

# EXPERIENCES IN SOIL SURVEY

1936 - 1976

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When I was a junior in college in 1935 I took a Civil Service examination for a Soil Scientist position with the U.S. Department of Agriculture. I did not pass the exam but I learned that soils had names and there was a system for naming soils and that a kind of soil had boundaries. The Bureau of Chemistry and Soils hired Soil Scientists to map soils in the western part of the United States. Later I learned that The Bureau of Chemistry and Soils had mapped an area in Orono, Maine and another area in Aroostook County, Maine. The Bureau had published these maps and they were available to the public.

I majored in Agronomy when I went to college but Soil Classification was not one of the subjects taught. When I was a senior, Dr. Chuka, one of the professors, mentioned that the Maine Agricultural Experiment Station was thinking about starting a Soil Survey in Maine.

I graduated from the University of Maine in June, 1936 without any indication that I would ever have a job. But I did not feel bad about not having a job as I did not know of any student that had any employment. We had probably become hardened to the fact that just being able to go to college and get enough to eat was a privilege.

There was going to be plenty to do on my father's farm even though the pay was poor. After being home three days I received a letter from the Maine Agricultural Experiment Station offering me a position on the new Soil Survey of York County, Maine.

I was really pleased to get a job of any kind, but to get a job with the Maine Agricultural Experiment Station was extra special.

Dr. Chuka told me that Kenneth Goodman of the Bureau of Chemistry and Soils was to be the Party Chief and that Delmar Lovejoy and I were to make up the survey crew. My pay was to be \$1,200 a year and a chance to work on my Masters Degree in the winter. The first working day of July 1936 I was to go to the County Agent's Office in Sanford, Maine for further instructions.

I met Ken and Del at the County Agent's Office and learned that we were to have an office nearby. Ken was a big red haired man who had been mapping soils in the "dust bowl" area of the west. Del was taller than I but not much bigger and probably only 5 or 6 years older. He had been working for the Maine Agricultural Experiment Station for several years. Goodman came with a government Chevrolet pick-up. Del came with a Studebaker Pick-Up.

Ken and Del had been in York County for several weeks before I arrived. So, Del had learned what he was supposed to do. He was out practicing his art, while I was with Ken. Ken was six feet tall and probably weighed 200 pounds. He was hard of hearing, sometimes he wore a hearing aid that worked poorly. At times the hearing aid would make a screeching noise in his ear, so he would turn the aid off. :

I was five feet five inches tall and weighed 128 pounds so we had a physical problem. Ken and I would go out into the county to map soils. When we got to a place where we were to map soils, Ken would get out of the pick-up and stride across the field. I would have to nearly run to keep up with him. He would bore a hold or dig one and tell me the name of the soil. I had a sheet of paper with the names of the soils we might find in the county, also the number to use on the map was listed. We had some soil descriptions in the office but they were vague and of limited help. The color books

were not used at that time. Each Soil Scientist described the soil color in terms that were part of his vocabulary. I remember one soil was described as yellowish brown with a greenish tinge. When I tried to talk with Ken about the soil he could not hear me. I would decide I will have to get closer and shout. He would turn up his hearing aid to better know what I had asked. Boom! I would go in his ear.

We were to map the soils on a topographic base map at one inch to the mile scale. The Pick-Ups were equipped with fiber geared speedometers that were designed at an earlier time. When we wanted to use them we adjusted the fiber gear against a gear on the front tire. The speedometer read in 1/100's of a mile.

I had never seen a plane table. Ken had to teach me how to use one because this was a tool used in the trade. Ken would set up the plane table at a comfortable height for himself, orient it north, take a hind sight and a forward sight. He would then ask me to look through the sights of the alidade. I would go to look at what he was trying to show me. The table would be so high I could barely see the top of the table. Invariably, I would kick the tripod leg of the table when I tried to look down the alidade and upset the table. Ken would have to orient the table again.

Mapping soils in Maine on a scale of one inch to the mile was frustrating. It worked in the West where the water table was many feet below the surface and the soils were not stony and slopes were uniform for miles. Our landscape has been glaciated so the soils are very irregular. Soils wise York County, Maine was a mess.

The topographic maps we were using for a base map turned out to be inadequate. The main roads were well located but the locations of the cross roads had been

estimated. We gave up using the topographic maps for base maps. We made our own base maps.

