

RESEARCH OPPORTUNITIES AND NEEDS IN THE TAIGA OF ALASKA

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ABSTRACT

An appraisal of taiga (the northern forests of interior Alaska) environment research opportunities and needs was made based upon accomplishments since Alaskan statehood, current involvement of citizens in resource issues, information needs incident to the National Environmental Policy Act of 1969, and needs of new resource managing agencies and changing ownerships brought about by statehood and the settlement of aboriginal land claims. Based upon this appraisal, it is proposed that the research needs can best be met through a multidisciplinary interagency program. The program suggests closer coordination among several departments of the University of Alaska and a number of State and Federal agencies currently involved in applicable research. The urgency of research implementation is related to rapid change and diminishing opportunity to insure orderly development of Alaska's resources.

Taiga environment information needs encompass five major problem areas:

- Ecology--the fundamental climate-soil-water-air-flora-fauna relationships in natural and perturbed environmental systems.
- Fire effects--characteristics of fire, fire ecology, and the effects of fire upon entire resource systems.
- Water--precipitation-soil-plant-runoff relationships are complicated by permafrost. Soil erosion and water quality will respond to fire, fire control methods, land clearing, insect outbreaks, road construction, and industrial developments.
- Culture--people will determine resource management; thus, what "Alaska" means to people the world over will influence the extent to which resource development and use is consistent with preserving environmental quality and natural beauty.
- Economics--goals and objectives in resource developments, and development of plans and policies.

Keywords: Taiga, Alaska, research, resource management, environment.

INTRODUCTION

The purpose of this discussion is to focus attention on research opportunities and needs in the taiga of Alaska and suggest a means of getting on with the tremendous task of obtaining facts upon which to evaluate future resource management alternatives.

The Alaskan taiga has acquired international significance as people look to the Arctic and subarctic to meet resource needs of an expanding population and economy. In addition to food, fuel, and building material, there is an increasing need for a healthful environment, recreational opportunities, and esthetically pleasing landscapes.

Taiga is a circumpolar zone of predominantly coniferous forest, with tall trees in dense stands along the southern edge which become progressively shorter and less dense toward the northern tree line. The Alaskan taiga, located primarily in the interior of the State, is bounded on three sides by the south slopes of the Brooks Range, the north and northwest slopes of the Coast Mountains, and the Canadian border. The western boundary includes the lower Yukon and Kuskokwim River valleys, Norton Sound, base of the Seward Peninsula, and the lower Kobuk and Noatak River valleys (fig. 1). Approximately 56 percent of the 152 million hectares (375 million acres) in the State is in the general zone of taiga. About half of the Alaska taiga zone consists of forests and bogs (fig. 2), the other half of alpine tundra, bare rock, permanent ice, and snow.

Knowledge about the Alaskan taiga began accumulating to a small extent as the Russians occupied "Russian-America" and increased when the United States explored the new land it bought from

Russia in 1867. By the 1920's, research on various renewable resources received attention with the growing awareness of their potential usefulness and of the need for management. A big impetus in research, concerned mostly with engineering problems, came in the 1940's with expanded military activity.

A steady growth of research related to natural resources in the past two decades has contributed to an understanding of the complexities of taiga environments, how exceedingly sensitive they are to change, and to a realization of how much research is needed. Nevertheless, only limited funds have been expended on research to determine the impact of man's activities on the Alaskan environment.

In contemporary Alaska, man is only beginning to influence the operation of natural systems on a substantial scale. As human activities increase, the need for information about resource management and about social and economic factors also increases. Problems that will confront all resource managers in Alaska are beginning to be recognized. There are many opportunities for studying natural ecological systems and for developing basic information about them which will be necessary for decisions in a broad spectrum of resource problems.

The National Environmental Policy Act of 1969 requires Federal agencies to understand and to explain to the public the impact of agency activities on the environment. A lack of understanding of the basic ecological processes in the taiga is affecting development and use of Alaska's resources. The delay in approval to construct the 1,290-kilometer (800-mile) pipeline across Alaska is an example of how this void in basic information affects use of Alaska's resources.

