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MEETINGS PACIFIC DIVISION A. A. A. S.

The meetings of the Pacific Division of the A. A. A. S. and affiliated societies will be held in Pasadena, June 16-21, under the auspices of the California Institute of Technology. The Northwest Scientific Association is one of the affiliated organizations and its members are cordially invited to attend the meetings. Scientists wishing to present papers should write Secretary, Pacific Division, A. A. A. S., Stanford University, California.

The Role of Research in Regional Development

JOHN B. APPLETON

Northwest Regional Council, Portland, Oregon

The highest economic and social well being of which a region is physically capable should be the goal in regional development. This can be achieved only through (1) the effective use of all available resources, physical as well as human, (2) a logical development that will be of permanent rather than transitory benefit to the people of the region, (3) the elimination of wasteful exploitation likely to result in social and economic dislocation and disintegration, and (4) the development of sound public policies to deal with regional affairs. Research and the effective use of its findings provide a scientific method by which this goal can be reached.

The role of research in regional development includes: (1) the collection and interpretation of the necessary data,

both physical and economic, which will insure a thorough understanding of the regional environment and of environmental relationships; (2) the discovery and application of improved or new techniques which will provide the basis for desirable readjustments and increased economic opportunity; (3) the dissemination of accurate information in ways that will assure public understanding of the salient facts concerning the region and of the problems confronting it, of its opportunities and limitations, of necessary readjustments that should be made to increase economic wellbeing, and of the need for cooperative effort in the formulation of action programs to implement desirable administrative policies.

A few pertinent examples drawn from the Northwest will illustrate these prin-

ciples. Land is the basis of human existence, for from it man derives the comforts and necessities of life. In the Pacific Northwest, agriculture is one of the two major occupations since approximately 24% of those gainfully employed depend directly or indirectly upon agriculture and the associated industries. In an area of 188,000,000 acres, only 16,000,000 are tilled, 8.4% of the whole region. Actually, the farm economy is based upon 10,000,000 acres because every year one-third of the crop land is either in fallow or crops fail to mature in consequence of drought. The effectiveness with which this small area is used and the degree to which its productivity is maintained are of vital significance to the economy of the region. Unfortunately, unsatisfactory methods of tillage, improper cropping, failure to maintain fertility by the application of fertilizers or the cultivation of soil-building crops, inadequate soil erosion control measures, are reducing the productive capacity of the land materially. Every one of these problems calls for intensive research, research which takes into account not only local physical conditions but the closely related economic and social factors which contribute to soil misuse.

The influx of farmers from the drought areas of the northern Great Plains has created a serious land problem in the Pacific Northwest since the amount of farm land is not adequate. During the past two decades the acreage of crop land has not increased in proportion to the change in population. Rugged terrain and arid or semi-arid conditions definitely restrict the area of cultivable land. By irrigation, drainage, and clearing it may be possible to add 5,000,000 acres to the present crop area. Where and how this reclamation can best be accomplished necessitates intensive research. Of this potential farm land some 1,200,000 acres are located in the Grand Coulee Reclamation Project. How can this area best be developed? Along what lines should

land-use be directed? These are major problems confronting a large group of researchers. The investigations now in progress provide an excellent example of the part that research can play in promoting sound regional development. Some 28 inter-related problems have been outlined, each of which calls for specialized study. This cooperative, coordinated research program is attempting to resolve in advance of settlement just how the region can best be developed. These scientists are surveying and classifying the soils, determining land-use capabilities under the physical and economic conditions that will obtain, designing the most effective water distribution system, analyzing potential marketing problems, and plotting the settlement pattern. On the basis of experience in similar types of areas, they are attempting to determine for the Columbia Basin project the optimum size of farm units, the crop systems best suited to the various parts of the area, the potential water requirements of each soil type, the controls likely to insure proper land-use, the optimum rate of settlement, the necessary economic and social facilities that should be provided, and so forth. This piece of cooperative research should provide complete and accurate information upon almost every aspect that will affect the lives of the new settlers. If put into action, the mistakes usually associated with pioneer settlement should be minimized—if not avoided. This type of comprehensive research should be duplicated in other parts of the region in order to insure the wisest possible land-use.

Forest lands comprise 36% of the entire area of the Pacific Northwest, contain 48% of the remaining sawtimber of the United States, and supply half the national output of soft-wood lumber. Lumber constitutes 63% of the railroad tonnage originating in the region and 87% of the inland-water tonnage. That one out of every ten persons gainfully employed is engaged di-

rectly in a forest industry indicates the regional importance of timber. Still more striking is the fact that industries based directly on the use of forest products give employment to 62.5% of all wage earners engaged in manufacturing. Obviously, problems connected with the growing, management, and exploitation of these forest and with the utilization of their products offer innumerable opportunities for research. Solution of these would have far-reaching effects upon the economic stability of the region. To neglect them will prove a major disaster.

