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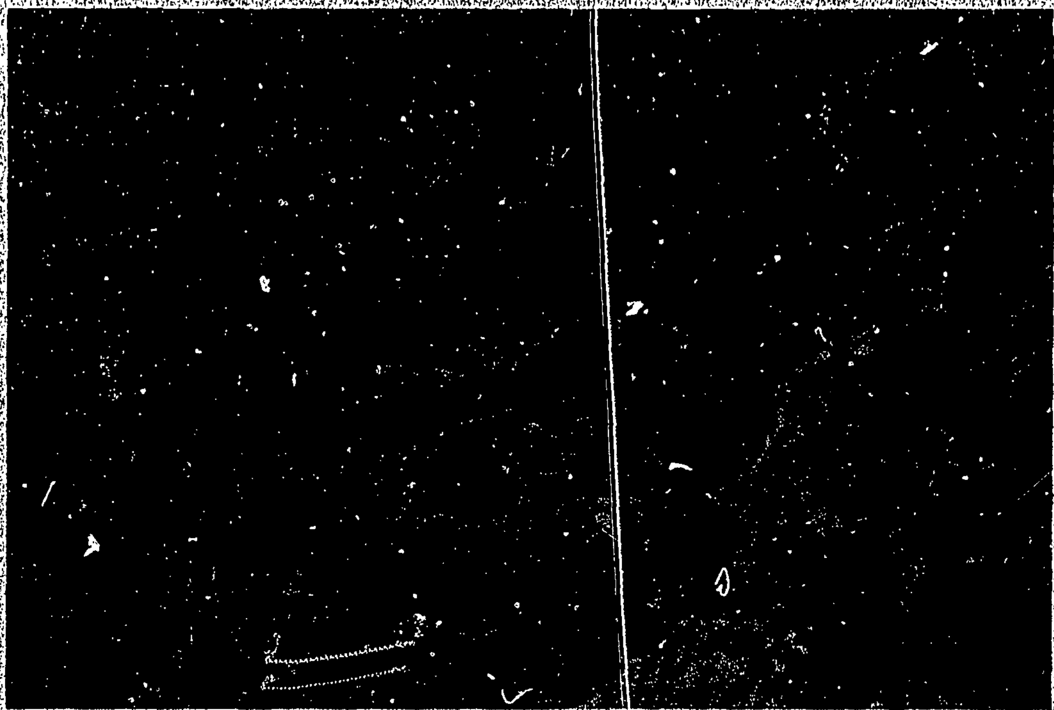
ABSTRACT

This collection of secondary readings contains general information about the ecology of living space, and specific information about the prehistory ecology of Mesa Verde, Colorado. There is also a section on how anthropologists use trees to date artifacts. A related document is indexed as ED 001 721. (AWW)

MESA VERDE

A Study of Man in an Agricultural Setting



LIBRARY PACKET

Based on a study by

The Colorado Academy Curriculum Development Group

Under the Auspices of

the Kettering Foundation

AUGUST 1966

Why Do You Live Where You Live

There are many different kinds of places across the continent: some warm, some cool; some in the mountains, others in broad river valleys; deserts, forests, grasslands, swamps; cities, towns, and open spaces--enough variety to appeal to every taste.

But do you live where you would really most prefer to live? Is there perhaps a "better" place, a "dream spot", that you have either seen or imagined, that you would rather call home?

Why do you live where you do?

Most of us, of course, live where we live for good and necessary reasons. Where our families are, or where jobs are available, or perhaps where health and happiness dictate - and so it has been since time began.

Early man faced similar limitations on the choice he could make about where to live. If he were a hunter, an abundance of game animals and the conditions to support them would become a major concern; if a farmer, then he needed the kind of land and climate in which he could successfully grow crops.

However, aside from how favorable or unfavorable the environment itself may have been, other factors were bound to affect where he lived. Family, clan and tribe were strong ties. Traditions were not easily or lightly broken. "Greener pastures", in the sense of a better land, could not easily be reached, if, indeed, one had any knowledge that they really existed.

Yet, even early man changed his home and way of life as need dictated and opportunity arose. One factor which could bring about change was population increase. Recall for a moment, what happens in your own home when company arrives for a week, a day, or even just one meal. The more there are, the more the work involved and the greater the supply of food that's needed.

Of course, you can always go to the supermarket to add to your dwindling stock, but suppose the supermarkets were not there. No store could provide you with food. Instead, you and all your neighbors had to depend on hunting and trapping the animals in your immediate area.

Early man may have found himself in such a situation at one time; i.e., with more people than hunting alone could feed. Of course, he and his tribe could always move on to a new spot, but even that wouldn't guarantee enough for everyone and the problem would soon repeat itself.

Many undoubtedly would die along the way (a solution of sorts, but not one that appeals to the person doing the dying).

