Stories of Water, Stories of Resilience: Community Voices of Hāmākualoa

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Abstract

Climate change is shifting rain patterns and increasing flooding globally. The benefits and challenges of water shape the stories of people and places worldwide, influencing cultures, livelihoods, and ecosystems. In Hawai‘i, wai (freshwater) is foundational to life, identity, and connection. Community members from Hāmākualoa, Maui, know deeply about their water, streams, and watersheds. They also face uncertainties as increased floods and droughts, exacerbated by climate and land use changes, threaten their homes and livelihoods. Severe flood events in Hāmākualoa, including a dam breach in 2021, highlight the urgent need for community-driven solutions. Guided by the Hawaiian proverb “I kahiki ka ua, ako ‘ē ka hale” (While the rain is still far away, thatch the house; Be prepared), the primary objective of this project was to weave the stories of water and resilience in Hāmākualoa, integrating ‘ike Hawai‘i (Indigenous knowledge) and community voices with scientific insights to strengthen preparedness. Through a participatory approach, this study amplifies the voices of Hāmākualoas people—those who have lived through and learned from these events. A community survey (n=33) found that 64% have experienced flooding firsthand, with significant concerns including property damage, blocked waterways, and poor road conditions. Semi-structured interviews (n=9) with residents revealed that traditional stream stewardship once helped regulate water flow, but modern disruptions, such as diversions, climate change, and increased development, have altered natural hydrological patterns. Many emphasized the need to restore traditional stream stewardship practices, to reinforce that resilience is rooted in knowing and caring for the land, and to embrace the unknown. This project has taken meaningful steps toward strengthening community resilience. Specifically, through hosting a stream restoration event that engaged residents in education of stream names/histories along with an activity to create stream name signs for local bridges, reinforcing education and awareness as a step into resilience. These efforts have deepened community awareness, strengthened local stewardship, and provided a foundation for continued collaboration between residents, researchers, agencies, and policymakers. The stories of water in Hāmākualoa are equally stories of resilience, offering lessons for this community and others facing similar climate challenges.

Keywords: Floods, Adaptation, ‘Ike Hawai‘i, Climate Change, Ha‘ikū, Maui

Acknowledgments

No Hāmākualoa mai au. I am from the moku of Hāmākualoa, Maui – the ʻāina of my kūpuna, my ʻohana, and my future. This ʻāina guides me, shaping my research journey and strengthening my understanding of who I am. My identity is woven within this place, and the inspiration for this project flows through its passing showers and streams. I have witnessed the abundance and challenges that its water brings. Through this capstone journey, I have deepened my relationship with this place, gaining a more intimate understanding of its rhythms, landscapes, place names, people, stories, and needs. For this, I am deeply grateful.

I would like to thank my Opana ʻOhana for raising me with love and encouragement. I am greatly inspired by my mom, Maile, for her dedicated work towards the well-being of our kaiāulu and ʻāina. I would like to thank my papa Toots for introducing me to wahi pana, connecting moʻolelo to place, and allowing me to see Hāmākualoa through his perspective. Thank you to my friends and kāne for being a solid support system! Thank you, Hauʻoli Mau Loa Foundation, for funding my education. I thank my panel, Dr. YinPhan Tsang, Dr. Creighton Litton, and Dr. Leah Bremer, for their endless support, guidance, and direction. Thank you to Dr. Mehana Vaughan and Dr. Chris Shuler for believing in me, providing opportunities to grow, and inspiring me to use research to empower communities. Thank you all for being my mentors.

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Motivation

Flooding is becoming one of the most pressing climate-related threats facing communities worldwide. As climate change accelerates, the intensity and frequency of extreme precipitation events are increasing, leading to both rapid-onset disasters and long-term disruptions to ecosystems and infrastructure. While conventional gray infrastructure, like levees, culverts, and drainage channels, has long been used to manage flood risk, these systems are increasingly recognized as insufficient on their own (Flores et al., 2025). In response, there is growing global momentum toward nature-based solutions and integrated watershed approaches that emphasize ecological restoration, cultural relationships, and inclusive governance (Raub et al., 2024). Indigenous communities have long stewarded water systems through place-based practices that embody resilience and reciprocity. Scholars and practitioners alike have called for the centering of Indigenous knowledge as both an equity imperative and an effective adaptation strategy (Berkes, 2001; Whyte, 2018).

In Hawai‘i, the need to restore balance between land, water, and people is particularly urgent. The archipelago is experiencing shifts in rainfall patterns, rising temperatures, and more extreme storm events that put both natural systems and communities at risk. Historically, water management in Hawai‘i was governed through the Moku system (Land Division) and enforced by Konohiki (Land Division Overseer?) under the framework of Kānāwai—a sophisticated system of environmental law and social responsibility (Winter et al., 2018). This Indigenous system organized resource use according to ecological principles and ancestral relationships to place. However, widespread disruptions caused by the illegal overthrow of the Hawaiian Kingdom, plantation agriculture, stream diversions, and development have altered the island's hydrology and eroded these governance systems (McGregor, 2007). Today, many flood response strategies in Hawai‘i remain rooted in centralized, top-down planning that often excludes communities and fails to engage historical or cultural knowledge (Harangody et al., 2022). Federal flood maps and hazard plans frequently overlook areas that local residents know to be vulnerable (Flores et al., 2025). This disconnect contributes to under-preparedness, uneven exposure, and a continued loss of trust in public systems.

"I kahiki ka ua, ako ʻē ka hale. While the rain is still far away, thatch the house. Be prepared." — Mary Kawena Pukui (1983)

Map of location

The Moku of Hāmākualoa is situated on the north slopes of Haleakalā, Maui, and serves as a site for examining the integration of Indigenous and community-centered approaches to flood resilience. This moku experiences intense rainfall and hydrological instability due to both natural topography and layered human impacts. In 2021, a dam breach in Haʻikū, Hāmākualoa, exposed gaps in warning systems, infrastructure, and flood preparedness. By focusing on Hāmākualoa, this research amplifies community voices, documents flood patterns, and uplifts practices of mālama (care) that are critical for resilience. This interdisciplinary project bridges hydrology, land-use change, Indigenous governance, and community planning to model a more relational, responsive approach to environmental management in the face of climate change.

Background

Flooding is one of the most widespread and devastating natural hazards globally, resulting in significant human, ecological, and economic impacts. Flood events have increased by over 130% in the past two decades due to climate change, land-use intensification, and inadequate infrastructure (World Meteorological Organization, 2021). Floods now affect more people annually than any other type of disaster, with underserved and rural communities often facing the most significant risk (Wing et al., 2018). In the United States, flooding causes more average annual property damage than any other weather-related hazard, with flash floods, riverine overflow, and storm surges resulting in billions of dollars in damages and loss of life (NOAA, 2022). As rainfall patterns intensify and become more erratic due to rising global temperatures, traditional flood control methods—such as levees and drainage systems—are proving insufficient. This shift has sparked a growing recognition that successful flood resilience requires integrating engineering approaches with community-driven planning and localized knowledge (Pfefferbaum et al., 2013).

In Hawaiʻi, flooding is shaped by both environmental and anthropogenic forces. Island ecosystems are particularly prone to extreme weather due to steep terrain, limited drainage

capacity, and changing rainfall regimes. Areas like Hāmākualoa, on Maui's north shore, are especially at risk. Historically, the people of Hāmākualoa have stewarded water systems through land-based knowledge and collective governance, including the konohiki system and Kānāwai (customary water laws). These systems enabled the careful regulation of streamflow and loʻi kalo irrigation, thereby maintaining a balance between human needs and ecological cycles. In 1848, there were 919 registered loʻi kalo in the māhele for Hāmākualoa (Maly, 2001). However, colonial and plantation-era land transformations, such as large-scale agriculture, forest clearing, and stream diversions, severely disrupted these systems. Post-contact development reduced the land's natural ability to absorb and redirect excess water, increasing vulnerability to flash floods, erosion, and infrastructure failure (Maclennan, 1997). In Hāmākualoa today, aging bridges, undersized culverts, and poorly maintained drainage systems compound the risk, especially as storm intensity increases.

The epistemological framework of ka wai ola, water as the giver of life, is central to Kānaka ʻŌiwi understandings of resilience. As Vaughan (2016) echo, ancestral knowledge embedded in moʻolelo, place names, and seasonal rhythms offers essential guidance for adapting to contemporary climate challenges (McGregor, 2010). Yet, this ʻike kūpuna is often excluded from formal flood policy and hazard maps. There is a pressing need to restore these systems of relational stewardship as part of modern resilience planning (Landström et al., 2019).