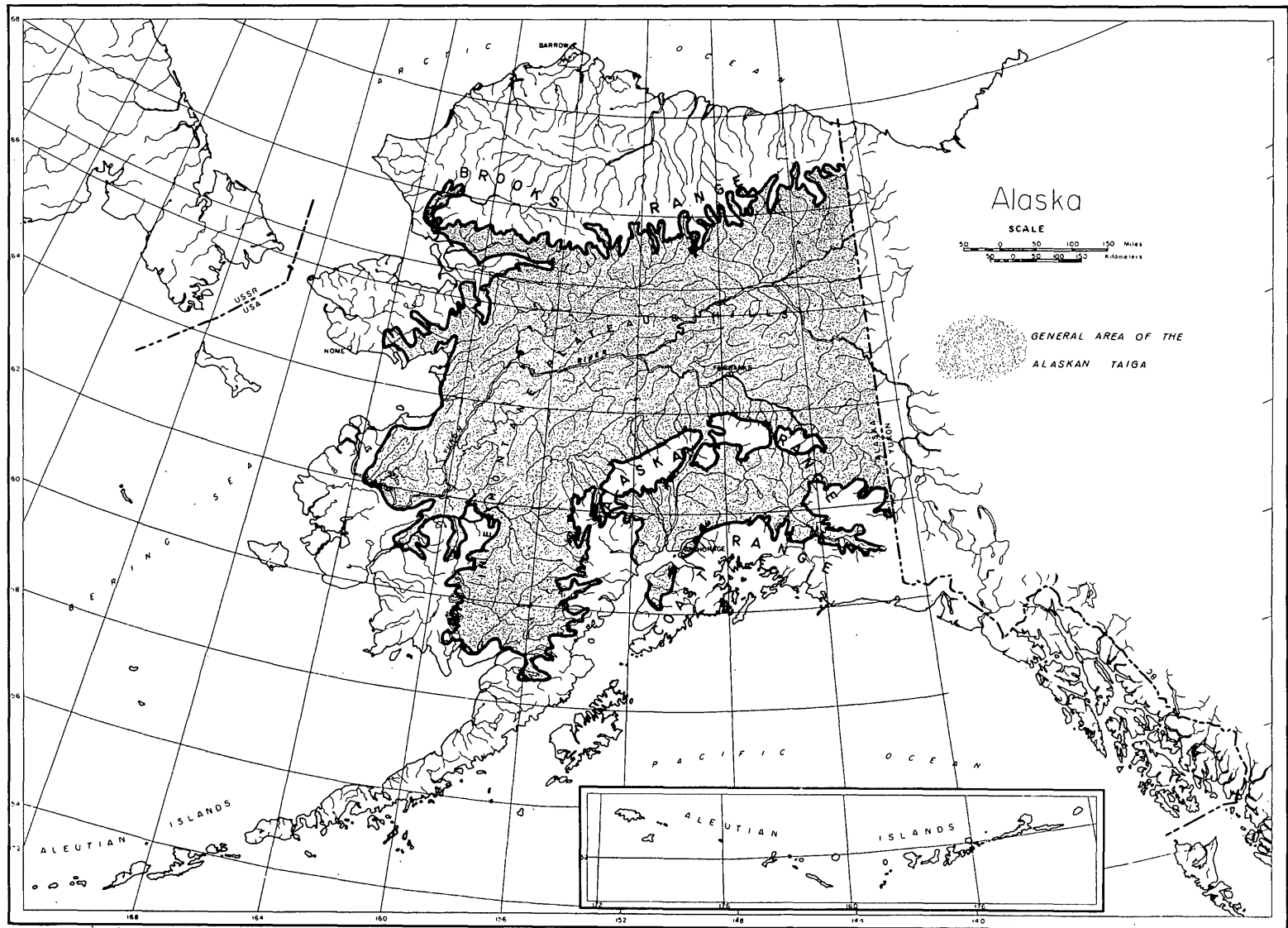


Figure 1.--Map of Alaska showing major mountain ranges and general zone of taiga.



Figure 2.--Alaskan taiga, showing a variety of vegetation types, ponds, and bogs, and a wildfire. Swanson River, 1969.

A new appraisal of research needs and opportunities and a reevaluation of existing research programs are timely.

There has been more than a decade of research accomplishment in interior Alaska since statehood. This was a formative period in which socioeconomic progress and resource use gradually acquired more purposeful direction. Policies about environmental quality became clearer and firmer. The average citizen became more deeply involved in resource issues.

These factors, combined with settlement of the aboriginal land claims and State and Federal land selection, have created new resource managing organizations, changing ownerships, and changing management aims which have immediate needs for guidelines.

SETTING

Interior Alaska landscapes are a product of :

1. Recent geomorphological history which includes glaciation in the three

major mountain ranges, associated processes in the intermontane valleys, and sensitively balanced ecosystems in early stages of development.

2. Mean annual temperatures ranging from -10° C. (13° to 15° F.) in the Brooks Range to about 2° C. (35° F.) on the base of the Aleutian Chain. Annual precipitation ranges from 178 to 760 millimeters (7 to 30 inches) over these same zones; frost-free days range from 50 to 130 annually. Daylight varies from 20 to 24 hours in June to 0 to 4 hours in December.

