

RISE: Climate Change and Coastal Communities
Part 1 - Sounding the Waters
Final Script

0. Billboard

Narration:

Sea level rise and extreme weather, brought on by climate change, threaten cities and towns along the world's coasts.

Craig: London, Tokyo, Los Angeles, Miami. All these cities are cities on the water.

Narration:

San Francisco is one of them. And waves are already overtopping the financial district's levees.

Paul: What happens to our infrastructure? What happens to roadways, what happens to water treatment plants?

Narration:

We need to start planning for the impacts that we can no longer halt.

Paul: So this is a big adventure, a big adventure of survival that we're all on together.

Narration:

Proposed solutions range from traditional to creative to way out.

Travis: My job involves thinking outside the box. More and more I don't even know where the box is.

Narration:

How will we respond to a world changing fast around us.

Travis: We're best when conditions are worst. And this is a time for us to be our best.

Narration:

RISE: Climate Change and Coastal Communities. After this...

I. Intro

Narration:

RISE: Climate Change and Coastal Communities. Sounding the Waters.
 (Run this in opening water sounds)

MUSIC: Main

Wave breaks. Main music swells. Runs in clear, then under . Fades out as Paul comes on

Narration:

Most of the great cities, the world over are built along the water. So are towns, hamlets, villages. Because living along waterways makes a lot of sense for any society. And San Francisco is no exception. With the ocean to the west, the Bay to the east and the golden gate connecting them, this peninsula is defined by the water that surrounds it. Other major cities ring the coast of the San Francisco Bay as well. Oakland, Richmond, Hayward in the East Bay. San Jose and Silicon Valley cities in the South Bay. But, sea level rise, fueled by climate change, is threatening to reclaim this land and the communities that are built on it.

Ambience: Kayak launching sounds up.

Music: OUT by now.

Narration:

Paddling a kayak, eyelevel to the water, is a good way to get a view of the San Francisco Bay's coastline.

Paul: Okay, so here we are, it's a beautiful day on the San Francisco Bay. I've got my trusty kayak. (Splash) Plopping it into the water. So when you're launching from a dock, you have to scootch your butt over onto the boat. Slide in very carefully.

Whoops. (Splashy sounds. Bonk) And it's always a little tricky getting in your tippy kayak. Good. Rudder down, paddle in my hands, push off, time for a voyage.

Ambience: More Canadian Geese
(Paddling begins.)

Narration:

Paul McHugh has been covering the Bay Area's natural environment as a journalist for over 30 years now. Yakking and kayaking around the Bay.

Paul: I'm Paul McHugh, long time Bay Area resident. Long time Bay Area writer. And a very long time Bay Area kayaker. About to do one of my favorite things, which is launch a sea-kayak onto San Francisco Bay and go for a tour.

Narration:

Paul had the outdoor beat at the San Francisco Chronicle. He's also written for the New York Times, the Washington Post and the LA Times.

Paul: It's a pearl gray day. There's a high fog and a kinda silvery light. And that reflects off the surface of the Bay. So it's a pewter experience this morning, paddling along.

II. Climate change is coming

Ambience: City sounds come up. Boat horn.

Narration:

Of all the cities circling the Bay, San Francisco stands out as the area's icon.

Paul: And now as I paddle closer to San Francisco, one of the world's most fabled skylines is coming into view. There's all those familiar landmarks. The Transamerica Pyramid, Coit Tower. There's Boudin Bakery, where you can get your sourdough rolls. What a pretty, pretty town. (Louder city sounds) And now we're starting to cruise by the Financial District of San Francisco. Behind the ferry building are those big, soaring glass towers of the financial district. Some of them with their tops lost in the cloud of mist.

MUSIC: City(Debate)

In here

VoxPop:

Adilah: We're in the financial district in San Francisco.

Jack: Uh, this is actually the Embarcadero,.

Joel: In front of the ferry building on Embarcadero.

Michael: I actually don't know what this area is called. Ferry Center? Maybe?

Jenny: Downtown area? I guess?

Denise: The Embarcadero. It's at the edge of the financial district.

Travis: This is the Embarcadero. It's a fabulous boulevard as you can see with palm trees in the middle of it.

Narration:

And this is Will Travis.

Travis: My name is Will Travis. Most my friends just called me Travis or Trav.

Narration:

Travis heads up BCDC. It stands for the Bay Conservation and Development Commission.

Travis: ...which is a state coastal management agency.

Narration:

The "coast" that Travis is responsible for is the edge of the San Francisco Bay.

Travis: The challenge that we're facing now with sea level rise is that the Bay is going to get bigger. So our responsibility is to come up with strategies for dealing with this problem.

Narration:

And the Financial District may be his biggest problem.

Travis: We've got a whole series of high rises around us both office buildings and hotels and condos. So this is the basic hub of downtown San Francisco, a lot of activity.

VoxPop:

Michael: A lot of people come to the Financial District to do consulting or banking.

Jenny: A lot of business people work there.

Michael: It's where a lot of people spend a lot of their day-to-day lives is the Financial District.

Narration:

But... the Financial District of San Francisco is vulnerable. It floods. And it's been flooding more and more.

