



Florida Housing Coalition Hurricane Member Update Webinar

February 12, 2021
Sponsored by Fannie Mae

AGENDA

- Rebuild Florida: Hurricane Michael Applications are open
- Flood Hazard + Housing Practitioners Information Network for Florida's Coastal Communities



Rebuild Florida: Hurricane Michael Applications are OPEN!

Webinar: February 24 from 2:00-3:00 p.m. EST
[RSVP here](#)

Learn more about Rebuild Florida's Housing Repair and Replacement Program at this webinar that will:

- Walk through the application process and guidelines for the program.
- Offer an overview of applicant eligibility
- Provide an overview of the application website, mobile app, and other resources



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FLOOD HAZARD + HOUSING
INFORMATION NETWORK
for Florida Coastal Communities

Flood Hazard + Housing Practitioner Information Network for Florida Coastal Communities

Andrea Galinski, cfm

Department of Landscape Architecture &
Shimberg Center for Housing Studies
at the University of Florida

andrea.galinski@ufl.edu



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Presentation

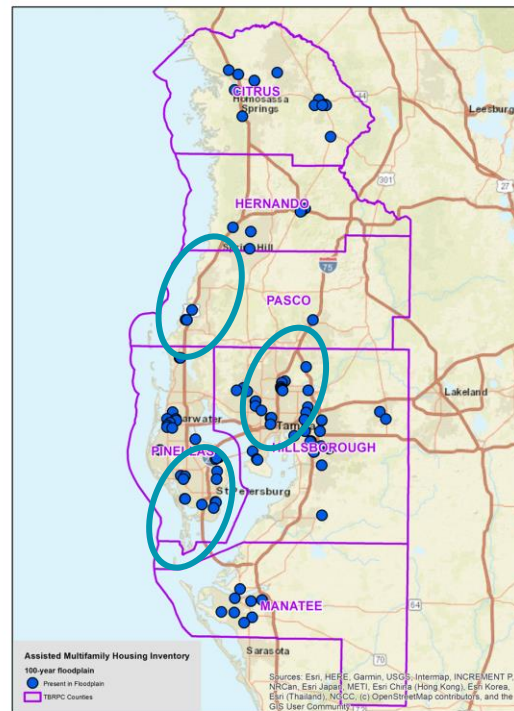
- NSF Smart & Connected Communities Program + Grant Overview
- Project Team Members
- Overview of “Flood Hazard + Housing Practitioner information Network”
- Pilot Projects + Progress to Date
 - Drone test flights
 - Community conversations
 - Workshops
 - Web application
- Next Steps

**FLOOD HAZARD + HOUSING
INFORMATION NETWORK**
for Florida Coastal Communities

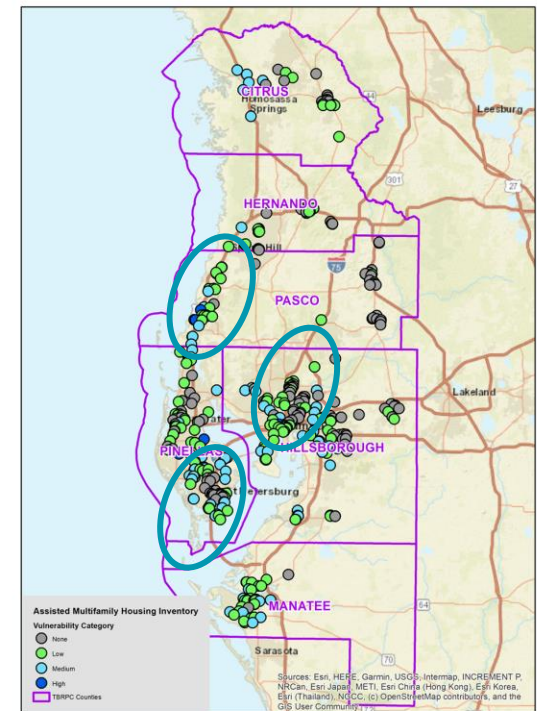
Where is Assisted Housing Exposed to Coastal Flooding?

We could look at **assisted multi-family housing (AH)** in the 100-year floodplain...

.....But this may not tell the whole story.



AHI in 100-Year Floodplain



AHI w/ Low, Medium, High Exposure

NSF Smart and Connected Communities Program / Grant Overview



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Background - NSF S&CC Planning Grant

- Recent **National Science Foundation (NSF) Smart and Connected Communities (S&CC)** 1-year planning grant, enabled team of UF researchers to collaborate with Florida communities to better understand the type and quantity of housing stock at risk from coastal flooding.
- Specific project goal is to assess **structures' lowest floor elevations** to promote effective pre- and post-disaster management strategies and to equip communities with tools to assist the most at-risk populations.
- **Workshop is the first step in the development of a larger 3-year, \$1.5 million NSF S&CC grant.** The University of Florida invites local governments, regional planning councils, and other partners to join this collaboration to build smarter and more connected communities.



Award Number:
1951997



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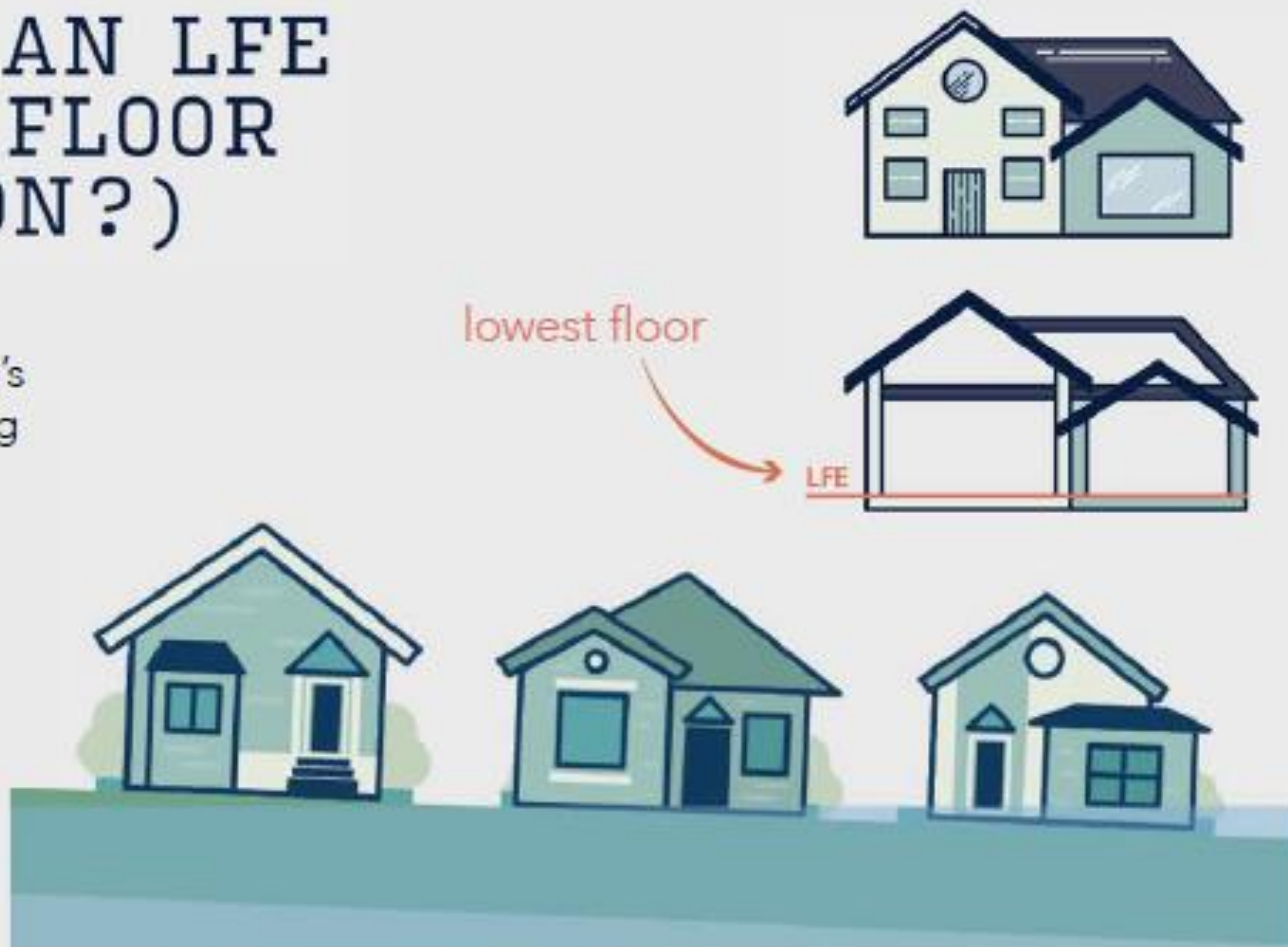
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WHAT IS AN LFE (LOWEST FLOOR ELEVATION?)

