A MULTIPLE-USE RESOURCE MANAGEMENT PROJECT

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INTRODUCTION

The Natural Resource Development curriculum at Ohio State University may be said to be a specialization in generalization. Whereas a chemistry major probes deeply into his esoteric science, as would a physics major or an agronomy major, etc., my curriculum has given me an overview of a dozen or more fields. Because of this background I should be able to set up a management program for a given tract of land which would take into account many potentials and pitfalls. Rather than design a program which would maximize one commodity's output, at a cost of decreasing production of all others, my preparation should enable me to manage a land area as a system with each specific component adding to the total output. Unlike most disciplines, Natural Resource Development uses a broad definition of output. It is not merely a dollar definition, rather it takes into account aesthetics, the value of wildlife (both game and non-game species), and almost any other commodity, quantifiable or not, which is considered to be desirable. This is clearly output's meaning taken to its widest possible extent. With these assumptions and definitions in hand, I proceeded to select a site on which to apply them. I chose a ten acre area in Centre county, Pennsylvania as my project location.

DESCRIPTION OF AREA

The site selected lies just north of 2200-foot Tussey Mountain and is used as a cattle pasture. The area is quite rocky with limestone outcroppings appearing in numerous locations in the clay soil. This type of rock is so common that it was once gathered and converted to lime and the remains of a lime kiln in the pasture testify to that fact. A spring-fed stream passes through the center of the plot, its flow being added to only slightly from runoff. The fact that it is spring-fed results in only moderate flow fluctuation and a very cold temperature. The rocky soils have supplied its bed with high resistance to erosion. The cool,

swift, clear, constant-flowing stream provides a good environment for rainbow trout. Their population varies according to fishing pressure and state stocking procedures. The stream segment that passes through the farm contains at least one muskrat den and has been frequented by migrating ducks as well earlier this year. Other wildlife noted within the pasture during work on this project included: groundhogs (2), gray squirrels (7 sightings), one rabbit, and various songbirds. No game species of birds were noted. Adjacent lands contain deer, red squirrels, opossums, and raccoons.

Approximately one-third of the site is forested and is included in the area in which cattle are allowed to graze. The three most commonly encountered species of trees found in the area are thornapples, red oaks, and shag-bark hickories. Less numerous but at least as significant economically are black walnuts and wild black cherries. Walnut is the only species which has been cut for sale within recent years. A 27-inch walnut stump serves as evidence of the site's capacity to grow this tree species. Maple, apple, black locust, black willow, and quaking aspen are also found occasionally. Many of the oaks and at least one walnut have entered decadent stages and have become hollow. The quite substantial squirrel population is so amply supplied with nesting trees that I noted no nests made of twigs as are common in younger forests.

The pasture is only one part of a farm which produces wheat, hay, corn, oats, apples, and berries of various types. See print 1 on following page.

POTENTIALS

Although the tract is currently utilized in nearly a single-use type approach, I feel that it has the potential to sustain at least six distinct employments. The present exclusive concern with cattle ignores other capacities which the land has. These six capacities include:

