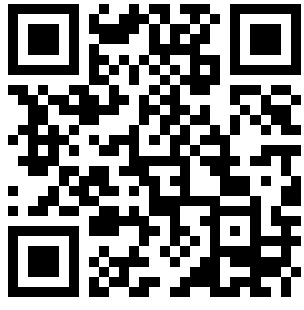
This is a reproduction of a library book that was digitized by Google as part of an ongoing effort to preserve the information in books and make it universally accessible.

Google™ books

https://books.google.com



LIBRARY
SCRIPPS INSTITUTION
OF OCEANOGRAPHY
UNIVERSITY OF CALIFORN
LA JOLLA, CALIFORNIA

NOV 19 1965

GEOLOGICAL SURVEY RESEARCH 1965

Chapter C

QE
1
U595
no. 525-C

GEOLOGICAL SURVEY PROFESSIONAL PAPER 525–C

Digitized by Google

ORT PAPERS IN—

lytical methods

nomic geology

neering geology

chemistry

chronology

morphology

physics

ial and
eistocene geology

nd water

rologic
strumentation

ology

ine geology

eralogy

deposits

ontology

ology

lity of water

tigraphy

tural geology

ce water

Digitized by Google

GEOLOGICAL SURVEY RESEARCH 1965

Chapter C

GEOLOGICAL SURVEY PROFESSIONAL PAPER 525–C

Scientific notes and summaries of investigations by members of the Conservation, Geologic, and Water Resources Divisions in geology, hydrology, and related fields

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON: 1965

Digitized by Google

UNITED STATES DEPARTMENT OF THE INTERIOR

STEWART L. UDALL, Secretary

GEOLOGICAL SURVEY

Thomas B. Nolan, Director

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C., 20402 - Price $2

Digitized by Google

GEOLOGICAL SURVEY RESEARCH 1965

This collection of 44 short papers is the second published chapter of Geological Survey Research 1965. The papers report on scientific and economic results of current work by members of the Conservation, Geologic, and Water Resources Divisions of the U.S. Geological Survey.

Chapter A, to be published later in the year, will present a summary of significant results of work done during the present fiscal year, together with lists of investigations in progress, reports published, cooperating agencies, and Geological Survey offices.

Geological Survey Research 1965 is the sixth volume of the annual series Geological Survey Research. The five volumes already published are listed below, with their series designations.

Geological Survey Research 1960—Prof. Paper 400
Geological Survey Research 1961—Prof. Paper 424
Geological Survey Research 1962—Prof. Paper 450
Geological Survey Research 1963—Prof. Paper 475
Geological Survey Research 1964—Prof. Paper 501

Digitized by Google

RECENT HISTORY OF THE UPPER TANANA RIVER LOWLAND, ALASKA

By ARTHUR T. FERNALD, Washington, D.C.

Abstract.—Twenty radiocarbon analyses provide dates for the following events that postdate late Quaternary glaciation and eolian activity: (1) Stabilization of dunes initiated in late Wisconsin and postglacial times probably was completed more than 5,000 years ago. (2) Alluvial-colluvial filling along lowland borders began 10,500 to 6,000 years ago and continues today. (3) Deposition of fluvial-lacustrine sediments in the lowland has become widespread within the last 3,000 years.

Surficial deposits that cover the northwest-trending lowland of the upper Tanana River in east-central Alaska (fig. 1) include dune sand, alluvial-colluvial sediments, fluvial-lacustrine sediments, and volcanic ash. The chronology of the deposits, as dated by 20 radiocarbon analyses that give a range in age of 850 to 12,400 years, is summarized in this paper; the climatic implications of the deposits are not considered here. Data on the samples, grouped by type of deposit, are given on figure 2. Dates and descriptions of individual samples analysed in the Washington laboratory of the U.S. Geological Survey have been published (Ives and others, 1964, p. 60–69). Location of the samples is shown on a sketch map of all surficial deposits of the valley (fig. 1) that are mappable at this scale. Older deposits in terraces along the Tanana River have been correlated with a glacial sequence established in the piedmont area along the Nabesna River, where the Black Hills Glaciation of Illinoian age and the Jatahmund Lake Glaciation of Wisconsin age have been defined (see article beginning on p. C120 of this chapter, and Fernald, 1965b).