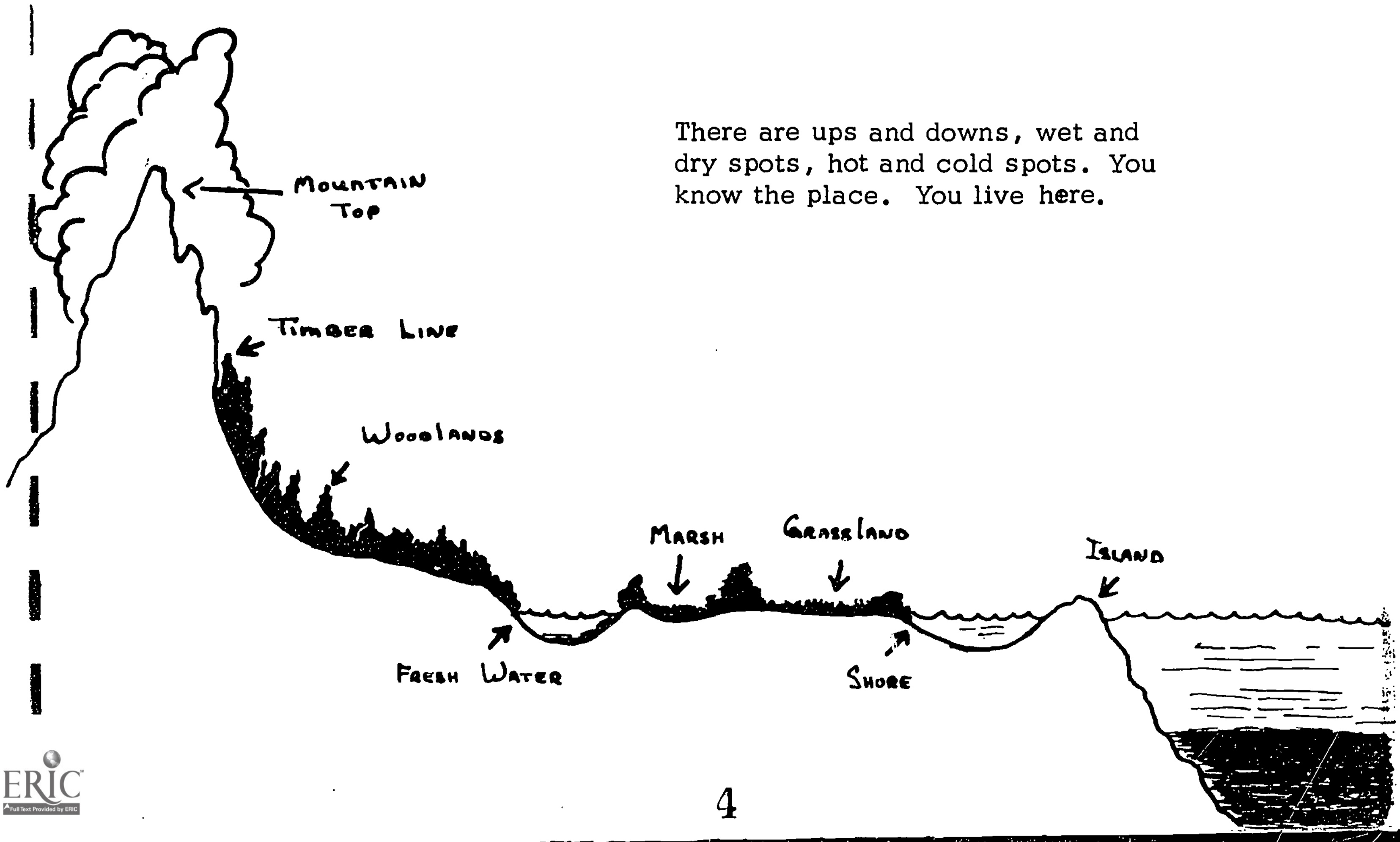
However, another solution was open to early man. Farming. No one knows for sure whether he found it by chance or by the plan of a few clever individuals. In effect, though, farming meant an added source of food - not without its hazards, but a least fairly reliable.

I. HOME SWEET HOME

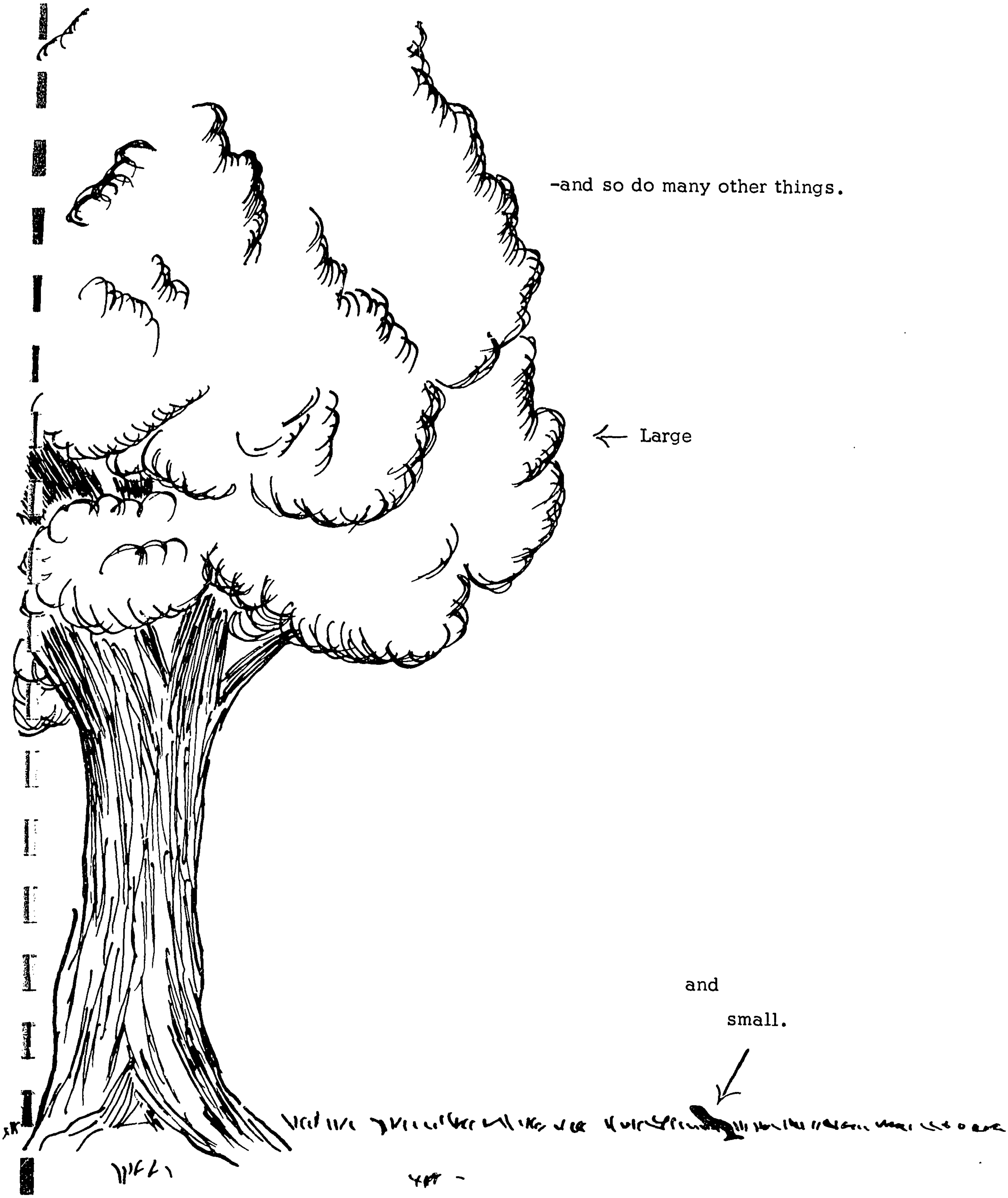
This is where it all begins.

-on a small planet, circling a small star somewhere on the outer edge of an average galaxy.

