

Northeast Florida Regional Council
Military Installation Readiness Review



Threats and Hazard Analysis

MARCH 2026



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Acronyms and Abbreviations

DoD	Department of Defense
EF	Enhanced Fujita
FAA	Federal Aviation Administration
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FFS	Florida Forest Service
JAXPORT	Jacksonville Port Authority
JTC	Joint Training Center
MCSF	Marine Corps Support Facility
MEOW	maximum envelope of water
MIRR	Military Installation Readiness Review
NAS	Naval Air Station
NEFL	Northeast Florida
NHC	National Hurricane Center
NOAA	National Oceanographic and Atmospheric Administration
NS	Naval Station
NWS	National Weather Service
OLF	Outlying Landing Field
SJRWMD	St. Johns River Water Management District
SLR	sea level rise
T&E	threatened and endangered
TM	technical memorandum
UAV	unmanned aerial vehicle
WUI	Wildland Urban Interface



Executive Summary

This Technical Memorandum (TM) documents the identification and characterization of natural and human-made hazards, shocks, and stressors that may affect the operational readiness and mission execution of military installations in Northeast Florida. Prepared as part of the Northeast Florida Military Installation Readiness Review (NEFL MIRR), this TM aligns with the Unified Resilience Assessment Standard Methodology and builds upon prior project efforts, including the TM 3: Priority Asset Analysis (Jacobs 2025, Jacobs 2026a). The purpose of this TM is to define the hazards and stressors relevant to the region and individual installations and to establish the foundation for subsequent vulnerability and risk analysis.

The assessment evaluates four participating installations—Camp Blanding Joint Training Center, Marine Corps Support Facility Blount Island, Naval Air Station Jacksonville, and Naval Station Mayport—through a combination of data analysis, stakeholder engagement, site visits, and review of existing regional and installation-specific studies. Hazards are categorized as short-duration shocks (such as hurricanes, storm surge, and extreme rainfall) and long-term stressors (such as sea level rise [SLR], erosion, extreme heat, infrastructure aging, and social pressures). Profiles were developed to distinguish hazards that apply at a regional scale from those that present localized risks to individual installations.

Natural shocks and stressors evaluated in this TM include extreme rainfall, SLR, storm surge, erosion, extreme heat, extreme wind, and wildfire. The analysis highlights increasing climate-driven risks across Northeast Florida, including more frequent and intense rainfall events that strain stormwater systems, accelerating SLR affecting coastal and riverine assets, and extreme heat that impacts personnel health, training, and critical infrastructure. Coastal installations, particularly Naval Station Mayport and Blount Island face heightened exposure to storm surge and erosion, while inland areas such as Camp Blanding are more susceptible to wildfire and extreme heat. These hazards have the potential to disrupt access routes, utilities, communications, potable water systems, and other mission-supporting assets.

Beyond natural hazards, this TM identifies key infrastructure, encroachment, social, and human-caused stressors that influence readiness. Infrastructure challenges include aging systems, increasing demand pressures associated with regional growth, and limited redundancy in mission-critical utilities such as power, wastewater, water supply, access roadways, and communications. Encroachment issues—such as incompatible land development, light pollution affecting training operations, threatened and endangered species constraints, and increasingly congested regional airspace—pose long-term constraints on installation operations. Social stressors, including lack of attainable housing, limited childcare availability, and potential school closures, affect workforce stability and personnel well-being. Regulatory requirements, such as compliance with wastewater discharge mandates and the impacts of recent state housing legislation, represent additional operational considerations.

Collectively, this TM establishes a comprehensive inventory of the hazards and stressors facing military installations in Northeast Florida. The findings inform TM 5, the Vulnerability Assessment and Risk Analysis, which will evaluate how these identified hazards and stressors interact with mission-critical assets and where failures could impede mission execution. By clearly defining applicable shocks and stressors, this TM provides a critical step toward



advancing resilience planning, prioritizing mitigation strategies, and supporting long-term installation readiness in a changing environmental and regulatory landscape.



1 Introduction

This Technical Memorandum (TM) focuses on the natural and human-made shocks and stressors that may pose a risk to the missions of the installations. To assess the effects of these threats on the installations, the Northeast Florida Military Installation Readiness Review (NEFL MIRR) Project Team developed a methodology for evaluating vulnerability and risk to installation missions, as described in the Unified Resilience Assessment Standard Methodology (Jacobs 2025). This TM explains the alignment of hazards with the Northeast Florida Regional Council's methodology, selection criteria, and the recommendations for threats and hazards to include in the analysis.

1.1 Hazard Selection

Hazards, or disruptive events, can be split into two categories: shocks and stressors. This TM is informed by data collection, feedback from stakeholder workshops, and review of previous vulnerability assessments conducted in the region. Where TM #3 Priority Asset Analysis reviewed the assets that support the installations and their missions, this TM reviews the shocks and stressors that can affect those assets. It further lays the groundwork for TM 5 Vulnerability Assessment and Risk Analysis by identifying the shocks and stressors that are relevant to the region (Jacobs 2026a, Jacobs 2026b). The subsequent TM 5 Vulnerability Assessment will identify where asset failures caused by shocks and stressors described herein can impact the ability of the installations to execute their missions.

During the NEFL MIRR Kickoff meeting, installation commanders from the four participating bases briefed the group on the diverse shocks and stressors affecting their installations. They highlighted natural hazards—including flooding and high-wind events—as well as infrastructure vulnerabilities such as limited redundancy in critical systems. Commanders also underscored social and human stressors such as inadequate childcare availability for service members, along with regulatory pressures, such as emerging wastewater treatment requirements, that place additional burdens on mission execution. These concerns were consistently reinforced during site visits and in subsequent stakeholder workshops.

Shock and stressor profiles were compiled for each installation in the NEFL MIRR study area, describing how their locations and operations can be impacted by which shocks and stressors. Shocks and stressors for each installation are evaluated at either the regional (study area) or local (installation) scale—this depends on the installation's location and the applicability of the shock or stress to said location. Table 1-1 summarizes the shocks and stressors relevant to each of the four installations examined in the NEFL MIRR: Camp Blanding Joint Training Center (JTC), Marine Corps Support Facility (MCSF) Blount Island, Naval Air Station (NAS) Jacksonville, and Naval Station (NS) Mayport.

Sections 2 and 3 describe the individual shocks and stressors recommended for inclusion in the vulnerability assessment in more detail.



Table 1-1. Installations and Relevant Hazards

	Camp Blanding	Blount Island Command	NAS Jacksonville	NS Mayport
Natural Hazard				
Extreme Rainfall	X	X	X	X
Sea Level Rise	X	X	X	X
Storm Surge		X	X	X
Erosion		X	X	X
Extreme Heat	X	X	X	X
Extreme Wind	X	X	X	X
Wildfire	X			X
Infrastructure Shocks and Stresses				
Increasing Demands on Infrastructure				
Lack of Redundancy	X	X	X	
Transportation Congestion		X	X	X
Encroachment Hazards				
Land Development	X		X	
Light Pollution			X	
T&E Species	X			
Airspace Congestion			X	
Social and Human Stresses				
Lack of Attainable Housing	X	X	X	X
Lack of Childcare	X	X	X	X
Lack of Funding for School Buses				
School Closures				X
Physical Malevolent Threats (Drones/UAVs)	X	X	X	X

T&E = threatened and endangered

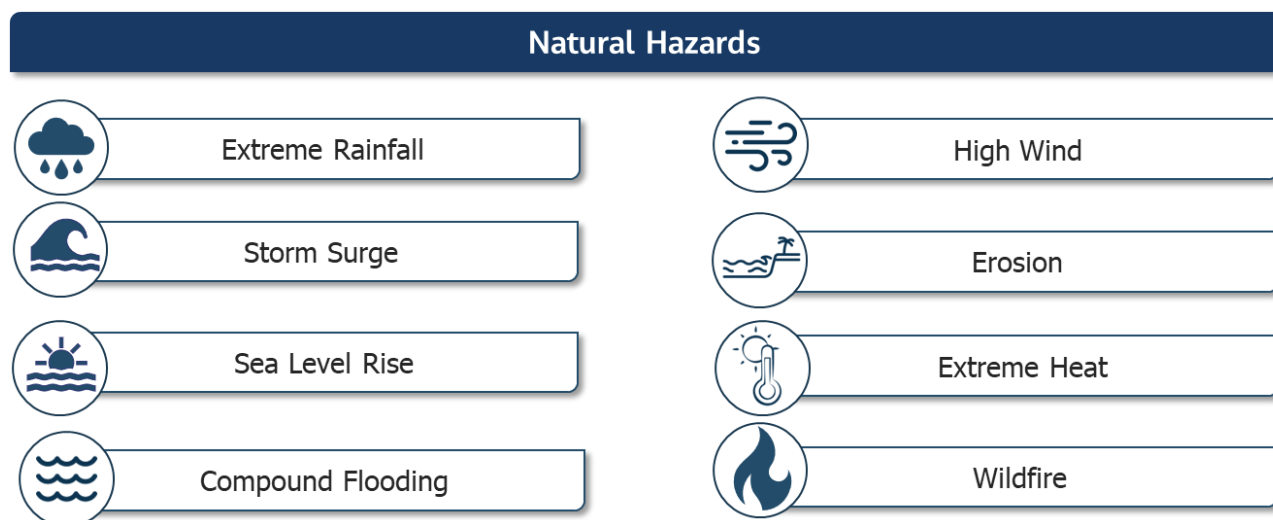
UAV = unmanned aerial vehicle

2 Natural Shocks and Stressors

Regional shocks frequently manifest as natural hazards, storms, and events that were not anticipated to the degree at which they occurred. Although natural hazards are usually short in duration, they have long-lasting effects on communities and should be incorporated into a resilience plan.