Severe flood events across Hawaiʻi, such as the 2018 flood in Kauaʻi that dropped nearly 50 inches of rain in 24 hours—the most ever recorded in the U.S. (NOAA, 2019) underscore how quickly climate extremes can overwhelm communities and infrastructure. Climate projections for Hawaiʻi forecast more intense and less frequent storms, causing higher peak streamflows and greater risk of flash flooding (Chu et al., 2010; Frazier & Giambelluca, 2017). In 2021, a flood, triggered by a stalled Kona low that dropped over 15 inches of rain in 24 hours over Hāmākualoa, exemplifies these trends (NOAA, 2021). This event caused the Kaupakalua Dam to breach, causing extensive damage and prompted emergency evacuations, further revealing the limitations of current flood mitigation systems and response protocols. While county-level plans acknowledge climate risks, they often rely on outdated data and overlook the importance of local ecological knowledge and community leadership. Positive strides from the

Maui County Hazard Mitigation Plan (2020) acknowledge gaps in community engagement and the availability of local-scale data, these agencies are often underfunded and short-staffed.

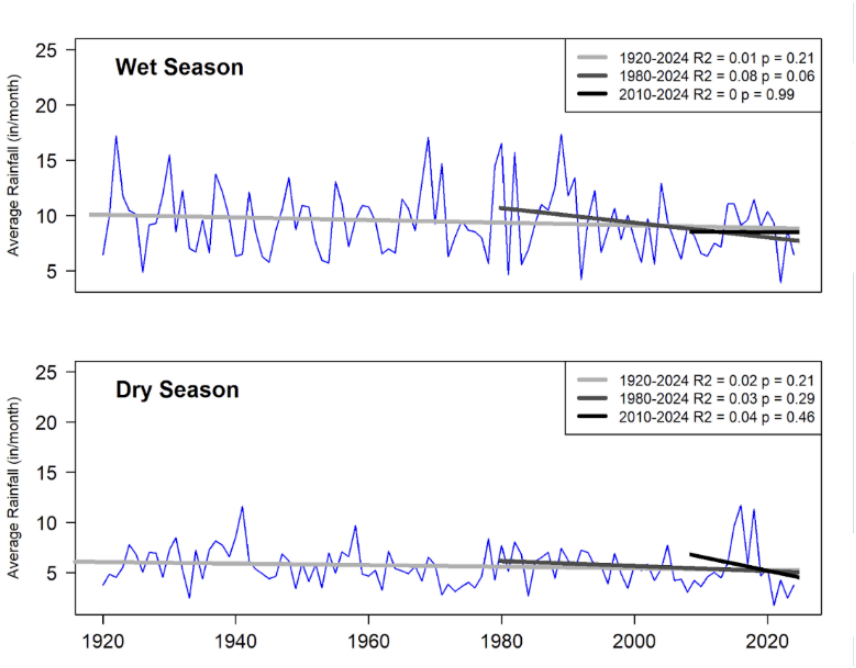

Figure 1. Average Hāmākualoa Rainfall (in/month) indicates a general decrease. (PDKE, 2023).

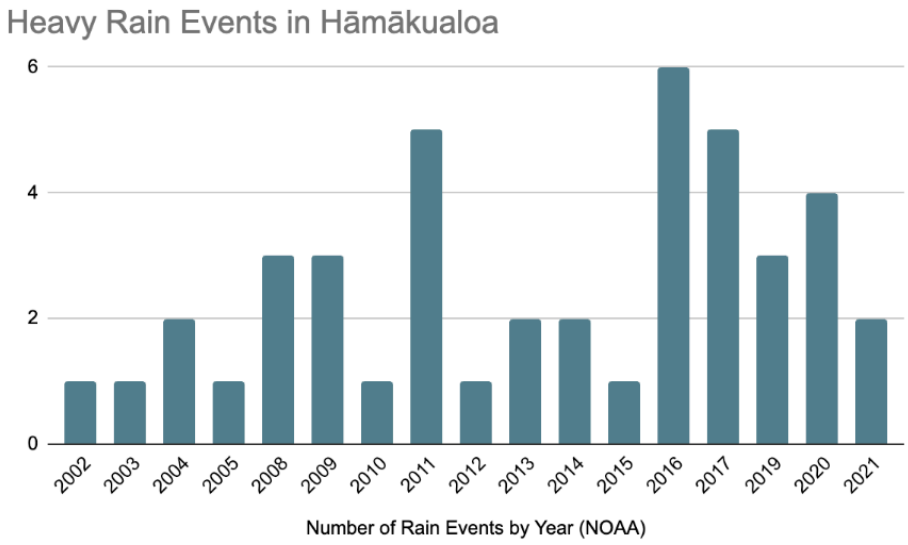

Figure 2. The number of Heavy Rain Events by Year in Hāmākualoa indicates a general increase. (NOAA Storm Database, 2021).

This project aims to address that critical knowledge gap. By integrating survey data, interviews, and participatory stream mapping, it documents the lived experiences of flooding in Hāmākualoa and uplifts ʻŌiwi-informed models of resilience (Oliveira, 2017). In doing so, it contributes to a shift in flood management—away from top-down infrastructure alone and toward rooted, community-driven strategies as seen in other communities around Hawaiʻi: Haleleʻa, Maunalua, Haleiwa, Kihei, to name a few.

"Wisdom sits in places. It's like water that never dries up. You need to drink to stay alive, don't you? Well, you also need to drink from places. You must remember everything about them. You must learn their name. You must remember what happened at them long ago."

- *Dudley Patterson*, Apache, Cibecue Horseman. (Basso, 1940).

Objectives

The fundamental objective is to enhance flood resilience in Hāmākualoa by addressing vulnerabilities in hydrology, infrastructure, and community preparedness. The intent is to strengthen local capacity for flood resilience through a place-based understanding of both environmental and social dimensions of flooding. Specifically, the project aims to:

(i) Document community knowledge regarding the spatial extent and severity of flooding in Hāmākualoa over time.

(ii) Understand community perception on the ways that flooding has impacted community well-being and way of life, and what they need or envision for a more flood-resilient future.

(iii) Support community resilience to flooding through organizing a community-based stream stewardship project.

Approach

This study employed a mixed-methods approach, combining qualitative and Indigenous research methods to analyze various data sources, including surveys, interviews, and climate data (Saldaña, 2013). Guided by *makawalu* (multiple perspectives), the research weaves ʻike kūpuna (ancestral knowledge) with contemporary science to better understand and support flood

resilience in Hāmākualoa (Keliʻikipikāneokolohaka, 2020). Through the University of Hawaiʻi, Institutional Review Board, via protocol #2024-00282, Human Research approval was obtained on July 25, 2024, for both the survey and interview process.

Surveys

Through ArcGIS Survey 123, an anonymous survey was distributed to collect community input on flooding locations, perceptions, water concerns, and climate perceptions. This method facilitates an understanding of community experiences and perceptions of local flooding by capturing a broad range of lived experiences across Hāmākualoa (Appendix A). It was distributed through two newsletters, three community events, and two social media accounts. A total of 33 responses were collected, comprising 18 in-person and 15 online.

Interviews

From August to October 2024, I conducted nine semi-structured interviews with Hāmākualoa residents. Six participants were selected based on their firsthand experience or generational knowledge, and three were identified through interviewee referrals or a snowball sampling approach (Saldaña, 2013). Interviews, guided by ten open-ended questions (Appendix B), lasted about one hour and were conducted in-person or virtually, depending on interviewee's preference. This format enabled deep and organic discussions, delving into the history of the place and the experiences of community members. Each participant received a lei, a gift card, and a poetic transcription of their words.

Data Analysis

Interviews were transcribed using OtterAI software and manually edited for accuracy in ʻŌlelo Hawaiʻi and place-based terminology. Survey responses were cleaned and reviewed in ArcGIS Survey123 and Excel to identify broad trends. Thematic analysis was conducted through an iterative, inductive coding process in NVivo software (Elliott-Mainwaring, 2021). This approach allowed key themes to emerge organically from participant narratives while honoring the knowledge embedded in community storytelling. Open coding identified initial categories, including flood impacts, memory, water flow, and changes over time (Onwuegbuzie et al., 2016). In vivo coding was employed to highlight participants' powerful expressions in their own words. These were transformed into poetic vignettes and shared throughout the report to reflect the tone,

rhythm, and ‘ike of community narratives (Sanders & Lamm, 2022). This method helped ensure that the emotional and cultural depth of the stories remained central to the analysis (Appendix E).

Results

This section presents findings from surveys and interviews with community members to illuminate how floods are remembered, felt, and responded to across generations. Rather than viewing flooding solely as a hazard, these results highlight how people understand its causes, impacts, and potential solutions. The following subsections are organized around the project’s three guiding objectives.

Spatial Extent of Flooding

The first objective sought to document how residents understand and track the spatial extent and severity of flooding in Hāmākualoa. By gathering both mapped survey data and interviews, this study captures how flood risk is distributed unevenly across the landscape and how long-term residents interpret recurring patterns of inundation.

