Florida Climate

It may seem like stating the obvious, but few people are better placed to talk about the climate and its impact on a specific region than experts, like those at Hoover, who deal in irrigation. We know from experience that even the smallest shift in metrics such as temperature and rainfall can impact hugely on the condition of the wider environment. More relevantly, the climate as a whole exerts the greatest single influence on the type and level of irrigation needed to maintain the kind of conditions which people in Florida – from residents to tourists and business people – have come to expect. Bearing that in mind it becomes impossible, or at least relatively futile, to discuss the minutiae of irrigation requirements and provisions – everything from water sources to flow rates, pumping stations and smart solutions – without taking on board the bigger picture of the changing climate in Florida and how the people charged with looking after the environment, not to mention the population, are coping with those changes. In this article we'll take a look at some of the evidence outlining exactly what is happening with the climate in Florida, at the time of writing and in a broader sense, and the actions which different communities across the state have taken and are taking in an effort to become more resilient.

A survey published in June 2022 by Harvard University, working in partnership with the Robert Wood Johnson Foundation and NPR, sets out some of the facts and figures relating to climate change in Florida. Interestingly, this particular survey, rather than looking at bare numbers such as rainfall levels and record temperatures – important though such figures are – examines the experiences of individuals and the manner in which they have been impacted by extreme weather or climate change in the past five years. Although the survey takes a nationwide look at the issue it also hones in on specific states and the section relating to Florida included the following findings:

- 68% of Florida residents have been personally impacted by hurricanes or severe tropical storms in the past five years
- 57% of Florida residents have been personally impacted by hot weather or heat waves in the past five years

Across the board, 83% of Florida households have experienced extreme weather events in the past five years. The impact of such events is hard to overstate, with 22% of the households affected having suffered serious financial problems as a result, 26% having to evacuate their homes and 21% reporting major home or property damage. What these figures highlight is not just the impact of the changing climate in Florida on a personal level but also the wildly varying nature of the Florida climate itself. Not only are extreme weather events becoming more frequent but they are also, this being Florida, almost equally likely to take the form of extended periods of hot weather or drought as they are to involve hurricanes or severe storms. This highlights the unique challenge facing the likes of gated property developments, golf courses, sporting facilities and shopping malls in Florida; places where the environment doesn't simply need to survive but to thrive. In simple terms, the people living in or visiting places such as these have come to expect the kind of year-round lush green vegetation, from lawns, fairways and pitches to plant life, that simply doesn't happen if nature is left to her own devices. According to a survey published by YouGov, Florida is the US state which other Americans are the most likely to have visited, with 61% having visited Florida, compared to 55% New York and 54% California. The appeal of Florida as a

destination is multi-faceted but one aspect of that appeal is undoubtedly the backdrop of well-tended plant life that visitors know they can expect to find there. The same kind of thinking has doubtless helped to power Florida into its position as far and away the most popular state for American retirees to move to. According to a 2023 study published by financial technology experts SmartAsset, 78,000 senior residents from other states moved to Florida in 2021 (the latest year for which relevant Census figures are available) with Arizona coming a distant second with 25,090 Americans choosing to retire there. The appeal of Florida isn't limited to the rest of the United States either, with only New York attracting more international visitors than Florida on an annual basis. What all of these figures add up to is the fact that the economy of Florida is driven by the ability of the state to attract visitors and new residents. According to figures published in 2023 the GDP of Florida is a massive $1.4 trillion, which makes it the fourth largest economy in the US and means that if Florida were a sovereign nation it would, according to the International Monetary Fund, rank as the 16th largest economy in the world. All of this is hugely impressive but none of it can be taken for granted, and working to counteract the negative impacts of the changing climate and extreme weather is vitally important if Florida is to maintain its national and international status.

The figures quoted above on extreme weather events provide a snapshot of such events and the impact they can have but it's equally important to take a longer view of the changing climate and interpolate the trends which are apparent into any attempts to mitigate those changes. According to temperature data gathered over the past ten years by the National Oceanic and Atmospheric Administration's National Center for Environmental Information, Florida, like the rest of the country, is getting hotter. Unlike some other parts of the country, Florida is also getting wetter. The data in question is used to create what are referred to as 'climate normals', which are used to compare the weather now with what would normally be expected over the past 30 years. Looked at in depth, the figures reveal that Florida is now 5% wetter annually than the 30 year average, and that although the average high temperatures across the board have only rose by three tenths of a degree in the years between 1991 and 2020 the change in figures such as the average overnight low temperature have been more marked. Less cooling overnight makes it more difficult for people and the environment to recover from the heat of the day, and as temperatures rise to new normals, warmer oceans have an impact on patterns of wildlife as well as helping to fuel hurricanes.

Across the State

Perhaps one of the most useful ways of looking at the issue of the changing Florida climate, the impact it is having and how this can be combatted, is to take a look at the steps being taken in communities across the state to deal with those impacts.