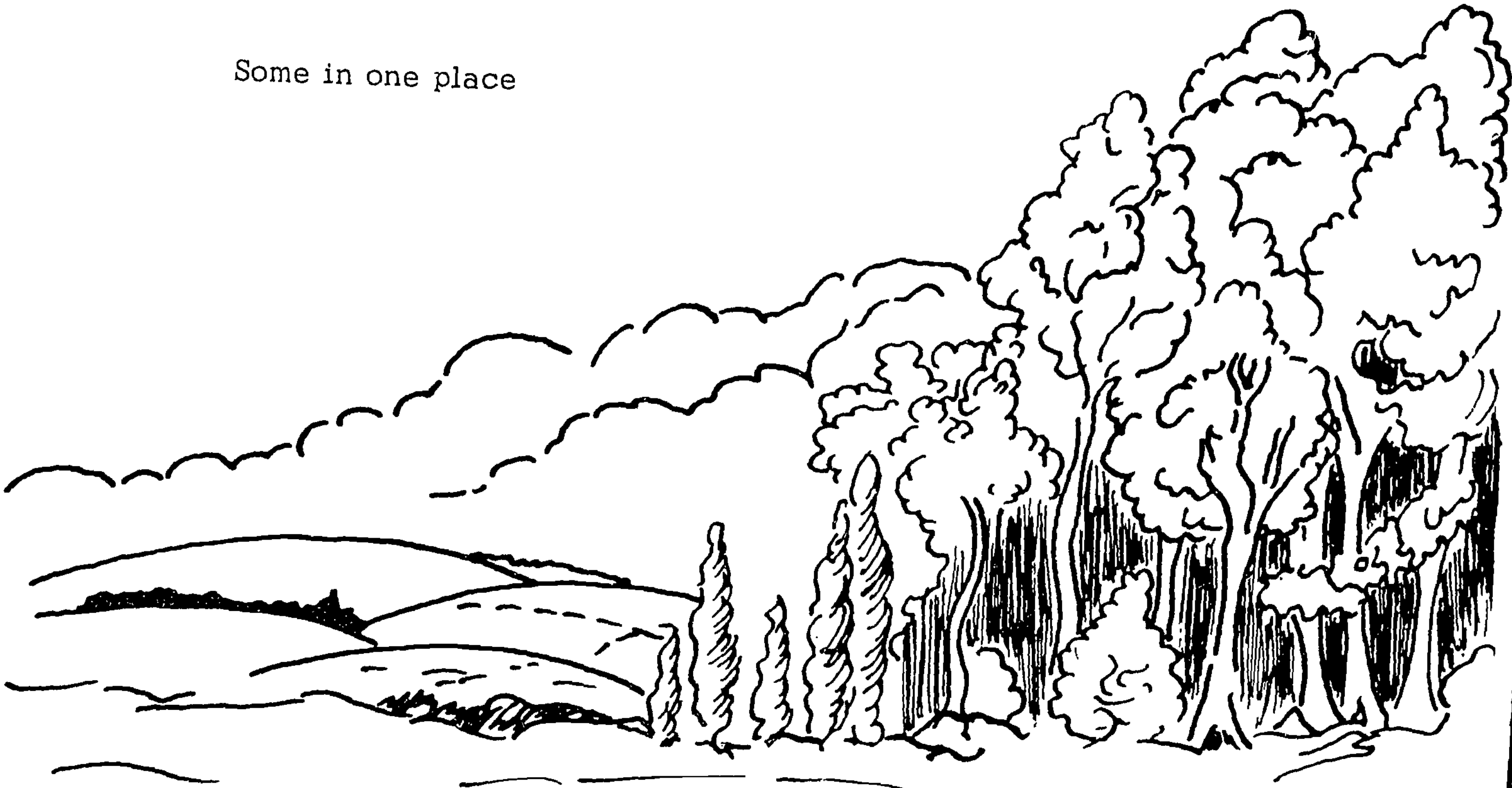
There are ups and downs, wet and dry spots, hot and cold spots. You know the place. You live here.



-and so do many other things.



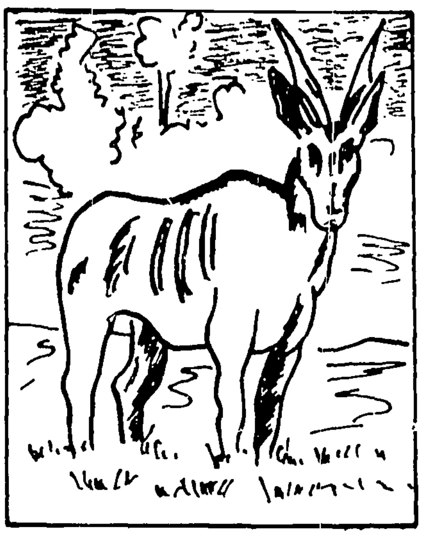
Some in one place



and some in another.

On this small planet there are many places where you and your kind could live. But most other living things are fussy: they prefer just one kind of home environment. A monkey would not be very happy in a desert; nor could a cactus live long in a jungle.

What makes one place "better" than another? Consider the antelope. He and his kind live in an area that gets twelve to thirty inches of rain a year. Part of the year is very dry. The sun shines daily, the temperatures climb, and the water becomes scarcer and scarcer. On the open plains the grazing animals are easy prey for the meat eaters. Not a comfortable place to live. So why do they stay?



Once one such grassy plain in Africa was made into a park. Trees were allowed to grow again where formerly they had been burned. A chance swarm of locusts stripped the land. Scrub thickets replaced the thick carpet of grass. In only nine years the antelope population dropped from 25,000 to 4,200. Why the change?

II. THE BUILDING BLOCKS

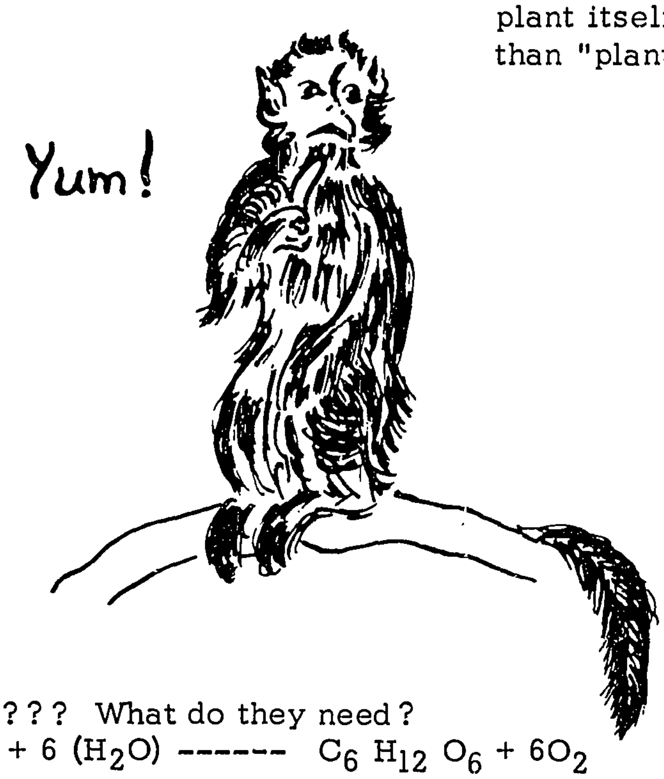
Sugar + shortening and flour and milk and salt = ?

