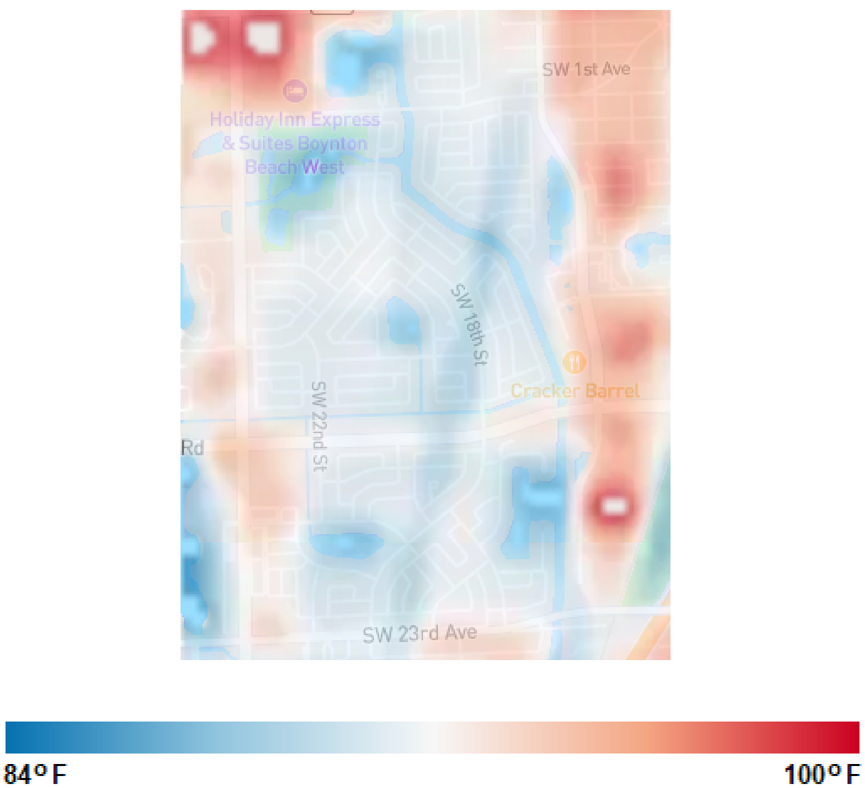
Leisureville (Boynton Beach, FL) Heat Assessment

AdaptGeo Consultants (November 21, 2025)

Summary

AdaptGeo found that remotely estimated values of Leisureville surface temperatures showed that the area maintains a slightly cooler surface temperature than surrounding neighborhoods that don't have Leisureville's widely-adopted white roofs. Given the observations of high heat in Leisureville, it is likely that radiant heat is most responsible. Solar radiation reflecting off of light-colored surfaces directly increases the radiant heat effects on residents despite the modest reduction in surface temperatures. This demonstrates the need for a multi-pronged strategy to heat reduction in Leisureville that combines the highly-reflective white roofs and surfaces with neighborhood tree canopy. Strategic siting of trees and shrubs can contribute to substantial reductions of radiant heat. AdaptGeo has the experience and skills required to plan for the precise placement of urban forestry for heat reduction in neighborhoods like Leisureville. This type of heat island mitigation can simultaneously incorporate stormwater runoff benefits when plantings are strategically placed (such as in swales).



*White pixels are missing data due to remote sensing errors in the source data.
Land Surface Temperature estimate based on Landsat data collected June 25, 2025.
Parastatidis, David, Charalampos Cartalis, Nikos Chrysoulakis, and Euripides Petrakis. 2017. "Online global land surface temperature estimation from Landsat." *Remote Sensing* 9 (12): 1208. https://doi.org/10.3390/rs9121208, https://rslab.gr/

Results

The map above shows land surface temperature (LST) estimates for Leisureville and nearby neighborhoods. AdaptGeo's analysis found that Leisureville's surface temperatures are low in comparison to neighboring areas and it's likely that this observation can be attributed to Leisureville's concentration of white roofs and walls.