Travis: Even now at relatively low tide, there's about 6 feet of freeboard--that's the space between the water level and the top of the sea wall. At high tides, we'll get waves splashing up and over the Embarcadero and this walkway. If we look over here... you can see sandbags stored along the waterfront because they have to put them up in front of the doors to keep the interior of that building from flooding now.

Music: OUT

Paul: Okay, swinging out past the ends of the piers, we're making our way down the San Francisco Embarcadero. From where I sit it looks like all the water has to do is come up 6 feet to flow onto the Embarcadero. 5 or 6 feet of water would begin to cover the Embarcadero. Let's say global warming happens according to some of the scenarios that have been laid out and you have the water going up many feet by 2100, well those places will be inundated.

Travis: The kind of intense storms that we've seen once every 100 years, we'll see ten times as often in the future.

Narration:

How worried should we be about flooding?

Healy: My name is Doctor Healy Hamilton.

Narration:

Healy Hamilton works at the California Academy of Sciences in San Francisco.

Healy: I am an academy scientist. And I direct the Center for Applied Biodiversity Informatics. My own research program looks at the impacts of climate change on biodiversity.

Narration:

According to climate measurement tools sea level rise is real and significant.

Healy: The projections a few years ago were 16 inches by 2050, and perhaps 55 inches by the end of this century.

Narration:

But that isn't the last word.

Healy: More recent studies raise that to 29 inches by 2050 and as much as 75 inches by 2100.

Narration:

The studies keep coming, and scientists agree that, based on increasingly sophisticated models, the numbers are only going up.

Healy: Global climate models are incredibly complex, run under huge super computers, using millions of different inputs, and trying to capture how the global climate system works. Today we are overshooting the worst-case scenario that we even imagined 10 years ago. We are headed right now on a path to an ice-free planet. And once we are there this planet will look nothing like it does today, and the human infrastructure that we all depend upon, will not be able to adapt to those kinds of changes.

MUSIC: City(Debate)

In here

Narration:

There are almost 150,000 people living and working in San Francisco's Financial District. This might soon be a big problem for them.

VoxPop:

Nan: Work brings me to the Financial District.

Adilah: I come here five days a week.

Acacia: I work in a law firm in the city.

Ron: Well, I'm part of the street artists program.

Judy: I work at a Credit Union.

Sonja: From 8:30 to 5:30.

Adilah: I also bank and I also shop here.

Judy: Clothes shopping everything,

Denmark woman: I'm just reading a book. Had my lunch.

Joel: I'm skateboarding. It's the only place anywhere near here that is flat and you don't get kicked out by the police.

Cesar: I got off early today. So yeah, I'm kinda just walkin' around.

Paul: So I am now paddling with the tide. I'm being carried on the wings of angels. Well maybe mermaids, well wait, mermaids don't have wings. I'm being carried on the wings of angels wearing aqualungs.

Narration:

So... where is this sea level rise that everyone's talking about?

VoxPop:

Nan: I don't know anything about sea level rising in San Francisco.

Adilah: I don't really have an opinion.

Cesar: Sea level right now – we're above it.

Denmark woman: It's not something I know a lot about.

Cesar: Honestly, I never really stopped to think about it.

Healy: Climate change is causing sea level rise in two different ways. When water molecules are warm they expand. It's called thermal expansion.

Music: OUT

Narration:

So as the oceans heat up, they take up more room. And then, as Dr. Healy Hamilton explains, there are the melting ice sheets.

Healy: Increasingly we see very rapid melting of those land ice caps, and that is mainly in Greenland and Antarctica. That literally adds new volumes of water to the world's oceans, contributing another portion of rising sea levels.

Narration:

Plus... there are what's called "feedback loops."

Healy: When ice melts, instead of being bright and white and reflecting the sun's rays back into space, you now have darker oceans that are absorbing the sun's heat. The more the ice melts, the more that sunlight is absorbed rather than reflected, which heats things up even more, which causes more ice to melt and there we are in a feedback loop.

Narration:

Climate change will also cause more extreme weather patterns. It's called climate disruption.

Healy: Those storms that we used to have are now getting more intense. That means more rainfall, more winds. And wind is what pushes the surface of the water around creating bigger waves and those bigger waves are causing coastal flooding.

Paul: In the event that sea level rise continues the way that we've been told it might, then we have the water expanding in the ocean and the Bay, just from heat. You'd have melting glaciers and ice caps Antarctica, Greenland, so forth, raising the sea level. Let's say you've got more rainfall, then you add a little extra high tide, a plus tide, and shake it together and shazam. You've got a flood.

Travis: So if you combine sea level rise, a slow filling of the bathtub of the Bay, with these splashing events which will occur far more often, you can see we're going to have much more flooding more regularly.

Healy: This will happen with increasing frequency into the future, and that's a direct impact of climate change.

VoxPop:

Denmark woman: I mean I've heard about this.

Michael: I think we've all seen the photos, right, of polar bears scrambling to stay on their little ice boats and that's not looking so hot.

Juanita: When people say things like that you have to take it with a grain of salt.

