INVESTIGATOR'S ANNUAL REPORT
(Natural Science Research).

This form is to be completed by the researcher and returned to the Superintendent of the Park by JANUARY 1. See reverse for additional instructions.

TO __________________________
PARK Katmai National Monument, Alaska

Title: Vegetation map of Katmai National Monument.

2. Name(s) of Researcher(s) and Institution(s)

John G. Dennis
Alaska State Office, National Park Service

Source(s) and Amount(s) of Funds Other Than NPS, if Any
None

Starting Date of Project Jan. 1972
5. Percent Completion of Project to Date: 10%

6. Est. Additional Time Required for Completion Beyond January 1st: 2 Years 0 Months

Summary: (a) of progress; (b) of significant findings, if any, to date; (c) recommendations regarding future course, i.e., on basis of work so far, should it proceed as planned, be reoriented, expanded, reduced, time schedule and support level adjusted, etc.

(a) Air photo coverage has been obtained for the existing Monument. The photos have been labelled and organized. Approximately 10% of the photos have been studied closely, with information obtained from study being transferred to U.S.G.S. topographic maps, scale 1:63,360. Vegetation types tentatively recognized are: conifer forest, tall hardwood forest (poplar), short hardwood forest (birch, poplar), shrub land, and meadow (includes tundra). Several overflights have been made to start field checking details extracted from the air photos.

(b) The project is not far enough along for assessment of significant findings.

(c) The work should proceed as planned. Support level ideally should be increased to permit greater amount of field checking (both overflight and site access flights will be needed).

Signature of Investigator

John G. Dennis, Research Biologist

Date

RSP Number

KATM 1 8
Title: Vegetation Map of Katmai National Monument
KATM-N-18

Investigator: John C. Dennis
National Park Service

Summary of Progress: Work on the Katmai vegetation map during 1975
was conducted in late June and early July and consisted entirely of field
reconnaissance. Visits were made to the Valley Road corridor, the Valley
Overlook area, and the south side of Katmai Bay. Overflights were made of
the Valley, Alagoshak Creek, Kejulik River, Pacific Coast, Savonoski River,
Naknek Lake shoreline, and Idavain Lake areas.

Examination of the Valley Road corridor and Valley Overlook area was
done to identify possible causes of the widespread destruction of the corridor
area spruce forest that occurred sometime in the past, to identify what
characteristics the former forest might have had, and to determine what
successional trends are taking place now. One sample, taken along the Valley
Road about 3 km from Brooks River in what was essentially a two layered forest,
showed the taller, live *Picea glauca* trees to be greater than 300 years old,
7 to 15 m tall, and 20 to 36 cm DBH. One of three taller trees cored showed
a release of growth at about 50 years BP, a second showed a release at about
59 years BP. One of two standing dead spruces cored was about 120 years old
(at a height of 22 cm) when it died. It was 5.3 m tall and had a bark-free
DBH of 10 cm. The other dead tree cored was 90 years old (at 46 cm) when it
died, and was 6.5 m tall with a barkless DBH of 15 cm. Four trees were selected
to represent the range of heights of the smaller size class. Their ages
ranged from 37 years (at 18 cm) to 49 years (at 17 cm). Their heights ranged
from 0.8 m for a 45 year old to 4.4 m for the 37 year old. Of 10 dead, fallen
trees, 6 had beetle galleries, 4 did not. Of 21 dead, standing trees, 21 had
beetle galleries. There was no evidence of charcoal on any log or stump. The ash layer here was 21 to 28 cm thick.

