THE ARNOT FOREST

A
Natural Resources
Research and Training
Center

1964

A landmark at the Arnot Forest . . .

THE STORY OF THE TOTEM POLE

The totem pole (cover illustration) was carved by the Salmon-Eaters, a clan of Tlingit Indians who live along the coast of southeastern Alaska. It is not an idol and was not worshiped by the Indians, but merely illustrates one of the ancient legends of the Salmon-Eater clan.

In the course of their migration southward along the North Pacific Coast, the Salmon-Eaters had several epic adventures. This totem recalls the story of Gunas, the nephew of the Head Chief who went out to swim in the ocean and was swallowed by the Supernatural Halibut. One of the crests of the Salmon-Eater clan was the Thunder Bird or Eagle. The figures on the pole are, from top to bottom: the Thunder Bird, the Supernatural Halibut, and Gunas.

This pole, which is very old, was removed from Cape Fox near the Alaska-Canada border by the Harriman Expedition which visited Alaska in 1899 after its voyage "around the Horn." It was presented to Cornell University on the return of the Expedition by Professor B. E. Fernow, a member of the Expedition and at the time dean and director of the New York State College of Forestry at Cornell. The pole was first erected on the campus at the northwest corner of the Old Armory, where it stood for more than 20 years. In 1934 it was erected in the Arnot Forest where the flagpole now stands. Ten years later it was moved to its present location.

THE ARNOT FOREST

A Natural Resources Research and Training Center

compiled and edited
by

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Ithaca, N. Y.

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ARNOT FOREST CHRONOLOGY

1926	"Original Forest" (1641.23 acres) given to Cornell by Arnot heirs
1933-37	CCC Camp S-81 operated at Arnot
1934	Soil Erosion Experiment Station established by USDA
1935	Schwarz Lodge built by CCC camp
1939-41	CCC camp re-established at Arnot
1945	Prisoner of War Camp established briefly
1948	Newly established Department of Conservation inherits Arnot Forest
1948	Annual 4-H Leaders Training Session first held at Arnot Forest (1947 session was at Spruce Top)
1950	First Arnot Teachers Conservation Workshop held
1954	First donated cabin built by Niagara County group
1955	N.Y. State Conservation Council appoints Camp Arnot Development Committee
1957	First maple syrup production
1957	Sanitary facilities building constructed at Camp Arnot
1962	First charcoal production
1964	Dedication of Recknagel Memorial
1964	Camp Arnot dedicated, with central camp building and 13 cabins completed

THE ARNOT FOREST

A Natural Resources Training and Research Center

This is the story of the Arnot Forest. Less than 20 miles southwest of Ithaca, it encompasses 4025.73 acres, making it the largest single landholding of Cornell University. The Department of Conservation of the New York State College of Agriculture manages and directs its operations.

The value of the Arnot Forest lies in the fact that it is not unique. Rather its lands, their use and misuse, are typical of more than six million acres in the Southern Tier of New York. It is this similarity that makes the Arnot invaluable for research, teaching and demonstrations in the management of forestry, wildlife, soil, water and other resources. Here are developing prototypes of land use for thousands of other owners of young timber and abandoned farmland--soundly based prototypes from both the standpoint of economics and wise use of natural resources.

Soils of the Arnot are primarily of the Lordstown and Volusia series. They are generally shallow, acid loams and clay loams of glacial origin. Their shallowness tends to make them wet in spring and droughty in summer. The highest elevation reaches 1963 feet. Rainfall at the Arnot averages 30 to 40 inches a year. Drainage from these hill lands is south to the Susquehanna River through Banfield, Jackson and McCorn Creeks.

The Arnot has been mapped as to physiographic site types and land forms on aerial photographs, providing a basis for land use planning.

Flora and Fauna

The timbers are mostly second-growth hardwoods of the beech, birch, maple and hemlock community. There are some oaks and hickory. With the exception of the white pine and hemlock, the conifers have been planted as part of reforestation programs.

Approximately one-third of the Arnot land has been burned over. Where new growth has become established it is largely aspen, pin cherry and red maple with black birch, yellow birch and basswood found in some places.

The Arnot abounds with other flora and with fauna, too. A profusion of wildflowers, ferns, mosses and shrubs are to be found.

It takes a fortunate, patient and quiet observer to glimpse the mammals other than the chipmunks, red and grey squirrels and woodchucks. But they are there. The white-tailed deer attract hundreds of hunters in the fall. Raccoons, foxes and cottontail rabbits prowl the woodlands. The handiwork of shrews, moles and whitefooted mice is in evidence but their public appearances are few.

Birds, however, are a different story. At least they can be heard if not seen. The downy and hairy woodpecker, nuthatch, chickadee, great horned owl, ruffed grouse and the noisy crow are permanent residents of the Arnot. Commonly seen or heard at different times of the year are the robin, catbird, song sparrow, wood thrush, cardinal, scarlet tanager, indigo bunting, flicker, cedar waxwing, mourning dove (in the pine plantings), chipping sparrow, wood pee-wee, phoebe, towhee and the red-shouldered hawk.

Camp Facilities

The facilities that make the Arnot a teaching, research and demonstration center have made their impact on the landscape. Most conspicuous to a visitor and a key to its success as a training center are the buildings at Camp Arnot. Its beginning dates back to 1954 and the vision and enthusiasm of several Niagara County sportsmen excited by 4-H Club Agent John Stookey. Under their stimulus the New York State Conservation Council formed a Camp Arnot Development Committee in 1955 with J. Victor Fitchlee as chairman. The camp today is a tribute to the tremendous efforts and resulting success of this committee.

The twelve cabins were built first, most of them from contributions from interested organizations. Before these cabins were started, the Department of Conservation built a sample cabin to test out the plans. It is now staff sleeping quarters.

In 1957 a sanitary building was constructed from development funds and a College of Agriculture contribution. Six years later--again with contributions from the Conservation Council efforts, added to those from Cornell University and the New York State 4-H

Club Foundation--the central camp building was started. Completed and equipped for 1964 use, it provides kitchen facilities, and a dining and assembly room. Thus, the basic elements of Camp Arnot were completed and the full-scale conservation education program closer to reality. At the formal dedication August 8, 1964, the sources of funds for the development of Camp Arnot to that date were summarized as follows:

N.Y.S. Conservation Council campaign with many cooperating	$ 34,500
New York 4-H Foundation	8,300
Cornell University, several divisions	22,200
Total	$ 65,000

Off from the main camp area is the Schwarz Lodge. Originally headquarters for forestry students, it has been converted into a comfortable year-round home for the resident manager of the Arnot.

Research Sites

Across Banfield Creek from the headquarters road and a short distance up Banfield Road is a very modern and, at the same time, extremely practical and usable sap house. During the spring a complex network of plastic tubing reaches out in all directions to the forest, converging at the gathering tanks.

Along the same road is the metal charcoal kiln which operates on the thinnings from experimental plantings and pays the labor cost for this forest improvement. Nearby is the sawmill which furnishes some of the lumber for Arnot building.

Picnic tables and benches also constructed from the thinnings are available along the Banfield Road.

Other research and demonstration areas can be located from the map in the center spread.

How the Arnot Forest became "the Arnot" of today and the many and varied uses of its resources and facilities are narrated on the following pages.

The Arnot Forest . . .

HOW IT STARTED

What is the Arnot Forest? Tall timbers--white pines, hemlocks, hardwoods? Once it was.

The tall timbers were there when only the howl of the wolf and the cry of the Indian warrior broke the stillness of the forest. Through their branches drifted the circling smoke from the wigwams of the Senecas. In the forest the Indian hunted deer and moose. Beaver, otters and martens were in abundance and salmon were smoked at the campfires.

