

Key Climate Change Impacts in Hawai'i: Findings from the 5th US National Climate Assessment

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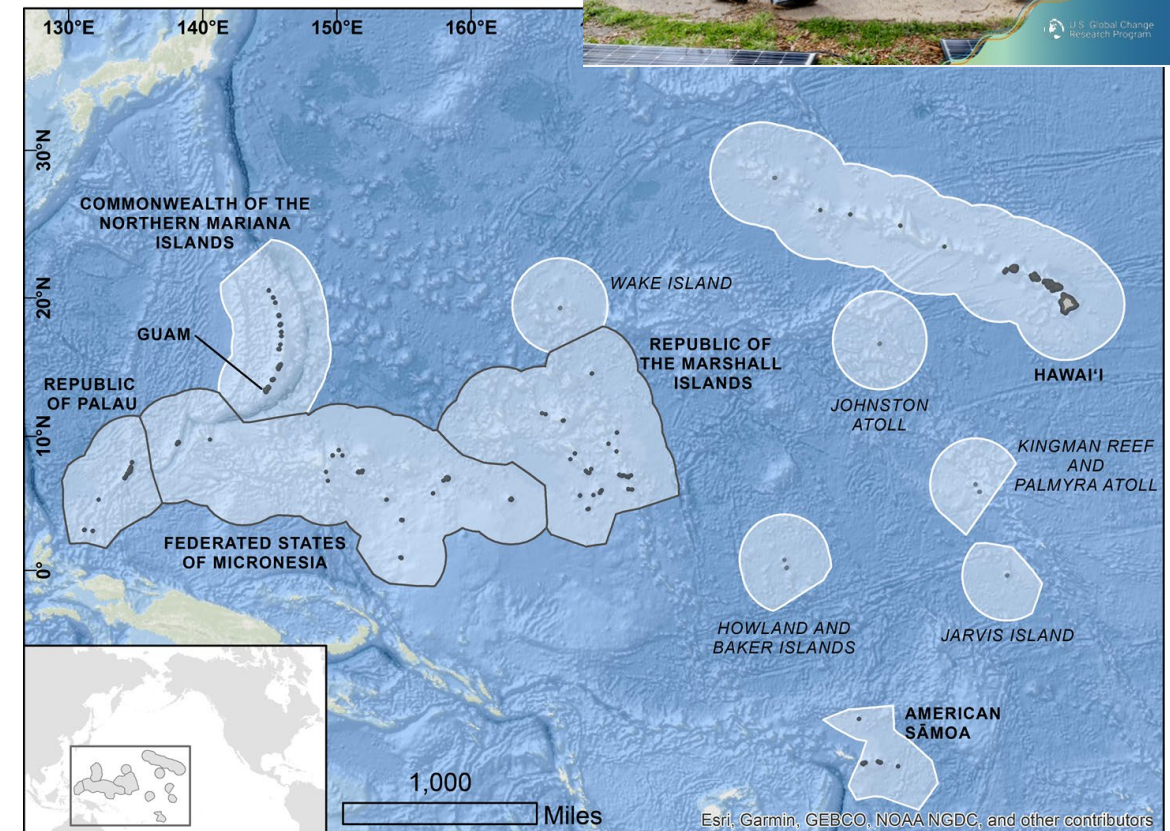
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The 5th US National Climate Assessment (NCA5)

- The NCA is a quadrennial report released by the White House to quantify national climate risks and sectoral adaptation options
 - Federal Highly Influential Scientific Assessment (HISA)
- The Hawai'i and Pacific Islands Chapter:
 - 2+ years
 - 5 key message workshops
 - 16 authors
 - 41 technical contributors
 - 486 references assessed