The lowest floor elevation is a building's lowest floor,* including a basement, if any.

Measuring a house's lowest floor elevation is important because it can indicate how a potential flood could impact the home. Homeowners can also better understand what steps they could take to prevent flood damage.



** If your home is elevated, different standards may apply. Check out www.fema.gov for more information.*



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Research Questions

1. Can we use drone-based **thermal infrared imaging technology** (TIR), or “heat mapping” to determine buildings’ lowest floor elevations (LFEs)?
2. What **types of information are needed** to develop better flood risk mitigation strategies?
3. How can we **support practitioners and information exchange** across disciplines and domains?



Project Team



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Project Team + Partners



University of Florida

- Shimberg Center for Housing Studies
- UrbSys Lab
- M.E. Rinker School of Construction Management
- Department of Landscape Architecture
- Levin College of Law Conservation Clinic
- College of the Arts
- Florida Sea Grant
- UF IFAS Extension

Partner Agencies + Organizations (2 region focus)

- Pinellas County
- Tampa Bay Regional Planning Council
- Apalachee Regional Planning Council
- City of Oldsmar
- Florida Housing Coalition



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Project Team - Faculty



(PI) Ravi Srinivasan, PhD, Associate Professor, UF M.E. Rinker School of Construction Management
Ravi Srinivasan's research focuses on advanced modeling and simulation in the fields of building energy and sustainability. He is the Director of the UrbSys Lab that explores urban building energy, sensing, controls, big data analysis, and visualization. Visit built-ecologist.com for more information.



Bill O'Dell, Director, UF Shimberg Center for Housing Studies
Mr. O'Dell has spent several years at the Shimberg Center collaborating on the development of a number of data products, among them the Affordable Housing Needs Assessments, Florida Housing Data Clearinghouse, and more.



Andrea Galinski, MLA, CFM, Assistant Scholar, UF Department of Landscape Architecture
Andrea Galinski's research focuses on holistic, data-driven resilience planning. Her work brings together networks of floodplain managers, planners, and housing program managers to advance equity-centered resilience planning. Her professional background includes climate adaptation planning, analysis, policy development, and public outreach.



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Project Team - Faculty



Rui Liu, PhD, Assistant Professor, UF M.E. Rinker School of Construction Management
Rui Liu's research focuses on data mining, geospatial database development in order to advance the construction industry with new technologies for a more sustainable and resilient world.



Russell Watkins, PhD, Geographer, UF Shimberg Center for Housing Studies
Russell Watkins's work focuses on geospatial analysis of housing-related data. A recent project includes the "Housing and Coastal Flood Hazard Exposure" web application, which illustrates the Assisted (Multifamily) Housing Inventory across the state of Florida in relation to several current and future coastal flood hazards.



Libby Carnahan, UF/IFAS Extension Pinellas County, Florida Sea Grant Agent
Libby Carnahan is the Florida Sea Grant Agent for UF/IFAS Extension Pinellas County. She holds her Climate Change Professional® (CC-P®) credential from the Association of Climate Change Officers. She is also founder and co-facilitator of the Tampa Bay Climate Science Advisory Panel, CSAP.



Jim Martinez, MA., Senior Systems Architect, UF Shimberg Center for Housing Studies
Jim Martinez is a senior systems architect for the Shimberg Center for Housing Studies. His technical duties include software engineering, developing web applications, system administration, database administration and maintenance, and on occasion vacuuming. In his free time Mr. Martinez, who has earned both a Masters and a Bachelors degree in Mathematics, enjoys playing baseball, and salads. He is blessed with one wife, two sons and one original ACL.



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Project Team - Students



Erin Fowler, MA Candidate, Urban and Regional Planning; Graduate Research Assistant, UF Shimberg Center for Housing Studies



Meiqing Fu, Ph.D. Candidate, M. E. Rinker, Sr. School of Construction Management



Harvey Halprin, J.D. Candidate; Student Associate, UF Levin College of Law Conservation Clinic



Sourabh Kakade, MS Candidate, Mechanical Engineering; Graduate Research Assistant, UrbSys Lab



Qusai Nalawala, MS Candidate, Mechanical Engineering: Thermal Sciences and Fluid Dynamics



Samira Shiridevich, MA Candidate in Design and Visual Communications



Junghoon Woo, Ph.D. Candidate in UF M. E. Rinker, Sr. School of Construction Management



Xiang Zhou, MS Candidate, UF Computer and Information Science and Engineering



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Project Team - Students



Mint Design Studio, UF School of Art + Art History

Mint Design Studio is a faculty-supervised, student graphic/communication design studio established in 2002 with the goal to provide advanced students the opportunity to apply design in real-world contexts.

Mint responds to the changing field of design through interdisciplinary collaborations, partnering with people in their communities to co-design responses to mutually important issues and challenges.