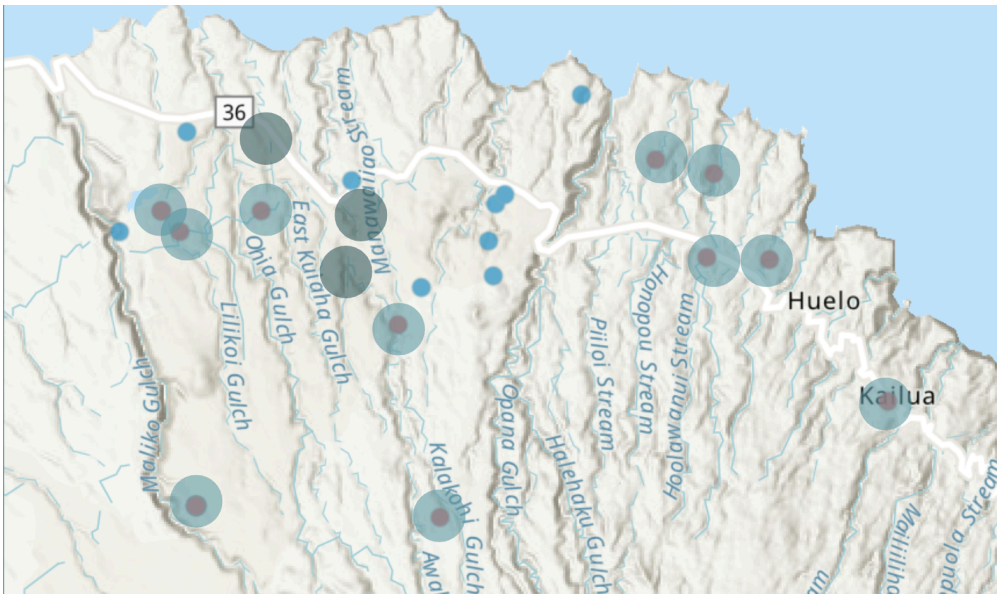

Figure 3. Flood-Prone Areas in Hāmākualoa, Maui. This map highlights locations identified by community members and flood data as experiencing frequent or severe flooding events.

Out of 33 survey respondents, 22 (67%) reported experiencing floods in Hāmākualoa. Flooding was described as recurrent and intensifying, especially for residents living near low-lying gulches or stream crossings. Interviewees affirmed this, referencing major floods in 1986, 1998, 2006, 2018, and 2021: roughly every ten years, pointing to a cyclical flood pattern in the region. One resident recalled a flash flood that "*took out the bridge*" and heard the roar of boulders. Another described watching the water rise to their carport, calling it "*a reminder that the stream remembers its way.*" Residents repeatedly tied flood risk to disrupted hydrology due to diversions, development, and poor infrastructure maintenance. Themes like *stream overflow, water reclaiming power*, and *erosion control* emerged in interviews. There were frequent mentions of blocked culverts and bridge failures. Historical knowledge of natural drainage paths, altered over time by roads or plantations, was cited as essential but overlooked in current flood planning.

Figure 4. Community Resilience Amid Flood Damage in Hāmākualoa.

A resident navigates a washed-out road following a severe flood. The overlaid quote from Interviewee 7 highlights both the trauma and strength experienced during the event

Flood effects on the community

Building on this spatial and historical knowledge, the second objective shows how flooding affects community well-being and daily life. This includes physical impacts, such as road closures and property damage, emotional responses, cultural disconnection, and visions for a more resilient Hāmākualoa. Interviews and survey responses revealed that flooding in Hāmākualoa affects not just homes and roads, but also emotional and spiritual well-being. Participants expressed frustration with poor communication from agencies, confusion around evacuation procedures, and a lack of clear information. The codebook frequently referenced categories such as *gap in public knowledge*, *stressful event*, and *trauma*.

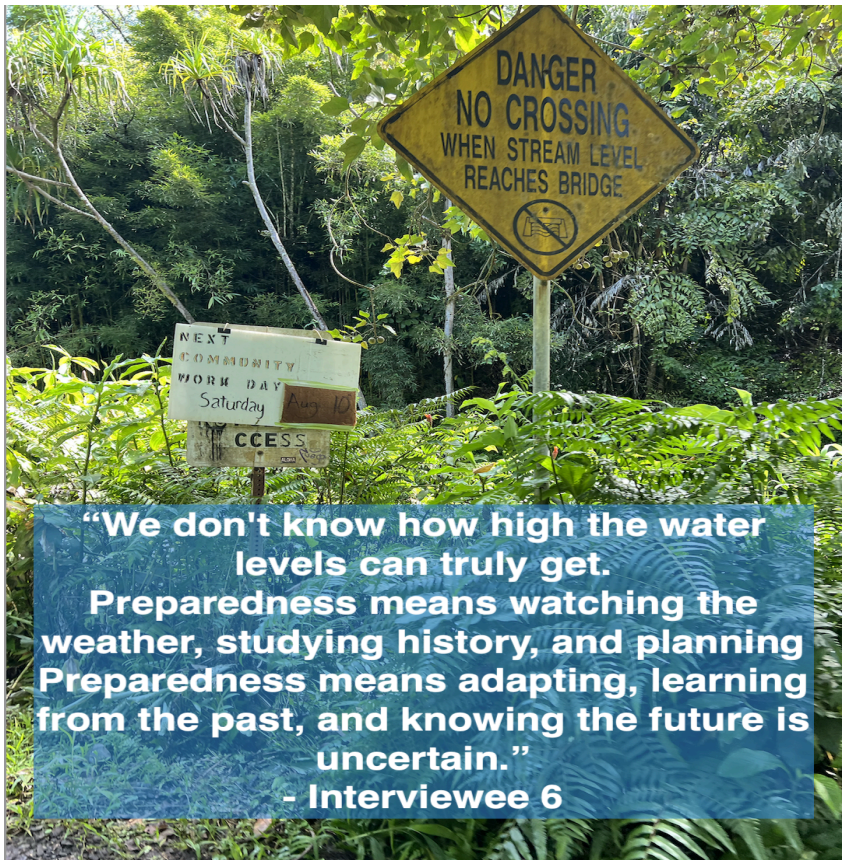

Figure 5. Resilience moving forward in Hāmākualoa.

A sign shows a community work day and a dangerous stream crossing area. The overlaid quote from Interviewee 6 highlights ways to move forward.

One interviewee recalled evacuating with only their "*slippers and phone*," while another described the emotional toll of "watching the stream come closer and not knowing who to call." Another interviewee described bringing three pairs of clothes with him on his way to school: the first one soaked, a second change for the day, and a third for just in case. These narratives show a community grappling with both the physical and psychological impacts of increasingly unpredictable floods (Appendix D, Appendix E). Despite these challenges, residents articulated strong visions for the future. When asked what healthy streams in Hāmākualoa should look like, responses consistently emphasized *flow, restoration, and connection.* Common words included: water, streams, flow. Many residents hoped to see stream names restored, mauka-to-makai connectivity repaired, and invasive species removed to improve stream capacity. A recurring theme was kuleana—both personal and collective. One participant noted, "When we forget the names, we forget the responsibilities. Naming the stream is part of knowing how to protect it." Others emphasized the need for youth education, culturally grounded flood planning, and accessible early-warning systems.

Resilience through Action

Lastly, the third objective focused on supporting resilience through action. Through a stream name sign-making event and community education efforts, this project aimed to reconnect residents with their local streams' names, functions, and significance as a foundation for stewardship and long-term flood preparedness. To activate resilience, this project hosted a community stream name sign-making event in partnership with the Friends of Twin Falls and the Haʻikū Community Association. Over 40 residents, from keiki to kūpuna, participated. They learned traditional names of streams near their homes and created physical signs to be installed at local bridge crossings.

Figure 6. Pictures from the Community Event highlighting maps, signs, and discussions.

Participants described the process as fun and empowering. One said, “I didn’t know the name of the gulch near my house until today.” The event reconnected people with the cultural identity of place while opening space for shared knowledge and flood awareness. This participatory action also functioned as informal data collection. Attendees discussed flood histories of specific streams, identified flood-prone areas, and contributed ideas for future adaptation projects. The activity became a tool for documenting community knowledge while nurturing long-term stewardship (Woo et al., 2025).

The interview code *stream restoration* appeared across five transcripts, while *community action*, *kuleana land*, and *resilient communities* reinforced the power of grassroots organizing in response to environmental uncertainty. This integration of cultural practice, community education, and ecological planning reflects a model of resilience rooted in ‘āina and identity. As one resident concluded, “Resilience is in the relationships. Between us and the stream. Between the past and the future.”