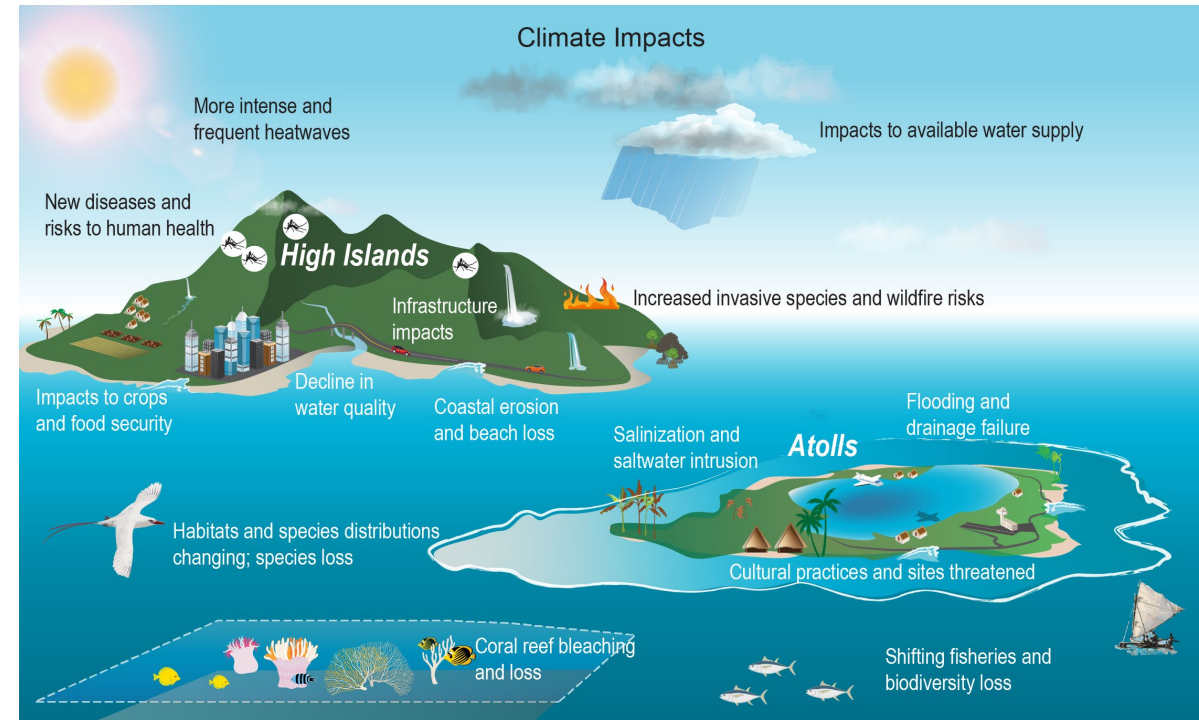
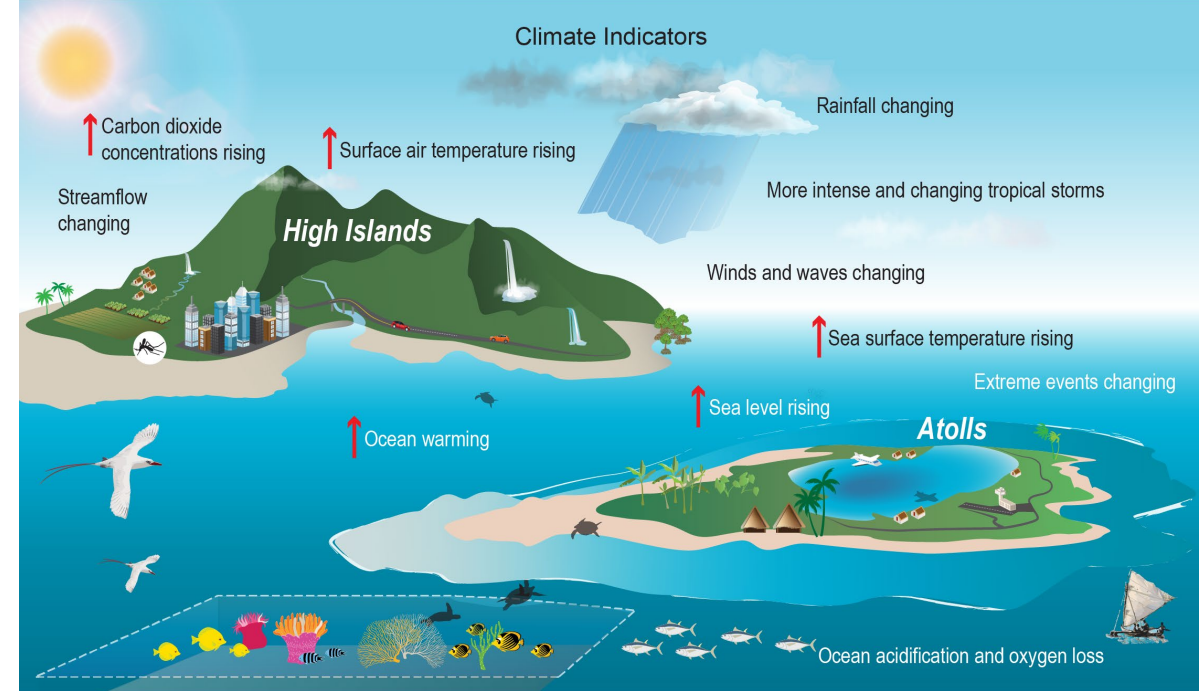


