ANNUAL REPORT NO.

NONR 477 (24)
T.O. 307 252

1 December 1964

DEPARTMENT OF ATMOSPHERIC SCIENCES

UNIVERSITY OF WASHINGTON

Seattle 5, Washington

CONTENTS

INTRODUCTION

This report covers investigations under contract NONR 477 (24) for the period of 1 December 1963 to 1 December 1964 under the direction of Dr. Phil E. Church, Chairman of the Department of Atmospheric Sciences, University of Washington.

Investigations were conducted at the facilities of the Arctic Research Laboratory near Pt. Barrow, Alaska, on drifting stations ARLIS II and ARLIS III, and at the University of Washington. A new program at Fletchers Island (T-3) was initiated in October.

This report summarizes the progress of research programs in radiation, sea ice physics, atmospheric chemistry (carbon dioxide and ozone), the physics of wind-blown snow, and several others.

On 1 October Dr. F. G. van der Hoeven joined our staff. He will study the possibilities of observing in the field the relationship of the wind stress field and large scale ice deformation. Dr. Untersteiner visited the field sites at Pt. Barrow, ARLIS II, and ARLIS III for three weeks in February and March. Dr. Church spent the latter part of August at the Arctic Research Laboratory, inspecting the new atmospheric chemistry-micrometeorology station and coordinating field work.

Appended is a list of papers that have been presented at scientific meetings, published work, and reports and papers submitted for publication.

SCIENTIFIC PERSONNEL

The following people have been investigators for this project during the report period:

Dr. Phil E. Church, Director

University of Washington:

Dr. Norbert Untersteiner, Research Associate Professor, Principal Investigator

Dr. Kenneth O. Bennington, Research Associate Professor

Dr. F. G. van der Hoeven, Research Associate Professor, from 1 October 1964

Mr. William Campbell, Predoctoral Associate, terminated 15 June 1964

Mr. John J. Kelley, Jr., Graduate Student

Mr. Pedro Schafer, Graduate Student

Miss Joan Vyverberg, Graduate Student, from 16 September 1964

Arctic Research Laboratory:

Mr. Bruce J. Lieske, Senior Meteorologist

Mr. Leander Stroschein, Micrometeorologist

Mr. Darrell Weaver, Micrometeorologist, from 25 August 1964

Mrs. Darrell Weaver, Laboratory Helper I, from 25 August 1964

ARLIS II, ARLIS III, and T-3:

Mr. Arnold M. Hanson, Micrometeorologist

Mr. Richard Sommerfeld, Micrometeorologist, terminated 3 April 1964

Mr. Ronald Priebe, Micrometeorologist, from 1 February, terminated 15 June, from 10 September 1964

Mr. Bruce Mendenhall, Micrometeorologist, from 28 May, terminated 30 September 1964

Mr. Ronald Roulet, Micrometeorologist, from 28 May 1964

Mr. Peter Witt, Assistant Micrometeorologist, terminated 27 February 1964

Mr. Charlie Cooke, Assistant Micrometeorologist, from 10 September 1964

Mr. Earl Secor, Scientific Aide, from 10 February, terminated 13 April 1964

Mr. Clyde Haglund, Field Assistant, terminated 9 March 1964

Mr. Daniel Davis, Field Assistant, from 1 September 1964

In addition to the above listed personnel, the following persons have contributed to the progress of the investigations as consultants:

Drs. Franklin I. Badgley, Joost Businger, and Richard Reed.

Mr. Sam Antion, Instrumentation Technician, has provided invaluable assistance in the design, construction and repair of instruments and equipment used in the Arctic.

BARROW, GENERAL

Considerable effort has been expended in the first half of 1964 in setting up the new micrometeorology-atmospheric chemistry field station at North Meadow Lake, 2.1 km south of the ARL. The station is located about 85 meters north of the lake on a tundra-covered beach ridge. Altitude of the station is about six meters. The micromet and atmospheric chemistry wanigans are about 100 meters apart on an ENE line. During December and January an existing 2300 volt power line from camp was extended by cable and poles, about 570 meters, to North Meadow Lake and a transformer bank was installed to give the two wanigans power capability of 15 kW.

Pieces of the Niksiruk micromet wanigan, washed away on 3 October 1963, were found on Martin Island in May 1964; chances of equipment recovery are practically nil.

The new field site at North Meadow Lake has been in full operation since June 1964. No major difficulties with respect to maintenance or power have been encountered. Snow stakes at the station indicated that the maximum snow pack depth of 40 cm occurred in late May. Minimum and maximum air temperatures for the report period were -47.7°C and 18.0°C on February 19 and July 23, respectively. On 1 July virtually all ice had disappeared from North Meadow Lake, and the tundra was snow-free except for isolated drift remnants.

Mr. B. J. Lieske, after 20 months of work at Barrow, returned to the University of Washington to complete data evaluation and reports on the Arctic radiation climate.

ARLIS II, GENERAL

In the spring a healed crack, 1-2 meters wide, was found alongside the series of hummocks, indicating that this is an area of poor hydrostatic adjustment, susceptible to rupturing.

The problem of soot from the generator and the huts necessitated a move of the net radiometer to the bay ice, an area of clean sea ice near the edge of the island.

Contamination, accumulation of drifted snow, and consideration of safety finally necessitated a move of all installations at ARLIS II during August. The micromet wanigan was moved about 2 km to the opposite edge of the island. Only five days of observation were lost.

ARLIS III, GENERAL

The establishment of this small, short-term station was particularly welcome. Its efficiency of operation and proximity to shore made it especially useful for investigations in the field of sea ice physics. It is hoped that similar installations will be planned for the future.

T-3, GENERAL

In view of the possibility of ARLIS II drifting into the Greenland Sea, two additional investigators have been placed on T-3, in October 1964. They will observe net radiation and attempt to measure the changes of ice thickness taking place at the underside of the island. These observations will be part of a more extensive program planned for the coming year, aimed at a direct measurement of the vertical heat flux in the oceanic boundary layer.

RADIATION

Barrow

The principal goal of the Barrow radiation work has been to establish a radiation climate for the Alaskan north coast. Radiation data from the Arctic are scarce, and accurate measurements are difficult to obtain. Some researchers have proposed that the radiative components can be more accurately known by estimation than by measurement. Hopefully, our data will help to resolve this question.

Measurements of global short wave radiation, using a Kipp and Zonen solarimeter, began with the first sunrise on January 24, 1964. In April C.S.I.R.O. Funk radiometers were installed for measurement of net total radiation and total global radiation. In May we began measurement of air temperature inside a standard Stevenson screen, utilizing a thermocouple and automatic ice-point system. The sensors' outputs are recorded continuously on Leeds and Northrup analog strip chart recorders. The recorders are equipped with mechanical or electronic integrators, and half-hourly output means are obtained. The integrating system also requires two Sodeco counter-printers, and a programmer which was designed and built by Stroschein. The data acquisition system has worked well, and data have been gratifyingly free of electrical noise and disturbance due to the care taken in providing good shielding and grounding.

All radiometers were calibrated with an Eppley temperature-compensated pyrheliometer in the period March to June. For solar elevation angles above

25°, and utilizing a temperature coefficient of sensitivity of 0.2 per cent $°C^{-1}$, solarimeter calibration constants agreed closely with the factory constants. We found that sensitivity decreased with decreasing elevation angle, and the loss of sensitivity became increasingly severe with angles less than 15°. The Funk radiometer had a maximum sensitivity at solar elevation angles of 15 to 20°. The C.S.I.R.O. calibration constant for each Funk radiometer is valid at 90° solar elevation; extrapolation of our curve to 90° gives a constant close to the C.S.I.R.O. constant. However, the C.S.I.R.O. "constant versus elevation angle" curve shows exponentially decreasing sensitivity with decreasing angle, and is in disagreement with our results.

A Funk radiometer with perspex domes was used this summer to measure net short wave radiation over 10 different tundra vegetative surfaces. The surfaces were identified by Dr. P. Johnson, C.R.R.E.L. botanist. Preliminary data analysis indicates that albedos do not vary greatly, except for tundra swales, which have significantly lower albedos than the other vegetative surfaces.

The net radiative divergence was investigated in two ways: 1) A gimbalized Funk radiometer was flown to altitudes up to 250 meters, using one or two kytoons, and 2) A Funk radiometer was used with the adjustable-height adjustable-time (AHAT) tower at levels from one to five meters; the tower was designed and built by Antion of the Department of Atmospheric Sciences. Both methods have been successful in detecting net long wave radiative divergence. Kytoon flights in fog proved infeasible due to static charge buildup on the mooring cable. Two inflated kytoons are conveniently stored in an 8 x 8 x 12 foot "hangar" provided by the ARL.

Reduction of the 1963 Niksiruk radiation data is nearly complete, and these data will be published in Part II of a report "Radiative Energy Exchange over Arctic Land and Sea." The North Meadow Lake 1964 radiation data are approximately 50 per cent reduced, to data, and will be published in a paper entitled "Radiative Regime over Arctic Tundra."

Preliminary analysis of the 1962 Niksiruk data gave an annual net total radiative energy sum (partially estimated) over the sea that was small, and positive. Even though the Niksiruk data included three months of low-albedo sea water, the annual sum was less than the average annual sum for eight years of Russian ice station data (NP-2, 3, 4, 5, 6, and 7). Other investigators have noted that the Russian sums seem high. Russian authors have not seen fit to attach any statement of accuracy to their data, nor to comment on the instrumentation used.

ARLIS II

Continuous observations were made of net total radiation, total global radiation, global short wave radiation and snow surface temperature. Some of the data have been checked to see if the net radiation and the total radiation and snow surface temperatures were compatible during the dark period. The new C.S.I.R.O. net radiometers which have been in use since June 1964 are far superior to any other radiometer used so far though frosting continues to be a problem. This summer's radiation data are being reduced and analyzed by Roulet at the University of Washington.

SEA ICE PHYSICS

Collections of ice samples for salinity analysis were made during the past year on both ARLIS II and ARLIS III. Salinity measurements on all the samples collected have been recently completed.

Two sampling techniques were followed. One was designed to examine salinity changes in new ice as the season progressed. Duplicate cores were taken at the same time and at the same site and were cut into 10 cm sections without regard to any banding or internal features. The second sampling technique was to cut cores from the same site into sections containing individual bands.

After melting in sealed plastic containers the water was stirred and filtered, and 50 cc samples were sealed for laboratory density determinations. In addition, hydrometer measurements were made in the 10 cm core sections.

The density measurements were made with a Becker torsion balance measuring specific gravity to 0.0001 with an enclosed thermometer plummet. The balance and all samples were stored in a controlled temperature room and measurements were made at 20°C.

The limit of error on the measurements was such that if any agreement or correlations were possible they would have been apparent. The salinity, or in this case density, profiles show no similarities that may be interpreted. The profile plots are not only off-set from one another but are not parallel and cannot be shifted to bring them into agreement. It was unexpected that the salinities of zones with the same time-place growth history and collection technique should be so apparently completely unrelated.

The same lack of correlation is true for banded ice. However, there is a subtle hint that dark bands may be of slightly higher salinity than immediately adjacent whitish bands. Even this observation is obscured by the greater spread of salinity values inice with no distinct banding at all.

The negative results of this study are baffling, especially because there is no obvious reason why the repeatability of the observations should be so poor. There is a possibility that the 3" core is inadequate to show the relationships that are sought, consequently sampling will be done using larger blocks in order to first obtain reproducible results. Following this the reasons for brine retention and expulsion may be pursued.

The study of efflorescence crystals shows the very fine shards to have the same "platy" structure as sea ice. This was to be expected because earlier analyses show the Cl^- concentration to be about equal to that of "green" sea ice but the $SO_4^=$ concentration exceeds that of the same sea ice sample by nearly a factor of 2. This study must be continued in the laboratory. The natural crystals appear to grow considerably from sublimation, consequently efforts will be made to study their growth in the cold room under carefully controlled conditions.

ATMOSPHERIC CHEMISTRY

BARROW

Carbon Dioxide. Throughout the period covered by this report CO_2 was monitored by bimonthly sampling of air by means of glass flasks.

Continuous monitoring of the atmosphere by infrared analysis was suspended because of the 3 October 1963 storm and all of the analytical equipment was sent to the University of Washington for repair and integration into the flask analysis and reference gas standardization program.

An atmospheric chemistry site was set up near the North Meadow Lake micrometeorology site at Barrow.

During September 1963 a 16 meter mast was set up at North Meadow Lake. Air will be sampled at levels of 1, 4, 8, and 16 meters above the tundra surface. The Hartmann-Braun URAS-1 nondispersive analyzer arrived late in September from Germany, and after testing at the University of Washington it will be installed at the Barrow atmospheric chemistry site.

Air was sampled twice a month for C^{14}. Air was drawn through containers of "molecular sieve" which is selective for CO_2 and water vapor. The C^{14} was analyzed by the Radio Chemistry Group, Department of Chemistry, University of Washington.

A comprehensive report covering all of the analytical data for the period 10 July 1961 to 20 February 1963 was completed. All of the reference tanks for the Barrow CO_2 program have been analyzed by the Scripps Institution of Oceanography and an index value assigned to them. A final report on the data 21 February - 3 October 1963 is in preparation.

Ozone. A Mast 725-7 portable ozone analyzer was used at Barrow for the continuous monitoring of the ozone content of the air near the ground. The instrument had many mechanical and electrical problems and was sent to the University for repair and major design changes. These changes were completed and the analyzer was field tested at Deer Park (Olympic National Park) Washington at about the 1825 m level. The analyzer was then returned to Barrow for field operation. In addition to the continuous surface observations, two flights were made to obtain ozone concentrations at different altitudes. The first flight utilized an R4D aircraft, and a profile to 5100 m was obtained; the second flight was made with a Cessna 180 from Barrow to Fairbanks. The data were reduced after each flight.

It is planned to send the analyzer back to the University for recalibration and further modification.

ARLIS II

Supplementing the carbon dioxide program at Barrow, Alaska, flask samples have been taken twice a month and sent to the University of Washington for analysis.

Air has been sampled twice a month for C^{14} by drawing the air through a container of "molecular sieve" which selectively absorbs CO_2 and water vapor. All samples were sent to the University of Washington for analysis.

University of Washington

Laboratory space has been provided by the Chemistry Department, University of Washington, for the installation and operation of equipment necessary for the routine analysis of CO_2 and ozone.

The infrared analyzer for CO_2 flask analysis and reference gas tank standardizations is operational. Work is progressing on the construction of a vacuum system for the transfer of air samples from the flasks.

ARLIS II WEATHER

Synoptic weather observations were taken on a three or six hourly basis. In addition, aircraft weather observations were made in support of flight operations. Copies of all observations were sent to the National Weather Records Center, Asheville, North Carolina. Maximum and minimum temperatures for the period were 2.5°C and -48.3°C on 4 July and 31 January, respectively.

The summer of 1964 was exceptionally cool. Temperatures remained below freezing continuously between 6 and 19 July. A small portion of the snow cover survived the entire melting period, and surface ice ablation was practically nil.

Two short duration (each less than six hours) rainstorms occurred during the summer on 27 July and 15 August, yielding 8 and 5 mm of rain, respectively.

ARLIS II NAVIGATION

In December 1963 the island was at approximately 88°N 97°W. Since then it has moved southeastward, and on 3 November 1964 it was located at 85°N 10°W. There was very little net movement during the months of June through September, and the island was confined in its meandering to a 60 x 120 km area.

Details of the draft path were determined by approximately 20 astronomical fixes per month, except during the summer when obscuring clouds limited fixes to approximately 10 per month. Stars, Venus, the sun and the moon have been used to obtain the positions. In April the Wild theodolite was replaced by a Kern theodolite, the latter being more convenient for field use.

In June, navigation responsibility was assumed for the summer by the University of Wisconsin.

OTHER INVESTIGATIONS

Supercooling. The results obtained by N. Untersteiner and R. Sommerfeld have been published (see appended list of publications). During the spring of 1964, R. Sommerfeld made a large number of further observations of supercooling of the sea water underneath the ice which corroborate the previous findings, but do not permit more detailed and quantitative calculations. It is hoped that the attempts to measure accretion or ablation at the underside of T-3, initiated this autumn, will either prove or disprove accretion by supercooled water.

