Moquah (ER?)

Classification
Moquah
Natural Areas

Park Falls, Wisconsin
September 19, 1934

REPORT ON MOQUAH NATURAL AREA

CHEQUAMEGON NATIONAL

FOREST.

Relation of the area to the research work of the Region and its needs in connection therewith:

The study of this natural area is to be carried on jointly by the Chequamegon National Forest and the Lake States Experiment Station. A copy of the working plan prepared by Dr. Hardy L. Shirley, Associate Silviculturist of the Lake States Experiment Station, accompanies this report.

The object in setting aside such an area is to determine what will naturally take place on this area if it is afforded fire protection only. No cultural treatment, release cutting or any other treatment which would interfere with the natural course of events will be given.

Transfd 12/22/35.

Description of Area:

The proposed area will comprise all of Section 23, Township 48 North, Range 7 West of the 4th Principal Meridian. This section contains 640 acres and is Government owned.

Acreage of dominant cover types:

This section of land has represented on it most of the different vegetation types common on the Moquah District. It contains areas of open grassland, blueberry - sweet fern, aspen, mixed hardwoods, jack pine, and a few norway pine seed trees.

An acquisition examination in 1929 shows 143 acres of open grassland and 497 acres of brush, jack pine and aspen in mixture.

Physical and Climatic conditions prevailing on Area:

The topography is rolling with some, small relatively flat areas. There are no steep slopes present.

Elevations vary from 800 to 900 feet above sea level.

The soil is sandy throughout with a few small sandy clay pockets. The original stand of timber was largely Norway pine with a few scattered White pine growing in mixture.

The growing season varies from 110 to 120 days. The mean annual temperature is from 40 degrees to 41 degrees and the mean summer temperature only 65 degrees, and the mean winter temperature approximately 13 degrees. The average date of the last killing frost in the spring is May 20 and the first killing frost in the fall is September 20. Rainfall varies from 28 to 34 inches.

Forest Value:

This area originally supported a heavy stand of Norway Pine and a small amount of White Pine. It was logged in the late 1800s and repeated fires since that date have removed practically all evidence of the original stand. There are no swamps, lakes or streams and the area can be considered 100% productive from a timber standpoint. The present stand consists of a few scattered clumps of Jack Pine saplings and the remainder is open grassland or stocked to non-commercial species such as scrub oak, aspen and red maple.

Agricultural Value:

None. The type of topography and soil within the area are not adapted to farming. The nearest operating farm lies 5 miles southeast on a sandy clay soil.

Grazing value:

The area has very little grazing value due to lack of water. The establishment of plantations surrounding this section within the next two years will eliminate any possible grazing.

Mineral Value:

None. So far as known there are no mineral deposits of value in Bayfield County with the exception of brownstone deposits along the shores of Lake Superior.

Value for Public Uses:

This tract is not suitable for a game refuge, public camp ground or recreational area. It is used occasionally by blueberry pickers in season and its designation as a natural area may make it necessary to close the tract to blueberry picking.

Transportation Facilities:

The area is traversed by the Seventeen Road, a Forest development road which connects with U. S. Highway No. 2 and County Trunk Highway C. Nearest towns with railroad facilities are: Iron River (900) 13 miles southwest; Washburn (2200) 21 miles northeast; Ashland (10,000) 18 miles southeast.

Public Sentiment:

It is not felt that the setting aside of this 640 acre tract will arouse any public antagonism, eventhough it is necessary to close the area to all public use including hunting, trapping and berry picking. The general public is vitally interested in the progress being made in reforesting the Hoquah District and will abide by the Department Regulations. If public use is restricted on the area, signs to that effect should be posted along the boundaries explaining that fact.

Relation of Proposed Area to the future use of Resources of the adjacent National Forest areas:

It is expected that the data secured from the study of this natural area over a period of years will aid in the determination of the rate at which a denuded area will reseed itself naturally to commercial species if afforded protection from fire. The designated area, being limited in extent, will not interfere with the development and future use of adjacent lands.

Recommendations:

It is believed that the establishment of this natural area is highly desireable from an experimental standpoint. Data on the length of time needed for a heavily burned, denuded area to restock itself to commercial species is very meagre. The area will also serve as a check and comparison with adjoining and recently established plantations.

Respectfully submitted,

DONALD R. HALL,
Assistant Forest Supervisor.

Approved:

Oct 7, 1934 — Forest Supervisor
(Date)

December 7-'34 — Raphael Zon
(Date) — Director L. S. Exp. Sta.

Dec. 15, 1934 — Regional Forester
(Date)

July 19, 1933 — Forester
(Date)

(3)

NATURAL AREA INFORMATION FORM

1. Name of Natural Area Moquah Natural Area

2. Administering Agency U. S. Forest Service

3. Supervising Field Unit Chequamegon National Forest

4. State and County STATE: Wisconsin COUNTY: Bayfield

5. Latitude and Longitude ✓ Latitude: 46°30'; Longitude: 91°10'
(This information will not be given to the general public)

6. Primary type on areas ✓ SAF - Aspen 180 acres
SAF - Jack Pine 165 acres

7. Other important types represented on area:

7a. Botanic ✓ SAF-14-Northern pin oak-50 acres (Total of 6 & 7a-640 acres)
SAF-55-Northern red oak-45 acres
Grasslands -110 acres
Aspen and Northern red oak-90 acres

7b. Zoologic ✓ Z-16, Sharptailed grouse, Ruffed grouse
Z-17-Whitetailed deer

7c. Geologic ✓ G-10-Pitted outwash

7d. Aquatic ✓ no aquatic features

8. Acreage 640

9. Elevation and Topography ELEVATION: 800-900 feet. TOPOGRAPHY: Rolling with some small relatively flat areas. There are no steep slopes.

10. For information contact: Director, North Central Forest Experiment Station, Forest Service, U. S. Department of Agriculture, Folwell Avenue, St. Paul, Minnesota 55101

This form should be filled out in accordance with the instructions on the accompanying information sheet.

1610 - PLANS
(1+2.) KEEP - DO NOT DESTROY - ever!
US Forest Service
Washburn Wis

HISTORY OF THE MOQUAH DISTRICT

Written about 1937

The first record of any white men having set foot on the area now known as the Moquah District of the Chequamegon National Forest is that of Raddison and Grosseilliers, who made a trip to Namakagon Lake or Lac Court O'Reilles during the winter of 1659-1660. Probably no unrecorded visit was made prior to that time.

There are no records of any permanent Indian settlements within the district boundaries. However, the Indians must have frequently crossed the boundaries in traveling from the St. Croix River and Namakagon River to Chequamegon Bay. Included among the visitors were probably some of the Sioux and Chippewas' war parties, these tribes being traditional enemies.