We had some cloth backed paper which I taped to the plane table. Then I would drive to a place where three roads came together within my mapping area for the day. After setting up the tripod and table top I would orient the table with the compass. I would push a survey needle into the paper where I wished to start the mapping. Survey needles were No. 10 sewing needles that had been stuck into a gray birch twig until the head of the needle met a bend in the birch twig leaving 3/4" of the needle exposed. We usually made up several survey needles and carried them in our hats. It is easy to break a No. 10 needle. (Survey needles are also handy to prevent an egg from breaking when you are boiling it for breakfast. Just poke it 1/16" of an inch into the round end of an egg to make a hole. The shell will not break when the egg is boiled.)

Now I had to choose one of the three roads to start making the base map. While driving along the road I recorded in a notebook the location of houses, brooks and soil boundaries in miles, tenths and hundredths of a mile. When coming to the first bend in the road and the end of my forward sight, I would take a speedometer reading and record it in my notebook. I would then continue along the road recording in my notebook the speedometer readings at the location of the houses, brooks and soil boundaries until I came to another bend in the road. At this point I would set up the plane table and orient it north. Then I would transfer the measurements recorded in my notebook to the base map up to the first bend in the road. Next I would take a back sight and record on the base map the measurements taken up to this second bend in the road. I would continue taking forward sights and backsights and recording them. I

would make a traverse along the road until I returned to the starting point. The last few sights were nervous ones. Will my lines join within 200 feet? If not, where is the error?

Since we have two trucks and three men, I turned the truck over to the next man when I have finished my traverse. He runs his road while I walk within the road circuit to identify and map the soils.

Many of the Soil Scientists in 1936 had a background in geology. They first looked at the substrata or geological material from which the soil developed. They tried to determine how the geological material got to its present location; was it glacial till, terrace of an alluvial material, etc. Next they would determine if the geological material was from schist, slate, granite or some other kind of rock. These kinds of properties were used to determine the name of the soils that had developed.

Before any mapping was done W.J. Latimer, Soil Correlator from Washington, D.C., and Ken Goodman rode around the county digging into road banks and other places of interest and taking notes of what they saw. From his notes and general knowledge of soils, Mr. Latimer developed a legend for us to use in mapping the soils.

The soil descriptions in the York County Survey of individual soils described their geological properties. The descriptions also mentioned the color of the soil in broad terms. Each Soil Scientist had his own color vocabulary. The texture was estimated, but uniform terms were used to describe the texture, such as silt loam, sandy loam. Depth of the entire soil profile was more often given instead of the thickness of soil horizons. Variable terms were used to describe the structure and consistence of the soils. Soils were also described as well drained, moderately well drained, or poorly

drained. We had no knowledge of how much moisture any soil would hold available to plants.

Although other soil surveys had been made in Maine, this was the first one that would have enough detail for individual farm planning.

In 1936 soil series were classified into higher categories. The degree and way in which soils had developed over time and under the influence of the climate determined how the soil was classified into a higher or broader category, or Great Soil groups. In southern Maine it was thought that most of the soils were Podzols or brown Podzols. York County had a cool moist climate and it was thought that the soils would be Podzols. When is a soil a Podzol or a Gray-brown Podzolic soil? Was a gravelly terrace soil Merrimac or Colton? We wondered if a soil developed in granitic glacial till was Gloucester or Hermon.

My Master Degree thesis was "The Silica Sesquioxides Ratio of some York County Soils." This was thought to determine the degree of Podzoolization of a soil and therefore its name.

Mr. Latimer, known as "Pop" Latimer, came several times to York County to help us with the survey. "Pop" came on the train with his little black bag. Someone would meet him at the train and take him to the hotel. He would put on his work clothes and unroll his beaver felt hat. I admired his hat. It always looked brand new and he would roll it up and put it away in this bag. "Pop" wanted to retire but there was no one to take his place. Soil series were so vaguely described that "Pop" was needed to interpret the descriptions. The Bureau of Chemistry and Soils had raised his pay to the maximum to

keep him working. I liked "Pop" Latimer. He was not as tall as I am and he was stocky with short legs. He looked for breaks in fences where it was easy to cross. "Pop" was boss and long-legged Goodman could not lead the way.

Charles Kellogg was head of the Soil Survey at the national level. He came to look at our soils a couple of times. I was too inexperienced to know what all the discussion was about. I did know he was an internationally known Soil Scientist. He had studied the soils in many countries and that his department had Soil Scientists working in other countries. If I could not understand the National Classification of soils, I could appreciate the value of Dr. Charles Kellogg's highly polished riding boots and pants and his gold watch chain.

