

Narrator:

Hello, newborn desert tortoise!  
Welcome to your world. Look around.  
Break out of your shell and explore what lies ahead. Stretch your legs.  
Feel the desert soil. One thing for sure, though—  
it won't be easy.

Man / Woman exchange: And this is a male? Yes. Oh yeah look at that tail...yes.

Becky Jones:

"...it appears that the desert tortoise is in trouble."

Ken Nussear:

"At, I think, eight or nine study sites we say declines between 30 and 50 percent."

Larry LaPre:

"The tortoise has started having severe population declines in about 1989...."

Becky Jones:

"... very few of the small tortoises survive. There's about a 95% mortality rate within the first five years."

Ken Nussear:

"We're seeing declining populations due to a variety of factors. Not just disease not just predation, not just habitat loss but I think a mix of all those things  
.... are really causing some declines that i hope we can reverse."

Male scientist:

"1-4-7-2-3."

NARRATOR:

Desert tortoises have lived across this southwest landscape for thousands of years. Their adaptation to its extreme harsh environment is amazing: ... surviving ground temperatures greater than 130 degrees Fahrenheit. ... and able to live a year, or even two, without water. But now, the desert tortoise is in danger of extinction. In the 1920s, there were hundreds of desert tortoises per square mile in parts of the Mojave desert. Now, in those same areas there may be fewer than a dozen per square mile ...

Narrator

Tortoise extinction would have a ripple effect across the desert. As tortoise numbers drop so too do the numbers of underground burrows that they dig. A wide host of animals depend upon these burrows from shelter from extreme summer heat and the cold of winter. Even in a protected Critical Habitat area like the Red Cliffs Desert Reserve, in southern Utah, the tortoise population dropped nearly 50% since 2000. But perhaps science can yet turn the tide.

Becky Jones:

"Science can give us a lot of information on how best to manage populations and areas on which the tortoises live."

Roy-Averill Murray:

"... I work with the Desert Tortoise Recovery Office, our job is to facilitate recovery efforts for the species.

Roy-Averill Murray:

"There's four states, three Fish and Wildlife Service regions, countless agencies and stakeholders and interest groups and researchers..."

NARRATOR:

Much of the research guiding the recovery effort is being carried out by ecologists and biologists with the Department of the Interior, U.S. Geological Survey.

Todd Esque:

"USGS researchers are conducting a really great variety of research - including tortoise physiology, general ecology, their responses to fires ...

Todd Esque:

"disease and health... hibernation, reproduction, all aspects of their ecology..."

Roy-Averill Murray:

"What works? What doesn't work?"

Becky Jones:

"The more we can learn about the tortoise, the better chance we have to bring it back."

NARRATOR:

Because the Mojave desert tortoise is listed under the Endangered Species Act, there is a federal mandate to restore the populations. The tortoise is among the top recipient of federal dollars—because their decline has been quite sudden and wide ranging. ... and because they are so long-lived it takes years to know which recovery efforts are working or not.

NARRATOR:

The Mojave Desert covers some 25,000 square miles. It is a part of Utah, Arizona, Nevada and California. Over 30 years ago, USGS researcher Kristin Berry set up 27 study plots in the Mojave and adjoining Colorado Deserts. These plots were designed to help understand how tortoise populations and their habitats might be changing over time.

Kristin Berry:

"The long term study plots provide a substantial amount of data on the status and trends in tortoise populations. They are places one can return to year after year, decade after decade and find out how tortoise populations are doing. I selected for longterm study 15 of the plots that had an adequate sample size of at least 20 to 30 tortoises per square mile.

NARRATOR:

These plots have all experienced declines in tortoise numbers. ..and have helped identify some of the causes behind that decline.

Woman counting:  
"...18, 19, 20...."

NARRATOR:  
In this particular plot near Needles, California the scientists are counting the numbers of the invasive plant Saharan Mustard. It is one of several invading plant species causing widespread change to southwest deserts.

