Maximizing the Utility of a Lake Ecology

New Mexico
Supercomputing Challenge
Final Report
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Melrose High School

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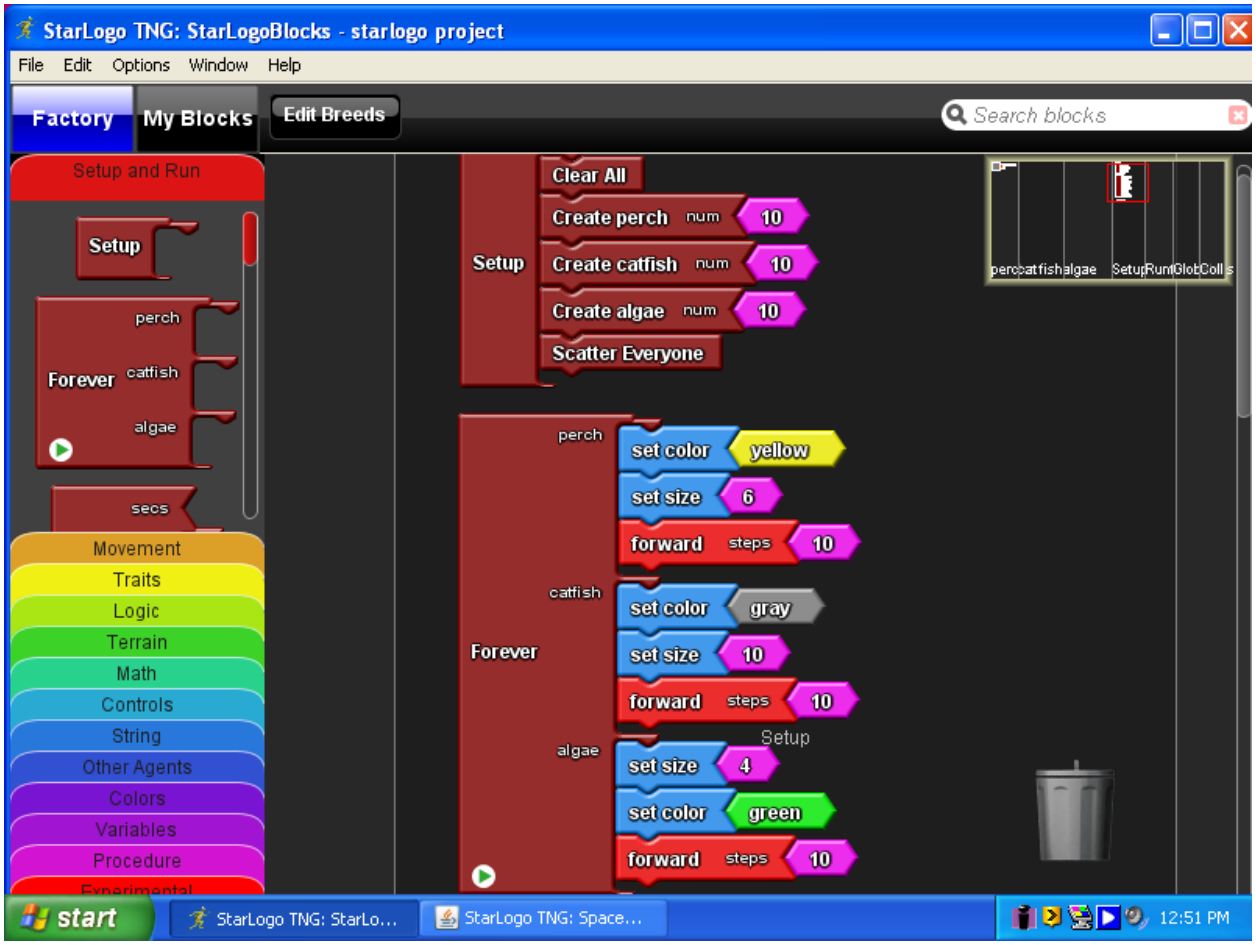
Executive Report

Our project is over the ecology of lakes. We have studied food webs, growth patterns, habits and life cycles of many different organisms. After researching these subjects, and others, we built our project around three organisms and their interactions. We wanted to test the limits on what size of creatures a lake could support and how food chains could be manipulated to create different sizes of life. Some of the questions we asked were, “How much food does an organism need, not only to survive, but to thrive?” and “How fast would smaller organisms need to reproduce to be able to feed larger organisms while still maintaining their own population?” We have answered these questions and gained new knowledge along the way.

Project Description

We wanted to know how large a creature could grow in a lake, given the amount of food available and growth rates of the fish population. We decided to study channel catfish because they can grow to such large sizes and they are natural in most freshwater lakes in the United States. They are partly bottom feeders but also feed mainly on smaller fish, commonly perch. The perch in our project serve as the food supply. We have modeled their reproduction and death rate. The perches food source is algae, which grows fast so unless the perch population goes out of control there is no way the algae will ever expire.

To model our project we used StarLogo TNG and although it's still beta the program worked excellently to depict the way our organisms interact. We used a feature of the programming called sliders to change the numbers of catfish, perch and algae to see what would happen with more or less of an organism. We could also change the different organisms death rates, reproduction rates, and eating habits.


StarLogo TNG: StarLogoBlocks - starlogo project
File Edit Options Window Help
Factory
My Blocks
Edit Breeds
Search blocks
Setup and Run
Setup
Forever
perch
catfish
algae
secs
Movement
Traits
Logic
Terrain
Math
Controls
String
Other Agents
Colors
Variables
Procedure
Clear All
Create perch num 10
Create catfish num 10
Create algae num 10
Scatter Everyone
set color yellow
set size 6
forward steps 10
set color gray
set size 10
forward steps 10
Setup
set size 4
set color green
forward steps 10
start
StarLogo TNG: StarLo...
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12:51 PM

MODEL

Conclusions

Our results showed us that the catfish would continue to grow as long as there was a steady food supply. The bigger the catfish got, however, the more they ate. They eventually reached an impasse because they couldn’t eat enough perch to continue to grow at a noticeable rate without decimating the perch population. Given enough time a few would continue to grow but the death rate of the catfish usually took care of the ones that had been around the longest. This is why fish of such monstrous sizes are rare. It is almost a fluke that they can escape natural death and find somewhere with enough small fish to support them as they continue to grow.

Bibliography

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http://www.nmnh.si.edu/botany/projects/algae/

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