

WILD HOPE

The Frog Ark

	TIME CODE	VIDEO	AUDIO
1.	01:00:02;20		<p>DR. GINA DELLA TOGNA:</p> <p>Frogs are beautiful animals. My earliest memories with frogs, they were very abundant. They were very common, nowadays they are not.</p>
2.	001:00:18;18		<p>DR. GINA DELLA TOGNA:</p> <p>What amphibians are going through, it's been described as a mass extinction and they're going extinct in every part of the world.</p>
3.	01:00:27;22		<p>DR. GINA DELLA TOGNA:</p> <p>To be able to apply the tools we have developed to conserve these species, it's a very important contribution for amphibian conservation.</p>
4.	01:00:38;01		<p>DR. GINA DELLA TOGNA:</p> <p>My vision for amphibians is to see them thrive again.</p>
5.	01:00:42;08	<p>GRAPHIC: TITLE</p> <p>WILD HOPE</p> <p>THE FROG ARK</p>	<p>TITLE</p> <p>THE FROG ARK</p>
6.			<p>ACT ONE</p>
7.	01:00:47;17		<p>NARRATOR:</p> <p>IN CENTRAL AMERICA, RIGHT NEXT TO THE PANAMA CANAL, LIES A NOAH'S ARK – OF FROGS. THESE FORMER SHIPPING CONTAINERS HOLD AN IRREPLACEABLE TREASURE: CREATURES THAT NO LONGER EXIST IN THE WILD.</p>

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8.	01:01:05;09 01:01:07;14	<p>LOWER THIRD:</p> <p>BRIAN GRATWICKE</p> <p>Conservation Biologist Smithsonian's National Zoo</p>	<p>BRIAN GRATWICKE:</p> <p>The Panama Amphibian Rescue and Conservation Project is based in the town of Gamboa at the Smithsonian Tropical Research Institute.</p>
9.	01:01:15;05		<p>NARRATOR:</p> <p>SIMPLY NICKNAMED, THE ARK, IT HOUSES ONE OF THE MOST ADVANCED AMPHIBIAN BREEDING FACILITIES ON THE PLANET.</p> <p>IT'S A REFUGE FROM A PANDEMIC THAT SCIENTISTS, LIKE GINA DELLA TOGNA HAVE BEEN FIGHTING FOR DECADES.</p>
10.	01:01:31;13 01:01:38;09	<p>LOWER THIRD:</p> <p>DR. GINA DELLA TOGNA</p> <p>Reproductive Physiologist,</p> <p>Research Associate,</p> <p>Smithsonian's Tropical Research Institute</p>	<p>DR. GINA DELLA TOGNA:</p> <p>This is the most threatened class of vertebrates. There are other threats, of course habitat destruction, but when you add disease to that, it makes a fatal combination.</p>
11.	01:01:44;18		<p>NARRATOR:</p>

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			<p>ALARM BELLS FIRST SOUNDED IN THE 1970'S, WHEN AMPHIBIANS BEGAN DYING IN DROVES ALL OVER THE WORLD.</p> <p>IT TOOK MORE THAN 20 YEARS—UNTIL 1998— BEFORE SCIENTISTS CONFIRMED THE CULPRIT.</p> <p>A FUNGUS THAT CAUSES A DEADLY DISEASE KNOWN AS CHYTRIDIOMYCOSIS, OR CHYTRID FOR SHORT.</p> <p>DISEASES ARE OFTEN SPECIES-SPECIFIC, BUT CHYTRID ATTACKS ALL AMPHIBIANS—WITH DEVASTATING EFFECT.</p>
12.	01:02:19;13		<p>BRIAN GRATWICKE:</p> <p>Chytrid affects tropical frogs by infecting their skin. Once it's thoroughly infected by the fungus, the digits and the belly will be very flaky and it could be bleeding and they tend to lose weight and be very lethargic.</p>
13.	01:02:36;16		<p>NARRATOR:</p> <p>IT HAS CAUSED THE DECLINE OR EXTINCTION OF HUNDREDS OF SPECIES ACROSS SIX CONTINENTS, MAKING IT THE WORLD'S WORST WILDLIFE DISEASE EVER RECORDED.</p> <p>FROGS HAVE BEEN PARTICULARLY HARD-HIT - AS BOTH FROGS AND CHYTRID FUNGUS DEPEND ON WATER FOR SURVIVAL.</p> <p>FROGS LAY THEIR EGGS IN WATER, SPEND THE EARLY STAGES OF THEIR LIVES IN IT, AND CAN</p>