The tall timbers stood while empires bridged the Atlantic Ocean and were untouched when James I granted this wilderness to the Plymouth Company in 1606. For still another century few white men except traders, explorers, trappers and Jesuit missionaries ventured into this forest.

The Six Nations at the zenith of their power in the early 18th century had encompassed the territory with a colossal Indian empire. For a brief moment in history this confederacy ruled supreme.

The struggle for territorial rights embroiled the French and the British, the Indian and the colonist, Massachusetts and New York. A treaty in Paris in 1754 gave the lands to the British. The Six Nations surrendered to General Sullivan in 1779 on the site of Elmira. And at the end of the Revolutionary War New York secured title to these same lands.

Scarcely had the smoke from the fires set by General Sullivan's army cleared away than the white man began to thread his way through the wilderness, anxious to raise a home in the fertile lands of the Senecas.

By 1794 the land had passed from state to private ownership. A New York City lawyer, John W. Watkins, and an associate, Royal W. Flint, and certain others applied to the Commissioner of the Land Office for 363,000 acres of ungranted lands in western New York and agreed to pay the price of three shillings 4 pence per acre.

The purchase itself was divided into 12 townships, each subdivided into quarters, called sections. Watkins and Flint, after receiving the grant, sold a large tract in southern Tompkins and northern Schuyler counties to Robert C. Johnson. Included in this land was the southeast section of Township 6. A speculator rather than a developer, Johnson turned his purchase over to the Pumpelly Real Estate office in Owego to find buyers.

It was to this land that Captain Gabriel Ogden, the first settler in Cayuta, brought his family in 1798. Other settlers followed in quick succession. In 1816 Jess D. White erected the first sawmill. Eight years later the village of Cayuta was formally organized.

Axes went into the forest for timbers for homes, barns and the needs of mushrooming settlements.

The nation, too, was growing. A Civil War was fought, spurring industrial development in the North. Everywhere the clamor was for goods and the goods had to be moved.

The Vanderbilts, Drews, Goulds, Fisks and Van Sweringens began building railroads at an unprecedented rate. Power-driven machinery accelerated the rate of production and the fast-growing economy reached into the tall timbers of Schuyler and Tompkins Counties.

An enterprising and experienced lumberman, Joseph Rodbourn, began acquiring timberland in the region in 1871 and continued until 1884. He had acquired a reputation for large sawmills and for the unexcelled quality of the timber products, especially hemlock and native white pine.

In 1873 the crosscut saw moved into the tall timbers. Soon a network of logging roads opened up this wilderness. Rodbourn felled the white pine and hemlock, took out the black and yellow birch, cut down the oak, maple and chestnut. His mill at Swartwood sawed two million feet annually. Shipped out on the Elmira, Cortland and Northern Branch of the Lehigh Valley Railroad, the lumber was swallowed up by eastern manufacturers and builders.

The hemlock bark also found a waiting market. It was hauled 90 miles to a tannery in Bridgeport.

Once the tall timbers were gone a small steam mill for cutting fuelwood was placed on the tract in Banfield Hollow to use the remaining cull hardwoods. A novelty mill was set up for the same purpose. It operated profitably for several years.

Then a major recession struck the country. The novelty mill closed. Rodbourn mortgaged 1641.23 acres to the Chemung Canal Bank of Elmira. The bank foreclosed the mortgage in 1910 and four years later sold the land by a quit claim deed to the Matthias H. Arnot Estate.

The forest suffered its most severe damage in the immediate years before the Arnots acquired it. Fires in 1900 and 1911 ravaged almost half the area. Whatever the cause--the railroad, careless stump burning, thoughtless campers--the fires delayed the restocking of the forest with second-growth hardwoods for 20 or more years.

In the same year the Arnot Estate purchased the forest there appeared in the annual report of Professor Mulford of the Department of Forestry at Cornell University the following: "The Department's greatest need is for an adequate demonstration and experimental forest. The need is imperative."

Another faculty member, Professor Moody, who had been faithfully scouting the countryside, came upon a forest which answered all the department's requirements. His enthusiastic account led other faculty members and students to this land in the southeast corner of Township 6. Taking the Elmira, Cortland and Northern train to and from Swartwood was a comfortable all-day round trip from Ithaca.

The executors of the Arnot Estate were ready to sell this most desired forest but at the time the money from the University was not available to purchase it. So matters stood for a decade. An understanding with the executors permitted classes to continue to visit the area, however.

Then in 1926 Mr. Arnot having died, the heirs of the Arnot Estate gave the University their 1641.23 acres. The transfer of title to Cornell University in fee simple was made in 1927. The tract was named the Arnot Forest. It consisted of 17 lots or portions of lots in the southeast section of Township 6 and a portion of one lot in the southwest part of Township 6 of the Watkins and Flint Purchase.

Once Cornell received title, William B. Timbrell, a licensed surveyor from Elmira, located, brushed out and marked all forest boundaries. A total of 292.5 acres were purchased later to consolidate the holdings.

Plans were undertaken at once to bring the forest under systematic management. But first it was urgent to repair and reopen the old lumber roads of the Rodbourns and to divert some of the streams by grading culverts and rock fill. Local labor was used.

Under the direction of Professor C. H. Guise, three permanent bridges were built at the first three crossings on the main road up the valley of Banfield Creek. Each consisted of steel I beams mounted on concrete abutments. Each bridge was 12 feet wide, one with a span of 14 feet and the other two of 12 feet. The structural steel was salvaged from old Cornell buildings. Total cost of the bridges--less than $350.

The Arnot Forest itself was immediately put to use. In the summer of 1927 Professor J. N. Spaeth established and made the initial measurements on 16 permanent sample plots to obtain exact data on the growth and yield of second-growth hardwoods.

In the fall of 1927 and for the following ten years forestry students in the senior class were taken to the Arnot Forest each week for a full day's work.

The College of Agriculture made $500 available in 1930 for roads.

A gift from Mr. Archer M. Huntington of New York City in the summer of 1930 made other developments in the forest possible. Later that same year Mr. C. Frederick Schwarz of Boston gave $1,000 as a start toward a fund for a headquarters building or a Foresters' Lodge.

But the Wall Street crash was complicating the management of the Arnot. The depression curtailed University income that could go to the development of the Arnot. Markets for salable products

from the Forest were few. They were further limited to avoid competition with neighboring farmers.

The principal purchaser of sawlogs from the Forest was L. R. Chaffee, owner of a small sawmill in the valley and a reliable local businessman. An early report of the Arnot called these transactions mutually beneficial. Income from these timber sales provided much of the Arnot development capital in those "lean" years.

Although the director of the Forest was pleading for a permanent caretaker, the best there were funds for in those early days was a part-time watchman employed at the wage of $10 a month!

Along with the development of forest management were the establishment of certain experiments in forest management and of permanent sample plots for measurements of growth and yield under controlled conditions.

As Professor Spaeth said, "The Arnot Forest is admirably adapted to serve as an experimental laboratory in which improved silvicultural practices for the important forest types of the Allegheny Plateau region may be worked out, as a laboratory for the fundamental studies in forest ecology, as a practical demonstration of sound silvicultural practices and ultimately as an example of intensive commercial forestry--the continuous production of full timber crops at a profit."

By 1933 these projects had been completed: establishment of methods of cutting permanent sample plots, study of stem form in the basswood, white ash and black birch, volume table for second-growth hardwoods, study of root habits of several important species, continuous record of environmental factors on burn and 45-year-old second growth, experimental planting on burn, experiments in poisoning undesirable trees, studies on wood utilization and markets, intensive studies of the burn type in relation to its future management.

