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1963



THE SECRETARY OF THE  
**INTERIOR**

Stewart L. Udall

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# Annual Report 1963

THE SECRETARY OF THE

# INTERIOR

STEWART L. UDALL

*For the Fiscal Year Ending June 30, 1963*

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THE SECRETARY OF THE INTERIOR  
WASHINGTON

DEAR MR. PRESIDENT: Transmitted herewith is the 1963 annual report of the Department of the Interior.

On President Kennedy's late fall conservation tour of the United States he quoted Robert Frost's remark: "What makes a nation in the beginning is a good piece of geography." He went on to pay tribute to this good piece of geography that is America, but as both you and he have emphasized what is important is what the people of America do with it.

There is little we can do in the field of conservation today that will materially alter our lives in the next 3 or 4 years. But we can build today for the 70's, just as those great men with distance in their eyes built for us, back in the early part of this century.

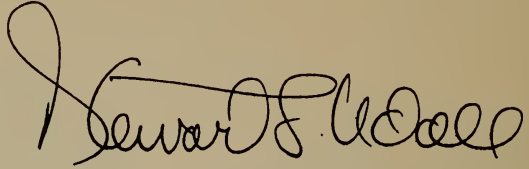
Science must become the servant of conservation. It is our responsibility to the future to generate a third great wave of conservation which will be a worthy successor to the forward thrust supplied by the two great Roosevelts—to devise new programs that will enable us to preserve this green environment which means so much to us all.

True conservation, in the final analysis, is something of the mind. It is an ideal of men who cherish their past and believe in their future.

In our perpetual search for abundance, beauty and order, we manifest both our love for the land and our sense of responsibility to future generations. The inheritors of a pastoral America made sure that this legacy was preserved in great part for us today. We must develop a conservation ethic that encompasses the entire relationship of man to his environment, that stresses the unity of all our resources, that recognizes the live-and-help-live logic of the great chain of life.

Only thus can we fulfill our responsibility to the land and to the future; only thus can we sustain the hope of opportunity, progress and security for continuing generations.

Sincerely yours,

A handwritten signature in black ink, reading "Stewart L. Udall". The signature is written in a cursive style with a large initial "S" and a prominent flourish at the end.

STEWART L. UDALL,  
*Secretary of the Interior.*

THE PRESIDENT,  
*The White House.*





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# Office of the Secretary of the Interior

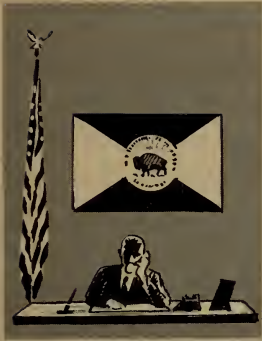
Stewart L. Udall, Secretary

James K. Carr, Under Secretary









# Office of the Secretary of the Interior

Stewart L. Udall,  
Secretary

James K. Carr,  
Under Secretary

The Secretary of the Interior—as head of a major executive department of the Federal Government—serves as a member of the Cabinet of the President of the United States and the principal Federal executive officer charged with the administration of programs to conserve and to develop the natural resources of the United States.

The Secretary—assisted by the Under Secretary—directs and supervises the activities of the 24 bureaus and offices of the Department of the Interior. The Under Secretary, with the exception of certain actions requiring the personal attention of the Secretary, has the full authority of the Secretary on any matter which comes before him.

The responsibilities of the Secretary include :

. . . **Management** of some 553 million acres of public-domain lands and mineral leasing responsibilities for all other federally owned lands, as well as on the Federal areas off the coasts of our Nation.

. . . **Marketing** of electric power from plants with an installed capacity of about 13.6 million kilowatts, derived from federally constructed water, and flood, and navigational projects.

. . . **Providing** irrigation water for about 8 million acres of

Shasta Dam, a key feature of the Central Valley Project in California, harnesses water in the north for irrigation, flood control, municipal and industrial use, navigation, power, and recreation.

agricultural lands in the arid and semiarid West which, for the most part, produce high-quality nonsurplus foods and fibers, worth \$1.2 billion annually.

. . . **Exercising** Federal trust responsibilities for about 350,000 Indians, working constantly to improve the natural and human resources of the Indians.

. . . **Administration**, economic improvement, social and political betterment in the remaining territorial areas of the United States—Guam, American Samoa, the Virgin Islands, and the United Nations-mandated Trust Territory of the Pacific.

. . . **Increasing** the mineral and fuel potentials of the Nation by assisting technically—and in the case of strategic minerals, financially—in developing and improving mining methods and geologic knowledge, and by promotion of conservation through wise utilization of our mineral and fuel resources.

. . . **Protecting** and administering almost 200 national parks, monuments, and historic sites, and creating new recreational areas at multipurpose water resource projects—as well as making public lands available for recreational needs to States and municipalities and providing planning aids to States. The various recreational lands and areas of the Department are visited by over 125 million Americans annually.

. . . **Promoting** the conservation and development of our vital sport and commercial fish populations and natural wildlife resources and protecting these resources from unnecessary depletion and wasteful use.

. . . **Surveying** the water and mineral resources of the Nation for present and future needs and providing for the basic geologic and topographic mapping of the Nation.

. . . **Directing** and coordinating the national effort to achieve the economical conversion of the waters of the oceans and brackish water into fresh water for human use.

In addition, the Secretary also exercises delegated defense mobilization responsibilities related to minerals, fuels, electric power, and commercial fisheries.

As the principal conservation agency of the Federal Government, the Department of the Interior is engaged in activities which daily affect the lives of all Americans. The term, "Interior," is actually a misnomer—the Department might be described more accurately as a department of natural resources.

Representatives of the Department are at work today around the globe. Employees are engaged in resource conservation activities in every State of the Nation, in our few remaining territorial areas, in the major oceans, at the north and south polar regions, and by invitation in more than a score of foreign countries. The Department has major responsibilities in the international field, particularly in foreign trade affecting minerals, fuels, and fishery products.

The Department receives annual appropriations from the Congress. The Department also returns substantial revenue to the Federal Treasury and to the States from its resource conservation activities.

In recent years, the appropriation of the Department for all purposes has been slightly under \$1 billion, and its income from resource conservation and development activities has been about 55 to 60 percent of its appropriations. The annual investment in resource conservation by the Department continues to create new wealth and to generate new income each year throughout the Nation far beyond the cost of Federal expenditures.

In formulating and administering programs for the management, conservation and development of natural resources, the Department pursues the following objectives: The encouragement of efficient resource use; the assurance of adequately developed resources to meet the requirements of national defense and an expanding economy; the maintenance of productive resource capacity for future generations; the promotion of equitable distribution of the benefits of publicly owned resources; the discouragement of wasteful exploitation; and the orderly incorporation of Indian groups into national life by providing equal educational and economic opportunity.

In the following pages, the programs of the Department during fiscal 1963 designed to meet these responsibilities and objectives are described.





Office of the Assistant  
Secretary  
Public Land Management

John A. Carver, Jr., Assistant Secretary







# Office of the Assistant Secretary Public Land Management

John A. Carver, Jr., Assistant Secretary

A program Assistant Secretary in the Department of the Interior must bring the Secretary's policy direction to bear, and make decisions, on the issues presented by the programs under his jurisdiction; and he must perform the liaison involved in securing public, political, and congressional acceptance of those policy decisions. As in any dynamic organization, the number and complexity of such issues seem never to diminish. As the Public Land Management bureaus enter fiscal year 1964, their workload is no less than it was a year previous. Progress can be claimed, however, in the fact that many of the pending issues are new ones and a substantial number that were on the agenda as fiscal 1963 opened have been resolved satisfactorily.

A major center of attention involved the fixing of a more reasonable price for the forage which the public lands furnish to the western livestock industry. Effective March 1, 1963, the fee structure for each animal unit month was increased slightly more than 50 percent. Despite small pockets of vigorous dissent, this was accomplished with the general acquiescence of responsible range users and defended in extensive hearings before Congress.

Largely due to the sympathetic cooperation of the Congress, also, a vexatious problem of long standing was resolved when Public Law 87-851 provided an equitable formula for regularizing unauthorized residential occupancy of invalid mining claims. Close cooperation between industry and Government and among major Government agencies permitted the beginning of a program of

Managed under a program of multiple-use, public lands offer mineral wealth, productive forests, grazing lands, wildlife habitat, and recreation opportunity for hunting, fishing, and camping.

orderly salvage of millions of board feet of timber downed by the savage onslaught of a Pacific Northwest storm. Failure in this respect would have threatened the economy of a whole region and exposed a valuable resource to inestimable damage from pest infestation and fire. Systematic attack on the backlog of soil and water conservation work was started through substantial increases in appropriations, to be concentrated in designated project areas where improvements can be measured in businesslike fashion.

Two major units were added to the National Park System with the creation of Point Reyes and Padre Island National Seashores. Major land acquisition efforts and funds were concentrated on Cape Cod so key tracts might be made available for public use at the earliest date. Three congressional committees focused their attention on the concessions management policies followed by the Park Service. To meet the various issues raised, these policies have been restated, looking toward legislative restatement. On a day-to-day basis, continued acceleration of the number of park visits and use and conflicts between the pure preservationist philosophy and the need for intensive development to meet public demand posed problems demanding immediate decisions. A committee of eminent scientists and wildlife management experts formulated a broad program for effective husbandry of this resource.

Congress enacted a legislative charter for the Bureau of Outdoor Recreation, created by Executive action the previous year. The Bureau immediately undertook the major projects for which it was created: securing enactment of legislation to establish a fund for supporting expanded National and State recreation development programs and developing standards, policies, and criteria to serve as the basis for a national recreation plan. The Bureau also was assigned the responsibility for finding solutions to a series of highly controversial issues which had hampered full development of recreation potential over long periods of time, including the Northern Cascades area, Flaming Gorge Reservoir, the Allagash region, Assateague Island, and future policies for the management of free-flowing streams in various parts of the Nation.

Developments affecting the Indian people of the Nation were less dramatic and not as sharply defined as in the other areas of responsibility. While Congress devoted extensive time and attention to some of the major policy issues which block full development of Indian resources—material and human—no major legislative enactments were forthcoming. The gross lag in educational and employment opportunities continues as the major deterrent to Indian advancement. The substantially increased



appropriations provided by the Congress have permitted an expanded effort to close the gap, but the process is and will continue to be a methodical one whose results will be felt only over a period of years. Individual problems of tribal organization, distribution of tribal assets, law and order under local jurisdictional laws, and treaty rights have had to be treated as separate parts of a broad complex.

The administration of territorial affairs was marked by a sharp change in policy regarding one area, a period of marking time on progress toward increased self-government in others, and the need for emergency measures to aid in the recovery of Guam from natural disaster.

Congress doubled the limitation on appropriations for the Trust Territory of the Pacific Islands. This action, and the actual appropriation which followed, gives meaning to a policy commitment that our relationship to the people of Micronesia should be converted from that of mere passive custodianship to one of positive assistance in raising educational, health, economic, and overall social standards to a level commensurate with those existing in the rest of the world. Efforts to confer upon the American citizens of Guam and the Virgin Islands greater latitude to manage their own affairs and elect their own leadership did not bear fruit in 1963.

However, the framework for such a shift in national policy is fully developed and at year's end was before Congress for its further consideration. Overshadowing these developments, however, was the crushing blow dealt the island of Guam by successive typhoons. While loss of life and serious personal injury was gratifyingly low, property damage and destruction of public facilities created extreme hardship and a heavy impact on the local economy. Emergency measures by the military departments, Office of Emergency Planning, the Red Cross, and other agencies enabled Guam to reestablish normal activity after a relatively short period. However, permanent reconstruction requires capital investment far beyond local capability to finance. In close cooperation with local officials, this Department has assumed the responsibility for securing assistance in the form of Federal grants and loans.





# Bureau of Indian Affairs

Philleo Nash, Commissioner

Early in the 1963 fiscal year—on August 2, 1962—President Kennedy received at the White House the first group of 10 Indian and Eskimo young men from Alaska who had completed an 18-month course of electronics training in New York City under auspices of the Bureau of Indian Affairs and who were headed for high-paying jobs in their native State. Ten months later—on June 7, 1963—the U.S. Supreme Court finally settled a decades-old controversy between the Navajo and Hopi Tribes over the ownership of a 2,500,000-acre rectangle in northern Arizona.

These were two of the outstanding events of the period in the field of Indian affairs and both had important economic implications.

The Alaskan trainees were, in a sense, a pioneer group—the first in what may eventually be a long line of Indians and Eskimos from the northernmost State who take an intensive course of electronics instruction in preparation for jobs at defense and communications installations in the far reaches of their native land. Their visit to the White House was one of the most interesting phases of the adult vocational training program which the Bureau of Indian Affairs began in 1958 and which has equipped thousands of Indians from reservations in the older States with marketable job skills.

Training for natives of Alaska was carried out under an agreement between the Bureau and the Radio Corp. of America. Under its terms the first contingent was trained at the RCA Institute in New York City; subsequent groups have been and will be enrolled at the similar institute in Los Angeles, Calif. Training now





The first 10 Alaskan natives to complete the 18-month RCA electronics training program are shown being received by President Kennedy prior to reporting for employment on communications.

is being financed partly by BIA funds and partly by the Department of the Air Force, which contemplates employment of those trained under its auspices. At year's end, 10 more Alaskans had completed training at the Los Angeles Institute and were entering jobs in the satellite and space exploration program at the new data acquisition facility which RCA Service Co. is operating under contract for the National Space and Aeronautics Administration at Fairbanks. Twenty-five others were still in training at Los Angeles; 40 additional were scheduled to enroll and about 20 others were slated to begin training in February 1964.

The Supreme Court's action of 1963 affirmed the decision reached in the fall of 1962 by a special three-judge court established under

a 1958 congressional law to adjudicate the Navajo-Hopi controversy. At the center of the disagreement was a reservation set aside from the public domain by Executive order of the President in 1882 "for the use of the [Hopi] and such other Indians as the Secretary of the Interior may see fit to settle thereon."

The litigation revolved largely around the Navajo Tribe's contention that the major portion of this area is, in effect, part of the surrounding Navajo Reservation since many Navajo tribal members have been settled there over the years with the implied approval of the Secretary of the Interior. As long as tribal ownership of the land remained in contention, economic development of its mineral and other potentialities was necessarily limited.

In its decision of September 28, 1962, the three-judge court ruled that the Hopi Tribe has exclusive interest in and to that part of the 1882 reservation lying within the boundaries of Land Management District No. 6 as defined in 1943. The area thus awarded to the Hopi Tribe embraces about 500,000 acres and includes all the principal Hopi settlements. It was conceded to be Hopi territory by the Navajo litigants.

As for the remaining part of the Executive order reservation, embracing about 2 million acres, the Court determined that both the Hopi and Navajo Tribes "have joint, undivided and equal interests" in and to this land and joint rights of use.

"It will now be," the Court concluded, "for the two tribes and Government officials to determine whether, with these basic issues resolved, the area lying outside district 6 can and should be fairly administered as a joint reservation. If this proves impracticable or undesirable, any future effort to partition the jointly held area, by agreement, subsequently-authorized suit, or otherwise, will be aided by the determination in this action of the present legal rights and interests of the respective tribes."

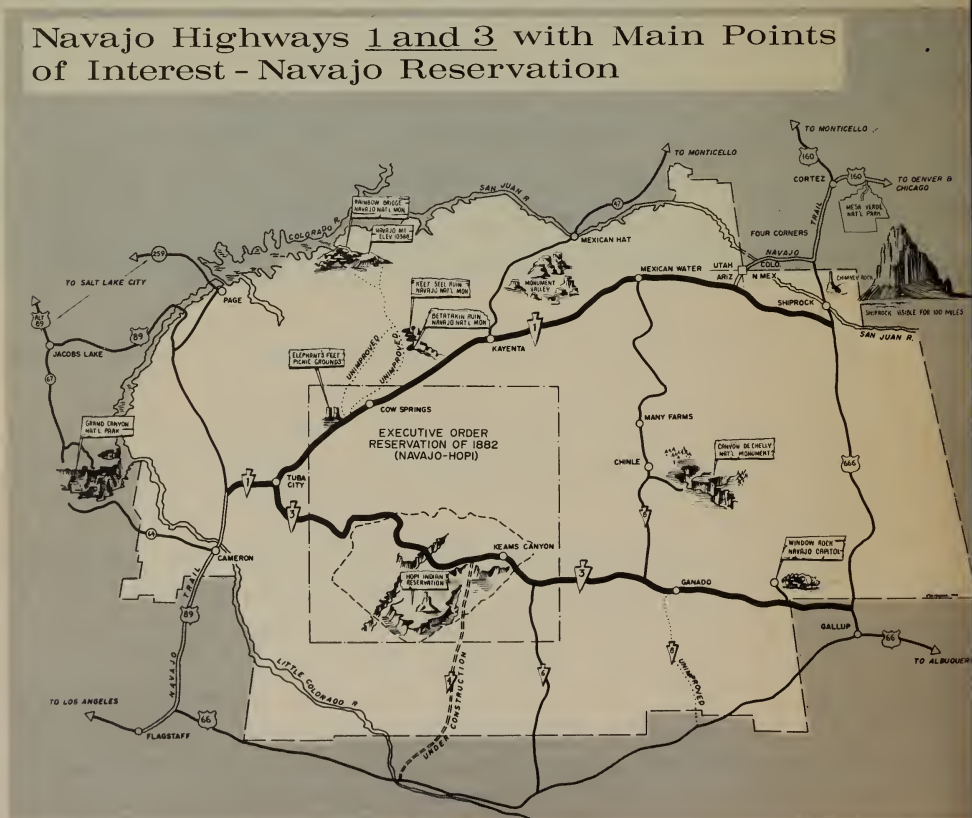
Representatives of both tribes and of the Bureau of Indian Affairs were to meet at Phoenix, Ariz., in August 1963, to explore the problems involved in administration of the area as a "joint reservation."

