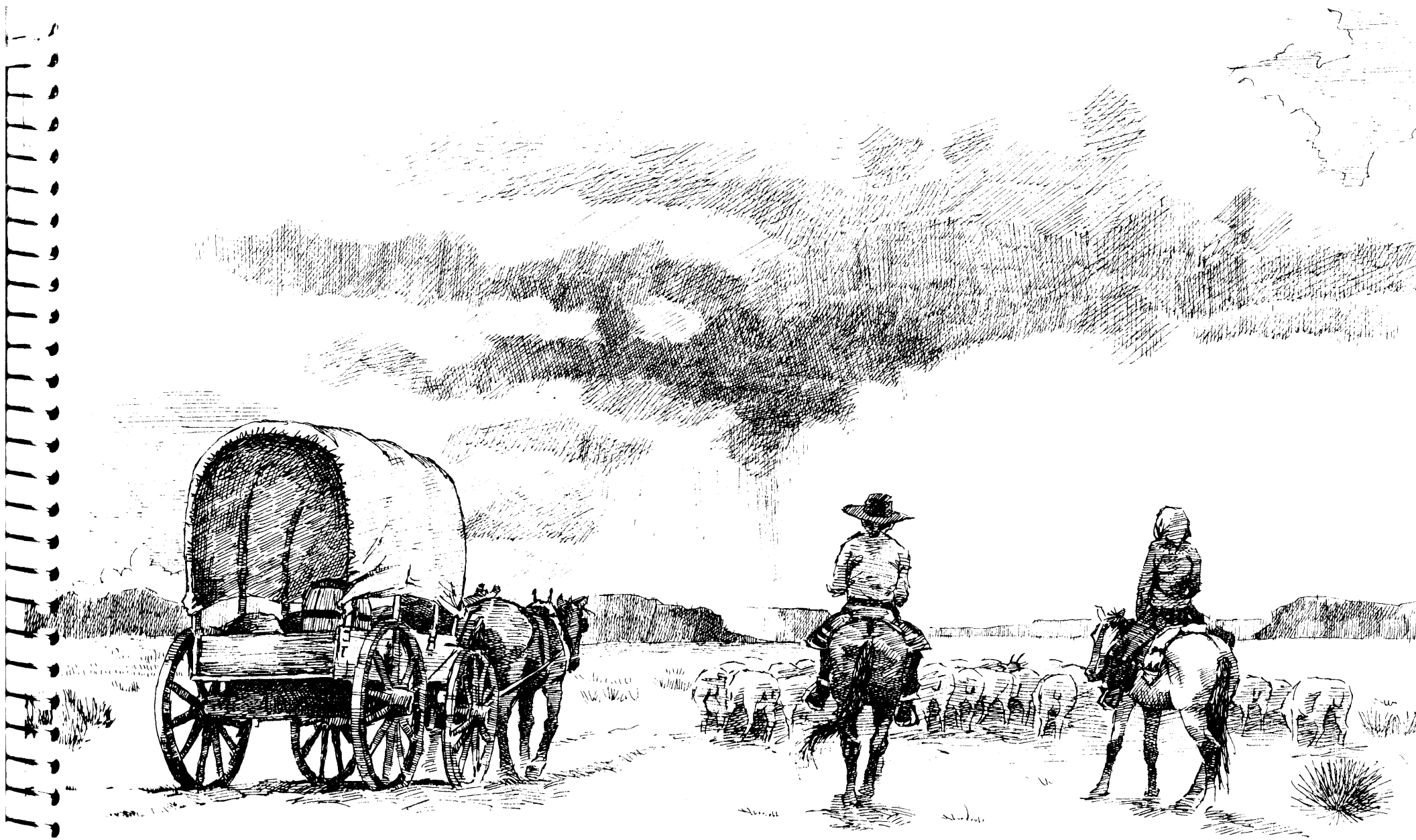
Living from Livestock

A classic from 1984, written for Navajo country in the American Southwest by Sam Bingham.

Some of the concepts and recommendations (such as the recommendation to build radial grazing cells) are outdated or superceded. For examples see *Holistic Management: A new framework for decision making* by Allan Savory with Jody Butterfield, and *Holistic Management Handbook: Healthy land, healthy profits* by Jody Butterfield, Sam Bingham, and Allan Savory.

However, this clear and wonderfully illustrated classic remains a superb introduction to the relationship of grazing to ecosystem function in an arid environment. Enjoy.



Living From Livestock

Living From Livestock

Range Management and Ranch Planning for Navajo Country

by

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and the ***Rock Point Range Management Project***
Illustrations by ***Hank Willie***

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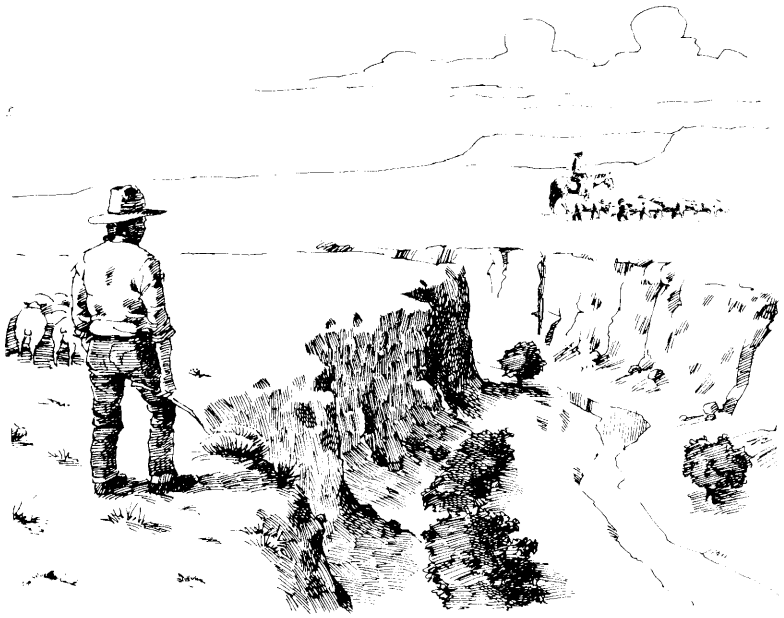


FOREWORD

For decades the problem of rangeland that supports less and less life has cursed Navajo destiny. It drives our young people from the land, divides families, turns neighbor against neighbor, and cheapens the price of the land to outsiders who would use it for their own ends. Until recently, no modern technology could rescue the land from this fate, and the people could not escape it.

It is an economic fact that livestock offers the only way to make a living from most of Navajo land. This is true because the land is too isolated, too dry, and too rough for other uses. It is also true because the erosion from damaged rangeland destroys irrigation projects, roads, and crop land, and causes water tables to fall.

We believe that the methods suggested in this book represent the first real solution to these problems. They form the only technology known today based on scientific research that has proven compatible with traditional Navajo ideas about land and livestock. They were first formulated by Allan Savory, late of Zimbabwe, Africa, and now of Albuquerque, New Mexico. His help in preparing this book and in advising the Navajo Nation deserves our deepest gratitude.

Also instrumental in promoting new ideas in Navajo Country were Bobby Begay of Rock Point School, who first brought together BIA and Tribal officials in the summer of 1980 to hear Savory speak; Leo Beno of the Navajo Tribe, who made Savory's ideas part of Tribal policy; Robert Archuletta of the BIA, who supported them; and Casey Francisco and Joanne Manygoats of the Tribe's Agricultural Resources Division, who have tirelessly promoted them among the people.

This book is designed as a text for schools and training courses in Navajo Country. It does not cover many problems encountered by people operating in other environments. We hope that it will give new hope to the many ranchers and young people who still have faith in our land and have the desire and the energy to make it rich once more.

THE GIFTS OF THE LAND

She is called Laughing Woman, but she is not laughing. She looks out from her hogan door at her empty land baking in the sun on the mesa above Rock Point, Arizona. Then she looks straight at you and speaks as if she isn't sure you want to listen.

"Who thinks about the sheep? Who thinks of making a living off the sheep? There is no one. They just want to go forward. They just get in their car, and zoom. Off they go. Who cares anymore about the wisdom of the past and the way we survived on the land? I hope there may be one or two young people around who do respect that wisdom, but where are they?"

"Maybe you are one of them?" she says, and then she does laugh a little, and you wonder what she thinks about you. Then she speaks again, and her voice sounds both sad and hopeful at the same time.

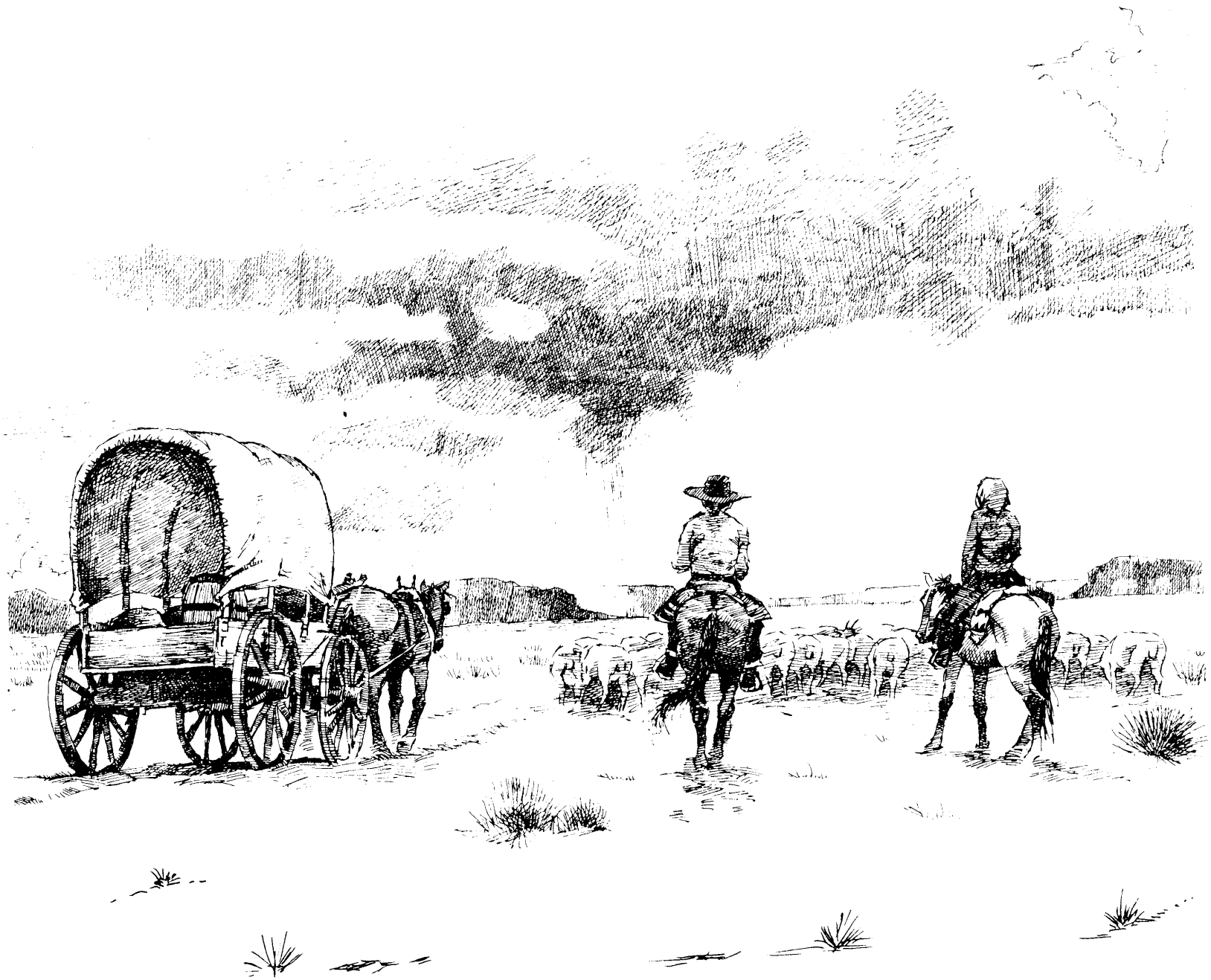
"It will be hard for you," she says. "So much needs to be done before we can think about livestock again, and we old ones are gradually being taken by old age. What will happen when old age no longer has pity on us?"

She has reasons for what she says. Among the seniors who graduated from Rock Point Community School in 1983, only one or two seriously thought about livestock. Half wanted no part of the ranchers' life. The rest thought about it, but they had no grazing permit or believed the land was too poor.

But Laughing Woman is also wrong. Most of those graduating seniors wanted to stay on their own land. They wanted to believe that the old wisdom could help them make a living, but they could not see how to use it. The land *is* poor. It is so crowded that people argue over land. A miner or a school teacher or a construction worker earns much more in one week in town than most Navajo herders ever see all year.

This book is about making a living from livestock on Navajo land in today's modern world. It can be done, and you may have to try if you want to live in a place like Rock Point. Ranching is almost the only way to make a living on land like ours, if you don't want to depend on Washington, on mines and oil wells, or on welfare. As the old people tell it, Father Sky gives light and rain to Mother Earth and she in return gives life to plants and animals. These gifts of the land are the only things that are truly ours.

The stories of the old people can give us hope for the future because old people have seen what the land can give. They tell us that Navajo Country used to be richer than it is now. They say that the grass used to be better. They say there used to be more rain. There were more sheep, more lambs, and more wool. At least they tell us that. If that was true, then the older generation really did have something that we have lost. Was it true? What have we lost? Can we get it back?

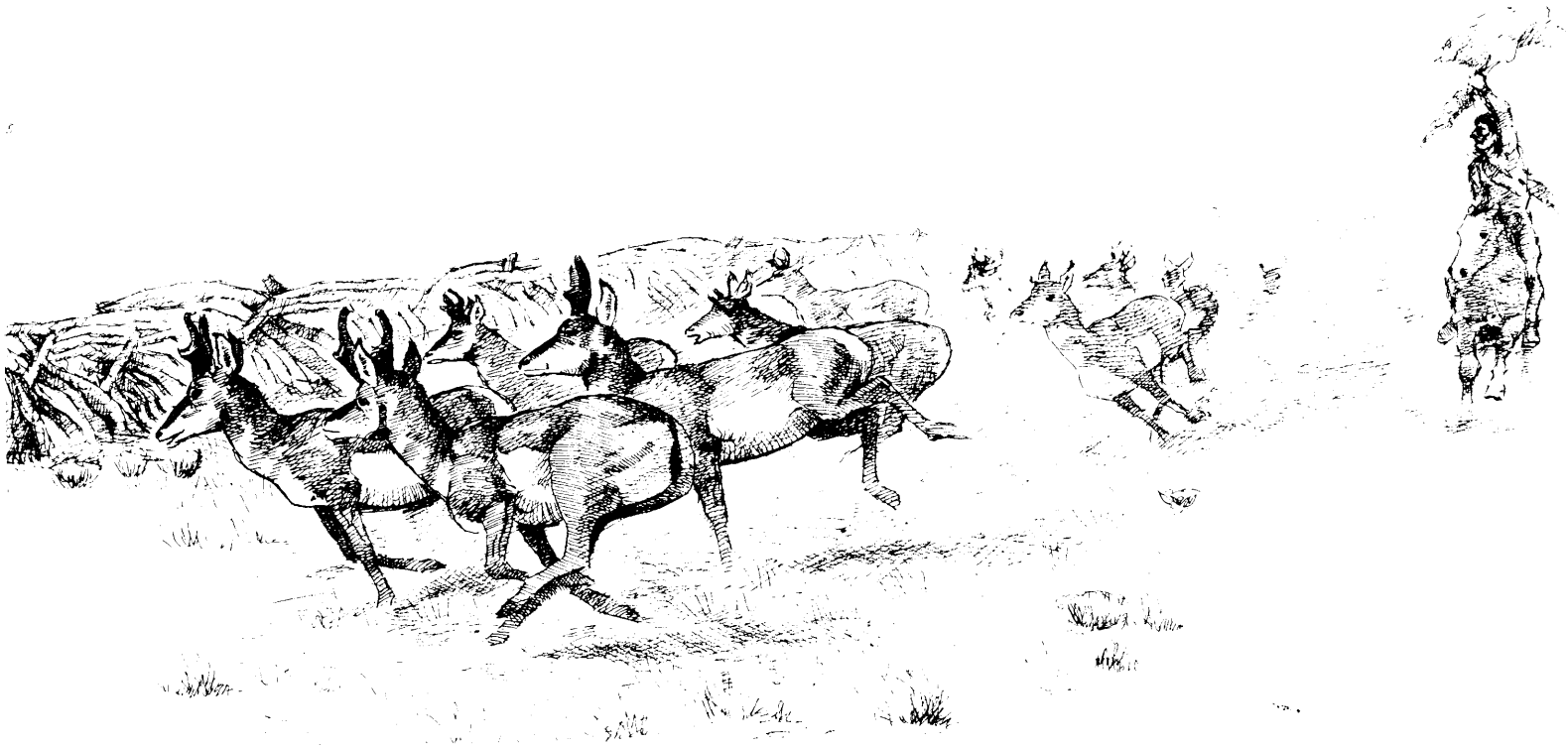


Changes

Wildlife has changed. West of Rock Point a high rocky hill called "Antelope Lookout" rises out of the plain, but no living person has ever seen an antelope from there. According to the old stories, however, thousands of them did roam nearby, and Navajos hunted them. The old stories are true. Not far away, near Rough Rock Demonstration School, you can still see a line of old juniper branches that once made a corral where riders drove in the wild herds and killed them for buckskin and winter meat.

There are ruins of these old antelope and deer traps in all parts of Navajo Country so the wild herds must have been very large. But nothing like them exists today, and the songs and ceremonies that people once used to call in the game have almost all been forgotten.

Plant life has changed. Laughing Woman points away from her hogan door to the pale green rabbit brush (k'iiłtsoi) all around and says sadly, "We saw few of these long ago. There was no tumbleweed. There was no snakeweed (ch'il dilyéśii). Livestock do not like these plants, but right now they are taking over the land. None of the plants of the past remains today. Once from here on out you could see the land covered with beauty, colored by many flowers of many different plants of green, yellow, red, and purple. But now, which of them has the color to dress the earth in beauty? What is there around for the animals to eat or for us to eat? Everything around now is just plain grey. There are no more sunflowers."



Rose White, Laughing Woman's neighbor, is the age of Laughing Woman's children, but she also has seen changes. "From time to time people from the school ask me to teach the children about wild plants that make traditional Navajo food. I know all of these plants, because I lived on them all my young life, but I say to these people who come, 'You can pay me to teach something, but where are the plants? These things are only forgotten because the plants have left us. Find me the **tł'ohdeii**, the **waa'**, the **hashch'éédą́ą́'**, and I will teach, but those things are not seen now. If we had to live on the wild plants now, we would starve'."

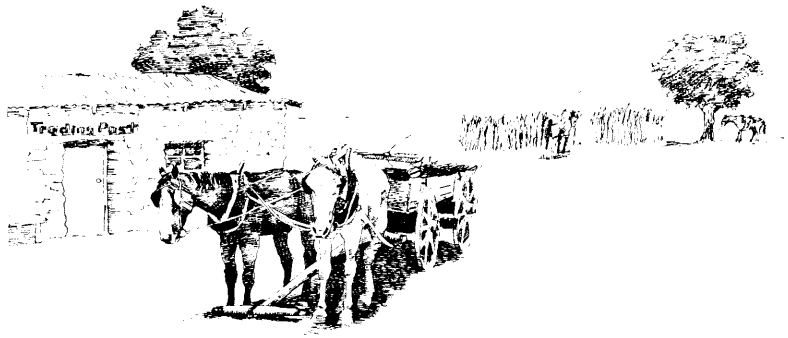
The way people herded has changed. Rose White remembers moving often with the stock. "We used to herd our sheep to other places from Sweetwater on west to the other side of the Chinle Wash. Often we put our sheep together with sheep from other families. My brother and I used to herd the rams separately all summer. Other people used to bring us their rams and paid us with sheep to look after them.

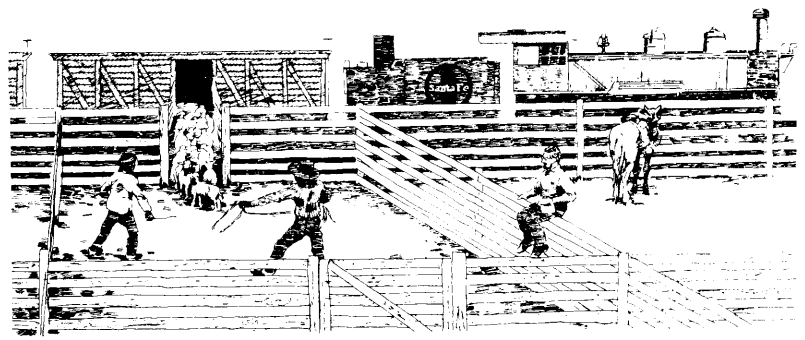
"Now we have no summer and winter camp. We just stay here all year. That is why our grass looks like it has been mowed. You see it bitten off all over, all the time. Today when you let the sheep out of their corral they take off to look for grass and only settle down to graze a long way from here. If you have two or three camps, you move when the grass is short, and you will find it big when you come back. In this way you do not ruin your land."

"Now you can see the bare ground where people live," says Tommy Suen, also from Rock Point. "Where people spend their winters and summers in the same place, there is nothing. When the wind blows, dust covers everything. There are many places like this — corrals close together — so everything goes up in dust."

The way people use their stock has changed. According to Rose White, her family, and many others like them, eating meat was a celebration. "We lived on goat milk all summer. We put cloth bags over the kids' noses in the evening to keep them from sucking. Then in the morning we got buckets full of milk. We also milked the sheep and used that. When someone came to visit, then we could butcher a sheep, and usually they would take most of it."

Sheep paid for almost everything. "You could get credit at the trading post on sheep," says Tommy Suen. "We used to all sell our lambs on the same day in the fall and pay off our bills. The trader hired men to help drive the lambs to the railroad in Gallup. You could also get credit on wool and mohair and then pay back at shearing time. In that way we lived from year to year. Jobs and welfare were not a part of it at all. Now you can't sell livestock at most trading posts at all. You have to haul them to town, and you don't know what you will get."





The laws have changed. Between 1935 and 1945 the people of Rock Point like everyone else on the reservation were given grazing permits that said how many sheep a family could keep and where they could take them. Says Tommy Suen, "In the past when there was no rain, we went to other people's land. About 40 years ago when all the grass dried up over here we moved over toward Sweetwater to Laughing Woman's land. Now if you tried that, you could be told not even to cross someone else's land."

Says Rose White, "We used to herd our sheep to other places, to Sweetwater, to Bitter Water, to salt bush and greasewood areas, and way across to Sheep Manure Spring not far from Tommy Suen. Since the sheep permits were given out everything has gone wrong. They have ruined the whole process of living. People can no longer move with stock to other places, and neighbors have turned against each other. Everywhere now you hear, 'This is my land, and you cannot walk on it.' That is the voice of the permit. It is not people speaking. You can hear them whenever the grazing committee meets, but no one can ever agree".

The Present

The winter of 1982-83 was long and wet. In early March horses began dying in the northern part of Rock Point and in the neighboring communities of Sweetwater and Mexican Water. Perhaps as many as 100 died in a few weeks, and some families lost almost all the horses they had.

Meetings were held, and specialists came from Window Rock and from the University of Arizona at Tucson to find out what had gone wrong. Two sophomores from the high school, Theresa Yellowhair and Marjorie Tso, wrote a story for the *Navajo Times*, so the news spread to Albuquerque and the newspaper there sent reporters to the Reservation to photograph dead horses.

Clearly something terrible was happening to the land. Some of the graduating seniors who had thought about becoming ranchers remembered the dead horses and made other plans for the future. Worst of all, no one could agree on the cause of the horses' deaths.

The tribal veterinarian came out from Window Rock, cut open one of Rose White's dead horses, and took blood samples from several sick ones. "They died of starvation," he said, when the high school girls interviewed him on the telephone. "An animal that doesn't get enough to eat, lives on the fat in his body. These horses had no fat left, not even around the heart where even a skinny horse usually has some fat.

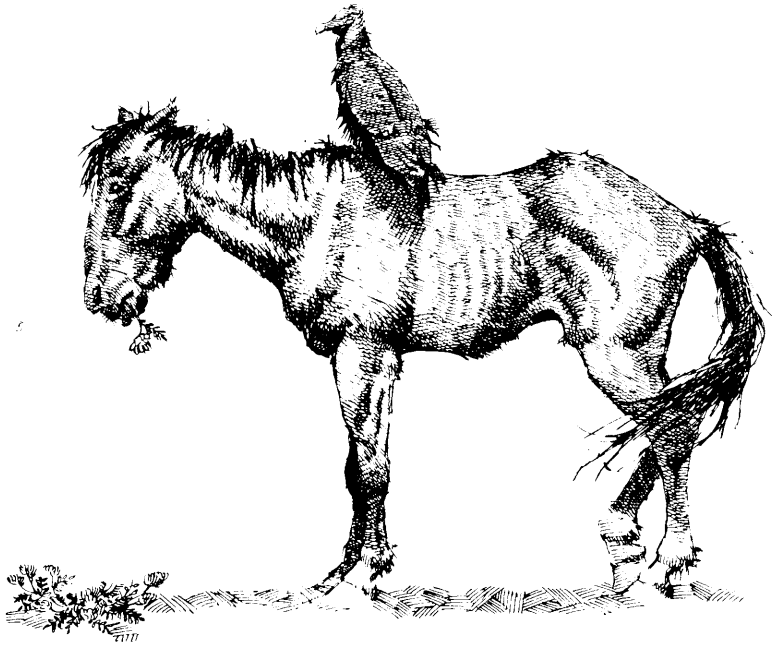
"The blood samples showed the same thing. Even some of the living horses had so little blood protein that I don't know how those animals could stand. Blood samples also will show any infection or disease in the body, but I didn't see any sign of that. Without doubt the horses starved. The problem is worse this year, but I hear about it every year, because every year the land gets worse."

Thomas Jones, the grazing committee representative from Rock Point, was doubtful. "We could blame starvation," he said, "but I want to know *why* they are starving. The only reason they kept giving us was that it is all our fault because we overstock the range. We have been told this for years, 'If you Navajos had reduced your livestock, none of this would have happened!'"

The people did not believe that. A lot of the stock did look thin at the end of the winter, but there had been rain the summer before, and the grass was probably better than in past years. Also the horses did not die everywhere. Horses in the southern

half of the community had few problems, even though the grass looked worse.

"The problem is pretty clear to me," said Kim Nih, a Rock Point man whose horses did not die. "They are poisoned by loco weed. I see it around my home, so I keep my horses in and feed them hay. Horses are like winos about this plant. Once a drunk gets hold of a bottle, each time he gets a hangover he will search for a drink again. A horse does the same thing if he starts eating loco weed.



"He will go crazy. He may go blind and toss his head from side to side, up and down, and start to get thin. But when he is really bad, he will start to dig up the plant with his hooves and nibble the roots, and while he is doing this he will whinny."

It was true that loco weed and several other plants that people said poisoned horses had started to grow in places where they weren't seen before. Few loco weeds grew in the southern part of Rock Point Community and few horses died there.

Most people in the community agreed with Kim Nih and blamed the loco weed more than they blamed starvation, although that did not explain all the horse deaths. Some horses seemed to thin out and die without going crazy. Some got well when they were put in the corral and fed, but some died anyway. A few sheep also died or lost their lambs. Quite a few cows gave birth to calves that never stood up.

The tribal veterinarian still said the problem was starvation. "Sure, the loco weed might have killed these horses, but horses won't start eating loco until they get pretty hungry. I see horse problems in that area every year. Sometimes it's loco weed. Sometimes it's sore mouths from eating rough bushes. Sometimes worms or disease put them down because they're so weak to begin with."

Many questions were not answered:

Why did horses suffer more than other stock?

Why were poisonous plants moving into the community?

How could stock be hungry when there was more grass than last year?

Would cutting down the livestock make any difference?

Would the problem get worse or better?

Nobody had answers to these questions. Worst of all, nobody could offer much hope for the future. Families with money bought hay and planned to feed their horses all next winter. Those who had nothing could do nothing. People blamed air pollution and the weather, and witchcraft and religion. Neighbors argued over grazing land. Officials began to talk about enforcing grazing permits and cutting down livestock. There was no reason for a young person to try ranching for a living.

THE TROUBLE ON THE RANGE

Why did horses die? Why did poisonous plants choose to grow where they did? Why did the grass that our grandparents remembered disappear? Why did the tumbleweed and the snakeweed move in on us?

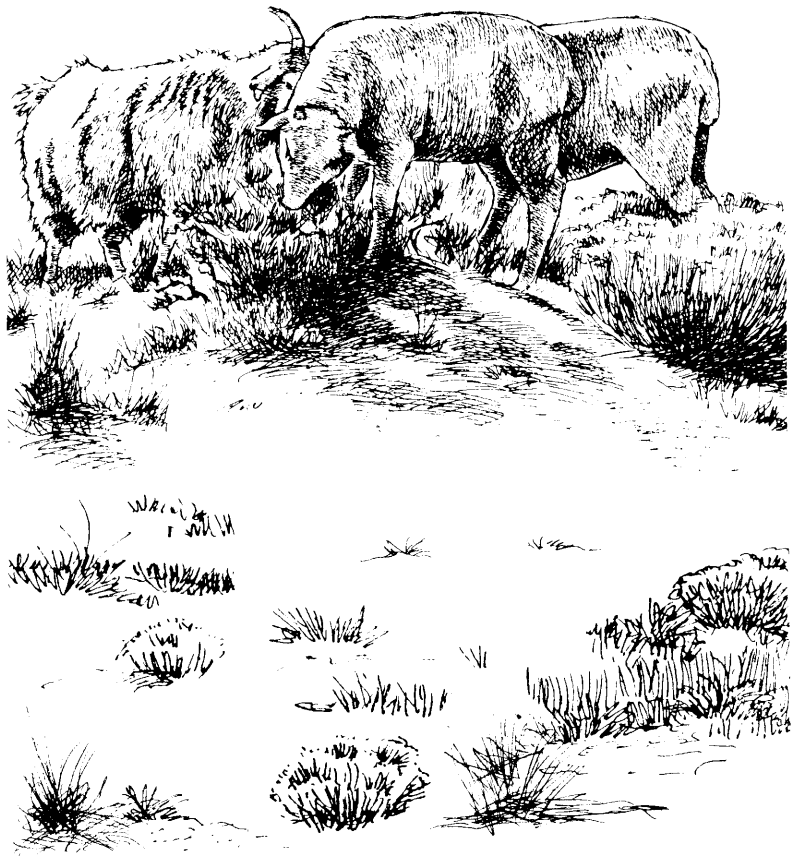
To answer these questions, you must understand how grass grows, how it is eaten, and what can happen to it. It is true that grass is not the only thing livestock eat. Other plants are very important, and in some seasons more important than grass, but in Navajo Country the grass shows the health of the land. There are very few places in Navajo Country where grass cannot grow, but many places where it *doesn't* grow anymore. Where grass is good, the livestock will also be fat. Where the grass is good, the other weeds and bushes that livestock need will also be good. So in this chapter we will talk mostly about grass.

For years and years we have been told that the "overgrazing" in Navajo Country is causing the grass to disappear. There is no special word in the Navajo language for "overgrazing". It means that grass is eaten faster than it can grow. Grass, like all plants, uses the power of the sun to grow. If the leaves are always bitten off, the grass can't catch the sunlight and will stop growing and die like a car that runs out of gas.

Around windmills and camps all over Navajo Country you will find land where livestock passes by every day and bites off every tasty green leaf the minute it comes up. If the lands gets bare or only bad-tasting or poisonous plants keep growing there, someone will say the land is "overgrazed".

However, you will find many people, especially older people, who will tell you that there is no such thing as "overgrazing". They will say, "Our creator made both the animals and the grass, and they have belonged together since the beginning of time. It is not possible that the animals are suddenly killing off the plants they must live by. If the grass disappears, it is our fault for changing our way of life."

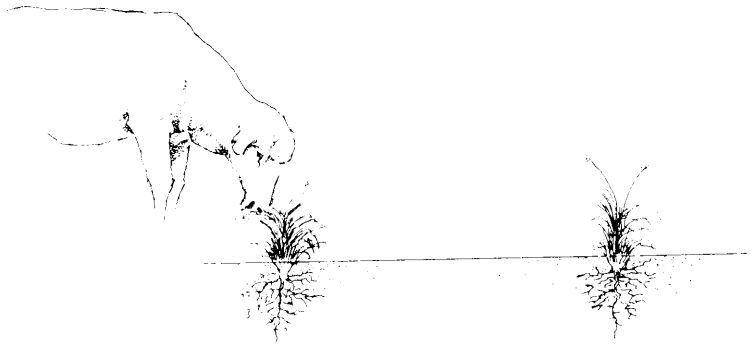
We who wrote this book believe that the older people are right. We believe that *people, not animals* cause the grass to die away. However, we will use the word "overgrazing" because it helps explain what people may be doing wrong.



Overgrazing

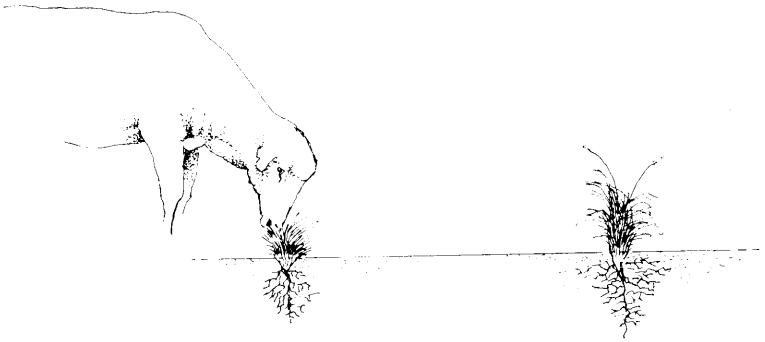
These drawings show what "overgrazing" means.

1



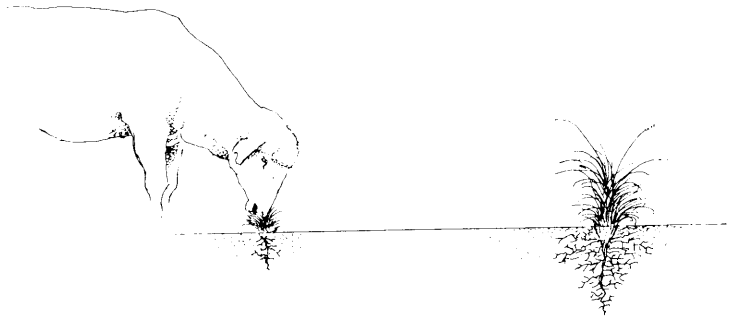
When grass is bitten off. . .

2



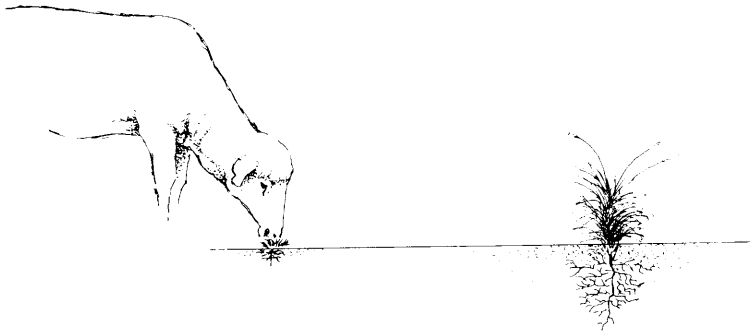
. . .it uses food stored in its roots to grow new leaves.

3



If the NEW leaves are bitten off right away. . .
. . .it must borrow more food from its roots. . .

4



. . .and after a while it will die.

Experiment

You can easily prove this to yourself by growing grass in two pots or tin cans.