3. Continuous or discontinuous permafrost (permanently frozen ground) underlying most of the area. This factor is characteristic of the interior of Alaska and many other lands at high latitudes.

4. Lightning-caused wildfires. These have occurred in the interior since prehistoric times--the taiga is a fire environment with its flora and fauna adapted to, or dependent on, frequent disturbance by fire.

5. Frontier environment. The vast "unspoiled" open space is the popular conception of Alaska.

RENEWABLE RESOURCES

Interior Alaska includes wood, water, wildlife, recreational, and cultural resources.

WOOD

The 43 million hectares (106 million acres) of taiga classed as forest land in the interior constitute about 15 percent of the tree-covered land in the United States. About 9.1 million hectares (22.5 million acres) of the taiga are classed as commercial forest land and support a net growing stock volume of 404 million cubic meters

(14-1/4 billion cubic feet)(Hutchison 1967). These forests are capable of a sustained harvest of 10 million cubic meters (358 million cubic feet) of wood annually. However, production and use of the wood resource are limited by the northern environment.

The relationships of environmental factors to tree or forest growth are not well understood. The mosaic of taiga vegetation is attributed to fire (Lutz 1956). In some instances fire has indirectly but significantly changed soil temperatures and vegetation. River-bottom white spruce sites may deteriorate due to lowering soil temperatures and rising permafrost levels as shade increases from the developing stand (Viereck 1970). Increased timber harvesting heightens problems of spruce regeneration, which is inadequate under current logging practices (Zasada 1972) and creates an undetermined impact on the environment.

WATER

The annual water crop from interior Alaska watersheds is estimated at 617 billion cubic meters (500 million acre-feet). This is about one-fourth of the United States freshwater runoff and of correspondingly great power potential. The rivers are of major importance in transportation, fish spawning, and recreation, domestic, and industrial uses.

The abundance of water does not preclude water problems. Major rivers carry heavy sediment loads, related to numerous tributaries that arise from glaciers and icefields, and to the natural meandering of these large watercourses in broad alluvial valleys. Watersheds without glaciers and permanent snow usually produce water of good quality and of major importance to fish and human use, but the soils of such

watersheds are highly erodible. In the cold-dominated climate, some streams and rivers are believed to freeze to the bottom during the long winter, and in many cases overflows and groundwater seepages freeze into large deposits of "stream icings" ("aufeis"), which may persist well into summer.

Related to precipitation and temperature distribution, streamflow patterns vary greatly with high flows during the spring breakup, moderate but variable flows (with storm flows sometimes exceeding spring flows) during the summer, and low or no flows during the winter.

Water supply, despite its annual quantity, is a potentially serious problem and will require conservation and management in connection with man's uses. Floods occur and cause significant destruction along main streams. The Fairbanks flood of 1967 was the largest in recent times, causing damages in excess of \$170 million.

WILDLIFE

The history of Alaska is closely tied to fur, fish, and game. Until Alaska was purchased by the United States, fur trading was the main industry. Commercial fishing, which began in 1868, then became the main industry and still ranks as one of the most important. Mining, especially in its early years, would not have been feasible without game and fish as sources of food.

Dependence on fish and game as a source of food, combined with the importance to the State's economy, plus the need to satisfy demands for sport hunting and fishing place consumptive uses of wildlife high on the list of valuable resources of the State. Nonconsumptive uses, such as nature study, photography,

and seeing birds, animals, and fishes in their natural habitats, are also important considerations.

Alaska must also consider her role in insuring the continued protection and enhancement of breeding habitats for many migrating species, as well as her international responsibility in preservation of endemic species in danger of extinction elsewhere. Consequently, management of Alaska's wildlife resources will continue to be one of the most complex issues facing resource managers.

RECREATION

Where but in Alaska can one walk from an icefield to the ocean in half a day, or drive for hours with a view of the highest mountain in North America, or visit primitive cultures and experience a step back in time where man is still living close to nature?

The importance of recreation does not mean that finding its place in the resource management balance will be simple. For example, Rogers (1962, p. 53) pointed out that "Alaska's vast empty spaces... have tangible or intangible values as 'amenity resources' in a society which is becoming increasingly congested, as recreation resources, and as elbow room for the perfection and maintenance of a modern military machine [referring to national defense withdrawals in Alaska]. Unfortunately, these uses are not entirely compatible and, as in the case of the more traditionally defined natural resources, choices must be made. "

Outdoor recreation in Alaska is forecast to continue rapidly increasing, based upon doubling of the State's population and a sevenfold increase in the number of tourists during the next 30 years

(State of Alaska 1970). The role of interior Alaska recreation will be important not only in relation to the needs of the United States and North America, but also to the needs of the rest of the world. The word "Alaska" has a special meaning to people the world over--a meaning that is usually related to wilderness, wildlife, and spectacular scenery in an uncongested environment.

