Name of Project: Effect of Human Interaction on Wildlife
2018 Supercomputing Challenge
Team #: 184
School: Mesa Middle School
Computer Language: StarLogo Nova
Grade: 8th
Team Members: Jade Collins and Gabriel Agnew
Teacher Sponsor and Mentor: Tracie Mikesell
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Summary: Habitat loss is a big problem. Humans are taking the natural homes from the animals we share habitats with. Not only are we making them homeless and eventually die of starvation, we are also harming ourselves. We are cutting down the very trees that give us the oxygen we need to survive. With nowhere else to go, the animals come to the cities that once were their homes. What do we do when they get here? We blame them, call pest control, drive them out once again, and even kill them. Then, if they get away, we hunt them down and kill them for glory. I understand a little death is natural, but we are making them go extinct. We are ruining this world we know so little about for what? Our comfort. Our population number in general, as well as, the agriculture we practice also harms the animals. The factories we build release toxins into the air, creating rain harmful to the environment, and causing huge temperature changes. Some humans are helping and trying to save the animals and their environment. We will show people what they are doing and to persuade them to contribute to the efforts that are being made to help the animals. We, as the human race, have only helped a little, but there is still hope. We have set up national parks, as well as, come up with a system where you can only hunt animals at certain times. We have also created a list of the animals that are endangered, extinct, or fine currently. Our final act of help is that we set up the Endangered Species Act. This act protects endangered species, and the ecosystems that they live in.

We are going to consider the habitat after the Chernobyl Disaster. This area was devastated by a man made nuclear disaster, which forced humans to evacuate the area. When humans were forced out a miraculous thing began to happen to the wildlife in the area came back faster then we ever thought was possible.

On April 26, 1986, there was a nuclear explosion unlike any other nuclear disaster before, in Chernobyl, Russia. Though there were many contributing factors, the main thing that caused the disaster was that the cooling water that was supposed to keep the heat leveled, flooded out. Once that happened, a major power surge came up, causing way too much heat. Because of the immense heat, most of the pipes containing the fuel ruptured, reacting with the water beneath it, creating a steam explosion. That caused the 1,000-metric-ton cover to come off the top, rupturing the rest of the pressure tubes, causing an explosion at the core, leaking nuclear fuel everywhere. The fire that emerged from the explosion was ginormous and

destructive, burning Chernobyl for about 10 days straight. The reason that all this happened was, in fact, because of human error, contributing to the fact that humans are capable of making mistakes that can harm ecosystems. After all the humans evacuated or died, and the fires stopped, several species were still around the area. On top of that, many species who used to live in Chernobyl before the humans returned. Among others, one of the species that returned was the Brown Bear. Chernobyl became a sanctuary for animals when the humans left. Many endangered species took shelter here including, the Lynx, the European Bison, the Przewalski Horse.

Purpose of Project: No one knows about how badly we humans are affecting the wildlife around us; we want to change that. Even our normal lifestyle now - what we do everyday - harms the flora and fauna around us. When we expand our cities, farm resources, or build production units, we are hurting the environment. In fact, over the past 500 years, about 322 known species have gone extinct because of humans. We, Gabriel Agnew and Jade Collins, plan to raise awareness of habitat loss and how humans are the cause of it. We want to show data of when there is no human intervention, and how animals and their habitat can thrive.

Steps We're Taking to Complete Goal/Purpose: We have decided to showcase the effect of the interactions of humans on animals by having two side-by-side models showing Chernobyl with the radiation leak, and Chernobyl without it. By comparing these two models, we are hoping people will start to understand better the destruction we are causing.

Model 1: This model will showcase what actually happened in Chernobyl on April 26, 1986. In this model, you can see how, after the radiation leak, animals began to adapt and continue breeding. Animal breeds that haven't been to Chernobyl in forever came back and are now happily living there, despite the radiation. We only showed the bear population, but there are other kinds of animals still in Chernobyl today. The flora and fauna flourished without the humans.

Model 2: This model will showcase a hypothetical situation where, Chernobyl's nuclear power plant never malfunctioned, and the humans stayed with the animals in Chernobyl. As time goes on, the animals decrease more and more with each inevitable interaction with a human. The humans do die sometimes, but not as much as the bears.