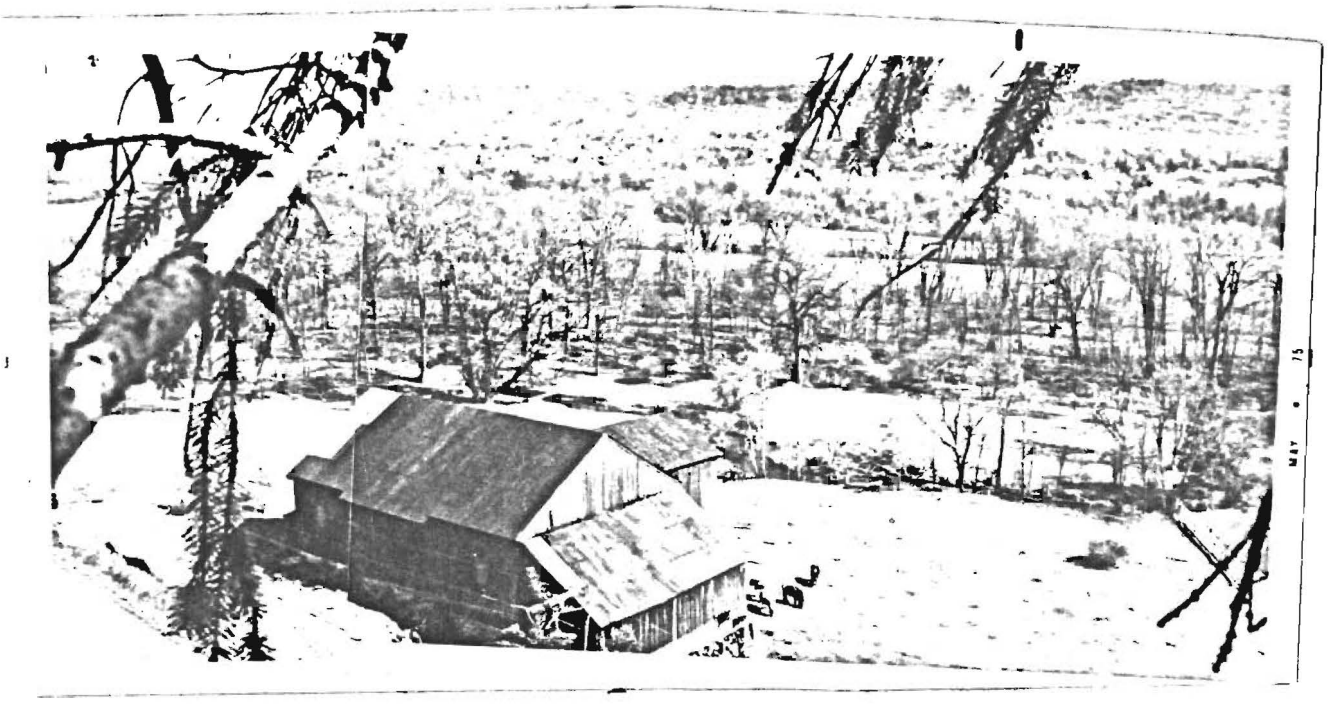
1. Pasture. Unless land use totally changes (e.g. a shift to cultivated

crops or a small residential development project) the employment for pasture is the most economically profitable activity. Grazing could continue with the following five uses at a cost of several water access areas and a nominal amount of actual grazing area. Reduction in quality of the pasture would be so slight as to not require any reduction in the current Holstein herd.

2. Production of forest products. Although the soil is rocky and is clay-like, several areas within the pasture are reasonably good tree-growing sites. These sites can and have produced high quality saw and veneer logs. In order to conform with other planned uses, selective cutting would be the only feasible harvesting method. A discussion with a sawmill owner in December, 1974, revealed that most mills in the area generally specialize in only one type of wood. A mill owner in Everett, Pennsylvania deals only in walnut and oak - only mills are also common in the area. No market was found for hickory, although the sawmill owner assured me that one could be. A market for wild black cherry is also needed. Trees of sawlog and veneer quality would be sold only. No pulp or coniferous sales would be transacted. The woods is easily accesibles by tractor path for tree-harvesting equipment.

3. Wildlife habitat. The area's capacity for squirrels has already been noted. Gray squirrels are the only species found within the woods. Fox squirrels are not common to the area but red squirrels are and are found nearby. Hickory, oak, and walnut trees, especially when hollow, have created a high carrying capacity. By leaving den trees and keeping harvesting levels moderate in using the area for wood production, current population could be largely maintained.

Cottontail rabbits and woodchucks can also live successfully in the tract in substantial umbers. Their population has been checked in the



Print 1
View of pasture, stream, and woodlot. In the background lie two cultivated fields and Tussey Mountain.

