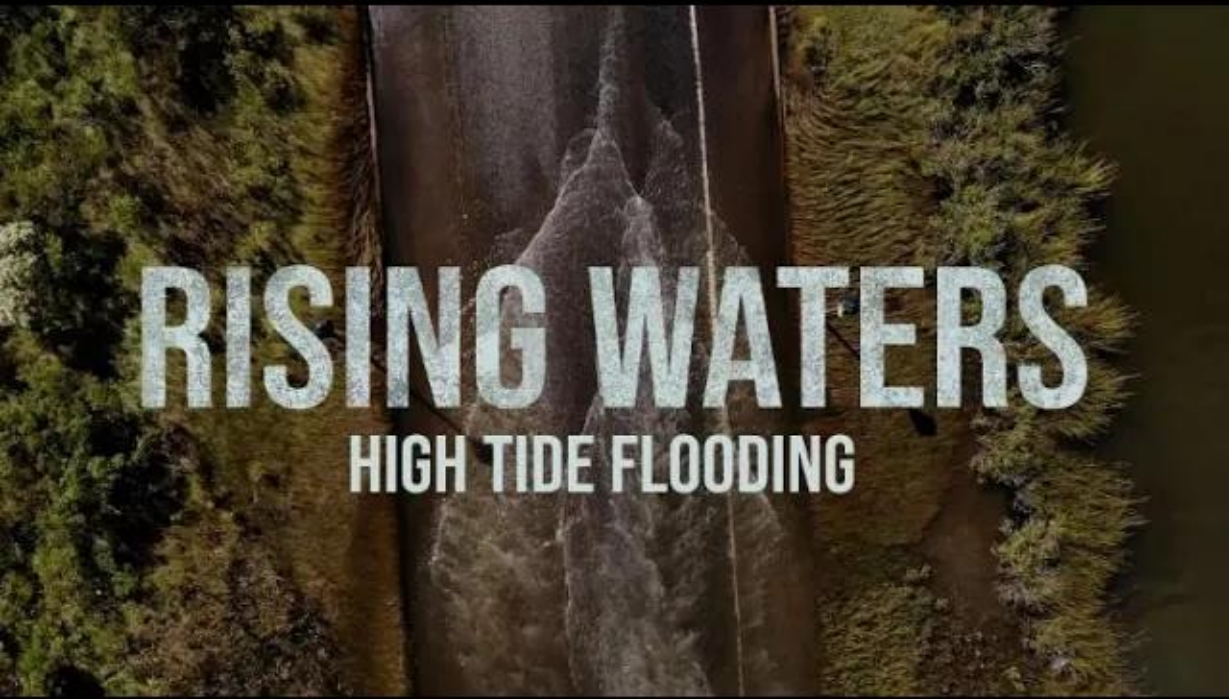
RISING WATERS
HIGH TIDE FLOODING

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00:00:01,070 --> 00:00:05,070
[rhythmic music]

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00:00:05,070 --> 00:00:09,000
Kriebel: High tide flooding is the leading edge of the sea level rise problem.

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Grieco: We've been following the data for decades.

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Going back 50 years, we experienced a flooding like that

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maybe four times a year where a roadway would be totally flooded

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and impassable. Most recently in 2018,

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we had 52 days of flooding. And so the frequency

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is increasing and the severity, the depth of the water is increasing as well.

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Hamlington: Over the past decade or so, we've seen very high rates

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00:00:37,070 --> 00:00:41,070
of sea level rise along all the coasts of the US, so the US West coast,

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the Gulf coast, and also the East coast.

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And if you look at a global map of the ocean and the satellite altimeter measured sea level trends,

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the US really stands out as this hot spot

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00:00:53,070 --> 00:00:57,000
with all coastlines going up very rapidly.

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Sweet: You know, it’s causing disruption in people's lives. Patience is starting to be lost in some of these comm

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and it's, it's a struggle, but it's not just a local problem.

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It's really a national problem as we want to deal with the increased

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00:01:09,070 --> 00:01:13,070
risk of coastal flooding due to sea level rise now,

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and as we move into the future.

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[music builds and fades]

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00:01:21,000 --> 00:01:25,070
Hamlington: As sea level continues to increase,

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as ice melts, the ocean expands due to global warming,

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we're going to continue to see these effects increase.

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You're going to get more frequent and worse high tide flooding in a lot of locations. And locations that aren't ex

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high tide flooding now, 10, 20, 30 years from now,

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00:01:41,070 --> 00:01:45,000
they will be experiencing high tide flooding on a pretty regular basis.

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And on top of that, minor meteorological events. So a slightly lowered And on top of that, minor meteorological

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lowered atmospheric pressure, on-shore winds that might in our case,

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00:01:53,070 --> 00:01:57,070
push up the Chesapeake Bay or push in the Severn River. Any of those factors

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00:01:57,070 --> 00:02:01,070
can cause a little bit of an additional rise in water level

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00:02:01,070 --> 00:02:05,000
on top of the astronomical tides.

