Executive Summary: Climate-Sensitive Hazards in Florida

The Building Resilience Against Climate Effects (BRACE) Program at the Florida Department of Health (DOH) is working to improve the ability of the public health sector to respond to health effects related to weather variability. As part of the Centers for Disease Control and Prevention's Climate-Ready States and Cities Initiative, the BRACE Program, along with internal and external partners, is implementing the five-step BRACE Framework. As part of BRACE step one, forecasting climate impacts and assessing vulnerabilities, DOH collaborated with the University of South Carolina Hazards and Vulnerability Research Institute to produce the following vulnerability assessment of climate-sensitive hazards in Florida.

Due to unique geography, the state of Florida is at risk of a variety of hazards, and losses from hazards have been increasing over the past 60 years. This report features seven priority hazards: hurricane winds, storm surge, flash flooding, sea level rise (SLR), extreme heat, drought, and wildland fires. The potential geographic impact of each hazard is presented individually and coupled with the Social Vulnerability Index (SoVI) and the Medical Vulnerability Index (MedVI) to illustrate the intersection of the social, medical, and hazard vulnerability throughout the state. SoVI incorporates a variety of socio-economic factors to measure social well-being and a community's ability to prepare for, respond to, and recover from disaster. MedVI incorporates health care access, health system capacity, and medical need factors to measure community health infrastructure. Areas at both elevated risk and vulnerability are places where a combination of classic hazard mitigation and social mitigation practices should be utilized in order to maximize optimal outcomes.

In comparison with other states, Florida has experienced the greatest number of landfalling hurricanes. Projections indicate that while there may be a decrease in the total number of tropical cyclones in the Atlantic Ocean, there could be more intense hurricanes (Category 3-5) in the future. Potentially, hurricane winds can affect any county in Florida, and storm surge can potentially affect any coastal county, but some counties have a higher risk than others. In addition, sea levels have been rising and are expected to continue rising throughout the current century. In combination with land subsidence, rising sea levels can affect drinking water supplies, infrastructure, and amplify storm surge risk.

The potential impact of storm surge on Florida's coastline was calculated using the National Oceanic and Atmospheric Administration's Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model. All of south central Florida, depending on the direction of the storm, and counties along the Gulf Coast are at highest risk of storm surge. In a Category 5 hurricane, 5.6 million people living in 38 counties are at extreme or high risk of storm surge. Approximately 1.5 million people living in these areas are socially vulnerable, and approximately 1.2 million people are medically vulnerable.

The potential impacts of tropical storm- and hurricane-force winds in Florida were calculated using Extended Best Tract data for 1988-2012 and an idealized buffer around storm tracks for 1952-1987. The Panhandle and south Florida are at highest risk of hurricane-force winds. Overall, approximately 2.9 million people living in 19 counties are at extreme or high risk of hurricane-force winds. Approximately 1.5 million people living in these areas are socially vulnerable, and approximately 620,000 people are medically vulnerable.

Florida's vulnerability to SLR was calculated using the best available digital elevation data. Areas contiguous from shore were considered at risk under three future scenarios by the year 2100 compared to 1990 sea levels: low scenario, 28.5 cm of SLR (approximately one foot); mid

scenario, 66.9 cm of SLR (approximately two feet); high scenario, 126.3 cm of SLR (approximately four feet). South Florida and other coastal communities throughout the state are at risk of the high SLR scenario. Overall, approximately 590,000 people living in 25 counties are directly at extreme or high risk of SLR. Approximately 125,000 people living in these areas are socially vulnerable, and approximately 55,000 people are medically vulnerable. However, the long-term and sustained impacts of SLR, including infrastructure damage and population migration, have the potential to ultimately affect many more people.

In the southeastern United States, heavy rain events have been increasing in frequency over the past 20 years. In Florida, extreme precipitation is closely linked to La Niña conditions. While there is uncertainty, it is projected that there will be both more dry days and more intense precipitation events in the future. In combination with changing land cover and use, these conditions could result in more flooding. Since it is not possible to identify specific geographic areas where more rain will fall, a modeled surface Flash Flood Potential Index (FFPI) was used to identify areas of interest for planning and adaptation. FFPI defines risk based on a location's pre-event slope, land cover, soil drainability, and land use. Urban regions with a high flash flood risk include areas surrounding Cape Coral, Jacksonville, Miami, Tallahassee, and Tampa. Overall, approximately 3.3 million people living in 24 counties are at high risk of flooding. Approximately 1.8 million people living in these areas are socially vulnerable, and approximately 225,000 people are medically vulnerable.

Florida has historically been vulnerable to drought and wildfire, although these hazards take a different form than in other parts of the continental United States due to the subtropical climate. While the southeast United States has not experienced substantial increases in temperatures over recent decades, projections indicate that in the future, there will be warmer temperatures. This warming, coupled with projected increases in dry days, could lead to more persistent drought and increased likelihood of wildland fire.

Downscaling was used to generate state-specific downscaled data for Florida, derived from the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4). These downscaled projections were used to create spatial representations of future summer heat and drought hazard areas by the year 2100 under three different emissions scenarios. Under the highest (A1FI) scenario, nearly all the state is at high risk (over 18 million people) and approximately 335,000 people in 20 counties are at extreme risk of summer heat. Approximately 4.9 million people in these areas are socially vulnerable, and 5.8 million people are medically vulnerable. Also under the A1FI scenario, approximately 7.7 million people in 15 counties are at extreme risk of summer drought. South and central Florida and the western Panhandle are most at risk. Approximately 3.2 million people living in these areas are socially vulnerable, and 720,000 people are medically vulnerable.

To assess vulnerability to wildland fire, the Wildland Fire Suppression Index (WFSI), developed by the Florida Forest Service, was used to determine the probability of an acre of land burning if ignited. Central Florida is most at risk of wildland fire. Overall, approximately 515,000 people living in 19 counties are at high or medium risk of wildland fire. Approximately 186,000 people living in these areas are socially vulnerable, and approximately 357,000 people are medically vulnerable.

This vulnerability assessment and associated mapping tools will be a resource for future health adaptation planning in Florida.