Jack Glencross, an old settler on Pigeon Lake, says that the Chippewas once ambushed a Sioux war party at a bend in the Totagatic River and annihilated the entire party. The Sioux, who were traveling down-stream in canoes, were taken by surprise. He did not know even approximately when the event occurred or just where. Since he is married to a part Indian woman, it is likely that the story was told to him by Indians a long time ago and is authentic. The Totagatic River rises within two miles of the southwest corner of the district, so it is possible that the event occurred a very few miles from the Forest. Eventually the Sioux were driven west to the prairies and never returned.

However, Indian settlements were established on the Eau Claire Lakes a few miles southwest of the district but were abandoned prior to the

building of the "Omaha" railroad through Drummond in 1880-81. Jack Glencross claims that a Catholic Mission and Chippewa Indian campground was located at Pigeon Lake on the exact site now occupied by the dwelling on the east side of his property on Lot 7, Section 7, T. 45 N., R. 8 W. Who the missionary was or when the mission was abandoned is unknown. Anyhow, the building was entirely gone when Mr. Glencross came to Pigeon Lake in the 1880's so it is probable that the missionary left long before 1870. Arrowheads and other Indian relics were frequently found on the site for many years.

The original G.L.O. plats show a number of trails crossing the Moquah when the original surveys were made between 1852 and 1858. These lead west to the headwaters of the St. Croix and Brule Rivers, southwest to the Eau Claire Lakes Region, and south to the Namakagon River and Lac Court O'Reilles from Chequamegon Bay. The origin of these trails is lost history. However, it is probable that they were traveled as early as 1670 when the Hudson Bay Fur Company was organized. This company controlled the fur trade of America for over a hundred years.

LeSueur was sent to Chequamegon in 1692 to keep open the Bois Brule and St. Croix routes and established trading posts on Chequamegon Bay. He went down to the Mississippi, probably by the Brule River-St. Croix route. Logically he crossed the upper Moquah while on these trips.

In 1783 the Northwest Fur Company was organized at Quebec, and a post established at LaPointe. In 1808 John Jacob Astor organized the American Fur Company. Its headquarters were in LaPointe until 1853 when the affairs of the company were closed.

During this period of nearly two hundred years the value of furs carried over the trails across the present Moquah District must have aggregated millions of dollars.

The Railroads

The "Omaha" railroad was completed from Cable to Bayfield between 1880 and 1884 and was the first railroad inside the Moquah District boundaries. The Northern Pacific reached Ashland in 1884. Both are still in operation. Other railroads, less stable than the above but probably as important to the logging business on the Moquah, include the Duluth South Shore and Atlantic; Minneapolis, St. Paul and Ashland (usually called the Peerless. It ran from Ashland to within two miles of the boundary near Ino and continued about five miles south. This road was built in 1895.); and the Washburn, Bayfield and Iron River Railroad (built in 1896 and called "The Battleaxe". This road ran from Iron River to Washburn. It finally went into the hands of receivers and was sold to the Northern Pacific.) The three roads described last have all been completely dismantled and abandoned, the latter two since early in the present century; the Duluth, South Shore and Atlantic still runs trains on the Northern Pacific Track.

The "Omaha" and Northern Pacific were land grant railroads and were given the odd numbered sections ten miles on either side of their rights-of-way. The loggers bought much of their stumpage from these railroad companies.

The Loggers

> "Commercial logging of pine along the south shore of Lake Superior, between the cities of Superior and Ashland, started prior to the Civil War. At that time White Pine was the commercial pine. Its harvest was followed by frequent fires which destroyed much standing timber. There is an authentic record of a forest fire in what is now Douglas and

Bayfield Counties in 1863. The estimated loss of lumber ready for shipment on the shore of the lake in this area during that year was $1,000,000. The loss within the forest was evidently much greater, for records of that time state that the pall of smoke was so heavy that as far south as La Crosse the sun was hidden for two days. Jack Pine has come in largely as the result of these destructive fires and not as is commonly supposed because it is the only pine that will grow on this area. It might well be called the "fire" pine as fires open up its cones and prepare an ideal seed bed for the germination of its seeds.

"Growth studies in the Jack Pine of the level sandy plains as well as the morainal hills of Bayfield County, show that little or no Jack Pine is now standing which did not seed in after these early fires, for most of the older stands are from fifty to sixty years old. Much of this early growth of Jack Pine has disappeared largely through fire. Isolated areas of young Jack Pine date back to fires of ten to thirty years ago." (4)
The above reference is the earliest reference to logging in the immediate vicinity of the Moquah Ranger District.

The following article that appeared in the Eau Claire Leader, Eau Claire, Wisconsin, Saturday morning, November 18, 1933, briefly covers the History of Drummond and vicinity. The names of residents are included for their possible future historical value. Mr. Edward Skille of Drummond generously loaned his copy of the clipping for Forest Service use:

"Through courtesy of Arnt Finseth, Route 4, Mondovi, Wisconsin, we have received a story by Edward Skille that has to do with that interesting little village, Drummond, Wisconsin, as told at the celebration there on September 4. It is in part as follows:

<u>Drummond Up to 1900</u>

'John S. Owen, of Saginaw, Michigan, came through the Bibon Swamp with a pack sack on his back in the summer of 1879 to locate a tract of timber for sawmill operations. Timber was cruised and purchased and the Rust-Owen Lumber Company, Limited, was organized April 28, 1882.

'Frank H. Drummond came here with a crew of men on February 2, 1882, starting to carve the place out of the wilderness. They built the first camp about where the railroad depot is now located. Some member of the crew,

probably the shanty boss, wrote the name Drummond in large letters on a piece of board and nailed it over the root-house door. That is supposed to have been the original naming of this pl ce.

'The sawmill was erected during the summ r of 1882 and was ready for a short term of sawing in the fall. As usual in those days, they built the mill by a dam site. The dam was made later by the wood superintendent, John G. Riggs, from Maine.

'A then modern planing mill and large boarding house was built; lso houses for the workmen and their families as required. In 1894 and again in 1914 a few more such houses were added. They total now about 78. A large house was built on the hill for Mr. Riggs and family. That is the house now occupied by the Bartlett family.

'A combined office and store building was erected in 1886. This was destroyed by fire on March 21, 1914 and a new building took its place.

'A town hall, with school rooms on the first floor, also came to be during one of the early years. The first school, however, was hel. for a short period in the house where Martin Overby family now lives. The Town Hall school rooms were replaced by ones in a more modern wooden structure in 1902, abandoned in 1923 for the present up-to-date brick school house.

'Logging was done entirely by sleigh haul the first nine years. In 1891, the company completed their own logging railroad, called the Drummond and Southwestern, or D & S for short.

'Some of the early camp foremen were George Aldworth, W. J. Armstrong, Abner Boyd, Roland B. Brown, Nate Cameron, James Cernaghan, William Cernaghan, Mose Charett, Tim Dorgan, Chris Foss, Sam Haslett, James Headrick, Matt Kennedy, Charles O'Neill, James Owens, Tom Powers and Nehemia L. Shaw. William Cernaghan's camp was commonly called "Crusoe Camp" with "Robinson" left off.