In September 1936, I went back to the University of Maine to study for my Masters Degree. When the snow came, Ken was transferred to a southern State. York County Soil Survey took a rest until spring. After classes were over in June, I returned to Sanford. Ken and Del had returned and were mapping soils. The three of us worked in York County until September 1937 when I again returned to my studies. When the mapping season was over, Ken went south and Del went to the Soil Survey Office in the Maples of the University of Maine campus.

The three of us returned to Sanford, Maine the next spring and that summer finished mapping the soils in York County.

I now had my Masters Degree and Del and I worked the winter of 1939 in our office on the first floor in the Maples.

<sup>"Bart"</sup>  
I often saw W.B. Oliver come downstairs from the second floor in the Maples and wondered what he did for work. Later I learned that he was State Conservationist for the Soil Conservation Service in Maine.

I had heard about the "Dust Bowl" from Ken Goodman. He told me of the dust storms that would shade out the sun.

Hugh Bennett, Soil Scientist, with the USDA Bureau of Chemistry and Soils mapped soils in the west and also the southern part of the United States. He claimed that there were gullies in Georgia deep enough to bury a small house.

For several years he tried to get Congress interested in doing something to stop soil and wind erosion. When dust from the fields in the corn belt settled on congressmen's desks, they decided it was time to act.

In 1933 the Department of the Interior established the Soil Erosion Service and Hugh Bennet was its Chief. He established Soil Erosion Surveys in many parts of the United States. One was in the Presque isle and Caribou area.

The Survey was staffed by former employees of the Civilian Conservation Corps. They were W.B. Oliver, D.W. Frutchey, <sup>"Stew"</sup>J.S. Hardesty, Richard Stone, Russ Albright and later Lewis Parlin.

In 1935 the Soil Erosion Service was transferred to the USDA and the name changed to Soil Conservation Service.

Our next project was to map Waldo County. Our party was increased to four men. <sup>Sneider</sup> S. Von Day, employee of the Soil Conservation Service, came to work with us. Our Soil Survey Party now consisted of Kenneth Goodman with the Bureau of Soils, Del Lovejoy and John Arno with the University of Maine and Von Day with the Soil Conservation Service.

We were to use aerial photographs for a base map in Waldo County. The photographs were at a scale of three inches to a mile. The roads, houses, fields, lakes and streams were already shown on the base map. This scale gave us room enough to put the map symbols within the delineated area.

The Soil Conservation Service told us we had to show the degree of erosion on our soil maps to justify the help of Von Day.

Waldo County, except for Knox Ridge, was not intensively farmed. Most of the farms were in grass and were seldom plowed. On some roads the farms were idle. The government had purchased the land under some former poverty program. It was decided we would indicate on our soil mapping unit the hazard of erosion if the area was intensively farmed.

In Waldo County there were some soils we had never seen. "Pop" Latimer did not know what to call the soils. Descriptions of the soils were written and checked in Washington, D.C.

There were no records of these kinds of soils. They had developed in slate and phyllite kind of glacial till. They were similar to Charlton except Charlton soils developed from schistose kind of glacial till. The unknown soils were silt loams or loams and Charlton was a fine sandy loam.

We delineated areas of these soils on the soil maps and gave them a number. Later it was decided that they were new soils and we could give them a name from the town near where they were mapped. The well drained soil was called Bangor, the moderately well drained soil was called Dixmont, and the poorly drained soil was called Monarda and the very poorly drained soil was called Burnham.

Life was more enjoyable mapping soils in Waldo County. Our headquarters was in Belfast. We enjoyed the cool ocean breezes when we came home after work from inland. When we got within a few miles of Belfast, we could feel the change in the air.

The University of Maine increased my pay. Now my salary was \$1,800, a 50% increase.

In York County we were always pushing to get more done. Ken was in charge of the party. He said he was a little slow in mapping his last county and Charles Kellogg told him he only had three years to map York County. We had no photographs. We were slowed down with the bulky heavy plane table. As an example of how pushed we felt. I had two big boils on my arm. The doctor cut them open and told me to keep a wet cloth over them at all times so the pus would drain out. The last few days of mapping I carried a thermos of water in my knapsack to pour on the bandage as I walked through the fields and woods.

Waldo County was sparsely populated and the people were mostly friendly. Only one man did not want me to walk on his land. In York County there were many tourists. When I mapped Ogunquit, Wells and other areas along the beaches, people were suspicious about what I was doing. I had to be careful where I walked.