In 1933 these projects were underway: censuses of all plants, animals, tree diseases, forest insects, intensive research on basswood canker, probably the most serious disease problem in the forest, and classification of soils and preparation of an intensive soil map.

But again events on the national scene were to reach into the Arnot Forest. The United States had elected a new president. Government programs were underway to employ the millions of unemployed. These programs introduced a new phase in the history of the Arnot Forest and became a major landmark in conservation history.

Camp S-81, a forestry camp of the Civilian Conservation Corps, was opened at the Arnot in 1933 and operated continuously until the end of May 1937. The camp was under the direction of the U.S. Forest Service and administered in New York by the State Conservation Department at Albany.

Construction began on October 3. By the time the last nail was pounded, 18 barracks and other camp buildings were in the headquarters area.

The main contingent of 200 CCC men between the ages of 18 and 25 arrived for duty on November 29, 1933, under a staff of U.S. Army officers. The superintendent of the Camp's work was Mr. H. W. Hobbs, an engineer. The technical foremen were all Cornell foresters: W. E. Petty, Abraham George, W. B. Secor, A. D. Quick, W. A. Rieman and D. E. Curtice.

No time was lost in putting the crews to work and keeping them busy. The work projects for the first year were truck trails, 5.9 miles; horse trails, 1.9 miles; foot trail, .9 mile; vehicle bridges, 8; foot bridges, 2; boundary surveying, rerunning lines and painting blazed trees, 20.8 miles; topographic survey of the Forest to secure data for a map, 1,730 acres; forest stand improvement, 321 acres; stream improvement, 2.2 miles; forest planting, 100 acres; fire breaks, .3 mile; construction of gates and landscaping.

What did all this mean to the Arnot Forest? Again from an annual report for 1933-34: "It is doubtful if the engineering projects could under our ordinary circumstances have been completed in less than 20 to 25 years . . . Now that the greater part of the engineering work has been completed, our efforts will be devoted to the problems of stand improvement and of protection of the existing forest."

During later years the CCC workers completed the excellent system of roads and trails, firebreaks, stream-retaining walls to control flood waters and numerous other jobs. They also carried out thorough stand improvement over the whole tract.

During the CCC days the totem pole was repaired and repainted and moved to near the main entrance at the southeast corner of the property in the center of the CCC camp. The men promptly adopted it as a mascot and named their camp newspaper "The Totem Pole."

Another project that stood still until 1935 was the construction of the Foresters' Lodge. That year it was learned that an allotment for materials and supplies to the extent of $155 would be allowed from Federal and State Emergency Conservation Work Funds. This allotment combined with the original Schwarz fund plus $116.75 interest was felt to be adequate. Unskilled labor was to be furnished by the CCC camp.

Built from plans drawn by a University architect, the building was a substantial one-story structure. Its exterior dimensions were 25 x 40. It had one central room, 20 x 25 feet, with stone fireplace and four corner rooms, each 10 x 12 in size. Original cost estimates from the architect were from $4,500 to $5,000. The actual cost to the University was the amount of the Schwarz fund. In April 1939, Miss Ida T. L. Schwarz, a sister of the original donor, gave $500 to be applied to the upkeep of Schwarz Lodge.

In the summer of 1934 the Federal government added still another chapter to the development of the Arnot Forest.

Cornell University entered into an agreement with the Soil Erosion Service of the U.S. Department of Interior establishing a Soil Erosion Experiment Station on Lot 36 of the Arnot Forest. It was one of 17 experiment stations scattered over the country for the study of runoff and soil erosion in places typical of the soil conditions of the given section. The Arnot situation was unique in that plots were laid out in the open to record the exact runoff under varying conditions, and there were also plots under partial and full forest cover.

During 1934 and 1935 these plots were laid out, instruments installed and two substantial buildings erected--one a headhouse for the erosion plots and the other a sizable barn for equipment storage.

To facilitate the soils research work, the University in July 1934 purchased the north half of Lot 36, the Rosak farm. This brought the total acreage to 1880 and gave access to the Forest by road from the western side.

Still another government agency was to have a major impact on the Arnot Forest in the mid-thirties. The Federal Resettlement Administration had acquired considerable areas of marginal and submarginal land in Tompkins and Schuyler Counties. The University applied for a transfer of some of the lands on a 99-year lease for forest planting and for other conservation purposes. Negotiations started in 1935 but the transfer was not technically and legally accomplished until February 18, 1939, when Federal and college officials signed a formal lease agreement. A year before this time, however, the U.S. Department of Agriculture authorized Cornell to proceed with the use and development of certain of the requested areas adjoining the Arnot Forest. In 1956 these Federal lands, aggregating 2092 acres, were transferred to the University permanently.

The addition of this new land on the north and west sides of the Arnot Forest to the existing lands which through several purchases now totaled 1933.73 acres more than doubled the size of the tract. The total acreage had now reached 4025.73 acres. The new area was largely abandoned farm land.

Why were the farms abandoned? The Model A Ford, tractors, and other farm machinery did not eat hay and hay was about all those hill lands were producing.

Nor could the hill farmer take advantage of machinery to increase his own efficiency. The fields stayed too wet in spring for the tractors and other machinery to work, even if the farmer could have figured out a way to use them and could have afforded to buy them. Some of the descendants of the settlers who followed Captain Ogden into the region were reluctant to leave the farmsteads where their grandparents had been born and buried. But their sons and daughters found it easier to make a living off the farm in nearby Elmira and Watkins Glen. It had reached the point where it was cheaper for the government to resettle these farm families than to pay for mail delivery, road upkeep and school transportation.

Part of these lands was needed by the Soil Erosion Experiment Station but the rest offered opportunities for reforestation, a feature the Arnot Forest had lacked.

The Cornell Department of Forestry planted these lands in 1940, 1941 and 1942 with trees secured cost free from the State Conservation Department.

In 1937 events taking place outside the Arnot Forest were again to have far-reaching effects on its future development. The New York State Legislature had established the State College of Forestry at Syracuse and the Cornell Board of Trustees ordered all instruction in undergraduate professional forestry discontinued after June 30, 1937.

The first two purposes for which the forest had been established--teaching and research in forestry--had suddenly dwindled in importance. The third--demonstration--took on new meaning since the main work of teaching in the department had shifted to farm forestry.

In that year of 1937 the policy of the College of Agriculture in regard to the Arnot Forest was settled for the future at an administrative conference at Schwarz Lodge. "It was decided that the Arnot should be made a field station for various conservation works as a part of the general conservation program at Cornell University and in particular of the State College of Agriculture."

The time of diminished activity was short lived, however.

In 1939 back to the Arnot Forest came a company of the Civilian Conservation Corps transferred from Rensselaer County. In the two years the camp was reopened about 7,000 man days of work went into the Forest. Road maintenance, bridge repair and forest stand improvement were the primary accomplishments at an estimated value to the Forest of over $22,000. In the words of a director of the Arnot, "this offset numerous difficulties which arose in connection with the administration of the camp."

In 1940, the north half of Lot 14--52 acres--was added to the Arnot. It was a key area to the entrance to the headquarters camp and it gave needed control of the area traversed by Banfield and Jackson Creeks immediately above their junction and of Jackson

Creek to near its confluence with McCorn Creek.

As if the developing and expanding Arnot had not weathered enough complications, Nature had to take a turn too. A record rainfall of six and a quarter inches fell during a three-hour period on August 13, 1942. No erosion resulted in the forest but sections of the road were completely washed out, two bridges were badly damaged and a stream bed required relocation.