Table 1. Thematic Codes Derived from Community Interviews on Flooding in Hāmākualoa

Sections	Emergent Themes	Key Emergent Codes
Community Perspectives	Community Action Community Resilience	Grassroots movements, Advocacy Organizing Efforts
	Gaps in Public Knowledge	Evacuation confusion Misinformation
	Trauma & Emotional Toll	Scared for safety, life Loss of belongings Uncertainty
Environmental Changes	Climate Change & Extreme Weather	Increase in Storms Rainfall Changes Drought Inconsistency
	Changing Landscapes	Shifts in streamflow Invasive Species Development
Infrastructure & Risks	Flooding & impact	Property Damage Evacuation Routes Loss of Access Preparedness
	Infrastructure Concerns	Road failures Bridge collapse Drainage issues Debris blockage
Water Management	Flow of Water	Stream diversion Springs disappearing Altered man-made paths
	Traditional Knowledge and Rights	Kuleana Land Rights Loʻi Kalo Legal Battles
	Local Governance & Water Authority	East Maui Water Authority Board Neighborhood Boards Clean-Up Work Days
Future Strategies	Emergency Preparedness	Data Collection Flood Planning Early Warning Systems
	Community Monitoring	Stream quality tests Stream level records
	Solutions & Adaptation	Restoration work Policy changes Restore Stream Flow

Discussion

The findings of this project highlight the complexity and depth of flood resilience in Hāmākualoa. While many resilience studies focus primarily on infrastructure or technical risk models, this study emphasizes that resilience is equally, if not more, rooted in relationships between people and water, communities and place, past and present. The results show that flood adaptation in Hāmākualoa must be culturally relevant, community-informed, and ecologically grounded to be effective and lasting.

A key outcome of this research is the clear documentation of lived flood experience across a broad geographic range. The survey revealed that two-thirds of respondents have experienced flooding firsthand, while interviews emphasized recurring flood cycles roughly every decade. These patterns align with both scientific predictions around climate-driven increases in extreme weather and local generational knowledge. Residents remembered past floods not simply as weather events, but as disruptions that altered their physical landscape and sense of safety. One kūpuna described the stream as "taking back what was blocked," reminding us that nature has its own memory and rhythm. This observation reflects a broader Hawaiian perspective: that natural systems are not separate from human systems but intertwined in daily life and kuleana.

The observed disconnect between formal agency planning and on-the-ground knowledge is a critical finding. Many residents expressed confusion around responsibilities for stream maintenance, flood alerts, and emergency response. These communication breakdowns have resulted in uneven preparedness across neighborhoods and have intensified feelings of vulnerability. While county and state plans identify Hāmākualoa as flood-prone, they often fail to incorporate spatial and emotional data provided by residents, where flooding happens, how it is experienced, and what people need to feel safe. The results call for a more participatory planning process, one that values localized insight as much as engineering metrics, going beyond FEMA.

Despite systemic gaps, the study also reveals emerging systems of care. Interviews pointed to informal flood response networks, where families and neighbors monitor streams, text alerts, and help kūpuna prepare. These grassroots practices are significant—they show that residents are not passive victims of climate change, but active agents of adaptation. Community

action is not a backup system but a frontline strategy. Supporting and resourcing these efforts is essential to long-term resilience.

The stream name sign-making project is a powerful case study of culturally grounded action. The event restored more than language by reconnecting people with traditional stream names and reactivating relationships. Participants described how learning names changed their understanding of place, revealing histories and responsibilities previously forgotten or hidden. This act of naming becomes a form of stewardship. It is not symbolic; it is infrastructural. Knowing a stream by name can improve awareness, monitoring, and response. This project demonstrates how cultural revitalization and hazard mitigation can be the same (Norris et al., 2008).

This capstone contributes to a growing body of work that argues for Indigenous and community-based knowledge systems as central, not supplemental, to environmental management. ʻIke kūpuna, moʻolelo, and Hawaiian governance principles such as Kānāwai offer tested, place-specific frameworks for balancing ecological function with community well-being. The guiding principles discussed in the results, like *Kānāwai Kākoʻi* (Disturbances) and *Kānāwai Manamana* (Connectivity), allow us to interpret flooding not only as a hazard but also as a teacher (Lincoln-Maiʻelua et al.,). Water reminds us to adapt, to prepare, and to care for one another.

The results also align with broader climate literature (Guido, 2023), hat underscores the need for hybrid models of adaptation, models that integrate scientific forecasting with social, cultural, and historical dimensions. The recurring words in stream vision statements—flow, restoration, connection—mirror restoration goals across other Indigenous communities globally.

Looking ahead, the anticipated release of a county stream restoration report offers a tangible opportunity to apply these insights. The Hāmākualoa community is already engaged in this planning process, and this capstone can inform that work by offering a foundation of community-voiced concerns and visions. Recommendations include: 1) incorporating stream names and community maps into official restoration plans; 2) funding ongoing community engagement and education; and 3) formalizing relationships between local monitors and agencies to bridge gaps in maintenance systems. Flood resilience in Hāmākualoa is not only about

infrastructure but about intimacy with place. This project demonstrates that when residents are invited to share their stories, insights, and hopes, the result is more than data—it is a blueprint for adaptive, culturally rooted resilience. As climate uncertainty grows, so too does the need to restore the relationships that hold our communities together.

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Appendix A. Survey Questions

Ha'ikū Water Survey

**Mahalo for sharing your time and mana'o with this quick anonymous survey.
Your participation is entirely voluntary, protected, and greatly appreciated!
My name is Lilia Davis; I am from Ha'ikū. I am a Graduate Student at UH Mānoa in Natural Resources and Environmental Management. For my thesis project, I am documenting flood events in Ha'ikū to better understand the history of water and strengthen future community resilience towards flood events. This survey will build on community knowledge.**

1. Where do you live? (Ex: Street, Town, Area)

2. How long have you lived here?

3. How much time do you spend in Ha'ikū?

Every day Once a week Once a month (+)

4. How concerned are you about climate change in Ha'ikū?

No concern Very concerned

5. How has the environment changed?

6. What concerns do you have, regarding water? (Multiple choice)

Change in rainfall Water quality Aquifer Recharge

Floods Drought Other:

7. Have you experienced floods?

Yes No

8. Where, when, and how were the flood events? (Be as detailed as possible)

9. How often do heavy rain events or flood events effect you?

10. What does the future of healthy Ha'ikū streams look like to you?

11. Interested in future project updates? Email:

Mahalo for participating in this project! Contact liliawd@hawaii.edu for questions.

Appendix B. Interview Guide

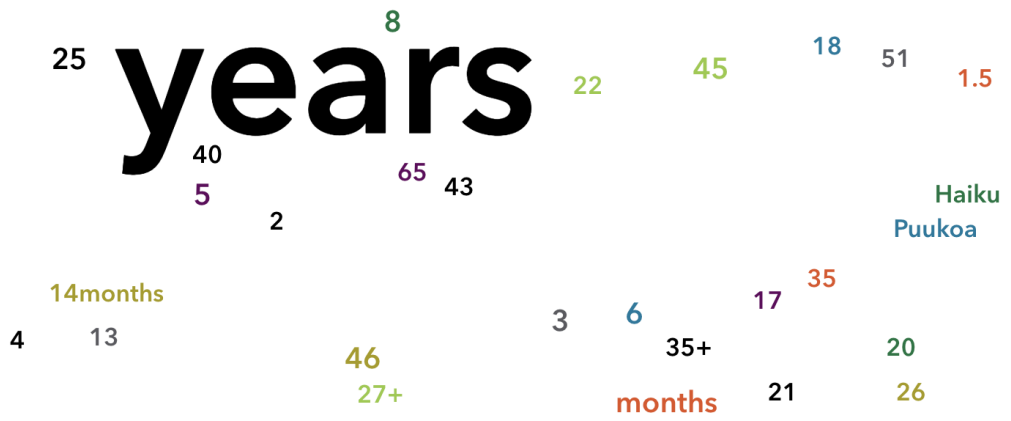
Introduction	Aloha. My name is Lilia Davis, and I am from ʻŌpana, Hāmākualoa, Maui. Mahalo, thank you for taking the time to talk to me; I genuinely appreciate it. Today's interview is part of my research to understand community flood resilience in Haʻikū as part of my master's project with UH Manoa. This interview should last thirty minutes to one hour, depending on how much you are willing to share. To ensure our conversation is captured in its entirety, is it okay to record with my device? If not, I will take notes as we speak. The information you share with me today will be kept anonymous, and any attribution quotes will be handled by ____. Our discussion today will ultimately help our community prepare and adapt to floods. During this interview, I will ask questions about your connection to Hāmākualoa and your experience with climate change. Please share what feels natural, take as much time as you need to answer, and let me know if you have questions or concerns. Before we begin, do you have any questions?
Goals	- Understand community experiences, perceptions, and collective place-based knowledge about flooding in Hāmākualoa - Envision ways to move forward in terms of community strength and resiliency
Guiding Questions	Introduction Can you share your name? Where are you from? How long have you lived in here? What are your earliest memories? Favorite activity here? Experiences Can you share your connection to this place? Have you noticed any environmental changes over the past __ years that you have lived here? Do you remember any flood or heavy rain events? When and where were you? How did this impact your life? Did you feel educated and prepared? What can you tell me about the March 2021 floods? Impact? Future How do you feel about the possibility of floods in the future? What would make you feel more prepared? What/who/how/by when?