Climate change in the Pacific Islands **exacerbates inequities** and **threatens** ecosystems, cultural resources, human health, livelihoods, built environment, and access to water & food

- Natural internal climate variability means that there is a range of possibilities for any particular year, and short-term trends may go against the long-term climate projections
- Future global greenhouse gas emissions will heavily influence what happens in the Pacific after mid-century
- Warmer air and sea surface temperatures with more heat extremes and marine heat waves;
- Increasing ocean acidification;
- Increase in frequency and intensity of heavy rainfall events and riverine flooding;
- A greater proportion of more intense tropical cyclones;
- Continuously rising sea level rise and increased coastal flooding
- Fisheries and aquaculture operations negatively impacted by increasing SST, acidification, and degraded coral reefs

<https://nca2023.globalchange.gov/chapter/30/>

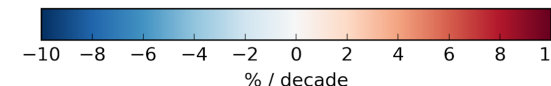
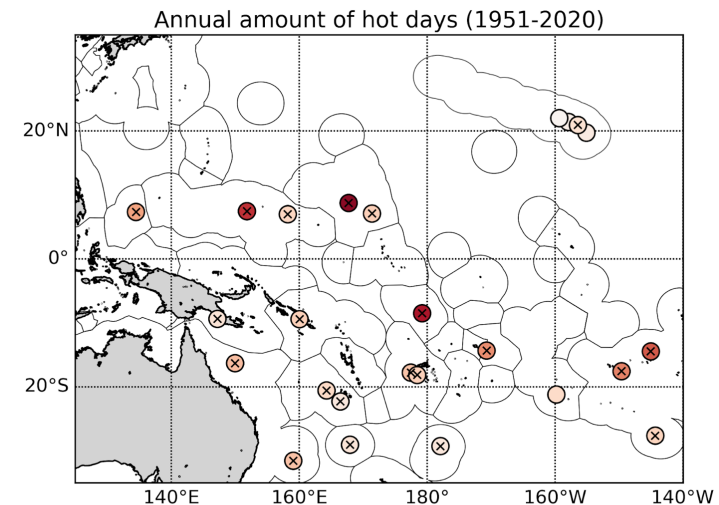
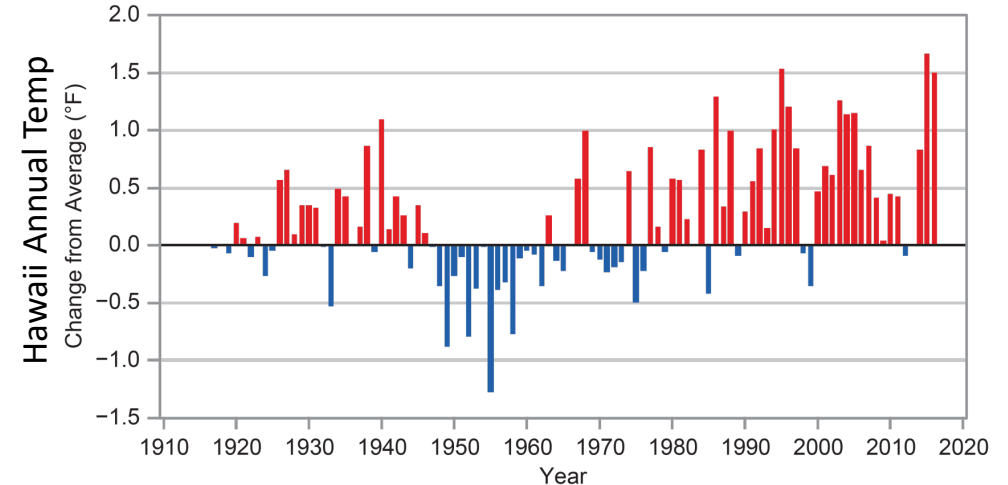
NCA5 FIGURE 30.5