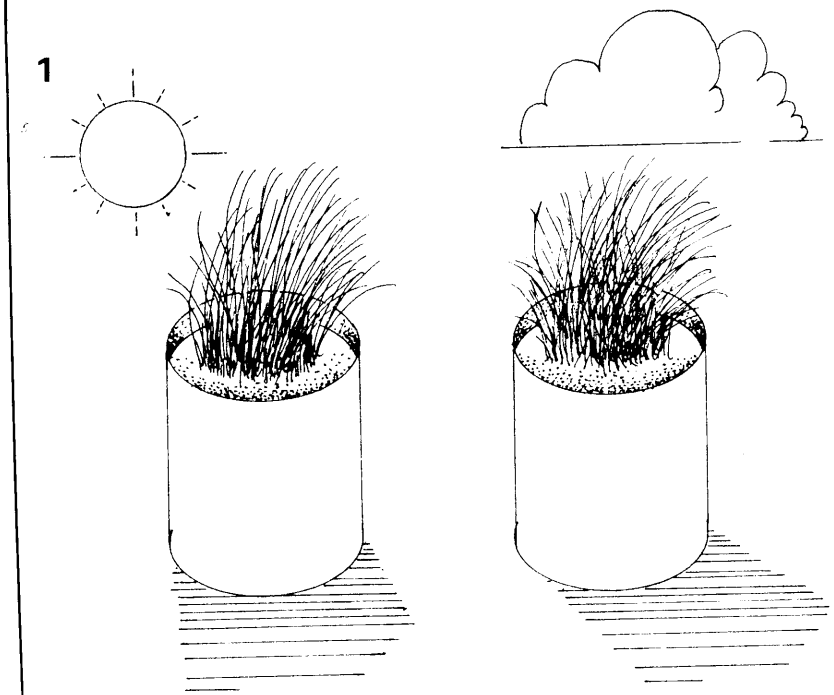
Give them both plenty of water and sun.

Once a week cut the grass in the first pot down to six inches.

Every day cut the grass in the second pot down to 1 inch.

Save the leaves you cut off. Perhaps you can guess which plant will provide the most cut leaves, and which one will be the strongest.

1



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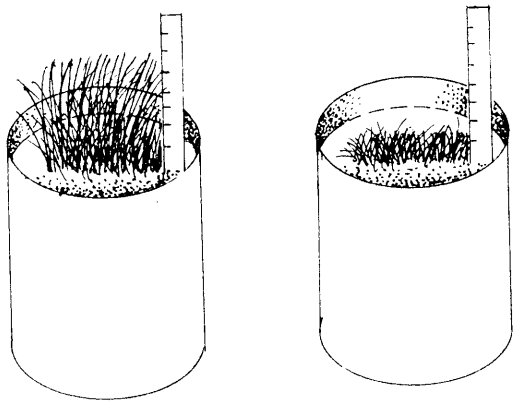

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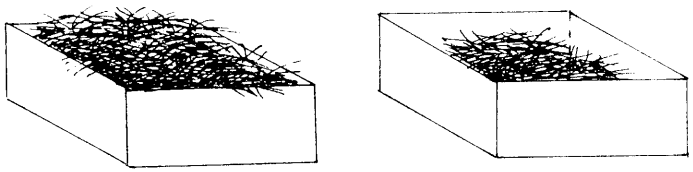


Does Overgrazing Really Happen?

You must decide this for you own land, but here are some things to look for:

Try to find some grass. If you can't find any, "overgrazing" is *probably* the reason, but you can't be sure. Usually, however, you will find some grass growing under bushes, in the middle of tumbleweeds or in the cracks in rocks. Then you know that grass can grow there.

At a time when plants are growing, look at grass leaves. Are they all bitten down, or do they have a chance to grow?

Also check good-tasting bushes like greasewood and salt bush.

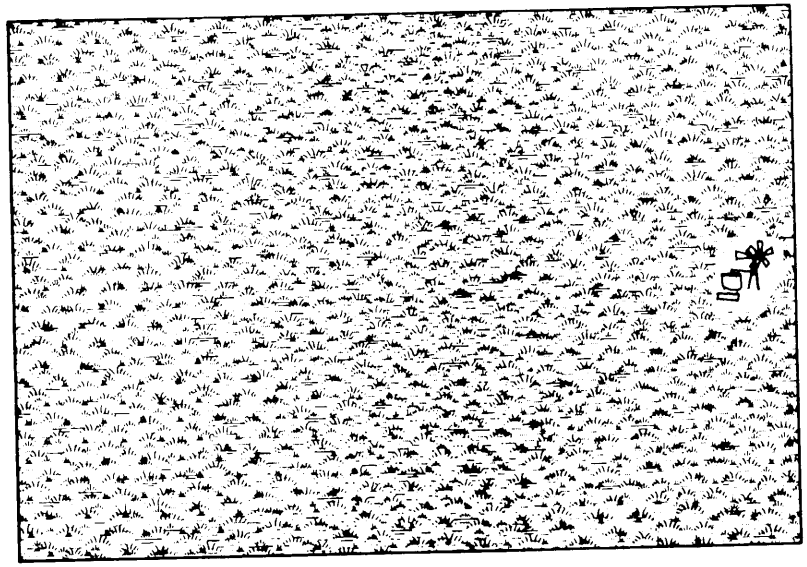
Overgrazed bushes show dead wood, and the leaves are hidden in thick, stickery bunches where the branches have been bitten off many times.

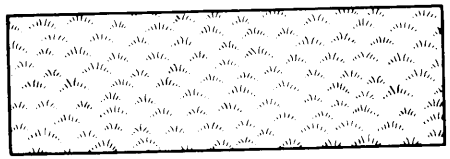
Normal bushes have longer, softer, straigher branches and show little dead wood.

Stock Reduction

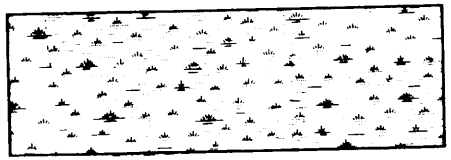
For a long time some people said you could only stop overgrazing by getting rid of stock. Now we know that cutting stock *doesn't* stop it. It just slows it down.

This picture shows three kinds of plants near a windmill:

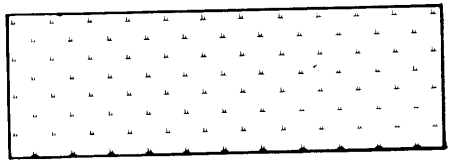




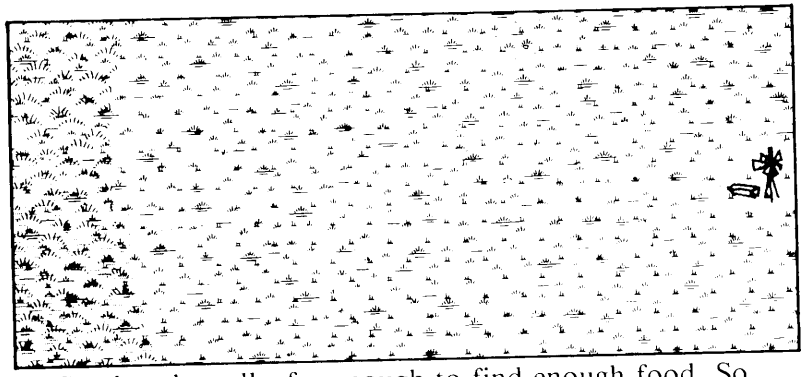
Good grass such as gramma, wheat grass, sacaton.



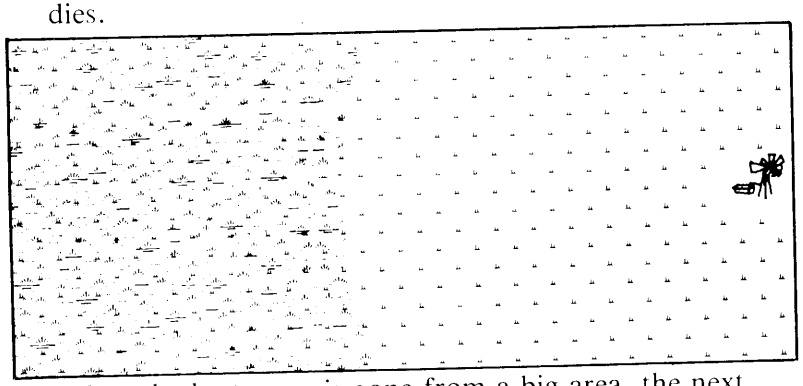
Lower succession plants - salt bush, sage, broom grass, rice grass, etc.



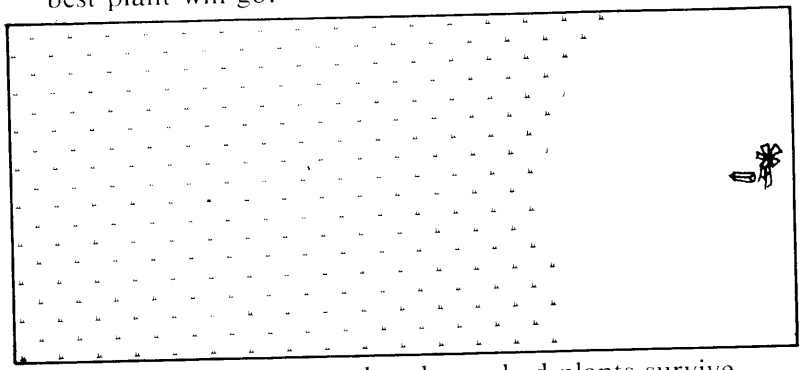
Very low succession plants - cheat grass, tumbleweed, snake weed, etc.



Stock only walks far enough to find enough food. So near the windmill, the best grass gets no rest and soon dies.



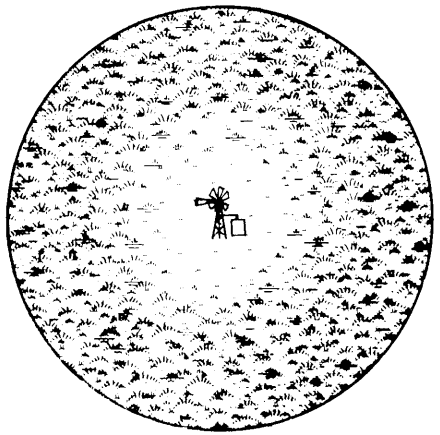
When the best grass is gone from a big area, the next best plant will go.



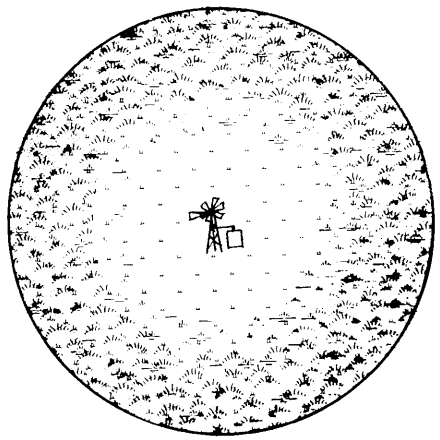
Finally only bare ground and very bad plants survive. When you drive toward a sheep camp, you may see grass change to tumbleweed and bushes before you see the camp.

Here is what would happen around the same windmill if you cut the livestock in half:

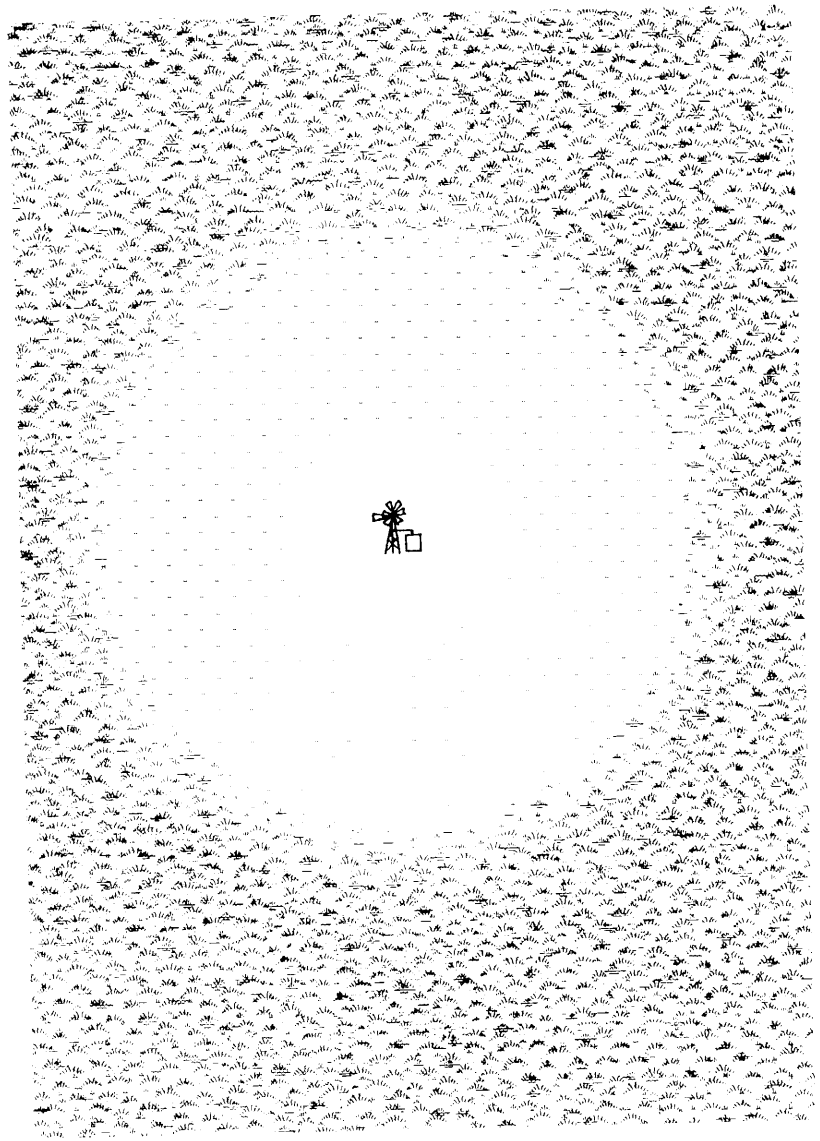
The small herd will take twice as long to overgraze the same area, but it *will* overgraze it in time.



A small herd will not have to walk so far to find enough grass, but they will still bite off the grass near the windmill every time it grows.



The sheep may not ever get to some of the land at first.



But the circle of bare ground around the windmill will keep growing and in time may become very large.

Experiment

Here's an easy experiment that shows why cutting down the livestock does not stop overgrazing. You will need:

a. 3 bowls

b. 15 cookies

c. 20 Ritz crackers

d. 20 small pieces of bread

e. 15 people to use instead of animals. (Children are best because they have no manners.)

Give each of the people a chance to pick three things from the bowls, and be sure to tell them that they can take three from the same bowl if they wish.

Note how many cookies, Ritzes and pieces of bread are in each bowl after everyone has taken what he wants.

Now try the same experiment with only seven people and note what is left in each bowl.

Did 7 people eat fewer cookies than 15?

Did 7 people eat fewer Ritz crackers than 15?

Did 7 people eat fewer pieces of bread than 15?

How far would you have to cut your guest list to make sure that there would be some cookies left after the party?

If the people in your experiment happen to like cookies, you will have to get rid of most of the people before you will make any difference to the cookie bowl.

The same thing is true for animals and good grass. The grass doesn't care whether there are 50 sheep or 150. They may eat almost the same amount of grass. Just cutting down the livestock doesn't stop "overgrazing".

In your experiment you could stop offering cookies and just put out bowls of crackers and bread. Probably your guests would "overgraze" the crackers. If you took those away, you would certainly "overgraze" the bread.

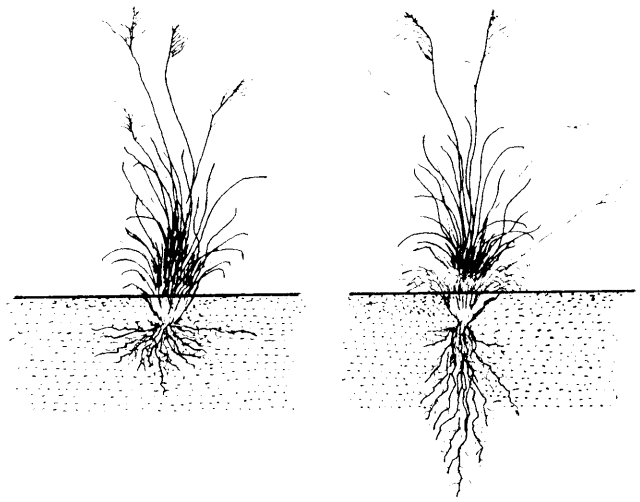
"Overgrazing" doesn't happen to an area all at once. It happens to one kind of plant at a time. The best plants go first.

Since the best plants usually grow where the water and soil are best, those places get overgrazed first, so places that once were the best for livestock are often now the worst.

Undergrazing (Also known as "over-resting")

Cutting down the livestock does not stop overgrazing in the places where the animals roam. Cutting down the stock *does* mean that animals don't get to some other places for a long time. You might think that these places would get better and better without the stock. But in fact they often look about the same as the places where the stock goes every day. Grass that is never eaten at all will become "over-rested". It can actually die of old age.

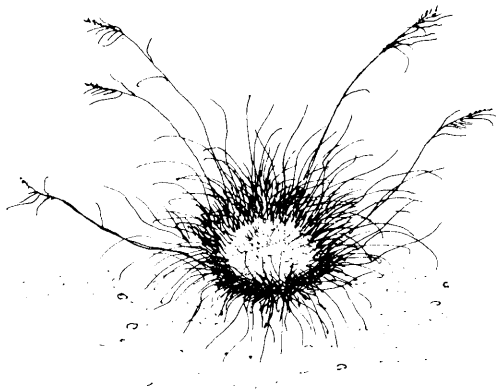
These drawings show what happens when grass is over-rested:



1. The grass grows tall and makes seed early.

2. The next summer the old dry grass gets in the way of new leaves and block the sunlight.

3. Roots may become longer, but do not spread out under the soil.



4. In time the heart of the plant begins to die from lack of sunlight because the old leaves shade it.

5. You may find these old plants growing in the shape of a doughnut. The old dead grass still stands in the center. Green leaves grow only weakly around the outside.

The old dead grass is not only bad for the plant. It is wasted food. Again you can show how this happens with your cookies, crackers, and bread.

Experiment

You will need:

a. 3 bowls

b. 15 cookies

c. 15 crackers

d. 15 pieces of bread

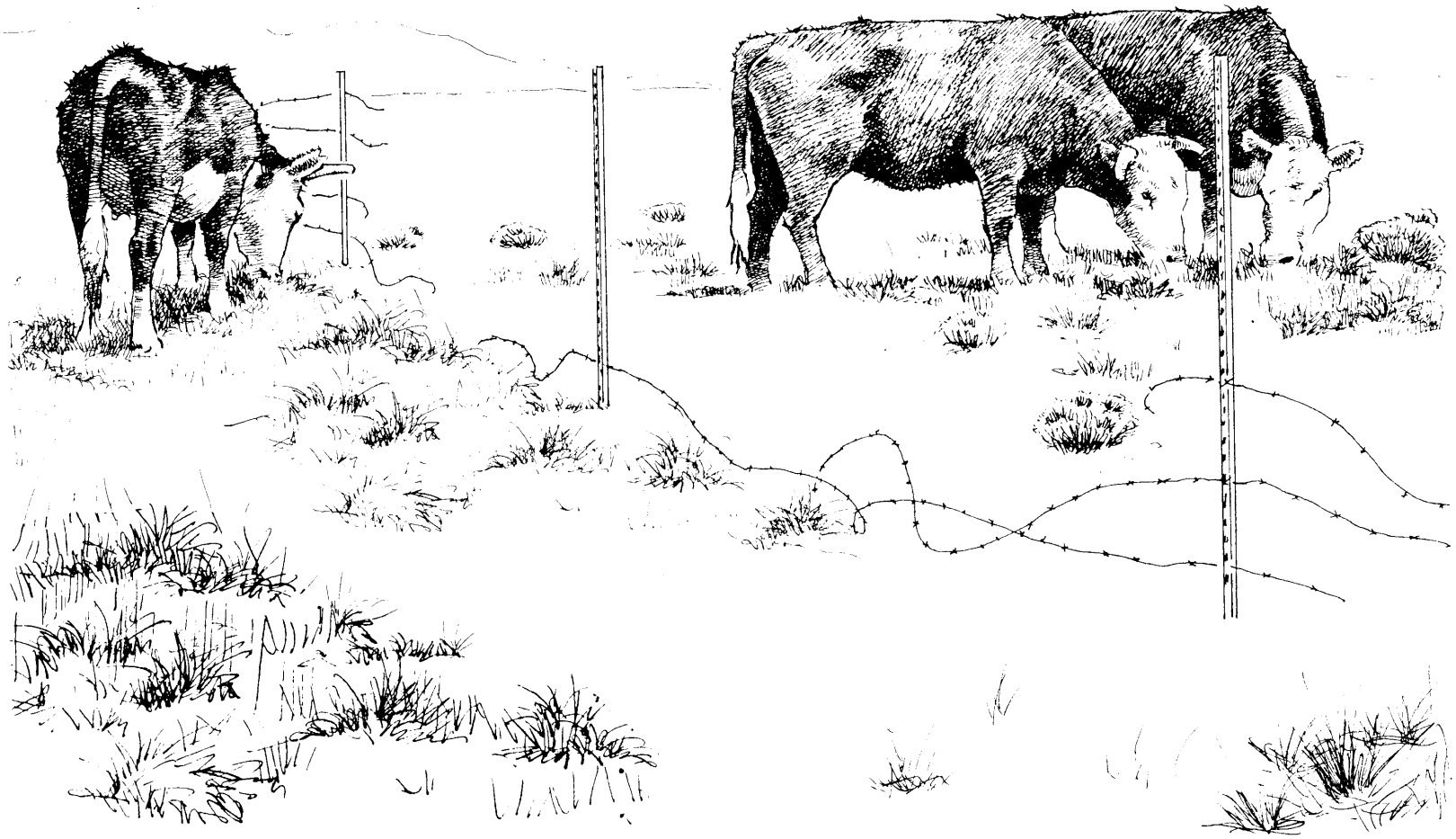
e. 15 people

If you put out the cookies, crackers, and bread and told the fifteen people they could each take three things, of course they would eat all of everything. If you put out the bowls and fresh goodies every day, the fifteen people would probably eat everything every day. Everything would be fresh for them.

BUT, try putting out the same goodies in the three bowls for only 7 people. The next day replace *ONLY* the things that were eaten the day before. Just leave anything that wasn't eaten.

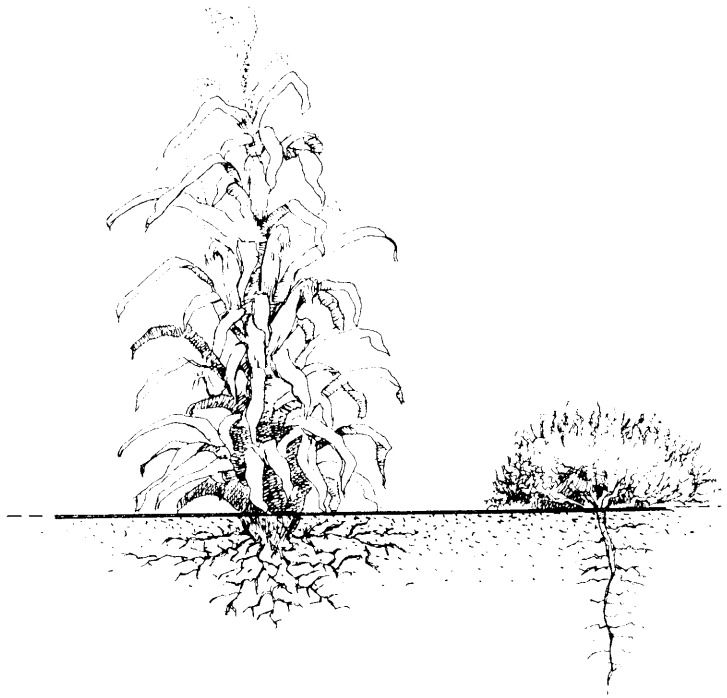
Do this every day for a week. Then look at the bread you are putting out. You may find it is too dried out and stale for anybody to eat it at all. The bread is "over-rested".

The same thing happens to grass and many other plants that are not eaten. They get dry, tough, and stale. Along roadsides and in other places where livestock seldom wander, you will see over-rested grass. It is yellow or even gray, and only starving animals will eat it.



Wind, Rain, and Soil

Besides sunlight, plants need both water and food to grow. They get what they need by their roots. The roots of wild plants, however, are not all alike. Different kinds of plants look for their food and water in different places.



Grass, like corn, sends out many roots right from the seed that spread out just under the soil. They are very good at catching water quickly when it rains, but they do not reach deeply for food.

Tumbleweed and most "woody" plants send down one main root that may reach very deep. It can find water deep in the ground, and good topsoil is not so important.

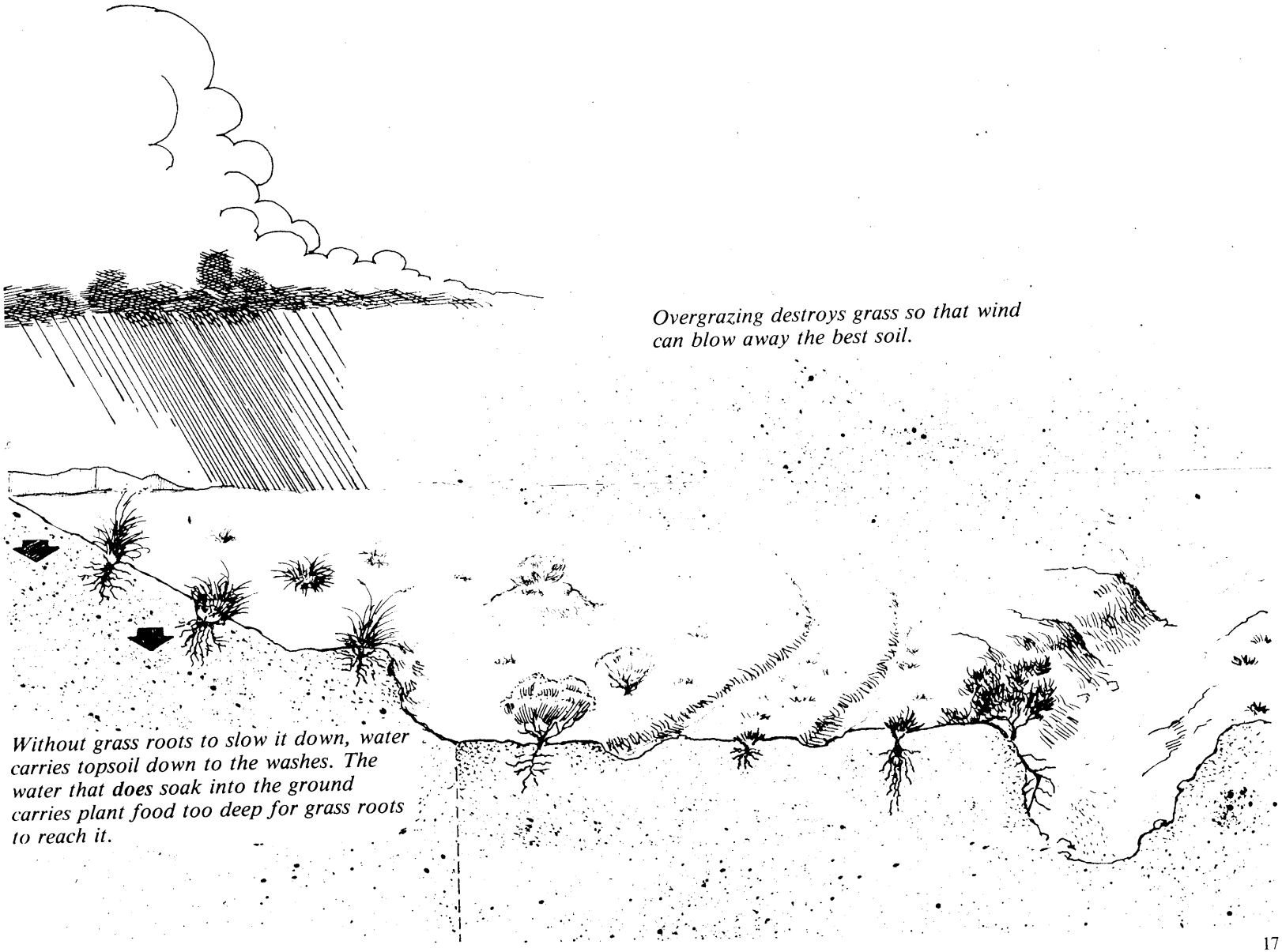
Observation

Find a bunch of grass and dig around it. Look at the roots.

Look along the bank of a wash for the roots of tumbleweed, greasewood, and other woody plants.

Good grass cannot grow if there is no food for it in the "topsoil". Unfortunately both overgrazing AND over-resting (especially in dry areas) may destroy topsoil.

Over-rested land will also have too much bare ground and most of the same problems. Without livestock dead grass is left standing. It does not go back to the soil in the manure of animals and is not stamped back into the ground by the feet of animals.



Overgrazing destroys grass so that wind can blow away the best soil.

Without grass roots to slow it down, water carries topsoil down to the washes. The water that does soak into the ground carries plant food too deep for grass roots to reach it.

Observation

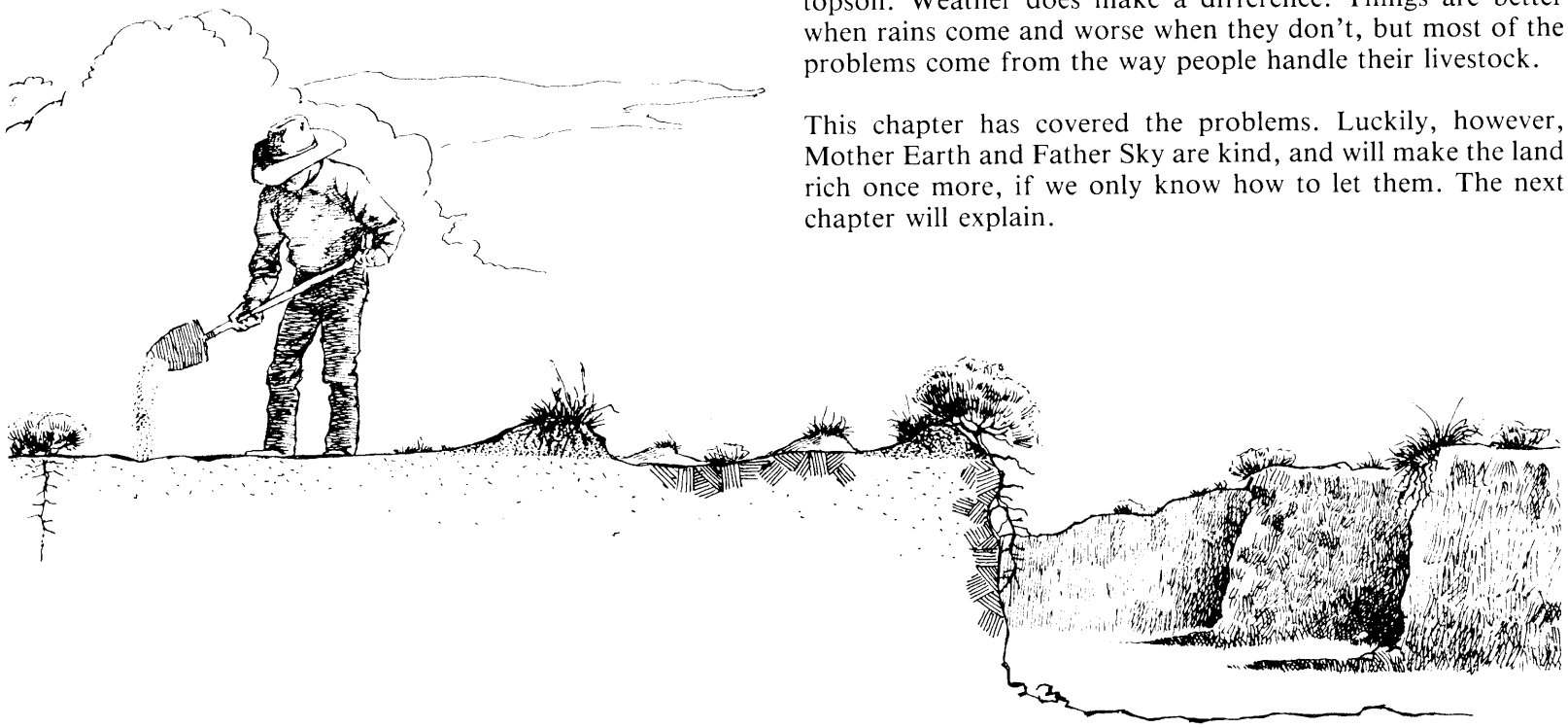
Signs of lost topsoil are nearly everywhere in Navajo Country. Here are some of them:

Many plants, especially older bushes, are up on small hills because their roots have held soil, while it has blown away everywhere else.

Where grass is growing, you can see roots where the soil has blown away, and bushes like snakeweed that usually grow close to the ground stand up on short stems.

Small washes and ditches have very sharp straight edges because they are cut more each time it rains.

You can find very few pieces of manure or dead plants in a shovelful of soil.



Conclusion

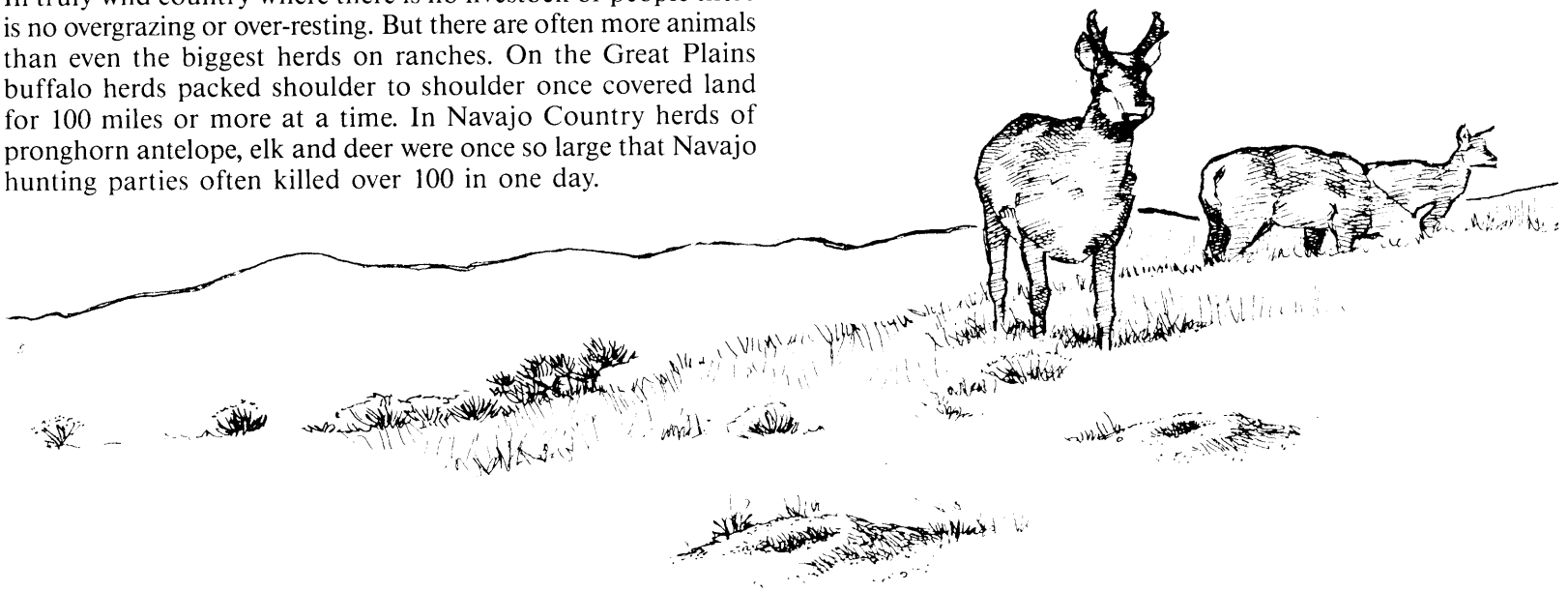
There are troubles on the Navajo rangelands for two main reasons. These are *overgrazing* and *over-resting*. Both of these things allow wind and water to destroy topsoil, and grass needs topsoil. Weather does make a difference. Things are better when rains come and worse when they don't, but most of the problems come from the way people handle their livestock.