Theory of steady-state ice drift. The theoretical model of ice drift developed by W. Campbell has been very successful, and may be considered a major contribution towards an understanding of the dynamics of Arctic sea ice. A full treatment of the theory and its numerical execution has been published as a "Scientific Report." A somewhat abbreviated version is being submitted for publication to the Journal of Geophysical Research.

Heat flux and temperature of old sea ice. This investigation combined observational data and theory and lead to a coherent picture of the annual variation of temperature of equilibrium ice and permitted the calculation of an overall heat budget of the Arctic Ocean in accordance with meteorological and oceanographic evidence. This paper has been published by the Journal of Geophysical Research.

Blown snow. Experimental data obtained by R. Sommerfeld have been evaluated and theoretically interpreted by J. Businger. The explanation given for the vertical density distribution appears to be of fundamental importance for an understanding of the physics of wind-blown solid particles.

Further progress will depend on the possibility of improving the measuring apparatus. Two papers on this subject have been submitted for publication to the Journal of Geophysical Research.

REPORTS PUBLISHED

Campbell, W. J., On the Steady-State Flow of Sea Ice, Univ. of Washington Scientific Report, ONR 477 (24) (NR 307-252), 167 pp., 1964.

ABSTRACT. A steady state theory for the circulation of a wind-driven, baroclinic, ice-covered ocean is presented. The ice is considered to flow under the action of five forces: the air stress, the water stress, the internal ice stress, the Coriolis force, and the pressure gradient force due to the tilting of the sea surface. Prandtl-type boundary layers are held to exist at both ice surfaces. The ice is treated as a film of highly viscious fluid composed of ice floes acting as fluid elements. The upper and lower boundaries of this film are considered rigid and are characterized by roughness parameters. A vorticity-transport equation for a two-layered system is developed in which horizontal viscous stresses and inertial forces are neglected in the ocean. This equation is analogous to that of Munk (1950) for a single layer system. The vertical eddy viscosity is held constant with depth in the Ekman-spiral regime, but it is allowed to vary horizontally over the ocean. The linear ice equations are developed by treating the eddy viscosity as a variable parameter.

The theory is applied to the circulation of the Arctic Ocean. Because the North Pole is in the solution area, the beta-plane approximation cannot be made, thus first and second order effects of the variation of the Coriolis parameter with latitude must be considered. The solutions are governed by the pattern of wind stress and the following parameters: the eddy viscosity of the ice, the depth of the logarithmic boundary layer, and the roughness parameter of the ice-water interface. A non-analytical stress field deduced from the field of mean sea-level pressure is used for the numerical integration of the equations.

Eight solutions for the same air stress field are discussed. All solutions show an anticyclonic gyral in the surface waters on the Pacific side of the ocean. The gyral is displaced to the west as the ice eddy viscosity as high as 3.0×10^{12} cm^2 sec^{-1} is necessary in order for the gyral to occupy its observed position. The solutions for ice circulation resemble the observations of an anticyclonic cell in the Beaufort Sea region with the broad stream running from the Asian coast across the pole to Greenland. For a given stress, it is found that the ice speed is mainly determined by the depth of the boundary layer, and a value of two meters fits the observations best.

Kelley, J. J., Jr., An analysis of Carbon Dioxide in the Arctic Atmosphere at Point Barrow, Alaska 1961-1962-1963, Univ. of Washington Technical Report, ONR 477 (24) (NR 307-252), 167 pp, 1964

ABSTRACT. The results of measurements of carbon dioxide in air at Point Barrow, Alaska, and the principle of operation of the infra-red gas analyzer are described. Reference gas comparison data are given in tables, and the method of calculations discussed. The average daily concentrations of atmospheric carbon dioxide are tabulated for the period 10 July 1961 to 20 February 1963. The diurnal variations of carbon dioxide during this period are also presented. Results of the analyses of carbon dioxide in air collected in flasks from several other Alaskan locations are given.

Untersteiner, N., and R. Sommerfeld, Supercooled Water and the Bottom Topography of Floating Ice, Journal of Geophysical Research, 69, 6, pp. 1059-1062, 1964.

ABSTRACT. Observations of surface ablation and internal temperature of ice islands in the Arctic Ocean suggest the possibility of bottom accretion which cannot be explained in terms of heat conduction through the ice. It is proposed that this accretion can be caused by the advection of supercooled water forming under the surrounding normal pack ice. Since the degree of supercooling to be expected is of the order 10^{-2} or 10^{-3}°C, a direct determination of the freezing point (temperature and salinity) of the sea water in situ is experimentally difficult. To avoid this, two experiments were designed to measure supercooling indirectly by its effects, one showing the rate of accretion of an ice nucleus and the other showing the temperature difference between the sea water in its undisturbed state and simultaneously, in the state of freezing. Both experiments conclusively showed the presence of supercooled water. The experimental results are supported by a comparison of the vertical fluxes of heat and salt in the boundary layer. The possible significance of supercooled water to the persistence of topographic features of the ice bottom is discussed.

Untersteiner, N., A Nomograph for Determining Heat Storage in Sea Ice, Journal of Glaciology, to be published in the October 1964 issue.

Untersteiner, N., Calculations of Temperature Regime and Heat Budget of Sea Ice in the Central Arctic, Journal of Geophysical Research, to be

published in the November 1964 issue.

ABSTRACT. The equation of heat conduction, including variable thermal conductivity and specific heat, an internal heat source diminishing with depth, and an advective term, is integrated numerically for sea ice of equilibrium thickness. The annual cycle of thickness (ablation-accretion) is imposed as an external parameter. The boundary values for temperature and the vertical distribution of ice salinity are taken from empirical data. The computed temperature field is in good agreement with observations. The thermal history of individual particles of ice, the relative effect of the internal heat source (penetrating solar radiation), heat storage, and the annual cycle of heat flux by conduction at various depths are described. The observed maximum of brine volume at 40 to 70 cm depth is explained as the combined effect of salinity profile and internal absorption of radiation. The requirement that heat flux in the ice plus the heat equivalent of surface ablation equal the heat flux in the atmospheric boundary layer is well met by Badgley's values of radiative and turbulent heat transfer. During the melting season, 15 June to 20 August, the surface of the ice receives about 4.5 kcal/cm^2 and loses, during the freezing season, 21 August to 14 June, an only slightly greater amount of heat to the atmosphere. The annual sum of heat conduction at the base of the ice is 3.6 kcal/cm^2. Of this, 2.0 kcal/cm^2 originates from ice accretion and 1.6 kcal/cm^2 is drawn from the ocean. The atmosphere over the central Arctic receives an annual total of 2.5 kcal/cm^2, which is mainly the heat of fusion of exported ice.

MANUSCRIPTS ACCEPTED FOR PUBLICATION

Radiative Energy Exchange over Arctic Land and Sea, Part I, Data 1962, by John J. Kelley, Jr., Desmond T. Bailey, and Bruce J. Lieske, U. of Washington Scientific Report.

Net Radiation over Fast Sea Ice during Spring Breakup at Pt. Barrow, Alaska, by Bruce J. Lieske, Proceedings of the 15th Alaskan Science Conference.

An Automated Radiation Climatology Station at Pt. Barrow, Alaska, by Leander A. Stroschein, Proceedings of the 15th Alaskan Science Conference.

PAPERS PRESENTED AT MEETINGS - SEMINARS - COLLOQUIA

Church, P. E., Meteorological Research in the Arctic.
Olympic College, Bremerton, Washington

Church, P. E., The Arctic Ocean: Western and Soviet Research.
Presidential Address at Annual Meeting of Pacific Division of American Association for the Advancement of Science, Vancouver, British Columbia

Church, P. E., Arctic Ocean Heat Budget.
Olympic College, Bremerton, Washington

Hanson, A. M., Drifting Stations in the Arctic.
Hamilton Junior High School, Seattle, Washington

Kelley, J. J., Jr., Variations of CO_2 in the Arctic Atmosphere.
American Meteorological Society, Puget Sound Chapter, Seattle

Kelley, J. J., Jr., Carbon Dioxide Fluctuations in the Arctic Atmosphere.
15th Alaskan Science Conference, College, Alaska

Lieske, B. J., Net Radiation over Fast Sea Ice During Spring Breakup at Point Barrow, Alaska.
15th Alaskan Science Conference, College, Alaska

Stroschein, L. A., An Automated Radiation Climatology Station at Point Barrow, Alaska.
15th Alaskan Science Conference, College, Alaska

Untersteiner, N., Calculation of the Thermal Regime and Heat Flux in Sea Ice.
University of Washington

Untersteiner, N., Temperature Regime of Sea Ice in the Arctic.
Research Seminar United States Naval Reserve, Sand Point, Seattle, Washington

SOME OBSERVATIONS OF SOIL TEMPERATURE AT BARROW, ALASKA

Final Report

prepared under Contract NONR 477(24), T. O. 307 252

by

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INTRODUCTION

A study of the thermal regime of representative plots of tundra soils was undertaken at Point Barrow, Alaska, during the period from 4 July 1962 to 24 September 1962. The observations cover a relatively short period and do not warrant an independent, detailed study. However, they are presented here in the hope that they may be of some value within the scope of other studies concerning the physical environment of the tundra.

The observation plots were designated as follows:

1. GRAVEL, consisting of 4 cm of predominately dark, pebbly cherts (Hume, 1961) over clay.

2. DRY GRASS, consisting of short, dry, brown grass over clay.

3. GREEN GRASS, consisting of a thick stand of green grass about 10 cm high over gravel.

4. POND, a shallow marsh composed of short, red grass and algae in water.

All four sites were located within several meters of each other on the tundra about 120 meters southeast of the Arctic Research Laboratory.

METHODS

Soil temperatures were obtained by means of thermocouples (18 gauge, copper-constantan), mounted on plexiglass rods, at 0, 1, 2, 3, 4, 5, 7.5, and 10 cm depth. A schematic diagram showing the physical and electrical arrangement of the thermocouples is given in Figure 1.

The rods were placed vertically in the soil at each of the four tundra plots, and the cable containing the thermocouple wires were run underground several feet before being brought to the surface. After the rods were placed in the ground, the soil was carefully replaced around them. The plots were then left undisturbed for several days before temperature recording was begun. The surface thermocouple was exposed by embedding the bottom half of its diameter in the soil (or water) and leaving the upper half exposed to the air.

Regular observations were begun on 11 July 1962. At first, readings were taken manually with a Rhodes potentiometer-voltmeter (precision $\pm$ 5 µv) and recorded usually three times daily. On 25 July 1962, recording of temperature profiles commenced with the aid of a Brown Instrument Co. multipoint recorder.

During the period of high sun (until about the middle of August) high temperatures, steep temperature gradients, and large daily variations prevailed. By mid-August, daily variations became smaller and the profiles almost isothermal as uniform cooling took place.

The temperature regimes in the green grass plot are similar to the gravel plot. However, the temperature variations compared to those of the gravel plot are greatly damped, showing almost no variation by mid-August. Undoubtedly the green grass, which had grown to a height of 15-18 cm by mid-August, produced a good insulating effect, and the low sun was unable to penetrate the flora. The dry grass plot shows characteristics similar to the green grass plot.

After 27 July 1962, the water at the pond site rose to such a height that the thermocouples below the surface were no longer recording temperatures for their intended levels. Pond and grass sites show similar trends during that period. The small variations are apparently due to a low sun angle and increase in height of the pond grass.

The surface temperature of the pond dropped to freezing on 5 September 1962 and remained at or below 0°C for the remainder of the recording period despite several periods when the air temperature was above freezing.

The overall maximum surface temperature usually is attained one hour after local noon (maximum solar radiation). Local noon at Barrow occurred about 1225 AST, but the maximum surface temperature rarely occurred before 1325 AST.

Measurements of soil moisture content were made at the gravel site (Table 1). Samples were obtained with a plastic tube by inserting the tube into the soil and then withdrawing it. The samples were then transferred to paper sacks, weighed, allowed to dry for 24 hours at 105°C, weighed again, and then dried for another 24 hours to make sure that no additional dehydration would take place.

After determining the percent of water, the specific heat of the gravel was calculated according to the formula given by Lachenbruch (1962):

$$C = \frac{1}{100}\left[1.0W + 0.17\,(1-W)\right]$$

where: W = Weight percent water

C = Specific heat in cal $gm^{-1}\ {}^{o}C^{-1}$

TABLE 1

Date	Specific Heat cal gm^{-1} $°C^{-1}$	Weight Percent Water
7 August 1962	0.283	13.6
10	0.261	11.0
14	0.226	6.7
18	0.243	8.8
21	0.232	7.4
23	0.228	7.0
27	0.275	12.6
30	0.238	8.2
3 September	0.255	10.2
5	0.246	9.2
11	0.255	10.2

REFERENCES

Hume, J. D., 1961, "Shallow Water Studies in Vicinity of Barrow, Alaska," Coastal and Shallow Water Research Conference (unpublished manuscript).

Lachenbruch, A. H., 1962, Personal communication.

TEMPERATURE THERMOCOUPLE ARRANGEMENT

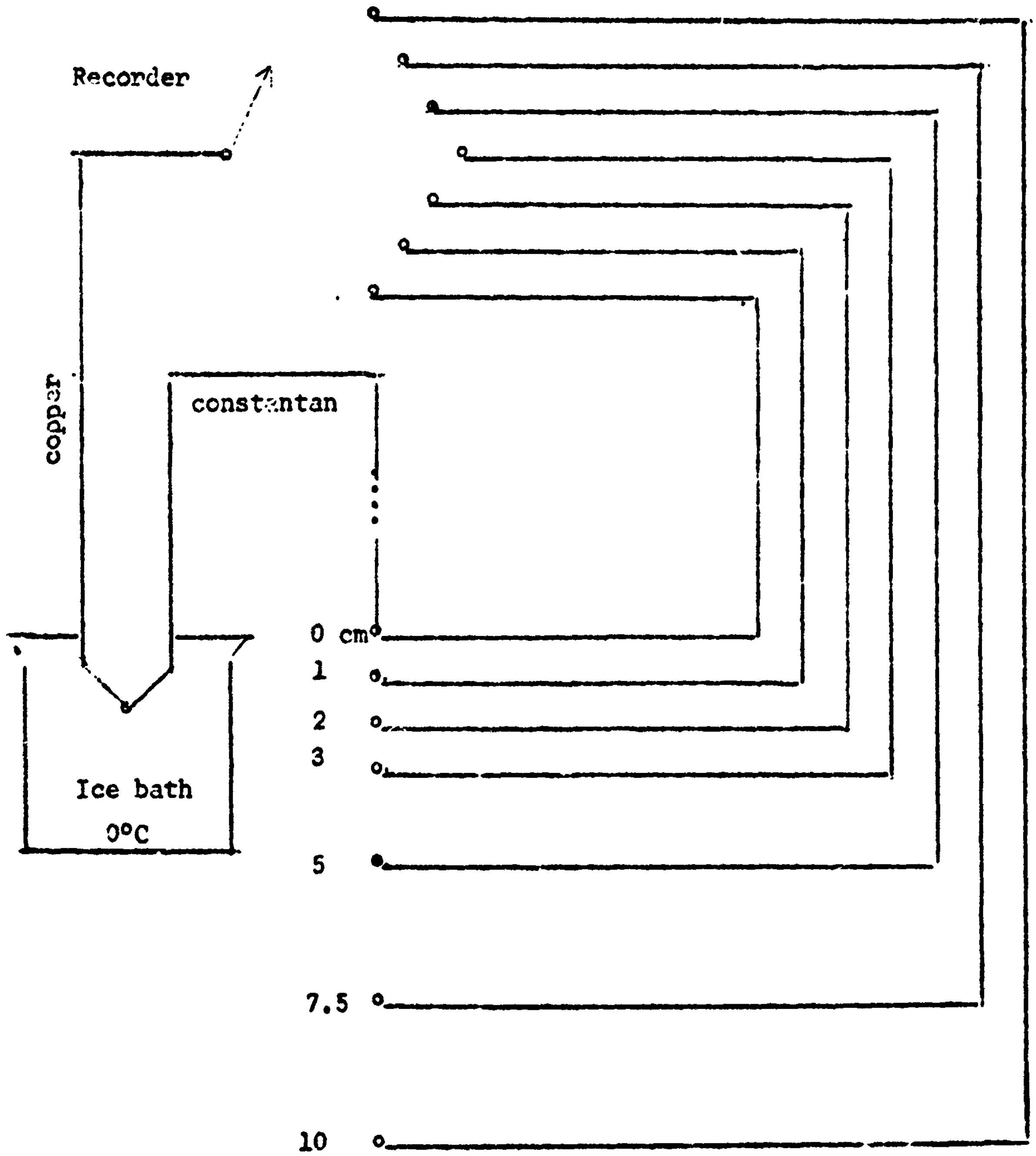

FIGURE 1

SOIL TEMPERATURE PROFILES

For

GREEN GRASS, DRY GRASS, GRAVEL AND POND SITES

POINT BARROW, ALASKA

SUMMER 1962

Temperatures are reported in °C

SOIL TEMPERATURE, GREEN GRASS
POINT BARROW, ALASKA - 1962

JULY Level / Time:	11 0805	11 1415	11 1855	13 0910	13 1420	13 1820	14 0900	14 1420	14 1820	16 1350	16 1835	17 0920
surface	7.8	9.4	7.6	6.1	7.4	7.4	7.7	9.7	7.1	11.3	5.4	12.3
-1.0 cm	6.6	8.9	7.5	5.4	7.0	7.2	7.0	8.4	6.8	10.7	4.9	10.0
-2.0	6.1	8.4	7.4	5.4	6.8	7.2	6.6	8.3	6.7	10.2	5.0	9.3
-3.0	5.4	7.3	7.0	4.7	5.9	6.7	5.5	7.2	5.8	8.8	4.4	7.6
-4.0	5.0	7.4	6.7	4.4	5.6	6.5	5.1	--	5.5	8.2	4.1	7.0
-5.0	4.9	7.3	6.4	4.4	5.6	6.4	4.7	6.5	5.4	8.2	3.8	6.7
-7.5	[illegible].4	6.7	6.1	4.1	5.2	5.9	4.1	5.7	4.9	7.5	3.5	5.6
-10.0	4.4	6.1	5.9	3.9	5.2	5.8	3.9	5.6	4.6	7.0	3.3	5.3