Another noteworthy development took place in June 1963 when the Department complied with a request of the San Carlos Apaches and restored to tribal ownership the subsurface or mineral rights in an area of roughly 225,000 acres in eastern Arizona known as the "San Carlos Mineral Strip." The lands were originally part of the San Carlos Apache Reservation, but were ceded to the United States in 1896 with the understanding that proceeds from disposing of the tracts under the mineral land laws would be credited to the

Indians. Since 1932, however, the area has been withdrawn from all forms of public entry. Recently interest has been shown in the copper and other mineral potential of the lands. Restoration of the mineral interests to the tribe will open up the area for development and should be beneficial both to the Indians and to the State of Arizona.

Apart from these events, the Bureau of Indian Affairs in fiscal 1963 continued emphasizing greater development of human and natural resources on Indian reservations in line with policies recommended by the 1961 Task Force on Indian Affairs. Work was pushed on construction projects that will add thousands of classroom seats to the BIA school system, especially on the Navajo Reservation and in Alaska. Summer programs for students in BIA schools were expanded and increased attention was given to improving English-language teaching and other types of classroom instruction. More Indians than in any previous fiscal year were provided with vocational training through the combined operations of BIA's program in this field and the training projects ap-

### Navajo Highways 1 and 3 with Main Points of Interest - Navajo Reservation







These new school buildings at Crownpoint, N. Mex., on the Navajo Reservation, comprise one of 38 projects in school construction completed by the Bureau of Indian Affairs in fiscal year 1963 to provide more classroom and dormitory space for the steadily increasing Indian population.

proved for Indian communities by the Area Redevelopment Administration.

Work was completed on two major roads spanning the Navajo Reservation and linking it up with other principal highways of the Southwest.

Projects launched under the Accelerated Public Works Program on nearly 100 reservations provided useful work for thousands of tribal members and contributed importantly to the protection and development of Indian timber stands and other physical resources. A new industrial plant, expected to provide jobs for some 200 workers, began operations during the spring on lands of the Laguna Pueblo in New Mexico and negotiations were underway seeking establishment of several additional plants that further will broaden employment opportunities for residents of other reservations.

## EDUCATION AIDED

When school construction funds are added to those for operation and maintenance of BIA's farflung school system, it becomes apparent that nearly 60 percent of the Bureau's total appropriations in any recent fiscal year has been for purposes directly related to education. Improved education is essential for accomplishing the more comprehensive BIA goals of maximum Indian economic self-sufficiency, full participation of Indians in American life, and equal citizenship privileges and responsibilities for Indians.

### **School Construction Gains**

One of the principal educational objectives of the Bureau is to provide a physical plant—embracing classrooms, dormitories, and all related facilities—that will include sufficient space to accommodate, without overcrowding, all Indian children who cannot feasibly be educated in non-Bureau schools. A second and closely related purpose is to replace structures that have become obsolete or hazardous to health with modern, safe, and sanitary facilities.

The Bureau entered the 1960's with a substantial backlog of needs for expanding and modernizing buildings in its far-reaching school network. These needs were particularly acute on the Navajo Reservation of Arizona and New Mexico and in the native villages of Alaska, but were by no means confined to those localities. Complicating the problem still further was the fact of year-by-year increases in school-age populations to be accommodated in Federal facilities.

In fiscal 1963 the Bureau completed 38 school construction projects involving over 5,000 classroom seats. About half these seats were additions to the total capacity of the BIA-operated school system; the others were included in replacements of previously inadequate structures. The completed work will accommodate more pupils and will relieve serious overcrowding in many localities.

At year's end, 38 additional projects were underway. When finished, they will provide about 9,700 classroom seats. Of these, nearly 6,000 seats will be additions to the BIA-operated system and approximately 3,700 will be replacements.

### **Art Institute Opens at Santa Fe**

On October 1, 1962, the Bureau began operating a new Institute of American Indian Arts in Santa Fe, N. Mex. Unique in the Bureau's school system, the Institute is being established on the grounds of the Bureau's former Santa Fe boarding school and was

operated on a limited basis during its first year because the boarding school continued in partial operation. Plans call for an eventual enrollment of about 500 students in the Institute; in fiscal 1963 the student body included 150 enrollees from 74 tribes in 20 States.

Courses were offered at the senior high school level and in two postgraduate years. The curriculum included a fully accredited academic program with special emphasis on the vocational implications of fine and applied arts. The postgraduate students concentrated on a major and minor field in the arts and were required to enroll in at least two academic courses related to their art studies. Specialized instruction and guidance were provided in painting, sculpture, jewelry craftsmanship, ceramics, design and printing of textiles, and creative writing. Advanced academic courses were available, at the student's expense, at a nearby college.

Results of the Institute's first year of operation were highly encouraging. Artistic works produced by the students in practically all fields won high praise from qualified experts visiting the school



Students gain practical experience in applied art at a technical institute at Santa Fe, N. Mex., opened by the Bureau of Indian Affairs in the fall of 1962, which offers a basic high school curriculum plus 2 years of postgraduate work emphasizing the vocational aspects of fine and applied arts.



and from the general public. Several young people who had shown little previous interest in education responded enthusiastically to the unique opportunities offered at the Institute and there were comparatively few dropouts. A large percentage of the first-year students is expected to return in the fall of 1963 and the enrollment is being planned for not more than 300. Further expansion of facilities will be required before the full complement of about 500 students can be accommodated.

### **Enrollment in Summer Programs Increases**

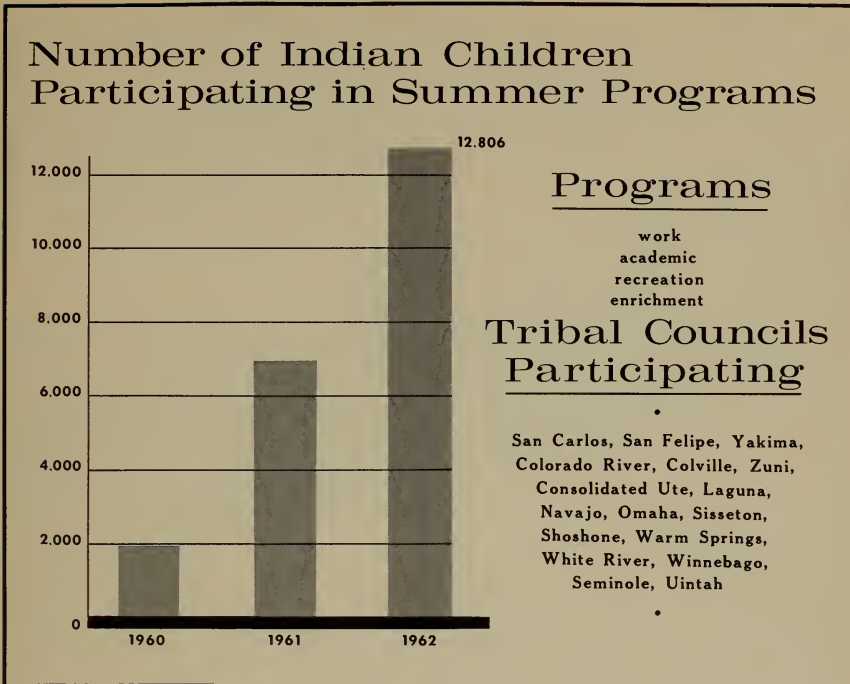
In the summer of 1962 the Bureau continued for the third year its offering of special programs designed to broaden the horizons of Indian students and contribute to their personal development. As in previous years, the summer programs were of four principal kinds: academic, student employment, organized sports and other leisure-time activities, and field trips. With the growing popularity of these programs, about 12,800 students took part in 1962; this was an increase of about 90 percent over 1961.

Preschool sessions for beginners were a feature of the academic phase. Youngsters entering school for the first time in the fall of 1962 were taken into some schools for periods up to 6 weeks. During these sessions the teachers concentrated on widening the conceptual background of these children and on teaching English.

Several branches of the Bureau concerned with the conservation and development of resources such as soils and timber have cooperated with the Branch of Education at numerous locations across the country to provide summer employment for Indian youth. The work of the students has contributed to the advancement of the resource programs and also has given the participants a greater measure of self-respect and pride in being able to earn money. These work opportunities also helped encourage many students to remain in school.

The recreational phase of the programs is aimed at teaching students how to use their leisure time constructively and thus develop a sense of the responsibilities of good citizenship. Activities included Scouting, 4-H Club work, arts and crafts, Little League baseball, softball, playground games, camping, swimming, golf, tennis, volleyball, archery, badminton, and bowling. All helped fill the summertime void for students by developing a heightened sense of fairplay and sportsmanship, fostering social adjustment in group activities, and broadening the scope of associations with non-Indians. These attitudes may well carry over into other facets of the students' lives.





Field trips were also important. Many Indian children from reservation homes have had little or no experience outside the immediate periphery of their reservations and this deficiency is frequently reflected in the classroom achievement of the students at certain academic levels. Educational field trips helped broaden the students' horizons. The youngsters visited our larger cities, used shopping centers, and stayed in hotels and motels. In addition, they were guided to scenic and educational points of interest. They thus acquired the kind of enriching experiences most non-Indian youngsters consider commonplace. These experiences, in turn, had classroom value since they gave a new dimension of meanings to many topics discussed in their studies.

### English Emphasized as a Second Language

Because more than 80 percent of the students enrolled in BIA schools come from homes where an Indian language is spoken regularly, development of facility in speaking and understanding English is one of the most important primary tasks of the Bureau's school system. In May 1963 the Bureau concentrated attention on this task at a Washington conference of some of the country's outstanding experts on the Indian languages and their relationship

to English. Consultants included Dr. George Sanchez of the University of Texas, Dr. Edward Kennard of the University of Pittsburgh, Dr. Edward Dozier of the University of Arizona, John Connelly of San Francisco State College, and Robert Young, tribal operations officer at the Bureau's Gallup (N. Mex.) area office. In a 4-day meeting with the Commissioner and his top education staff, past and present programs of English-language instruction in Bureau schools were appraised and recommendations for improvements were formulated.

As a result of the conference, arrangements were made for developing a series of tape-recorded training lessons for orienting school personnel who work with Navajo-speaking pupils. A second series of tapes is to be used in connection with other southwestern tribes. The conferees also recommended better pretraining and more thorough orientation of BIA teachers in the cultural and language backgrounds of the people they are going to teach, employing linguists to develop materials for use in language laboratories and to select vocabularies that will facilitate language learning at various grade levels, and revision of the "Minimum Essential Goals" document used in all BIA schools to reflect more accurately the Bureau's current philosophy of English language teaching.

### **Demonstration School Opened**

In common with public schools all over the country, the Bureau faces a serious problem in the large number of students who drop out of school before completing the 12 years considered a minimum prerequisite for adequate employment. Considerable evidence suggests that the dropout rate in Bureau schools is substantially higher than the national public school average.

To find better ways of coping with this problem, the Bureau opened a demonstration school in the fall of 1962 in two renovated cottage-type dormitories at Concho, Okla. The student body consisted of 78 youngsters who either had dropped out of school or had shown a pronounced inclination to do so. The staff consisted of highly qualified personnel whose assignment was to diagnose the individual difficulties of each student and help him overcome his education indifference and personal problems.

When a pupil reached the proper stage in terms of motivation and academic preparedness, he was transferred either to his former school or to another school believed to be better equipped to meet his individual needs.



In its 1963 education program BIA stressed the use of language laboratories for the purpose of improving English language capability. These students at the Santa Fe Institute are engaged in vocabulary studies with the most modern equipment.

At the close of the school year, 27 of the 78 enrollees were still in attendance at Concho, 32 were still in attendance at other schools to which they had been transferred during the year, and 12 were no longer in school. This represented a salvage rate of 85 percent. While the results were encouraging, efforts to curb dropouts will be increased. For the 1963-64 term, a psychologist will be added to the Concho staff to study causes of educational indifference and special services will be provided by a supervisor trained in psychiatric social work.

### **Post-High-School Training Stressed**

To keep pace with changes in the employment market caused by rapid advances in automation, the Bureau took additional steps in fiscal 1963 to make its high school programs less "terminal" and more preparatory for postgraduate technical or vocational training or for college enrollment. At the Haskell Institute in Lawrence, Kans., the ninth grade was eliminated to provide additional space for students seeking post-high-school training in electronics, the



building trades, the service occupations, or business and commercial subjects. At the Institute of American Indian Arts in Santa Fe, 2 years beyond high school were offered to provide training in arts-related occupations. And at the Chilocco School in Oklahoma, post-high-school courses were offered in some of the distributive and service occupations.

### School Enrollment Gains

Since 1960, Bureau reports have not included the number of Indian children enrolled in the public schools of California, Idaho, Michigan, Minnesota, Nebraska, Oregon (except Warm Springs



Like other schools throughout the country, those operated by the Bureau of Indian Affairs are now giving heightened emphasis to science courses. These Navajo students at the Intermountain School in Utah are learning the differences between the mythology of the rain dance and the meteorology of air masses.



Agency), Texas, Washington, and Wisconsin, because these are States where full responsibility for educating resident Indian children has been taken over by the public school system. In other States where the BIA operates, the enrollment of school-age Indian children in all schools increased 3.1 percent in fiscal 1963. Of the 121,236 enrolled, 7.7 percent were in mission and other private schools. Public school enrollment increased by 2,508 students.

The Bureau in fiscal 1963 operated 264 schools with an enrollment of 43,435 including those under 6 and over 18 years of age. This was an increase of 1,390 students, or 3 percent, as compared with fiscal 1962. In addition, dormitory facilities were provided at 20 locations for 4,082 Indian students attending public schools. Dormitory operations of this type meet unusual emergencies and do not represent a permanent pattern for educating Indians.

Apart from the regular school program, the Bureau continued offering classes on the reservations for adult residents to increase their understanding of the work around them and to upgrade their skills for earning a living.

## EMPLOYMENT OPPORTUNITIES EXPANDED

With unemployment on Indian reservations across the country averaging about 40 percent and running as high as 50 or 60 percent in some areas, it was clear that upgrading of Indian skills and the creation of more local job opportunities are tasks of the highest priority for the Bureau of Indian Affairs.

In recent years the Bureau has given increased attention to this problem. In fiscal 1963 the attack was broader than ever with five distinct operations of the Bureau contributing directly to alleviating Indian unemployment. These were adult vocational training, voluntary relocation of Indians for employment in urban centers, industrial development on or near the reservations, the accelerated public works projects on the reservations, and increased use of "force account" by the Bureau in its construction. In addition, the Bureau continued emphasizing greater economic development and wider employment opportunities through its "resource" programs in the fields of forestry, range management, irrigation, soil and moisture conservation, and mineral development.

### **Adult Vocational Training at Peak**

Fiscal 1963 was a peak year for vocational training of Indians. During the year, 2,911 trainees were enrolled in vocational schools



across the country under the Bureau's program. This was 549 more than the 1962 total, or an increase of more than 20 percent. Of the 1963 trainees, 1,164 were carried over from the previous year and 1,747 entered training. When family dependents are included, 5,047 persons benefited from the 1963 operation.

In addition, 675 Indians took part in 19 training programs of the Area Redevelopment Administration in Indian communities of 5 States, and an undetermined number of others participated in ARA training programs in non-Indian communities. Eighteen different occupations were involved in the 19 ARA Indian-community projects. An outstanding example of cooperation between BIA and ARA was the movement of 35 Indians from Arizona and New Mexico reservations to Los Angeles, where they completed a basic electronics course and then moved directly into jobs.