CULTURE

Alaska's cultural dimensions vary from the metropolitan penthouse dweller to the wilderness trapper. Within this range the following groups are identified:

Resident

- a. Indigenous or aboriginal peoples--Athapascan, Eskimo, and Aleut.
- b. Nonindigenous peoples--from locations throughout the world.
 - 1. Permanent resident--Alaska is home.
 - 2. Temporary resident--people in Alaska for short periods of time, such as military personnel, some university students, or individuals with large companies who move frequently.

Nonresident

- a. Visitor or tourist--in Alaska to see,, use, or enjoy its resources but not to become resident.
- b. Nonvisitor--hears about Alaska, sees it on television, or reads about it and is concerned, but does not come to Alaska to use its resources.

The 302, 760 residents^{1/} are scattered across the 152 million hectares (375 million acres) of Alaska in a variety of settings--ranging from native villages, towns, and metropolitan areas to the individual homestead or wilderness cabin. These resident groups have a wide array of ideas, experiences, education, philosophies, values, and concerns about resource use and environmental quality.

Complexity of the cultural environment is increased when the nonresident dimension is added. Opinions, concerns, and ideas are frequently based on a brief visit, reading, or television.

Individuals from all these groups influence the future of Alaska's environment and resources.

DIMENSIONS OF RESEARCH NEEDS

The urgency and scope of research needs are determined by the rapid change and the diminishing opportunity to insure orderly development of Alaska's resources. Alaska, the largest of the 50 States, contains more land than the combined States of Washington, Oregon, California, Arizona, and Nevada.

Current and impending economic and social developments, such as expanding recreation and tourism, improving transportation systems, oil, gas, coal, and mineral exploration and development, and settling aboriginal land claims, are requiring long-term resource use and management decisions. Yet the capability of this northern environment to support man's interests and activities has not been determined. A statement made in 1966 holds true today: "What

the state needs now more than anything else is more precise and integrated knowledge about the northern environment and related problems of land management and development" (Cooley 1966, p. 93). Development of the needed research capability to provide management alternatives is in its infancy.

The depth and complexity of research needs are determined by the characteristics of taiga. The taiga is one of the youngest, more primitive and least understood biomes or plant-animal systems on earth. The cold-dominated environment, manifest in part by large areas underlain by permafrost, affects life processes and biological production. Although temperature is a dominant factor, other parameters, such as solar radiation, moisture, nutrients, and the geologic youth of the land surface, are also important influences on flora and fauna. The combination of severe environment and the paleoclimate has led to ecosystems in which an individual element of the system is extremely sensitive to, or dependent on, the other elements. As a result, populations or environmental parameters fluctuate dramatically following small disturbances; the passage of a tracked vehicle leaves a scar for decades; postfire recovery of lichen forage in the alpine tundra takes 40 to 100 years; and the disturbance of a gentle slope underlain by permafrost can cause large-scale soil movements and stream sedimentation within a single season.

The complexity of taiga management is due in large measure to the cause and effect relationships between permafrost and terrain, climate, flora, and fauna. It is the close interrelationship and delicate balance of factors that is meant by the frequently mentioned "fragile ecology," with reference to interior Alaska.

^{1/}
— 1970 census.

There is an increasing demand for coexistence between industrial progress and natural beauty. Hence, in the taiga of Alaska, resource use for economic gain must include maintenance of environmental quality. However, the basic cost of doing business in interior Alaska will continue to be high. Technological advances make possible continuation of many basic operations year-round but not without increased cost.

The more critical gaps in knowledge about five major problem areas involve the following informational needs.

ECOLOGY

Research in this area deals with fundamental climate-soil-water-plant-animal relationships in natural and disturbed systems. Information is needed to:

- a. Determine the environmental conditions and plant successional trends leading to major vegetation types, such as white spruce, paper birch, and aspen, and the vegetation composition and successional responses to such disturbances as fire, clearing, logging road construction, and recreational use.
- b. Develop a habitat classification system based upon air-soil-water-plant-animal relationships and interactions in disturbed and stable systems.
- c. Determine growth patterns for white spruce, aspen, paper birch, black spruce, and balsam poplar and correlate these patterns with environmental patterns, especially temperature, soil moisture, and soil nutrients.
- d. Determine the effects of abiotic factors on the dynamics of forest and range insect populations.
- e. Determine the productivity of taiga ecosystems for wildlife food and the degree of use by different wildlife species; develop procedures for

classifying habitat production in terms of wildlife.

f. Identify successional stages of vegetation that are critical in habitat requirements for different wildlife species and determine the effects of disturbance on wildlife habitats.

g. Develop simulation models to predict the consequences of management manipulations on productivity and biomass, energy flow, and decomposition and nutrient turnover in cold-dominated ecosystems.