	Closing Would you like to expand or add anything that did not come up? Is there anything we discussed today that you do not feel comfortable sharing beyond this interview?
Conclusion	Mahalo for your time and manaʻo today. The information you shared with me will be used to _____. According to your wishes, your identity will/will not be revealed in any product or presentation resulting from this effort. If you have any questions or concerns, please contact me. I expect to conclude the results by December 2024 and plan to present my results at Haʻikū Community Association Meeting in December 2024/March 2025. Once again, mahalo for your time.

Appendix C. Survey Results

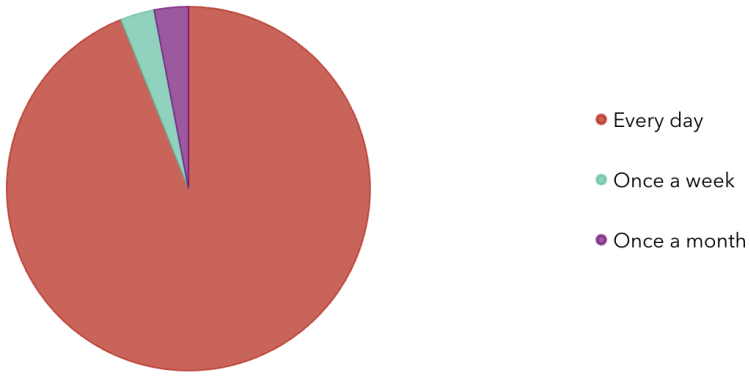
How long have you lived here?

Word cloud



How much time do you spend in Haʻikū?