Mint covers the range of communication design activities, beginning with design research to understand context and opportunities, field research, UI/UX, data visualization, branding, workshops, strategy, and more. Since Mint is also a course, projects have a pedagogical function for students.
hdesing@arts.ufl.edu



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Project Overview

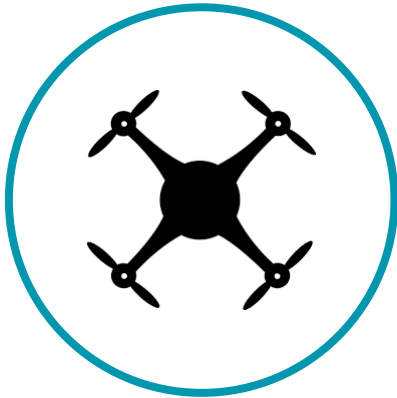


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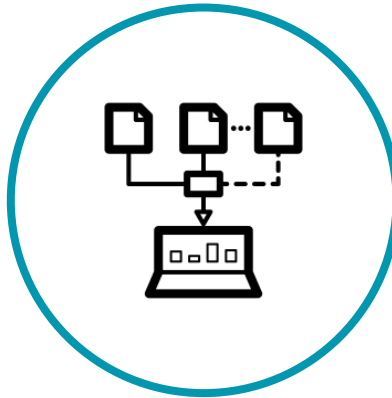
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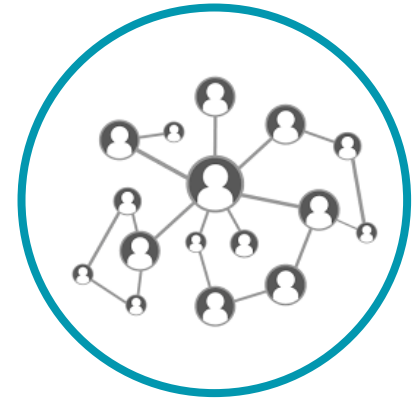
Project Goals



goal #1:
develop technical tools
to estimate LFEs



goal #2:
develop integrated
database to share
information



goal #3:
connect practitioners to
reduce flood risk

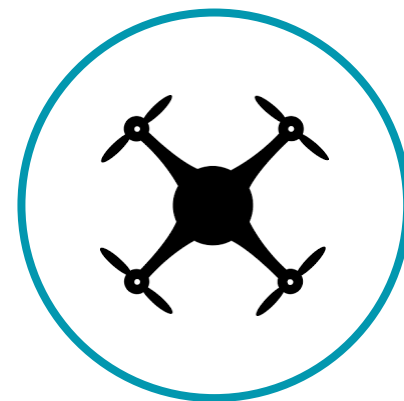


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Project Goal #1: Developing Technical Tools



Testing Technologies

- Developing new method to estimate LFEs- **Thermal Infrared Mapping (TIR)**
- Piloting ideas in case study areas: Tampa Bay and Apalachee Regional Planning Council areas
- Conducting drone test pilot in Pinellas County (City of Oldsmar, FL)
- May provide a significant improvement over existing approaches to determine foundation types and predict LFEs
- Considering **sustainability + resilience**:
 - Also looking at estimation of building's energy efficiency at the neighbourhood scale

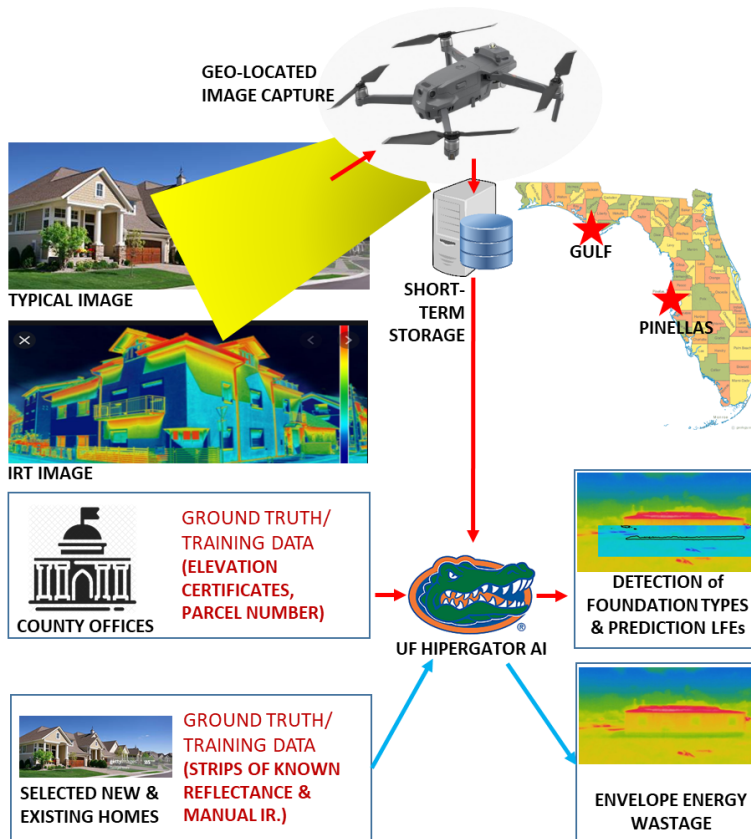


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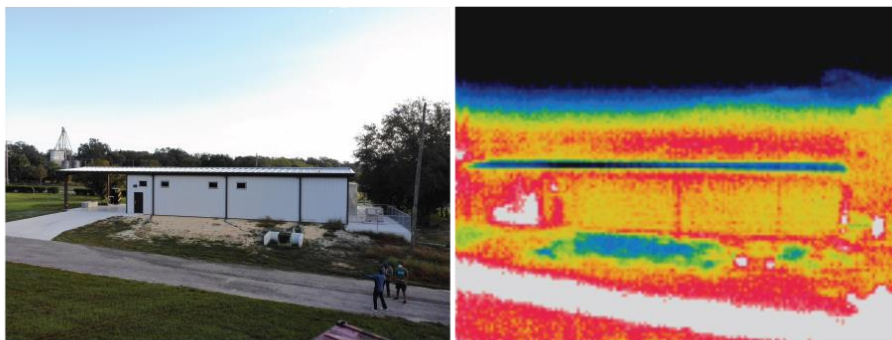


Project Goal #1: Developing Technical Tools

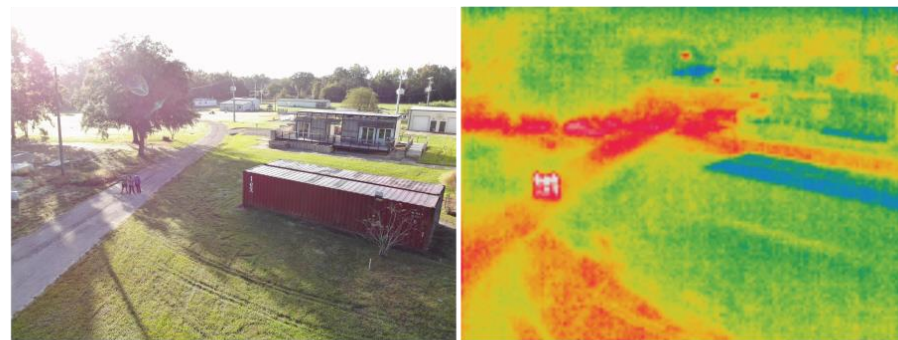


- Use GPU-accelerated image processing techniques, and dual-images of building structures to (a) detect the foundation types and (b) predict LFEs.
- UF's Hipergator AI is well-suited to detect features and predict LFEs from high-resolution images.
- An extension of this work will attempt the estimation of building envelop energy wastage which is critical as well.

Drones + “Heat Mapping” (IRT)



1) Drone-based photograph of structure (L) and infrared thermal image (R). Warmer colors indicate higher temperatures.



2) Drone-based photograph of students near structure (L) and infrared thermal image (R).