Nor did the demands of World War II bypass the Arnot Forest. The government requested the use of the old CCC camp buildings for housing 50 prisoners of war in 1945. Scarcely had the barbed wire gone up and the prisoners arrived than victory in Europe brought to a close this brief interval in the history of the Arnot Forest.

Three years later the formation of a new Department of Conservation within the College of Agriculture was to prove a most significant milestone in the development of the Arnot Forest. Emphasis shifted to multiple use of the entire Arnot for purposes of research, demonstration, teaching and resource management. Under these categories were five different fields of activity: forestry, fish and wildlife conservation, soil conservation experimental work, general conservation education and controlled timber harvesting.

From this past has evolved the Arnot of the present. The following pages record the emphases and accomplishments of today and perhaps a glimpse into the direction for tomorrow.

At the Arnot . . .

MANY COME TO LEARN

Cornell Classes

Forestry classes of the old department of forestry used the Arnot Forest extensively, and many Master's degree theses have been written from Arnot projects. The students who study woodlot management in the current Department of Conservation also make ample use of the Forest. They learn good forestry by seeing the results of experiments and management. Four half-day field trips per year concentrate on plantation establishment and management, weed or brush control, Christmas tree management, maple syrup production and the general problem of use of abandoned land.

Other classes using the resources of the Forest for field work, particularly, are ornithology and wildlife management. R.R.M.

4-H Leader Training Conservation Camp

The Arnot Forest has been the scene of an unusual activity each August since 1948. This has been the annual 4-H Leader Training Conservation Camp operated as a joint activity of the Departments of Conservation and Agronomy and the State 4-H Club Office.

In keeping with the 4-H philosophy of "Learning by Doing," 4-H boys from all parts of the State have come to the Arnot to learn the theory and put into practice many of the conservation skills needed on their own farms or in their county.

Before the first Conservation Training Camp could become a reality in 1948, the staff involved found themselves not only planning the program but building the camp, too. The old CCC Camp was sold in 1946 with the exception of two storage buildings and the site was bare and rough. Many hot July days were required to re-work existing buildings, re-organize water supplies and build basic facilities for campers. The Farm Labor organization supplied tents, tent platforms, showers, dishes and kitchen equipment - - enough to house 50 boys and staff. Over the years, the tents served well until

a reservoir of camp alumni and 4-H agents in the counties saw the desirability of developing a permanent camp with permanent buildings.

Educationally, the camp set out to offer three courses: (1) soil and water; (2) forestry; (3) wildlife based on the interest of the participants. Rather than taking a smattering of knowledge in general conservation, each participant chose his prime interest and studied intensively the whole week to learn the skills and theory in that particular field.

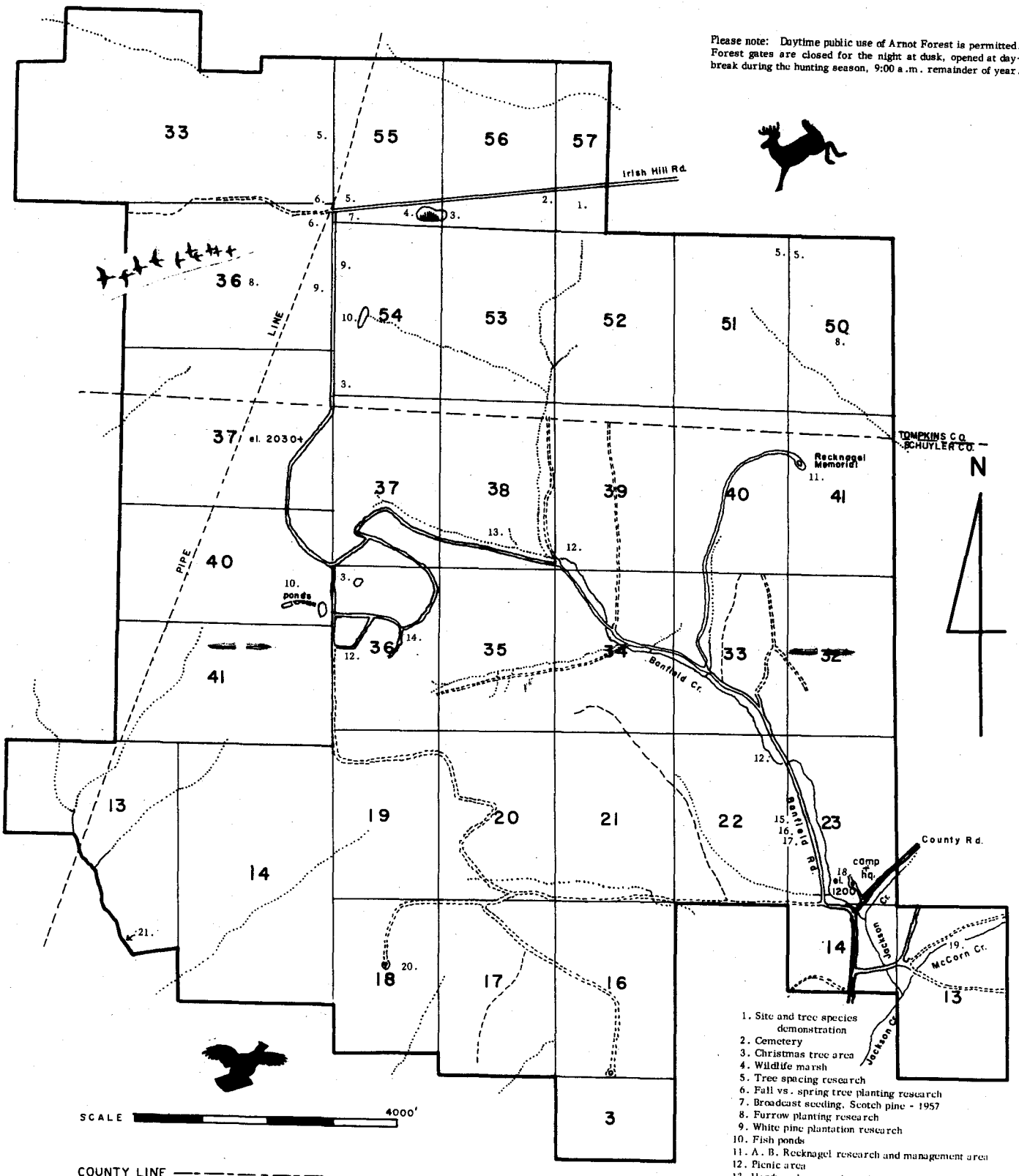
In soils and water broad studies of the Arnot and surrounding country were made and some years boys laid out, and constructed with heavy equipment, diversion terraces needed on the Arnot for water control.

Foresters learned to identify trees, how to operate and care for equipment and to do the needed thinning, log scaling, pruning and other work needed in the normal forest operation.

Wildlife students learned to develop improved habitat for both fish and game, work with trees and shrubs and to trap and skin animals in fur projects.

One test of the education offered here is to see whether the boys, young men in their formative years, return another year for more course work; part is to look at what happens to these prospective leaders. Over the nearly 18 years the camp has been in existence a high percent return to take a course of second choice--forestry one year, soil and water the second. Nearly five percent of the boys attending have returned to take all three courses, some years as high as five have "graduated" from the Arnot Conservation Camp.

A further look at the effectiveness of the camp in developing leaders has been to follow these young men in their work after leaving the 4-H age class (20 years maximum age). Several are successful farmers and lay leaders in their community. Others have gone on for higher education, many in general agriculture, several in forestry and wildlife management. Among the alumni are several county agricultural agents, even more 4-H agents; several on teaching staffs at forestry and agricultural colleges.