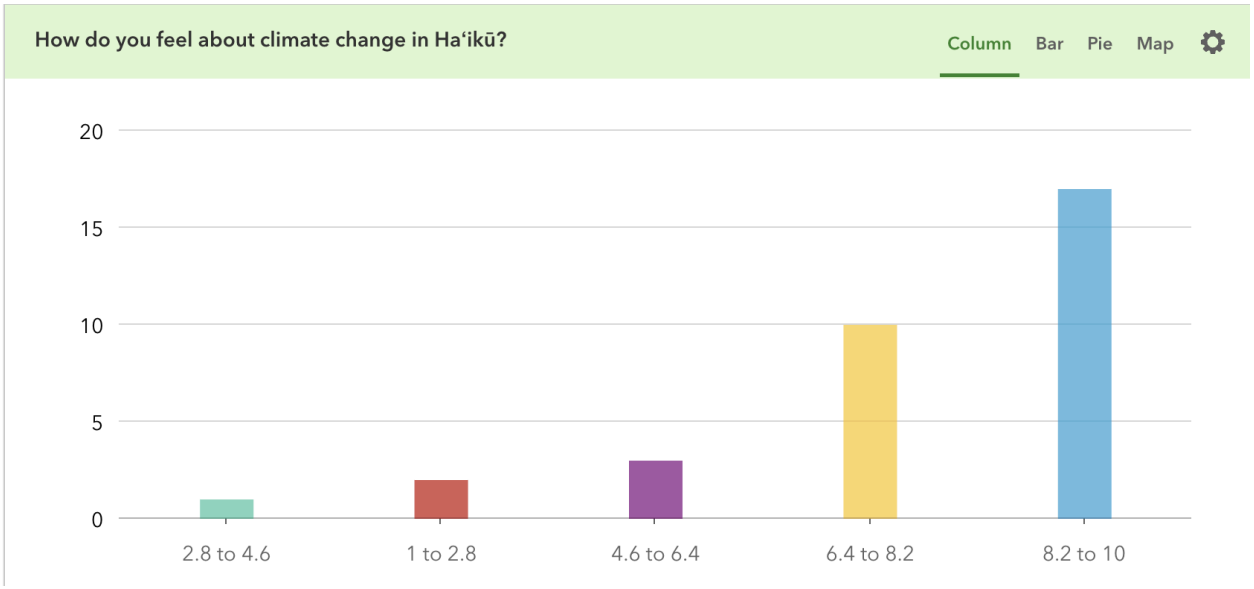
Column Bar Pie Map

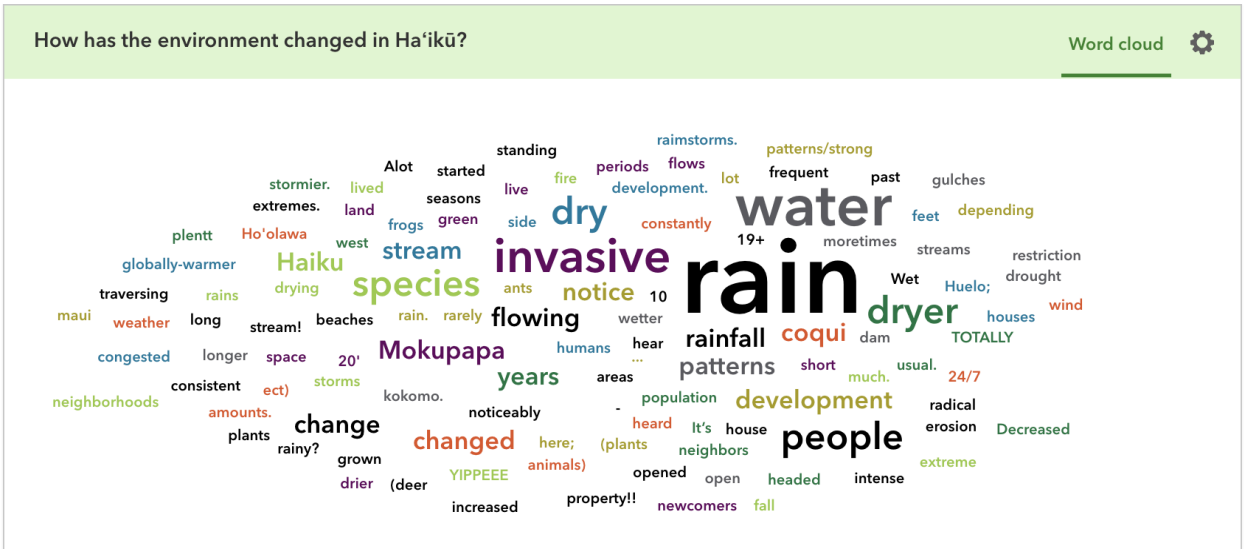


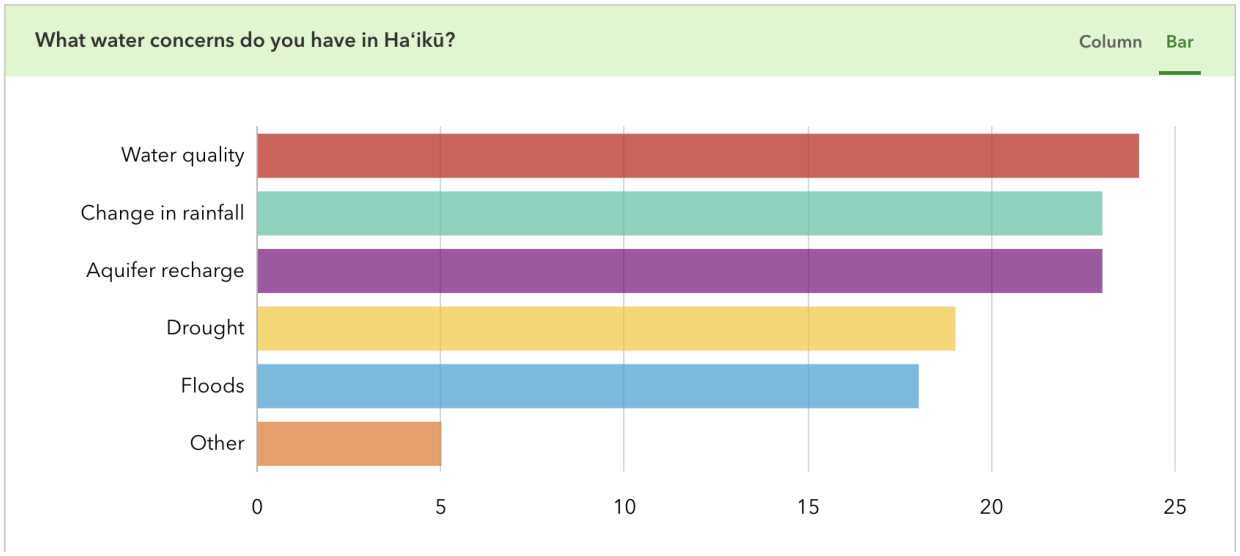
Hide table

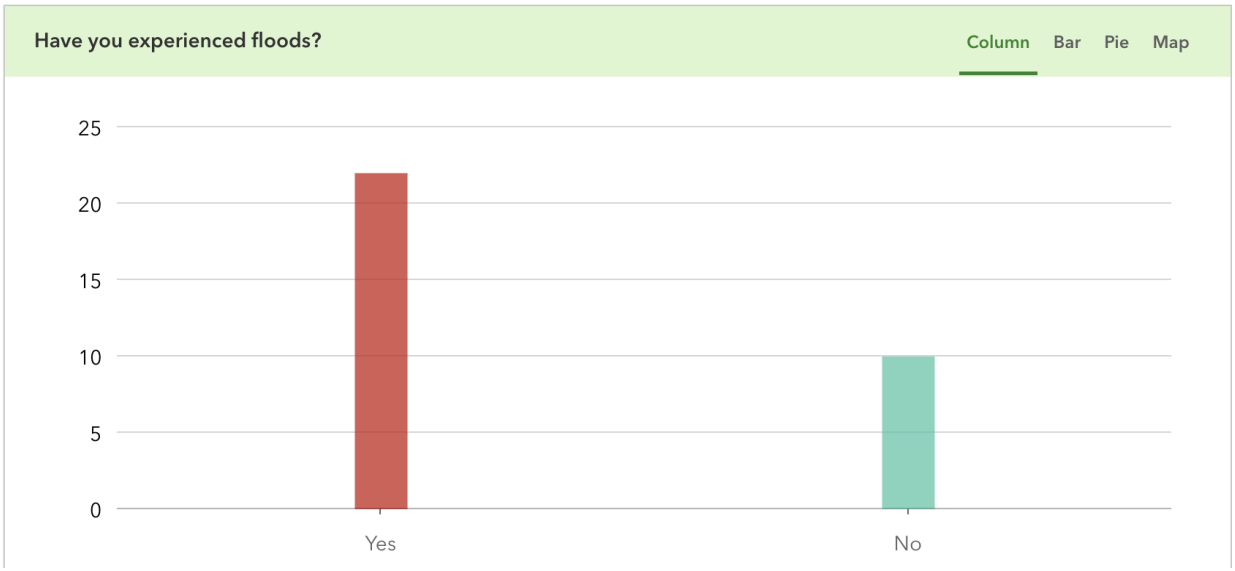
Empty categories Sort

Answers	Count	Percentage
Every day	31	93.94%
Once a week	1	3.03%
Once a month	1	3.03%


How do you feel about climate change in Ha'ikū?
Column
Bar
Pie
Map
20
15
10
5
0
2.8 to 4.6
1 to 2.8
4.6 to 6.4
6.4 to 8.2
8.2 to 10


How has the environment changed in Ha'ikū?
Word cloud
rain
water
invasive
dry
dryer
species
Haiku
stream
Mokupapa
flowing
rainfall
coqui
patterns
development
people
changed
change
years
notice
Alot
started
standing
raimstorms.
patterns/strong
periods
flows
lot
frequent
past
gulches
stormier.
lived
fire
live
development.
extremes.
land
seasons
frogs
green
side
constantly
feet
depending
plentt
Ho'olawa
west
19+
moretimes
streams
restriction
globally-warmer
drought
traversing
rains
drying
ants
10
Wet
Huelo;
maui
weather
long
stream!
beaches
rain.
rarely
wetter
houses
wind
congested
longer
space
20'
humans
hear
dam
TOTALLY
consistent
ect)
storms
kokomo.
areas
short
much.
usual.
24/7
neighborhoods
amounts.
noticeably
population
radical
plants
rainy?
heard
It's
house
erosion
Decreased
grown
here;
(plants
neighbors
extreme
drier
(deer
YIPPEEE
animals)
opened
open
headed
intense
increased
property!!
newcomers
fall


What water concerns do you have in Haʻikū?
Column
Bar
Water quality
Change in rainfall
Aquifer recharge
Drought
Floods
Other
0
5
10
15
20
25


Have you experienced floods?
Column
Bar
Pie
Map
25
20
15
10
5
0
Yes
No

Where, when, and how were the flood events?

Word cloud

Hide table

Show wor

Response	Count
When it rains heavy, the Kokomo road is like a river. Near the market it floods bad during floods.	1
West kuiaha til Holokai rd. Storm that caused kapukalua damn to breech, not sure what yr it was. Never have I eve r seen flood waters come down so quickly from all those roads all at once	1
The flood from Kapakalua reservoir I	1

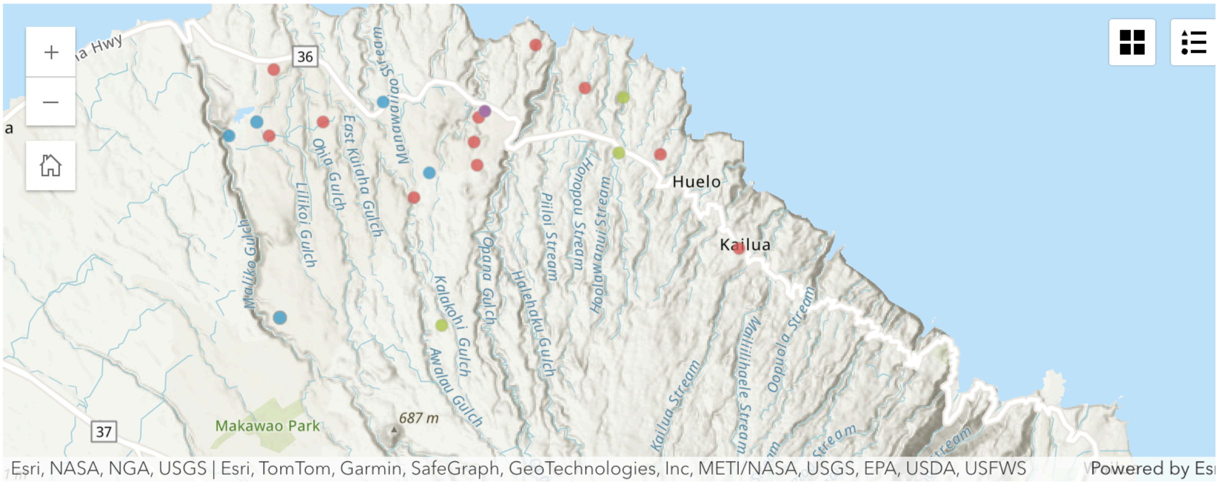
Response	Count
The 2021 flood	1
Piiholo, waihiwi rd. Feb 14 2019	1
often	1
mostly affected us on the roadways	1
Molupapa stream, with my home 20+ feet above, has had flash flooding over the years .... last was when Kapakal ua Dam overflowed	1
march 2022 haiku dam, dam almost failed roads washed out. Ground saturation for extended periods.	1
kihei in winter for 3-5 times for the last 4 years	1
I've seen floods during/after storms or just times it's rained hard and long. From flooding on the roads to water g oing over some bridges. Peahi rd is still closed due to the bridge being taken out after a storm in. March of 2021.	1
Hoolawa stream rose at the last flood (lane) up to 11,000 cfs, 10 feet plus. I monitor USGS honopou gauge and m ade a correlation to hoolawa nui & li'i	1

Response	Count
havent had one yet	1
Flooding through my yard in Makawao during rainy season	1
Every year there is flooding in my area	1
Down in our gulch got damaged from floods	1
dec 2021 in kula	1
Before we relocated	1
A few years ago, our property on Kaupakalua had small streams flowing through normally dry areas, at a level unlike any I've seen before.	1
2021 wakina lp took out houses and farm.	1
2021	1
20 winter	1
1990s, flood plain below haiku hill	1

Answered: 23 S

How often do heavy rain or flood events affect you?

