

Chapter X

Region 6, Alaska

Known as Region 6, Alaska acquired its regional status within the Fish and Wildlife Service shortly after World War II. The regional headquarters were in Juneau, the capital city. Alaska kept its status as a separate region until 1962 when its regional functions were transferred to the regional office in Portland, Oregon, and it became a part of the BSW's Pacific Region.

The early conservation history of Alaska is interesting. With no pretense at being other than fragmentary, some of that history's highlights are mentioned herein in the belief that they may throw some light on the current role of the BSW in its river basin studies operations. They have largely been abridged from Jenks Cameron's 1929 book on the Bureau of Biological Survey.

The initial interest of the U.S. Government in the fish and wildlife resources of Alaska after the Territory was acquired by the United States from Russia in 1867 for \$7,200,000 lay in the fur seals, considered at the time to be the most valuable source of revenue. They were at once placed under protective legislation. It was not long thereafter, however, when it was recognized that the fisheries were more valuable and the need became manifest that the salmon fisheries needed protection as well.

Supervision of the salmon fisheries, as of the seals, was at first given to the Treasury Department. Later, in 1903, it was transferred to the Department of Commerce and Labor, to be administered by the Bureau of Fisheries. By 1908, that Bureau had three agents in the field, checking on the methods used for catching salmon, preparing and marketing them, enforcing existing laws, and handling related activities. The function was called the Alaska Salmon-Inspection Service. There were problems. Quoting from Hugh M. Smith's paper of 1908:^{1/}

"The protection of the Alaska salmon fisheries has been a difficult problem. The unheard-of-magnitude of the resources invited a corresponding recklessness and improvidence. As the canning industry developed, every device that could be used for wholesale capture of fish was put into operation,

^{1/} International Fisheries Congress, by Hugh M. Smith, Bureau of Fisheries, Govt. Printing Office, Wash., D.C., 1908, pp. 47-49.

and gradually all of the favorite streams of the salmon became so blocked with seines, gill nets, traps, and barricades that but a small proportion of the fish could find passage to the spawning grounds, and the future supply was thus most seriously endangered. The Alaskan aborigines likewise conducted their fishing in a very destructive way, often placing impassable barriers in streams up which salmon were running, and, through ignorance or indifference, leaving the obstructions in place after the full supply of fish had been secured. It was soon apparent that the laws and regulations were inadequate to meet the special conditions prevailing, and were of such a nature as to make their enforcement very difficult.

"In 1903 a special commission was appointed to make exhaustive study of the natural history of the salmon of Alaska and to submit recommendations for an improved regulation of the fisheries. As a result a new code of laws is now in effect and promises to prevent the threatened decline in these enormous industries. With increased restrictions as to fishing methods, obstructions in streams, close seasons, etc., the Department of Commerce and Labor is empowered to set aside any streams as spawning preserves whenever such course shall be desirable, all fishing in such waters to be prohibited. A license tax is required on all salmon products; from the payment of this tax, however, all canning and salting establishments are exempted upon condition of their returning young salmon to the streams in the ratio of 1,000 fry to every 10 cases of salmon canned. Three private hatcheries, representing extensive canning interests, were in operation in 1907 and liberated a total of 119,000,000 young fish. The Government itself has undertaken extensive hatchery work, having now in operation a station at Yes Lake established in 1905 and one at Afognak Bay just completed. In the two years of its operations the Yes Bay hatchery has produced and liberated over 61,000,000 salmon fry.

"The seal and salmon fisheries have hitherto overshadowed all other aquatic resources in Alaska, not only in commercial value but in revenue to the Government. The rental from the fur-seal islands alone has more than repaid the purchase price of the Territory, and the tax derived from the salmon fisheries now amounts to about \$90,000 a year. Some long-neglected products are gradually coming into importance, however, and the cod, halibut, and herring fisheries especially have undergone remarkable development in the last few years. Since it became a part of the United States, Alaska has yielded fishery products amounting in value to \$158,000,000, of which about \$49,000,000 was derived from fur seals, \$86,000,000 from salmon, and the remaining \$23,000,000 from all other aquatic

products. The sum paid by the United States to Russia for the Territory of Alaska was only \$7,200,000."

According to Jenks Cameron, the Bureau of Biological Survey likewise became involved in Alaska at a comparatively early date. He recounts that Mr. Edward H. Harriman of New York organized and financed an elaborate scientific expedition to the Territory in the summer of 1899 and that the Survey participated in it by request.^{1/} It also participated in the same expedition in 1900. In 1899 the Survey also made a reconnaissance survey of the entire Yukon River. Succeeding years found that agency making faunal surveys along the Alaskan spurs of the Rocky Mountains, in the upper and middle Yukon, about the base of the Alaskan Peninsula, and among some of the southeastern Alaskan islands. These investigations were biological explorations, concerned with the identification of species and their habitats, studying life histories, making zonal maps, and collecting related data. Such work in Alaska was an extension of similar work being performed in the United States, notably in the Western States. Today, such surveys probably would be called baseline reports.

In those early territorial days, market hunting was flourishing in Alaska and there was a great commerce in the carcasses of deer, mountain sheep, moose, and bears and in skins and trophies. Concern over such wanton practices mounted with sportsmen. At the behest of their organizations and especially with the Boone and Crockett Club, a movement began that resulted in the passage of the Act of June 7, 1902 (32 Stat. 327). It was a game protective statute that established seasons, bag limits, hunting restrictions, and the usual features of such acts. The Boone and Crockett Club of course had a membership of influential and wealthy sportsmen and their voices were heard.

Thanks to the cooperation of the Treasury Department, the law did stop the shipping out of game, hides, and trophies by the wholesale. But with no active warden force, its effect upon such abuses as killing out of season, wasting game, et cetera, long committed in Alaska, was negligible.

It was an unpopular law in the Territory and stirred up a great deal of bitter feeling. Alaskans believed they were being discriminated against, especially in the matter of permits to ship trophies, in favor of the wealthy sportsmen from the continental United States who invaded the Territory in considerable numbers each year. Most of them went to the Kenai Peninsula after the giant moose found there. In the interest of perpetuating the Kenai moose and other game of the region the Department of Agriculture through the Biological Survey began to restrict the issuance of permits for the shipment of trophies from the Kenai country. Though efforts were made to administer this feature of

^{1/} Bureau of Biological Survey, Its History, Activities, and Organization, by Jenks Cameron, Johns Hopkins Press, Baltimore, Md., 1929, p.35.

the law with impartiality, Alaskans wanted "home rule" in the granting of permits. Therefore, with full approval of the Survey and of the sportsmen's organizations which had worked for the passage of the 1902 law, that law was radically amended and enlarged by the Act of May 11, 1908 (35 Stat. 102). It gave the territorial Governor the right to issue licenses, which were required both for hunting and exporting instead of the former permits. He also acquired the right to name wardens and prescribe rules and regulations. The old permit system continued to apply to hunting for scientific collecting and to exporting of specimens for propagation, exhibition, or scientific purposes, the permits in all cases being issued by the Secretary of Agriculture. Game matters continued to be administered under the 1908 amendment until 1925.

Some other developments had occurred in the early days of the Territory. In 1879 the Treasury Department had jurisdiction over the Pribilof Islands in the Bering Sea for the better protection of the great seal herds there. By the Act of March 3, 1879 (20 Stat. 383), Congress gave the Secretary of the Treasury the right to lease lands that were unoccupied and unproductive. Thus in 1882, that Secretary began to lease a number of small islands off the southern coast of Alaska for the propagation of foxes.

When the statute creating the Department of Labor and Commerce was enacted in 1903 (32 Stat. 825, 829), the authority of the Treasury Department to protect the seals and lease islands for fox raising, though the foxes ran wild at the time and were merely trapped, went to the new Department of Labor and Commerce and hence to the Bureau of Fisheries. Thereby, that bureau inherited the authority for handling fur seals and inferentially all fur-bearing animals as well.

That jurisdictional difficulty between the Bureau of Fisheries and the Bureau of Biological Survey arose is not surprising. The root of the problem lay in the laws under which the two bureaus operated, basically in the functions that were inherited from the earliest days of American jurisdiction of the territory.

On that aspect and the related complications involving the Department of the Interior, then responsible for the territorial government in Alaska, Jenks Cameron had the following to offer:^{1/}

"Meantime the act of April 21, 1910 (36 Stat. L., 326, 327), providing for the protection of the fur seals of Alaska, and

^{1/} Ibid., pp. 114, 115.

for other purposes, had been passed. This act made some substantial changes in the fur-seal protective procedure, but the fur-bearing animal situation was left practically as it had been, save that the jurisdiction with regard thereto was in the Department of Commerce and Labor instead of in the Treasury. In 1910, therefore, the wild life jurisdiction in Alaska was a somewhat scattered affair. The Department of the Interior, through the territorial government of Alaska, divided the jurisdiction as to the game phases of it with the Department of Agriculture, represented in the premises by the Biological Survey. The fur-bearing part of it was held by the Department of Commerce and Labor, through the Bureau of Fisheries. The result was an awkward division of authority.

"This fact was soon recognized by the Bureau of Fisheries, and, when sentiment began developing for a readjustment, that Bureau interposed no objections. In fact in their annual reports for 1919 both the Secretary of Commerce and the Commissioner of Fisheries expressed the desire that jurisdiction over land fur-bearing animals be transferred to the Biological Survey. A bill was introduced in Congress in 1917 providing for the transfer, but nothing came of it.

"Finally, however, the unsatisfactory situation was largely, but not entirely, cured by the act of May 31, 1920 (41 Stat. L., 694, 716), which transferred all powers and duties with regard to all land fur-bearing animals in Alaska to the Secretary of Agriculture; and transferred to the Secretary of Commerce all powers and duties with regard to walruses and sea lions, which the game laws of 1902 and 1908 had placed, rather incongruously, with the Secretary of Agriculture. Along with this readjustment went the leasing rights for fox-farming purposes of those twelve 'certain islands' off the coast of southern Alaska, which the Secretary of the Treasury had acquired back in the eighties. These islands were mostly in the Semidi, Chugach, and Shumagin groups. It developed after the 1920 transfer that two of them now lay within the boundaries of the Chugach National Forest, so those two were transferred to the Forest Service in order that its jurisdiction might be complete, and that their leasing for fox propagation might be handled by the authority logically situated therefor. Already for several years the Forest Service had been leasing islands for this purpose which lay within the two Alaskan national forests, under its system of special use permits.

"The improvement brought about by this legislation was that whereas before its passage fur-bearing animal jurisdiction and game animal jurisdiction had been absolutely separated, departmentally, they were now only partially separated. The Biological Survey now had full land fur-bearing animal jurisdiction and - under the just-mentioned 1908 amendment - full game jurisdiction, subject to the 'home rule' device which put the granting of licenses in the hands of the Governor of Alaska together with the control of the game warden service. This was undoubtedly a great improvement over the status existing prior to the law's passage, but that it contained the seeds of discord scarcely needs to be pointed out. Land fur-bearing animal protection was now to be administered entirely by one authority, the Biological Survey of the Department of Agriculture; and game animal protection, almost entirely by another, the territorial government of Alaska, under the Department of the Interior."

In a footnote bearing on the readjustment between the two bureaus, Cameron stated:^{1/}

"Early in 1915 a joint committee of the two departments concerned was appointed to devise a plan to simplify the administration of the Aleutian Islands Bird Reservation in Alaska, which had been created by executive order two years before, with respect to fur farming therein. The reservation itself was under the Survey, but the fur-bearing animal administration thereof under the Bureau of Fisheries of the Department of Commerce. It reported that such a distribution of authority was unwise and should be adjusted to conform to the functions and equipment of the two departments. Both departments concurred in the recommendation. See Department of Agriculture, Annual Report, 1915, p. 36."

Another event, leading finally to better order in the administration of Alaska's wildlife, may merit mentioning.^{2/} Reindeer had been introduced into Alaska from Siberia in 1892 to furnish the Alaskan Eskimos with a profitable operation. Between 1892 and 1902, 1,280 of the animals were imported, the original herds being established around Teller on the Seward Peninsula. By 1920 the original importations had increased to 200,000 animals, not counting about 100,000 that had been killed for food and clothing.

1/ Ibid., p. 115.

2/ Ibid., pp. 116-119.

The original intention had been that the experiment should be for the benefit of the Eskimos alone. But the Bureau of Education, which had brought the reindeer over, also brought in some Laps from northern Norway to teach the Eskimos in reindeer handling. The Laps acquired some small bunches of the animals for their own in the form of bonuses granted them from the increase to retain their interest. In time, some of them sold off their holdings to other white men who had seen the possibilities of reindeer raising in a territory capable of grazing 3-4 million animals.

So the Bureau of Biological Survey was commissioned in 1920 to review the situation. Dr. E.W. Nelson, Chief of the Survey, made a trip to Alaska in 1920. ~~As a result of his visit, a laboratory was set up at Unalakleet to study parasites and diseases of reindeer, grazing requirements, forage plants, and methods of herding.~~ The experiment station was moved to Nome in 1922, and to Fairbanks in 1925 so that the research could be conducted in cooperation with the Alaska Agricultural College (now the University of Alaska) and the Alaskan Railroad.

Demand for straightening out the divided wildlife authority kept mounting. So on his return from his reindeer visit, Dr. Nelson drafted a new law providing for the administration of both the game and the land fur-bearing resources by the same authority. The draft was studied and criticized intensively by Alaskans and such organizations as the Boone and Crockett Club, the Camp Fire Club of America, the American Game Association, and the National Association of Audubon Societies.

A measure evolved that was satisfactory to practically all parties. The result was the passage on January 13, 1925 (43 Stat. 739), of the "Act to establish an Alaska Game Commission to protect game animals, land fur-bearing animals, and birds, in Alaska, and for other purposes." It became best known for its short title as the "Alaska Game Law."

In brief, the Bureau of Biological Survey, acting for the Secretary of Agriculture, was put in the position of the Governor of Alaska under the 1908 law, thus concentrating in it all Alaskan wildlife authority regarding game and fur animals. Steps were taken to end the anomalous situation created by the existing dual warden force. One force, known as the United States game wardens, acting under one chief Alaska game warden, was created to enforce game laws and fur-bearing animals alike. It is interesting to note in this connection that under the 1908 law, the Governor of Alaska appointed wardens within the Territory and that the Bureau of Biological Survey, after the 1920 readjustment with the

Bureau of Fisheries, had a fur warden force of one chief and about a dozen deputies, having supplanted a somewhat similar fur warden force that had been maintained prior to 1920 by the Bureau of Fisheries.

The 1925 law provided for a five-man Commission, one member of which was the chief Alaskan representative of the Survey and, ex-officio, the Commission's executive officer and fiscal agent. The law was hailed as a model game act. It established unity of control as to all forms of Alaskan land-wildlife under the Biological Survey while recognizing the Alaskan passion for home rule. Seals, sea lions, walruses, et cetera, continued to remain under the jurisdiction of the Bureau of Fisheries, and with some changes in recent times continue to remain so under its descendant agency, the National Marine Fisheries Service.

As mentioned, the point in touching briefly on the historical divided jurisdiction of wildlife in Alaska is to identify some of the traditional roots of the Bureau of Fisheries and the Bureau of Biological Survey. In the view of the writer, such roots had a bearing on subsequent events related to the function that came to be known as river basin studies.

Early investigations in Alaska as elsewhere with respect to the effects of hydroelectric power projects on fish resources were conducted by the Bureau of Fisheries. The Federal Power Commission, an independent regulatory agency, came into being under the Federal Power Act of June 10, 1920 (41 Stat. 1073). Having the authority to issue licenses to applicants for hydropower projects, it also had the power under its organic law to require applicants to provide fishways to enable migrating fish to get around obstructing dams. To do so, the Commission requested the Bureau of Fisheries to supply its views on applications. The Bureau's functions were advisory in nature; it had no power to insist that its recommendations were carried out.

In Alaska, a substantial number of such applications were reviewed over the early years by the Bureau of Fisheries. Most of the proposals seem to have been of a minor nature and since they interposed no difficulties, were approved out of hand. An example of the handling of such applications appears in the annual report of the U.S. Commissioner of Fisheries for fiscal year 1933 under the heading "Water-Power Projects in Alaska":^{1/}

^{1/} Report of the U.S. Commissioner of Fisheries to the Secretary of Commerce for the Fiscal Year 1933, Govt. Printing Office, Wash., D.C., 1934, p. 21.

"Eight applications for licenses for minor power projects in Alaska were referred to the Bureau by the Federal Power Commission for report as to whether any special conditions for the protection of migratory fish should be included in the licenses, if issued. These applications were for projects located at the following places: (1) and (2) Baranof River, within Tongass National Forest; (3) an unnamed stream at Ward Cove, Revillagigedo Island; (4) Hanley Creek, McClure Bay; (5) Sahlin Creek, Sheep Bay; (6) San Juan Lake and Creek, Evans Bay, Evans Island; (7) Stevens Creek, Orca Inlet; and (8) an unnamed stream on the west shore of Upper Trail Lake, within Chugach National Forest.

"Upon the basis of information from field agents of the Bureau the Commission was notified with respect to each case that the stream in question was not a spawning ground for salmon, and that therefore the Bureau had no objection to the utilization of the waters for power development."

Other annual reports of the U.S. Commissioner of Fisheries provided similar summaries of investigations of minor power projects by the Bureau of Fisheries. There may have been some isolated cases of major as well as minor projects that called for fishways but the references available to the writer do not so indicate. The major interest in big hydropower proposals in the early 1920's and 1930's were centered in the Pacific Northwest in Washington and Oregon, and also in California.

During the early post-World War II years, when the river basin studies activities were taking on a new and broader dimension in the United States, the chief concern of the Fish and Wildlife Service in water-resource projects in Alaska seemed to have centered on hydropower projects, the licenses on many of which were up for renewal. Bud Elkins was chief of Federal aid activities in the Fish and Wildlife Service regional office in Juneau during the late 1940's and recounted his early experiences with Federal Power Commission license applications. With no river basin studies staff, whoever had some knowledge of a particular stream where a renewal of a license or a new license was in the making, that party was drafted to lend his knowledge to the situation and assist in drafting a letter report to the Federal Power Commission.

A personal interview with Urban D. (Pete) Nelson, who was in the Federal Aid Division with Bud Elkins and had a hand in the early river basin studies activities at the time, corroborates Bud's account of the early days in Juneau. Now retired and living in Juneau, Pete was the last regional director of the Bureau of Sport Fisheries & Wildlife before the

Alaska regional office of that Bureau was abolished in 1962. Not long after his retirement in the late 1960's, Pete for a short time became the Commissioner of the Alaska Department of Fish and Game, a position equivalent to that of director of other similar State fish and game agencies.

The first full-time river basin studies employee of the Fish and Wildlife Service in Alaska was Melvin A. (Mel) Monson. He was an aquatic biologist with the Minnesota Conservation Department in 1944-48, prior to engaging as a commercial fisherman first in Wisconsin and then in Alaska. Giving up commercial fishing in September 1950, he became an engineering aid and photographer for the Bureau of Reclamation on the Eklutna Project, a hydroelectric power proposal to supply power to the cities of Anchorage and Palmer and the outlying districts.

An early shot in the arm for Anchorage came in 1935 when 200 families from the drought-stricken midwestern United States were transported to Alaska in the nearby Matanuska Valley by the Government-directed Alaska Rural Rehabilitation Corporation. With the War years, thousands of workers were rushed north to undertake new defense projects.

Anchorage flourished. And as it continued to grow, its demands for electric power kept mounting. The Government's response, through the Bureau of Reclamation, was the Eklutna Project the surveys for which were made in mid-1948. Construction started in April 1951 and was completed in June 1955. It diverts water from Eklutna Lake through a 4.5-mile 9-foot diameter tunnel to a penstock which conveys water to the powerplant at the base of a mountain on Knik Arm, an inlet to the sea close to Anchorage.

