1

00:00:00,569 --> 00:00:07,572

The power of the sea is awesome.

2

00:00:07,572 --> 00:00:11,574

Its large waves have three tons of pressure per square foot.

3

00:00:11,574 --> 00:00:18,577

A wave ten feet high and one mile wide has more than 300 million pounds of power.

4

00:00:18,577 --> 00:00:24,580

A force equal to an atom bomb.

5

00:00:24,580 --> 00:00:29,582

Millions of Americans throng to the beaches each summer weekend.

6

00:00:29,582 --> 00:00:33,584

All of us assume we are safe from tidal waves.

7

00:00:33,584 --> 00:00:37,586

Our sense of security can suddenly be shattered.

8

00:00:37,586 --> 00:00:42,588

This happened in the Kurole Islands, north of Japan in 1969,

9

00:00:42,588 --> 00:00:46,590

as seen in this extraordinary film of the actual tidal wave.

10

00:00:59,595 --> 00:01:06,599

In 1979, tidal waves killed 200 people in Indonesia.

11

00:01:06,599 --> 00:01:12,601

Where will they strike next?

12

00:01:30,609 --> 00:01:37,613

Hilo, Hawaii, a peaceful coastal town located in the middle of the Pacific Ocean.

13

00:01:37,613 --> 00:01:46,617

Few places in the United States are as blessed with a combination of sun, sea, and beautiful weather as Hilo, Hawaii.

14

00:01:46,617 --> 00:01:51,619

At the same time, few places are as constantly threatened.

15

00:01:52,619 --> 00:02:00,623

On April Fool's Day 1946, a tremendous tidal wave took the residents of Hilo by surprise.

16

00:02:13,629 --> 00:02:19,631

The tidal wave raced up the town's main river, destroying Hilo's only railroad.

17

00:02:20,632 --> 00:02:25,634

These photographs show a man on the dock being swept to his death by the giant wave.

18

00:02:25,634 --> 00:02:29,636

Seconds later, he is gone.

19

00:02:30,636 --> 00:02:33,638

More than 170 people were killed.

20

00:02:33,638 --> 00:02:41,641

Hilo was left a water-soaked ghost town, still vulnerable to another tidal wave attack at any time.

21

00:02:42,642 --> 00:02:48,644

Nothing makes us feel as helpless as facing natural disasters.

22

00:02:48,644 --> 00:02:57,648

We're frightened by the prospect of feeling an earthquake or being caught in a tornado, a thunderstorm, or a fire.

23

00:02:57,648 --> 00:03:06,652

None of them strikes with the suddenness and savagery of the so-called tsunami, the Japanese word for tidal wave.

24

00:03:07,653 --> 00:03:13,656

They are born miles below the surface, underneath the seemingly tranquil ocean floor.

25

00:03:13,656 --> 00:03:21,659

Strong underwater disturbances such as a volcanic eruption may generate a tsunami.

26

00:03:36,666 --> 00:03:41,668

Underwater earthquakes are the most common cause of tidal waves.

27

00:03:41,668 --> 00:03:46,670

When the earth shifts vertically, tons of water are forced upward.

28

00:03:46,670 --> 00:03:53,674

A series of tidal waves form on the surface, spreading out from the epicenter in every direction.

29

00:03:54,674 --> 00:03:59,676

The massive energy of the wave pulsates to the deepest depths.

30

00:04:00,677 --> 00:04:05,679

Once born, the tsunami cannot be stopped or controlled.

31

00:04:07,680 --> 00:04:14,683

From this origin, tidal waves travel thousands of miles, losing very little energy.

32

00:04:14,683 --> 00:04:22,687

On the open ocean, the wave is only a few inches high, passing undetected beneath ships at sea.

33

00:04:23,687 --> 00:04:37,693

Races across the ocean at speeds in excess of 500 miles per hour, each wave more than 100 miles long.

34

00:04:38,694 --> 00:04:43,696

As the tsunami enters shallow water, it suddenly slows down.

35

00:04:43,696 --> 00:04:49,699

The forward energy can rise up hundreds of feet, forming a terrifying wall of water.