The number of hot days per year has increased dramatically

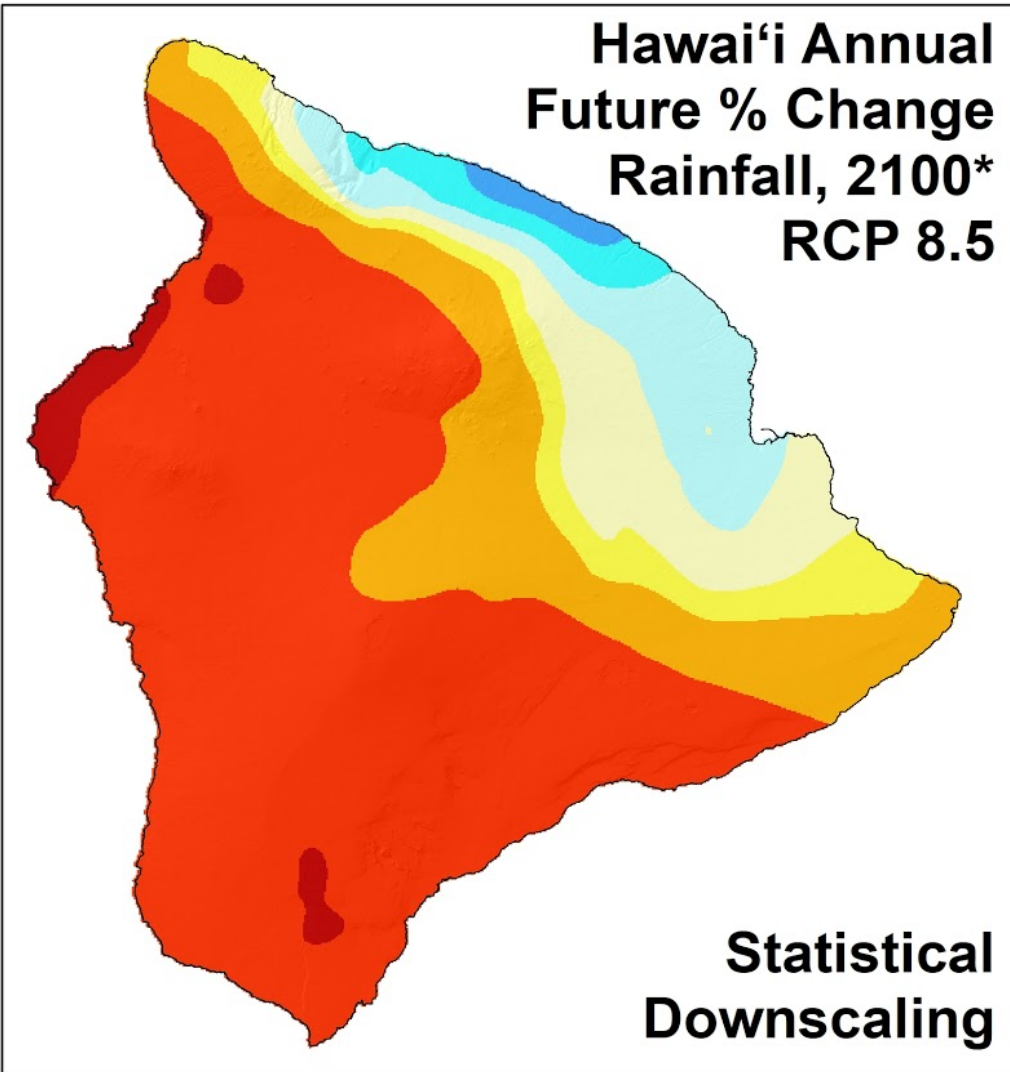
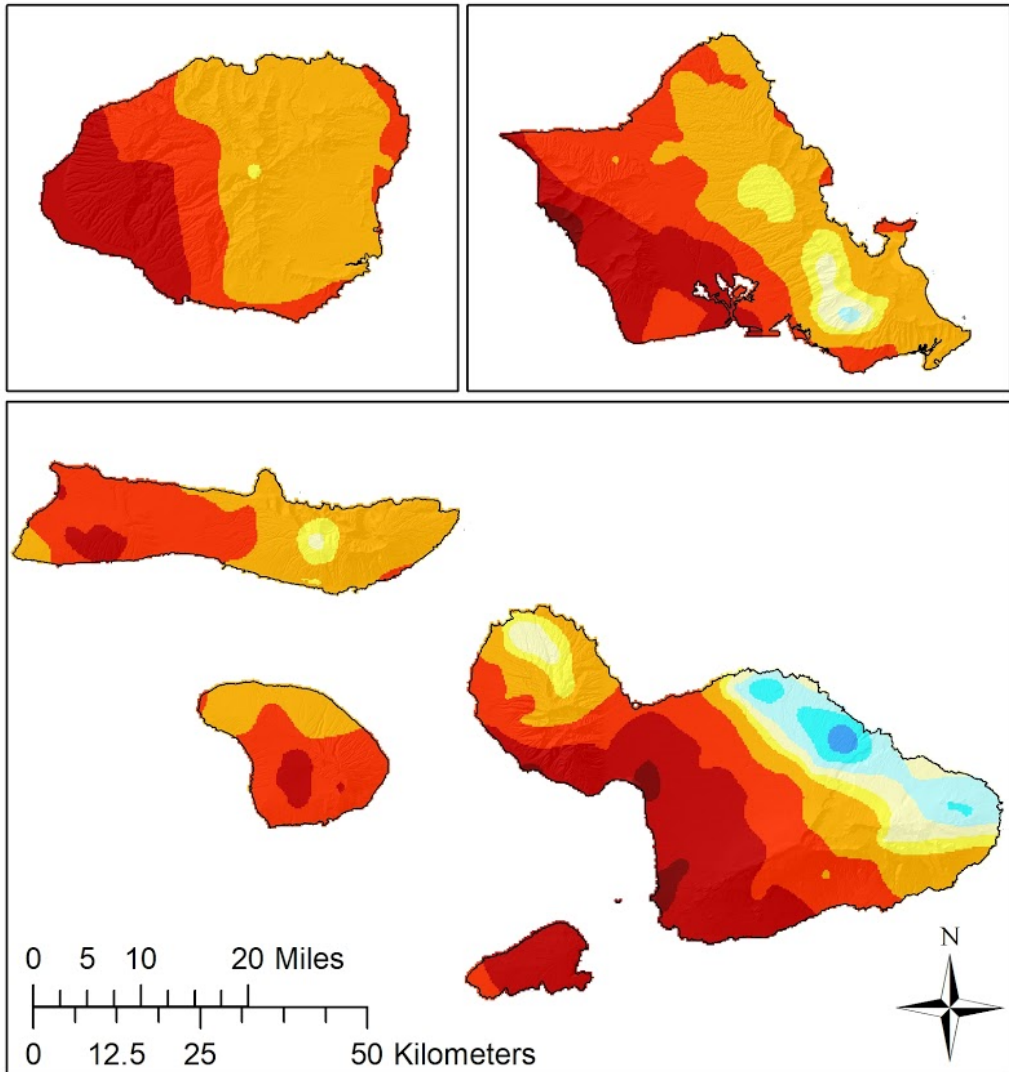
- The average # of hot days has increased while the # of cool nights has decreased
- Shift across the Pacific to more extreme and frequent daily heat events
- Seven of the warmest eight years on record have occurred since 2007. Every year since 1983 has been above the 1961–90 average.