When the mapping season was over Ken and Von left for a warmer climate. Ken was no longer with the Bureau of Soils. They had received their orders from the area office of the Soil Conservation Service.

Del Lovejoy and I worked in our office in Belfast in the winter. We lived in town within walking distance of the office. No worry about getting stuck in the snowbank. No boss to frown if we were late to the office. We inked our soil maps. Thought and worked a little on a generalized soil map. We dreamed a little about the coming summer.

In 1942 we started the Penobscot county Soil Survey. Ken and Von returned from the south. We rented an office in Bangor. "Pop" Latimer came and developed a soil legend. The county is large and the most populated part is south of Lincoln. Our legend was adequate for this part of the County. This is where we did our mapping. Latimer came several times during the first summer to help with soil identification.

The second summer both Latimer and Henry Adams came to check our survey. Adams was administrator for Area 1 Soil Survey. They worked with us several days.

Before he left, Adams asked me if I would work for the Soil Conservation Service. My salary would be \$4200 a year. The University of Maine had increased my pay by

50%. The Soil Conservation Service had offered to increase my salary by 133%. I was happy to accept the offer.

Adams told me to fill out a Civil Service Application and submit it to the Civil Service Office and when my name came up on the list he would write and tell me what to do next. In a couple of weeks, I got his letter. I was to report to the Soil Conservation Service in Upper Darby, Pennsylvania. Here I received in-service training for two weeks. I was shown all the workings of the office from compiling the field maps into a finished publication even how to make out vouchers for purchases and train tickets.

I had a hard time to find Upper Darby as it was not on any map. When I got off the train in Philadelphia I asked people in the station where Upper Darby was and no one knew. At last I located a policeman. I asked him how I would get to Upper Darby. He did not know, but he had a little book which he referred to. He said Upper Darby was 69<sup>th</sup> Street. He said go down the street one block and take the subway. I went down the street what I thought was a block but did not see anything I could ride on. Then I noticed people were going down a hole in the ground. I looked in the hole and there were stairs so I went down the stairs. To my surprise there were railroad tracks and a train came. People put a quarter in a turnstyle and went through to the train. So I did the same. The train started and went under ground for a distance and then came out and over the street and I could see automobiles on the street below.

The train kept stopping and people would get off. I asked the man next to me, "How would I know when I was at 69<sup>th</sup> Street? He said, "That is the end of the line. You see that man over there sleeping, he gets off at 69<sup>th</sup> Street. When he gets off, you get off." The train stopped at a railroad station and I went in and asked if they knew where the

Soil Conservation Service Office was. They said that it was the building across the street. I went over and located Henry Adams. I was glad to see someone I knew. He asked me if I wanted him to reserve a room at a hotel in Philadelphia and I said, "No, I do not want to go back there again. I can find my way among the trees but the city scares me." He located a place for me to stay. I slept on a porch in a women's house a short distance from the office.

At the end of two weeks they assigned me a Pick-Up from the Soil Conservation Service garage which was located in the next block, and told me to go to Waterloo, New York where I worked during the summer.

In November 1942, I was assigned to the Centerville Maryland work unit. This was an interesting place to map soils. The landscape was nearly flat except for an occasional steep sided gully. There were not many decisions to make. The land was devoid of trees, except in the gullies. The soil was all water deposited. I could see from one road to the next. There were no stones to stop my soil aguer. Just a sissy job.

Room and board was \$7.00 a week in Centerville, Maryland. About the only thing wrong was I did not have my own personal car. My father had bought me my own personal car, a new Model A Ford Sedan when I was 17 years old. I had never been without a car until I started working for the Soil Conservation Service. The Country was in World War II and gasoline was rationed, three gallons a month. Not enough to get me out of the State of Maine.

When spring came, I was to leave the government Pick-Up in Maryland for Laurence Lindley and get a Ford Sedan from the Soil Conservation Service garage in Philadelphia, Pennsylvania and drive it to East Aurora, New York.

Many of the people in East Aurora worked in Buffalo, New York in the factories making things for the Army. The workers in the factories were receiving over time pay and sometimes double time. The manufacturing companies were generous. The products they manufactured for the Armed Services were on a cost plus basis. The more it cost, the more the profit. I thought I was getting good pay but these people were getting more money. There were no rooms available except in the hotel. I was not making enough to cover my expenses while working in East Aurora.

