FEARLESS
A TEXAS TECH PRODUCTION

Season 2 | Episode 2 | Earth, Wind and Water

TV Report: Environmental experts have called it a massive wakeup call.
TV Report: Fossil Fuels still make up the bulk of the global energy and the effects on the environment is clear.
TV Report: According to current estimates, we will run out of oil and gas in 50 years or so. And in about a century for coal.
TV Report: The next decade is decisive.
Dale Woerner, Endowed Professor, Animal and Food Sciences: We are sitting at one of the most critical, pivotal points in our history and we have to do something about it.

(Fearless Intro Music)

FROM THE OFFICE OF COMMUNICATIONS AND MARKETING AT TEXAS TECH, THIS IS FEARLESS, A PODCAST FEATURING THE UNTOLD STORIES OF THE SCHOOL WE LOVE SO DEARLY.
THIS REGION DISPLAYS AN ABUNDANCE OF NATURAL RESOURCES. HOW CAN WE LEVERAGE THEM TO GAIN MORE SUSTAINABLE FORMS OF ENERGY? RESEARCHERS ON CAMPUS ARE WONDERING THE SAME THING, SO THEY'RE ASKING THE RIGHT QUESTIONS TO FIND A SOLUTION.
WORK THEY'RE CONDUCTING IN SMALL TEAMS ACROSS CAMPUS IS DESIGNED WITH PEOPLE LIKE YOU IN MIND. TO CREATE POSITIVE CHANGE IN OUR SOCIETY USING EARTH, WIND AND WATER.

(Upbeat Jazz Music)

Taylor Peters, Host: THERE ARE LOTS OF WAYS THAT I COULD DESCRIBE GERARDINE BOTTE... FOR STARTERS, SHE'S THE CHEMICAL ENGINEERING DEPARTMENT CHAIR IN THE WHITAKER COLLEGE OF ENGINEERING... SHE'S A RESEARCHER AND PROFESSOR, A MOM OF TWO DAUGHTERS, A WIFE, AN AMATUER CHEF, AND A PRETTY EXCEPTIONAL GOLFER. ACTUALLY, WHEN I WALK INTO HER OFFICE, ONE OF THE FIRST THINGS I SEE IS A GOLF BALL IN A GLASS CASE ON TOP OF HER BOOKSHELF- IT'S FROM A HOLE IN ONE AT A COURSE IN OHIO. SO, YEAH. SHE'S PRETTY IMPRESSIVE ON MANY LEVELS. SHE HAS PATENTS FOR DOZENS (LITERALLY DOZENS) OF INVENTIONS THAT SHE HAS CREATED OVER THE YEARS, MOST RECENTLY A COVID-19 DETECTOR AND A RAPID COVID-19 TEST. WE'LL GET INTO THAT MORE IN A LATER EPISODE. BUT TODAY WE'RE GOING TO ANGLE HER STORY AROUND A SMALL PORTION OF HER VAST KNOWLEDGE BASE AS IT RELATES TO CREATING SUSTAINABLE ENERGY.

Gerardine Botte, Department Chair, Chemical Engineering: This type of research is kind of becoming like the bread and butter of every chemical engineer for generations to come, and particularly when we look at Texas and the way we are with all the wind, I always tell people we could be pumping electrons out of Texas. Why? Because we use those electrons to make chemicals, to make fertilizers, to clean water, to make metals, to make materials and components for electronic circuits, rare-earth elements. So, it's a bunch of things. We are golden to have the opportunity to get a lot of things out of Texas because of this energy.

Peters: IN A SCHOLARLY ARTICLE, GERRI SAYS THAT HYDROGEN IS THE LIGHTEST AND CLEANEST ENERGY CARRIER. SHE CALLS IT THE FUEL OF THE FUTURE. AMONG THE OTHER RESEARCH SHE IS BALANCING, GERRI HAS BEEN WORKING TOWARD AN INTIATIVE THAT CONVERTS WASTE INTO A RENEWABLE SOURCE OF ENERGY. HOW IS SHE DOING THIS? I WONDERED THE SAME THING. FOR MANY YEARS, SHE WORKED IN WATER RESEARCH, DISCOVERING HOW TO USE MICROORGANISMS TO ELIMINATE CONTAMINANTS. SHE APPLIED THAT CONCEPT TO AMMONIA FOUND IN WASTE AND DISCOVERED THAT IT WAS THE SAME.