JULY Level / Time:	17 1355	21 1345	21 1855	22 1315	24 1340	27 1855	27 2000	27 2100	27 2200	27 2300	27 2400	28 0100
surface	17.5	9.4	6.[illegible]	9.0	10.2	4.7	4.7	4.4	4.1	3.6	3.6	3.2
-1.0 cm	14.8	8.7	6.[illegible]	8.2	9.7	5.0	5.0	4.9	4.2	4.1	3.8	3.7
-2.0	13.9	8.3	6.4	8.2	9.3	5.0	5.0	4.7	4.6	4.1	4.2	3.8
-3.0	11.4	7.5	6.3	7.4	8.2	5.5	5.3	5.1	4.9	4.8	4.6	4.4
-4.0	10.7	7.1	6.2	6.7	7.6	--	--	--	--	--	--	--
-5.0	10.3	6.8	6.4	6.6	7.4	5.1	5.0	4.9	4.8	4.4	4.6	4.2
-7.5	9.0	6.2	6.2	5.9	6.7	5.3	5.2	5.1	4.9	4.9	4.7	4.6
-10.0	8.2	6.0	5.9	5.6	6.2	4.9	4.8	4.8	4.8	4.5	4.6	4.4

JULY Level / Time:	28 0200	28 0300	28 0400	28 0500	28 0600	28 0700	28 0800	28 1000	28 1100	28 1200	28 1400	28 1500
surface	3.1	2.9	2.6	2.7	3.0	3.3	3.4	4.7	5.0	5.7	6.5	6.3
-1.0 cm	3.1	2.8	2.7	2.8	2.8	3.2	3.9	4.9	5.5	5.8	6.8	7.0
-2.0	3.8	3.6	3.4	3.4	3.6	3.9	3.7	5.2	5.3	5.9	5.6	5.7
-3.0	4.3	4.0	3.9	3.[illegible]	3.5	4.0	3.8	4.9	5.3	5.5	6.8	6.9
-5.0	4.4	4.1	4.0	4.0	3.9	4.0	3.2	4.5	4.6	5.0	5.2	5.3
-7.5	4.7	4.4	4.3	4.1	4.1	4.0	3.8	4.3	4.5	4.7	4.7	5.0
-10.0	4.4	4.4	4.1	4.0	4.1	3.9	3.3	4.1	4.0	4.5	4.5	4.6

SOIL TEMPERATURE, GREEN GRASS
POINT BARROW, ALASKA - 1962

JULY Level / Time:	28 1600	28 1700	28 1800	28 2100	28 2400	29 1300	29 1800	30 1300	31 1300	31 1200	31 1800
surface	5.7	5.2	4.4	6.3	5.7	3.4	2.4	3.5	1.3	2.6	2.6
-1.0 cm	6.2	6.0	4.8	6.5	6.1	3.4	2.9	3.9	1.7	2.6	2.6
-2.0	5.5	--	4.9	6.7	6.1	4.1	3.1	3.9	2.0	2.8	2.8
-3.0	6.3	--	5.5	6.7	6.4	4.1	3.7	4.0	2.3	2.8	2.9
-5.0	5.3	5.1	5.0	6.8	6.3	3.8	3.4	3.4	2.1	2.6	2.8
-7.5	5.2	--	5.1	6.8	6.5	3.8	3.8	3.4	2.4	2.6	2.9
-10.0	4.7	4.7	4.8	6.9	6.4	3.6	3.4	3.1	2.4	2.5	2.7

AUGUST Level / Time:	1 0900	1 1300	1 1400	2 1235	2 1810	3 1238	3 2100	3 2400	4 0200	4 0400	4 0600	4 0800
surface	4.4	6.7	6.3	10.1	7.7	8.8	6.3	5.7	5.8	5.5	5.2	5.4
-1.0 cm	5.2	7.0	6.9	10.0	7.9	9.5	6.5	6.1	5.9	5.6	5.5	6.1
-2.0	4.5	6.4	6.3	9.5	7.7	8.9	6.7	6.1	6.0	5.7	5.4	5.7
-3.0	4.7	5.3	6.4	8.6	7.5	8.7	6.7	6.4	6.1	5.8	5.8	6.1
-5.0	3.8	4.9	5.5	7.8	7.3	7.7	6.8	6.3	6.2	5.9	5.6	5.7
-7.5	3.8	4.7	5.5	7.1	7.2	7.4	6.8	6.5	6.2	5.9	5.8	5.9
-10.0	3.2	4.1	4.9	6.6	6.8	6.8	6.8	6.4	6.2	6.0	5.7	5.6

AUGUST Level / Time:	4 1000	4 1215	4 1400	4 1600	4 1800	5 0830	5 1309	5 1820	6 0830	6 1255	6 1840	7 0819
surface	5.9	6.2	5.9	5.8	5.5	4.0	4.0	3.8	4.5	5.3	6.2	5.9
-1.0 cm	6.0	6.8	6.3	6.3	5.9	4.5	4.7	4.7	4.5	5.9	6.6	6.2
-2.0	6.1	6.5	6.3	6.2	6.1	4.2	4.4	4.3	4.4	5.8	6.1	6.0
-3.0	6.1	6.7	6.3	6.2	6.1	4.6	4.9	4.9	4.4	5.6	6.2	5.9
-5.0	5.9	6.1	6.1	5.9	6.1	4.1	4.4	4.4	4.0	4.9	5.5	5.1
-7.5	5.8	6.2	6.0	5.9	5.9	4.5	4.7	4.9	4.0	4.9	5.5	5.2
-10.0	5.7	5.7	5.6	5.7	5.8	4.2	4.4	4.4	3.9	4.4	5.0	4.6

SOIL TEMPERATURE, GREEN GRASS
POINT BARROW, ALASKA - 1962

AUGUST Level / Time:	7 1235	7 1855	7 2100	7 2400	8 0200	8 0400	8 0600	8 0800	8 1000	8 1245	8 1400	8 0810
surface	9.0	7.0	6.4	5.4	5.1	5.0	5.0	5.4	5.8	6.6	6.6	5.4
-1.0 cm	9.0	7.4	6.7	5.7	5.4	5.3	5.3	5.9	5.9	7.1	7.4	5.9
-2.0	8.4	7.2	6.5	5.7	5.4	5.2	5.3	5.7	6.1	6.9	7.0	5.7
-3.0	7.6	7.2	6.7	5.9	5.7	5.5	5.4	5.8	5.8	6.7	6.8	5.8
-5.0	6.6	6.8	6.4	5.9	5.6	5.4	5.4	5.5	5.7	6.1	6.3	5.5
-7.5	6.0	6.7	6.4	6.0	5.8	5.6	5.5	5.6	5.4	5.9	5.9	5.6
-10.0	5.4	6.3	6.2	5.9	5.7	5.4	5.3	5.3	5.5	5.7	5.7	5.3

AUGUST Level / Time:	8 1600	8 1800	8 1815	10 1240	10 1055	10 2100	10 2400	11 0200	11 0400	11 0600	11 0810	11 1000
surface	6.9	6.7	6.7	7.2	6.5	5.2	4.6	4.4	4.5	4.7	5.9	5.4
-1.0 cm	7.4	6.8	6.8	7.0	6.1	5.2	4.4	4.2	4.4	4.4	5.4	5.0
-2.0	7.4	6.9	6.9	7.5	7.1	5.9	5.2	5.0	5.0	5.2	6.4	5.8
-3.0	7.0	6.7	6.7	7.0	6.6	5.8	5.2	4.9	4.9	4.9	5.6	5.4
-5.0	6.8	6.7	6.7	7.0	7.1	6.2	5.6	5.3	5.2	5.2	6.0	5.5
-7.5	6.4	6.4	6.4	6.6	6.7	6.2	5.6	5.4	5.2	5.2	5.6	5.4
-10.0	6.1	6.3	6.3	6.6	6.9	6.4	5.9	5.7	5.6	5.4	5.8	5.5

AUGUST Level / Time:	11 1820	12 1240	12 2400	13 0200	13 0400	13 0600	13 0800	13 1000	13 1230	13 1400	13 1600	13 1810
surface	6.3	9.1	5.5	4.9	4.5	5.0	6.4	6.2	7.4	8.0	7.7	7.1
-1.0 cm	5.9	9.3	5.2	4.7	4.4	4.9	6.0	6.0	6.8	7.6	7.1	6.4
-2.0	6.6	9.0	6.1	5.6	5.2	5.5	6.8	--	--	8.2	7.8	7.4
-3.0	6.1	8.7	6.0	5.6	5.3	5.3	6.0	6.2	6.8	7.1	7.1	6.8
-5.0	6.4	7.9	6.4	6.0	5.7	5.7	6.3	6.3	7.1	7.1	7.2	7.2
-7.5	6.3	7.5	6.4	6.0	5.8	5.7	5.9	6.1	6.4	6.6	6.8	6.7
0.0	6.4	7.0	6.8	6.4	6.1	5.9	6.0	6.2	6.7	6.7	6.9	6.9

SOIL TEMPERATURE. GREEN GRASS
POINT BARROW, ALASKA - 1962

AUGUST Level / Time:	14 1305	14 1855	14 2100	14 2400	15 0200	15 0400	15 0600	15 0830	15 1000	15 1220	15 1400	15 1600
surface	8.5	8.4	6.9	6.2	5.7	5.4	5.4	5.9	7.1	8.5	7.2	7.8
-1.0 cm	7.9	7.9	6.4	5.9	5.4	5.2	5.2	5.7	6.7	8.0	7.0	7.6
-2.0	8.4	8.6	7.3	6.7	6.3	5.9	5.9	6.3	7.4	8.7	7.7	8.2
-3.0	7.2	7.9	7.1	6.4	6.1	5.8	5.7	6.0	6.6	7.5	7.2	7.6
-5.0	7.1	8.0	7.4	6.9	6.6	6.3	6.1	6.1	6.7	7.7	7.4	7.7
-7.5	6.6	7.5	7.2	6.8	6.5	6.3	6.1	6.1	6.7	6.9	7.6	7.2
-10.0	6.6	7.6	7.4	7.0	6.8	6.4	6.4	6.2	6.4	7.0	7.0	7.3

AUGUST Level / Time:	15 1615	15 1830	16 0825	16 1225	16 1830	17 0840	17 1250	17 1840	18 0855	18 1300	18 1840	20 0845
surface	7.1	7.1	5.2	6.1	5.2	4.2	5.6	4.9	3.4	4.2	4.0	3.6
-1.0 cm	7.0	7.0	5.0	5.6	5.0	3.9	5.2	4.5	3.2	4.0	3.9	3.2
-2.0	7.7	7.7	5.7	6.4	5.7	4.5	5.9	5.3	3.9	4.7	4.7	3.9
-3.0	7.4	7.4	5.4	5.8	5.7	4.2	5.6	5.2	3.3	4.3	4.7	3.5
-5.0	7.5	7.5	5.7	6.1	5.9	4.5	5.6	5.4	4.0	4.4	4.9	3.9
-7.5	7.3	7.3	5.6	5.9	5.9	4.6	5.3	5.4	4.0	4.3	4.9	3.7
-10.0	7.4	7.4	5.8	6.0	6.0	4.9	5.3	5.5	4.4	4.4	5.0	3.9

AUGUST Level / Time:	20 1250	20 1900	21 0600	21 0800	21 1000	21 1300	21 1400	21 1600	21 1810	2. 0825	22 1235	22 1825
surface	4.7	3.0	1.4	2.3	2.6	3.1	3.2	3.1	3.6	2.1	3.2	2.6
-1.0 cm	4.4	2.7	1.2	1.8	2.5	3.0	3.1	3.0	3.8	2.2	3.4	2.9
-2.0	5.0	3.6	2.1	2.7	3.2	3.6	3.9	3.8	3.8	2.2	3.4	2.9
-3.0	4.4	3.4	2.1	2.5	2.8	3.2	3.4	3.4	3.8	2.3	3.1	3.1
-5.0	4.6	3.9	2.6	3.1	3.1	3.4	3.6	3.9	3.8	2.3	2.9	3.1
-7.5	4.1	3.9	2.7	2.9	2.9	3.2	3.4	3.0	3.6	2.3	2.7	3.1
-10.0	[illegible]	4.2	[illegible]	[illegible]	3.2	3.4	3.7	[illegible]	3.6	2.5	2.7	3.1

SOIL TEMPERATURE, GREEN GRASS
POINT BARROW, ALASKA - 1952

AUGUST Level / Time:	23 0835	23 1845	23 2100	2 2400	24 0200	24 0400	24 0600	24 1000	24 0805	24 1220	24 1400	24 1600
surface	2.2	2.6	2.6	2.3	2.3	2.[illegible]	2.3	2.6	2.9	3.6	4.2	3.6
-1.0 cm	2.4	2.9	2.7	2.5	2.5	2.3	2.3	2.8	2.9	3.6	4.2	3.6
-2.0	2.3	3.0	3.0	2.5	2.6	2.3	2.5	2.8	3.1	3.6	4.1	3.6
-3.0	2.3	3.1	3.0	2.7	2.7	2.5	2.6	2.7	2.9	3.3	3.6	3.7
-5.0	2.2	3.0	3.1	2.7	2.7	2.6	2.6	2.6	2.9	3.2	3.2	3.4
-7.5	2.2	3.0	3.1	2.9	2.8	2.6	2.6	2.6	2.6	3.0	3.1	3.3
-10.0	2.2	3.0	3.1	2.9	2.8	2.6	2.6	2.5	2.6	3.0	2.9	3.2

AUGUST Level / Time:	24 1810	25 0850	25 1300	27 1335	27 1805	28 1245	28 1835	29 0835	29 1240	29 1820	30 0840	31 0820
surface	3.2	2.3	3.1	3.2	3.0	2.7	2.6	2.8	4.2	3.6	1.2	0.5
-1.0 cm	3.2	2.4	3.4	3.6	3.0	3.1	2.9	2.9	4.3	3.8	1.4	0.3
-2.0	3.3	2.5	3.5	3.6	3.2	3.1	2.9	2.9	4.2	3.8	1.4	0.9
-3.0	3.4	2.6	3.4	3.3	3.2	3.0	3.0	2.9	3.9	6.5	1.7	1.2
-5.0	3.4	2.3	3.0	3.0	3.2	2.7	3.1	2.7	3.6	6.5	1.6	1.3
-7.5	3.2	2.3	2.9	2.8	3.1	2.7	3.1	2.6	3.3	3.8	2.0	1.6
-10.0	3.2	2.3	2.6	2.6	3.1	2.6	3.1	2.6	3.2	3.6	2.0	1.6