Column Bar Pie Map

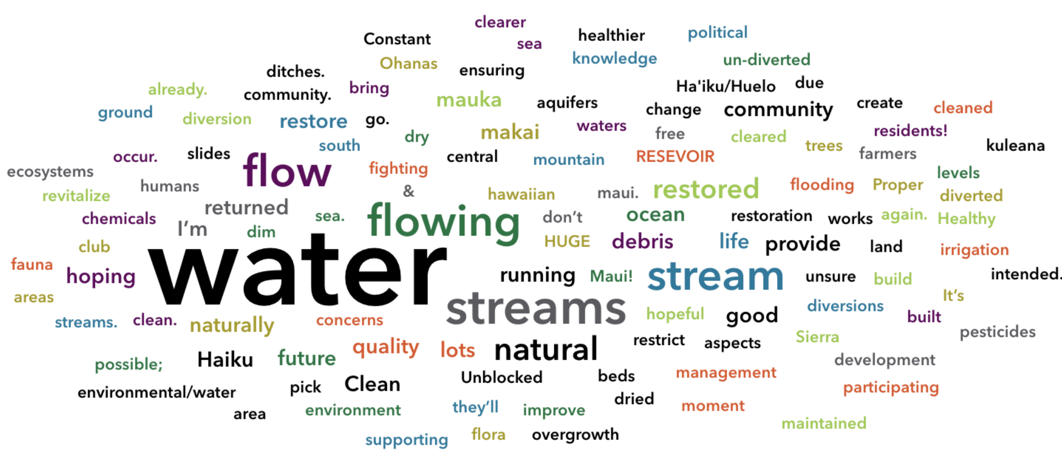


Hide table

Answers	Count	Percentage
Never	1	3.03%
Rarely	9	27.27%
Sometimes	19	57.58%
Often	4	12.12%

What does the future of healthy streams look like in Ha'ikū?

Word cloud



Show table

Answered: 31 Skipped: 2

Appendix D. Interview Codes and Themes

Name	Description	Sources	References
agency relations		1	1
county changes		1	1
EMI control		1	1
fire department		2	2
Not enough resources		2	3
Ongoing projects		2	5
Poor county communication		1	1
Community authorirty on Water		2	5
community action		3	3
due diligence		1	3
first hand experience		2	2
power in numbers		1	1
reclaiming traditional rights		1	2
road association		1	1
same teams		1	1
Support community response		5	9
Community dissolving		2	7
community struggle		3	5
community trust		1	3
loss of aloha		2	2
community education		1	2

Name	Description	Sources	References
balance between people and nature		1	2
Community networks		3	6
awareness		1	4
look to others		1	1
strengths and gifts		3	3
Resident education		4	11
Gap in public knowledge		1	1
Ignorance		5	10
new comers		1	2
newcomers		1	1
strange stream activity		1	1
New kuleana to haiku		1	1
visitor education		1	2
speak up		1	1
debris		3	5
boulders		3	4
debris 12 feet high		1	1
Deep connection to place		8	14
appreciative of land		1	1
engaged life		2	2
kuleana land		2	3

Name	Description	Sources	References
Long time resident		5	7
Love for place		2	2
love rain		2	2
recreation		1	1
early warning system		1	1
experience through social media		1	2
East Maui Water Authority Board		1	1
Haiku relates to East Maui, Molokai		1	1
Water Authority		2	3
hierachy		1	2
public trust		1	2
water rights		1	2
engineer		0	0
bridge repair		1	1
bridge overflow		5	7
dip crossing		1	2
disagree with engineering		1	1
Ditch overflow		2	2
redo culverts		1	1
remove diversions		1	1
Reverse siphon		2	2
erosion control		1	3

Name	Description	Sources	References
1986 flood		1	1
1998 flood		2	2
2008 flood		1	1
2021 flood		2	6
always floods, not always people		1	1
flood 2006		1	1
Increasing floods		1	1
New Years Flood		1	1
Winter flood event		1	1
Government foundational response		1	1
Frustration in legislature		1	1
Government can uplift community		3	3
hard work		5	10
kuleana stewards		1	1
need konohiki		1	1
Hawaiian lifestyle		5	7
abundance mindset		1	2
generational connection		2	2
loss generational knowledge		1	3
Purpose in ‘aina		2	2
traditional practices		3	5
hurricanes		1	1

Name	Description	Sources	References
landslide possibility		1	1
runoff		1	2
Expect climate change		6	10
extreme event		4	6
unsure of future		1	1
unpredicatable weather		2	3
Failures		2	3
Dam failures		2	2
Evacuations		1	1
system not working		1	1
flood data		2	3
Data collection tools		4	9
Family monitoring system		1	2
documentation		1	1
flood records		1	1
outdated data		4	4
Flood effect		4	10
biggest effect to haiku (2021)		1	1
force of nature		2	2
high water levels		2	2
houses washed away		1	1
trail gone		1	1

Name	Description	Sources	References
water quality		2	2
flood experience		1	1
car flooded up to the door		1	1
flood map		1	1
flood zones		2	3
flood rescues		1	1
grab whatevers near		1	1
overflow loʻi		1	1
raging flood		4	5
reach higher grounds		1	1
save animals		1	1
Trauma		1	1
destruction		1	1
I cant believe this is happening		1	1
moment of evacuation		1	1
Lucky		1	1
shaking in stress and fear		1	1
stressful event		1	1
Stuck in place		2	2
unnerving sounds		1	1
vulnerable		1	1
Flood frequency		4	6

Name	Description	Sources	References
hurricane lane		2	5
landscape change		5	11
eucalyptus trees		1	2
guavas		1	1
invasive species		4	11
wedelia		1	1
Overgrown hau		1	1
Lessons learned		1	1
caution around stream		1	1
future generations		2	3
pack a bag to go		1	1
in a hurry		1	1
respect for water		2	5
lifestyle choice		4	7
life in boots		5	7
Not going anywhere		1	1
Stay home from work due to rain		1	1
Swim in yard		1	1
trek to school		2	3
native forest capacity		3	4
mauka to makai flow		4	5
native forest culture, spirituality		1	1

Name	Description	Sources	References
Upstream effects		2	4
no control		2	3
Personal action for change		4	5
start with small action		1	1
proactive		2	5
preparation		1	2
think ahead		1	3
Resilient communities		4	8
Adapatation		6	8
family stays together		1	1
share with others		1	1
togetherness		1	2
work with, not agaisnt		1	1
Responsibility		4	7
no deaths		1	1
road conditions		1	2
abandoned roads in limbo		1	1
road was gulches		1	2
Solutions		1	1
Clear communication (evacuate)		1	2
Dam removal		2	3
Hopeful for environment legislature		2	2

Name	Description	Sources	References
Improved maps for evacuation		1	1
master plan management		1	1
more water way space		1	1
recover efforts		1	1
Room for improvement for aina		1	1
safety		1	2
Stream restoration		5	11
Stream change		4	7
Perennial stream		2	2
intermittent stream		1	1
river systems		1	1
Stream characteristic		3	4
stream overflowed		1	1
water comes up in seconds		1	1
Water diversion		5	7
water encroaching carport		1	1
water reclaiming power		2	2
water source		2	4
stream life		1	1
opae		1	1
o'opu		2	8
weather		0	0

Name	Description	Sources	References
1990 storms		1	1
70's weather		1	1
Drought related to flood		1	1
lightning		1	1
More fires, droughts, floods, less life		2	2
Rain type		3	6
decrease rainfall		3	8
increase in rain		1	1
summer storm		1	1
Wind		1	1

Appendix E: Transcription Poems

Poem 1

Our ʻohana has tended taro in XXXX
since before the Māhele, since before Kamehameha II.
Though we lost some knowledge along the way,
we fought to restore Honopou stream for 18 years alongside our kupuna.

Taro patches once filled the valley — forty strong
I dream of seeing them return.
But water is scarce now;
climate change has dried the forests, drained the streams.
We must replant native trees, rebuild our aquifers, and protect our streams.

East Maui Irrigation diverted waters,
damaging ecosystems, stranding ʻoʻopu and harming our ʻāina.
We need our ʻoʻopu, our limu, our streams
for our children, for our future.

Stream restoration has helped, but brought new challenges:
people fishing, floods destroying ʻauwai,
neighbors altering flows for their own gain.
We have no konohiki — we must be our own stewards now.

Through community meetings, signs, and road associations,
we educate, organize, and protect our streams.
Sometimes it's one conversation at a time,
reminding others: this water has a place, a scent, a home.

Floods still take what we build.
Plantations leave scars.
Climate change quickens the loss.

But we gather, we speak,
we sit at the table,
and we keep fighting for our water.

Poem 2

My connection to ʻāina is deep
it's part of who I am.
That connection drives me to work for natural resources, climate action, and community resilience.
I don't see enough being done, so I stepped into leadership to push for change.

Water issues remain at the heart:
who uses it, who benefits, and how communities are impacted.
People are demanding a seat at the table for decisions about streams and groundwater.

Climate change is already here.
Some impacts are inevitable;
our task now is to reduce harm and prepare communities to be resilient.
But the resources aren't there yet.

Government should help —
not just in disaster, but by empowering communities to organize and respond faster.
Building resilience means building stronger communities even before disasters hit.

