Blood Ivory Final Report

Melrose Middle School

Team number 99

Area of Science: Conservational Ecology

Computer language: Netlogo

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Executive Summary:

Our project is about how elephants are at risk because of ivory trade. The elephant population is very low now compared to past decades, and this is due to the supply and demand for ivory. If the ivory industry continues to grow elephants will face mass extinction within the next century. Elephants are a keystone species within their ecosystem. Small animals such as birds and mice depend on their foot prints to collect water, also their foraging affect the growth of any plant species and their subsequent consumers. If the elephants go extinct there will be a major link in the food chain lost. With our model we have shown how the elephants are affected by these things, and by doing so proving that things can be done to save the elephants.

Problem:

Ivory, although a pretty thing to have, comes at a huge cost to the African elephant population. In some countries of Africa including Senegal, Somalia, and Sudan, elephants have already been driven to localized extinction. Elephants share the same emotions and cognitive behavior as humans. They grieve for their losses, they feel fear, joy, and empathy. Therefor it is not being directly poached that kills them, they can be depressed because they lost their loved ones and may not leave the spot where the other was killed, and starve. Therefor by killing off one elephant directly it also kills others indirectly. Elephants are a keystone species. Other animals, plants, and ecosystem depend on their survival. If the ivory trade does not stop or at least slow then elephants will face mass extinction.

Method:

We have tried to help with the problem by promoting awareness for elephant extinction. We are helping others understand that it is not just elephants that will go, but along with them entire ecosystems, tree species, and small animals.

We built a model about elephant ecology. In our model we have shown the rate elephants are going extinct, different variables as to how it can change and will change as elephant poaching speeds up and slows down. Some variables we can show are the rate of reproduction, death by disease and poaching, the way the ecosystems change, and how people can slow down their extinction by decreasing the ivory demand.

Results:

We have researched how Ivory trade has increased in the 1970s. Demand of ivory rocketed with 80% of Ivory coming from poached elephants. We have learned how international Ivory trade was prohibited in an attempt to fight this illegal trade. Since records began, 2011 saw the largest recorded black market ivory trade increase. We read that 38 elephants range states were set with the main objective to stop poaching of the elephants but it did not work. We expect to raise awareness of the problem by modeling what can happen. We believe that if people are aware that if the elephants go they will take entire ecosystems with them. They will help in the fight against ivory trade. The usefulness of this is to show people that elephants are a keystone species in large ecosystems and many different species depend on their survival. This model will show the importance of their survival.

Conclusion:

It has been concluded that elephants could be extinct by 2020 if the black market ivory trade dose not slow down. The importance of doing a project on ivory trade is to raise awareness for the elephants. The main leader of elephant poachers is in Africa. After the Africans poach the elephants they take their tusks and ship them to China. The Chinese people believe that Ivory brings good fortune. China is the world's most populated country in the world. So Ivory is in high demand. We hope that the outcome of doing this project is to show how important the elephant's lives are.

Program:

In our program we show how the black market ivory trade effects the African elephant population. When you set up the program It creates the background which consists of some green (for grass), very little blue (for water), and the rest brown (for dirt). Then you press the button “animals and people”, this creates the elephants, poachers, and the wardens. There are monitors that count the turtles that are left. When you press start the elephants start to reproduce, the poachers kill the elephants, and the wardens kill the poachers. There are sliders that control warden and hunter population. There is also a slider on the rate the elephant’s death.

Significant Achievement:

In our model we have shown how ivory trade is effecting the elephants. First we’ve show what species is being effected by ivory trade the most. We put in some variables to show how the rate of the elephant’s extinction can be changed these will include poaching rate elephant mortality rate and elephant reproduction rate. A ratio that we can show will be the rate of the elephant’s extinction compared to the time it will take for the population to go extinct.

Validation:

We have found that by manipulating our variables that we can make an elephant population that is stable and mimics the elephant populations of the world.

Acknowledgments:

We would like to acknowledge our parents who drive us to and from school for supercomputing practice every weekend. Also we would like to acknowledge our sponsor Mr. Daugherty who introduced us to the Supercomputing Challenge.

We would also like to acknowledge the writers of the ‘FLOCKING’ program, as we used parts of it to help our elephants stay in herds.