Botte: That area intrigued me because I was excited by removing ammonia, which is NH3, out of wastewater, which is basically you need to remove, you cannot have that. In municipal, this ammonia is coming from the nitrogen that we release, humans. Like every time you go to the bathroom you do number one, number two, there is going to be this nitrogen in organic form or inorganic form. Ideally, that's what wastewater treatments do.

Peters: ESSENTIALLY GIVING WASTE NEW LIFE. PARTS OF THIS RESEARCH TOOK PLACE AT WESTERN TEXAS COLLEGE IN SNYDER. THEY HAVE A FACILITY WHERE THEY RAISE PIGS. THIS PARTNERSHIP WITH WESTERN TEXAS ALSO PROVIDED GERRI AND HER TEAM THE CHANCE TO BROADEN THE SCOPE OF THIS RESEARCH. MORE INDIVIDUALS CONNECTED, MORE POSSIBILITIES FOR ITS FUTURE. IN THIS NEXT PORTION THERE'S A LOT TO UNPACK, SO WALK WITH ME.

Botte: They use these microorganisms so that when the water is released, it doesn't have this nitrogen compound because it creates algae bloom and all these type of things. What I did, I did that electrochemically. I was breaking down the molecule of ammonia, NH3, by applying an electric field, and that produces nitrogen, which is back into air like the nitrogen molecule that is part of air, and hydrogen...and that was the beauty of the process, that, for first-time, you were able to take a waste that contains ammonia and then convert it into nitrogen and hydrogen, and that hydrogen goes back into the wastewater treatment plant, or you could use it for electric vehicles, for fuel cell cars or for any other type of system.

Peters: SO, SHE'S TAKING A PRODUCT AT THE END OF IT'S LIFE AND TRANSFORMING IT TO POTENTIALLY POWER OUR VEHICLES OR BE USED AS A FUEL REPLACEMENT... WHAT?

Botte: ...Now, as a follow-up with that system, the intriguing part is that we discover ways on how to actually use electrocatalysis and release that ammonia and concentrate it in a way that we can also use it as a fertilizer, which is another follow-up.

Peters: SHE HAS USED THIS THEORY FOR WATER, WASTE, EVEN COAL. WHEN WE FIRST SAT DOWN WITH GERRI FOR THIS INTERVIEW, I ASKED HER HOW SHE BALANCES ALL THE DIFERENT KINDS OF RESEARCH SHE CONDUCTS. I WAS LOOKING AT THE FINAL PRODUCT, THE INVENTIONS THAT WERE ON THE MARKET AND THEY ALL SEEMED SO DIFFERENT. HOW CAN A COVID-19 RAPID TEST BE DEVELOPED IN THE SAME LAB AS THE WORK WE'RE DISCUSSING TODAY? BUT SHE EXPLAINED TO ME THAT IT'S THE SAME CONCEPT JUST APPLIED IN DIFFERENT WAYS.

Botte: It's like a perfect match. Then the same thing we're working with farmers in the state of Texas, we're also working with manufacturers with ag cooperative, it's an extended ecosystem.

HER WORK HAS GAINED THE ATTENTION OF THE NATIONAL SCIENCE FOUNDATION.
THE NSF ANNOUNCED IN EARLY AUGUST THAT TEXAS TECH AND FOUR PARTNER INSTITUTIONS WERE SELECTED TO RECIEVE THE LARGEST FEDERALLY FUNDED GRANT IN SCHOOL HISTORY.
ITS FOR A RESEARCH CENTER CALLED CASFER- THE CENTER FOR ADVANCING SUSTAINABLE AND DISTRIBUTED FERTILIZER PRODUCTION... IT'LL BE ON THE TEXAS TECH CAMPUS, JUST STEPS FROM THE ADMINISTRATION BUILDING

NATS walking

TEXAS TECH WILL WORK WITH MIT, CASE WESTERN RESERVE, FLORIDA A&M AND GEORGIA TECH TO EXPAND ON THE RESEARCH WE TALKED ABOUT TODAY...
THE NSF HAS GRANTED 26 AND A HALF MILLION DOLLARS FOR THE FIRST 5 YEARS... ANOTHER 24 AND A HALF FOR THE FOLLOWING FIVE.
THIS IS AN ENORMOUS DEAL FOR TEXAS TECH, ITS PARTNER INSTITUTIONS AND FOR GERRI, THE DIRECTOR OF THE FACILITY.
SO, STAY TUNED, YOU'LL BE HEARING A LOT MORE ABOUT THIS IN THE FUTURE.