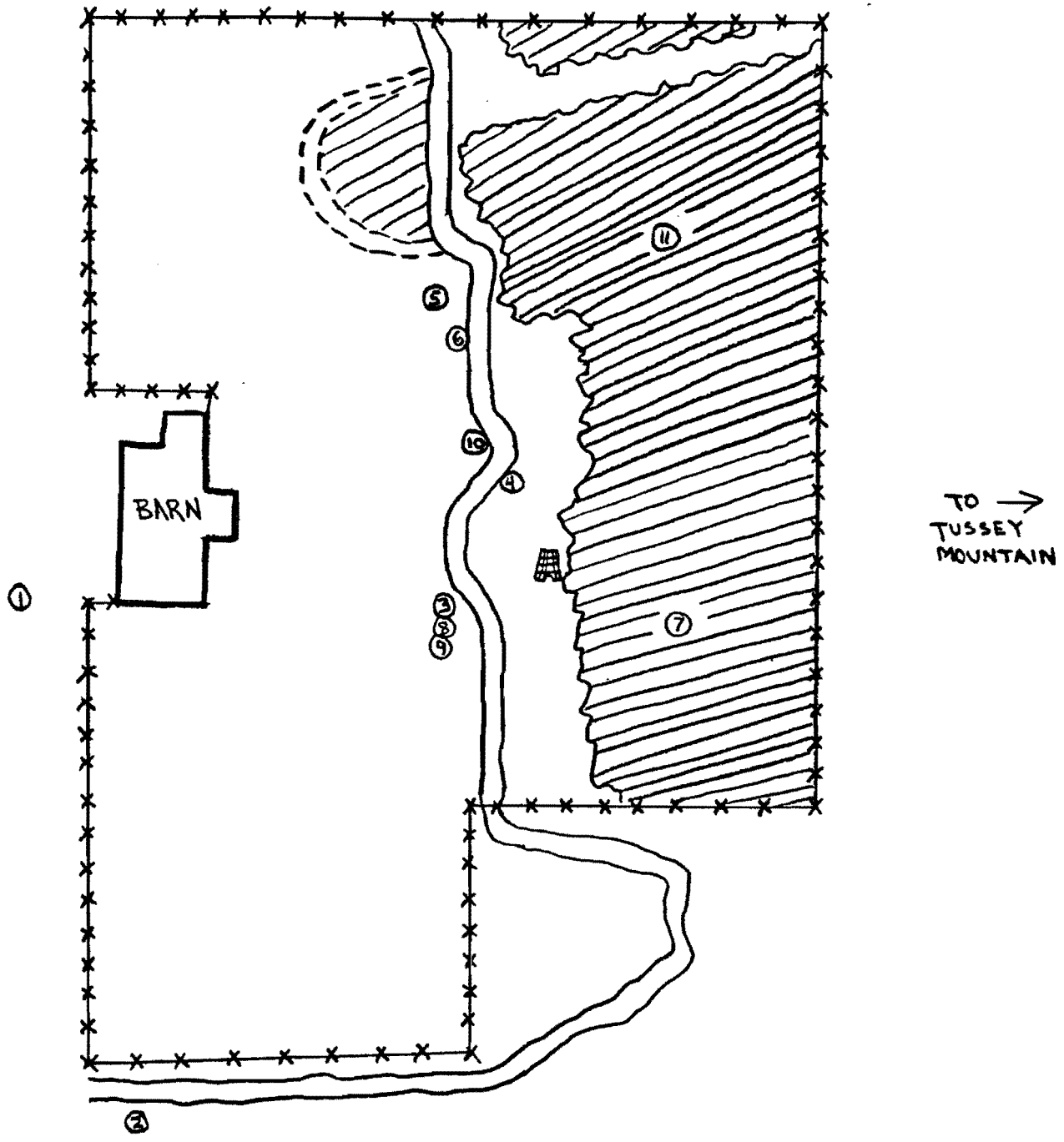


Figure 1
Map of project area. Key shown below for notation used.

fences

site of lime kiln

camera location for corresponding print

present stream bed

former stream bed

forested areas

past by factors which will be discussed in the section entitled "PROBLEMS."

4. Fishing. As has already been described, the creek in the tract is very well suited for rainbow trout. The limestone outcroppings supply a ready source of rocks for dam building which helps to create pools which offer protection to the fish. These dams also help aerate the water and increase dissolved oxygen. No species other than rainbow trout is found within this portion of the creek.