Stressors are often less noticeable than shocks because they only increase in severity by a little at a time or only over a long period of time. This allows for more time to plan and safeguard against the effects of stresses, but it can be difficult to predict when the stresses will become critical and at what rate they will increase in severity. Chronic stresses also harm regions even if they are not critical. SLR and erosion, for example, both impact regions daily, even if the entirety of the region is not affected or the effects are not sudden.

Figure 2-1. Regional Natural Shocks and Stresses

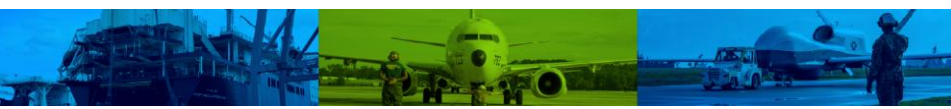


2.1 Extreme Rainfall

Extreme rainfall is an emergent threat to communities in Duval and Clay counties (Winsberg n.d.). When rainfall volumes exceed the capacity of current stormwater infrastructure systems, flooding often occurs. Both the capital and human costs of flooding caused by extreme rainfall are significant (EPA 2025). There is an urgent and extensive need for stormwater infrastructure expansions and upgrades to accommodate increasingly frequent extreme rainfall events and associated flood risks.

2.1.1 Historic and Current Conditions

Historically, Jacksonville, Florida, has seen annual rainfall measurements between 32 and 82 inches, with higher annual values during the last 20 years (Winsberg n.d.). One of the most recent extreme rainfall events occurred in August 2020, when 2.5 inches of rainfall fell in Jacksonville over the course of 2 hours (NWS n.d.a.). As a result, flash flooding occurred in downtown Jacksonville causing major property damage. Additionally, the summer of 2024 was



recorded as the rainiest summer on record, with nearly 37 inches of rainfall for 3 months (McCormick, 2024)

2.1.2 Future Projections

This pattern of frequent and extreme rainfall events is expected to increase in both frequency and extremity in the future as global climate changes influence atmospheric conditions. Threats posed by extreme rainfall and associated flooding may be mitigated with adequate preparation and infrastructure upgrades.

2.1.3 Relevant Assets and Impacts

Mission-critical infrastructure such as roads, structures, and communication systems are vulnerable to threats from extreme rainfall events. Northeast Florida's military installations include NAS Jacksonville, NS Mayport, Camp Blanding JTC, and MCSF Blount Island. Each installation is at risk of flooding or experiencing reductions in access and communication capacity. Access and evacuation routes at the installations are susceptible to stormwater drainage issues in extreme rainfall events, which may cause water to overtop the road surface and disrupt traffic.

2.2 Sea Level Rise

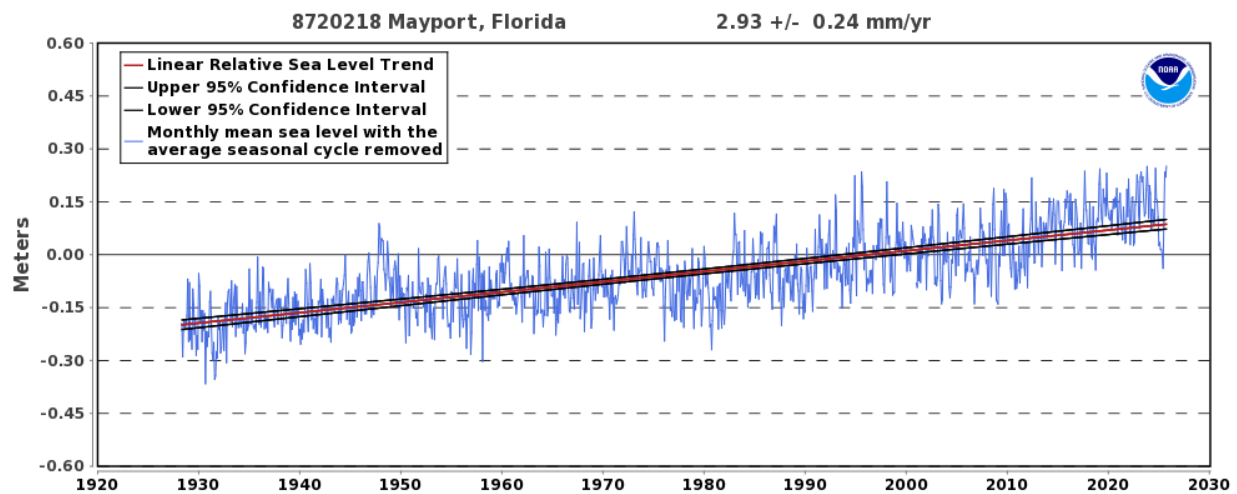
SLR is occurring because of the melting of land ice and the thermal expansion of water. SLR is a significant stressor for Duval and Clay counties. SLR exacerbates issues such as flooding and salinification of potable water sources (Lindsey 2023).

2.2.1 Historic and Current Conditions

Recent data show that the sea levels along the coast of Northeast Florida has been rising. Measurements from the Mayport tide gauge (870218) indicate that since 1930, the mean sea level has increased by approximately 0.11 inches (2.9 millimeters) per year, for an approximate increase of 11 inches between 1930 and 2025 (Figure 2-2). The monthly mean sea level has been increasing and is projected to continue increasing at an accelerating rate through 2050 (NOAA n.d.).



Figure 2-2. Historical Sea Level Rise at the Mayport Tide Gauge

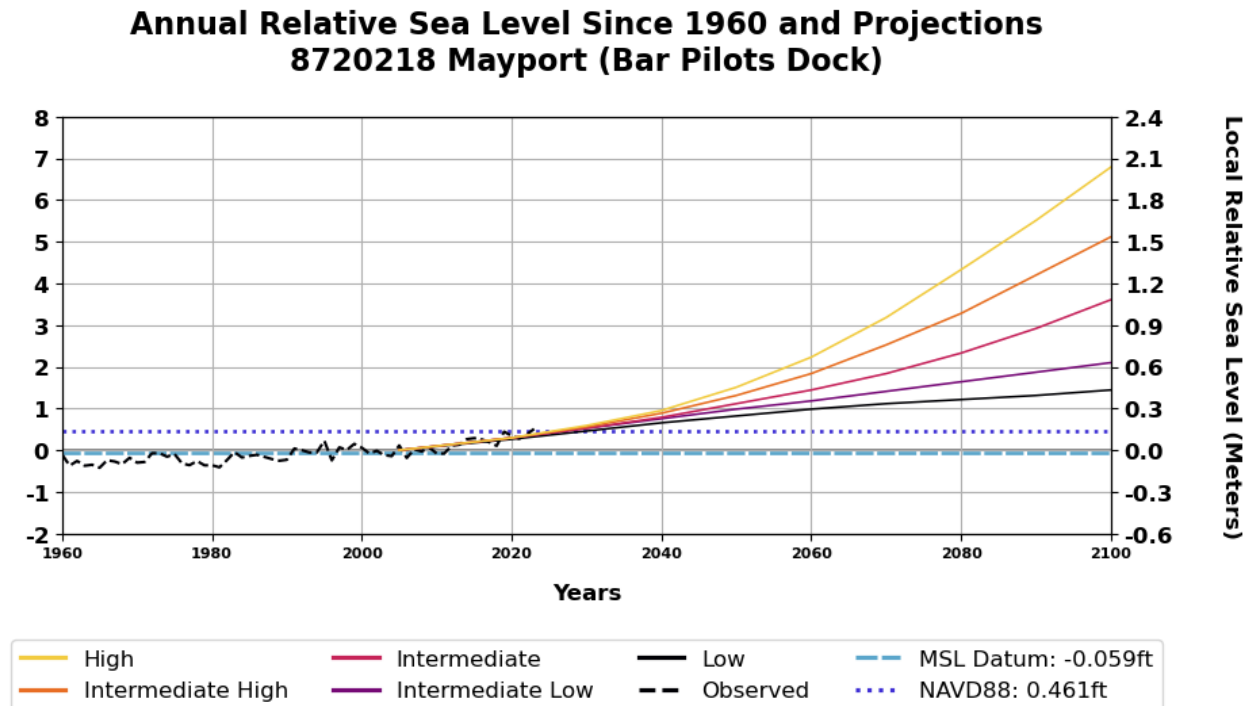


Source: NOAA n.d.

2.2.2 Future Projections

The extent of SLR depends on the scenario that future SLR follows. NOAA has developed five SLR scenarios: low, intermediate low, intermediate, intermediate high, and high (Figure 2-3).

Figure 2-3. SLR Scenarios at the Mayport Tide Gauge



Source: NOAA n.d.



The Resilient Florida Program uses the 2022 Intermediate Low and Intermediate SLR scenarios from NOAA. In addition, the Florida Flood Hub has noted that, according to its modeling, SLR statewide is approximately aligned with the NOAA Intermediate Scenario (Florida Flood Hub for Applied Research and Innovation, 2023). As a result, the Project Team opted to evaluate the intermediate low and intermediate scenarios in the vulnerability assessment (Table 2-1).

Table 2-1. SLR Scenarios and Associated Depths at the Mayport Tide Gauge

Year	Intermediate Low	Intermediate
2050	1.05 feet	1.18 feet
2080	1.71 feet	2.40 feet

Source: Sweet et al. 2022, NOAA n.d.