Hawai'i annual average temps over the past century show a statistically significant warming trend (Keener et al. 2018; McKenzie et al. 2019)

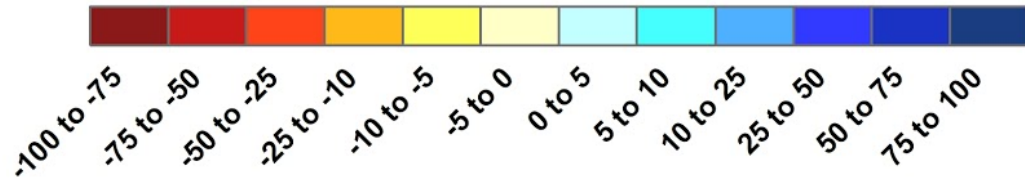


Marra et al. 2022

Rain



Percent Change



Data Sources:
Oliver Elison Timm. See Elison Timm et al. 2015,
Journal of Geophysical Research: Atmospheres

Processing and Map by Abby Frazier
(abbyf@hawaii.edu), East-West Center. 5/31/2019

*Future Percent Change in Rainfall, 2070-2099

Climate Boundary Organizations are Critical to Transform Global Science into Local Implementation

- Climate impacts are being felt now, and adaptation is critical at local scales
- Natural resource managers and communities often need data in different formats, scales but lack time and expertise
- Boundary organizations create a productive interface between science and policy
- Help make climate data more accessible, standardized, and relevant for local & sectoral decision-making
- New partnership models needed between researchers, governments, businesses, and communities
- Relational, non-transactional, collaborative approaches to adaptation are needed

Key Climate Impacts

1. Climate Change Impairs Access to Healthy **Food & Water**
2. Climate Change Undermines **Human Health**, but Community Strength Boosts Resilience
3. Rising Sea Levels Threaten **Infrastructure & Local Economies** and Exacerbate Existing Inequities
4. Responses to Rising Threats May Help Safeguard Tropical **Ecosystems & Biodiversity**
5. **Indigenous Knowledge Systems** Strengthen Island Resilience