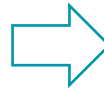
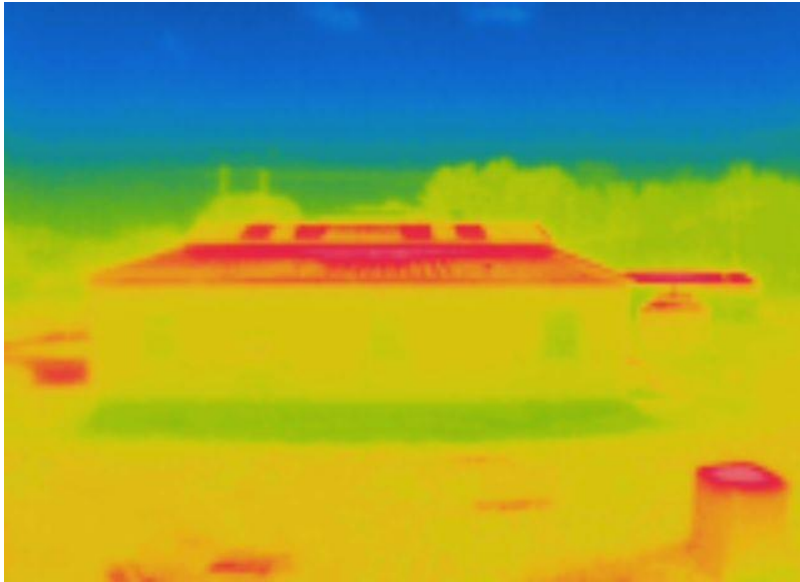


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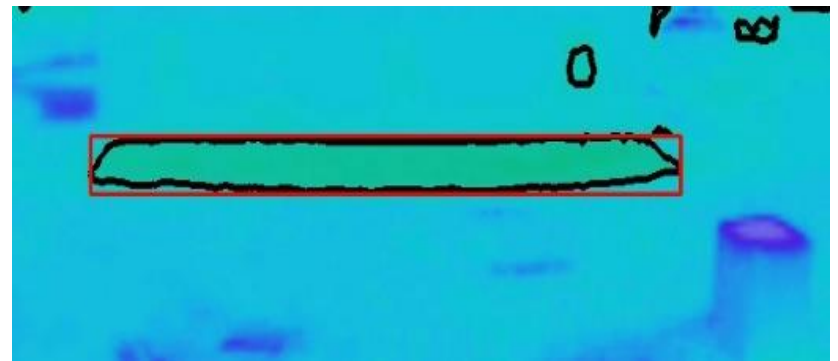
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Drones + “Heat Mapping” (IRT)



- Python script detects the color change between the buildings and the foundation structure mainly due to difference in temperature.
- Draws a bounding box across it as shown here.
- Pixels per feet for each building is calculated using the GIS data for the building and then LFE is calculated.



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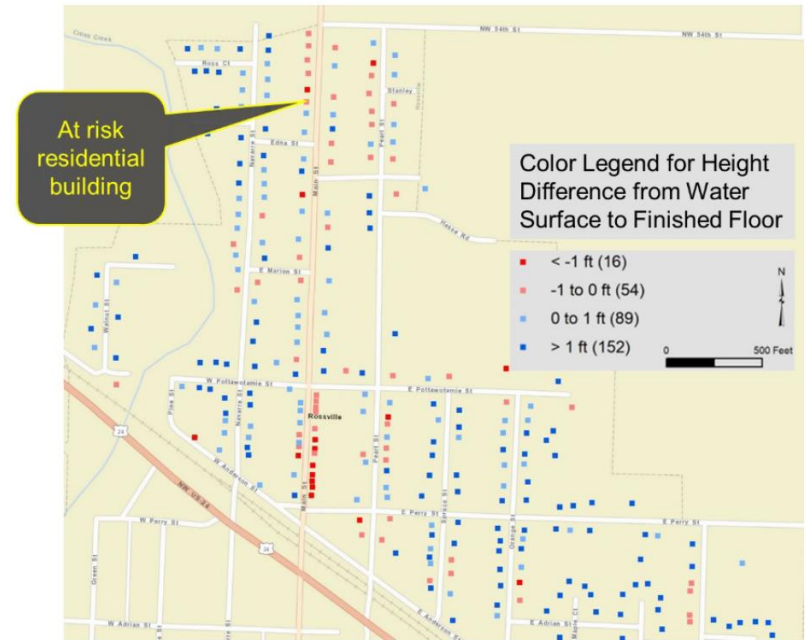
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Project Precedents

Case Study: Cross Creek in Rossville, Kansas

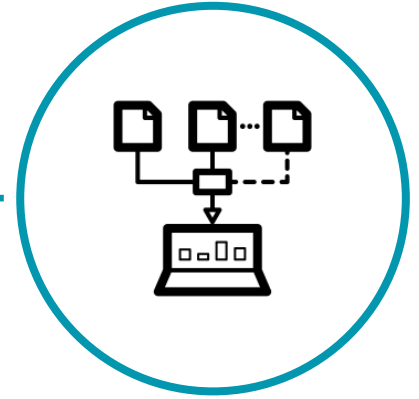
- *Rossville is a small town of about 1,100 residents outside of Topeka, classified by FEMA as a disadvantaged community.*
- *The team focused analysis on the consequences of flooding, rather than the probability, which means figuring out the best measures to avoid damage within the floodplains rather than changing the floodwaters' behavior.*
- *The USACE team made a map of buildings colored depending on finished floor elevation compared to the base flood elevations.*



The NWS Advanced Hydrologic Prediction Service provided an interagency tool in partnership with KDA DWR, USACE, and USGS in Rossville.

The above was abstracted from: “Interagency Work, Community Efforts Mitigate Wicked Flood Risk in Rossville, Kansas” by Brian Rast, USACE Kansas City District [in the ASFPM’s “The Insider,” Jan 2021 Newsletter].

Project Goal #2: Sharing Information + Database Integration



Testing Technologies

- Testing digitizing Elevation Certificates (ECs) to 1) validate results and 2) integrate into database
- Testing data mining/scraping of housing-related websites (Zillow, etc.) and creating database structure
- Integrating LFEs, digitized ECs, and other housing data into comprehensive, user-friendly database

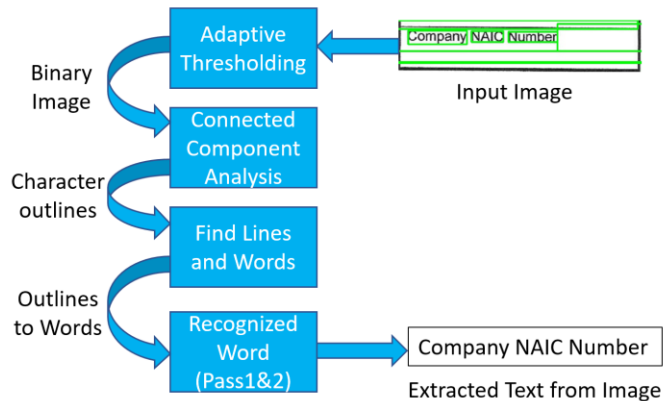


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Optical Character Recognition (OCR) Data Extraction



U.S. DEPARTMENT OF HOMELAND SECURITY
Federal Emergency Management Agency
National Flood Insurance Program

OMB No. 1560-0008
Expiration Date: November 30, 2022

ELEVATION CERTIFICATE

Important: Follow the instructions on pages 1-9.

2024-21-250C

Copy all pages of this Elevation Certificate and attachments for (1) community official, (2) insurance agent/company, and (3) building owner.