Because other projects in Alaska were in the making, there was stirring in the Central Office of the Fish and Wildlife Service to establish a full-fledged river basin studies office in the Territory where the investigations of water-resource projects could be centered. One of those projects was Reclamation's proposal for 19 potential dams for hydropower purposes on the Susitna River, which drains south-central Alaska and empties into Cook Inlet, a few miles west of Anchorage. In accordance with the Fish and Wildlife Coordination Act of 1946, Reclamation asked the Juneau regional office of the Fish and Wildlife Service to review the proposal for its effects on fish and wildlife.

It was felt by the Service's regional people in Juneau that they had nobody on hand to do justice to the review. At the behest of Bud Elkins, the Service asked for the services of Mel Monson who was a trained biologist and had some experience with Reclamation by virtue of his employment with that agency. Consequently, Mel went to the Service on a special assignment in 1952 to review and report on the Susitna River proposal. Mel's endeavors resulted in a Service report entitled, "A Preliminary Report on Fish and Wildlife Resources in Relation to the Susitna River Basin Plan, 1972."

That special assignment of Mel's developed into a permanent association with the Service for Mel was chosen to establish the new and first river basin studies Alaska field office in Anchorage in July 1952. Perhaps typical of the Fish and Wildlife Service in those days, he was initially offered a transfer to the Service at the same grade he held with Reclamation, a GS-7. He declined. The Service finally agreed to raise him to a GS-9, whereupon he agreed to the transfer.

The writer well recalls the opening of the Anchorage field office. He had returned to Billings from Sacramento in July 1951. With the opening of the new Anchorage field office in July 1952, Rudolph Dieffenbach, heading up what was then known as the Office of River Basin Studies, called the writer on the long-distance phone and asked him if he would be willing to go to Anchorage for two or three months and assist in getting the office established. The writer had just contracted for having a new home built in Billings and was watching it grow with anticipation. But he was willing to go to Anchorage for the detail. He had once before missed going to Alaska, it could have been in 1931 or 1932, when he was offered a job cruising timber with the Forest Service out of Ketchikan. He looked forward to that experience between college years. His disappointment was keen when a wire on the eve of his departure notified him that the anticipated appropriation fell through and the hiring could not be made.

Here, twenty years later, was another opportunity to visit Alaska, if for but a short time of a few weeks. But in his telephone call Dief cautioned that funds were tight and that the Anchorage detail to get Mel and one or two others on his staff started, might, it just might have to be cancelled. It was. A week or two later Dief called again, saying that because funds were lean for the ensuing fiscal year the writer's anticipated detail of assisting the new Anchorage field office would have to be abandoned. It was strike two on visiting Alaska.

Gordon W. Watson left the Billings field office in November 1952, initially driving alone to Anchorage, to join Mel Monson's lean staff as a wildlife biologist. Gordon for long had a yen to go to Alaska, making his desires known to the Central Office when he attended the Interior Department's management training course in Washington, D.C., somewhat earlier. In his zeal to go to Alaska, he committed himself to go laterally, with no raise in grade.

In discussing his move with the writer in Billings, the latter suggested to Gordon that he should ask for a grade raise. His response was that he had committed himself to go as a GS-7 wildlife biologist. Well, he hadn't departed yet. He pondered the suggestion, finally wrote the Central Office that he had reconsidered and believed the move warranted a grade raise to a GS-9. There was some grumbling in the Central Office but the

grade raise was granted and Gordon took off. He was grateful for the counsel. In those days, grades were not what they are today and a GS-9 was not to be ignored. In Gordon's words, his new grade commanded respect by his peers in other Federal agencies.

The Anchorage field office was an outpost in those days. Yet, all river basin studies work in Alaska was processed out of that office. The regional office of the Fish and Wildlife Service was in the capital city of Juneau 500 miles to the southeast and there was no regional supervisor to give the operation guidance. In a real sense, Mel Monson, Gordon Watson, and a typist, the total complement of personnel of the Anchorage field office in those early days, were on their own.

The situation of one small river basin studies field office in Alaska obtained until 1956 when Mel moved to Juneau and established a new field office there. Gordon Watson became the field office supervisor in Anchorage, succeeding Mel. Gordon then obtained the services of Jack Lentfer and Don Thurston. The field office in Juneau started up with Mel, who then acquired the services of Robert W. McVey, Dale R. Evans, and one typist.

The Fish and Wildlife Act of August 8, 1956, broke up the Fish and Wildlife Service into a Bureau of Commercial Fisheries and Bureau of Sport Fisheries and Wildlife, as mentioned earlier. Much of the fish and wildlife activity in Alaska of course pertained to commercial fisheries, especially the important anadromous salmons. Moreover, the historic responsibilities for managing the fur seals of the Pribilof Islands, and the walrus, sea otters, and other marine mammals went to the new Bureau of Commercial Fisheries. Remaining with the Bureau of Sport Fisheries and Wildlife were such activities as game law enforcement, Federal aid in wildlife restoration, wildlife refuge management, and predator and rodent control. Important though such activities were, the loss of the fisheries responsibilities and of marine mammals left the new Bureau of Sport Fisheries and Wildlife in a relatively weakened position.

The question arose as to what to do with river basin studies. Its function crossed over into both of the two new bureaus. The impact of water-resource projects on the fisheries that became the responsibility of the Bureau of Commercial Fisheries appeared to be more important than the impact on wildlife resources. It was thus decided by the powers in control of making such decisions that the river basin studies function should be housed in its entirety in the Bureau of Commercial Fisheries. And so it came about that unlike the river basin studies in the United States which remained in the Bureau of Sport Fisheries and Wildlife, that function in territorial Alaska went to the Bureau of Commercial Fisheries. As in the case of the Columbia River fisheries program, the funds for the river basin studies operation were obtained by the Bureau of Sport Fisheries and Wildlife in its budget requests and transferred to the Bureau of

Commercial Fisheries. The arrangement was in keeping with Reorganization Memorandum No. 20 of September 8, 1959.^{1/}

While in charge of the field office in Juneau, which covered all of southeastern Alaska, Mel Monson also performed in the capacity as staff advisor to the regional director of the Bureau of Commercial Fisheries.

Paralleling the regional river basin studies organizations of the Bureau of Sport Fisheries and Wildlife in the United States, the Bureau of Commercial Fisheries regional office in Juneau decided to establish a regional supervisor's position. Gordon Watson, the supervisor of the Anchorage field office got the post and moved into the new position in October 1961. He was succeeded in the Anchorage field position by Charles D. Evans, who had earlier for about ten years worked in river basin studies out of the Minneapolis regional office.

Gordon Watson held the regional supervisor's job in Juneau to August 1965, when he went back to school, to the University of Michigan, to work on his doctor's degree. In August 1967, he spent some time in the Central Office of the Bureau of Commercial Fisheries working on programs and budgets, following which he resumed his studies at the University of Michigan. In mid-June 1970, he became the first director of the Anchorage Area Office of the Bureau of Sport Fisheries and Wildlife, a position somewhat analogous to a regional director's position in the Lower 48 States.

Mel Monson transferred to the Central Office's river basin studies operation in October 1961. Prior to his departure, he concentrated on regional office activities whereas Robert McVey served as supervisor of the Juneau field office operation. Mel returned to Juneau in January 1967 to become the regional supervisor of river basin studies with the Bureau of Commercial Fisheries.

Jack Lentfer left the RBS operation in Anchorage in January 1964 and was succeeded by Ray Morris who transferred from the Juneau field office. Dale Evans moved to Anchorage for a short time, then on to Fairbanks where he stayed through 1964. Dale moved back to Juneau in 1965. Bob McVey left Juneau for Washington, D.C., in January 1966, and a foreign assignment. When Mel returned to Juneau in 1967, the staff consisted of Dale Evans and a secretary; in Anchorage, there were Charles Evans, Don Thurston, and a stenographer. With Mel, the total RBS operation in 1967 thus consisted of four professionals and two typists.

^{1/} See Exhibit 26, Appendix.

With the transfer of the Bureau of Commercial Fisheries to the Department of Commerce under the National Oceanographic and Atmospheric Administration and renamed the National Marine Fisheries Service on July 9, 1970, the river basin studies function in Alaska went to the Bureau of Sport Fisheries and Wildlife. Mel Monson then moved to Anchorage as regional supervisor of the operation under Gordon Watson who, as noted, became the first area director of the new office. In January 1971, Don Orcutt transferred to Anchorage, to become Mel's assistant regional supervisor. He came from the Boise field office of the NMFS Columbia River fisheries program. Don retired from Government service in the spring of 1973.

There were other developments in Alaska during the years mentioned above. Alaska lost its territorial status with the passage of the Alaska Statehood Act of 1958 and became the 49th State of the Union. In becoming a State, it acquired some of the functions held by the Fish and Wildlife Service. A newly formed Alaska Department of Fish and Game was established and began functioning.

As a consequence, the regional office of the Bureau of Sport Fisheries and Wildlife in Juneau became still weaker and, in terms of personnel, considerably smaller. Justifying the retention of a regional office for reduced activities became increasingly difficult. As a result, 1962 saw the abolishment of the remnant of a once much larger regional office and the transfer of its functions to the regional office at Portland, Oregon.

There is no regional office of the Bureau of Sport Fisheries and Wildlife in Alaska today. Something resembling a regional office was initiated in July 1970 in Anchorage and called an area office. Currently, many of its administrative functions of a housekeeping nature, covering personnel actions, contracts, fiscal matters, et cetera, still remain with the Portland regional office. Only time will tell whether the Anchorage area office will develop into a full-fledged regional office of the Bureau of Sport Fisheries and Wildlife.

When the river basin studies function was transferred from the Bureau of Commercial Fisheries to the BSWF in Anchorage in July 1970, the river basin studies employees were given the option of staying with what became the National Marine Fisheries Service or transferring to the Bureau of Sport Fisheries and Wildlife. It was a difficult decision for some. As indicated, Mel Monson moved to Anchorage. The river basin studies field office stayed in Juneau but no longer was responsible to the National Marine Fisheries Service office next door; it became responsible to the Anchorage area office. Wayne E. Oien, a biologist with the Juneau field office, took over as supervisor of its operation. Wayne had earlier worked in the Portland, Oregon, river basin studies field office, and later, in the Spokane, Washington, field operation prior to transferring to Juneau.

One professional who decided to stay with the National Marine Fisheries Service was Dale R. Evans. His stenographer also elected to stay. Dale joined the river basin studies staff in 1959 when it was lodged in the Bureau of Commercial Fisheries. Dale had wide exposure in Alaska, working on potential hydropower sites of the Bureau of Reclamation and Corps of Engineers, and applicants for Federal Power Commission preliminary permits and licenses. With Mel's leaving for Anchorage in 1970, Dale became to all intents and purposes a regional supervisor of river basin studies with the National Marine Fisheries Service, except that the function within that agency became known as a division of water-resource projects and Dale's title became that of a regional coordinator for such projects.

When the Bureau of Commercial Fisheries left the Department of the Interior and went to the Department of Commerce in July 1970, in an organizational sense it severed all past ties with its former sister agency, the Bureau of Sport Fisheries and Wildlife. It was now independent of Interior and past policies and dictums of that department no longer obtained. But though it lost the river basin studies function in name, it did not do so in fact. Because of its involvement in anadromous and commercial fisheries of Alaska, a great responsibility indeed, it could not very well afford to ignore water-resource projects in their effects on its sphere of responsibilities, particularly in Alaska's important estuarine zone. It had no choice but to set up a river basin studies function of its own.

In Alaska today, as elsewhere, the National Marine Fisheries Service prepares its own reports on selective water-resource projects and particularly so on navigation permits, the applicants for which are compelled by law to obtain them from the Corps of Engineers before going ahead with any proposals, whatever their nature, in the navigable waters of the United States. The regional office of the National Marine Fisheries Service in Juneau collaborates closely with the Bureau of Sport Fisheries and Wildlife. After all, river basin studies biologists in Alaska at one time were one family in the same agency and the organizational convolutions of Government, though they have to be reckoned with, do not inhibit professionals from working together in a common cause. Perhaps the pity is that such dedicated people have to be divided.

Waine E. Oien is currently the supervisor of the Juneau river basin studies field office. He has a small staff. His office occupies space in the Federal Building.

Charles Evans, supervisor of the Anchorage field office following Gordon Watson's departure for Juneau in 1961, held that position until December 1971 following which he joined the Sea Grant program of the University of Alaska. Working with scientists of other disciplines, in August 1972 he was working on an atlas of the resources of the Gulf

of Alaska. He was succeeded in the Anchorage field office by Donald B. Thurston, present supervisor of that field unit. Don joined the RBS operation at the field office Anchorage, Alaska, as a fishery research biologist in January 1957. He was acting supervisor of that office for awhile prior to becoming supervisor in May 1973. Earlier work with the FWS included summer work at Yellowstone National Park in 1950. Don also worked for a short time for the Utah Game and Fish Commission and for the Nevada Fish and Game Commission from the fall of 1951 to December 1956. Starting in October 1950, he also had experience as an oceanographer with the U.S. Navy following which he went to Nevada.

Robert McVey left the river basin studies operation but stayed with the Bureau of Commercial Fisheries. He is currently the assistant regional director of the National Marine Fisheries Service in that city.

The small Anchorage field office handles water-resource projects and related activities in western Alaska above the coastal town of Yakutat, just about where the panhandle joins the Alaska pan. Southeastern Alaska below Yakutat is the area of responsibility of the Juneau field office. It covers the Alaska panhandle proper, the sounds, straits, and islands of the Alexander Archipelago, and the drainages of the mainland emptying into the sea below Yakutat.

Alaska appears to be a world of its own. Its rich natural resources, including its fish and wildlife, have long commanded the respect and interest of various Government agencies, diverse organizations, and private individuals. While pockets of wilderness and of frontier living exist in the lower 48 States, Alaska still has vast areas that have never been exploited or developed. If in spite of the airplane a last frontier of any size still exists in the United States, it has to be in Alaska.

Yet, this largest State of the United States with a land area of 586,000 square miles and a shoreline of an unbelievable 33,000 miles, with its astonishing treasure trove of mineral resources, timber, and fish and wildlife, is undergoing change. Unlike the slow change that historically followed exploration in the Lower 48 States, Alaska since World War II has literally gone from the dogsled era to that of the airplane. In so doing, it may be overlooking the need to pause and take stock of the direction it is taking. The misfortune may lie in not reckoning with the cost of developing its natural bounty.

The stirrings of growth and development of Alaska in the post-World War II years, largely centered on hydroelectric proposals for harnessing Alaska's rivers, spurred the interest of river basin studies biologists on the effects of such development on fish and wildlife. A

case in point was the expressed joint interest of the American Aluminum Company of America and the Canadian Frobisher with Ventures, Ltd., in high dams on the upper Yukon River in Yukon Territory, Canada. Though the project was expected to be located almost entirely within Canada, American salmon resources would be affected. Since information on the fishery resources of the remote area were limited, FWS people began gathering preliminary information and compiling it. Mel Monson supervised their efforts. They contacted members of the Royal Canadian Mounted Police, the Canadian Department of Fisheries, the Yukon Territorial Game Commission, Fish and Wildlife Service people, and various residents of the small towns in Yukon Territory who displayed interest in the work and provided background information.

The preliminary plan of Frobisher with Ventures, Ltd., called for a 140-foot dam on the Yukon River near Whitehorse, diverting its dammed waters through tunnels into lakes and a creek thence into the Taku watershed on the west side of the Coast Range where powerhouse facilities would be located. Also called for was a dam on one of two alternate sites on the main stem of the Yukon below Whitehorse. Either site would have called for a dam at least 160 feet in height. Its function would have been that of a control structure to assure navigation on the river below Whitehorse.

The preliminary plan proposed by the Aluminum Company of America called for a dam at Miles Canyon on the Yukon River above Whitehorse. The diversion of its reservoir waters was to have been by means of a tunnel through the coastal mountain range to generating units located at tide-water on the Taiya River near Skagway.

Investigation in the upper Yukon Basin entailed two major phases, one on the ground in May of 1955 to obtain general information on the magnitude, distribution, and time of arrival of salmon runs. The second phase was an aerial survey during the latter part of August of 1955 to determine spawning areas and the numbers of salmon utilizing them.

The effort resulted in an assessment of the salmon runs in Canada, greater in magnitude in the Teslin River watershed than in the Yukon River above the confluence of the Takhini River. Limited though the data were, they were indicative of what was learned that summer of 1955. They were summarized in a report of April 1956, revised in December 1957.^{1/}

^{1/} Progress Report No. I, A Special Report on the Salmon Resources of the Upper Yukon River Basin (above Carmacks), Yukon Territory, Canada, Fish and Wildlife Service, Juneau, Alaska, Apr. 1956, Revised Dec. 1957, 26 pp.

The specter of additional hydroelectric power development in the Yukon River in Alaska spurred additional studies covering the entire Yukon Basin. And so subsequent reports were issued in 1957 on the Yukon River Basin proper^{1/}; in 1958 on the Upper Yukon River Basin between Eagle, Alaska, and Carmacks, Yukon Territory^{2/}; and another in 1957 on the Lower Yukon River below Marshall.^{3/}

All of these reports were of a preliminary nature, assessments as it were to bring together as much information as could be collected in limited time. They were pioneering river basin studies reports to gather as much knowledge as possible from whatever sources and pull it together between covers. Some of the data were collected on the ground but other sources of information were tapped including fish canneries, biologists whatever their agency or divisional affiliation, aircraft pilots, past reports of the U.S. Bureau of Fisheries, bulletins of the American Museum of Natural History, and other literature. All available statistics were utilized and sifted to pick out relevant data to identify the importance of fish and wildlife in the economy of the basin.

Some idea of the size of the Yukon River Basin can be gleaned from the fact that it covers 330,000 square miles, about 60,000 square miles larger than the State of Texas. About half of the basin lies in Alaska, the balance in Yukon Territory and British Columbia. The Yukon River itself flows 2,300 miles from its origin. About 1,300 miles of it are in Alaska, the balance in Canada. It is one of the great rivers of the North American continent, the fifth largest after the Mississippi, Mackenzie, St. Lawrence, and Columbia.

Oddly enough, the Yukon River originates within 30 miles of the Pacific Ocean, in the region northeast of Haines and Skagway. From its origin in lakes on the east side of the Coast Range in Canada, it flows northwesterly in a big arc with its apex at Fort Yukon just above the Arctic Circle and continues on a southwesterly course before it empties into

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- ^{1/} Progress Report No. II, General Information Relative to the Fish and Wildlife Resources of the Yukon River Basin, Fish and Wildlife Service, Juneau, Alaska, Nov. 1957, 48 pp.
 - ^{2/} Progress Report No. III, Fishery Resources of the Upper Yukon River Basin Between Eagle, Alaska, and Carmacks, Yukon Territory, Fish and Wildlife Service, Juneau, Alaska, Jan. 1958.
 - ^{3/} Progress Report No. IV, Fish and Wildlife Resources of the Lower Yukon River (Marshall to Mouth), Fish and Wildlife Service, Juneau, Alaska, Feb. 1957, 33 pp.

the Bering Sea. It has nine major tributaries in Alaska and four in Canada. In size of flow, it resembles the Columbia River of the Pacific Northwest.

The basin is sparsely populated. Not counting its guessed at military population of 35,000 at air bases and other installations in the Fairbanks area, in 1950 it had but around 14,000 resident inhabitants. About two-thirds were in Fairbanks, the rest in smaller towns many of which were native villages that had less than 200 people in a village. From the Canadian border to Marshall, the population was largely Indian, of Athabaskan stock. Downstream from Marshall, a native village about 75 miles above the river's mouth, Eskimos were the dominant native population. The Yukon RBS report of November 1957 indicated that one of the most primitive cultures remaining in Alaska was found from the Yukon River Delta south to the Kuskokwim River.

The tempo of fish and wildlife studies within the Yukon Basin increased as the Rampart Canyon proposal came to the fore. The Senate Public Works Committee passed a resolution on April 24, 1959, requesting the Corps of Engineers to investigate and report on that project. In turn, on March 14, 1962, the Secretary of the Army and the Secretary of the Interior signed an agreement which dealt with the division of responsibilities between Interior and the Army in certain areas in Alaska. The agreement provided for the Corps to continue its studies and complete its report on Rampart, with Interior's report on the marketing of the project power and the project's effect on all natural resources to be completed prior to any recommendations for authorization of the project.