'To mention the names of all the men who worked for the Rust-Owen Lumber Co. is next to impossible, even for the first few years, and more so when the chronicler was eight and one-half years behind time. A complete list would run into thousands. It is believed the following worked here the summer of 1882: George Aldworth, Louise Barnaby, Charles Blaisdell, Gustav Carlson, James Cavanaugh, Peter Cavanaugh, James Cernaghan, William Cernaghan, Joe DeGuise, Thomas Desermo, Halvor Fredrickson, Ole Gagnat, Daniel Gilbrant,

Sivert Glarum, John Hallen, Fred Hammer, John Hemski, Ed. Holt, Martin Holt, John Husby, Martin Iverson, Hans Johnson, Hugh McDonald, Martin Madson, Hans Marten, Lars Mogstad, Julius Ness, Charles Noyes, Jacob Olson, Nils Olson, Ole Paulson, Paul Pelonquin, August Peterson, Halvor Peterson, Magnus Peterson, John Ryan, Daniel Sorgjerd, Gustav Sorli, Martin Sorli, Olaus Olson, Peter Sten, James Sullivan, John Sullivan (not the famous John L.), Frank Tomlinson, Knut Valstad, Nolton Van Horne, George Williard, and John Willard. The list is incomplete. Several other men, now forgotten, worked here during that first summer.

'Nils Olson, well remembered by the older people, came here March 5, 1882. They were then cutting a road down the hill from the camp to the mill site. Olson is responsible for telling about the name plate over the root-house door.

'Hans Johnson and his saw-partner, Olaus Sten, sawed down the timber on the site of the dwelling houses. Hans Johnson is still very much alive at Bemidgi, Minnesota.

'The following are the names of some of the men who worked here priorto 1900, arranged alphabetically and not according to the dates they came here to work:

'Tim A. Alcott, Nick Anderson, Peter Anshus, J. A. Arbo, George Archer, Martin Aune.

'Amos Babcock, George H. Baily, Julius B. Bauman, Julius Beck, Andrew Berg, August Bergdal, Peter O. Berg, Robert Berry, Howard Blair, Arnoldus O. Blix, Andrew Bohn, Ole Borgen, Ole Borset, Joseph F. Boss, Gus Bowman, Iver E. Brack, Albert Buaro.

'William Campbell, Harry Carter, Tom Carter, E. E. Chase, Andrew Christianson, Emil Christianson, Ernest Clock, Morris Compo, Ed. Conlon, Douglas Cory, Joe Currier.

'Gustav Dahl, John Danielson, Morten Danielson, William Delaney, Antoine Duval, Joseph Duval.

'A. W. Echart, Frank Ehnebom, Carl A. Erickson, E. R. Evans.

'Andrew Falk, John Feeley, Arnt A. Finseth, Nels Finstad, F. W. Fitze, Levi Flint, Hans Frogner.

'James Garvey, Willard Gaskill, Louis Gauper, Frank Ginder, Carl Glaso, Andrew Gleddi.

'Louis Hagen, Luke Haines, Gilbert Hanson, Peter Hare, Olaus Hagerud, Otto Hedland, John Heffron, Ed Hemstad, John

Hemstad, Peter Hemstad, Ole Hepso, Paul Hervin, John Hilstad, Nels Hosnove, Louis Hovind, Ole Hovland, Andrew Hugdal.

'Albert Jacobson, Carl Jacobson, Olof Janer, Jacob B. Johnson.

'Rudolph Kamm, Charles Keough, Ole Kittelstad, Ole Kragemo, Julius Kveno.

'A. B. Larkin, Louis Lawrence, Napoleon Lemieux, Ole Lenning, Fred Lessard, Oscar Linander, Hans Lybek, Willard Lymburner.

'Mike McKinley, Richard C. McLeod, A. F. Malam, George Marsden, Lars Mjos, Nick Moe, Peter Moe, William Morgan, Ole Mork.

'Ole Nelson, Herman Nordby, Julius Nordby.

IJohn Ohms, Haaken Olson, Jens P. Olson.

'Martin Peterson, James F. Pike, John Potterud.

'Louis Ramstad, Nels Ramstad, Ole Ramstad, James Redmond, John M. Richards, Arthur N. Riggs, Fred Riggs, Even Rogstad, Ingwald A. Rosok, Marius Rosok, Ole T. Rudd, John Rydberg.

'Walter Schmidt, Ed Sertimo, William Simpson, C. L. Skatvold, Calvin Smith, John Solberg, Ole Soli, Halvor Stangvik, Edvart Stein, Ingebrigt J. Sten, Morten J. Sten, Sivert J. Sten, Anton P. Stone, E. W. Stone, Henry Strand, Sivert P. Strand, Anton Sumstad.

'Albert Teigen, Peter Thorp, Arnt Tiller, John Tuff.

'Charles Ulrich, John Unseth.

'Lars Vetta.

'David Waffer, Henry Wagner, Gustaf Warnast, Oscar Wesling, John Westberg.

These names have been listed regardless of face, color, age or distinction.

'Of the men still employed, Nels P. Nelson's name appears earliest on the books, his first start dating back to April, 1887. Five others have worked here over forty years and are still on the job. They are Louis Anderson, Ovidius Benson, Albert Johnson, Martin Overby and Edvard Skille.

'A sixth person, Engineer Charles Clock, could, prior to his death September 2nd, look back on services rendered the Lumber Company for more than forty-two years.

'Among the second generation, Martin O. Berg is the oldest resident in Drummond, being brought here by his mother about May 1, 1886, when he was only three weeks old. Harry Thorp and Ida Berg O'Brien are the oldest residents now living in Drummond born here.'"

In interviews with F. H. Bartlett, secretary and treasurer of the Rust-Owen Lumber Company; Edvard Skille, a resident of Drummond since 1890 (incidently probably the most reliable source of information; and other local residents, additional facts concerning Drummond were obtained.

The real founders of the Rust-Owen Lumber Company were F. W. Gilchrist of Alpena, Michigan, and W. A. Rust of Saginaw, Michigan. John S. Owen married Gilchrist's daughter, hence the Rust-Owen name for the company.

The flume from Lake Owen to Drummond (see transportation) was built about 1885 along with "The Dam" (now impounding waters of Rust Flowage) by John G. Riggs. No one contacted knew the exact year. The portion of the flume from Lake Owen to Rust Flowage was actively used until 1902. The portion of the flume from Rust Flowage to Lake Drummond was used off and on until 1915 with very light use the last six years. The number of board feet of logs that went through this flume is a matter of conjecture. At any rate it is likely that nearly all the pine from about eighteen sections adjacent to Lake Owen were rafted and flumed to Drummond.

The lumber manufactured during the early life of the firm was shipped to Eau Claire from which point it was distributed, after which time shipments were made direct from Drummond.

Mr. Bartlett stated that Lammer Brothers logged the pine in all the

even numbered sections in Township 45 North, Range 8 West, and sections 4 and 6 in Township 44 North, Range 8 West. The logs were landed at Swede Lake in Township 44 North, Range 9 West, and transported via water through the Eau Claire chain of lakes, the Eau Claire River and the St. Croix River to Stillwater, Minnesota, a distance of over 160 miles. One of their camps was located on the site now occupied by the Pigeon Lake CCC Camp which has also been abandoned.