Put them together in one set of proportions under one set of conditions and you have bread. Change the formula a bit and you have cake - or cookies - or pancakes - or tortillas - or white sauce - or - (or even a sticky, gooey mess).

What you get in the end depends on the ingredients you start with and how you put them together.

So it is with living things.

All of them need the same basic ingredients as part of their world, (air and water and food), but how those ingredients are put together makes the difference between a "good" world for a monkey or a "good" world for a cactus. The good world for the monkey depends, of course, on the tasty plants he can find around him. But for the cactus (being a plant itself) something more than "plants" is needed.



Plants? ? ? ? What do they need?

$6 (CO_2) + 6 (H_2O)$ ------ $C_6 H_{12} O_6 + 6O_2$

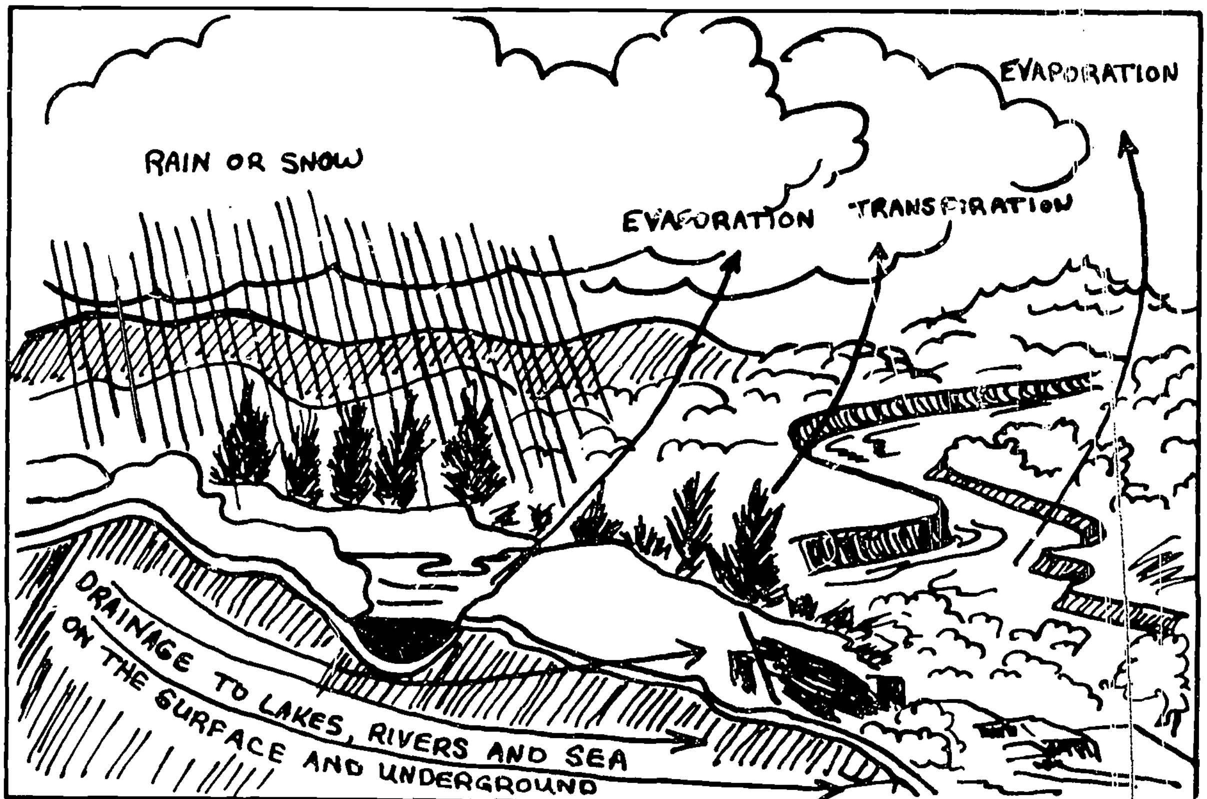
YUM!!

-or in other words plants make their own food (sugar) from a synthesis of water and carbon dioxide, a gas, and produce oxygen as a by-product. A few other ingredients, such as nitrogen and mineral salts, go into the recipe to help make the great diversity of plant forms that cover the earth.

Sunlight provides the energy that helps the plant "digest" its CO_2 + H_2O. But some plants get more sunlight than others. Near the equator, for instance, the suns rays are "concentrated", whereas near the poles the same amount of sunlight is spread out over a larger area. Plants in an open field get more sunlight than those in a shady forest.

Of all the sunlight that reaches the earth less than one per cent is directly used by plants to make food. But the other 99% is not wasted. Far from it. This "extra' solar radiation plays an important part in making the climatic conditions (temperature, winds, evaporation and rainfall) which make plant and animal life possible.

Plants vary widely in the kind of climatic conditions they can stand. Solar radiation is the great "conditioner" of climate. It's the moving force behind the water cycle, for instance.



The moisture in the atmosphere owes its air-borne existence to the sun. Were water not able to evaporate, rain would be impossible. No rain, no plants. Moreover, while the moisture is held aloft in the form of clouds, it shades the earth. For a quick idea of what this can mean, take a look at the desert where few clouds shade the ground or deflect the sun's rays.

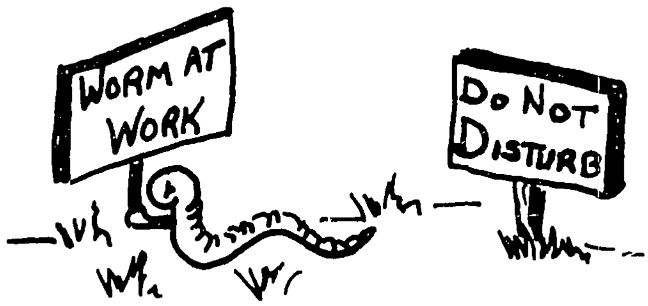
Rainfall, in its turn, affects the levels of lakes, streams and ponds. In addition it affects the amount and depth of water in the soil itself. However, even if an area gets a goodly amount of rainfall, there is no guarantee that it all can be used for plant growth. The slope of the land, the hardness of the rock, and the compactness of the soil may gang up to keep the water from soaking in. The rainfall is wasted in run-off.