AUGUST Level / Time:	31 1245	31 1855	31 2100	31 2400
surface	0.7	0.7	0.7	0.6
-1.0 cm	1.3	1.3	1.0	0.7
-2.0	1.3	1.3	1.2	1.0
-3.0	1.3	1.6	1.3	1.2
-5.0	1.3	1.6	1.5	1.3
-7.5	1.3	1.7	1.6	1.3
-10.0	1.4	1.7	1.7	1.5

SOIL TEMPERATURE, GREEN GRASS
POINT BARROW, ALASKA - 1962

SEPTEMBER Level / Time:	1 0200	1 0400	1 0600	1 0830	1 1000	1 1220	1 1400	[illegible]	1 [illegible]	4 0855	4 1245	4 1820
surface	0.3	0.4	0.3	0.7	2.1	3.6	3.2	2.9	1.8	-0.3	0.3	1.3
-1.0 cm	0.5	0.5	0.5	0.7	2.3	3.6	3.3	3.0	2.2	-0.2	0.6	1.3
-2.0	0.8	0.9	0.7	1.0	2.3	3.6	3.4	3.0	2.2	-0.1	0.6	1.4
-3.0	1.0	1.0	0.9	0.9	2.0	3.1	3.0	2.9	2.3	0.0	0.6	1.4
-5.0	1.0	1.3	1.0	1.0	1.6	2.9	3.1	2.7	2.4	0.0	0.4	1.3
-7.5	1.0	1.3	1.3	1.0	1.6	2.3	2.5	2.7	2.6	0.3	0.5	1.2
-10.0	1.3	1.4	1.3	1.0	1.4	2.3	2.3	2.8	2.6	0.3	0.3	1.2

SEPTEMBER Level / Time:	5 1250	6 0825	6 2100	6 2400	7 0200	7 0400	7 0600	7 0805	7 1000	7 1225	7 1400	7 1600
surface	0.0	-1.0	-0.7	-0.7	-0.7	-0.3	-1.0	-0.7	-0.7	-0.7	-0.8	-1.0
-1.0 cm	0.3	-0.7	-0.6	-0.6	-0.7	-0.7	-0.8	-0.5	-0.7	-0.7	-0.3	-0.9
-2.0	0.3	-0.6	-0.4	-0.3	-0.5	-0.7	-0.7	-0.3	-0.6	-0.3	-0.4	-0.5
-3.0	0.7	-0.3	-0.3	-0.2	-0.3	-0.4	-0.4	-0.3	-0.3	-0.3	0.0	-0.5
-5.0	0.7	-0.2	-0.1	-0.1	-0.1	-0.3	-0.2	-0.1	-0.3	-0.1	0.0	-0.2
-7.5	0.8	0.1	0.0	-0.1	0.0	-0.1	-0.1	0.0	-0.2	-0.1	0.1	-0.1
-10.0	1.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SEPTEMBER Level / Time:	7 0855	8 1240	8 1856	8 2100	8 2400	9 0200	9 0400	9 0600	9 0810	9 1000	9 1225	9 1400
surface	-1.0	-0.7	-1.0	-0.7	-1.0	-0.9	-0.7	-0.7	-0.7	-1.0	-0.5	-0.9
-1.0 cm	-0.7	-0.6	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.8	-0.7	-0.7
-2.0	-0.7	-0.6	-0.7	-0.5	-0.7	-0.7	-0.6	-0.5	-0.4	-0.9	-0.3	-0.7
-3.0	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.4	-0.3	-0.3
-5.0	-0.3	-0.3	-0.5	-0.3	-0.3	-0.3	-0.2	-0.2	-0.1	-0.4	-0.2	-0.3
-7.5	-0.1	-0.1	-0.3	-0.2	-0.1	-0.1	-0.2	-0.2	-0.1	-0.3	-0.2	-0.1
-10.0	-0.1	-0.1	-0.2	-0.2	-0.1	-0.1	-0.1	0.0	0.0	-0.3	-0.1	-0.1

SOIL TEMPERATURE, GREEN GRASS
POINT BARROW, ALASKA - - 1962

SEPTEMBER Level / Time:	9 1810	10 1305	10 1855	11 1235	12 1240	13 1600	13 1800	13 2000	13 2200	13 2400	14 0200	14 0400
surface	-0.5	-1.0	-0.9	-0.4	-0.1	-0.7	-1.0	-0.7	-0.7	-0.7	-0.7	-0.8
-1.0 cm	-0.7	-1.0	-0.6	-0.5	-0.3	-0.7	-0.7	-0.4	-0.7	-0.7	-0.4	-0.8
-2.0	-0.5	-0.9	-0.6	-0.2	-0.2	-0.5	-0.7	-0.5	-0.5	-0.6	-0.3	-0.3
-3.0	-0.3	-0.6	-0.4	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.5
-5.0	-0.2	-0.7	-0.6	0.0	-0.1	-0.3	-0.3	-0.4	-0.3	-0.3	-0.1	-0.2
-7.5	-0.2	-0.2	-0.3	-0.1	-0.1	-0.1	-0.2	-0.2	-0.3	-0.1	-0.1	-0.2
-10.0	0.0	-0.2	-0.2	0.0	0.0	0.0	-0.2	-0.2	-0.2	-0.0	0.0	0.0

SEPTEMBER Level / Time:	14 0600	14 0800	14 1000	14 1200	14 1600	14 1800	14 2200	14 2400	15 0200	15 0400	15 0600	15 0800
surface	-1.0	-0.7	-0.9	-0.7	-0.3	-0.7	-1.3	-1.3	-1.5	-1.0	-1.0	-1.0
-[illegible] cm	-0.7	-0.7	-0.8	-0.5	-0.3	-0.4	-1.0	-1.9	-1.3	-1.0	-1.0	-1.0
-2.0	-0.7	-0.3	-0.7	-0.4	-0.3	-0.4	-0.7	-1.0	-1.0	-0.9	-0.7	-0.9
-3.0	-0.4	-0.3	-0.5	-0.3	-0.2	-0.2	-0.5	-0.4	-0.5	-0.5	-0.3	-0.7
-5.0	-0.4	-0.1	-0.4	-0.1	0.0	-0.2	-0.3	-0.3	-0.2	-0.3	-0.2	-0.5
-7.5	-0.2	-0.1	-0.2	-0.1	0.0	-0.1	-0.3	-0.2	-0.2	-0.1	-0.2	-0.3
-10.0	-0.1	0.0	-0.1	0.0	0.0	-0.1	0.0	-0.1	-0.1	0.0	0.0	-0.3

SEPTEMBER Level / Time:	15 1000	15 1200	15 1600	15 1800	15 2000	15 2200	15 2400	16 0200	16 0400	16 0600	16 0800	16 1000
surface	-0.7	-0.3	-0.7	-0.7	-0.7	-0.7	-0.7	-0.9	-0.9	-1.0	-0.7	-0.7
-1.0 cm	-0.7	-0.4	-0.6	-0.7	-0.7	-0.6	-0.7	-0.7	-0.9	-1.0	-0.7	-0.8
-2.0	-0.5	-0.2	-0.3	-0.7	-0.6	-0.5	-0.4	-0.5	-0.7	-0.9	-0.6	-0.7
-3.0	-0.4	-0.3	-0.3	-0.4	-0.3	-0.3	-0.3	-0.4	-0.5	-0.5	-0.3	-0.3
-5.0	-0.1	0.0	-0.2	-0.4	-0.3	-0.3	-0.1	-0.3	-0.3	-0.3	-0.2	-0.3
-7.5	-0.1	0.0	-0.2	-0.2	-0.1	-0.1	-0.2	-0.1	-0.3	-0.3	-0.1	-0.2
-10.0	0.0	0.0	0.0	-0.2	-0.1	0.0	0.0	0.0	-0.1	-0.2	0.0	-0.2

SOIL TEMPERATURE, GREEN GRASS
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SEPTEMBER Level / Time:	16 1200	16 1400	16 1600	16 1800	16 2000	16 2200	16 2400	17 0200	17 0400	17 0600	17 0800	17 1000
surface	-0.6	-0.5	-0.5	-0.5	-0.7	-0.6	-0.7	-0.9	-0.6	-0.7	-0.9	-0.8
-1.0 cm	-0.6	-0.4	-0.5	-0.5	-0.7	-0.6	-0.6	-0.7	-0.4	-0.7	-0.8	-1.0
-2.0	-0.4	-0.3	-0.3	-0.5	-0.6	-0.5	-0.5	-0.7	-0.4	-0.5	-0.7	-0.7
-3.0	-0.3	-0.2	-0.3	-0.3	-0.3	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3	-0.5
-5.0	-0.3	-0.1	-0.2	-0.3	-0.3	-0.3	-0.2	-0.4	-0.3	-0.2	-0.3	-0.4
-7.5	-0.1	-0.1	-0.2	-0.1	-0.1	-0.1	-0.1	0.0	-0.7	-0.1	-0.3	-0.3
-10.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	-0.3	-0.2

SEPTEMBER Level / Time:	18 1000	18 1200	18 1400	18 1600	18 1800	18 2200	18 2400	19 0200	19 0400	19 0600	19 0800	19 1000
surface	-1.0	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
-1.0 cm	-1.0	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
-2.0	-0.7	-0.4	-0.5	-0.5	-0.7	-0.6	-0.5	-0.5	-0.5	-0.6	-0.3	-0.4
-3.0	-0.4	-0.3	-0.3	-0.3	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3	-0.3	-0.2
-5.0	-0.4	-0.1	-0.3	-0.3	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3	-0.3	-0.2
-7.5	-0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1	-0.2	-0.3	-0.2	-0.1
-10.0	-0.1	0.0	-0.1	-0.1	0.0	-0.1	-0.2	-0.1	-0.1	-0.1	0.0	-0.1

SEPTEMBER Level / Time:	19 1200	19 1400	19 1600	19 1800	19 2000	19 2200	19 2400	20 0200	20 0400	20 0600	20 0800	20 1000
surface	-0.7	0.8	-0.3	-0.7	-0.8	-0.7	-0.3	-0.7	-0.7	-0.7	-0.7	-0.9
-1.0 cm	-0.7	-0.8	-0.4	-0.7	-0.7	-0.7	-0.5	-0.7	-0.7	-0.7	-0.7	-0.9
-2.0	-0.3	-0.5	-0.3	-0.6	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4	-0.6	-0.7
-3.0	-0.2	-0.3	-0.1	-0.3	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3	-0.4	-0.3
-5.0	-0.2	-0.3	-0.1	-0.3	-0.3	-0.3	-0.1	-0.1	-0.3	-0.1	-0.3	-0.3
-7.5	0.0	-0.1	-0.1	-0.2	-0.1	-0.2	-0.1	-0.1	-0.3	-0.1	-0.3	-0.2
-10.0	0.0	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	0.0	-0.1	-0.1

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SEPTEMBER Level / Time:	20 1400	20 1600	20 1800	20 2000	20 2200	20 2400	21 0200	21 0400	21 0600	21 0800	21 1000	21 1200
surface	-0.7	-0.5	-0.7	-0.7	-0.7	-0.9	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
-1.0 cm	-0.7	-0.9	-0.9	-0.7	-0.7	-1.0	-0.8	-0.7	-0.9	-0.7	-0.8	-0.9
-2.0	-0.5	-0.3	-0.4	-0.5	-0.7	-0.7	-0.5	-0.7	-0.7	-0.5	-0.7	-0.5
-3.0	-0.3	-0.3	-0.3	-0.3	-0.3	-0.5	-0.3	-0.4	-0.4	-0.3	-0.7	-0.3
-5.	-0.3	-0.2	-0.3	-0.3	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3	-0.5	-0.1
-7.5	-0.2	-0.2	-0.1	-0.3	-0.2	-0.2	-0.2	-0.2	-0.3	0.0	-0.2	-0.2
-10.0	-0.1	-0.1	0.0	-0.1	-0.2	-0.1	0.0	0.0	-0.2	0.0	-0.2	0.0

SEPTEMBER Level / Time:	21 1400	21 1600	21 1800	21 2000	21 2200	21 2400	22 0200	22 0400	22 0600	22 0800	22 1000	22 1200
surface	-0.7	-0.7	-0.7	-0.7	-1.0	-1.0	-0.9	-0.9	-1.0	-0.7	-0.7	-0.7
-1.0 cm	-0.7	-0.7	-0.9	-0.8	-1.0	-1.0	-1.0	-1.0	-1.0	-1.3	-0.7	-0.9
-2.0	-0.7	-0.5	-0.7	-0.7	-1.0	-1.0	-0.7	-0.7	-0.9	-1.0	-0.7	-0.5
-3.0	-0.3	-0.3	-0.4	-0.7	-0.7	-0.5	-0.7	-0.7	-0.9	-0.7	-0.6	-0.4
-5.0	-0.2	-0.1	-0.3	-0.3	-0.5	-0.3	-0.3	-0.3	-0.5	-0.3	-0.3	-0.2
-7.5	-0.1	-0.1	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.2	-0.3	-0.2
-10.0	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	-0.1	-0.2	-0.1	-0.2	0.0

SEPTEMBER Level / Time:	22 1400	22 1600	22 1800	22 2000	22 2200	22 2400	23 0200	23 0400	23 0600	23 0800	23 1000	23 1200
surface	-0.7	-0.7	-0.7	-1.0	-0.9	-0.9	-0.7	-1.0	-1.0	-1.0	-0.7	-0.9
-1.0 cm	-0.7	-0.8	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.2	-1.0	-1.0	-1.0
-2.0	-0.7	-0.7	-0.7	-0.9	-0.7	-0.7	-0.6	-0.9	-1.0	-0.9	-0.7	-0.7
-3.0	-0.5	-0.7	-0.5	-0.5	-0.5	-0.5	-0.6	-0.7	-0.7	-0.7	-0.5	-0.7
-5.0	-0.3	-0.4	-0.5	-0.4	-0.3	-0.3	-0.3	-0.2	-0.5	-0.3	-0.3	-0.5
-7.5	-0.3	-0.2	-0.5	-0.3	-0.3	-0.1	-0.3	-0.1	-0.4	-0.2	-0.2	-0.3
-10.0	-0.1	0.0	-0.3	-0.1	-0.1	0.0	0.0	0.0	-0.1	-0.2	-0.2	-0.1

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SEPTEMBER Level / Time:	23 1400	23 1600	23 1800	23 2000	23 2200	23 2400	24 0200	24 0400	24 0600	24 0800	24 1000	24 1200
surface	-0.9	-1.0	-0.9	-0.9	-0.7	-0.8	-0.7	-0.3	-1.0	-1.0	-0.7	-0.4
-1.0 cm	-1.0	-1.0	-1.0	-1.0	-0.9	-1.0	-0.9	-1.0	-1.0	-1.0	-1.0	-0.8
-2.0	-0.7	-0.9	-1.0	-0.9	-0.7	-0.7	-0.7	-0.7	-0.8	-0.9	-0.7	-0.4
-3.0	-0.4	-0.7	-0.5	-0.7	-0.3	-0.6	-0.7	-0.7	-0.7	-0.8	-0.7	-0.4
-5.0	-0.3	-0.5	-0.3	-0.3	-0.2	-0.6	-0.3	-0.3	-0.4	-0.5	-0.3	-0.1
-7.5	-0.1	-0.3	-0.1	-0.3	-0.2	-0.5	-0.3	-0.3	-0.3	-0.3	-0.3	-0.2
-10.0	0.0	-0.2	0.0	0.0	0.0	-0.1	0.0	-0.2	-0.3	-0.3	0.0	0.0