The Department of the Interior had been assessing the hydroelectric power potentials and their marketing feasibility of the project as well as its anticipated effects on natural resources for nearly five years prior to its agreement with the Corps in 1962. A big concern was in the project's effects on fish and wildlife.

The effort that went into the Rampart Canyon Dam study of the project's fish and wildlife aspects was an all-out endeavor on the part of the Bureau of Sport Fisheries and Wildlife and the Bureau of Commercial Fisheries. Its synthesis is reflected in the 1964 joint report of the two bureaus.^{1/}

^{1/} A Report on Fish and Wildlife Resources Affected by Rampart Dam and Reservoir Project, Yukon River, Alaska, a joint report by the Bureau of Sport Fisheries & Wildlife and the Bureau of Commercial Fisheries, Juneau, Alaska, April 28, 1964, 13 pp., with Substantiating Report, 122 pp.

A good idea of the magnitude of the project, located in central Alaska on the Arctic Circle and 750 miles up from the Yukon River's mouth, can be had from the following brief description taken from the Interior Department's summary report of 1967:^{1/}

"The Rampart Project is one of the great hydroelectric potentialities of North America and the largest ever studied in the United States in terms of power production and reservoir size and capacity. However, it would be remote from any present major power markets and would adversely affect fish and wildlife resources of national and international concern. It would be located in the largest State in the Union, which has the smallest population.

"As shown on Plate 1, the reservoir would be located on the Yukon River on the Arctic Circle, where extremes of cold weather prevail and present developments are at a minimum.

"The project would create a reservoir with a water surface area of about 10,600 square miles, a maximum length of about 280 miles, and a maximum width of about 80 miles. The reservoir would inundate the Yukon Flats, the unique and self-perpetuating ecosystem which occupies the major part of the reservoir area.

"The proposed project would have an installed capacity of 5,040,000 kilowatts and would produce firm energy estimated by the Corps of Engineers at 34.2 billion kilowatt-hours annually. The latter is equal to roughly 50 times the present energy requirements of all utility systems in the State of Alaska. The construction costs of the dam, reservoir, and powerplant proposed by the Corps of Engineers (exclusive of any fish and wildlife measures) would total about \$1,222 million on the basis of January 1967 prices. This includes about \$13 million for navigation transshipment facilities at the dam, and

^{1/} Alaska Natural Resources and the Rampart Project, a Memorandum to Secretary of the Department of the Army Stanley R. Resor from the Secretary of the Department of the Interior Stewart L. Udall, June 15, 1967, 2 pp.; A Joint Memorandum to the Secretary of the Interior from his Assistant Secretaries for Water and Power Development, Mineral Resources, Fish and Wildlife and Parks, and Public Land Management, June 1, 1967, 8 pp.; and a Summary Report, U.S. Department of the Interior, 44 pp., Govt. Printing Office, Wash., D.C., 1947.

about \$2 million for recreation facilities. The construction costs of the fish and wildlife mitigation measures proposed by the Fish and Wildlife Service would total about \$634 million on the basis of January 1967 prices. The construction costs of the transmission systems considered to deliver the project power to the potential load centers were estimated by the Bureau of Reclamation on the basis of January 1967 prices to range between \$692 million and \$1,802 million, dependent upon the power markets assumed."

The 1964 fish and wildlife report referred to above was one of several prepared by Interior agencies on natural resources. Following the agreement with the Corps in March 1962, a task force of the Interior agencies in Alaska was activated in December 1962 through the chairman of Interior's Alaska Field Committee to accomplish the Rampart studies provided for in the Corps-Interior agreement. Commensurate with their responsibilities, the Interior agencies produced their reports working closely with appropriate Federal and State agencies. Reclamation in turn agreed to prepare the overall report and incorporate the contributions of the other agencies. Copies of the field report entitled "Field Report - Rampart Project, Alaska - Market for Power and Effect of Project on Natural Resources - January 1965" went to appropriate agencies, public bodies, organizations, interests, and individuals. Full briefings were held with Governor William E. Egan and his staff and others like the directors of Yukon Power for America. The Interior Department also furnished copies of the report to the Alaska Congressional delegation and others.

The political powers in Alaska as well as the State's boosters were greatly disappointed over Interior's recommendation that Rampart Dam should not be built. The project was viewed by those who espoused growth as one that would give the new State of Alaska a much-needed economic shot in the arm by creating a great number of jobs and thus catalyzing the economy. Of course, Uncle Sam would have to pick up the tab, to the tune of \$2 billion or so.

Two fundamental reasons emerged for Interior's negative view of the project: (1) lack of an adequate power market and (2) the loss of fish and wildlife resources. In this paper, we are essentially concerned with the latter, so a few more thoughts on that subject may be germane.

The joint Bureau of Sport Fisheries and Wildlife and Bureau of Commercial Fisheries report of 1964 analyzed the project's effects very well. It was a fine report indeed, having gone through a number of drafts and reviews before the final copy was released. Gordon W. Watson had a strong hand in fashioning the study and subsequent report. Among the report's highlights, it pointed out the importance

of the Yukon River upstream drainage in contributing significantly to the fisheries at the mouth of the Yukon as well as providing subsistence for people, namely natives, residing along the tributaries both in the State of Alaska and in Yukon Territory. The report pointed out the average annual combined catch of chinook, chum, and coho salmon from the Yukon River approximated 800,000 fish. With the project in operation, the dam would block salmon spawning runs and would totally destroy the subsistence and commercial fisheries above the dam. It was estimated that the average combined annual fisheries of the Yukon River system would be reduced by almost 50 percent.

An account of some of the field studies is found in a supplementing report of March 1962, by Murray L. Hayes and Howard S. Sears.^{1/} The studies on migrating salmon were conducted out of the BCF's river basin studies office at Fairbanks though the Corps of Engineers field camp 30 miles downriver from the village of Rampart was used to trap and tag salmon. A second field camp was established at Sixmile Island about five miles downstream from Rampart. Tag recoveries were made at that site.

The Alaska Department of Fish and Game conducted a similar tagging program near the mouth of the Yukon River. That department also conducted utilization surveys over the entire length of the Yukon River in Alaska.

Routine logistic support was supplied by scheduled aircraft to the villages of Rampart and Tanana and by charter aircraft to the dam site. Heavy equipment, materials and fuel were transported by commercial barge or river boat. In addition to making their facilities below Rampart available to BCF, the Corps of Engineers furnished transportation to Fairbanks by helicopter for crew and equipment at the close of the season when ice conditions halted operation of boats and light aircraft.

Personnel of the Canadian Department of Fisheries provided help in recovering tags and supplying information on Yukon River salmon runs in Canada. Arrangements to collect tags and pay rewards of one dollar per tag were made with storekeepers at Rampart, Stevens Village, and Beaver, with the postmistress at Fort Yukon and the field crews of the BCFW at

^{1/} Adult Salmon Migrations Through Rampart Canyon on the Yukon River, A Preliminary Report, by Murray L. Hayes and Howard S. Sears, Bureau of Commercial Fisheries, Biological Laboratory, Auke Bay, Alaska, Mar. 1962, 14 pp.

the same location; with a field crew from the University of Alaska in the Circle-Eagle area; with the Royal Canadian Mounted Police at Old Crow, Teslin, and Carmacks; with the Canadian Department of Fisheries at Whitehorse, Dawson, and other points in Yukon Territory; and with the Alaska Department of Fish and Game below Tanana.

The purpose of the study was to estimate the total number of salmon that migrated upstream beyond the Rampart dam site and to gather other data related to the subsistence and commercial fisheries of the Yukon River. The subsistence fishery was that done by natives in taking fish for purposes other than for sale or barter and included the taking of fish for dried dog food.

The above report by the Auke Bay Biological Laboratory biologists is but one example of the efforts made to obtain information and relate it to the potential effects of Rampart Dam. There were of course other studies to collect data of one sort and another for the same purpose.

The joint BSWF-BCF report of 1964 pointed out that some striking changes were in the offing for wildlife if the project were built, especially so in the case of waterfowl. Somewhat more than 36,000 lakes and ponds totaling 760,000 acres were contained in the 10,500 square miles of the impoundment area. The interspersion of such ponds and lakes with land areas made a waterfowl production unit of 7 million acres. The Yukon Flats, as the impoundment area was known, provided prime waterfowl habitat that was heavily used from the breakup in April until the freezeup in October. Migrant waterfowl used the Flats for resting and feeding though the greatest importance of the area was for nesting, with about 2.4 million acres being regarded as high-density breeding habitat.

It was estimated that the half million breeding ducks raising young in the Yukon Flats represented 1.6 percent of the total continental breeding population which averaged 32 million birds annually for the period 1950-62, inclusive, and further, that the area produced annually 1.5 million ducks, 12,500 geese, and 10,000 little brown cranes to the four major waterfowl flyways of the continent. In terms of hunting, the waterfowl produced on the Yukon Flats were estimated as supplying an annual average of 300,000 man-days of duck hunting and 25,000 man-days of goose hunting in the United States and Canada. Inevitably, construction and operation of the project would completely destroy the valuable and unique waterfowl production area of the Yukon Flats.

Big game singled out for attention in the report were moose, caribou, black bears, and grizzly bears. Moose alone were estimated at 5,000 animals, a low figure for an area calculated to be able to sustain 12,500 animals. Somewhat over 300 of these animals were taken annually, largely by the natives of the Indian villages within the impoundment area. Moose supplemented the salmon which was the mainstay of their

subsistence. With the project, all of the big-game habitat in the area would be destroyed. The inhabitants of course would have to be relocated and become more dependent than ever on the Federal Government.

Fur animal habitat also would go by the wayside with a loss of 41,000 pelts taken annually, mostly of martens, wolverines, lynxes, snowshoe hares, red foxes. That fur take was 7 percent of the entire Alaska fur harvest. It also featured in the Indian economy of the villages. Eradicated from the area too would be willow ptarmigan and several species of grouse.

Attention was given in the report to remedial measures if the project were built, initially of pilot facilities and studies to learn of the feasibility of bringing migrating salmon around a dam estimated by the Corps to be 530 feet high with a top length of 4,700 feet. Nothing in the line of fishways of such magnitude had ever been attempted. Thoughts also were given to acquiring and developing some waterfowl areas. But the best of all measures that could be conceived at the time would still not compensate fully for the anticipated losses. Further, the costs appeared prohibitive.

The recommendations of the joint BSWF-BCF report of 1964 were as follows:

"(1) That Rampart Canyon Dam and Reservoir project not be authorized for construction.

"(2) That, if construction of the project is authorized, the following recommendations be included in such authorization:

(a) Additional detailed studies of fish and wildlife resources be conducted, as necessary, after the project is authorized, in accordance with Section 2 of the Fish and Wildlife Coordination Act; and that such reasonable modifications be made in the authorized project facilities as may be agreed upon by the Secretary of the Interior and the Secretary of the Army, for the conservation, improvement, and development of these resources.

(b) Project funds in the amount of \$80.5 million for studies and construction of pilot facilities and \$1.5 million for annual operation and maintenance of these facilities be made available to the Secretary of the Interior at the time of authorization for development of the most effective means and measures for the mitigation of fish and wildlife losses.

(c) Project funds in the amount of \$500 million for capital expenditures be authorized for appropriation to the Secretary of the Interior, as required, for the ultimate

implementation of measures to mitigate losses to fish and wildlife resources, and that \$10 million be made available annually during the life of the project for the operation and maintenance of these measures."

It was said that the fish and wildlife report raised some cries of anguish with some of the proponents of what surely would have been the biggest boondoggle in the history of public works projects in the United States; also, that it resulted in demands in some Alaskan political quarters for the ouster of one or more of the biologists guilty of doing what was no more than the job for which they were hired.

The potential destruction of the unique ecosystem of the Yukon Flats attracted wide attention nationally. Interior's field report of 1965 was reviewed by representatives of the University of Michigan as a part of a study of the ecological and economic consequences of the Rampart Project undertaken under a July 1964 grant by the Natural Resources Council of America. Such study included a review of the findings of the Corps of Engineers on the project as well. The Michigan team recommended against the project.

Early in 1965, the Department of the Interior requested the assistance of the National Academy of Sciences to review the fish and wildlife findings of its field report which earlier had been circulated to all concerned, following which an Interior task force was appointed to review the report and consider the comments and findings made by the public.

The National Academy of Sciences transmitted its findings to the Secretary of the Interior in a report of November 1, 1965. It found, among other things:^{1/}

"1. The Yukon Flats, with its rivers, vast network of marshes, and lakes and potholes, is one of the finest fish, wildlife, big game, and small game production areas in North America.

"2. Construction of the Rampart dam would destroy the productivity of the Yukon Flats in renewable resources, and leave in its stead a huge wind-swept lake, an unsatisfactory habitat for wildlife.

"3. If Rampart dam is constructed, individual animals might survive flooding of the reservoir area, but the likelihood that populations of animals would survive is extremely doubtful. Other habitats to which these populations might migrate are already supporting all the life forms they can support.

"4. Construction of the Rampart dam would result in the destruction of the valuable up-river salmon stocks. On the other

^{1/} Alaska Natural Resources and the Rampart Project, U.S. Dept. of the Interior, Summary Report, p. 7, 1967.

hand, the Committee is not convinced that the four proposals for mitigation of the fishery effects of the Rampart dam are feasible, and, if feasible, that they would be successful.

"5. The Yukon Flats presently contributes more than one million waterfowl annually to the continental duck population. The proposed waterfowl mitigation measures would be almost prohibitively expensive and would ultimately contribute less than a third of the present waterfowl production. The reservoir would not provide suitable nesting habitats, marshes, and shallow water areas because of its relatively steep banks, rising waters as the reservoir is filling, and later, because of wave action and ice push.

"6. Big game, small game, and various fur-bearing animals would also disappear. Mitigation measures for resident game populations are not feasible.

"7. It seems inconceivable that serious thought is given to the investment of more than \$650 million to support mitigation programs whose feasibility and likelihood of success can only be regarded as extremely problematical. There is need for thorough comparative evaluation of the benefits from both the present situation and those reasonably to be expected from the proposed impoundment.

"8. Construction of the dam would destroy a highly productive area which is presently benefiting the whole of North America at no cost."

The vast network of marshes, lakes, and potholes of the Yukon Flats, with their interspersed land areas, must be seen to be appreciated. The writer has seen the potholes and marshes of much of northeastern Montana, the Dakotas, and western Minnesota, and quite a bit of the more extensive similar waterfowl habitat of the Canadian Provinces to the north. He appreciates their nature and importance as waterfowl breeding, resting, and migrating grounds for the waterfowl that live, reproduce, and traverse the flyways. Without making any adverse comparisons, he has never seen anything on a square-mile basis comparable to what he observed while flying over the Yukon Flats.

When finally the opportunity came in August 1972 to visit Alaska, he was very pleased to be able to fly over the Flats on a flight that took him from Fairbanks to Fort Yukon and on down the Yukon River to the Rampart Dam site. For sheer numbers of ponds, lakes and marshes stretching from one horizon to another, he had never seen anything quite like them. Flying fairly low, literally thousands of ponds and small lakes of every

conceivable size and shape in close proximity to each other were observed. If ever there was a waterfowl paradise, the Flats had to be it. A number of moose likewise were observed before the Aleutian Goose, the Bureau of Sport Fisheries and Wildlife rebuilt and more powerful amphibian Grumman goose, landed at Fort Yukon. To have destroyed that vast ecosystem of marshes and flats with a reservoir approximating the size of Lake Erie would have been a travesty on one of the finest handi-works of nature.

It may well have been that the lack of a market for the power generated by Rampart Dam was the determining factor for opposing the construction of the monstrous project. Certainly Alaska could have used but a fraction of it and transmitting it to the American Northwest as contemplated by some was much too expensive to justify. Years of experience working on water-resource projects, however, creates the suspicion that fish and wildlife losses alone would not have killed the project. The writer is equally convinced that the collective voice of the Bureau of Sport Fisheries and Wildlife and the Bureau of Commercial Fisheries alone would not have deterred the promoters from achieving their desired ends. The Michigan study and that of the National Research Council Committee of the National Academy of Sciences were assists that could not be minimized. But whatever the roles of the voices that were raised in the democratic process of being heard, the Department of the Interior said no and a signal victory was scored by the two bureaus for collecting the facts and underscoring the effects of a project that at best had but a tenuous economic justification.

It has been the history of many water-resource projects that they simply do not die. By late 1973, rumblings were heard in some Alaskan quarters to revive the Rampart Project. Whether the move will gather enough momentum to acquire the requisite political muscle to get the project authorized and appropriated remains to be determined. The current energy crisis no doubt has revived the talk for the project. And if in future years studies reveal there is a market for the power, what then?

There were other projects that occupied the attention of the small Alaskan contingent of biologists concerned with water-resource developments. One such was the proposal of the town of Wrangell, in southeastern Alaska, desiring to replace its existing diesel generator facilities by a three-stage development of (1) a dam 40 feet high at the outlet of Kunk Lake, 3,500 feet of penstock from the dam to the powerhouse of Kunk Creek with a turbine and generator, and 6,000 feet of submarine transmission cable to Wrangell Island; (2) two diversion channels each 3,000 feet long, and (3) a 1,800-foot tunnel tapping Anita Lake and connecting with another penstock to a powerhouse. The entire development proposed was on Etolin Island.

The study of the area entailed gillnetting the fish in Kunk Lake and Anita Lake, learning something of the cutthroat trout and the pink chum salmon inhabiting waters affected by the project. No information was available from other sources so the river basin studies biologists had to develop their own data. The project proposal, for which a preliminary permit was issued by the Federal Power Commission on February 29, 1956, entailed no great involvement. The project was not opposed and the 1958 report merely detailed the effects.^{1/} The reason for mentioning the project at all is to illustrate that it was but one example of the many relatively small hydropower proposals on which river basin studies biologists had to investigate and supply their views to the Federal Power Commission.

It is interesting to note that the Forest Service listed some 200 sites in southeastern Alaska as suitable for hydroelectric development. The anticipation was that many of the sites would eventually be developed to supply power for increased domestic and industrial needs. Certainly there was nothing wrong in such site designations. They were in keeping with the many uses national forests served. But it was equally important whenever an applicant became interested in a preliminary permit or license under the Federal Power Commission regulations that the Bureau of Fisheries (prior to 1940), or the Fish and Wildlife Service (from 1940-56), or the Bureau of Commercial Fisheries (after 1956), and finally the Bureau of Sport Fisheries and Wildlife and the National Marine Fisheries Service (after 1970) had their look-sees and report to the Commission on what was involved.

There were of course more involved water-resource projects than small hydroelectric power developments. A case in point was the lowgrade magnetite development possibility in southeastern Alaska about 20 miles north of Haines. The iron-bearing deposits were in an alluvial fan near the Chilkat and Klehini Rivers. The Columbia Iron Mining Company was considering diversion of the Chilkat River from its present location into an artificial channel to provide a tailings disposal area of six square miles. Since the Chilkat Basin had valuable fish and wildlife resources, what would the effect of the proposal be?

The obvious answer was to find out. So the Bureau of Commercial Fisheries in 1958 proceeded to do so. It will be recalled that the river basin studies activity by that time was under the aegis of that bureau.

^{1/} Progress Report on the Fish and Wildlife Resources of Kunk and Anita Basins, Etolin Island, Territory of Alaska, Fish and Wildlife Service, Juneau, Alaska, Aug. 1958, 24 pp.

The study called for a determination of the timing, extent, and location of anadromous fish spawning; the location of significant rearing areas of the salmonid fishes; and determining the sport fishing and hunting efforts and their potentials in the Chilkat Basin.

The primary survey method in this case was to examine the tributaries and sloughs of the Chilkat River on foot. An airboat was chartered and proved useful in the extremely shallow waters of the upper Chilkat Basin and finally aircraft was used to get in and sample by seine and gill net the fish populations of Chilkat Lake. Catches of fish by the natives were checked daily and local residents were interviewed for information on sport fishing and hunting.