A similar series of measurements in a younger appearing forest near the Margot Falls rest area yielded similar results. Three of the tallest live trees in the area were 11 to 12 m tall, 20 to 30 cm DBH, and 55 to 59 years old (at 26 to 46 cm). Medium sized, live spruce were 1.2 to 7.2 m tall, 3 to 11 cm DBH, and 25 to 44 years old. Live spruce trees in the 16 to 105 cm height class had approximate ages as determined by terminal bud scale scar counts of 7 to 32 years. Two of the taller standing dead spruce were at least 67 and 73 years old when they died (based on branch whorl counts), 8.1 and 9.6 m tall, and 20 and 16 cm barkless DBH. Of ten, randomly selected, fallen trees, the longest was 12.9 m, the shortest 6.3 m. Seven of these trees had fallen toward the northwest. Observations made on 9 of them showed that all were lying on top of ash or on a thin organic layer that overlay ash. Sixteen of 21 randomly chosen standing dead trees, stumps, and logs had beetle galleries, and 16 of 18 randomly chosen standing dead trees had beetle galleries. Two, small, dead, standing trees that had no visible beetle galleries were measured. One was 2 m tall, had 33 major branch whorls, and had a thin layer of ash on a remnant piece of bark about 1.5 cm above the ground. The other was 1.5 m tall, had 31 branch whorls, and had a thin layer of ash on some bark about 20 cm above the ground. In addition to the dead spruce in the area, there also were a few scattered logs of *Populus balsamifera*, *Betula papyrifera*, and *Salix* spp. There was no evidence of charcoal on any of the dead trees examined. The ash layer in this area was about 22 cm thick.

The third area sampled was at the base of the west end of Three Forks Ridge where the dead forest reaches its southeastward limit. No measurements
were made of the scattered live spruce that have invaded the dead forest.
Three standing dead spruce were measured. They were 8.7, 10.0, and 10.6 m
tall and 31, 16, and 20 cm barkless DBH, respectively. Seven of the standing
dead spruce had beetle galleries. There were a few dead balsam poplar trees.
No charcoal was found. On top of Three Forks Ridge there were a few, widely
scattered, live and dead spruce. One live tree was 16 years old at 17 m, 1.4 m
tall, with an 8 cm basal diameter. One dead spruce was 49 years at 105 cm,
9.0 m tall, and 14 cm barkless DBH. No sign of charcoal was found.

In the Ukak River valley at the base of Three Forks there is a series of
ash-covered, morainal hills that emerge through the sand flow, giving the
appearance that the incandescent sand flowed around and between the hills,
but did not flow over them. Stumps and broken, 2 to 3 m tall standing dead
trees of *Betula nana* and *Populus balsamifera* occur both on the moraine and
in the adjacent sand flow. Many of these dead trees that are more than 100 m
away from the nearest sand flow margin show little to no charcoal, whereas
trees that are near the sand flow have an outer layer of charcoal, and trees
buried in the sand flow are carbonized. The ash on the morainal hills has been
removed from some spots and consolidated as dunes in other areas, so it will
be difficult to determine how much ash actually was deposited by the eruption.

These exploratory data from both ends and the middle of this 25 to 30 km
long stretch of dead and now rejuvenated forest suggest that the developing
forest will be similar to the old one, that the old one died shortly before,
during, or after the eruption of 1912; that the cause of death was not fire;
and that not all trees were killed by the mortal factor or factors. Based on
viewing a photograph of a beetle gallery, Dr. Robert I. Gara (pers. comm.)
suggested that the beetle infestation was more likely by species that attack
dead trees rather than by species that attack live trees. The ash thicknesses are no greater here than in other areas of the Lake District where no destruction of forest took place, so the apparent timing of the death of the forest either is coincident with the 1912 eruption or is related to an ephemeral facet of that eruption (Griggs' hot, poisonous gas?) that was expressed down the length of the Margot Creek drainage but perhaps nowhere else in the Monument. Future, detailed, quantitative analysis of tree axes and of beetle galleries at many places along the length and width of the dead forest may be able to show conclusively whether the forest died simultaneously throughout its entire extent (to be expected if mortality factor of volcanic origin) and whether the beetle galleries were made only by species that attack dead trees (to be expected if trees were killed by some factor other than beetles).

The visit to the south side of Katmai Bay permitted ground observations to be made of *Populus balsamifera* forest, heath muskeg, coastal strand, alder thicket, and alpine tundra vegetation. These data will be added to the file of ground truth data to be used in interpreting the aerial photographs.