Kristin Berry:  
... there are 6,000 approximately in this group on the same transect where there was a handful in 1999....the proportion of plants that we have now ten years later is just enormous. It's been major change"

NARRATOR:  
Exact impacts of this invasion are being assessed. The invaders take up precious water and nutrients. If the trend continues there's likely to be a profound effect on native creatures such as the desert tortoise.  
Invasive plants pose other dramatic threats as well.

Roy Averill-Murray:  
"One of the threats facing the desert tortoise today are increasing wildfires. Because of the invasion of exotic grasses and things which perpetuate a fire cycle that is not historically present in the Mojave Desert.

NARRATOR:  
The dry stems of spreading invasive grasses fuel devastating backcountry fires. Tens of thousands of acres of critical tortoise habitat have burned in one year. Native plant foods disappear. Shrub and shade covers are eliminated. Some tortoises have been burned to death.

Roy Averill-Murray:  
"It looks like this is going to be a recurring risk for a long time, at least until we figure out how to deal with invasive grasses."

NARRATOR:  
The Desert Tortoise Conservation Center was originally established as a way-station for tortoises displaced by Las Vegas development.

NARRATOR:  
Today, with the expertise of management by the San Diego Zoo and the U.S. Fish and Wildlife Service...it will fill a key role by providing a base for applied research, training and community support.

NARRATOR:  
One of the U.S.G.S. studies underway at the Center involves a promising Head-starting program.

NARRATOR:  
Head starting is taking place at several locations across the Mojave. It is a technique where captive tortoises lay eggs in pens with the young being raised and later released so that researchers can better learn about their survival.

NARRATOR:

Since females lay the eggs deep in burrows, how do scientists know when the eggs are laid ... so they can get the eggs to incubate them?

Scientist: (on camera)

"1-4-7-2-7"

Phil Medica

" ...so we're in the process now of every two weeks we X-ray the female tortoises ...

Phil Medica:

"..put the tortoise on the plate...and I'm going to shoot the x-ray now."

[X-rays

Phil Medica:

" Okay, stay back. Done."

Kristina Drake:

"So this is one of the X-ray images we shot about 5 minutes ago. And this is tortoise 1-4-9-9-8 ... and you can see five visible shelled eggs on the x-ray here."

Phil Medica:

"... and subsequently, if they lay eggs, based on the weight change, we know that at least the 6 eggs that we xrayed last week have been deposited somewhere inside the enclosures. We will go and find the nest and collect the eggs and then put them in incubators to hatch, hatchlings.

Scientist:

"You guys...I found an egg!"

Scientist:

"Got one? Alright!"

Kristina Drake:

Once the egg's laid in the ground, the temperature in which the eggs are incubated will determine the sex of the offspring. Warmer temperatures are going to produce females, cooler temperatures are going to produce males.

... Once the eggs hatch in the incubators, one of the first things we're going to do is remove them from the incubator. Put them in some sort of out door enclosure, allowing them to get the natural sunlight and hopefully the natural vegetation that they would normally be eating. And then just monitor these animals and try to ensure survival as best we can.

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NARRATOR:

For the desert tortoise to be taken off the Endangered Species List, populations must increase or remain stable for 25 years.

Hey, baby tortoise. You're beginning an amazing life. The desert tortoise is the largest reptile in the Mojave Desert.

The life span is a bit like humans: Young are soft-shelled and

vulnerable. Sexual maturity arrives around age 15. Males and females court... .. and the female digs a nest for the four to eight eggs, each about the size of a ping-pong ball. The shell, called a carapace, has two layers: bone underneath, ...and on top: "scutes"--made of keratin, like fingernails. Desert tortoises spend 90% of their time in underground burrows--which can be shallow, or as long as 30 feet. There they hibernate in winter and stay cool in summer ... when the burrow temperature may be 40 degrees cooler than the searing heat above. Desert tortoises can live to be over 50 years old.

Brian Jacobs:

We're tapping him out with the hopes that when he hears noise he's going to come charging out of the burrow, right on cue. ....ready?