Soil plays its part in building a world for a plant. Soil is not just "dirt", but rather a complicated mix of living and non-living materials. What makes this "mix" is partly the kind of plants that grow in the area and the "feed-back" they give the soil. Water is lost with no plants to hold it back.

In summary, water, soil and plants are part of a closely connected cycle. The sun, directly or indirectly, provides the energy. Without it there would be no world for plants.

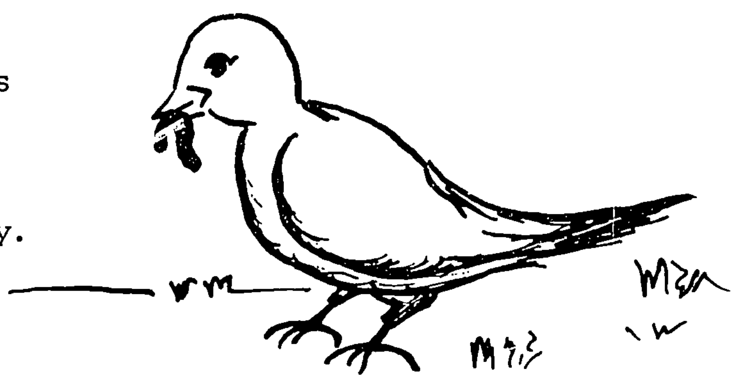
III. MEET THE FAMILY

Where do animals fit into the picture? In many ways they do more than just fit in. They help make the environment. Consider the earthworm, who makes his home in a forest of oaks. The particular spot in which he lives, including the plants and animals that share it with him, is called his "habitat". His "job" is to condition the soil for the plants. In helping the plants, he also helps the other animals as well, from the birds that nest in the tree tops to the deer that browse at the forest's edge, This job, or place he occupies, is called his niche. It includes the work he does, the things he eats and the things he, in turn, is eaten by.



Of course, in a forest the oak tree is going to have more to say about what goes on than the earthworm - if only because he's bigger.

But sometimes little things can make a big difference. A few grasshoppers in a field or forest will fit nicely into the pattern of life in the community. Put them together into a swarm and they become the dreaded migratory locusts. They can clean out a field in a matter of minutes. In seconds they can eat wet laundry off a clothesline. They actually "kill" the environment for all of the plants and animals that once lived



there.

Sometimes a community is changed rapidly and violently, as when locusts invade the area. More often, however, it undergoes a gradual change. It grows and develops to a mature level in much the same way as the organisms which make up its many parts. For example, over a goodly number of years, if conditions are right, a grassy field may merge with a nearby forest. First weeds and shrubs creep out from the edge of the forest. They shade the ground and crowd out the sun-loving grasses. Trees spring up displacing the shrubs. They create new light, soil and moisture conditions which favor the growth of taller trees. As the plant life changes, so changes the animal life, until a new environment is produced. Eventually, the community reaches a final stage in which its many plants and animals find a balance.

IV. KEEPING THE FAMILY ALIVE

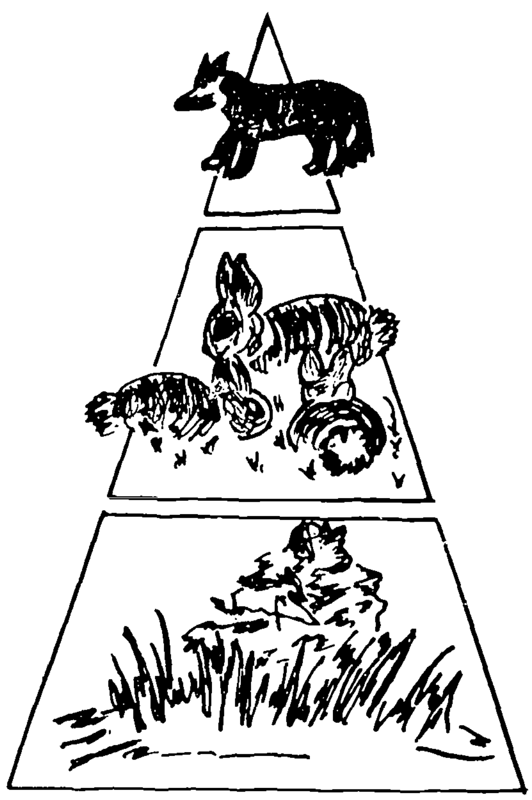
The way in which all the living things in a community manage, through competition and cooperation, to coexist is known as the web of life of that community.

Some animals eat plants; some eat other animals. In other words, the question of what lives where and why can partly be answered by knowing who eats whom.

The life forms in a community can be thought of in terms of a number of food chains. The chain begins with green plants which transform the sun's energy into food. The plants are eaten by a variety of herbivores (plant eaters), who in turn are eaten by carnivores (flesh-eaters). When the carnivores die, their remains decay through the action of bacteria and fungi to become the raw material for new plant growth.

The sun is the source of the energy that is passed along from plants to carnivores and back to plants. But along the way much of the energy gets lost. Plants "spend" some on their own growth, development and reproduction. The rabbit that nibbles on their tender shoots is the first, or "primary", consumer of the stored plant food. He, in turn, spends energy on moving around from place to place. However, he eats more than he spends. The stored energy he keeps becomes a dinner for a secondary consumer, the fox. The fox, in his turn, will waste some energy and store some, so that, when he dies, a bit of the original energy is left for a hungry coyote. The rest goes to the worms and bacteria.

All of which is a round about way of explaining what is known as "The Second Law of Thermodynamics", which states that: In any transformation of energy some energy is lost in the form of heat. No transformation of energy is 100 per cent efficient. (It can be compared to the problems of trying to carry water from one place to another using just your hands as containers. Some of it leaks.)



What started out as a food chain, on second thought, fits neatly into the pattern of a food pyramid. At the bottom are many food producing plants; then, a smaller number of rabbits that feed on them; and finally, at the top, the fox that needs a number of rabbits to keep itself going.