FIRE EFFECTS

The particular susceptibility of the taiga to fire is due to climate and vegetation types. Fundamental factors in fire ecology are fire intensity and behavior, which are functions of fuel, weather, and topography. Information is needed on:

- a. Fire characteristics and the ecological effects of fire on interior vegetation systems. Present knowledge is only general.
- b. The effect of fire on hydrologic factors and soil stability, known now only in principle.
- c. The effects of fire upon entire resource systems.

Filling this informational gap will require a continuing integration of knowledge about how fire affects taiga resources, both social and ecological.

WATER

Watershed dynamics is one of the least understood aspects of the taiga. The precipitation-soil-plant-runoff relationships appear to be extremely complex, probably due in a large measure to permafrost. Information is needed to:

- a. Develop mathematical or conceptual models of hydrologic processes.
- b. Develop methods and obtain accurate hydrologic data on several

undisturbed localities preparatory to designing research in disturbed areas.

c. Quantify soil erosion and changes in water quality accelerated by fire, fire control methods, land clearing, large-scale insect defoliation, road construction, and industrial developments such as the trans-Alaska pipeline.

CULTURE

As land selection proceeds in Alaska, four major groups of landowners will emerge:

- State of Alaska
- Alaska native
- Individual or corporate
- Federal Government.

Several State agencies have a long history of resource management in Alaska through experience gained in the territorial government some years before statehood. Since statehood, the State agencies have been assuming increasing responsibility as the State's landholdings grow. Concerns of the Department of Natural Resources parallel those of the Federal Government, with the added burden of making larger inputs into the State's new economy. Therefore, an immediate concern is how to use resources under the jurisdiction of the State for economic gains in keeping with local, State, national, and international concern about environmental quality.

The Alaska native is the most recent group concerned with resource management. The granting of 16 million hectares (40 million acres) of land to sustain an increasing quality of life for the native will probably place more intensive demands on this land than will be placed on the land under the jurisdiction of the State.

The individual landowner in Alaska

is confronted with similar needs, i.e., to make a living from the land under his ownership. Consequently, his demands and impacts will parallel or become more intensive than those of other groups.

The Federal Government currently manages public resources according to a variety of policies, of which the National Environmental Policy Act of 1969 is one of the more recent. These policies attempt to maintain or enhance environmental quality while developing and using resources. Federal resource management agencies have accumulated considerable experience in Alaska as well as in other States. The Federal Government is therefore able to put proven policies and methods into use and to assist new management groups in developing initial guidelines.

What has this to do with cultural or social problems? Policies and philosophies about resource use and environmental quality arise from people. We know that in Alaska there are tremendous variations in experience, attitudes, values, and philosophies among cultural groups. Therefore, a reasonable deduction seems to be that a wide range of attitudes and policies concerning use of Alaska's resources may emerge from these diverse groups.

Ideas of the indigenous people may vary considerably from those of the non-indigenous group. Within the nonindigenous group the permanent residents' ideas may not be compatible with those of temporary residents. No doubt the resident and the nonresident will view the use and development of Alaska's resources differently. Each cultural group will have ideas, opinions, and philosophies that will influence policy and ultimately the use and development of Alaska's resources.

Therefore, the desires of the people must be considered if recurring issues such as the proposed Rampart power project, the trans-Alaska pipeline, and nuclear device testing on Amchitka Island are to be resolved. Information is needed to determine:

- a. What is the "real value" of Alaska? What does the word "Alaska" mean to people the world over?
- b. What is the State government's responsibility to its citizens, the citizens of the other States, and the rest of the world?
- c. How do these meanings relate to development of the State's resources?
- d. What changes in the meaning of "Alaska" have taken place during the past few decades as transportation, communication, and industrialization increased?
- e. What changes should we expect during the next decades?
- f. What action should be taken to insure orderly development and use of resources consistent with preservation of environmental quality and natural beauty?

Answers must come from Alaskans as well as from residents of the other 49 States who share the responsibilities, costs, and benefits of a democratic society, and from interested people in other countries. Only if this information is coupled with the basic biological facts on land capability and condition in this northern environment will we be able to provide a sound basis to resolve conflicts of interest in the future development and management of the State's resources.