The findings of this initial study were incorporated in a progress report in March 1960.^{1/} Its essential finding was to the effect that the six square miles desired for tailings included the most important chum salmon spawning area in the Chilkat River Basin. The location was unique in that it was an area of groundwater upwelling. Due to the importance of the area, it was recommended in a letter-type report to the Columbia Iron Mining Company that alternate disposal sites be selected. As a result, the company delineated three alternate sites.

Through its Branch of River Basin Studies, the Bureau of Commercial Fisheries scheduled a continuation of the 1959 studies with special emphasis on the alternate sites. In this additional effort, data on spawning escapements, the commercial fishery, the personal-use fishery at the native village of Klukwan above Haines, and the data on big game in the basin, were collected in cooperation with the newly established Alaska Department of Fish and Game. The entire operation was typical in many respects of the kind of effort river basin studies biologists in Alaska were called upon to perform.

Close to the two major population centers of Anchorage and Fairbanks as it is, the Susitna River and its hydropower potentials continued to receive attention from the Bureau of Reclamation. Of the many potential dam sites singled out for special attention were the Devil Canyon Dam and the Denali Dam, lumped together under the title of the Devil Canyon Project, located about midway between Anchorage and Fairbanks.

The Devil Canyon Dam, at river mile 134, would be the site where the power would be generated. The Denali Dam would be higher above on the

^{1/} Fish and Wildlife Resources in Relation to the Proposed Diversion of the Chilkat River, Bureau of Commercial Fisheries, Juneau, Alaska, Mar. 1960, 38 pp.

Susitna, at river mile 248. The reservoir formed by this upper dam would provide for water storage and regulation of flows to be utilized downstream at the Devil Canyon site.

The findings and recommendations of the Bureau of Commercial Fisheries and Bureau of Sport Fisheries and Wildlife appeared in their joint report of 1960.^{1/} The findings were that big game, small game, fur animals, and both resident and anadromous fish would be affected by the project. With the inundation of 61,000 acres of land, some good moose range would be lost. Some concern also was indicated for the loss of the Nelchina caribou wintering range although the movement patterns of such animals were such that the thought was expressed that they would not be seriously affected by project development and operation.

As usual with such projects, there were unknowns. The effects of the alteration of stream flows and temperature patterns were bound to have effects on the fish but the extent of such effects could only be speculated. Recommendations were made for minimum water releases during the period of dam construction and initial power filling and during power operation.

Somewhat unusual for Alaska rivers, the Susitna apparently had no salmon migrating through or above Devil Canyon. While there were no falls or other physical barriers above the lower dam site and resident species like grayling, whitefish, burbot, lake trout, and a few others were found in the drainages of the tributary streams above, the absence of salmon was attributed to what was termed a "hydraulic block," the high water velocities for several river miles within the narrow Devil Canyon.

The good fish habitat for which concern was felt because of the altered regimen of the river due to the dams was below the Devil Canyon dam site where in varying abundance king, red, pink, chum and coho salmon were found in the tributaries. Rainbow trout, grayling, lake trout, Dolly Varden char and burbot were also found in the clear tributary streams below the dam site. The commercial fishery was in Cook Inlet where the wholesale salmon case pack averaged over \$7.3 million annually for the 10 years preceding 1960. The Susitna River was believed to contribute 38 percent or about \$2,744,000 of the annual value of the pack.

Like so many rivers in Alaska, the Susitna River is seasonally silt-laden throughout its entire course. The condition is due to its glacial origin. The river characteristically has a high rate of discharge from May to

^{1/} A Detailed Report on Fish and Wildlife Resources Affected by the Devil Canyon Project, Alaska, Bureau of Commercial Fisheries, Juneau, Alaska, May 2, 1960, 26 pp.

September and low flows from October through April. The high discharges are caused by snowmelt, rainfall, and glacial melt. The silt-laden condition obtains during the warmer summer months. During the colder months when the snow and glacial melt ceases, the river becomes clear. In the upper basin, which is predominantly mountainous, the valleys of the river and its tributaries have a thick fill of glacial moraines and gravels. A number of clear streams, however, do empty into the tributaries of the Susitna. Many are feeder streams that drain clear-water lakes.

In 1965, a report on the Vee Project was prepared by the river basin studies biologists of the Bureau of Commercial Fisheries. Vee Canyon lies between the Devil Canyon Dam and Denali Dam sites. The proposed dam was viewed as a third stage in the power development of the Susitna River. A fourth unit, the Watana, was also thought of for the Susitna.

Close to the most populated section of Alaska, the Susitna is bound to be developed for hydropower to meet the needs of the Railbelt Area, that section of Alaska served by the Alaska Railroad which runs between Anchorage and Fairbanks. The studies of the Susitna proposals are examples of studies made where no significant fish and wildlife problems appear to be involved; yet, if the dams are built, inevitable habitat changes will take place.

Interesting is the fact that the newly formed Alaska Department of Fish and Game was asked to concur with and did so in the Devil Canyon Project report of May 2, 1960. In seeking such concurrence, the Alaska river basin studies operation in that respect was paralleling that in the Lower 48 States where it was the practice to obtain concurrence of the counterpart State fish and game departments and in so doing demonstrate the unity of views of both the Federal and State conservation agencies concerned.

Petroleum development in Alaska has also raised its share of questions regarding its meaning for fish and wildlife. The 1967 Department of the Interior report on the Rampart Project gave the following thumbnail sketch of oil activities in the 49th State:^{1/}

"Petroleum has become a permanent Alaskan industry and is expected to be Alaska's major industry for decades in the future. Transportation facilities for crude oil and markets for natural gas to a great extent will determine development.

"Within the past ten years, since the discovery of the first Alaskan commercial oil well, natural gas is heating the city of

^{1/} Alaska Natural Resources and the Rampart Project, Summary Report, U.S. Dept. of the Interior, 1967, p. 9.

Anchorage, and is being utilized for power generation; a refinery processing Alaskan crude oil is producing heating oils and jet fuels for its transport; work is under way on the construction of the State's first petrochemical plant; pipelines are beginning to lace the Cook Inlet Basin area showing some indication of the future potential of the inlet; and a formal contract has been signed for a gas-liquefaction project involving a 3-year construction program to export liquefied natural gas to Japan.

"The Cook Inlet area is now regarded as one of the more important offshore petroleum production sites in the world. Within the past year, there has been no let-up in the intensity and variety of petroleum development in Alaska. Continued exploration success, coupled with recent advancements in offshore technology, has encouraged the search for petroleum that is expected to convert the region into a major producer of hydrocarbons.

"Outside the Inlet, the industry is actively seeking petroleum on the North Slope and on the Alaskan Peninsula. Seismic work is continuing in broad areas of the Bristol Bay and the Gulf of Alaska.

"At the beginning of 1966, Alaska's proved petroleum reserves estimated by American Petroleum Institute and American Gas Association were as follows:

Oil Reserves (barrels)	Gas Reserves (million cubic feet)
159,767,000	1,985,325

"Reported reserves by definition are conservative and are not indicative of the potential of future production.

"In 1966 Alaska contained 5 oil fields, but only 3 - the Swanson River, Middle Ground Shoal (Cook Inlet), and Trading Bay (Cook Inlet) - produced oil. Approximately 75 percent of the State's daily oil production originated from the Swanson River Field. There are 10 gas fields. All but the East Umiat Field are located in the Cook Inlet area. Three fields, Kenai, Swanson River and Sterling, were the only gas producers."

There is of course another side of the coin. Revealing is the exchange of correspondence in 1968 between Secretary of the Interior Stewart L. Udall and Mr. Harry Morrison, Vice-President and General Manager of the Western Oil and Gas Association. As a result of the findings and apprehensions of the biologists of the Bureau of Commercial Fisheries and

Bureau of Sport Fisheries and Wildlife regarding oil operations in the Cook Inlet area of Alaska, Secretary Udall wrote Mr. Morrison a letter on March 27, 1968.^{1/} In it he outlined the concern occasioned by the recurring series of pollution incidents in Cook Inlet and the possibility of similar incidents occurring during the forthcoming exploratory and development programs in the Gulf of Alaska and Bristol Bay. Mr. Morrison replied on April 1, 1968.^{2/}

The exchange merits attention since it points up not only the nature of the problem but the attitude of the petroleum people in coping with it. Press releases were issued by both sides on April 1, 1968, stating essentially what was in the exchange of letters. In a sense, such releases were invitations to acquaint the public with the two viewpoints. Mel Monson, then with the river basin studies operation of the Bureau of Commercial Fisheries, and James G. King, waterfowl biologist with the Bureau of Fisheries and Wildlife, collaborated in drafting the enclosure Secretary Udall sent to Mr. Morrison.

In a speech in the latter part of July 1968 at Kodiak, Alaska, Regional Director Harry L. Rietze of the Bureau of Commercial Fisheries at Juneau gave a talk at the meeting of the American Fisheries Advisory Committee on the "Potential of Alaska's Fishery Resources."^{3/} The committee served at the time as a sounding board and counsel to the Secretary of the Interior on fishery matters. It no doubt does so today to the Secretary of the Department of Commerce.

Among the many items covered in his talk, Harry had the following to say regarding the petroleum industry in Alaska:^{4/}

"Environmental alteration: I would like to briefly mention one other serious problem confronting sustained fishery development in Alaska.

"We have talked about the huge potential of fishery resources in Alaska. Alaska has other resources such as petroleum,

1/ See Exhibit 55, Appendix.

2/ See Exhibit 56, Appendix.

3/ Harry L. Rietze's Presentation on the Potential of Alaska's Fishery Resources, Bureau of Commercial Fisheries, Newsletter No. 9, Sept. 13, 1968, 16 pp.

4/ Ibid., p. 15

minerals, and timber, which are also being developed. In some cases, these developments may alter the environment of valuable species of fish and wildlife.

"Within the past several years, the petroleum industry in Alaska has enjoyed a phenomenal growth. In a short span of time, Alaska has risen to the eighth ranking state in petroleum production. Within the past few days, a new strike along the Arctic Slope has been billed in the newspapers as the largest oil field in the world.

"The recent spectacular growth in oil has not been without incident. In the past 2 years, nearly 100 incidents of oil and related pollution have occurred in Cook Inlet with an unknown amount of damage to salmon, crabs, shrimp, clams, waterfowl, and marine mammals.

"Undeveloped petroleum fields lie offshore on much of the Continental Shelf that is rich in fish, shellfish, marine mammals, and waterfowl. It is absolutely essential that the petroleum industry and the fishery and wildlife managers sit down together and plan a rational development that will ensure adequate protection for wildlife and fish and their environment."

The oil strike referred to on the Arctic Slope was of course one of the biggest news items of 1968. Atlantic Richfield Company announced on July 18 of that year the discovery of rich oil reserves 150 miles east of Point Barrow on the Alaskan Arctic Coast at Prudhoe Bay on the Beaufort Sea. The find precipitated a burst of oil and gas exploration activity unparalleled in the Arctic.

A consortium was formed, named the Alyeska Pipeline Service Company, owned by Amerada Hess Corporation, ARCO Pipeline Company, British Petroleum Pipe Line Corporation, Humble Pipe Line Company, Mobile Pipe Line Company, Phillips Petroleum Company, and Union Oil of California. The acknowledged ownership is in the control of three parent companies which have found the most North Slope oil: Atlantic Richfield Company, British Petroleum Company Limited, and the Standard Oil Company of New Jersey.

The consortium formulated a plan, earlier known as the Trans-Alaska Pipeline System (TAPS or TAP for short), for bringing out the oil by means of a pipeline 48 inches in diameter which would run from Prudhoe Bay to its terminus at the ice-free port of Valdez on Prince William Sound in the Gulf of Alaska. It would be 789 miles long. From Valdez, the oil would be shipped by tankers to ports in the United States with some going to Japan. An unprecedented undertaking for sheer magnitude on all counts, the pipeline would cross treeless tundra underlain with permafrost, barren glaciated mountain passes, plateaus, and meandering river valleys.

With the involvement of so much Federal land, notably that under the jurisdiction of the Department of the Interior, it was of course necessary for the oil companies to obtain the proper permits from the Department of the Interior through the Bureau of Land Management on the lands of the public domain and the Department of Agriculture on the Chugach National Forest in the vicinity of Valdez. Therein the Government had something to say about how the work should be conducted.

Recognizing the implications of the development and further exploration as well as drilling on the Arctic Coast, the location of the pipeline, and the development of terminal facilities for transshipment to the Lower 48 and elsewhere, Interior asked its component bureaus to make a study so that appropriate stipulations could be incorporated into the rights-of-way. The idea was not to oppose the pipeline and related activities but to safeguard affected natural resources as much as possible.

It fell to the river basin studies people of the Bureau of Commercial Fisheries to head the investigation and come up with a report. Their findings were incorporated in a report of March 1970.^{1/} Understandably, such biologists could hardly tackle the job alone. For help they drew upon the marine biologists of the BCF, especially the fine staff at the Auke Bay Biological Laboratory on the outskirts of Juneau; BCFW biologists whatever their calling including some from the Lower 48 States; Alaska Department of Fish and Game personnel; and whoever might contribute in any way. But the responsibility for pulling all the information together lay with the river basin studies people.

The joint 1970 report of the two bureaus was a signal document in its description of the topography and biota of Prudhoe Bay, the 789-mile route of the pipeline, and the marine tankship terminal site near Valdez on Prince William Sound. Field work began in the latter part of 1969 and was completed in mid-September. The biologists involved also cooperated closely with the Bureau of Land Management in the preparation and review of stipulations designed to protect the ecology of the terrain and the fish and wildlife resources.

The field work consisted of surveys by automobile, light airplane, helicopter, boat, and on foot. The Alaska Department of Fish and Game also participated in the field work. Thus, all of the directly affected sites were examined, no small task when the size of the State of Alaska is considered.

^{1/} A Reconnaissance Report on the Impact on Fish and Wildlife Resources of the North Slope Oil Development, The Trans-Alaska Pipeline System, and the Marine Terminal Sites, Bureau of Commercial Fisheries, Juneau, Alaska, Mar. 1970, 57 pp.

The effects of past activities on the natural environment of the North Slope were already apparent at the time of the field investigations in 1969. Oil barrels were scattered all up and down the Arctic Coast, creating an eyesore and a pollution hazard. Many of course were the result of military operations related to Dewline activities, the watch that was posted by the United States to alert the country in the event the Russians launched some missiles over the top of the world. Trash was heaped in diverse areas and the area was tracked up by equipment. The surface layer of the tundra that insulates the permafrost was destroyed in countless locations and the widespread subsidence, deep ditches, and new drainage patterns, even draining some lakes, were quite evident. The Interior Department's stipulations currently restrict off-road movements of vehicles but how well the oil people will abide by the rules remains to be seen.

The Arctic Coast in the vicinity of Prudhoe Bay, and particularly to the west in the Colville River region and farther on, is a plain dotted with an immense number of ponds, lagoons, and braided streams emptying into the Beaufort Sea. It is a fragile environment, an area that receives but a sparse amount of precipitation a year, around four or five inches. It can be termed an Arctic desert, a description that to a layman might appear to be a contradiction of terms. It is a region rich in birds and mammals. The description of the region's fauna, brief though it is, from the 1970 report is interesting:^{1/}

"Extensive flocks of sea ducks, geese, and brant migrate along the coast of the Beaufort Sea (plate 2). Black brant and thousands of sea ducks have been observed molting along the coast, while whistling swans and flocks of molting Canada geese and pintail ducks occur in river deltas and coastal lagoons. Old squaws are the most abundant ducks that breed and summer along the coast and may number 100,000 birds. Large numbers of eiders, predominantly the common eider, also nest along the coast and on coastal islands. Other birds are numerous; about 100 species have been listed for the Arctic coastal plain alone.

"Marine mammals are abundant, including polar bear, four species of seals, beluga whales, right whales, killer whales, narwhals, and porquals.

"The discussion of upland species that occur on the northern end of the pipeline is applicable here also.

^{1/} Ibid., pp. 30, 31.

"Marine fish populations along the Alaska coast of the Beaufort Sea are probably small, but the invertebrate fauna has been reported as remarkably abundant in the vicinity of Point Barrow, but may be more sparse eastwards. The only commercial fishery in the area at present is a small one for char and whitefish at the mouth of the Colville River. Commercial fishing is unlikely to expand greatly although Eskimos at Point Barrow fish for their own use for cod and smelt through the ice and in the summer for char and whitefish at stream mouths. Except at Barrow and the Colville River, the Beaufort Sea coast has been largely uninhabited for the past few decades, and the small fishery resources have been largely unharvested. With the increase in human population on the North Slope, however, the Arctic char may become an important sport fish in waters near populated areas."

The upland species referred to, including the larger mammals, and the fish of the streams along the pipeline route on the North Slope, were described as follows:^{1/}

"Rivers and estuaries such as the Sagavanirktok are the first waters of the Arctic Coast to open up in spring, and until other waters become ice-free, they are the resting habitat of thousands of ducks, geese, and shore birds. The rest of the Sagavanirktok River is of limited value to waterfowl. Most nesting in this area takes place in thaw lakes adjacent to the rivers.

"The Sagavanirktok and Atigun River portion of the route lies between the ranges of the Arctic and Porcupine River caribou herds, which are estimated at 200,000 and 100,000 animals, respectively. No definite migratory movements of caribou have been defined in the area of the pipeline, and animals observed there are generally in scattered small bands. Atigun Pass itself is a passageway for some north-south caribou movements. A few moose are found north of the Brooks Range, mainly along streams where willows provide winter browse; animals occasionally occur along the upper Sagavanirktok River.

"Grizzly bears are distributed sparsely on the North Slope; they are most frequently found along streams of the highlands and become scarce along the coast. Wolves are relatively abundant and

^{1/} Ibid., pp. 13, 16, 18.

are usually found in association with caribou. The wolverine is frequently observed also. The apparent high density of some of the large mammals such as wolverine may, however, result partly from their conspicuousness in the open terrain of the Arctic tundra.

"Below Galbraith Lake, the Atigun River flows through a narrow canyon, one side of which is considered important habitat for Dall sheep.

"The Sagavanirktok and Atigun Rivers have considerable sport fish potential. Arctic char from six to eight pounds can be taken in July and August from the mouth of the Sagavanirktok to the mouth of the Atigun River at Galbraith Lake. Arctic char smolts are found in the Atigun River, indicating that it is a spawning stream. The Sagavanirktok River and many of its tributary streams and lakes more than 10 feet deep appear to contain grayling. The Sagavanirktok also contains whitefish and burbot. The presence of burbot and of Arctic char smolts two years old with no evidence of having been to sea indicates the Sagavanirktok is probably an overwintering stream and may be important to seasonal populations of other streams.

"Galbraith Lake is large and clear and surrounded on three sides by mountains. This scenic setting gives it a high potential as a recreational area. Lake trout are found in the lake but the slow growth rate, typical of Arctic waters, probably limits the productivity of this fishery."

The description of the pipeline route itself is worth quoting:^{1/}

"The route the pipeline will follow north of the crest of the Brooks Range stands in marked contrast to the remainder of the route. Soils there are permanently frozen except for a thin layer which thaws in summer. The terrain graduates from ice-worn coast (plates 1 and 2) to flat coastal plains with undeveloped surface drainage (plate 3) on to rolling foothills cut by braided streams and dotted with small lakes (plate 4), and to the mountains of the Brooks Range (plate 5).

"Mean daily minimum temperatures range from -22°F. on the coast to -16°F. inland; annual precipitation ranges from about four

^{1/} Ibid., pp. 7-10.

inches at Point Barrow on the coast to about eight inches in the foothills. Grasses, mosses, lichens, and low woody plants vegetate the tundra of the coastal plain, and willows and alder begin to appear along stream courses as the elevation increases. Balsam poplar grows along the larger streams in the foothills.

"The permanently frozen ground, or permafrost, ranges in thickness from a few to several hundred feet. Removal of the insulating cover of tundra vegetation exposes this frozen layer to the summer's sun, and the effects of melting and erosion may cause irreversible changes in the ecologic balance of the Arctic.