<https://nca2023.globalchange.gov/chapter/30/>



1. Climate Change Impairs Access to Healthy Food & Water

- Regional food security is negatively impacted by rising temperatures and sea level
- Rising average, night-time temperatures, and heat extremes threaten commercial, subsistence, and cultural foods
 - Spread of pests linked to heat and drought
- Droughts have become longer and more severe and are the principal cause of crop loss
- Access to healthy food is an issue of

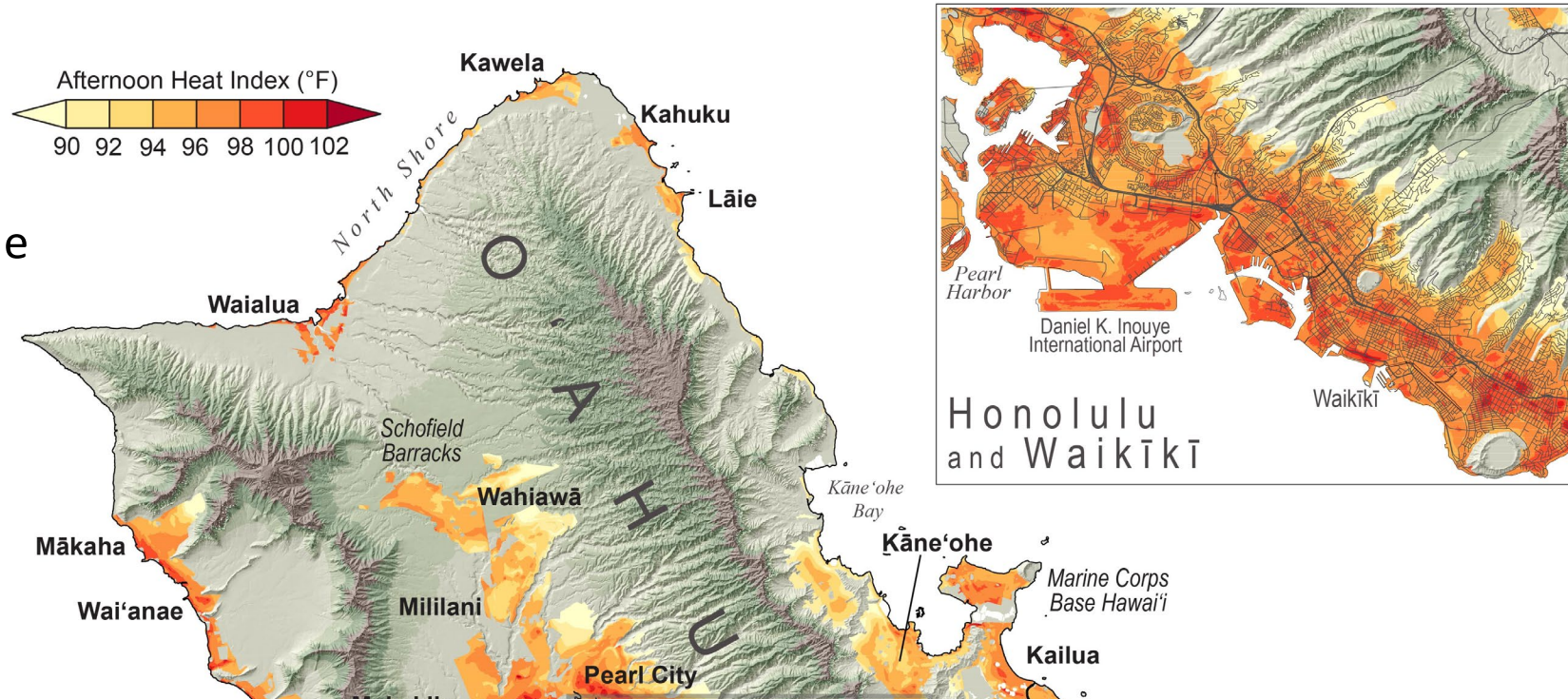


- SLR 2022 (1.4): Balance managed retreat from urban areas with preservation of ag and conservation lands
- Decarb Strategy: Recommend ag best management practices; consider impacts to frontline and low-income communities
- Green Fee: Reinvest in local food security planning; support groundwater and streamflow monitoring
- Prior Session: Sen Bill 420 Support establishing sustainable food systems working group within the Department of Agriculture