5. Trapping. Muskrats and raccoons are common to this area of the county. The potential for fur bearer populations is seen by examining adjacent stream sections flowing through unused land. From these areas it is clear that muskrat and raccoon populations can achieve a level which easily would justify trapping operations. Current management practices have kept populations low, as will be discussed later.

6. Creation of a park-like atmosphere. As should be obvious at this point, this tract of land benefits from the potential to sustain a wide variety of flora and fauna. Although perhaps not significant to the forester or hunter, the chipmunks, wild spearmint, wood thrushes, and mushrooms found here would undoubtedly leave a lasting impression on the city visitor. Game species of wildlife and marketable timber would also prove interesting. The lime kiln mentioned before would add a historical flavor. Another landmark noting the past is an indistinct dried-up creekbed which connects to the present bed at both ends, as is shown in the map (Figure 1, following the first page.) The dry loop is obviously what remains of the original bed after a drastic change in streamflow. To the best of my knowledge this fact was unknown prior to my investigation of the area.

PROBLEMS

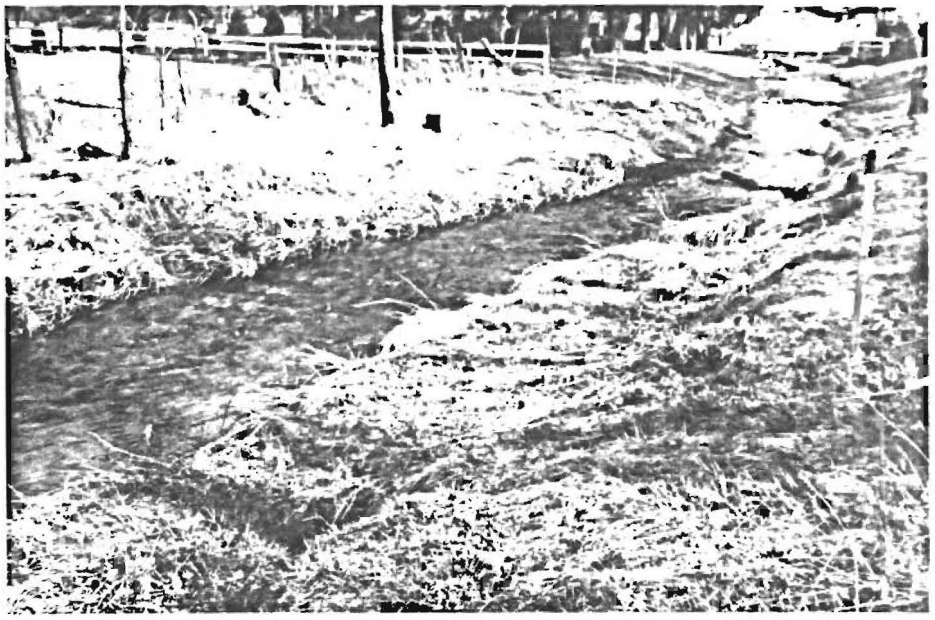
The above-mentioned potentials give this farm pasture an aura of

the unbelievable: a profitable, attractive area well suited for hunting, fishing, and trapping. Unfortunately such is not the case. Many significant problems lie between actuality and potentiality. Most of these problems can be handled with a minimum of capital but a significant amount of labor. I will discuss the four types of problems which were apparent to me.

1. Erosion. Erosion problems are unquestionably some of the most serious problems on the tract. The only area affected is the bank of the creek. The primary cause of erosion appears to be the breaking-down resulting from cattle crossing or entering to drink from the creek. Two prints vividly show the difference between pastured and unpastured streambanks (see next page). The first print, print 2, taken along an unpastured segment, shows a narrow, swift stream. Stream width (measured from vegetation on one side to vegetation on the other) is as low as approximately seven feet. The second print, print 3, shows a section in the pasture where the stream banks have been broken down until forty feet lies between them. This print and the next clearly show the effects of cattle-induced breakdown. Once the soil is knocked into the stream it is quickly washed away. The cattle create the biggest erosion dilemma, although some erosion occurs even when livestock is not present.