Narrator:

While deaths from upper respiratory tract disease triggered the endangered species listing...additional threats are multiplying. Ravens have become an increasingly deadly predator of young tortoises.

Larry LePre:

"The easiest place to find Raven nests is underneath power towers. Yep, they're back for a visit. Sticks blown off the nest ... "Oooh, here's a tortoise... that's been eaten by a raven. .... its characteristic [sign] ..... that they'll peck a hole in the top to kill it., in northern forests such as Maine, ravens are still a wilderness bird. In the Mojave Desert, which has had urban sprawl and so many human modifications, ravens have increased up to 1,000% in the last 50 years. and the availability of food has just caused this huge population increase....they're social birds and they congregate around landfills, around sewage ponds, around fast food restaurants, cattle yards, horse properties, anywhere there's easy food.

"But the ones who have learned to eat juvenile tortoises they can decimate a generation of tortoises right around the nest. So, those ravens are targeted, and if they find evidence of tortoise predation under a raven nest, then the Bureau of Land Management calls the Wildlife Services of the U.S.D.A and they come out and kill the raven... The power company comes out and knocks down the nest.

Larry LePre:

"They're just so adaptable."

"and then they teach the young that tortoises are good eatin', and so the next generation becomes a tortoise predator, too."

NARRATOR:

Desert tortoise recovery is enormously complicated because there is so much that scientists need to learn. For instance, just with the exotic, non-native plants: What happens to tortoises who eat them? Or, if spraying herbicides is used to control the invasive plants - and the tortoises eat them... what then?

Kristina Drake: (on camera)

"We're studying the nutritional ecology of tortoises in relation to wildfires of 2005. ..but the pens are so armored to keep the predators from eating them .....about 25 of them are actually progeny from adults that were removed from this property when the housing development started to go in ...so we xrayed those adult females, collected the eggs - incubated the eggs and then raised them at the Desert Tortoise

Conservation Center throughout the last 6 months... Today we were taking our first blood samples. We have plans to take blood samples 3 times per year for all the animals that went into this project and with the blood we're going to study a variety of parameters...mostly parameters that will help us understand their metabolic fitness that would again to some of the various treatments and their diet.

Roy Averill-Murray:

"So, the nutrition study is asking primarily—do tortoises on a native diet perform better, grow better, survive better than tortoises on an exotic, unnatural diet?

NARRATOR:

So much about the life of the reclusive tortoise is a mystery—that scientists are beginning to solve with 21st century technology. For example, a customized GPS logging system collects more data, over the vast desert landscape, than ever would be possible with field crews.

Ken Nussear:

"One of the things we've been kind of on the leading edge of for a long time is to get some technology to do a difficult job. Just the act of putting a radio transmitter on a tortoise, means that we've got to have people out there on a monthly or sometimes weekly basis monitoring tortoise activity to get data on how they're using habitat and kinds of body temperatures they're achieving.

Ken Nussear:

"We got a company to help us miniaturize GPS's and actually now we have GPS loggers that are as small as the radio transmitters we were using ten years ago. And now it has a radio transmitter and a GPS and a data logger all in the same package so we're pretty happy about being able to work with technology companies to get the kinds of things that you have in your cell phone working for us on tortoises to help us understand how they're using habitat.

NARRATOR: ... the GPS logger can follow and monitor the tortoise all day, every day, and everywhere it moves.

Ken Nussear:

"So if I want to know for example are tortoises using burned habitat or not after a wildfire and I only get one picture of each tortoise a day it takes me a lot longer to achieve the information than if I get detailed information about every day how much time is that animal spending in or out of the burned areas. So, we're getting all of this now with people watching tortoises but I think in the future we can get a lot more detailed information and be able to put a better picture together of what they're doing.

PART 3 OF 4

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Todd Esque:

"... we've been watching tortoise populations for the desert tortoise for a little over 30 years in the desert, almost 40 years in some areas. And everything indicates to us that there has been a steady decline in populations over that time. Until recently, that was kind of

a mystery.  
cutaway to:

Todd Esque:

"... we knew that it was lots of influences but only recently have we had the ability to get on the ground and collect massive amounts of information across the entire Mojave Desert and then put it all into analysis so that we can start to understand the pattern for the Mojave. And we're starting to pin down pieces of that story about why we are having these declines."

