfall. The future rainfall amounts in inches for midcentury (left) and late-century (right) for the 100-year rainfall event with the darker the blue, the greater the rainfall amount. By midcentury and late century, the 100-year rainfall event is expected on average to drop 7.8 inches and 10.79 inches respectively across KRADD.

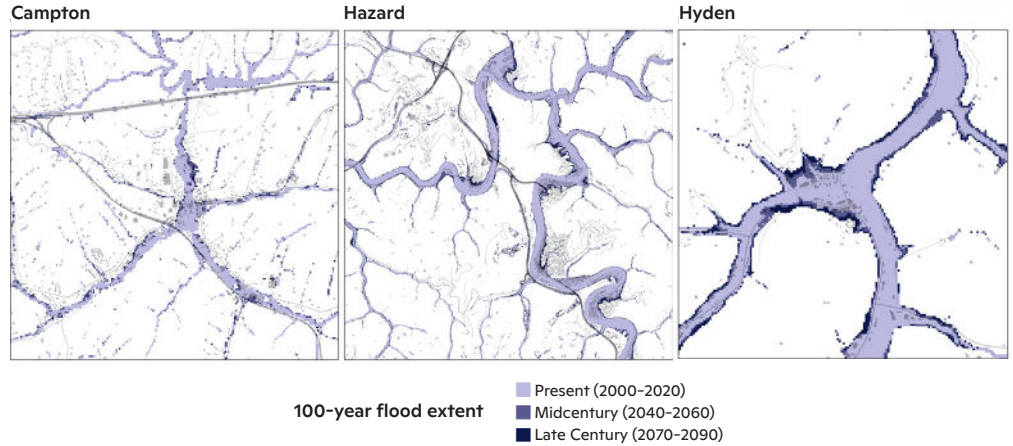


Figure 2. Present-day and future 100-year flood KRADD. The flood extent, quantified as having a depth of at least 0.5 ft (0.15 m), for select cities (Campton, Hazard, and Hyden) around KRADD. The maximum extent for the 100-year pluvial/riverine is shown. Gray polygons are buildings.

Woodwell's Climate Risk Assessments

The way that Earth's natural systems respond to a rapidly warming climate will impact our quality of life for generations to come. Communities to countries worldwide must be armed with the most up-to-date science so that planning, zoning, and adaptation decisions can be made in the near term to protect against future climate-driven risks. Understanding the scale and nature of climate risks can also be an important motivator of mitigation action.

Combining technical expertise with local knowledge creates the most complete climate risk profile—one that is intentionally created to actually be used by local decision makers. Woodwell has already cultivated municipal partnerships with cities and towns throughout the world that have long-term sustainability goals, providing them with the science they need to make climate-smart decisions.



Communities for which Woodwell Climate has completed or is preparing municipal risk assessments.

We have expertise studying a wide range of climate hazards	Drought	Flooding	Water Scarcity	Sea Level Rise
	Heat Stress	Hurricanes	Agriculture Yield	Permafrost Loss
	Wildfires	Storm Surge	Precipitation	



Woodwell Climate conducts science for solutions at the nexus of climate, people and nature. We partner with leaders and communities for just, meaningful impact to address the climate crisis. Our scientists helped to launch the United Nations Framework Convention on Climate Change in 1992, and in 2007, Woodwell Climate scientists shared the Nobel Prize awarded to the Intergovernmental Panel on Climate Change. For 40 years, Woodwell Climate has combined hands-on experience and policy impact to identify and support societal-scale solutions that can be put into immediate action. This includes working with municipalities on the frontlines of the climate crisis.

For more information about this analysis, or Woodwell Climate's other climate risk assessments, please contact us at: policy@woodwellclimate.org

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