SEPTEMBER Level / Time:	24 1400	24 1600	24 1800	24 2000	24 2200	24 2400	25 0200	25 0400	25 0600	25 0800	25 1000
surface	-0.7	-0.7	-0.7	-0.7	-0.5	-0.5	-0.7	-0.7	-0.6	-0.7	-0.7
-1.0 cm	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
-2.0	-0.4	-0.7	-0.7	-0.4	-0.3	-0.3	-0.4	-0.4	-0.4	-0.4	-0.5
-3.0	-0.3	-0.7	-0.4	-0.3	-0.3	-0.3	-0.4	-0.3	-0.3	-0.3	-0.5
-5.0	-0.3	-0.4	-0.3	-0.3	-0.3	-0.2	-0.3	-0.3	-0.2	-0.3	-0.3
-7.5	-0.1	-0.3	-0.2	0.0	-0.2	-0.2	-0.1	-0.1	-0.1	-0.2	-0.3
-10.0	0.0	-0.3	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2

SOIL TEMPERATURE, GREEN GRASS
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SEPTEMBER Level / Time:	23 1400	23 1600	23 1800	23 2000	23 2200	23 2400	24 0200	24 0400	24 0600	24 0800	24 1000	24 1200
surface	-0.9	-1.0	-0.9	-0.9	-0.7	-0.8	-0.7	-0.3	-1.0	-1.0	-0.7	-0.4
-1.0 cm	-1.0	-1.0	-1.0	-1.0	-0.9	-1.0	-0.9	-1.0	-1.0	-1.0	-1.0	-0.8
-2.0	-0.7	-0.9	-1.0	-0.9	-0.7	-0.7	-0.7	-0.7	-0.8	-0.9	-0.7	-0.4
-3.0	-0.4	-0.7	-0.5	-0.7	-0.3	-0.6	-0.7	-0.7	-0.7	-0.8	-0.7	-0.4
-5.0	-0.3	-0.5	-0.3	-0.3	-0.2	-0.6	-0.3	-0.3	-0.4	-0.5	-0.3	-0.1
-7.5	-0.1	-0.3	-0.1	-0.3	-0.2	-0.5	-0.3	-0.3	-0.3	-0.3	-0.3	-0.2
-10.0	0.0	-0.2	0.0	0.0	0.0	-0.1	0.0	-0.2	-0.3	-0.3	0.0	0.0

SEPTEMBER Level / Time:	24 1400	24 1600	24 1800	24 2000	24 2200	24 2400	25 0200	25 0400	25 0600	25 0800	25 1000
surface	-0.7	-0.7	-0.7	-0.7	-0.5	-0.5	-0.7	-0.7	-0.6	-0.7	-0.7
-1.0 cm	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
-2.0	-0.4	-0.7	-0.7	-0.4	-0.3	-0.3	-0.4	-0.4	-0.4	-0.4	-0.5
-3.0	-0.3	-0.7	-0.4	-0.3	-0.3	-0.3	-0.4	-0.3	-0.3	-0.3	-0.5
-5.0	-0.3	-0.4	-0.3	-0.3	-0.3	-0.2	-0.3	-0.3	-0.2	-0.3	-0.3
-7.5	-0.1	-0.3	-0.2	0.0	-0.2	-0.2	-0.1	-0.1	-0.1	-0.2	-0.3
-10.0	0.0	-0.3	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2

SOIL TEMPERATURE, DRY GRASS
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JULY Level / Time:	11 0840	11 1440	11 1830	13 0950	13 1340	13 1920	14 0920	14 1340	14 --	15 1330	16 1900	17 0845
surface	4.4	6.4	5.2	5.4	6.9	7.0	8.1	9.2	7.4	11.7	7.6	12.2
-1.0 cm	3.8	6.7	5.8	4.7	6.7	6.9	8.2	9.2	7.4	11.8	7.6	10.6
-2.0	3.0	6.1	5.4	4.7	--	6.4	7.5	8.0	7.2	11.0	7.5	9.5
-3.0	2.4	6.0	5.2	4.4	--	6.1	7.4	7.0	7.4	10.2	7.5	8.5
-4.0	2.6	5.5	5.1	4.0	--	6.1	6.8	6.4	7.0	9.6	7.5	8.0
-5.0	2.6	5.4	5.0	3.9	5.3	5.9	6.6	6.3	6.7	9.2	7.3	7.5
-7.5	2.5	4.6	4.7	3.6	5.2	5.5	5.9	5.4	6.1	8.0	7.1	6.3
-10.0	1.8	3.9	4.0	3.2	4.7	5.0	4.9	4.2	5.6	6.9	6.5	5.5

JULY Level / Time:	17 1425	21 1425	21 1820	22 1335	24 1315	27 1820	28 0840	28 1255	28 1830	29 1240	29 1855	29 2400
surface	15.7	10.5	6.8	7.7	10.4	5.0	4.7	5.6	4.7	4.7	2.4	2.3
-1.0 cm	17.1	10.5	9.3	7.7	10.2	4.9	3.9	5.6	4.4	4.1	2.1	2.5
-2.0	14.8	9.2	8.8	7.2	9.2	5.2	3.9	5.1	4.9	3.8	2.7	2.6
-3.0	14.0	8.5	8.6	6.7	8.7	5.5	3.8	5.5	5.3	4.2	3.4	2.8
-4.0	13.0	8.1	8.5	6.7	8.5	--	--	--	--	--	--	--
-5.0	12.3	7.8	8.3	6.4	8.1	5.2	3.6	4.9	5.1	3.8	3.3	2.9
-7.5	10.5	6.7	7.7	6.0	7.5	5.4	3.6	4.9	5.2	3.8	3.6	2.9
-10.0	8.6	5.8	6.7	5.2	6.1	5.0	3.5	4.0	4.7	3.1	3.2	2.9

JULY Level / Time:	30 0100	30 0200	30 0300	30 0400	30 1000	30 1100	30 1200	30 1400	30 1500	30 1225	30 1600	30 1700
surface	2.2	2.1	1.8	2.1	3.1	3.8	4.4	4.1	4.7	4.4	4.4	4.3
-1.0 cm	2.5	2.3	2.1	2.1	3.1	3.4	4.2	3.9	4.4	4.2	4.7	4.1
-2.0	2.5	2.3	2.1	2.2	2.9	3.3	4.1	3.8	4.2	4.1	4.5	4.4
-3.0	2.8	2.6	2.5	2.3	2.9	3.2	3.9	3.8	4.2	3.9	4.5	4.3
-5.0	2.8	2.6	2.5	2.6	2.7	3.1	3.8	3.5	3.8	3.8	4.1	4.3
-7.5	2.9	2.7	2.6	2.6	2.6	2.9	3.3	3.4	3.6	3.3	3.9	3.9
-10.0	2.8	2.7	2.6	2.6	2.5	2.6	3.0	3.1	3.1	3.0	3.2	3.0

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JULY Level / Time:	30 1800	30 1900	30 2000	30 2100	30 2200	30 2300	30 2400	31 0100	31 0200	31 0300	31 0400	31 0500
surface	4.1	3.1	2.8	2.3	1.8	1.7	1.2	0.8	0.2	0.3	0.2	0.6
-1.0 cm	3.9	3.5	3.2	2.6	2.3	2.1	1.2	1.1	0.4	0.5	0.3	0.7
-2.0	4.4	3.6	3.6	3.1	2.8	2.6	2.2	1.8	1.3	1.3	1.1	1.4
-3.0	4.2	4.0	3.8	3.4	3.2	2.9	2.3	2.1	1.7	1.7	1.5	1.6
-5.0	4.2	3.8	3.7	3.4	3.2	3.1	2.8	2.3	2.1	2.0	1.8	1.8
-7.5	3.8	3.9	3.8	3.6	3.4	3.2	2.9	2.7	2.3	2.3	2.0	2.0
-10.0	3.8	3.4	3.4	3.4	3.2	3.1	3.1	2.7	2.6	2.6	2.2	2.2

JULY Level / Time:	31 0600	31 0700	31 0800	31 1000	31 1100	31 1200	31 1220	31 1830
surface	0.6	1.0	0.6	1.1	1.3	1.9	1.9	1.8
-1.0 cm	0.6	1.0	0.8	1.4	1.6	2.0	2.0	2.0
-2.0	1.4	1.5	1.2	1.7	1.8	2.1	2.1	2.2
-3.0	1.5	1.8	1.4	1.8	2.0	2.1	2.1	2.9
-5.0	1.8	2.0	1.5	1.8	2.0	2.2	2.2	2.3
-7.5	2.0	2.1	1.8	2.0	2.1	2.1	2.1	2.5
-10.0	2.1	2.1	1.8	2.0	2.0	2.1	2.1	2.2

AUGUST Level / Time:	1 0825	1 1230	1 1820	2 1255	2 1840	3 1300	4 0840	4 1255	4 1840	5 0855	5 1240	5 1900
surface	3.6	7.9	8.7	10.9	8.0	10.2	5.7	6.1	5.7	3.8	4.2	3.8
-1.0 cm	4.1	8.8	9.3	13.3	8.8	10.6	6.1	6.7	6.1	4.0	4.5	4.4
-2.0	3.9	7.4	8.6	11.2	8.5	9.6	5.5	6.4	6.2	4.0	4.4	4.4
-3.0	4.2	7.2	8.9	11.0	8.8	9.8	6.0	6.8	6.5	4.0	4.7	4.7
-5.0	3.5	6.1	8.0	9.6	8.4	9.0	5.2	6.4	6.4	4.2	4.4	--
-7.5	3.6	5.6	7.8	8.8	8.4	8.6	5.2	6.4	6.3	4.0	4.5	4.5
-10.0	2.8	4.4	6.6	7.4	7.6	7.4	6.0	5.8	6.0	4.2	4.4	4.3

SOIL TEMPERATURE, DRY GRASS
POINT BARROW, ALASKA - 1962

AUGUST	5	5	6	6	6	6	6	6	6	6	6	7
Level / Time:	2100	2400	0200	0400	0600	0800	1000	1230	1400	1600	1800	1255
surface	3.3	2.9	2.8	2.8	3.1	4.6	5.4	6.4	6.9	6.7	6.7	9.6
-1.0 cm	3.8	3.0	3.0	3.1	2.9	4.1	5.5	6.8	7.1	7.0	7.4	11.4
-2.0	3.9	3.5	3.2	3.2	3.2	4.0	5.3	6.1	6.6	6.7	6.6	9.3
-3.0	4.2	3.7	3.6	3.6	3.4	4.1	5.0	6.1	6.3	6.4	6.8	9.1
-5.0	4.2	3.9	3.6	3.6	3.6	3.9	4.8	5.5	5.9	6.1	6.0	7.7
-7.5	4.4	3.9	3.9	3.7	3.6	3.8	4.3	5.2	5.5	5.7	5.9	6.9
-10.0	4.2	4.0	3.8	3.6	3.5	3.6	3.8	4.4	4.9	5.2	5.2	5.6

AUGUST	7	8	11	11	12	13	13	15	16	16	16	16
Level / Time:	1830	0835	0840	1250	1305	1255	1845	1245	0855	1300	1855	2100
surface	8.4	6.1	3.2	6.4	10.7	7.2	6.4	8.8	4.9	5.7	4.4	4.1
-1.0 cm	9.5	6.1	2.8	6.3	11.0	7.1	6.2	9.0	4.7	5.6	4.5	4.0
-2.0	9.2	5.9	3.2	6.4	10.0	7.3	7.0	8.8	5.5	6.0	5.5	4.9
-3.0	9.4	6.0	2.8	6.1	10.0	7.0	7.1	8.4	5.5	5.9	5.6	4.9
-5.0	9.0	5.8	2.9	6.2	9.1	7.0	7.2	8.1	5.8	5.9	5.8	5.4
-7.5	8.7	5.8	2.6	5.7	8.7	6.5	7.2	7.4	5.9	5.9	5.9	5.4
-10.0	7.9	5.5	2.6	5.5	7.6	6.4	7.0	7.1	5.9	5.9	5.9	5.7

AUGUST	16	17	17	17	17	17	17	18	18	20	21	21
Level / Time;	2400	0200	0400	0600	1000	1400	1600	0825	1240	1825	0845	1840
surface	3.5	3.4	3.4	3.6	4.7	5.9	5.8	3.2	4.2	4.1	2.0	3.2
-1.0 cm	3.4	3.1	3.1	3.3	4.6	5.8	5.8	3.1	4.0	4.2	1.6	3.6
-2.0	4.2	3.9	4.0	4.0	5.0	5.9	6.3	3.7	4.4	5.0	2.3	3.7
-3.0	4.2	3.9	3.9	3.9	4.7	5.7	5.8	3.6	4.2	5.1	2.2	4.1
-5.0	4.7	4.2	4.4	4.4	4.9	5.7	6.0	3.9	4.4	5.5	2.6	4.0
-7.5	4.9	4.4	4.4	4.4	4.7	5.4	5.7	3.9	4.2	5.4	2.8	4.1
-10.0	5.2	4.6	4.8	4.7	4.7	5.4	5.6	4.2	4.3	5.4	3.1	3.9

SOIL TEMPERATURE, DRY GRASS
POINT BARROW, ALASKA - 1962

AUGUST	22	22	22	22	22	23	23	23	23	23	23	23
Level / Time:	0850	1305	1900	2100	2400	0200	0400	0600	0800	1300	[illegible]	1400
surface	1.7	3.9	2.5	1.6	1.0	1.2	1.2	1.4	2.7	4.3	5.2	4.2
-1.0 cm	2.2	4.5	3.1	2.0	1.2	1.3	1.2	1.4	2.5	3.9	4.5	4.2
-2.0	2.2	3.9	3.1	2.3	1.6	1.6	1.6	1.8	2.5	3.6	4.4	4.1
-3.0	2.5	3.9	3.6	2.6	1.8	2.0	1.7	1.8	2.3	3.2	4.1	4.1
-5.0	2.3	3.2	3.6	2.9	2.2	2.1	2.0	2.0	2.3	2.8	3.8	3.8
-7.5	2.5	3.2	3.6	3.2	2.3	2.7	2.0	2.9	2.2	2.5	3.2	3.5
-10.0	2.2	2.8	3.5	3.3	2.7	2.5	2.3	2.3	2.3	2.3	2.9	3.1

AUGUST	23	23	24	24	24	25	25	25	27	27	27	28
Level / Time:	1600	1805	0830	1250	1840	0820	1235	1250	1845	2100	2400	0200
surface	4.2	3.5	2.5	3.5	2.5	2.9	4.7	3.9	2.0	1.9	2.2	2.5
-1.0 cm	4.0	3.4	2.6	3.9	2.9	2.8	5.0	3.9	2.5	2.0	2.3	2.7
-2.0	4.0	3.6	2.5	3.4	2.9	2.5	4.5	3.6	2.5	2.2	2.3	2.7
-3.0	4.1	3.6	2.6	3.4	3.3	2.5	4.2	3.0	2.9	2.3	2.3	2.8
-5.0	3.9	3.9	2.4	3.2	3.2	2.5	3.8	3.0	2.7	2.5	2.3	2.6
-7.5	3.8	3.6	2.5	2.9	3.3	2.3	3.2	2.9	2.9	2.5	2.3	2.6
-10.0	3.5	3.6	2.3	2.6	3.2	2.3	2.9	2.6	2.9	2.6	2.3	2.6

AUGUST	28	28	28	28	28	28	28	28	29	29	29	29
Level / Time:	0400	0600	0830	1000	1220	1400	1600	1350	0355	1300	1855	2100
surface	2.6	2.5	2.2	2.9	4.8	0.1	4.9	3.6	3.5	5.3	3.3	2.5
-1.0 cm	2.8	2.7	2.4	2.9	4.5	3.9	4.9	4.0	3.8	5.6	3.6	2.5
-2.0	2.9	2.7	2.4	2.7	4.2	2.9	4.7	4.2	3.6	5.1	3.6	3.0
-3.0	2.9	2.9	2.6	2.7	3.7	2.3	4.5	4.5	3.8	4.9	4.2	3.2
-5.0	2.9	2.8	2.5	2.7	3.6	2.0	4.2	4.5	3.6	4.2	4.0	3.4
-7.5	2.9	2.8	2.6	2.7	3.2	1.8	3.9	4.9	3.8	4.0	4.1	3.6
-10.0	2.7	2.8	2.5	2.6	3.1	2.6	3.6	4.9	3.6	3.3	6.5	3.6

SOIL TEMPERATURE, DRY GRASS
POINT BARROW, ALASKA - 1962'