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	<p>01:03:24;03</p> <p>GRAPHICS ONSCREEN:</p> <p>Chytrid Explainer</p> <p>01:03:27;04</p> <p>GRAPHICS ONSCREEN:</p> <p>Chytrid Spore</p>		<p>BREATHE UNDERWATER BY ABSORBING OXYGEN DIRECTLY THROUGH THEIR SKIN.</p> <p>UNFORTUNATELY, THIS PERMEABLE SKIN LEAVES THEM VULNERABLE TO TOXINS AND PATHOGENS LIKE CHYTRID.</p> <p>IT'S WHY SOME REFER TO FROGS AND OTHER AMPHIBIANS AS CANARIES IN THE COAL MINE - AN EARLY WARNING SYSTEM FOR ENVIRONMENTAL THREATS.</p> <p>CHYTRID FUNGUS THRIVES IN WATER,</p> <p>WHERE ITS MOBILE REPRODUCTIVE CELLS SEARCH FOR A LIVING HOST AND EMBED THEMSELVES IN ITS SKIN.</p> <p>ONCE THE AMPHIBIAN IS INFECTED, THE SPORES MULTIPLY, MAKING THE VICTIM A SOURCE OF MORE DISEASE.</p> <p>AND INFECTED ANIMALS CAN MOVE ON TO CONTAMINATE SURROUNDING POOLS.</p> <p>FROGS, THEIR EGGS AND TADPOLES ARE ALSO VITAL SOURCES OF FOOD FOR BIRDS, SNAKES AND MAMMALS.</p>
14.	01:04:02;22		<p>BRIAN GRATWICKE:</p> <p>Frogs do eat, pests that spread human diseases and eat our crops. So they have a very strong ecological value.</p>

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15.	01:04:12;05		<p>NARRATOR:</p> <p>40% OF THE WORLD'S REMAINING AMPHIBIANS ARE NOW AT RISK OF EXTINCTION. SO SCIENTISTS ARE SCRAMBLING TO SAVE AS MANY AMPHIBIANS AS THEY CAN.</p>
16.	01:04:23;04		<p>BRIAN GRATWICKE:</p> <p>This is a Smokey Jungle frog. What we have to do is to swab it and then look for the DNA of the chytrid fungus on that swab. There's about 200 species of amphibians in Panama, And there's not enough room in the ark for all of them.</p>
17.	01:04:45;21		<p>NARRATOR:</p> <p>ONE OF THE MOST AT-RISK GROUPS IS THE HARLEQUIN FROGS. THE PANAMANIAN GOLDEN FROG – PANAMA'S NATIONAL ANIMAL – IS ONE OF THEM.</p>
18.	01:04:56;05		<p>BRIAN GRATWICKE:</p> <p>Harlequin frogs are very, very sensitive to the amphibian Chytrid fungus.</p>
19.	01:05:02;00		<p>GINA DELLA TOGNA:</p> <p>Panamanian golden frogs are believed to be extinct in the wild. It saddens me because the last sighting was in 2009. We cannot let these animals die without reproducing.</p>
20.	01:05:14;13		<p>BRIAN GRATWICKE:</p> <p>It really is an opportunity for us to tackle a wildlife pandemic. If we can solve the Chytrid fungus problem using a highly sensitive, very charismatic species, the chances are we can replicate this all over the world.</p>