We must expect heavier, unpredictable rains, more floods.
Failures like the dam breaches reveal our vulnerabilities.
We need to prioritize audits, repairs, and long-term plans —
not just patch roads after every flood.

We can't stop the flooding.
But we can change our behaviors,
support vulnerable communities,
and learn how to live with the water,
not against it

Poem 3
I've lived in Haʻikū my whole life,
Between Kuiaha and Hoʻolawa
growing up jumping into streams and EMI ditches.

In 1997, the first big flood came.
We lived in a tent on high ground and stayed safe,
While others lost everything to the river's rise.
It wouldn't be the last time.

Rain poured on already saturated land,
Rivers swelled from 300 to 6000 cubic feet per second,
Thunder and lightning lit the sky.
History showed us: floods rival those of a century ago.
What we thought impossible became inevitable.

Three major floods taught hard lessons—
Loss of property, broken roads, and the power of water.

Living here means living with uncertainty.
Forty days of rain, then seasons of dust.
Getting to school meant crossing rivers,

never knowing if you'd make it dry.
Packing three pairs of clothes

The river nearly dried up once —
tourists panicked, but nature doesn't work like a spigot.
You prepare by understanding the river:
Its history, its paths, its warnings.

Stewardship comes from knowing these rivers deeply,
and passing that knowledge on to those who will need it most.

Poem 4

Years ago, it rained almost every day,
never hard, but constant.

Now, rain comes in storms.
Afternoons stay dry.
Less rain overall,
but when it falls, it floods.

2021 was proof.
Heavy, concentrated rain, widespread damage.
No one was ready.
Now we prepare,
but what about next time?
Are we ever ready?

People change, but Haʻikū stays Haʻikū—
old town, country, home.
You grow up here, you know everyone.

I've seen rain, major rain.
March 8, 2021—
the one time I felt fear.
Streams overrun, land reshaped.
Mother Nature reminds us—
she's in charge.

Old-timers knew.
Uncle Toots knew.
When rain comes, streets turn to rivers.
Stay home, stay safe.

Be ready—roads flood, stores close, power goes out.
They taught us how to prepare.
Not everyone had that knowledge.

Storms come, we go out.
Highways crew, infrastructure workers—
rain means work.
Landslides, blocked roads—
we clear them.

I wish everyone knew.
Floods change everything.
Some grew up with this,
some learned to adapt,
but newcomers don't always know.

When it rains, be ready.
Stay off the roads.
If water rises, turn back.
Wait it out.

And don't complain.
It's nature.
We don't control it.
I can't call the rain and ask it to stop.
Mother Nature decides.
She's smarter than all of us.

So we work together,
take care of each other,
just like we always have.

Poem 5

We've lived off-grid in Honopou for 49 years,
immersed in water issues, mud boots, and community life.

In the 1970s, rain was constant —
146 inches a year.
Now it's down to 86,
Rainfall has been cut nearly in half by climate change.

We built strong ties in the valley:
sharing fish, stories, and swimming in Honopou and Puniawa,
watching heavy rains flood the Honopou Bridge monthly.

Today, the bridge stands neglected, unsafe even for fire trucks.
We're pushing for a plan before the next disaster comes.

Our community fought to restore stream flows;
the streams still hold life — ʻopae, small fish —
though the prawns have grown smaller,
and people now struggle against rising costs and crumbling roads.

The land feels different now.
The aloha for place isn't as strong as it once was.

Poem 6
When I first moved here,
I lived in rubber boots, crossing uneven ground between heavy rains and dry spells.
I love the rain — good for my bananas and turmeric —
even as climate change brings uncertainty.

I watched the land change:
One African Tulip tree turned into many,
Rose apples died off, and Albizia Trees invaded.

In the gulch, small streams became raging floods,
Washing away bridges and waterlines.
Almost every year between Thanksgiving and New Year's,
The floods returned, sometimes with 10 inches of rain in a day.
Even droughts didn't spare us;
Debris piled up, waiting for the next deluge.

With EMI gone, no one manages the land —
and when floods come now, they come unchecked.
Resilience, I learned, must include confidence in your water source.

Living in the gulch meant battling bamboo, floods, and wild growth,
caring for a place with ancient Hawaiian rock walls,
where bulldozers had no place, only respect and work.
No electricity for 10 years, no easy comforts —
But it was paradise.

Here, you either love this place and live with it,
Or you don’t.
We loved it.

Poem 7
We love the rain as much as it is a challenge

As the years passed, we just felt very comfortable and appreciative of the land.
Like when you've had a long day, and you come home,
You're happy to be home
We definitely grew to love it very much so
We chose to raise our kids here

We have a natural stream bed
It flows during heavy rains
There's a bridge to get to our house.
Once or twice a year, the water goes over the bridge.
We may not be able to get across to go to school in the morning.
We'd have sticks or branches that clogged our culverts under the bridge.
We put our boots on and clear it out.

The stream started running like a good trickle for four months.
We thought they opened these diversions for the local people and the stream.
That was exciting. Yay, we have a running stream.
We could have a loʻi patch one day,
Then one day it stopped. Like, well, that's a bummer.

It's caused our community and the county to make changes
To re-analyze all that.
I hope they're looking at the areas where there's flooding
On the news or Instagram, the message was you better evacuate,
I remember everyone who could see that was confused
Where is it? We had no idea
We can improve

As much as we've had our challenges on that flood day, a little trauma.
We still are here; we're not scared.
We learned a few things and not going anywhere.
But we're lucky.
We still have our home.

Poem 8

I've lived on a two-acre homestead in Huelo for 40 years,
Restoring native plants, which depend on streams and rain for water.
My Hawaiian neighbors taught me the ways of the streams —
But the rain faded after the '80s, streams began to dry.

Our tight-knit neighborhood, once bonded by kuleana and aloha,
now faces change: outsiders, estates, diversions, and neglected watersheds.
Rain patterns shift, winds change, brown waters spill into the ocean,
and the land suffers from a loss of stewardship.

We live on an old Kingdom dirt road, unclaimed by the county or state —
we fix it ourselves, taxing each other, planning repairs.
I learned by doing: raising funds, patching roads,
pulling neighbors out of the mud in my old 4WD truck.

Big storms shook our homes, erased trails,
bent bamboo, and raised debris seven feet high.
Nature grows more extreme.

We can't stop the storms,
but we can fight for our streams,
care for our forests,
and hold onto the kuleana we inherited.

Poem 9

Twin Falls
Before we even lived out here, when my daughter was born, Fall #5 was the first waterfall I brought her to, and that, to me, is special.
She had her rite of passage up at that waterfall, and the grandkids, at that waterfall
My connection is an intense love of nature and all its different aspects here

Guava, Christmas berry, Rose apples.
It was different then, wild, way more weeds.
Families started reorganizing the weeds and putting in the good things.
We started out as a community that actually wasn't working,
many different people who weren't all on the same page
It's not easy being a community; how do we work together?
We are a farm. So that means the farm work.
it became more productive and more organized, it works

Can you tell me about any flood or rain events that happened here?

I just looked up the peak chart from USGS for this river
It's really interesting.
The highest that came to was about 4000 cubic feet.
Through now 100 years of measurements,
Now in our time, we already had two floods that went over 8000 cubic feet.
So what's happening now is more concentrated, locally, way more input in here
It's quite serious because we see it globally,
We have more extremes with hot and wet, and more tragic events, and more weather events.
It's very unpredictable.

The EMI is taking out the ditch diversions.
Now that has never happened.
These rivers have not run free in our time.
It's really hard to say what will happen.
So then there is bigger floods, more concentration.
You also get more turbidity, and so you get more bacteria.
At times, the water is high, you get more bacteria. Water is low, you get more bacteria.
At least I keep Track.

I started out with this 20 years ago, with my own little water probe
How are we as people impacting our environment?
We have this really fancy, actually, machine. It's a fluctuation.
But over time, you might get a picture of this fluctuation.

When Hurricane Lane happened, I made a flood map,
The red areas is how high the water is.
In this area where we have become kind of 34 feet, 34 feet up at ropes.
It actually came right to the road, the adventure sign up the dump there.
This, was very scary.

Nobody has permission to build
When all these get washed away, including the bridge,
It took like two years to clean up the river.
All the good was there, but there was ignorance
We went as far as the sea, where our junk ended up
These families are more don't look at us, we are doing our thing,

One rain, maybe 18 years ago or so,
All of this was underwater. (the Twin Falls office area, parking lot 3).

Yep, this force gives you chicken skin

The stream life 40 years ago, there was o‘opu.
They were big and red and black.
I haven't seen them in so long.

I think we have an excellent core group of people
We have been thinking in terms of the land,
And that is still the number one priority.
We were really lucky,
everybody has a gift.
We want to work together, and that takes time,
Taking care of building trust over time,
There is no beginning and no ending. It's just a process; it evolves.