Note: all depths given relative to current mean higher high water.

The frequency of tidal flooding events is expected to increase as sea levels continue to rise.

2.2.3 Relevant Impacts

2.2.3.1 Temporary and Permanent Inundation of Assets

As sea levels rise in the region, certain assets may experience temporary (for example, tidal) and eventually permanent inundation. This is particularly relevant for coastal facilities and infrastructure, such as groundwater wells, stormwater management systems, and roadways. One such example is at the A1A roadway, adjacent to NS Mayport. The roadway's western and southern stretches are expected to experience SLR-related impacts by 2035 (RS&H 2021). Stormwater management systems will experience drainage issues because of higher sea levels, which will prevent draining and reduce their effectiveness requiring additional infrastructure (for example, pumps) to function properly.

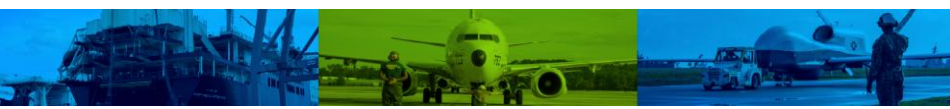
2.2.3.2 Saltwater Intrusion

All military installations in Duval, Clay, and St. John's counties rely on the Floridan aquifer for drinking water. Therefore, the safety and reliability of the aquifer is considered crucial to the mission at each installation. The St. Johns River Water Management District (SJRWMD) has noted localized saltwater intrusion in the Jacksonville area west of NS Mayport, showing increases in chloride concentrations ranging from 100 to 250 milligrams per liter over time. SJRWMD has noted in its 2023 Water Supply Plan its intention to develop a water quality model that will assess saltwater intrusion because of SLR and other future conditions (SJRWMD and SRWMD 2023). Because of the coastal location of NS Mayport, saltwater intrusion impacts on its wells may need to be evaluated, with potential mitigation options explored.

2.2.3.3 Amplification of Other Hazards

SLR will amplify other hazards, including:

- **Storm surge (and other coastal flood events).** Higher sea levels will result in greater wave heights during coastal flood events, increasing the depths and extents of coastal flood events.
- **Erosion.** Greater depths associated with regular wave action will enhance coastal erosion, further endangering shorelines and other coastal assets (Oppenheimer et al. 2019).



2.3 Storm Surge

Storm surge results from storm systems that cause flooding from high winds and low air pressure (UCAR Center for Science Education 2026). The most well-known and destructive cause of storm surge is hurricanes, though surge events can also be caused by other storm events such as nor'easters. The extent and depth of storm surge depend on a variety of factors, including storm intensity, storm size, the angle of the approach, the storm's forward speed, and shoreline characteristics (NOAA n.d.). Storm surge does not include the tide at the time of the event; the combination of storm surge and the tide is known as the storm tide.

2.3.1 Historic and Current Conditions

The Northeast Florida region has avoided direct hits from hurricanes since Hurricane Dora in 1964. However, several storms have passed near Duval and Clay counties, causing notable surge events (Table 2-2). Storm surge events primarily affect Duval County because of its coastal location; however, Clay County has experienced inland flooding as well during some storms.

Table 2-2. Historic NE FL Storm Surge Events

Storm Event	Year	Location	Storm Surge (feet)	Notes
Hurricane Dora ^a	1964	Region	2.3 ^b	Surge depth taken from highest recorded depth at Mayport tide gauge for September 1964. Some areas in the region have been said to have surge greater than 10 feet. ^c
Hurricane Matthew	2016	Mayport	4.69 ^d	
Hurricane Irma	2017	Mayport	6.44 ^a	
Hurricane Irma	2017	Buckman Bridge	5.71 ^a	
Hurricane Milton	2024	Mayport	3.45 ^e	
Hurricane Milton	2024	Buckman Bridge	2.48 ^e	

^a Cangialosi et al. 2021

^b NOAA n.d.

^c Campbell 2014

^d Stewart 2017

^e Beven et al. 2025

Most notably, Hurricane Irma passed by Jacksonville in 2017 and caused record storm surge and flooding as the region's St. Johns River flooded. Record flooding was recorded at St. Johns River at the Buckman Bridge. Broward River, Clapboard Creek, Dunn Creek, Cedar River, Julington Creek, Nassau River, Ortega River, Pottsburg Creek, and Trout River experienced major or record flooding during Hurricane Irma (NWS n.d.b.).

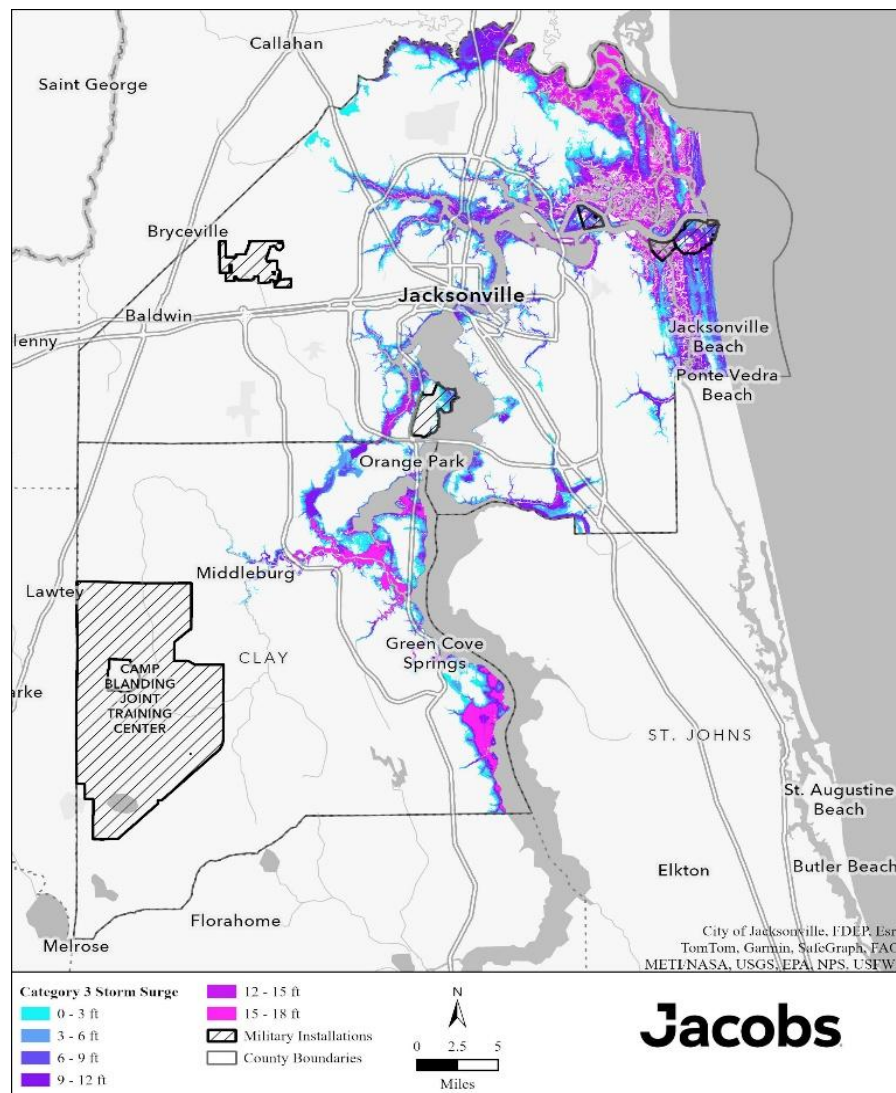
The NEFL region has estimated return periods of 13 and 40 years for hurricanes and major hurricanes passing within 50 nautical miles of the coastline (NHC n.d.).



2.3.2 Future Projections

The frequency of surge events is tied to the frequency of major storm events, such as hurricanes. The frequency of hurricanes is expected to stay approximately the same or slightly decrease moving into the future. However, it has been documented and is expected that the hurricanes will continue to intensify at a greater rate, resulting in a greater amount of stronger hurricanes compared to previous hurricane seasons (Knuston 2024). Therefore, the number of storm events may not change significantly but the magnitude of surge events may increase. It is important to note that hurricane storm surge heights are not tied to the category of hurricane. The Saffir-Simpson scale, which is used to classify hurricanes, is based only on hurricane wind speeds. Hence, a category 2 storm may have greater surge height than a category 3 hurricane. The National Hurricane Center develops storm surge risk maps using SLOSH models, which develops storm surge composites (maximum envelopes of water [MEOWs]) and maximum of MEOWs which incorporate a variety of factors. These maps are used to project storm surge from hurricane events (Figure 2-4).

Figure 2-4. Category 3 Storm Surge Map



2.3.3 Relevant Impacts

Storm surge can create significant impacts throughout the region. Along the coastlines of the Atlantic Ocean, surge can directly damage coastal assets, washing out roadways and flooding or even demolishing buildings. Surge can also move up the St. Johns River, having similar effects and causing flooding along tributaries to the River. Flooding may persist for days after an event, posing challenges for emergency response teams responsible for search and rescue efforts.

2.4 Erosion

2.4.1 Historic and Current Conditions

Erosion in Northeast Florida, particularly in Duval and Clay counties, is shaped by a combination of coastal dynamics, riverine processes, and human modification. In Duval County, coastal erosion is most pronounced along the Atlantic shoreline from Mayport south through Jacksonville Beach. The Florida Department of Environmental Protection has identified multiple segments of Duval County's beaches as critically eroded, where storm activity, long-term wave action, and inlet dynamics have caused shoreline retreat that threatens infrastructure, recreation, and habitat (FDEP 2025a). Hurricanes, nor'easters, and periods of heavy rainfall intensify these impacts by accelerating dune erosion and sand loss, particularly near the mouth of the St. Johns River (Winsberg n.d.). In response, the U.S. Army Corps of Engineers and the City of Jacksonville routinely implement large-scale beach nourishment and dune stabilization projects to reduce erosion hazards and improve shoreline resilience (USACE n.d.; Stormwater Solutions 2024).