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21.	01:05:32;20		<p>NARRATOR:</p> <p>TO STAVE OFF AN AMPHIBIAN APOCALYPSE, THE TEAM IS EMPLOYING A RANGE OF STRATEGIES.</p>
22.			<p>ACT TWO</p>
23.	01:05:39;00		<p>BRIAN GRATWICKE:</p> <p>Each one of these shipping containers is its own little bio-secure unit and so if we had an outbreak in one of the pods, it hopefully would limit the spread throughout the entire collection of amphibians.</p>
24.	01:05:53;20		<p>NARRATOR:</p> <p>THE ARK WAS CREATED IN 2009, WITH FUNDING AND EXPERTISE FROM A GLOBAL COALITION OF ZOOS AND RESEARCH PARTNERS. WITH THE DISEASE LURKING JUST OUTSIDE THESE WALLS, THE FIRST TASK TO SAFEGUARDING SPECIES WAS CREATING AN ARTIFICIAL RAINFOREST.</p>
25.	01:06:13;04		<p>BRIAN GRATWICKE:</p> <p>We have to recreate nature and all of the needs of the frogs in this captive environment. The temperatures will always be a cool mountain type temperature with special UV light that will help them to form healthy bones. We'll mist the frogs automatically are, sorry. This is misting time, so this is bath time for the frogs. The goal is to buy ourselves some time to do the work that we need to do to get these frogs back out into the wild.</p>
26.	01:06:49;12		<p>NARRATOR:</p> <p>JUST KEEPING THE SPECIES AFLOAT IS NOT ENOUGH. THEY NEED TO EQUIP THE FROGS WITH DEFENSES AGAINST THE DISEASE. THEIR ROBUST CAPTIVE COLONY ALLOWS THEM TO CONDUCT</p>

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			EXPERIMENTS THAT WOULD BE TOO RISKY TO TRY ELSEWHERE.
27.	01:07:05;07		<p>BRIAN GRATWICKE:</p> <p>One of the things we're focusing on is seeing if we can develop a vaccine for the chytrid fungus.</p>
28.	01:07:11;15		<p>NARRATOR:</p> <p>BRIAN DOES THIS BY EXPOSING SOME FROGS TO CHYTRID IN A QUARANTINED CORNER OF THE ARK. HE THEN DIPS THEM IN AN ANTIFUNGAL BATH THAT TEMPORARILY ELIMINATES THE FUNGUS.</p>
29.	01:07:23;15		<p>BRIAN GRATWICKE:</p> <p>We give it a bath for 10 days and we can clear the chytrid fungus, but that animal is still susceptible to the disease.</p>
30.	01:07:34;05		<p>NARRATOR:</p> <p>THE FROG IS THEN RE-EXPOSED TO THE FUNGUS. THIS REPEATED EXPOSURE AND CLEARANCE IS MEANT TO PRIME THE FROG'S IMMUNE SYSTEM TO RECOGNIZE THE PATHOGEN, GIVING IT PROTECTION AGAINST FUTURE INFECTION. THE TEAM MEASURES THE FROG'S IMMUNE RESPONSE AFTER EACH ROUND OF EXPOSURE – SEARCHING FOR SIGNS THAT THE ANIMAL IS BETTER ABLE TO FIGHT OFF THE DISEASE. THE RESULTS ARE PROMISING, BUT EVEN IF THIS METHOD WORKS, IT WILL ONLY HELP INDIVIDUAL FROGS. AND THIS KIND OF DISEASE RESISTANCE CAN'T BE PASSED DOWN TO FUTURE GENERATIONS. SO BRIAN AND HIS TEAM ARE ALSO SEARCHING FOR INNATE IMMUNITY OUTSIDE THE LAB. THEY'RE ON THE HUNT FOR CHYTRID SURVIVORS IN THE WILD.</p>

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31.	01:08:25;00		<p>BRIAN GRATWICKE:</p> <p>When it's been raining and the conditions are really good, you're gonna run into a lot of frogs and hear a lot of cool sounds.</p>
32.	01:08:32;23		<p>NARRATOR:</p> <p>THE TEAM'S PRIORITY IS TO FIND SPECIES THOUGHT TO BE EXTINCT. SO-CALLED "LOST FROGS."</p>
33.	01:08:41;15		<p>BRIAN GRATWICKE:</p> <p>The reason we call "Lost Frogs" lost is because people haven't seen them for a very long time.</p>
34.	01:08:49;13		<p>NARRATOR:</p> <p>EVEN NOW, THEY DON'T EXPECT TO SEE THESE FROGS. THEY LISTEN FOR THEM, USING ARTIFICIAL INTELLIGENCE.</p>
35.	01:08:57;05 01:09:09;15 01:09:11;09	<p>GRAPHICS ONSCREEN:</p> <p>Atelopus zeteki</p> <p>Panamanian golden frog</p> <p>GRAPHICS ONSCREEN:</p> <p>Atelopus varius</p> <p>Variable harlequin frog</p>	<p>BRIAN GRATWICKE:</p> <p>We deploy these recorders into the rainforest that will record one minute every 10 minutes. We can give a time date stamp for each of those one minute recordings and the geographic locality. We'll get thousands of recordings from many, many sites, bring those back to the lab, and then we'll use artificial intelligence to match the sounds of any calls that sound just like that in the collection.</p>