"The Brooks Range is largely treeless, and its expanses of bare rock clearly show its glacial past. Although its highest peaks are less than 10,000 feet above sea level, its rugged topography has made it a barrier between the North Slope and the populated regions of interior Alaska. The pipeline route follows headwater drainages of Galbraith Lake and the Sagavanirktok River, passes through the mountains at Atigun Pass (plate 6), and continues down the Dietrich River, a tributary of the Koyukuk system.

"From the southern foothills of the Brooks Range, across the interior highlands to the coast at Prince William Sound, the Yukon and Tanana Rivers are the principal drainages crossed (plates 7-12). Except in these river valleys and the passes through the Alaska Range and the Chugach Mountains, the topography consists of rolling, well-vegetated hills and craggy mountains that extend above timberline. The climate is dry in summer, and most of the annual precipitation comes with fall rains and winter snow.

"The Yukon and Tanana valleys and the lower drainages of tributary streams are generally broad and flat and are dotted with innumerable ponds and lakes, many of which are old sloughs and oxbows of meandering river channels. Even the highlands and plateaus of the interior are plentifully endowed with standing water. Aquatic grasses and forbs are thus abundant in spite of the moderately low rainfall.

"The ecologic change from the Gulkana River basin through the Chugach Mountains (plates 13-14) to the Pacific Coast at Valdez (plate 15) is abrupt. In a relatively few miles the pipeline route goes from the spruce-birch-aspen interior forest, through the rugged, glacially eroded passes of the coastal mountains, to dense Sitka spruce-alder forest at tidewater at the head of Valdez Arm. A breakdown of the extent and proportionate distribution of the major vegetation types along the pipeline route from the crest of the Brooks Range south to Valdez is shown in Table 1. Vegetation types were not surveyed north of the Brooks Range.

Table 1. Distribution of vegetation types
from crest of Brooks Range to Valdez

<u>Vegetation Type</u>	<u>Miles</u>	<u>Percent</u>
White spruce forest	40.5	6.5
Black spruce forest	164.5	26.3
Broadleaf forest (aspen, birch and balsam poplar)	54.5	8.7
Mixed conifers and broadleaf forest	71.0	11.4
All shrub types	185.0	29.6
Tussock upland meadow	40.5	6.5
Tussock wet bog	28.0	4.5
Recent burns	9.5	1.5
Other	31.0	5.0
	<u>624.5</u>	<u>100.0</u>

"The pipeline route between the Brooks Range and the Chugach Mountains traverses an area of discontinuous, or sporadic permafrost. Permafrost temperatures here are generally close to 32° F. and often are so near the thaw point that even a slight disturbance of insulating cover will cause massive degradation. This area also has extremes in air temperature and recorded ranges are as much as 176° F. Differences in soil moisture conditions and exposure to solar radiation cause marked variation in vegetation."

In its analysis of the possible effects of the pipeline on fish and wildlife resources, the report examined its entire length and attempted to assess in rather cryptic terms, as befits a reconnaissance report, what might be involved. It discussed the known composition of fish life in the many rivers that might be affected, the big game, the fur animals, and the other forms of wildlife that undoubtedly would be affected in one degree or another. It stressed the importance of Prince William Sound on which the Port of Valdez, the terminus of the pipeline is located, pointing out that the terminus would be adjacent to one of the most important commercial fisheries of Alaska where all five species of Pacific salmon were found.

Deep concern was expressed over the effects of the oil development, with its construction activities and inevitable human involvement, on the ecology of affected areas and on the fish and wildlife resources. Under a heading of Anticipated and Possible Problems, the following appeared:^{1/}

^{1/} Ibid., pp. 34, 35.

"Construction and operation of the pipeline, access roads, and borrow areas could cause a number of problems. These include erosion and siltation, creation of barriers to fish movements, physical damage to spawning areas or fish, entrapment of fish, thermal pollution, disturbance of wildlife, interference with big game migrations, interference with local movements and entrapment of animals in areas of melting permafrost, increase in fish and wildlife harvest, and problems resulting from improper disposal of sewage and solid waste. Last, and certainly of greatest potential impact are the effects of oil pollution.

"Some of the effects listed above, such as erosion, may be temporarily severe, but can be minimized and limited to the actual period of construction. Other factors, such as increase in human population, will be continuing in nature, and may in the long run have greater impact.

"Most of these potential effects have been recognized in the stipulations for construction of the pipeline prepared by the U.S. Department of the Interior and the Federal Task Force on Alaskan Oil Development, with participation by State agencies. Much of the pipeline and the northern production area, however, are on lands belonging to the State of Alaska. The State's program of adoption and implementation of these or similar stipulations is not yet clear. The new State land-use regulations, however, are intended to provide adequate protection for these lands."

The report discussed all such anticipated and possible problems rather fully. On the subject of oil pollution, with reference to the pipeline, the report stated:^{1/}

"Oil pollution -- Some of the problems discussed above are transitory, can be minimized, or will heal with time; others are long-term and will require constant care. None, however, approach in importance the potential problems created by the crude oil carried in the pipe.

"Personnel of TAPS have reported that under ideal functioning of communications and mechanical equipment, flow of oil could be shut off three minutes after a break is detected. The designed capacity of the line is reported to be about 2,000,000 barrels per day, thus, more than 4,000 barrels of oil would escape during the minimum time required to shut off the flow at pumping stations. TAPS

^{1/} Ibid., pp. 42-44.

believes, however, that a complete rupture of the line is unlikely unless a major earthquake were to occur.

"Plans available at this time call for valves, at unspecified intervals, to protect stream crossings and other areas particularly susceptible to damage from oil pollution. These valves would be shut-down mechanically by pumping station personnel traveling by helicopter. The time required for shutdown could vary from less than an hour under good conditions to several days under adverse weather conditions. A pipeline 48 inches in diameter could contain nearly 12,000 barrels per mile. Depending on the slope of the line, the distance between a valve and the break, and the time required to close the valve, a certain portion of 12,000 barrels per mile could be spilled.

"Although the effects of crude oil on birds are fairly well known, its toxic properties with respect to other animals and their habitats are only partly understood. The effects of a major spill, whether on land or water, in winter or summer, though difficult to predict, would be disastrous. The other effects of this project on fish and wildlife discussed above are generally understood through experience with other construction activities, but we have no experience with oil spills of the magnitude that would be possible with this project. Any spill along the pipeline route would be in a major watershed and could affect lands and waters for great distances downstream.

"The frequency and effect of spills can probably best be minimized through (1) application of standards of design that emphasize spill prevention, even though they may be more rigid than those established on the basis of economics; (2) provision of adequate shutdown facilities; (3) maintenance of crews and equipment for immediate and complete cleanup of spills; and (4) an intensive surveillance and spill-detection program."

With respect to the potential pollution in the production area on the Beaufort Sea, at the oil discovery site, the report went on to state:^{1/}

"Oil pollution -- This is the most significant factor affecting fish and wildlife populations and habitats. Not only will the numerous feeder pipelines have a potential for pollution, but the

^{1/} Ibid., pp. 48, 49.

drilling of wells and production of oil from them has a high potential for leaks, spills, and even blowouts. Fuel will be handled and stored under adverse conditions where safety precautions are more likely to be bypassed. Small refineries or topping plants, one of which is already located at Prudhoe Bay, will add to the potential for pollution. Tankships or other vessels loading and unloading at a northern terminal may also spill oil.

"Such fish and wildlife as are not eliminated or driven away by other factors will be under continual threat from oil pollution. Foremost will be ducks and other birds, which are highly tolerant of human activity and will nest in the area, but are particularly vulnerable to oil pollution. Concentrations of waterfowl along the Arctic Coast are temporarily immobilized during the molting period and would be unable to escape an oil spill. Other birds migrating through the area could become contaminated. Caribou and other wildlife species could suffer loss of habitat.

"Spills from these operations can be minimized by the following practices: (1) application of standards for oil storage and handling procedures that exceed current practice, (2) provision of adequate shutdown facilities, (3) maintenance of crews and equipment for immediate and complete cleanup, (4) intensive surveillance and spill detection programs, and (5) prevention of any discharge from ships in Arctic waters."

The reference to tankships loading and unloading at a northern terminal and spilling oil into Arctic waters had to do with the possibility of an Arctic shipping terminal. Fresh in the minds of the report writers at the time was the successful navigation of the Northwest Passage by the Manhattan, the super-tanker. Consequently, their report considered the possibility of establishing a terminus near the oil development fields at Prudhoe Bay.

Similarly on the subject of oil pollution, and with regard to the terminus at Valdez on Prince William Sound, the report commented:^{1/}

"Oil pollution -- The capacity of the pipeline will be about two million barrels per day, and the terminal is expected to store a 10-day supply. This large amount of oil will create an unprecedented potential for oil pollution in Port Valdez, Valdez Arm,

^{1/} Ibid., pp. 52, 53.

and all of Prince William Sound. Forty-four million gallons per day of ballast water could also be brought in by tankers and require treatment at the terminal. Experiences in Cook Inlet, Alaska, and some reported elsewhere, indicate that oil pollution can be expected at tankship terminals.

"The effects of oil pollution on a marine environment are not completely known. However, juvenile salmon depend heavily on intertidal food sources and could be affected, even if they were not in the area of a spill when it occurred. The effect of oil on intertidal salmon spawning is unknown but could be severe. If persistent oil slicks occurred in Port Valdez, the sport fishery would certainly be damaged. Oil pollution could also inhibit spawning in the intertidal zone of Prince William Sound.

"Direct effects on marine fish, bird, and mammal life of a major oil spill would be expected to be severe. Sea otters are particularly vulnerable to the effects of oil on their fur. Waterfowl and other sea birds often die from even small amounts on their feathers. An oil spill or oily ballast washed ashore on the Copper River Delta could have disastrous effects on important waterfowl concentrations and the utilization of razor clam beaches.

"Winds and currents that would affect the distribution of oil are not well known in Prince William Sound. In Valdez Arm and Port Valdez, however, prevailing winds would tend to move oil toward the head of the bay in summer and seaward the rest of the year.

"Glacial tributaries contribute much silt to the sound and some of the oil will undoubtedly adhere to silt particles and sink. If it becomes a part of the benthic sediments in this manner, it may not be susceptible to oxidation and with the low temperatures in the area, oily materials would probably be persistent.

"Even with the greatest precautions and the use of all known spill prevention and cleanup techniques, some alteration of the relatively undisturbed environment of Prince William Sound must be expected. A gradual degradation of the environment from chronic pollution could become severe without being detected if background studies are not made to provide a yardstick for measuring change."

A summary of the potential problems resulting from the construction and operation of the pipeline, as well as the terminal and production areas,

was summarized under the following three headings:^{1/}

Problems Associated with Construction and Maintenance

"These problems include erosion and siltation, barriers to fish movements, physical damage to spawning areas and fish, and entrapment of fish. They can be highly significant in certain areas, particularly the Atigun and Sagavanirktok Rivers with their potential sport fishery, the clear-water grayling streams north of the Yukon River, the sport fisheries of the Chatanika, Chena, and Salcha Rivers, the Summit Lake-Gulkana River region with its sockeye salmon habitat and recreational resources, the Little Tonsina River with its king salmon spawning and recreational use, the Lowe River with its salmon spawning grounds, and Port Valdez with its coho salmon sport fishery.

"A certain amount of siltation is a part of the natural process of spring breakup in much of Alaska. Even normally clear grayling streams carry a load of silt during periods of high flows, but the gravel bottoms remain clean. In general, the solution is to assure that siltation is reduced to a minimum and controlled in its time of occurrence where timing is critical to a fish and wildlife resource.

"Pipeline stipulations of the Department of the Interior, or equivalent controls on State of Alaska or U.S. Forest Service lands should, if properly administered, minimize damage from construction activities and reduce it to a short-term acceptable level.

Chronic Problems Associated with Permanent Change

"Longer term chronic problems associated with the project include disturbance of wildlife, interference with big game migrations, entrapment and interference with local movements of animals, increased harvest, sewage and solid waste disposal, and thermal pollution. With the exception of the latter, which probably will not be significant, these factors could exert considerable impact and will require continued effort to control. For instance, the pipeline could cause major alterations of caribou migrations and could exert a long-lasting adverse effect on their range by restricting movements of animals. Disturbance and hunting pressure will have permanent effects on intolerant species and on those which are of most interest to man, such as grizzly and brown bears, wolves,

^{1/} Ibid., pp. 54-57.

wolverines, Dall sheep and peregrine falcons. The harvest of these animals can be controlled by regulations and enforcement, but harassment, such as by individuals in aircraft viewing and photographing them, would probably cause them to leave areas of intense human activity.

"Even though problems of sewage disposal in Arctic areas may be solved, disposal of garbage and litter will be more difficult to control, and continued adverse effects on bears and foxes around garbage pits can be expected. Continued effort will be required to dispose of the accumulation already present and to prevent further accumulation.

Potential for Oil Pollution

"The greatest danger of this project to fish and wildlife resources and their environment is posed by the following: Transportation of two million barrels per day of crude oil through 800 miles of main pipeline; a maze of feeder lines, pumps and valves on the North Slope, as well as a possible loading terminal; transshipment and handling of two million barrels per day of oil and storage of as much as 20 million barrels at the Valdez terminal; and the operation of a fleet of tankships of uncertain registry capable of carrying two million barrels of oil per day through Prince William Sound. Experience indicates that engineering and housekeeping practices that will prevent oil pollution from these numerous operations have not been put into practice.

"Wherever leaks, breaks, or spills occur, they will affect important drainages -- the Beaufort Sea, the Sagavanirktok River system, the Yukon River System, the Copper River system, Prince William Sound, and the Gulf of Alaska, where most offloading of ballast water at sea will probably be done. A major spill, even though it might occur on an insignificant creek, on a drainage such as the Yukon system could cause lasting damage to important fish resources, waterfowl and their habitat, and important winter moose range in the river bottoms. We can only speculate at this time on the long range effects that various levels of chronic oil pollution might have on ecosystems such as the intertidal zone of Valdez Arm."

In flying over the route of the proposed pipeline in the Gulkana River and Copper River drainages in the Aleutian Goose on August 12, 1972, Mel Monson pointed out to the writer some of the more important sockeye salmon spawning areas. Also pointed out was a proposed somewhat altered route of a few miles, to avoid disturbing important spawning stretches of river. The rerouting was recommended by the biologists who studied the route. The oil companies turned thumbs down on the suggestion, advancing the argument that the rerouted stretch might cost \$4 or \$5 million more.

Yet, out of an estimated cost of perhaps \$2 billion or more, an additional cost of \$5 million would amount to but a quarter of one percent, 2.5 mills on the dollar. With their pious statements of environmental concern, one cannot help but wonder how sincere some of the oil companies are.

Under the National Environmental Protection Act of 1969, the oil development and its pipeline called for an environmental impact statement. In March 1972, the Department of the Interior made public its Final Environmental Impact Statement on the application for the right-of-way. The statement, consisting of a massive six-volume report together with a three-volume analysis of the economic and security aspects of the proposal, was delivered in accordance with law to the Council on Environmental Quality. Publication of the statement and accompanying documents climaxed three years study by Interior. An indication of the involvements related thereto can be found in the Interior press release of March 20, 1972.^{1/} Inputs to the statement were of course provided by the Bureau of Sport Fisheries and Wildlife and National Marine Fisheries Service.

By this time, the conservationists of various national organizations were duly aroused. Pleas were entered in the courts to hold up on the construction of the pipeline. A Federal court found that by law the Department of the Interior was limited to issuing a right-of-way not to exceed 50 feet in width. The consortium wanted a width of 150 feet. The court ruled that Congress should amend the law to permit Interior to grant that width. The Congress did so in July 1973, with both houses approving by substantial margins. The bill was signed by the President on November 16, 1973. Congress then set a deadline for suits testing the constitutionality of the legislation. No such suits were filed.

A court injunction barring the project after the expiration of the deadline was lifted by U.S. District Judge George Hart in Washington, D.C., and Secretary of the Interior Rogers C.B. Morton on January 23, 1974, signed the long-awaited permit for the pipeline the cost of which, according to one late estimate as reported in the press, would be \$5 billion. Officials of the Alyeska Pipeline Service Company, which will build and operate the line, were reported to have handed Secretary Morton a check for \$12.15 million to pay for environmental studies in connection with the construction. As of late January 1974, the oil people still needed a permit from the State of Alaska covering its own lands. But its granting seemed to be a foregone conclusion.

^{1/} See Exhibit 57, Appendix.

With the signing of the Interior permit for the trans-Alaska pipeline, the BSWF contemplates that it will have a 14-man pipeline monitoring team. By the end of January 1974, LeRoy Sowl of the RBS staff at Anchorage attended two meetings with representatives of the Bureau of Land Management, the National Marine Fisheries Service, and the Alaska Department of Fish and Game (ADF&G) to coordinate the inter-agency monitoring team expected to include about 30 persons. In January 1974, LeRoy and some of his staff also provided the Federal Environmental Protection Agency (EPA) with information to assist EPA set the level of oil discharge required for Alyeska's ballast treatment plant at Valdez. Also in January, Don Ross of the Fairbanks RBS field office joined the U.S. Geological Survey, BLM, and ADF&G on a British Petroleum-sponsored field trip to assess the environmental impact of a proposed test well to be drilled by the oil company on the North Slope. From all indications, RBS biologists are entering a new phase of activity now that the oil pipeline is going in.

As may be noted, the arguments pro and con since the 1968 oil strike at Prudhoe Bay went through a distillation that lasted years before a decision was reached. In the meantime, the 48-inch pipe remained stacked at Valdez. It would take a book to do justice to the history of one of the most controversial environmental issues of modern times.

Alaskans by and large have been for the pipeline. Much resentment was shown in local quarters over the meddlers in the Lower 48. Stickers appeared on cars giving vent to local feelings. There was even some nonsense peddled about seceding from the Union. There is no question that the royalties and other income to the State of Alaska will prove a fine assist to a State that is in rather poor economic straits, one that since its admission to the Union is still dependent in large measure for its economic health on Federal largesse.

There were many factors that went into the decision to go ahead with the pipeline. The growing dependence of the United States on foreign oil and the gasoline shortages of the summer of 1973, culminating in the cutoff of Arabian oil imports into the United States following the Arab-Israeli War of October 1973, undoubtedly were major considerations. Yet, some nagging questions remain. Would it have been environmentally less damaging if the pipeline were routed through Canada and on to the Midwest, close to centers of demand? An interesting paper on the subject was written in 1973 by Dr. Charles J. Cicchetti, visiting associate professor of economics and environmental studies at the University of Wisconsin, Madison, Wisconsin.

His opening statement was as follows:

1/ The Wrong Route, by Dr. Charles J. Cicchetti, Environment, Vol. 15, No. 5, June 1973, St. Louis, Mo., pp. 4-13.

"Attempts to balance the economic benefits of the Alaskan oil field in Prudhoe Bay against the environmental costs of getting the oil to market are handicapped by heavy emphasis on the Trans-Alaska Pipeline (TAP) as opposed to overland pipeline routes through Canada. This stems largely from the fact that the TAP is preferred by the oil companies developing the Alaskan fields. A major reason for this preference, as will be explained, is that the TAP until recently appeared to offer the oil companies considerably greater profit potential than the Canadian routes. Recent changes in government oil import regulations have nullified the profit advantage, however. Yet so entrenched has the TAP route proposal become, and so urgent has Alaskan oil development been viewed by the companies, that the developers continue to press for the Alaskan route even though the Canadian pipeline would, in fact, yield more profits for them, produce more tax benefits for Alaska and the federal government, deliver oil where it is most needed in the U.S., and probably do less damage to the environment."

He went on to add:

"To summarize briefly what follows, a Trans-Canadian Pipeline (TCP) would be subject to fewer environmental stresses, would avoid ocean pollution associated with port and terminal facilities which are a part of the TAP system, and would be a more logical trunk pipeline for combined oil and gas developments in Alaska and Canada. In addition, the Canadian pipeline would deliver oil to U.S. markets east of the Rocky Mountains, which are in short supply, rather than to the West Coast where oversupply caused by input from the TAP eventually will produce a misallocation of natural resources. Furthermore, utilization of the Trans-Canadian as opposed to the Trans-Alaskan line would mean a present value of up to \$1 billion more in oil tax revenue for the state of Alaska, probable lower costs to oil consumers east of the Rockies, and a present value of up to \$5 billion more in net profit to the oil companies before corporate income taxes. The higher corporate income taxes would, in turn, add more to the U.S. federal treasury.