This chapter has covered the problems. Luckily, however, Mother Earth and Father Sky are kind, and will make the land rich once more, if we only know how to let them. The next chapter will explain.

Large, grass-eating wild animals belong in country like ours. They once roamed all parts of the world where land and weather are like Navajo Country. Now people and their sheep, goats and cattle cover most of this land. In many places the grass has also disappeared, but other areas are as rich as ever, and the herds are large. In Navajo Country itself there have been large herds and good grass at the same time. This chapter will discuss the life of wild herds on wild land, because that is the knowledge that can bring back the grass on our land today.

LIFE

In truly wild country where there is no livestock or people there is no overgrazing or over-resting. But there are often more animals than even the biggest herds on ranches. On the Great Plains buffalo herds packed shoulder to shoulder once covered land for 100 miles or more at a time. In Navajo Country herds of pronghorn antelope, elk and deer were once so large that Navajo hunting parties often killed over 100 in one day.

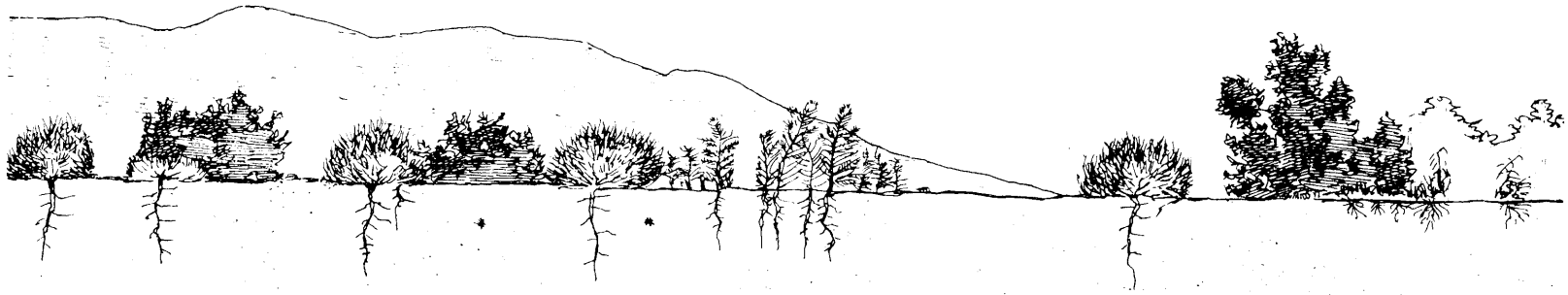


Succession

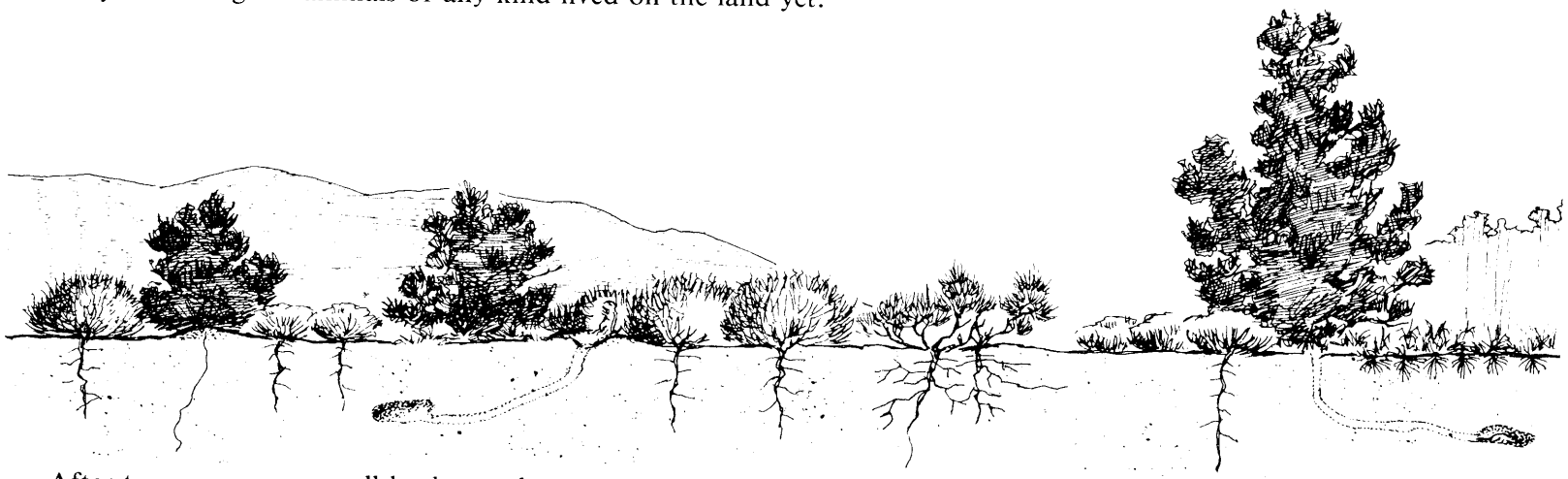
In English the word "succession" means "following". To people who study plants and animals "succession" means the way different kinds of plants and animals "follow" each other when something happens to the land. All living things including people are part of succession. Succession always tries to move forward, because all living things from the smallest to the largest are trying to grow, have children and make homes for themselves.

Example

A flood kills all the plants on a piece of land that is mostly grass, snakeweed, and rabbit bush. After 40 years people can hardly tell anymore where the flood happened, because most of the plants have grown back. The same animals that used to live there have returned. *But,* the old plants and animals did not start living there right away. Others came first. Still others followed them. Finally, after a long "succession" the old plants and animals returned.

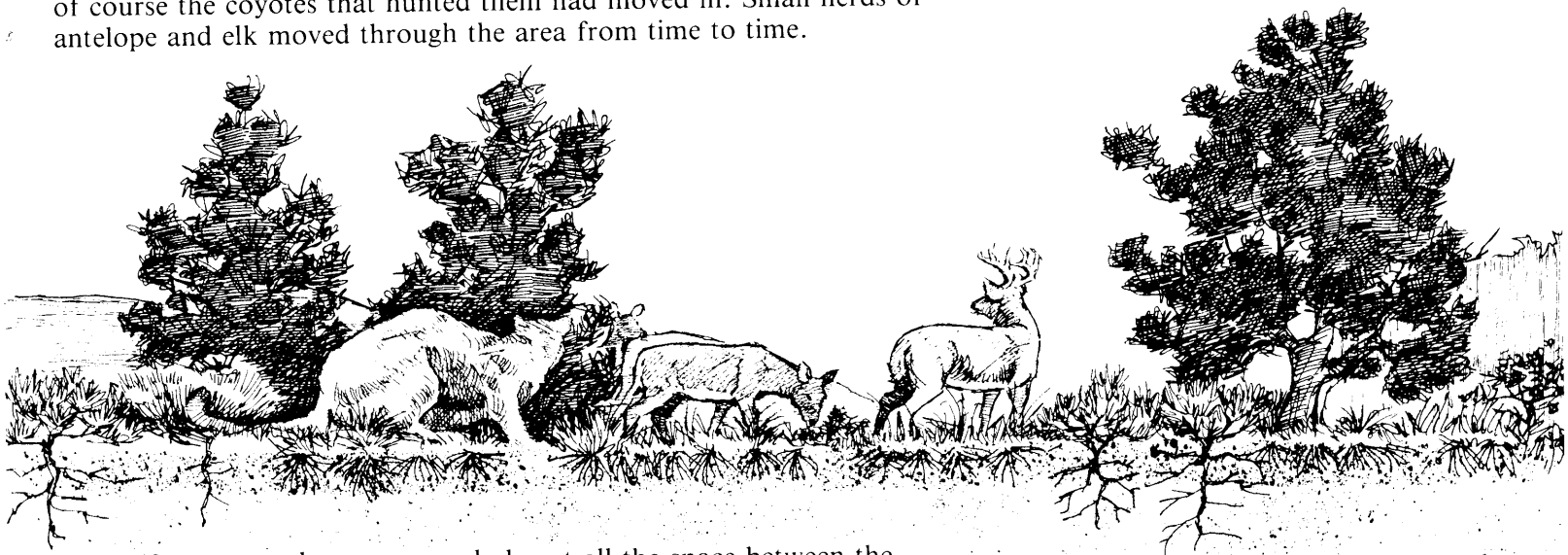


The very next year after the flood tumbleweed, mustard, and some quick-growing grasses started here and there. These are *annual* plants. (Annual plants don't last the winter and have to start from new seed every spring.) Only a few bugs or animals of any kind lived on the land yet.



After ten years some small bushes and stronger weeds had started to grow, but still most of the plants were short-living things like tumbleweed. Ants and stink bugs and a few small mice began to live there.

After 25 years the bushes were bigger, but between them more and more *perennial* grass was beginning to grow. (Perennial grass grows from its old roots every spring, so it can live through drier weather and provide more food than annual grass.) Rabbits, more ground squirrels and mice, and of course the coyotes that hunted them had moved in. Small herds of antelope and elk moved through the area from time to time.



After 40 years good grass covered almost all the space between the bushes. Many antelope and elk passed through now, and wolves hunted them.

On the very first step of succession are the lichens (dlaad) that grow on rocks. They are tiny light green or black plants without leaves or roots. They can also be seen growing on bare soil where nothing else can grow. In most areas of Navajo Country succession stops when grass and small bushes like sage brush cover the land. On the mountains, however, and other cooler, wetter places, trees and other plants also grow.

By the law of nature, succession always *tries* to go forward as far as the climate and the soil will allow. This is true for people as well as for plants and animals. People also are always trying to build, to grow, and prepare the way for their children. You can see succession in the way cities grow. Skyscrapers and super highways are not built until smaller houses, roads and trails have led the way.

But succession can also go backwards. That has happened in places where grass and other plants that used to grow have disappeared. Overgrazing and over-resting usually causes succession to go backwards down the same steps — from good grass to bushes and bad tasting plants to quick-growing plants like tumbleweed to bare ground and lichens.

Observation

Check several areas and try to tell which is ahead in succession. Then try to decide if succession is going forward or backward. Here are some questions to help you decide:

1. How much grass of any kind do you find? Except in the thickest forest areas, little grass means low succession. High succession grassland in Navajo Country should have more grass than bare ground, and it should be *perennial* grass.

2. If you find grass, what kind of grass is it? Some kinds of grass shows higher succession than others. Here are a few from lowest to highest:

   - Annual grasses like cheat grass, foxtail and six weeks gramma grass.

   - Perennial grasses

     Spiney muhley and its relatives

     Indian rice grass

     Galleta grass, needle-and-thread, dropseed

     Alkali sacaton, gramma grass

     Western wheatgrass

3. If bushes and woody plants of any kind are the main plant, are they good for livestock or not tasty? Greasewood, salt bush, and sage brush are ahead of snakeweed and rabbit bush.

4. What kinds of animals live there? Ants and very small mice do well when succession is low. Cottontails and jack rabbits show higher succession.

5. How long-living are the plants? Lots of tumbleweed, mustard, cheat grass and other plants that grow new from seed each year show lower succession.

6. How many different kinds of plants are there? Many different kinds show higher succession. The same kind of plant everywhere shows lower succession.

The steps of succession may be different in different places. The plants and animals that live on clay soil beside a wash will never be the same as those on the top of a sandy mesa, but some kind of succession is going on wherever you find living things.

How can you tell if succession is going forward or backward? The best way to find out, of course, is to ask someone who has known the area for a long time. They will tell you what used to grow there. However, there are other signs to look for:

Observation

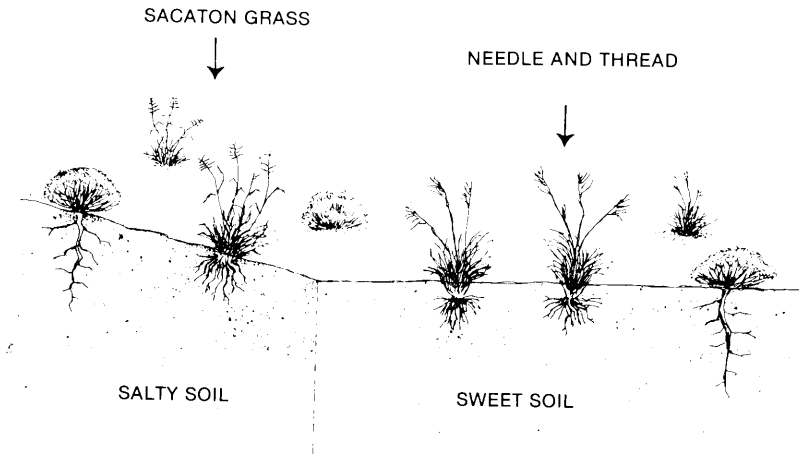
Look for young plants. If young grass seedlings are growing on bare ground, succession is probably moving forward. If you only find them in the protection of other plants, it is probably going backwards.

Look for old plants, especially bushes. When succession is going backwards you can often see where saltbush, greasewood or sage bushes used to grow but have now died.

At the end of summer, if succession is moving forward, you should be able to see how much bushes and grass have grown since spring. If succession is going backwards, it may be hard to tell.

Specialization

Succession happens because plants and animals are not all the same. All plants and animals have something special about them. That is why you find them living in one place instead of another. If that place changes for any reason the plants and animals living there may also change. New plants, *specialized* to live in the new conditions will move in.

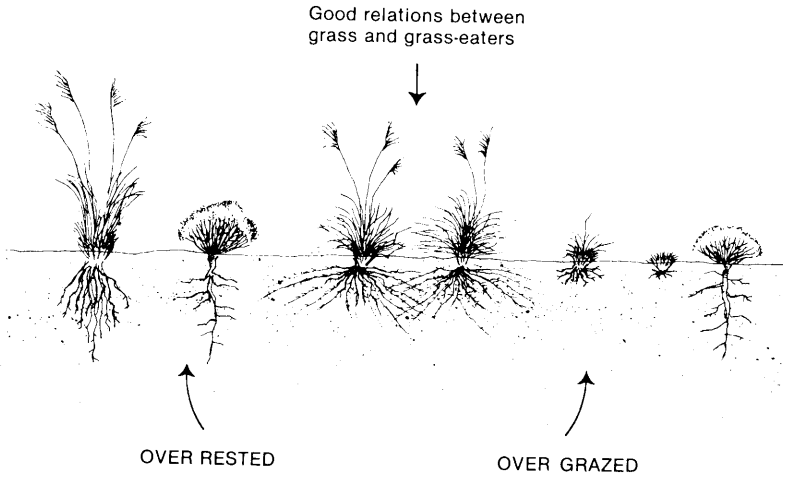


The roots of grass are *specialized* to suck up and use rain water very quickly after it falls. Healthy grass leaves only enough water for a few deep-rooted plants like snakeweed to grow. Soil also make a difference. Sacaton grass is specialized to use salty soil and will push out plants that don't like salt.

Interdependence

Succession also happens because plants and animals depend on each other. If some kinds of plants and animals belong together, all of them will change if one of them changes. That is *interdependence.*

As the old people said, grass-eating animals and grass are interdependent. To grow thick and healthy leaves, grass needs to be eaten. If eaten too often it dies of over-grazing, but if no animals eat it, it becomes weak and dies from over-resting.

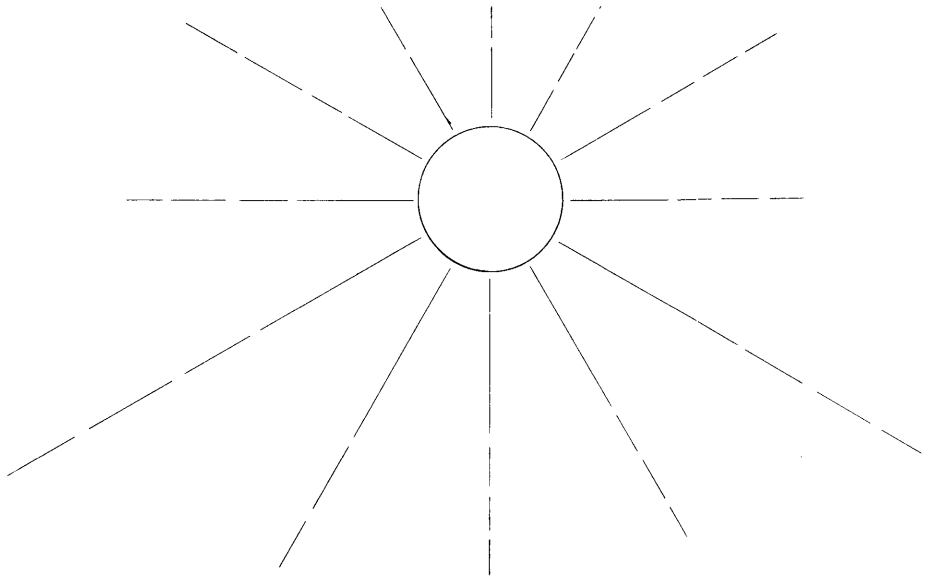


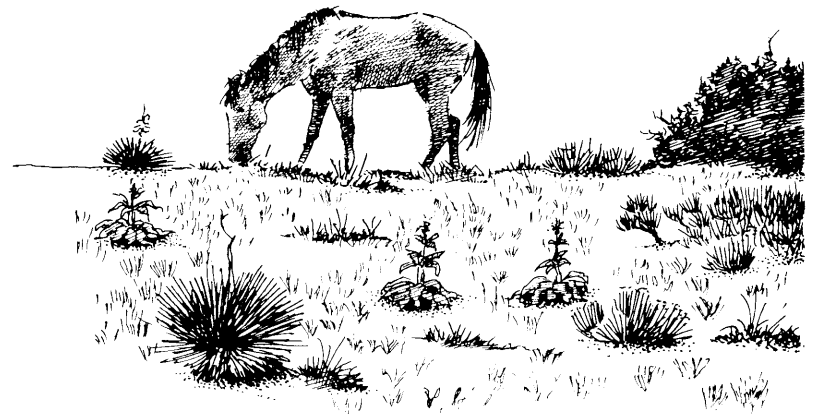
Observation

Find a place where only one kind of plant is growing, and try to figure out how it is specialized to grow better there than any other plant. The area you choose may be very small.

Water, Plant Food, and Energy

When succession moves forward the plants and animals on the land use more and more of the water, plant food, and solar energy that is available. The path of the water from cloud to earth and back to the sky is called the *water cycle.* The path of food from earth to plants and animals and back to the earth is the *mineral cycle.* The path of the sun's power through living things is called *energy flow.*





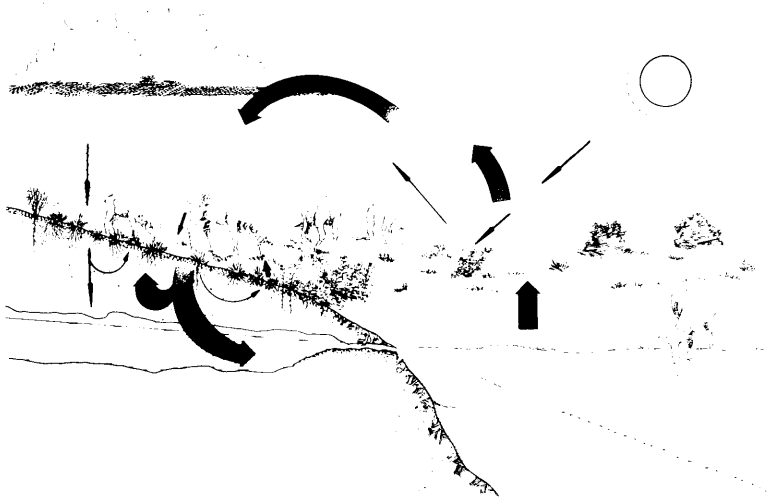
Energy Flow

In areas of low succession most of the sun's power just heats up the bare ground and does no good for anything — a useless *energy flow.*

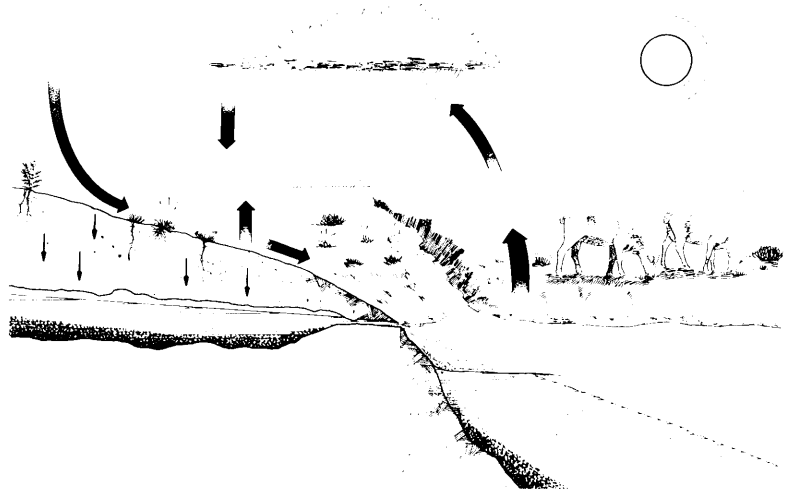
In areas of high succession there will be more plants and those plants will have bigger leaves. More and bigger green leaves put more sun power to work growing stronger plants and feeding bigger animals — a good *energy flow.*

Water Cycle

In areas of high succession water may be used several times by several plants and animals before it goes back to the sky. The *water cycle* is good.



In areas of low succession much water runs off the land or dries up and goes back to the sky without helping anying. The *water cycle* is bad.



Mineral Cycle

In areas of low succession plant food is used slowly and may stay for a long time deep under the ground or in the dead leaves of dry plants. The *mineral cycle* is bad.

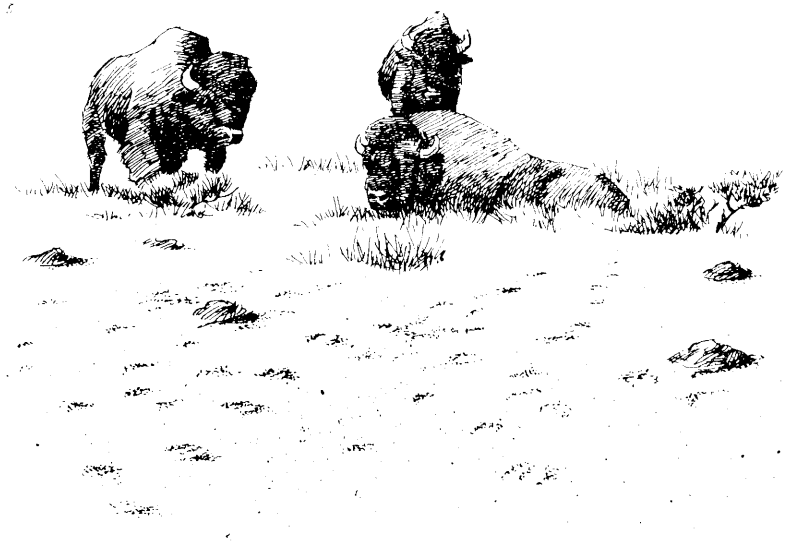
In areas of high succession plants take food from the soil, are eaten and trampled, and the food goes quickly back to the soil where it is used again and again — a good *mineral cycle.*

Why Succession Moves Forward and Backward

Many things can change the succession of plants — wet weather, floods, wind storms, construction projects, roads, fire, and of course *animals*. All animals are part of succession, and in grassland areas like the Navajo Reservation, the plants cannot reach the highest steps of succession without the animals.

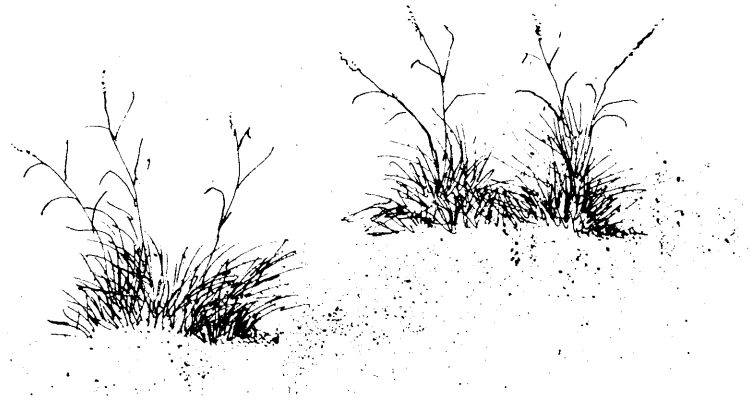
Large grazing animals can change succession in three ways:

1 By just being on the land, trampling the ground with their feet and leaving behind their urine and manure.



2 By biting off the plants.

3 By *not* being on the land and allowing plants to rest.



The feet, manure, and urine of large animals *move succession forward.* Manure and urine are good fertilizer. The feet plant seeds and open the ground so more water soaks into it. Good grass can stand a lot of trampling. A herd will break down many low succession plants like snakeweed.

Observation

In badly overgrazed areas you will usually find only low succession plants like tumbleweed, but often they will be greener than plants in over-rested areas because they get more water and fertilizer. There may also be more different kinds of plants, because more seeds are planted. Check this out on land you know well.

Look at land where no animals have been for a long time. Usually the soil has a crust on it like bread. Sometimes this crust is as hard as pottery. It keeps water from soaking in and new seeds from breaking through. Try sprinkling water on soil like this. Does it soak in as fast as water sprinkled on land where livestock have broken up the crust?

Biting off plants also can move succession forward. It hurts many low succession plants, but remember that grass *must* be bitten off from time to time or it becomes weak, tough, and can die of old age.

Over-resting of course moves succession backwards, but grass that animals have bitten off must have *enough* rest to grow back. A herder can decide how much rest his grass gets. *This is the main way a herder can change succession on his land!!*

Wild animals on wild land — buffalos, antelope, elk, deer, and wild sheep — decide for themselves what they will do to the land. *People* must decide these things for their livestock. If our stock is causing succession to move backwards, then we must try to see how it acts differently from wild herds.

Wild herds are often very large and, at least part of the year, move together in a tight bunch, so they give the ground a good trampling and cover it with their manure.

Wild herds are always moving and seldom spend more than a few days at a time in the same place, so they bite a little off the best plants, but do not stay long enough to overgraze anything.

Wild herds often move long distances and often leave an area for months at a time in very dry weather, so the land gets rest when it needs rest.

The different kinds of wild herds of course are part of succession. In Navajo Country mule deer and elk rank near the top. The deer eat more from bushes and trees. The elk eat more grass. In former times large elk herds roamed far out onto the grass land away from the mountains, when the grass was tender and fresh, but now even the mountain meadows are not rich enough to feed them, and there are no more elk in Navajo Country.

Deer need the bushes and thickets of the pinon-juniper forests near the foot of the mountains.

Buffalo live best on thick, tough, grass that an antelope could scarcely eat. According to legend some buffalo once roamed Navajo Country east of the Chuska Mountains, and names like "Buffalo Pass" and "Buffalo Spring" near Lukachukai seem to say that a few even crossed the Chuskas, but Navajo Country has never had large buffalo herds like the plains east of the Rio Grande.

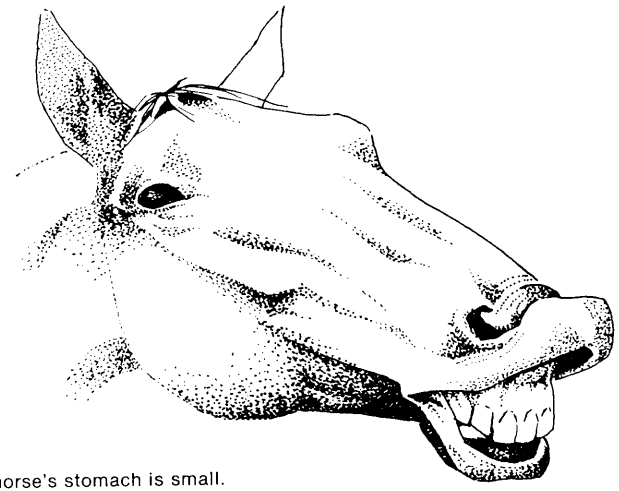
Pronghorn antelope are lower in succession than buffalo. They eat both grass and the tough bushes of the dry country such as snakeweed and rabbit brush. Enormous herds once roamed Navajo Country. They could probably still survive if they weren't such shy animals, and the land weren't so full of roads, people, guns, and noise.

Livestock and Succession

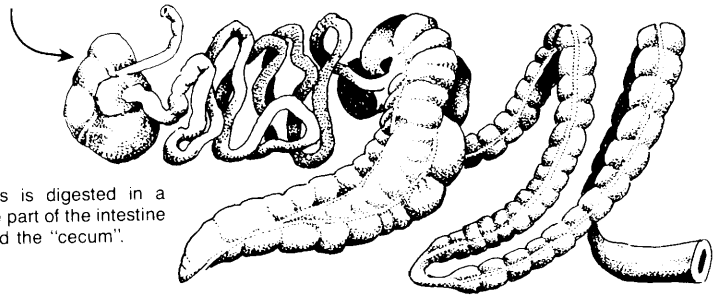
Horses, cattle, sheep, and goats are of course part of succession like all other animals. They are specialized to eat different plants, and to move in different ways. Where succession is changing, you will also find the *kind* of livestock will change as well as the number of animals.

Horses

Horses stand highest in succession among the different kinds of livestock. Their teeth are specialized to bite off very tough grass, and a lot of it. They can eat more in the same time than a cow, and they are such good runners that they can cover much more land to find the grass they like.



The horse's stomach is small.

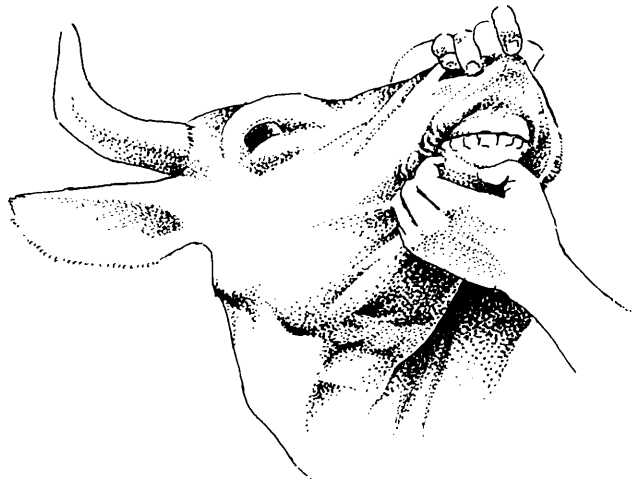


Grass is digested in a large part of the intestine called the "cecum".

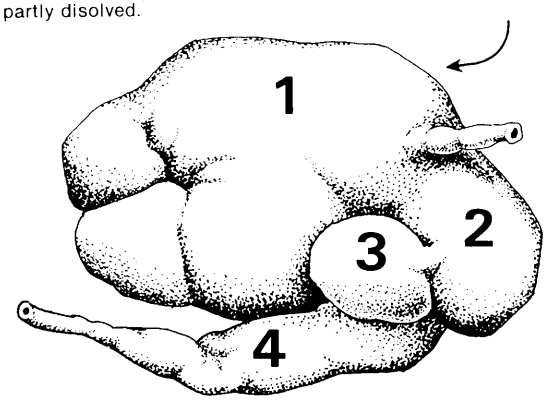
Horses have to find more and better grass than cattle, because a horse's stomach does not get as much food value out of the same grass. You can tell this by looking at horse and cow manure. You can see much more undigested grass in the horse manure. Also many plants, like loco weed, that don't bother cattle, will kill horses. This is why horses usually suffer most in dry years and long winters. Succession moves backwards, and they lose their place.

Cattle

Cattle come behind horses. Although cattle have no front teeth in their upper jaw they can take very heavy, tough grass, and their four stomachs allow them to get all the nutrition from the things they eat. Poison plants bother cattle less than horses.



In the first stomach, the "rumen", rough food "rots", becomes soft and partly disolved.



In stomach no. 2 "cuds" form and go back to the mouth for more chewing. Food swallowed the second time goes back to stomachs no. 3 and no. 4.

Sheep

Sheep, like cattle, have four stomachs and no upper front teeth, but they can eat even more plants without trouble, and their small mouths and dainty lips allow them to reach and nip off very small leaves that a clumsy cow could not touch.

Goats

Goats are similar to sheep, but they will stand on their hind legs, climb rocks and even trees to find food in places a sheep would never go. Even when grass is growing, goats will often eat bushes that sheep only nibble when they are hungry.

Observation

Follow different kinds of livestock around for a few hours, and notice what different plants they eat, and how much land they cover. If you follow a herd in several different areas, and keep score carefully, you will quickly discover the favorite plants of different kinds of livestock. That will help you understand the true value of your land.

Check the history of different kinds of livestock in your community.

Do older people remember years when horses died of starvation or other causes?

Look at herds of goats and sheep in your community and ask about their history. On good range, most people prefer sheep, because they are easier to herd, have more young ones, are better mothers, and grow much more meat. On poor range, however, goats survive better, and the mohair from goats is worth more than the wool and meat from skinny sheep that have few lambs. If herds have slowly changed from sheep to goats, it tells you that succession is going backwards.

Conclusions

Much of the best plant and animal life has disappeared from Navajo range land, ***but*** plants and animals will return if they have the chance. This natural rebuilding of life is called *succession*. Succession happens in steps. One set of plants and animals prepares the ways for the next. Our livestock affects succession in three ways:

1. By just being on the land.
2. By biting off the plants.
3. By *not* being on the land and letting it rest.

If people do not bother them in any way, wild animals will move and eat properly so that succession moves forward. Livestock, however, is also part of succession. The kind of animals we raise and the size of our herds must change as succession moves forward or backward. The next chapter will tell how a herder can make his livestock move succession forward the way wild herds used to.

PLANNING FOR SUCCESSION

Herds of wild animals move succession forward on wild land where roads, fences and people do not bother them.

Their feet, manure, and urine open the soil for water, plant seeds and fertilize them.

They will bite off the grass enough to keep it young and healthy, so it grows better than other plants.