In 1944 I decided to resign and go to farming as I owned a farm in Ripley, Maine. I wrote to Henry Adams telling him I wanted to resign and go to farming in Maine. He wrote and told me not to resign. If I wanted to farm, go back to Maine, but map soils whenever I had the time.

So Imogene and I raised poultry. We kept about 2000 laying hens and sold hatching eggs to Hubbard Farms. It was a profitable enterprise. The cost of grain was fixed by the government. Red meat was rationed, only a few pounds a month per person. One had to go to the Ration Board to get coupons to buy sugar, butter, beef, pork and lamb. Poultry was not rationed. You could buy all you could find, and the price was not controlled. Plastic wrap had not been invented so there was no frozen poultry in the stores.

When I was not taking care of the poultry I was mapping soils in Piscataquis and Somerset counties. The Work Unit Conservationists were pleased to see me because they could not report a completed farm plan until they had a soil map.

I needed something to eat up the excess grass on the farm so I raised some sheep.

The salesman at the grain company told me there was good money in raising turkeys. So each year we raised 300 to 400 turkeys. We dressed them and sold them to the people in town.

The men were coming home from the War and the government told them they would pay the returning soldiers \$90.00 a month to get more education. I had taken a few education courses when I was in college. The Superintendent of Schools wanted to hire me to teach agriculture in the high school evenings. It was a part time job so I took it. Now besides raising chickens, turkeys, sheep and mapping soils, I was teaching school evenings. Imogene and I were very busy but the money was good.

Then the War came to an end and so did rationing and the chance to make money in farming looked bleak.

I asked W.B. Oliver if he wanted to hire me full time. He said, "Sure". On April 1, 1955 I was to go to Bangor and start mapping soils in Penobscot County.

Ken Goodman, Ken LaFlamme and Richard Riley were in the Bangor Work Unit Office. It was not soil mapping weather yet, but in a few weeks Bart Oliver issued me a Ford pick-up. He said it was old and had been used in the Lincoln Work Unit and did not

have many miles on it. If I could get some miles on the Pick-Up, the Soil Conservation Service could trade it. He said, "Take it home and map from Dexter, Maine."

Now all Soil Scientists were assigned to the State they worked in. They were no longer a part of the Regional Office.

During the last ten years, I have not had much contact with other people mapping soils. Now I have been given a book of Munsell soil charts and definitions of texture, structure and consistence terms.

Walter Lyford was now Correlator for Area I as W.J. Latimer had retired. Walter told me, "We now describe the thickness, color, texture, structure, consistence, soil reaction, shape of the lower boundary of each layer of soil or horizon and give it a letter to indicate how we interpret that horizon: O for organic horizon, A2 for an horizon that has lost iron and aluminum, B for horizon or layer that has accumulated iron, aluminum or clay, C for an horizon or layer of material that has not been changed by soil forming processes." Now all the terms used in soil classification are described in the Journal of Soil and Water Conservation; Volume 25, No. 1, January-February, 1970.

At the present time, these soil descriptions are more useful than the descriptions I was writing in 1936 to 1955. The chemical and physical properties of these horizons can be measured in the laboratory. There has been a new classification system developed in which either the field description system or the laboratory data can be used to place the soils in a higher group than the series. We were using the terms Podzol soils, brown Podzolic soils and Humic Gley soils. Now we will place some of our soils in higher categories with new terms. Soils that have little soil development such as

those on flood plains will be Entisols. Soils that are so wet that the wetness overpowers other soil forming properties are Inceptisols. Soils which have iron, aluminum in the B horizon greater than the horizon above or below are Spodosols.

Now it is 1955 and I am back mapping soils and writing profile descriptions. There is something new in the office for mapping soils besides the spade and soil auger. It is a stereoscope. It covers enough area so I can see all of the photograph. It is fun to look through the stereoscope. All the houses, trees and hills stand up giving a three dimensional view. The other men in the office do not seem so thrilled with it. But I can transfer the soil boundaries from one photograph to the joining ones. It just takes a little practice and I have soil boundaries of one map joined to the soil boundaries of the next photograph. So before I go out in the field with a new photograph, I use the stereoscope to transfer the soil boundaries of the mapped photo to the new one.

I find that I can see the small streams and brooks that are partly obscured by the trees so I put the brooks on the photo in blue ink. Each day I see something new, such as the square terrace face and the cigar shaped eskers. So, I ink them in on the map. When I get out in the field I see the nearly flat terrace. I should be able to delineate that in the office with the aid of the stereoscope. If it is a terrace it has got to be sand or gravel. So in Penobscot County it can be only one of four soils. The esker has got to be gravel so it is limited to about two soils - probably Colton.

