

# MEGA TSUNAMI

“As our climate continues to warm, the research and study of these interconnected phenomena is wildly important —as important, perhaps, as visiting an Alaskan glacier.”

-Bjorn Olson

## Setting a Precedent

In October of 1967, a landslide sent a wave hundreds of feet in the air and over four miles (6.4 kilometers) out into Kachemak Bay, scouring everything in its path. Although rare, this phenomenon is not unique to the Grewingk Valley. A 1958 event occurred in Lituya Bay, Alaska where an earthquake-triggered landslide resulted in the largest and most significant wave recorded in modern times. The run-up washed out trees 1,720 feet (524 meters) high at the mouth of the inlet. More recently, in 2015, a 200-million metric ton landslide in Icy Bay, Alaska generated a wave that was approximately 300 feet (91 meters) high with run-up of 633 feet (193 meters). These and other recorded events are sometimes called *mega tsunamis* by scientists to distinguish them from earthquake-generated tsunamis that do not reach as high.

## Colossal Forces at Play

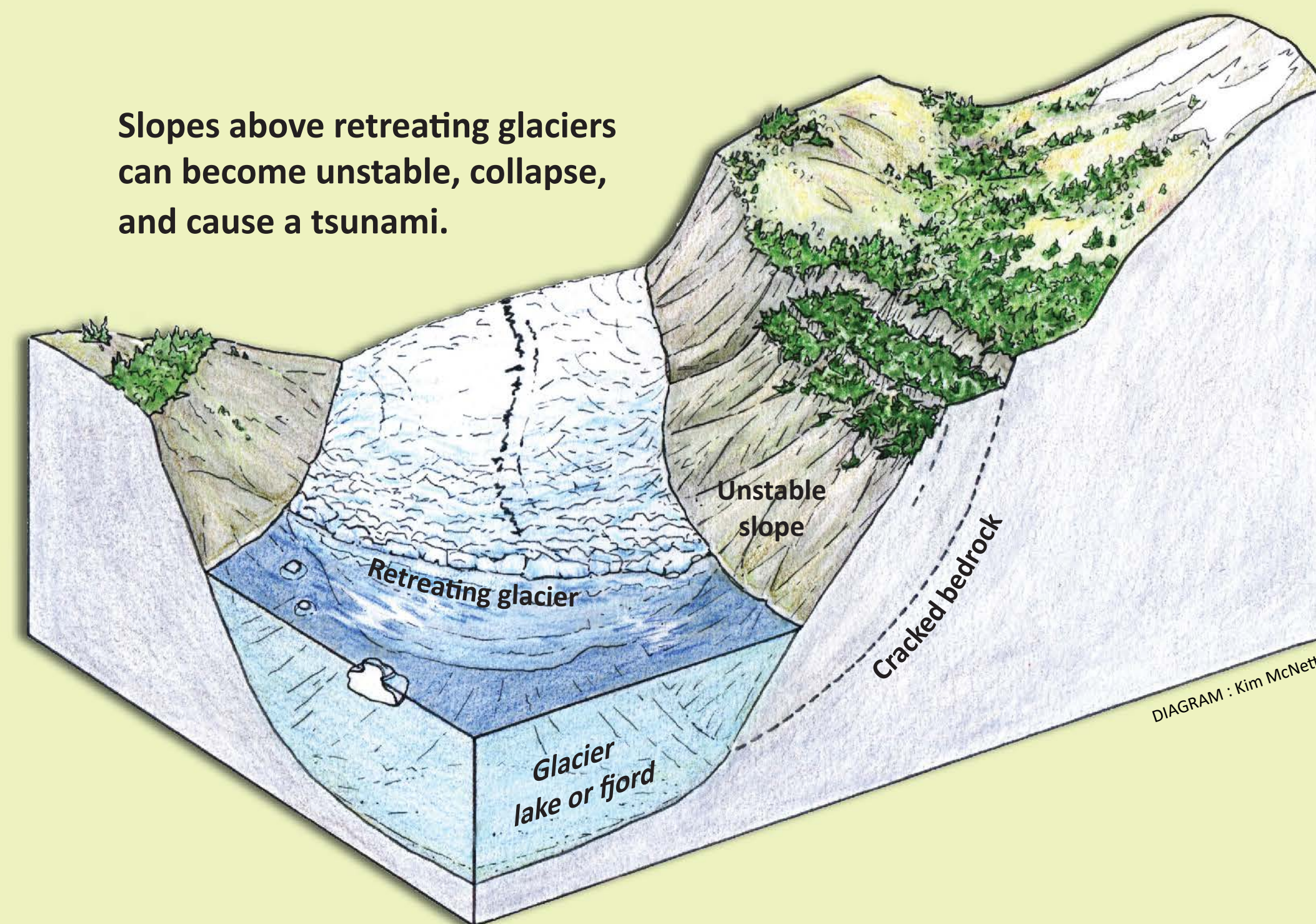
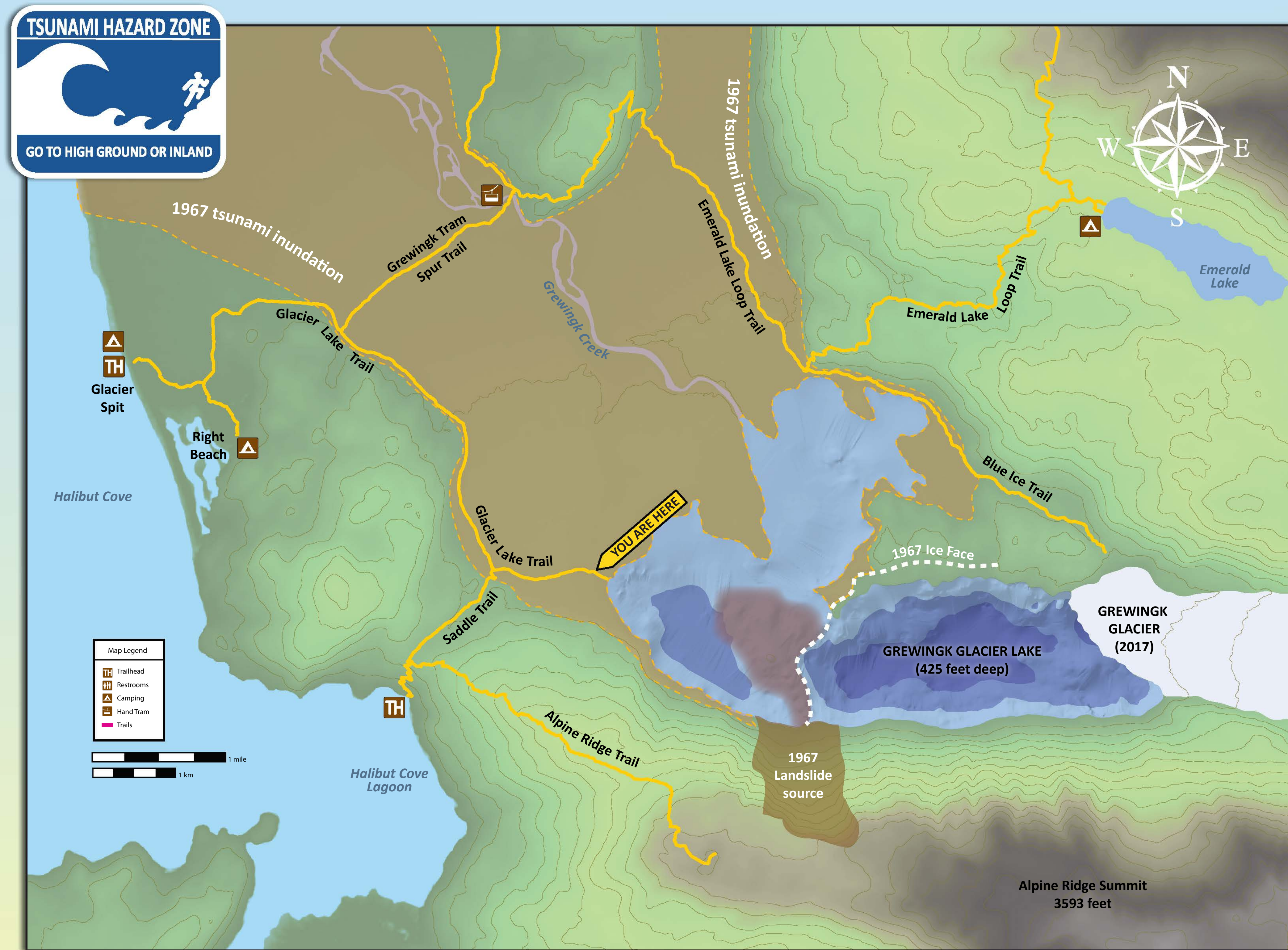
Special conditions are needed to generate a mega tsunami.