Catherine Nolte:

"and then did you say that number two is the one without the transmitter? ...(mumble)"

Ken Nussear:

"Over the last five years we've been working with a team of scientists, including biologists, but also ecologists, plant ecologists, people who do GIS remote sensing hydrologists, geologists and geographers to put together a desert tortoise habitat model."

Ken Nussear:

"So looking at different elevations, different rock types, vegetation associations, different precipitation and temperature regimens...and how those all come together to influence what we know as the current desert tortoise distribution."

NARRATOR:

Shades from yellow to orange then red show good to ideal tortoise habitat...while dark blue is not tortoise habitat.

Ken Nussear:

"So here in the Mojave Preserve you can see we have areas of high tortoise concentration and predicted high suitable habitat and also areas like these blue ones where we predict that it would be low suitable habitat."

Narrator:

The model's ability to predict habitat type is proving to have wide applications across the Mojave and into the future. It's an invaluable tool for guiding the search for best locations to site new green energy projects. And the model can project us into the future, helping to clarify possible impacts of climate change. Model components such as rainfall totals and temperature can be adjusted to show how habitats will shift as the climate changes. The model helps scientists understand the desert tortoise on a range-wide scale over millions of acres. It has the potential to make a huge difference in desert tortoise recovery ... helping to insure that critical habitats will be suitable into the future.

NARRATOR:

There's no one thing killing off the desert tortoises; a multitude of threats are interacting. Scientists must prioritize which are the most important and which problems can be solved.

NARRATOR:

Hey, baby tortoise, the heat is on.

Not only do you have all the struggles of life in the harsh desert, and dwindling habitat ... now there are new threats on the horizon.

Todd Esque:

".. I think uh, in pre-Western history of people moving out here, this was a giant wilderness.

Todd Esque:

"It was a very hostile environment to humans. And about just a little over a hundred years ago, the West began to be opened up with new trails for immigrants ... Those folks were sort-of eking out a living in the low desert areas.

... Then, the highway system was put in. That opened up the area so people were moving through ... And widespread availability of lots of electricity and air conditioning made it a less hostile place...

Todd Esque:

"And what this all leads to is going from an area that was just little island of human habitat 80 years ago and 60 years to what is now becoming an area that is dominated by human influence with little tiny islands of open natural habitat left.

Todd Esque:

"And that's where we still find the tortoises, in these little islands that are left."

NARRATOR:

Not only has development encroached into the desert.

Scientists have recently found a pattern that shows human impacts extending beyond where people are living.

There's a shadow that's much larger than the actual footprint of buildings and roadways ..... it's created by predators such as coyotes and ravens, that are subsidized by human food and waste ...

... living outside the edge of these areas. Others have their eye on the desert, too.

Roy Averill-Murray:

"There's a lot of sunshine in the Mojave Desert. And there's a lot of open land that energy developers and people who are really interested in getting the country off fossil fuels look at and say, 'Wow! Look at all that sun hitting the ground...

Roy Averill-Murray: (voiceover)

... We can put solar fields there.' Well, that's also where the desert tortoise lives, and other sensitive species."

Larry LePre:

"I think it's important that you put these solar projects and the windmill projects over at the edge of the desert, the western edge, or maybe the eastern edge or near major cities, but not in the middle.

Larry LePre:

"... then you're bringing an industrial park into the middle of tortoise habitat...

"So, siting of the energy projects is crucial, the first priority being to put them on lands already disturbed or where there is no tortoise habitat, and the second being to not fragment large areas that are a uniform block of habitat."

Roy Averill-Murray:

"The challenge is finding the right balance to be able to achieve our alternative energy goals while not sacrificing the native landscape and our natural heritage at the same time.

NARRATOR:

One definition of "desert" is a landscape that gets less than 10 inches of rainfall a year.