Challenges We Faced: Some challenges we have faced thus far have been, figuring out how to make the bears repopulate, and programming the humans to delete or "run away" when they hit the edge of the spaceland. We also had trouble with making the bears head toward the food. For the task of making the humans run away, we had to manually make a perimeter, due to the platform we used not having a direct command to interact with the edge. We accomplished this by creating a new breed, then programming it to stamp around the perimeter of the spaceland. This created an edge that could be interacted with, and, in turn, let us program the humans to delete upon collision. For the task of making the bears repopulate, we had to try multiple different things. This originally wasn't our idea, but when we presented, Dove Price gave us a good suggestion for human-bear interaction, and bear repopulation. At first, we just made it to where when the bears collided, they repopulated with a certain percentage, but that didn't work. The newborn bear would run into one of its parents and repopulate with it. This lead to swarms of bears in a short amount of time that crashed our program. So, we had to figure out another way. Next we tried making the newborn pop up

slightly away from the parents, but that still didn't stop the swarms. On top of that, it was really unrealistic. After that plan failed, we tried creating a new breed; "cubs". The cubs are baby bears, and are unable to repopulate with their parents, keeping everything under control. However, there also needed to be death and growth factors in the code, which was, at first very tough to code. But, after a while, slides were created to adjust rates of death and growth, and we could eventually make the cubs grow into bears, and make the bears die. For the task of making the bears head towards the berry bush, we had to try two different things. First, we just made them face and walk towards the nearest bush, but that resulted in a huge reproduction outburst, which ultimately lead to the system crashing. So to fix that, we added a percent chance of them noticing the berry bush; that worked and there wasn't a mass reproduction of bears.

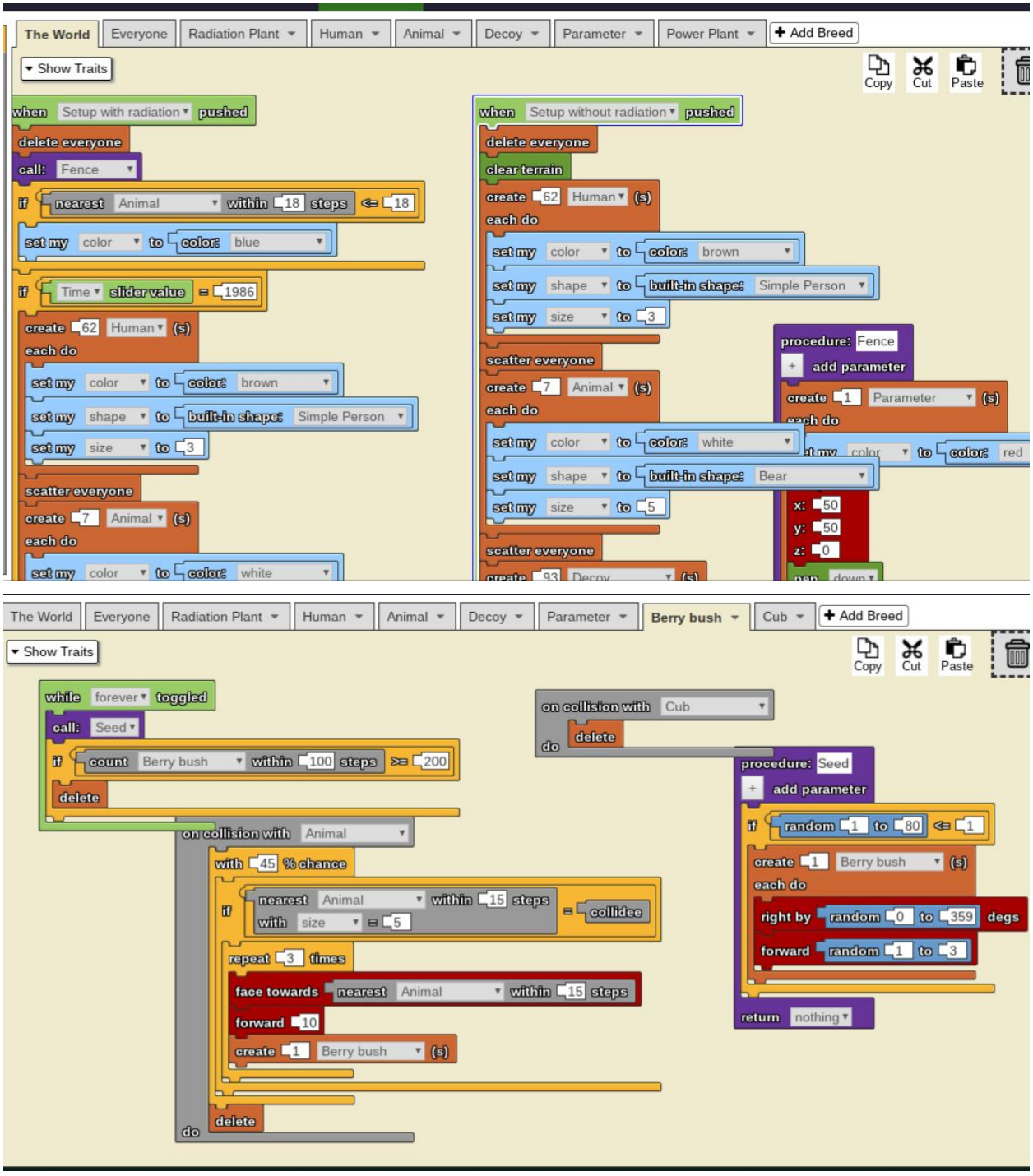
Results: We ended up being able to code various things including multiple breeds to represent the animals, humans, and the power plant in Chernobyl, a graph of bear population, a graph of human population, bear repopulation, human-bear interaction, growth and death of bears, plant growth, death when in radiation plant, side-by-side hypothetical model of Chernobyl without radiation, a way humans can run away from the radiation, and an effective way to show people that animals do better without human influence, even when faced with radiation.