2. Climate Change Undermines Human Health, but Community Strength Boosts Resilience

- Climate change impacts human health both directly and indirectly
- Climate change is increasing the frequency, intensity, and duration of heat extremes. On this afternoon, the maximum recorded heat index was 107.3°F
- 82% of heat-related deaths in Honolulu are already attributable to climate change
- An increase in the incidence of

O'ahu Community Heat Assessment (August 31, 2019)



- SLR 2022 (2.6): Protect human health via implementing flood design standards
- SLR 2022 (6.1): Support DOH to develop criteria for identification of contaminated sites at high-risk of causing significant harm due to rising sea level and flooding; support a One Health framework; cesspool conversion
- Decarb Strategy: Prioritize minimizing health impacts to frontline and low-income communities
- Prior Session: Climate Impact Special Fund HB1052

3. Rising Sea Levels Threaten Infrastructure & Local Economies and Exacerbate Existing Inequities



- Sea level rise will increasingly impact coastal infrastructure, transportation, ecosystems, and communities
- Changes from SLR will exacerbate existing social challenges by disrupting livelihoods
- Hawai‘i has enacted forward-looking state and county policies
 - increased minimum setbacks for coastal development
 - setbacks incorporating science-based erosion rates and long-planning horizons that account for future SLR
 - mandate to disclose SLR hazards prior to real estate transactions
 - requirement for state agencies to assess and plan for SLR impacts

- SLR 2022 (1.2): Seek opportunities to plan new development outside of the SLR-XA under long-term, comprehensive managed retreat strategy; (3.7) Develop pre-disaster recovery frameworks at state and county levels that incorporate opportunities to adapt to sea level rise through disaster recovery; (6.1) Cesspool conversion
- Green Fee: Reinvest in supporting SLR strategy recommendations
- Prior Session: Climate Impact Special Fund HB1052; Erosion Rate Disclosures SB1839; Tax Credit Wind Retrofits SB709; Rebates for EV Ready at Affordable Housing HB1252; DLNR Managed Retreat Program HB756