36

00:04:53,700 --> 00:05:05,706

The tsunami that hit the island of Oahu in 1946 shows how a seemingly harmless wave can quickly inundate a shoreline.

37

00:05:14,710 --> 00:05:21,713

The Pacific Tsunami Warning Center was established in Honolulu to predict where tidal waves will strike.

38

00:05:22,713 --> 00:05:27,716

Seismographs monitor the Pacific for earthquakes which can generate tsunamis.

39

00:05:30,717 --> 00:05:35,719

The Warning Center is in constant touch with tide stations throughout the Pacific.

40

00:05:35,719 --> 00:05:43,723

These stations measure changes in the water level, indicating a tidal wave's exact location and direction.

41

00:05:44,723 --> 00:05:51,726

Once its location is known, the wave's estimated time of arrival to any area can be calculated.

42

00:05:51,726 --> 00:05:53,727

A warning can then be issued.

43

00:05:55,728 --> 00:06:01,731

These procedures were in full operation at the Warning Center on May 22, 1960.

44

00:06:03,732 --> 00:06:09,735

In search of will recreate the events of this day, a day the residents of Hilo will never forget.

45

00:06:11,735 --> 00:06:18,739

9.38 a.m. 7,000 miles away, a tremendous earthquake shatters the coast of Chile.

46

00:06:22,740 --> 00:06:27,743

The Tsunami Warning Center is in constant contact with the Earth's earthquake intensity.

47

00:06:29,744 --> 00:06:31,744

Tom, we've got a big one here.

48

00:06:32,745 --> 00:06:33,745

Where do we have it?

49

00:06:33,745 --> 00:06:36,747

Well, it looks like a big pea.

50

00:06:37,747 --> 00:06:39,748

Looks like we've got a real good quake here.

51

00:06:41,749 --> 00:06:43,750

It is now a race against time.

52

00:06:44,750 --> 00:06:47,752

The man at the Warning Center first saw the earthquake.

53

00:06:47,752 --> 00:06:48,752

8.5, Tom.

54

00:06:50,753 --> 00:06:51,753

We've got a tsunami.

55

00:06:57,756 --> 00:07:02,758

Throughout the morning, the residents of Hilo, Hawaii go about their usual business,

56

00:07:02,758 --> 00:07:06,760

as yet unaware of a sequence of events taking place.

57

00:07:08,761 --> 00:07:12,763

10.27 a.m., tied in a tight tight tight tight line,

58

00:07:12,763 --> 00:07:15,764

and the city of Hilo is set to take off in the next few days.

59

00:07:16,765 --> 00:07:21,767

10.27 a.m., tied information is requested from Valparaiso, Chile,

60

00:07:21,767 --> 00:07:24,768

the closest tied station to the epicenter.

61

00:07:25,769 --> 00:07:30,771

From Chile, it will take the wave 15 hours to reach the Hawaiian Islands.

62

00:07:32,772 --> 00:07:37,774

12.18 p.m., the first tied report comes in from Chile.

63

00:07:37,774 --> 00:07:39,775

We're reporting unusual wave activity.

64

00:07:40,775 --> 00:07:41,776

We've got a good wave here.

65

00:07:41,776 --> 00:07:43,777

We better give a Pacific-wide advisory.

66

00:07:43,777 --> 00:07:45,778

We do have a tsunami spreading across the Pacific.

67

00:07:54,782 --> 00:08:00,784

James' look of the Army Corps of Engineers is sent to Hilo to record eye-witness observations.

68

00:08:01,785 --> 00:08:07,788

So little was known about a tsunami's impact that a firsthand account was deemed extremely valuable.

69

00:08:09,788 --> 00:08:13,790

James' look decides that a bridge on the bay itself is a safe location.

70

00:08:15,791 --> 00:08:19,793

He starts to record normal changes in the water level and currents.

71

00:08:20,793 --> 00:08:26,796

12.19 p.m., the decision is made to issue a preliminary bulletin to the Hawaiian Civil Defense.