Paul: That's no idle threat because climate change is starting to really set in. We're starting to see the effects now.

Travis: We've had eight inches of sea level rise in San Francisco Bay and we know this.

Narration:

That's Will Travis, again.

Travis: Because the oldest and longest continuously operating tide gauge in the entire United States of America is at the Golden Gate. So we have 154 years of data. So this isn't a guess, it isn't a prediction, it isn't an estimate, it's measured for the past century and a half.

Ambience: Transition to Tide Gauge pier.

Healy: We are standing on a pier that is right above the tide gauge and it's totally under water and we can't see it. (laugh) The tide gauge is basically a tube that the water flows into, and using air pressure we are able to measure the level of the sea, which is then transmitted to computers, which upload that information to satellite.

Ambience: Walking to computer room.

So, we're in a tiny little room on top of the pier. And in this room are boxes filled with computers that are registering the data that comes in from the pressure gauge and the tide gauge. There's about a half dozen grey metal boxes mounted to the wood, and all of them are connected by big wads of wires leading everywhere. It looks like tide gauge command central. Along with almost a hundred and seventy five other tide gauges around the country, together they give us a clear picture of how sea level has been steadily increasing over time.

Narration:

Today, tide gauges are only one tool used to measure the level of the sea.

Healy: In addition to tide gauges, we use laser altimetry, from airplanes that fly over the Bay and measures the distance between the sea floor and sea level. And we use satellites to measure the surface of the oceans. All three of these together give us our best understanding

of how sea level rise is occurring today and allow us to project the rate and magnitude of change into the future.

MUSIC: City(Debate)

In here

VoxPop:

Juanita: Sea level rise? You know you can have all these horror stories (laughs).

Judy: I mean you immediately think of like rising water.

Acacia: I see me underwater

Cesar: Mother Nature is really strong.

Michael: I think of the water's just sort of enveloping you, just moving higher past your ankles, up to your knees. Who knows when it's going to stop.

Cesar: People talking about end of the world here and it's like, Oh my god.

III. The role of wetlands and infill in this problem

Narration:

Well.... not end of the world. But a world that is changing fast around us. And it's coming about because of changes we have been making to our planet -- not only to the climate, but also to the land. Here in the San Francisco Bay Area, we not only built beside the water, but into it, filling in 40% of the Bay to create real estate.

Music: OUT

Craig: When I'm looking out this window 24th floor of One Front St. I'm seeing to my right a tall building that is about 30 stories of vertical stripes. Right in front of me a building of aluminum and glass that is also about 35 stories. To my left another building of say 25 stories. To it's left, 30 stories. You have a sea of tall buildings.

Narration:

That's Craig Hartman.

Craig: Craig Hartman. I'm an architect uh partner at Skidmore, Owens and Merrill San Francisco and we design buildings and cities literally.

Narration:

SOM is one of the biggest design firms in the world. Craig describes what this same view from his office window would have looked like -- a few centuries back.

Craig: This was originally called Front Street because this was the front street onto the Bay. And had we been here, what we would have

seen is the Bay lapping at the shore and certainly a lot of pelicans, egrets, sea gulls.

Narration:

The original shoreline of San Francisco is about a half a mile inland from the edge of today's Bay. So, all those skyscrapers surrounding Craig's office tower are sitting on landfill.

Craig: The process of creating new land around the Bay was to first create a levee, then water was pumped out from behind those levees, and land was filled in, in some cases entire hills were cut down and flattened and brought to make land fill.

VoxPop:

Sonja It's just so hard to believe that this whole area was water and then filled in and built upon.

Cesar: I don't know, I would've never thought about that. It's crazy! (chuckle)

Narration:

Along with using entire hilltops for fill, Paul and Travis explain that the Financial District was created with another surprising material.

Other Music:

Barbary Coast music

Paul: Once upon a time this was the most robust commercial fishing port on the west. And there were mast upon mast and boat upon boat crowded. That's just the heyday of the rip-roaring Barbary coast.

Travis: The ships that were bringing the miners to the Gold Rush came into Yerba Buena Cove. The sailors weren't paid much, if anything, and they jumped ship. Trash was thrown overboard from the ships, which were used for storage and saloons and most everything else. The wooden hulled ships rotted into the mud and downtown San Francisco was built on an armada of derelict ships.

Paul: And so sometimes when they dig down in the financial district to sink one of those mighty towers of commerce they hit one of the former hulls of commerce and then all of the archeologists get excited.

VoxPop:

Nan: I did not know there were old shipwrecks underneath the financial district. That's awesome (laughs). I wanna dig down and find one.

Denise: We're on a piece of history right now.

Cesar: If it's built on top of a whole bunch of old Gold Rush ships, I mean, might be haunted, or

Acacia: Oh yeah, maybe that's why all the spirits come through the buildings. I'm totally kidding though.

Jenny: It's pretty crazy.

Michael: That is really cool!

Jenny: I guess it's a way of recycling, I don't know! (laughs)

Narration:

Cool? Crazy? Maybe. But it's this created land that is now threatened by floods.