(Wind)
(TV Broadcast)
"It looked like a bomb had hit, it was unbelievable."
"It was scary, it was wild. It was a wild night in Lubbock Texas."
Monty Monroe, University Archivist: On May 11th, 1970 at 9:46 p.m. Lubbock was devastated by the first historically documented category 5 tornado...

Peters: THAT VICIOUS TORNADO TORE THROUGH EAST LUBBOCK. TAKING WITH IT, HOMES, BUSINESSES AND CHURCHES. 26 PEOPLE DIED AND 500 MORE WERE INJURED. IT'S ESTIMATED THE TORNADO CAUSED MORE THAN 135 MILLION DOLLARS IN DAMAGE. KISHOR MEHTA HAD BEEN ON CAMPUS FOR SIX YEARS WHEN THE TORNADO STRUCK. HE HAD INVESTED HIS TIME AND RESEARCH INTO UNDERSTANDING HOW DIFFERENT MATERIALS ARE IMPACTED BY NATURAL DISASTERS. HE HAD HOPED TO USE THAT INFORMATION TO DEVELOP SAFER BUILDING PRACTICES. AND NOW, IT LOOKED LIKE THAT CHANCE WOULD COME A LOT CLOSER TO HOME THAN EXPECTED.

Kishor Mehta, Horn Professor, Civil, Environmental & Construction Engineering: When the tornado came through in 1970... I did have the lights flicker, but it stayed on. When I came to the department next day, we started to realize the amount of damage and the type of damage and the number of people killed, and so on.

Peters: KISHOR AND FELLOW RESEARCHERS JOE MINOR AND JIM MCDONALD JUMPED INTO ACTION. THEY LAUNCHED THEMSELVES INTO LEARNING MORE.

Mehta: You take a building and see what was the material, because they were different materials, steel, concrete, timber, masonry. Write down what the material is and see what direction the failure is...

Peters: THEY COLLECTED DATA EVERYWHERE THEY COULD- WHAT TYPES OF MATERIALS WERE USED, WHAT WAS THE LEVEL OF DAMAGE, HOW DID THE STRUCTURES FAIL? AND THEY WROTE A REPORT BASED ON EVERY SINGLE DETAIL THEY HAD LEARNED. KISHOR AND HIS COLLEAGUES WOULD USE THAT INFORMATION TO HELP CREATE A NEW STANDARD FOR SCHOOL BUILDINGS. IT TOOK YEARS TO IMPLEMENT, BUT THEIR RESEARCH RELATED TO MATERIALS WOULD PROVIDE DIRECTION FOR A SAFER BUILDING PRACTICE IN CONSTRUCTION.

Mehta: Probably, one of the better approach to it is how to calculate the wind speed from the damage, which years later on helped us to refine the F scale, that the in future had developed into EF scale. That's why EF scale is used. My file for EF scale is right over in that corner.

Peters: HE POINTS TO THE CORNER OF HIS BOOKSHELF, WHERE AN OLD BINDER IS RESTING. THEY CREATED THE EF SCALE THAT WE STILL USE TODAY TO IDENTIFY THE STRENGTH OF A TORNADO. KISHOR WENT ON TO BECOME THE FIRST TEXAS TECH FACULTY ELECTED TO THE NATIONAL ACADEMY OF ENGINEERING. WE TALKED FOR ABOUT AN HOUR AND A HALF ON THIS DAY... MOSTLY HIM SHARING STORIES OF HIS LIFES WORK, WHAT HE'S PROUD OF AND THE JOYS OF SPENDING HIS LIFE WITH PEOPLE WHO SHARE HIS PASSION. HE TOLD ME AT ONE POINT THEY