In contrast, erosion issues in Clay County are primarily riverine rather than coastal, affecting shorelines along the St. Johns River, Black Creek, and associated lakes and tributaries. Fluctuating river stages, heavy rainfall events, boat wakes, vegetation removal, and shoreline development contribute to gradual but persistent bank erosion throughout the county (SJRWMD n.d., Winsberg n.d.). These processes increase sediment loads, reduce water quality, and can destabilize residential shorelines and public infrastructure. Management efforts led by SJRWMD and local governments focus on shoreline stabilization, riparian vegetation restoration, and basin-wide water resource planning within the Lower St. Johns River system (FDEP 2025b).

2.5 Extreme Heat

There are a variety of ways to define extreme heat – overall, the definitions generally consist of a combination of high heat and humidity where temperatures exceed a given threshold for a certain number of days. The U.S. Department of Defense (DoD) uses the Global Wet Bulb Temperature, which accounts for temperature, humidity, sun exposure, and wind speeds, when assessing heat impacts to personnel. Extreme heat can occur at any time but typically occurs in the summer between June and September.

2.5.1 Historic and Current Conditions

Changes in the climate in recent decades have contributed to higher average daily temperatures, which often correspond with more extreme heat events. In Jacksonville, 3 of the past 5 years were among the five hottest on record, and 8 of the past 10 years ranked in the top 50



(NWS n.d.). This pattern of extreme heat has resulted in numerous deaths, including 13 in Duval County, which is the sixth highest spot for statewide heat-related deaths. Clay County reported at least one heat-related death annually from 2010 to 2020 (Gorucu et al. 2021). Figure 2-5 shows extreme heat index mapped in Duval and Clay counties.

2.5.1.1 Future Projections

Both the intensity and frequency of hotter days in the region is expected to increase. Average daily temperatures are expected to increase regionally (Table 2-3).

Table 2-3. Projected Average Temperatures in Jacksonville

Decade	Duval County	Clay County
1961–1990 Observed Average	78.6	79.8
2050s	83	84.5
2080s	86	87.1

Source: U.S. Climate Resilience Toolkit n.d.

The number of days greater than 100°F is expected to increase significantly during the coming decades (Figure 2-6) in both Clay and Duval counties, with Clay County experiencing slightly more.

Figure 2-5. Map of Extreme Heat in Duval and Clay Counties

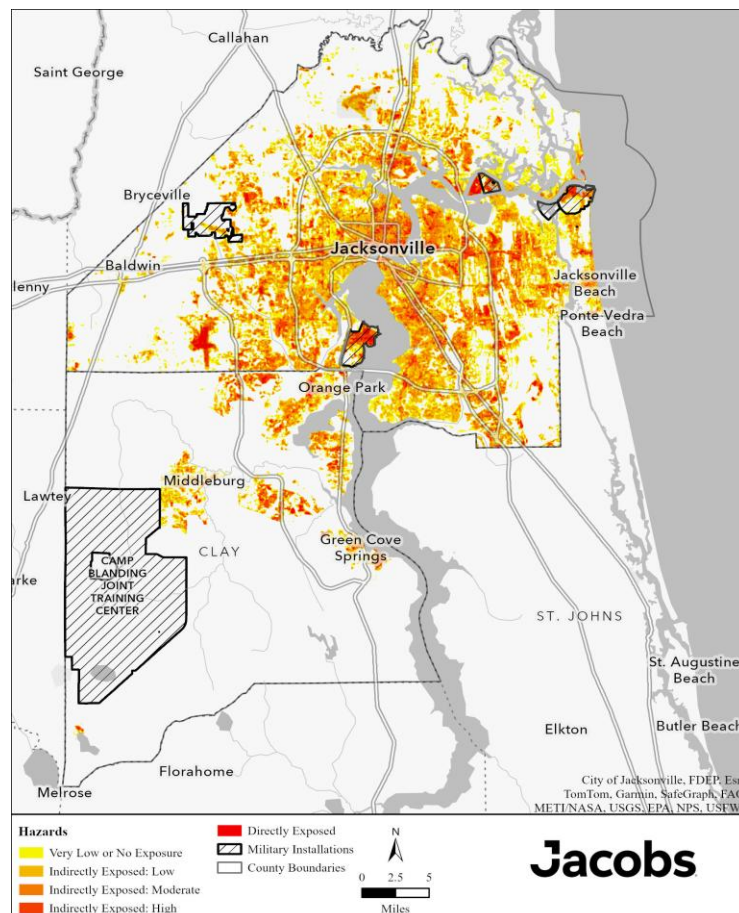
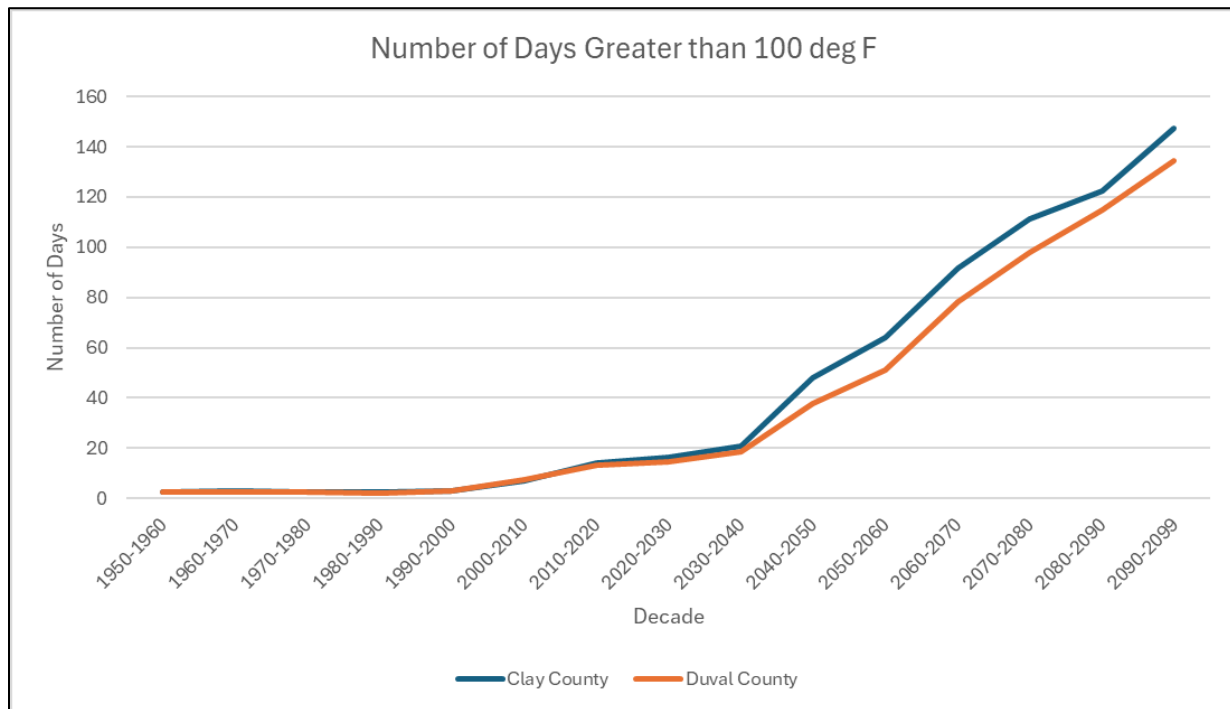


Figure 2-6. Number of Days Exceeding 100°F



Source: U.S. Climate Resilience Toolkit n.d.

2.5.2 Relevant Assets and Impacts

Extreme heat can have significant impacts on people and infrastructure systems.

Heat can have significant impacts on electrical systems and transportation networks.

- **Electrical systems** experience a variety of impacts under hotter temperatures:
 - Under hotter conditions, regional power users will use more electricity for cooling, resulting in greater demands on electric grids. One study projected an increase between 8% to 15% in summer air conditioning demand across the United States (Obringer et al. 2022). Overall summertime electrical loads may rise between 4% to 15% on average (Bartos et al. 2016).
 - Transmission capacity is projected to decrease by approximately 2% to 6% between 2040 and 2060 (Bartos et al. 2016).
 - Transmission lines may sag during hotter events. This can impact their transmission capacity and increase their exposure to fire or other ground-level hazards.
 - The service life of an electrical transformer decreases by 4 years for every 1 degree of average temperature increase (Gao et al. 2017).
- **Potable water systems** experience an increase in demand as the agriculture sector, private residents, and fire-fighting efforts require more water to compensate for the excessive heat.
- **Airports** and their operations can be impacted significantly by extreme heat events. Aircraft operations can be impacted under higher temperatures, requiring more distance to become



airborne. Runway lengths may be insufficient at higher temperatures. Heat events can also damage runways, requiring additional maintenance.

- **Roadways** expand during high heat events, causing buckling. The buckling of a roadway typically results in road closures, potentially impacting installation access.
- **Railroads** have steel rails that expand during high heat events, which can cause the railroad to buckle. During high heat events, trains slow down to help prevent buckling (AAR n.d.). This can potentially impact on deployments and material shipments at MCSF Blount Island.