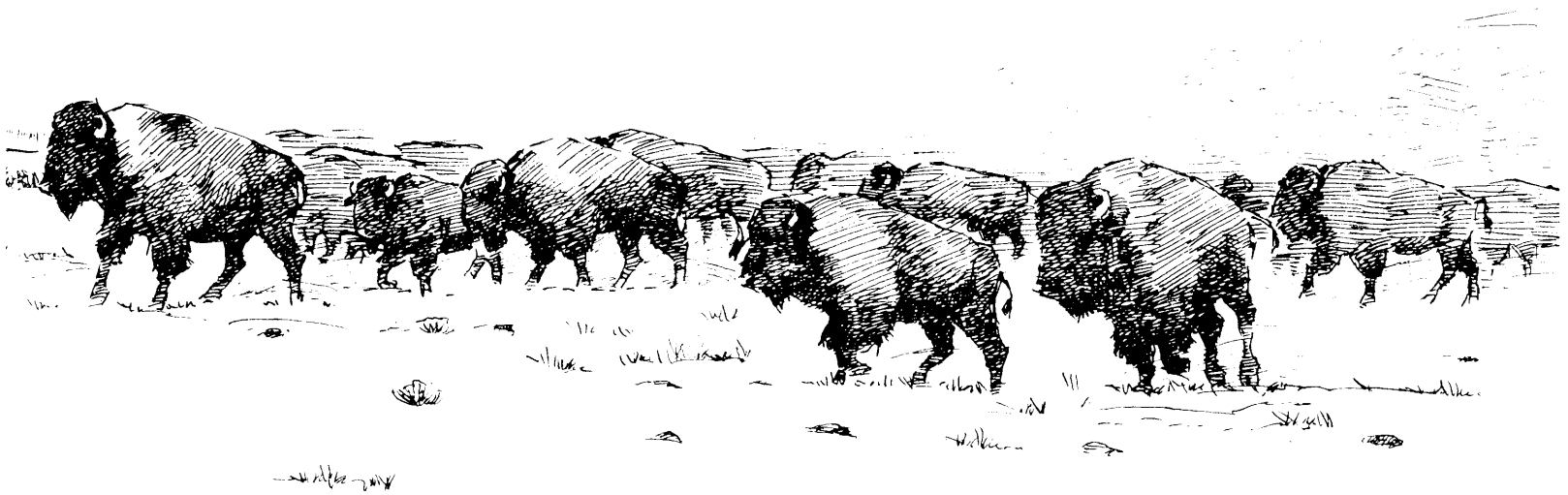
They move around enough to give grass the rest it needs.

The old people who say that sheep and grass belong together are old enough to remember a time when Navajo sheep moved like wild herds. There were no roads, fences, or grazing regulations. There were far fewer people, and no one "claimed" land only for himself. Land was free, and people moved wherever they wished. Many people had herds of more than 1,000 head, and herders stayed with them all the time.

Now, all that has changed. According to tribal grazing regulations no one can have more than 300 sheep. Grazing permits are only good for a family's "customary use area", and it is illegal to take livestock into other districts without a special permit. The land is now full of people, and all of them want their own piece of land for their own small herd. Neighbors now often push against each other and argue over land.

The traditional life has changed in other ways, too. Most people now don't depend completely on their stock. They work or receive checks of some kind. People who work have less time to herd sheep. Many people now have cattle instead of sheep and goats, because they don't have to put them in the corral every night.

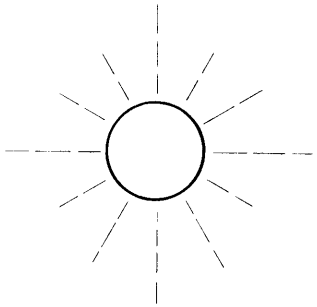
These changes in the Navajo way of life have also changed the land. Succession has gone backwards almost everywhere in Navajo Country. This chapter, however, tells how to plan your livestock operations so that the grass that the old people remember will return. This can be done, even after so many things have changed.

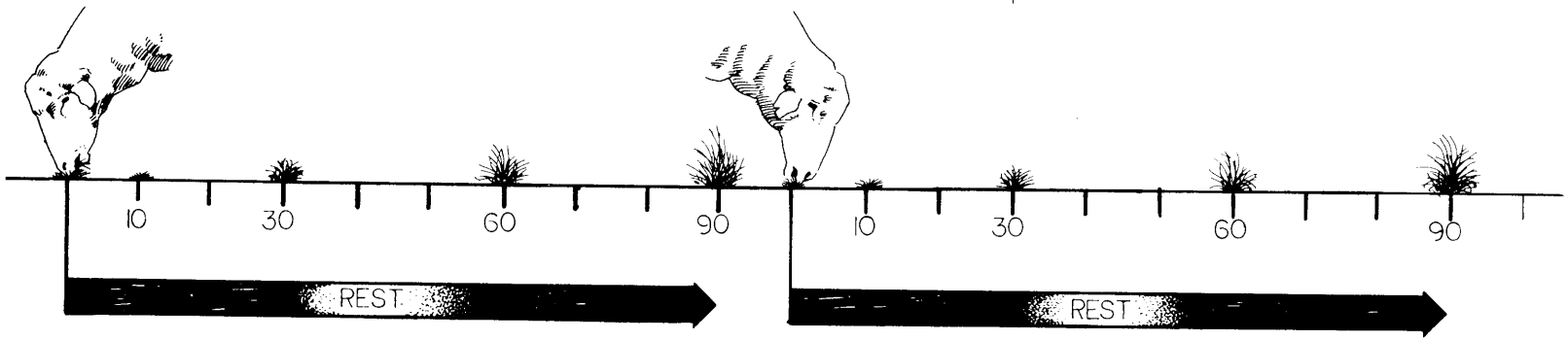


Long and Short Rest

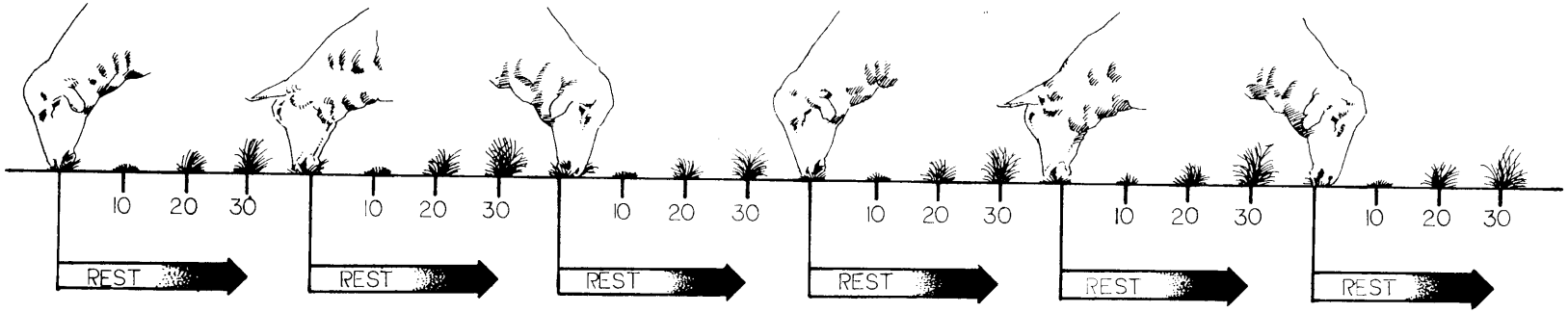
During the time that plants are growing, the herder must think of one thing first of all. *Does the grass get the right amount of rest?*

PLAN TO GIVE YOUR GRASS THE RIGHT AMOUNT OF REST, AND YOUR STOCK WILL ALSO GIVE IT MORE WATER, MORE FOOD, AND SUCCESSION WILL MOVE FORWARD.





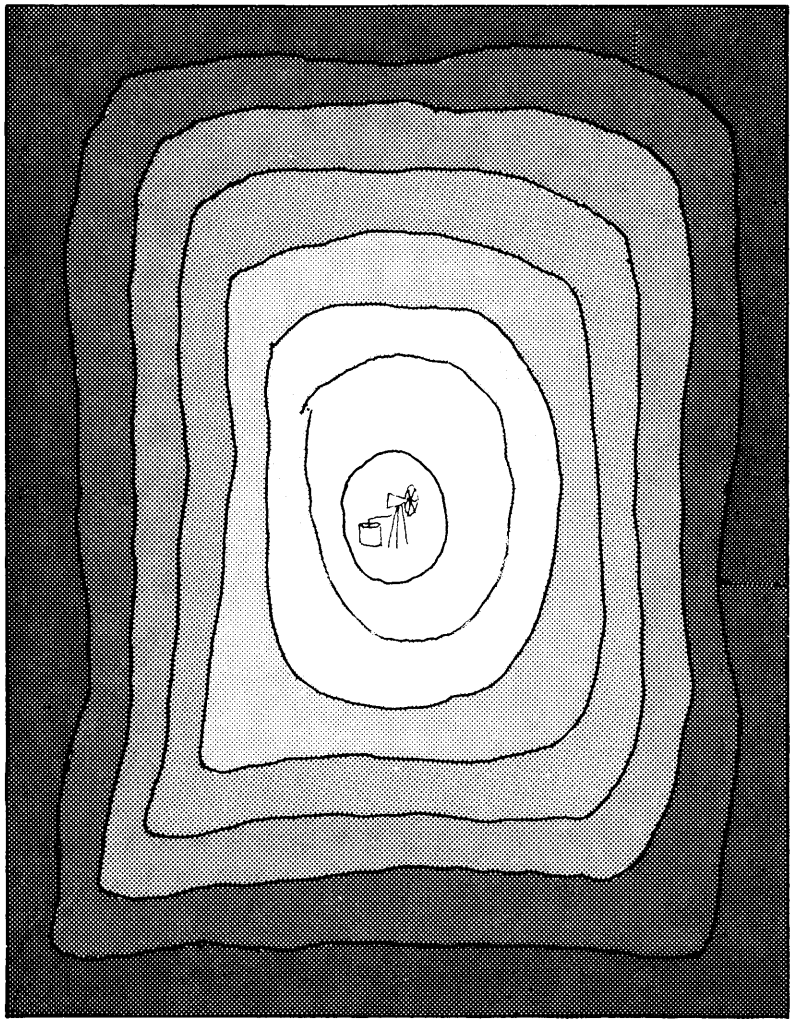
During warm weather grass in Navajo Country may need as much as 90 days of rest after it has been bitten off.



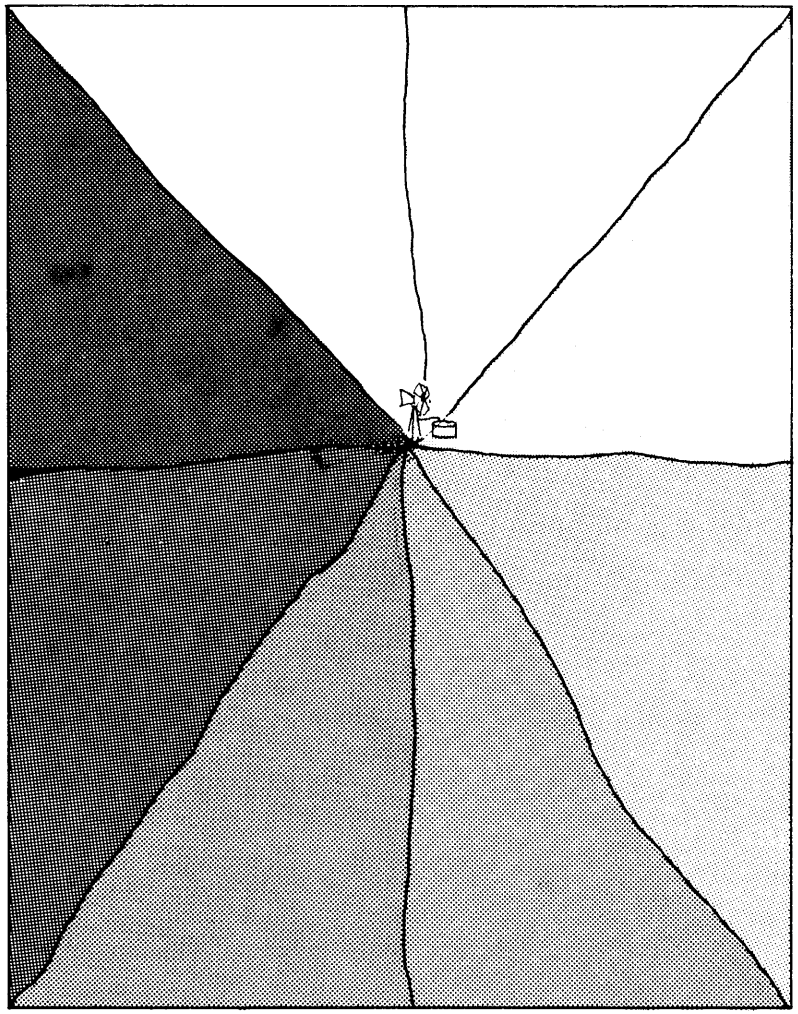
If it rains, however, the grass may start to grow very fast. Then it does not need so much rest and animals may bite it off again sooner, sometimes as soon as 30 days.

Grazing by Areas

In the old days it was easy to move a big herd so that it gave the land just the right amount of rest. That is harder today but it can be done by dividing the land into several grazing areas and keeping all the stock in one area for a few days and then moving on to the next. See the difference:



Here the stock hang around the windmill and overgraze that area, while the land far from the windmill is over-rested.



Here the stock cover all the land. Twelve or thirteen days in each area will give the land 90 days rest. When they come back to the place they started, fresh grass is waiting for them. Four to five days will give the land 30 days rest.

Keeping the stock together in one area also makes them break up the soil, plant seeds, and move succession forward the way the big herds did when they moved across open land.

Slow Growth - Move Slowly

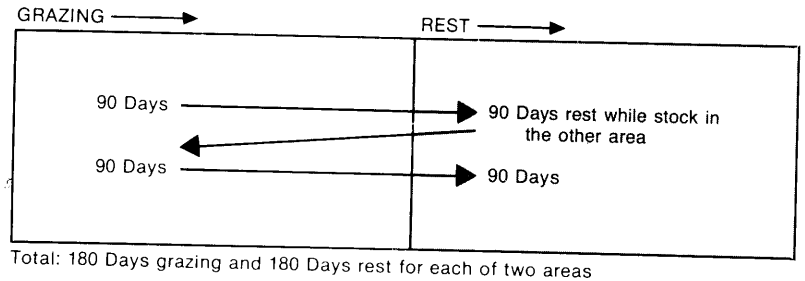
In dry weather when the grass is growing slowly, you may think, "There is no grass, I should move my stock to a new area quickly." This is wrong!! *Moving stock too fast means the grass gets no rest.* The herd will come back to the same place before new leaves are ready to eat. Don't leave your stock in one area until they starve. But dry grass is tough. Animals will probably eat other plants and bushes before they bite down the grass too far. In dry weather grass will not grow new leaves while the stock is there.

Fast Growth - Move Fast

In wet weather when grass is growing quickly, you may think, "There is lots of grass here, why should I move my stock to a new area." This is wrong!! *Now moving stock too SLOWLY means the grass gets no rest.* If grass is growing fast, animals that stay too long in one place will bite off new leaves at once. That is over grazing and will weaken the plants. Also, if stock stays too long in each area, they will take too long to get back where they started. By the time they get back the grass will be old and tough.

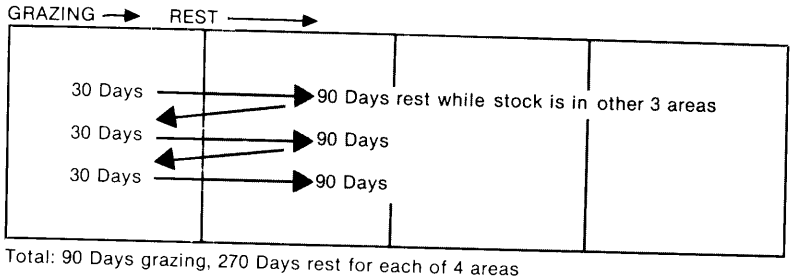
The more grazing areas you make on your land, the more days of rest your grass will get during the year.

TWO GRAZING AREAS



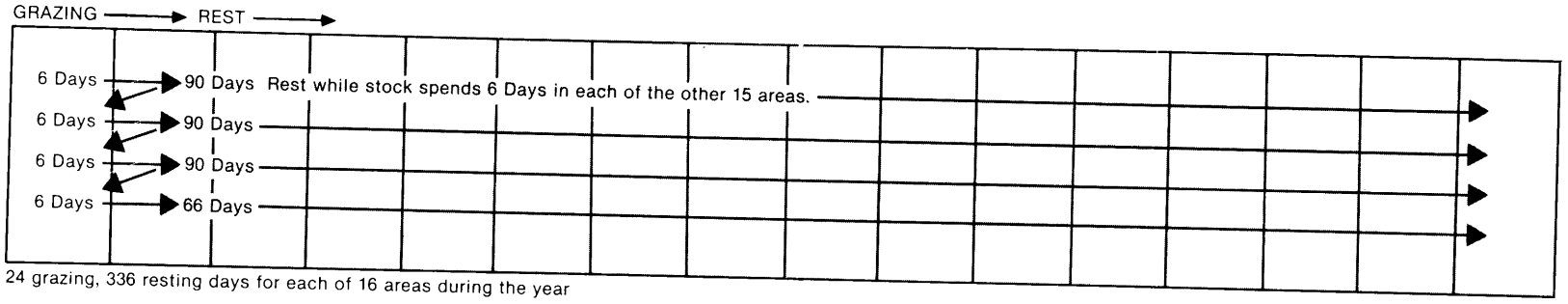
Total: 180 Days grazing and 180 Days rest for each of two areas

FOUR GRAZING AREAS



Total: 90 Days grazing, 270 Days rest for each of 4 areas

SIXTEEN GRAZING AREAS



24 grazing, 336 resting days for each of 16 areas during the year

Experiment

These circles show land divided into different numbers of grazing areas. Figure out how many days stock should stay in each area. Remember, when stock leave an area, they should not come back for 90 days.

The first piece of land is done for you. It has eight grazing areas.

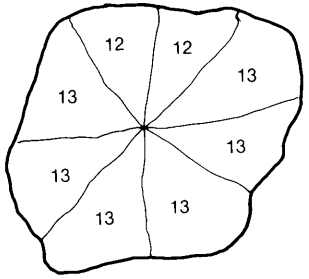
The stock is in one area, so it must go through the other 7 areas in 90 days.

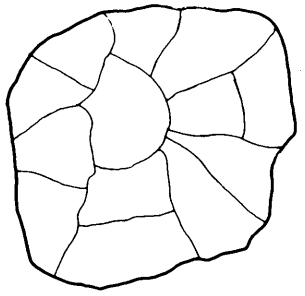
$\frac{90}{7}$ = 12 days in each area and 6 remainder.

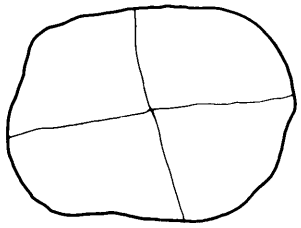
Stock can spend 12 days in two areas, and 13 days in the other six areas.

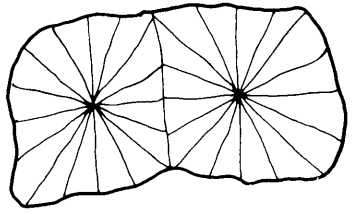
Now, if plants grow for about 180 days from spring to fall, fill out the following table to show how much time stock spends in each area, and how many days rest it gets. The 8 area example is filled out for you.

As you can see, the more grazing areas you can make on your land, the more you can rest each area. Of course you cannot divide real land like pie unless it is perfectly flat, and you have no roads, neighbors or rough places on it. Also in Navajo Country, all ranchers must plan for water.









No. of areas		Areas resting		Days of rest	Areas resting		Days in each area	No. of areas		Time to graze all areas		Growing season	Time for all areas		Times each area grazed	Days grazed each time		Total time each area		Growing season	Total time each area		Total rest in season
	− 1 =		THEN		÷	=		×		=	THEN	180	÷		=		×		=	THEN	180	−		=	
8	− 1 =	7	THEN	90	÷	7 =	12.9	×	8	=	103	THEN	180	÷	103	=	1.75	×	12.9	=	22.5	THEN	180	−	22.5	=	157

Example

This page shows a simple case where the land is cut by a canyon. There may be many ways to divide the land into grazing areas to make herding easier and water more available.

Make a copy of this blank map[1] and make a plan with 8 grazing areas for yourself. Here are some things to think about:

1. Mark the boundaries of all the land you can use.

2. Next mark all springs and wells so you can see them clearly.

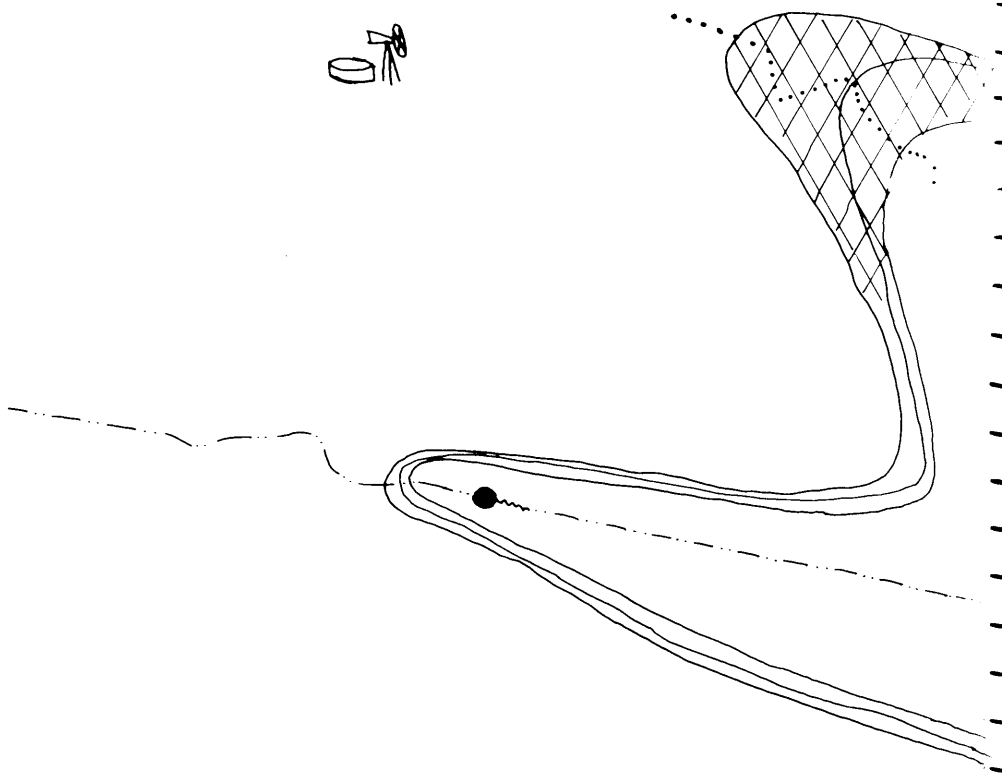
3. Mark all natural boundaries such as cliffs, canyons, washes, hills, and roads.

4. Color all areas that are useless for livestock such as bare rock.

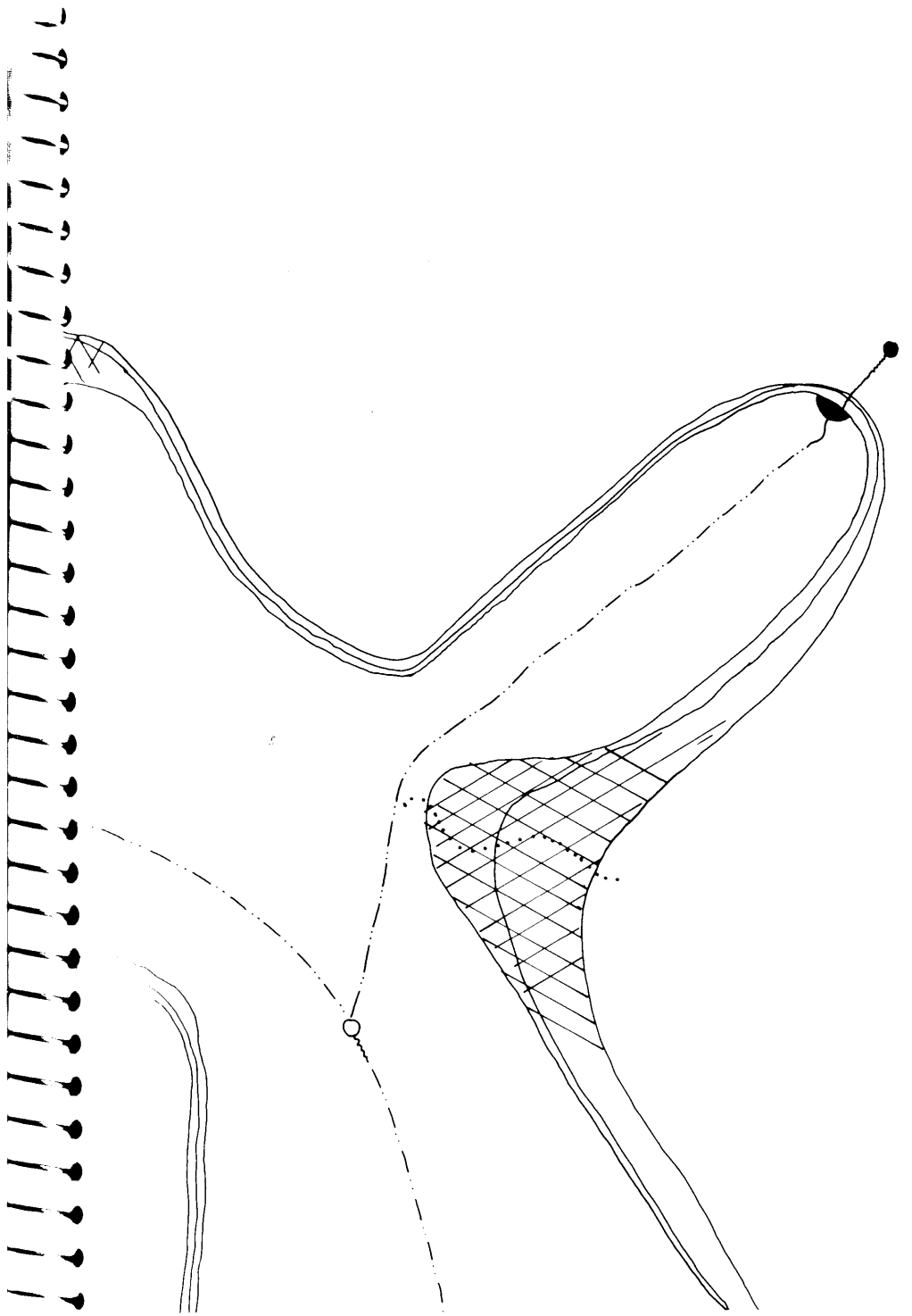
5. Look at the land livestock can reach from each watering place. (Cattle graze 4 miles from water. Sheep 2 miles. Use the map scale to make paper circles 4 miles and 2 miles in radius.)

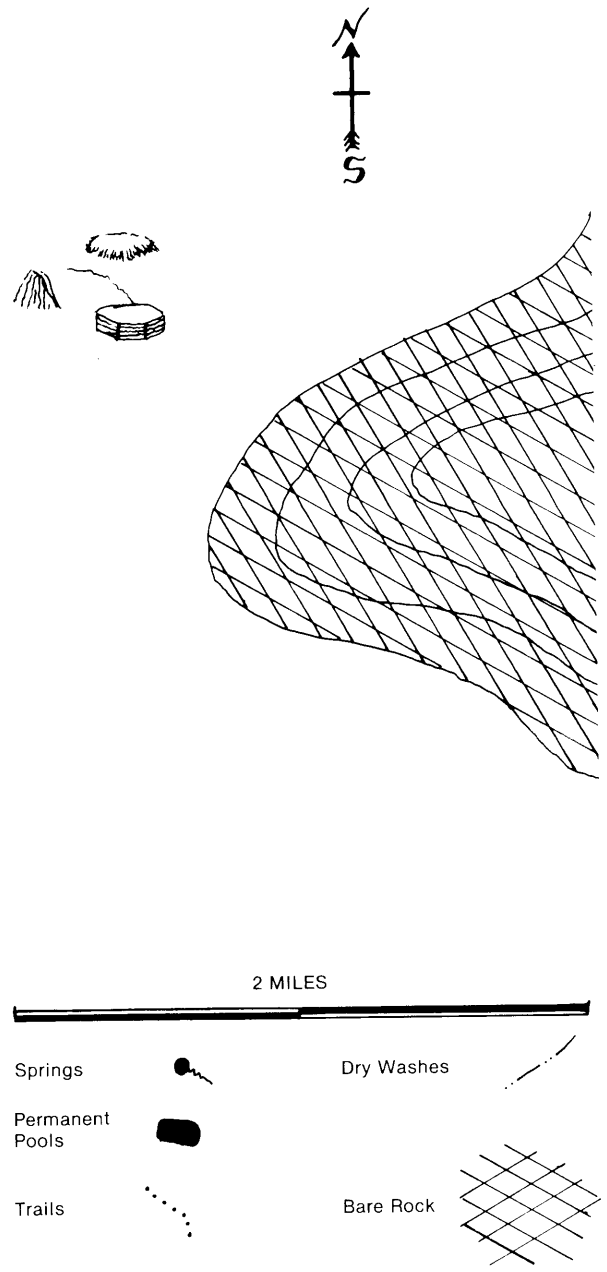
6. Try to make all of your grazing areas share only one or two watering places. That will make your herding much easier.

Sometimes you can't make a perfect plan without adding a well somewhere. In real life you may be able to do this. Try your plan again and put in a windmill somewhere. Choose the place carefully so stock in all areas can use it.



[1]For planning your own land, good maps of Navajo Country are available. See Appendix II on page 80.

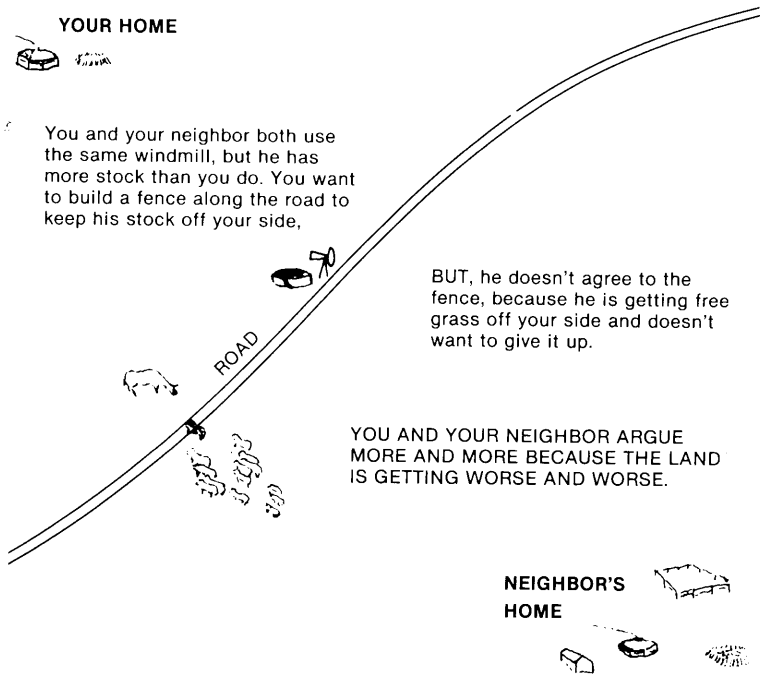



N
S
2 MILES
Springs
Permanent Pools
Trails
Dry Washes
Bare Rock

Neighbors, Horses, and Drought

Planning to give your land enough rest is easy on paper. It is much more difficult to do in real life. Cattle and horses wander freely over wide areas of land. In most of Navajo Country no clear boundaries mark one person's "customary use area" from his neighbor's.

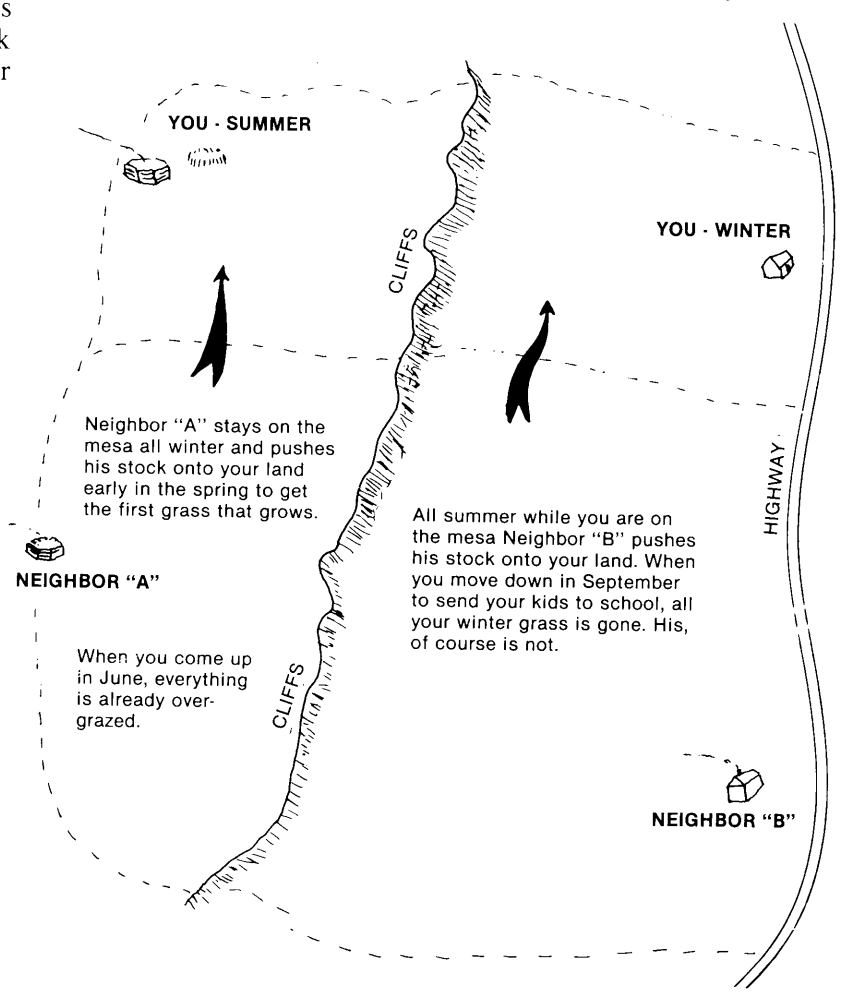
Controlling cattle and horses without fences is nearly impossible, but you can do nothing for your land at all if your neighbors disagree. Almost everywhere in Navajo Country neighbors argue over land and livestock. People are always saying to each other. "This is my land, so keep your stock off!!" or "You are over your permit, so cut down your stock!!"



The old arguments never help the land, however, because *LIVESTOCK AND LAND ARE NOT THE PROBLEM.* The problem is *TIME* to rest. Each herder tries to make sure that his own animals get to eat the grass before the other herder gets to it.

If neighbors could agree to share *TIME,* they would not have to argue about sharing land. The land would grow more food, and all their livestock would benefit.

Here are two small maps showing some real land arguments:

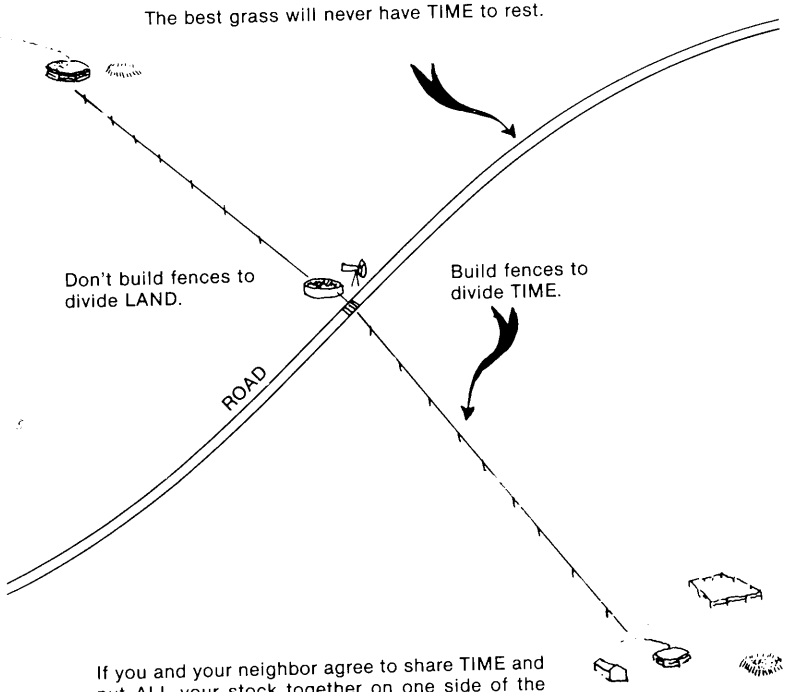


Here is a solution to one of the examples. Can you figure out ways to solve the other one?