ECONOMICS

The complex economic situation in Alaska has been and is being studied by experts on the national, State, and local levels. According to Johnson and

Jorgenson's review (1963, p. 22):

The high cost of living is attributable principally to the cost of import of most of the necessities of life, to the naturally greater expense of living in a far-north environment, and the business philosophy that is keyed to high interest and a quick return on investment.

In the process [of high prices and high wages interacting to keep the cost of living going up] the competitiveness of Alaska's resources and products on outside markets seriously suffers.

Nathan (1970), in summarizing the economy of Alaska from a national view, felt there were many problems of an economic nature to be solved, and challenges for the future were the combination of a vigorous rate of economic growth, a wholesome and healthy environment, and the degree to which Alaska has or develops her human resources. He believed that:

- a. The citizens of Alaska and their leaders should seek to determine their goals and objectives, taking into consideration the needs and wants of the people of Alaska relative to the expanded resources that will be available to them, and
- b. Alaska needs to undertake some imaginative planning and must formulate carefully conceived policies to avoid much waste and missed opportunities.

OPPORTUNITIES FOR MULTIDISCIPLINARY RESEARCH

Management activity influences the taiga system; therefore, research capability must also be aimed at determining the impact of man's decisions and activities on the system rather than his impact on a single element or part.

Since most elements of these systems are extremely sensitive to or dependent on other elements, few studies can

be unique to single disciplines. Komarek (1971) summarized such multidisciplinary needs in terms of a proposed cooperative ecological experiment station for Alaska. This approach had been discussed in Alaska previously and has been implemented elsewhere; the Taiga Research Station of the University of Alberta, the Subarctic Research Station of McGill University, and the Finnish Kevo and Oulanka Stations are examples.

Research on any-one facet of the taiga system necessarily involves many interacting factors of the environment. The informational gaps identified previously are not mutually exclusive with respect to environmental factors, research studies, or research disciplines. For these reasons, a multidisciplinary research approach, including social, economic, and ecological aspects, should be considered for the taiga in Alaska.

Also, there are probably few large areas where the opportunities for inter-agency, public and private, cooperation and coordination in research are greater than in interior Alaska--and there are probably few areas where interests in such cooperation and coordination provide a better climate for it. Cooperation and coordination with agencies, groups, and individuals must be a significant feature of this approach to fill major informational gaps as quickly as possible. Working arrangements among agencies need to be coordinated and cooperative agreements established or strengthened. Examples are the University of Alaska and several universities in the conterminous States; the State of Alaska Departments of Natural Resources, Fish and Game, and Environmental Conservation; National Weather Service; U.S. Geological Survey; U.S. Army Corps of Engineers Alaska District and the Cold Regions Research and Engineering Laboratory;

Soil Conservation Service; Institute of Northern Forestry of the U.S. Forest Service; Bureau of Sport Fisheries and Wildlife; Bureau of Land Management; Environmental Protection Agency; Alaska Agricultural Experiment Station; and the International Biological Program in the coniferous and tundra biomes.

A steady growth in research since the mid-1940's by the University of Alaska and a number of other universities and agencies, mainly through contracts, grants, and the internal programs of some agencies, was recently supplemented with what might be termed "ad hoc" research related to environmental issues associated with the proposed 1, 300 kilometer trans-Alaska pipeline. Some of this research is funded or conducted by oil companies, some is conducted by resource management agencies, and some is being done under the International Biological Program's Tundra Biome research.

By Executive decision, the Department of Agriculture is responsible for Federal forest research, which is in turn delegated to the Forest Service by departmental administrative regulations.

Forest Service research, as a continuing activity in interior Alaska, began in 1957. During 1970, the U.S. Forest Service recognized the opportunity for a more active role in developing intensive taiga research programs. Consequently, a multidisciplinary research unit was established in July 1971 with seven scientists to develop the new research program at the Institute of Northern Forestry. The mission of this group is to understand the ecology of the taiga and associated environments and to provide a sound basis for orderly development of resources consistent with maintenance of environmental quality.

The President, in his February 8, 1971, message on environment to the Congress, stressed the need for Federal cooperation with the State of Alaska in a land use planning effort for the area north of the Porcupine, Yukon, and Kuskokwim Rivers. This cooperative agreement was accomplished November 22, 1971. The Northern Alaska Planning Study Team, consisting of more than 20 Federal and State employees, was assembled with the objective to collect, analyze, and display data in developing a regional land use policy for northern Alaska within 2 years. This effort was expanded in August 1972 into the Resource Planning Team, Alaska Land Use Planning Commission.

All of the present and anticipated efforts by these groups bears directly on the taiga environmental research opportunities. Therefore, it is essential that this program coordinate and participate in common fields of interest.