SECTION A - PROPERTY INFORMATION		FOR INSURANCE COMPANY USE
		Policy Number:
A2. Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. 405 S.W. 20TH LANE		Company NAIC Number:
City GAINESVILLE	State FLORIDA	ZIP Code 32607
A3. Property Description (Lot and Block Numbers, Tax Parcel Number, Legal Description, etc.) 0935-03-0000		
A4. Building Use (e.g., Residential, Non-Residential, Addition, Accessory, etc.) <u>RESIDENTIAL</u>		
A5. Latitude/Longitude: Lat <u>28.29015</u> Long <u>-82.29015</u> Horizontal Datum: <input type="checkbox"/> NAD 1927 <input checked="" type="checkbox"/> NAD 1983		
A6. Attach at least 12 photographs of the building if the Certificate is being used to obtain flood insurance.		
A7. Building Diagram Number <u>0</u>		
A8. For a building with a crawlspace or enclosure(s):		
a) Square footage of crawlspace or enclosure(s) <u>N/A</u> sq ft		
b) Number of permanent flood openings in the crawlspace or enclosure(s) within 1.0 foot above adjacent grade <u>0</u>		
c) Total net area of flood openings in A8b <u>0</u> sq in		
d) Engineered flood openings? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
A9. For a building with an attached garage:		
a) Square footage of attached garage <u>N/A</u> sq ft		
b) Number of permanent flood openings in the attached garage within 1.0 foot above adjacent grade <u>0</u>		
c) Total net area of flood openings in A9b <u>0</u> sq in		
d) Engineered flood openings? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
SECTION B - FLOOD INSURANCE RATE MAP (FIRM) INFORMATION		
B1. FIRM Community Name & Community Number CITY OF GAINESVILLE 00001		B2. County Name ALACHUA
		B3. State FLORIDA
B4. Map/Panel Number 0000-0000	B5. Sheet 0	B6. FIRM Index Date 6/9/2004
B7. FIRM Panel Effective Date 6/9/2004	B8. Flood Zone(s) A	B9. Base Flood Elevation(s) (Zone A0, Use Base Flood Elevation) UNDESIGNED
B10. Indicate the source of the Base Flood Elevation (BFE) data or base flood depth entered in item B9: <input type="checkbox"/> FIRM Profile <input checked="" type="checkbox"/> FIRM <input type="checkbox"/> Community Determined <input type="checkbox"/> Other Source: _____		
B11. Indicate elevation datum used for BFE in item B9: <input type="checkbox"/> NGVD 1929 <input checked="" type="checkbox"/> NAVD 1983 <input type="checkbox"/> Other Source: _____		
B12. Is the building located in a Coastal Barrier Resources System (CBRS) area or otherwise Protected Area (PA)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Designation Date: _____ <input type="checkbox"/> CBRS <input type="checkbox"/> PA		

FEMA Form 0950-03 (12/15)

Replaces all previous editions.

Form Page 1 of 6

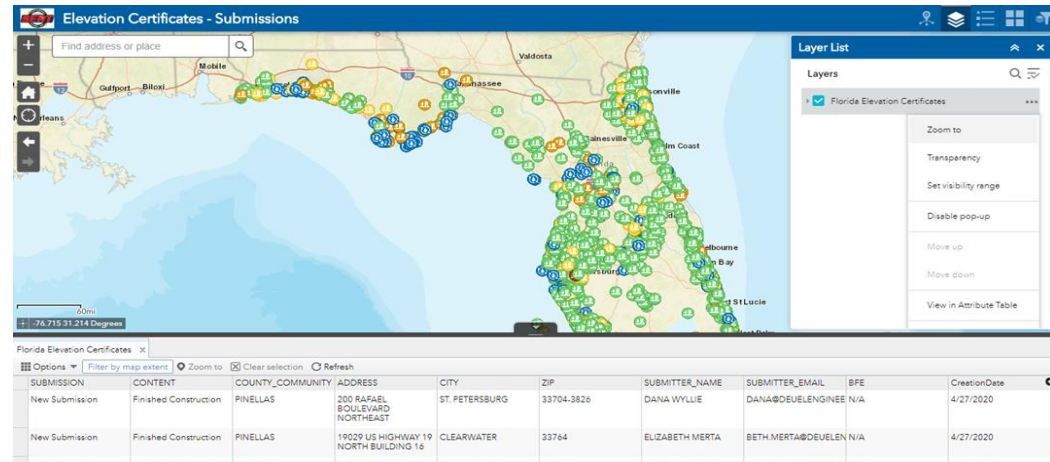
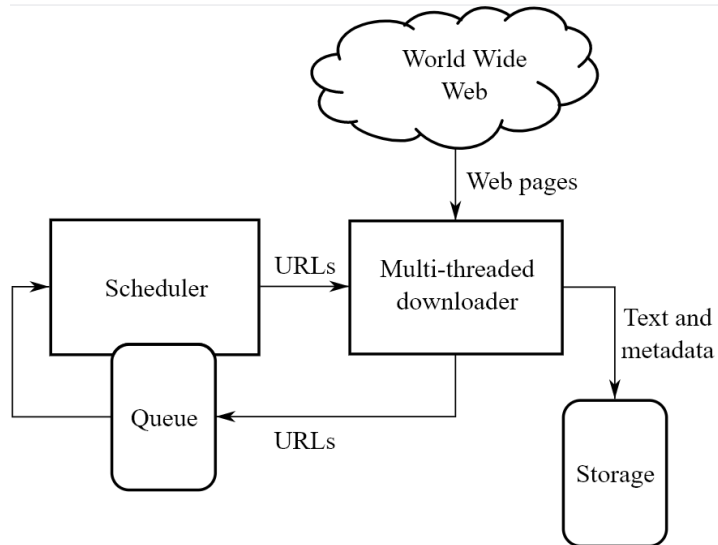