Building a fence along the highway might end the argument but it will not help the land. Your herd and your neighbor's herd will overgraze BOTH sides of the fence.

There will be some stock on ALL the land ALL the TIME.

The best grass will never have TIME to rest.

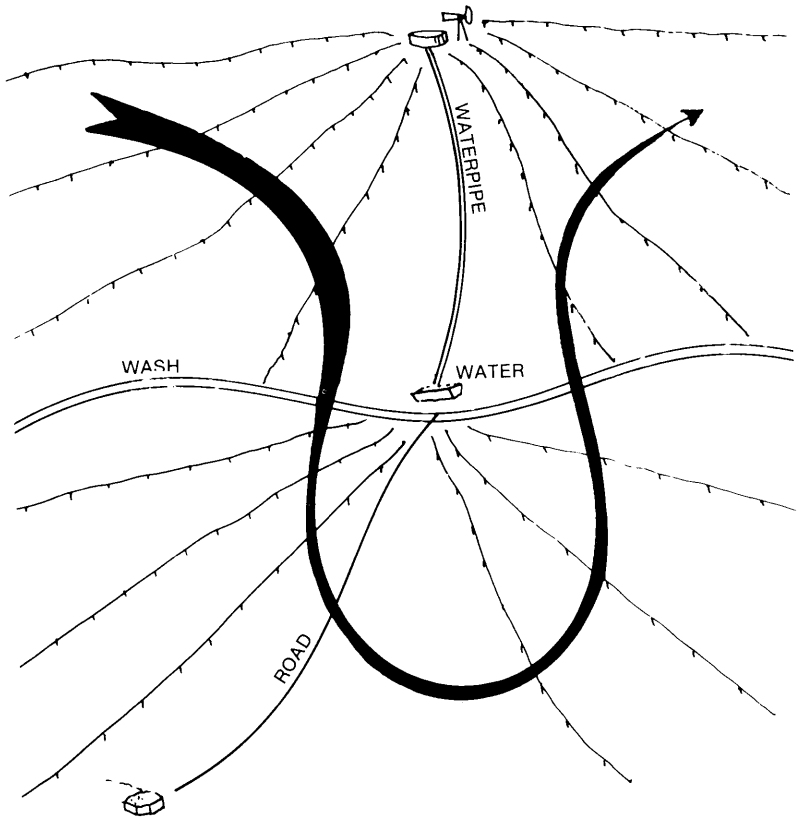


If you and your neighbor agree to share TIME and put ALL your stock together on one side of the fence and then on the other, you will cut overgrazing in half.

In very dry weather neighbors who can share *TIME* have a much better chance of keeping their stock well fed. In drought conditions the land needs even more rest than usual. You may not be able to give your land more rest by just letting your stock stay in each grazing area for a few extra days. There may not be enough food. You can, however, give your land more rest by sharing *TIME* with your neighbor.

Example

This map shows two neighbors that each have eight grazing areas. Normally they have two herds and keep them separate. In very dry weather, however, they can put their herds together and use all sixteen areas. Although there will be more animals, they will spend less time in each area, and grass will get more rest.



Conclusion

Succession will move forward on your land, if you can give your plants *TIME*. You can do this by dividing your land into grazing areas. The more grazing areas you can make, the more *TIME* you can give your plants. Your neighbor's livestock will not hurt your land, if you can agree to share *TIME*.

The ideas in this chapter could be used by anyone who herds sheep every day. You would not need any fences or fancy equipment. The next chapter will explain how a few ranchers in Navajo Country and elsewhere have planned their land, and have used fences to make the work of herding easier.

Remember to *LOOK* at the land. *FAST* growth, *FAST MOVES, SLOW* growth *SLOW* moves.

GETTING THE MOST FROM THE LAND

You can easily draw grazing areas on a piece of paper. It may not be so easy to really use them. If you only have sheep and goats, and you herd them all the time, you can take them wherever you wish. If you have cattle and horses, however, grazing areas don't mean much without fences.

Fencing land in Navajo Country is hard, because all neighbors and the chapter must agree before any fence can be built. A few Navajo livestock owners and some of the Pueblo tribes *have* fenced grazing areas for cattle, however. This is the way many large commerical ranches also run their cattle. This chapter will explain how all these ranches were planned. A man from Africa named Allan Savory was one of the first people to plan ranches in this way. Savory was also one of the first people to use knowledge of wildlife to improve grassland. He discovered very quickly that more grass grew where livestock stayed in a tight herd and moved to give the grass enough rest. When he tried to actually raise cattle and sheep, however, he discovered that all the moving around tired out the cowboys and the stock. To make the idea work he had to find an easy way.

After many experiments he and other ranchers learned to divide land into groups of grazing areas that come together at a center point. The corrals, handling facilities, and usually the main water source are at the center.

Grazing Cells and Paddocks

Savory called these groups of grazing areas *cells,* and the grazing areas themselves *paddocks.* The word "paddock" is rarely heard in the United States, but we will use it here because it is the word most ranchers use for this kind of planning. Remember, a "cell" is a fenced piece of land for a whole herd. The "cell" is cut into "paddocks", and the herd moves from paddock to paddock to give the grass the rest it needs.

Running livestock in Savory style cells has many advantages:

Moving stock, branding, vaccinating, and keeping track of new calves is much easier when cattle are all together in one paddock and you know they must come into the center for water. (On sheep or goat ranches, lambing and shearing are easier for the same reasons.)

You can easily keep your stock away from poison plant areas at times when those plants are most dangerous.

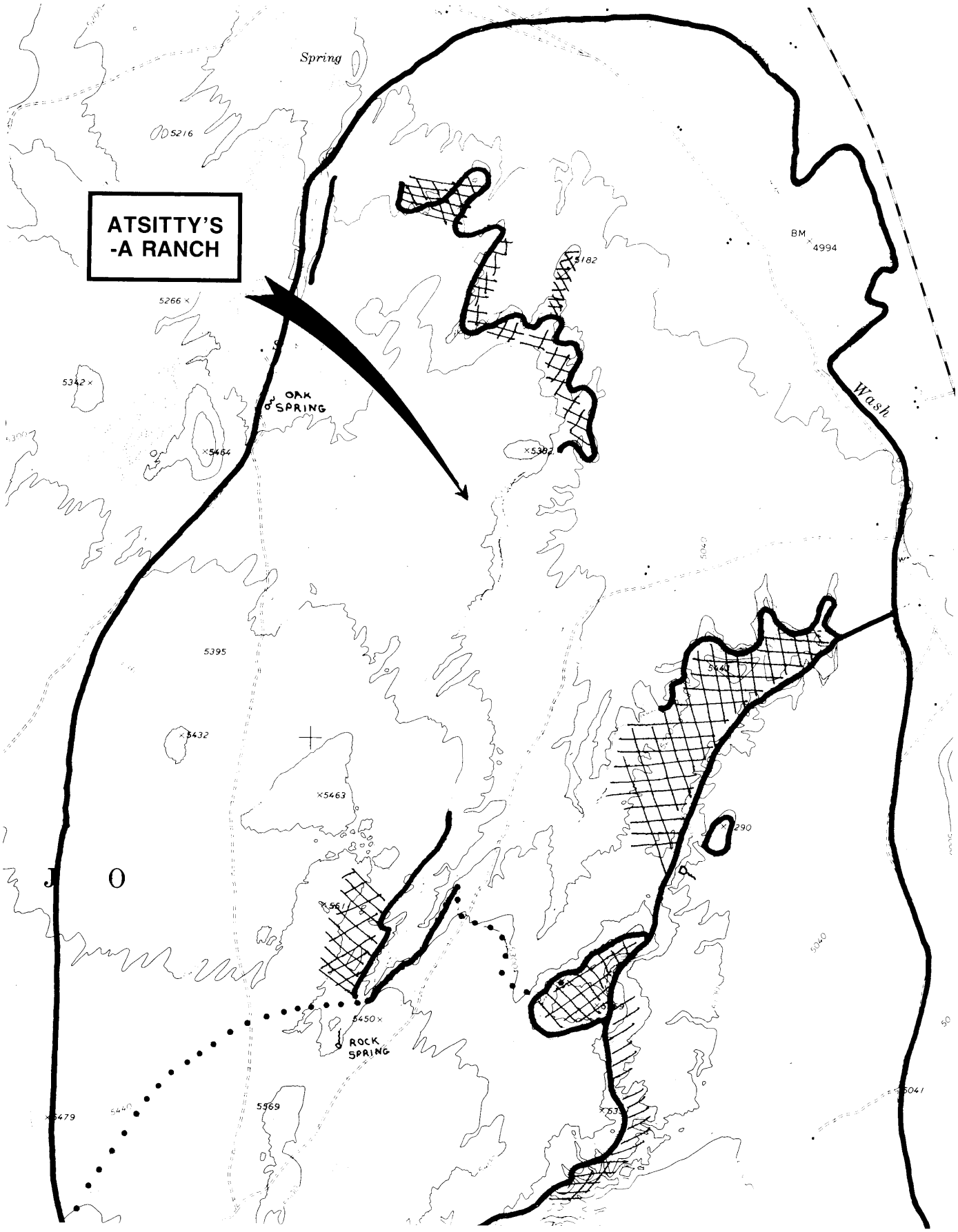
You can make sure your stock really uses all your land instead of hanging around and ruining the best parts of it.

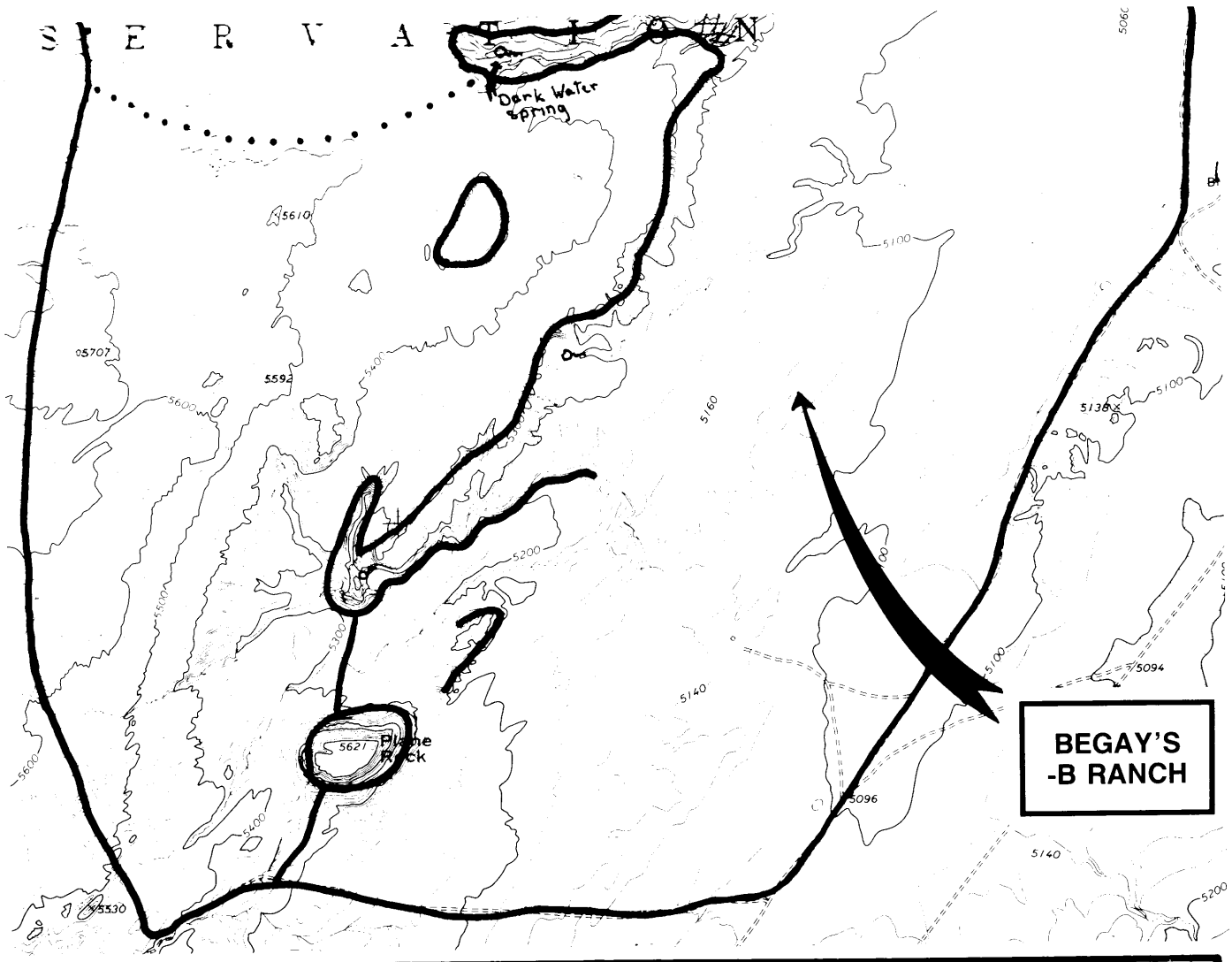
You can easily measure your winter food supply so you will know in October whether or not you must sell stock or buy hay to get through the winter.

You can keep your stock bunched together so their feet and manure improve the soil as much as possible. You can change your operation in hundreds of different ways to deal with dry weather, land questions with your neighbors, different breeding programs, etc.

You can give your grass exactly the *TIME* it needs so that succession will move forward, and the grass will increase.

On the next two pages a map shows land owned by the Atsitty and Begay families. In this chapter you will see how they planned to make the "A" Ranch and "B" ranch first class operations.


ATSITTY'S
-A RANCH
Spring
5216
5266
5342
OAK
SPRING
5464
5382
5182
BM
4994
Wash
5395
5432
5463
5290
5611
5450
ROCK
SPRING
5569
5479
5041



A & B RANCHES

1 ½ 0 1
MILES

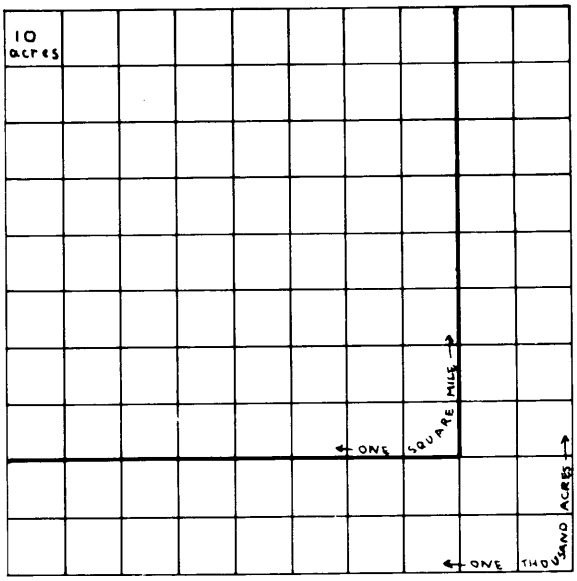
Scale 1:24000
Contours 20 ft.

Use area boundaries & cliffs stock can't cross

Disputed boundaries

Slick Rock-Useless to livestock

Natural water sources — OAK SPRING



Acres and Animals — Stocking Rate

To start planning the two families had to know how much useful land they had and how much each animal used. They measured the land using the map on the last two pages. You can check them by following the same steps:

The heavy lines show the land they use and the land they share.

Bare rock that has no plant life is marked.

The checkered square shows 1,000 acres in 10-acre squares. (A square mile is 640 acres. That is eight 10-acre squares on each side.)

Trace the 1,000 acre block onto a piece of paper and use it to find out how big the two ranches are together.

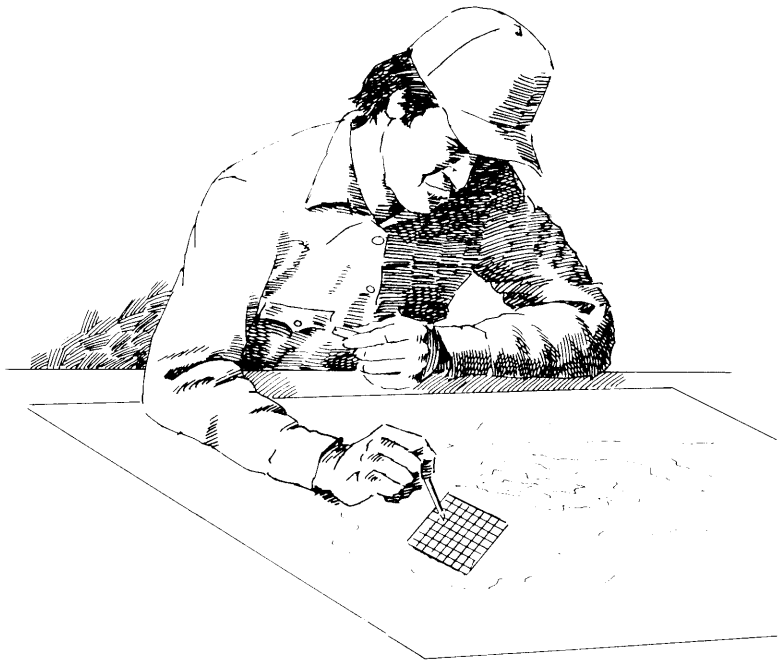
The Atsitties and Begays found they had about 8,000 acres together, and they each had 200 sheep. The amount of land each animal uses is called the *stocking rate.* It is given in *acres for each animal.* To find the stocking rate, divide the number of acres by the number of animals.

Example

200 sheep on 2,000 acres have a stocking rate of 1:10. That is "one sheep to 10 acres".

$2{,}000 \div 200 = 10$

Navajo Grazing Regulations say one cow equals 4 sheep and one horse equals 5 sheep, because the Tribe wants people to have more cows. In fact both horses and cows eat about the same. Five sheep equal one horse or cow. One sheep to 10 acres equals one cow to 50 acres.



Here are some examples to practice working out the problem. Figure out the stocking rate for sheep or cattle. Then put them in order from the highest to the lowest stocking rate.

150 cows on 30,000 acres
150 cows on 10,000 acres
550 sheep on 20,000 acres
400 sheep on 10,000 acres

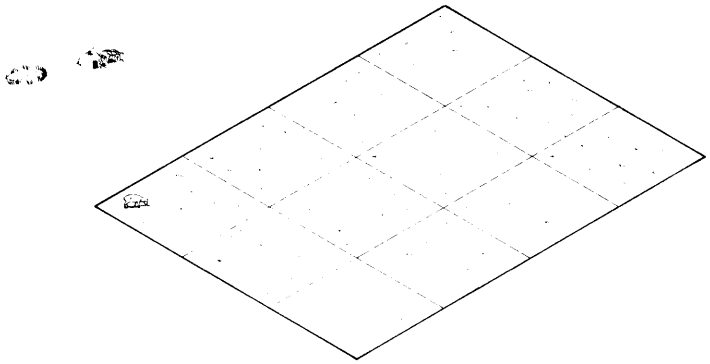
Remember, the stocking rate tells how hard your ranch land is working for you. If your stocking rate is too high (not enough acres for each animal), then the land cannot feed your herd. You will have to buy hay during the winter, some animals may starve or not give birth, and others may grow weak and die from disease or be killed by coyotes.

At the time of Stock Reduction in the 1930's and 1940's people were told that grass would not improve (succession would not go forward) if the stocking rate was too high. That was wrong. Even when the stocking rate is much too high, succession will go forward, if the grass gets *TIME* to rest.

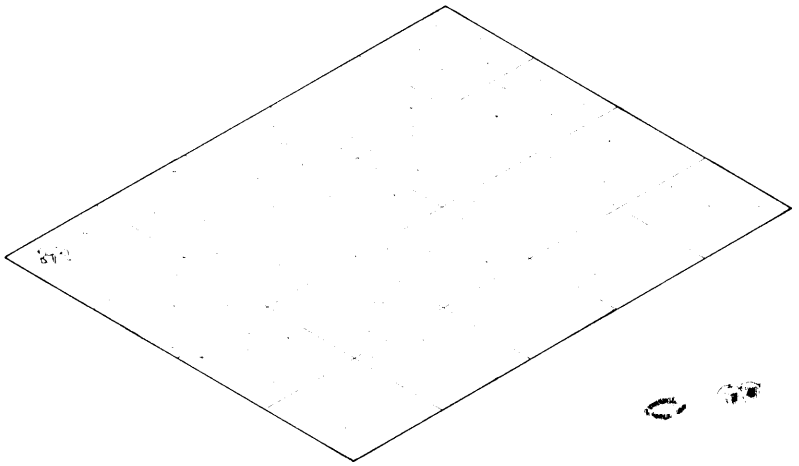
Succession sets the stocking rate! If succession is moving forward, the stocking rate can increase. If succession is moving backward, the stocking rate *will* go down. It will take more and more land to feed each animal. Big herds will not get enough to eat and they *will get smaller* until the land can feed them.

In most of Navajo Country people have the highest possible stocking rate, and succession is usually going backwards. When this happens, ranchers often don't get enough young animals to replace the ones that they lose. They have very few extras to sell. Some complain that their herds are going down every year.

The Atsitties and the Begays had these problems. They realized that their stocking rate of 1:20 (one sheep for every 20 acres) was not good. Ten years before they had bigger herds on the same land and had fewer problems. They planned grazing cells for their land, hoping succession would move forward so they could improve their stocking rate.



1 SHEEP FOR 12 ACRES
STOCKING RATE 1:12



1 SHEEP FOR 20 ACRES
STOCKING RATE 1:20

Grazing Cells for the A & B Ranches

The Atsitties and Begays wanted to put grazing cells on their land, but they had a problem with water. Both families depended on small springs that seep out of the cliffs, but stock on top of the cliffs can only get to water at two places. The two families shared one of these places, and often argued over it.

In the old days when herders could move more freely around the land, people could take a big herd five or ten miles from one spring to the next, and this moving of big herds helped the land, but nowadays we have windmills, pipes, and water tanks on trucks, so everyone is supposed to have water on his own land.

The Atsitties and Begays first had to decide where they would like new wells, and fences to be, and then which ones should be built first. All of these things are expensive, but if the stocking rate can improve, they are worth the money.

As they planned the cells on their land, they thought about three things. Grazing cells should:

1. Fit into the land, so that canyons, cliffs, washes, and roads do not get in the way of livestock and fences.

2. They should be part of a plan for the whole ranch. (If you decide you need three new water places, but can only get one, plan for all three. Then decide which one to build first.)

3. They should not cause any new arguments over land.

The map on the next page shows one plan for water and grazing cells on the A & B ranches. It may not be the best plan, but it will show how to fit water and grazing cells into a complicated piece of land.

1. Before even thinking about where to drill, the two ranchers drew in the "natural fences" on their land. These are the cliffs and canyons that livestock cannot easily cross. Heavy dark lines mark them on the map. Colored markers would do the job better.

2. Next they cut several paper circles two miles from the center to the edge. Two miles out and back is about as far as most people like to take sheep in one day.

3. Finally they moved the paper circles around on the map until they could see where the water had to be.

As you can see, they had some problems. The Atsitties wanted one well for the Northern part of their land, but they couldn't decide whether to put it on the top of the cliff or at the bottom. Finally they put it on the top, but piped water down to the bottom, so they could have water in both places.

The Begays' land at the bottom of the cliff was so long that one two-mile circle couldn't cover it. They figured that sometime in the future they would try to get another well for the south end of their land, so they planned their fences with that in mind.

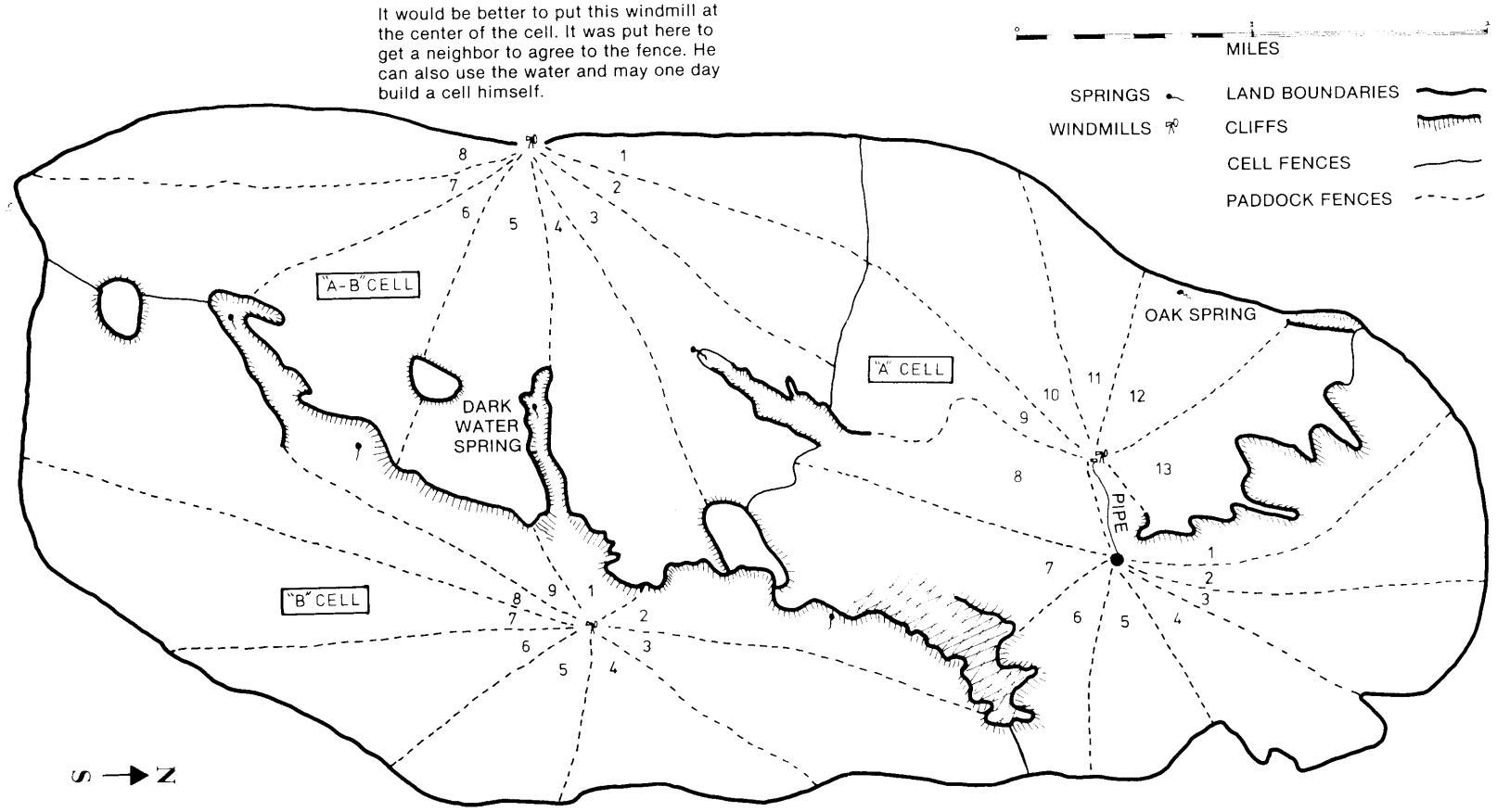
Both families agreed to drill the well on their shared land first. It would help both of them the same. It would help end their arguments over that land. They did not try to split the land with the fences, because they could not agree on who owned it. They agreed to share *TIME* on the land and share the corral at the windmill.

Around that windmill. they could share time in several ways.

They could put all their stock together and herd it through all the paddocks in that cell.

They could let one herd go through all the paddocks, and then let the other one go through.

They could each use four paddocks, and keep their herds separate. (Note that this way would not give the grass as much *total resting time* as putting both herds together in one paddock. Using four paddocks means the stock has to stay twice as long in each paddock to give the other paddocks the same rest.)

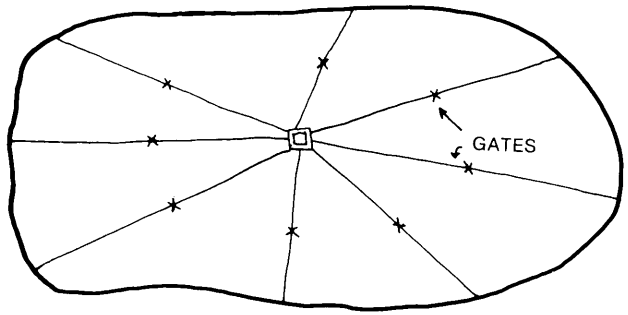


Exercise

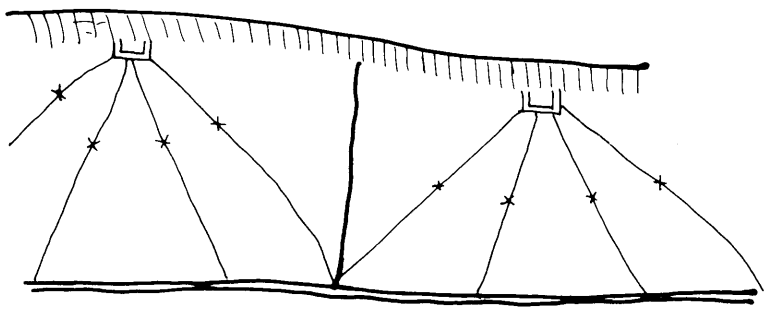
To try your own skill at planning for water, use a xerox copy of the first map and use paper circles one mile in radius. Make your cells so that the sheep will never go more than a mile from water.

You will need more water places, but you may be able to pipe water from one well to several cells. If you do this, put the well high enough, so the water can run down hill.

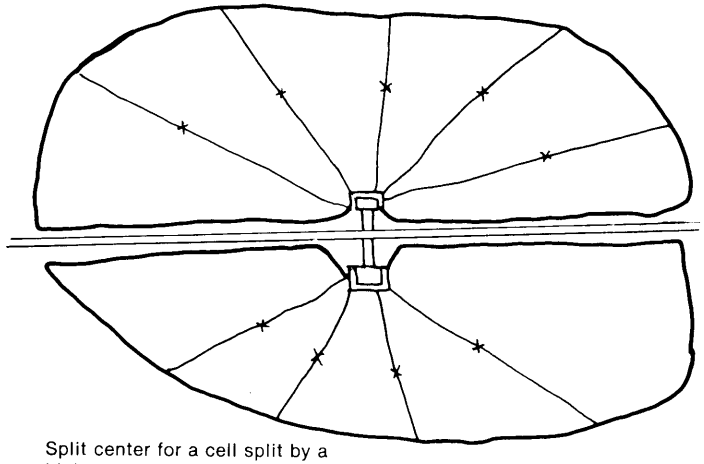
To give you some ideas, here are some cell patterns that others have used:



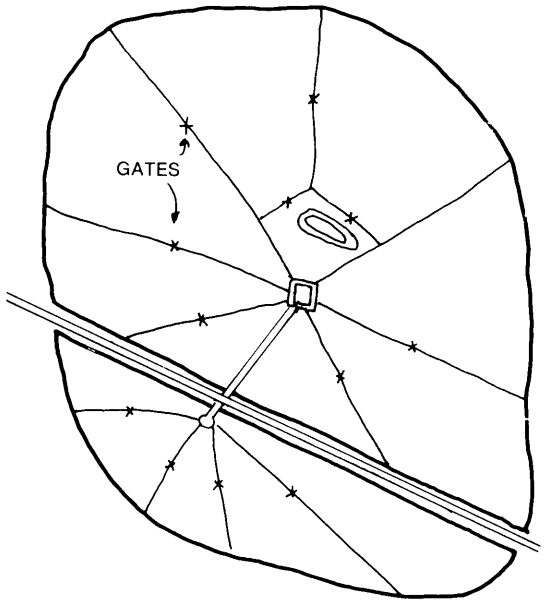
Standard "wagon wheel" on flat land.



A row of "fans" in a narrow area between cliff and road.



Split center for a cell split by a highway, river or cliff.



"Satellite" cell for small area cut off from main cell. Note also fencing around large rock.

Moving the Stock

After the land has been divided into grazing cells and paddocks, the stock can be handled in many ways as long as each paddock gets the rest it needs and is never grazed down too far at one time.

It takes a little arithmetic to figure these things out at the beginning, because the paddocks are different sizes. Also, you may keep your stock in one herd, two herds, or more. As soon as you have figured out your grazing plan, however, anyone who can watch the plants carefully can make it work.

Example

The A-B cell on top of the mesa that both ranchers share has eight paddocks. Questions:

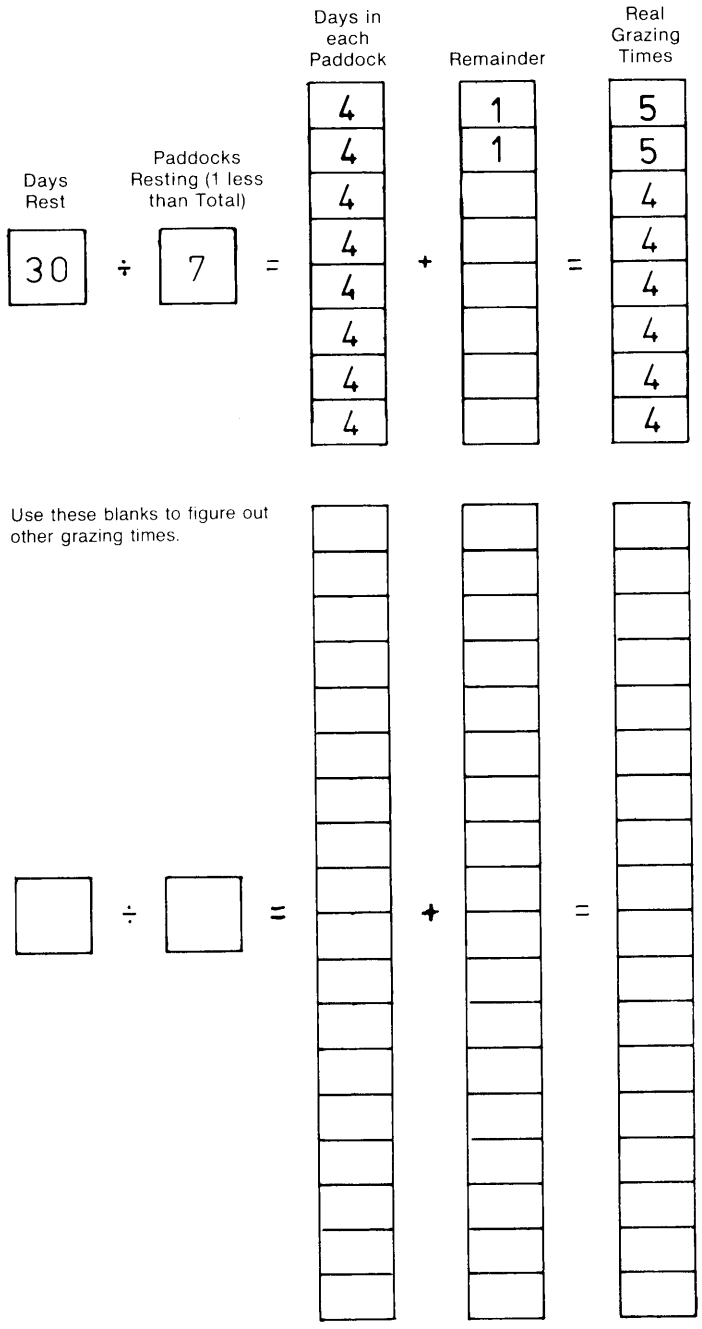
How many days should stock spent in each paddock so that each paddock will get 30 days rest?

How many days in each paddock will give 90 days rest?

Think of it this way: After the stock leave a paddock, they have 30 days to go through the other seven. Thirty days divided by seven paddocks is 4 days per paddock and 2 days left over. That means, if all the paddocks are about the same size, stock would stay 4 days in most of the paddocks, but 5 days in two or three of them.

