

# FLORIDA FOREST SERVICE

## Hurricane Helene 2024

### October 10, 2024

### Initial Estimate of

## Altered, Damaged, or Destroyed Forest Resources in Florida

Starting as a low-pressure system south of Cuba and east of Mexico in the western Caribbean Sea, the system was designated Potential Tropical Cyclone Nine (PTC9) on September 23, 2024, due to its imminent threat to land. PTC9 became better organized and was upgraded to Tropical Storm Helene on September 24, 2024. Florida Governor Ron DeSantis then declared a state of emergency for 61 of Florida's 67 counties. One day later, the National Hurricane Center (NHC) upgraded Helene to a hurricane as it entered the Gulf of Mexico. The NHC noted in multiple forecast discussions that Helene was a very large system in the 90th percentile, meaning an exceptionally large area would be impacted by damaging wind, rainfall, and storm surge. On September 26, 2024, Helene began to intensify rapidly, strengthening from Category 2 to Category 4 in less than twelve hours. Hurricane Helene made landfall on September 26, 2024, at 11:20 pm ET near the mouth of the Aucilla River and just west of Perry, FL, with maximum sustained winds of 140 mph. Perry, FL, recorded the highest peak wind gust of 99 mph, according to the National Weather Service Weather Prediction Center. In addition, there was an estimated 15 feet of storm surge in the Big Bend region. Helene's storm surge had far-reaching impacts, creating an estimated 10.33 foot storm surge at Cedar Key, a 6-7 foot surge in the Tampa-St. Petersburg metro area, and a 4-5 foot surge in the Naples and Fort Myers Beach area. However, there is limited information available from weather stations in the area, and the Post Tropical Cyclone Report from the Tallahassee office of the National Weather Service notes that the values recorded are not likely to be the actual peak values. After landfall, Helene weakened into a Category 1 hurricane as it made its way through southeastern Georgia. It continued weakening as it moved into the Carolinas and Tennessee as a tropical storm.

The methods described here pertain to forest resources damage from wind, but more damage and mortality can be expected from flooding events and saltwater intrusion, which is particularly deadly to coastal and upland pine forests. Negative impacts from both fresh and saltwater inundation can take months or even years to be fully revealed. There is an added layer of difficulty in assessing the forest damage from this storm because Hurricane Helene is the third hurricane to impact this region in 13 months. Hurricane Idalia in August of 2023, Hurricane Debby in August 2024, and Hurricane Helene in September 2024 all made landfall along the Taylor County coast. Due to the number of storms to impact the Big Bend region in a relatively short timeframe, some challenges exist in assessing forest damage from one storm versus another.

### **Methodology**

Following landfall, maps were prepared using available wind speed data to calculate potential affected areas. These maps were further refined using available aerial imagery, aerial surveys, and ground reconnaissance. Damage estimates are based on categories listed as catastrophic, severe, moderate, and light based on wind speed estimates, modeling, and observations. Catastrophic damage is when

forests show more than 50% of a stand being altered, damaged, or destroyed. Severe damage was assigned to forests, which had between 33% and 50% damage. Moderate damage was assigned to forests, which had between 25% and 33% damage. Light damage was assigned to forests having less than 25% damage.



*Figure 1 Moderate to Severe damage of a pine stand in Lafayette County following Hurricane Helene.*



*Figure 2 Light to Moderate damage of a pine stand in Madison County following Hurricane Helene.*

A team of Florida Forest Service employees utilized the ESRI applications Survey123 and Field Maps to collect and document ground observations. A two-kilometer by two-kilometer grid layer was included in the map, and the team attempted to log an observation point in as many grid squares as possible to get a representative sample of the impact area. Each time a survey point was taken, a team member recorded the time, date, and location of the point, the primary forest type, and the forest resources damage category: catastrophic, severe, moderate, light, or none. The Florida Forest Service team was able to collect a total of 1,313 survey points in a thirteen-county area within Hurricane Helene's path.

Information collected from these survey points showed a variability in the damage pattern across the affected counties and, at times, differed from the modeled damage map. Based on these two facts, the ground-based surveys proved to be a valuable component of the methodology used to determine the extent of forest damage caused by Hurricane Helene and provided the crucial insight necessary for estimating the total value of the damaged timber. A map was generated based on ground observations and wind speed estimates to portray the geographic range of forest resource damage in Florida due to Hurricane Helene (Map 1).

However, this method of data collection depends on the availability and accessibility of roads, and there were some areas within the affected counties where the team was unable to collect any observation points. By aggregating the data from these points and comparing that information with aerial flight observations, TreesDIP modeling provided by the United States Forest Service, and Forest Inventory and Analysis data, an estimate of damaged acres by forest type could be generated for the impact area. 2022 Florida Cooperative Land Cover data was used to ascertain the acreage and cover types of forest land in each affected county, along with the FIA timber volume per acre of each forest type.