Erosion creates many undesirable effects. First of all, a muddy, broken-down bank is less aesthetically pleasing than is a grass-covered one (compare prints 2 and 4). When the stream becomes sufficiently wide it becomes more swamp-like than stream-like, becoming stagnant and weed-filled. Secondly, muskrats are unable to build dens in the constantly-changing bank. The one den found within the pasture acreage is protected by a fallen tree trunk which prevents cattle damage. Other locations generally prove to be too vulnerable, greatly hindering the land's use

PRINT 2



PRINT 3

PRINT 4

for trapping. Third, as the banks recede there is often loss of trees. Print 5 shows an oak tree which was undercut by the creek and eventually fell. Print 6 shows how undercutting may soon cause a footbridge to fall. Of special concern is the effect of erosion on the trout population. As was mentioned earlier, the pasture creek's clarity, temperature, swift flow, and deep pools were well suited for rainbows. Erosion replaces clarity with turbidity, cool water with warmer (as stream widens its surface increases, allowing more solar heating), swift flow with slower (increasing the sun's ability to heat it), and deep pools with shallow fords. Finally, erosion around the ends of dams rapidly cuts their effectiveness for holding and aerating water.

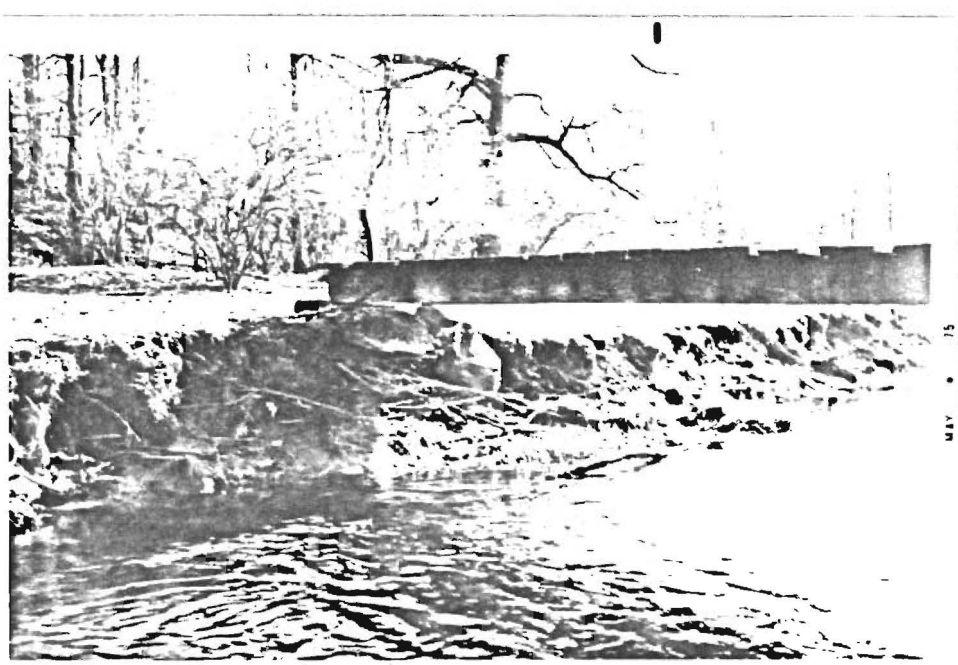
2. Forestry problems. The forest's potential in this project exceeds the actual by a large degree. Any forester will quote the adage, "Hardwoods and cattle don't mix." As cattle graze under the trees they compact the ground, preventing proper root aeration. Their hooves often expose and snap roots, dislodge bark, etc. Seedlings must survive uncropped as the grazers pass by if they are to ever replace the trees removed in harvesting.