The Rust-Owen Lumber Company logged a large number of descriptions in Township 44 North, Range 8 West for the North Wisconsin Lumber Company (a Weyerhauser concern located at Hayward). The logs were hauled by railroad and landed on the Namakagon River at its junction with Big Brook in Township 43 North, Range 8 West, from which point they were driven to Hayward. This operation ceased when some of the North Wisconsin Lumber Company lands were deeded to the Rust-Owen Lumber Company on October 1, 1938.

In 1897 the Rust-Owen Lumber Company's original circular mill was replaced with a band mill. During this same year the mill began sawing a few select hardwood logs. Previously only pine lumber was manufactured. In 1900 some hemlock and more hardwoods were sawn. In 1910 the addition of a resaw increased production to approximately 150,000 board feet per day from approximately 120,000 board feet prior to 1910.

The mill ordinarily operated six to seven months each year between October and November. However, in 1922 the mill did not shut down until February 22nd.

The following article printed in the May 2, 1931 issue of the "American Lumberman" is a good recapitulation of the Rust-Owen Lumber Company's operations:

"Milwaukee, Wis., April 27. - In connection with other interesting and important events that occurred in 1930, that year also marked the closing of another of the pioneer mills of Wisconsin. On Nov. 7, 1930 the last log went through the mill of the Rust-Owen Lumber Co. at Drummond, Wis. John S. Owen, of Eau Claire, formerly president of the company and a member of its board of directors since its inception, was present to see the last log cut. This log, a big white pine, which scaled 1,120 feet, completed the cut of this old company.

"The Rust-Owen Lumber Co. was founded in 1882 by F. W. Gilchrist, of Alpena, Michigan, and John S. Owen, A. J. Rust, J. H. Rust, R. E. Rust and W. A. Rust of Eau Claire, the original officers being John S. Owen, president; F. H. Drummond, Vice President, and R. E. Rust, secretary and treasurer. The holdings of the company consisted of 80,000 acres of excellent pine in Bayfield County, Wisconsin, which was acquired about the time the Ashland branch of the Omaha railway was built through to Ashland. Under the direction of the company, the town of Drummond was established.

"The plant was originally equipped with a circular mill, but about 1884 this equipment was replaced by band mills and more modern saw-mill machinery. The old gang, which was installed about 1884, recently was purchased by Henry Ford, who will set it up in his Fort Dearborn (Mich.) Museum of American Life, where it will rest after more than 40 years of active service.

"On November 16, 1930, nine days after the closing of the mill, while two of the present officers of the company were sitting in the company hotel looking out at the mill, one of the big smokestacks tottered and fell, a valedictory from the old mill.

"Present officers of the Rust-Owen Lumber Co. are A. R. Owen, president; R. E. Gilchrist, vice president; R. W. Owen, secretary and treasurer, and F. H. Bartlett, manager.

"A representative of the "American Lumberman" recently has been supplied with figures giving a recapitulation of the sales of this company between 1883 and 1931, as follows:

Lumber	Feet
Pine	1,031,567,283
Hemlock	76,186,009
Hardwood	54,405,512
Cedar	308,251
	1,161,467,055

Box Lumber

Pine	22,823,671	
Hemlock	2,247,629	
Hardwood	2,488,288	
		27,599,588
Total manufactured		1,189,026,643
Norway piling		7,941,620
Pine logs	48,300	
Hemlock logs	9,041,590	
Hardwood	533,530	
		9,623,420
Hemlock ties	5,685,535	
Hardwood ties	1,310,528	
		6,996,063
Grand total		1,213,587,746

Lath	196,519,660 pieces
Shingles	78,460,500 pieces
Pickets	17,336,686 pieces
Molding	21,870,638 lin.ft.
Bolts	8,656 cords

Sawmill operated 48 years.

Average cut per year

Lumber	24,771,588 feet
Lath	4,094,160 pieces
Shingles	1,634,500 pieces
Pickets	361,223 pieces

Nearly all this timber was cut in the town of Drummond. In addition, unknown millions of board feet were taken by Lammers Brothers and the North Wisconsin Lumber Company as described above. Millions more board feet than would today be merchantable have been consumed by fire. The Technical Management Atlas contains figures on the present stands plus timber cut under Forest Service jurisdiction. The present stands are the remnants of hardwoods left after logging operations and the reproduction following fires.

Lack of time prevents gathering as complete histories for the remainder of the district; hence brief facts must suffice for the present.

The Delta area was logged principally by the Humbird Lumber Company (also a Weyerhauser concern) later known as the White River Lumber Company, and purchased about 1906 by the Edward Heinz Interests. The mill was located at Mason. Transportation consisted of sleigh haul, a narrow gauge railroad, and the White River, used separately and in combination. Operations were completed many years before the Rust-Owen Lumber Company mill closed. A small amount of timber from the western part of the Town of Delta was sawed at Iron River.

Timber from the upper Moquah was nearly all hauled by railroad to mills adjacent to the district (Iron River, Ashland, Washburn, Bayfield, and possibly other points).

The Speculators

Through high pressure methods thousands of acres of cutover lands were sold to non-residents for agricultural, resort, or speculative purposes. Logging companies maintained land departments for such disposal or turned their lands over to land companies who, in turn, "unloaded" it onto a gullible investing public at premium prices.

It cannot be truthfully stated whether the companies believed the lands to be agricultural or were profiting at the expense of the purchasers' ignorance. In any event, many purchasers bought a "pig in a poke" and never cleared a square foot after seeing the land. Others expected to sell later at a higher price. Some tried farming and lasted a number of years before being forced to abandon their land. A few were fortunate enough to have purchased lands actually agricultural in character and have made a respectable living (however, some are only able to maintain

themselves through relief or employment other than farming). In general, the resort properties turned out the best in the long run.

The lands abandoned very often became tax delinquent and eventually reverted to the County or to new owners via the tax deed route. Occasionally the original owner got the land back through foreclosure proceedings. Some who held out long enough were able to dispose of submarginal farm lands to the Resettlement Administration in 1935-36.

The extent to which tax delinquency hit Bayfield County is indicated by the following tabulation:

Acres in County Forest under the Forest Crop law as of March 15, 1938	124,711.73
Acres of County lands sold or optioned to U. S. Forest Service (subject to slight revision for areas dropped)	56,026.92
Acres to which the county has a tax title other than land in County Forest	64,087.65
Total acres	244,826.30

Most of this tremendous area reverted to the county, because the owners could not pay taxes or did not consider it worthwhile to pay them. These lands comprise 25.3% of the total area of the county (958,172 acres).