Travis: Because when those wetlands were filled, they were filled only high enough to get them above sea level. And that was the sea levels of the past. So there's a high likelihood that areas that were wetlands in the past, will probably be subject to future sea level rise, inundation and storm surge.

Narration:

And this is the crux of the problem: Bay coastline filled just up to sea level to make new real estate back then. And the level of the sea rising today.

IV. Imagining the floods

Paul: I wonder if global warming really kicks in, the sea level rises, what's going to happen to that financial district?

Narration:

Paul McHugh and Craig Hartman have some colorful ideas about what might happen.

Craig: If we do nothing in the next century, uh, what we'll have is Venice by the Bay. We'll have streets that are now canals and tall buildings rising out of this waterway.

Paul: I mean the guy up on the 20th floor of the tower may be okay, until he tries to leave.

Craig: Well for those of us who dwell on the 24th floor, like myself, we'll have no problem as long as we have a canoe to get to our building.

Paul: Is the new commute vehicle for the financial district of San Francisco going to be a canoe, not a limo? Interesting to contemplate.

Craig: But you could not inhabit the city if it were flooded. Even a foot of water would stop the city. If nothing were done We'd have an empty city.

Ambience: Stormy FX

Other Music: Disaster movie

Travis: If you can imagine us here in 2050 on a dark and stormy night with high tides and the wind pushing the water up over the sea wall

and onto the Embarcadero and into the buildings. It would kind of be like that.

VoxPop:

Nan: I can't even picture that. What would that even look like?

Sonja: Sea level rising, I think is pretty frightening.

Alex: I get an anxiety, um extreme anxiety about it.

Michael: Fear. I think it's a sort of open-ended fear.

Cesar: It kinda scares me.

Narration:

But while sea level rise feels threatening, it also feels, somehow, unreal.

MUSIC: City 2 (Gma/Perspectives)

In here

VoxPop:

Jenny: I haven't noticed any difference in the level of the water. So it looks the same to me

Sonja: I don't see it as being rapid.

Ron: Probably not in my lifetime. That's just my opinion.

Paul: What happens to our infrastructure? What happens to roadways, what happens to water treatment plants?

Travis: It's important to remember as we look down here now and we see a street, that you're going to get flooding on what's underneath all that too. BART lines, MUNI lines, sewer lines, the basements of hotels and office buildings.

VoxPop:

Sonja: The whole financial district would be affected. The economy of San Francisco.

James: People get hurt, people lose homes, businesses will suffer.

Jack: Shipping and tourism.

James: It would create chaos.

Judy: Probably the location of where I work change, where I eat would change.

Michael: I work for a pretty big company so I'd imagine they'd up and relocate somewhere.

Nan: I don't like my office all that much anyway! I could see it go.

Cesar: I think it would affect a lot of people, actually. A lot of people.

Music: OUT

VoxPop:

Alex: It's awful. I mean, I can't imagine how that will affect the economy, people's livelihoods. I mean probably pretty awfully.

Judy: I think that would be awful.

Narration:

And it's not just Downtown that will get hit.

Paul: (Light plane noise) Another airplane passing overhead on its way to SFO. One of the great airports of the world and one of the low-lying airports of the world. Right down on water level on San Francisco Bay. What do we do to maintain an airport on the peninsula?

Travis: San Francisco and Oakland International Airports. Silicon Valley, home to Apple and Intel and Google are vulnerable to sea level rise. And we're looking at about 332 square miles of land that houses about 270,000 people. So low-lying areas around the shoreline of the Bay, which are now lovely waterfront locations, may be lovely underwater-front locations in the future.

Narration:

How about houses built higher up in the hills around the Bay? They're safe. Right?

Trav: It's important to understand that you're part of an overall system. When you get your water it may very well be coming through a pipeline that is vulnerable to sea level rise and inundation by salt water. And uh, we also have in the Bay Area a lot of police stations, fire stations, schools in low-lying vulnerable areas. Climate change will have impacts on all of us here in the Bay Area.

MUSIC: City(Debate)

In here

Paul: This really is a beautiful waterfront and it's well loved and the question is how do we save it? Can we save it if the Bay seriously starts to rise?

VoxPop:

Acacia: Well, I definitely wouldn't want it to be abandoned.

Sonja: There's way too much at stake. There's people's lives and businesses and the economy and...

Acacia: I would think that you'd wanna protect it.

Sonja: Yes, it's extremely important to protect this.

Michael: I think that the goal for everyone here in the Financial District is probably going to be make sure that business goes on uninterrupted.

Denmark woman: I mean, it's really not an option.

Travis: We are going to protect downtown San Francisco, we're going to protect Silicon Valley, we're going to protect the

international airports. Some of the areas that are simply essential to civilization as we know it.

Narration:

But how're we going to do it?

VoxPop:

Denmark woman: I guess you could rise? Make higher buildings or...

Michael: Live like the Jetsons! Super-high off the ground.

Sonja: I have no idea how, what you would have to do to prevent this from happening.

Jack: I really don't know. I'm not a scientist.

Denmark woman: I guess you could do stuff, I mean, I wouldn't actually know.

Music: OUT by now

Station ID

MUSIC: Main

Theme music comes in for Station ID break. Runs for full 60 seconds.