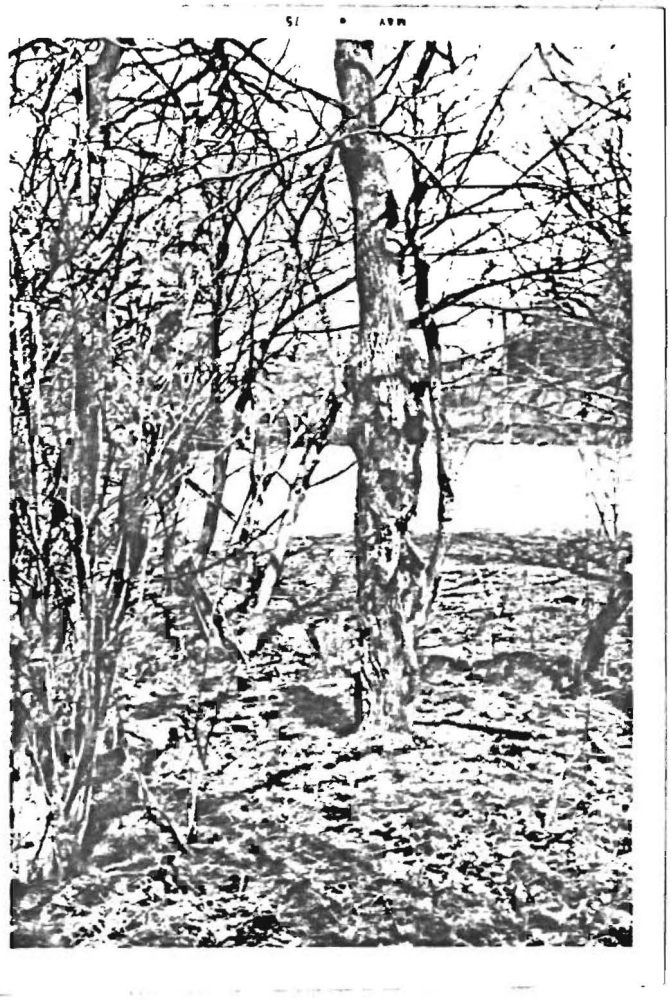
Cattle are not the only enemies of forest production. The walnut trees in the woodlot are often badly deformed by a disease known as nutria canker. Wayne Ellet of OSU's plant disease clinic identified the disease for me and a reference text which he had revealed some important facts about this problem. The disease is caused by a fungus and is transmitted by spores ejected from wounds in affected trees. (See print 7) The spores enter a wound in the unaffected tree and begin to form a lesion in its bark. As the lesion grows in concentric rings it eventually girdles and kills the tree. Some walnuts are already dead, others are dying, many are healthy.

Man is also to blame for a second-quality stand of timber. Wood

PRINT 5

PRINT 6





PRINT 7

that has been functional or profitable has been removed, leaving less desirable species such as hornbeams and thornapples. Walnut, an intolerant tree, has been largely removed from the shaded areas within the woods and is found more frequently at its fringes or along fencerows. In these sunnier areas the trees develop and retain low branches, greatly reducing their value for saw logs or veneer. Rarely is it possible to get more than one eight foot saw log before a branch is encountered.

3. Lack of rabbit and woodchuck habitat. Because cattle have total access to all areas of the pasture there are very few opportunities for rabbits or groundhogs to construct safe dwelling places. Grasses are removed which offer shelter from the elements and protection from predator's sight. Only where wild blackberry vines have been allowed to grow will rabbits nest and half of the observed groundhog dens were in these areas.

4. A potential problem: red squirrel dominance over grays. As has been mentioned earlier, red squirrels occupy adjacent acreages to the tract under study. Refering back to the composite picture, print 1, gives a vivid illustration of how close these two species live. The picture was taken from the top of a spruce tree which is frequented by red squirrels. The barn seen in the foreground serves as the northern limit for the woodlot's gray population. Should the reds decide to move on to nuttier pastures, they could quickly eliminate the gray squirrels, the more desirable from a hunter's point of view. Klugh notes in his article that when red squirrels and grays contend for the same area that the red resorts to castrating his foe in fighting, eliminating the species in a generation whether death results or not. The close proximity of the two species is clearly something worthy of occasional surveillance.