"If Alaska, Canada, the U.S., the oil consuming public, the oil companies, and the environment all stand to gain from the Trans-Canadian line, why have the oil companies steadfastly focused their plans on the Trans-Alaskan route? A number of reasons were given publicly, particularly the desirability of a line completely on U.S. soil to circumvent possible political difficulties with Canada. But there were far more compelling reasons for companies to favor the TAP: Despite the apparent economic disadvantages, the companies planned the distribution of TAP oil in a way that would ingeniously take advantage of complex U.S. laws regarding the

import, export, and ocean transport of oil. The laws were designed in large part to give domestic oil producers and U.S. merchant shippers advantages in the U.S. oil market. Companies with trading interests in the Alaskan oil, however, planned to seek U.S. Presidential support for an elaborate scheme (to be explained later) that was proposed in 1970 which would have enabled them to play off Alaskan oil exports against imports to Japan, thereby reaping a profit even larger than would be obtained by using the seemingly advantageous TCP."

Dr. Cicchetti then compared the Trans-Alaskan and Trans-Canadian pipeline systems. His wording appears worth quoting:

"A brief description of the Trans-Alaskan and Trans-Canadian systems provides a comparison between their market potentials and environmental problems. The route (TAP), which is currently proposed by the consortium of oil companies, would move the oil in a north-south direction across Alaska, crossing two major mountain ranges and, in its southern half, the most earthquake-prone region in North America (Figure 1). The pipeline would terminate in the port city of Valdez, Alaska, where storage and terminal facilities would be constructed to service the oil for ocean shipment to final markets.

"The Trans-Canadian Pipeline actually is a misnomer, since segments of the line would cross part of Alaska before proceeding to the southeast across Canada. Several alternative TCP routes have been proposed, as seen in Figure 1. One alternative would be a pipeline from the North Slope to the Canadian city of Edmonton, following the natural corridor of the Mackenzie River. Actually, there are two routes which have been proposed for the Mackenzie Valley, labeled TCP-1A and -1B in Figure 1. Another alternative would follow the TAP route to the Alaskan city of Fairbanks, then the man-made corridor of the Alaska Highway, and, in some portions, previous pipeline routes, to the Canadian city of Edmonton. This route is labeled TCP-II in Figure 1. The all-land TCP pipeline alternatives would link up with existing lines from Edmonton to the U.S. Midwest and perhaps even the Pacific Northwest.

"Either the TAP or the TCP obviously would cross long stretches of land, and ruptures or settling of the pipelines along any of the routes would lead to serious environmental problems (see 'The Long Pipe,' Environment, September 1970). The pipeline itself might interfere with migrations of caribou. A route which would minimize damage could be chosen, but some environmental damage is inevitable. Other alternatives such as air or rail transport have been suggested, but much debate over their economic and

environmental characteristics seems to indicate that a pipeline will inevitably be the system used. The experiment to test ocean transport through the Northwest Passage, from the Atlantic to the Pacific, utilizing the specially outfitted tanker Manhattan, produced difficult technical and legal problems that also make the overland route more attractive. Another alternative, of course, is to cap the oil fields of the Alaskan North Slope as a reserve for some future need. This would prevent all immediate environmental hazards, but in terms of any benefit-cost analysis, it would mean that those environmental impacts would be assigned a value in excess of the economic and resource allocation benefits to be obtained by immediate use of the oil. While such a comparison should have preceded the current debate, it did not. Accordingly, the following discussion will concentrate on the current controversy over the best route.

"Among the pipeline alternatives, there are some clear-cut differences in potential environmental difficulties. The TCP routes cross a far less rugged terrain as well as avoid the zone of most intense earthquake activity along the southern leg of the TAP from Fairbanks to Valdez. Fragile soil conditions imposed by permafrost (a permanently frozen layer of soil or subsoil) are most extensive along the TAP route but do exist on the Trans-Canadian courses as well, particularly along TCP-1A, the line that follows the Arctic Ocean coastline, then the Mackenzie River channel. TCP-II, the southernmost Trans-Canadian route, passes through less permafrost than the other TCP routes. Since TCP-II follows the Alaska Highway from Fairbanks, physical effects of the pipeline on permafrost probably would be minimal from that city to Edmonton.

"Perhaps the most notable difference between the TAP and the TCP environmental impacts would be in marine pollution. Key to the TAP system is the ocean link between the city of Valdez on Prince William Sound and terminal facilities at Puget Sound or at Los Angeles. Oil transfer and tanker operations along this route would produce chronic, low-level oil contamination as well as probable major discharges resulting from tanker accidents. The hazards of navigation near Valdez and Puget Sound include many islands, frequent fog, violent winds, and high waves. These problems would have to be negotiated by large tankers that have had an unfortunate safety record in the past ten years (see 'Horizon to Horizon,' Environment, March 1971). Shipment of oil to Japan and to the Caribbean, according to plans discussed earlier, for marketing oil not needed on the West Coast would greatly increase the areas affected by the marine pollution. If tankers associated with greater pollution were utilized and more oil terminal operations were involved, the level of marine pollution would increase.

"Although the Trans-Canadian routes present much less of a direct threat, there are nonetheless potential problems. TCP-1A passes close to the coast of the Arctic Ocean as well as across many rivers flowing into that ocean. An oil leak from the pipeline thus could be carried into the sea. Furthermore, if TCP oil were piped from Edmonton to Seattle in Puget Sound, then shipped by ocean to Los Angeles or San Francisco, ocean pollution would result as it would in that portion of the TAP system. Although the TCP Seattle-California arrangement has been suggested by TAP proponents, the Edmonton-Chicago pipeline to the Midwest would produce far greater profit, and so it is much more likely to be selected by the oil companies if the companies are forced to accept an all-land system."

He then described the natural gas problem:

"In addition to these overt environmental considerations, there is a related point that has regrettably had little attention. The natural gas that will be released from the oil wells in Prudhoe Bay most probably will be piped to market, since Alaskan law now forbids flaring (burning) it. This means that developers must plan for still another pipeline across the North. The most likely route for the gas line would be across Canada to the Midwest for the following reasons: (1) it is a cheaper system, since it avoids the expensive liquification that would be necessary if tanker transport were used; (2) many of the same companies have found vast gas fields in Canada and need a transport system; and (3) the gas market in the Midwest is far larger than on the West Coast.

"The natural gas pipeline will not present the imminent environmental hazards inherent in pipes carrying hot crude oil, but there will be considerable environmental disruption in securing over-land rights-of-way for the gas line. Since this disruption appears to be an inevitable, overlooked, environmentally significant cost of the North Slope development, it can be argued that the cost could best be minimized by combining oil and gas pipelines in one Trans-Canadian corridor to Edmonton. This would do away with the need for one pipeline route to Valdez for oil (the TAP plan) and another route through Canada for natural gas. The combined corridor through Canada would also better serve transport of oil and gas from the Canadian Northwest Territories. The various pipeline developments thus might be combined into a northwestern petroleum transport corridor.

"A number of these considerations are weighed in a comparative analysis of the alternative routes in the environmental impact statement on the TAP prepared by the U.S. Department of the Interior. The department concluded: 'No single generalized route

appears to be superior in all [environmental] respects to any other.'

"However, the department concluded that, first, the TAP was superior to the Trans-Alaskan-Canadian routes only from the standpoint of its impact on the abiotic, or nonliving, environment. This difference occurred because the TAP right-of-way would occupy less land than the TCP route. Department of the Interior analysts pointed out that this advantage was lost if a natural gas pipeline were to be considered as part of the Arctic development plan, since the gas pipeline would require a right-of-way in addition to that for the TAP, resulting in a vast increase in land exposed to environmental problems related to development of North Slope oil. Second, the department concluded that from the standpoint of the impact on the overall biotic environment, TCP-1A was superior. Third, the department concluded that from the standpoint of the unavoidable impact upon 'socio-economic systems, ...recreation, aesthetic, wilderness, communities, and native culture and substance,' the TCP-1A route was superior. Fourth, the department concluded that routes TCP-1B and TCP-III would probably have the least impact on the marine environment. From the standpoint of risk, or threatened environmental impact, the Department of the Interior concluded that both the TCP routes were superior to the TAP from the viewpoint of both the terrestrial and marine environments. Since the TAP is environmentally inferior, its economic advantages will be examined next to determine the social tradeoffs that are necessary to select the optimal route."

In his economic analysis, Dr. Cicchetti stated:

"An interested person who attempts to keep track of the various public estimates of the cost of a Trans-Canadian pipeline will probably have a difficult time of it. Estimates of construction costs ranging from \$1 billion to \$7 billion may be found by reviewing the public statements and writings of various oil companies and public officials in both Canada and the U.S.

"It should be noted that all TCP routes avoid the necessary expenditures for terminal and marine facilities that are included in the TAP estimates above. Using the same costs per mile as TAP, the capital costs of crude oil pipeline from the North Slope to Edmonton down the Mackenzie Valley range between \$2 billion and \$2.75 billion in 1971 U.S. dollars. Beyond that it is often presumed that it may take two years longer to put a Canadian route into operation than it would the TAP. This can be accounted for by further discounting against the proposed flow rate.

"The second component of costs, after capital costs, is the operating cost per barrel of crude oil. This has been estimated by the three major North Slope companies for the North Slope-Edmonton-Chicago system operating at 2 million barrels per day to be approximately \$0.30 per barrel. This operating cost may be broken down into costs of \$0.174, \$0.126, and \$0.065 per barrel for the North Slope to Edmonton, Edmonton to Chicago, and Edmonton to Puget Sound, respectively."

He then proceeded to make his comparative analyses, using flow rates, various other factors, and market needs of the Midwest and East Coast as opposed to those of the West Coast. He concluded that the cost comparisons between TAP and TCP-I were inconclusive and so he went to the subject of profits. He found that there were economic advantages of the Trans-Canadian systems, but that profits were tied to an import-for-export plan under the Mandatory Oil Import Quota Program, a Federal requirement that, until the President changed the system on April 18, 1973, dictated permissible quantity of oil imports according to a complex formula. The plan would have made it very profitable to sell the excess Alaskan oil to Japan, which needs large amounts of petroleum. The oil would be shipped in tankers from Valdez to Japan, using foreign and hence cheaper tankers. The exporters would then be allowed to import an equal amount of foreign oil to the East Coast, again in foreign tankers. In brief, the import-for-export plan would have allowed oil companies to import a foreign barrel of oil on the East Coast for every barrel of oil exported from Alaska to Japan.

The preferred tax treatments afforded the oil companies, higher prices obtainable on the East Coast, juggling quotas, selling or swapping oil through subsidiaries, refining in the Virgin Islands, all such manipulations were attributed to the oil companies in rooting for the Trans-Alaska pipeline route, according to Dr. Cicchetti. That route was calculated to bring as much as 50 cents per barrel more for North Slope oil as opposed to the most favorable Trans-Canadian route.

Interestingly, as facts began to emerge, Alaska moved to protect itself against loss of revenue from the marketing schemes and passed a law to the effect that the posted price of oil in Alaska would be used to calculate taxes regardless where the oil is marketed. The law is being challenged by the oil companies who would prefer to use the \$2.01 per barrel world-price in their manipulations. The low world price would yield Alaska only 10 cents per barrel, some 35 cents per barrel less than if the oil companies sold the Alaskan oil in California at prices much higher than the world price. Under the Alaska law, oil companies cannot use transportation costs and low market prices elsewhere to reduce their tax obligations. The main concern in Alaska of course has been the most rapid development possible in order to gain immediate tax

revenue and to provide employment to ease a chronically high employment rate.

Dr. Cicchetti closed his paper by stating:

"To summarize, the TAP system is inferior to the Trans-Canadian route in a number of respects. First, the over-land route through Canada is environmentally superior, though by no means environmentally harmless - it avoids the most serious earthquake and avalanche problems in southern Alaska and will not contribute directly to ocean pollution since tankers will not be used. Furthermore, TCP-I or TCP-II would utilize existing rights-of-way over part of the distance rather than all new construction as would TAP. The interprovincial pipeline, which now carries oil from Edmonton to eastern Canada and the Midwest, could be incorporated into the TCP to carry North Slope oil to Chicago. The pipeline could be extended from Chicago to the East Coast without loss of profits, because the higher East Coast prices would offset added construction and transportation costs. Finally, the Department of the Interior conceded that a joint oil and gas transportation system through Canada would be environmentally superior to an arrangement requiring an oil pipeline through Alaska and a gas line through Canada, as probably would be the case if the TAP were built.

"A Trans-Canadian system would supply the U.S. markets most in need of oil at costs that would be of greatest benefit to the public and, seemingly, to the oil companies. It was only when the companies' profit motive alone was considered under the now defunct Mandatory Oil Import Quota Program that the TAP had the edge - and then only if arbitrary, though legal, manipulations were made to take advantage of U.S. laws that are at least ostensibly designed to benefit more than just the oil companies. The only remaining justification for the TAP is the cash flow problem of two American and one British oil companies; it hardly seems wise to let this one factor dominate a major decision of this type.

"To close, I would like to quote from the final two paragraphs of my basic report written for Resources for the Future:

'It is not surprising that the possibility of a Trans-Canadian pipeline for Alaskan oil has never been thoroughly explored with the Canadian government - although there is every sign that Canadian officials are receptive to such a proposal. After all, this alternative has been resisted by both the oil men and [the Department of the Interior] and has suffered in comparisons with TAP because

too little has been known about its economic and environmental merits.

'No one analyst can produce all the answers needed to resolve the controversy over Alaskan oil, particularly when so many variables and unquantifiable factors are involvedBut it is my hope that the merits of TCP alternatives will receive further consideration before a final - perhaps irreversible - decision ends the controversy over TAP. The consequences of a TAP-tanker system for transporting Alaskan oil could haunt an entire continent for many years to come. Even [the Department of the Interior] acknowledged this in its environmental impact statement: "Because of the scale and nature of the project, the impact would occur on abiotic, biotic, and socioeconomic components of the human environment far beyond the relatively small part...of Alaska that would be occupied by the pipeline and oilfield. ""

In the light of the Congressional desire to go ahead with the Trans-Alaska pipeline, Dr. Cicchetti's hope that the alternatives to that route, namely the Trans-Canadian routes, receive further consideration before a final, perhaps irreversible decision is made, has been dashed. Perhaps time, and only time, will tell whether the right decision was made.

The writer is no economist and has no way of assessing Dr. Cicchetti's paper. He presents it as a viewpoint of one not solely concerned with ecological considerations.

An interesting aside on the heat generated in some quarters on the Trans-Alaska pipeline appeared in the Albuquerque Journal, Albuquerque, New Mexico, on Friday, June 8, 1973. In a syndicated column under the title "Alaskan Pipeline is Delayed Again," James J. Kilpatrick wrote:

"WASHINGTON. A group of Midwestern legislators, pressing for regional advantage at the expense of national needs, has managed once more to delay construction of the trans-Alaskan pipeline. The project is bogged down in committee, and faces a bruising fight when it reaches the floor.

"The story is one long chronicle of frustration. If construction of this pipeline had been started three years ago, when its prospective builders were ready to go, the nation might now be benefiting from one to two million barrels of oil per day. We would be significantly less dependent upon supplies from the Middle East. Our balance of payments would not be quite so dangerously out of kilter. At least \$2 billion could have been saved in construction costs.

"All this is what might have been. Much of the exasperating delay has resulted from the opposition of the eco-freaks, those conservationist zealots whose frenzy carries them, like the Jesus freaks,

beyond dedication to obsession. Their spokesmen have conjured up damage to the migratory habits of the caribou; they have expounded pathetically upon the harm that a four-foot-pipeline would do to hundreds of thousands of square miles of tundra; they have raised vague fears of earthquakes, melting ice, oil spills, and harm to polar bears, fish, and to 320 species of arctic birds.

"I do not mean to challenge the sincerity of these conservationists. It is their judgment and their sense of priorities that compel a blunt rejoinder: The United States urgently needs Alaska's North Slope oil. We have to have it. Further delays cannot be condoned.

"Yet further delays are in prospect. On Feb. 9, the U.S. Court of Appeals for the District of Columbia enjoined construction of the pipeline on a single point: The Mineral Leasing Act of 1920 limits rights-of-way on Federal lands to 25 feet on either side of a pipeline. The proposed line from the North Slope to Valdez would have required 70 to 75 feet on either side at certain points. It is puzzling, in retrospect, that this obstacle was not comprehended and resolved long ago.

"On Feb. 21, less than two weeks after the court ruling, Alaska's Senators Mike Gravel and Ted Stevens introduced a bill to overcome the objection. They proposed to cut all the red tape in a single blow, by declaring that the bulky environmental impact statement, long ago supplied by the Department of the Interior, filled all requirements of law. Similar legislation was offered in the House.

"We are now into June, and nothing has happened. Instead, the old alternative of a trans-Canadian route has been revived. Senators Walter Mondale of Minnesota, Adlai Stevenson of Illinois, and Birch Bayh of Indiana are insisting that the Canada plan be studied anew. On the House side, John B. Anderson of Illinois is blandly urging that an Alaskan route not be 'canonaded' into law.

"William E. Simon, deputy secretary of the Treasury, demolished these arguments in a recent statement. Building a Canadian line, he said, 'would delay receipt of vitally needed Alaska crude oil from three to five years.' The Canadian line would be much longer; it would have to cross 12 major rivers; it would cost twice as much; it could not be built without prolonged negotiations with Ottawa, in which the Canadians understandably would insist upon protecting their own domestic concerns.

"The Nixon administration many times has cited the 'urgent necessity' for building the trans-Alaskan line. The state's spokesmen

in Congress, who know and love their wilderness area, have pleaded for prompt action. Every national interest, it seems to me, demands that we get on with this job - and get on with it now."

Mr. Kilpatrick stated that he does "not mean to challenge the sincerity of these conservationists." One cannot help but wonder, however, how much he contributes to the situation by labelling them "eco-freaks" whose "frenzy carries them, like the Jesus freaks, beyond faith or fanaticism, beyond dedication to obsession." He dismisses damage to migrating herds of caribou as having been "conjured", fear of earthquakes and oil spills as "vague", and so on. Well, this is a free country. And because it is, he is entitled to the exercise of poetic license as with no constraint he grinds out grist for his column. Presumably, like the eco-freaks, he is sincere, too.

There can be no rationale against the development of Alaskan oil, whether at Prudhoe Bay, other points inland, or on the great continental shelf off the coast of Alaska. Until other forms of energy can replace some of the demands made on oil, the demand for it will continue to mount. The basic problem lies not in opposing oil development in Alaska but in safeguarding the environment to the greatest possible extent. That the environment must suffer to some degree is inevitable. To keep the expected damages within reasonable bounds, without callously ignoring the greater potential dangers and taking all appropriate measures to insure against accidents, therein lies the artistry of preserving the Alaskan environment and its dependent fish and wildlife resources. Perhaps at this point in time it is too much to expect of a frontier state like Alaska. Perhaps in its yen for growth and economic development, it must go through the historical phase of environmental disregard that marked the growth and economic flexing of so many of the Lower 48. If so, it will be a pity.

The writer was most impressed with the quantitative evidence being collected by Bureau of Sport Fisheries and Wildlife biologists on the bird life, notably waterfowl, of the Arctic wetlands bordering the Beaufort Sea in the vicinity of the oil development and exploration in Prudhoe Bay; also, of similar studies of the great concentrations of avian marine species of Prince William Sound. The patrols, the counts on the ground, by boat, by air, the numerous transects, and the computerization of data, have already produced a mass of information without parallel. LeRoy W. Sowl, chief of RBS special studies outlined the studies to the writer in Anchorage in August 1972. Their scope and coverage was impressive.