#### Direct Employment Assisted

Relocation of Indians for direct employment in urban centers (as distinguished from relocation for purposes of vocational training) declined slightly in fiscal 1963. The total family units or unattached individuals assisted in this way was 1,696, compared with

1,866 for 1962; the total number of individuals involved was 3,318, compared with 3,494. The decrease reflected BIA's greater emphasis on vocational training as preparation for the steadier and better paying types of employment.

Apart from the relocation to urban centers, the Bureau helped an additional 2,052 family heads or unattached individuals find jobs, temporary or permanent, on or near reservations. Many had qualified for this employment through on-job training in industrial plants recently established in reservation areas.

Availability of increasing numbers of Indians with job skills has made it possible to assist more and more Indians to obtain adequate employment near the reservations and in urban centers. Employers representing many fields are becoming favorably aware of the productive ability of Indian workers, both men and women.

### **Industrial Development Promoted**

By the late spring of 1963, reports to the Bureau indicated that more than 500 Indians were working in industrial plants established over the past several years on or near Indian reservations. Through its industrial development program, the Bureau encourages this trend by working closely with tribal organizations and maintaining liaison with industrial concerns interested in new plant locations. In cases where the companies have programs for training workers on the job, the Bureau is in position to compensate them, under terms of a formal contract, for the cost of training Indian workers.

The most noteworthy new plant to begin operations in Indian country during fiscal 1963 was an electronics establishment on lands of the Laguna Pueblo west of Albuquerque, N. Mex. The tribal group agreed to construct a \$440,000 building to house the operation and to lease it to the company. The BIA helped the arrangement in a liaison capacity and provided financial assistance through an on-the-job training contract. The plant is expected to provide jobs eventually for 200 or more Indian workers.

Arrangements were also completed in fiscal 1963 for a plant to manufacture hair curlers and similar cosmetic aids on the Cherokee Reservation in North Carolina. This will be the third industrial plant for that reservation. It is expected to employ about 200 at full operation. Under an agreement between the company and the tribe, the tribe will construct a \$250,000 building to house the operation and make building and equipment available to the company under a 25-year lease. The Bureau has agreed to help through an on-the-job training contract.



By the end of March 1963 the Bureau had on-the-job training contracts with 13 industrial concerns and was financing the training of 245 Indians in their plants.

### **Many Accelerated Public Works Projects Start**

Under the Accelerated Public Works program, more than \$12 million was allotted the Bureau of Indian Affairs in fiscal 1963. These funds permitted the Bureau to move immediately on a backlog of urgently needed public works on Indian reservations impossible to reach with regular appropriations.

Eighty-six APW projects began on Indian reservations in 18 States during the year, providing over 17,000 man-months of employment for Indians. Preference was given jobs with comparatively low costs for equipment and supplies so funds would create greatest employment. By year's end, over 5,500 Indians were working on these projects.

The APW projects on Indian reservations had four principal objectives: upgrading Indian-owned timber stands, conserving of soil and water, improving reservation roads, and constructing community centers.

The forestry projects were carried out under principles of sustained yield and well-balanced multiple use. They involved the thinning of overcrowded young stands to promote the growth of selected trees, pruning to produce knot-free timber of greater value, cleanup of roadsides to improve scenic values and reduce fire hazards, construction of firebreaks, and provision of campgrounds and picnic facilities.

Soil and water conservation projects were designed for local needs and conditions. One type involved the fencing of Indian rangelands to promote better use of the resource. Others were concentrated on brush eradication and range reseeding. In addition to controlling erosion, these practices will increase forage production as much as 15 to 20 times by eliminating low-grade plants that compete with the grass. Another type of conservation project, carried out on many reservations, involved the construction of small dams to control floods and store water for livestock or recreational use.

Road projects under the APW program ranged from improvement work on forest protection trails to complete construction and surfacing of roads serving reservations. Such work was accomplished on 88 roads totaling 651 miles on 38 reservations.

Allocation of the APW funds also made it possible for the BIA to build long-needed community centers on many Indian reserva-



Funds available for accelerated public works on Indian reservations have brought urgently needed improvements in the resource base of many tribes and urgently needed jobs for many tribal members. Thinning and pruning of young stands of timber was an important phase of the work.

tions to house tribal gatherings and promote greater cohesion of tribal populations. Nine such constructions were undertaken in Alaska and 14 on Indian reservations in the other States. All but three were completed by year's end.

### **Use of Force Account Increases**

There are two principal ways in which the Bureau can accomplish needed work in road maintenance and construction, repair and maintenance of buildings, and construction of buildings and utilities. One is by awarding a private contract; the other is through the use of "force account" which involves direct employment by

the BIA and BIA supervision of the job. Experience has shown that the force account method generally creates more employment opportunities for Indians and provides them with valuable construction training.

Accordingly the Bureau adopted in 1961 the following policy for construction work :

The force account method shall be used when justified by the employment and training of Indian workers, and where the acquisition of equipment can be justified. The contract method shall be used on projects where Indian workers are not available, or where the acquisition of specialized equipment cannot be justified.

In line with this policy, the Bureau has for the past 2 years used force account, wherever practicable, in its construction and has staffed its crews to the fullest possible extent with Indians. At the end of fiscal 1962, there were 2,847 workers employed on force account projects throughout the Bureau, compared with 1,260 in fiscal 1961. Of the 987 additional force account workers in 1962, an estimated 776, or nearly 80 percent, were Indians. During fiscal 1963, the Bureau continued emphasizing force account and was employing over 1,000 more workers on such projects at the end of the period than at the beginning. It is estimated that 90 percent of the additional jobs created were occupied by Indians.

## ECONOMIC DEVELOPMENT SPURRED

Apart from the direct employment expansion activities described earlier, the Bureau also accelerated its longer range efforts to create a more dynamic climate of economic activity on Indian reservations. In this connection, economic feasibility studies, road construction, and the financing of Indian economic enterprises were especially important.

### **26 Feasibility Studies Started**

Twenty-six new studies were undertaken in fiscal 1963 to explore the feasibility of various types of economic enterprises on Indian reservations. These were in addition to the 19 such studies launched the previous year and continued in fiscal 1963. Two of the new studies were financed by the Area Redevelopment Administration and the balance by the BIA.





Indian tribes are showing an increased awareness of the possibilities for developing revenue-producing and job-creating tourist attractions on their reservations. Pyramid Lake in Nevada is one of many Indian areas which have a high potential for such development.

A large number of the studies were focused on the possibilities of developing tourist attractions to create additional jobs for reservation Indians and bring more revenue into tribal treasuries. The more important Indian areas being surveyed for such potentialities included the Pyramid Lake Reservation in Nevada, the Warm Springs Reservation in Oregon, the Allegany (Seneca) Reservation in New York State, the Big Bend Redevelopment Area embracing the Crow Creek and Lower Brule Reservations in South Dakota, the Hopi Reservation in Arizona, the Nez Perce Reservation in Idaho, and the right-of-way along the newly completed Routes 1 and 3 on the Navajo Reservation in Arizona and New Mexico.

Other major types of studies focused on the possibilities of food processing (on the Quinault Reservation in Washington and the Kotzebue area of Alaska) and on the commercial utilization of forest products (on the Blackfeet and Rocky Boys Reservations in Montana, the Wind River Reservation in Wyoming, and the Navajo Reservation of the Southwest).

## Road Construction Reaches Peak

Over the past 30 years the BIA road system has been gradually expanding and evolving into a complex transportation network on reservations in 22 States. In fiscal 1963 the system was substantially improved by construction of more miles of road than in any previous year. Roadway grading was accomplished on 475 miles of road, compared with 383 miles in 1962; all-weather surfacing was completed on 575 miles, as contrasted with 543 in the preceding period. Emphasis was on two principal objectives: the improvement of schoolbus routes and the construction of roads serving existing or potential business enterprises and tourist attractions.

## Road Building Sets Record

By the close of fiscal 1963, all the more important work was finished on the biggest road construction job ever undertaken by the Bureau of Indian Affairs. This involved the building of two prime highways, designated as Routes 1 and 3, across the Navajo and Hopi Reservations, which have a combined area roughly the size of West Virginia. A \$20 million contract authorization for the two roads was provided by Congress in August 1958 and contracts totaling \$2 million were awarded during the balance of the fiscal year that ended June 30, 1959. The program was completed with successive annual programs of \$4 million to \$5 million in the following fiscal years. All that remained to be accomplished at the end of fiscal 1963 was the widening of bituminous-surfaced sections. This work was expected to be under contract during the 1963 construction season.

The two roads come together at Tuba City, Ariz., on the western side of the Navajo Reservation. From there, Route 3 runs for 168 miles in a general easterly direction across the Hopi Reservation through Ganado, Ariz., to a point on U.S. Route 666 north of Gallup, N. Mex. Route 1 is roughly 200 miles long and proceeds in a northeasterly direction across the northwest corner of the joint Navajo-Hopi reservation through Kayenta and Mexican Water, Ariz., to a point on U.S. Route 666 south of Shiprock, N. Mex.

Prior to construction of Routes 1 and 3, State highways did not enter the Navajo-Hopi area or cross its interior. Only three of the four edges of the Navajo Reservation were served by improved State highways: the eastern side by the north-south Route U.S. 666, the western border by north-south Route U.S. 89, and the

## Relationship of Navajo Routes 1 and 3 to U.S. Highway System and Cities



southern edge by the famous east-west Route U.S. 66. The interior was inadequately served by a system of BIA routes ranging from trails, at the worst, to unsurfaced roads, at the best.

The prime significance of the new construction is that it opens up this vast area—with its rich scenic values and its great potentialities for economic development—to traffic moving along major highways from almost every part of the country. Both the Navajo and Hopi Tribes, as well as the U.S. public at large, should benefit greatly.

In terms of tourism, the potentialities are extremely far reaching. The Navajo-Hopi area contains many points of interest to tourists and should benefit from the growing tourist traffic now being drawn to the southwestern United States as the existence of the two all-weather routes becomes more widely known. This, in turn, will lead to a mounting demand for motels and other overnight accommodations, restaurants, camping facilities, riding and hiking trails, and guided tours of the reservation area—and to greatly increased job opportunities for Navajo and Hopi Indians. As noted earlier, a study was started in fiscal 1963 to determine the



most desirable pattern of tourist-accommodation development along these two routes. It should provide the key to the types and specific locations of facilities that will prove most financially rewarding.

In addition, Routes 1 and 3 should enhance industrial development in the Navajo-Hopi area. As constructed, the two roads can handle large volumes of industrial traffic. The two reservations, taken together, have a large pool of available manpower which should become increasingly skilled as vocational training opportunities provided to Indians by the BIA and other Federal agencies are continued and expanded.

Completion of Routes 1 and 3 was unquestionably a major milestone in the centuries-old history of the Navajo and Hopi Indian Tribes; it should mark the beginning of an era of unprecedented economic growth and development in this long-neglected portion of the American Southwest.

### **Credit Financing Creates Problems**

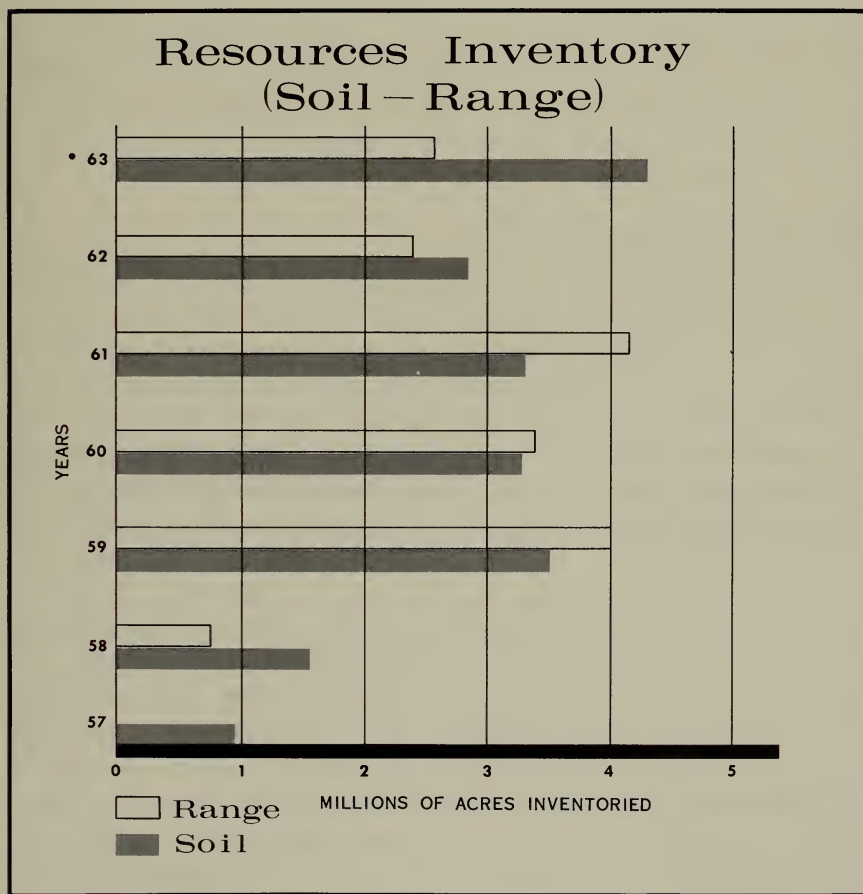
To finance a wide variety of economic enterprises on Indian reservations, ranging from individually owned livestock herds to tribally owned sawmills and motels, the Indians need credit.

For several years past, the most important source has been the banks and other lending institutions serving the general public. Indians, however, have been at some disadvantage in dealing with these lenders because of the trust and restricted status of Indian land titles and the custodial role of the Government in Indian affairs. The Bureau of Indian Affairs has a credit program; one of the chief functions is to facilitate transactions and assist Indian tribes or individual Indians obtain loans from these institutions. Success of the efforts is indicated by the fact that the financing of Indian enterprises from such sources has nearly quadrupled over the past decade, rising from \$22 million in calendar year 1952 to \$85 million in 1962.

A second source of Indian financing is tribal funds. Nearly \$26 million of such money was being used in tribal credit programs at the close of fiscal 1962, the latest date for which comprehensive information is available. Prospects are that this source of financing will be substantially enlarged in the future in many areas as judgments are awarded by the Indian Claims Commission in compensation for tribal claims against the United States.

The revolving credit program of the BIA provides financing to Indian tribes and individual Indians in cases where loans from other sources cannot be obtained or are insufficient to meet needs.

A total of \$27 million has been authorized by Congress for the BIA credit program. Of this, about \$23.7 million has been appropriated. Because of the revolving nature of the fund, however, loans totaling more than \$48 million have been made over the history of the program since the 1930's. Of this \$30.5 million has been repaid and \$236,000 has been canceled. Over the years prior to 1961, the average amount of new advances made from the fund per year was about \$1.5 million; by contrast, the total for fiscal 1963 was nearly four times as great, or roughly \$5.8 million. Of this, about \$2 million was advanced to tribal organizations for relending to individual members; about \$3.5 million was for financing of tribally owned enterprises, such as sawmills, livestock herds, pasture improvements, and the operation of salmon canneries in Alaska; and \$350,000 was for attracting industries to establish plants on or near the reservations.



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## RESOURCE CONSERVATION AND IMPROVEMENT GROW

In addition to projects made possible on Indian reservations by allotment of Accelerated Public Works funds, much valuable work in resource conservation and development was accomplished during the year by the Bureau with its regular appropriations.

### **Soil and Range Surveys Pushed**

In the early 1950's, the Bureau started a systematic program of soil surveys on Indian reservation lands to meet mounting demands for such information in connection with farm, range, and watershed planning. In 1957 this program was expanded to include data on forage and water resources and recreational potentials of the range as well as the soils information. Since then, both range and soil surveys have progressed simultaneously. Because the surveys are made on a crop-year basis, data for 1963 are incomplete. Indications are that soil work will be completed in fiscal 1963 on some 5 million acres and range surveys on more than 6 million acres.

### **Forestry Activities Increase**

During the past 10 years, up-to-date inventories have been completed on all the commercially important Indian forests to provide a basis for calculating the allowable annual cut under a program of sustained yield management. On most forested reservations, the new data indicate that the annual harvest can safely be increased by 50 percent or more as compared with the level of cutting that has prevailed in recent years. On such reservations, the volume of timber harvesting will be stepped up as rapidly as funds become available to administer additional sales and as markets for the additional timber can be developed.