Todd Esque:

"When the desert gets a good year... maybe one in ten years we'll have a really good winter rain fall and in those years it's just unbelievably spectacular..."

NARRATOR:

In the Mojave and Sonoran deserts, there live nearly 150 species of mammals... including mountain lions, ground squirrels and desert big horn sheep. ... along with 70 species of amphibians and reptiles, and more than 300 species of flowering trees, shrubs and wildflowers.

PART 4 OF 4

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Larry LaPre:

"The desert grows on you ...

It's fabulous in the spring. The spring bloom is the most dramatic change of season of any other kind of ecosystem in the U.S. probably, from brown to green to color all within a month."

Todd Esque:

"This year was an above average year, it was great. We brought people out on a field trip from all over the world. Everywhere we went in the desert we found 15 to 20 species of wildflowers growing...it was just a super abundance, just a month ago out here when things were a little bit fresher.... You just think, every time you go around a corner, you're walking up a wash you wonder what's going to be around the next corner. There might be a Gila Monster walking along or a tortoise or some kind of a snake ..you just never know what you're going to find so it makes it really fun to be out here when it's reasonable to walk around in the spring.

NARRATOR: These desert adapted plants and animals may hold some keys to human survival in a rapidly warming world.

The unique genetic make-up of desert plants and animals - is a sort of "resource for the future"- potentially crucial for developing new crops, livestock and medicines as our climate warms. Over the next 50 to 100 years temperatures in the Mojave are expected to rise between 5 and 10 degrees Fahrenheit. Rainfall is expected to decrease. Will temperatures in some places be greater than tortoises or their eggs can tolerate? What will happen to the plants making up their diet? How will tortoise habitat change?

NARRATOR:

Science is the starting point for addressing these questions. There is already a foundation of scientific knowledge to build on. Tools such as the habitat model can help forecast some effects of climate change

while guiding management of habitat and species.

Narrator:

Mounting threats to the tortoise now include: invasive plants, disease, wildfires, roads, ravens, coyotes, off road vehicles, other predators and now climate change.

Narrator:

The question remains can the tortoise population stabilize and thrive?

Ken Nussear:

" people know about the tortoise, they care about the tortoise-- and I think that one thing may be the biggest thing that helps turns it around...

...and so we've gotta have people on our team and people that want to help and people that care and I think that's coming around and that's a big positive thing.

Todd Esque:

"But in fact we're dealing with 60 million years of evolution here. Desert tortoises have been around for a very, very long time and people revere them for that reason. The general public wants to know that we have tortoises on the landscape that are not just being put there for their viewing, but they're existing out there in a natural habitat on their own.

NARRATOR:

Humans collectively have had a big negative impact on desert tortoise habitat. But people individually can make a big positive difference, too.

Larry LaPre:

"If you see a tortoise in the wild, look at it and take its picture, see what it's doing ... Basically, it's something to appreciate but not to mess with. ... take a good look so you really can understand the essence of tortoise, half of which is pulling its head in its shell and stand like that for an hour."

Narrator:

Before dawn, the scientists' work begins.

Roy Averill-Murray:

" Science is critical to desert tortoise recovery because there are a lot of uncertainties in how all the numerous threats ... that face the tortoise interact and affect tortoise populations ... Without science we wouldn't be able to sort any of that out and anything we did on the ground would just be a crap shoot ... "

Becky Jones:

"I find the tortoise to be very fascinating because it seems like such a meek species but has been able to survive all these years out in the desert."

Ken Nussear:

"I think more and more as we're facing bigger and bigger threats we need to use whatever science we can to understand how these animals are responding ."

Kristine Berry:

"The tortoise tells us so much about the health of the desert it's a very long lived animal it's a sentinel of the well being of our environment and for that reason alone I think we should be very concerned about its well being and that it thrive..."

**NARRATOR:**

Building on our knowledge of the tortoise, it's habitat and threats to its existence remains a key to Mojave Desert Tortoise survival into the future.

End