

Name:

### **Norte Chico Society: Modeling Resistance and Resilience**

By 4000 BCE civilization had sprung up independently in 6 different regions across the globe. Mesopotamia, Egypt, India, China, Mesoamerica, and Peru, all gave rise to humanity's first complex societies.

However, one of these regions is so unlike the others that archaeologists were initially in disbelief that an advanced society could begin in such an inhospitable region. They were also perplexed at the complete lack of warfare and the initial lack of subsistence agriculture.



The region that puzzled archaeologists is nestled between two rain shadows making it one of the driest places on earth. One of the rain shadows is caused by a volcanic mountain chain prone to eruptions. It is also on a fault line, making devastating earthquakes all too common. When it does finally rain, it is in the form of extreme flooding every 4-7 years due to El Nino. How could a society flourish without a stable agricultural food source, without defending itself, and without a stable climate?

- What region of the world is being described above? Peru
- What made this region uniquely able to support society? The ocean had plentiful amounts of fish for the people of Norte Chico to hunt.
- **Imagine:** It's 4000 BCE and our class are the founding members of the Norte Chico society. We have made great advances in fishing, net making, and textiles. Our knowledge of irrigation is unparalleled the entire world over. In spite of our dry habitat, we have risen to become the dominant trade center for thousands of miles, creating a stable peace that will last thousands of years.

**Goal:** As a group you will be role playing as the initial settlers of north central Peru. You have a game area divided up into the Coast, Lowlands, Highlands, Andes, and Amazon to mirror the landscapes found where the Norte Chico civilization prospered. You have to be able to feed everyone in your population each year, but in order to become an advanced society, you need to

do it with the least number of citizens working in subsistence jobs. Put simply, you win by feeding the most and working the least.

**Set Up:** Your new society has unlimited seafood resources, but that requires cotton for nets. You can also farm beans and squash, but that requires irrigation. Sweet potatoes from the Andes and guava from the Amazon can be easily collected and require nothing. You've heard of this thing called Maize from Mesoamerica, but learning to farm it requires developing a trade relationship. You have to decide how to divide your labor up in order to feed everyone in the class. Remember, for "high society" to develop, citizens need to be free from labor so they can focus on astronomy, music, textiles, and record keeping in elaborate Quipu. Jobs:

- Guava Picker: Can feed 1
- Sweet Potato Harvester: Can feed 2
- Irrigator: Can supply water to 1 farm
- Bean and Squash Farmer: Needs 1 Irrigator, can feed 3
- Cotton Farmer: Needs 1 Irrigator, can supply 2 Netmakers
- Netmaker: Needs 1/2 Cotton Farmer, can supply nets to 3 Fishers
- Fishers: Needs 1 net, can feed 5

*Special Job Achievement:* If, for 2 consecutive years, you are able to maintain a society where 20% ( \_\_\_ ) of your citizens are free from the burdens of manual labor **AND** you are exporting a 50% ( \_\_\_ ) food surplus, then you may start Maize farming.

- Maize Farmer: Needs 1/2 Irrigator, can feed 5

We will be recording our labor, our food production, and possibly any disturbances that arise for 15-20 years. We will be graphing both to see how our society might change over time. A table is provided on the next page.

### Questions Part One :

1. What are the *abiotic* components in our ecosystem? What are the *biotic* components?

The abiotic components are the ocean, the weather/ disasters that were not fruit borers, the soil, and the sun. The biotic components are the fruit borers, the plants and crops, the fish, and the people.

2. Categorize the disturbances Peru faces as *density-dependent* or *density-independent*.

The disturbances Peru faces are density-independent factors because it will affect the area regardless of the amount of organisms present, besides the fruit borers since they act as competition for the guava fruit, so that makes them density-dependent.

3. The north central coast of Peru is prone to many natural disasters. What type of *succession* is likely to follow a flood that destroys crop land? What type of *succession* is likely to follow a volcanic eruption?

A secondary succession is going to occur after a flood because the soil is still present. On the other hand A primary succession will follow the volcanic eruption because the ingenious rock covers the soil making it so moss and lichen have to convert the rock back into soil.

4. What type of ecosystem is more likely to survive a changing environment: One with many members of a few species, or one with few members of a large variety of species?

The one with a few members of a large variety of species would be more likely to survive a changing environment. This is because more biodiversity creates a resilience to disasters as there is a higher likelihood that at least one species survives compared to only some species with a lot of members.

**DATA TABLE:** [Make Yourself a Copy of the Data Table Using This Link!](#)

### Questions Part Two:

1. On a sheet of graph paper make a graph that details how your society changed over time. It should include population, any disturbances, your food totals, and a line representing your carrying capacity. Use the graph on page 205 in your textbook if you

are lost [or click here for an example](#). Remember all good graphs have a *Title, Axis Labels, Key, Scale, and Data*.

2. *Resistance* is the ability of an ecosystem to not change when a disturbance occurs. This is like a boxer being able to take a punch. *Resilience* is the ability of an ecosystem to recover after it has been impacted by a disturbance. This is like a boxer getting up after being knocked down. Looking at your graph, describe any years your society was resistant and the disturbance you resisted. Do the same for resilience. Why were there different outcomes?

- a. Resistant:

From the years 13 to 19 our population and food count showed resistance because they experienced six disturbances and had an overabundance of food with little population change.

- b. Resilient:

From the years 7 to 11 our population and from years 7 to 13 our food count showed resilience because food production dropped after a bad year and then bounced back up to an over abundance. Also the population spiked and then had a disturbance then spiked again.

3. How might the adoption of new technology (Maize farming) impact the stability of your society?

The adoption of Maize farming impacted the stability of our society by producing a lot of resources without taking up a lot of population, which led to a stable food supply which led to a stable population.

4. Potatoes are a staple crop around the world, but they are originally from the Andean highlands of Peru. Today, there are over 4000 varieties cultivated and eaten throughout Peru.

From 1845-1849 Ireland lost 20-25% of its population due to mortality and emigration in an event known as The Great Famine.

- a. Do some quick research and describe why the great famine happened.

The great famine happened because of the infection of the potato crops due to the blight and the fact there was no biodiversity, which led to no resilience in the ecosystem.

- b. The fungus *P. infestans* thrives in moist environments, like those of Ireland, and can spread more easily in densely planted areas. Peru is very dry and mountainous, which has led to a [unique terraced form of agriculture](#). Compare what happened in Ireland to the likelihood of the same event happening in Peru.

Peru would not likely experience the same type of potato famine Ireland did. This is because of the arid and mountainous terrain. Peru also has 4000 species of potato compared to Ireland's one, so they have a level of biodiversity which leads to resilience in case of a disaster. The blight is a density- dependent factor so it would not affect Peru as much because the step-like terraces split of the Potatoes also with the intermingling of potato species the density of a specific type of potato the blight could infect decrease, unlike ireland with one type of potato densely packed together.

- c. Your answer must include the terms: biodiversity and the type of limiting factors involved (density-dependent, density-independent, biotic, abiotic)