ARNOT FOREST

CORNELL UNIVERSITY

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The work of the 4-H Camp has involved many people, youths and adults, in contributing to the cause of conservation, and has also expanded the learning of a youngster to cover more than himself alone. F.E.W.

Teachers Conservation Workshop

Teachers Conservation Workshops were first offered at the Arnot Forest in 1950 and they have been an annual occasion every year except 1962. The Workshop is a cooperative arrangement between the Departments of Rural Education and Conservation who along with the Department of Agronomy provide the staff. The normal complement of teachers is fifty per summer.

Field trips, demonstration, lectures, film screenings and evening speakers highlight the four-day Workshop. It is designed to provide teachers with a great many of the facts of conservation and methods for teaching them to others who are concerned about the conservation of our natural resources. The State Education Department granted two units of in-service training credit to participating teachers, until that system of recognition was terminated in 1961.

"School" starts at 8:30 a.m. with a three-hour field trip. After lunch, there is another three-hour field trip which terminates at 4:30 in the afternoon. After classes some of the teachers go fishing or swimming in the farm ponds while others get together for informal discussions of teaching problems. Many find their free time periods good opportunities to learn more about birds, amphibians, plants or how to conduct field trips. Some teachers make leaf, soil or rock collections.

The Arnot Forest is an ideal setting for the Workshop. Its topography, soil associations, and waters, its fields and woodlands, indeed the whole story of man's impact on the area, are all spread out before the teachers to see and comprehend. The Workshop curriculum is divided into four areas: soil and water conservation, forest conservation, wildlife conservation and conservation teaching methods.

The soils of the Arnot, like those of the rest of the State, are glaciated and fall into a variety of categories. As a result of the Ice Age, entirely different types of soil may be found adjacent to one another. This provides unusual teaching demonstrations. Since soil and water conservation have always been acute problems at the Arnot, the various conservation measures that have been put into practice make it possible for the teachers to see conservation in action.

The waters of the Arnot Forest range from swampy areas to ponds and streams and offer unique teaching opportunities. For example, the artificial wildlife marsh suggests the enormous wildlife potential of such a habitat and ponds teeming with interesting aquatic life demonstrate the important role farm ponds play in soil and water conservation. A small stream--McCorn Creek--adds another dimension for instruction. There the teachers see the conservation improvement practices that have been put in by the 4-H youth working under the Cornell staff.

The forested areas of the Arnot Forest are typical of many cutover unmanaged woodlands of New York and Eastern United States. The big problem is how to improve such forest stands and how to develop them to reach a sustained yield operation. Thinning, cutting, and actual logging are all carried out at the Arnot and teachers who come to the Workshop have an opportunity to see how important these silvicultural practices are in producing good forests. The forest research activities are equally interesting to the teachers since they involve such a range of investigations, including site studies, growth studies, Christmas tree plantations and maple syrup production. The great variety of forest trees on the Arnot Forest aids in teaching tree identification.

The variety of wildlife at the Arnot ranges from the very smallest of mammals to some of the very large ones and include both the game and non-game species. All the problems of wildlife--food, cover, water and breeding places--are there. Not only do the teachers get a good grasp of the problems of wildlife, but they learn at the same time how man is able to manipulate their habitats in order to increase their numbers. The teachers develop new understandings of such matters as management versus stocking, why certain forms are present and others are not. In addition, they learn how to tell what kinds of animal life are present by interpreting the various signs and traces that animals leave. R.B.F.

Other Groups

A wide range of groups, other than teachers and 4-H conservation leaders, have used the facilities of this unique outdoor laboratory. A list of them would include public school and college classes, Scout troops and 4-H Clubs, sportsmen, camp counselors, lay leaders in a host of natural resource-related organizations, and professional workers in numerous fields. The past 15 years has been a time of marked growth in the use of the property for education, general and highly specific, formal and informal. This growth is in direct response to widening interest in natural resource conservation and has been intensified by the steady increase in the variety and quality of Arnot demonstrations and improvements in essential facilities required to accommodate visitors. This period has also been a time rich in experimentation in educational programs and activities that offer strong evidence of the truly exceptional quality of teaching resources and opportunities available at the Arnot Forest.

Land-use change in New York State, particularly in the post-World War II years, has brought the opportunity to enlarge the Extension Service's educational programs in the natural resources fields. This expansion has been occurring steadily and in many counties county agents devote a significant amount of time to programs in woodlot forestry, wildlife conservation and soil and water management for both commercial farmers and non-farm audiences. As a result, a concerted in-service training effort was called for and has come about to strengthen the background of the agents. Field instruction at the Arnot Forest figures prominently in this program.

Currently, training programs for county agents of several days duration are held at the Arnot at least every two years. In intervening years, 4-H Club agents are present for a session patterned to meet their needs to lead and teach in what also is an expanding aspect of their total program. Groups of new county agents who now routinely come to Cornell for a three-week subject matter training program for their first three years of employment, are also brought to the Forest for portions of the natural resources segment of their school.

The field demonstrations relating to woodlot forestry are used most often, particularly, an especially effective demonstration of the varying influence of internal soil drainage on the survival and growth among the several species of conifers used here in reforestation and Christmas tree production. Some types of training schools may be conducted more efficiently on a regional basis, but no other location in the State has such a wealth of natural resource demonstration and research at one site, or so many professional instructors only a short distance away.

The Arnot Forest in 1951 was the site of the initial three-day session of New York's Sportsmen's Conservation Workshop. This marked the beginning of applying the concept of in-depth field-oriented training for the informal leaders of our statewide sportsmen's organization, the N.Y.S. Conservation Council, and its county and local affiliates. The concept has also been applied in numerous one-day regional or county workshops and is enjoying parallel success in the Province of Ontario.

This State workshop, an event which purposely is held in a different location each year, convened at the Arnot Forest in 1951, 1955 and 1964. The wealth of teaching situations, both on the Forest, and within easy touring distance, made it possible to present an entirely different program each year. Important timely topics included: small watershed management, lake trout fisheries, trout stream problems, public and commercial outdoor recreation development, woodlot forestry topics, plant succession on retired farmland and many more.

Since about half of the 50 or more sportsmen attending the workshop each year are repeaters, and unusually well informed leaders, planning has been underway for some time toward a different event to serve the newcomer to responsibility in a conservation organization; a basic program to be repeated annually for a different audience. September 1963 marked the start of a new program--a two-day lay-leader training event emphasizing ecological principles basic to natural resource management. Attended by 30 leaders from sportsmen's clubs, soil conservation district boards, planning bodies and other groups, it promises to become another of the annual educational offerings at the Arnot Forest. H. B. B.

At the Arnot . . .

THE SCIENTISTS SEARCH FOR ANSWERS

Soil and Water Conservation

The year 1934 marked the start of cooperative soil and water conservation research at the Arnot. Equipment for measuring run-off and erosion was established on plots under widely different vegetative cover and cropping systems. Some of these measuring structures still stand.

Cooperators in this new research venture were the Soil Erosion Service, U.S. Department of the Interior and the Cornell University Agricultural Experiment Station. All Federal activities pertaining to erosion research and demonstrations on agricultural lands were soon to be brought together under the Soil Conservation Service, U.S. Department of Agriculture. Years later, most of the research functions were transferred to the Bureau of Plant Industry, and finally into the Agricultural Research Service, U.S. Department of Agriculture.