72

00:08:27,796 --> 00:08:29,797

This is a seismic sea wave advisory bulletin.

73

00:08:30,798 --> 00:08:32,799

A severe earthquake has occurred in Chile.

74

00:08:32,799 --> 00:08:35,800

It is possible that damaging sea wave has been generated.

75

00:08:35,800 --> 00:08:40,802

We do not know at this time, but tied reports are expected late this afternoon.

76

00:08:41,803 --> 00:08:45,805

The decision is made to issue a preliminary bulletin to the Hawaiian Civil Defense.

77

00:08:45,805 --> 00:08:48,806

We do not know at this time, but tied reports are expected late this afternoon.

78

00:08:52,808 --> 00:08:56,810

At five o'clock, the wave passes the halfway point to Hilo.

79

00:08:58,810 --> 00:09:01,812

It has been 14 years since the last major tsunami.

80

00:09:02,812 --> 00:09:07,814

Forgotten is the fact that Hilo's Bay acts as a funnel, sucking in a wave,

81

00:09:08,815 --> 00:09:11,816

further magnifying its height and destructive force.

82

00:09:15,818 --> 00:09:20,820

12.19 p.m., the general warning is issued to the public.

83

00:09:26,823 --> 00:09:30,825

At 6.47 p.m., the general warning is issued to the public.

84

00:09:31,825 --> 00:09:35,827

Attention all stations, attention all stations, this is the Pacific Tsunami Warning Center.

85

00:09:36,827 --> 00:09:38,828

This is a tsunami warning.

86

00:09:38,828 --> 00:09:42,830

A severe earthquake in Chile has generated a tsunami which is spreading over the Pacific Ocean.

87

00:09:43,831 --> 00:09:47,832

The estimated time of arrival of the first wave is 12 midnight for the island of Hawaii

88

00:09:48,833 --> 00:09:50,834

and about 30 minutes later for the island of Oahu.

89

00:09:51,834 --> 00:09:53,835

The danger may last for several hours.

90

00:09:54,836 --> 00:09:56,836

The intensity of the wave cannot be predicted.

91

00:10:06,841 --> 00:10:09,842

9 p.m., May 22, 1960.

92

00:10:10,843 --> 00:10:13,844

The tidal wave races toward the Hawaiian islands.

93

00:10:14,845 --> 00:10:18,846

Tide stations closer to Hawaii begin reporting to the warning center.

94

00:10:19,847 --> 00:10:25,849

Getting some information from Tahiti, the reporting unusual wave activity at 09 p.m. our time.

95

00:10:26,850 --> 00:10:28,851

Hilo is only three hours away.

96

00:10:32,853 --> 00:10:37,855

From his observation point on the bridge, James look waits for the water to recede.

97

00:10:37,855 --> 00:10:40,856

The first sign of the tidal waves approach.

98

00:10:41,857 --> 00:10:43,858

Hilo's fishermen know the sea.

99

00:10:44,858 --> 00:10:48,860

They rush towards open water hoping to escape the waves' devastating impact.

100

00:10:53,862 --> 00:10:56,863

Shortly after midnight, a small wave enters the bay.

101

00:10:57,864 --> 00:11:00,865

It has been 15 hours since the earth shook in Chile.

102

00:11:01,866 --> 00:11:06,868

The men who have relentlessly tracked the wave are now powerless.

103

00:11:08,869 --> 00:11:12,871

12.40 a.m., a second wave enters Hilo Bay.

104

00:11:14,871 --> 00:11:17,873

Ignoring the warnings, Julius residents come to the shore.

105

00:11:18,873 --> 00:11:23,875

These actual photographs were taken minutes before the giant waves struck.

106

00:11:23,875 --> 00:11:28,878

At 1 a.m., the water recedes, sucked into the approaching tidal wave.

107

00:11:53,889 --> 00:11:55,890

The waves are now clear.

108

00:11:59,892 --> 00:12:01,893

The waves are now clear.

109

00:12:02,893 --> 00:12:04,894

The waves are now clear.