When I get near where the Penobscot River joins the salt water I can see the finger like geological erosion through the stereoscope. It probably is a clay soil - that is the way it eroded when the land rose above the sea. I check the topographic sheet - it is below 300 feet so it has got to be Suffield or Buxton - probably Suffield because it is

steep or strongly sloping. When I get to working up around Charleston, Exeter, Corrina and East Corinth, I check the road banks while I have the pick-up. The pick axe is handy to dig in a road cut. I find there is only one kind of glacial till and the bedrock is slate or phyllite. I have read and observed that glacial till is derived from the underlying bedrock. So in this area, the shallow to bedrock soil is Thorndike and the other soils on the glacial till are in the Bangor catena. I have learned that water deposited soils such as Colton and Adams seldom were deposited above 600 feet. So, in the office on a rainy day I outline all the major formations, the streams, brooks, terraces, terrace faces and eskers.

Later each soil scientist was issued a pocket stereoscope. Only a two-inch wide area could be seen with this stereoscope, but a larger area could be exposed by turning up one photo. I took my stereoscope and the photo I was to use as a base map to the field with me. In the office, I had stereoscoped the streams, brooks and major formations onto my base map photo. Also I took the photographs that overlapped the base map photo with me. The pocket type stereoscope magnifies the relief.

I mapped the open fields and other easily observed areas first to get familiar with the soils and other features of the landscape. Then I would use the hood of the truck as a table to plot in slopes, bogs, wet areas, well drained areas and sometimes moderately well drained soils on to the base map photo. I learned to separate slope groups by first delineating them on the photo and checking them with the Abney level. It is difficult to map in the woods because one can see only a few hundred feet. There can be a change in soil type three hundred feet from where one is standing and not be recognized. With the stereoscope it is like looking down on to the landscape. I can see

there is a change in the landscape from where I stand. With the stereoscope I delineate the area.

At one time the Soil Conservation Service in Maine was administratively divided into two regions: Area I and Area II. Aroostook and Washington Counties were in Area I. There were four work units in Aroostook County, Fort Kent, Caribou, Presque Isle and Houlton. Richard Akeley was the Area Conservationist. The Area I office was in Presque Isle.

In 1957 I was transferred to Presque Isle as a Soil Scientist for the four work units in Aroostook County and Supervisor in Washington County. Kenneth LaFlamme was Soil Scientist for the Washington County Work Unit.

The Regional Office and the State Office had decided to combine the Fort Kent, Caribou and Presque Isle Work Unit areas into one soil publication area and call it, "Soil Survey Aroostook County, Maine, Northeastern Part" and the Houlton Work Unit area was to be a separate publication called "Soil Survey of Aroostook County, Maine, Southern Part".

A large part of the area had been mapped as the Presque Isle Work Unit was formed earlier. One of the first soil scientists to map soils in the area was J.S. Hardesty. He also mapped soils in New Hampshire. Stu Hardesty said he used to take his soil auger and go by train to map soils in New Hampshire. I do not know what his title was. It must have been State Soil Scientist. He made up the entire Maine Soil Survey staff for the Soil Conservation Service. A few years later, A.O. Backer and A.P. Faust mapped

individual farms in the Work Units. After I went to Aroostook County, B.W. McEwen was hired to help on the survey.

A few days before I moved to Presque Isle, Stu Hardesty said he would show me some of the soils. We went up to the University of Maine Agricultural Experiment Station Farm and drove out to the edge of a field to an area that had not been farmed. There was about a four foot deep pit. He told me a Soil Scientist from the Washington office was working on the new soil classification system and had come to Maine to look at the Caribou soils. He said they had examined this pit and called it Caribou. Stu and I examined the pit. It had a thick organic horizon over a whitish gray horizon. The next horizon was reddish brown and graded to dark yellowish brown with depth. Below about two feet the soil was subangular blocky in structure and the peds were different in color on the outside from the interior. By examining the peds with the hand lens we determined there could be clay films on the peds. The Correlator told Stu that Caribou was a bi-sequal soil. Under the old classification system the upper horizons were characterized as Podzols and the horizons below about 20 inches were characterized as Gray-Brown Podzolic soils. We put the spade and pick back in the car. Stu said, "Now you have seen it," and we went back to Orono.