Eolian sand occurs in completely stabilized dune fields that are scattered over the lowland. Dunes in 3 areas (Tenmile Creek, Northway, and Beaver Creek; see fig. 1) were initially stabilized at 12,400 years Before Present (W–1212), 11,250 B. P. (I–302), and 8,200 B.P. (W-1206), respectively. These dates were obtained from thin organic beds within the uppermost parts of the dunes, at depths between 5 and 7 feet; evidently most of the sand was deposited previously, but some deposition continued afterward. All dune fields have been inactive for a time sufficiently long to permit development of soils; the fields were stabilized prior to deposition of a volcanic ash between 1,520 and 1,750 B.P. (Fernald, 1962). Dunes in 2 areas (Beaver Creek and Bitters Creek) were completely stabilized by 10,230 B.P. (W-980) and 6,200 B.P. (W-1167), respectively, as dated from overlying organic-rich, alluvial-colluvial sediments. In all the fields the crests of the dunes have well-developed soil profiles and the hollows commonly have peaty soils. On the basis of this weathering and of the dates available, an age of more than 5,000 years is suggested for complete stabilization of the dune fields.

Mixed alluvial and colluvial deposits, transported by running water and by mass movement, have accumulated along the borders of the lowland and in the lower parts of tributary valleys within the uplands. These deposits are exposed in terrace escarpments where major streams and lakes of the lowland abut the uplands. They contain variable amounts of irregularly stratified sand, silt, rubble, and organic material; much of the sand and silt is reworked eolian sediment. In places, as at Bitters Creek, the fill overlies dune sand and a thick series of organic-poor deposits that have been related to aggradation during Wisconsin time (Fernald, 1965a). A measured section of the fill, nearly 20 feet thick, is given below. As is indicated by the radiocarbon dates, sediment accumulation began sometime before 6,200 B.P. It amounted to more than 5 feet between that date and 5,380 B.P. and occurred at a rate of approximately 7 feet per 1,000 years. Thereafter, the rate of accumulation averaged about 2 feet per 1,000 years, but the accumulation has been minimal during the last 1,500–2,000 years.

Radiocarbon-dated organic material from 3 other localities (Beaver Creek, Tahamund Lake, Porcupine Creek), collected at the lowest exposed depths (between