In fiscal 1963, cash returns from Indian timber sales increased 8 percent over 1962 and totaled over \$9 million for 591 million board feet. This was accomplished despite a distressed condition in the lumber market. Indian timber sales were sufficient to build about 60,000 five-room houses.

Additionally, the 1963 harvest of Indian timber generated about 5,000 man-years of direct employment and probably 2,000 man-years of indirect employment in service occupations as a result of



the increased payrolls. About 1,500 man-years of this work was accomplished by the Indians.

### **Indians' Understanding of Resources Improved**

One of the major objectives of the Bureau's resource management programs is to give Indians, and particularly Indian youth, a better understanding of the lands and other physical resources held in trust for them by the United States and to instruct them in the proper care of these assets.

One example of this is the land judging school which has become an annual event on the Cherokee Reservation in North Carolina. As many as 12 teams from high schools in 5 counties of western North Carolina participate in these yearly contests, held under BIA auspices.

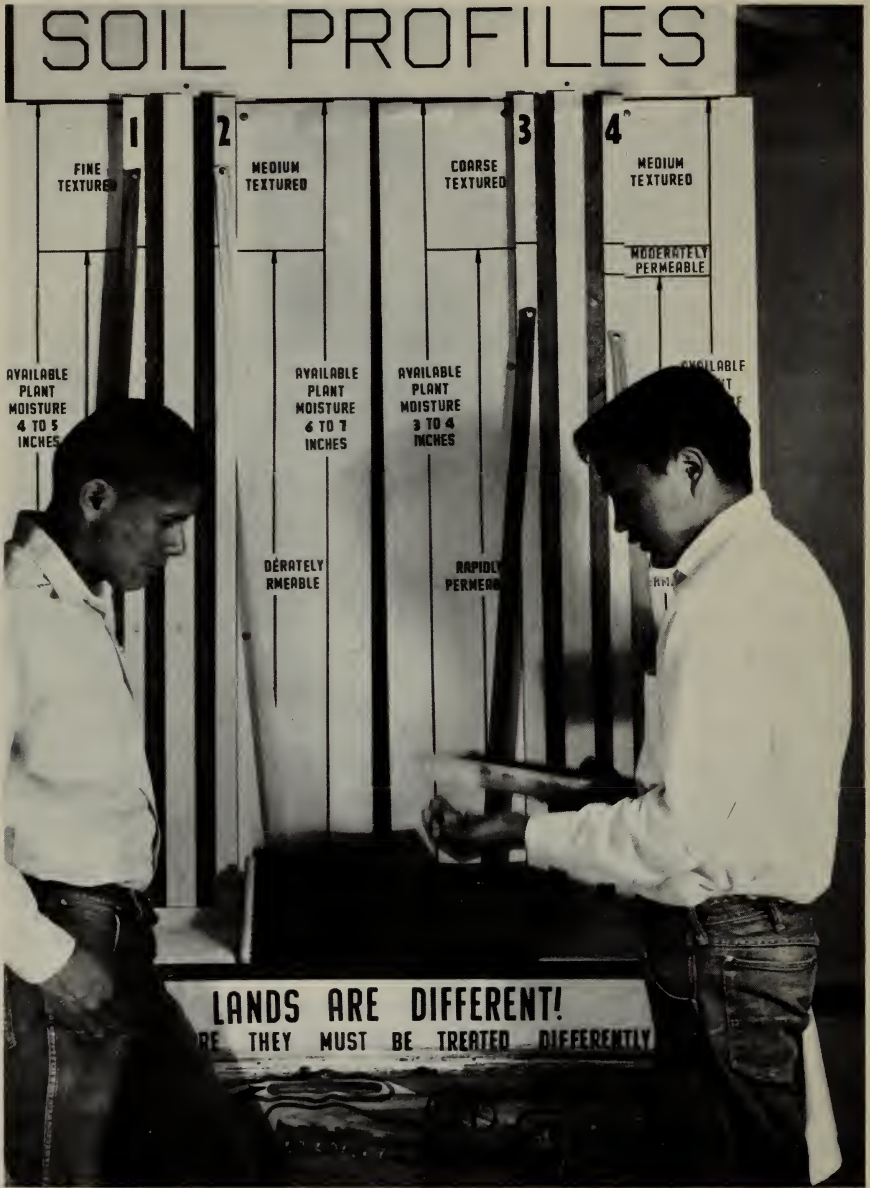
Another method of improving Indians' understanding of the use and management of their resources is through conservation youth camps, part of the summer programs mentioned earlier. Thus, at the Fort Defiance Subagency on the Navajo Reservation in Arizona, four such encampments were organized in fiscal 1963 and probably will be continued in future years. The goal of the camps is to help the boys and girls learn about soil and range conservation from qualified technicians while they perform valuable work on the land.

Efforts are also being made to promote fuller Indian appreciation of the potentialities of their reservation resources for recreational development and use by tourists. Through meetings organized by the Bureau and explanations provided by BIA specialists, Indians on many reservations are becoming enthusiastic about these possibilities and have begun planning for recreational development. In several instances, advice and help are being sought from other agencies of Government with special expertise in the recreational field.

### **Irrigation Activities**

In the calendar year 1962, more than 837,000 acres were farmed on Indian irrigation projects. They produced crops valued at \$67.3 million. Work advanced in rehabilitating facilities and extending them to new lands.

In this connection, the Bureau conducted studies at all the more important projects to gather engineering, soil, and economic data that can be used both in depicting the present status of each project and in developing orderly plans for necessary rehabilitation and



Through youth conservation camps organized by BIA, young Indians are being given a better understanding of the lands and other resources on reservations that comprise their most precious heritage.

further expansion to the full potential. Studies were completed on the Fort Peck and Flathead Projects in Montana and the Wapato Project in Washington.

Another noteworthy development was the work being done at several localities to convert reservoirs built originally as capital investments for Indian irrigation projects into important recreational assets. An example was the Wild Horse Reservoir adjoining the Western Shoshone Reservation in Nevada. After completion of construction, the manmade lake was stocked with fish and this has created a demand for camping and picnicking facilities along the shoreline which has already become more economically significant than the original irrigation purpose of the reservoir. Potentialities for similar development at other Indian irrigation projects are being actively explored.

### **Lease Income Gains Slightly**

Although income from leasing of Indian lands for oil and gas and other mineral development declined in fiscal 1963, it was more than offset by a gain of roughly 30 percent in income from grants of surface uses, both leases and rights-of-way. Such income totaled \$13.1 million compared with \$10.1 million in fiscal 1962. The gain was largely attributable to greater awareness of rental values resulting from the Bureau's expanding real estate appraisal activity.

Despite the decline in income from mineral leasing, the following significant developments occurred:

. . . A coal mining lease covering nearly 8,800 acres on the Navajo Reservation in New Mexico was approved. The lease resulted under an exclusive exploration permit approved in March 1959. It still contains an option for leasing an additional 13,880 acres. Under the lease, the coal mined is to be used for fuel in a proposed gasification plant to be constructed on the Navajo Reservation.

. . . An exclusive 2-year permit to prospect for minerals other than oil and gas covering 19,200 acres of tribal land on the Gila River Indian Community, Arizona, which grants an option to lease, was approved. This marks the first effort in mineral exploration by modern methods on this reservation.

. . . Another "first" was an oil and gas lease sale held on the Northern Cheyenne Reservation, Mont. Bonus offerings totaled \$177,327.





Indian irrigation projects in 1962 produced crops valued at \$67.3 million. Studies are now underway to provide a factual basis for appraising the present economic strength and potential future benefits of these projects.



In the summer of 1962 a three-man task force appointed by Secretary Udall visited the native areas of Alaska to study the effectiveness of local programs of the Bureau of Indian Affairs. Here two task force members confer with Eskimo villagers at Point Hope who have been skinning walrus.

## TASK FORCE STUDIES ALASKA

In 1961, the Secretary of the Interior appointed a special task force to study Indian affairs throughout the Nation. Because of an extremely crowded schedule, the group was unable to visit Alaska. In its report, however, it commented briefly on Alaskan programs of BIA and emphasized the need for a separate study of these activities. As a result, Secretary Udall scheduled a special Alaskan study to begin during June 1962.

Serving on the task force, which traveled more than 5,000 miles throughout Alaska, were W. W. Keeler, principal chief of the Cherokee Indian Nation, chairman; Hugh J. Wade, Secretary of State for Alaska; and James E. Officer, Associate Commissioner of Indian Affairs. They submitted their report to the Secretary in December 1962, and some of their suggestions have already been carried out. Groundwork for fulfillment of others was laid in fiscal 1963.



Recommendations of the task force cover education, the serious native land problem, the BIA loan program which has made it possible for the Indians of southeast Alaska to operate village salmon canneries, the Eskimo reindeer herding program, and hunting and fishing matters which are of vital concern to the native population.

## Education

Native children in Alaska lag behind the general population in educational attainment because of lack of schools and because of a deficiency in the English language.

To combat this situation, the task force recommended that the Bureau's Branch of Education intensify its collaboration with the State of Alaska to develop an adequate educational system that will include Indian and native children throughout Alaska. Task force recommendations in keeping with this goal include providing better educational services in the native villages, expanding the regional high school program, and providing greater vocational training and placement opportunities to the natives.

In realizing these suggestions, the Bureau has continued to expand elementary and high schools in the native villages where it has responsibility. The 1963 fiscal year budget provided \$4,511,000 for the planning, construction, and major improvement of new and expanded elementary school buildings and utilities. Funds were appropriated for building of high schools at Unalakleet, Barrow, and Kotzebue. In addition, a teacher-directed correspondence program was made available by the Bureau to high-school-age students and adult natives in isolated areas. Hot-lunch programs were started in all Bureau schools, and the boarding school program continued to operate on an expanding basis throughout the year. Other accomplishments included the addition of the ninth-grade level at Wrangel Institute and the provision of 150 additional spaces for Alaskan youths of high school age. The spaces were provided at Chemawa Indian School in Oregon.

Vocational assistance, scholarship aid to qualified college-age students, and provision of additional opportunities for commercial and vocational training for Alaskan natives at the Haskell Institute also were realized throughout fiscal 1963. The Bureau likewise intensified its adult education program in the villages.

The extent of BIA participation in education is characterized by the fact that during fiscal 1963, the Bureau financed and oper-



ated 83 schools in Alaska, completely subsidized 21 others (under Johnson-O'Malley funds), and provided financial help to 5 others. Total cost of the program was over \$7 million.

### **Hunting and Fishing Studied**

The most widespread forms of livelihood for the Alaskan natives, especially the Eskimos and Athapascans, are fishing and hunting. While these subsistence activities have been improved upon by modern technology, many problems remain. The task force devoted much of its 110-page report to the controversy over enforcement of the Migratory Bird Treaty of 1916 which forbids hunting of certain types of migratory fowl in Alaska when fresh meat is in short supply. The task force recommended a thorough study by the Department's Fish and Wildlife Service to determine possible relief to Indians in this matter.

In addition, task force recommendations started special studies of hunting and fishing license programs in Alaska. These concerned activities of big-game hunters in the sport killing of polar bears from low-flying planes, the hunting and conservation of walrus, and bag limits on migratory birds.

In response to these studies, Alaskan and BIA officials in 1963 directed their employees to provide outlying villages with qualified agents to issue token subsistence licenses, provided for by the Alaska State Legislature in a law of March 14, 1963.

State and BIA cooperation fulfilled another Task Force recommendation—assuring native representation on the Alaskan State Board of Fish and Game and on local district advisory boards. At the end of fiscal 1963, 4 of the 10 State board members were Alaska natives.

### **Economic Development**

Contrasted to the economic development programs for the Indians of the lower 48 States, the program in Alaska in tribal enterprise was rather limited. This is true regarding reindeer herding, arts and crafts, canneries, tanning, and mining.

The oldest economic development activity for Alaskan natives and one with many vagaries is the maintenance and care of reindeer herds. This activity is suffering from a conflict of the natives' time and interests. A BIA official in Alaska reports that many Indians leave their herds at a crucial time in the season to go hunting and fishing.

Other problems impeding the natives' economic progress in the reindeer industry result because they have been relatively unacquainted with herding practices and because markets for reindeer meat are scarce. Bureau and task force studies have recommended programs to improve reindeer management and marketing.

Similar to reindeer herding problems are arts and crafts. The task force report indicated that arts and crafts had not flourished partly because the natives feel prices do not compensate them adequately for time spent in manufacturing curios.

The Arts and Crafts Board of the Department, established to further such activities among Indians and Alaskan natives, has had a representative in Alaska since 1952. The supervisor is aided by several employees throughout the State's Indian regions.

Regarding industrial development, the task force cited the need for classifying the native communities (which are widely differentiated) in terms of their economic needs and development potential. The force also felt that a "peace corps" program may be the only realistic approach to improving the economy of the Alaskan communities where isolation and lack of technology have limited development.

### **Land Problem in Alaska Complex**

In its report, the task force emphasized that the land situation in Alaska has tended to hamper development among the Alaskan natives. In the Alaskan Organic Act of 1884, Congress promised that the natives "shall not be disturbed in the possession of any lands actually in their use or occupation or now claimed by them," but reserved to itself a determination as to how title to these lands might be conveyed. As a result of the Alaskan Statehood Act of 1958, which authorized the State to select more than 100 million acres from the public domain, the question of native rights under the 1884 act has now become a main issue. Some of the lands claimed by the natives have already been selected by the State.

The task force suggested several steps for resolving this controversy. These include granting individual natives the title to home sites and hunting and fishing sites; withdrawing acreages in near native villages for their growth and development; establishing native hunting and fishing privileges in larger areas; and setting up a special tribunal for considering native claims for lands taken from them by others since 1884.

It also recommended that Congress prescribe a definite period in which to adjudicate native claims so the State land selection program will not be indefinitely postponed.

All these recommendations were under consideration at the close of fiscal 1963.

### **Credit Operations Pose Problem**

The Bureau of Indian Affairs has operated a credit program in Alaska since 1936. At the close of fiscal 1963, about 40 percent of the outstanding loans from the Bureau's revolving fund were concentrated in this area. Alaska has long constituted the Bureau's chief credit problem area. About 93 percent of the entire reserve of the Bureau for potential losses on loans is for loans made in this area.

The program falls into three principal categories. In terms of amounts loaned, the largest is for the purchase, maintenance, and operation of salmon canneries at four communities in southeastern Alaska. A fifth cannery is operated by a native association, but it is not financed by the Bureau. The cannery program of the four communities generally has not been successful. There are many reasons, but the shortage of fish is the main cause. Operations in 1962 were again unsuccessful. In addition to small packs, the price of canned salmon declined and pack sales were slow, increasing costs.

Under recommendations in the task force report, a private research organization is studying possible diversification and expansion opportunities. This will help determine the feasibility of continuing operations. To increase production, funds have been made available for the purchase or construction of nine additional large boats to fish for the canneries. A tentative plan for consolidating the canneries has been developed, but activation will await a study still underway at year's end. A conference at Juneau, attended by representatives of the village associations, attempted to develop closer working relationships between the Bureau and the village councils.

The second category involves loans to native organizations for relending to members. About 78 percent of the amount in this category outstanding at the close of the year was to the organizations operating the canneries, which finance the fishing activities of their individual members. Generally, the loans were not in good



condition. Arrangements were made to permit title to boats purchased with loans to be retained by the community associations, in accordance with the suggestion of the task force.

The third category involves loans to native organizations in remote areas of Alaska for operating stores and trading posts. This program has been successful. In harmony with recommendations of the task force, seven additional loans totaling \$189,500 were approved during 1963 to enlarge this program. This program has probably benefited more people with a comparatively small amount of money than any other loans made from the revolving fund. Only about 13 percent of the outstanding loans at the close of the year were for this purpose, but they were benefiting a native population of over 9,000. In contrast, loans to the four cannery villages represented about 80 percent of the unpaid loans, and were benefiting a population of less than 1,500.



Indian tribes need effective and stable governments in order to take full advantage of economic development opportunities. Elections, like this one on the Navajo Reservation, are an important part of the process.

## TRIBAL OPERATIONS PROMOTED

In tribal operations, the Bureau's primary mission is to help Indians improve and stabilize their political structures and assist them in developing their tribal business capabilities. These goals are more rapidly achieved when the tribes themselves furnish able leadership toward these ends. Some 251 tribes, bands, or other identifiable groups of Indians and Alaska natives throughout the United States function with written organizational documents, and over 150 others are self-governing on a more informal basis.