AUGUST Level / Time:	29 2400	30 0200	30 0400	30 0600	30 0810	31 0850	31 1310	31 1825
surface	1.1	0.3	0.1	0.1	1.3	0.1	1.6	1.7
-1.0 cm	1.2	0.5	0.3	0.1	1.3	0.3	1.7	1.8
-2.0	1.6	0.9	0.7	0.6	1.4	0.3	1.0	2.0
-3.0	2.0	1.4	1.0	0.7	1.4	0.8	1.5	2.0
-5.0	2.5	1.8	1.7	1.3	1.4	0.7	1.4	2.0
-7.5	2.7	2.2	1.9	1.5	1.5	1.2	1.4	2.0
-10.0	3.0	2.3	2.5	2.0	1.8	1.1	1.4	2.0

SEPTEMBER	1 1250	4 [illegible]	4 1310
surface	3.9	-0.3	0.7
-1.0	7.9	-0.3	1.0
-2.0	7.6	-0.4	0.8
-3.0	7.5	-0.1	0.8
-5.0	3.4	-0.1	0.4
-7.5	2.7	0.0	0.5
-10.0	2.1	0.0	0.3

SEPTEMBER Level / Time:	4 1850	4 2100	4 2400	5 0200	5 0400	5 0600	5 0850	5 1000	5 1220	5 1400	5 1600	6 1300
surface	1.4	1.3	1.6	2.0	2.3	1.4	0.3	0.0	0.1	0.0	-0.1	-1.0
-1.0 cm	2.0	2.0	2.0	2.3	2.3	1.4	0.4	0.0	0.1	0.1	0.0	-0.9
-2.0	1.6	1.6	2.0	2.3	2.6	1.7	0.7	0.5	0.3	0.3	0.4	-0.5
-3.0	1.6	1.6	1.8	2.2	2.2	1.9	1.0	0.7	0.7	0.7	0.5	-0.3
-5.0	1.3	1.3	1.7	2.0	2.3	2.0	1.2	0.9	0.9	0.7	0.7	-0.3
-7.5	1.3	1.3	1.6	1.8	2.0	2.0	1.3	1.2	1.0	1.0	0.9	0.0
-10.0	1.0	1.0	1.4	1.6	2.6	2.0	1.6	1.3	1.2	1.0	0.9	0.0

SEPTEMBER Level / Time:	6 1820	7 0850	7 1255	7 1335	8 0825	8 1300	...	9 0835	9 1255	9 1835	10 1235	10 1820
surface	0.8	-1.0	-1.0	-1.2	-1.0	-1.0		-1.0	-1.0	-2.0	0.0	-0.7
-1.0 cm	0.7	-0.9	-0.7	-0.8	-1.0	-0.7		-0.9	-0.7	-1.6	-0.2	-0.5
-2.0	0.6	-0.9	-0.7	-0.8	-0.7	-0.7		-0.9	-0.7	-0.5	-0.5	-0.5
-3.0	0.3	-0.4	-0.4	-0.4	-0.5	-0.3		-0.3	-0.3	0.1	-0.3	-0.3
-5.0	0.1	-0.4	-0.4	-0.4	-0.4	-0.4		-0.5	-0.4	0.0	-0.3	-0.3
-7.5	0.0	-0.1	-0.1	-0.3	-0.3	-0.2		-0.2	-0.2	-0.3	-0.2	-0.3
-10.0	0.1	-0.1	-0.1	-0.3	-0.3	-0.1		-0.2	-0.2	-0.3	-0.2	-0.3

SOIL TEMPERATURE, GRAVEL
POINT BARROW, ALASKA - 1962

JULY Level / Time	6 1400	6 1630	7 0915	7 1415	7 1915	8 0930	8 1400	8 1430	8 1830	9 [illegible]	9 [illegible]	9 1930
surface	21.4	13.5	19.1	22.0	9.4	19.0	23.0	19.0	13.5	15.0	21.8	10.5
-0.1 cm	22.2	12.5	14.7	20.5	11.1	15.2	20.2	18.8	14.2	13.0	23.4	14.4
-2.0	20.8	12.1	13.3	18.4	12.2	13.5	19.2	16.2	14.2	11.7	21.0	14.8
-3.0	18.6	11.5	11.8	16.6	12.7	11.7	17.8	17.0	14.1	10.9	19.2	14.6
-4.0	17.0	11.2	10.8	15.1	13.1	10.1	17.0	16.2	13.9	10.2	17.2	14.6
-5.0	16.3	10.9	10.2	14.2	12.9	9.7	15.8	15.2	13.9	9.7	16.7	14.6
-7.5	15.3	10.2	9.6	13.3	12.9	9.0	15.0	12.6	13.7	9.2	15.0	14.0
-10.0	13.8	10.0	9.5	12.6	12.9	8.4	14.0	12.7	13.0	8.6	14.5	13.6

JULY Level / Time:	10 0900	10 1445	10 1600	11 0920	11 1345	11 1920	13 0845	13 1405	13 1845	14 0840	14 1405	14 1650
surface	11.5	11.8	--	13.1	18.3	11.5	8.3	11.4	12.7	16.2	20.1	11.8
-1.0 cm	10.9	12.0	13.3	12.1	17.5	11.3	8.3	10.0	13.1	14.6	17.8	12.5
-2.0	10.2	11.6	14.8	11.2	15.8	11.0	8.1	9.5	12.2	13.0	16.1	12.2
-3.0	9.6	11.1	15.0	9.5	14.4	10.5	7.9	9.0	11.3	11.3	14.3	12.4
-4.0	9.3	10.5	15.5	8.5	13.0	10.4	7.6	8.8	10.5	10.0	12.6	12.2
-5.0	9.1	10.1	15.0	8.0	12.4	10.1	7.6	8.6	10.2	9.5	12.2	12.2
-7.5	8.7	9.8	13.9	6.9	11.4	9.9	7.4	8.6	9.9	8.6	11.2	12.0
-10.0	8.9	9.1	13.0	6.4	10.6	9.7	7.2	8.3	9.3	8.0	10.5	11.4

JULY Level / Time:	16 1410	16 1920	17 0950	17 1330	17 2400	18 [0030	18 1200	18 0130	18 0220]	18 0225	18 0300	18 0330
surface	17.7	10.9	28.2	34.3	7.2	6.8	8.0	7.8	8.1	7.7	7.6	9.5
-1.0 cm	17.1	11.0	22.7	29.9	8.7	8.2	9.3	9.0	9.1	8.6	8.2	10.0
-2.0	16.6	11.5	20.9	27.0	10.1	9.3	10.4	9.9	10.1	10.0	9.0	10.5
-3.0	15.9	11.5	18.3	23.5	11.2	10.6	11.6	11.2	11.4	11.0	9.8	11.3
-4.0	15.2	11.5	16.2	20.6	12.4	11.7	12.7	12.0	12.2	11.7	10.7	11.7
-5.0	14.6	11.6	15.0	19.4	12.9	12.2	13.4	12.7	12.7	12.2	11.0	12.0
-7.5	14.0	11.2	13.7	17.7	13.3	12.7	14.0	13.2	13.2	12.6	11.8	12.3
-10.0	13.1	11.1	12.2	16.0	13.5	13.1	14.2	13.3	13.5	13.0	11.5	[illegible]

SOIL TEMPERATURE, GRAVEL
POINT BARROW, ALASKA - 1962

JULY Level / Time:	18 0410	18 0430	18 (0500	18 0530	18 0610	18 0630	18 0700)	18 0725	18 0835	18 0905	18 0935	18 1010
surface	10.3	11.5	11.1	13.7	13.5	15.5	15.2	16.5	22.3	24.8	25.9	26.7
-1.0 cm	10.3	10.7	10.5	12.6	12.8	14.1	15.1	15.2	18.0	22.0	22.3	22.2
-2.0	10.6	11.0	10.5	12.2	12.2	13.6	14.0	14.2	16.9	19.7	20.3	20.0
-3.0	11.3	11.3	10.2	12.0	11.6	12.9	13.2	13.3	15.0	17.3	18.2	18.1
-4.0	11.7	11.7	10.3	11.9	11.2	12.3	12.5	12.3	13.4	16.0	15.8	15.9
-5.0	12.0	11.8	10.3	11.8	11.0	12.2	12.2	11.9	12.9	15.1	15.3	14.8
-7.5	12.3	12.1	10.7	11.8	11.0	12.0	11.9	11.4	12.1	13.7	14.3	14.3
-10.0	12.3	12.2	10.7	11.8	11.0	11.9	11.7	11.0	11.3	12.7	13.2	13.0

JULY Level / Time	18 1035	18 1105	18 1135	18 1200	18 1300	18 1315	18 1325	18 1400	18 1430	18 1500	18 1535	18 1600
surface	27.7	27.0	27.4	28.2	27.5	27.1	25.8	21.7	25.3	23.4	21.6	21.1
-1.0 cm	24.2	23.5	24.4	23.9	24.8	26.1	25.0	22.7	24.6	25.0	20.8	23.2
-2.0	21.7	20.9	21.9	22.3	22.8	23.5	23.3	22.1	23.3	23.7	19.7	21.9
-3.0	19.3	18.6	19.5	20.3	20.6	21.1	20.5	20.6	22.1	21.8	18.5	21.3
-4.0	17.0	16.2	17.0	17.8	17.8	19.8	18.3	19.1	20.2	20.3	17.8	19.5
-5.0	16.1	15.8	15.5	16.3	17.2	18.2	17.3	17.8	19.1	19.4	17.3	19.0
-7.5	15.6	14.2	14.2	15.3	16.1	16.6	16.0	16.7	18.3	18.4	16.9	18.1
-10.0	14.4	13.3	12.7	13.8	15.0	16.1	15.0	15.5	17.0	17.1	15.6	17.1

JULY Level / Time:	18 1640	18 1700	18 1810	18 1830	18 1900	18 2000	18 2035	18 2130	18 2200	18 2230	18 2300	18 2400
surface	19.2	17.7	13.2	13.7	15.1	12.3	11.5	10.5	10.0	7.9	8.6	8.6
-1.0 cm	20.3	20.3	14.9	14.7	16.3	13.9	13.1	11.7	11.2	9.7	10.5	9.6
-2.0	19.8	20.4	15.3	15.6	16.4	14.8	13.9	12.4	12.2	10.5	11.2	10.5
-3.0	19.0	19.7	15.6	16.1	16.3	15.4	14.7	12.9	13.1	11.4	11.5	11.1
-4.0	17.2	19.3	16.1	16.4	16.2	15.7	15.2	13.5	13.7	12.0	12.7	12.2
-5.0	16.7	19.0	16.0	16.5	16.2	15.7	15.3	13.6	13.9	12.3	13.3	12.5
-7.5	16.6	18.1	16.1	16.6	16.2	15.7	15.4	13.9	14.2	12.7	13.5	13.0
-10.0	16.1	17.6	15.7	16.4	16.1	15.7	15.4	13.9	14.4	13.1	13.6	[illegible]

SOIL TEMPERATURE, GRAVEL
POINT BARROW, ALASKA - 1962

JULY Level / Time:	18 0410	18 0430	18 (0500	18 0530	18 0610	18 0630	18 0700)	18 0725	18 0835	18 0905	18 0935	18 1010
surface	10.3	11.5	11.1	13.7	13.5	15.5	15.2	16.5	22.3	24.8	25.9	26.7
-1.0 cm	10.3	10.7	10.5	12.6	12.8	14.1	15.1	15.2	18.0	22.0	22.3	22.2
-2.0	10.6	11.0	10.5	12.2	12.2	13.6	14.0	14.2	16.9	19.7	20.3	20.0
-3.0	11.3	11.3	10.2	12.0	11.6	12.9	13.2	13.3	15.0	17.3	18.2	18.1
-4.0	11.7	11.7	10.3	11.9	11.2	12.3	12.5	12.3	13.4	16.0	15.8	15.9
-5.0	12.0	11.8	10.3	11.8	11.0	12.2	12.2	11.9	12.9	15.1	15.3	14.8
-7.5	12.3	12.1	10.7	11.8	11.0	12.0	11.9	11.4	12.1	13.7	14.3	14.3
-10.0	12.3	12.2	10.7	11.8	11.0	11.9	11.7	11.0	11.3	12.7	13.2	13.0

JULY Level / Time	18 1035	18 1105	18 1135	18 1200	18 1300	18 1315	18 1325	18 1400	18 1430	18 1500	18 1535	18 1600
surface	27.7	27.0	27.4	28.2	27.5	27.1	25.8	21.7	25.3	23.4	21.6	21.1
-1.0 cm	24.2	23.5	24.4	23.9	24.8	26.1	25.0	22.7	24.6	25.0	20.8	23.2
-2.0	21.7	20.9	21.9	22.3	22.8	23.5	23.3	22.1	23.3	23.7	19.7	21.9
-3.0	19.3	18.6	19.5	20.3	20.6	21.1	20.5	20.6	22.1	21.8	18.5	21.3
-4.0	17.0	16.2	17.0	17.8	17.8	19.8	18.3	19.1	20.2	20.3	17.8	19.5
-5.0	16.1	15.8	15.5	16.3	17.2	18.2	17.3	17.8	19.1	19.4	17.3	19.0
-7.5	15.6	14.2	14.2	15.3	16.1	16.6	16.0	16.7	18.3	18.4	16.9	18.1
-10.0	14.4	13.3	12.7	13.8	15.0	16.1	15.0	15.5	17.0	17.1	15.6	17.1

JULY Level / Time:	18 1640	18 1700	18 1810	18 1830	18 1900	18 2000	18 2035	18 2130	18 2200	18 2230	18 2300	18 2400
surface	19.2	17.7	13.2	13.7	15.1	12.3	11.5	10.5	10.0	7.9	8.6	8.6
-1.0 cm	20.3	20.3	14.9	14.7	16.3	13.9	13.1	11.7	11.2	9.7	10.5	9.6
-2.0	19.8	20.4	15.3	15.6	16.4	14.8	13.9	12.4	12.2	10.5	11.2	10.5
-3.0	19.0	19.7	15.6	16.1	16.3	15.4	14.7	12.9	13.1	11.4	11.5	11.1
-4.0	17.2	19.3	16.1	16.4	16.2	15.7	15.2	13.5	13.7	12.0	12.7	12.2
-5.0	16.7	19.0	16.0	16.5	16.2	15.7	15.3	13.6	13.9	12.3	13.3	12.5
-7.5	16.6	18.1	16.1	16.6	16.2	15.7	15.4	13.9	14.2	12.7	13.5	13.0
-10.0	16.1	17.6	15.7	16.4	16.1	15.7	15.4	13.9	14.4	13.1	13.6	[illegible]

SOIL TEMPERATURE, GRAVEL
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JULY Level / Time:	31 0825	31 1310	31 1805
surface	2.0	3.2	3.5
-1.0 cm	2.0	3.4	3.4
-2.0	2.2	3.4	3.8
-3.0	2.6	3.7	3.8
-5.0	2.6	3.4	3.7
-7.5	2.8	3.5	3.8
-10.0	2.8	3.2	3.7

AUGUST Level / Time:	1 0840	1 1245	1 1840	2 1310	2 1800	2 1900	2 2100	2 2400	3 0200	3 0400	3 0600	[illegible] 0800
surface	7.0	13.1	12.4	19.7	10.9	10.0	11.5	9.6	7.7	7.0	8.6	10.8
-1.0 cm	7.2	13.2	12.8	20.1	11.0	10.4	11.7	10.0	8.2	7.4	8.6	10.7
-2.0	7.2	12.2	12.2	19.0	11.2	10.3	11.6	9.9	8.4	7.4	8.4	10.4
-3.0	7.5	11.9	12.6	18.3	11.5	10.9	11.7	10.3	9.0	8.0	8.7	10.3
-5.0	6.5	10.0	11.7	16.0	11.7	10.8	11.3	10.3	9.1	8.2	8.6	9.6
-7.5	6.7	9.5	11.8	15.1	11.8	11.2	11.3	10.6	9.6	8.7	8.8	9.6
-10.0	5.7	8.1	10.9	13.3	11.8	11.1	11.0	10.4	9.6	8.7	8.7	9.1