Narration:

You're listening to RISE: Climate Change and Coastal Communities.

V. What can we do?

Narration:

A rising sea is lapping at San Francisco's shores as well as coastal cities around the country and the planet. How do we stop the rising waters?

Travis: Even if we all over the world, we park all of our cars, shut down all of our power plants and turn off all the lights everywhere today, there's so much greenhouse gas in the system, it will continue to get warmer for at least another quarter century if not a half-century.

Narration:

Will Travis of BCDC, the Bay Conservation and Development Commission.

Travis: So that's why we have to couple our efforts of reducing greenhouse gases with efforts to adapt to the changes that are inevitable.

MUSIC: Solutions

Begins here

Narration:

But what's it mean to adapt? What can we actually do? Architect Craig Hartman has a couple of ideas:

Craig: There are two solutions to sea level change. One is a wetlands approach, which lets the waters spread as sea level rises. The second is a hard levee system.

Travis: When people use the term “hard armoring,” they are essentially talking about building a very high sea wall that is very thick, so the water will always stay on one side of it and the development can be on the other side of it. A firm demarcation between the water’s edge and the land.

Craig: A place like San Francisco, we don’t have the luxury of letting water creep up Market street as the sea levels change.

Travis: We will either raise the height of the Embarcadero, or we will put some sort of a huge levy outboard of the piers.

Narration:

Journalist Paul McHugh is getting a good look at the current levees in front of San Francisco’s Embarcadero from the perspective of his kayak.

Paul: Do we try to do what the Dutch did and put in a vast system of pumps and drains, levees, dams and dikes. They have 8000 miles of it around that tiny country. Would we have to do a similarly robust system here?

Music: OUT

VI. Levees

Narration:

Many low-lying cities along the San Francisco Bay are already defended by levees. But as sea levels rise and storms increase, these levees may not be up to the job.

Ambience: Traffic sounds

Narration:

Fremont is a part of the coastal development stretching along the eastern shore of the Bay -- between Oakland and San Jose. And Alameda Creek runs through Fremont from the hills above, to the Bay below. The levee along the creek protects this coastal town from flooding – from both rain run-off and Bay tides.

David:

You know you see the canal with the water on one side. And uh, the houses are, well as you can see, a little bit lower than the water here.

Narration:

That’s David Cruz.

David:

David Cruz. I’m a foreman for, uh, Ferma .

Narration:

Ferma is a Bay Area construction company that works on levee maintenance along the Bay's coastline.

David:

San Mateo bridge levee. And we did Guadalupe in San Jose a while back. We've done quite a bit.

Ambience: Work sounds

Narration:

Today they are working on Fremont's levee.

David:

When it rains it gets all filled up and I think its eroding the levee here. So, I don't know – with time it'll you know collapse, I guess. So they'll get all flooded. You see the levees in other areas failing, you know, like. I guess they're trying to prevent that, you know.

Narration:

They're strengthening the rip-rap – a barrier of jumbled rocks along Fremont's – levee to keep it from eroding.

David:

You can see, the rock ain't all the way to the bottom and they want to extend it all the way to the bottom, to the edge of the water. So the water won't erode the levee. We're gonna bring trucks with rock, throw it down and place it in place and that's basically it. And then the city will keep a watch on it and make sure it's holding up.

Travis: Well generally the problem with levees is that sea level won't stop. You tend to build a levee, and it is a certain height, but sea level is going to continue to keep going up. They need to go higher and higher. So you have to redo it.

Narration:

Travis understands that while levees are vital, they may not be a match for the problems ahead.

Travis: Levees are expensive to build. They need ongoing maintenance and they are very expensive to maintain. So it is not a question of the cost for the levee, you have to put in the cost of maintaining it.

Travis: The other problem with levees is we all love living around San Francisco Bay, but if you build a levee you are in essence separating yourself from the bay that you want to be next to. They break the connection between land and water. And they destroy habitats.

Paul: Of course, the big thing to bear in mind is there's only two kinds of levees. Those that fail and those that are going to fail. It takes a lot of willpower, a lot of economic strength, a lot of diligence and vigilance to keep that kind of thing from springing a leak. As hurricane Katrina proved in New Orleans, if you blow it you blow it big.

VII. Wetlands

VoxPop:

Michael: I don't know, maybe the other alternative is to you know, take what the sea gives us.

Jenny: Try to figure out ways to help the environment.

James: I think conversion of wetlands is the right direction.

Narration:

Wetlands are the other traditional solution for flood control.

MUSIC: Solutions

In here

Mendel: What's a wetland? It's really not that complicated. The simple layman term is land that's wet. The easiest way to think of it is that's wet, at least temporarily wet, for some period of time.

Narration:

This is Mendel Stewart. He works for the Fish and Wildlife Service, managing a huge and ambitious project to convert salt ponds back to wetlands around the San Francisco Bay.

Mendel: 85 to 90% of the historical tidal wetlands of San Francisco Bay have been lost. They've been diked and drained and converted to other uses. Particularly through filling for development.