LeRoy Sowl joined the Division of River Basin Studies in Anchorage, Alaska, in June 1970 to become the coordinator for the BSW study of the trans-Alaska oil pipeline. Initially, there were two pipeline project studies, one in the BSW and the other in BCF. When RBS activities in Alaska were transferred in 1970 from the BCF to the BSW, there was no real need to maintain two separate projects. By late 1970 it became evident that the

trans-Alaska pipeline would be delayed and that the two studies would neither be funded nor staffed at the levels programed by the two sister agencies. Consequently, 1971 saw the pipeline study consolidated as a single project study in the BSW and LeRoy was placed in charge of it.

LeRoy Sowl's previous experience with the BSW was with the Wildlife Refuges Division, having started in October 1958 on the Lower Souris National Wildlife Refuge (now known as the J. Clark Salyer Refuge) in North Dakota. In December 1959, he was transferred to the Upper Mississippi Refuge as a district manager at Lansing, Iowa, remaining there until July 1964. He then returned to North Dakota as supervisor of the Crosby wetlands acquisition office. In July 1970, LeRoy went on to Anchorage to serve on the staff of the associate refuge supervisor for Alaska as one of two wildlife biologists assigned to Amchitka Island in the Aleution chain of islands. The two were rotated monthly, each monitoring the Atomic Energy Commission activities on Amchitka for a month and then performing staff duties in the Anchorage refuge office for a month.

It was the experience on Amchitka Island that brought LeRoy into the Division of River Basin Studies. Yet, as early as 1960, he was being exposed to the activities of the Division when with the Division of Wildlife Refuges he worked with the Corps of Engineers on the Mississippi River with such activities as maintenance dredging of navigation channels and the control of docks, piers, and houseboat moorages. Prior to joining the BSW in 1958, LeRoy also worked with the Minnesota Division of Fish and Game as a seasonal biologist aide doing lake and stream surveys. Such work was done during the summers of 1955-1957.

On his visit to Alaska in August 1972, the writer was also informed of the studies going on to test the reaction of caribou to simulated pipelines. A report on the subject was completed and released the following year.^{1/}

The pipeline of course will not be the sole intrusion into the Alaska landscape. Road systems, oil drill rigs and pads, airstrips, construction camps, and other related activities all will invade the territory of the caribou. Research is under way by the Alaska Cooperative Wildlife Research Unit, funded by moneys made available by the BSW, to find some answers to

^{1/} The Reactions of Barren-Ground Caribou (Rangifer tarandus granti) to Simulated Pipeline Crossing Structures at Prudhoe Bay, Alaska, by Kenneth P. Child, Alaska Cooperative Wildlife Unit, Univ. of Alaska, Fairbanks, Alaska, June 30, 1973, 49 pp.

the questions posed by oil development and transport. But for the moment, it may be of interest to touch briefly on the pipeline and its effects on the movements of caribou, abridged herein from Kenneth P. Child's report.

The Prudhoe Bay oilfield is situated within the historic range of caribou. The area is important summer range, insect-relief habitat and calving grounds for a small population of approximately 3,000 animals using the area. The oil field area also is characterized by occasional large scale and intermittent movements of thousands of caribou. Such movements usually coincide with major population shifts between the Arctic and Porcupine caribou herds, to the west and east, respectively. The area has also been known to over-winter caribou. The numbers have varied over the years but in the winter of 1959, S.T. Olson, in a Federal aid in wildlife job completion report, estimated that the Central Arctic wintered 150,000 animals, 30 percent of which were located coastally near the Sagavanirktok River, on the east side of the Prudhoe Bay area.

To determine the effects of the pipeline on caribou movements, Alyeska Pipeline Service Company (ALPS) constructed a two-dimensional barrier 10,200 feet in length out of four-foot snowfencing, elevated 20 inches above ground on 10-foot spruce poles, with burlap sacking stapled on the east side of the fence, to make an optical barrier similar to the proposed pipeline. Two gravel ramps and four underpasses were included in the design. The ramps were 75 and 100 feet in length with 2:1 side slopes and aligned with the axis of the fence. Three of the underpasses were 100 feet long providing ground clearances of approximately 7 feet 8 inches; a fourth, 150 feet long, provided a 4-foot clearance above the ground. To give a three-dimensional illusion at the underpasses, two spans of snowfencing were used. Observations were made from a 14-foot tower approximately 50 feet from the fence and positioned equidistantly from the ramps.

In 1972, the ramps were modified as were the underpasses. The ramps were reconstructed equal in length with 5:1 slopes, and the underpasses increased in length to 200 feet. At two of the underpasses, the snowfencing and burlap sacking were replaced by 32-inch galvanized culverting to remove possible bias in the results due to movement of the burlap by the wind.

In 1971, British Petroleum Alaska, Inc., concerned with the impact of feeder pipelines on caribou movements through the Prudhoe Bay oilfields, constructed a pipeline simulation of 3,600 feet using 24-inch culverting suspended and anchored for 3,000 feet on water-filled drums. The remaining 600 feet were raised on various types of pilings to provide a ground clearance from 4 to 8 feet. To intercept and channel movements of animals toward the structure from the north, a cable with fluorescent flagging was strung from the north end of the pipeline eastward 900 yards on oil drums. A 14-foot observational tower was constructed adjacent to the simulation on the gravel service road.

To facilitate behavioral observations and permit mapping of summer movements of caribou through the Prudhoe Bay oil field; caribou groups were aerially sprayed with commercial fabric dyes.

A brief summary of the findings of Kenneth P. Child's report indicates that the majority of caribou showed a tendency to avoid the structures; crossing of caribou groups over the pipelines was correlated with size and composition of the group and sex of group leadership; individual animals crossed the pipeline more frequently than groups of caribou; ramps appeared to be a better method to facilitate crossings than underpasses which were generally avoided.

For a fuller understanding of the details and involvements of the study, the reader of course must peruse the report, which also gives recommendations on the location and details of construction of the actual pipeline itself.

Recognizing that the Prudhoe Bay study of caribou reaction to man-made barriers was dependent on caribou cooperation, something that could not be guaranteed, it was proposed in early 1971 that the semi-domesticated model reindeer herd at Nome be used to test the reaction of reindeer to a simulated pipeline.

Consequently, in October 1971, a cooperative agreement was entered into between the Alaska Department of Fish and Game, Bureau of Land Management, Bureau of Sport Fisheries and Wildlife, Bureau of Indian Affairs and the Alaska Cooperative Wildlife Research Unit for the accomplishment of the proposed test. River basin studies personnel participated for the BSWF. These studies were conducted during the summer and fall of 1972 and were scheduled for completion in 1973. Tentative conclusions in 1972 were that reindeer preferred to avoid the test barrier much as the caribou did at Prudhoe Bay.

Not much has been said thus far about Corps of Engineers activities. Its Alaska district engineer's office in Anchorage was established in April 1946 although Corps activities in Alaska go back to 1911. Many comparatively small projects have been completed by the Corps, such as harbor deepening at coastal ports, navigation channeling, and small flood control projects around some of the towns. In contrast to the huge hydroelectric power projects in the Lower 48, the only hydropower project being built by the Corps in Alaska is the Snettisham Project 28 air miles southeast of Juneau. There are of course many military installations that were planned and constructed by the Corps for the Army and Air Force, but the concern of RBS biologists essentially has been with civil works.

The Chena River Project was authorized by the River and Harbor Act of 1968 to construct flood control works above Fairbanks to protect that city

and the nearby military installation from flooding. Dams on the Chena River and the Little Chena River were called for as were 22 miles of dikes, five miles of levee, and interior drainage facilities. Total cost was estimated at \$119 million, no small amount as such projects go, with \$116 million as the Federal share.

The first report of the river basin studies people of the BCF to the District Engineer at Anchorage was dated October 13, 1967, in response to a Corps inquiry for BCF views on the Corps survey report. BCF called its response a detailed report though understandably it was somewhat speculative in nature. It stressed the importance of the salmon runs of the Chena River. It toyed with the possibility of a salmon spawning channel, a salmon incubating channel, and a grayling hatchery. It gave the usual statistics regarding fish and wildlife, covering commercial and sporting aspects, and recommended such basic measures as unrestricted public access around the reservoirs for hunting and fishing, conducting detailed biological studies of salmon, grayling, and other fish species over a four-year period prior to construction and a similar study after construction. Releases of water were asked for as well as construction of an experimental salmon incubation channel. There were other considerations.

The Corps of Engineers changed its plans, a common occurrence in project planning. So on August 2, 1971, the now new National Marine Fisheries Service issued its report; and on August 9, 1971, the Bureau of Sport Fisheries and Wildlife at Anchorage issued its report. They were compatible reports since in spite of going to separate Departments, the two agencies cooperated closely and coordinated their views.

The two reports of August 1972 reflected the changes, the major one being the discarding of the earlier dam proposal on the Chena River at mile 28 and relocating it 10 miles downstream with two pools separated by a low rock-faced overflow sill, and retaining the Little Chena River detention dam and the Tanana-Chena levees.

Since the new proposal would not destroy the chum salmon spawning areas that would have been destroyed had the earlier plan jelled, changed recommendations were in order. So the NMFS report stressed the need for fish passage facilities, scrapping the idea of a hatchery but asking for more studies and flexibility in project planning and construction. The BSWF report paralleled the NMFS report. It also stressed the importance of fish passage facilities and suggested that the Corps work closely with the BSWF, the Alaska Department of Fish and Game, and NMFS in the development of detailed plans so that fish and wildlife might receive adequate consideration during the planning, construction, and operational stages of the project; also, that adequate funding for future needed studies be provided by the Corps of Engineers.

What stands out in this situation is that there were reports by two Federal conservation agencies where once upon a time there would have been one and, further, the two agencies worked closely together in spite of their complete dismemberment. The inherent seeds of discord did not germinate.

In conjunction with this project, on August 30, 1971, the NMFS sent the district engineer of the Corps a proposal for a salmon propagation facility, largely an enhancement feature, and asked for \$20,000 for consultative services to design and operate a salmon fry propagation unit designed by its Auke Bay Fisheries Laboratory. It would entail an adequate water source, enclosed insulated space for incubators, facilities for trapping and holding adults, facilities for washing, grading, and storing gravel, and holding ponds for limited feeding of king salmon fry and chum salmon fry. The fry propagation unit was based on a similar successful unit for pink salmon in operation by the Laboratory on Auke Creek near Juneau that was constructed in 1971. The Auke Creek unit during its first year of operation had yielded fry at better than a 5 to 1 advantage over natural spawning. At this writing, it is not clear what the unit would cost nor how the Corps reacted to the proposal. It does show, however, the thoughtfulness and ingenuity of the NMFS fisheries biologists in suggesting measures to maintain salmon runs under altered project conditions.

An increasing activity of the Corps pertains to the issuance of permits for all sorts of activities in navigable waters in accordance with Sec. 10 of the River and Harbor Act of 1899. With more growth in sight for Alaska and the resultant demands for more development of all kinds, Corps activity is bound to increase.

One of the recommendations of the four Assistant Secretaries of the Interior to their Secretary on June 1, 1967, in their report on the Rampart Project, was that the Interior Department establish an Alaska Power Administration (APA) to promote the development and utilization of the water, power, and related resources of Alaska. On June 16, 1967, the Alaska Power Administration was established as a separate bureau of Interior, headquartered at Juneau. It replaced the Bureau of Reclamation, taking over that bureau's functions. Thus it took over the operation of the Eklutna hydropower plant near Anchorage and launched other power studies and activities related to Alaska's growth. When the Snettisham power project near Juneau is completed, the first generator having been scheduled to go into commercial service in December 1972, the Alaska Power Administration will operate the project and market its power.

An idea of the APA's activities can be gleaned from its annual reports to the Secretary of the Interior. They tell of the Alaska Water Study, a regional study handled by a committee of 30 State and Federal agency

representatives. The study was one of those broad 21 framework studies that blanketed the nation. It was a product of the Water Resources Planning Act of 1965 which established the Water Resources Council. That Council requested Interior to make the study and the Secretary designated the APA to be the lead agency. Like other comparable studies, it was broad in scope covering programs of other agencies in addition to the primary objective of preparing a comprehensive multiple-purpose plan for the best use of Alaska's immense water and related land uses.

APA inherited irrigation studies from Reclamation and in February 1970 completed a joint study team report on the development and irrigation of new lands in the Matanuska Valley. In December 1971, a similar study team completed a report on the irrigation potentials in the Tanana River Valley, an area the size of Pennsylvania. As one result, according to APA, a large new area of good land had been identified with a view to development.

The APA is quite involved in studies of hydropower potentials with Canada in the Yukon-Taiya Project in the upper Yukon River drainage. The proposal involves raising some lakes on the Yukon Plateau in Canada by construction of a dam at Miles Canyon just upstream from Whitehorse. It would then back water into Lindeman Lake, also in Canada but close to the divide that is the boundary between Canada and the United States, and then delivering the water into Alaska by a 17-mile tunnel under the Coast Range for a 2,000-foot drop into an underground powerhouse which would discharge into the lower reaches of the Taiya River near Skagway.

Like the Bureau of Reclamation before it, APA is involved in many joint activities like reviewing over 200 waterpower sites now reserved on the public lands for revocation and release of the land for other uses. It assesses the granting of transmission line rights-of-way across Federal lands, comments on proposed licensing of hydroelectric projects by the Federal Power Commission, and works on a host of other interwoven Federal-State activities. But power studies and activities seem to be its prime concern. As such, it reflects the Federal Government's interest in the growth and development of Alaska.

In turn, all such studies and activities are of interest to the NMFS and BSWF since the interrelationships of fish and wildlife resources are inextricably tied to the land and water on which they are dependent.

Of particular concern to the two agencies are coastal activities and their effects on the biota. Logging operations in southeastern Alaska, for example, pose problems. The inlets and bays are used for making and storing rafts of floating logs before towing them to the mills, a logical way of transporting them. Yet, there is widespread concern and speculation by fishermen and conservationists that log-dumping and long-term log storage in protected bays may be harmful to the marine fauna, especially crabs, that inhabit such areas.

Underwater observations by the Auke Bay Biological Laboratory biologists revealed that large amounts of bark, wood, and other debris on the bottom were having deleterious effects on the crabs, shrimps, clams, snails, sea anemones, and other species present in those areas. In 1970, seven such areas were examined by biologists with scuba diving equipment. Observed was such junk as old cables, bundle straps, cast iron stoves, engine headgaskets, bottles, sunken logs, and deep layers of rotting bark, twigs, chips, and silt. The animals seen in such dump areas were markedly less abundant on the outfall of the underwater dumps. Much of the decomposing material was black and foul and obviously anaerobic. Some of the dumping sites were used for five years and more, where many millions of board feet had been dumped from the clear-cutting operations. More studies were indicated, to gauge the fuller effect of such logging garbage areas on marine life. The BSWF also proposed additional studies to collect data as to which bays were the more important fish and wild-life producers.

The Yukon-Taiya Project mentioned above also called for a study of the physical, chemical, and biological properties of the Upper Lynn Canal, the inside passage route leading to Skagway, to learn what the effects might be as a result of the project's infusion of massive quantities of fresh water into a saltwater environment. Here again, the Auke Bay Biological Laboratory proposed a three-year study prior to possible construction involving a three-man crew and a minimum of three scientists aboard a research vessel for 60 days each year.

As the Rampart Dam received its big play, the Yukon-Taiya project dropped into the background. With the failure of Rampart, the Yukon-Taiya proposal is being revived. As with all such large projects, it would be built in stages. The total energy output of 235 billion kilowatthours a year would exceed that of Grand Coulee Dam on the Columbia River. The estimated cost of the project would be around \$2 billion. The power would serve mining interests in the Haines-Skagway area. Extra power would intertie with the British Columbia transmission system, with surplus power tying in with the existing West Coast power system. Ultimately, power also would go to Anchorage and Fairbanks. To assess the effects of the huge proposal on fish and wildlife will take some doing, to say the least. The project raises a host of questions. The answers will not come easily.

Power from a proposed hydropower project near Port Stettisham might be used by the Marcona Corporation in developing the iron ore deposits near that port. The plan is to pelletize the ore and ship it to Japan for further processing. The operation in Alaska might very well involve taconite tailings and wash water being dumped into the nearby coastal waters. So another involved FPC license might need close scrutiny.

Another development in the offing that may well involve permits from the Forest Service, Corps of Engineers, and the Federal Power Commission is

the proposal by U.S. Plywood-Champion Papers, Inc., to build a pulp mill at Berners Bay, about 40 miles north of Juneau. The Forest Service sold a large block of timber to the company and the pulp mill is in the offing. It will be the job of the BSW river basin studies field office in Juneau to evaluate the effects of the mill and submit letter reports to licensors and the licensee evaluating the proposal and develop appropriate recommendations to save or at least minimize the effects of the mill operation on the salmon, herring, smelt, bottomfish and shellfish of the affected waters. Moose have been established in the area and there are large populations of seals, sea lions, ducks, and bald eagles occupying Berners Bay at various times of the year. The NMFS no doubt will also prepare its own report, now that it is an independent agency in the Department of Commerce.

The Mitsubishi International Corporation has recently taken over the lease of the Klukwan iron ore deposit agreement with the Klukwan Village Council. The deposit is an alluvial fan on the Chilkat River 20 miles northwest of Haines. The mill for the 20-year project could produce 1,600 tons of iron concentrates a day from about 14,000 tons of ore. Low cost power from the Yukon-Taiya project would enhance the economic potential of the mill but the project is also feasible with power generation by low grade fuel oil. Large power shovels would load 200-ton trucks and haul the ore to the processing mill, where screening, crushing, washing and magnetic separation would take place. Crushed to the consistency of powder, the concentrate would be mixed with water to be pumped through a 12-inch pipeline to Haines. At tidewater, the slurry would be dewatered and the concentrates made into pellets by mixing with bentonite clay. The pelletized concentrates would be hardened in a curing kiln and shipped by freighter to Japan for reduction to pig iron.

What has all of this to do with fish and wildlife? The Chilkat River supports one of the most important runs of chum salmon in southeast Alaska. Pink, chinook, sockeye, and coho salmon also migrate up the river. The project calls for removing some ore from the river channel, thus necessitating diversion of the river. Wildlife in the Chilkat River environs include black bears, brown bears, moose, mountain goats, beavers, minks, and otters. Waterfowl also use the area during spring and fall migrations. Thousands of eagles use the area during spring and fall migrations. Some of the eagles nest in the tall trees along the river. The river basin studies job, if the project goes forward, will be to evaluate its effects on fish and wildlife resources. The BSW, the NMFS, and the Alaska Department of Fish and Game will all have some input into the assessment. Recommendations will be all important.

On a leg of a plane flight in Southeastern Alaska, the writer flew up the Lynn Canal from Juneau on August 18, 1972. He was much impressed with the grandeur of the mountains and glaciers around Auke Bay and on both

sides of the Lynn Canal, the last segment of the Inside Passage from Juneau to Haines. He had a good view of the braided Chilkat River near its mouth and its mountain-flanked valley above. Recognizing that development surely will come to areas like the Chilkat River Basin, he could not help but wonder what portions of Alaska might remain unscathed.

Alaska's exposed land mass is big. As mentioned, its 580,000 square miles makes the State about one-fifth as large as the total Lower 48 States. Its coastline is a winding 33,000 miles and represents 56 percent of the total United States coastline. With its adjacent outer continental shelf of 550,000 square miles, 56 percent of that entire shelf of the United States, the coastal zone is undoubtedly the most productive habitat for finfish and shellfish, marine birds, and marine mammals on the North American Continent. Its proximal islands and shorelines likewise teem with birds and mammals.

Some idea of the importance of the coastal fisheries can be had from the estimated average annual first wholesale values of the salmon and shellfish packs of recent years. The statistics were prepared by the NMFS. The salmon in Bristol Bay averaged \$21 million, with a peak value of \$54 million in 1965. Cook Inlet's salmon pack averaged \$15 million a year and its shellfish pack, king crab, Dungeness crab, and shrimp, around \$1.5 million. The Gulf of Alaska, where Japanese and Russian fishermen were taking so many ocean perch, had an annual pack of \$20 million and a shellfish pack of around \$25 million, also consisting of king crab, Dungeness crab, and shrimp. What the sport fishing value of the coastal fisheries might be can only be surmised though it is growing every year, especially in Southeastern Alaska.