The Arnot area is typical of millions of acres of the Allegheny Plateau in southern New York and northern Pennsylvania. The erosion plots, mostly 1/100-acre in size, were located on the hill-top far above the present conservation campsite. The soil is Bath very channery (meaning many thin, flat stones) silt loam. Many other plots and a few watersheds were soon made a part of a comprehensive research program in the Arnot area.

A substantial part of the labor for plot and watershed installations was furnished by WPA and CCC workers.

The first plots were ready to collect runoff in May 1935. On July 7 and 8, 1935, a flood-producing storm of eight to ten inches over a wide area in Central New York caused many tragic and expensive demonstrations of erosion and flood damage. The Arnot was on the southern fringe of this storm, with a rainfall of about three inches.

The selective nature of erosion on the stony Bath soil was soon evident. About 95 percent of the soil washed from the plots was fine enough to pass through a 1/4-inch screen, whereas only one-third of the plow layer would pass through the same screen.

Emphasis during the early days was on erosion and its control, but it was soon apparent that crop yields benefited from moisture conserved by erosion control practices such as contouring and strip cropping.

With an increasing interest in water resources and efficient water management, there was a need for data on peak flows and water yields on a small watershed basis. Complete year-round records were obtained from two 18-acre watersheds during the years 1941-47, and peak flow data were obtained over a somewhat longer period. More than 50 percent of the average annual runoff from this somewhat poorly drained soil occurred during March, April and May. This contrasted sharply with the time of maximum erosion which invariably occurred later in the season during thunderstorms of high rainfall intensity.

The first farm pond at the Arnot was constructed in 1944, and by1949 there were eight ponds of various sizes. These were soon stocked with either trout or bluegill and bass. With water stored in ponds, and with aluminum irrigation pipe, it became possible to start experiments to determine the benefits of supplemental irrigation for potatoes and pasture.

Yields for well fertilized, nonirrigated and irrigated potatoes averaged 400 and 452 bushels per acre, respectively. Pasture plots were irrigated at different levels of fertilizer and lime. While irrigation was of some benefit, it was concluded that for this soil and climate, fertility was the most important factor limiting pasture yields. Yields of forage at the Arnot were raised to an average of four tons of dry matter per acre by fertilizer and lime alone.

Among the research activities undertaken on a limited and less formal basis was the construction of diversion terraces at one or two locations on larger cropped areas. Another was the planting of various old and new varieties of shrubs to furnish food for wildlife. Survival, growth and production were evaluated periodically.

The original erosion control plot studies were not terminated until 1954. In 1946-47, corn yields on the stony Bath soil, despite liberal fertilization under uniform treatment, ranged from 17 to 88 bushels per acre, depending upon past management and erosion during the preceding 11 years. Even in 1954, the ninth year of continued uniform good management, including fertilization, rotation, and low rate of additional erosion, corn yields ranged from 71 to 93 bushels per acre, with the yield pattern still definitely associated with differences in past management and erosion. G.R.F.

Wildlife Conservation

The Arnot Forest has been an area of major interest for wildlife research to the New York State Conservation Department and to Cornell University, because it is in the Southern Tier of New York. Historically, the Arnot property is typical of Southern Tier hilly forest and farmland which has been heavily used, and then abandoned for half a century. Cornell's foresters have used the "old Arnot" which has been entirely lumbered and burned over for the development of the best methods for transforming a poor second-growth forest into a productive one.

Ruffed grouse. Likewise the Arnot is invaluable for studies on the relationships between forest and wildlife management in this section of the State. During the mid-thirties the State Conservation Department conducted a very intensive ruffed grouse research program on Connecticut Hill, almost adjacent to the Arnot property. To compare winter populations of grouse on two adjacent areas, the first wild game inventory of the Arnot was made in 1936 by Frank C. Edminster. Throughout January 1936 Edminster, using manpower available from the CCC camp, carried out a complete ground census of ruffed grouse over the 21 lots (1900 acres) of the "old Arnot." Notes were kept on other wildlife species, particularly white-tailed deer, predators and minor game species. The results of this survey are available in an unpublished report. They indicate that at that phase of its history, the Arnot Forest was rich in grouse and potentially was highly productive of deer. Deer were just beginning to increase in suitable habitat throughout the Southern Tier, after being almost eliminated because suitable habitat was lacking. The report states that the ruffed grouse population on the Arnot was approximately 105 birds, and that the deer population consisted of about 16 animals.

Studies of the wildlife populations and their use by sportsmen were initiated in 1948. Lawrence S. Smith, a graduate student in wildlife management using a sampling method called the "King strip census" estimated that a grouse population on the "old Arnot" increased from about 140 in midsummer to 300 in early October. Since this study wildlife classes at Cornell have used the same method for annual estimates of grouse numbers. The results from early October counts have varied from 60 (1953) to 300 (1960), and have shown that grouse populations fluctuate over a rather wide range and with a fair degree of predictability.

White-tailed deer. The white-tailed deer, a species which traditionally has attracted a very high concentration of hunters, has also attracted the researchers' attention. In 1936 Edminster's estimate of deer at the Arnot was about 16 animals (five or six per square mile). Fourteen years later the harvest of deer in the same area was about 16 per square mile. The deer population from which this harvest was obtained was probably twice this figure. To reduce this high and rapidly increasing deer herd, the State permitted the harvest of antlerless deer on the last day of several seasons, beginning in 1950. Each "doe day" has brought hundreds of hunters, both expert and novice, to the Arnot. On the last day of the 1956 season, when antlerless deer could be legally taken, members of the wildlife management class kept individual notes on the number of shots heard throughout the day. Checking stations at the two points of entrance to the Arnot permitted accurate figures on number of hunters and harvest. A total of 300 hunters, operating on about six square miles throughout the day, harvested 74 deer, but fired the incredible total of 2,150 shots.

Techniques are still developing to provide information on density of deer populations in relation to food available. These are particularly needed in late winter, when the capacity of the habitat is at its lowest. During the CCC period, the lot boundaries had been marked by posts placed at all lot corners, and at intervals of five chains along boundaries. These posts helped in establishing transect lines for grouse census, and in locating permanent plots for study of vegetative changes.

Selective browsing. In 1951-52, research by another graduate student, Warren H. McKeon, provided data on the effects of selective browsing by deer. His experimental plots were located in lot

corners, so that it was possible in 1955 for another student, Anne LaBastille, to secure similar data in the same plots. She then compared the long-time effects of browsing by deer on reproduction of forest trees and shrubs and related these observations to a program of forest-wildlife management. The contrast was sharply drawn. In 1951 the browse was heavily eaten, indicating a deer population far too great for the capacity of the range. By 1955, however, the effects of the several "doe day" hunting seasons in reducing the population were evident. A reasonable balance between deer and their food production had been established. O.H.H.

Farm ponds. Although there are now some 20,000 farm ponds in New York, one of the first to be constructed anywhere in the State was the one-acre Boyce pond, built at the Arnot Forest in 1944. It is a long, narrow pond that sits off by itself near the bottom of a hill in Lot 54. Between 1947 and 1950 seven more ponds were built, all in Lots 36 and 40.

Each of the ponds was stocked with fish soon after it was built. By 1950 the Arnot ponds figured prominently in a farm fish pond research program, by Cornell's Department of Conservation, with financial assistance from the New York Conservation Council, the State Conservation Department and several Federal agencies.

The objectives of this research were to meet the rapidly increasing public demand for practical methods of managing New York farm ponds for producing trout, bass, and other species for fishing and eating, and bait minnows for sale to fishermen. A series of research projects that spanned 15 years and eventually included some 200 farm ponds in Central New York State fulfilled these objectives. The results have been published in series of articles for popular consumption, extension bulletins for pond owners, and scientific papers for biologists.