### **Tribal Government Gains**

Fiscal 1963 marked the awakening of tribes in many areas to their growing political and economic responsibilities. The need for effective government and business management became more apparent as large sums of money were awarded to some tribes by the Indian Claims Commission. The Bureau's efforts were directed toward overcoming historic suspicions regarding modern governmental procedures. A particular target was Alaska, where Bureau specialists in tribal organization were assigned among the Indians and Eskimos for the first time. Wainwright and Angoon were newly incorporated as fourth-class cities and nine other villages either incorporated under State town laws or set up credit associations. Many others were reexamining their political structure with a view to make changes to meet modern situations.

Specific attention was devoted to updating tribal organizational documents among the numerous Indian groups of western Washington, where political development has been slight. The Quinault Tribe, having the largest reservation in the area, drew up a constitution and bylaws which, when adopted, will permit advancement in both political activity and economic development. Likewise, the Suquamish, the Skokomish, the Squaxon Islanders, and the Lummi moved toward more effective tribal organization. Elsewhere in the Pacific Northwest, the Warm Springs, Coeur d'Alene, and other tribes began discussing the need for changes in their organic documents.

The Winnebago Tribe of Nebraska amended virtually its entire tribal document to enable it to cope with present responsibilities. The Winnebagos of Wisconsin adopted a new constitution and bylaws.

Throughout the year, aid was provided the Executive Committee of the Minnesota Chippewa Tribe in modernizing its organization.

The tribe's document limits the authority of the six tribal bands and fails to provide the representation they want. An amended version has been approved and the tribe will vote to accept or reject it. The amendment election poses a difficult problem since the Indian Reorganization Act requires that at least 30 percent of the eligible voters participate. Over half of the population has moved from the reservation, increasing the possibility that a quorum may not participate in the constitutional election.

The Seminoles of Florida significantly amended their constitution and charter during the year. The tribe's organization is now unique, separating political functions from business management. Several other tribes are studying this arrangement for possible use.

The Crow Creek and Lower Brule Sioux made organizational changes to meet the increased responsibilities created by the Big Bend Dam and Reservoir project. Simplified articles of association for the Las Vegas Colony and Summit Lake Reservation (Nevada) and the Santa Rosa Rancheria (California) were developed to meet the needs of these comparatively small groups without overburdening them with complicated and expensive political machinery. The Bureau is trying to interest other small tribes in streamlining their organizations.

### **Tribal Funds Used for Rehabilitation**

Assisting tribes in the effective control and use of their funds has long been a major program of the Bureau. In seeking to improve tribal management, the Bureau in fiscal 1963 helped in developing a \$4 million rehabilitation program for the Crow Creek Sioux Tribe (South Dakota); a \$2 million program for the Lower Brule Tribe (South Dakota); a \$10 million program for the Crow Tribe (Montana); and smaller programs for the Nez Perce (Idaho), Ute Mountain (Colorado), Navajo (Arizona, New Mexico, Utah), Yakima (Washington), and other tribes. Administrative plans, tribal enterprises, housing authorities, and many other organizational devices were used to implement and improve tribal business operations.

In fiscal 1963, approximately \$67 million in tribal funds from annual income and from judgment awards was employed for many purposes. About \$50 million went for special tribal programs, community development, economic development, and capital investment; and \$17 million went to tribal members in the form of dividends, family plans, and outright per capita payments.



Indian leadership has shown increasing interest in developing administrative proficiency and in economic programs upon which stronger and more durable communities can be built. This is evident in their willingness to commit millions of dollars to special projects. The present situation contrasts with the strong view of a few years ago that unrestricted per capita payments to individual members represented the only acceptable use of tribal capital. Many Indian leaders now advocate programing for development and for income-producing ventures first, and dividend payments second.

### **Many Tribal Claims Settled**

In 1946, Congress created the Indian Claims Commission to hear and determine claims of tribes, bands, and other identifiable groups of Indians in the United States. More than 850 claims were filed; 138 have been dismissed. Seventy-three claims have so far brought 43 awards totaling \$95.9 million. (These awards have been made primarily as additional payment for the taking of 143 million acres of land.) Six hundred and forty claims remain to be adjudicated and are in various stages of prosecution.

During fiscal 1963, Congress appropriated \$7,315,000 to the Pawnee Tribe; \$4,647,000 to the Miami Tribe of Indiana and Oklahoma; \$3 million to the Kalispel Tribe; \$97,025 to the Tillamook Band; and \$72,162 to the Nehalem Band of Tillamook Indians. Besides this total of \$15,132,000 which was appropriated, awards were made for an additional \$10,100,000 involving cases either on appeal to the Court of Claims or for which Congress had not yet appropriated funds. Undoubtedly the remaining 640 claims, if they are successfully adjudicated, will provide financial opportunities unparalleled in tribal history. Liability has been established in some 60 instances and the prospect of 15 to 20 new awards each year is indicated.

Many of the tribes have claims for the taking of large tracts, but are not able to finance the cost of appraisers to set a value for the land.





# Bureau of Land Management

Charles H. Stoddard, Director

The 466 million acres of public lands administered by the Bureau of Land Management are among our Nation's most valuable natural resources. On the public lands are some of the most productive forests, and under the public lands lies much of the mineral wealth necessary for our modern economy. The public rangelands provide forage for thousands of cattle and sheep, and for another national treasure—our native wildlife. The public lands contain developed recreation values and even greater potential for all citizens to enjoy through hunting, fishing, camping, or simply being outdoors.

Through its program of *multiple-use* management of the public lands, the Bureau of Land Management seeks to balance all beneficial uses for the public domain. The BLM works constantly to protect resources from natural and manmade hazards such as fire and erosion. BLM engineering programs help make multiple-use management and protection possible.

This report presents BLM's accomplishments in fiscal 1963 in all these areas of its activity. It also outlines many of the Bureau's plans to continue to improve the public lands and their management.

The national responsibility of the Bureau of Land Management was clearly stated by President Kennedy in his special message on natural resources of February 23, 1961: "We cannot, however, delude ourselves—we must understand our resources problems, and we must face up to them now. The task is large but it will be done."



## Legislation Aids Efficiency

Effective management of the public lands depends in part upon efficient processing of applications filed by the public for public land. In the past, difficulties in prompt handling of applications led to delays in needed disposals, complications of management problems, and large expenditures for "paper processing." Full correction of this situation requires legislation, as well as administrative departures.

A major administrative step in this direction was the adoption of a complete revision, effective June 14, 1963, of part 296 of title 43 of the Code of Federal Regulations. The changes are expected to expedite the handling of applications for public lands by BLM in cases where land classifications or similar determinations are involved.

A key aspect of the new regulation is that it clearly distinguishes the two parts of the application process: (a) a petition for classification and opening of the land to entry and (b) application for entry.

The new regulations specify the land laws under which classification and other action to open lands to disposal are necessary. They also specify the general criteria to be used by the Department in making the classification decision. They further streamline procedures by moving the review of classification actions from appellate channels to administrative channels.

Another significant simplification of public land procedures was restriction of small-tract applications to areas opened to such application.

Much attention was devoted to updating regulations. Twenty-five proposed changes in regulations were being developed or had already been submitted for departmental approval at year's end. Most were designed to bring regulation language clearly into line with departmental decisions, so people doing business with the Government would be given a clear impression of the current rules and what they mean.

To further the program of modern management of the public lands on a multiple-use basis, several legislative proposals were introduced in the 88th Congress.

## Congress Enacts Land-Management Bills

Two important public land-management laws were enacted by the 87th Congress. They are the Mining Claims Occupancy Act of October 23, 1962 (Public Law 87-851), and the Petrified Wood Act of September 28, 1962 (Public Law 87-713).

The Mining Claims Occupancy Act applies generally to unpatented and unpatentable mining claims which were used as principal places of residence on October 23, 1962, and since July 23, 1955. The law permits certain "old" occupancy situations to be legalized for as long as the public interest allows. Under certain circumstances, persons living on unpatented mining claims may acquire an interest in the lands from the Federal Government. A 5-year period had been provided for people to apply for privileges under the act. The act was passed as the key measure to terminate the unauthorized occupancy of public lands based on invalid mining claims.

Public Law 87-713 excludes petrified wood from location under the mining laws and provides for free use of it by hobbyists and scientists. The law was passed to protect the public recreation values of deposits of petrified wood on the public lands.

## LANDS OFFER RECREATION

The Bureau of Land Management is responsible for the conservation, management, and development of nearly one-half billion acres of the Nation's public lands. They include nearly 300 million acres in Alaska and some 175 million acres in 27 other States.

In his first natural resources message, President Kennedy called the Nation's attention to the importance of the public lands under the jurisdiction of the Bureau of Land Management. His message contained a mandate for action and established conservation goals to which the Department is committed. The portions of this program particularly applicable to the lands and recreation activities of BLM are the *inventory* and *evaluation* of the public lands outside Alaska, and the development of a program of multiple use designed to reconcile the conflicts among the wide variety of uses of these lands. The Bureau's goals in this connection are: the development of public land laws responsive to conditions which now exist; improvement of the land tenure pattern; substantial reduction in annual resource losses from fire, insects, unauthorized use, vandalism, water pollution, and waste; and improvements and extensions of access roads, structures, and facilities for the protection, improvement, and recreational use of the scenic, wildlife, and other resources of the public lands.

### **Public Land Moratorium Terminated**

The moratorium declared by the Secretary against the filing of nonmineral applications for public lands in all Western States ended September 4, 1962. During the previous 18 months the



The Bureau of Land Management maintains facilities on public lands for recreational use of scenic and wildlife resources. This covered picnic area with elevated stove is part of an accelerated public works project at the Red Cliffs Recreation site near St. George, Utah.

Bureau of Land Management was able to reduce a backlog of more than 41,000 applications to less than 18,000, a reduction of approximately 57 percent. Outside Alaska (where because of the settlement laws, the moratorium had only minor applications) there was an even more effective reduction of two-thirds. In addition, the moratorium was lifted ahead of schedule in 8 of the 17 States originally affected. Elimination of the greater part of the pending caseload resulted in action on the cases and also freed personnel and resources for other important work.



## **Inventory and Evaluation Advance**

The Master Unit Study System, put into operation during fiscal 1962 in direct response to the President's call for "an inventory and evaluation of the Nation's public domain holdings," was progressing on about 175 million acres of public lands. To accomplish this task, the system is divided into four major steps:

Accumulate all available basic data, and on the basis of these data define general units of study. These units are defined on the basis of similar physiographic and economic characteristics, and are called Master Units;

Analyze the available data for each of these Master Units and determine to what uses certain specific areas within each Master Unit are most suited in terms of land capabilities and resource needs;

Study the areas in detail to determine the action programs necessary to realize their capabilities and meet their needs; and

Outline, schedule, and effect the action programs. Thus the system will be, in effect, the first master planning tool for these public lands.

By year's end, trained technicians had completed nearly all initial analysis work. Detailed analysis started in many areas.

## **Disposition**

During fiscal 1963, 4,858 patents were issued by the Bureau of Land Management which transferred ownership of 639,316 acres. This total does not include 20,534 acres in school lands, 82,944 acres in Indian Fee and reissue trusts, and 67,905 acres in curative and supplemental patents, a total of 171,384 acres not included in the final total. These disposals were made under a variety of public land laws to private citizens and nonprofit organizations, State, county, and local governments, and other Federal agencies.

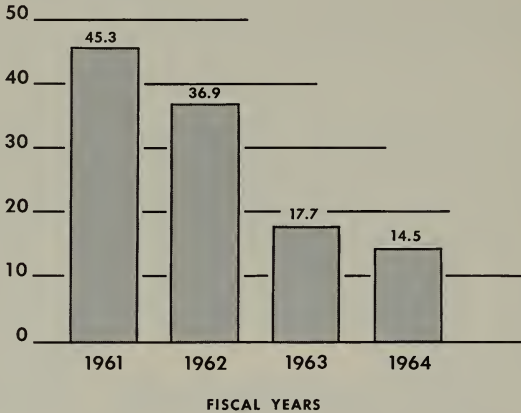
The Bureau issued 441 patents for 59,874 acres under the homestead laws and 231 patents issued for 52,662 acres under the Desert Land Act for agricultural development. In addition, 2,162 small tracts were patented involving 7,343 acres. There were 83 exchanges consummated on a total of 66,062 acres. Conveyed to the States were 262,565 acres under 88 separate grants.

For a discussion of disposals made under the Recreation and Public Purposes Act, see the following subsection.

## Land Adjudication

Cutting Down The Backlog

THOUSANDS  
OF CASES PENDING



## Outdoor Recreation Enhanced

The use of the public land under jurisdiction of the Bureau of Land Management for outdoor recreation purposes continued to increase rapidly. Recreation is becoming a full partner with live-stock grazing, mining, timber production, and other resource management activities. However, private development and needs are exerting great pressure on all these resources, especially in areas where population is expanding rapidly.

Every year many millions of people hunt, fish, camp, and picnic on the 466 million acres of BLM-administered land, most of which is in 12 Western States, including Alaska. These lands contain some of the most spectacular desert scenery and rugged mountain and canyon country in the United States. There were over 15 million recreation visits to such lands in 1963.

But because of the lack of even minimum sanitation and recreation facilities on most of the land, many visitors unintentionally abuse the areas, creating litter and fire hazards, accelerating erosion, and polluting vital water sources.

The need for designated recreation sites with essential facilities to protect the public lands and to provide for their recreational use by the public has led the Department to request funds for the construction of minimum facilities. Under the authority of the Oregon & California Act of 1937, some 50 campgrounds and picnic areas have been built since 1958 in western Oregon. As a pilot effort, the 1963 Accelerated Public Works program provided about \$1,400,000 to construct minimum access and protective facilities on 49 public land sites in economically depressed counties of 8 States.

Recreation, fish, and wildlife resources on the public lands are being inventoried and evaluated. Acute problem areas will be identified for corrective action, including the installation of needed facilities. The overall potential of the land to provide public benefit will be determined. The long-range objective is effective integration of recreation resources and their proper functions into a system of multiple use. Important aspects of the inventory are the identification of archeological and historical remains for protection and the identification of sites suitable for transfer to non-Federal public agencies under the Recreation and Public Purposes Act of 1954.

Working for BLM, employees of accelerated public works improved boat-launching facilities on Walker Lake, near Reno, Nev.





Improvement of wildlife habitat and preservation of the wildlife resource is a basic part of the Department's program to insure the best care and management of the public domain. Fourteen land management areas in California totaling 810,570 acres of public lands are being managed on a cooperative basis by the Bureau of Land Management and the State. Plans for special intensive management on a demonstration basis of scenic, wildlife, and other natural resources are being formulated for certain other areas in California, Oregon, and Utah.

In harmony with the recommendations of the Outdoor Recreation Resources Review Commission, States and local government agencies are encouraged to acquire tracts of public domain land for recreation and other public purposes under the Recreation and Public Purposes Act. The land is made available only if a definite plan of utilization and schedule of development are submitted. By establishing the low charges of \$2.50 per acre for purchases and 25 cents per acre per year for lease, the Department encourages communities to expand their open space and recreation programs.

During the past 2 years, 133 patents totaling 11,277 acres have been issued under the act and 142 leases totaling 90,000 acres have been put in effect. To stimulate even greater use of this opportunity for State-Federal cooperation, the Department has published a comprehensive brochure which explains to prospective applicants the opportunities that exist under this program and the procedures that are to be followed in making application.

Of growing significance are the patents issued under the Recreation and Public Purposes Act. During fiscal 1963, 98 patents were issued under the act for 11,816 acres. Of these, 73 patents were issued for 10,275 acres under the new special pricing schedule of \$2.50 per acre. Some of the land conveyed under this act is used for public education and public health purposes. Included in the year's Recreation and Public Purposes transfers were Angel Island, San Francisco Bay, Calif.; Imperial Hot Spa, California; Smith Rocks State Park, Oregon; and Grand Lake Park, Grand County, Colo.

## MANY ACCELERATED PUBLIC WORKS PROJECTS UNDERTAKEN

On September 14, 1962, the President signed into law the Public Works Acceleration Act (Public Law 87-658). This law enabled Federal agencies to initiate or accelerate, upon approval, public works projects to help erase unemployment.



Local workers employed under the accelerated public works program are shown improving an access trail to the scenic Rio Grande Gorge administered by the Bureau of Land Management in New Mexico.

The type of public works intended by the legislation proved ideal for the Bureau of Land Management. Most of the Bureau's projects are relatively small and can be accelerated and completed in a short time. The completed projects have an immediate beneficial effect on public lands and also aid in the future management of the land's water, wildlife, forage, mineral, and recreational resources.

In October, the Bureau received \$1,972,000 as its first allocation of APW funds for projects in northern New Mexico, northern California, southwestern Oregon, south-central Utah, and southern Ne-

vada. In less than a week the Bureau had 192 APW workers on its payroll.