WEREN'T TRYING TO BE REVOLUTIONARY OR CREATE SOMETHING THAT WOULD CHANGE THEIR FIELD... THEY WERE JUST DOING THIER JOBS. I APPRECIATE THE HUMILITY HERE, BUT THE REALITY IS THAT THEY DID ALL THOSE THINGS- THEY DEVELOPED A NEW WAY OF CATEGORIZING TORNADOS, THEY ESTABLISHED A NEW BUILDING CODE AND THEY CREATED THE WIND SCIENCE AND ENGINEERING RESEARCH CENTER. IT'S STILL ON CAMPUS, KNOWN TODAY AS THE NATIONAL WIND INSTITUTE. WHICH HAS CONTINUED TO GROW- IT STILL FOCUSES ON ATMOSPHERIC SCIENCE BUT HAS EXPANDED TO INCLUDE OTHER AREAS OF REASEARCH LIKE RENEWABLES.

John Schroeder, Director, National Wind Institute: But we also have research agendas related to wind energy, renewable energy, more broadly.

THE NWI IS LED BY JOHN SCHROEDER.

Schroeder: How to improve our forecast models to be able to do a better job of integrating renewables into the grid, even things like battery storage or other research tangents like lightning research...

Peters: JOHN'S RESEARCH IS SPECIFICALLY FOCUSED ON WIND ENERGY. AND IF YOU'RE GOING TO BE STUDYING WIND, IS THERE A BETTER PLACE TO DO IT THAN THE HIGH PLAINS?

(Wind)

Schroeder: How many days do we just have windy conditions? They may not be associated with a storm, but yet, on a lot of days the wind kicks up. So, what you find is it is a premier location.

Peters: JOHN AND OTHER RESEARCHERS ARE LOOKING CLOSELY AT WIND FARMS. YOU KNOW WHEN YOU'RE DRIVING DOWN HIGHWAY 84 HEADED TOWARD SNYDER AND YOU SEE DOZENS OF TURBINES ON EITHER SIDE OF THE ROAD CLUSTERED TOGETHER? THAT'S A WIND FARM, IT'S STRATEGICALLY DESIGNED TO MAXIMIZE WIND FLOW AND PRODUCE ELECTRICITY.

Schroeder: When the wind moves through and by a turbine, we know that the turbine extracts energy. That's how it produces energy. The wind behind that turbine is decreased in magnitude and that decrease moves downstream, and if another turbine is located downstream, it can impact that next turbine downstream. So the wake that develops behind one rotor can impact another rotor. We can mitigate the negative impact to some degree by being proactive. We might be able to turn the upstream turbine, for instance, a little bit out of the wind, and actually deflect the wake.

Peters: EVEN ROTATING A TURBINE THE SLIGHTEST DEGREE CAN HAVE AN ENORMOUS IMPACT.

Schroeder: We might be able to manipulate one to say sacrifice a percent or two of energy from the first row of turbines, but actually gain five or more percent from a second turbine downstream and in the process of doing that, the actual farm itself produces more energy, and that's the next frontier. How do we maximize these farms? It's a big data, it is a big problem.

Peters: BUT IT'S SOMETHING THAT JOHN IS INVESTED IN. HE SAYS THAT IT'S THE FUTURE OF WIND ENERGY.

Schroeder: How do you take in all of these points of data, understand the wind flow, understand how these individual turbines are operating, and put that all together in real time and optimize them. It's a big task. JS: But that's where the industry is going, that's where Department of Energy is headed, and that's where we can contribute.

Peters: JOHN'S FOCUS IN HIS OWN RESEARCH MAY BE WIND ENERGY, BUT HE OVERSEES DOZENS OF FACULTY CONDUCTING RESEARCH CONNECTED TO THE NATIONAL WIND INSTITUTE. IT'S

INTERDISCIPLINARY, MEANING THAT THERE ARE RESEARCHERS WITH VERY DIFFERENT BACKGROUNDS WHO ARE PART OF THE NWI- WIND ENGINEERS, AND ATMOSPHERIC SCIENTISTS

(Thunder Cracking)

LIKE CHRIS WEISS...