AUGUST Level / Time:	3 0900	3 1000	3 1230	3 1400	3 1600	3 1800	3 1830	4 0855	4 1240	4 1825	5 0845	5 1255
surface	12.7	17.2	16.8	13.6	8.7	7.9	7.6	7.7	8.6	7.5	6.0	5.5
-1.0 cm	12.4	15.5	16.3	13.6	9.2	8.2	8.0	7.7	8.8	7.7	5.7	6.3
-2.0	11.5	13.9	15.9	13.3	9.3	8.4	8.2	7.5	8.9	8.0	5.9	5.5
-3.0	11.3	13.3	15.5	13.4	10.1	9.0	8.8	7.7	9.1	8.4	5.9	5.6
-5.0	10.0	11.4	14.2	12.8	10.4	9.1	9.0	7.3	8.6	8.4	5.7	5.4
-7.5	9.8	11.4	13.4	12.7	10.9	9.5	9.3	7.4	8.5	8.5	5.9	5.7
-10.0	9.1	9.8	12.2	12.0	10.8	9.5	9.3	7.1	8.4	8.2	5.7	5.7

SOIL TEMPERATURE, GRAVEL
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AUGUST Level / Time:	5 1830	6 0850	6 1300	6 1820	7 0830	7 1245	7 1840	8 0820	10 1225	11 0825	11 1235	11 2100
surface	4.6	11.4	9.8	8.7	8.8	18.9	11.9	8.9	11.8	7.9	10.5	7.1
-1.0 cm	5.2	10.0	9.7	9.5	9.1	18.3	12.5	8.4	10.9	7.4	9.7	7.1
-2.0	4.9	8.6	9.1	9.0	8.5	17.1	12.4	8.3	11.4	7.9	10.0	7.9
-3.0	5.7	8.2	9.2	9.5	9.0	16.6	12.9	8.2	10.8	7.7	9.5	7.9
-5.0	5.3	6.5	8.4	8.8	7.9	13.9	12.6	7.8	10.9	7.6	9.2	8.4
-7.5	5.9	6.2	8.3	8.9	7.9	12.5	12.7	7.6	10.3	7.4	8.7	8.4
-10.0	5.6	5.5	7.5	8.1	7.1	10.4	12.0	7.4	10.3	7.4	8.5	8.3

AUGUST Level / Time:	11 2400	12 0200	12 0400	12 1000	12 1220	12 1400	12 1600	12 1830	12 2100	13 0857	13 [illegible]	13 1825
surface	7.0	6.8	7.5	15.8	16.7	14.6	13.8	9.5	6.9	9.5	12.5	8.4
-1.0 cm	6.5	6.4	7.0	15.4	15.8	13.8	12.9	9.5	7.1	8.6	11.1	8.5
-2.0	7.4	7.2	7.8	14.3	15.3	13.9	13.6	10.5	8.2	--	11.3	9.5
-3.0	7.2	7.0	7.2	14.1	14.9	13.6	13.0	10.7	8.4	8.5	10.8	9.6
-5.0	7.6	7.4	7.9	12.2	13.8	13.3	13.0	11.2	9.5	8.4	10.4	10.1
-7.5	7.5	7.4	7.4	11.8	13.1	12.8	12.5	11.3	9.6	8.2	10.0	10.2
-10.0	7.8	7.5	7.7	10.6	12.0	12.4	12.3	11.4	10.3	8.1	9.7	10.4

AUGUST Level / Time:	15 1235	16 0835	16 1245	16 1840	17 0850	17 1300	17 1855	17 1900	17 2100	17 2400	18 0200	18 0400
surface	17.6	6.1	8.4	4.7	6.1	8.5	4.5	4.5	3.9	3.2	2.9	2.7
-1.0 cm	15.1	5.7	7.7	4.7	5.4	7.8	4.8	4.8	3.9	3.2	2.8	2.6
-2.0	15.0	6.4	8.2	5.8	5.8	8.2	5.8	5.8	4.9	4.1	3.8	3.6
-3.0	14.1	6.4	8.0	6.0	5.6	8.0	6.1	6.1	5.0	4.2	3.9	3.6
-5.0	13.0	6.8	7.9	6.7	5.6	7.8	6.7	6.7	5.9	5.0	4.5	4.3
-7.5	12.0	7.0	7.7	7.1	5.5	7.6	7.0	7.0	6.0	5.2	4.8	4.5
-10.0	11.2	7.4	7.6	7.5	5.5	7.4	7.3	7.3	6.6	5.7	5.3	5.0

SOIL TEMPERATURES, GRAVEL
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AUGUST Level / Time:	18 0600	18 0800	18 1000	18 1400	18 1600	18 1800	18 1820	18 1900	20 1300	20 1810	21 0825	22 0810
surface	3.1	3.9	3.9	7.5	7.8	5.9	5.9	3.8	6.5	6.4	3.8	3.6
-1.0 cm	2.8	3.6	3.7	7.0	7.2	5.6	5.6	3.9	7.7	6.3	2.6	3.6
-2.0	3.8	4.4	4.4	7.5	7.9	6.5	6.5	4.7	8.2	7.4	3.4	3.2
-3.0	3.6	4.2	4.4	7.1	7.4	6.4	6.4	4.9	7.7	7.1	3.1	3.4
-5.0	4.2	4.7	4.7	6.8	7.4	6.8	6.8	4.9	7.5	7.8	3.2	3.2
-7.5	4.4	4.5	4.7	6.3	7.1	6.7	6.7	4.9	7.0	7.6	3.4	3.3
-10.0	4.9	4.9	4.9	6.1	7.0	6.8	6.8	--	6.8	7.8	3.8	3.2

AUGUST Level / Time:	22 1000	22 1220	22 1400	22 1600	22 1810	23 0850	23 1310	23 1830	24 0850	24 1825	25 0835	25 1250
surface	7.1	8.4	7.2	7.1	4.3	6.3	10.9	3.9	3.6	3.2	4.9	12.2
-1.0 cm	4.9	6.5	7.4	6.8	4.9	5.3	9.3	4.4	3.3	4.0	4.3	10.3
-2.0	4.2	6.2	7.0	7.0	5.2	4.5	8.4	4.5	3.6	4.2	4.0	9.4
-3.0	4.1	5.6	7.0	6.8	5.2	4.3	7.9	5.1	3.6	4.5	3.9	8.8
-5.0	3.6	5.2	6.2	6.5	5.5	3.3	6.7	5.0	3.2	4.7	3.6	7.2
-7.5	3.5	4.5	5.7	5.9	5.5	3.2	6.5	5.2	3.3	5.0	3.3	6.5
-10.0	3.2	4.2	5.2	5.8	5.5	2.9	5.6	5.2	3.2	5.0	3.2	5.5

AUGUST Level / Time:	25 2100	25 2400	26 0200	26 0400	26 0600	26 0830	26 1000	26 1245	26 1400	26 1600	27 1220
surface	1.5	1.0	1.8	1.3	2.3	4.3	4.5	7.8	12.6	5.3	9.3
-1.0 cm	2.6	1.4	2.2	1.4	2.3	4.1	4.5	7.4	8.1	5.6	7.7
-2.0	3.3	2.0	2.5	2.0	2.3	3.8	4.5	6.8	7.7	5.8	7.1
-3.0	4.2	2.3	2.6	2.3	2.6	3.8	4.5	6.5	7.4	5.9	6.5
-5.0	4.9	3.1	3.2	2.7	2.6	3.2	4.0	5.6	6.5	5.9	5.5
-7.5	5.5	3.5	3.3	2.9	2.8	3.2	3.9	5.2	6.1	5.9	4.5
-10.0	5.8	4.1	3.6	3.2	2.9	2.9	3.6	4.6	5.5	5.8	4.2

SOIL TEMPERATURE, GRAVEL
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AUGUST	27	28	28	28	28	29	29	29	29	29	29	29
Level / Time:	1820	1300	1810	2100	2400	0200	0400	0600	0805	1000	1220	1400
surface	2.9	9.1	3.6	2.3	1.8	2.0	1.8	2.4	2.5	7.1	8.4	6.1
-1.0 cm	3.2	7.7	4.0	2.6	2.2	2.3	2.3	2.4	2.5	6.5	7.8	6.5
-2.0	3.6	6.8	4.0	2.9	2.3	2.3	2.4	2.4	2.5	5.9	7.5	6.5
-3.0	3.8	6.5	4.1	3.3	2.7	2.5	2.6	2.7	2.7	5.8	6.9	6.9
-5.0	4.0	5.2	4.0	3.6	2.9	2.7	2.6	2.6	2.7	4.9	6.4	6.8
-7.5	4.2	5.0	3.9	4.0	3.2	3.0	2.9	2.9	2.9	4.5	5.8	6.9
-10.0	4.2	4.4	3.6	4.2	3.2	3.5	2.9	2.9	2.9	3.9	5.4	6.8

AUGUST	29	29	30	30	31	31
Level / Time:	1600	1810	0855	0840	1255	1840
surface	8.2	5.0	3.2	0.4	4.0	2.0
-1.0 cm	8.2	5.1	2.3	0.6	3.5	2.3
-2.0	8.2	6.0	2.0	0.6	3.1	2.6
-3.0	7.7	6.1	2.0	1.0	2.9	2.9
-5.0	7.1	6.4	1.4	1.0	2.3	2.9
-7.5	6.5	6.4	1.5	1.0	2.3	3.0
-10.0	6.1	6.5	1.3	1.0	2.0	3.0

SEPTEMBER	1	1	1	1	2	2	2	2	2	2	2	2
Level / Time:	1235	1900	2100	2400	0200	0400	0600	0830	1000	1300	1400	1600
surface	13.1	2.2	0.3	0.3	0.0	0.5	2.0	2.0	2.1	2.1	2.3	1.6
-1.0 cm	11.5	3.9	2.0	1.0	0.8	1.0	1.9	1.7	2.3	2.1	2.3	1.8
-2.0	10.7	3.6	1.6	1.0	0.7	1.0	2.0	2.3	2.3	2.6	2.7	2.0
-3.0	9.6	4.5	2.6	1.7	1.3	1.3	2.0	2.1	2.6	2.6	2.8	2.2
-5.0	7.7	4.9	3.2	2.0	1.5	1.3	2.0	2.3	2.4	2.8	2.9	2.5
-7.5	6.5	5.5	3.9	2.6	2.0	2.0	2.0	2.3	2.6	2.6	2.9	2.5
-10.0	5.4	5.5	4.0	2.7	2.0	2.0	2.0	2.3	2.4	2.7	2.9	2.6

SOIL TEMPERATURE, GRAVEL
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SEPTEMBER Level / Time:	2 1830	2 2100	2 2400	3 0200	3 0400	3 0600	3 0830	3 1000	3 1300	3 1400	3 1600	3 1830
surface	0.4	0.3	-0.1	-0.3	-0.7	-0.1	-0.1	0.7	0.3	0.3	-0.7	-1.2
-1.0 cm	0.7	0.1	-0.1	-0.4	-0.7	-0.6	-0.3	0.7	0.7	0.7	-0.3	-0.7
-2.0	0.7	0.7	0.1	0.0	-0.1	0.1	0.1	0.9	0.7	0.7	-0.3	-0.7
-3.0	2.2	0.7	0.1	0.0	0.0	0.0	0.1	1.0	1.3	1.0	0.1	-0.3
-5.0	1.7	1.4	1.0	0.6	0.5	0.5	0.4	1.0	1.3	1.3	-0.6	0.0
-7.5	2.0	1.5	1.0	0.6	0.5	0.3	0.5	1.0	1.3	1.3	-0.7	0.2
-10.0	2.3	2.0	1.7	1.3	1.0	1.0	0.7	1.0	1.3	1.3	1.0	0.3

SEPTEMBER Level / Time:	3 2100	3 2400	4 0200	4 0400	4 0600	4 0815	4 1000	4 1225	4 1400	4 1600	4 1805	5 1305
surface	-1.1	-0.7	-1.1	-0.7	-0.7	-0.4	-0.4	1.8	2.1	2.6	2.9	0.2
-1.0 cm	-0.8	-0.6	-0.7	-0.6	-0.7	-0.4	-0.4	1.6	2.1	2.6	2.6	0.1
-2.0	-0.8	-0.6	-0.7	-0.6	-0.7	-0.3	-0.3	1.6	2.0	2.5	2.7	0.0
-3.0	-0.4	-0.3	-0.3	-0.3	-0.5	-0.2	-0.3	1.3	1.8	2.4	2.5	0.1
-5.0	-0.1	-0.2	-0.3	-0.3	-0.3	-0.1	-0.3	1.0	1.4	2.0	2.5	0.1
-7.5	0.1	0.0	0.0	0.0	0.0	0.0	-0.1	0.9	1.4	2.0	2.2	0.3
-10.0	0.3	0.1	0.0	0.0	0.0	0.1	0.0	0.7	1.0	1.6	2.2	0.4

SEPTEMBER Level / Time:	6 0855	6 1250	6 1835	7 0835	7 1240	7 1850	7 2100	7 2400	8 0200	8 0400	8 0600	8 0810
surface	-0.7	4.6	-1.3	-1.4	-0.3	-1.6	-2.6	-2.6	-2.7	-2.2	-2.0	-1.3
-1.0 cm	-0.7	1.9	-0.7	-1.0	-0.3	-0.8	-1.3	-1.3	-1.5	-1.4	-1.4	-1.3
-2.0	-0.7	1.6	-0.6	-1.0	-0.4	-0.8	-1.1	-1.2	-1.3	-1.3	-1.0	-0.7
-3.0	-0.5	1.4	-0.1	-0.7	-0.5	-0.3	-0.4	-0.7	-0.7	-0.7	-0.7	-0.7
-5.0	-0.5	1.0	0.0	-0.5	-0.5	-0.3	-0.3	-0.4	-0.4	-0.5	-0.3	-0.2
-7.5	-0.3	0.7	0.3	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2
-10.0	-0.3	0.3	0.4	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0

SOIL TEMPERATURE, GRAVEL
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SEPTEMBER Level / Time:	8 1000	8 1225	8 1400	8 1600	8 1800	9 0825	9 1310	9 1820	10 1255	10 1840	11 1250
surface	-0.6	-0.6	-0.4	-0.2	-1.3	-1.[illegible]	2.0	-0.4	2.[illegible]	-1.0	2.5
-1.0 cm	-0.7	-0.8	-0.3	-0.7	-0.7	-0.7	1.3	-0.4	1.7	-0.7	2.0
-2.0	-0.7	-1.0	-0.3	-0.7	-0.5	-0.7	0.7	-0.5	1.6	-0.4	1.8
-3.0	-0.5	-0.9	-0.1	-0.3	-0.3	-0.4	0.3	-0.3	1.6	0.1	1.6
-5.0	-0.5	-0.8	-0.2	-0.4	-0.1	-0.4	-0.5	-0.4	1.2	0.2	1.0
-7.5	-0.3	-0.8	0.0	-0.3	-0.1	-0.3	-0.2	-0.3	1.3	0.7	0.8
-10.0	-0.3	-0.7	0.0	-0.3	-0.7	-0.3	-0.1	-0.3	0.7	0.7	0.4

[ ] Gravel patch in shade

( ) Gravel patch in sun

SOIL TEMPERATURE POND
POINT BARROW, ALASKA - 1962

JULY Level / Time:	11 0820	11 1500	11 1815	13 0930	13 1340	13 1900	14 0935	14 1320	14 --	16 1315	16 1915	17 0325
surface	6.7	13.5	10.8	7.1	9.4	8.4	11.4	11.5	6.6	14.5	10.3	13.6
-1.0 cm	5.9	12.6	10.8	6.1	9.1	8.6	10.5	12.8	7.5	14.0	10.2	13.7
-2.0	4.8	11.2	10.2	5.4	8.6	8.6	9.1	11.0	7.2	12.7	10.0	11.2
-3.0	4.2	10.3	9.7	5.0	8.0	8.3	8.5	9.9	7.7	11.7	9.8	10.3
-4.0	3.9	9.6	9.3	4.7	7.6	8.2	7.9	9.1	7.4	10.8	9.3	9.6
-5.0	3.7	9.5	9.2	4.5	7.4	8.2	7.7	8.6	7.5	10.3	9.3	9.4
-7.5	2.3	6.5	7.0	3.4	5.6	6.7	5.4	5.5	5.7	6.5	7.6	6.8
-10.0	2.0	5.4	6.2	3.2	5.0	5.9	4.8	4.4	5.4	5.4	6.0	6.1