Subsequently, the Bureau received APW funds in several allocations which totaled \$6,537,000 by year's end. This money was distributed among 44 separate projects in 10 of the Western States. Each project had to be approved by the Bureau, the Department, the Area Redevelopment Administration in the Department of Commerce, and by the President before it could receive funds.

Because salaries of permanent Bureau of Land Management employees cannot be paid from Accelerated Public Works funds, all supervision, planning, and contract preparation was done by permanent Bureau personnel financed by regular BLM funds.

The Bureau had scheduled the following for completion in fiscal 1963 under APW funds: 150 miles of access roads; 2 buildings; 49 recreation sites containing 518 family units; 3 road maintenance projects; timber stand improvement on 24,000 acres; site improvement on 10,000 acres; seeding 20,000 acres; brush control on 5,000 acres; 1,300 erosion control structures; 482 miles of fencing; 70,000 posts cut; 300 cattleguards; 57 livestock and wildlife wells; 40 springs and water developments; 250 wooden gates fabricated; rodent control on 120,000 acres; 10 miles of stream clearance; and 53 miles of stock trails.

The funds were allotted among States as follows:

<i>State</i>	<i>Amount</i>
Alaska .....	\$35, 000
California .....	702, 500
Colorado.....	168, 000
Idaho.....	180, 000
Montana.....	201, 100
Nevada.....	260, 000
New Mexico.....	1, 059, 000
Oregon.....	2, 432, 300
Utah.....	1, 383, 100
Wyoming.....	116, 000
<b>Total.....</b>	<b>6, 537, 000</b>

Typical major APW projects were:

**Eureka Project, California:** This involved construction of 5 miles of access roads, foot trails, and protection and sanitation facilities in the scenic King Range recreation area of Humboldt County.

**Taos Project, New Mexico:** Included development of six recreation sites and parking areas, and 11 miles of foot trails in the Rio Grande Gorge recreation area. Many of the trails, which provide



access to the good fishing waters and scenic beauty of the Rio Grande River, were blasted from solid rock.

**Josephine Project, Oregon:** This consisted of 400 acres of timber site improvement, 1,000 acres of pruning and thinning, 1,000 acres of snag felling, and protection and sanitation facilities at Deer Creek. Some of the Rogue River trail, which traverses approximately 18 miles of the most scenic country in Oregon, was improved. Also approved for construction in Oregon were several projects for access roads to aid in harvesting timber blown down during the devastating windstorm of October 12, 1962.

**Garfield Project, Utah:** Stagnated ponderosa pine stands were thinned to allow more rapid growth of the selected trees. The felled trees were pushed into washes and gullies to act as erosion-control structures. In the same project, stands of juniper were



The Bureau of Land Management was one of the first Federal agencies to begin construction projects under the accelerated public works program. New employees, hired under the program, get safety instructions on their first day at work on the Rio Grande Gorge in New Mexico.

removed and replaced by ponderosa pine seedlings and crested wheatgrass. Everything of value was utilized. Fenceposts salvaged from downed juniper trees were used in fencing the area to protect the tree and grass seedlings until they could become established. Protection and sanitation facilities were constructed at three sites.

**Canyonlands Project, Utah:** This project included the construction of protection and sanitation facilities along the eastern rim of the Colorado River. These facilities are within a buffer zone surrounding the proposed Canyonlands National Park. Nearly 600 man-years of on-site employment were created on BLM administered lands. In addition, the APW program has enabled many citizens to become closely acquainted with the functions of BLM in the administration of the public lands.

Through the APW program, the Bureau of Land Management demonstrated its ability to proceed on short notice with any improvement, protection, conservation, or maintenance program on the public lands under its jurisdiction.

## FOREST RESOURCES SAFEGUARDED

In the years ahead, increasing demands will be made on the Nation's forests, one of our most vital renewable resources. The country will need lumber, plywood, and pulp, and other forest products. By 1980, the Nation's demand for timber is expected to be at least 25 percent greater than now. In addition, the forest lands themselves are a source of much of the Nation's water, forage, recreational opportunities, minerals, and wildlife. To meet all these future needs, increasingly efficient forest and woodland management is necessary throughout the Nation.

The Bureau of Land Management, in its own area of administration, is striving to meet this challenge by applying the latest techniques in multiple-use forest management.

### **Uniform Practices Followed**

To approach uniformity in timber sale and management practices on Federal forest lands, the Secretaries of Agriculture and the Interior continued the cooperative effort that began subsequent to President Kennedy's request in 1961. Differences in timber sale and inventory practices were studied further in 1963.



Timber salvage operations are underway on BLM lands in western Oregon where more than 1.2 billion board feet of timber were down after a severe storm in October 1962. Removing the fallen timber will lessen the threat of bark beetle epidemics.

### **Forest Management**

To meet future demands, more wood fiber must be obtained from fewer acres. A major goal for all BLM commercial forest land in the Western States is to reach a maximum sustained-yield level. The management of the Oregon and California Railroad Grant Lands (O&C), the Coos Bay Wagon Road Lands (CBWR), and public domain lands in western Oregon has pointed the way to such an objective.

Lands administered by BLM in western Oregon are producing timber at an annual rate of approximately 1 billion 127 million board feet. These lands are examples of intensive, large-scale administration of public forest land. Besides these projects, management activity on approximately 4 million additional acres of



commercial forest lands in the Western States was being steadily increased to bring these forests to full sustained yield capacity. Woodlands management will be increased on another 29 million acres of lands.

On October 12, 1962, a wind and rain storm hit the west coast with hurricane force. It toppled or damaged approximately  $1\frac{1}{4}$  billion board feet of timber on lands administered by BLM. Plans to sell the allowable cut of green timber had to be abandoned. Instead, the Bureau faced the gigantic task of measuring and preparing the salvage timber for sale before a deadline imposed by the twin hazards of damage by fire and insects. A further complication was the scattered, jackstraw pattern of the damage, a condition which made access doubly difficult.

In cooperation with other public agencies and with the timber industry, BLM immediately started planning a salvage program. This program sought to minimize losses from the storm by removing damaged timber by the summer of 1964, and at the same time maintain the sensitive market balance in the lumber industry. By year's end, BLM had sold approximately 926,544,000 board feet of salvage and green timber and was ahead of schedule in the salvage program.

During the past year, both before the storm and after, the volume of timber sold from these lands totaled 1,567,267,000 board feet valued at \$36 million, a substantial contribution to the economy of western Oregon. Timber sales from public domain lands in eastern Oregon and in Western States contributed over 100 million board feet of timber valued at approximately \$1.1 million.

### **Forest Development Aided**

The major objective of Federal land and resource management is to meet future resource requirements. A progressive program for the development, improvement, and conservation of public lands assures adequate land and resources for tomorrow. In keeping with this objective, BLM has started an accelerated program of forest development. In areas where the economy is closely related to harvesting and procuring forest products, it is imperative that forest lands be restored to a productive state as soon after the harvest as possible.

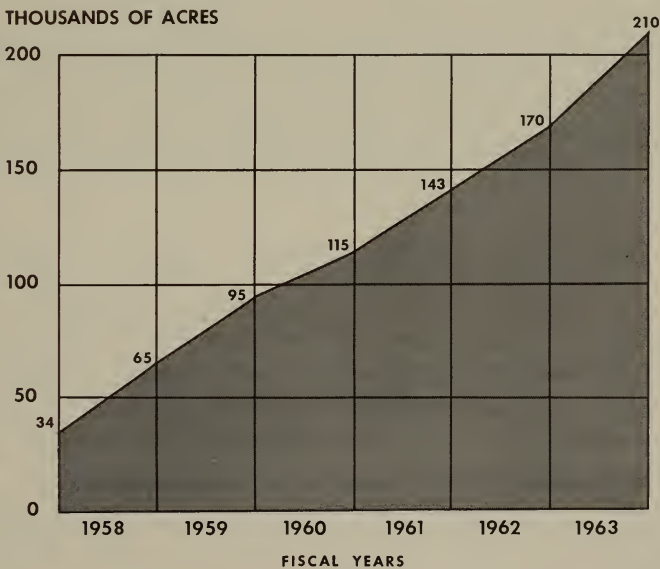
Prior to 1958, a total of approximately 34,000 acres under the Bureau's stewardship had been reforested. Since then, the reforestation program has been increasing at the average rate of 18,700 acres annually. This program is designed to assure a sustained and continuing crop of timber.

In fiscal 1963, approximately 24,000 acres of forest land were planted with forest tree seedlings and approximately 15,000 acres were seeded. This reforestation effort was largely devoted to areas where timber had been harvested. In addition, areas which had been denuded by fire were reforested to restore them to productive status and to curb erosion.

On certain lands, site improvements are a prerequisite to the reestablishment of forests. These improvements include snag felling, terracing, eradication of competing brush, and soil scarification (loosening the soil preparatory to planting young trees). In fiscal 1963, site improvements on 14,323 acres were completed. Commercial thinnings, which have as their objective the production of superior crop trees and the removal of poorly formed or undesirable trees, resulted in the harvest in western Oregon of 7,657,000 board feet with a value of \$147,089. Thinnings were also made on approximately 6,500 acres of forest lands where the trees had not yet reached commercial size. While there is no immediate monetary return from the trees removed in such operations, the result

## BLM Reforestation

Cumulative Accomplishments By Years



is increased volume and value on stands which may otherwise stagnate. Growth of the remaining trees is often dramatic when young stands have been thinned.

### **Forest Inventory Continues**

A full inventory is necessary for sustained yield management. A forest inventory, similar to that completed in western Oregon in 1959, was underway during the year on the commercial timberlands of the public domain in other Western States. It is scheduled for completion in 1965. Permanent sample plots are being established so that periodic reinventory can be made.

### **Access Roads Built**

Full multiple use of the Nation's forest lands requires a good access road system. To harvest forest resources roads must be designed and built for heavy logging equipment. The Bureau of Land Management constructed many miles of high-standard logging roads in order to make possible harvesting mature green timber, and salvaging dead and dying timber. Accelerated Public Works funds paid for expansion of this road network to get loggers into remote areas of windthrown timber. Such a system helped make possible the Oregon salvage operation after the October storm.

Access roads allow the full utilization of forest products. Thinning programs can be conducted, and small-volume or low-value sales can be made in areas where roadbuilding costs would otherwise prohibit them, especially to small operators.

Access roads serve two other important purposes. They are needed to protect the forest from fires, insects, and disease. They make many acres of public land accessible to the public for recreational activities such as fishing, hunting, picnicking, and camping.

## **RANGE RESOURCES IMPROVED**

In managing the Federal rangelands in fiscal 1963, the Bureau of Land Management emphasized the principle of multiple use and the development of the range's full productive potential. Evidence of changing conditions in the overall condition of BLM's 170 million acres of semiarid western rangelands develops slowly. Nevertheless, there has been marked improvement on seeded ranges and ranges that have received brush control or other rehabilitation measures.





Range rehabilitation in the West often requires replacement of brush with more productive perennials. Here a BLM equipment operator works at reclaiming range lands in Nevada.

The most significant progress was made in laying the foundation for both continued improvement of the range and production of forage. This foundation for progress is being developed by bringing forage harvest and plant growth into balance, selecting sites which will respond to land treatment operations, and planning programs to provide optimum use of resources and sustained full production.

### **Resource Inventory Underway**

The BLM continued its resource inventory program—which provides accurate maps and data on forage production, range types, and existing and needed improvements. During the year, 8,489,680 acres were inventoried in statutory grazing districts. Before the year, 99,354,439 acres had been inventoried. Of the 156,643,572 acres of Federal lands suitable for grazing, 98,799,453 acres remain to be inventoried. All lands within statutory grazing districts are programed for inventory by 1966.

### **Range Adjudication Helps Conservation**

Basic requirements for sound range management include determination of individual applicants' qualifications for Federal range use, apportioning the available range in accordance with their qualifications, and assignment of use areas and grazing seasons. These activities—termed “adjudication”—are necessary to stabilize the livestock industry dependent upon the public range—an objective fixed by the Taylor Grazing Act of 1934. Adjudication was given high priority during 1963 and is scheduled for completion by July 1, 1967.

### **Range Condition and Trend Surveyed**

The Bureau conducted field surveys of range conditions on approximately 20 percent of the Federal lands in the organized grazing districts. This condition survey activity provides for repeat surveys on ranges every fifth year. Data on range conditions are extremely valuable in developing and improving range management plans.

### **Utilization Surveys Conducted**

Surveys of the current use of forage by livestock, big game, and other animals were conducted on many range areas. Big-game concentration areas, rehabilitation sites, and problem areas received particular attention. State game departments cooperated in surveys of important wildlife areas. Evaluation of data on the use of forage (in view of the normal year's plant growth) helped BLM experts determine how much livestock and wildlife the land should support, and how much hunting is suitable.

### **Grazing Fees Increased**

Following a 2-year study, fees for grazing livestock on public lands were increased from 19 cents per animal unit month to 30 cents per animal month. At the same time the portion of the fees designated for range improvement was increased from 25 percent to 33 $\frac{1}{3}$  percent. This has the effect of doubling the funds designated for range improvement. The grazing fee increase was part of a continuing program of review and adjustment to maintain reasonable public land resource user fees and charges.

### **Studies and Cooperative Research Undertaken**

Scientific range management is still young and many problems remain to be solved to create an optimum balance between production and use of range resources. During the past year, the Bureau emphasized range studies and research.



Sheep graze high in the colorful Colorado Rockies on Alpine Range near Cinnamon Pass, on public lands administered by the Bureau of Land Management.



Revised procedures for making forage inventories on public rangelands were issued following several years' study of research findings and consultation with the Nation's leading ecologists and range scientists. This study helped inaugurate many new management techniques for rangelands.

The Bureau is working to integrate economic analysis into its resource management programs. An economist trained in benefit-cost studies was employed to prepare a handbook on economic analysis. Although the experience of other agencies can be most helpful in planning water resource projects, the development of economic analysis procedures for activities of the Bureau of Land Management is a pioneering effort. Relatively little work has been done on the economics of public land resources.

The Bureau continued working closely with Federal, State, and private research agencies, with special emphasis on economic considerations. The study of western livestock ranches with the Economic Research Service, the Forest Service, and three agricultural experiment stations—begun last year—was completed. An interim report filed with the Bureau and the Forest Service was used in advisory board deliberations on grazing fees. The researchers submitted for review a manuscript of the final comprehensive report to be published in 1964.

The BLM began a cooperative study with the Oregon Agricultural Experiment Station on rates of return from investments in public rangeland improvements. Economists and ecologists are seeking to relate economic information to basic ecological data, using modern computer techniques.

In cooperation with the Bureau of Land Management, the Bureau of Sport Fisheries and Wildlife began a new study to determine the effects of various types of rangeland fences on pronghorn antelope. The study, being conducted in Wyoming, has received widespread interest and support from stockmen's and sportsmen's groups, as well as State and Federal agencies.

Millions of acres of public lands are covered with piñon pine and juniper scrub. These species have been considered almost worthless and thousands of acres have been cleared and seeded to grass. In fiscal 1963 the BLM began a cooperative study with the Utah Agricultural Experiment Station on unrealized potentials of these vast piñon pine and juniper areas. The relationship of the trees to the water and soil conditions of the areas is being examined in this study. It involves teams of plant ecologists, soils technicians, and economists and is being conducted throughout the West where piñon-juniper woodlands and ranges are important.



To learn more about range productivity, BLM's range managers use many types of test plots such as the deer-proof enclosure on the left and the cattle-proof enclosure on the right in the Owyhee Project area of southwestern Idaho.

State experiment stations in Montana, Utah, and Arizona, the Bureau, and the Forest Service, agreed on a new study of range economics. Included will be an economic comparison of ranches using public rangelands to those using private rangelands. Different methods of determining the economic values of range also will be tested.

Studies of the tenure problems encountered by users of public land resources started. A special committee of the National Advisory Board Council met to analyze these complex problems. The committee submitted recommendations for the consideration of district advisory boards. The Bureau is providing professional assistance to groups cooperating in this continuing study.

The Bureau continued its cooperative study with the Soil Conservation Service of procedures for soil and vegetation inventories.

The purpose is to determine the feasibility of using standard soil survey procedures or some modification of them in BLM resource inventories. The standard soil survey procedures were devised for agricultural lands. To be practical for use on vast acreages of semi-arid grazing lands, survey procedures must be economical and accurate. In addition, they must provide data that are subject to meaningful interpretation for management purposes. The study will be concluded in 1964 with a consolidated report of findings at sites in Montana, Nevada, and New Mexico.