(Rain and Wind)

PICTURE THIS...
THE DARKENED SKY IS THICK WITH BILLOWING CLOUDS IN VARYING SHADES OF GRAY. IT'S LATE SPRING, IN THE AREA KNOWN AS TORNADO ALLEY.

(Rain)

Peters: A BLAST OF COLD WIND SMACKS THE WINDSHIELD OF AN ALL-WHITE PICKUP TRUCK RACING TOWARD THE STORM. AS A FLASH OF WHITE LIGHTNING ILLUMINATES THE SKY, CHRIS WEISS AND HIS TEAM KNOW THAT THE STORM THEY'VE BEEN TRACKING IS HERE. AS THE CLOUDS CONTINUE TO DARKEN, SPITTING RAIN AND HAIL, THE SIGNAL TO STAY INDOORS HAS LONG BEEN DELIVERED. SEE, BECAUSE PEOPLE LIKE CHRIS ARE OUT THERE, WATCHING AND STUDYING, THE REST OF US CAN KNOW THE RISKS AND THE DANGERS OF SEVERE STORMS LIKE THIS ONE. THE DATA HE COLLECTS IN THE FIELD HELPS PREPARE THE PUBLIC FOR SEVERE STORMS AND TORNADOS WITH MORE TIME TO GET TO A SAFE AREA.

(Tornado Siren)
(Music)

Chris Weiss, Professor, Atmospheric Science: We're trying to look at how tornados form...you look at the rotation and a lot of the rotation is forming in the low levels, but some produce tornados and some don't.

Peters: CHRIS STARTED AT TECH IN 2004 AND SINCE THAT TIME HAS CONDUCTED DOZENS OF FIELD EXPERIMENTS ALL OVER THE COUNTRY. MOST RECENTLY IN LATE SPRING 2022... TWO RESEARCH PROJECTS GOT DELAYED BECAUSE OF COVID, RESULTING IN BACK-TO-BACK PROJECTS FOR BASICALLY THREE MONTHS STRAIGHT... FROM APRIL TO JUNE.

Weiss: One of the things that drives me is false alarms. Our tornado false alarms nationwide are around 70- 75% right now.

CHRIS WAS ON TWO PROJECTS, ONE IN THE CENTRAL PLAINS, THE OTHER IN THE SOUTHEAST. KNOWN TO SOME AS DIXIE ALLEY.

Weiss: It's kind of a disproportionate loss of life of tornados out there.

Peters: CHRIS SAYS THEY LEARNED THAT HERE, TORNADOS ARE MORE LIKELY TO STRIKE HERE DURING THE NIGHT, WHERE IT'S HARDER TO SEE THEM COMING. HE SAYS THAT THE NATIONAL WEATHER SERVICE SOFTWARE UPDATES EVERY 6 MINUTES, AND AS CRAZY AS IT SOUNDS, ROTATIONS HAVE THE ABILITY TO DROP DOWN WITHIN THAT WINDOW. THIS WAS THE THIRD TIME THIS GROUP OF PEOPLE WAS OUT IN THE FIELD CONDUCTING RESEARCH FOR THIS PARTICULAR PROJECT SINCE 2019. THEY CLOCKED 9,000 MILES IN 5 WEEKS...

Weiss: At $5.50 a gallon in diesel prices, it was quite a lot of fun (laughing)

Peters: 9,000 IN 5 WEEKS IS QUITE A BIT ABOVE AVERAGE, BY THE WAY. I ASKED BECAUSE I KNOW YOU'RE THINKING IT TOO. BUT CHRIS IS ADAMANT THAT THERE'S A REASON HE SPENDS WEEKS ON THE ROAD AT A TIME.

Weiss: I don't think you need any more motivation than driving through the areas impacted by tornados. Northeast Arkansas, across the path of the December tornado.

(TV broadcast)

Weather Forecast: This is the rotation right now that we're watching...
Anchor: We continue to follow breaking news tonight where there's a mass casualty incident unfolding in Monet.
Weiss: It was incredible to see all those folks standing there with the debarked trees and still some spots where there are foundations wiped off by the tornado and you can just generally sense in the people that they're beat down.
Reporter: Kentucky's governor says the death toll from Friday night's tornados is likely expected to rise to more than 80 victims.
Andy Beshear Kentucky Governor: Every line of this tornado that touched down and stayed down for 227 miles...