Reflection: We are mostly happy with what we got done. We would have liked to get done with a little bit more, but overall, the project looks pretty complete and it functions well for the most part. It would

Future Plans: If we had more time, we would have liked to code more things into our project. One would be to code the humans to build up a civilization after a certain amount of time in the model without radiation. This would show how the buildings affect wildlife. We would also have liked to be able to code a better representation of what the radiation leak actually looked like. We would also have wanted to code better bear repopulation tactics; to make it more realistic, accurate, and more efficient.

Real World Applications: Others can use the data we have gathered by applying it to real-world situations, where humans have left the environment. Anyone viewing this data can come to a conclusion that, even through nuclear disasters, communities of animals can thrive where humans have left. People can apply this data to areas where fauna populations are threatened, and learn how to help that place.

Code:


The World
Everyone
Radiation Plant
Human
Animal
Decoy
Parameter
Power Plant
Add Breed
Show Traits
Copy
Cut
Paste
when Setup with radiation pushed
delete everyone
call: Fence
if nearest Animal within 18 steps <= 18
set my color to color: blue
if Time slider value = 1986
create 62 Human (s)
each do
set my color to color: brown
set my shape to built-in shape: Simple Person
set my size to 3
scatter everyone
create 7 Animal (s)
each do
set my color to color: white
when Setup without radiation pushed
delete everyone
clear terrain
create 62 Human (s)
each do
set my color to color: brown
set my shape to built-in shape: Simple Person
set my size to 3
scatter everyone
create 7 Animal (s)
each do
set my color to color: white
set my shape to built-in shape: Bear
set my size to 5
scatter everyone
procedure: Fence
add parameter
create 1 Parameter (s)
each do
x: 50
y: 50
z: 0
The World
Everyone
Radiation Plant
Human
Animal
Decoy
Parameter
Berry bush
Cub
Add Breed
Show Traits
Copy
Cut
Paste
while forever toggled
call: Seed
if count Berry bush within 100 steps >= 200
delete
on collision with Animal
with 45 % chance
if nearest Animal within 15 steps with size = 5
= collidee
repeat 3 times
face towards nearest Animal within 15 steps
forward 10
create 1 Berry bush (s)
delete
do
on collision with Cub
delete
do
procedure: Seed
add parameter
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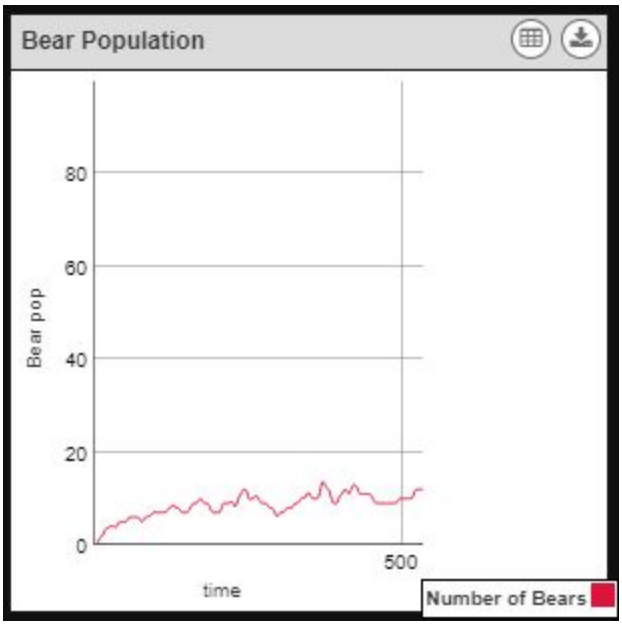
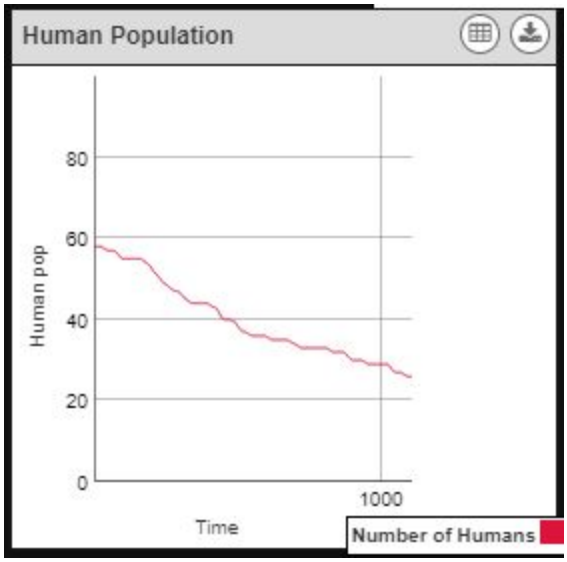
create 1 Berry bush (s)
each do
right by random 0 to 359 degs
forward random 1 to 3
return nothing