Narration:

Obviously we can't restore San Francisco to its natural state. But in front of a lot of other major development around the Bay are huge tracts of industrial salt ponds that used to be wetlands. While many wetlands were filled in for real estate development, these wetlands were made into briny ponds – to harvest salt.

Mendel: One of the great things about salt production, there's still open space. If it wasn't for those marshes being converted to salt production they would have been filled and built on. It gave us the opportunity that we would not otherwise have to do many of the restoration projects that we're doing all around the Bay.

Music: OUT by now

Ambience: Truck rumbling along.

Narration:

Sitting along the Bay's shoreline about an hour's drive south of San Francisco is the city of East Palo Alto.

Michelle: My name is Michelle Orr. I am a hydrologist by training.

Justin: My name is Justin Vandeber. I am a coastal engineer.

Michelle: We're out at the Coolie Landing Salt Pond Restoration. It's about a 115 acre site. Used to be marsh a long time ago. Thick stands of pickleweed in their reds and greens, with channels running through it. And the Indians may have used area for harvesting shell fish.

Justin: Then in the 20th century, for several decades, it was used for industrial salt production.

Michelle: And 10 years ago, the tides were reintroduced so it could once again become natural marsh. It's not rocket science. But we basically just opened it up to tides in right locations and let the tide waters come on to the site.

Narration:

So now, ten years later, Michelle and Justin are out here today to see whether this area is, in fact, reverting to wetlands.

Ambience: Truck stops. Engine off. Door opens

Michelle: Alright. I have your field book, Justin.

Michelle: I spend most of my time in the office. (laugh) So it's nice to get out here today. It's beautiful. What we're looking out on is a very nice young marsh that's building up. And then some areas that are still mudflats.

Narration:

Mudflats are a stage this area is going through on it's way to becoming a marsh.

Michelle: What I'm seeing is an ecosystem come back to life.

Narration:

What I'm seeing is a lot of mud.

Michelle: You know I do think it's an acquired taste because when I first went out on marshes it just looked like a lot of mud. And I remembered thinking, that's kinda nice. But, you know, it's really not that much to get too excited about. (laugh)

Narration:

As we look over this muddy perhaps, but natural landscape, we are enveloped by the sound of several freeways, a bridge and endless airplanes.

Michelle: So behind us is the community of East Palo Alto. And it's built on very (chuckle) very low ground, prone to coastal flooding.

Narration:

While East Palo Alto is nestled within Silicon Valley, this city is primarily Latino, poor and sitting in the path of sea level rise.

Michelle: With climate change we can expect sea level rise and more frequent, intense storm events. An, uh the city of East Palo Alto would be subject to increasing levels of flooding. I mean that, that's not an acceptable solution I think from a public perspective.

Narration:

This marsh will be part of the solution.

Michelle: These marshes will help provide flood protection to East Palo Alto here. And, uh, as a wave travels from the Bay across this marsh, the marsh surface and the plants on the marsh will absorb the wave energy so by the time that wave hits this levee here it's going to be a lot smaller. The marshes can help there, but you definitely need levees to be part of your flood solution. So marshes and levees can work together to provide a system of flood protection.

Michelle: Why don't we go ahead. And I think we'll head up to the north part of site.

Justin: Watch your step. The boards not in great shape on the boardwalk here.

Michelle: You can see here the quality of some of the board walks. And you do need to be careful.

Ambience: Walking on the boardwalk.

Narration:

"Boardwalk" was a polite euphemism, as I faced a thin, rickety plank, rotten through in places, propped up on even thinner stakes and running above the mud about 4 feet in the air. With too much recording equipment and some misgiving, I followed my guides onto the boardwalk.

Michelle: This whole area looks completely different than when site first restored. And uh, I love this cause you can see where shorebirds have been in this channel, feeding. They clearly like it here. They've been all over it. The little footprints with the, uh, like 3 forks. Looks like an egret to me. So here are some raccoon tracks. You can see where they've been scampering around. They look a little bit like little human feet. Right there along the edge of the channel in the mud.

Michelle: (laugh) That looks like some researcher tracks.

Justin: Human footprints.

Michelle: Alright. Shall we keep going? We'll look for our sedimentation plates.

Justin: We may have to step down into the marsh. But, uh, the mud is pretty firm here so should be OK.

Narration:

So now, we're abandoning even the relative security of the boardwalk and clambering down onto the mudflat itself.

Justin: Anything with water on it is going to be softer. And you'll sink farther down. Look for dry mud or, uh, or vegetated marsh. That will be the firmest to walk on.

Ambience: Walking in the mud.

Narration:

I pick my way, every so carefully through the muck...

Michelle: We're just going to check how much sediment has...

Claire: Ahh, ahh! Ah! Oh, this isn't good. (continues under narration...) What do I do! (Under)

Narration:

Down to my shins in mud. And then stuck, like Br'er Rabbit to Tarbaby for the next 20 minutes.

Jan: Do you want to just give me your recorder...

Narration:

They finally pulled me out with only minimal damage to my self respect.

Michelle: This is the benchmark for the sedimentation plate. That's where we'll measure. So we're going to put a rod down into the mud.

Narration:

Could have used me for that part.