Heat events can have a negative impact on people, causing illnesses and even death. Military installations use the Centers for Disease Control and Prevention reports that extreme heat events may result in increased hospital admissions for heat-related illness, as well as cardiovascular and respiratory disorder complications and death. Northeast Florida installations have been predicted to have more than 30 days per year where the heat index exceeds 100°F, including NS Mayport (Dahl et al. 2020).

Military installations may experience disruptions in mission-critical communication services or reduced security because of failing redundancies in utilities. Installation personnel may also experience physical symptoms of heat stroke or exhaustion, possibly resulting in death.



2.6 Extreme Wind

Extreme winds in Northeast Florida can be caused by a number of events, including tropical cyclones, tornadoes (and waterspouts), nor'easters, and thunderstorms. Table 2-4 describes regional wind hazards.

Table 2-4. Wind Hazards in Northeast Florida

Wind Event Type	Seasonality	Description	Wind Speeds	Notes
Tropical Cyclones	June 1–November 30		>39 mph	
Hurricanes	June 1–November 30		Saffir-Simpson Scale: Cat. 1: 74–95 mph Cat. 2: 96–110 mph Cat. 3: 112–129 mph Cat. 4: 130–156 mph Cat. 5: >157 mph	
Tornadoes	March–September but possible year-round	A violently rotating column of air touching the ground	Enhanced Fujita (EF) Scale: EF0: 65–85 EF1: 86–110 EF2: 111–135 EF3: 136–165 EF4: 166–200 EF5: >200 mph	Florida's strong tornado season is March through May. EF scale is measured by 3-second gusts.
Waterspouts	March–September but possible year-round	A tornado over the water	Utilizes EF scale	
Nor'easters	Fall–Spring	Strong onshore winds that come from the northeast; generally coastal events	Speeds can vary, but gusts >40 mph in stronger nor'easters	
Thunderstorm	Year-round		Three categories: General: 20–40 mph Strong: 40–57 mph Severe: >58 mph	



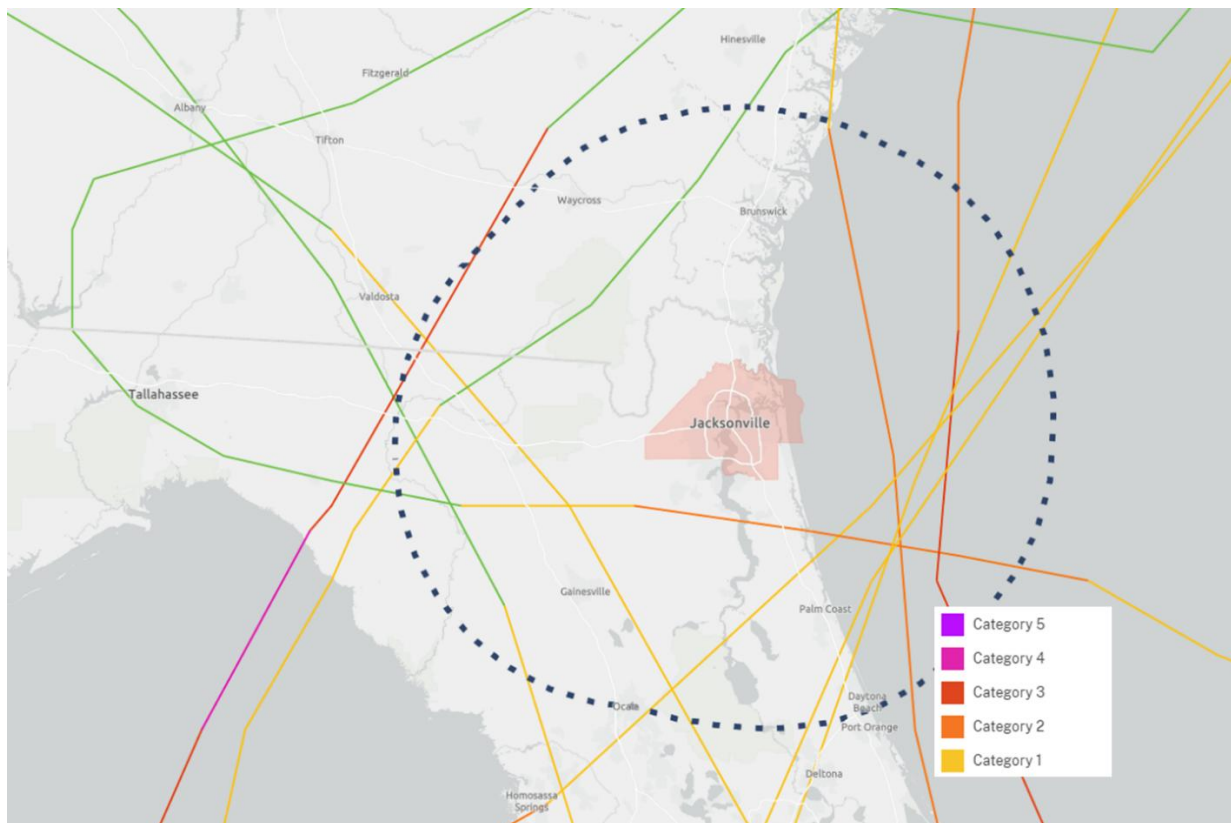
2.6.1 Historic and Current Conditions

The Jacksonville region has a well-documented history of extreme wind events driven by its exposure to hurricanes, tropical storms, and severe thunderstorms associated with subtropical weather systems. Coastal and near-coastal locations have repeatedly experienced damaging winds from landfalling and passing hurricanes, while inland areas are also affected by strong straight-line winds and tornadoes spawned by intense convective storms. These events have historically caused widespread impacts, including power outages, structural damage, downed trees, and disruptions to transportation and port operations. As a result, extreme wind hazards are a recurring and significant component of the region's overall risk profile

2.6.1.1 Tropical Cyclones and Hurricanes

The likelihood of a tropical cyclone and a hurricane in the region is 7.7 and 2.5 events per every 100 years (NOAA n.d.). Figure 2-7 shows known major hurricane tracks within 60 nautical miles of Duval County.

Figure 2-7. Historical Hurricane Tracks within 60 Nautical Miles of Duval County



2.6.1.2 Tornadoes

Tornadoes do occur in the region, with 77 and 27 documented tornado events having occurred in Duval and Clay counties, respectively, between 1950 and 2025. Since 2007, only EF0 and EF1 tornadoes have been documented in both counties (NCEI n.d.a., NCEI n.d.b.). Figure 2-8 shows documented tornado tracks since 2011.

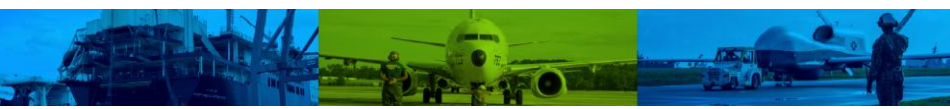
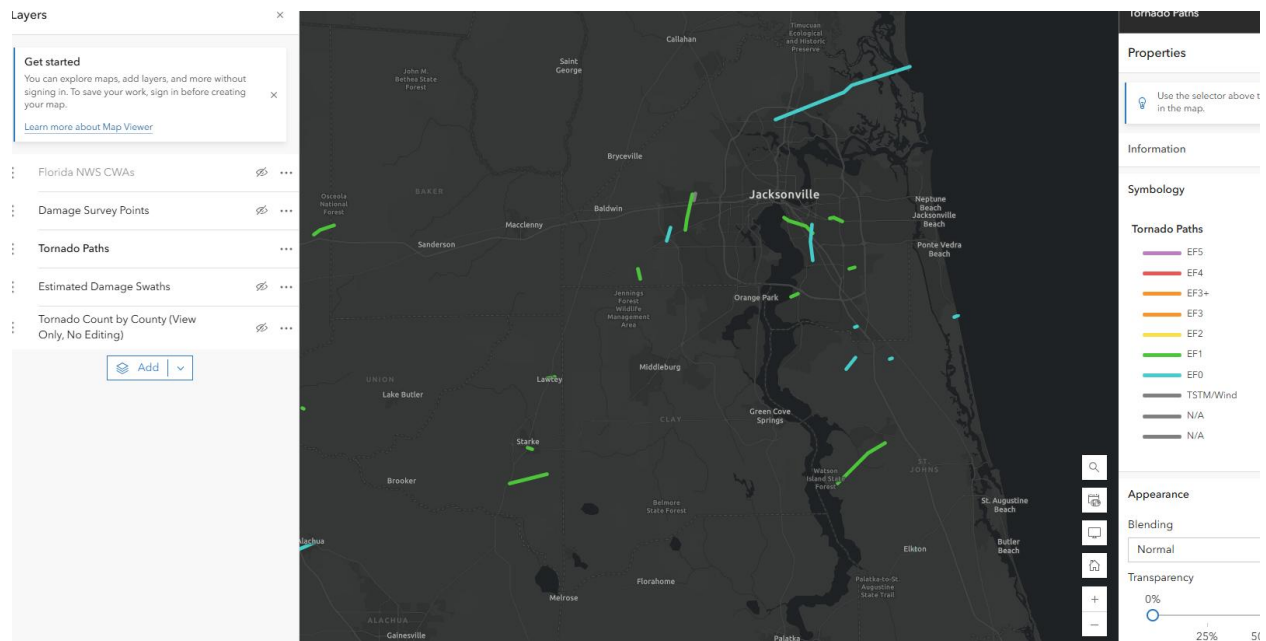


Figure 2-8. Tornado Tracks in Northeast Florida Since 2011



2.6.1.3 Thunderstorms

Thunderstorms occur regularly in the region, where thunderstorms with significant winds occur less so. Between 2000 and 2025, 165 and 457 severe thunderstorm events occurred in Clay and Duval counties, respectively (NCEI n.d.c., NCEI n.d.d.) A notable thunderstorm event occurred in August 2008, where strong winds knocked one of the gantry cranes into others at JAXPORT's Blount Island Terminal (Figure 2-9).