Tampa Bay – According to Tampa Bay Watch, an organization 'dedicated to fostering a healthy Tampa Bay watershed', the issue which needs to be tackled most urgently is that of rising sea levels. In order to combat this threat, and also to increase resilience when dealing with events such as category five hurricanes, the community has embarked on a program of green infrastructure, designed to harness the power of nature itself to fight back against nature at its worst, in particular along the shoreline. Initiatives include volunteers shifting 15 tons of oyster shells down to the bay and using things like mangroves and reef balls to reduce the impact of the waves reaching the shore.

The Keys – in Monroe County and the Keys the issue pressing most urgently is tidal flooding in October, November and December, which is being exacerbated by rising sea levels. The floods in question can now last for as long as three weeks, with water levels hitting twelve inches and deeper. Experts in the region have made use of technology such as Light Detection and Ranging (LIDAR), which enables them to identify those areas which are lowest lying and thus at most risk from flooding, whether it is caused by sea level rise, a storm surge or rain events. Using the data gathered it was established that by 2045 half of the roads in the area – 150 miles worth – would be impacted by inundation from the sea level rising, and would therefore need to be elevated. Coming up with a plan is one thing but funding it could be more problematic, with the cost of elevating roads running through almost 100 neighborhoods estimated to be $1.6 billion. The risk of not taking such action is already being highlighted in some parts of Key Largo, however, where roads can be flooded for weeks at a time, with the water level being anything from a few inches to more than a foot and local residents being impacted in terms of their day to day life and the services they can access.

St. Petersburg – in St. Petersburg the projection for the rise in sea levels by 2050 is currently running between 1.44 feet and 1.48 feet, and the emphasis has been placed on using the aforementioned LIDAR technology, alongside survey and topographical data, to help create better and more efficient drainage and stormwater systems, focusing on exactly where the drainage barriers and ridges need to be located. In addition, St. Petersburg is also looking into the use of the kind of mechanical pumps used in New Orleans, with plans for a pump station as well as projects centered on upstream canal clearing and widening and the elevation of some sections of roadway. The authorities in St. Petersburg believe that the use of a pump to deal with rising levels of sea water will be necessary due not only to the risk of extreme flooding but also to the impact on infrastructure such as underground pipes, and the issue of sea water infiltrating freshwater in aquifers.

USF College of Marine Science - The USF College of Marine Science is the location for the Flood Hub for Applied Research and Innovation which was launched in 2021 with a stated aim to 'improve flood forecasting and inform science-based policy, planning, and management.' The work of the Flood Hub is based on an analysis of factors such as the relatively old or ageing stormwater system across the state, the impact of the growing population in the state and with it an increase in the water entering that stormwater system and rising sea levels, as well as the effects of tropical storm events and the changes in precipitation patterns. In layman's terms, this last refers to the increase in extreme rainfall events. When Hurricane Ian hit Florida in September 2022, for example, figures from the National Oceanic and Atmospheric Administration (NOAA) classified a 1-in-1000 rainfall event in some parts of the state – Placida was hit by 15 inches of rain over 12 hours and Lake Wales in central Florida reported almost 17 inches of rain in 24 hours. The Flood Hub will analyze data such as this on a granular level and combine it with information on infrastructure to come up with solutions for lower lying areas of Florida such as St. Petersburg – such as drainage which can accommodate a greater flow of water moving through or higher sea walls – and also to build models which make it easier to predict extreme rainfall events.

Clearwater – in the city of Clearwater the local tide gauge shows that the sea level has risen by just over 7 inches in the last 50 years. Data such as this informs the approach being taken to protecting the environment, and much of this is centered upon the natural protection

offered by mangroves. Coopers Bayou Park was purchased by the city to prevent any development of the land taking place, and the mangroves which grow there with their roots embedded deep in the mud play a huge role in protecting the city from storm surges or waves driven by hurricanes. In addition, the Resilient Florida program has enabled the city to launch a vulnerability assessment, looking at issues such as water, wastewater and the accompanying infrastructure, sea level rises, storm surges and extreme heat. In order to do so the vulnerability assessment will include the creation of a 'digital twin' of the city, enabling them to gauge the impact of specific weather events or climate changes and investigate how possible solutions – such as creating a living shoreline along a certain stretch – might help to lessen those impacts.

At the time of writing – April 2023 - Florida is in the grip of the worst drought since April 2020. Orlando, for example, would normally have experienced 8 inches of rainfall since January 1st but, as of the start of April, had only had 2 inches, while Melbourne, Sanford, Daytona Beach and Leesburg have all had 4 to 7 inches less rain than they should have. The severe drought in central Florida is a timely reminder of just how damaging the changing climate and extreme weather events can be, from floods to droughts, and how important it is for the infrastructure across the state, from drainage to flood protection and irrigation, to be developed with the new normal of the Florida climate placed front and center.