As energy flows from the bottom of the pyramid, where there is an abundant supply, to the top, there is a gradual shrinkage until only a small amount is left.

Obviously, there must be a balance between the amount of food being produced and the amount being eaten. Since all life depends on green plants, the total amount of plant life must always be greater than the total amount of animal life. In the same way the primary consumers, such as rabbits, must be more numerous than the predators that feed on them. If there were not enough rabbits, the foxes would starve. If there were too many rabbits, the plant life would suffer.

Sometimes one member of the community gets "out of hand". Great confusion results until a new balance is reached. How this happens can be seen in the "Case of the Kaibab Deer".

Once upon a time, in the pinyon and juniper forests of the Kaibab plateau of Arizona, there lived a healthy herd of mule deer (about 4000 in all). The brush and shrubs on which they lived were adequate. The winters were hard, though, and mountain lions, wolves and coyotes took their toll. So it was and so it had been for many centuries.

1907. Enter our hero. Some kind-hearted people decided to "protect" the deer from their natural enemies. Thousands of "mean and nasty" predators were hunted and destroyed. By 1925, the deer population numbered about one hundred thousand. Success! - ??

Not quite. As the deer increased, the plants decreased: grass, shrubs, herbs, tree seedlings, large trees stripped of their bark. New trees were planted but never had a chance to grow up. Without ground cover, the soil washed away. The deer starved. Other animals deserted the area. By 1939 only ten thousand unhealthy deer were left. A whole community was destroyed.

Who was to blame? You be the judge.

V. THE HEAD OF THE FAMILY

One theory that trys to explain why three-fourths of North America's large herbivores no longer exist is that the organisms in the complex food chain are vulnerable to any physical change that strikes at the base of the pyramid, the primary producer. Climatic change alone could not have caused directly the mass extinction of the herbivores of North America, (the camel, the mammoth, the bison), but climatic change that affected the producers, the grasses themselves could have sent up, through all the successive levels of the food pyramid, quakes severe enough to eventually topple it.

It's a good theory in that anything that strikes at the base of the pyramid, the green plants, shakes the whole structure. Climate has not changed much in North America in the last few thousand years, but the pyramid is shaky. The wolf, the bison and the prairie dog, for example, are on the brink of extinction.

Early man was but a small part of the food and energy chain of his natural environment. He killed a few animals and ate a few roots, berries and nuts. Nature was not something separate from himself. It was a part of him and he, a part of it.

The man became a farmer. He got his energy directly from the base of the pyramid. He could short cut the chain of energy flow and, hence, get a larger per cent for himself. In the process he cleared the land and chased away the animals. He built villages and laced the land with roads to connect them. His fields spread across the continents. He could feed more people and populations grew.

Nature became his enemy, so he set about trying to control it. He changed his physical environment to suit his "needs" and conveniences. Wildlife communities were destroyed to make room for his fields. Plants and animals were developed which could survive only with human help. The balance has been upset; the web, torn.

But man is an intelligent animal, or so we have been led to believe. After ten thousand years, he has become aware of some of the results of his thoughtless spending of the natural wealth around him. Whether he is yet aware of his place in the family is an unanswered question.

You are part of the web of nature. Where do you fit in?

CLIMATE

The Mesa Verde area lies within a steppe and desert climatic region of little precipitation. The higher elevations of the foothills and mesa tops are semiarid, while the lower elevations of the valleys and plains are arid. Variations in climate within the area come from such things as exposure, nearby land forms and elevation.

Temperatures vary greatly, with a range of 120° degrees between the highest and lowest recorded January averages range from 21° to 28°, while the July averages range from 66° to 80°.

The growing season is long considering the elevation. There are a few oddities in this respect; for example, Chapin Mesa, with an elevation more than a thousand feet higher, has a growing season of 167 days compared to the lower Mancos Valley's growing season of 110 days.

Precipitation in most of the area is enough for the growing of crops without irrigation, but is not abundant. If comes in the form of snow during the relatively wet winter months. The driest months, May and June, come to an end with the arrival of the summer rains during the first week in July. These usually come in the form of violent afternoon thunder showers.

Adapted from Herold pp. 8-9

CLIMATE AND AGRICULTURE

Growing Season:

When the region was first settled, the Anasazi were more hunters than farmers and hence were attracted by a rich game locality. As time went on they became progressively more dependent upon agriculture, and with an increase in numbers of people there would have been a strong drive to move to places where a longer growing season would give a better chance of getting a crop. When beans became a part of the food supply, the growing season became even more important, because the bean plant is extremely sensitive to frost. "Spilling out to places more distant from the mountain foothills would have involved but a short journey, one which hunters could easily retrace if need of meat indicated a temporary return to the mountain game range."

Adapted from - Morris & Burgh, 54, p. 86 as quoted in Herold, 61, p. 68.

CLIMATE AND AGRICULTURE

Rainfall & Water Supply:

The primary source of water in the Mesa Verde region is the precipitation it received. Secondary sources of water depend, ultimately, on rainfall and snowfall. Hence, in drought years, not only rainfall itself, but also ground water, intermittent streams, and any attempt at water storage will suffer, even though the actual decrease in water may not be felt immediately. 94-5

Mesa Verde is in a zone of intermediate aridity: wet enough so that the people could use a moderate supply of water, but still dry enough to require intensive development of all available resources. Water was, and still is, a constant concern, especially to moderate or large populations. 110

The chief use of water by the Anasazi was for agriculture. By intensive farming a little moisture could go along way. Indian farming methods generally did not disturb the ground cover and hence open the way to erosion and a lowering of the water table. The crops themselves could survive on precipitation alone by the use of dry farming techniques, such as planting many seeds in one hill and the erection of brush canopies to prevent drying from wind and sun. With the help of springs; water holes; some man made devices such as primitive wells, check dams, reservoirs and ditches; and even seasonal floods, the Anasazi developed ways of getting the most from the available water supply. 110 - 113

Adapted from Herold, 1961

CLIMATE AND AGRICULTURE

The Great Drought:

Chapin and Wetherill Mesas, in the heart of the Mesa Verde area had many advantages for the early farmer: "a relatively greater amount of rainfall than the surrounding area, a sufficiently long growing season, and large areas of arable land." (Herold, p. 116) Hence, many of the Anasazi chose these mesas for their home. More people, however, meant more pressures on the sources of water. What, then, would happen, when a period of drought added to the strain on the water supply?