Graphs:





Acknowledgements: We give thanks to Ms. Mikesell for always supporting us and helping us when we were stuck. She traveled to our school every Thursday after her work just to give us time and help to finish our project. We also thank Ann Gomez for coming in to help us as well.

Team Biographies:

Jade Collins: I worked on the human-bear interaction, coding the perimeter, making the side-by-side without radiation model, programming the humans to run away from the radiation plant, and coming up with making a decoy breed of bears so we could program some

to die, and others to live. I also contributed my time to the research and writing of the reports. I am currently in 8th grade with plans to go to Centennial High School. After that, I am hoping to get into and afford an out-of-state college. There I want to get degrees in graphic design, culinary, and computer science. I am not sure which I will major in, and which I will minor in. I participate in many school sports, and I'm a part of a local 4-H club. This is my first time participating in a SuperComputing Challenge. Email: collinsjade@lcpsmail.org

Gabriel Agnew: I worked on the birth, growth and death rates of the bears, the bushes, the timeline, and any unrealistic problems that we had. I also worked on the reports and I supplied some research; mainly in specific areas. I am also currently in 8th grade, with plans to go to Onate High school. Afterwards, I do hope to be able to get into a college - preferably with little fees, and my careers of interest include: anything with mathematics in it, technology, or medical sciences. There are other careers I may consider, though, so I am not entirely fixated on just one subject. I am currently enrolled in orchestra, and I write music with my dad. This is my second time participating in a SuperComputing Challenge. Email: agnewgabriel@lcpsmail.org

References:

1. www.greenfacts.org From this website, we learned how many people died at the time of the Chernobyl disaster, and how many people died after the accident. We also learned that the flora and fauna were directly impacted within 30km of the nuclear leak.
2. www.nei.org We learned exactly what happened at the Chernobyl disaster from this article. The facts on what happened were described in the background part of our Final Report.
3. www.telegraph.co.uk From this article we learned that, the Chernobyl site is one of the "most important habitats for scientists studying native wildlife in Europe.". We also learned that the town of Chernobyl was 800 years old, and housed "a top-secret Soviet military base.". The Chernobyl "zone" has become an unplanned sanctuary for many endangered species in Chernobyl. These fauna include the Lynx, the European Bison, the Przewalski Horse, and the Brown Bear (this animal is not endangered but hasn't been seen in this area for over a 100 years).
4. www.livescience.com From this article, we learned that the population numbers of the animals in the Chernobyl "exclusive zone" are similar to the population numbers in nearby nature reserves. In fact, the wolf population in Chernobyl is seven times greater than the population in the nearby nature reserves. We also learned that there was a similar nuclear leak - just not as bad - at the Fukushima Daiichi Nuclear Power Plant in Japan, in March 2011.
5. https://news.nationalgeographic.com From this article, we learned that scientists are still in a debate about whether the radiation is good or bad for the wildlife living in the Chernobyl exclusive zone. We also learned that, Chernobyl houses tons of birds, and a growing beaver population. The Beavers are returning the Chernobyl landscape to what it looked like a hundred years ago, a bog.
6. https://www.britannica.com From this website, we learned how much power the power plant could make. Which would be 1,000 megawatts of electric power. We also learned

that this disastrous event took place in 1986. As well as Chernobyl being in Ukraine, Russia.

7. http://www.nmfs.noaa.gov From this article, we learned that, “The Endangered Species Act of 1973 (ESA) was signed on December 28, 1973, and provides for the conservation of species that are endangered or threatened throughout all or a significant portion of their range, and the conservation of the ecosystems on which they depend.”.