### **Resource Development and Conservation Accelerated**

Acceleration characterized the Bureau's resource conservation and development program in 1963. Plans were made on the basis of the total resources in individual small watersheds. There were more than 640 of these development units, or community watersheds. Each watershed is a community of interest, with natural boundaries and similar soils, vegetation, and user interest.

Total conservation needs of each community watershed are being determined by resource inventories and conservation surveys. On-the-ground application of key practices, including range seeding, brush control, water management, and fencing, has been started in areas of greatest need.

Complete conservation treatment programs were begun in four demonstration areas. They lie principally in the Vale District in Oregon (the Vale Project), the Winnemucca District in Nevada (the Beowawe Project), the Boise District in Idaho (the Owyhee Project), and the Albuquerque District in New Mexico (the Rio Puerco Project). The rehabilitation of 158,000 acres of rangeland by seeding, brush control, and mechanical land treatment is among the major accomplishments in these demonstration areas. The protection and proper use of these treated areas have been assured by modern grazing practices and by the construction of 300 miles of fences and 135 new stockwater developments. Severely eroded areas have required the construction of 45 detention dams and numerous other structures.

The number of forest and range fires during fiscal year 1963 dropped. Emergency treatment was given all fire-damaged lands where needed. Reforestation and range seeding on burned areas help prevent excessive flood and sediment damage and also assure production of timber and forage and of a continuous protective cover for the watershed.

Special problems in the control of poisonous and noxious weeds were identified and control measures were applied. Maximum





Laid barren by a disastrous fire 4 years ago, these now grass-covered hills in Idaho were restored and the soil stabilized by terracing and seeding done by the Bureau of Land Management.

efforts have been made to control the poisonous plant halogeton, the aggressive invader Medusa-head rye, and the host plants of the beet leafhopper.

Grazing by domestic livestock is a primary use of rangelands administered by the Bureau. All BLM range conservation and development activities are planned with grazing and grazing potential as a major factor. In addition, recreation, mining, forestry, watershed, and other uses are fully considered in planning and development. Local and State organizations are consulted and encouraged to become full partners in the planning and execution of range-development programs.

### **Wildlife Management Grows**

Americans receive many important benefits from wildlife on the public rangelands. Hunting, photography, and merely observing wildlife in its natural habitat are recreational activities of physical, cultural, and social benefit. Because of the Nation's increasing population, leisure time, and per capita income, these recreational activities have a prominent place in BLM's programs.

The Bureau's habitat development and management programs provide optimum numbers of game animals. Access roads on the

public lands facilitate recreational use of wildlife resources as well as BLM's own projects of land improvement. The BLM estimates that the number of big-game animals inhabiting public rangelands outside Alaska in 1963 was 2,055,989, compared to 1,928,053 in 1962 and 1,900,529 in 1961.

Wildlife and domestic livestock share the public ranges and the Bureau has a responsibility to maintain range resources in such a way that both will thrive. State game and fish agencies, of course, have full control over scientific herd management and harvesting of game, so that disease and starvation will not result from overpopulation of game animals.

Most of the Bureau's State offices had full-time wildlife specialists in the field during fiscal 1963, conducting independent studies and working with range managers. The pronghorn antelope fencing study in Wyoming was only one of the special projects undertaken. Others included a study of the Black Rock deer herd in Arizona, which had grown so large that it was destroying the range and starving itself. As a result of the study, hunting pressure on



Close cooperation with State and local agencies is a keynote of BLM's field operations. Here a Bureau engineer and a representative of the Nevada Fish and Game Department survey the route of an access road through BLM's Battle Mountain District in Nevada.

the herd was adjusted and the herd was brought into proper balance with the livestock that share its range. In Nevada, the BLM is conducting an experiment on a new wildlife management instrument: the deer funnel. By a network of fences, deer are made to go through a specially built funnel under a highway. The BLM developed this device in cooperation with the Nevada fish and game officials to avoid accidents often fatal to both deer and automobile riders.

The BLM further recognized the importance of wildlife resources on the public lands when it took steps at the close of the fiscal year to staff its Washington office with a wildlife technician to guide wildlife specialists in the field. Each State office was instructed to have a full-time wildlife specialist on its staff.

## MINERAL RESOURCES INVENTORIED

The public mineral resources of the United States are the source of many raw materials for industry. The Bureau of Land Management has the duty of insuring the availability of mineral resources to the mineral industries and of encouraging exploration and development of minerals in accordance with the principles of conservation and orderly development. Proper management of these nonrenewable resources requires informed classification of lands, adherence to a policy of conservation, and resolution of any conflicts in land development or use.

The Bureau of Land Management administers the mineral resources under the General Mining Laws, the Mineral Leasing Act of 1920, the Materials Disposal Act of 1947, and other leasing acts which pertain to acquired lands, special areas, and the Outer Continental Shelf.

A minerals study program announced in 1962 called for a comprehensive analysis of the existing and potential mineral resources of the public lands. The basic phase of this "Minerals Inventory" is a preliminary compilation of known geologic and economic data. Excellent progress was made on this compilation, and a continuing analysis to refine the data will be carried on. The total area being studied in the Minerals Inventory is over 480 million acres of public lands in the Western States, including Alaska.

The first phase of this inventory and evaluation of federally owned mineral resources has been completed by 7 of the 11 State offices. The remaining States average 75 percent completion. Detailed analyses are being made of mineral areas slated for intensive





Rockhounds find many treasures on public lands, and with passage of legislation in the fall of 1962, free use of the public lands for rockhounding has been assured while the commercial collection of petrified wood and other collector's materials is regulated.

management or development. There are two products of the initial analysis phase. Maps of individual master units show known or suspected areas of valuable minerals. Summaries of the geology and mineral development furnish supplementary technical information on the areas. These initial reports serve as a tool for land planning and classification and as a base for refining and developing meaningful resource data for the areas.

## **Mineral Leasing Active**

The administration of mineral leasing for public lands is particularly vital to the Nation's mineral fuel industries. While the greatest activity continues to be in the oil and gas field, other leasable minerals such as potash, sodium, and coal are of major importance in certain States and areas. In addition, disposition of minerals, other than the leasing act minerals, is accomplished by permits and leases for acquired lands.

The activity in simultaneous filings for oil and gas leases continued at a lively rate. The BLM constantly investigates possible abuses of this system. Proposed new regulations, which clearly define what constitutes collusive filings, will deter abuses.

The first leases for oil and gas exploration were issued for the North Kaibab National Forest area in northern Arizona. After much deliberation by the Departments of Agriculture and Interior, the area was opened and 127 leases issued, subject to rigid stipulations to safeguard the area's scenic and wildlife resources.

## **Mining Claims and Multiple Use Examined**

The Multiple Surface Use Act (Public Law 167, 84th Cong.) authorizes the Bureau of Land Management to determine whether the Government or the miner has the right to manage surface resources of unpatented mining claims on federally owned land. The Bureau has adjudicated such surface rights determinations at the request of the Forest Service for most of the national forest lands. A limited program has been carried out for BLM-administered lands. Additional surface rights determinations will be made as necessary for the proper administration of public land resources. Such determinations are being made to facilitate the Vale project in Oregon and to manage timber areas in Wyoming. Determinations have been completed for 6,705,838 acres of public domain lands.

A mining claim utilization survey was conducted for the 12 Western States, including Alaska. This survey was made to estimate the number of mining claims started, the number currently active, and the use pattern for both patented and unpatented claims. The survey reveals that approximately 6 million mining claims were started in the 90 years between 1872 and 1962 in these 12 States. About 160,000 such claims were active on BLM lands in fiscal 1963. The information from this survey is being analyzed in relation to long-term planning for the BLM minerals program. A review of the number of mineral patents over a 20-year period reveals a direct relation between the volume of patents issued and uranium



boom years, which were also periods of high metal periods. A trend toward greater acreage per patent indicates the growing importance of industrial minerals of high volume but low unit value.

For over a year, the Department of the Interior and the Federal Bureau of Investigation have examined questionable applications under the mining laws for over 14,000 acres of public lands near Phoenix, Ariz.

If approved, the mineral patent applications would have allowed the applicants to receive title to the land for \$2.50 per acre. Land in the burgeoning Phoenix area is worth up to \$200 an acre for subdivision or other purposes.

BLM mining engineers and Arizona State office officials first brought to the attention of Secretary of the Interior that "salting"



A BLM mining engineer makes a mineral examination of an adit near Reno, Nev. The Bureau leases public lands containing mineral resources.



of the mining claims was suspected in the area. "Salting" a claim consists of adding gold to low-yield ore to increase the assayer's estimate of the ore's value.

On April 16, Secretary Udall ordered a "freeze" on pending and future applications. Shortly thereafter, the patent applications for 14,591 acres were voluntarily withdrawn.

It is the responsibility of the Bureau of Land Management to determine, when necessary, the validity of mining claims on lands administered by other Government agencies. During the year, such investigations were carried out of the Department of the Army, the Department of the Navy, the Bureau of Reclamation, the Bureau of Indian Affairs, and the Bureau of Public Roads.

In Arizona, for example, a project was being completed in which validity determinations for approximately 18,000 mining claims on the 2 $\frac{3}{4}$  million acre Papago Indian Reservation was undertaken. This work has resolved title uncertainties to mineral rights and has enabled the Papago Tribe to embark on a prospecting permit and leasing program for their lands, which lie in one of the most active areas of the Nation for mining.

Several laws directed toward specific mining claims situations were enacted. Two acts (Public Laws 87-747 and 754) withdrew certain areas in Arizona from mining claim location to facilitate high-value surface development. In these areas the surface had previously been patented, but the minerals were reserved by the Government.

The Bureau of Land Management continued its interest in the modernization of mining laws. The need for such modernization is now generally accepted. In fiscal 1963 a study draft of a general revision was circulated to the mining industry for review and comment.

### **Construction Materials Developed**

The public lands are the source of much of the materials essential to the construction and roadbuilding industries in the Western States. Fill material, sand, concrete aggregate, lightweight aggregates for building blocks, and clay for bricks are becoming increasingly important. Not generally subject to the mining or leasing laws, such materials are made available by contract sale to companies and individuals and by free-use permits to communities and State agencies. Community pits are being established to make materials available in small lots where needed. New legislation

now makes it possible to negotiate sales of materials exceeding \$1,000 in cases where public interest dictates rapid consummation of the transactions. Thus, the delay caused by advertising and competitive sales is eliminated.

### **New Leasing Office Opened**

The first leasing office for the Outer Continental Shelf on the west coast was opened in Los Angeles during the year. The initial offering of oil and gas leases by that office in May resulted in the leasing of 57 tracts totaling over 300,000 acres for cash bonuses of \$12,807,587 and \$938,838 first year's rental. An earlier offering of nine leases in proven offshore areas by the New Orleans office yielded cash bonuses of \$43,887,385, plus \$161,780 first year's rental.

Interest in offshore mineral leasing for oil and gas continued high. Technological progress has kept pace with the level of in-



Offshore oil and gas explorations moved forward in 1963 with the sale of several leases off California—the first west coast sale of Outer Continental Shelf leases by the Federal Government. Meanwhile, OCS explorations and drilling in the Gulf of Mexico continues at a high pace.

terest. Rigs capable of drilling in greater water depths and new underwater completion and servicing techniques have been developed. Techniques for extracting other minerals offshore are still in a relatively early stage, but interest is active.

Leasing maps of the entire Continental Shelf off Oregon and Washington were published during the year. These maps extend seaward from the outer limit of the State's jurisdiction to a water depth of 500 fathoms (3,000 feet). Previously issued Outer Continental Shelf maps have been extended only to a water depth of 100 fathoms. Extension to include the greater depths was made at the request of the oil industry which claims that new drilling and production techniques make oil operations feasible at these greater depths.

Areas of Outer Continental Shelf covered by the newly published maps are 5 million acres off Oregon and 3 million acres off Washington.

### Mineral Statistics Listed

The following reflect the scope and importance of mineral activities during fiscal 1963 :

Oil and gas filings and lease applications.....	243, 521
Acreage under lease (including OCS).....	79, 391, 424
Other mineral lease applications.....	780
Acreage under lease (including OCS).....	730, 630
Total revenue from mineral leasing on the public lands.....	114, 270, 585
Total revenue from mineral leasing (including acquired lands and OCS).....	485, 377, 262
Payments to the States from mineral leasing receipts.....	45, 408, 020
Payments to the Reclamation Fund from mineral leasing receipts..	51, 666, 238
Mineral patent applications received.....	90
Mineral patents issued.....	92
Mineral classification and investigation cases processed.....	8, 960
Acreage involved in Public Law 167 determinations (combined Forest Service and Bureau of Land Management).....	26, 694, 172

## RESOURCES PROTECTED

An essential part of the management of lands and resources under Bureau of Land Management jurisdiction is to protect them from the destructive forces of nature and the carelessness and willfulness of man. This protection is provided through prevention and suppression of fires, control of forest insects and diseases, prevention and control of unauthorized use, and protection of visitors on the public lands.





Modern techniques and equipment have increased fire-control and aided BLM protection efforts on forested public lands. Here BLM smoke-jumpers descend on a blaze while it is still small.

### **Fire Control Improves**

Modern techniques and equipment have increased fire-control accomplishments in recent years. However, fire remains one of the principal enemies of our forests, rangelands, and watersheds. During calendar year 1962, the number of fires and the area burned was somewhat less than the average for the past 5 years. A total of 1,083 fires burned 164,111 acres in 1962, compared to the 5-year average of 1,370 fires which burned 444,099 acres annually. The fire-control objective was to train, organize, and develop a force to hold fire losses to a minimum.

## **Fire Conditions Near Normal**

Weather and burning conditions were nearly normal for the season. The fire season occurred somewhat later than usual because substantial winter snows and spring rains kept fuels damp. Although this precipitation contributed to the growth of light flammable fuels which could have caused an extreme fire hazard, cool weather through most of the fire season held the moisture content of vegetation high enough to counteract the hazard caused by the abundance of fuels. A near-normal season, combined with aggressive and improved fire-control methods, helped keep resource losses well below the 5-year average.

## **Preparedness and Prevention Emphasized**

In preparation for the fire season, all equipment and tools were readied and fire guards were assigned to specific areas.

During the past year, training for fire supervisory personnel increased. All districts conducted training sessions for Bureau of Land Management personnel, and in many cases sent trainees to cooperative schools conducted by the Forest Service, State fire or forestry departments, and other agencies. The first National Interbureau Fire Behavior Training School conducted by the Department of the Interior was held in January for fire supervisors from several States.

The Bureau also cooperated with other fire-protection agencies in organizing and training specialized firefighting crews. The Southwest Forest Fire Fighters, in Arizona and New Mexico, are Indians and Mexican nationals. They have been available for several years and have proved to be an asset in fire-control work. Training for similar specialized crews started in several other States, including Alaska. Emphasis was on training fire supervisors in organizing and managing men and equipment.

## **Suppression Costs \$1.5 Million**

In 1962, areas burned over included 164,111 acres of Federal land and 186,694 acres of State and private lands protected by the Bureau of Land Management. Damage to Federal lands was nearly \$1½ million, and to State and private lands nearly \$1½ million. Nearly 28,000 man-days were spent fighting fires. Suppression cost was almost \$1.5 million. Lightning caused 45 percent of the fires, while in 1961 it had been responsible for 62 percent.

### Alertness Increased

Many advances were made in 1962 and early 1963 in improving detection facilities and constructing new lookouts. These new and improved detection facilities, in conjunction with aerial surveillance, alleviated the danger of fires spreading over a large acreage before detection. Many more facilities and a more complete network of truck trails and roads into large blocks of public land are needed to reach an optimum standard of fire control.



Teaming up to battle a range fire in Idaho, two BLM employees and a local rancher work to bring the fire under control.



### Contract Fire Protection

Private companies, State agencies, and even Federal agencies (such as the Forest Service) sometimes contract to protect BLM lands on a per-acre basis. Lands under such fire protection in Idaho, Montana, New Mexico, Oregon, Washington, and Minnesota experienced a season of near-normal climatic conditions. The average number of fires per year for the past 5 years was 248. There were 261 fires in 1962. During the 1962 season, 67 percent of all fires on lands protected by contract were man caused, while in 1961 the figure was 25 percent. This comparison emphasizes the need for continued expansion of the fire-protection program.

### Air Operation

The use of the Bureau's aircraft in fire-control activity is increasing each year. Nearly 300,000 gallons of fire-retarding slurry were dropped on fires suppressed by the Bureau, with positive results reported on 91 percent of all aerial drops. The slurry was bentonite and sodium-calcium borate.