Figure 2-9. Aftermath of a Crane Collapse at the Jacksonville Port Authority (JAXPORT) Blount Island Marine Terminal on August 13, 2008, Following a Microburst Storm Event



Source: Ships Nostalgia n.d.

2.6.2 Future Projections

Future frequencies and intensities of extreme wind events depend significantly on the type of wind event, as shown in Table 2-5.

Table 2-5. Wind Event Types and Project Future Changes

Wind Event Type	Projected Future Changes	Source
Tropical Cyclones	Cyclone intensity is projected to increase, resulting in a slight increase to wind speeds.	Knuston 2024
Hurricanes	No anticipated change to frequency. Cyclone intensity is projected to increase, resulting in a slight increase to wind speeds.	Knuston 2024
Tornadoes	It is possible there may be more off-season tornadoes in the future but changes to tornado strength and frequency under future conditions are inconclusive.	
Waterspouts	It is possible there may be more off-season tornadoes in the future but changes to tornado strength and frequency under future conditions are inconclusive.	
Nor'easters	Nor'easter intensity is projected to increase; however, the frequency of such events is projected to decrease.	Chen et al. 2025, Zarzycki 2018
Thunderstorm	Frequency and intensity of thunderstorms is projected to increase, with storm wind speeds increasing by 7% per °F in the Central United States.	

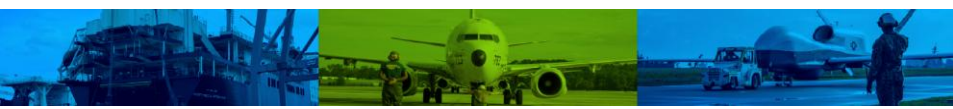
Overall, most wind events will increase in strength (hurricanes, thunderstorms, and nor'easters) in the future while few are anticipated to increase in frequency (thunderstorms).

2.6.3 Relevant Assets and Impacts

Wind impacts are heavily variable, often depending on the type of object or structure and its location. Elevated structures, such as large vehicles (trucks or railroad cars), can be lifted by strong winds. Tall structures, such as cell towers or cranes, can also be toppled by wind.

2.7 Wildfire

Wildfires are natural or human-caused fires that burn forests, shrublands, or other highly vegetated environments. The magnitude and extent of wildfire is a function of the availability of fuels (combustible material), topography, and weather. Controlled burns are contained and intentionally set fires that are prescribed to prevent uncontrolled wildfires and to encourage ecosystem health.



2.7.1 Historic and Current Conditions

Despite the large presence of timber lands and dense vegetation, the region's humidity and frequent precipitation generally prevent large wildfires (Routley 1998). Neither Clay nor Duval County has had a documented fire larger than 10,000 acres since 1981 (FDACS n.d.). Small fires, however, do regularly occur in the region and are managed by the Florida Forest Service (FFS).

The most significant historical wildfire event in the region is related to the statewide wildfires of 1998 (known as "the Florida Firestorm"), where abnormally dry conditions resulted in fires throughout the state. In Duval County, The Yellow Water Fire in the western areas of the county burned approximately 6,000 acres while Clay County contended with a small blaze in the southeast (Figure 2-10) (Florida Forestry Service n.d.).

Figure 2-10 Florida Complex Fires (June–August 1998)



2.7.2 Future Projections

Northeast Florida will likely experience higher than average seasonal temperatures and precipitation levels consistent with current climate conditions (NWS 2025). This combination of higher temperatures and warmer conditions can create an environment where wildfires may thrive. Figure 2-11 shows wildfire hazard potential (the combination of fire exposure and likelihood) for the study region.

Areas with high potential for wildfire include natural areas west and south of NS Mayport, as well as small pockets of southern Clay County. Areas with high potential for wildfire include much of western Jacksonville and most of Clay County, including lands around Outlying Landing Field (OLF) Whitehouse and Camp Blanding JTC.

2.7.3 Relevant Assets and Impact

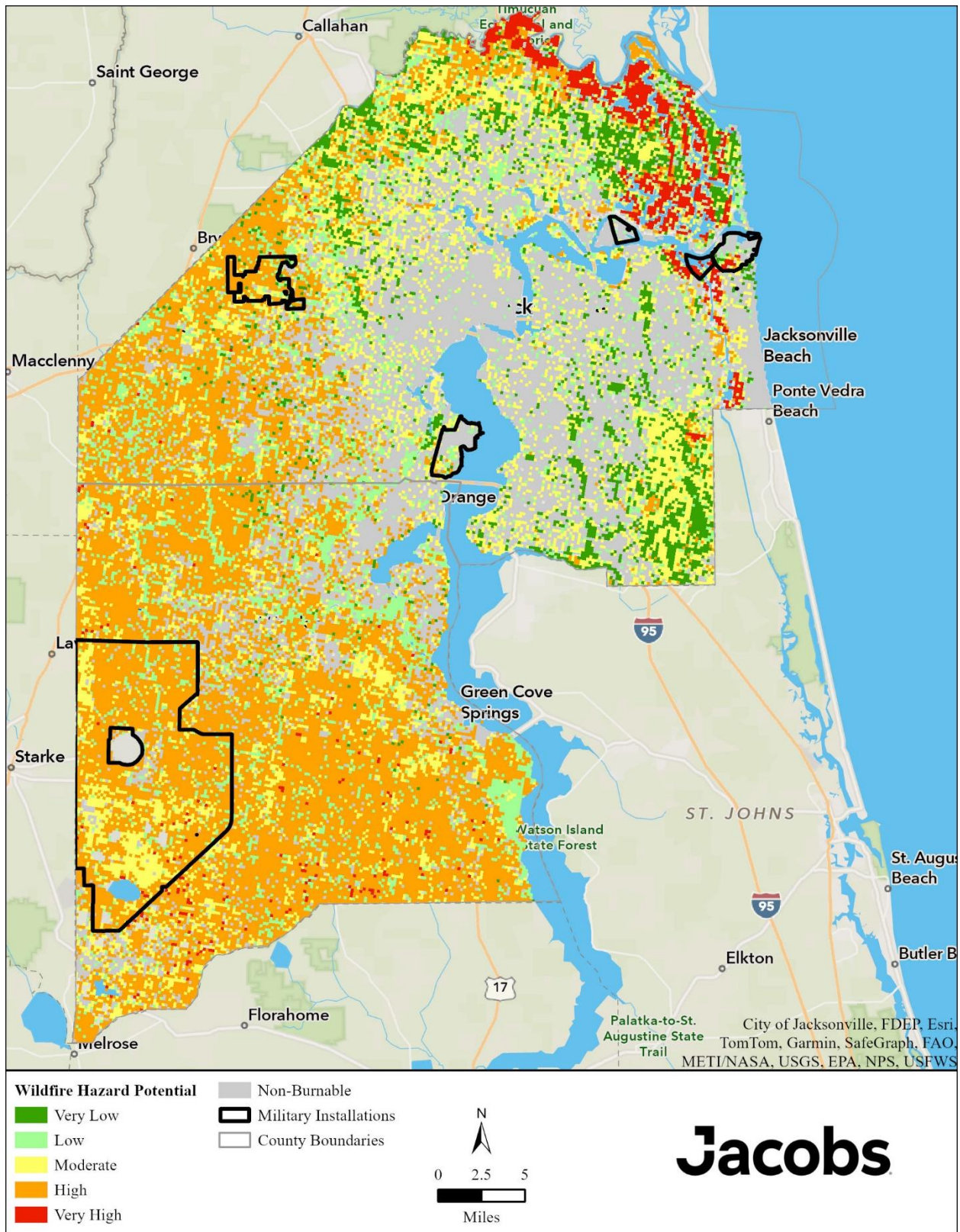
There are two components to wildfire exposure: direct and indirect exposure. Direct exposure generally occurs within the Wildland Urban Interface (WUI), the area where urban areas meet more heavily vegetated rural or natural areas. Assets within the WUI are going to be exposed directly to fire hazards. Indirect exposure occurs through the movement of windborne embers, which can burn areas and assets that are not directly within the WUI.

Wildfire (through direct or indirect exposure) can burn buildings and disrupt utility services. Electrical infrastructure is particularly vulnerable to fire and embers; even smoke can cause flashing at transmission lines. Roadways may be closed during or after fires. Belowground polyvinyl chloride pipes may be damaged by the heat from the fire event. Post-fire flooding can damage unpaved forest roads and carry contaminated water into rivers and other water bodies, impacting water quality. Significant smoke can impact pilots' visibility, disrupting training activities.

Wildfire can also threaten human health, especially the health of installation personnel and neighboring communities. Wildfire smoke contains particulates and toxic gases, which can cause a variety of health impacts, such as cardiovascular or respiratory events and exacerbation of existing respiratory diseases (for example, asthma). Even wildland firefighters (such as those on Camp Blanding) can experience health effects from smoke exposure.