110

00:12:05,894 --> 00:12:07,895

The waves are now clear.

111

00:12:08,896 --> 00:12:10,897

The waves are now clear.

112

00:12:11,897 --> 00:12:13,898

The waves are now clear.

113

00:12:14,898 --> 00:12:16,899

The waves are now clear.

114

00:12:17,900 --> 00:12:19,901

The waves are now clear.

115

00:12:19,901 --> 00:12:21,901

The waves are now clear.

116

00:12:26,904 --> 00:12:28,905

The waves are now clear.

117

00:12:29,905 --> 00:12:31,906

The waves are now clear.

118

00:12:32,906 --> 00:12:34,907

The waves are now clear.

119

00:12:35,908 --> 00:12:37,909

The waves are now clear.

120

00:12:38,909 --> 00:12:40,910

The waves are now clear.

121

00:12:41,910 --> 00:12:43,911

The waves are now clear.

122

00:12:44,912 --> 00:12:46,913

The waves are now clear.

123

00:12:49,914 --> 00:12:51,915

The waves are now clear.

124

00:12:52,915 --> 00:12:54,916

The waves are now clear.

125

00:12:55,917 --> 00:12:57,918

The waves are now clear.

126

00:12:58,918 --> 00:13:00,919

The waves are now clear.

127

00:13:01,919 --> 00:13:03,920

The waves are now clear.

128

00:13:04,921 --> 00:13:06,922

The waves are now clear.

129

00:13:07,922 --> 00:13:09,923

The waves are now clear.

130

00:13:10,923 --> 00:13:12,924

The waves are now clear.

131

00:13:13,925 --> 00:13:15,926

The waves are now clear.

132

00:13:16,926 --> 00:13:18,927

The waves are now clear.

133

00:13:20,928 --> 00:13:23,929

Eight waves attacked Hilo.

134

00:13:24,930 --> 00:13:27,931

More than 250 homes and businesses were demolished.

135

00:13:28,932 --> 00:13:30,932

Another 300 damaged.

136

00:13:31,933 --> 00:13:34,934

Loss of property amounted to more than 40 million dollars.

137

00:13:40,937 --> 00:13:42,938

61 people were killed.

138

00:13:43,938 --> 00:13:45,939

Another 200 were caught in the waves.

139

00:13:46,940 --> 00:13:49,941

James Look's body was found near the bridge he had thought was safe.

140

00:13:51,942 --> 00:13:54,943

Ironically, his detailed notes and eye witness accounts were lost.

141

00:13:59,945 --> 00:14:01,946

Two decades have not wiped out the memories.

142

00:14:02,947 --> 00:14:05,948

This mark here shows the 1960 May 23 paddle wave.

143

00:14:06,949 --> 00:14:09,950

This is how high the wave has come in this particular restaurant.

144

00:14:09,950 --> 00:14:12,951

I find that being curious is one of the worst things that can happen to a human being.

145

00:14:13,952 --> 00:14:16,953

People should never be curious in the event that there is a paddle wave coming.

146

00:14:17,954 --> 00:14:20,955

The wave had hit us and the dining room set went against the back door so we couldn't go out anyway.

147

00:14:21,955 --> 00:14:24,957

Things happened so fast that I was running away from the wave

148

00:14:25,957 --> 00:14:27,958

and I just couldn't get out of the way.

149

00:14:28,958 --> 00:14:30,959

I was in the back door and I was in the back door.

150

00:14:31,960 --> 00:14:33,961

I was in the back door and I was in the back door.

151

00:14:34,961 --> 00:14:36,962

I was in the back door and I was in the back door.

152

00:14:36,962 --> 00:14:41,964

I was in the back door and I just couldn't think about anything else but running.

153

00:14:42,965 --> 00:14:45,966

Harry Kim of the Hawaii County Civil Defense.

154

00:14:46,967 --> 00:14:50,968

The 1960 tsunami was a tragic experience I think primarily

155

00:14:51,969 --> 00:14:56,971

because the Hawaii County government, the state government, territory, a civil defense to me.