Weiss: You see that and you think 'what can we do?' Not just with the forecasting and the warning but in the aftermath to help these people regain their livelihoods. When I see that, we replay that event and see something to give these people more time? That's what it boils down to for me, I hate seeing people get hurt and killed by tornados.... I'd say that's really the number one thing for me.

(Rain)
(Music)
(Stream of Water)

Peters: IT'S A QUIET, PEACEFUL MORNING... MOMENTS BEFORE THE SUN SPILLS OVER THE HORIZON, ILLUMINATING THE SLEEPY LIFE BELOW.THE SMOOTH, SOFT, NEVER CEASING SOUND OF MOVING WATER DRIFTS THROUGH THE TREES AND INTO THE ENDLESS OPEN SKY. THE PRESENCE OF THE RIVER IS COMMANDING. IT'S PEACEFUL, POWERFUL BODY CONTAINS A PRECIOUS RESOURCE. BUT IT HAS BEEN THREATENED... IT'S LIFE-GIVING POWER IS POISONED BY SOMETHING UNSEEN AND UNFORGIVING. THERE ARE BODIES LIKE THIS ONE THAT EXIST ACROSS THE COUNTRY, CARRYING FOR MILES A SOURCE OF LIFE THAT HAS BEEN CONTAMINATED. FOR DECADES, RESEARCHERS HAVE ATTEMPTED TO ANSWER THE QUESTION- WHAT CAN WE DO ABOUT IT? AND DANNY REIBLE HAPPENS TO BE ONE OF THEM.

(Walking into office)

Peters: HIS OFFICE IS QUIRKY HUMOR COUPLED WITH UNMISTAKIBLE ORGANIZATION.

(Star Trek Motion Sensor)

Danny Reible, Professor, Civil, Environmental, and Construction Engineering: If you watch Star Trek, you'll know that sound.

Peters: THIS PIECE OF WALL ART IS STATIONED NEXT TO HIS LIGHT SWICH. IT ALERTS DANNY ANY TIME SOMEONE ENTERS HIS OFFICE OR PEEKS THEIR HEAD IN FOR A QUICK HELLO.

Peters: I appreciate your little Leonard figurine over there...

Reible: The big bang has a special relation to me because they are at Cal Tech and I was at Cal Tech, so I often see myself as a Leonard, more than I care to at times!

Peters: A LIGHT BROWN FELT HAT SITS ATOP THE PRINTER BESIDE HIS DESK, SANDWICHED BETWEEN TWO FLOOR-TO-CEILING WOODEN BOOKSHELVES THAT ARE IN PERFECT CONDITION. I'M TALKING METICULOUS- DOWN TO THE CONTENT OF EACH ACADEMIC BOOK.

Allison Hirth, Co-Producer: Do you have these organized a certain way? They are... how are they organized?

Reible: By topic, so each area so there is numerical algebraic information on the second shelf in the middle right here…

Peters: YEARS AGO, AFTER HIS DAD RETIRED FROM THE AIR FORCE, HIS FAMILY MOVED FROM DELAWARE TO LIVE NEAR LAKE WHITNEY HERE IN TEXAS...

Reible: I thought I had fallen off the edge of the earth, even from lower Delaware, this area west of Waco, about 30 miles, no paved roads, no running water, no phones...

Peters: HE GRADUATED HIGH SCHOOL IN THE SMALL TEXAS TOWN OF CHINA SPRINGS- WELL, IT WAS SMALL WHEN HE WAS THERE. NOW, NOT SO MUCH. ACTUALLY, LATER THIS FALL HE'S RETURNING FOR HIS 50TH CLASS REUNION... LAST YEAR HIS ALMA MATER WON THE 4A DIVISION II FOOTBALL STATE CHAMPIONSHIP. HE'S PROUD OF THAT. DANNY'S RESEARCH INTERESTS HAVE BEEN DRIVEN BY THE ONE THING OUR WORLD DEPENDS ON. SOMETHING THAT IS BECOMING A DWINDLING RESOURCE. SEE, DANNY IS TRYING TO FIND A WAY TO PURIFY BODIES OF WATER THAT HAVE BEEN CONTAMINATED FOR DECADES.