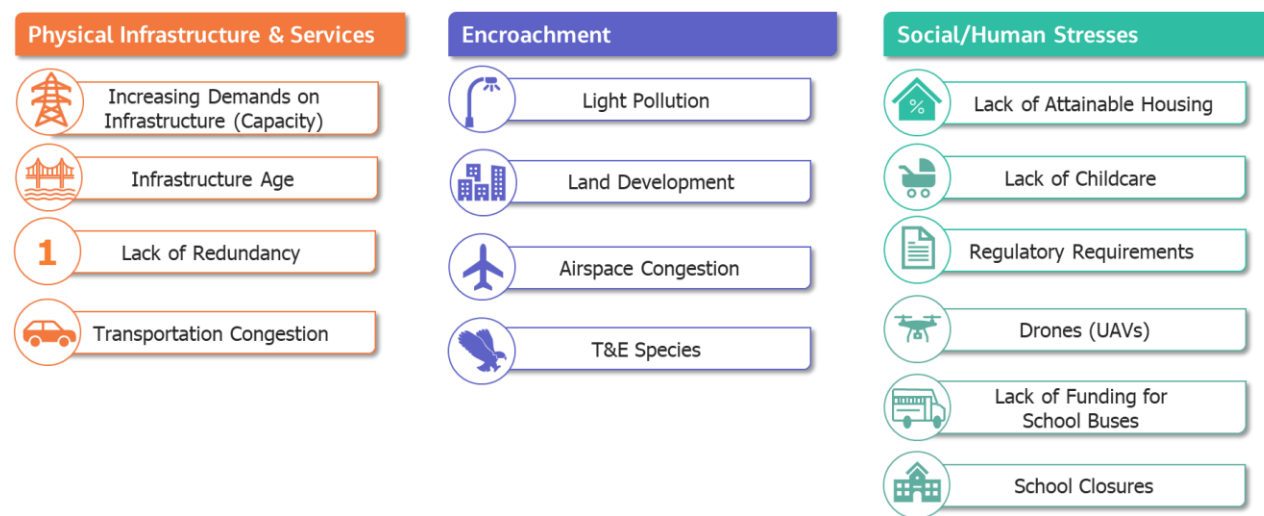
Figure 2-11. Wildfire Hazard Potential



3 Infrastructure and Service Shocks and Stressors

In addition to natural hazards, a variety of other shocks and stressors were brought to the attention of the Project Team during the data collection process. These stressors are related to the infrastructure systems and services that support the installations, encroachment challenges that can inhibit missions, or social and human-caused stresses that pose challenges for installation activities or personnel (Figure 3-1).

Figure 3-1. Infrastructure and Service Shocks and Stresses



The following subsections detail each of these shocks and stresses.

3.1 Increasing Demands on Infrastructure

A typical concern with infrastructure systems, particularly related to population growth, stems from the increasing demands on infrastructure and the resulting capacity constraints and concerns.

3.2 Aging Infrastructure/Infrastructure Failure

Older infrastructure systems and assets are generally more prone to failure than newer ones.

3.3 Lack of Redundancy

Redundant systems promote resilience: a single point of failure within a system results in a less resilient system. During the stakeholder engagement workshop, the Project Team communicated with representatives from each installation and discussed vulnerabilities and opportunities related to redundancy. Tables 3-1, 3-2, 3-3, and 3-4 describe redundancy challenges at Camp Blanding JTC, MCSF Blount Island, NAS Jacksonville, and NS Mayport, respectively.

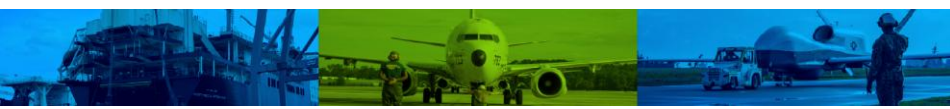


Table 3-1. Camp Blanding JTC – Redundancy Challenges

Infrastructure System	Mission-Criticality	Lack of Redundancy?	Description
Communication Systems		No	
Electric Production and Supply Facilities	Primary	Yes	Currently only one substation supplies the installation.
Potable Water Systems		Yes	Installation has robust onsite potable water system (with its own internal redundancies) but lacks a redundant connection to external utilities.
Roadways/Installation Access	Primary	No	
Wastewater Systems		Yes	Installation has robust onsite wastewater system but lacks a redundant connection to external utilities.

Table 3-2. MCSF Blount Island – Redundancy Challenges

Infrastructure System	Mission-Criticality	Lack of Redundancy?	Description
Communication Systems	Primary	No	
Electric Production and Supply Facilities	Primary	Yes	Currently only one substation (on-base) supplies the installation.
Potable Water Systems	Secondary	Yes	There is currently only one potable water connection.
Roadways/Installation Access	Primary	Yes	Hecksher Drive is the only means of accessing Blount Island.
Wastewater Systems	Secondary	Yes	Installation has one wastewater connection.

Table 3-3. NAS Jacksonville – Redundancy Challenges

Infrastructure System	Mission-Criticality	Lack of Redundancy?	Description
Communication Systems	Primary	Yes	Stakeholders noted a single, critical fiber connection between NAS JAX and NS Mayport.
Electric Production and Supply Facilities	Primary	Yes	Currently only one substation supplies the installation.



Table 3-3. NAS Jacksonville – Redundancy Challenges

Infrastructure System	Mission-Criticality	Lack of Redundancy?	Description
Potable Water Systems	Secondary	No	Installation has onsite potable water systems and a redundant connection with JEA.
Roadways/Installation Access	Primary	Yes	While the installation has three entrances, Roosevelt Blvd. is the sole means of accessing the installation. Stakeholders noted that traffic congestion and major events can inhibit access.
Wastewater Systems	Secondary	Yes	Installation has robust onsite wastewater system but lacks a redundant connection to external utilities. Installation is exploring opportunities with JEA.

Table 3-4. NS Mayport – Redundancy Challenges

Infrastructure System	Mission-Criticality	Lack of Redundancy?	Description
Communication Systems	Primary	Yes	Stakeholders noted a single, critical fiber connection between NAS JAX and NS Mayport.
Electric Production and Supply Facilities	Primary	No	Multiple substations supply the installation and the supplying transmission/distribution systems are looped.
Potable Water Systems	Secondary	No	Installation has onsite potable water systems and a redundant connection with JEA.
Roadways/Installation Access	Primary	No	Installation can be accessed through Mayport Road, Seminole Road, and A1A.
Wastewater Systems	Secondary	Yes	Installation has robust onsite wastewater system but lacks a redundant connection to external utilities. The installation is currently exploring opportunities with JEA.



4 Encroachment Hazards

Encroachment occurs when one land use gets near another incompatible land use, disrupting one or both uses. The DoD defines encroachment as “external, as well as internal, DoD factors and influences that constrain or have the potential to inhibit the full access or operational use of the live training and test domain. This includes, but is not limited to, endangered species and critical habitat, unexploded ordnance and munitions, radio frequency spectrum, maritime or airspace restrictions, air quality, airborne noise, urban growth, physical obstructions, and renewable energy projects” (GAO 2016).

Encroachment hazards were discussed with installation personnel and stakeholders during the stakeholder workshops and site tours. After reviewing data and notes, the Project Team identified four categories of encroachment relevant to this MIRR: land development, light pollution, T&E species, and airspace congestion.

4.1 Land Development

Development around the installations poses an encroachment hazard, particularly if the development has a use that is incompatible with installation activities.

4.2 Light Pollution

Helicopter pilots training at OLF Whitehouse require dark skies for their night-vision goggle training. Dark skies are necessary for military training activities at OLF Whitehouse. Increasing urban development and its accompanying light pollution can inhibit the needed dark skies training activities. Red lights were noted to be particularly problematic because they are not night-vision compatible. The Navy has worked with Duval County to develop a Lighting Regulation Zone that currently extends approximately 1.5 miles south of the OLF (Figure 4-1). However, NAS JAX personnel noted that there are issues farther south of the existing lighting zone and that cell towers shorter than 200 feet tall (which do not require Federal Aviation Administration [FAA] approval and have red lights) can interfere with installation operations.