U.S. GEOL. SURVEY PROF. PAPER 525-C, PAGES C124-C127

Digitized by Google

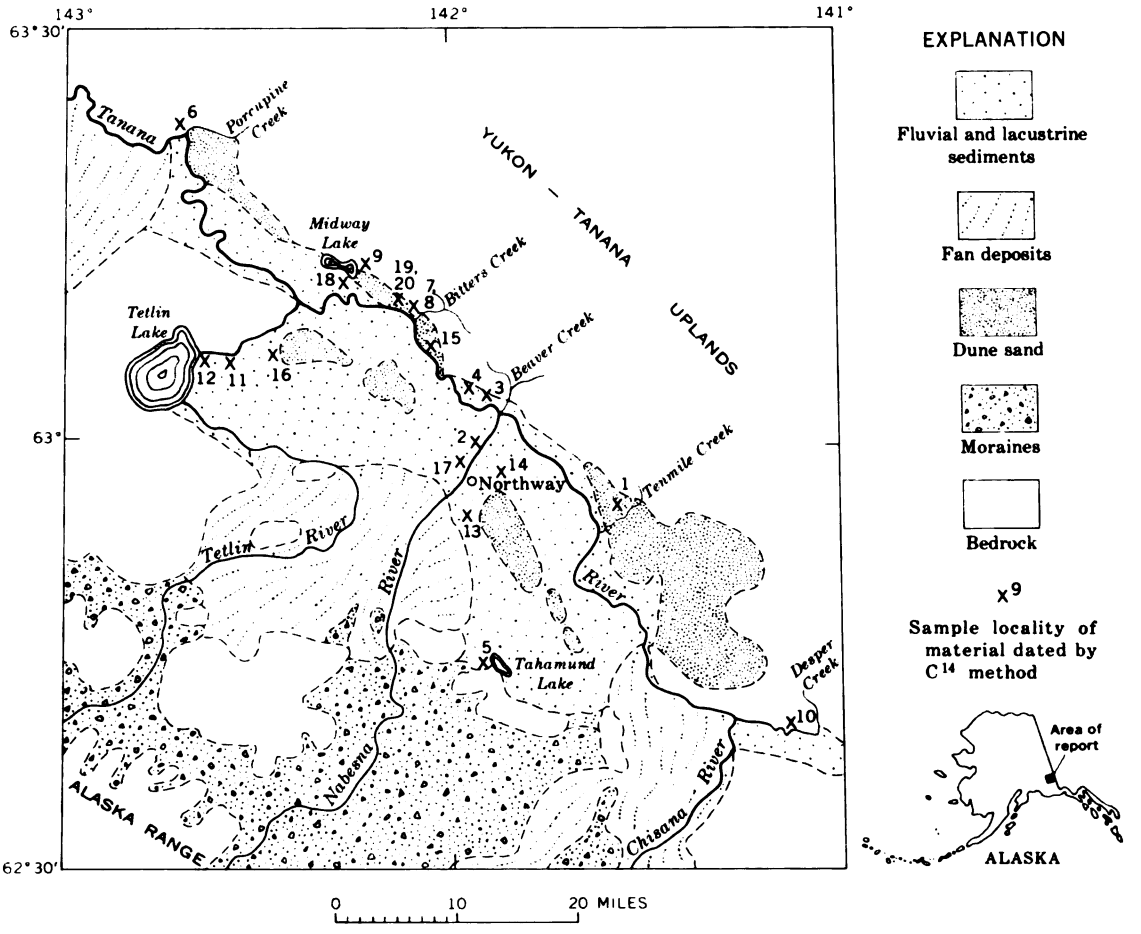


FIGURE 1.—Index map of part of east-central Alaska, showing the upper Tanana River valley, and sample localities.

6.5 and 15 feet below the surface), has an age of 10,230, 8,175, and 6,930 years, respectively. In an exposure at Midway Lake, the age of organic material at a depth of 6 feet is 5,300 years. Similar material, 3 feet down in an exposure along Desper Creek, has an age of 3,120 years. The deposits, although diverse in character because of local controls, do show a generally similar chronology: earliest organic-bearing accumulations began during the period between 10,500 and 6,000 B.P.; greatest accumulations apparently occurred chiefly around 6,000–5,500 B.P.; minimal accumulations have occurred during the last 1,500–2,000 years (that is, since deposition of the volcanic ash). The average rate of accumulation has been about 1½ feet per 1,000 years.

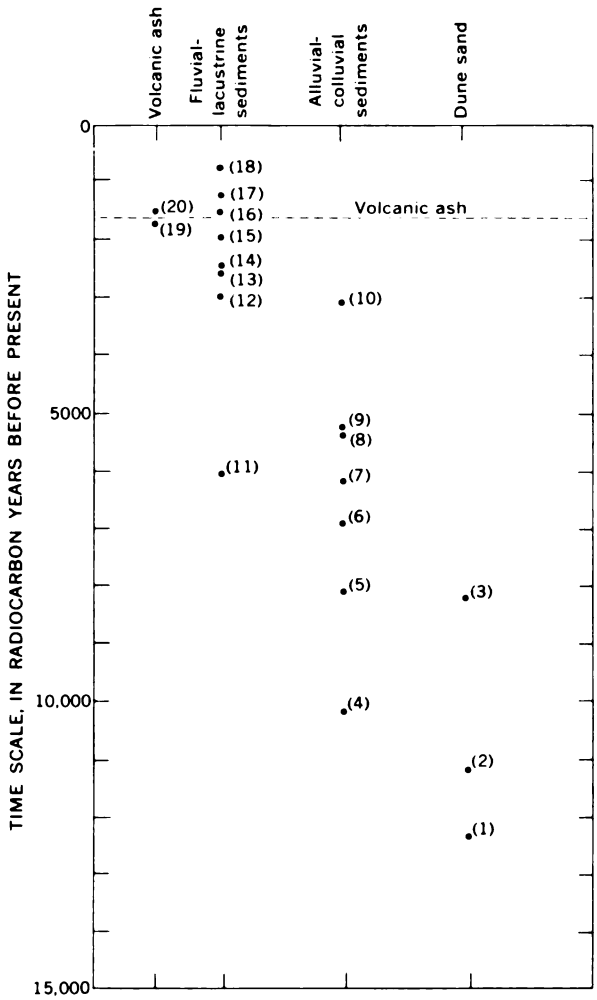
Measured section of alluvial-colluvial deposits between the Tanana River at Bitters Creek (Riverside bluff) and the adjacent Yukon-Tanana uplands; lat 63°10′ N., long 142°07′ W.