To get a 90 day rest for each paddock in an 8-paddock cell is the same problem. After leaving the first paddock, it should take 90 days to go through the other seven. Ninety divided by seven is 12 and 6 left over. Twelve days in two of the paddocks and 13 days in the other six would work pretty well.

Try figuring 30 and 90 day rest periods for cells with 10, 16, and 30 paddocks to get used to the problem.



In real life the problem is not quite so easy, however, because the paddocks in a cell are usually not the same size and don't grow the same plants, so you can't treat them all the same way. This is true in the A-B cell. Stock can stay longer in the big paddocks than they can in the small ones. Also, the grass might be better in some paddocks than others, so they could have extra time. You will need a pocket calculator to figure this out.

This is the way it's done for Cell A-B:

Exercise

1. First figure the *average* paddock size
   (Total acres in cell ÷ number of paddocks)
   2,610 ÷ 8 = 326 acres average paddock size.

2. Figure in *decimals* how much bigger or smaller than average each paddock is.
   (Real paddock ÷ average paddock = difference in a decimal fraction [round off to two places])

   Paddock #1 300 acres ÷ 326 acres = .96
   Paddock #7 380 acres ÷ 326 acres = 1.16

   (You could say that if the average paddock is worth $1.00, then Paddock #1 is worth 92 cents and paddock #7 is worth $1.16.)

3. Figure out how many stock days should stay in an average paddock to give 30 and 90 days of rest.
   (30 days ÷ 1 less than the number of paddocks.)
   (60 days ÷ 1 less than the number of paddocks.)

   30 days ÷ 7 = 4.29 days in an average paddock
   90 days ÷ 7 = 12.86 days in an average paddock

4. Multiply these days times the decimal differences you found in step 3 above for the days to spend in each paddock.

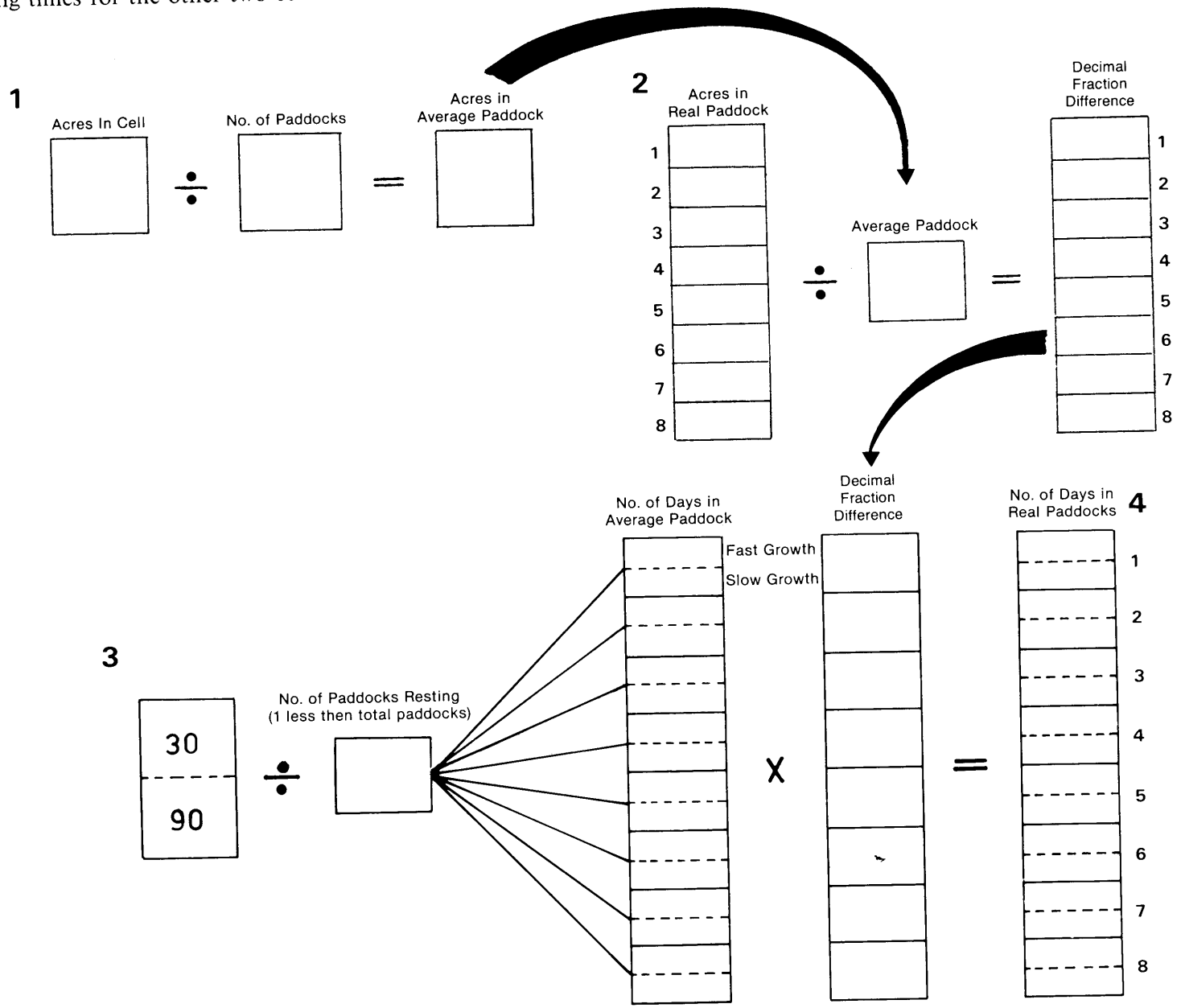
   Paddock # .96 x 4.29 = about 4 days
   .96 x 12.86 = about 12 days

   This means stock should never stay in paddock #1 less than 4 days when grass is growing fast, but can stay as long as 12 days when grass is growing slowly.

   Paddock #7 is bigger. You will see that stock can stay there for 5 to 15 days.

5. Think about the plant life in each paddock. If one paddock has much better grass than another, you may want to add some days to one and substract them from the other. Just remember that any days you add or subtract from one paddock, you must subtract or add to other paddocks, so the total is the same.

Make copies of the following chart to figure grazing times for all paddocks in any cell. You can start by figuring out the grazing times for the other two cells on the A & B ranches.



The Atsitties and the Begays can use their cells now in many different ways.

They can split the A-B cell on top of the mesa and each use part of it along with their other cells. The Atsitties A cell has 13 paddocks. They could use three from the A-B cell and run their whole herd through 16 paddocks. The herd in the Begays 9 paddock B cell could use 5 from the A-B cell and have 14 altogether.

They could put both herds together in the A-B cell at the end of the summer. That would harvest all the grass there, while the grass below was resting. Then, during bad weather they would have feed for their stock down below.

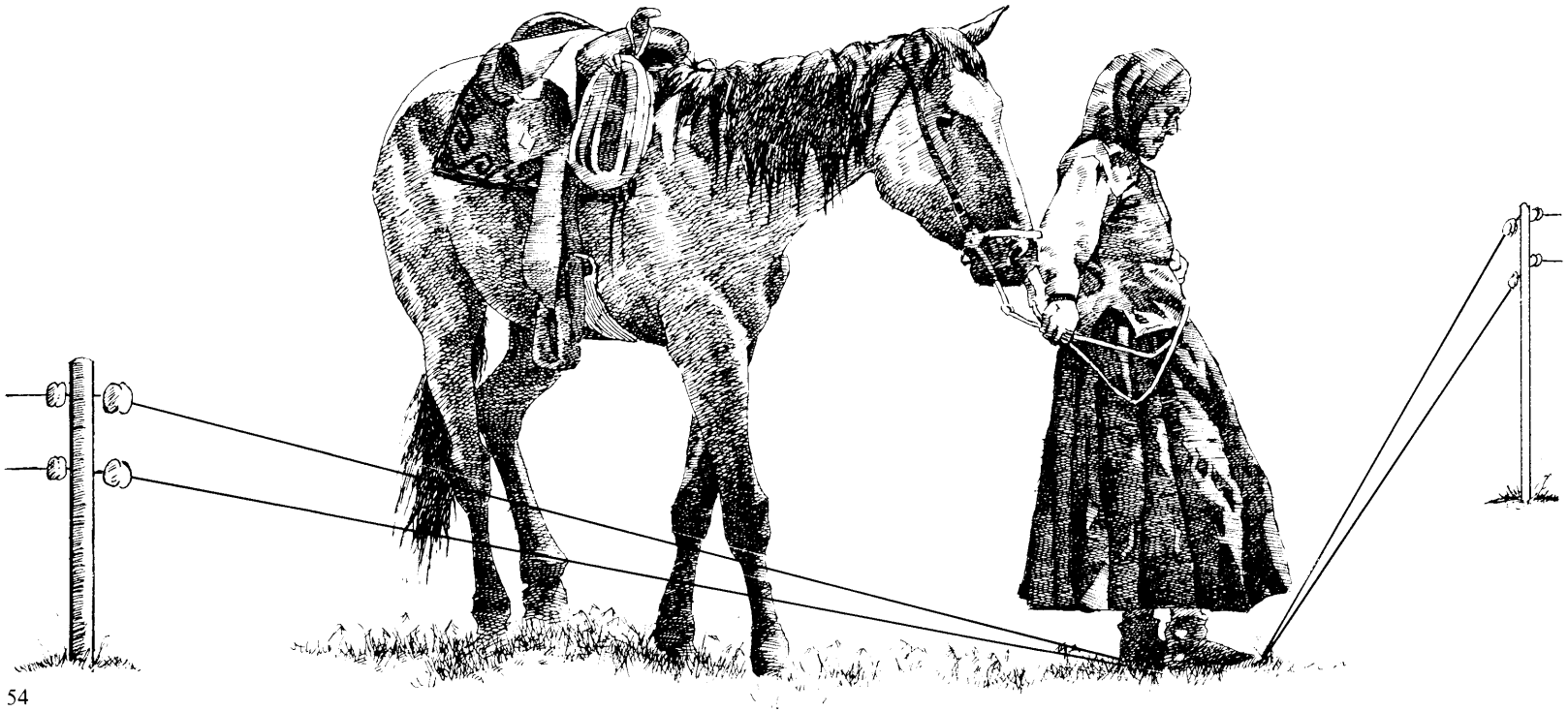
When the grass improved after a few years, they could start a cattle herd in the A-B cell and keep their sheep separately in their other cells.

In time of drought they could put all their stock together in one herd and go through all 30 paddocks of all three cells. (If they did this for 180 days, spending about 2 days in each paddock, stock would spend only 6 days in each paddock during the whole summer. Each paddock would get 174 days of rest.)

Fences

To fence off the paddocks, you don't need heavy, expensive barbed wire. Two strands of slick electric fence cost less and do the job better. Remember the "job" is only to keep livestock grazing in one area. You want a fence that wildlife can pass through, that a calf can easily cross to find its mother, and that doesn't bother riders, drivers, and other travelers.

The slick wire electric fences are easy to cross, and you only need to turn the power on in the paddock you are using. They are also much cheaper to build, and easy to move.

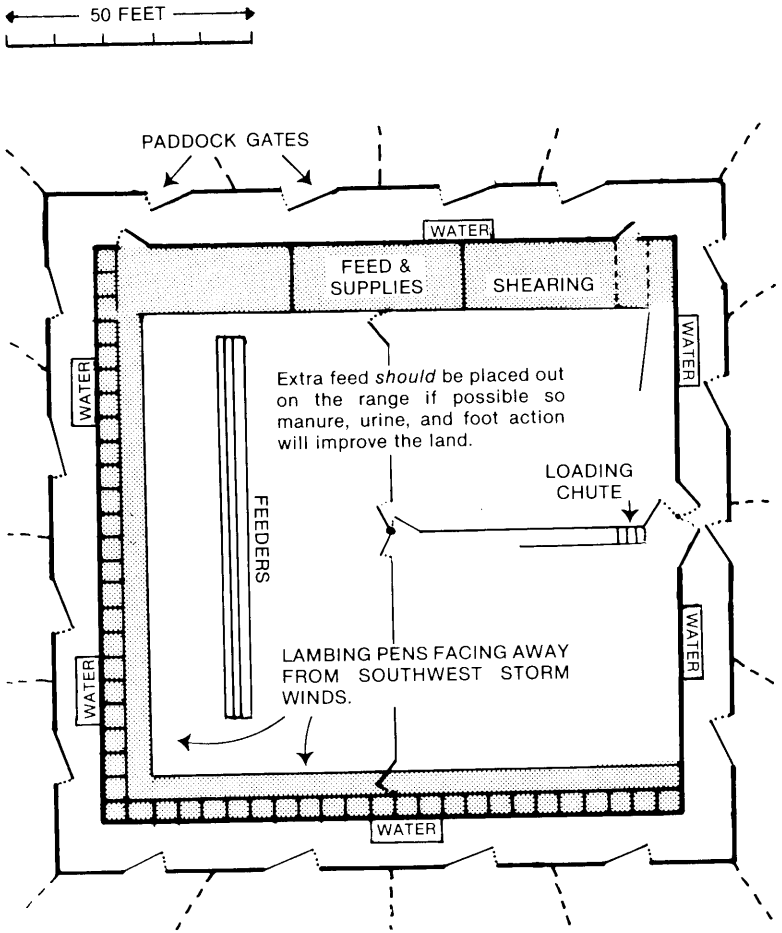


Cell Centers

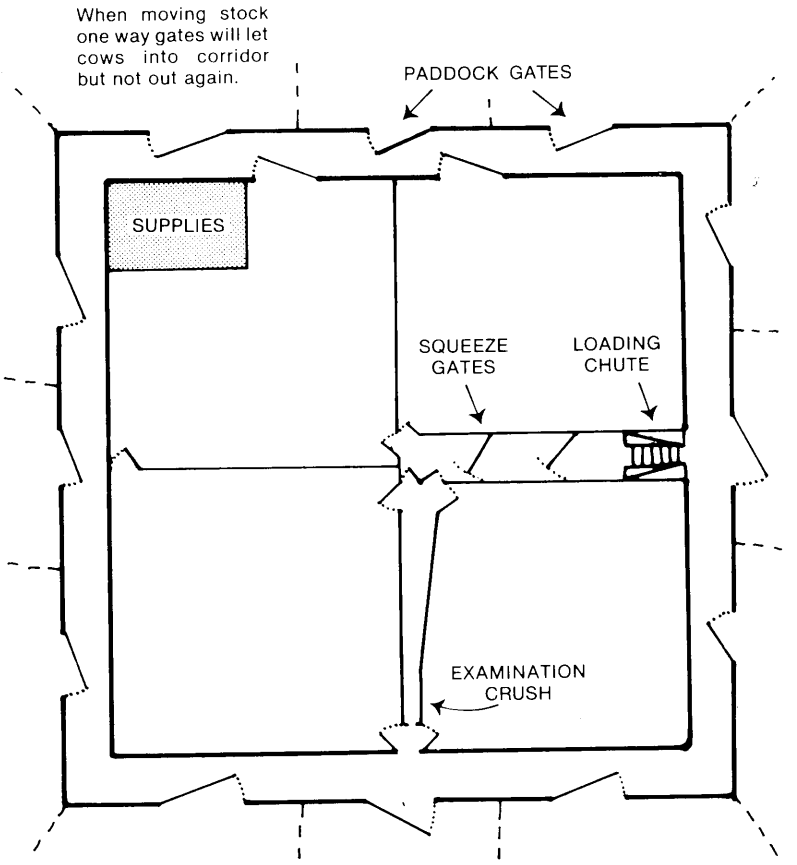
The first grazing cells for cattle had many problems with the corrals in the center. The cattle came in to drink and stayed in the corral for hours at a time instead of going out on the range and getting fat. Also, the corral filled up with manure that smelled bad and caused disease. To solve this problem, ranchers started building cell centers like the ones drawn here.

Although one is for cattle and the other for sheep, both have a narrow "corridor" around the outside. It should be wide enough for a pickup to drive through, but no more. Stock will not hang around too long in a narrow corridor, and will leave their manure out on the range, where it will help the land, but there is plenty of room in the middle of the center for all kinds of handling facilities.

Most ranchers build the corridor first and little by little add fancy facilities inside. When you build, *always* look ahead and leave space for all future needs.



CELL CENTER FOR SHEEP



CELL CENTER FOR COWS

Conclusions

The main reason for building fences is *NOT* to divide your ranch from your neighbor's. Fences are mainly to save time and work herding stock. Fences make it possible to make your stock go exactly where you want it to go and stay for the *TIME* you want it to stay according to your plan. You can share any paddock with your neighbor as long as you can agree on the *TIME* each herd will use it. With fenced paddocks you can herd in many different ways depending on the weather, the land and your own needs.

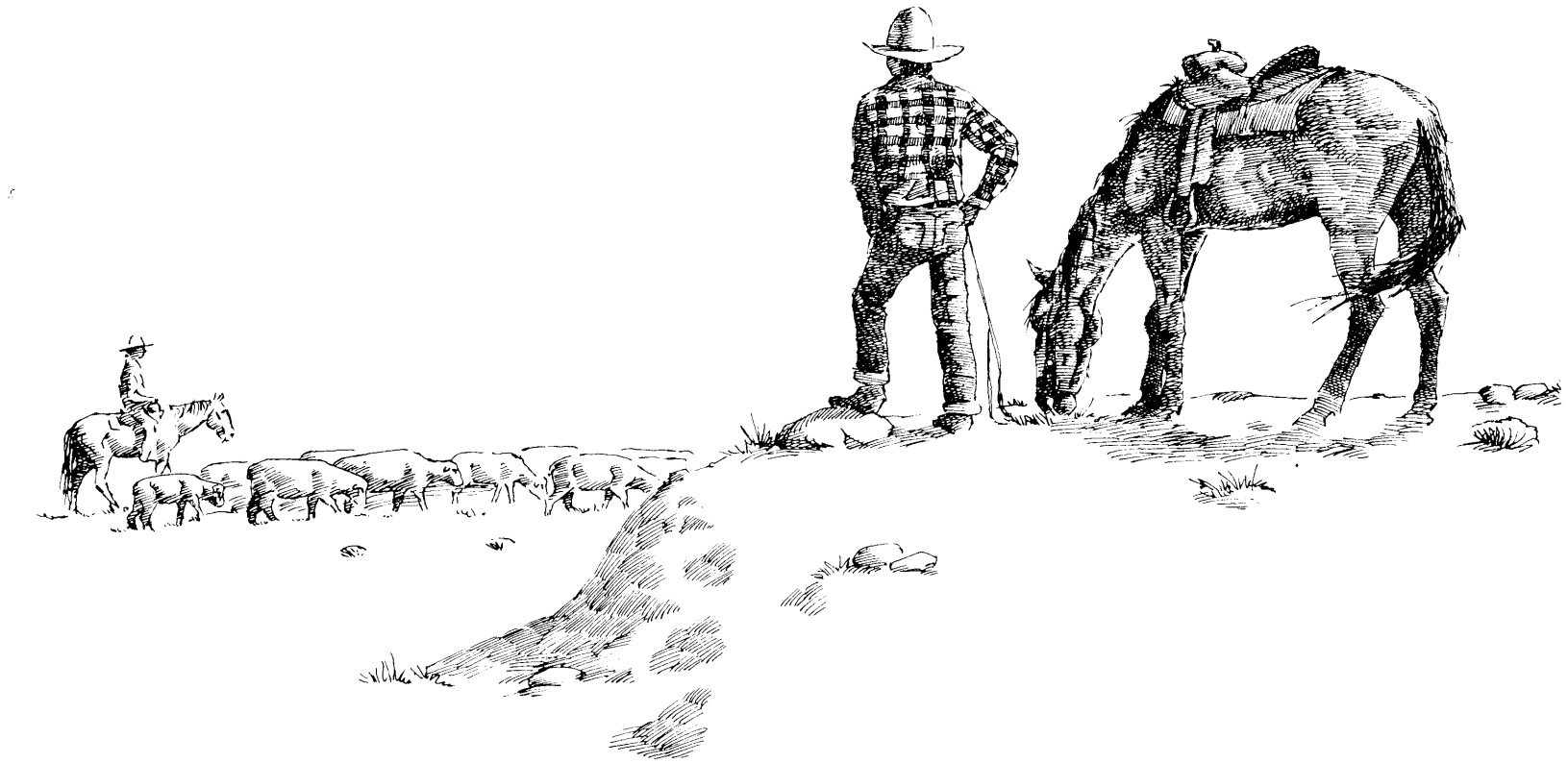
The next chapter will explain how you can measure the things that happen to your land when you change your way of herding, so you can use your land in the best possible way.

KEEPING SCORE

If the Atsitties and Begays use their grazing cells well, they can be sure that the grass will increase. Their ewe sheep will be in good condition, and so will have more lambs and stronger lambs, and so their stock will increase as succession moves forward.

Every year will be different, however. Some of their paddocks will improve more than others. Some summers will be drier than others. Some winters will be wetter. Their herds also will change. They may start running cattle as well as sheep. All of these changes may mean changes in the number of animals they keep, the number of days they spend in each paddock, their plans for winter feed, and many other things. They can be sure to do the right thing if they can measure what is happening to their land.

This chapter will show you how to find out this information and use it.



How Much Do Your Stock Eat?

You measure the food animals take from the range in "sheep-days" and "cattle-days".

Here is the information that you, as a rancher should know about your land:

1. Since some paddocks have better grass than others you need to know how much feed the stock really get out of each acre of land. Then you can change grazing *TIME*s to take less from the poorer land.

2. Too much livestock will not hurt the *LAND* if you give the grass *TIME* to rest, but the *STOCK* will suffer during the winter without extra feed. You need to know in October whether or not the land can feed the stock until spring without help.

3. A new way of herding will always change the succession of plants in some way, but the same things don't happen to every piece of land. You can plan better if you know exactly what is happening to the different kinds of land on your ranch over the years.

If 10 cows spend 10 days in a paddock they take 100 cattle-days of food from that paddock. Five cows in 20 days would also take 100 cattle-days of food.

Five sheep-days are about the same as one cattle-day.

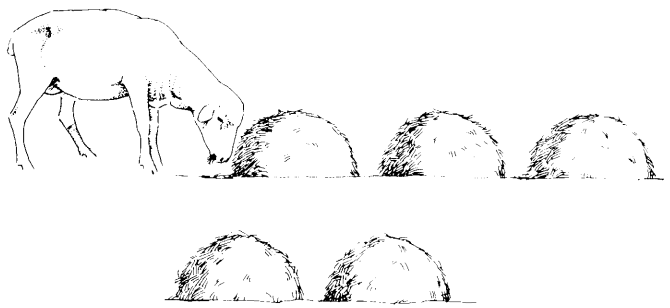
If you want to figure cattle-days and sheep-days more exactly, add lambs, calves, bulls, and rams to your count this way:

Calves = 2/3 cow until weaning.
Lambs = 2/3 ewe from 6 weeks before lambing until weaning.

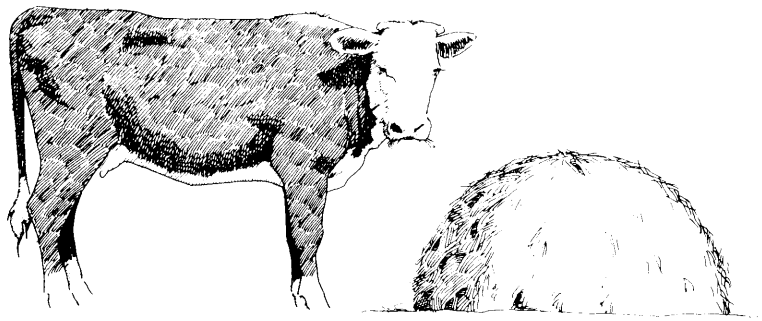
Bulls = 2 cows
Rams = 2 ewes

It is useful to know how many animal-days (sheep-days or cattle-days) your herd takes out of each acre of land in a paddock so you can decide later if you are working that land too hard or too little.

A SHEEP-DAY is the food a grown sheep eats in one day. About 5 Sheep Days = 1 Cattle Day.



A CATTLE-DAY is the food a grown steer eats in one day.



Example

In cell B Paddock #1 is in a very wet canyon, where the plants, the soil, and even the weather is different from the other paddocks in the cell. At the end of the summer the Begays' herd has been in the cell three times for two days each time. They look at the grass and decide that next summer their stock should be able to take twice as much food from that paddock.

BUT, next year their herd may be a little bigger, and they may want to use the paddock at different times.

They need to find out how many sheep-days of food their herd took this year so they can decide what to do next year. You could figure out their problem this way:

There were 200 ewe sheep.

They had 150 lambs in early May.

The lambs were weaned in early September.

The herd was in the canyon May 1-2, July 1-2, and September 12-13.

How many sheep-days did they take from the canyon?

May 1, the 200 ewe sheep (some pregnant, some with lambs) ate the same as 300 ewe sheep without lambs. (2/3 x 150 lambs = 100)

July 1, the ewes and lambs again equalled 300.

September 12, most of the lambs were weaned so the herd equalled 350. (200 ewes + 150 weaned lambs)

The herd stayed two days each time so the number of sheep-days for the season was:

2 x 300 = 600 sheep days
2 x 300 = 600 sheep days
2 x 350 = 700 sheep days

TOTAL 1,900 sheep days

There were only 50 acres in the paddock so the herd took 38 sheep-days of food off each acre. (1,900 sheep-days ÷ 50 acres)

Animal-days per acre = number of animals x days ÷ acres

Measuring Winter Feed

In the winter time, when grass is not growing, you do not have to worry about the time the stock spend in each paddock. It is good to keep them together in a tight herd, because they help the soil more that way, but you do not have to worry about giving the plants rest, when the plants aren't growing.

BUT, when plants stop growing, the food supply starts going down. If you walk across your land after the first freezing night in fall, you will see *ALL* the food your stock will get until spring, unless you plan to buy feed for them.

Is it enough?

If your herd runs out of food before spring, then *ALL* the animals will go hungry. Some may weaken and die of disease. Others will lose lambs. Others will not escape the coyote. You may have to sell off thin animals at low prices to buy enough hay to save the rest.

If you know about how many animal-days of food your land can supply, then you can sell off a few animals in the fall while they are still fat and be sure that the rest will make it through the winter.

Example

Both the Atsitties and Begays have a stocking rate of about 1:20. That means they have 20 acres for every sheep. Since there are no lambs to account for during the winter, you can use that number.

Grass does not grow for about 6 months from mid October to mid April. That is about 180 days.

That means each 20 acres has to supply 180 sheep-days of food during the winter.

180 sheep-days ÷ 20 acres = 9 sheep-days per acre.

1/9th acre must be able to feed one sheep for one day.

All the Atsitties and Begays have to do is look at samples of their land and see if one sheep could eat for one day on 1/9th acre.

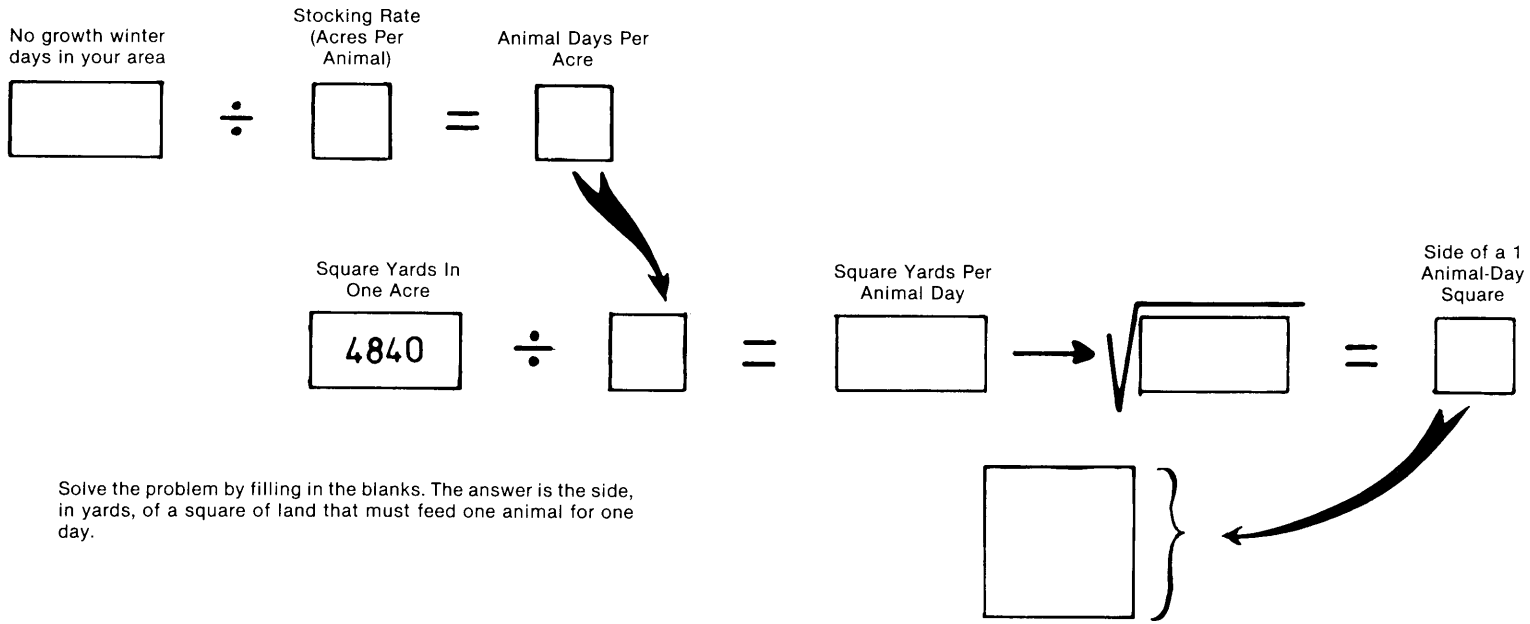
An acre is 4840 square yards.

1/9th acre = 4840 ÷ 9 = 538 square yards.

The square root button on a pocket calculator will quickly tell you that 538 square yards is 23 yards along each side.

With that knowledge any herder who knows his sheep can go out on the land, step off a 23 yard square, and decide if enough grass grows there to feed a sheep for a day. Of course it's a good idea to remember that wildlife, wandering horses, etc., also take some feed.

As an exercise, figure out the size square you would need for a stocking rate of 1:30, 1:10, 1:40, etc., for 180 days of winter.



Solve the problem by filling in the blanks. The answer is the side, in yards, of a square of land that must feed one animal for one day.

Example

You can also work the same problem the other way to find out what stocking rate you *can* have through the winter.

After a very dry summer suppose Mr. Atsitty decides that a 23 yard square is not big enough to feed one sheep for one day. He looks again and decides that the square has to be at least 35 yards on each side. How much stock must he sell to make sure he can get through the winter? (Or how many stock days worth of feed must he buy?)

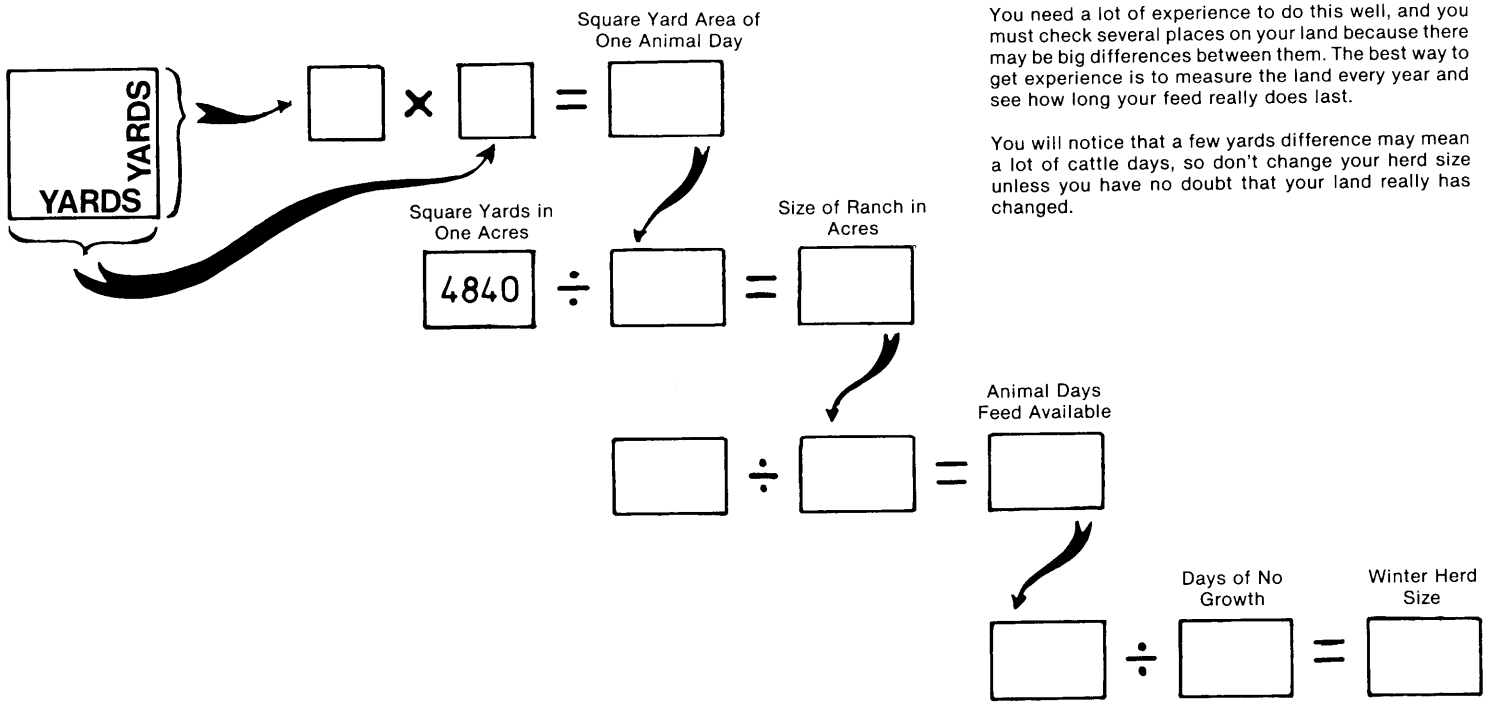
35 yd. x 35 yd. = 1,225 sq. yd.

One acre (4840 sq. yd.) would give 4 sheep-days of food. (4840 ÷ 1224 = 3.95)

A 4000 acre ranch would give 16,000 sheep-days of food. (4 sheep-days per acre x 4000 acres = 16,000 sheep-days)

16,000 sheep-days will feed only 89 sheep for 180 days. (16,000 ÷ 180 = 88.8)

If the Atsitty herd is 200 head at that time, and the Atsitties decide to keep them all through the winter, they will run out of food on the range in about 80 days (16,000 ÷ 200 = 80). Then *all* their sheep will start thinning out, or the Atsitties will have to buy food for them.



You need a lot of experience to do this well, and you must check several places on your land because there may be big differences between them. The best way to get experience is to measure the land every year and see how long your feed really does last.

You will notice that a few yards difference may mean a lot of cattle days, so don't change your herd size unless you have no doubt that your land really has changed.

Measuring the winter feed on the land can help in other ways also. Suppose the Atsitties and Begays decide they would like to have their stock close to home during the winter and early spring. They can measure the sheep-days of feed available in the A-B cell on top of the mesa, and plan to use it all early in the winter, then move their herds to the A and B cells.