Reible: I often think of my career as driven by the years 1965- 1970 because during that time in the pre-EPA, pre-earth day era, there was a lot of industrial chemicals, the use and growth of industrial chemicals that are persistent and we are now dealing with the legacy of those.

DOING THIS KIND OF WORK IS HARD AND AT TIMES FRUSTRATING. IN A LOT OF WAYS, THE RESULT OF HIS WORK MAY NOT BE SEEN IN HIS LIFETIME. BUT THAT HAS NEVER SLOWED HIM DOWN. SEVERAL YEARS AGO, HE DEVELOPED SOMETHING CALLED IN-SITU SEDIMENT CAPPING.

Reible: Sediment capping is a way of managing large amounts of contaminated sediment in bodies of water. It's simple, it is effectively placing a cover of a clean sediment, perhaps with certain amendments added to it, a clean layer of sediment over the contaminated sediment. So, if there are contaminated sediments that are a meter deep, they become less threatening. So, if we can basically start over with a clean layer of material, just to physically separate organisms... it reduces the rate of contaminants.

Peters: THIS PROCESS IS DESIGNED TO DECREASE THE AMOUND OF BAD STUFF EXPOSED TO THE WATER... OVER TIME THE GOAL IS TO CREATE A CLEANER STREAM OF WATER THAT'S SEPARATED FROM THE TOXINS FAR BENEATH THE RIVER'S BED.

Reible: I'm talking about picograms per liter, well parts per trillion is nano grams...
Hirth: I haven't even heard of that...
Reible: So, ten to the minus 15 in terms of concentration.

Peters: DANNY BELIEVES IN THIS WORK. HE KNOWS THAT WHAT HE'S DOING IMPACTS PEOPLE ACROSS THE COUNTRY. IF HE CAN HELP CLEAN THIS POLLUTED WATER IT COULD MAKE AN IMMEDIATE DIFFERENCE.

Reible: My particular interest in contaminated sediments are the big challenge to surface water quality. When we worry about mercery in fish, when we worry about the quality of rivers and whether we can swim in them or whether we can eat the fish in them... these are the issues that my research addresses, especially in areas where there are these legacy contaminants. These are real challenges that pose significant difficulties for. That's a factor why I think people should be interested, or that they're already interested in them without knowing the root causes.

Peters: DANNY KNOWS BETTER THAN ANYONE- WE HAVE A PROBLEM ON OUR HANDS. THIS REGION IS RUNNING OUT OF WATER. THERE'S EVIDENCE AND TRUTH BEHIND THAT AND PEOPLE LIKE DANNY ARE HAVING CONVERSATIONS ABOUT HOW TO FIX IT. HE'S IN GOOD COMPANY WITH RUSTY SMITH, THE DIRECTOR OF THE TEXAS PRODUCED WATER CONSORTIUM HOUSED AT TEXAS TECH.

(Music End)

THE TEXAS STATE LEGISLATURE IN 2021 CREATED THE CONSORTIUM TO LOOK AT THE TECHNOLOGICAL, ECONOMICAL, ENVIRONMENTAL AND PUBLIC HEALTH SAFETY CONSIDERATIONS OF USING PRODUCED WATER FROM OIL & GAS OPERATIONS FOR REUSE OUTSIDE OF THE INDUSTRY. IT HAS THE CRITICAL TASK OF PROVIDING THE LEGISLATURE INFORMATION ON HOW PRODUCED WATER CAN SERVE AS A NEW WATER SOURCE IN TEXAS....

Rusty Smith, Director, Texas Produced Water Consortium: If we don't start working now to figure out where those resources are going to be or going to come from, we're going to have a much bigger, much more pressing problem later that will be harder to solve in the amount of time that they'll need to solve it.

I LEARNED THAT MOST OIL AND GAS-BEARING ROCKS ALSO CONTAIN WATER, SO DURING THE FRACKING PROCESS, THAT OIL AND GAS IS EXTRACTED. BRINGING WITH IT THIS 'PRODUCED WATER' BYPRODUCT.

