

# SAMBURU CONSERVATION RESEARCH INITIATIVE: GREVY'S ZEBRAS

As a species, the Grevy's zebra is disappearing quickly. Over the last century, both its numbers and the amount of available rangeland for it to graze have fallen steadily. During the past 30 years, though, the decline has been the most dramatic. Of the 15,000 Grevy's zebras that once roamed the **semiarid** areas of Kenya, only about 2,000 remain, predominately in Kenya's Samburu District and Laikipia Plateau, with a small group of about 150 in southern Ethiopia. Historically, Grevy's zebras were widespread, ranging from central Asia to southern Africa. They are now endangered, and broken into small, vulnerable subpopulations throughout the Samburu landscape—their only stronghold left.

In the past, these animals were hunted extensively for their meat and skin, but this ended more than 20 years ago—ample time for the species to begin rebounding. This has not happened, and no one is entirely sure why. Kenya boasts one of the highest human population growth rates in the world—and as the local population grows, so does its impact on Kenya's wildlife. The Samburu people were traditionally nomadic, and shared their space with wildlife for hundreds of years. However, their shift to a more settled way of life on community-owned ranches put them in direct competition, and added the threats of deforestation, overgrazing by cattle, and increased use of water to the survival of all the region's wildlife—including the Grevy's zebras. Still, changes in the use of land and encounters with people and their domestic livestock can only account for part of the species' decline: even on private, livestock-free land, Grevy's zebra numbers are barely stable. Three other factors seem to be at work: competition with other wildlife (particularly plains zebras), predation by lions, and disease caused by **parasites and pathogens**.



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In a country known for its abundance of life, the Samburu-Laikipia region is exceptional. Along with Grevy's zebras, it is home to one of the largest concentrations of threatened **savannah** species in Kenya, including elephants, black rhinos, lions, reticulated giraffes, leopards, and endangered African wild dogs. Despite its importance, though, 90 percent of the land lies on privately-owned ranches where the landowners make the rules. Of these, one—the 267-square kilometer Lewa Wildlife Conservancy—is especially significant: Lewa is the first cooperatively-managed private wildlife conservancy in Kenya, and it is dedicated to the protection of Kenya's wildlife and the critical habitat on which it depends.

In an area where three-fourths of wildlife lives on unprotected lands, and almost half has been wiped out by habitat loss and **poaching** over the last two decades, Lewa serves as a model of conservation. As it is entirely protected, Lewa provides researchers and conservationists with an ideal environment in which to study the zebras, and identify the factors responsible for

their decline. Information gathered here can then be compared to results from studies of Grevy's zebra populations in other parts of the Samburu-Laikipia area—particularly on **pastoral** lands where human interaction is common. Ultimately, these comparative studies should help policy makers develop conservation and management strategies aimed at building a healthy population of Grevy's zebras and ensuring their survival.

## ONE ZEBRA, TWO STUDIES

The Grevy's zebra study under the **Samburu Conservation Research Initiative** (CRI) is made up of two related projects designed to help preserve the species' population in the Samburu-Laikipia region. Through studying the zebras in two different environments—the Lewa Wildlife Conservancy in the southern end of the study area, and the grazing around it—researchers can compare how zebras interact with people, livestock, or other wildlife in protected and unprotected areas. From this, they can determine the key factors affecting their survival, and recommend ways to help them thrive.

## ZEBRA SOCIAL LIVES

Unlike plains zebras, Grevy's zebras do not form long-lasting bonds. Grevy's zebra social structure is also vastly different. A male plains zebra will defend a harem of many females who live in his territory year-round. Grevy's males, on the other hand, live alone except when females move through their territories during mating season. Non-territorial male Grevy's will often travel together in groups of two to six animals.

### Ecological Monitoring on Lewa Wildlife Conservancy

For the past five years, Dr. Daniel Rubenstein of Princeton University, with assistance from Joseph Kirathe of Lewa Conservancy and Dr. Nicholas Oguge of Earthwatch Institute, has been studying Grevy's zebras on the conservancy. Their work at Lewa is crucial because it allows them to observe how Grevy's zebras use the landscape and interact with other members of their natural community (plains zebras, lions, and other predators in particular) when human impact is limited. By comparing their observations at Lewa with those from other areas where zebras share their territory with people and livestock, Rubenstein, Oguge, and Kirathe can determine if human activity is contributing to the zebras' decline. If human influence can be eliminated as a cause, they can then identify other factors—such as predation, competition with other wildlife, and disease—that may be responsible. This, in turn, will help them develop accurate recommendations for the management and conservation of Grevy's zebras. Specifically, Rubenstein's team is concentrating on how Grevy's zebras, plains zebras, and lions respond to each other, and how both species of zebras use the available rangeland. They are also continuing to collect data on the birth and mortality rates of Grevy's and plains zebras, and looking into the drinking and **foraging** behaviors of Grevy's zebras.