PROBLEM SOLUTIONS

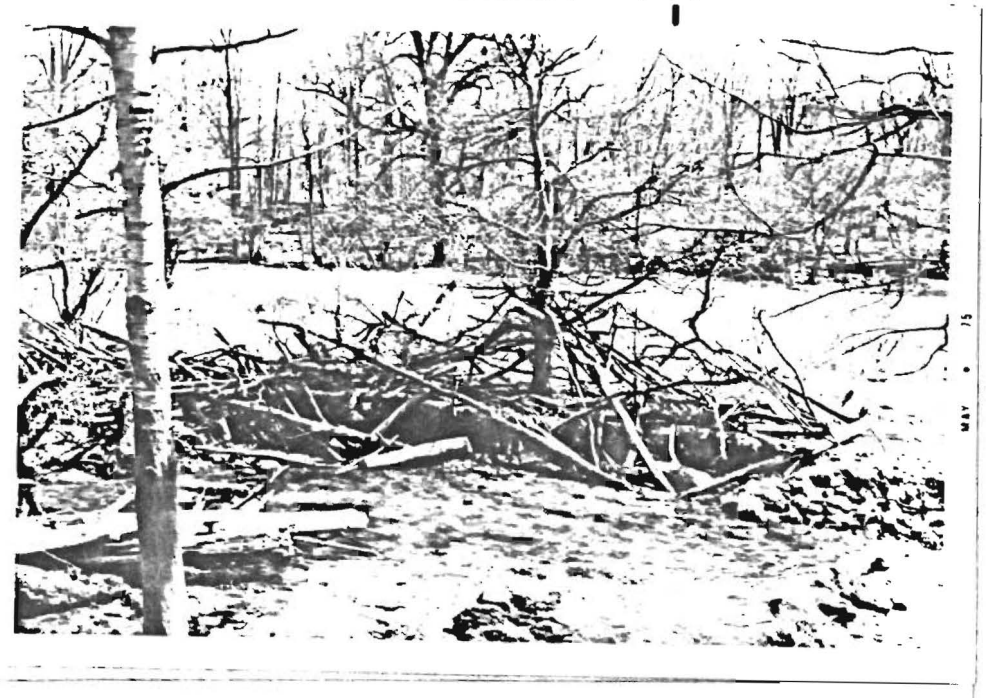
Some of the problems found on my project site have been operating for decades and will take decades to successfully mitigate. Progress can begin at once, however. On my excursions to the farm plot I made various improvements and measurements. Their effect in most cases cannot be measured within the time span of this project. I intend on continued observation and further applications on my own in upcoming years.

1. Erosion treatment. Simply stated, if cattle break down the streambank, keep the cattle away from the stream. Prints 8 and 9 show "before" and "after" situations in which brush was used to prevent cattle access. A nearby elm tree, killed by Dutch Elm Disease, was felled and used to supply a substantial portion of the wood. Wherever possible elm, walnut, or other decay-resistant woods were used to promote long life of the brush piles. Because cattle will be excluded from these areas it is hoped that wild blackberries, etc. will become established so that even after the brush has rotted away, cattle will choose not to reenter the area. Cattle currently have two low-incline rock-strewn access lanes to the creek. Brush stacking hopefully will divert them to more frequent use of these areas which erode at a markedly less rate. Measurements of current erosion rates were made using 21 pins placed twenty inches from the edge of the bank. (Print 10) Seven pins were placed at the site of print 2, seven at print 9, and seven at print 10. Erosion was measured by determining how much the bank receded toward the pins. Time between readings was only four weeks. Within that period there was an average difference of 0.6 inch between brush-protected and unprotected banks.