Smith: At current, it's being treated and re-used for those exploration activities and sometimes more commonly it's being injected back into the ground through a disposal injection well.

Peters: WHILE THE EXACT DATA IS HARD TO FIND, MOST ESTIMATES SAY AN AVERAGE OF BETWEEN FOUR TO SEVEN BARRELS OF WATER ARE PRODUCED WITH EACH BARREL OF OIL IN THE STATE... AND THE RAILROAD COMMISSION REPORTS ALMOST 1.8 BILLION BARRELS OF OIL IN THE LAST YEAR ALONE. YOU CAN SEE HOW THE VOLUME OF PRODUCED WATER ADDS UP QUICKLY. THIS MATTERS FOR WEST TEXAS, AN AREA THAT IS GRIPPING TIGHTLY TO THE DWINDLING OGALLALA AQUIFER. RUSTY AND HIS TEAM ARE WORKING TO DETERMINE HOW WE CAPTURE AND TREAT THAT WATER AND WHAT WE CAN POTENTIALLY DO WITH IT.
IN SEPTEMBER, HIS TEAM WILL PROVIDE AN REPORT TO THE TEXAS LEGISLATURE OF THEIR INITIAL FINDINGS. FROM THERE, WE MAY HAVE SOME INSIGHTS TO FUTURE WATER SOLUTIONS IN TEXAS.

(Music)

Peters: KISHOR MEHTA STILL COMES UP TO CAMPUS A FEW TIMES A WEEK, SITS IN HIS OFFICE FACING THE ENGINEERING KEY, AND HE WORKS. HE'S IN HIS 80'S NOW BUT HIS MIND IS SHARP AS A TACK. HE LIVES IN A RETIREMENT COMMUNITY, WITH HIS OLD FRIEND AND FORMER COLLEAGUE JIM MCDONALD. HE'S STILL SHARING WHAT HE'S LEARNED OVER THE YEARS, TO ME AND ANYONE ELSE HE INTERACTS WITH.

Mehta: The facilities manager asked me, since you have done all this and I said I'd be happy to do it.

Peters: HE PROVIDED A SAFETY SEMINAR TO OTHER RESIDENTS IN HIS COMMUNITY…
Mehta: In case of a Tornado, what would you do? The questions are the same, if I'm outside or if I'm on the fourth floor, what do I do?

IT SEEMS TO ME THAT KISHOR IS STILL LIVING HIS BEST LIFE. AND IT'S TRUE WHAT THEY SAY- THAT WHEN YOU LOVE WHAT YOU DO, YOU NEVER WORK A DAY IN YOUR LIFE.

(Music)

Peters: 271 MILES AWAY, AN ATMOSPHERIC SCIENCIST AND A SOCIOLOGY PROFESSOR WALK INTO A HOUSE... NO, SERIOUSLY. IT SOUNDS LIKE THE START OF A JOKE, BUT WHAT THEY'RE ATTEMPTING TO DO COULD CHANGE THE SCOPE OF HOW WE APPROACH AND USE SUSTAINABLE ENERGY. THAT STORY IS NEXT TIME ON FEARLESS...

(Music)

Peters: FEARLESS IS BROUGHT TO YOU BY THE OFFICE OF COMMUNICATIONS AND MARKETING. IT'S HOSTED BY ME, TAYLOR PETERS AND CO-PRODUCED BY ALLISON HIRTH. EDITING AND SOUND DESIGN FROM THOMAS BOYD.
Peters: FEARLESS IS A TEXAS TECH PRODUCTION – FROM HERE, IT'S POSSIBLE.

(Music)

Peters: HEY GUYS, IT'S TAYLOR. LISTEN, WE ARE SO THANKFUL FOR YOUR SUPPORT OF FEARLESS. THANKS FOR LISTENING AND SHARING WITH YOUR FRIENDS! IT HELPS SPREAD THE STORIES OF PEOPLE WHO ARE TRULY DOING LIFE-CHANGING WORK ON OUR CAMPUS. AS ALWAYS, DON'T FORGET TO LIKE, REVIEW AND SUBSCRIBE WHEREVER YOU GET YOUR PODCASTS!