Over the years, the eight Arnot ponds have been involved in nearly all of the different kinds of fish experiments conducted, and in demonstration and instruction for the various groups of youths and adults who come to Camp Arnot each year. Collectively, experimental histories of these ponds give a representative panorama of the entire farm fish pond research program. Several of them have been used to assess the growth and survival of various kinds

of trout (including brook x brown trout hybrids), the possibility of gravel beds placed in spring seepage areas to permit trout spawning in ponds, and the life span of trout in these impoundments. One brown trout in the Pine Tree pond attained the relatively advanced age of six years. He was measured at 18 1/2 inches and weighed three pounds. Because of their high elevation, Arnot ponds maintain cool summer water temperatures and as a result tend to have better-than-average trout survival.

Five of the ponds have been used principally for experiments involving warmwater species or combinations such as largemouth bass, or bass in combination with golden shiners or bluegills. One of the string of four small quarter-acre ponds, stocked in 1952 with a three-way combination of bass, bluegills and yellow perch, made ecological history by its stability. All three species grew and reproduced throughout the ensuing seven years of observations. Yellow perch are often notorious "weeds," yet in this pond, while they were always present in moderate numbers, the total weight of perch never exceeded five pounds.

Another of the quarter-acre ponds was used successfully in a test of commercial minnow-raising. It was stocked with 500 adult silvery minnows in May 1955. In late September of the same year two hauls of a fine-meshed seine yielded 7,500 minnows, including a large portion of salable size. A.W.E.

Forest Conservation

Forest pathology. The Arnot Forest provides an exceptional opportunity for the investigation of certain types of tree diseases. As an example, the so-called "Nectria Canker" of basswood was found to be present and destructive in the forest at the time it was acquired by the University. Little was known at that time about this disease of forest trees, especially about the relation between cut wood and stumps from diseased trees and infection of healthy trees.

Basswood trees with canker infections were cut at intervals throughout the year, and monthly examinations were made of the cut parts to determine the behavior of the fungus pathogen. At the end of the two-year study it was possible to predict how the treatment of cankered trees, by felling , lopping of branches, leaving in place or removal

from the area, might reduce the hazard of this disease in the remaining trees.

More recently, studies on "Maple Decline" have involved artificial defoliation, the manipulation of environment to produce drought conditions, and other treatments calculated to shed light on the cause and nature of this obscure malady. Evidence obtained in this work has supported the theory that the maple trouble is due to a peculiar combination of environmental factors rather than to a single agent or pathogen.

Both of the above studies required that trees of considerable size be sacrificed in order to obtain the desired results. It was also necessary that experiments once started should be undisturbed for many months. Such ideal conditions were found in the Arnot Forest. D.S.W.

Forest plantations. Most of the northern part of Arnot Forest is abandoned farm land. Too poor for agriculture, what about tree plantations? Research both on and off the Forest has shown that much of this land is also too poor for economic tree growth either because of poor drainage or too much brush. Often the poorer land is also the most brushy since it was abandoned first. Nevertheless, some land is potentially good for trees with proper management techniques and brush control. Thus the prerequisite for a good plantation is selection of a site suitable for the species desired, as well as knowledge of the growth potential of each species.

Many experimental plantings were made at Arnot Forest in the early 1950's. Larch, red pine and Norway spruce often were planted in adjoining rows or blocks on similar soils. The difference in early growth of these species is most striking. In one typical experiment near the cemetery in Lots 56 and 57, eleven-year-old Japanese larch, red pine and Norway spruce were respectively 29, 15 and 10 feet tall on a good deep spoil. On an eroded soil of medium depth they were respectively 28, 10 and 3 feet tall, and on a very poorly drained soil only spruce survived well. It is apparent that all three species need deep soils, while the spruce also needs a soil fairly rich in nutrients. It is also apparent that larch is much the fastest grower in youth; the best larch tree is 37 feet tall at age 13.

Once the proper species is matched to the proper site, the spacing of the trees is most important. Close spacing of 6x6 feet improves quality somewhat, but planting and thinning costs may be excessive.

A number of accurately spaced plantings of larch, pine and spruce were made in 1950 and 1951, and the following guide for planting in medium and good soils was made partly as a result of these plantations.

Species	Markets available for		
	Lumber, poles pulp, posts	Lumber, poles	Lumber only
	Spacing in feet for planting		
Larch	6 x 10	8 x 12	10 x 12
Red pine	6 x 10	8 x 10	8 x 12

Management of the plantation doesn't stop here, however. Weeding out of hardwoods, pruning of selected crop or sawlog trees, continuous thinning as needed throughout the life of the plantation, and finally harvest of useful crops of pulpwood, poles and logs follow in order.

The Recknagel Memorial Management Forest dedicated on August 29, 1964, has already contributed information on management. A grassy knoll when Professor Recknagel selected it as a planting site 25 years ago, the forest now has some trees 45 feet tall and 10 inches in diameter. Five plots in Lot 41 have been marked out in this stand of planted red pine, the crop trees have been identified with a band of blue paint and pruned, and various degrees of thinning have been done in the different plots.

Maple syrup. The year 1956 marked the beginning of a new and most successful enterprise at the Arnot Forest--maple syrup. Although maple trees were small and scattered on steep hillsides, it was reasoned that new research might show the way for a profitable operation. The sugarhouse was completed in 1956 and sap was first collected and boiled into syrup in 1957.

That first year was a memorable one for those who gathered the sap by hand and carried it either to a dumping station on the hillside or down the bank to the waiting truck. They became strong and fit from the hard work, even though the wage returns for their labor was only a little over a dollar an hour.

Sap from 700 tap holes was boiled in the wood-fired evaporator. The first year's production matched the State's average of one quart of syrup per tap hole, but syrup quality sometimes suffered because of inexperienced workers. Nevertheless hundreds of people were attracted to this "new" and fascinating operation, and the Arnot was then committed to continued research and demonstration in maple production.

Plastic tubing was first used in large amounts in 1958, a year of extremely heavy snowfall. Because most of the tubing was in place before the heaviest snowfall and in time to collect the earliest runs, Arnot production exceeded the State average by about 50 percent. The tubing greatly reduced the most difficult job of gathering sap and provided the first big breakthrough toward a profitable operation.

In later years tubing was used more abundantly and more efficiently. Four hundred more tap holes were added from areas accessible only with tubing. In 1960 vacuum pumps were first used to keep the sap flowing through tubing on uneven slopes and during "weeping flows" on warm days. Now 90 percent of the sap is collected through tubing and two-thirds of it under vacuum.

Other studies were concerned with labor and equipment costs, the efficiency of hardwood fuel and quality control. A lot of equipment is needed and a lot of labor is expended before a drop of syrup can be made. Therefore, it is important to catch every run and make top quality syrup. Early tapping and the use of vacuum have increased the amount of syrup. In 1962 paraformaldehyde "pills," placed in the tap hole in the tree, were first used to reduce growth of microorganisms which are the principal cause of dark color and poor flavor in syrup, as well as the cause of premature drying of the tap holes. Also, sap flows are boiled within 24 hours when possible and equipment is continuously cleaned throughout the season.

The evaporator was first fired by oil in 1964 and the steady heat helped produce a better quality syrup. Aluminum covers and a special steam pipe now eliminate steam and keep the sugarhouse clean and dry. All of these steps have so improved quality that by 1964 over 90 percent of the syrup was graded light amber--the best. This was accomplished even though the sugar in the sap averaged less than two percent and 47 gallons of sap were needed to make a gallon of syrup.