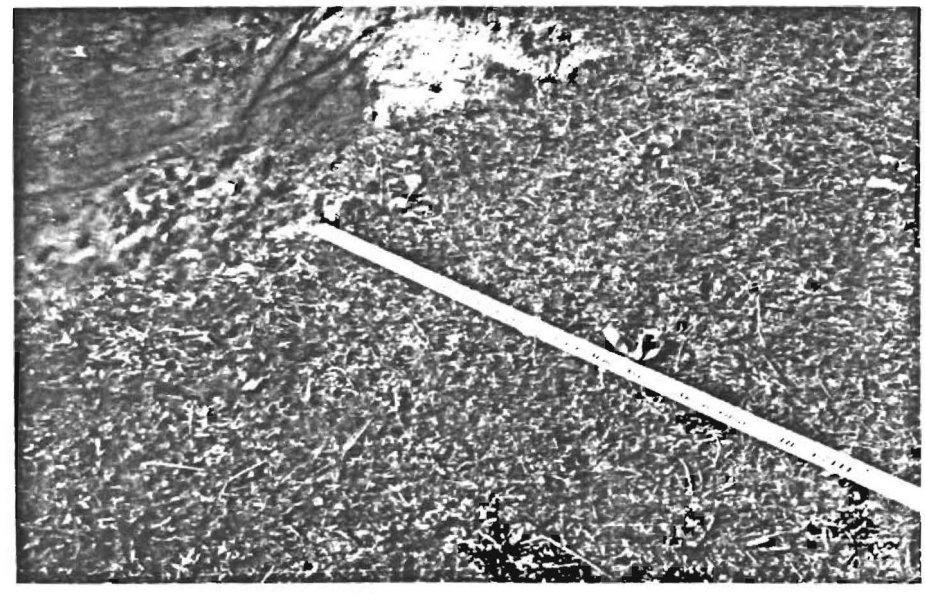
Another successful erosion-control tactic was the building of much higher ends on dams, leaving the centers low. In one application of this

PRINT 8

PRINT 9



PRINT 10



technique current was swift in center stream and slow at the edges. The resulting sedimentation at the edges narrowed the channel 28 inches.

Proper construction of these limestone dams can promote swift center flow for a substantial distance downstream. This results in a deep central channel and eventually a narrower stream. One dam, built in 1968, directed water flow in such a way as to move one streambank inward eight feet. This effect, produced totally by accident in this case, could undoubtedly be duplicated.

2. Forestry improvement. Print 11 shows my idea of how to defeat the old adage about cattle and hardwoods. Oak and hickory trees generally fare well despite cattle's presence on the sight. Major problems exist with black walnut and black cherry, the two most valuable species. Walnuts tend to grow very slowly and have an extremely high susceptibility to nutria canker in areas severely compacted. Cherry trees often topple over when they reach heights of over 30 feet as their root systems suffer damage. In order to combat this problem I stacked brush in circular piles around five of the best trees (three of these were done in December). Once again, wood resistant to rotting was often used. It is expected that thornapples, common to the woodlot; will grow within the protection of the brush piles and will replace them functionally before decay levels them. The brush will also promote reseeding of the protected tree as seedlings will also benefit from the protection. The brush piles put in place in December yielded an unexpected benefit. As wind-blown leaves pass through the barrier they become trapped. Leaf litter is several times as thick under the trees due to this fact. This will result in more nutrient availability to the tree and a more moist soil. Hopefully this system will allow walnut and cherry populations to remain constant despite harvesting. Should they decrease, planting seeds or

PRINT 11

seedlings is an available option.

Nutria canker is the single largest enemy of walnuts on the farm. Two types of treatment are in order. Corrective treatment for diseased trees consists of cutting and burning severely affected specimens. Trees only slightly diseased can be treated by cutting out the canker and treating the wound with a wound dressing. Preventative treatment consists of covering all wounds with wound dressing and insuring optimum growing conditions. This would include the brush stacking described above and making sure that the trees have plenty of direct sunlight. The fungus grows poorly in lighted areas; walnuts, on the other hand, grow best there. Sunlight could be supplied by removing trees which shade the black walnuts. Because sunlight on the trunk will promote low branches, a trimming program is necessary. I have put in two days of work within the last six months to complete this year's trimming operations.

3. Wildlife habitat improvement. Wildlife enhancement is inherent to the practices in the last two sections. Brush piles and the weeds they will support will provide ideal shelter for nesting rabbits and burrowing woodchucks. The pasture's grasses will provide readily-available food.

4. Red squirrel control. Simply stated, any red squirrel seen south of the highway should be shot. The situation as it exists now should not be altered.

CONCLUSIONS

For the most part, practices implemented within this project will take years to prove effective or ineffective. Some techniques do show a lot of promise, however, such as reinforcement of the ends of dams, current direction performed by dams, brush pile protection of the stream bank, and brush around the more valuable trees. Much work still remains

to be completed. The information I acquired while working on this project should help considerably in these future efforts.

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