### Ecological Monitoring on Pastoral Land

Since 2002, Dr. Paul Kimata Muoria, of the National Museums of Kenya and the African Wildlife Foundation, has been working with Kirathe, Rubenstein, and Oguge to determine the health of the Grevy's zebra population on the unprotected pastoral lands in the Samburu region, and to identify habitats critical for their survival. In an effort to encourage conservation strategies aimed at sustaining a healthy, stable population of Grevy's zebras on the community-owned land in this landscape, Muoria and his team must first discover how the zebras spread themselves out over their range, and how availability of food and water affects their distribution and movement. As the zebras share this region with people, livestock, and other wildlife (both competitors and predators), Rubenstein, Muoria, Kirathe, and Oguge are also exploring the type and extent of interaction with each group. From this data, they will be able to determine the impact that competition with livestock or plains zebras has on Grevy's zebras, and if any other wildlife species are involved.

### GATHERING THE DATA

In order to determine how Grevy's zebras arrange themselves over the landscape of the Lewa Wildlife Conservancy and interact with competitors and predators in their territory, Rubenstein's team, led in the field by Kirathe, drives along five loops established in the study area and takes a census of the animals they see. As they drive along each loop, the researchers count the number of Grevy's and plains zebras found within 250 meters of either side of the road. When zebras are located, researchers record data on the group's **Global Positioning System** (GPS) location, weather conditions (wind, shade, cloud cover, etc.), vegetation, and soil types. To determine whether the two species of zebra compete, the project team records their observations of each species' behavior separately, such as feeding, resting, traveling, socializing, mating, as well as their interactions with each other, including aggressive behaviors, such as kicking, biting, and chasing. Using **triangulation**, a way of calculating a location of an object from the known locations of two other objects (creating a triangle), researchers determine the locations of animals previously radio-collared (Grevy's zebras, plains zebras, and

lions) along each loop. The movement of predators and prey relative to each other can give the project team a sense of whether predators are driving or following prey from habitat to habitat. To get an idea of the zebra's preferred habitat and risk of predation, researchers also record the thickness of vegetation around each group of zebras.

One of the easiest ways to measure the growth or decline of a population is to look at birth and death rates over a period of time. To do this, Rubenstein and Kirathe's group first locates a focal zebra (one that was radio-collared) and then identifies 50-100 neighboring animals using their stripe patterns across their hindquarters. As identifying as a fingerprint, each zebra has a unique stripe pattern. Each animal is photographed, added to a database, and periodically re-identified. This allows the researchers to determine how individual animals travel across the landscape, and with whom they keep company, which allows them to understand the zebras' social structure. It also lets them identify the sick or dying zebras (ones that look too thin or are injured). By keeping track of individuals, researchers can look back at records and figure out why certain animals might not be doing well—for example, if a zebra is old or was recently injured. For comparison between species, the team collects this data for both Grevy's and plains zebras.

Researchers measure drinking and foraging behavior through direct observation of which animals come to drink and when. Kirathe and his team record the species and gender of each animal that comes to water, and whether or not other species are present. They also record characteristics of the surrounding habitat and the quality of the water at the drinking site. From this information, they can develop a picture of the impact of environmental conditions and species competition on Grevy's zebras' use of water.

Muoria's team takes population surveys and examines distribution patterns of Grevy's zebras across the pastoral landscape during both dry and wet seasons. Once they find zebras, the teams record the group's size, how many of each sex, any young, and their GPS location. Using GIS, they calculate the distance of each zebra group from water sources and human settlements. They measure the distance from livestock and other animals using a **rangefinder**. The



team also photographs the rear right thigh of any animals within 50 meters. This section of the zebra provides a unique pattern for re-identification, similar to a fingerprint. Researchers can identify individual zebras from this unique pattern, and can track individuals and see where they go to determine patterns of movement. Other **herbivores**—including plains zebras, elephants, antelope, buffalo, and livestock herds—are potential competitors of Grevy’s zebras, and thus researchers count them whenever they see them. They note the GPS locations of these groups, as well as any distinct features of the landscape in which they are found. They also determine the distance from water, human settlement, and the nearest group of Grevy’s zebras. In order to estimate the abundance of predators in the study area, the research teams record any sightings and/or track counts of lions, cheetahs, hyenas, and wild dogs as they occur.

Scientists believe that the presence of human settlements is likely to limit the Grevy’s zebras’ ability to reach nearby food and water. Zebra females with young foals have to drink every day, and therefore remain close to water. Samburu herders lead their animals to and from water

throughout the day; because of this, there is great potential for competition with the zebras. The research teams are mapping all settlements in the study area, and monitoring the activities of livestock and Grevy’s zebras at water sources.