SHORT-TERM PROGRAM

It is highly urgent that a multidisciplinary research program for the Alaska taiga be implemented. Alaska provides a rare opportunity for us to combine all information, experience, and technology with the desire to protect our environment and demonstrate that we can use and develop Alaska's resources without destroying her natural beauty and environmental quality. Modern man can live in harmony with nature--we should not pass up this excellent opportunity to demonstrate our capability. By this view, the overall research need is to understand the environments and the consequences of technology upon them.

GEOGRAPHIC LIMITS

Limitations in physical facilities

and manpower preclude research on all problems of the whole of interior Alaska. The immediate program should be limited on geographical rather than agency, disciplinary, or ecological lines. That is, within a key area the major ecosystems should be considered. The key area should be the middle and lower Tanana River valley and the adjacent Tanana-Yukon uplands. This area is selected because it is representative of the Intermontane Plateau, the landform of largest extent in the interior, and the area of rapidly expanding industrial development and resource use, with related problems of environmental protection. This would not preclude attention to other areas as opportunities and the need to formulate future program plans arise. The main program effort would be centered around Fairbanks.

Due to the limited accessibility of potential study sites, research should be concentrated on a few study areas to the extent consistent with study objectives, with major research efforts concentrated on the Caribou-Poker Creeks Research Watershed and the Bonanza Creek Experimental Forest. Supplemental study areas will be needed, however; and consideration should be given to establishing areas representing the wide range of ecological conditions in the taiga of Alaska. These areas would be used to test the impact of man's activities on the environment, while appropriate portions of each area would be maintained as research natural areas to preserve and study natural processes in taiga systems.

PROGRAM LIMITS

For some time, analyses of research needs and the subsequent selection of individual studies should be flexible in approach, scope, and detail in response to new information, to changing needs of

resource-oriented programs, to gradually intensifying management practices, and to the climate for financial support. Based on a reasonably clear view for the next few years, a 5-year research program time unit is logical.

The need for information about the Alaskan taiga over the next 5 years will be possibly greater than for any previous or future 5-year period in Alaska's history. It is this period that will encompass the major thrust of the Northern Alaska Planning Study Team efforts. It is within this period that the resource management plans, and perhaps management precedents, will be initiated on as much as 16 million hectares (40 million acres) of land involved in the aboriginal claims settlement and on up to some 40 million hectares (100 million acres) selected by the State under the provisions of the Statehood Act.

A minimum 5-year staffing level by disciplines including scientists from all agencies would result in the following level of research effort:

	<i>Man-years of effort needed annually</i>
Ecology	4
Fire (control and effects)	8
Forest diseases	3
Forest insects	3
Watershed and aquatic habitats	3
Wildlife habitats	3
Social, economic, and recreation	3
Total	27

The cost to implement the proposed program is estimated at \$80, 000 to \$100, 000 per scientist man-year. A substantial contribution can be and is being made by university-State-Federal

research groups; however, these efforts could be more closely coordinated through increased funding using existing research facilities to develop an integrated program of research to solve the previously mentioned problems.

ANTICIPATED ACCOMPLISHMENTS

The foregoing research program is to provide information for major developments including: some 40 million or more hectares of land coming under new management and ownership--the State for the remainder of Statehood Act land selection, and the Eskimo and Indian village councils for the land allotments in the settlement of their claims; intensifying management of Federal lands as manifested in the activation of the Northern Alaska Planning Study Team; expanding needs of agencies responsible for monitoring or controlling environmental quality; and the demands for determining the environmental impacts of public management of resources.

The anticipated accomplishments , to be attained to a level effective for resource management, are:

a. Determination of fundamental ecological relationships in resource management in order to provide for resource use and benefits with the least environmental damage and to predict the results of different management systems.

b. Effective fire control methods developed from research on weather modification, lightning sensing, fire danger rating, fire detection and reconnaissance, fire control planning, and fire attack methods.

c. Determination of the relationship of wildlife to the economy of interior Alaska, and the impact of fire, industrial, and recreational developments on wildlife use and management.

d. Determination of insect impacts on vegetation important for wildlife forage and for recreation enjoyment, and development of control methods for minimizing impacts and maintaining environmental quality.

e. Interim guidelines for resource managers--State, Federal, and private--based on available information from all outside and local sources with the understanding that modification and revision will be necessary as research results and experience are gained under Alaskan conditions.

f. Determination of the "value" of Alaska to Alaskans as well as to other

people of the United States. As methodologies develop, consideration should also be given to expanding this survey to the world population.

g. An evaluation of the basic capability for fulfilling recreational needs on a sustained basis while maintaining maximum environmental quality.

h. A determination of the productive capability of the land and environment, as basic to assessing the economic needs, present and future, of the State. The supply of raw materials, feasibility of using these resources, and the real need or demand for products purchased are basic informational gaps.