The fact that as high as 1,200 foreign fishing vessels a year visit the Alaskan fishing waters is a measure of the importance attached to such waters by Japan, the Soviet Union, Canada, and more recently South Korea. This influx of foreign fishermen is causing concern to the American fishing industry, beset as it is with high labor costs, relative isolation, and distance from the larger markets. Improved air and sea transportation, technological advances in catching, handling, processing, and transporting fish are helping to alleviate the situation though problems still remain.

There are many wheels within wheels in the economics related to the commercial fishing industry. But there appears to be a need for some protection against foreign over-exploitation of the eastern Bering Sea groundfish stocks, the Pacific ocean perch stocks in the Gulf of Alaska, and the Bristol Bay red salmon and other salmon stocks originating on the coast of western Alaska. Such international conventions as the North Pacific Fisheries Convention, the Halibut Convention, the Continental Shelf Convention, and the Fur Seal Convention have resulted in major conservation measures benefitting salmon, halibut, crabs, fur seals, and other species. Needed, however, is some mechanism, international or otherwise, to assure that the

resources in international waters are harvested rationally, with an eye to the future.^{1/}

For the Alaska Department of Fish and Game to do a good job of managing the State's important fisheries, there is of course need for more biological knowledge. That department must know how many animals can safely be taken without harming the breeding stock. In essence, the knowledge is necessary for managing such renewable resources on a sustained yield basis.

Suffice it to say at this point that the Alaska coastal zone with its fine bays and estuaries and fiords is an immense source of wealth. It contributes the major share of the value of the fisheries in Alaska which with the freshwater species is estimated by the NMFS to have a value of over \$200 million dollars annually, half of which goes to the fishermen.

The coastal zone of course is the home of many marine mammals and millions of birds. A partial enumeration of the more important animals frequenting that zone would include mammoth stocks of salmon, king crab, tanner crab, Dungeness crab, shrimp, halibut, herring, ocean perch, pollock, flounder, sole, and other fish species. The mammals include the fur seal, sea otter, sea lion, polar bear, walrus, and hair seal. Beluga whales and porpoises use the coastal waters at least seasonally. The array of bird life which uses the zone for breeding, resting, and migrating covers a great variety of colonial marine birds, waterfowl, and shorebirds. The coastal environment of the islands and mainland of the irregular coastline harbors stocks of big game like the great bears, giant moose, caribou, deer, and on slopes virtually rising out of the sea, mountain sheep and mountain goats. Grouse, ptarmigan, and other birds, normally looked upon as inland birds, are also found in the coastal zone of Alaska where the life zones are in close juxtaposition to each other. Even such species of fish commonly referred to as freshwater varieties, namely chars, whitefish, sheefish, lake trout, pike, and grayling, are found close to or within waters that, depending on definition, are part of or are influenced by the coastal zone.

Development of oil resources is vital to the economic well-being of Alaska and thus to the United States. But it is equally apparent that the fish and wildlife resources of the coastal areas are equally vital to the economic well-being of the 49th State.

^{1/} Harry L. Rietze's Presentation on the Potential of Alaska's Fishery Resources, Bureau of Commercial Fisheries, Newsletter No. 9, Sept. 13, 1968, pp. 11, 12.

The fact that Alaska today is on the threshold of becoming a major supplier of petroleum is the cause of uneasiness with the knowledgeable scientists of the NMFS and BSWF. They do not question the need for developing the oil resources of Alaska. What disturbs them is how the development will progress. It is for this reason that both agencies seek more knowledge of its effects on fish and wildlife resources.

Production from the North Slope alone, where the reserves are estimated at 15 billion barrels, could cause a tenfold increase over the State's present annual production rates by 1980. The North Slope is one of at least seven major petroleum provinces identified in Alaska and there are indications that an equal number of offshore areas may be even more productive.

In terms of its effects on the environment, the oil business to date has simply been a dirty business. There is no other way to describe it. No oil port has been able to avoid spillage during loading and unloading and the history of oil development and transportation indicates that oil spills and discharges in oil ports and their vicinity have been very common. Moreover, the often encountered high winds and rough seas, the low temperatures, and the poor visibility in Prince William Sound and other Alaskan waters are bound to increase the potential for accidents.

The National Marine Fisheries Service has looked into the problem of oil spill incidents and has learned that 85 percent occur within 50 miles of a port and that one-tenth of one percent of the total oil carried has been lost during shipment. Applying such figures to the terminus at Valdez and vicinity indicates a potential spillage of 620,000 barrels a year that may be polluting Prince William Sound. Effluent from deballasting would add more.

And what about accidents that giant oil tankers may have transporting the 2,000,000 barrels of crude oil a day from Valdez to other ports? Much publicity was given to the Torrey Canyon disaster off the coast of England a few years ago when that tanker went aground and polluted so much of the coastal environment. Several books have been written about that incident and the footage devoted to it in the newspapers covered untold hundreds of feet of print. There have been other similar if less publicized incidents. And witness the recent oil pollution from wells off the coast of California near Santa Barbara. The potential for biological damage from oil accidents in Alaskan waters is infinitely greater than on the shores of England or California.

The BSWF has already performed some aerial censuses of avian life in the Bristol Bay area, the staging and feeding grounds of millions of birds. What is needed is a more intensive program of study for the entire Bay

for both avian and mammalian species. Planes and boats must be used to gather the data. It is a matter of deep concern to the entire Bureau of Sport Fisheries and Wildlife, not to the river basin studies people alone.

The National Marine Fisheries Service has accumulated an astonishing amount of knowledge of the marine life of Alaska. Yet there are gaps. That bureau, too, seeks more knowledge of the coastal zone, oriented to the possible effects of oil exploration in that zone and the nearby continental shelf where the Federal Government is issuing leases covering the exploration and development of oil and gas resources.

The biological consequences of oil pollution on marine life can be determined only through bioassay laboratory tests and field studies of the biota of the areas involved. Maps of the organism communities are needed, as are the effects of oil pollutants on the organisms themselves. Probably the best approach to carrying on such research is by means of a continuing program of a small group of scientists with technical competence for sophisticated physiological and biochemical research. Yet, funds for anything resembling adequate research are lacking.

The BSWF in Alaska is faced with a similar dilemma and like the NMFS has had to come up with answers on a "fire-fighting" basis. How, for example, can BSWF biologists respond to requests for comments on the Bureau of Land Management oil leases for drilling on the Alaskan Peninsula without adequate knowledge of the potential effects of such exploration on the fish and wildlife affected? How, under the present state of knowledge, can they do more than generalize?

Accustomed as they are to dealing with more measurable entities, engineers associated with water-resource projects and related activities often are perplexed because biologists cannot produce quantitative and positive assessments of effects of their doings. But how does a biologist come up with the specific effects of an oil spill or oil blowout on marine species, or the hundred and one other effects like the evils of hydrocarbons on plankton and other forms of life at the pyramidal base of marine food chains? Is biological knowledge simply a quantum of data from which ready answers can be plucked anytime a disaster or evil influence strikes a biotic community? And what about the chronic and additive effects of terminal port operations and the low-level but constant pollution of giant oil tankers daily furrowing the waters of the coastal zone as they transport their cargoes to other ports? Even with the best of research, there undoubtedly will be no absolute answers. But the gaps can be narrowed as the horizon of unknowns is pushed back.

Seismic exploration, on the sea and on the land, in itself poses problems. One survey technique of the oil companies in the Beaufort Sea in the Prudhoe Bay area during the season of heavy ice cover from January

to April involves the detonation of explosive charges in the seabed or in the water column beneath the ice. There is virtually no information on the effect of such underwater explosions on arctic marine organisms. Even more basic is the lack of knowledge on the organisms that are present during the winter period in the area of exploration. The NMFS would like to find out, initially with a small-scale study, using divers equipped with scuba-diving equipment.

As an indirect effect, the mere ingress of seismic-oriented vehicles poses problems. On his August 1972 flights in Alaska, the route of some of the vehicles was pointed out to the writer. The disregard of the exploration parties for the environment they invaded was only too evident. The fragile tundra was tracked up, crisscrossed by gouged trails that had no regard for the terrain. And where higher vegetation was involved as along stream courses, the wanton and careless swamping out of roads was equally evident.

Perhaps it is too much to expect operators of oil exploration vehicles to demonstrate a sense of propriety and discretion when they wander over the tundra at will or follow water courses slashing their way with reckless abandon. Altogether too often in the past, they have littered their routes during winter crossings with tangles of logs and debris in fine salmon and grayling streams. Failure to remove such obstructions have created barriers to the movement of fish not to mention the siltation damage that followed in the wake of such improvised stream crossings.

Then, too, there are procedural difficulties within the Department of the Interior in coping with such work, as indicated in the memorandum of February 12, 1972, to the Director of the BSW from Area Director Gordon W. Watson at Anchorage.^{1/} At the least, such differences between bureaus reflect differing philosophies, and perhaps traditions, whose origins have roots in the distant past.

Perhaps seismic exploration of the sea will be accompanied by the same why-care attitude for the consequences of the actions as has been the case with the doughty and rugged oil people in their land explorations. Why should they care about their environmental transgressions? Yet there is need for caring about what happens to the biota of the coastal zone as such environmental invasions and the succeeding well drillings take place on the continental shelf of the Beaufort, Chukchi, and Bering Seas, the Gulf of Alaska, and their bays and sounds and estuaries.

Both the BSW and the NMFS have outlined research programs for gathering important information relevant to oil exploration and development on land and sea. With the current constraints on Federal funding, the two bureaus are in competition with each other and with other Federal agencies

^{1/} See Exhibit 58, Appendix.

for pieces, however small, of the overall funding pie. Therefore, how much money can be earmarked for what surely has to be an important facet of natural resource conservation remains to be seen.

Interesting in this connection are the NMFS studies of Prince William Sound, related to the terminus of the Trans-Alaska pipeline at Valdez. The studies began in fiscal year 1970 and were financed in large measure by transfer funds from the BSWF, in accordance with the last paragraph of Reorganization Memorandum No. 20 of September 8, 1959.^{1/} Such funds of course were augmented by NMFS funds. By September 1972, the NMFS estimated that the studies were about 50 percent complete. How the efforts were to be financed beyond fiscal year 1973 was not clear. Some idea of the involvement of such studies can be obtained from the NMFS regional director's memorandum of September 11, 1972, to the BSWF area director at Anchorage.^{2/}

The Alaska Native Claims Settlement Act was signed into law by President Nixon on December 18, 1971. It set up a framework for settlement of the aboriginal land claims of Alaska's estimated 90,000 Eskimos, Indians, and Aleuts. Highly involved, the law was many years in the making.

At the time of the Act's passage, 375 million acres or 97 percent of Alaska, were still under Federal management. The 1958 Statehood Act gave the State of Alaska the right to choose some 103 million acres to help support itself financially. The unresolved issue of Native claims delayed the selection of lands by the State. Consequently, only about 5 million acres changed hands to 1968, when a freeze order was imposed by the Federal Government to hold State selection in abeyance until the Native claims issue was settled by legislation.

The Alaska Native Claims Settlement Act opened the way for the State to go ahead with its selections. However, the Act provided for a selection by the Natives of 40 million acres and a cash settlement of \$962.5 million, to be paid over a period of years. The selections are to be completed by December 1975.

The Act also gave the Secretary of the Interior nine months to withdraw from other uses up to 80 million acres deemed suitable as additions to the national park, national forest, national wildlife refuge, and national wild and scenic rivers systems.

^{1/} See Exhibit 26, Appendix.

^{2/} See Exhibit 59, Appendix.

There were many safeguards and clauses included in the Act to insure that the Natives, 55,000 of whom live in Alaska, would benefit by the settlement. Twelve regional corporations overseeing the financial end of the transactions were stipulated by the Act, as were Village corporations. Too long and detailed to examine fully herein, the Act in essence provided for land use planning of unprecedented magnitude.

By December 1973, the Secretary of the Interior announced his recommendations to retain the 80 million plus acres mentioned above. With some late acreage and boundary adjustments, the original 80 million was exceeded somewhat. The selections came after studies were made by the respective agencies concerned. The Interior team, known as the Alaska Planning Group, was headed by a good friend, T.R. (Ted) Swem. One-time employee of the Colorado Game and Fish Commission in pre-World War II years, Ted was for years a recreational specialist with the Bureau of Reclamation regional office in Denver. He collaborated closely with the Missouri River Basin Studies biologists in the preparation of reservoir management plans on Reclamation reservoirs.

There is of course no point in speculating what the Alaska Native Claims Settlement Act may mean to water-resource development. The basic purpose of the Act is to arrive at a fair and just settlement of all claims by Natives in Alaska, based on their land claims, and to accomplish the settlement rapidly, with maximum participation by Natives affecting their rights and property. It will take many years before the Act's provisions are effectuated. But there can be no doubt that economic development will be spurred by the Act, on both the lands going to the State and those going to the Natives. It's no more than a normal course of events and certainly so far as the Natives and State are concerned, long overdue. The hope is that such development will be wise, with careful exploitation of all natural resources. The knowledge and techniques are available.

It is the writer's view that neither the NMFS nor the BSWF in Alaska are adequately financed to do a reasonable job of coping with water-resource projects and related activities. As of December 1973, the total complement of BSWF river basin studies people in Alaska consisted of 17 people, 13 biologists and four stenographic or clerical ladies. The regional supervisor in the Anchorage area office was without an assistant, his regional staff consisting of himself and a stenographer. The Western Alaska field office at Anchorage had four people, three biologists and an administrative clerk. A new field office was established recently in Fairbanks, attached to the Anchorage field office. It had but one fishery biologist. The Southeastern Alaska field office at Juneau had four biologists and one clerk-stenographer. The special studies contingent working on the Trans-Alaska oil pipeline had four biologists and one clerk-typist. A BSWF pipeline monitoring team is in

the making, but it will have its hands full checking on the construction of that huge oil transport system.

The total BSWF complement of people in Alaska, to handle all of the Bureau's diverse responsibilities, is about 100 people. There, as elsewhere, the BSWF is over-committed. The same situation holds true for the river basin studies function with its 13 professionals. As an organizational unit trying to keep abreast of water-related and other activities assigned to its operation, the river basin studies function in Alaska is scraping bottom.

By the very nature of the involvements of personnel in the Bureau of Sport Fisheries and Wildlife in Alaska, the distinctions between divisions appear to be more blurred than they are in the Lower 48 States. While such organizational units have their prime duties defined, their personnel may be and often are called upon to assist in performing tasks quite apart from those defined in their respective position descriptions. The situation stems from the inherent nature of the relatively small number of Bureau personnel in a huge State that is one-fifth as large as the total area of the Lower 48.

River basin studies personnel in Alaska aptly illustrate the point. In the Lower 48, they busy themselves preeminently with water-resource projects or water-related activities. It was not always so but it is generally true today. In Alaska, however, such activities as seismic explorations for oil, oil pipelines, highway construction, and other activities not directly related to water resources, all fall under the river basin studies function.

In its discharge of water-resource projects and related activities, the National Marine Fisheries Service is no better off. At the end of the calendar year of 1973, its Water Resources Division had but eight people, consisting of five professional biologists and three ladies in stenographic or clerical capacities. The regional office had a chief, a stenographer, and a clerk-typist. Its Southeast field office, also based in Juneau had three fishery biologists. Its newly established Anchorage field office had but one biologist and a clerk-typist. Plans called for filling a position of biological oceanographer at the regional level, to handle environmental impact assessments of Alaskan petroleum developments; obtaining the services of a clerk-typist for the Southeast field office; filling a fishery biologist vacancy at the Anchorage field office; and the hiring of about five biologists to make up an environmental monitoring team to work on the Trans-Alaska pipeline.

The writer's hat is off to the river basin studies people of the BSWF and the NMFS in Alaska. He has a high regard for all of the dedicated employees of both bureaus and particularly so for the handful of people directly involved in water-resource activities.

With so much at stake in growing Alaska, it would appear that both agencies would examine their priorities to see what is involved with water development and uses, before it is too late. It may be that the eruptive influences of growth and development in that fish and wildlife storehouse of the North cannot be stemmed or modified to any reasonable degree. But with so much at stake, it seems that a reexamination of priorities within both agencies is warranted.

On December 5, 1973, the RBS Staff in Alaska consisted of:

Area Office, Anchorage, Alaska

Monson, Melvin A.	Regional Supervisor
Jackson, Phyllis	Secretary (Steno.)

Western Alaska Field Office, Anchorage

Thurston, Donald B.	Supervisor
Seidl, James A.	Fish & Wildlife Biologist
Boughton, Leonard A.	Wildlife Biologist
Copeland, Barbara J.	Administrative Clerk

Interior Alaska Field Office, Fairbanks

Ross, Donald E.	Fishery Biologist
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Special Studies (Pipeline), Anchorage

Sowl, LeRoy W.	Supervisor
Netsch, Norval F.	Fishery Biologist
Haddock, J. Larry	Wildlife Biologist (Airplane Pilot)
Bergman, Robert D.	Wildlife Biologist
Eggen, Beverly F.	Clerk-Typist

Southeastern Alaska Field Office, Juneau

Oien, Waine E.	Supervisor
Montgomery, Donald T.	Fishery Biologist
Berg, Ronald J.	Fishery Biologist
Conant, Bruce	Fishery Biologist
Ciraulo, Marlene	Clerk-Stenographer

After this chapter was written, an article in the Albuquerque Journal dated January 25, 1974, caught the writer's eye. Its bold-type heading, "Canada Considering Arctic Railway," read as follows:

"TORONTO (UPI) - The sudden need for oil to replace supplies curtailed by Arab nations has given strong impetus to demands in Canada for construction of the world's most northerly railway.

"The railway, as envisaged by experts and supported by the state-owned Canadian National Railways, would run from an existing railhead on the shores of Great Slave Lake in the Northwest Territories more than 1200 miles to the resource-rich Canadian shores of the Arctic Ocean.

"A further spur of 180 miles at the northern end would extend it to Prudhoe Bay on Alaska's North Shore, now established as one of the biggest remaining sources of oil in North America.

"The Canadian government has been considering the railway among several proposed alternative methods of moving the oil south and the suggestion for a railway is winning strong support for a number of reasons despite the impending construction of the Trans-Alaska Pipeline.

"One concern is for the environment. Canadians have become worried about the effects which exploitation of their northern natural resources could have on land, wildlife and people. The MacKenzie River Valley, along most of which a railway or pipeline would pass, is the home of caribou, bear and many other furred animals, and the nesting ground of millions of geese, swans and other birds.

"Most of the route also would be over permafrost, frozen soil which thaws and erodes rapidly when its thin covering layer of soil and vegetation is removed - a spade hole can turn into an eight-foot-deep trench within a few hours, and very little is known about the possible effects of thawing on a large scale.

"For these reasons a proposal for a \$6 billion natural gas pipeline along much the same route has already run into strong opposition, although it seems inevitable the Canadian government will approve an application for the gas pipeline, as the shortage of energy mounts in North America, within the next year.

"A study made by the Canadian Institute of Guided Ground Transport at Queen's University in Kingston, Ont., and Carnegie-Mellon University in Pittsburgh, said a railway has a number of benefits over a pipeline for transportation of Arctic oil.

"Oil flowing through a pipe would thaw the permafrost because the oil, unlike natural gas, would have to be transmitted at a temperature well above freezing point. The study also points out that the area has frequent earth tremors, which pose more problems for a pipeline than for a railway track.

"The railway advocates are at their weakest point in dealing with possible damage to wildlife. But it is on economic grounds that they are making their biggest pitch. They estimate building the Arctic track would cost \$1.5 billion; more than 40 bridges would have to be built, including two of three-quarters of a mile each across the MacKenzie River.

"To haul 2 million barrels of oil a day (the amount envisaged by a pipeline) would require 20 trains a day, each of 168 insulated tank cars hauled by five locomotives. The system would require 11,000 tank cars in all and the cost of the rolling stock would be \$433 million."

The portents are unmistakable. The winds of change are accelerating in the Far North.

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UNITED STATES DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service
Bureau of Sport Fisheries and Wildlife

A HISTORY OF
RIVER BASIN STUDIES

Volume II of III

By

John L. Sypulski

Albuquerque, New Mexico
June 30, 1974

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