Citations:

Iworry.com - A web site that gives info about ivory trade

National geographic - Blood ivory Issued October 2012

Wwf.com - web site that gives info about elephants

I dreamed I was in Africa - book by kuku gullmann

Ivory ghosts by Caitlin O’Connell - book about ivory trade

Netlogo flocking program

Program Code:

```
breed [elephantherds elephantherd]
breed [hunters hunter]
breed [wardens warden]
turtles-own
[flockmates         ;; agentset of nearby turtles
  nearest-neighbor   ;; closest one of our flockmate]
;; xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
to setup
    reset-ticks
    ask patches [set pcolor 37]
    create-turtles 10 [setxy random-pxcor random-pycor]             ; creates grass, dirt, and water
    ask turtles [repeat 25[RT random 180 FD 1 set pcolor green]]
    ask turtles [repeat 2[FD 1 set pcolor blue] die]
    ask turtles [repeat 25[RT random 10 FD 1 set pcolor green]]
```

```
    ask turtles [repeat 2[FD 1 set pcolor blue] die]
end
to elephants                    (creates elephants)
  create-elephantherds herdsize [set shape "elephant " set color gray set size 3 setxy random-pxcor
  random-pycor]
end
to wander
  ask elephantherds [ flock fd 1]
  ask wardens [LT random 60 RT random 60 FD 2]              (makes turtles move)
  ask hunters [lt random 250 rt random 250 fd 1]
  tick
end
to poach              (asks poachers to poach)
       ask elephantherds [ if (any? turtles-here with [breed = hunters])and (random 100 < killrate)
       [set color red set size 1 stamp die] ]
end
to createhunter              (creates poachers)
    create-hunters hunterpop [set shape "poacher" set size 2 setxy random-pxcor random-pycor]
end
to mate             (asks elephants to poach)
    ask elephantherds [ if count elephantherds < 100 [ if (any? turtles-here with [breed = elephantherds])
    and (random breedrate < 5) [hatch-elephantherds 1]]]
end
to law              (asks wardens to enforce law)
      ask hunters [if (any? turtles-here with [breed = wardens]) and (random 100 < 40)
      [set shape "x" set        color black set size 1  stamp die]]
       if count hunters < minhunter [ create-hunters 1[set shape "poacher"
       setxy random-pxcor random-   pycor]]
   ask wardens [if (any? turtles-here with [breed = hunters]) and (random 100 < 5)
   [set shape "x" set color   black set size 1  stamp die]]
end
```

```
to police            (creates wardens)
   create-wardens 4 [set shape "truck" set size 3 setxy random-pxcor random-pycor]
end



;; xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
to go                                    (makes elephants herd together)
     ask elephantherds [ flock ]
    repeat 5 [ ask turtles [ fd 0.2 ] display ]
    tick
end
to flock  ;; turtle procedure
  find-flockmates
  if any? flockmates
    [ find-nearest-neighbor
      ifelse distance nearest-neighbor < minimum-separation
        [ separate ]
        [ align
          cohere ] ]
end
to find-flockmates  ;; turtle procedure
  set flockmates other turtles in-radius vision
end
to find-nearest-neighbor ;; turtle procedure
  set nearest-neighbor min-one-of flockmates [distance myself]
end
to separate
  turn-away ([heading] of nearest-neighbor) vision
end
to align
  turn-towards average-flockmate-heading max-align-turn
end
```

```
to-report average-flockmate-heading
 report atan sum [sin heading] of flockmates
             sum [cos heading] of flockmates
end
;;; COHERE
to cohere
  turn-towards average-heading-towards-flockmates max-cohere-turn
end
to-report average-heading-towards-flockmates
  report atan mean [sin (towards myself + 180)] of flockmates
              mean [cos (towards myself + 180)] of flockmates
end
to turn-towards [new-heading max-turn]
  turn-at-most (subtract-headings new-heading heading) max-turn
end
to turn-away [new-heading max-turn]
  turn-at-most (subtract-headings heading new-heading) max-turn
end
to turn-at-most [turn max-turn]
  ifelse abs turn > max-turn
    [ ifelse turn > 0
        [ rt max-turn ]
        [ lt max-turn ] ]
    [ rt turn ]
end
```