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00:02:05,000 --> 00:02:09,070
Sweet: And we're not talking about extreme winds. We're talking about the kind of winds that we like when we

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00:02:09,070 --> 00:02:13,070
15, 20 knot winds. But it's that kind of variability

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00:02:13,070 --> 00:02:17,000
that is causing flooding to happen at record breaking instances.

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00:02:17,000 --> 00:02:21,070
Hamlington: So we have seasonal cycles that occur.

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00:02:21,070 --> 00:02:25,070
So over the course of a year, you're going to have a time of the year where sea level is higher than others.

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You have a, what we call inter-annual to decadal variability.

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00:02:29,070 --> 00:02:33,070

So El Niño would be example of this. So when you have an El Niño that occurs,

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00:02:33,070 --> 00:02:37,070
you have a higher sea level than normal on the US West coast.

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Then on even longer time scales than that we have melting of ice, we have thermal expansion

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00:02:41,070 --> 00:02:45,000
due to global warming that's causing long-term sea level rise.

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Sweet: The other part is, what’s land doing?

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On the East coast and Gulf coast, we have a land subsidence issue.

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Some of that’s natural. Compaction of sediments

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00:02:57,000 --> 00:03:01,070
in the Mississippi Delta, you know, glacial isostatic adjustment that’s occurring.

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00:03:01,070 --> 00:03:05,070
But there's a part that's unnatural. It's extraction of fresh water for drinking

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00:03:05,070 --> 00:03:09,070
and fossil fuels for consumption. That component

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can exacerbate relative sea level rise, almost on the same order of magnitude

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00:03:13,070 --> 00:03:17,000
that the ocean is rising itself.

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00:03:17,000 --> 00:03:21,000
[gentle wave sounds]

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00:03:21,000 --> 00:03:25,000
Hamlington: Yeah, so a lot of times we talk about coastal flooding

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and sea level rise as a future problem. So you see projections out to the end of the century,

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00:03:29,070 --> 00:03:33,070
but in reality, sea level rise and coastal flooding is a problem that we're experiencing now.

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Kriebel: Right where we’re at right now is a road that flooded 41 times

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times last year. And you can see

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how the road is so much lower than the top of the sea wall.

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The storm drains are really the problem that the water can come up freely from

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from the Severn River and just backflow right through the storm drains.

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Grieco: And when the tides rise to a certain elevation,

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the water backs up through the storm drain system and comes out through

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the storm drains in parking lots, for example.

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One particular intersection that floods is a main arterial to the downtown area.

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And so it gets completely closed. And so, first responders are impacted.

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When the parking lot's flooded, then their clients can’t park there,

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00:04:21,070 --> 00:04:25,070
or they tend not to even come downtown

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when these days are reported. It's been documented there’s impacts to their revenues

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upwards of $200,000 a year just due to tidal flooding.

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Kriebel: I guess you could say it’s sort of a battle between land elevation and water elevation.

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It's what I've been calling the game of inches.

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Of all the hundreds of high tides a year, some are just a few inches higher than others.

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And those are the ones of course that are causing flooding now.

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The real problem though, is all the high tide events that are just a few inches below,

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it's only gonna take a few inches of additional sea level rise

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to nudge them upward. So what will happen over time

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is with sea level rise … we're going to end up not with 20 or 40 flood events,

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but we'll then be into hundreds of flood events per year.

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[music fades and rebuilds]

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Sweet: One of the things that communities are doing

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is they’re preventing water from coming back through the stormwater systems.

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They’re called backflow preventers. You want to let rain out,

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but you don’t want to let the ocean in.

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Kriebel: Some places like Charleston are putting large underground

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water storage facilities, deep underground, where they can direct rainwater and get it off the city streets

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and try to hold it there until after you know the rainstorm goes.

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If you have low lying areas, you may need pump stations

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to collect rain water and pump it.

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Hamlington: But then there's these other strategies where coastal communities are trying to reduce

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the amount of pavement they have for instance, increase the amount of green space they have

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in these different locations, restoring beach front. A lot of these

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different things can reduce the impact of coastal flooding going forward.

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So NASA has the observations

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that are really needed to improve our understanding of

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sea level science. So across the board,

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we have processes that are contributing to sea level change on a range of timescales

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and the variety of satellite observations that we have available to us now

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really allow us to improve our understanding of these different processes.

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Sweet: What we're doing at NOAA is really trying to give the

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data to decision makers so that they can make informed decisions

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that's best for their community. But one thing's for certain,

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is under current flood defenses, these projections suggest that a floodier future

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00:06:45,070 --> 00:06:49,070
is going to be here in the next few decades