156

00:14:57,971 --> 00:15:00,973

I cannot put it in no other words except we watched the job.

157

00:15:01,973 --> 00:15:04,975

The warning was poor, the evacuation system was nonexistent,

158

00:15:04,975 --> 00:15:07,976

the setting up of inundation lines were nonexistent.

159

00:15:08,976 --> 00:15:13,979

The 1960 wave proved that something had to be done to prevent another disaster.

160

00:15:14,979 --> 00:15:16,980

To rebuild the downtown seemed futile.

161

00:15:17,980 --> 00:15:23,983

Unless the right answers were found, Hilo would be doomed to more death and destruction.

162

00:15:26,984 --> 00:15:31,987

The Look Laboratory, named after James Look, was set up at the University of Hawaii

163

00:15:31,987 --> 00:15:34,988

to help solve Hilo's unique problem.

164

00:15:35,989 --> 00:15:38,990

Simulated waves are generated in wave tanks.

165

00:15:39,990 --> 00:15:44,993

Preventing tidal waves seems unlikely, but scientists such as Professor Franz Gerritzen

166

00:15:45,993 --> 00:15:47,994

hope they can improve tsunami predictions.

167

00:15:48,994 --> 00:15:52,996

Dr. Gerritzen explains why Hilo is so vulnerable to tsunami attack.

168

00:15:53,997 --> 00:15:59,999

The city of Hilo has been hit hard several times from various tsunamis.

169

00:15:59,999 --> 00:16:04,001

Hilo is situated on a bay inside of a harbor.

170

00:16:05,002 --> 00:16:10,004

And the geometry of the bay and the special location of the bay make it very vulnerable

171

00:16:11,004 --> 00:16:19,008

because tsunami waves that arrive in the area are magnified, as you may call it, inside the bay

172

00:16:20,008 --> 00:16:22,009

and create large run-ups near the shoreline.

173

00:16:23,010 --> 00:16:26,011

Such happened in the 1960 tsunami wave in Hilo

174

00:16:26,011 --> 00:16:32,014

when a bore, a breaking tsunami wave entered Hilo Bay and did great damage on the shoreline.

175

00:16:33,014 --> 00:16:35,015

The residents of Hilo had had enough.

176

00:16:36,015 --> 00:16:43,019

Their solution? Rebuild the devastated downtown away from the shore, away from the waves' destructive force.

177

00:16:44,019 --> 00:16:47,020

A 300-acre park now confronts the sea.

178

00:16:48,021 --> 00:16:54,024

The open park space acts as a buffer, protecting the 27,000 residents of Hilo.

179

00:16:54,024 --> 00:17:01,027

When the next giant wave strikes, hopefully only trees and grass will be destroyed.

180

00:17:03,028 --> 00:17:09,030

Since World War II, more Americans have been killed by tidal waves than by earthquakes.

181

00:17:10,031 --> 00:17:14,033

Most of the United States is relatively safe from tsunami attack.

182

00:17:15,033 --> 00:17:20,035

But the possibility does exist that the violent forces of the Earth and the sea may combine,

183

00:17:20,035 --> 00:17:24,037

sending a tidal wave speeding toward our populated shores.

184

00:17:29,039 --> 00:17:36,042

Thirty million Americans live on the West Coast, most never having experienced a tidal wave.

185

00:17:37,043 --> 00:17:41,045

People associate the West Coast with earthquakes, not tidal waves.

186

00:17:42,045 --> 00:17:47,047

What would happen if a tidal wave were racing towards Southern California?

187

00:17:47,047 --> 00:17:50,049

In search of simulates this possibility.

188

00:18:01,054 --> 00:18:05,055

Let's assume an earthquake rocks Japan, generating a tsunami.

189

00:18:07,056 --> 00:18:12,059

Commander Ed Bernard of the Pacific Tsunami Warning Center will issue the alert.

190

00:18:13,059 --> 00:18:14,059

Tsunami is heading for the West Coast.

191

00:18:14,059 --> 00:18:17,061

The better issue is a tsunami warning supplement.