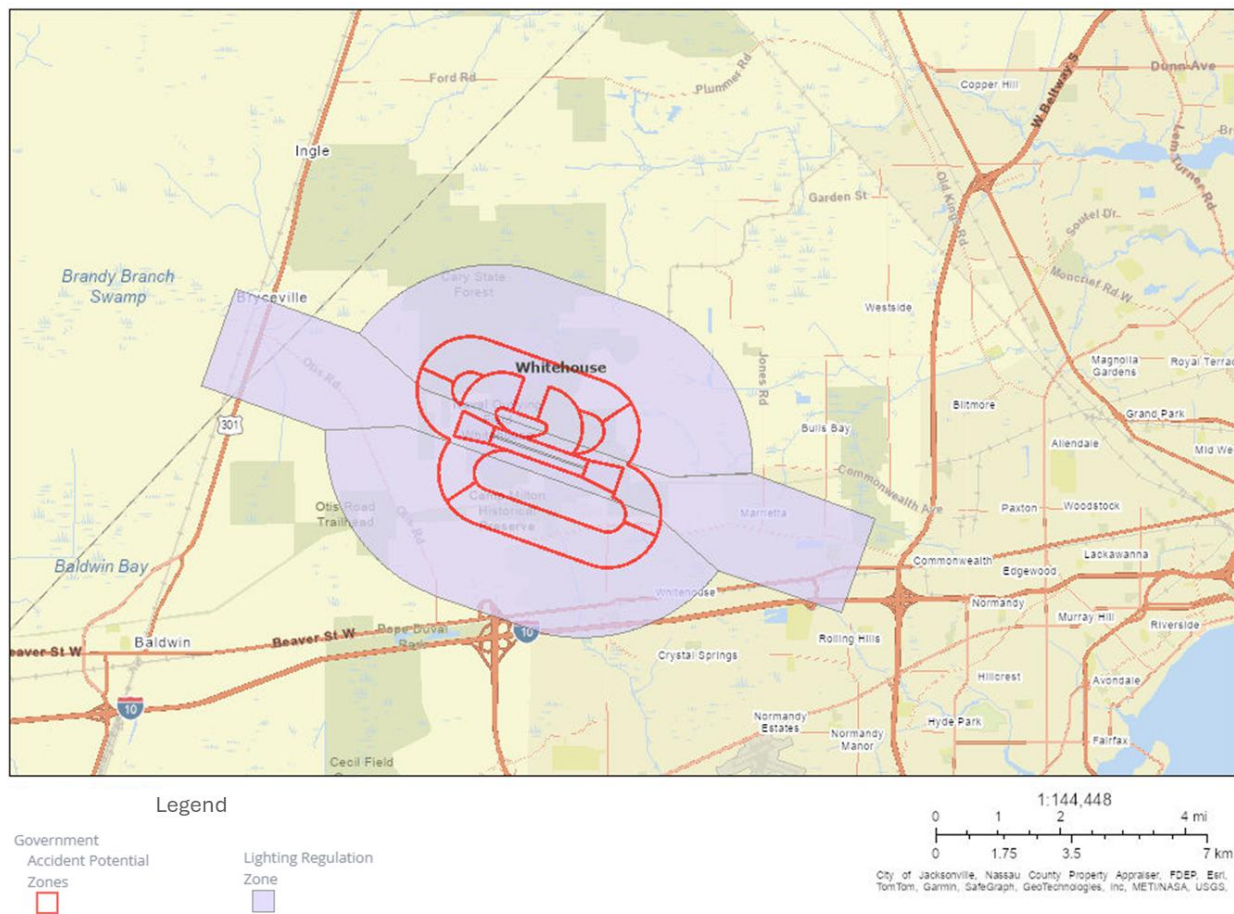
4.3 Threatened and Endangered species

The DoD has stated that T&E species’ presence requires that an installation “ensure that any actions authorized, funded, or carried out by the installation are not likely to jeopardize the continued existence of” any T&E species (Department of Defense 2016). As a result, installations document how they will manage and protect such species in their Integrated Natural Resources Management Plans and conduct a variety of management activities.

T&E species encroachment is most significant at Camp Blanding, which manages a number of T&E species across its lands.



Figure 4-1. Light Regulation Zone Around Outlying Field Whitehouse.



4.4 Airspace Congestion

During discussions with stakeholders with NAS Jacksonville’s Air Operations team, the Project Team learned of significant concerns related to congestion in the airspace in and around Duval County. The region contains several general aviation airports (Herlong, Cecil, and Craig) near NAS Jacksonville. The combined civilian and military flight activity concentrates a high volume of aircraft into a relatively confined airspace. This congestion increases the risk of airspace conflicts for Navy pilots and can restrict the availability of airspace needed for mission training, flight pattern work, and operational maneuvers, thereby encroaching on scheduled training activities. This issue lies outside the scope of this project; however, it is important to highlight to encourage the need for the FAA, the Jacksonville Aviation Authority, and the DoD to identify opportunities for airspace reform and congestion management.



5 Social and Human Stresses

In the four stakeholder workshops held June through September 2025, attendees noted a number of social and human-caused stresses. Though these stressors were not quantitatively analyzed in the vulnerability assessment, they have been qualitatively addressed and are described in Section 5.1.

5.1 Social Stresses

5.1.1 Lack of Attainable Housing

During the stakeholder engagement workshops, personnel from NS Mayport, MCSF Blount Island, and NAS Jacksonville noted the cost of housing for installation personnel. During the workshops with NAS Jacksonville, one stakeholder noted that 48 housing units are available for every 100 families looking for housing.

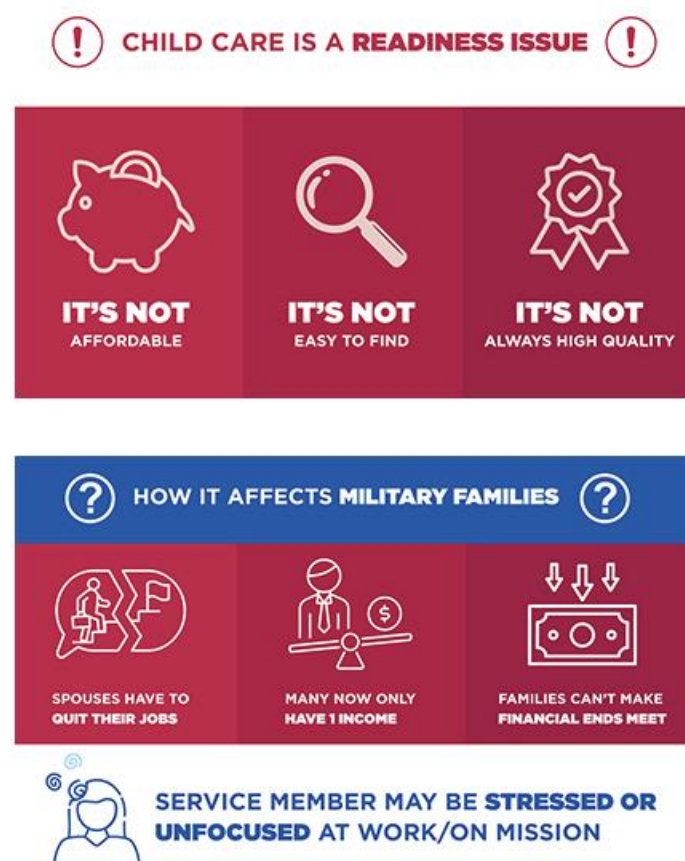
5.1.2 Lack of Childcare

The lack of childcare for military families is a national level issue, having been documented by multiple entities. Lack of affordable and available childcare poses a challenge to installation readiness (Figure 5-1). Lack of affordable or available childcare facilities means that families are either traveling farther to find childcare, paying more, or the spouse is quitting their job to take care of their children. This can place additional financial stress on personnel, distracting them at work. Representatives from NAS Jacksonville and NS Mayport both identified the lack of childcare as a significant stressor for military families and, by extension, the installations. Though both installations have child development centers, there is still not enough childcare for all families who require it.

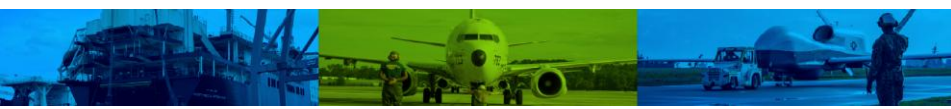
5.1.3 School Closures

The presence of high-quality schools near the installations is significant for installation personnel. The lack of schools near the installation can result in parents taking longer commutes to drop off and pick up their children from school, potentially diverting them from their work on-base.

Figure 5-1. Factors that Contribute to Lack of Affordable or Available Childcare



Source: National Military Family Association



Stakeholders from NS Mayport expressed concern that Anchor Academy Elementary School, which is located adjacent to the installation, may be consolidated with Mayport Elementary School. At a Duval County Commission Meeting in December 2025, it was decided that any decision regarding the two schools would be postponed until the 2028–2029 school year while the County pursues a potential federal grant for constructing a new school (Burgess 2025).

5.2 Regulatory Requirements

Regulations and policy can pose a long-term stressor on installation operation. Either direct compliance with new regulations can be a stressor for an installation or the effects of policy changes within the surrounding community can potentially conflict with an installation’s mission.

5.2.1 Senate Bill 64

Florida State Senate Bill 64, signed into law in June 2021, requires that domestic wastewater utilities plan and move to eliminate “nonbeneficial surface water discharges” by January 2023 (Florida Statute Chapter 2021-168). Installation representatives from Camp Blanding JTC and NAS Jacksonville noted their concerns with modifying their wastewater systems to comply. Camp Blanding personnel noted they have looked at spray fields, with some sort of on-base solution being more feasible for the installation. NAS Jacksonville’s Public Works team noted that they are working with JEA to evaluate opportunities for conveying wastewater outside the fence line.

5.2.2 Live Local Act

The Live Local Act, signed into law in 2023, is one of Florida’s most significant housing reform efforts, designed to expand affordable and workforce housing across the state. It preempts many local zoning restrictions by requiring administrative approval—without public hearings—for multifamily or mixed-use projects in commercial, industrial, or mixed-use zones when at least 40% of units are reserved as affordable for a minimum of 30 years. Developers are allowed to build at the highest density permitted anywhere within the jurisdiction and at heights up to the tallest building within 1 mile (or at least three stories), greatly accelerating project approvals and reducing local regulatory barriers.

To further incentivize development, the Act provides substantial financial benefits, including new property tax exemptions, sales tax refunds on building materials, and the largest housing funding commitment in Florida history through major investments in SHIP and SAIL programs. These mechanisms lower construction costs and encourage mixed-use, higher-density projects intended to help workers live closer to their places of employment. Collectively, these measures form a statewide strategy to increase long-term housing affordability and production throughout Florida’s rapidly growing communities.

5.3 Human-Caused Stresses

Though outside of the scope of this project, the Project Team felt it was important to note additional human-caused stressors for the installations.



5.3.1 Drones (UAVs)

Almost every installation noted concerns about UAVs, commonly known as drones. UAV threats can emerge outside of the fenceline, with UAVs being flown above and onto installation property. The DoD is evaluating strategies for counter-UAV operations



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