KEYSTONE SPECIES

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I researched the extinction of rhinos and the impact that this extinction has had on the ecosystem. Rhinos are a "keystone species." A keystone species is a species that does a task that cannot be replicated by other animals, thereby making them unique; when this species goes extinct, it forces the ecosystem to change rapidly. I studied the impact that humans have on the ecosystem and discovered that humans are the ultimate keystone species on the planet.

That discovery is what inspired my artwork. I created a print that includes imagery of five different keystones species surrounding humans. I chose to use trapezoid plates and arch them as a way to represent the keystone aspect of my research. To make this print, 9 different plates were used (the first 5 were hard ground and etched into, and then I used an ink transfer in register on 4 other plates so that I could add color to the different animals). To hold ink, I used aquatint on all the plates. I used a frisket to line the plates on the press bed so that the plates would print in register. I chose to place all the plates on one page so that the plate mark would stand out and contribute to the print.

It is important to understand the role humans now play in the ecosystem and how vital it is to value and protect the resources around us.

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This research paper explores how keystone species impact the earth and why they are important. The paper talks about the danger of extinction of keystone groups along with protecting them. During the research, I discovered the impact that humans play on keystone species and on the earth as a whole. Which led me to tackle the topic of whether or not humans are a keystone species. Through all of the research, I bring together all of the information to come to the conclusion of how I believe humans need to go forward with their lives.

A keystone species is an animal that other species in an ecosystem largely depend on if it were removed the ecosystem would change drastically. Keystone species help define the entire ecosystem and without them, there would be a dramatic difference in the ecosystem leading all the way up to it ceasing to exist (Evers, "Keystone"). What makes them so important is that they have a low functional redundancy which means that once the species is gone there are no other species that would be able to fill their role. When keystone species go extinct it forces the ecosystem to rapidly change to try and adapt. The term keystone species comes from Doctor Robert Paine who was an ecologist and zoologist from Cambridge, Massachusetts. He discovered how one animal can impact the lives of many other animals (Wagner, "Keystone"). This discovery was found after Paine conducted what is now called the starfish exclusion experiment. Paine discovered a spot on the coast inhabited by 15 different species, he took notes and made charts of what animals eat what. He found that starfish were the top of the food chain in that stretch of coast. Each day he would go to that same spot on the coast and remove all of the starfish and throw them deep into the ocean. After a year and a half, he found that the ecosystem where he was working had changed drastically. Although the top predator had been removed the number of species living there went from 15 to 8 and then after 3 years it had simplified to 7. After 7 years it had simplified all the way down to a monoculture (Roberts, "Robert"). Paine discovered that the starfish regulated the population of species below them and when they were no longer there to regulate the balance was thrown off and the ecosystem collapsed (Carroll, "Ecologist"). This was the first research done that found how one species can regulate how all the other animals live. It is not just starfish that play an important role, there are many keystone species including, beavers, elephants, bees, wolves, and tiger sharks just to name a few (Adam, Carwardine, "Last"). The research supports just how important keystone animals are but how come they are not always taken so seriously?

While keystone species are crucial for ecosystems and other animals around them they are not often treated that way. Many keystone species are headed for extinction which would be devastating for many ecosystems. One keystone species that is already facing extinction is the Rhino. Due to modern civilization rhinos have been facing extinction for some time now because of poachers who kill for their horns. Rhino horns are popular on the black market and can be worth more than gold. They are used by many cultures for ornaments and traditional medicines. Rhinos are a major part of many ecosystems and environmentally crucial (Christy, "Special"). Rhinos make an impact on their environment, which means that if they disappear, then certain plant communities will be changed, threatening other species in the process. By protecting the rhinos we are helping to protect other species, such as elephants and buffalo (Goldman, "What"). Researchers learned more about the impact of Rhinos when they were driven out of Kruger National Park. The Rhinos were forced out of the South African park by 1896 due to hunting and were reintroduced beginning in the 1960s. The reintroduction was very successful, in 2010 there were around 10,000 rhinos within the park. However, they were not equally distributed. This gave scientist an opportunity to do research on the effects of the Rhinos on the park. They compared parts of the park in which rhinos have grazed for several decades to other areas which have been only recently recolonized. The scientists measured the ways in which rhinos exert pressure on the environment, they measured the number of short grass lawns within high- and low-density rhino areas and the surface area covered by those lawns. Through this experiment, the measurements revealed more short grasses in high-density rhino areas compared with spaces that have only recently seen rhino activity. In the African grassland, short grass cover is important and most beneficial for animals and of the plants in the ecosystem. The more short

grass lawns, the more diverse the landscape (Christy, “Special”). This research showed how valuable Rhinos can be in their ecosystem. Rhinos proved themselves invaluable when it comes to the ecosystem similar to many other species. Since keystone species are so important and play such an important role in many ecosystems what do we do once they go extinct?