Drought conditions occurred in the Mesa Verde area on an average of twelve times per century. The earliest severe drought that scientists know of was one which lasted 40 or 50 years in the first century A.D. Afterwards, humid conditions probably existed in the second and third centuries and again in the tenth and eleventh centuries. The centuries in between showed the usual pattern of wet and dry years.

At the end of the twelfth century began a period of drought which lasted, with only occasional relief, for one hundred years. The last 24 - 28 years of the thirteenth century are known as the time of the "Great Drought". (Herold p. 95) Water supply was low, ground cover thinned and the lower valley farming lands eroded away in the process known as arroyo cutting. Animal life deserted the area. No river on the mesa tops could supply water for the hand watering of crops and springs dwindled or dried up.

Check dams could be used to prevent run off of the precious rainfall. Shallow reservoirs could store the water between the infrequent rains. Seeds could be planted deeper in the dry earth to reach the lowered water table. But what can you do when it doesn't rain?

Adapted from Herold Ch. VII; Water Supply

TREES TELL A STORY

If someone asked you, "How old is that tree in your yard or neighborhood or by the school", could you tell them?

If you had seen it planted you could probably say, "Yes". But if you had not, this task might be more difficult. What might be the things that would help you in determining "how old a tree is"?

1. Size
2. Shape
3. Condition
4. "Looks"
5. Root System
6. Foliage

All of these factors or "things" are not really accurate measurements of age. Some trees grow much faster than others. Some get bushier or "fuller" earlier than others. Some, because of the environment they live in, look "older" than they are. Very cold winters or very hot, dry summers, "age" trees. Did you ever see an "aged" face of someone who lived outside all his life and therefore looked older? What does a person or place look like when we use the phrase, "Weather-beaten"?

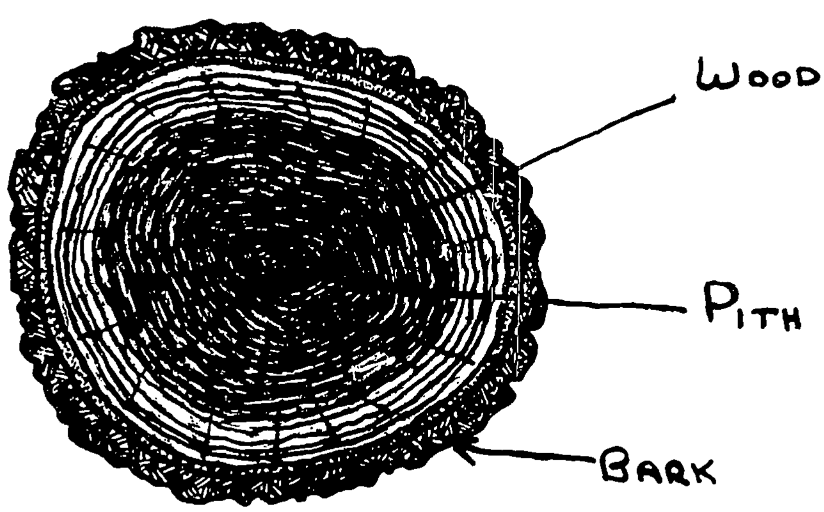
Some trees can live in very dry, sandy places that under normal conditions would "age" them quite rapidly, but because they are at the edge of a waterhole or along the banks of a stream, they don't look very old.

Trees are very much like you in the way you grow. Heredity, the kind of food the tree eats, the sunlight it receives and the water it gets through its roots, all will have some part in determining its size.

You're generally sure how old you are because with each passing year of your life you celebrate your aniversary with a birthday. Sometimes you have a party with friends. Sometimes you just get a card from someone who lets you know that he remembered that you are a year older. When you are young, birthdays are big events; as you get older, they don't seem to be as important and some people even try to forget them altogether. If you live to be very old, birthdays again become important and the older you get the more important the birthday becomes.

Trees celebrate each passing year, too, but they don't have parties, nor do they send cards to each other. But with the passage of each year, a tree produces a ring.

If you look at the picture or sketch, you will see that the trunk or branch of a tree going from the middle to the outside is made up of three sections. The Pith, which is the center, The Wood and The Bark. This view of a tree is called a cross-section. Have you ever seen a cross-section of anything else? A house? A plane? What would the cross-section of a carrot look like?



In the temperate areas of the world the normal growing season for plants is from spring into fall. Trees and wood are made up of tiny cells. During the growing period a tree will produce two groups of cells. One, a light colored innerpart, called Springwood, and a darker colored outer part called Summerwood. The first group of cells made up of larger cells is formed in the spring during the more active part of the growing season, and as summer ends, and fall begins the cells become smaller until growth stops altogether. These small cells form the dark line of Summerwood. The Springwood merges into the Summerwood, which ends very abruptly because of winter. In the spring a new ring is begun and this way a tree makes one ring a year.

If the growth conditions for a tree remain the same, the growth should be constant and produce the same size rings year after year.

Sometimes, however, we find trees that show variation on ring size. These are trees that are found over a very large area of maybe hundreds of square miles. Fire, bugs or disease will certainly cause change in a local area of several acres or perhaps over several square miles.

If you lived in the Northern regions of North America, the cold temperatures would have a direct affect on the growing season. If the weather got very cold early in the fall and stayed very cold till late in the spring, would the growth rings be very big or thin and narrow?

Our interest in the past several weeks has not been focused on a cold region, but upon a semi-arid region of the Southwest, and more particularly on Mesa Verde. Since it is a good distance from the cold of the North, temperature may not have a great effect on the growing season, but perhaps there is some factor that will have a definite effect on the growth of things in this area. Can you speculate on what climatic factor this might be?

Imagine that we have cut down a tree and are examining the rings. Perhaps the rings on the outer edge of the tree are evenly spaced apart; however, in the middle the rings are very narrow and close together and near the center they again become evenly spaced. Can you draw any conclusions as to why those rings in the center are so close together? What would be helpful to you to support your conclusions? Would such a discovery help you in understanding other things you have already found out about this area?

Tree rings can be very helpful to us for other reasons than simply recording climatic change. Generally, one of the first questions people ask when they see the prehistoric ruins of the Southwest is, "How old are they?" Today, finding out their age can be done with great scientific accuracy, by the carbon-dating process; but, before this, tree rings were used. How was this done?