In addition the Resettlement Administration purchased approximately 7,360 acres of submarginal farm land and the U. S. Forest Service has bought or optioned approximately 184,200 acres in Bayfield County (not including land purchased from the county). The percent of the 192,160 acres discussed in this paragraph that would have eventually reverted to the county through tax delinquency is a matter of surmise, but 75% seems conservative. Certainly the owners who "sacrificed" their holdings to the U. S. government saw little future for them. Taken all together, it is

probable that at least 40% of the area of the county would today be delinquent if lands did not revert to the county or the Federal Government had made no purchases. Under the present ownership, over 437,000 acres or nearly 46% of the area of the county is not paying the general property tax.

In spite of the vast area already taken out of private ownership many thousands of acres are practically in the same class as county land today through prolonged tax delinquency. Other thousands of acres could be bought by the Forest Service at low prices if acquisition money was available. In view of these facts, the problem of private ownership is still far from solved.

The Rust-Owen Lumber Company furnished an example of the methods used in land disposal. In 1914, E. C. Hart, now municipal judge at Washburn, became a land agent for the company. Many non-residents were induced to buy cut-over lands for farms at relatively "fancy" prices. Some succeeded, but most of the settlers were starved out in less than five or six years. Others have given up as late as 1937. A few were fortunate enough to actually get land suitable for agriculture and are managing to make a living as long as supplemental employment is available. When the occupants gave up, the company usually secured a quit claim deed to the property leaving the former owner to begin anew somewhere else.

In 1937 the Forest Service removed the remains of several former dwellings from government owned land, but many "memorials" to this "land use policy" still exist on private land. As discussed above, a few families salvaged a portion of their investment when the Resettlement Administration purchased submarginal farm lands in 1935-36. It can only be hoped that wise resettlement policies by the Forest Service and the county zoning

ordinances will prevent the recurrence of similar future tragedies, at least inside the boundaries of area influenced by the United States Forest Service.

The Present Population and Economic Setup

In 1929 the Moquah District was established as the first National Forest in Wisconsin. The Drummond area was added a few years later.

Statistics on the current distribution of Bayfield County residents by occupations are not available. Predominantly the county is agricultural. The major portion of the remaining population is engaged in commercial fishing (residents of Cornucopia, Port Wing, Bayfield and other Lake Superior ports), resort management, minor logging operations, and industries such as the DuPont factory at Barksdale. A large percentage of the population is dependent on direct or government work relief. The balance of the population is supported by miscellaneous employment such as local political offices and jobs for local government; taverns, stores, filling stations or similar operations; railroad workers, teaching; etc. Many workers resort to a combination of two or more of the above for a livelihood.

Until the late 1920's farming, fishing and the wood using industries maintained a prosperous population. With the decline of the logging industry the county became decadent. Even today after the purchase of many submarginal farms by the Resettlement Administration, a large part of the people are semi-stranded and dependent on government aid.

The farmers on the better soils, the fishermen of Lake Superior, and the resort operators appear to be the most stable groups. Under forest management, and a well thought-out resettlement policy there is no reason why the remaining unstable population could not be established on a permanent basis. The second growth timber now becoming merchantable on

large areas should point the way for future development. The resort business that is increasing each year, will add to the general prosperity. It appears that economically the Moqush District has hit its "low" and the future should show improvement.

METEOROLOGICAL INFORMATION

The following information is copies from data included in the written portion of the Timber Stand Improvement Atlas prepared by J. T. Horner and dated August 1, 1936:

"The following average rainfall may be expected on the Forest:

Season	Month	Rainfall
Spring	March	1.8
	April	2.8
	May	3.7
Summer	June	4.1
	July	4.0
	August	3.3
Fall	September	3.3
	October	2.4
	November	1.6
Winter	December	1.4
	January	1.3
	February	1.2

(From Bulletin 68 - Soils of Wisconsin)

"Climate is modified by proximity to Lake Superior. Summer temperatures run from 60° to an occasional 100° Fahrenheit, while winter temperatures go as low as 40° below zero. Mean summer temperatures average 60 to 66° Fahrenheit.

The length of the growing season onthe north half of the District varies from 120 to 140 days and from 110 to 120 days on the south half. The south half of the District is less affected by the presence of Lake Superior.

The last killing frost in spring occurs between May 20th and June 1st during the average year, and the average first killing frost occurs between September 10th and 20th in the fall.

GEOLOGICAL AND SOIL CLASSIFICATION AND CONDITIONS

Physiographic Features of the Moquah

The Moquah District contains a gross area of 130,739.20 acres (original G.L.O. acreage). The extreme distance between the north and south boundaries is thirty-six miles and between the east and west boundaries is nineteen miles. Roughly, the district occupies the center of Bayfield County, the district boundaries being approximately six miles from the County line on all sides.

The southern part of the district is a portion of the highlands of the northern part of the state and has an average elevation of 1300 feet.

> "From this highland area there is a broad ridge forming the axis of the peninsula between Lake Superior and Chequamegon Bay. This ridge varies from 1,000 to 1,200 feet in elevation. From the ridge the country slopes toward Lake Superior on the northwest and Chequamegon Bay to the southeast, producing a broad plain sloping gradually from the ridge to the lake on the north and to Chequamegon Bay and the broad valley extending from the latter southeastward." (4)

This ridge is occupied by the north portion of the Moquah District.

In the introduction to the "Forest Recreation Management Plan" of April 18, 1935 for the Chequamegon National Forest, by James B. Gray, this statement is made in describing the Forest: "It includes about every type of topography and soil found in the morainal areas of the Lawrentian glaciation, and about every degree of forest degernation and natural reforestation to be found in the wake of logging operations". The statement applies equally well to the Moquah Ranger District.

The physiographic features of the district are described in more detail in the following quotation, also from the "Forest Recreation Management

Plan":

"a. The Moquah area includes all of the original Moquah Purchase Unit except that portion of the southwest corner south and west of a line running through Sections 15, 10 and 4 of T.47 N., R. 7 W., Sections 32, 29 and 30 of T. 48 N., R. 7 W., and Section 25, T. 48 N., R. 8 W.

"It is composed of barren high rolling sand hills and some half dozen comparatively flat areas or small plains. It has no rivers within its boundaries. There are a number of lakes of varying size, with neither inlet or outlet, and representing, roughly, the natural ground water level. Usually these lakes are fairly deep and the water clear and cold, being fed and drained by springs and seepage. The beaches are fairly steep and clean.

"There are practically no marshes or swamps of any size. The whole area has been burned over so repeatedly and so deeply that scarcely a trace of the original stand of timber remains. The only cover over thousands of acres is the low growing highland blueberry while on other great areas the scrub oak and jack pine are beginning to creep in.

"The soil varies from a fine glacial sand to a sandy loam clay. Little remains of the original ground litter or top soil. Erosion undoubtedly would be severe were it not for the highly porous absorptive texture of the sandy soil.

"The climate is modified by the higher evaporation and absence of shade due to lack of forest cover and by proximity to Lake Superior. Summer temperatures range from 60 to 85 degrees Fahrenheit, with an occasional extreme of 100 degrees; and winter temperatures as low as 40 degrees below zero.