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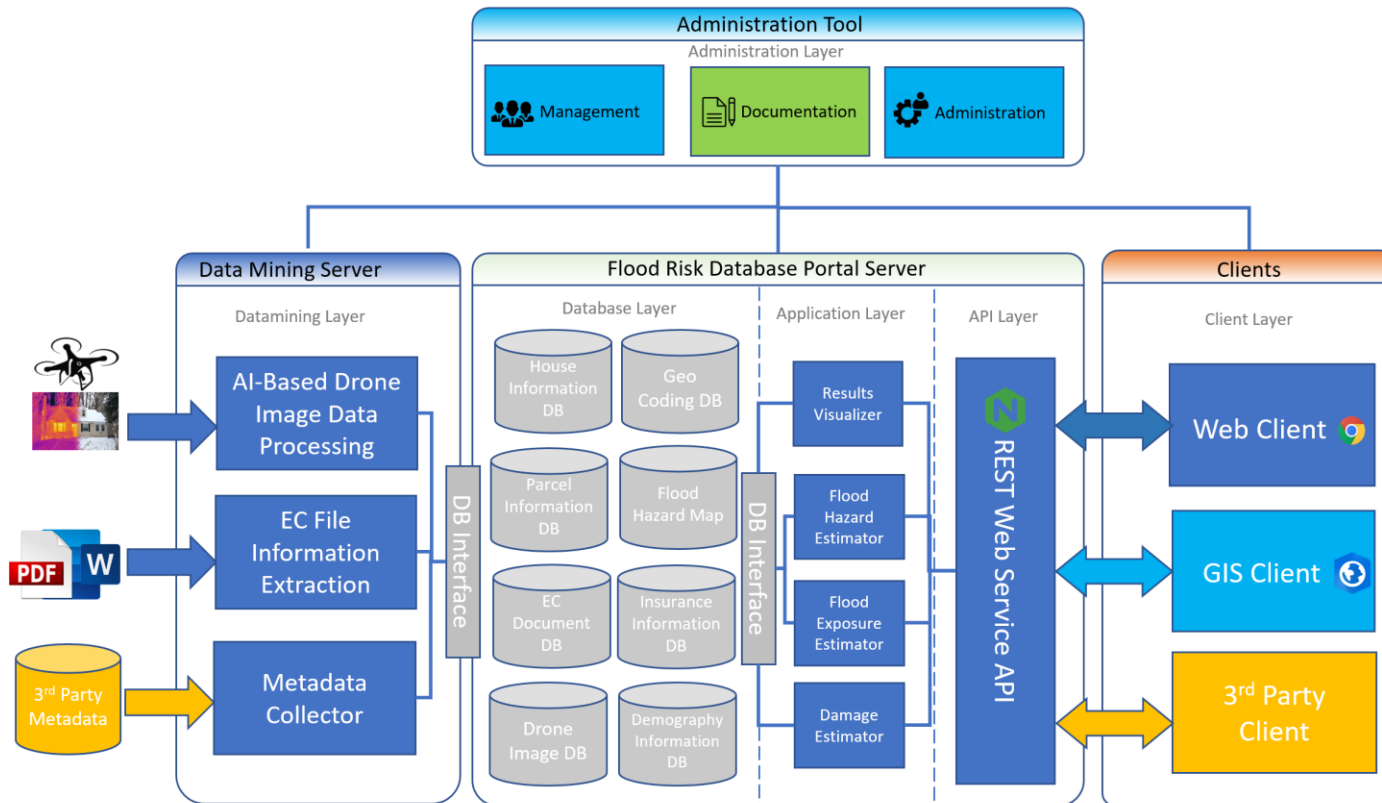


Web Scrapping



```
layer_list_button = wait.until(EC.element_to_be_clickable((By.XPATH, "//*[@data-widget-name='LayerL
print("layer_list_button is clickable")
if isinstance(layer_list_button, WebElement):
    print("layer_list_button click")
    layer_list_button.click()
    layer_items_node = wait.until(EC.visibility_of_element_located((By.CLASS_NAME, 'jimu-widget-row
    print("show layer_items_node")
    if isinstance(layer_items_node, WebElement):
        item_checkbox = layer_items_node.find_element_by_class_name("jimu-checkbox-visible-checkbox
        print("find layer_items_node checkbox")
        if item_checkbox.get_attribute("aria-checked") != "true":
            print("check layer_items_node checkbox")
            item_checkbox.click()
        popup_menu_button = layer_items_node.find_element_by_class_name("layers-list-popupMenu-div")
```

Project Goal #2: Sharing Information + Database Integration



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Project Goal #3: Connecting to Practitioners to Reduce Flood Risk



- “Community Conversations” with local stakeholders
 - Pinellas County, Tampa Bay Regional Planning Council (TBRPC), and Apalachee Regional Planning Council (ARPC)
- Workshop #1: Communities’ Data + Information Needs
 - 75-80 participants
 - Many disciplines- housing planners, floodplain managers, academics, etc.
- Public outreach + information communication during field testing



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“Community Conversations”

- **Smita Ambadi**, AICP, LEED AP, SCPM, Principal Planner, Pinellas County Department of Housing and Community Development
- **Libby Carnahan**, Sea Grant, Pinellas County Extension Agent
- **Ben Chandler**, AICP, Disaster Resilience Coordinator, Apalachee Regional Planning Council
- **Gladys Cook**, Director of Resilience and Disaster Recovery, Florida Housing Coalition
- **Felicia Donnelly**, Assistant City Manager, City of Oldsmar Florida
- **Lisa Foster**, Pinellas County Floodplain Coordinator
- **Chelsea Hardy**, Assistant County Attorney for Pinellas County
- **Hank Hodde**, Pinellas County Sustainability and Resilience Coordinator
- **Evan Johnson**, AICP, LEED AP, Interim Program Director, Principal Planner, Pinellas County Department of Housing and Community Development
- **Brendan Mackesey**, Assistant County Attorney for Pinellas County
- **Curt Nielsen**, OCP, GISP, Deputy of GIS/Land Records for Pinellas County
- **CJ Reynolds**, Director of Resilience and Engagement, Tampa Bay Regional Planning Council
- **Caroline Smith**, Economic Development Planner, Apalachee Regional Planning Council
- **Rebecca Stonefield**, CPM, Principal Planner, Pinellas County Department of Housing and Community Development
- **Noah Taylor**, Floodplain Coordinator and CRS Coordinator, City of St. Petersburg
- **Mike Twitty**, CFA, MIA, Pinellas County Property Appraiser
- **Jana Williams**, Economic Recovery Coordinator/RLF Manager, Apalachee Regional Planning Council



Workshop: Data + Information Needs



Gladys Cook Director of Resilience and Disaster Recovery, Florida Housing Coalition



Hank Hodde Sustainability and Resilience Coordinator, Pinellas County



Donald Morgan Housing Program Manager, Apalachee Regional Planning Council



Noah Taylor Floodplain Coordinator and CRS Coordinator, City of St. Petersburg



Josh Adams Environmental Planning Manager, Apalachee Regional Planning Council



Rodney Chatman AICP, Planning Division Manager, Forward Pinellas



Lisa Foster Floodplain Manager, Pinellas County



CJ Reynolds Director of Resilience and Engagement, Tampa Bay Regional Planning Council



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Workshop : Data + Information Needs

We want your feedback!

- On critical issues in mitigating housing, needs, ideas, etc.
- Suggestions to improve our work
- *Share your thoughts in the chat or on Jamboard!*
 - Link: <https://bit.ly/2YMZw59>

Suggestions will assist in the development of the 3-year, \$1.5 million NSF implementation research grant.



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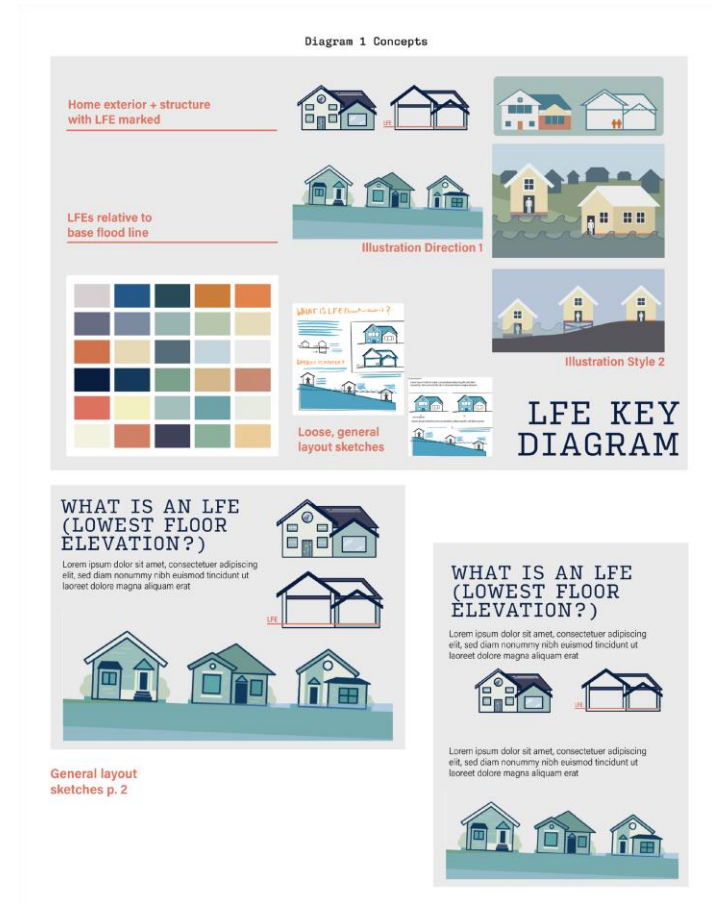
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Public Outreach + Information Communication