As you know from your reading and your discussion, the rings of a tree reflect the rainfall or climatic change from year to year, and so in a sense, represent a climatic calendar. Maybe, you need to chop down a tree to build a fence and when you do you examine the rings. As you know, the earliest rings are in the center and the latest ones are outside near the bark. In examining these rings you may notice that near the center, because of some climatic change, the rings have a different shape and size than most of the others. You may remember the railing in an old house and seeing a similar pattern on the outside edge of the fence post. So both of these pieces of wood reflect the same climatic change. You can tell how old your tree is by counting the number of rings you find. By comparing it with the piece of wood found in the old house, you can extend your calendar back even farther. Perhaps there is an even older dwelling in the area and in it you find an old beam that you could match with the railing at the old house. If we could find enough old pieces of wood, we could continue this dating process time and time again until we had a calendar of tree rings many hundreds of years old.

This is what some scientists have done and they have carried their study back all the way to some of the beams found in the cliff-dwellings. So we have had an accurate calendar into the past for many years and can make an accurate prediction on how old the ruins may be.

Not all of the wood used in such a study comes from a single area. Some parts of the calendar may come from Colorado, some from New Mexico and some from Arizona and yet all the pieces of the puzzle have similarities and so scientists are able to fit them into their proper places. This study is given the name DENDROCHRONOLOGY by scientists.

So trees can do more than give us shade on a hot summer's day or provide wood and warmth for a cold winter's evening. It can help us in our study of archaeology and perhaps give us some insight into climatic changes of the past.

WATER CONSERVATION IN SOUTHWESTERN COLORADO

Construction of one of these check-dams involved the stacking of rough sandstone blocks across a small intermittent stream channel to form a thick wall with a marked upstream batter and a level top course. A conveniently situated rock outcrop or large boulder frequently provided a natural nucleus or anchor, but customarily the walls simply tied into the flanking talus slopes. Rushing rainwater runoff would be temporarily caught behind this dam and forced to drop much of its silt. Combined with some possible filling by humans, this process would soon produce a nearly level plot of land.[1]

The more than 900 recorded check-dams represent only an unknown fraction of the total number built by the prehistoric Mesa Verdians. Undoubtedly, large numbers have been entirely washed away, leaving gaps in otherwise consistently spaced dam systems. In many cases the obvious violence of the runoff has made it impossible to tell whether an accumulation of rocks is a badly disrupted dam or simply the result of accretion around a natural obstacle. Many other dams, still holding, are apparently totally concealed by accumulated silt and by dense vegetation taking advantage of the immensely improved growing conditions.[2]

Why were the dams and terraces built? There are at least four possible explanations: (1) To conserve water, possible during times of slowly increasing aridity; (2) To conserve tillable soil which was being lost through erosion or through unknowing mismanagement; (3) To provide additional cropland for an increasing population which had already strained the existing resources; and (4) To provide diversification of lands under cultivation so that part of a crop would very likely mature even in adverse years.[3]

Whether this water conservation was purely incidental to some other reason for the dams, or the prehistoric Mesa Verdians considered it good practice to make the most of what little water they had, or whether actual drier conditions stimulated this activity, remain essentially unanswered. There is as yet no positive climatic evidence to indicate a change toward dryness during the construction and use of these farming terraces.[4]

Systems of check-dams would not only save some of this soil, but would also redeposit it in a state more favorable to plant growth. The Chapin Mesa Survey does seem to indicate a steady increase in population until nearly the time of complete abandonment at the end of Pueblo III, and this increase could have seriously taxed the productivity of the available land. Use of these artificial terraces apparently continued while population was decreasing, because of their better water supply and greater fertility, or because much of the mesa top had been depleted.[5]

Most of the draws in which dams were built also contained the remains of small seasonally occupied "farmhouses".[6]

Mummy Lake is a circular depression roughly 90 feet in diameter, formed by a high artificial bank on its south and east sides. The interior of the depression is lined with a stone masonry wall everywhere but at the inlet. A second stone wall supports the east exterior side for at least 95 feet, but a thick stand of brush completely conceals its possible presence on the south bank. Construction of the intake channel reveals knowledge of at least one significant engineering principle on the part of its prehistoric builders. The feeder ditch coming from the north did not empty directly into the north side of the reservoir, but rather, ran by the west, uphill side until it met the mouth of the intake channel at the southwest corner. There water was diverted into the inlet around a right-angle turn and conducted in a northeasterly direction into the reservoir. Such a complicated maneuver caused the suddenly slowed water to drop its silt burden in the intake channel, which could be easily dredged, rather than in the deepest part of the reservoir, where dredging operations would be difficult and would muddy the water. The constant supply of domestic water furnished by Mummy Lake permitted the largest concentration of population in one part of Chapin Mesa prior to the 1200's. Although Mummy Lake is unique on Chapin Mesa, it is not an isolated phenomenon in the Mesa Verde area.[7]

The Spruce Tree House cluster was served by the strongest spring on the Mesa Verde in the head of Spruce Tree Canyon. The Balcony House group had two good springs at Balcony House itself, as well as the spring fed pool already mentioned. Square Tower House, Little Long House, and their satellites had access to a good spring in the bottom of Navaho Canyon below Square Tower House. The remaining Cliff-Fewkes Canyon group housed more people than the other three clusters combined, but had access to local water supplies equal only to the poorest one of them. The construction of the Far View Ditch almost certainly involved community effort, even though possibly under the engineering direction and genius of one man or a small group of men. Community projects like this are very uncommon in the Mesa Verde, but may be found on Chapin Mesa in at least three cases. One is the already described Mummy Lake and feeder ditch system, the other two - Sun Temple and Fire Temple, both lie in the Cliff-Fewkes Canyon ruin group and were almost certainly carried out for religious purposes. It is quite probable that then, as now, water played a dominant role in Pueblo religion, and that a community project to bring in water could easily be organized on a religious basis.[8]

Considered as a whole, the check-dams, reservoirs, and ditches represent a major segment of the total material culture still in evidence on the Mesa Verde. They indicate that water was treated by the prehistoric Pueblos as one of their more valuable resources, and that much physical and possibly, religious energy was expended in assuring an adequate supply. Tillable soil was another resource important enough to warrant conservation and to influence the locations of habitation sites. In at least two instances, development of one of these two resources formed a prerequisite to occupation of otherwise favorable areas of Chapin Mesa.[9]

[1] Arthur H. Rohn, "Prehistoric Soil and Water Conservation on Chapin Mesa, Southwestern Colorado" (American Antiquity, Vol. 28, No. 4, April, 1963), p. 442.

[2] Ibid., 446.

[3] Ibid., 446.

[4] Ibid., 446.

[5] Ibid., 446.

[6] Ibid., 447.

[7] Ibid., 449.

[8] Ibid., 453.

[9] Ibid., 454.