Exercise

For practice in figuring what *stocking rate* your land can carry through the winter. See what it would be if:

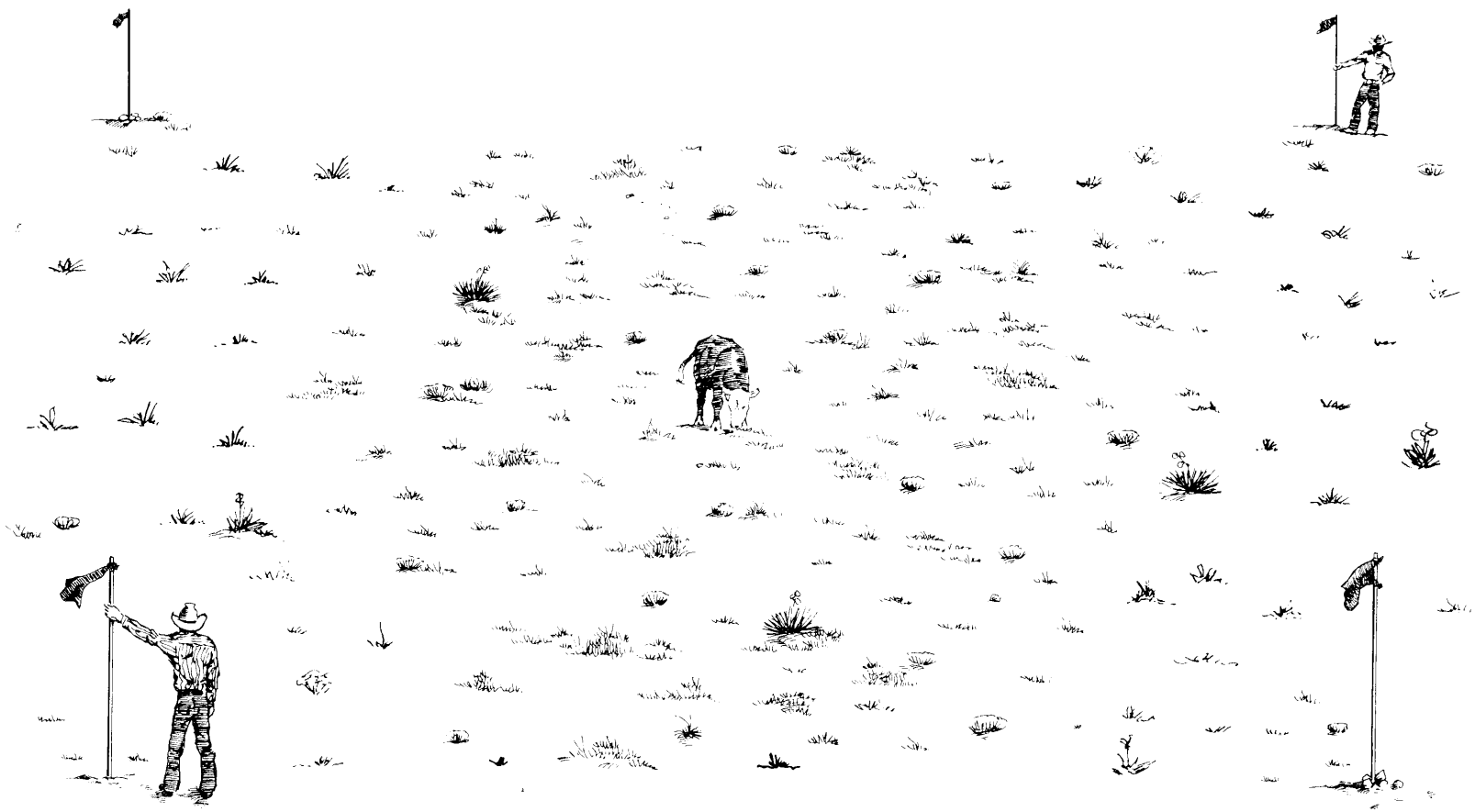
A sheep could eat for a day in a 15 yd. x 15 yd. area.

A sheep could eat for a day in a 30 yd. x 30 yd. area.

A cow could eat for a day in a 45 yd. x 45 yd. area.

Remember: an acre is 4840 sq. yd.
One cattle-day is 5 sheep-days.

If you have 6,000 acres, how many sheep or *cattle* could you keep in each case?



Measuring Changes

If you are running your ranch well, succession should go forward. This may show in many ways. Here are three that are easy to measure:

Exercise

1. There should be less bare ground. Living plants or the sticks and leaves from last year's growing should cover more and more ground.
2. There should be more different kinds of plants growing.
3. Perennial grasses (grass that grows from its old roots every year NOT from a new seed) should be a bigger share of all the plant life.

Here is a way to measure what kind of range you have[1]. By measuring at the same places year after year, you can tell what is happening to your land. It is also useful to measure different pieces of land so that you can really tell how one place is different from another. You will find that many areas you thought were almost the same are really quite different.

You will need:

1. A light wooden frame 1 ft. x 2 ft.
2. A form like the one shown (in the appendix) for each place you measure.
3. A way to mark clearly the places that you measure so you can find the same place next year. (You will measure the plants along a straight line, so two posts that show the starting place and the direction of the line will work well.)

To take your measurements, take your wooden frame and walk along your test line. Every five paces, stop and put down the frame with the center mark against the toe of your right foot.

You have to do this 100 times in a straight line. Each time, mark your score sheet according to the things you find in the frame:

FIRST look at the *back left corner* of the frame, and see what the point of the corner touches. Is it...

Bare ground
Rock (bigger than 1/2 inch)
Litter (dead plant leaves, etc.)
Live plants (the stems of grass or bushes)

Put a mark in the right space. After 100 frames you will have 100 marks in the four different spaces, and you will know what percent of your ground is bare ground, rock, litter or live plants.

SECOND try to identify all the different kinds of plants in the frame. As you find new kinds of plants, decide if they are trees or bushes, perennial grasses, perennial weeds, or annual plants of any kind.

Write the names of the plant if you know them. If you don't, just write "bush #1, weed #3, etc." and pick a sample so you can recognize the same plant if you find it in another frame.

You *don't* have to count all the plants in the frame, just write down each different kind of plant. Each time you find that plant in a frame, mark the space. After 100 frames you will know how many times you found each different kind of plant in a frame. You will also know the main plants that are feeding your stock.

[1]This way of measuring was developed by Christoper D. Allison, Extension Range Management Specialist at New Mexico State University.

Here is an example of a completed list.

RANGE CONDITION

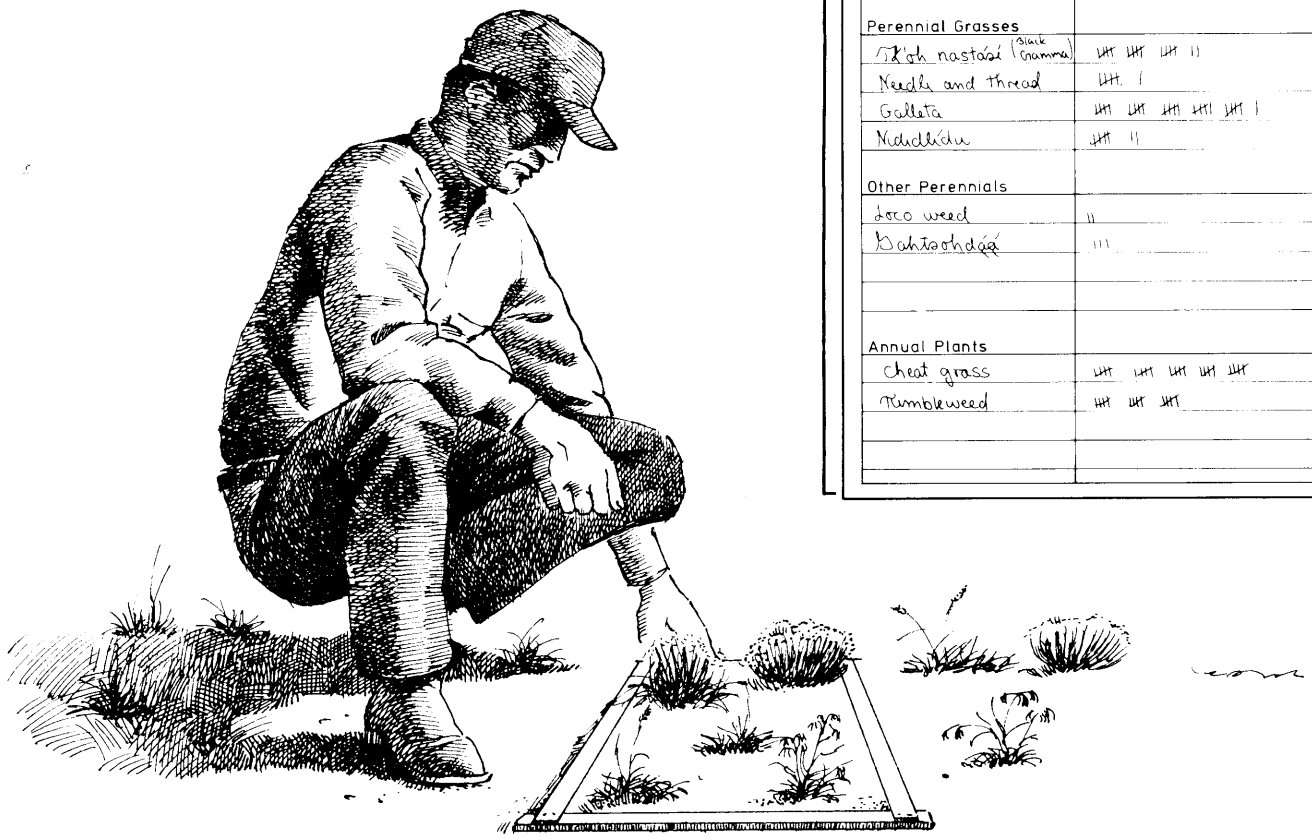
PLACE: Paddock #3 North from junked pickup truck DATE Aug 29'83

COMMENTS: Paddock had 23 cattle dung/pats on it since March 15 Summer rain was better than usual

Frame Corner Touches:	Point Tally	Total	%
Bare Ground	𝍸 𝍸 𝍸 𝍸 𝍸 ||||	29	29
Rock(½in or more)	|||	3	3
Litter	𝍸 𝍸 𝍸 𝍸	20	20
Live Plants	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 ||||	48	48
Bushes & Woody Plants	**Found in Frame**	**Total**	**%**
Snake weed	𝍸 𝍸 𝍸 𝍸 ||	22	22
Rabbit Brush	𝍸 𝍸 ||	12	12
Dwarf Mistletoe	||||	4	4
Perennial Grasses			
Blue gramma (Black gramma)	𝍸 𝍸 𝍸 ||	17	17
Needle and thread	𝍸 |	6	6
Galleta	𝍸 𝍸 𝍸 𝍸 |	26	26
Needlegrass	𝍸 ||	7	7
Other Perennials			
Loco weed	||	2	2
Dandelion	|||	3	3
Annual Plants			
Cheat grass	𝍸 𝍸 𝍸 𝍸 𝍸	25	25
Tumbleweed	𝍸 𝍸 𝍸	15	15

This part shows what the back left corner of the frame touched each time in 100 tests. The corner touched bare ground 29% of the time. Live plants cover about 48%.

This part shows the kinds of plants and which ones are most common. Galleta grass and cheat grass show in more frames than any other plants, snakeweed is also doing well.



PEOPLE AND SUCCESSION

In the good old days of the great herds and the rich life, the Navajo Nation was both wealthy and strong, because we could live well on our own land and usually had enough to trade for things we could not make or grow.

Life was simpler then. We needed less. No one thought of cars or televisions or houses with light, heat, and telephones, but we were rich, because we begged for nothing. Work was hard, but the land fed us. There was even *a little left over,* so there could be feasting at ceremonies, so that people could take time to learn songs and travel among their relatives.

The little bit left over is the key to the future. The little bit of top soil left over gives new seeds a chance to start. A little bit of grass left over gives a new animal a chance to find a home and raise its young. The little bit left over gives you a chance to go to a show or buy something you need. With the little bits left over you can help others, feed visitors, and improve the world around you. By the little bits left over you grow and change. That is succession moving forward.

In Navajo Country, however, succession has gone backwards for a long time. We forget that the old way of life meant getting that little bit left over from our own land. Young people who have never seen the grass growing no longer believe it can ever grow. People who have never seen fine herds of sheep or cattle, can't imagine that livestock can ever supply their needs or anything at all left over.

And so, to make a living, we look away from our land. We leave home and wander the towns and cities of the West looking for work, or try to get Washington to spend money on the reservation. We sell the coal, oil, and uranium from our land, even though we know that is a little bit like selling the land itself, because there will never be any more. In the end, if we keep looking away from our land, it will no longer be our home, and we will lose it.

To hold our place on this land we have to *believe* that it can give us a little bit left over that will be our share, and we have to work to make that happen. We must think of ourselves as part of succession and have confidence in our own ability to make a living from our own land as our grandparents did.

The earlier chapters have talked about things we can do to make the land itself richer. This chapter will talk about ways to use that little bit left over that we will get from better land.

Starvation and the Law of Limitation

Very few people or animals in the world ever die of starvation. In Navajo Country, even after the driest summers and the coldest winters, very few animals actually starve to death.

In the story of the horses dying at the beginning of this book, the people were told, "The problem is starvation!" But the people did not believe it, because many of the horses in the area did not starve, some even looked quite fat. Some sheep did get thin during the winter, but others survived very well.

The people of course were right. Starvation did not kill any horses. Most of the horses died of loco weed or stopped eating because of sore mouths or worms or a dozen other problems. Many of these problems might have happened because there wasn't enough good grass, but in fact most of the horses and other livestock did survive the winter. The problem was not starvation itself. Most animals did find enough food to survive, but *THERE WAS NOTHING LEFT OVER!!*

At the end of the following summer people counted up the horses and discovered that new colts just about made up for the ones that had died, *BUT THERE WERE NO EXTRA HORSES LEFT OVER* for people to use, sell, or give to their children.

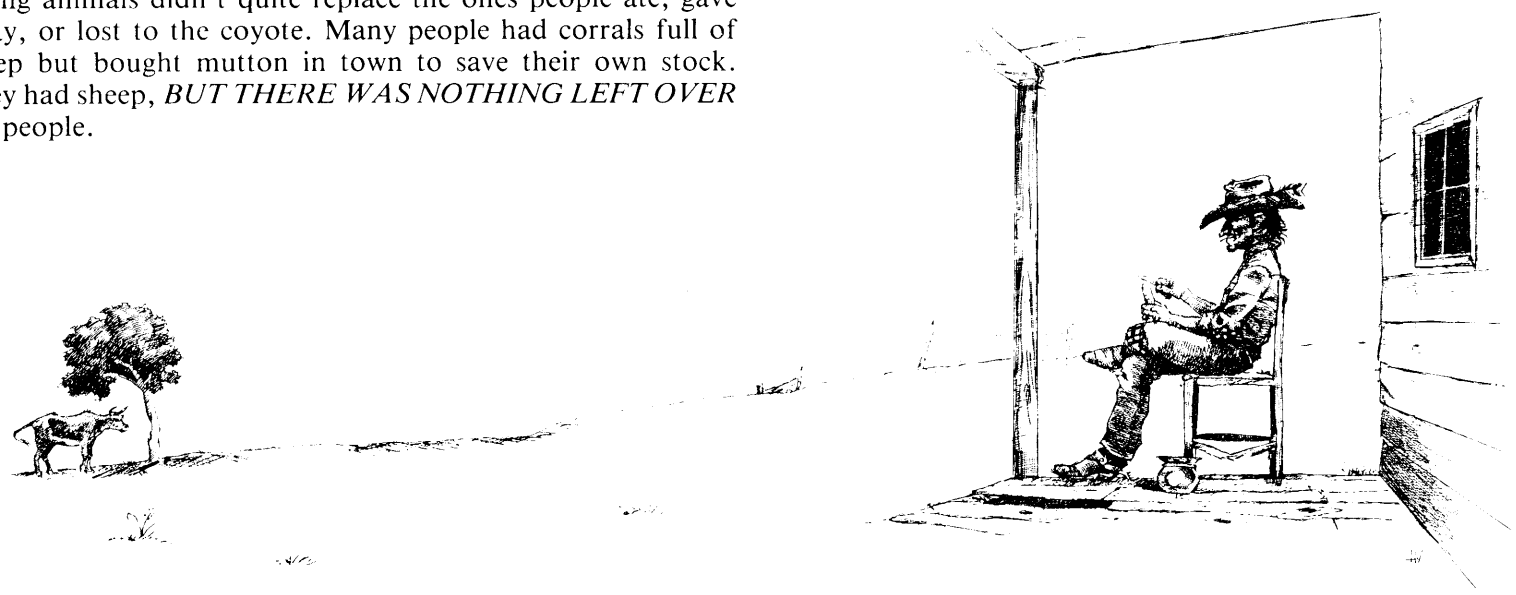
The same thing was true for the sheep, goats, and cattle. The young animals didn't quite replace the ones people ate, gave away, or lost to the coyote. Many people had corrals full of sheep but bought mutton in town to save their own stock. They had sheep, *BUT THERE WAS NOTHING LEFT OVER* for people.

You as a rancher usually don't have to worry much about your *livestock* starving, but *you yourself* will starve, if your herd does not raise healthy young animals for any reason. You as a person are on the top step of succession, and you depend on something left over from the animals and plants below you.

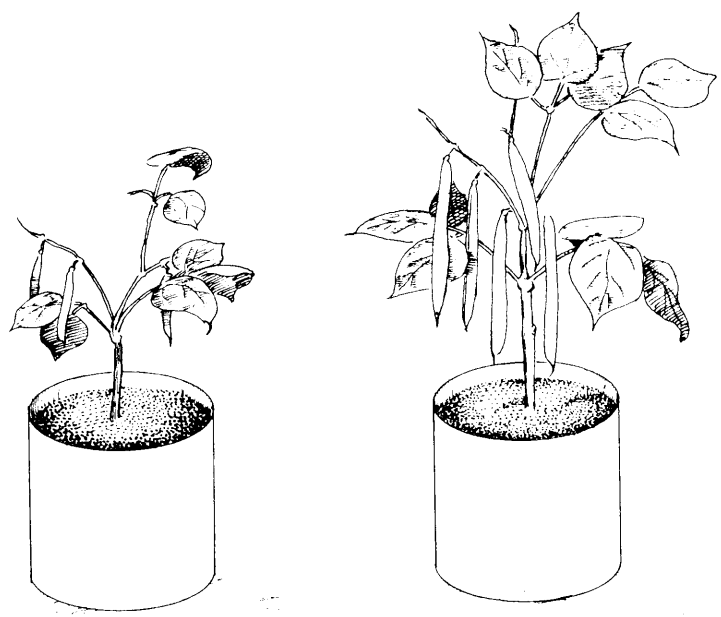
This is the "Law of Limitation" that is true for all living things: *When food, water, or heat cannot increase, growth must stop.*

You can see this law at work all around you. Among animals also, a limited food supply hardly ever kills healthy adults. It just means that the next generation will be very small. Some animals, such as rats and mice, will even eat their own children when food runs short.

You as a rancher usually don't have to worry much about your *livestock* starving, but *you yourself* will starve, if your herd does not raise healthy young animals for any reason. *You cannot live from your livestock by just keeping them alive.*



Observation



Plant beans in two pots, use sand in one pot, good soil in the other. After both have grown for six or eight weeks look at the plants. Both plants are probably still alive, but which will give you any beans to eat?

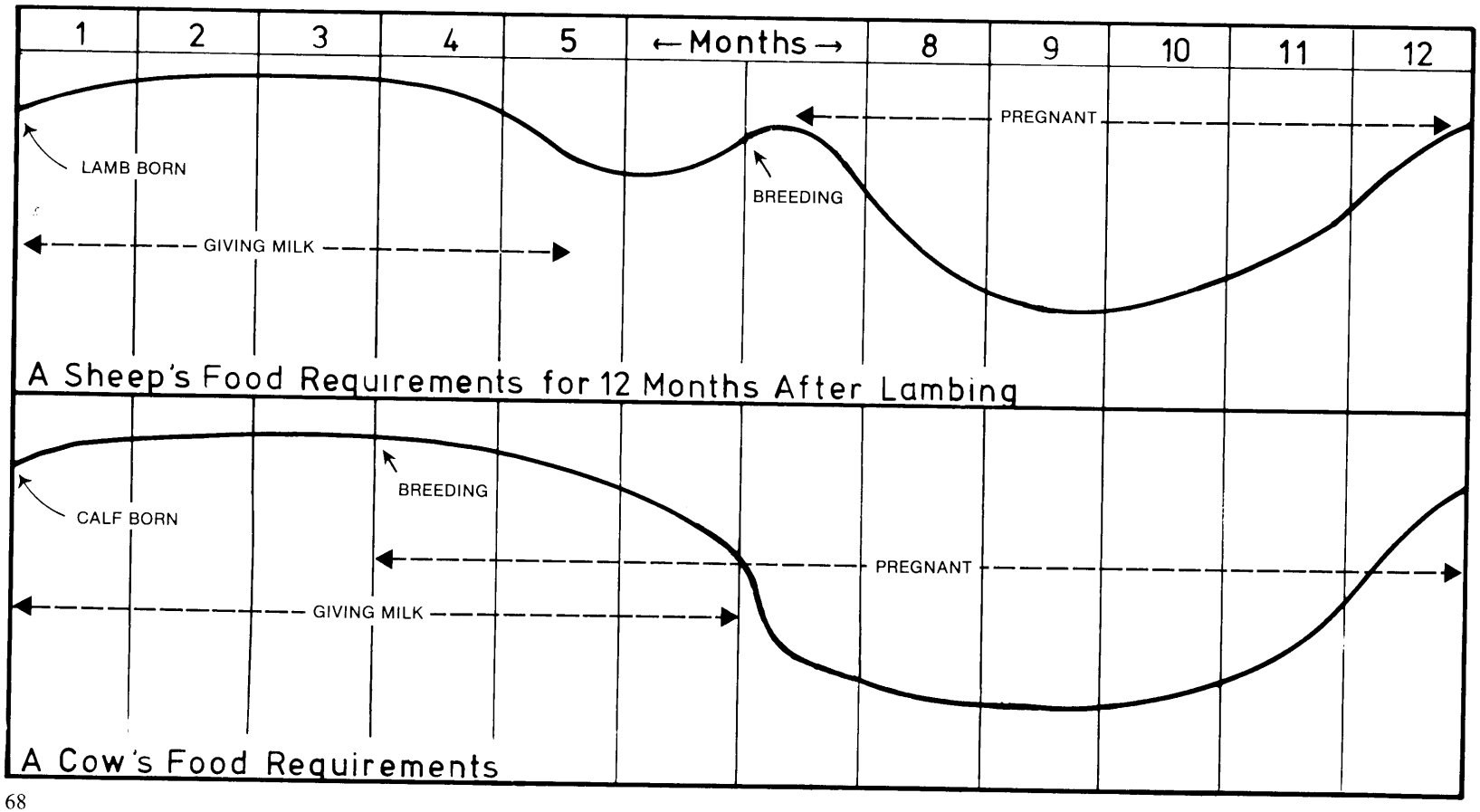
Look at a cornfield. Where soil or water is poor, what has happened to the corn? Very likely the plants are alive, but look closely at their size and the ears growing on them. How much is left over for you?

Nutrition and the Seasons

By the Law of Limitation your stock will not have enough young, if they don't get enough to eat. The land, however, supplies more food in some seasons than in others, and luckily, your herd also needs more food in some seasons than in others.

As a rancher, you can do much better if you can make sure your herd needs the extra food when the food is there. you can do this by making sure that the young are born at the right time. To do this you have these things to think about:

1. All animals need especially good nutrition in order to get pregnant.
2. All animals need extra nutrition as soon as they start giving milk.
3. Sheep and goats also need some extra nutrition a few weeks before giving birth.
4. It takes 9 months for a cow to have a calf.
5. It takes 5 1/2 months for a sheep to have a lamb.
6. A calf on the range will need milk for about 6 months.
7. A sheep will need milk for about 4 1/2 months.

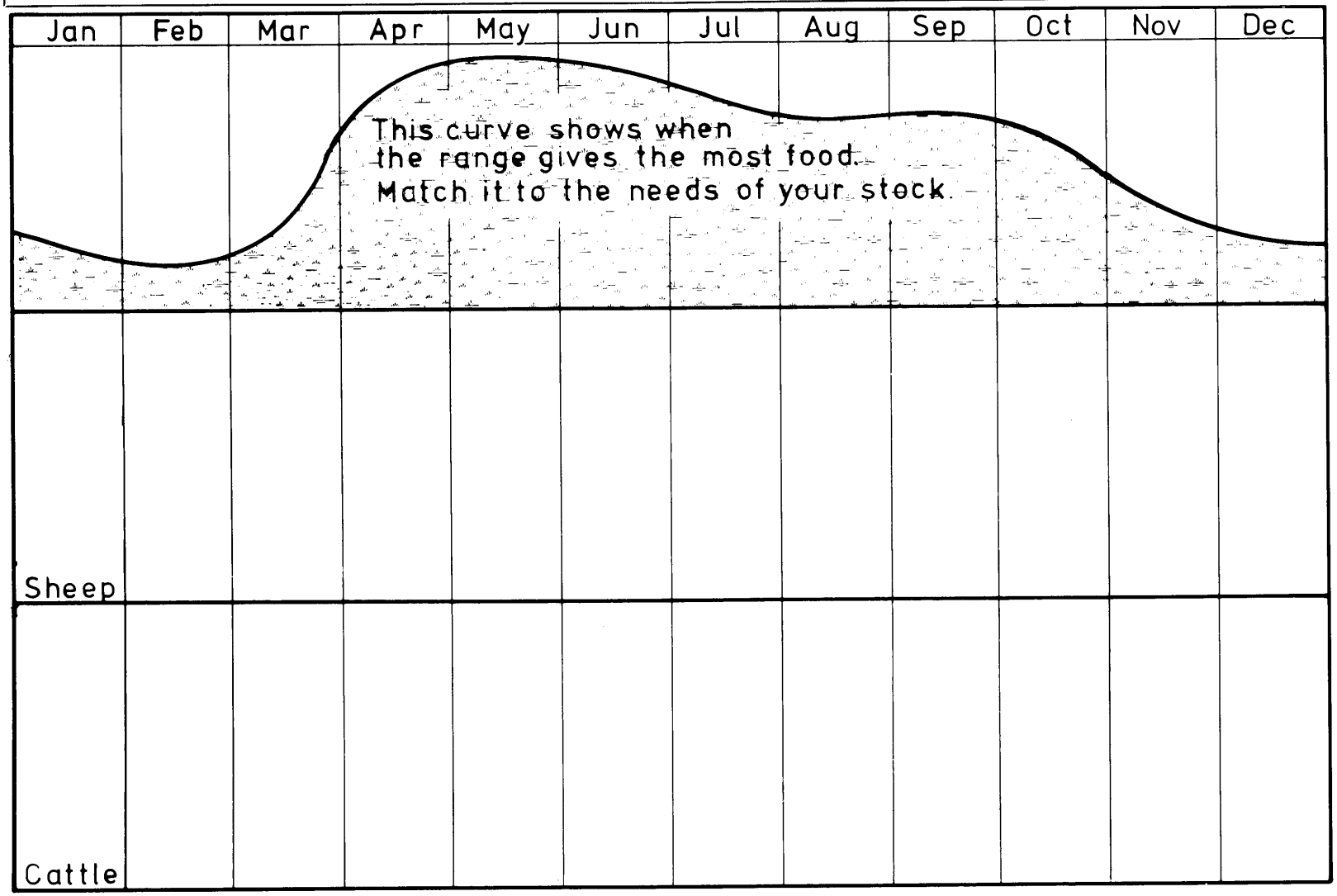


Exercise

Here are two charts that show the months of the year. One is for sheep and goats, the other is for cattle. Mark the times on each chart when you would like your calves or lambs to be born. Then mark the times you must put the bulls and rams into your herd. Last, mark the time you would wean the calves from milk.

Ask people in your area what they do and why.

How much do people disagree?



Culling and Selling

If your herd gets enough to eat, and luck is with you, all your female animals will give birth, and your herds will about double in size every summer. This is the "little bit left over" that you can live on. What do you do with the extra stock? You can:

1. Keep it to make your herd bigger.
2. Use it for your own food.
3. Sell it or trade it.

To decide what to do, you will have to know three things:

1. How much food can your range supply through the winter?
2. How much meat or money do you need yourself?
3. How can you improve your herd by keeping some animals and getting rid of others?

To understand the problem, here is an example of what the Atsitty family did with their herd of 200 ewes. Before they started using grazing cells to help give their land some rest, they hardly got enough lambs each year to keep their herd at 200. There was very little left over to supply mutton during the year, and the only money they got from their livestock came from the wool. Two years after they started using the grazing cells, their land had improved quite a bit. They still had 200 ewes, but they now had room for some more stock.

The Atsitty Family made this chart as they planned to get their share of the new grass on their land. The chart shows everything they hope to do with their sheep herd during the year, how much food their land will have to supply, and how much meat and money they hope to have for the coming year.

The top line shows the schedule for lambing, shearing, weaning, and putting the rams back with the ewes in the fall.

The next line shows the number of ewes. They kept 200 during the whole year, but notice that in September, they marked 40 that they would use for meat in the coming year.

The third line shows 40 ewes that they had kept from the last year's lambs. These are put with the breeding herd in September to replace the sheep they have set aside for meat. Forty more of the best ewes from this year's lambs will be kept for next year. In this way they can slowly improve the herd.

The fourth line shows the ewes they still keep for meat or to give away in the fall for ceremonies, etc.

The fifth line shows the lambs they mean to sell.

Last come the rams. They keep a ram for every 25 ewes in the breeding herd and replace them every two years with good quality rams from other stock.

At the bottom they have figured out the number of sheep-days of food their herd will need each month (Rams = 2 sheep. Lambs = 2/3 sheep from six weeks before birth until weaning.)

The time when grass will not be growing are marked and the times they expect to feed hay or grain to make sure they get a lot of healthy lambs.

Last they figured out how to measure the land for winter feed and the income they expect from their lamb and wool sales.

As you can see the sheep will take 11 sheep-days of food per acre through the winter. This is more than in the old days when 200 ewe sheep had fewer lambs. Then each acre of land only fed a sheep for 9 days.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MAJOR EVENTS		Unborn Lambs		Lambs born	Shearing				Weaning	RAMS		
EWES	200	200	200 (200)	200 (200)	200 (200	200 (200)	200 (200)	200 (200)	200 (200)	200	200	200
REPLACE-MENTS	40	40	40	40	40	40	40	40	40	40	40	40
FOR MEAT	18	16	14	12	10	8	6	4	2	40	30	20
TO SALE								Buy 4 rams		60 ewe lambs 100 wethers	sell 4 rams	4
RAMS	4	4	4	4	4	4	4	4	4	8	8	4
TOTAL (rams x 2 lambs x)	266 ×31	264 ×29	395 ×31	393 ×30	391 ×31	389 ×30	387 ×31	385 ×31	383 ×31	296 ×31	286 ×30	268 ×31
SHEEP DAYS	8,246	7656	12245	11,790	12121	11,670	11997	11,935	11,873	9176	8580	8308
RANGE	No Grass Growing				Grass	Growing					No Growth	
EXTRA FEED		Hay Grain Vitamins								Alfalfa		

WINTER FEED	
½ Oct	4,588
Nov	8,580
Dec	8,308
Jan	8,246
Feb	7,656
½ Mar	6,123
Total	43,501

Sheep Days

÷ 4,000 (acre) =

INCOME ESTIMATES							
	animals	×	lbs. animal	×	$ lb.	=	
Wool	256	×	11 lbs	×	$0.40	=	$1,126
Lambs	160	×	90	×	$ .45	=	6,480
Culls*	40	x	150	x	.30	=	1,800

Total Income	9,406
Less Expenses	1,100
Profit	8,306

one acre 4840 yd.² ÷ 11 (animal days per acre) = 440 → $\sqrt{440}$ = 21yd

Side of square that must feed one animal for one day.

*This family kept the cull sheep for meat worth $1,800

The amount of food taken from the land during the summer is also much greater because of the large number of lambs.

If the Atsitties and Begays run their ranches well, the land will improve, and their herds will grow. More animals will not hurt the land in any way. As long as there is enough food to feed their stock through the winter, they do not have to worry.

In fact many ranchers have seen their grass improve faster than their herd own could grow. They made a little extra money by keeping animals for other people. The extra animals actually helped their land improve faster.

Only a very, very dry year will slow down the improvement, and even then, the problem will not show up until winter. If a rancher knows his land and measures the animal-days per acre carefully, he will be prepared, and will buy hay while it is still cheap or sell animals while they are still fat.

Exercise

Start with the plan on the last page and decide how you would double your livestock by keeping more ewes each year. If you had 400 breeding ewe sheep, how many stock days per acre would get your herd through the winter?

How much income would you get before expenses?

Suppose a terrible drought came along, and you figured you only had 9 stock days per acre of winter feed. What would you do?

Make a plan for a breeding herd of 40 cows using the chart in the appendix, and plan how you would double this herd in 6 years.

WHAT CAN WE HOPE FOR?

At the beginning of this book an old lady called Laughing Woman looked out from her hogan door at empty land baking in the sun and scolded you. "Who thinks about the sheep? There is no one. They just want to go forward. They just get in their car, and zoom. Off they go. Who cares anymore..."

Many older people say these things, but you do care. You watch the land as you zoom through Navajo Country in your car. You notice that the plants change as you pass a corral. You look for signs of plants that once were there, but now have gone. You see which young plants have started to grow. Does the soil look good? Are the animals fat — cows, goats, sheep, or horses? Do the people look rich or poor?

Most of what you see will not make you happy. Nearly everywhere the succession of plants and animals goes down year by year. And that is why so many young people must leave behind dust and mud, wind and flood, tumbleweed and snakeweed of Navajo Country to find work elsewhere.

However, the poor land that others leave behind can become the rich land that feeds your family. You can't find new, fresh land and take it, but you *can* find old, tired land and make it young.

In that way you can make a place for yourself where nothing existed before. You don't have to wait for rain. You don't have to rest the land for years and hope that the grass comes back. You and your stock can go to work at once. By the laws of Earth and Sky, succession will go forward if you give it a chance.

History, also, is on our side. The land has often suffered most where water and soil are best. That means your work may turn the worst land into the best land again.

You will do nothing, of course, unless your family, your neighbors, and your community agree. But they will agree if you can share your strength and knowledge. People only become stingy and mean when they fear losing something. When land becomes poor, everyone loses, and everyone fears his neighbor.

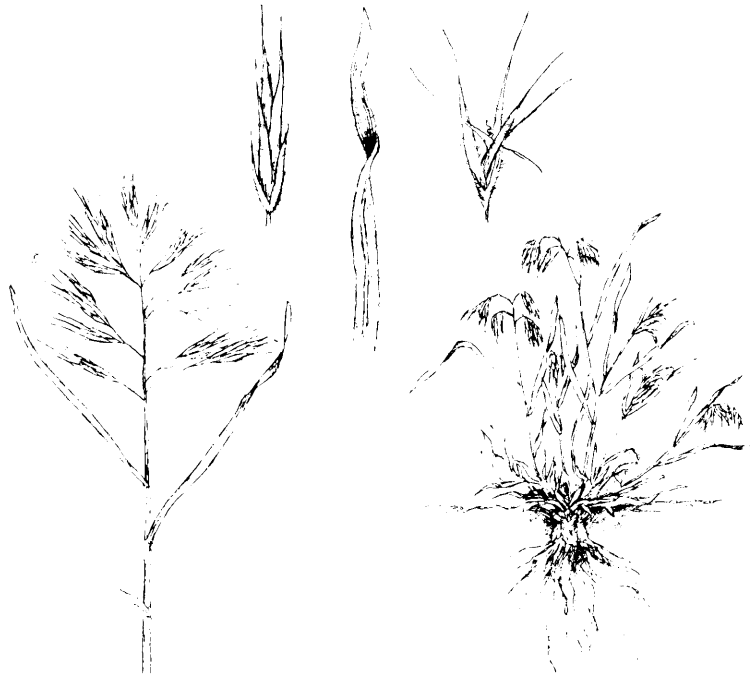
When horses are dying everywhere, you can't say to your neighbor or your brother or other relatives, "Give me land so I may become rich." But you can say to them, "Let's work together. We can double our herds."

