Final Report

Mustangs of America

Team # 36

Melrose Middle and High School

Area of Science; Ecology

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**Executive Summary**

Our project is about the mustangs of America and how to make their lives better. These are populations of wild horses that mostly live on federal lands in the western USA. They are generally unregulated and uncared for, and live their lives as feral herds. The question we want to answer is how can we improve the lives of these animals without having to put them in game preserves?

Last year we started our project with a simple and more well-known issue that would be easy to begin with, and that problem was overpopulation. We first created an accurate computer simulation of what goes on in many horse populations. We were able to show the basic ecology of horses and how they are affected by rain and vegetation amounts. With the same model from the previous year, we decided this year to expand the problem and work on the usually neglected issues that the mustangs in the United States face.  The two that we have expanded on more for this year are the issues of genetic conformation, and inherited diseases, specifically we chose Hereditary Equine Regional Dermal Asthenia (HERDA) and Equine Influenza.

By dealing with these two issues, we hope to make the individual horses in the herd more desirable for adoption by the general public. Decreasing genetic diseases and improving the average conformation and general looks of the horses should make this possible.

We hope that by presenting our project we can inform the public how important these creatures are and all the struggles they face that the average person doesn’t even know about! The more people know about the mustang’s issues the more we can have standing on the issue and our perspective to try to help the horses to live a better life.

**Problem Statement**

Wild mustangs are the majestic feral horses that for America mostly live and care for their own but are observed from afar to prevent them from moving into a property that they are not safe or supposed to be in. They currently live on their own with little protection and will suffer if there are bad years and little care. But there are programs that support them and have adoption options when the situation for the horses become dire. When we began our project, we found that horses have a war with the world, problems coming in waves of hundreds. Some of the major problems the mustangs deal with include overpopulation, starvation, and genetic defects or deformity. These issues greatly affect numerous horses in any single herd. They are the most common problems in the equine world.

Other situations negatively affecting them include diseases, droughts, floods, and many more various weather variables. Though with our model, we can express the situations that plague the wild mustang’s population and do our best in attempting corrections to these many issues. A horse’s population is an extremely tricky subject to replicate, considering all the variables. A slight miscalculation could send the graph to unproportioned measures. An entire herd could die off from a single seemingly simple change. A well represented model would help to forecast and predict all of these things that can cause so much trouble in the environment and with horse populations. We can then pro-actively deal with issues before they reach catastrophic levels.

To elaborate, it is necessary to control horse populations, and with this goal, we created a model to achieve just that. After information was acquired, we set forth to create the model, which did just as we wished. It worked well and assisted significantly in our plan to help improve the wild horses so that they will be more likely to be adopted by the general public.

 By helping people get involved to give donations to help the cause, start adopting more horses, or get them involved in becoming a volunteer, we can help more mustangs live a better life and be put aside from having to be exterminated because they started to overpopulate or had a genetic deformity or a disease that was too much for the life of the horse to be worth living. Because there are 3 main options that the caretakers have to choose on. 1. Give up for adoption 2. Relocate (temporarily or permanently) or the most disliked one 3. Exterminate. These choices are different for every horse and persons bias, but we wish to preferably have more horses either relocated or adopted rather than killed.

**Problem Solution**

As we began to progress with our project, we researched more about wild horse’s lifestyles and more about these two issues which we are adding to the NetLogo program. While doing research on the lifestyles of the horses, we discovered that their lives are far from pleasant for most of them. There is starvation from overpopulation, and the prospect of being transported to other countries to be slaughtered for meat. Even though they do not die a quick death, not enough people are willing to adopt them which leads to more and more of them being put down because of starvation, mutations, diseases, and more.

Our model is, naturally, the main component of our NetLogo project and holds all of the information going into this project itself. We have a lot of variables in this model. The variables control the horse’s motion, the horse’s direction, the horse population amount, much more on the horses, and quite a bit on the environment.

    The variables controlling the horses include-

* Herd size = the population # of how many horses are are on the range;
* Amount-water =  from rainfall, which affects grass growth and watering holes;
* Shrub-amount = how much low energy food is on the range;
* Energy-used = much energy it takes for a horse to move m;

With such a large amount of controls, the possibilities are endless.

**Results and Validation**

This model that we have created in NetLogo follows the generic rules of life based on what weather is to come. If the rain comes in larger amounts, the grass will grow thicker and more plentiful, and the horse’s population with increase as they will have more to eat, and more energy that allows them to reproduce. Eventually the breeding level will flatten out as grass levels are consumed. If the rainfall amount is very abundant, then the grass will grow at a high-speed which will allow the horse’s population to also increase at a high-speed but also will lead to the population being too great if too much food is provided. Then they shall start to slowly die off because there are too many horses and not enough grass.

If this problem happens to appear, we will take away some of the horses so that the grass can grow back enough for all of them. Another situation that can occur is if the rainfall amount is too little and the grass is not growing at a fast-enough rate to feed all the horses which will lead to them dying off. In this situation, we have created a command in the program that rounds up all the horses to a new pasture temporarily in the event that the grass does not grow fast enough. Based upon this information, the population of horses basically follow the grass amount whatever that may be on our population graph.

The addition of improvements in the horse herd by introducing the factors of body conformation and genetic diseases allowed us to show how improvements can be made through breeding programs that help to lessen these problems.

**Conclusion**

Overall, we created a model that can show the representation of ecology about the mustangs of America on reservations. This project consists of a realistic range where the horses may roam fairly free in a pasture not quite dissimilar to a reservation you might find in places like Wyoming. It also includes horses, a water source, buttons and sliders that control all of the possible actions and events of what could happen, population rainfall and grass growth variables, and more to show our models factors that changes from when we change each of them to show a different possible occurrence.

We were able to show that genetic diseases and horse conformation problems can be addressed through breeding programs designed to make an improved horse herd. This type of herd will be more easily adopted out to lessen the strain of horse overpopulation.

These factors are based on reality so when we change our variable of rainfall amount to a lower amount, as anyone would expect in real life, the grass will not grow to be as plentiful. Then the horses will become hungry and begin to starve unless we hit the round-up button. This moves the horses from the range and lets the grass grow steadily without horses eating it all before it can grow back. This is just one example of the variations we can do that actually occur in real life and is one of the problems based on weather patterns.

While we can only do so much, we can do more as well. Many people don’t know about their current situation and how bad it is. Though we try to be optimistic that the caretakers are doing their best to help the horses they care for live a better life, we want the world to know to get involved and to also make a difference. With our model, it can attract younger people as if it were a fun game and also learn something from it, and for other audiences it can be something more to research on and do a project of their own about. This project is a good learning tool and we still have much we can do with it to create an even more accurate simulator for real life possibilities and situations that happen on our federal lands.

**Achievements**

In an overall summary, we have created our model after we gathered enough information to assist us in our plan to deliver our project that will be able to assist the wild mustangs' caretakers in the process of raising them. With the project that we have created, this won’t only help  the caretakers on the reserve do a better job at helping the wild mustangs survive, but it will also help other ordinary people have a better understanding of what the lifestyle of the wild mustangs looks like and what needs to change in order for their survival.

Some more things we have accomplished were gathering more information in research. We have found a lot more information that will help us in the long run. Along with this, we have introduced more coding into our interface which included representations of sickness and conformation problems in the horse herd. Number counts on the side of our model represent the number of horses with equine influenza and another with number or horses with a HERDA mutation. These predictions can assist managers trying to increase horse adoption rates.

**References**

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