Developing Visual Graphics + Outreach Tools

- Aware of need for community engagement + responsible research + concerns about privacy issues
- Working with UF Mint Studio (College of Art) to communicate importance of LFEs, project goals, drone operations, etc.
 - Developing a series of outreach materials- postcards, flyers, etc.
- Want to ensure positive community/neighborhood sentiment during research process as well as share information about flood risk more broadly



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Pilot Project + Progress to Date

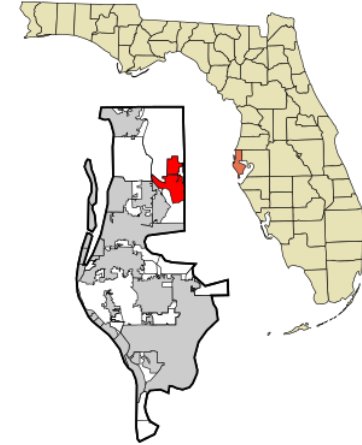


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Fieldwork – City of Oldsmar

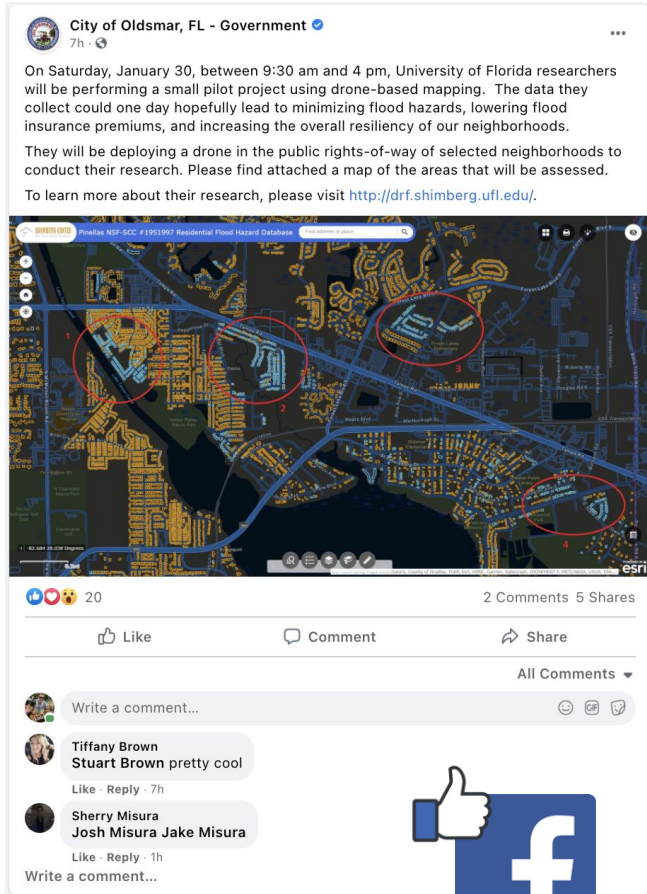


City of Oldsmar, FL - Government 7h · 🌐

On Saturday, January 30, between 9:30 am and 4 pm, University of Florida researchers will be performing a small pilot project using drone-based mapping. The data they collect could one day hopefully lead to minimizing flood hazards, lowering flood insurance premiums, and increasing the overall resiliency of our neighborhoods.

They will be deploying a drone in the public rights-of-way of selected neighborhoods to conduct their research. Please find attached a map of the areas that will be assessed.

To learn more about their research, please visit <http://drf.shimberg.ufl.edu/>.



Pinellas NDR-SCC #1901907 Residential Flood Hazard Database

20 2 Comments 5 Shares

Like Comment Share

All Comments

Write a comment...

Tiffany Brown
Stuart Brown pretty cool
Like · Reply · 7h

Sherry Misura
Josh Misura Jake Misura
Like · Reply · 1h

Write a comment...





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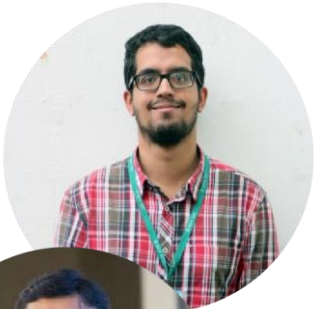


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Preliminary Project Products - Drones + Sensing



- Srinivasan, R.S., Nalawala, Q., Kakade, S. **Drone-based Lowest Floor Elevation. [Provisional Patent]**, US Patent & Trademark Office, 2020.
- Kakade, S., Nalawala, Q., Srinivasan, R.S. (2020). “**Preliminary Research in UAV-based Estimation of Lowest Floor Elevation for Flood Hazard Pre-Disaster Management,**” 20th International Conference on Sustainable Environment & Architecture.
- Kakade, S., Nalawala, Q., Srinivasan, R.S. “**Drone-based Building Envelope Energy Performance.**” Whitepaper (2021).



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Preliminary Project Products - Database Development



- Fu, M, Liu, R., and Watkins, R. **Flood Hazard Management & Practitioner Information Network for Florida Coastal Communities: Literature Review of Flood Risk Report.** Whitepaper (2021).
- Fu, M, Liu, R. **Flood Hazards Data Analysis Report.** Whitepaper (2021)
- Watkins, R. **Housing Flood Hazard Spatial Database and Mapping Application Summary.** Whitepaper (2021)
- Zhou, X. **Data Collection, Extraction, and Cleaning Report.** Whitepaper (2021)

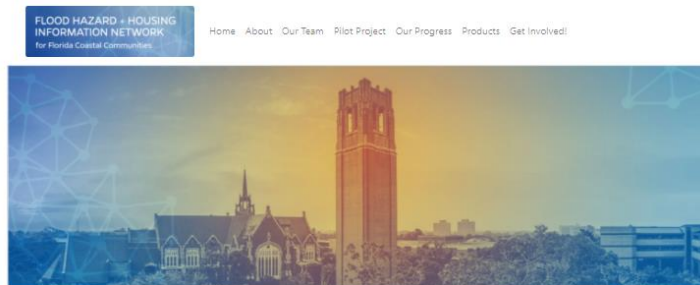


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Preliminary Project Website



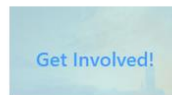
Welcome to the "Flood Hazard + Housing Practitioner Information Network" for Florida Coastal Communities

Through a recent National Science Foundation (NSF) Smart and Connected Communities (S&CC) grant, a team of UF researchers aims to collaborate with Florida communities to better understand housing stock at risk of coastal flooding. The goal of the project is to create a community of practice that focuses on strengthening the technology and social/planning systems of communities in order to create a more resilient affordable housing system including pre-disaster mitigation and post-disaster recovery planning.