Scientists have been working on the issue of the extinction of keystone groups to try and recreate the impact that species played in their habitat. An example of that would be Nikita Zimov, a scientist working in Eastern Siberia, just north of the Arctic Circle. Zimov became very worried about the future generations because of climate change. Zimov is trying to resurface Beringia with grasslands. He wants to summon the mammoth steppe ecosystem. Zimov believes that some of the frozen underground layers are warming too quickly, which would release some of the world’s most dangerous climate-change accelerants into the atmosphere, causing a catastrophe across the planet, altering humans and millions of other species (Parent et al, “Anthropocene”). He believes that the only way or at least the best way to stop this from happening is to recreate the keystone species from that time period to help rebalance the ecosystem (Andersen, “Welcome”). That is exactly what Zimov did, he built a tank like vehicle to recreate the impact that the woolly mammoth played on the ecosystem. The tank was designed to drive around and knock over trees during the summer in peak melting season to allow sunlight to reach the snow. This idea came from Zimov and a few of his peers, their plan was to cool the Earth by seeding the atmosphere with silvery mists of sun-reflecting aerosols. This mimics exactly what the woolly mammoths did during their time on earth (Slater, “Russian”). Humans have come full circle starting by destroying a species and now trying to recreate one so that we can continue to live the lives we are accustomed to.

Scientists such as Robert Paine gained a greater understanding of keystone species they discovered one predator that has more influence than any other, humans. We as humans have created an extraordinary ecological situation where we are the top predator and the top consumer in all habitats. Paine said, “Humans are certainly the over-dominant keystones and will be the ultimate losers if the rules are not understood and global ecosystems continue to deteriorate.” Since we are at the top the only thing that can regulate humans is us. We have more influence and power than any other species and humans will ultimately lose everything if the rules are not understood. The rules that Paine mentions are about humans respecting the animals and the ecosystems they live in (Carroll, “Ecologist”). This idea of humans being the greatest keystone species changes the way many think about keystone species. Many often think that a keystone species has to contribute a large positive impact on an ecosystem but its defined as “a species on which other species in an ecosystem largely depend, such that if it were removed the ecosystem would change drastically.” Many people would argue that animals do not rely on humans at all and that humans just use them without giving back. While others argue that animals have become reliant on humans because of all the change they have made in the wild. With both arguments being said, how closely do animals and our ecosystem rely on us, would the world be able to continue without humans?

Many would argue that when humans inevitably go extinct, plants and animals will not only continue to exist, they will thrive. Without humans mass combustion of fossil fuels, our continuing destruction of natural ecosystems, and our astounding mounds of wastes, the earth as an ecosystem would blossom. Others believe that our existence on earth has become a large part of the world's ecosystem in many different ways. We use and have even depleted numerous resources that the Earth provides, and therefore affected the lives of numerous species that we coexist with. We as dominant humans play an important role in maintaining our ecological

community, as well as constantly changing it. We have declared this dominance over the years, and through this authority, we have caused the earth to evolve, and this evolution has been directed to benefit us. With all of the changes and alterations, humans have made to the earth many scientists believe that it would not be possible to return to regular pre-human life if humans were to suddenly go extinct. All the man-made structures and systems that routinely get worked on by humans would no longer receive that maintenance causing them to fail. Buildings, bridges, and walls would eventually collapse hurting the ecosystem even more. Nuclear plants and power plants would fail without humans to monitor them causing mass destruction to ecosystems around them (Weisman, "Earth"). Humans have become too deeply rooted in the earth's ecosystem to be rapidly removed. Humans have forced their way into the keystone position without being aware of the consequences the earth may face.

Many humans live in fear that we have caused too much destruction and wish to return the world back to how it once was before humans were created and completely altered the world's ecosystem. Scientist along with everyday humans need to use the knowledge that we already have about keystone species to help protect them and keep them from going extinct. By protecting these species we are protecting the world from further destruction. We have seen what kind damage is done once a species like that is completely destroyed and it is devastating to life around it. The world is on the path to disaster because of the evolution of humans and without change the end is near. Humans have altered the world to a point that it is now reliant on humans. Humans have forced their way into the dominant position, unlike most other keystone species who work their way into their top role. Animals are forced to rely on what humans do on the earth. Fortunately for the planet, many scientists understand this idea and are working to create a better ecosystem for the animals (Weisman, "Earth"). What is next for the earth because of all this change?

Due to all of the modifications, modern-day humans have done to the earth animals would not be able to thrive if suddenly one-day humans were no longer on earth. Humans have become too deeply involved in the planet both for good and bad reasons. Starting with the bad, humans have completely over dominated the ecosystems of many important species (Roberts, "Robert"). Without change, the world was on course for disaster. Scientist realized how important many of the species were that were headed for extinction and were able to fix or at least improve the situation. Although this may seem good, the earth is now reliant on humans fixing the problems we have caused. If humans were to go extinct the earth would crumble without us there to fix what we have broken. In order to restore the earth to a balanced system, we need to step back from what we are doing and be more conscientious of what we are doing to the planet.

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