One example will serve to illustrate the role of research in this field. Forest depletion is progressing at a dangerous rate. Annual cut, more than twice annual growth, averages around 10 billion board feet. Fire, insects, disease and windthrow cause an additional average annual depletion of approximately two billion board feet. At present annual growth is barely five billion feet although, with scientific management, it would amount to several times this figure. Nor is depletion uniform throughout the region. The more accessible areas such as Grays Harbor have suffered severely from over-cutting and the economic base of many communities has been seriously undermined. The stability and permanency of such communities are possible only when cut is balanced by growth in the area that serves their mills. Sustained yield management seems to offer the best solution to the forest problem. It involves, however, a host of inter-related problems in the fields of forestry, industry, economics, and government. Scientific silviculture, the development of new and improved logging techniques, the multiple uses of forests, the reduction of waste both in the woods and in the mills, forest ownership, protection, taxation, marketing, wood technology, administration, public policy, and legislation offer many problems that research must solve before sus-

tained yield management becomes a reality, before the forest industries are put upon a permanent basis and the future of scores of communities is assured.

Fisheries, both river and off-shore, have long played an important role in the economic life of the Pacific Northwest. In Oregon and Washington the catch amounts to over 150,000,000 pounds a year and yields an annual income of approximately \$25,000,000. Of this salmon provides two-thirds. In addition, fisheries attract thousands of tourists as well as local residents. Scientific management is essential to the permanence of this regional resource.

For a long time ocean fisheries were considered inexhaustible and conservation received little consideration. Overfishing in streams and lakes, on the other hand, becomes apparent more quickly owing to the restricted area involved, and excites attention more readily. As modern commercial fishing expanded and techniques and equipment became more efficient, the effects of overfishing in the established fishing areas adjacent to the coast have become significant. The situation in regard to halibut is illustrative of what happened. Depletion was indicated by smaller catches per unit of equipment and by the desertion of once productive fishing grounds. Fishermen were faced with the loss of their livelihood. In recent years salmon runs on the Columbia, Fraser, and other rivers of the Pacific Northwest have seriously diminished and the need for corrective measures is urgent. Here is another rich field for scientific research that can have far-reaching effects, both economic and social.

Accurate information regarding the life history of all types of commercial and game fish is essential. This research should include such matters as pollution, siltation, and other physical conditions that disturb the normal habitat of the various species. Only when

of the industrialist. Likewise, research to discover improved techniques, equipment, and marketing practices is essential.

Mineral and metallurgical industries offer possibilities for a much more intensive development than heretofore, since they play an almost insignificant role in the present economy of the region. The Northwest is reputed to possess large and varied mineral resources. The extent and quality of the different deposits is not accurately known since "only about 10% of the mineral area has been surveyed in sufficient detail to provide base maps, and detailed geologic maps essential to mineral exploration are available for only approximately 5% of the area. Hence, the question of whether local deposits of iron ore, magnesite, allumina clays, etc., can be economically worked remains to be solved. The availability of large blocks of low-cost Columbia River hydroelectric power may justify the establishment of a wide variety of electrometallurgical and electrochemical industries. Which shall be developed? Where shall they be located? To what degree can they be developed under existing conditions of production and distribution? The Bonneville Power Administration is carrying on a number of "feasibility studies" to determine the answers to these and many other related questions. Some years ago a series of successful studies of this type were made by Cincinnati to provide

the information necessary to guide industrial expansion there. Similar research is necessary in the Pacific Northwest.

Pertinent to any development of mineral and metallurgical industries is the need for continuing technological research of the type carried on in the Engineering and Mining Experiment Stations and in the laboratories of industrial organizations. Through this medium special techniques and equipment are being developed to deal with materials and conditions peculiar to the region.

Industrial promotion should, therefore, be based upon the results of research, without which orderly and logical development is impossible. Industry offers a challenge to a very diverse group of researchers to carry out the investigations that will assure permanent rather than transitory benefits to the region through successful rather than unsuccessful industrial promotions.

Sufficient examples have probably been cited to indicate that research has a vital role in promoting orderly and logical economic development. Two conditions, however, are essential: (1) close cooperation among physical and social scientists, technicians, and administrators to secure coordination and eliminate duplication of effort, and (2) the results of research must be made available to all who can use them so that they can be put to work.