The counties included in this preliminary forest resources damage assessment report are: Alachua, Columbia, Dixie, Franklin, Gilchrist, Hamilton, Jefferson, Lafayette, Leon, Madison, Suwannee, Taylor, and Wakulla. Forest types were divided into pine, pine/hardwood, hardwood, and cypress. Prices were

based on Timber Mart South's average Florida prices for the third quarter of 2024. This report provides overall damage and loss calculations that reflect pre-storm values and does not reflect post-storm salvage rates, which may be much lower. Further, these figures represent all forest resources damaged, regardless of the potential to be marketed for products. **No urban land use classifications were used in calculating the damaged timber acreage.**

<b>Hurricane Helene Forest Resources Damaged Volume and Value for the 13 Affected Counties</b>				
<b>Forest Type</b>	<b>Forest Damage Category</b>	<b>Avg Damage to Forest Resources</b>	<b>Total Tons of Damaged Forest Resources</b>	<b>Damaged Total Forest Resources Value \$</b>
<b>Pine</b>	Catastrophic	0.50	15,583.04	\$ 200,160.00
	Severe	0.33	643,481.83	\$ 8,265,352.75
	Moderate	0.25	1,672,187.32	\$ 21,478,800.82
<i>Total</i>			<b>2,331,252.19</b>	<b>\$ 29,944,313.57</b>
<b>Mixed P/H</b>	Catastrophic	0.50	85,555.18	\$ 1,098,933.50
	Severe	0.33	1,039,089.20	\$ 13,346,824.06
	Moderate	0.25	1,025,486.01	\$ 13,172,094.71
<i>Total</i>			<b>2,150,130.39</b>	<b>\$ 27,617,852.28</b>
<b>Hardwood</b>	Catastrophic	0.50	396,149.98	\$ 5,088,441.00
	Severe	0.33	1,889,610.20	\$ 24,271,539.84
	Moderate	0.25	1,271,899.69	\$ 16,337,212.77
<i>Total</i>			<b>3,557,659.87</b>	<b>\$ 45,697,193.61</b>
<b>Cypress</b>	Catastrophic	0.50	61,060.32	\$ 784,303.51
	Severe	0.33	569,702.53	\$ 7,317,677.30
	Moderate	0.25	206,109.13	\$ 2,647,416.89
<i>Total</i>			<b>836,871.97</b>	<b>\$ 10,749,397.71</b>
<b>TOTAL</b>			<b>8,875,914.42</b>	<b>\$114,008,757.16</b>

*Table 1 An estimate of the amount and value of forest resources damage caused by Hurricane Helene.*

When reviewing this assessment, it is important to note that this region was impacted by three hurricanes between August 30, 2023, and September 26, 2024, and the most recent complete dataset of Forest Inventory and Analysis data for Florida at the time of this writing is from 2021. Since available FIA data is from before Hurricane Idalia (2023) and Hurricane Debby (2024) impacted the region, an altered methodology was used to estimate the value of forest resources damaged by Hurricane Helene. To account for forest damage that occurred in previous storms since the collection of the 2021 FIA data, the value of forest resources damage reported from Hurricane Idalia was recalculated using 2024 timber

prices and deducted from the initial estimate calculated for Hurricane Helene. It is difficult, if not impossible, to fully isolate Hurricane Helene's damage from Hurricane Idalia's and Hurricane Debby's damage, especially when basing the estimate for damaged or destroyed forest resources volume on 2021 data. Removing the updated value of timber damage reported from Hurricane Idalia is an attempt to report the most realistic value possible for forest resources damage caused by Hurricane Helene.

Though not as widespread as Hurricane Michael in 2018 or Hurricane Ian in 2022, the damage caused by Hurricane Helene has been observed to be severe within the impact area. Ground-based observers noted areas of catastrophic damage in several Florida counties, including Dixie, Hamilton, Lafayette, Madison, and Taylor. Several foresters collecting ground survey data remarked upon the general accuracy of the modeling but noticed that their observations for this storm tended to be one category lower than what was showing up on the model in the hardest-hit areas. For example, some areas marked as catastrophic on the model were labeled as severe by ground observers. However, ground-based observations also noted moderate to severe damage further east than was estimated in the model. Overall, the model provided a good starting point and generally did a good job of portraying forest resource damage in the area.

Hurricane Helene was a significant rainfall event for much of the southeast United States. In Florida, estimated rainfall accumulation totals reached over 10 inches for portions of Franklin County, Gulf County, and Liberty County (Map 2). Along the Gulf Coast, significant storm surge created broad areas of flooding from the Big Bend region down to the Paradise Coast. Trees should continue to be monitored in areas that experienced flooding due to Hurricane Helene, as mortality due to inundation and saltwater damage can take weeks, months, or even years to fully appear. Though this report focuses on Florida, it is worth noting that Hurricane Helene would go on to cause massive flooding in the southern Appalachian region.