Michelle: And it'll hit a plate that used to be at marsh surface ten years ago. And now it's covered in mud. Actually looks like quite a bit. So we'll find out how much. We'll take a couple of measurements here.

Michelle: OK I'm ready, Justin. Which are you on North, South, East or West.

Justin: The south reading for this pin is 1.02 feet.

Michelle: Got it.

Justin: The west reading is 1.03 feet

Michelle: Very consistent.

Justin: In a few more years, there's going to be so much sediment accumulated, that we won't be able to measure it off of this pin anymore.

Michelle: So shall we grab the other one, before we lose the light?

MUSIC: Solutions

In here

Ambience: Walking on the levee.

Mendel: Sea level rise is a reality. So these kinds of projects are critical. We've got to get these kinds of projects going. We've got to get them going fast so that the marsh starts to build.

Narration:

And flood protection is only one of the benefits to bringing back the wetlands

Mendel: It's such a no-brainer that wetland restoration is going to have a positive benefit to fisheries and fish resources, because wetlands provide the homes for fish, crustaceans, all of these critters as I call them.

Narration:

Wetlands are also a filtering system.

Mendel: Wetlands are the kidneys, often considered the kidneys, the liver (chuckle) of, of the Bay. And they provide the opportunity for water to be cleaned. And we don't have those cleansing opportunities. The run-off goes directly into the Bay. And as a result we're now having to pay to cleanse the water.

Narration:

Wetlands filter the air too, reducing the greenhouse gases that are causing climate change.

Mendel: Plants utilize the carbon when they go through photosynthesis. It's just a natural process.

Michelle: Restoring marshes takes patience. (laugh) It's rewarding to see it go from planning to construction equipment out here to a marsh forming in front of our eyes. And um, it's very satisfying.

VIII. Thinking outside of the Box

Narration:

Levees have a lot of problems. But architect Craig Hartman understands that wetlands have limitations, as well.

Music: OUT

Craig: We don't have that much horizontal land area to give over to wetlands. We have airports, We have highways. We have cities that are built up very, very close to these, to our edge. We can accommodate wetlands in some areas but this is not a single solution for a place that's as urbanized as the San Francisco Bay.

Travis: We have to understand that there is no silver bullet answer. There is maybe a silver buckshot, where we have a whole series of options. And in any one particular area, we aren't looking for the best

solution, we are going to be looking for the best of a series of imperfect solutions, all of which have downsides.

Narration: Will Travis of BCDC.

Travis: My job involves thinking outside the box. I think more and more I don't even know where the box is.

Narration:

Travis created a design competition asking for solutions to sea level rise in the Bay. He got 130 solutions. Bay Arc was one of them. It proposes to solve the problem for the entire Bay by regulating the water that comes through the very narrow throat of the golden gate.

Travis: BayArc was one of the entries, which is a proposal for essentially a curtain that would lay on the bottom of the Golden Gate and be raised up at the highest tides. And the jury said well this is a fascinating idea. I don't know if it's real, but it's certainly worth looking into.

Craig: The solution that we have proposed is one that is a gentle intervention, somewhere between a coastal wetlands and a hard dike. So this idea is one that had been percolating for some time and it was really the BCDC competition that was the catalyst to really begin thinking more seriously about it.

Travis: When they decided this was one of the winners, we found out it was Skidmore, Owens and Merrill, a very well renowned, successful planning and design firm internationally.

Ambience: Waves along rocky shore beside Golden Gate Bridge.

Craig: We are at Golden Gate Bridge right at the northern corner. Right at the water level.

Narration:

Craig is perched on a rock just below the Golden Gate Bridge.

Craig: We are standing on a beautiful rock escarpment here, right on the edge of the water here and looking out to the Golden Gate Bridge, looking up at this majestic structure. And we can hear of course the very gentle waves running up against the rock.

Narration:

Paul and his kayak are in the neighborhood as well.

Paul: So as I paddle towards the Golden Gate Bridge, it's beautiful, it's kinda half shrouded by fog and mist. And there's a coast guard boat sailing by. And some water birds floating on the surface, cormorants.

Craig: The idea would be to create a dam, uh, think of it as a curtain, which will be submersed down actually to the floor of the Bay. And

only when we have a flooding condition, this curtain would be deployed to rise up to the surface. Uh, just slightly above water level, by about 4 or 5 feet. And that structure would be deployed when we have these combinations of storms, tidal surge and sea level rise, of course, which together will cause flooding in the larger Bay Area. It simply rises when its needed and most of the time it's actually simply not visible.

Paul: Alright we're approaching the Golden Gate and looks like it'll be easy to swing around the south tower, which is my plan.

Craig: We'd anchor it just at the foot of the south tower. See the tall south tower there coming down at the water level. The same is true here on the north side just past this rock you see the north tower coming out here between two rocks. See the house back there with the red tile roof on it? There would be another one at that point.

Ambience: Traffic on the GG Bridge.

Paul: I'm out at the south tower and I'm going under the bridge. Maybe you can hear the traffic above me. Golden Gate bridge is about 240 feet high midspan and it really soars overhead.

