

01-82-01-02 PT. 1

Albert Johnson

August 25, 1969

Fairbanks, Alaska

Series: Alaska Science Conference, 1969

Albert Johnson talked about the ecology of the tundra of the North Slope. He uses a slide projector during his talk. He said he planned to talk about an ecological summary of known information on the North Slope. Jerry Brown asked him to include information from the International Biological Program (IBP). The IBP is an international effort to investigate properties of ecosystem around the world. Part of the program is concerned with predicting consequences of natural or man-induced changes in a particular ecosystem. They assess what is left in the world and what processes are going on in it and decide what can be done with it from a human interest point of view. There are efforts in other ecosystems in North America and the world including grasslands, forests, deserts and tropical ecosystems. The grassland program is active at the time. Other programs are being planned.

In his first slide he shows the general plan for all of the ecosystems being investigated under IBP. Large amounts of data are collected and mathematical models are made to predict the behavior of these ecosystems under different kinds of stresses. Integrated research programs are investigated.

[Interruption in the lecture because of slide projector problems] The Tundra International Biological Program will consist of several parts. They will take all of the data which has been collected in the Barrow area, especially between the late 1950s up to the mid-1960s and assemble them in one point. They will prepare a model of how the tundra ecosystem actually functions. The work will be conducted at San Diego State College. They have assembled several people interested in the arctic. Dr. Harry Hoolone is the director. There will be an integrated research program proposed for the arctic tundra. The research program will be sponsored in the Barrow area.

Albert Johnson commented on the arctic tundra as an ecosystem. One of the advantages studying this ecosystem is it is presumably simple. There are relatively low numbers of plant and animal species in the area. Several ecosystems are the easiest to understand, but they are also susceptible to the greatest disturbance. They are fragile because there are so few organisms present. If something happens to interfere with the growth and reproduction this creates waves which affect the rest of the system. The arctic is susceptible to disturbance. The tropical forest in contrast is less susceptible. He hopes to look at a particular system that has been investigated in some detail. He will look at the lemming and the predators which predate on the lemming.

Albert Johnson continues without his slides. He said they have a system of collecting data and analyzing the data. From the data that are collected they will draw conclusions. They hope to reach a better understanding of the functioning of the system. Slide projector is apparently fixed. He shows a slide of the tundra ecosystem which contains information on the parts of the system: atmosphere, autotrophs

(producers), soil, dead material, input of liquids and solids, predators, herbivores and the interactions between the components. There are thirty numbered [interruption again]. Albert said there are thirty-one functions that exist between the components of the system. The analysts would like to know the relative size of the boxes in terms of their mass and the rate at which they occur in the system. He looks at a basic model of how the arctic tundra ecosystem might function. It gives a rough framework one can base for further studies. He looks at basic habitats in the tundra around Barrow. A lot is known about the system. He said a lot is known about the soils, permafrost, thaw lakes, and component species. He shows a slide of thaw lakes and talks about Max Britton's work on thaw lakes. There is a lot of information about processes such as frost action in the tundra. Dynamics of parts of the system are known. He talks about the brown lemming and their cycle. The lemming is the primary grazer in the tundra. There is a whole series of predators of lemmings. There is a conversion of plant material to animal material which occurs on a cycle. The cycle takes three or four years. He points out the high points of a single cycle. He starts with the high end of the cycle. There may be 70 individuals in an acre or higher locally. At the end of the summer there is a great death rate in the lemmings down to 1 individual per acre. At the beginning of the next summer the lemmings start to increase in number. They can breed all year. The population begins to increase. The predators just pass through the area because of low numbers and the lemmings are essentially predator free. The vegetation has been reduced because of the high numbers the previous years. The vegetation starts to recover. Going into the next winter there is a modest increase in lemmings. In the following winter three or four generations may be produced. There is a modest increase in lemming numbers. By the beginning of the third summer there are large numbers of lemmings which can support predators, primarily bird predators. Predators aren't present in large enough numbers to limit the lemming numbers. The cycle can be three or four years. Going into the fourth year the lemming population has many predators including mammalian predators. The vegetation is grazed heavily. The lemmings are nutritionally deficient and susceptible to predation. At the end of the summer the population begins to decline. All the species are tied in together. He shows slides of the lemming cycle. This simple system is very susceptible to disturbance. If something were to happen to eliminate any part of the system then this would greatly influence the size of the lemming population and what they are able to do to the plants. He said even naturally occurring events can influence changes and fluctuations. If man-made disturbances are introduced the effects can be important in various parts of the system. Systems function in a prescribed way under undisturbed conditions. When dealing with the management of these systems there should be care when interfering with any of its particular parts.