### THE PERFECT TRIFECTA:

**STEEP SLOPES** – Mountains are always a contest between tectonics pushing them up and gravity pulling them down. The steeper they are, the higher the possibility of collapse. The greater the volume, the greater the impact.

**DECLINING STABILITY** – As glaciers quickly thin and retreat up the valley, the steep valley walls are no longer supported by the weight of the ice. Thawing of alpine permafrost combined with intense rainfall can bring these unstable slopes to the brink of failure.

**DEEP WATER** – Like Grewingk, some glaciers have created deep lakes in the valleys they have carved over centuries. Grewingk Glacier Lake is 425 feet (130 meters) deep at the base of the steepest slope.



Slopes above retreating glaciers can become unstable, collapse, and cause a tsunami.

## Aftermath

As high-volume landslides impact or displace water, a mega tsunami is generated. The "mega," high-velocity wave can uproot mature trees, scour landscapes, and carry large volumes of debris. These events are geologic curiosities until people are nearby, then they become potential tragedies.



ATTENTION

# GOT PLANS?

Wild weather and wildlife can wreck your plans...but a *tsunami*?! ...OH, MY!

Here are a few tips to help you enjoy your stay while recreating in this *wild* place.

Review the map and find your best "EXIT-STRATEGY" depending on where your journey takes you. It may be as simple as knowing where and how to move to higher ground.

**BE CAUTIOUS** when camping, consider higher ground for your overnight stay.

**REMAIN ALERT** while enjoying time at lower elevations or on the lake (even in winter). Pay special attention to your surroundings and watch for landslide warning signs.

HIGH RISK

## WARNING SIGNS

Any of the following signs could mean you're about to witness history! Act fast! Evacuate and move to higher ground at once.

If you **FEEL AN EARTHQUAKE**, leave the area. An earthquake can weaken slopes, leading to a landslide within seconds, hours, or even days.

If you **HEAR ROCKS FALLING** or **SEE RISING DUST CLOUDS** from the slopes above the lake and glacier, take heed. Steady, smaller rockfalls can be a sign of an imminent landslide. If you are on the lake and witness repeated rockfall events, it may be best to switch up your plans.

If you **HEAR A LOUD, SUSTAINED ROAR** from the lake, take immediate action!

➔ **EXIT STAGE RIGHT!** Drop your gear and run! Landslides can have devastating effects, but a large landslide will give you only a minute or two to get to high ground. That is not a lot of time—every second counts!



## The Best Defense is a Good Offense

The Grewingk Glacier area experienced a mega tsunami event in 1967, the effects of which are still visible. Scientists are striving to provide data from surveys and computer modeling that helps inform land management decisions. This collaborative effort leads to a better understanding of the inherent risks associated with visiting the area.

1967 TSUNAMI AREA OF INUNDATION