*Figure 3 Photo showing urban tree damage caused by Hurricane Helene.*

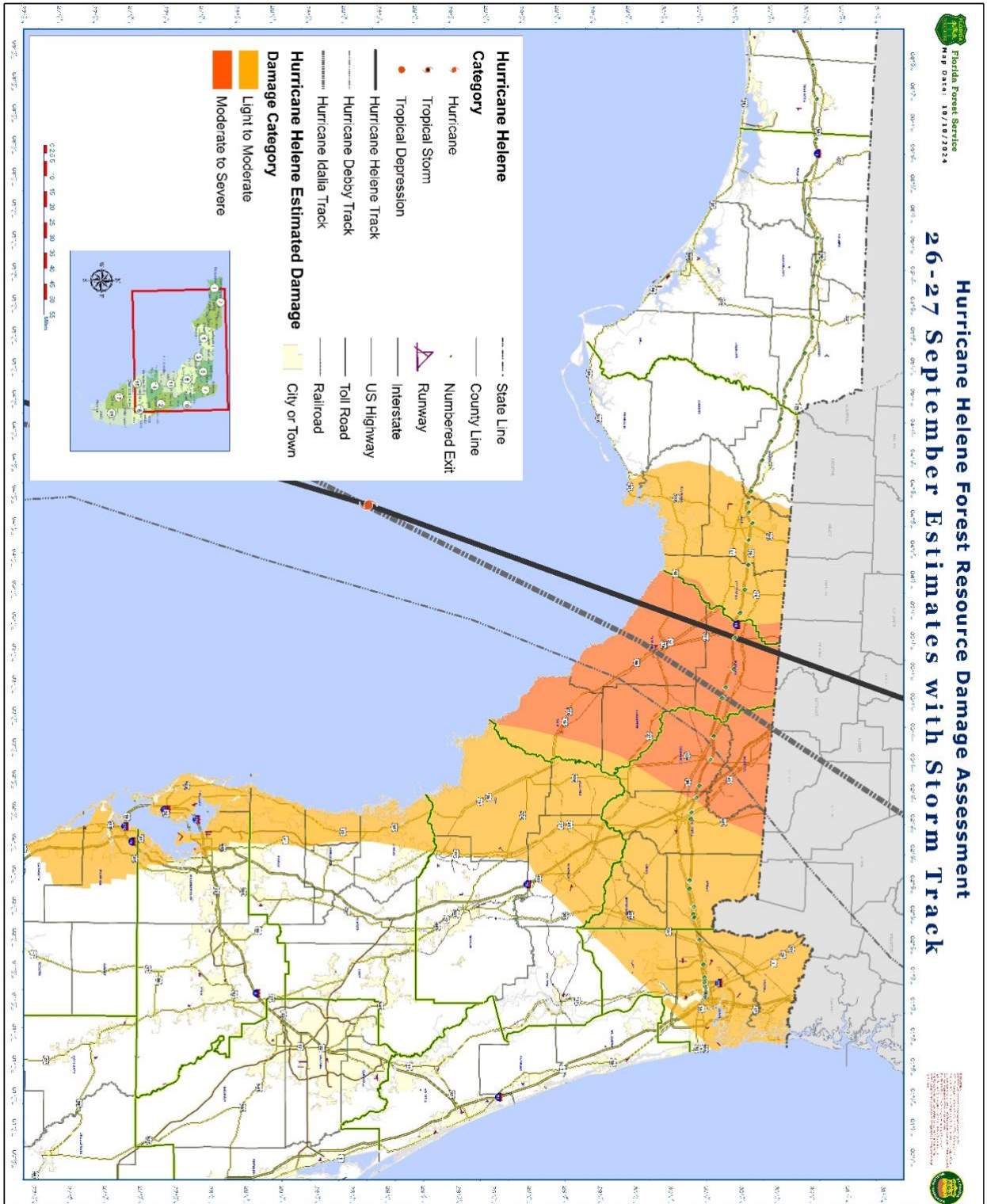
### **Urban and Community Forest Impacts**

Hurricane Helene made landfall within a predominately rural region of Florida. However, several communities and cities are located within the impact area, and the extreme wind and storm surge associated with this storm has led to the widespread destruction of their tree canopies. The Big Bend region can expect continued tree mortality due to storm damage for months and years. More populous areas, such as the Tampa Bay region and the Fort Myers-Naples region, experienced flooding due to Hurricane Helene and may expect to have some long-term tree mortality as a result of saltwater exposure or prolonged inundation.

In the absence or reduction of tree canopy, the developed areas impacted by Hurricane Helene can expect higher average temperatures, increased stormwater runoff, and lower air quality, among other issues related to sudden deforestation. To quantify what was lost and to make informed reforestation decisions, tree canopy assessments can be used to analyze the pre-storm tree canopy and compare it against what is remaining. Street tree inventories should be utilized to target specific areas most affected by Hurricane Helene. When used in combination, inventories, assessments, and targeted tree plantings are highly effective tools to help community forests recover from extreme weather events.



# Appendix



Map 1: Forest Resource damage map showing storm tracks for Hurricane Helene, Hurricane Debby, Hurricane Idalia, and estimated damage categories based on ground observations and wind speeds.