"b. The Drummond Lake area, including the southwest corner of the Moquah Purchase Unit, and the towns of Delta, Drummond and Namekagon, is gently rolling with steeper ridges in some localities, interspersed with broad nearly flat plains. The whole area is dotted by a network of lakes, large and small, some with no outlet, and representing the local ground water level, others forming the headwaters of the White River flowing northward to Lake Superior; and of the Namekagon River emptying into the Mississippi River system. Among the largest of these are the beautiful Lakes Owen and Namekagon, Star Lake, the Porcupine, Diamond and Atkins Lakes. Practically all of the lakes are fairly deep, with clear fresh water. There are numerous swamps, increasing in size from north to south.

"The soil varies from a loamy sand to a deep black sandy loam. The occasional fires have not been extensive except in a few cases, nor heavy enough to destroy the organic top soil or ground litter. Much of the area so far has escaped burning. There is a splendid

reproduction generally of mixed hardwoods; and in large areas, of white, Norway, and jack pines.

"The average temperatures for summer are 60 to 85 degrees Fahrenheit with occasional extremes of 100 degrees. Winter lows range down to -30 and -40 degrees. In summer the days usually are warm and the nights cool."

Geology and Water Supply Data (4)

"The geological formations of Bayfield County are the pre-Cambrian granitic formations, the Keweenawan trap, the Lake Superior sandstone, the glacial drift and the lacustrine red clays. The northern part of the county is underlain with Superior red sandstone, over which is thick mantle of clay and gravel forming an artesian slope, and producing an excellent source of underground water supply. The southern part of the county is underlain with crystalline rock over which is a variable thickness of glacial drift.

"The principal water-bearing formations are the surface deposits of sand and gravel associated with the glacial drift and the red clay. The coarse sandstone beds carry an abundant supply but the fine grained beds of shaly sandstone are low in water. Usually, however, a considerable increase in the supply over that obtained in the drift can be obtained by drilling twenty to fortyfeet into the underlying sandstone.

"The Keweenawan trap rock and the Huronian granitic formations are impervious, the supply being confined to the open fractures and joints.

"A well defined artesian slope is developed in the surface deposits of stratified clays and sand adjacent to Lake Superior, with head of twenty to forty feet above the lake.

"It may be said that there is a good supply of water available for household purposes and stock in all parts of the county."

The topographic symbols on the accompanying soil maps (see atlas) by the Wisconsin Geological and Natural History Survey give a more detailed picture of the topography.

Drainage

The Moquah District drains primarily into Lake Superior. The southwest corner of T. 44 N., R. 7 W. (approximately four sections) drains into the Namekagon River to the south, and the south and west portions of T. 44 N.,

R. 8. W. eventually drain into the Mississippi River by way of the Namakagon River.

The Town of Delta and the balance of the Town of Drummond is drained via the White River and its tributaries.

A glance at the forest base map will show numeruous streams with headwaters near the boundaries of the upper Moquah which is on a broad ridge. These flow to the east, north, and northwest into Lake Superior.

Soils

Soil maps of Bayfield County by the Wisconsin Geological and Natural History Survey as well as soil maps from the original LUP Atlas are included in this atlas so as to be available to all branches. Bulletin 72A, Wisconsin Geological and Natural History Survey describes these soils. A stone chart indicating stoniness and prepared by the same survey should also be included in the atlas.

Origin of Soils (4)

"The accompanying sketch map (see District soil maps) gives a general idea of the soils of the county. The underlying rocks of the extreme southeastern corner of the county are the granites, gneisses and schists of the Archaean period. A belt of basaltic rocks, chiefly diabase and gabbro, extends along the northern side of the granitic rocks, forming high rough ridges frequently free of soil. The remainder of the county is underlaid by Lake Superior sandstone.

"During the glacial period the ice flowing across the Lake Superior basin from the north formed a broad lobe down the narrowing end of Lake Superior and another down Chequamegon Bay. These lobes in meeting formed an intermediate moraine which extends from the northeastern to the southwestern corner of the county over the broad ridge mentioned above.

"The glacial material which forms a mantle varying in thickness up to several hundred feet over the underlying rocks includes glacial till, formed from the weathered material previously formed by the surface weathering of these rocks together with material swept southward from the basin of the lake and bay by the ice. It falls naturally into three chief classes,

first, that occurring on the granitic and basaltic rocks in the southern part of the county; second, the sandy drift forming the main axis of the broad northeast and southwest ridge, and third, the heavy red clay beds which form the broad plains bordering Lake Superior on the northwest and Chequamegon Bay and its valley extension on the southeast.

"The soils of the southern part of the county, being mainly derived from granitic and basaltic rocks, are chiefly loams and silt loams in texture with many cobbles and boulders. These are the Bennan soils. Over the main central broad ridge of the county, which is underlaid by sandstone rocks, the soils are largely of a sandy character, including the Vilas and Plainfield soils, while the flanking sides are chiefly of Superior clay. In each of these three areas, the bulk of the material occurs as it was left by the ice, while portions have been worked over and sorted by the water resulting from the melting of the ice. A considerable portion of the red clay beds were deposited in the quiet body of water, temporarily dammed between the highland on the south and the solid ice of the retreating glacier. In other words, it is of lacustrine character (water laid) and shows the stratification and lamination of that method of formation. Portions of this clay, however, were worked over by readvances of the ice. In addition to all of these various ways, there are numerous marshes in which organic matter has collected, forming a larger or smaller portion of the soil. In some areas the organic matter is a black humus forming 10% to 25% of the soil, the remainder of which is clay or other earthy material. In other cases the organic matter constitutes practically the entire soil, forming peat.

"We have, therefore, a considerable variety of soils in the county, due to the different kinds of material from which they were formed and the different agencies which gave them their present character and condition."

POPULATION DATA

The following tabulation covers the approximate population of various concentrations of people in the adjacent to the District:

Drummond	300
Cable	240
Iron River	900*
Ashland	10,622
Grand View	250*
Port Wing	350*
Herbster	75*
Cornucopia	250*
Bayfield	1,195
Washburn	2,238
Barksdale	250*
Solon Springs	282
Ino	25*
Moquah	25*
Delta	75*
Total Population	17,077

*Estimated

Inasmuch as detailed census records were not available, it was not possible to tabulate the population by township, occupation, rural, city, etc., at present

The following data is based on information in the old LUP Atlas and similar sources and is not 100% accurate. However, it is adjusted to allow for submarginal farms purchased by the Resettlement Administration and includes the Drummond Forest Community.

A. Communities

Permanent	1
Decadent	0
Total	1
Contiguous to Resettlement area	3

B. Families

1. Well located	
containing suitable forest workers	81
containing unsuitable " "	48
2. Poorly located	
containing suitable forest workers	39
containing unsuitable " "	25
Total families	193

Since there is usually only one suitable forest worker in a family, the above tabulation indicates approximately 120 suitable forest workers inside the district boundary.