That is how you must think as you zoom through Navajo Country. The land is old, but the land is good. If we give it a chance, it will bless us and our children forever.

APPENDIX I

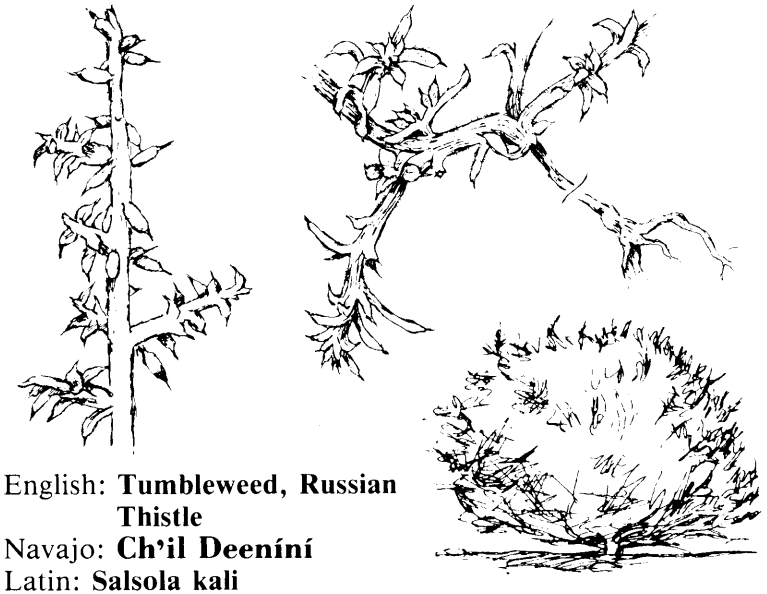
Some Common Range Plants of Navajo Country

ANNUALS



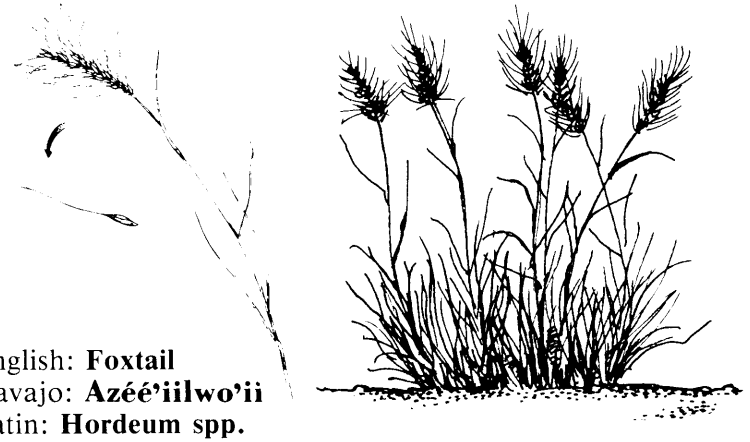
English: **Cheat Grass**
Navajo: **Shį Yináldzidí**
Latin: **Bromus tectorum**

This grows everywhere in Navajo Country. It starts very early in the spring and is good feed until June when it turns *purple* and grows very sharp black seeds that can hurt livestock. It was imported from Europe.



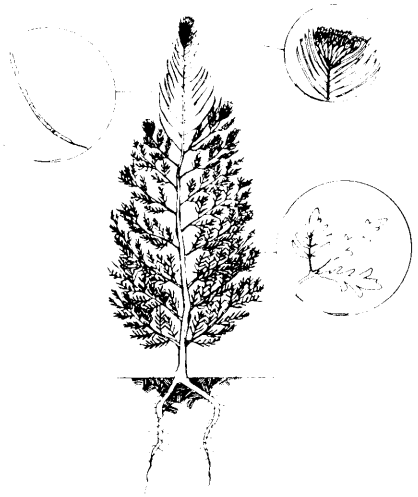
English: **Tumbleweed, Russian Thistle**
Navajo: **Ch'il Deeníní**
Latin: **Salsola kali**

Everyone knows this one. It is very nutritious feed as long as it is tender, although livestock will usually eat more grass if they can. In many overgrazed areas, however, stock would not live though without tumbleweed. Old, damp tumbleweed is not good feed, but it's better than nothing.



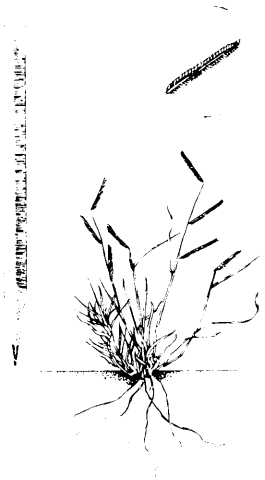
English: **Foxtail**
Navajo: **Azéé'iilwo'ii**
Latin: **Hordeum spp.**

There are several kinds of foxtail, some perennial. All are related to barley. These grasses make good feed when young and tender, but the sharp seeds with four long points ("awns") are a real nuisance and get struck in lips, ears, eyes, and wool of livestock, often causing bad infections.



English: **Mustard**
Navajo: **Ostse'**
Latin: **Brassica spp.**

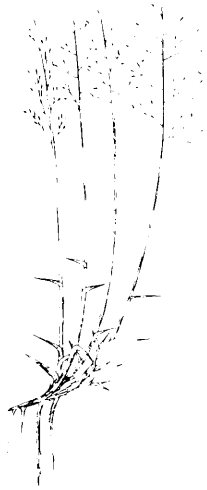
These plants grow early in spring and are dry by June first. People use the yellow seeds for food. Mustard often makes an area look beautiful and green in April and May, but they are not important livestock feed.



English: **Six weeks gramma**
Navajo: **Tł'oh Nástasíshchíín**
Latin: **Bouteloua barbata**

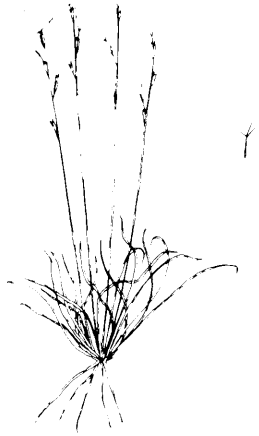
These tiny plants carry seeds like perennial grasses, but they are very small, short lived, and not much use to livestock. Sometimes you find them among greasewoods where no other grasses grow.

PERENNIAL GRASSES



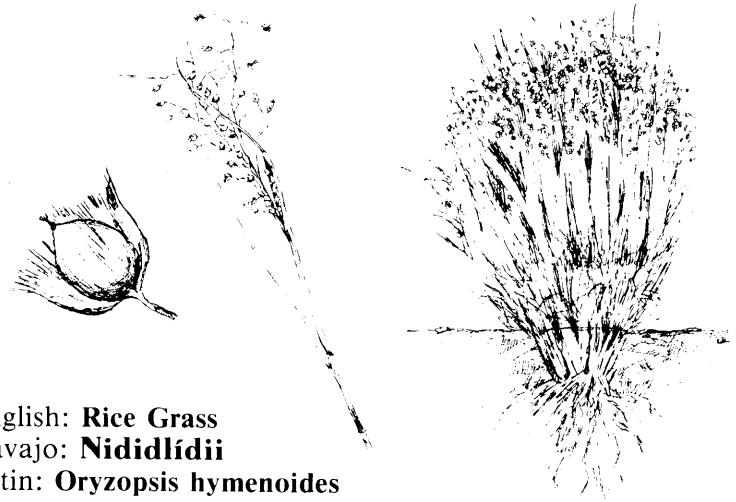
English: **Muhly**
(Spiny Muhly is most common)
Navajo: **Bé'ézhóó'**
Latin: **Muhlenbergia**
(Pungens and other species)

Spiny muhly is a low succession grass that often covers wide areas of overgrazed and over-rested land. It survives by growing sharp leaves that nothing can eat. The Navajo name comes from the hair brushes made from the stalks.



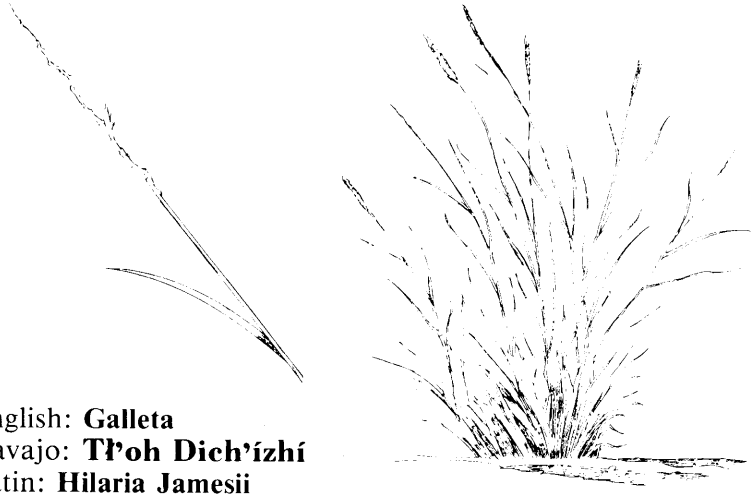
English: **Three Awn**
(Fendler three awn is most common)
Navajo: **Dłǫ́' Bibé'ézhóó'**
Latin: **Aristida**
(Fendleriana and others)

Several kinds of three awns grow. All have very sharp seeds with three long "awns" that stick in your socks and cause problems for livestock. Stock usually don't eat them if they can find anything better. Fendler three awn often grows right next to the pavement of reservation highways.



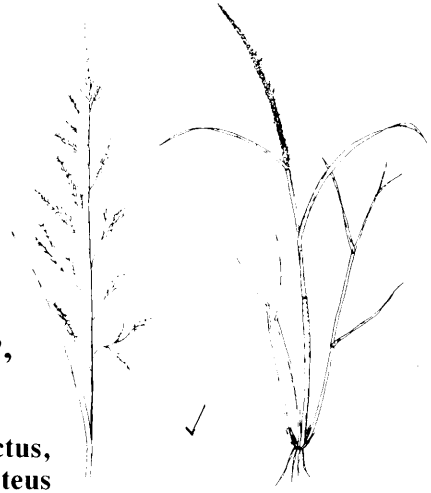
English: **Rice Grass**
Navajo: **Nididlídii**
Latin: **Oryzopsis hymenoides**

This grass looks like no other plant in Navajo country. It holds its seeds in a lacy cloud over its thin, almost round leaves. It is one of the first grasses to grow. It dries out in mid summer, and then grows again in the fall. It is good for livestock, but they will not eat the dried seed stalks. They often make an area look grassy when really there is nothing there to eat.



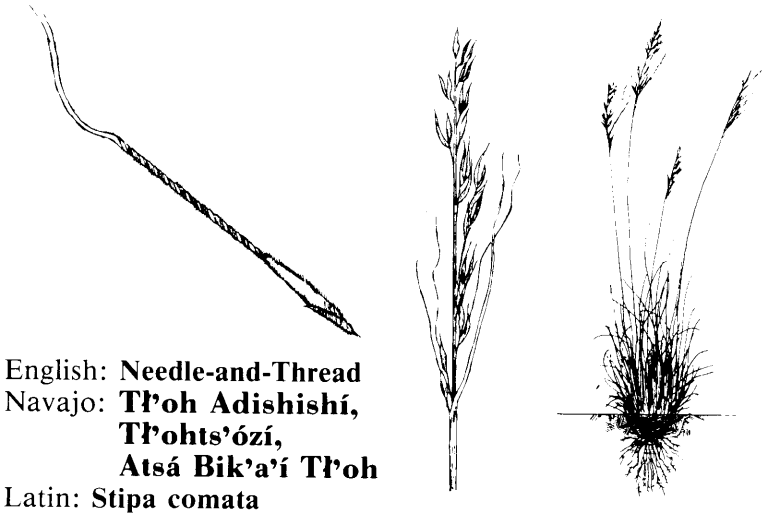
English: **Galleta**
Navajo: **Tł'oh Dich'ízhí**
Latin: **Hilaria Jamesii**

Galleta is one of the most common and important grasses in Navajo country. It is easy to spot, because when the seeds fall they leave a short, stiff stalk with a zig-zag end that usually stays around for the rest of the year.



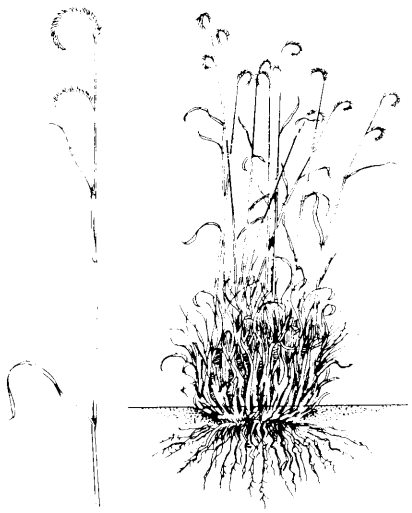
English: **Sand Dropseed,**
Giant Dropseed
Navajo: **Tł'ohtsohzhóó',**
Tł'ohts'ózí,
Tł'oh Yilzólii
Latin: **Sporobolus contractus,**
Cryptandus, Giganteus

Giant dropseed grows very tall (4 feet). Its strong seed stalk is bigger than a pencil, and the seeds run along it in a thin fuzzy head, almost like a cat tail. Sand dropseed looks exactly the same except smaller, though in some varieties (crytandrus) the seed head spreads into a small Christmas tree shape as it dries. Dropseed is good feed but seldom covers wide areas thickly.



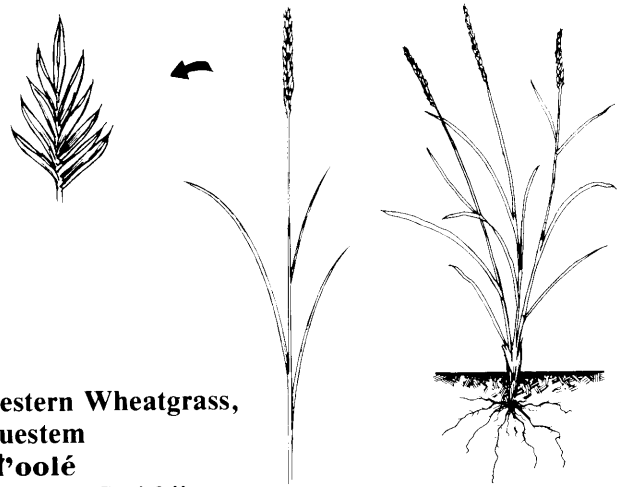
English: **Needle-and-Thread**
Navajo: **Tł'oh Adishishí,**
Tł'ohts'ózí,
Atsá Bik'a'í Tł'oh
Latin: **Stipa comata**

This is the only tall (3 feet) grass you are likely to see in Navajo Country whose leaves *seem* to be taller than any seed stalk. The sharp (like a needle) seeds are often hidden where the leaves join the stalk. Each seed has one very long "awn" (like a thread) attached to it. These long awns give the grass a feathery look.



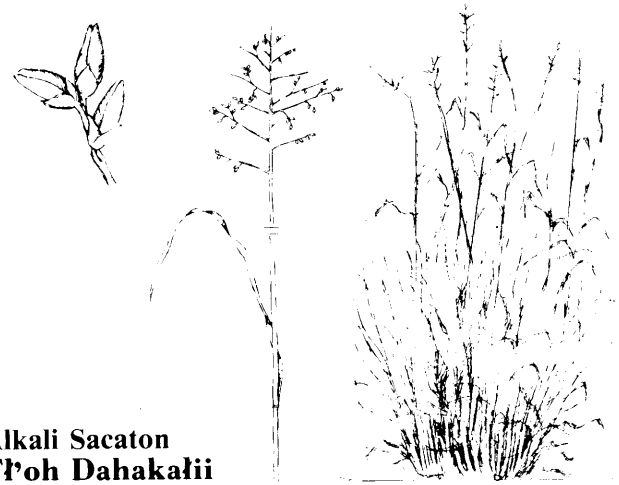
English: **Gramma grass**
(Blue and black)
Navajo: **Tł'óh Nástasí**
Latin: **Bouteloua gracilis,**
Bouteloua eriopoda

Blue gramma is most common in Navajo Country. You can tell it from black gramma because it usually has only two or three seed heads to a stalk. Black gramma has 3 to 8. Also blue gramma seed stalks have a tiny spike that sticks out beyond the last seed head. Both are very good range grasses. There are also other gramma grasses, but these two are most important on the reservation.



English: **Western Wheatgrass,**
Bluestem
Navajo: **Tł'oolé**
Latin: **Agropyron Smithii**

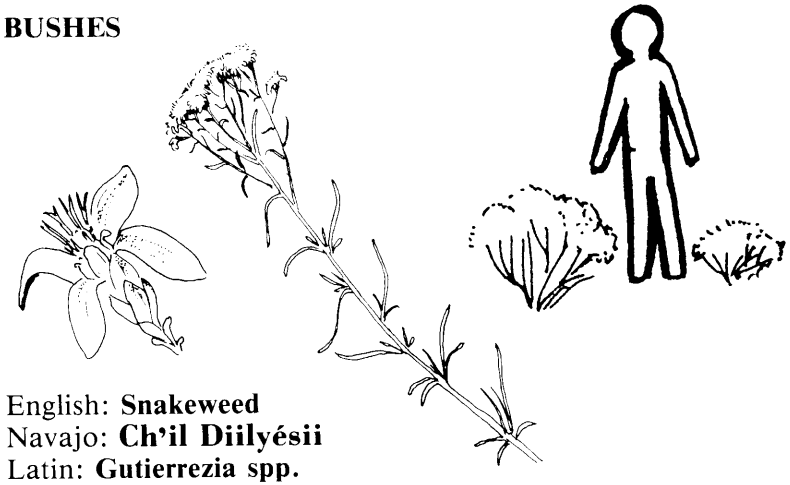
This blue-green grass grows best in the higher parts of Navajo Country. The seed head looks like wheat, which is closely related. It is very nutritious and has disappeared in many overgrazed areas.



English: **Alkali Sacaton**
Navajo: **Tł'oh Dahakałii**
Latin: **Sporobolus Airoides**

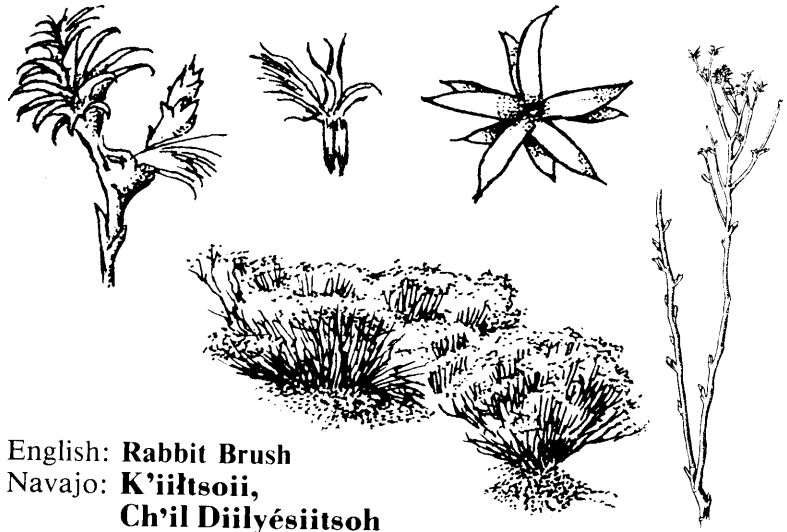
Alkali Sacaton likes salty clay soil, but may be found elsewhere. It grows tall (3 feet) and the strong seed stalk grows a head like a small Christmas tree. It is related to the dropseeds and some of them look just like small alkali sacaton plants.

BUSHES



English: **Snakeweed**
Navajo: **Ch'il Diilyésii**
Latin: **Gutierrezia spp.**

Snakeweed may be the most common plant in Navajo Country. The small round bushes grow nearly everywhere. Most of the summer they are bright yellow with small flowers. Sheep and goats will eat them, but don't like to. They hurt horses and cattle. They may take over overgrazed or over-rested land, and old timers say there used to be far fewer of them.

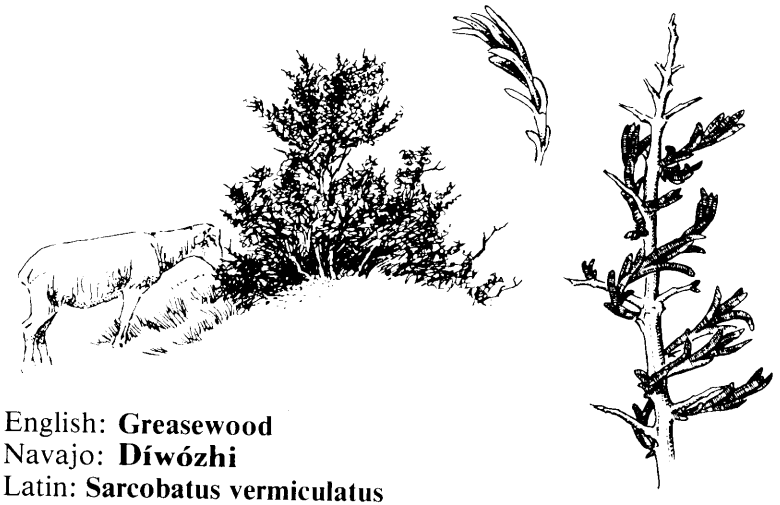


English: **Rabbit Brush**
Navajo: **K'iiłtsoii,**
Ch'il Diilyésiitsoh
Latin: **Chrysothamnus spp.**

This grey-green bush grows in the same areas as snakeweed and for the same reasons. It is a little bigger than greasewood and doesn't have ordinary leaves.

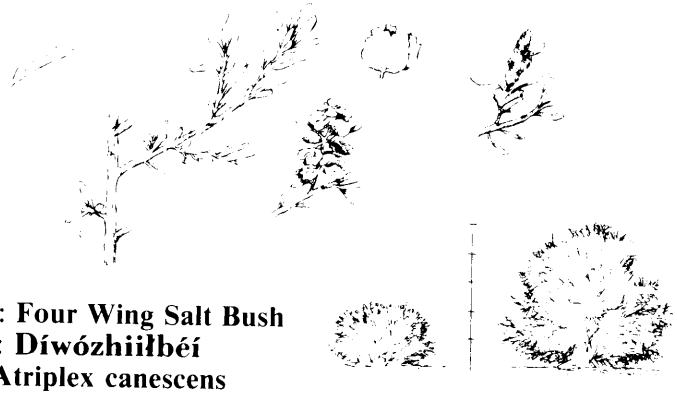
English: **Mormon tea**
Navajo: **Tł'oh Azihii**
Latin: **Ephedra spp.**

Mormon tea has no real leaves, only jointed green stems. It holds soil well, so it often grows on little hills in areas where wind erodes the rest of the land. It is not the best livestock food, but is green when other plants are not, and is therefore important.



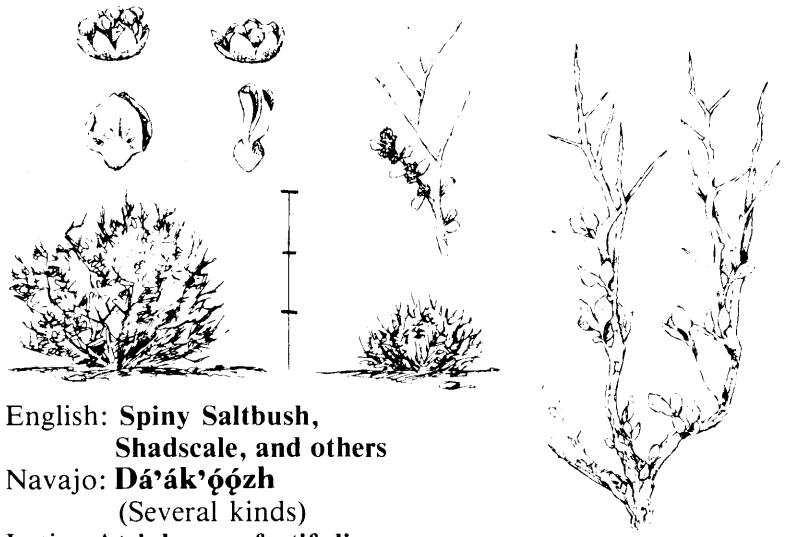
English: **Greasewood**
Navajo: **Díwózhi**
Latin: **Sarcobatus vermiculatus**

Greasewood often covers large areas where its long roots can find water. Almost all greasewood areas in Navajo Country are so badly overgrazed that few other plants besides tumbleweeds are found among greasewood. This happens for two reasons. In dry summers, greasewood will stay green when nothing else can, so animals may stay in greasewood areas for weeks at a time. Also, greasewood itself can stand overgrazing for years because overgrazed bushes become more and more stickery and hard to eat. Overgrazing does kill even greasewood in time, however.



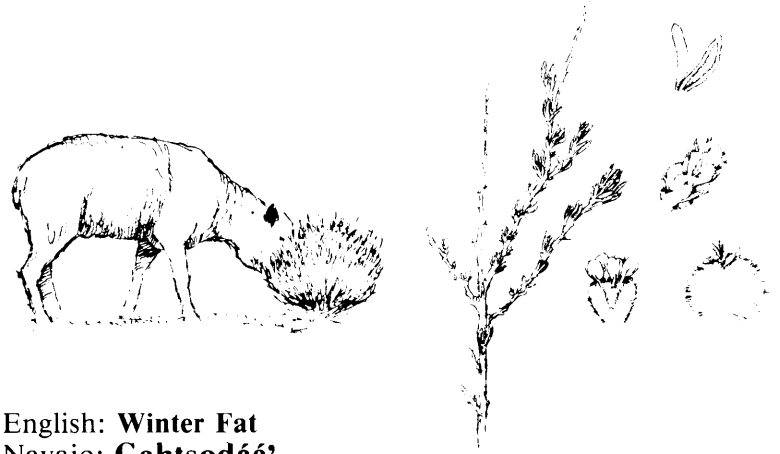
English: **Four Wing Salt Bush**
Navajo: **Díwózhiiłbéí**
Latin: **Atriplex canescens**

The Navajo name means "gray greasewood" and describes these plants well. They don't need so much underground water, however, and grow on dryer land. The seeds have four wings. These are good feed plants and provide salt as well as nutrition. Survive on overgrazed land where grass has disappeared. The leaves fall in winter.



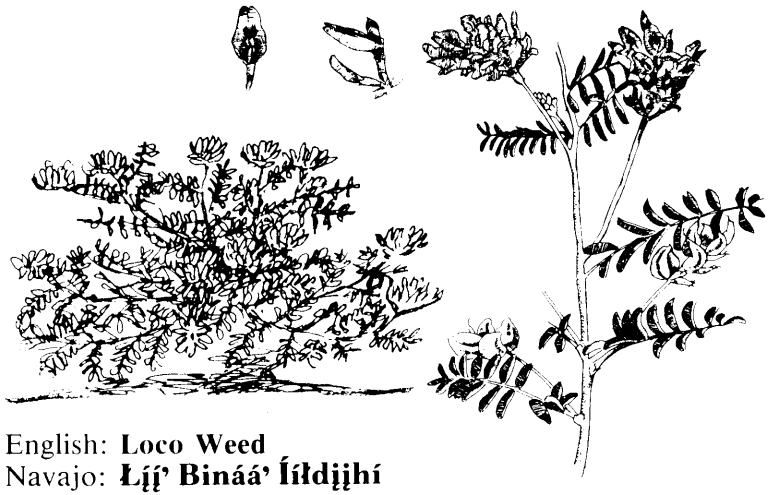
English: **Spiny Saltbush, Shadscale, and others**
Navajo: **Dá'ák'ǫǫ́zh** (Several kinds)
Latin: **Atriplex confertifolia** (and others)

Spiny Saltbush or Shadscale is "two-wing" saltbush. Its seeds have two wings. It is much like four-wing saltbush, but its leaves are rounder, and stay on the plant all winter. It is a good winter feed plant and survives well on overgrazed land.



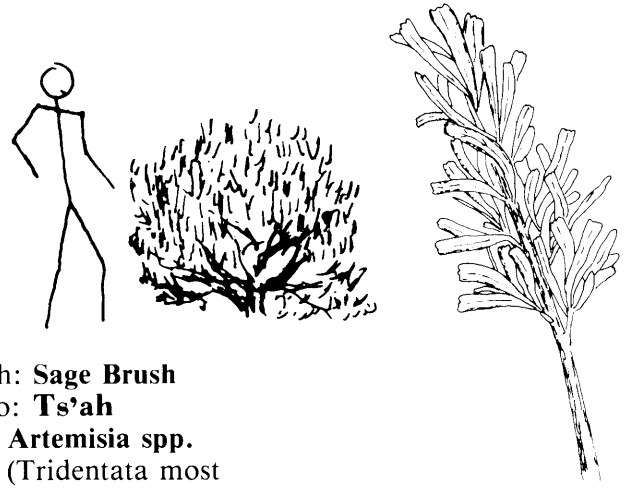
English: **Winter Fat**
Navajo: **Gahtsodą́ą́'**
Latin: **Eurotia ceratoides**

This excellent winter food plant is often grazed to death. Where it survives you can best recognize it by the fluffy seeds that make healthy plants look like lambs tails.



English: **Loco Weed**
Navajo: **Łįį' Binää' Íílđįįhí**
Latin: **Astragalus spp.**

Several kinds of loco weeds and related plants cause problems, especially for horses that seem to become addicted to them. They turn green before most other plants, so hungry animals may eat them in early spring. They often grow in wet places near the bottom of cliffs.



English: **Sage Brush**
Navajo: **Ts'ah**
Latin: **Artemisia spp.** (Tridentata most common)

Everyone knows this bush by its smell. Livestock do eat sage and sometimes even kill it by overgrazing, but usually it increases in overgrazed and over-rested areas. In many places sagebrush has been knocked down to give grass more room to grow, but it usually comes back quickly, if grazing is managed badly.

APPENDIX II

Maps for Planning Grazing and Handling Land Questions

Maps scare a lot of people, because they have so many lines on them and look complicated. Don't give up! You don't need a school education or English language to read a map or explain it to someone else, if you understand only a few things.

The only really good maps for range work are the U.S. Geological Survey (USGS) "7½ minute" maps. They are also called the 1:24,000 series because the land is 24,000 times bigger than the map. A mile is about 2½ inches on the map, and they show most springs, wells, dirt roads and houses. Each map covers an area about 9 miles north to south and 7 miles east to west.

When you use a map, put the top toward north so it will match the land. Then look for roads and land marks that you recognize. Usually, if you find one place you know, you can find other places.

The thin brown lines that look so confusing at first show up hill and down hill. You don't see them on the land, of course, but if you walk from one line to the next you will be going up or down 20 feet.

Where these brown lines are far apart, the land is flat. Where they are close together, it is steep. Dark bunches of these lines show cliffs. Hill tops will be circles. Small numbers on these lines show height above sea level.

How to Order

The BIA Land Operations office in your agency should be able to tell you the names of the 7½ minute maps for your land. Or you can send a post card to:

Branch of Distribution
U.S.G.S.
Box 25286
Federal Center
Denver, Colorado 80225

On the card say: "Please send me the 7½ minute map index for the state of _____." And give your address.

You will get a big map of your state covered with little squares showing the names of all the 7½ minute maps. On the back of this index will be a list of places you can buy the maps. Or you can order them straight from Denver. Just send $2.00 for each map by check or money order.

Say: "Please send the following 7½ minute maps from the state of _____."

List the names, and give your address. That's all you need to do. NOTE, however, the indexes for some areas of the reservation are old. Especially in Arizona many maps are not shown. But they do exist. You can get quick help over the phone from Denver by calling 303/234-3832. You can also circle the area you need on the index and send it back to them.

APPENDIX III

Withdrawing and Fencing Land

If you want to fence land on the Navajo reservation, you must go through some very complicated procedures involving neighbors, the local chapter, the grazing committee, the tribal government, and the BIA. This can take months, especially if you leave out any steps and have to do something over again. Here are the steps you must take:

1. Meet with all the people who will use the fenced off area. This may be one family or several families in a livestock association. It is a good idea to invite someone from the BIA Branch of Land Operations or from the Tribe's Division of Agriculture Resources to attend the meeting. They know what other groups have done.

   Start working on a *management plan* at this time. This plan will describe how you will manage your land — what fences you will build, how you will move your stock, how the ownership of the stock will be divided, etc.

   Since your neighbors will have to agree to your plans invite them to your meeting or tell them your plans as soon as possible so there will be no false rumors about your plans.

2. Get the *Customary Grazing Use Withdrawal Application Form* from the BIA Branch of Land Operations in your Agency. This must be signed by all the *grazing permit holders* on neighboring land. The BIA grazing officials can tell you who these are. You may be surprised to learn that some of them have moved far away or died.

   Many people give up here, because they find that the land they are using is not the same as the BIA's map. This is the time to sit down with your neighbors and reach agreement on where the fences really should be. The BIA will change their map if the permit holders involved agree.

3. Go to the chapter with your maps, your signatures, your plans, and friends who will speak for you. You must get the chapter to pass a *support resolution*. Also get a copy of the minutes of this meeting if you can.

4. Attend the District Grazing Committee meeting. Bring all the signatures you have collected, and invite all neighbors and relatives who will support you. You will have to explain your operation and management plan, so you will need at least a good map of the land. The Committee will schedule a special meeting on your land to check the exact area you have in mind.

   You must get a *support resolution* from the Committee and *a copy of the minutes of the meeting*. It may take several meetings, but *these papers are important.*

5. You must now get approval from the Resources Committee of the Navajo Tribe. Here are the things they require before they will put you on the agenda:

   - Copies of the grazing permits of all the people who will use the fenced land.
   - The BIA *Withdrawal Application Form* signed by all neighboring permit holders.
   - The *Chapter Support Resolution* and the *Minutes of the meeting where it was passed.*
   - The *District Grazing Committee Support Resolution* and the *Minutes of the meeting where it was passed.*
   - A certified map of the fenced area from the BIA Branch of Land Operations.
   - A short description of your plans for managing the land.

   The people at BIA Land Operations will help you get all this together and make the presentation to the resources committee.

6. If the Resources Committee approves, the whole packet of papers goes back to the Agency BIA Superintendent for final approval. The BIA will keep the originals and send a copy back to you.

7. Get to work at last.

APPENDIX IV Planning Chart for Cattle

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MAJOR EVENTS												
COWS												
HEIFERS												
STEERS												
CULLS												
BULLS												
TOTAL (bulls x 2 calves x)	×31	×29	×31	×30	×31	×30	×31	×31	×31	×31	×30	×31
CATTLE DAYS												
RANGE EXTRA FEED												

WINTER FEED	

÷ [ ] acre = [ ]

one acre
43560 yd² ÷ [ ] animal days per acre = [ ] → √[ ] = [ ]

Side of square that must feed one animal for one day.

INCOME ESTIMATES							
	animals	×	lbs. animal	×	$ lb.	=	
		×		×		=	
		×		×		=	

Total Income	
Less Expenses	
Profit	

Planning Chart for Sheep

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MAJOR EVENTS												
EWES												
REPLACE-MENTS												
FOR MEAT												
TO SALE												
RAMS												
TOTAL (rams x 2 lambs x)	×31	×29	×31	×30	×31	×30	×31	×31	×31	×31	×30	×31
SHEEP DAYS												
RANGE EXTRA FEED												

WINTER FEED	

÷ [ ] acre = [ ]

one acre 4840 yd.² ÷ [ ] animal days per acre = [ ] → √[ ] = [ ]

Side of square that must feed one animal for one day.

INCOME ESTIMATES							
	animals	×	lbs. animal	×	$ lb.	=	
		×		×		=	
		×		×		=	

Total Income	
Less Expenses	
Profit	