4. Responses to Rising Threats May Help Safeguard Tropical Ecosystems & Biodiversity

Characteristic Ecosystems of the Pacific Islands

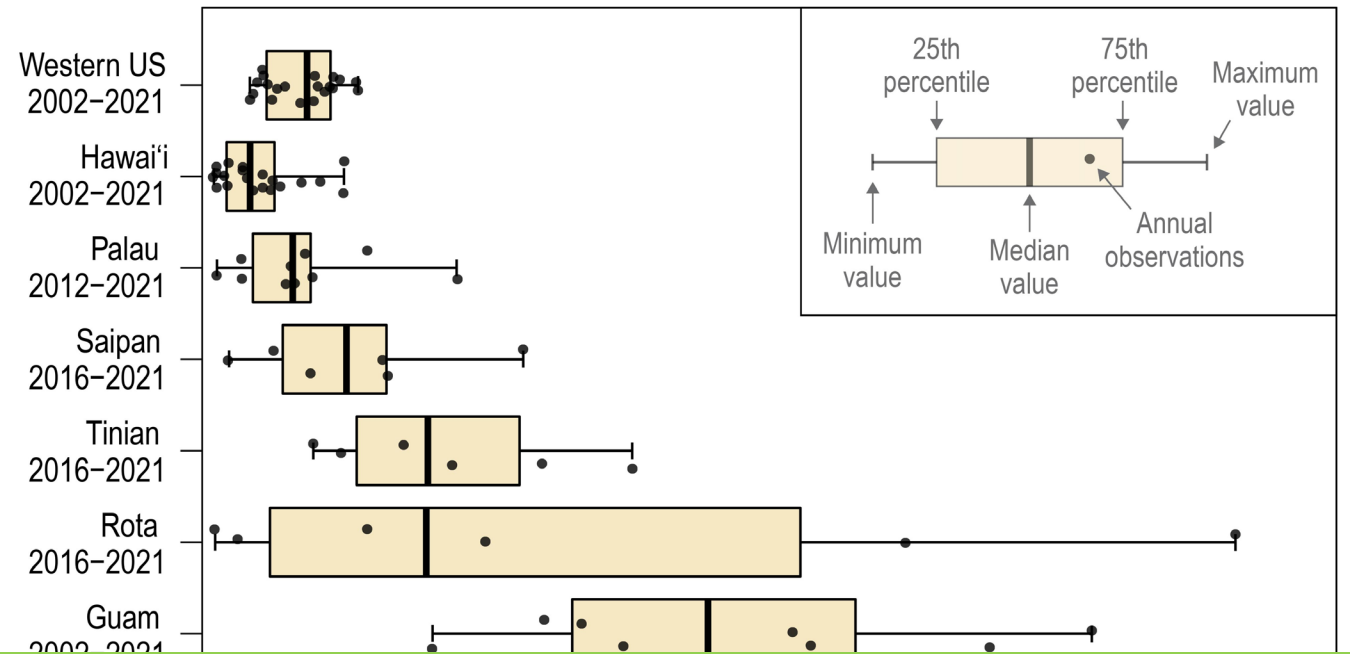


NCA5 FIGURE 30.12

- Fisheries and aquaculture operations will be negatively impacted by increasing SST, acidification, and degraded coral reefs
- Reduced commercial and subsistence catch, smaller fish, degraded reefs
- Increased drought will accelerate the contraction of ranges of endemic and endangered plants and animals
- Regional efforts increasingly focus on restoration management that enhances climate resilience:
 - boosting adaptive capacity
 - Hydrological benefits (aquifer recharge)
 - Sociocultural benefits
 - Carbon sequestration
 - Sediment retention

Wildfire Area Burned in the Pacific Islands Compared to the Western US

- Wildfire area burned has increased fourfold from the early 1900s and is most prevalent in nonnative grasslands and shrublands
- Climatic shifts are expected to impact native ecosystems via interactions with fire.
- Wildland fires already burn a higher percentage of total land area in the



- SLR 2022 (4.3) Explore legislative and policy mechanisms to designate funding for priority coastal lands and enable the use of a variety of practices and tools and utilize existing programs to acquire beaches and other coastal lands for recreational, cultural, ecosystem and resilience objectives
- Support watershed-based protection and restoration, Hawaii Watershed Partnerships Program; wildfire management; additional human resources
- Prior Session: Climate Impact Special Fund HB1052; Carbon Fee HB1146/SB1008

5. Indigenous Knowledge Systems Strengthen Island Resilience

- Climate Change affects health, well-being, and modern livelihoods of Pacific Island peoples
- Reciprocal and spiritual relationships among the lands, territories, waters, resources, and peoples are being strengthened and sustained as communities adapt and manage their resources collectively
- Climate is affecting cultural sites that show the heritage of interconnectedness with the environment (*right*)
- Communities and cultural practitioners are working with scientists to identify areas where food production (taro, breadfruit, sweet potato) could be expanded under future climate scenarios



- SLR 2017 (5): Conserve and adapt Native Hawaiian cultural resources and sites
- SLR 2022 (5.2): Work with Native Hawaiian Communities to develop a culturally-based adaptation process and protocols; (5.3) Develop adaptation plans to preserve access to coastal lands and water within Native Hawaiian communities
- Support community-led adaptation projects; watershed-based protection and restoration; additional human resources
- Prior Session: Climate Impact Special Fund HB1052

Local policies can **accelerate regional resilience** by replication across sectors and islands

- At higher global warming levels, we will experience **more severe** climate impacts.
- Local interventions can mitigate some amount of climate risk. **Include local organizations and communities** as partners to co-develop plans.
- **Future scenarios provide a range** to plan for depending on a system's risk tolerance:
 - Translate physical risk into financial risk
 - Worst-case scenarios provide upper limits for adaptation needs – for a high-risk investment
 - Best-case scenarios establish minimum adaptation requirements
- **Public-private partnerships** can combine actionable research, community building, collaborative learning, and leveraging resources
- Partnerships that integrate and **prioritize cultural knowledge** and natural resource management
- Peer exchange: what are adaptation **strategies that are transferrable** across sectors and islands?

Link & Citation:

<https://nca2023.globalchange.gov/chapter/30/>

Frazier, A.G., M.-V.V. Johnson, L. Berio Fortini, C.P. Giardina, Z.N. Grecni, H.H. Kane, V.W. Keener, R. King, R.A. MacKenzie, M. Nobrega-Olivera, K.L.L. Oleson, C.K. Shuler, A.K. Singeo, C.D. Storlazzi, R.J. Wallsgrave, and P.A. Woodworth-Jefcoats, 2023: Ch. 30. Hawai'i and US-Affiliated Pacific Islands. In: Fifth National Climate Assessment. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA.
<https://doi.org/10.7930/NCA5.2023.CH30>

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Chapter Webinar: February 13, 2024 1:00PM - 2:00PM HST. Register at
<https://www.globalchange.gov/events/nca5-webinar-hawaii-us-affiliated-pacific-islands>

White House release event at HI Climate Week, March 27 2024: More Info Soon!