LST estimates do not measure radiant heating, and McDonald et al. (2025) concludes that LST alone is not appropriate for quantifying heat risk to human health. Rather, it is important to focus on human comfort indices such as the Universal Thermal Climate Index (UTCI), wet bulb globe temperature (WBGT), mean radiant temperature (MRT), physiological equivalent temperature (PET), or others. There is abundant research showing that areas with high albedo reflectivity increase heat risk to human health through these various measures (Lopez-Cabeza, et al. 2022; Yang, et al. 2022; Mohammad et al. 2021; Erell et al. 2014). In fact, studies going back nearly 20 years demonstrated that white materials (e.g. clay tile) reflect substantially more UV radiation than other common building materials.

Leisureville's “reflectivity first” strategy can create cooler surface temperatures that reduce home cooling costs, reduce the heat of surfaces, lower night-time ambient temperatures, and reduce the risk of in-home heat stress during power outages or cooling equipment failure. However, persistent resident experiences of high heat demonstrate the need for a heat mitigation strategy that includes radiant heat reduction interventions, such as targeted tree canopy and other urban forestry actions.

Tree Canopy and Radiant Heating

Increasing tree canopy is not mutually exclusive with white roofs; in fact they may complement one another. Smithers et al. (2018) describes three mechanisms by which trees cool their surroundings: evapotranspiration, reflection of solar radiation (i.e. albedo), and shading. While white roofs have higher albedo than trees, the cooling benefits of tree canopy are particularly significant from shading and evapotranspiration. Roof-shading by trees also reduces surface temperature versus non-shaded roofs. Tree shading of other impervious surfaces such as streets, however, can dramatically reduce urban heat islands. Of particular significance to Leisureville, tree canopy can shade residents from the reflection of solar radiation off the white roofs and walls. This shading can occur either before the radiation reaches the surfaces or after the radiation bounces off of them. Additionally, through evapotranspiration, trees cool their surroundings by storing and eliminating heat as water vapor into the atmosphere. A diversified local cooling strategy rather than exclusive reliance on white roofs may also offer homeowners the option of installing rooftop solar panels without major increases in surface temperatures or home cooling loads.

Research suggests that increased tree canopy results in improved overall human comfort. A study in hot, humid, urban Malaysia demonstrated that the introduction of street trees under different scenarios lowered UTCI by up to 12°F (Castelo et al., 2024). Similarly, in a study conducted during a summer heat wave in the Czech Republic, Janku et al. (2024) found that trees reduced UTCI under their canopy by an average of about 6.3 °F. These considerations are in addition to the general well-being enhancement and air pollution reduction benefits of trees (Nature, 2016).

As for where, how many, and what sizes of tree should be planted, the research suggests that more is better. Smithers et al. (2018) found a positive correlation between leaf area (based on crown diameter and leaf area index) and all three tree-based cooling mechanisms. Highest priority tree/shrub planting would likely be in locations between the white reflective surfaces and where residents spend much of their time (e.g. patios, sidewalks). In addition to improving residents' thermal comfort and safety, planting trees where a property meets the street (i.e. "Veg the Edge") offers the additional benefit of slowing and reducing stormwater runoff. Although decisions regarding which species of trees and shrubs to plant must be made on a case-by-case basis, the research suggests that native (vs. non-native) plants generally: offer the most ecosystem services, best support native wildlife, and often have higher survival rates (Tartaglia et al., 2024).

To confirm the effectiveness of tree canopy on reducing radiant heating effects, field measurements of comfort indices can be taken in Leisureville over time. Future analysis by AdaptGeo could confirm that increased tree canopy correlates positively with significant improvements in field-measured comfort.

Further questions to explore:

- Identify potential swale locations (esp. near parcel edges) that can optimize both heat island and stormwater benefits from tree planting.
- Correlate tree canopy gaps with socioeconomic vulnerability analysis.
- Test whether increased tree canopy in a particular portion of Leisureville would entail further lowering of surface temperatures (in addition to lowering radiant heating).
- Estimate effects of tree planting on pollutant runoff (TMDLs).
- Model effects of tree planting on predicted days over 100F for a given neighborhood.
- Using historical flood data, map precise GSI interventions that would reduce the risk of repeat flooding events in the future.

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