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	01:09:13;03 01:09:14;21	GRAPHICS ONSCREEN: Agalychnis lemur Lemur leaf frog GRAPHICS ONSCREEN: Boana rosenbergi Rosenberg's gladiator frog	
36.	01:09:34;03		NARRATOR: A POSITIVE MATCH ON A SINGLE FROG CALL LEADS THE TEAM TO ITS LAST KNOWN LOCATION. FINDING AND CONFIRMING A CHYTRID-PROOF FROG WOULD FAST-TRACK THE SEARCH FOR IMMUNITY.
37.	01:09:49;04 01:09:52;02	GRAPHICS ONSCREEN: Triprion spinosus Crowned treefrog	BRIAN GRATWICKE: We recently rediscovered a population of <i>Triprion spinosus</i> . These animals have been living with the disease in the wild for a long time and if they have resistance genes, we could bring those genes into the captive population and breed frogs that have resistance qualities.
38.	01:10:15;02		NARRATOR: SELECTIVELY BREEDING DISEASE-RESISTANT INDIVIDUALS COULD HELP BUILD A CHYTRID- PROOF POPULATION.
39.	01:10:22;02		BRIAN GRATWICKE:

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			It's very exciting because it opens up a world of possibilities in terms of conservation of these species.
40.	01:10:31;00		<p>NARRATOR:</p> <p>ARTIFICIAL RAINFORESTS, VACCINE ATTEMPTS AND EAVESDROPPING ON LOST FROGS ARE ALL IMPORTANT PIECES OF THE PUZZLE. BUT SUCCESS ULTIMATELY HINGES ON MAINTAINING A SUSTAINABLE COMMUNITY OF AMPHIBIANS IN THE ARK.</p>
41.	01:10:46;06		<p>BRIAN GRATWICKE:</p> <p>We really need about 20 males and 20 females that are unrelated. And then we need to breed those to build up a captive population of about 300 animals that are evenly represented in those different genetic lines.</p>
42.	01:11:03;00		<p>NARRATOR:</p> <p>THAT SOMETIMES REQUIRES GIVING NATURE A HELPING HAND. SOME FROG SPECIES ARE NOTORIOUSLY DIFFICULT TO BREED IN CAPTIVITY. THEY WILL ONLY REPRODUCE WHEN THE TEMPERATURE, HUMIDITY AND LIGHT ARE JUST RIGHT. GINA DELLA TOGNA HAS FOUND A WAY TO BYPASS THESE CUES.</p>
43.	01:11:24;22		<p>DR. GINA DELLA TOGNA:</p> <p>Here's where assisted reproductive technology come in place.</p>
44.	01:11:29;23		<p>NARRATOR:</p> <p>AFTER SIX YEARS OF TRIAL AND ERROR, SHE WAS THE FIRST TO ARTIFICIALLY BREED THE CRITICALLY ENDANGERED VARIABLE HARLEQUIN FROG, A CLOSE RELATIVE OF THE PANAMANIAN GOLDEN FROG. HER SECRET: A SPECIFIC COCKTAIL OF REPRODUCTIVE HORMONES. AFTER</p>