Craig: It is actually deep between these towers. Very, very deep. And there's a lot of very, very massive forces - tidal forces going in and outside of the bay on a daily basis. Very, very powerful forces.

Paul: (*Windy*) My hat just blew off. The breeze is a little stiffer than I thought. I'm gonna make the sweep back into the Bay. There's the beautiful San Francisco hillside shrouded in fog. Like a demure maiden with a veil of mist drawn across her face.

Ambience: Transition from GG Bridge

MUSIC: Solutions

In here

Narration:

So... Is Craig's plan actually feasible?

Craig: Well it can work. I mean there's no question that technically it will work. We've done the analysis to know that is the case. This is really an environmental and political issue. That's the biggest challenge here, not the technical issues.

Travis: We're working with some of the entrants as inspiration, as guidance as we develop our policies. So I think it's worth exploring to see that if it is something that we might want to look into.

Craig: How do you deploy the financial resources to make any of these solutions happen. How bad do things have to get before there is the political will to do something, anything.

Music OUT**IX. Close****Narration:**

Of course, San Francisco is just one corner of the world. Sea level rise knows no boundaries.

Travis: Sea level rise isn't something that's a bubble here in San Francisco Bay. South Florida is particularly vulnerable. New York is now looking at the impact particularly on their subway system. And uh, New Orleans is one that we're all very, very familiar with.

Craig: London, Tokyo, Los Angeles, Miami. All these cities, all the great cities that you think of are cities on the water.

Travis: Around the world, this is going to be a problem, particularly in developing nations.

VoxPop:

Nan: When I hear the phrase sea level rise I picture poor Bangladesh.

Denmark woman: I'm sure there will be solutions for SF, but there's plenty of poor places where they haven't got the money to make these solutions.

Jack: It definitely will have an impact everywhere.

MUSIC: Main

Theme music comes in here.

Paul: So how do we adapt? And we do know this, we have to adapt in some fashion. Wouldn't it be smart to minimize those effects before they happen as much as possible? Then maybe your levees and dams don't have to be quite so high. Maybe you don't have to flee quite so far up hill. Maybe you get a few more species accompanying you on your way into the future.

Healy: The rate and the magnitude of current change is like nothing that evolution has ever had to adapt to before.

Narration:

Healy Hamilton from the California Academy of Sciences.

Healy: We still have time to halt the worst impacts of sea level rise. Making this transition to a green economy is the most important thing that we can do to allow us to be able to adapt to the climate change and sea level rise that's coming. But if we don't halt our carbon emission we may face a future that we actually cannot adapt to.

VoxPop

Jenny: It just makes me wonder what we need to do as a city, or as a state, as a country, to stop this.

Acacia: If you know that it's possible that we're going to be underwater, then why wouldn't you do everything to stop it?

Travis: In the past it was seen as a false choice. It was, either you try as hard as you can to reduce greenhouse gases and if you adapt, it's almost like admitting failure. Now we've recognized we have to do both, we have to couple the two together.

Craig: I see this as important for our future, certainly for my children and grandchildren and for the future generations who inhabit this place.

Paul: So this is a big adventure, a big adventure of survival that we're all on together. I'd like to think that humanity is a pretty smart species. But with all of our headlong pursuit of wealth and power and technology, I wonder if we've outsmarted ourselves. And so we'll see how clever human beings are.

Travis: This is the time for imagination and hope. I'm not suggesting that it will be easy, but the strength of human beings is that we're best when conditions are worst. And this is a time for us to be our best.

Music: OUT

Paul: So paddle up to Pier 39. Poke around here a little bit. And about half dozen seagulls and a couple of brown pelicans lined up. Taking a rest. A few tourists walking around. And there's the sea lions on the dock. I'd say there's about 80 of em. (barking). There's one take a little dive right next to me. And I think I'll just cruise underneath the pier. It looks like I got a good clearance and pop out on the other side. (louder barking) Hmm, kinda dark under hear (echo). But I can see the, uh, little light coming through from the other side. So I'm following that little silvery stream of reflected light.

MUSIC: Main

Theme music comes in here.

VoxPop:

Denmark woman: The water is nice and the sun.

Michael: You've got the waterline, you've got tall buildings.

Cesar: Just sittin' on the pier. Looking over towards Oakland, you can see everything from here.

Juanita: It's beautiful. (laugh) I love San Francisco.

Narration:

RISE: Climate Change and Coastal Communities. This program, Sounding the Waters, was produced and directed by Claire Schoen. Associate

Producer, Erica Mu. Original music by Jonathan Mitchell. Special thanks to Jan Stürmann, Stephen Most, Vanessa Lowe and Scott Koué. Funding for the RISE series came from The Lia Fund, Nu Lambda Trust, The Eastman Fund, The Awesome Foundation, Helen Engelhardt and Janine Lieberman. To hear all the stories in the RISE series and to learn about climate change in your area, please visit us on line at searise.org. I'm Claire Schoen.

Music: Music swells in the clear. Then out.

Time:

(Including ½ sec silence before/after each section)

Billboard:	1:00
Newshole	5:00
First half	24:46
Station ID	1:00
Second half	27:14
TOTAL	59:00