Stu thought there were some problems in soil identification and classification and they were going to give us problems when we tried to put them into the new classification system. He had lost interest in soil survey and left me to solve the problems.

Stu Hardesty knew he was being pushed out of his position. Stu was an Arts and Science major in college. I think he majored in English. There was no work when he

got out of college. He joined the Civilian Conservation Corps which was a make work project. From there he transferred to the Soil Erosion Project and later to Soil Scientist for the Soil Conservation Service. With the introduction of the new classification system the top administration wanted the State Soil Scientist to have studied chemistry, geology and plant physiology. Even some of us lower peons were sent to Cornell University for one semester to study these subjects.

After mapping a few months in Aroostook County and checking other mapped areas, I realized there were two kinds of soils called Caribou and some soils that were so badly eroded that farmers were plowing the former substrata or the B horizon of the Gray-Brown Podzolic soil. If there was a Podzol soil, it had washed away.

The Soil Scientists in New Brunswick, Canada were having problems classifying the soils they called Caribou. Several times they came across the border to see what we were mapping for Caribou.

Frederick Hutchinson, Soil Scientist for the University of Maine scheduled a meeting with the New Brunswick Soil Scientists and a few other Soil Scientists. I dug some pits to study. About all we decided was that we had two kinds of soils developed from limestone glacial till. The laboratory data in "Soil Survey of Aroostook County, Maine, Northeast Part" and the USDA Soil Conservation Service and Maine Agricultural Experiment Station and Canada's Department of Agriculture publication "Caribou Soils" show some soils called Caribou have lower horizons that increase in clay, others that do not.

Laboratory data for all the Conant and Easton soils show a pick up in clay in lower horizons. Laboratory data indicates Conant is a Podzol over a Gray-Brown Podzol.

Walter Lyford, Soil Correlator, wondered if the soil we called Plaisted was different from a New England Soil called Paxton. Even when we were mapping in Penobscot County, it troubled him. When I showed him the hundreds of acres of Plaisted in the Fort Kent area and the soil profile he decided there were two soils and they responded to different use and management.

I was having trouble describing the Caribou, Conant, Easton, Perham and Daigle soils. All the soils I knew about had parent material below about two feet. These soils just seemed to go on and on. I asked Stu if the Soil Survey Laboratory would analyze them. He said he did not know as it cost about \$500 to have one soil analyzed. In a few months he told me to select some sites I wanted studied as the Soil Survey Laboratory was sending a sampling crew. Two men with much equipment, even a power mounted soil auger came. We sampled soil for a week and most of the time it rained. They had several canvases and built a tent over the site whenever it rained hard. The data obtained is given in the Soil Survey Aroostook County, Maine, Northeastern Part.

Perham and Daigle soils almost got left out of the final correlation. They had been mapped and given an identification number. The upper 16 inches of the Perham was similar to Plaisted so at an early correlation the numbers shown on the soil maps for Plaisted and Perham were both listed as Plaisted. At the final correlation I could not influence Walter Lyford, Correlator, that Plaisted and Perham were not the same soil. He finished the correlation and left Perham out of the legend. About one week later he

came back to Maine. After three days of looking at the soils he added Perham to the final correlation legend.

The 10 large woodland owners in Maine had several hundred 1/5th acre plots in the forested areas of Maine. They had measured the growth of each tree on the plot twice at 5 year intervals. The woodland owners asked W.B. Oliver if he would have the soils on the plots named and classified. W.B. Oliver asked me to supervise the work. Leroy Bingham, Larry Safford and a University of Maine student helped me. The Forester for the woodland companies took us to the plots. Some of the plots were 3 miles from a driveable road. A few we got to by boat. I liked the boat rides. They were the boats used to move booms of pulpwood down the lakes on the way to the pulp and paper mills. Sometimes we stayed at the Pittson Farm 25 miles in the woods from Rockwood. A night's lodging and all the food you could eat for \$1.00. A big saving on the per diem.

In 1962 the Soil Conservation Service established a Watershed Party to help control floods and related problems. They did not have a geologist in their party. When a geologist was needed they would borrow the geologist from the New Hampshire Watershed Party.

I had learned how to classify the soils according to the Unified Soil Classification System used by the Bureau of Public Roads and how to collect soil samples for testing in their laboratory.

Soil Survey would sample named soil series and collect samples of the soils and the Bureau of Public Roads would analyze the samples in their laboratory and provide us with the data to use in our soil survey reports.