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			BEING INJECTED WITH THIS LOVE POTION, THE FROGS PRODUCE EGGS AND SPERM ON COMMAND.
45.	01:11:54;16		DR. GINA DELLA TOGNA: We see what's the window of time where the hormone peaks, so we have the greatest sperm concentrations.
46.	01:12:03;04		NARRATOR: THAT ALLOWS GINA'S TEAM TO HARVEST THE HIGHEST QUALITY AND QUANTITY OF SPERM.
47.	01:12:09;05	GRAPHICS ONSCREEN: eggs	DR. GINA DELLA TOGNA: Then we proceed with the females. We inject the female, wait for her to lay the eggs.
48.	01:12:16;19		NARRATOR: SIMPLY LAYING SPERM ON TOP OF THE EGGS MIMICS HOW HARLEQUIN FROGS MATE IN THE WILD.
49.	01:12:23;16		DR. GINA DELLA TOGNA: There is an anxious period of this five day window that we're always looking at the eggs. When we do have confirmation, there's a tadpole in the making. It is a very exciting and happy moment, like we jump around and we celebrate.
50.	01:12:44;22		NARRATOR: GINA'S FROGLET FACTORY IS WORKING AROUND THE CLOCK BREEDING HARLEQUIN FROGS.

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51.	01:12:51;20		<p>DR. GINA DELLA TOGNA:</p> <p>Our goal is to develop these protocols for each of the species that we have and collaborate with other institutions and help them develop these protocols for their own species.</p>
52.		ACT THREE	ACT THREE
53.	01:13:04;23		<p>NARRATOR:</p> <p>THE ARK NOW HOLDS 12 SPECIES OF ENDANGERED AMPHIBIANS, TOTALLING 2,000 FROGS. AND THEY'VE REACHED THEIR GOAL OF AT LEAST 300 INDIVIDUALS FOR THREE OF THESE SPECIES. FOR SOME SPECIES, IT'S AN INSURANCE POLICY AS CHANGES IN CLIMATE, HABITAT DESTRUCTION AND DISEASES LIKE CHYTRID CONTINUE TO RAVAGE WILD POPULATIONS. FOR OTHERS THAT HAVE ALREADY BEEN WIPED OUT IN THE WILD, IT'S A LAST STAND AGAINST EXTINCTION.</p>
54.	01:13:36;02		<p>BRIAN GRATWICKE:</p> <p>Panamanian Golden Frogs today only exist in captivity.</p>
55.	01:13:41;00		<p>NARRATOR:</p> <p>GINA IS DEVELOPING CRYO-TECHNOLOGY TO AUGMENT THE GENETIC DIVERSITY OF THESE PRECIOUS SURVIVORS.</p>
56.	01:13:47;18		<p>DR. GINA DELLA TOGNA:</p> <p>Biobanks are repositories of biological material. Amphibians - eggs cannot be frozen. Sperm on the other hand responds very well to freezing.</p>
57.	01:14:00;04		<p>NARRATOR:</p>

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			THE ARK’S BIOBANK IS A FROZEN ZOO – HOLDING GENETIC MATERIAL FROM SIX DIFFERENT SPECIES — INCLUDING THE PANAMANIAN GOLDEN FROG.
58.	01:14:09;07		<p>GINA DELLA TOGNA:</p> <p>The Panamanian Golden Frog represents hope because as long as we have a supply of liquid nitrogen, this sperm can be frozen forever and we have assurance policy for the species frozen forever in time.</p>
59.	01:14:25;06		<p>NARRATOR:</p> <p>NOT A SINGLE SPERM GOES TO WASTE. TO BOOST GENETIC DIVERSITY, SPERM FROM MULTIPLE “FATHER FROGS” GETS THAWED, AND USED TO FERTILIZE EGGS FROM A SINGLE FEMALE. FROZEN SPERM CAN ALSO BE SWAPPED AMONG GLOBAL PARTNERS, IMPROVING GENETIC DIVERSITY IN OTHER CAPTIVE FROG COMMUNITIES.</p>
60.	01:14:47;16		<p>BRIAN GRATWICKE:</p> <p>The lessons that we've been learning can have a global reach. We can share our experiences and publications. We've had Gina go and train people how to do assisted reproduction so there's a lot of potential for us to come together as a community and learn from each other.</p>
61.	01:15:07;06		<p>GINA DELLA TOGNA:</p> <p>We've been very successful with the amount of species that we have and the results we have achieved so far. We have a lot more to do and we're gonna accomplish a lot more.</p>
62.	00:15:22;02	GRAPHIC: END CREDITS	

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63.	TRT: 00:16:07;18		OUT
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