To determine resource availability and use, the research team is mapping and examining all water sources to see how long they hold water. During dry seasons, some watering holes completely dry out. The researchers also monitor food availability along 50 **transects** (each 100 meters long) randomly set in areas frequently used by Grevy’s zebras. Muoria uses what is called the pin/hit method to record the percent of plant cover in an area. Using a one square meter wooden frame with a grid of equally spaced points inside it, a researcher lowers the frame onto one of the randomly selected areas. At each point, there is a sharp pin that points downward. The pin pokes holes in any plants it encounters. The researchers then lift the grid, and record the species, plant part (leaf, stem, seed), and color (green, green-brown, brown-green, or brown) of each plant that has a pin prick in it. They record color because color often indicates quality – green food being of higher quality than brown. They also collect

## EARTHWATCH CONSERVATION RESEARCH INITIATIVES

Working with local conservation and community partners, policy makers, business leaders, and the general public, Earthwatch has established five Conservation Research Initiatives (CRIs) in areas of exceptional biological and cultural diversity, one of which is the Samburu CRI. Working with local partners and community members, researchers identify pressing information needs in the areas and work to fill those gaps. By involving local community members in the processes of identifying the research areas, gathering data, and applying the results of the research to their particular issues, CRIs help the people in these special places plan for a sustainable future.

vegetation along transects, from ten 0.25 meter-squared sampling areas 10 meters apart. They later dry and weigh the collected plant material and use the data to determine available biomass. This measurement helps researchers understand how much food is available to support the zebras and the other grazers.

## WHAT THE DATA SHOW

The wild population of Kenya's Grevy's zebras is estimated at 2,000 animals, some 1,000 or more of which live on the grazing lands of southern Samburu and Laikipia. With the population of southern Samburu increasing, developing conservation strategies that set aside critical zebra habitat—while also taking the needs of the people who live here into account—is vital to the zebras' survival.

Competition with plains zebras is clearly taking a toll on the Grevy's population. On both the Lewa Wildlife Conservancy and the pastoral lands surrounding it, the plains zebras' greater numbers are having a drastic impact on the Grevy's zebras' access to food and water, lowering their feeding rates. Whenever two species compete, the health of the less successful competitor tends to suffer due to limited access to resources. This, in turn, can reduce that species' birth rate, and make it a more likely target for both parasites and predators. An analysis of prey hair found in lion *scat* shows that zebras are their preferred prey, particularly Grevy's zebras. However, early results from studies of zebra droppings show that Grevy's zebras carry lower levels of parasites than plains zebras. This suggests that predators rather than parasites play a significant role in

reducing the Grevy's population. Competition (with plains zebras, humans, and domestic livestock) and predation, therefore, seem to be the most important factors in the Grevy's zebra's decline.

## USING RESEARCH TO SAVE GREVY'S ZEBRAS

Data that Rubenstein and Kirathe's team gathers at Lewa will serve as a valuable baseline that Muoria's group can use for comparison with results from their research on unprotected pastoral lands. This is the first-ever baseline for comparing behavioral differences of Grevy's zebras in landscapes both free of and affected by human activity, and should allow the scientists from both project teams to identify the main factors responsible for the Grevy's decline. Rubenstein and Muoria's work is also laying the scientific foundation on which to build effective conservation strategies for the zebras. Their research has already provided information on the status, distribution, and movement of the Grevy's population, as well as its interaction with people and livestock in the Samburu-Laikipia region. Using this information, the researchers can help develop land-use plans that combine protected wildlife habitat, wildlife corridors (for migration between territories), and multiple-use areas that foster sustainable economic growth for local communities. Kenya Wildlife Service—the government body charged with overseeing wildlife conservation in Kenya—will also be able to incorporate Rubenstein's and Muoria's findings into any future studies of Grevy's zebras.

## FIND OUT MORE

### Publications:

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Nelson, A. & S. William. 2003. Grevy's zebra survey: Kenya 2000 Final Report. Kenya Wildlife Service.

William, S.D. 1998. Grevy's zebra: Ecology in a heterogenous environment. Ph.D. Thesis, Institute of Zoology, University of London, U.K.

### Key Words

Grevy's zebras, competition, population decline, Samburu, Kenya, pastoral, parasites

## GLOSSARY

**foraging** – searching for food

**GPS** – the US Department of Defense Global Positioning System: A constellation of 24 satellites orbiting the earth at a very high altitude. GPS satellites transmit signals that determine, with great accuracy, the locations of GPS receivers.

**herbivore** – plant-eater

**parasite** – an organism that lives on or in another organism (the host), which it uses for food.

**pastoral** – relating to shepherds or herders

**pathogen** – something that causes disease

**poaching** – the illegal hunting or killing of animals

**rangefinder** – an optical device used to determine distance

**savannah** – a tropical or subtropical grassland, typically with scattered trees or shrubs

**scat** – animal droppings

**semiarid** – a dry area that still receives enough rainfall to support short grasses or shrubs

**transects** – predetermined lines in an ecosystem along which data is taken

**triangulation** – calculating the locations of an object from the known locations of two other objects. Creating a triangle from the three items, the angles and sides of the triangle can be measured and the location of the unknown object is calculated algebraically.

Volunteers have joined this project through Earthwatch Institute. Read more about this study and other scientific field research at [www.earthwatch.org](http://www.earthwatch.org).



3 Clock Tower Place  
Suite 100  
Maynard, MA 01754-0075