In less than a decade of syrup making at Arnot Forest, research has made possible the following gains:

Number of trees tapped increased by about half
Production per tap hole increased by nearly a quarter
Syrup quality increased by about a third
Labor per tap hole halved
Wage returns nearly doubled

Even more important, many maple producers in the State have made similar gains by application of new ideas and techniques from research. As a result, New York now rivals Vermont as the leader in maple syrup production. R.R.M.

Wood preservation. In Lot 23, behind the central camp building and in Lot 14, across the Jackson Hollow Road are a series of five fence post "graveyards." Various types of artificial wood preservatives are being tested. The posts are installed in test plots on soils with different drainage characteristics and include untreated posts as checks. The first posts were set out in 1955 to test a series of preservatives known as Osmosalts. Additions help to evaluate other preservatives or new ways of putting the chemicals into the wood. Each year a 50-pound pressure is applied to these posts, 18 inches above groundline, and the extent of wood failure noted.

Woodchucks provided an interesting sidelight to this investigation when they began to gnaw on some of the posts. So tasty did they find copper sulphate and sodium hydroxide in a double diffusion process that it was eliminated from the test. (This method of treatment was developed by Dr. John Ayers of the Department of Conservation as a successful way of rendering wood resistant to marine borer attack). In other treatments woodchuck damage varies with species, and is not serious. L.S.H.

Wood utilization. The Arnot Forest consists primarily of immature second-growth hardwood stands originating from cutting or fire, and young plantations planted on former farm land. As such, it is typical of some seven million acres of forested Allegheny Plateau. Possibly the major forestry problem facing the owners of this plateau forest is the lack of profitable outlets for the trees which should now be removed from these second-growth stands and plantations in thinnings and improvement cuttings. Consequently, some attention has been devoted to exploring methods of utilizing these immature trees at the Arnot Forest.

Wood chips, fireplace wood, charcoal and fence posts, picnic tables and benches, and Christmas trees were among the outlets tried for the thinnings. A wood-chipping machine converts tops, saplings and young pole-sized trees up to six inches in diameter into fragments which are useful as mulch, livestock bedding, poultry litter and soil amendment at costs ranging from $3 to $13 per ton depending on the type of material and efficiency of wood handling.

Strapping and bundling one-half cord units did not increase the efficiency of this operation significantly because of (a) problem of bundles loosening during the seasoning process necessitated extra labor in retightening, (b) the round bundles reduced the payload capacity of the truck used for delivery.

Production of charcoal from seasoned hardwood thinnings in a small, portable kiln has proved profitable. After poor experience with a cinder-block kiln, a metal kiln was fabricated, patterned on one designed by Stuart Wheeler, county forester at Cooperstown. This has been in operation since the spring of 1963. Production is averaging 572 pounds of high quality charcoal per cord of wood. This material is bagged and sold locally. The wholesale price is so low that there is no large margin of profit left over to assign to stumpage value for the trees, but it does cover the costs of making the thinning so that the benefits from thinning "ride free."

Larger immature trees suitable for sawing have been processed in the Arnot sawmill and used for bridges and miscellaneous construction on the Forest. Some of the material has been made into the rustic benches and picnic tables which are seen on the property. Plans for these benches and tables are available.

Many landowners in New York have become producers of plantation Christmas trees as a hobby or a serious business venture. They have sorely needed management advice from the Extension Service. Consequently a few plantations of Douglas-fir, white and Norway spruces, Scotch and Austrian pines have been devoted to Christmas tree management. Although the areas are demonstrations rather than research, much useful information to other growers has evolved from managing them. One particularly interesting plantation of Scotch pine at the intersection of Auger Hole and Irish Hill Roads originated from direct seeding. L.S.H.

Tree improvement. In 1956, in cooperation with researchers at Rutgers and Penn State, a search of the three states of New York, New Jersey and Pennsylvania was made for "mother" trees of Scotch pine having markedly desirable or occasionally undesirable characteristics as Christmas trees. Seed was collected from these to form the basis for a one-parent progeny test to be established at nine locations throughout the various forest regions of the three states.

One of these locations is a well-drained hillside on the Arnot Forest near the site of the old Rozak farmstead. The plantation was established in 1959 and contains 35 seed source offspring, replicated three times, with the final evaluation occurring in 1964 for needle length, needle color, height growth, branch angle, lammas shoots, number of branches per whorl, branch overlap, stem form, taper, male and female flowering and needle retention. The relative influence of environment and heredity is becoming apparent from information from all locations. This plantation will be converted to a seed orchard of trees with desirable characteristics for Christmas tree farming.

A second seed source study was established in the spring of 1964 involving 12 known sources of Douglas-fir from collections made in the American and Canadian West. The experimental design and measurements are similar to those for the Scotch pine, and this plot has a counterpart at Cornell's Biological Field Station on Oneida Lake.

Chemical debarking. The earliest work in chemi-peeling in New York State was conducted at the Arnot Forest. In 1951 tests were begun to find chemicals and methods of application to ease bark

removal over an extended peeling season, and to test the response of various species to such treatment. It was soon apparent that sodium arsenite was the most effective chemical and that the "hatchet-and-oil-can" technique was best suited for most situations. Subsequent investigations of the insect and fungi hazard following chemi-peeling were conducted and reported on. Most of the work in chemi-peeling and other tests of arsenicals using different methods of application for simply chemi-thinning have been conducted in Lot 33 east of Birch Road. L.S.H.

Chemoforestry. With the widespread use of 2,4-D and 2,4,5-T starting in the early 1950's, chemoforestry has come into its own. Much research, principally in chemi-thinning hardwoods, has been done at Arnot Forest starting in 1949. In 1959 the Forest was the scene of research and demonstration of chemoforestry techinques for the annual meeting of the Society of American Foresters. The day's most spectacular demonstration was the actual airplane spraying of brush in a ten-acre pine plantation in a matter of minutes.

The principal knowledge gained from the Arnot chemi-thinning research is that, unlike oaks and most southern hardwoods, our beech, maple and most other hardwoods require a complete frill of overlapping axe cuts for good kill. In recent years good results have been obtained in plantation weed control by mistblowing hardwoods in August when pine and spruce needles are relatively dormant and little affected by the spray. In 1963 and 1964 the new chemical Tordon was tested extensively. Preliminary results indicate it to be so superior to 2,4,5-T that the latter may soon be like the old Model T Ford. However, Tordon is very harmful to conifers and probably will find little use in Christmas tree or other plantations. Thus progress continues in chemoforestry and the Arnot Forest will continue to play its part. R.R.M.

THE MEN WHO WROTE THE STORY

Much of the story of the early history of the Arnot Forest comes from reports and unpublished manuscripts by Professors Ralph W. Hosmer, Arthur B. Recknagel and Cedric H. Guise, who served successively as Head of the Department of Forestry at the New York State College of Agriculture. Professor Gustav A. Swanson, Head of the Department of Conservation since its inception in 1948, is responsible for the story of the developments since that time.

The sections on research and conservation education were compiled by faculty members from the New York State College of Agriculture. Their initials identify their special areas of interest. These men include Professor George R. Free, USDA, Ithaca; Professors Harlan B. Brumsted, Alfred W. Eipper, Lawrence S. Hamilton, Oliver H. Hewitt, Robert R. Morrow, Fred E. Winch, all of the Department of Conservation; Professor Emeritus Donald S. Welch, Department of Plant Pathology; and Professor Richard B. Fischer, Department of Rural Education.

Alfred Fontana, resident manager of the Arnot Forest, has contributed data on many current developments at the Forest.