TRANSPORTATION

The Moquah District is served by 327 miles of road which may be classified as follows:

U. S. Highways	16 miles
County Highways	12 miles
Forest Service and other roads	299 miles
Total	327 miles

In addition there are many miles of woods and rut roads that can be traveled by motor vehicles.

With few exceptions (see Map 3K Travel Time Map in the Fire Control Atlas) the entire district is very readily accessible and has an adequate transportation system for all management activities.

The Chicago, St. Paul, Minneapolis and Omaha Railroad crosses the southeastern portion of the district and the Northern Pacific parallels the north side of U. S. Highway 2. These railroads join the Soo Line and Chicago and Northwestern at Ashland. The Chicago, St. Paul, Minneapolis and Omaha is a direct route from Ashland to the Twin Cities. The Northern Pacific runs from Ashland to Superior and then to the western United States.

The Moquah District is very well served by rail and highway, both within the Forest and beyond its boundaries.

In the pine logging days the White River carried the bulk of the logs from the Delta Country, but is no longer of any importance in transportation. Up to 1902 logs were brought from the country surrounding Lake Owen to the Rust-Owen Lumber Company mill at Drummond via flume. Otherwise water transportation has never been or will ever be of much consequence within the district.

Pulpwood is towed in rafts from Canada to Ashland on Lake Superior.

This suggests the possibility that in the distant future forest products from the Moquah District may be transported by way of the Great Lakes.

The Forest base map includes transportation features of the District.

MARKETS

The State and Private Forestry report on sawmills prepared in the spring of 1937 covers the local sawmill requirements, number of mills, etc. No copy of the report was available on this destrict, so data will have to be incorporated later. The written portion of the Reforestation Atlas includes requirements of paper mills throughout the state. Since markets for local wood products are very diversified, the market for products from a specific area are difficult to outline. For example, one timber sale operator on this district from a sale this winter sold basswood logs in Mellen, manufactured lumber and ties from hardwood logs. The ties were sold to the Northern Pacific railroad, the lumber to a buyer from Minneapolis, and the slabs were sold locally for fuelwood.

The contribution of Forest Service timber from the Moquah District to the wood using industries has been limited to date. In the neighborhood of 3,000 cords of aspen excelsior bolts have been logged in the Town of Drummond most of which were shipped to Rice Lake, Wisconsin. Small sales of saw timber and tie cut stumpage have been made to local loggers but would probably not exceed 350 MBM altogether. Timber property sales have added a few more MBM. Administrative use in the form of fuelwood for camps, fuelwood to local residents and material used in recreation structures, bridge timbers, telephone poles, plantation posts, portal material, etc. accounts for the remaining timber used. At a rough estimate the grand total for stumpage used on this district since its beginning would not exceed 1,000,000 board feet (more accurate figures will be available when the technical managementatlas is completed.)

The small mills operating within the adjacent to the district offer

potential market for more timber than will be available for sale within the next few decades. To date there has been an inward objection to the purchase of government timber by many private operators, because they believe that slash disposal, minimum stump height, utilization requirements, etc. would unduly cut into their profits. This attitude is gradually changing as more operators are either forced to buy government stumpage or become willing to take at least one chance. Perhaps the attitude is fortunate for the Forest Service is holding the cut to what the present growing stock can stand.

Numerous sales of aspen excelsior bolt stumpage have been made to farmers and local laborers in amounts running from 20 to 250 cords. Cost of administration of such sales is relatively high, but the social value of these sales in supplementing the income of local families that might otherwise resort to either direct or work relief more than compensates for added administrative costs.

Forest products find a diversified market. Ties are sold to local railroads, aspen goes to excelsior factories, for boxboards and a small amount into paper pulp, cedar telephone poles and posts are used locally; lumber of all kinds is usually shipped to markets beyond the Forest boundaries. The potential market is many times the present supply of nearly all products, and the demand will increase rapidly as privately owned natural resources diminish in amount.

SILVICAL DESCRIPTIONS

The following is copied from the written section of the Timber Stand Improvement Atlas and in general applies to the Moquah District as well as to the entire Forest:

"The Chequamegon National Forest lies in the northern coniferous hardwood region, which covers Michigan, Wisconsin, and Minnesota. The area is a region of many lakes and swamps with low ridges of heavier soil intervening, and comprising a broad sandy plain in the north. Forest types fall into four main classes. These are (1) northern hardwoods and hemlock, (2) Pine, (3) aspen-birch and (4) forested swamps.

"The northern hardwood type is composed largely of sugar maple (Acer saccharum), yellow birch (B. lutea), basswood, (T. glabra), hemlock (T. canadensis), together with a scattering of red maple, white ash, red oak, black cherry, and others. These secondary species range in number in different areas from almost pure stands of red maple to scattering individuals. Butternut and black cherry are never numerous, occurring individually in very limited numbers on the best sites. Red oak occasioally forms pure stands of fair sized timber. This type (northern hardwood) once contained a fair proportion of northern white pine which reached large size. An individual of this species of any size, however, is comparatively rare, since all were cut during the period of logging. This type occurs on the heavier soils of the Forest.

"The pine type varies from the broad sandy jack pine flats in the north to small patches of pure northern white pine, scattered throughout the forest in favorable sites.

"The jack pine flats are characterized by their sandy soil with a covering of grass, sweet fern, blueberry, scrub oak, and jack pine. These flats or barrens vary from the above to areas which contain fair stands of Norway pine or Norway and white pine in mixture. Northern white pine occurs on the moister well drained sandy loams. It at one time covered considerable areas. However, lumbering and subsequent fires in the slash have reduced these areas to small patches.

"The aspen-paper birch type is largely due to the deterioration of the northern pine sites by fire. It varies from pure stands of aspen through a mixture of aspen-paper birch to pure paper birch stands. It is ordinarily even aged and varies from ten to forty years of age. The quality and condition of the aspen and paper birch seems to be directly dependent on the site varying from large areas where the

maximum diameter is about 3" DBH to small patches where the diameter runs 12" DBH or more. Quality is also extremely variable with the largest portion of the type practically worthless due to the fact that most of the aspen is affected by heart rot and other diseases which cause the tree to break down before it reaches merchantable size. This type is the one which requires planting the most.

"Black spruce usually occurs pure in acid and poorly drained swamps. It varies greatly in size and age with most of it extremely slow growing. Those swamps where the spruce is of merchantable size are valuable, due to the demand for spruce pulp. However, their slow growth and lack of wind-firmness makes them extremely hard to manage.

"Swamps which have fair drainage usually develop northern white cedar type. This type contains northern white cedar, balsam fir, black spruce, red maple, black ash and other species withnorthern white cedar predominating and sometimes occurring in pure stands.

"The final type of swamp is the mized type. Swamps of this type are usually well drained. They contain a mixture of both high land and low land species. These species include black spruce, balsam fir, white pine, tamarack, red maple, black ash, cedar and others.

