Wainiha Hydrologic Vulnerability Assessment

Key Findings and Recommendations

The *Wainiha Hydrologic Vulnerability Assessment* evaluated flood risk within the 506 acres of the lower Wainiha River Watershed. A 3D hydraulic model was used to simulate river floods and to map locations where riverbanks would be overtopped. The assessment utilized detailed elevation models to map the river channels and to identify flow paths of the tributary channels that drain the steep slopes and carry water onto and across the valley bottom. The assessment identified the extent of flood waters over the floodplain, and determined which parcels in the study area are vulnerable to flooding from the river and tributary channels. Maps created using the model outputs provide visual renderings of where flooding and surface water runoff will occur within the project area.

Key Findings

- The entire portion of lower Wainiha River Watershed is vulnerable to inundation by river flood waters that impact the floodplain and/or flow paths that carry surface water runoff. Flooding occurs regularly and often with very little warning.
- Flood events that occur annually or every one-to-three years, as well as infrequent high magnitude flow events, were shown to overtop the lower reaches of the Wainiha River and spill out onto the floodplain.
- The parcels at highest risk from flood water are on the "island," an area bounded by the two branches of the Wainiha River. Other low-lying areas, including the area immediately mauka of the Wainiha Country Store and the area west of Anahulu Road, are also vulnerable to flood waters.
- The parcels at highest risk from water carried in the flow paths are located along the west side of the valley. Vulnerability is highest for parcels crossed by flows paths and parcels on which flow paths are overgrown or strewn with debris and/or plant materials.
- Wainiha Powerhouse Road faces threats from multiple flow paths that intersect the road and pass beneath it through culverts. Culverts are vulnerable when debris blocks their entrance or becomes clogged inside. This can cause overtopping, scouring, and flooding over the road deck, making vehicle passage dangerous and potentially damaging the road.
- Modeling of the sandbar berm at the mouth of the river determined that there would be no significant benefit to excavating a channel across the berm prior to high flow events, as doing so would result in only minor reductions in upstream flood water surface elevations.
- Climate change, and associated sea level rise, is projected to increase the impacts of flooding for floods generated under high river flow events, as well as for periods of dry flooding such as wave run-up and extreme high tides that push water inland into low lying areas. The potential effects of climate change on weather patterns in the Hawaiian Islands are uncertain, making it difficult to forecast the frequency and magnitudes of extreme storm events; however it is possible that the rainfall event of April 2018 and resulting flood could be representative of extreme rainfall events in the future.

How to Reduce Flood Vulnerability

The risk stemming from flooding and overland flow within the Wainiha River Watershed is challenging to alleviate due to two main factors. First and foremost, the inhabited regions within the steep-sided valley lie within an active floodplain adjacent to a river known for its susceptibility to high flows and flooding events. Second, the area experiences frequent bouts of intense rainfall, leading to substantial surface water runoff channeled through natural fluvial pathways. Combined, these conditions are responsible for the persistent risk posed by hydrological events in the region. *Vulnerability*, however, can be reduced through the following:

- Maintain stream channels to be clear of debris and rubbish.
- Dispose of green waste in locations outside the floodplain.
- Maintain culvert inlets by keeping them free of debris that could block or clog the culverts.
- Install flood warning signs along the roadways at routinely flooded locations.
- Locate structures back from the top of rivers and flow paths to prevent damage from flowing water.
- Ensure that dwellings and possessions are maintained above the base flood elevation.
- Ensure that structures within the base flood elevation are constructed to allow flow to pass underneath.
- Retrofit buildings with flood-proof materials.
- Bring structures and dwellings within the floodplain that do not conform to building code standards into compliance.
- Place loose items in secure locations above the expected flood water levels
- Inform tenants (residents and visitors) about flooding risks and provide them with evacuation plans and flood maps.
- Inform tenants (residents and visitors) on actions to take during flooding, such as sheltering in place if their dwelling is above the base flood elevation.
- Encourage tenants (residents and visitors) to maintain emergency kits containing water, food, first aid kit, and prescription medications for at least five days.
- Encourage homeowners and renters in the Special Flood Hazard Area to purchase flood insurance.
- Require approved plans and permits for any in-stream activities (e.g. bank stabilization).
- Establish an early warning and notification system to provide residents and visitors with advance warning of impending floods.

The results of this hydrologic vulnerability study should improve community preparedness and planning focused on flood mitigation and disaster resilience. The detailed maps that show flood-prone parcels and runoff flow paths should increase awareness of the risks and vulnerabilities of flooding and surface water runoff, aiding in the development of strategies to cope with and minimize vulnerability to hydrologic threats.

For more information contact: Mālama Kua‘āina, P.O. Box 536, Hanalei, HI, 96714
Caren Diamond, Executive Director, www.malamakuaaina.org, malamakuaaina@gmail.com