192

00:18:18,061 --> 00:18:23,063

The expected time arrival of a wave on the West Coast is four hours.

193

00:18:26,065 --> 00:18:29,066

The Coast Guard in Los Angeles would receive the bullet.

194

00:18:30,067 --> 00:18:32,068

Okay, just got a tsunami warning.

195

00:18:33,068 --> 00:18:35,069

The H.E.A. Southern California is about four hours.

196

00:18:36,069 --> 00:18:38,070

You want to take care of the U.M.I.B., I'll take care of the warning message.

197

00:18:38,070 --> 00:18:43,072

Handle San Diego and go north. I'll take Santa Barbara to the south with the harm department.

198

00:18:46,074 --> 00:18:51,076

All Coast Guard vessels, all Coast Guard vessels, this is RCC, RCC Channel E3.

199

00:18:52,076 --> 00:18:57,079

A Rosary tsunami has been generated off of the Japanese Coast.

200

00:18:58,079 --> 00:18:59,080

The H.E.A. is four hours.

201

00:19:00,080 --> 00:19:02,081

Take necessary evasive action.

202

00:19:03,081 --> 00:19:06,083

Attention attention, this is a tidal wave warning.

203

00:19:06,083 --> 00:19:11,085

The tidal wave makes nice and neat. Please evacuate immediately and move to higher ground.

204

00:19:12,085 --> 00:19:14,086

Attention attention, this is a tidal wave warning.

205

00:19:15,087 --> 00:19:21,089

The Pacific Tsunami Warning Center has issued a tidal wave warning for Southern California.

206

00:19:22,090 --> 00:19:27,092

The civil defense has called for an immediate evacuation of all coastal areas.

207

00:19:28,093 --> 00:19:34,095

The U.S. Coast Guard advises boat owners to move their boats out to sea immediately.

208

00:19:35,096 --> 00:19:38,097

Police ask curiosity seekers to stay away from the coast.

209

00:19:43,099 --> 00:19:45,100

Would Los Angeles be prepared?

210

00:19:46,101 --> 00:19:50,103

If an actual tidal wave was coming, would the warning be heated?

211

00:19:51,103 --> 00:19:57,106

Experts agree it is not a question of whether another tidal wave will strike, but when.

212

00:20:05,109 --> 00:20:18,115

What scientists fear most is a tsunami caused by a local earthquake.

213

00:20:19,116 --> 00:20:22,117

Lieutenant Stephen Frolic of the U.S. Coast Guard.

214

00:20:23,117 --> 00:20:27,119

If an earthquake occurred fairly close to the coastline in Southern California,

215

00:20:28,120 --> 00:20:29,120

in other words maybe a couple miles offshore,

216

00:20:29,120 --> 00:20:35,123

we would probably not have time if a tsunami was generated to really warn anyone.

217

00:20:36,123 --> 00:20:42,126

Hopefully if it was that close we wouldn't have to worry about it building up enough to have any great effect.

218

00:20:43,126 --> 00:20:45,127

But if there was it would be almost instantaneous.

219

00:20:46,128 --> 00:20:48,129

The large earthquake occurred in Southern California.

220

00:20:49,129 --> 00:20:54,131

If you were on the beach you felt the earth shaking strongly enough that you had to hold on to something to keep it falling down.

221

00:20:55,132 --> 00:20:56,132

That's nature's warning to you.

222

00:20:56,132 --> 00:21:03,135

We cannot possibly get a warning to you in five minutes, but you can save yourself by getting to higher ground.

223

00:21:18,142 --> 00:21:24,145

Coming up next, in search of continues with a revealing look at the survivors of the atomic tragedy of Hiroshima.

224

00:21:25,145 --> 00:21:34,149

Then the FBI behavioral unit creates the profile of a brutal killer and agents track him down on FBI The Untold Stories.

225

00:21:35,150 --> 00:21:42,153

And later tonight, Histories Mysteries journeys to the Southwest to investigate the strange

disappearance of the Anasazi people.

226

00:21:43,153 --> 00:21:46,155

At 8 here on the History Channel where the past comes alive.