The focus of the initiative is initially on communities within the Tampa Bay Region.

Sign Up for Our Community

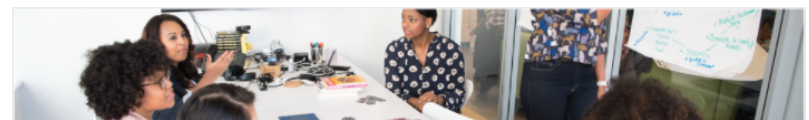
"Local Government Data + Information Needs"
Feb 5th, 2020 | 10:00am-12:00pm | Via Zoom
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Drone Test Flights

The need for flood hazard classification of building structures is critical for pre-disaster management and post-disaster mitigation. The importance cannot be understated especially with the rising sea levels and the threat of global warming. Among others, one of the important attributes is the Lowest Floor Elevation (LFE). We developed innovative drone-based LFE research including the development of novel methods to seamlessly gather, store, and extract relevant physical attributes for flood hazard management. Using the drone's digital and infrared thermal (IRT) cameras, a set of pictures were captured at predefined positions in front of the building structures. These pictures were, then, processed by algorithms for estimating the LFE per FEMA. More information is available in Products page.

Practitioner Workshops

Workshop #1. Through an [initial workshop in early 2021](#), we will explore the broader scope of data needs and potential desired technology to better assist local housing and affordable housing stock faces. The workshop will focus on data needs, as well as useful data sharing platforms/technologies.

Workshop #2. We will create a "Flood Hazard and Housing" community of practice, and how to leverage the results of the workshop will provide insight into effective methods of sharing local communities' knowledge, experiences, and best practices in pre-disaster mitigation planning and post-disaster recovery.

Community Consultations

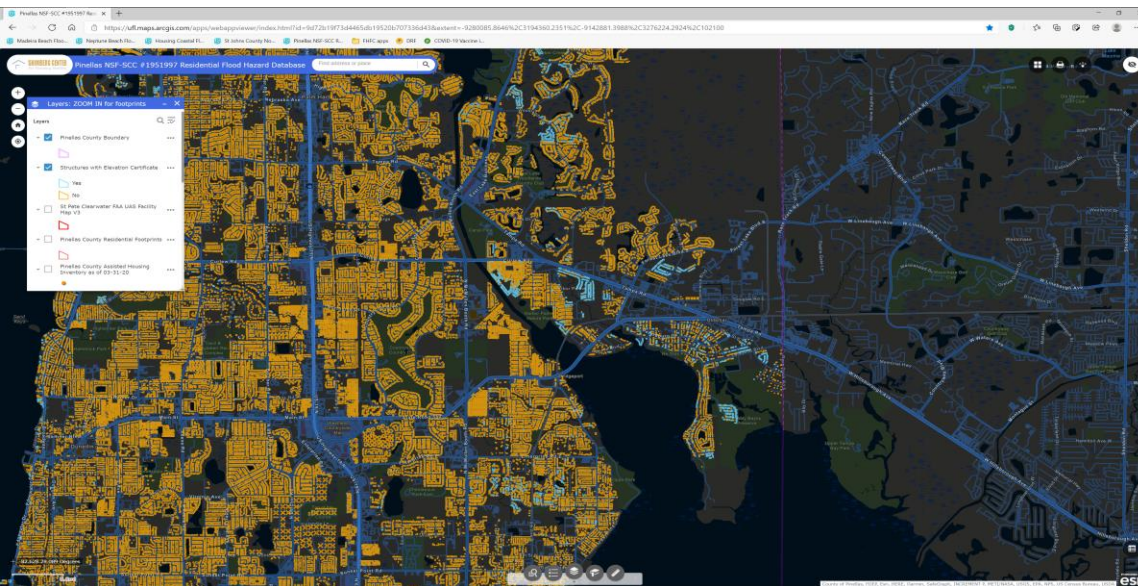
The purpose of the community consultations is to introduce the NSF S&CC project to potential stakeholders and engage collaborators prior to the larger workshops. The meetings are intended to be conversation-based and revolve around a few key questions between the participants and UF team.

- **Smita Ambadi**, AICP, LEED AP, SCPM, Principal Planner, Pinellas County Department of Housing and Community Development
- **Libby Carnahan**, Sea Grant, Pinellas County Extension Agent
- **Ben Chandler**, AICP, Disaster Resilience Coordinator, Apalachee Regional Planning Council
- **Gladys Cook**, Director of Resilience and Disaster Recovery, Florida Housing Coalition
- **Lisa Foster**, Pinellas County Floodplain Coordinator
- **Chelsea Hardy**, Assistant County Attorney for Pinellas County
- **Hank Hodde**, Pinellas County Sustainability and Resilience Coordinator
- **Evan Johnson**, AICP, LEED AP, Interim Program Director, Principal Planner, Pinellas County Department of Housing and Community Development
- **Brendan Mackesey**, Assistant County Attorney for Pinellas County
- **Curt Nielsen**, OCP, GISP, Deputy of GIS/Land Records for Pinellas County
- **CJ Reynolds**, Director of Resilience and Engagement, Tampa Bay Regional Planning Council
- **Caroline Smith**, Economic Development Planner, Apalachee Regional Planning Council
- **Rebecca Stonefield**, CPM, Principal Planner, Pinellas County Department of Housing and Community Development
- **Noah Taylor**, Floodplain Coordinator and CRS Coordinator, City of St. Petersburg
- **Mike Twitty**, CFA, MIA, Pinellas County Property Appraiser
- **Jana Williams**, Economic Recovery Coordinator/RLF Manager, Apalachee Regional Planning Council

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Preliminary Project Products – Web-based Mapping Application



Pilot Website:
drf.shimberg.ufl.edu

- ArcGIS Web App is used to provide web services for visualizing the data through the GIS maps.
- Powerful web interface is also designed to serve as a data viewer.

Project Benefits

- **Potential Benefits**

- Potential increase in accuracy from other LFE detecting technologies (such as Google Streetview images)
- Technology can be scaled up to be more cost-effective than surveying
- Potential for neighborhood-scale “energy audits”
 - Thermal imaging could also have benefits for larger scale thermal-envelope analysis

- **Practical applications to:**

- Floodplain management
- Mitigation project development and prioritization
- Housing planning and retrofit projects
- Weatherization programs



Conclusion - How Can We Help You?



- Welcome new partners to join project
- Welcome more feedback on NSF implementation grant
- Suggestions for:
 - Drone case study areas
 - Schools to partner with for STEM activities/lessons
- Please add ideas to Jamboard!
<https://bit.ly/2YMZw59>
- Sign up for project updates at!
<http://drf.shimberg.ufl.edu/get-involved>



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THANK YOU!!

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Upcoming Training

February 19, 2021 1:30 pm
Keep Safe Miami

[https://attendee.gotowebinar.com/register/
4138240017238938894](https://attendee.gotowebinar.com/register/4138240017238938894)



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Thank you!



Hawaiian Twin Hurricanes Iselle and Julio, 2014

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