REFERENCES

Cooley, Richard A.

1967. Alaska, a challenge in conservation. 170 p. Madison: Univ. Wis. Press.

Gourdeau, E., M. E. Britton, and J. C. Reed

[n. d.] The arctic dilemma: man and his environment vs. resource development. 26 p. Washington, D.C., and Montreal, Quebec: Arctic Inst. North Am.

Hardy, Charles E., and James W. Franks

1963. Forest fires in Alaska. USDA Forest Serv. Res. Pap. INT-5, 163 p., illus. Intermountain Forest & Range Exp. Stn., Ogden, Utah.

Hutchison, O. Keith

1967. Alaska's forest resource. USDA Forest Serv. Resour. Bull. PNW-19, 74 p., illus. Pac. Northwest Forest & Range Exp. Stn., Portland, Oreg.

Johnson, Hugh A., and Harold T. Jorgenson

1963. The land resources of Alaska. 551 p. New York: Univ. Pubis, Inc.

Komarek, E. V., Sr.

1971. A summation of "Fire in the Northern Environment," and a suggestion for a cooperative ecological experiment station. *In* Fire in the northern environment, a symposium, p. 257-265. USDA Forest Serv. Pac. Northwest Forest & Range Exp. Stn., 275 p., illus. Portland, Oreg.

Leupold, A. Starker, and F. Fraser Darling

1953. Wildlife in Alaska, an ecological reconnaissance. 129 p. New York: Ronald **Press** Co.

- Lutz, H. J.
 1956. Ecological effects of forest fires in the interior of Alaska. U. S. Dep. Agric. Tech. Bull. 1133, 121 p., illus. Washington, D. C.
- Nathan, Robert
 1970. The economy: a national view. *In* The Alaska survey and report: 1970-71, p. 68-70. Anchorage: Res. Inst. Alaska, Inc.
- Rogers, George W.
 1962. The future of Alaska: economic consequences of statehood. 311 p. Baltimore: The Johns Hopkins Press.
- Sater, John E. (Coordinator)
 1969. The arctic basin. 339 p. Washington, D. C. , and Montreal, Quebec: Arctic Inst. North Am.
- Spurr, Stephen H., Ernest F. Brater, Michael F. Brewer, et al.
 1966. Rampart Dam and the economic development of Alaska. Vol. 1, Summ. Rep., 62 p. Rampart Dam-Alaska Econ. Dev. Proj. , School Nat. Resour. , Univ. Mich., Ann Arbor.
- State of Alaska
 1970. Alaska outdoor recreation plan. Vol. 1, summary, 42 p. Juneau: Dep. Nat. Resour.
- Viereck, Leslie A.
 1970. Forest succession and soil development adjacent to the Chena River in interior Alaska. Arctic & Alpine Res. 2(1): 1-26.
- Zasada, John C.
 1972. Guidelines for obtaining natural regeneration of white spruce in Alaska. USDA Forest Serv. Pac. Northwest Forest & Range Exp. Stn. , 16 p. Portland, Oreg.

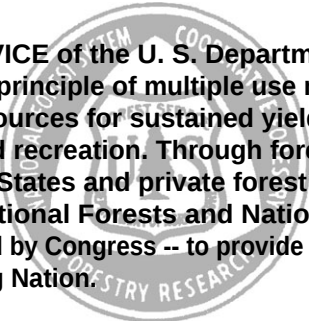
The mission of the PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION is to provide the knowledge, technology, and alternatives for present and future protection, management, and use of forest, range, and related environments.

Within this overall mission, the Station conducts and stimulates research to facilitate and to accelerate progress toward the following goals:

1. Providing safe and efficient technology for inventory, protection, and use of resources.
2. Development and evaluation of alternative methods and levels of resource management.
3. Achievement of optimum sustained resource productivity consistent with maintaining a high quality forest environment.

The area of research encompasses Oregon, Washington, Alaska, and, in some cases, California, Hawaii, the Western States, and the Nation. Results of the research will be made available promptly. Project headquarters are at:

Fairbanks, Alaska	Portland, Oregon
Juneau, Alaska	Olympia, Washington
Bend, Oregon	Seattle, Washington
Corvallis, Oregon	Wenatchee, Washington
La Grande, Oregon.	



The FOREST SERVICE of the U. S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives — as directed by Congress -- to provide increasingly greater service to a growing Nation.