On one watershed project, I was assigned to help the New Hampshire geologist for a few days. He had to return to New Hampshire before the study was completed. I was left to finish the project.

Geologists use the Unified Soil Classification System as do the engineers for the Bureau of Public Roads.

The Watershed crew was to build a dam in Aroostook County. I think it was in Fort Fairfield. They did not have a geologist. Since I had worked with a geologist at a former time, I was asked to do the geology part of the project. The site was on Caribou soils. I had to describe the soil using geology terms and sample representative profiles. Galen Bridge ran the land survey. A map was made showing the surface of the landscape and the location of each horizon below the surface. Some pits were 15 feet deep. I found the job and the resulting map very interesting. I have not heard of the dam breaking.

In about 1958 the Navy started to build a radio station on a part of Cutler that juts out into the ocean. Towers, wires and tunnels were eventually to be built on the area, and wires were to be laid in the adjacent ocean.

This station was to be powerful enough to locate a ship anywhere in the ocean.

The project manager came to see Stu Hardesty as the project had come to a stand still. The Navy had contracted to have the trees removed and the landscape smoothed. The men clearing the land said the Navy had not told them the truth. They could not do the work for the contracted price, and wanted more money. The project manager

thought that if someone could tell them about the soils they could negotiate a price. The Navy would pay for all the cost involved in the study.

Kenneth LaFlamme was mapping soils in Washington County. Stu Hardesty asked me to help Ken map the soils in the area. They wanted a detailed soil map. We took our plane tables and photographs of the area and went to Cutler. The project was fenced and we had to go through an identification process before we could get on the land.

Once there we could see their problem. Areas of bedrock were everywhere above the soil surface. Soils developed on clay were the predominate kinds of soils between the outcrops. Some soil areas were wet. Bulldozers had churned themselves into the mud.

We were two weeks mapping the area.

A few weeks later we were asked again to come to their rescue. They got the area graded and smoothed. Most of the land sloped to the ocean. They contracted to have the area seeded to grass, but they got very little grass. Ken and I made a map of the finished landscape, and a Soil Conservation Service Agronomist developed a grass establishment plan.

About 1964 Congress gave Maine a sugar quota. Dr. Elliot, President of the University of Maine was asked by Congress if sugar beets could be grown in Maine. Dr. Elliott did not know so he asked Dean Winthrop Libby and Dean Libby passed the question along to Dr. Roland Structemeyer.

Great Western, a grower of sugar beets in the West and a company that processed the beets into sugar had planted some sugar beets in Aroostook County. Great Western said the sugar beets were doing poorly. Frederick Hutchinson and I were asked to go to Aroostook County and check the sugar beet plantings. We decided the reason the beets were not growing was due to the fact that they were planted on ridges and some were on the shallow to bedrock soil, Mapleton. They lacked moisture. The Maine Agricultural Experiment Station designed a program that they thought might determine whether or not sugar beets could be grown in Aroostook County.

They decided that Caribou would be the most suitable soil. I was assigned to the project to check the soil. Lewis Roberts was to supervise the planting, growing and harvesting the crop.

The results of the project were: Sugar beets can be grown in Aroostook County. A short season variety of sugar beet is not available. Present varieties of sugar beets need 150 day growing season - Aroostook County has 90 day growing season. Sugar beets grown in Aroostook County were high in sugar but low in yield.

About 1973 State Conservationist, Richard Duesterhaus visited the Dover-Foxcroft Work Unit where I was mapping soils. He had been in Maine only a few months, so I thought he probably was not knowledgeable about our soil survey work in the forested part of Maine. I told him there were thousands of acres of forested land in which no one knew the kinds of soils. I had described the soils on the 1/5" acre plots for the large woodland owners. On some of the plots, I could describe the kind of soils but knew of no name for them.

In a few weeks the State Conservationist asked me to make a reconnaissance survey of the soils in the Unorganized Townships. Norman Kalloch was asked to help with the survey. We traveled every logging road we could find. We sketched the boundaries on our base map. We wrote profile descriptions of all the soils for which there was no official soil description. It took us three years to make the survey.

The large woodland owners are seeing the value of using soil maps in woodland management and several have provided financial assistance to the Soil Conservation Service to map their lands.

I feel my greatest contribution to Soil Survey was encouraging mapping to be done in the forested part of Maine. Trees are grown on over 90% of the land in Maine. Soil Conservation Service has done some work such as site index which is the rate of growth of a dominate tree on a specific site.