"In general all of the swamp forests are slow growing. This seems to be due more to lack of drainage rather than to the depth of the peat or to growth characteristics of the species. Of the swamp species northern white cedar is probably the slowest growing, often requiring from ten to twenty years to grow one inch. Black spruce is also slow growing, trees of $2\frac{1}{2}$ to 3 inches being fifty or more years old in some of the swamps.

TIMBER GROWTH DATA

Technical bulletin 39 of the University of Minnesota Agricultural Experiment Station (6) includes norman yield tables for aspen, mixed oaks, jack pine, second groth Norway (red) pine, and second growth white pine. These tables are applicable to the Chequamegon National Forest and are by far the most reliable growth data available to date.

Schwappach's yield tables for several species in Germany are included in the T.S.I. section of the Forest Manual Handbook and are recommended as guides in cultural work for balsam, white and black spruce, birch, sugar maple, and oak. Growth predictions based on these tables would indicate trends rather than true results. Yield tables for other species are needed very much.

The growth data gathered with post-cultural surveys is of doubtful value. Much of the data was gathered by enrollees, construction foremen, junior assistant technicians, and even some technicians who had little conception of the application of the data gathered and often believing that the information was something else that had to be done. As is usually the case speed took priority over accuracy. Consequently, the data as gathered in the field is open to question. The gathering of growth data is very scientific and highly technical work and should be done only by very competent and thoroughly trained technicians.

Furthermore, the obviously erroneous method of measuring rings in the last ½" of diameter has been used throughout rather than measuring growth for a definite period such as 10 years. No mortality data, which is very essential in predicting growth on the basis of diameter growth measurements has been gathered.

Data for each species and diameter class in each type is necessary, except for pure even aged stands in which normal yield tables can be applied. The present system of compound types is very complex and involved for management purposes.

There does not appear to be any satisfactory method of predicting the growth of the young even aged hardwood stands that have become established following logging. Probably the preparation of normal yield tables should be undertaken in order to make accurate growth predictions for these types.

TREE DISEASES

Tree diseases present on the Moquah District:

1. White pine blister rust
2. Nectria canker
3. Fomes ignarious
4. Aspen canker
5. Jack pine blister rust
6. Needle droop (red pine)
7. Heart rots in hardwoods and balsam

Although a number of tree diseases are present and potentially distructive, disease epidemics have not been a problem to date.

White pine blister rust is the most serious probable menace to the rather extensive white pine plantations and natural stands on the south half of this district. Infected individual trees have been found in Section 4, T. 44 N., R. 7 W., section 31, T. 45 N., R. 7 W. near the east end of Pigeon Lake in T. 45 N., R. 8 W., and outside the boundary on county highway D in Section 16, T. 43 N., R. 7 W. near Cable. Infected Ribes have also been found near Pigeon Lake. Control activities, etc., are completely covered in the Blister Rust Control Atlas and annual reports.

Nectria cankers are probably second in importance to the white pine blister rust and attack nearly all hardwood species but are especially prevalent on hard maple. Control measures consist primarily in sanitation operations to remove and dispose of infected trees and to so handle our hardwood stands as to eliminate bark injuries, etc., that might become the foci of infection. This disease is listed second to blister rust, because the latter is a more serious potential menace.

Fomes ignarius on aspen ranks third in importance on account of the extent to which aspen stands are infected. Control is primarily a problem of site selection and determination of site quality, since forest pathologists have determined that infection is closely correlated with the age of the stands and site quality. Therefore, the selection of better sites for growing this species is necessary so that merchantable sizes will be attained, before the stand breaks down. A pathological rotation of fifty years is recommended on better sites. On poor sites infection takes place even earlier. On poorer sites conversion to jack or red pine and occasionally to white pine is the only solution.

Heart rot in balsam occurs in most 60-year old and older stands. The problem may be taken care of similarly to aspen by managing on a pathological rotation.

Other diseases present on the Moquah District but of minor importance are aspen canker on aspen, blister rust on jack pine, needle droop on red pine, and various heart rots in hardwoods.

INSECTS

Insects present on the Moquah District:

1. Spruce budworm (jack pine form) (Harmologa Fumiferana)
2. White pine weevil
3. Aspen borer
4. Ips
5. Bronze birch borer
6. Larch or tamarack sawfly.

Because of the extensive areas of jack pine and the prevalence of orchard type trees, the jack pine form of the spruce budworm is the most serious potential insect menace on this district. The principal control measure is to remove orchard type trees that are especially favorable breeding places and to so manage present stands that orchard conditions are avoided. Mixed stands and close spacing are good insurance measures.

During the summer of 1936 an extensive infestation of the spruce budworm occurred on the southwest portions of the Moquah District, west portions of the Drummond District, and an area outside the Forest boundary adjacent to the areas described above. Roughly, the total gross area of infestation covered about 100,000 acres (most outside the Forest). In the late summer the foliage on most jack pine throughout the infected area took on a brownish tinge and appeared to be dying. However, all trees seemed to recover completely in 1937. Jr. Forester W. W. Barton believes that the abnormal drouth and unusually high temperatures of July and early August in 1936 were unfavorable to the insects and, fortunately, stopped the epidemic.

Balsam and spruce are highly susceptible to attack by another form

of the same insect and high percentages of balsam in stands are especially favorable to this form of the spruce budworm. The prolific reproduction of balsam on cutover and burned areas may eventually build up extensive stands of balsam that are liable to lead to severe infestations. Therefore, timber stand improvement work and timber sale agreements should be handled so as to eliminate as much as possible the amount of balsam in stands and to keep its reproduction to a minimum. Research along this line is needed very much.

The white pine weevil is responsible for a greater amount of net current damage than any other insect. "Cabbage" white pine and weeviled white pine are very common especially in open areas.

Although there is considerable disagreement among entomologists, it is generally accepted that maintenance of an overstory of hardwoods is necessary in order to avoid white pine weevil attacks. Local observations support this idea. Therefore, white pine should be planted only where there is a sufficient overstory to protect it and timber stand improvement work in white pine should avoid undue opening of young stands. Trimming rather than full release is probably safer in most instances.

The aspen borer occurs in pole and large sapling aspen and has been found especially on weakened trees. There is some question as to whether the aspen borer finds the weakened trees attractive or the trees are weakened by the aspen borer. In any event this insect is relatively unimportant at present.

A few Norway pine were attacked by bark beetles (Ips) in Sections 3 and 9, T. 45 N., R. 8 W., in 1936. During timber stand improvement operations of the winter of 1936-37 but killed trees were removed. Apparently this eliminated the attack or conditions became unfavorable for further increase in

the insects' activity. However, Ips is a constant menace and vigilance is necessary to bring all outbreaks under control promptly.

The bronze birch borer is not of great importance at present, but like the bark beetles it is an enemy that must be constantly guarded against. It is especially liable to attack yellow birch remaining after logging.

The larch sawfly infestetion during the first two decades of the current century has killed nearly all merchantable tamarack. Tamarack reproduction is common on suitable sites, but the larch sawfly has already attacked some of the young trees. Whether or not the reproduction will be destroyed in the same manner as the merchantable trees of earlier days is a matter of conjecture.