[Ages and laboratory numbers given for dated materials: I, Isotopes, Inc., Westwood, N.J.; W, U.S. Geological Survey Radiocarbon Laboratory]

	Thickness (feet)
Silt and peat	0.7
Volcanic ash (between 1,520 and 1,750 B.P., I–276 and I–275, from an age determination at a nearby locality)	.5
Silt, sand, fine granite rubble, organic material; varicolored; irregularly stratified	8.2
Tree stumps, in place (5,380 B.P., W–979)	.7
Sand, silt, fine granite rubble, peat, organic debris; varicolored; irregularly stratified	5.6
Peat, black (6,200 B.P., W–1167)	.1
Sand and silt, grayish-yellow; with minor organic material; irregularly bedded	3.5
Eolian sand, gray, crossbedded; grains frosted and of uniform size; contact with overlying sand and silt indistinct	Covered

A complex of fluvial and lacustrine sediments underlies most of the lowland, where the sediments occur in broad meander belts developed by the Tanana and tributary rivers, and in broad lake-dotted low terraces. The flood plains are now being enlarged by lateral migration of the rivers against dune fields in the lowland and, on the north side of the lowland, against terraces. The stream and lake deposits consist principally of sand, silt, and organic material. On the south side of the lowland they overlie organic-poor sand and gravel. At two such sites radiocarbon ages of 6,170 and 3,000

Digitized by Google



	Locality No.	Laboratory No.	Depth, in feet	Radiocarbon date, in years before present
Volcanic ash	20	I-276	1.3	1520±100
	19	I-275	2	1750±110
Fluvial-lacustrine sediments	18	I-278	3.5	850±90
	17	I-303	2.5	1270±80
	16	W-1171	2.5	1550±300
	15	W-978	7	2000±250
	14	I-279	3	2400±100
	13	W-1210	4.3	2560±250
	12	I-274	10	3000±120
	11	W-1173	9.5	6170±300
Alluvial-colluvial sediments	10	W-1209	3	3120±250
	9	I-277	6	5300±250
	8	W-979	9.7	5380±260
	7	W-1167	16	6200±300
	6	W-1170	15	6930±300
	5	I-305	6.5	8175±175
	4	W-980	14	10,230±300
Dune sand	3	W-1206	6.5	8200±300
	2	I-302	7	11,250±250
	1	W-1212	5.5	12,400±450

FIGURE 2.—Summary of data on radiocarbon samples from the upper Tanana River valley, Alaska. Location of samples shown on figure 1. Finite dates shown by dots; sample numbers enclosed by parentheses. Source of radiocarbon dates: *I*, Isotopes, Inc., Westwood, N.J.; *W*, U.S. Geological Survey Radiocarbon Laboratory.

years have been obtained for the underlying deposits in terrace exposures along the Tetlin River. Six ages from within the deposits, obtained from organic material in cut banks along rivers and lakes at lowest exposed depths (between 7 and 2.5 feet), range in age from 2,560 to 850 years. Thus, development of the lowland has become widespread within the last 3,000 years. The ash layer deposited between 1,750 and 1,520 B.P. is present on low terraces within the lowland, but it is not present on slip-off slopes of meandering rivers. It has been reworked into the deposits that were laid down at the time of the ash fall and are now intermediate in altitude between the low terraces and the slip-off slopes.

The recent events in the upper Tanana River lowland that postdate late Quaternary glaciation and eolian activity are summarized as follows:

(1) Stabilization of dunes was initiated in late Wisconsin and postglacial times (12,400 B.P., 11,250 B.P., 8,200 B.P.). All dunes were probably stabilized more than 5,000 years ago (10,230 B.P., 6,200 B.P.).

(2) Deposition of organic-bearing alluvium-colluvium along the borders of the lowland and within tributary valleys began between about 10,500 and 6,000 years ago (19,230 B.P., 8,175 B.P., 6,930 B.P., 6,200 B.P.) and has continued to the present. In one 20-foot section, more than 5 feet of sediment accumulated between 6,200 B.P. and 5,380 B.P.

(3) Deposition of fine-grained organic-bearing fluvial and lacustrine sediments has become widespread in the lowlands within the last 3,000 years. The deposits on the south side of the lowland overlie sand and

Digitized by Google

gravel (6,170 B.P., 3,000 B.P.); elsewhere the flood plains have expanded against dune fields and terraces.

REFERENCES

Fernald, A. T., 1962, Radiocarbon dates relating to a widespread volcanic ash deposit, eastern Alaska: Art. 11 *in* U.S. Geol. Survey Prof. Paper 450–B, p. B29–B30.

——— 1965a, Glaciation in the Nabesna River area, upper Tanana River valley, Alaska, *in* U.S. Geological Survey Research 1965: U.S. Geol. Survey Prof. Paper 525–C, p. C120–C123.

——— 1965b, Late Quaternary chronology, upper Tanana River valley, eastern Alaska [abs.]: Geol. Soc. America Spec. Paper 82, p. 60–61.

Ives, P. C., Levin, Betsy, Robinson, R. D., and Rubin, Meyer, 1964, U.S. Geological Survey Radiocarbon Dates VII: Radiocarbon, v. 6, p. 37–76.

769-328 O-65—12

Digitized by Google