JULY Level / Time:	17 1420	21 1405	21 1840	22 1325	24 1330	27 1810	28 0825	28 1240	28 1815	29 1255	29 1835	30 1310
surface	17.3	10.9	7.0	10.7	11.6	6.2	5.0	7.5	6.1	5.7	3.2	5.2
-1.0 cm	19.2	11.2	7.9	10.2	11.2	6.7	4.2	6.8	7.1	5.1	3.9	4.6
-2.0	16.8	10.1	8.0	9.3	10.[illegible]	6.2	4.2	6.3	6.6	4.9	4.3	4.2
-3.0	15.6	9.2	8.0	8.8	9.7	6.7	4.2	6.4	7.1	5.2	4.8	4.5
-4.0	14.4	8.7	7.9	8.4	9.1	--	--	--	--	--	--	--
-5.0	14.3	8.6	7.9	8.2	8.8	6.0	4.1	5.8	6.4	4.7	4.6	4.1
-7.5	8.9	5.7	6.7	5.7	6.0	5.4	3.8	4.4	5.3	3.9	4.1	3.6
-10.0	7.6	5.1	5.9	5.0	5.2	4.4	3.5	3.8	4.4	3.2	3.6	3.1

JULY Level / Time:	31 0855	31 1235	31 1850	31 1900	31 2000	31 2100	31 2200	31 2300	31 2400
surface	1.6	3.2	3.2	3.2	3.4	3.2	2.9	3.6	3.8
-1.0 cm	2.0	2.9	3.4	3.4	3.2	3.2	2.9	2.9	3.1
-2.0	2.1	2.9	3.4	3.4	3.4	3.4	3.1	3.2	3.2
-3.0	2.5	3.0	3.6	3.6	3.3	3.4	3.2	3.2	3.2
-5.0	2.4	2.9	3.3	3.3	3.4	3.4	3.2	3.2	3.2
-7.5	2.4	2.5	2.9	2.9	2.7	2.8	2.8	2.8	2.7
-10.0	2.2	2.3	2.5	2.5	2.6	2.7	2.6	2.6	2.6

SOIL TEMPERATURE, POND
POINT BARROW, ALASKA - 1962

AUGUST Level / Time:	6 2400	7 0200	7 0400	7 0600	7 0800	7 1000	7 1215	7 1400	7 1600	7 1810	7 0800	7 1220
surface	5.4	4.9	4.9	5.2	6.8	7.9	12.2	12.6	11.7	10.2	6.8	12.2
-1.0 cm	5.8	5.2	4.9	4.7	4.9	6.2	7.9	9.3	10.0	9.2	4.9	7.9
-2.0	5.6	5.0	4.5	4.4	4.4	5.6	7.0	8.0	8.9	8.7	4.4	7.0
-3.0	5.7	5.2	4.7	4.5	4.5	5.7	6.8	8.0	8.9	8.7	4.5	6.8
-5.0	5.6	5.0	4.7	4.4	4.2	5.3	6.4	7.4	8.3	8.4	4.2	6.4
-7.5	4.8	4.6	4.2	3.9	3.8	4.5	4.9	5.5	6.0	6.3	3.8	4.9
-10.0	4.4	4.1	3.9	3.6	3.2	4.0	4.4	4.5	5.8	5.6	3.2	4.9

AUGUST Level / Time:	7 1810	8 0850	11 0855	11 1305	11 1830	12 1250	13 0830	13 1240	13 1855	14 1250	15 1300	15 1845
surface	10.2	7.1	5.8	8.3	7.9	12.3	6.9	9.1	7.4	11.5	9.6	8.4
-1.0 cm	9.2	6.2	4.6	5.9	6.6	9.5	5.6	6.9	7.0	7.7	7.5	7.7
-2.0	8.7	5.7	5.0	6.1	7.0	8.4	--	7.0	7.4	7.9	7.5	7.9
-3.0	8.7	6.1	5.0	6.0	6.8	8.5	5.8	6.8	7.5	7.4	7.3	7.9
-5.0	8.4	5.7	5.2	6.1	7.0	8.0	6.0	7.0	7.6	7.6	7.4	7.9
-7.5	6.3	5.2	4.7	5.0	5.4	6.1	5.3	5.6	6.2	5.6	5.8	6.4
-10.0	5.6	4.7	4.5	4.8	5.3	5.2	5.3	5.5	5.9	5.6	5.6	6.1

AUGUST Level / Time:	15 2100	15 2400	16 0200	16 0400	16 0600	16 1000	16 1230	16 1400	16 1600	17 0825	17 1235	18 0840
surface	6.8	5.9	5.6	5.2	5.1	5.7	6.7	7.2	6.9	4.5	7.0	3.4
-1.0 cm	6.8	5.8	5.4	4.9	4.7	4.5	5.0	5.6	5.9	3.6	4.9	2.9
-2.0	7.4	6.5	6.1	5.6	5.4	5.2	5.7	6.0	6.3	4.2	5.2	3.6
-3.0	7.2	6.4	5.9	5.6	5.2	5.0	5.2	5.8	6.0	4.1	4.9	3.6
-5.0	7.6	6.7	6.4	5.8	5.7	5.3	5.7	6.1	6.3	4.4	5.2	3.9
-7.5	6.4	6.0	5.7	5.4	5.2	4.7	4.7	5.1	5.2	4.0	4.0	3.6
-10.0	6.3	6.0	5.7	5.4	5.2	4.7	4.7	5.0	5.2	4.1	4.0	3.6

SOIL TEMPERATURE, POND
POINT BARROW, ALASKA - 1962

AUGUST Level / Time:	6 2400	7 0200	7 0400	7 0600	7 0800	7 1000	7 1215	7 1400	7 1600	7 1810	7 0800	7 1220
surface	5.4	4.9	4.9	5.2	6.8	7.9	12.2	12.6	11.7	10.2	6.8	12.2
-1.0 cm	5.8	5.2	4.9	4.7	4.9	6.2	7.9	9.3	10.0	9.2	4.9	7.9
-2.0	5.6	5.0	4.5	4.4	4.4	5.6	7.0	8.0	8.9	8.7	4.4	7.0
-3.0	5.7	5.2	4.7	4.5	4.5	5.7	6.8	8.0	8.9	8.7	4.5	6.8
-5.0	5.6	5.0	4.7	4.4	4.2	5.3	6.4	7.4	8.3	8.4	4.2	6.4
-7.5	4.8	4.6	4.2	3.9	3.8	4.5	4.9	5.5	6.0	6.3	3.8	4.9
-10.0	4.4	4.1	3.9	3.6	3.2	4.0	4.4	4.5	5.8	5.6	3.2	4.9

AUGUST Level / Time:	7 1810	8 0850	11 0855	11 1305	11 1830	12 1250	13 0830	13 1240	13 1855	14 1250	15 1300	15 1845
surface	10.2	7.1	5.8	8.3	7.9	12.3	6.9	9.1	7.4	11.5	9.6	8.4
-1.0 cm	9.2	6.2	4.6	5.9	6.6	9.5	5.6	6.9	7.0	7.7	7.5	7.7
-2.0	8.7	5.7	5.0	6.1	7.0	8.4	--	7.0	7.4	7.9	7.5	7.9
-3.0	8.7	6.1	5.0	6.0	6.8	8.5	5.8	6.8	7.5	7.4	7.3	7.9
-5.0	8.4	5.7	5.2	6.1	7.0	8.0	6.0	7.0	7.6	7.6	7.4	7.9
-7.5	6.3	5.2	4.7	5.0	5.4	6.1	5.3	5.6	6.2	5.6	5.8	6.4
-10.0	5.6	4.7	4.5	4.8	5.3	5.2	5.3	5.5	5.9	5.6	5.6	6.1

AUGUST Level / Time:	15 2100	15 2400	16 0200	16 0400	16 0600	16 1000	16 1230	16 1400	16 1600	17 0825	17 1235	18 0840
surface	6.8	5.9	5.6	5.2	5.1	5.7	6.7	7.2	6.9	4.5	7.0	3.4
-1.0 cm	6.8	5.8	5.4	4.9	4.7	4.5	5.0	5.6	5.9	3.6	4.9	2.9
-2.0	7.4	6.5	6.1	5.6	5.4	5.2	5.7	6.0	6.3	4.2	5.2	3.6
-3.0	7.2	6.4	5.9	5.6	5.2	5.0	5.2	5.8	6.0	4.1	4.9	3.6
-5.0	7.6	6.7	6.4	5.8	5.7	5.3	5.7	6.1	6.3	4.4	5.2	3.9
-7.5	6.4	6.0	5.7	5.4	5.2	4.7	4.7	5.1	5.2	4.0	4.0	3.6
-10.0	6.3	6.0	5.7	5.4	5.2	4.7	4.7	5.0	5.2	4.1	4.0	3.6

SOIL TEMPERATURE, POND
POINT BARROW, ALASKA - 1962

AUGUST Level / Time:	20 0855	20 1840	21 0855	21 1825	22 0840	22 1250	22 1840	23 0825	23 1240	23 1820	24 0920	24 1300
surface	4.1	3.8	2.0	4.1	2.2	4.5	3.2	2.5	5.9	4.4	2.9	4.2
-1.0 cm	2.6	4.0	1.4	4.5	2.2	3.6	3.8	2.0	4.2	4.3	2.5	3.4
-2.0	3.3	4.9	2.2	4.3	2.0	3.1	3.5	1.9	3.9	4.2	2.5	3.1
-3.0	3.2	4.9	2.2	4.5	2.2	3.2	3.8	2.0	3.9	4.2	2.3	3.2
-5.0	3.5	5.0	2.6	4.3	2.2	3.2	3.8	2.0	3.6	4.2	2.5	3.2
-7.5	3.2	4.2	2.6	3.6	2.2	2.6	3.1	2.0	2.6	3.9	2.5	2.6
-10.0	3.3	4.1	2.8	3.2	2.2	2.3	2.9	2.0	2.3	2.9	2.3	2.3

AUGUST Level / Time:	24 1850	24 2100	24 2400	25 0200	25 0400	25 0600	25 0810	25 1000	25 1225	25 1400	25 1600	27 1235
surface	2.6	2.0	1.5	2.0	1.6	1.9	3.2	3.9	5.3	5.3	5.1	4.9
-1.0 cm	3.6	3.0	2.3	2.1	2.0	1.9	2.3	2.9	4.0	4.5	4.6	3.4
-2.0	3.3	3.1	2.3	2.3	2.0	2.0	2.3	2.6	3.9	4.0	4.5	3.1
-3.0	3.9	3.2	2.6	2.3	2.3	2.0	2.3	2.6	3.6	4.0	4.2	3.1
-5.0	3.6	3.2	2.5	2.3	2.3	2.1	2.6	2.6	3.6	4.0	4.2	3.1
-7.5	3.1	2.9	2.6	2.3	2.3	2.1	2.2	2.2	2.3	2.6	3.1	2.5
-10.0	2.6	2.7	2.5	2.3	2.3	2.1	2.2	2.0	2.3	2.5	2.9	2.3

AUGUST Level / Time:	27 1830	28 1230	28 1820	29 0845	29 1250	29 1335	30 0820	30 0825	31 0810	31 1000	31 1220	31 1400
surface	3.1	3.1	4.1	3.9	6.2	6.5	0.5	0.8	0.5	0.7	2.5	3.1
-1.0 cm	3.4	3.1	4.1	2.6	4.1	4.4	1.0	1.0	1.0	1.2	2.0	2.4
-2.0	3.2	3.1	4.0	2.3	3.7	4.3	1.3	1.0	1.3	1.2	1.9	2.6
-3.0	3.4	3.1	4.0	2.7	3.8	4.2	1.3	1.4	1.3	1.3	1.9	2.9
-5.0	3.4	3.0	4.1	2.3	3.5	4.1	1.5	1.3	1.5	1.4	2.0	2.9
-7.5	2.9	2.4	3.2	2.3	2.6	2.9	1.5	1.7	1.5	1.5	1.6	2.3
-10.0	2.6	2.3	3.0	2.1	2.3	2.8	1.6	1.6	1.6	1.4	1.6	1.7

SOIL TEMPERATURE, POND
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AUGUST Level / Time:	31 1600	31 1810
surface	3.0	2.6
-1.0 cm	2.7	2.6
-2.0	2.6	2.7
-3.0	2.6	2.6
-5.0	2.0	4.6
-7.5	1.9	2.0
-10.0	1.7	2.0

SEPTEMBER Level / Time:	1 1305	4 0845	4 1255	4 1830	5 1235	5 2100	5 2400	6 0200	6 0400	6 0600	6 0800	6 1000
surface	4.7	-0.4	1.0	2.0	0.0	-0.5	-0.1	-0.7	-0.6	-0.7	-0.5	-0.5
-1.0 cm	3.3	0.0	0.5	1.3	0.5	0.2	-0.1	-0.3	-0.3	-0.4	-0.3	-0.3
-2.0	2.9	0.0	0.3	1.3	0.7	0.7	0.0	0.0	-0.1	-0.3	-0.1	-0.2
-3.0	2.9	0.1	0.4	1.4	0.9	0.7	0.2	0.1	0.0	-0.1	-0.3	0.0
-5.0	2.7	0.1	0.3	1.3	0.8	-0.7	0.4	-0.1	-0.3	0.0	-0.3	0.0
-7.5	1.8	0.4	0.3	1.0	1.0	0.8	0.5	-0.4	-0.3	0.2	-0.3	-0.2
-10.0	1.5	0.4	0.3	0.7	1.0	1.0	0.6	-0.6	0.7	0.3	-0.4	-0.3

SEPTEMBER Level / Time:	6 1220	6 1400	6 1600	6 1800	7 0900	7 1310	7 1820	8 0840	8 1300	8 1840	9 0855	9 1240
surface	-0.2	-0.1	0.2	0.1	-1.0	-0.9	-0.8	-1.0	-0.7	-1.0	-0.9	-0.7
-1.0 cm	-0.2	0.4	0.6	0.4	-0.7	-0.1	-0.3	-0.2	0.0	-0.2	-0.7	-0.4
-2.0	-0.4	0.1	0.6	0.9	-0.6	-0.2	-0.3	-0.2	-0.1	-0.2	-0.7	-0.4
-3.0	-0.3	0.7	0.7	0.7	-0.3	0.0	0.0	-0.2	-0.1	-0.1	-0.8	-0.2
-5.0	-0.4	0.4	0.7	1.0	-0.3	-0.1	0.0	-0.2	0.0	-0.1	-0.3	-0.3
-7.5	-0.4	0.4	0.6	0.9	-0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
-10.0	-0.4	0.3	0.4	0.7	-0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1

SOIL TEMPERATURE, POND
POINT BARROW, ALASKA - 1962

SEPTEMBER	9	9	9	10	10	10	10	10	10	10	10	10
Level / Time:	1850	2100	2400	0200	0400	0600	0830	1000	1220	1400	1600	1805
surface	-1.0	-0.9	-0.7	-0.7	-0.5	-0.3	-0.7	-0.3	0.0	-0.6	-0.3	-0.1
-1.0 cm	-1.0	-0.9	-0.7	-0.7	-0.7	-0.7	-0.7	-0.3	-0.3	0.0	0.2	0.1
-2.0	-0.9	-0.7	-0.5	-0.5	-0.3	-0.2	-0.5	-0.2	-0.1	0.0	0.1	0.3
-3.0	-0.4	-0.3	-0.1	-0.3	-0.3	-0.3	-0.1	-0.1	-0.1	0.1	0.3	0.3
-5.0	-0.4	-0.4	-0.1	-0.3	-0.3	-0.1	-0.2	0.0	0.0	0.0	0.1	0.3
-7.5	-0.1	-0.2	-0.1	-0.3	-0.3	-0.1	-0.1	0.0	-0.1	0.0	0.1	0.2
-10.0	-0.3	-0.1	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.2

SEPTEMBER	11	12
Level / Time:	1305	1225
surface	-0.9	0.2
-1.0 cm	-0.2	0.3
-2.0	-0.2	0.4
-3.0	-0.3	0.3
-5.0	-0.1	0.4
-7.5	-0.1	0.1
-10.0	0.0	0.1

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