Helicopters were used for accurate droppings of small amounts of fire-retardant slurry, for transportation of men and tools, for



Dropping half of its 1,000-gallon load of fire-retarding borate on a forest fire near Bettles, Alaska, this converted B-25 bomber operates under contract with the Bureau of Land Management to help control forest fires in the far north.

fast initial action of fires in remote areas, and for shuttling men and equipment on the fire line of large fires.

### Unauthorized Use Controlled

Unauthorized use is a chronic problem in public land management. The BLM has a two-part program to control unauthorized use. The public is informed of the facts and dangers of trespass and a vigorous program of enforcement and control is maintained.

A backlog of 1,375 known trespass cases of various types existed at the beginning of fiscal 1963. During the year, 1,358 new cases developed, making a workload of 2,733 cases. Of this total, 1,982 cases were closed, leaving a backlog of only 751 cases. These trespass cases range from the unintentional to the criminal, and are widespread in all the public land States.

### Disease Control Pushed

The most serious tree disease affecting timber on land administered by the Bureau of Land Management is white pine blister rust, common to all five-needle pines. Eradication of the alternate host plant remains the principal measure for control of the disease, which is most widespread in northern Idaho, northern California, and western Oregon. The alternate hosts for white pine blister rust are several species of a shrub of the genus *Ribes*. Eradication of *Ribes* was conducted on forest lands in Oregon, where sugar pine is the major species of commercial timber. During the 1962 field season, 83,000 *Ribes* plants were destroyed on approximately 560 acres.

Two additional possibilities for controlling white pine blister rust appear promising. One is the treatment of infected sapling and pole-size trees with an antibiotic. During the 1962 field season, 20,708 trees were treated on 142 acres. Antibiotic treatments are still in the experimental stage. The other possibility is the breeding of rust-resistant seedlings. This involves locating rust-resistant trees, controlling pollination by placing bags over the cones, and obtaining seeds that will produce rust-resistant stock. The Bureau of Land Management installed bags on 94 sugar pine and 26 western white pine. Eventually, either the antibiotic treatment or the rust-resistant trees will eliminate the control system of grubbing or chemically treating *Ribes*.

### **Insects Create Problem**

Insect attacks are difficult to detect before they have reached epidemic proportions, thus making control difficult. Annual timber damage by insects is many times greater than by fire.

The BLM carried out bark beetle control projects in Wyoming, Colorado, and California. Approximately 22,000 trees on more than 6,000 acres were treated. A control project was started in Montana for a spruce budworm infestation. Adequate control of these infestations will require several years.

### **More Visitor Protection Required**

Increasing public use of the public lands for recreation places greater requirements on the visitor protection program.

The Bureau's visitor-protection objective is to identify, isolate, and correct hazards that threaten the general welfare and safety of citizens enjoying the public lands. Visitors should be guided to



Wayside shelters and sanitation facilities are provided on recreation sites as part of BLM's visitor protection program.



areas of natural interest and warned of hazards. Wayside shelters and sanitation facilities should be provided. A basic search-and-rescue organization should be developed for emergencies.

## ENGINEERING GAINS LISTED

Surveying the public lands is the oldest activity of the Department of the Interior. The U.S. rectangular system of public land surveys was the first technically designed and nationally coordinated cadastral survey system in modern history. It is essential to all public land transactions.

### **Many Areas Still Unsurveyed**

Outside Alaska some 112 million acres of public land remain unsurveyed. Much is under permanent withdrawals and until recently little or no demand for surveys had been anticipated. However, there are indications that some unsurveyed land, particularly in the national forests, has an exchange value which can be used to consolidate and improve the management of Federal lands. Because only surveyed public land can be used for exchange purposes, requests for original surveys are increasing.

For practical purposes the survey of common school sections outside reservations is complete with the exception of school sections in California. School sections in reservations cannot be acquired by the State upon survey. However, the States normally can select "lieu" public lands to compensate for the loss of school lands in reservations. Because of the large quantity of unselected lieu lands remaining to the credit of Utah, a demand for surveys in that State is effected so unsurveyed lands can be made available for selection.

### **Resurveys Needed**

Resurveys are needed principally because much of the evidence of the original surveys, made 50 to 150 years ago, has either disappeared or is becoming difficult to identify. In the extensive farming areas, the first settlers quickly erected fences or constructed roads along their common property lines. These lines have been perpetuated. But in the more remote areas, many boundaries of lands taken up for stockraising or other nonintensive



Range fencing in eastern Nevada, supervised by the Bureau of Land Management with employees hired under accelerated public works programs, aids in land management.

uses have become obliterated. This condition has resulted because of the ravages of time, impermanent original monuments, and such forces as erosion, animals, and man.

Since in many of these areas private land is intermingled with public land, it is becoming increasingly important for management and administrative operations to identify the boundaries of the public lands. The private landowner also benefits indirectly from these resurveys, since the boundaries of his land common with the public land are resurveyed and marked at the same time. The generally increasing value of real estate also contributes to the demand for resurveys.

A large number of special-purpose resurveys were made during the year in the BLM's valuable timberlands to gather information for timber sales and to detect timber trespasses for civil or criminal prosecution. Resurveys were also made to locate areas suitable for multiple use under mining laws and the land laws.

Well underway in fiscal 1963 were cooperative projects with the Forest Service to remonument public land survey corners of the boundaries of the western national forests. Under a cooperative agreement, Forest Service personnel search for original survey corner evidence, and BLM cadastral engineers examine this evidence and accept or reject it as a genuine survey marker. If accepted, the corner evidence is perpetuated by a BLM standard brass-capped iron post. Such marker reestablishment becomes part of the official survey records.

### **Alaska Surveys Increase**

Some 360 million acres of public lands are unsurveyed in Alaska. Because of remoteness, climate, and physical characteristics of terrain, much of this area need never be surveyed.

Surveying in Alaska has been concentrated on those lands selected by the State under the terms of its entry into the Union. The new State was granted over 103 million acres, with the right to make selections over a 25-year period.

To meet these State selection needs, the Bureau of Land Management increased its surveying organization in Alaska. Field-work was accelerated to meet a yearly survey requirement goal of 4 million acres—the average needed to provide transfer of the 103 million acres to the State in the stipulated period.

Under the Statehood Act, the Bureau has surveyed only exterior boundaries of approved selections at intervals averaging 2 miles.

In the expanded program in Alaska, new survey techniques have been developed and used. These involve electronic distance-measuring devices, photogrammetric procedures, and improved instruments.

### **Trails and Roads Program Starts**

Resource management for the public lands requires that access be provided to remote areas. A Public Lands Development Road and Trails Program has been started and a transportation plan for each State has been developed. This is the initial step in developing a road system in the Bureau to facilitate accelerated management programs.

Continued efforts have been made toward the standardization of buildings and other structures incorporated in the Bureau construction program.

The program to provide usable maps for resource management techniques continued satisfactorily.





Cattle water at a tank near Idaho Falls, Idaho, on public lands administered by BLM.

A handbook was published to standardize signs and further their use to help inform the public of the Bureau's work. A handbook on development of roads and trails on the public lands is planned.

### **Communications Expand**

Radiocommunication services expanded throughout the year. A typical accomplishment was the extension of such communications to an area of 300,000 acres of range and timber lands in Montana. In practically every State, new areas of public lands were "opened" to communications essential to fire prevention and control. The Bureau improved this important service by developing its own aircraft radio transceiver.

Not all progress has been restricted to systems engineering. Research—some performed jointly with other agencies—advanced in the presuppression and fire-detection field. A spherics (electrical storm) detection and tracking system, aerial infrared fire detection, automatic weather observation and reporting service, and several thermoelectric generating devices were under study. The spherics tracking system is scheduled to be installed in Alaska in 1965.



As part of the Department of the Interior's far-reaching program of conservation education, a group of school teachers attending a conference in Colorado were taken on a tour of some public lands in the Gunnison River Valley.

## PERSONNEL TRAINING ARRANGED

Major emphasis in Bureau of Land Management personnel operations was on training and developing top supervisory personnel in leadership and personnel management. Most BLM State Directors attended the Summer Institute in Executive Development for Federal Administrators at the University of Chicago. There was a substantial increase in participation by employees at the Montana State University School for Administrative Leadership.



Thirty-four range conservationists took a refresher course at Utah State University.

For the second successive year, two employees attended the University of Michigan, taking courses in Natural Resource Development and Policy Analysis for which they received masters' degrees. Approximately three times as many employees were trained through interagency and inter-Bureau courses and through private agencies outside the Government. They took courses in real estate appraisal, fire behavior, supervisory development, trespass, and many other subjects. One week of orientation on Bureau functions was given 260 new professional employees.

In accordance with the President's Executive Order 10988, Employee-Management Cooperation in the Federal Service, a plan was developed for fully recognizing rights of employees and their organizations.

The Employee Handbook was revised, a comprehensive recruiting pamphlet on Careers in the Bureau of Land Management was published, and a pamphlet on summer employment was issued.

In the field of safety, frequency rate of disabling injuries declined 30 percent. Similarly, there was a reduction in the frequency of preventable motor vehicle accidents. The direct cost of all accidents per employee dropped from \$45.13 in 1959 to \$16.22 in 1962. Many short training sessions were held in fiscal 1963, and a Safety Handbook was prepared to promote accident prevention.

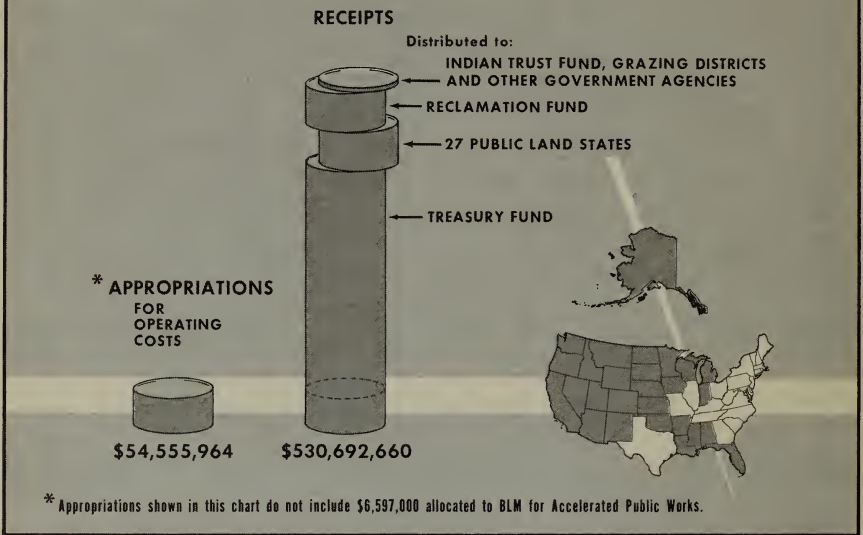
Emphasis on economic reforms, including land reform, in the United States foreign programs created increased demands for technical assistance from the Bureau of Land Management. Many of the Bureau's methods in the survey, distribution, and management of land in developing areas can be applied directly, or with modifications, to other countries.

Opportunities were provided for over 60 nationals of 15 countries to investigate the public land policies and programs which have played a major role in the security and development of the United States. Nine former Bureau cadastral survey, land, and range management officials were on assignment with the Agency for International Development.

Technical consultation in all areas of the BLM's operations was provided nationals of nearly all free world countries.



## BLM Finances for Fiscal Year 1963



### RECEIPTS TOTAL \$530 MILLION

Appropriations during fiscal 1963 for operations of the Bureau of Land Management were: Management of lands and resources, \$44,410,200; construction, \$1,000,000; O & C grant lands, \$7,703,025; range improvements, \$696,525; and Public Lands Administration Act, \$746,214. In addition, \$6,537,000 was allocated the Bureau under the Accelerated Public Works program.

During the year the Bureau received from the sale and management of public lands and resources a total of \$530,692,660. These came principally from mineral leases and permits; timber sales; sales of public lands and materials; grazing leases, licenses, and permits; fees and commissions; and leasing of rights-of-way.

Receipts of the Bureau of Land Management for fiscal year 1963 were distributed as follows: \$209,355 for Indian trust funds; \$1,200,000 returned to the grazing districts for range improvements; \$4,099,437 transferred to other Government agencies; \$55,521,101 deposited to the reclamation fund; \$61,051,134 to 27

public land States (of which \$15,031,270 went to the 18 western Oregon timberland counties) ; and \$408,611,633 to the general fund of the U.S. Treasury.

Receipts of BLM and its predecessor agencies total \$3,127,222,-993. Since BLM was established in 1946, receipts have totaled \$2,390,577,840.

Spiny cholla cactus is one of the picturesque plants found on arid BLM lands of the southwest.









# National Park Service

Conrad L. Wirth, Director

On August 22, 1962, the one billionth visit to the national parks was recorded since the first visit in 1904. At the current pace, the second billionth will be reached in 11 years.

The National Park System affords Americans opportunities to enjoy great scenic and inspirational areas of their country in a natural, unspoiled condition and the rare quality of the primitive wilderness that was America before it was touched by civilization. They may better comprehend the physical and spiritual links that bind America's past to its present and future and they may find release from the care and tension of the workaday world.

The supply of outdoor recreational facilities and opportunities is proving inadequate in both number and distribution to meet the increasing demand. The Nation's burgeoning and mobile population will be hard put to find extensive areas of open space. But it will be the Federal, State, and local parks that will bear the burden: Several thousand recreation seekers cannot be satisfied in a park designed to accommodate several hundred.

Secretary of the Interior Udall cautioned that "the least we can do . . . before our land patterns become inalterably fixed . . . is to preserve the few remaining extensive areas of natural open space . . . now, while there's still time."

The Service is providing more and better opportunities for Americans to visit, understand, and fully enjoy their great natural, historic, and scientific heritage. While holding to the traditional concept of preserving wilderness values as completely as possible, the National Park Service, during fiscal 1963, made great strides

in modernizing its services to the public. These improvements are evidenced in better access roads, more trails for hiking and horseback riding, more campgrounds, more and better visitor accommodations, and more modern and imaginative interpretive facilities.

The National Park Service in fiscal 1963—

. . . Welcomed a new high of 91,496,000 visitors to the National Park System and recorded 6,106,000 camp-use days—a startling 21-percent gain over fiscal 1962.

. . . Saw three areas established as units of the park system: Petrified Forest National Park, Ariz.; Fort Clatsop National Memorial, Oreg.; and Bents Old Fort National Historic Site, Colo. The Service also welcomed the authorization of six areas including national seashores at Point Reyes in California and Padre Island, Tex.; three national historic sites—Theodore Roosevelt Birthplace and Sagamore Hill, both in



Bent's Old Fort National Historic Site, near La Junta, Colo., one of the three new areas established during fiscal year 1963, preserves the remains of one of the West's most significant fur-trading establishments.

New York, Fort Saint Marks, Fla., and the Frederick Douglass Home, a unit of the National Capital Parks.

. . . Cooperated in important special studies of the North Cascades region in Washington State, the Coast Redwoods region in California, and a comprehensive park and recreation area study of Hawaii. In addition, the Service is also cooperating in a special Wild Rivers Study being conducted jointly by the Departments of Agriculture and Interior.

. . . Saw the long-range requirements program, which began in 1956 with Mission 66, enter a new phase with the assignment of a task force to chart the future course of both the Service and the National Park System.

. . . Received from Congress \$13,622,000 to purchase privately owned lands urgently required for recreation, conservation, development, and construction purposes in 24 long-established areas and 7 newly authorized ones.

. . . Accomplished a construction effort in which more than 90 percent of all programmed projects either had been completed or were being built.



The new Visitor Center, Dinosaur National Monument, Utah-Colorado, one of the nine new visitor centers opened during the fiscal year, is an example of creative architecture making its appearance in the National Park Service.



. . . Highlighted the release of the Secretary's Special Wildlife Advisory Board Report on March 4, 1963, whose wildlife management recommendations were subsequently accepted and implemented in the program.

. . . Opened or installed 9 new visitor centers and installed more than 150 exhibits.

. . . Moved the Horace M. Albright Training Center to newly constructed facilities at Grand Canyon National Park.

. . . Raised to 404 the total number of sites eligible for status in the Registry of National Historic Landmarks.

. . . Increased attention to the equal opportunity program and to the employment of women in types of positions for which they are particularly suited, such as park guides and park interpreters.

. . . Issued an unprecedented number of factual reports and publications to the general public.

. . . Processed, through its Division of International Cooperation, more than 2,000 letters of inquiry from foreign countries.

. . . Recorded more than 7 million visits to units administered by the National Capital Parks.

## PARK ATTENDANCE AT NEW HIGH

National Parks registered a total of 91,496,000 visits. This record figure was an increase of 11.2 percent over fiscal 1962—and more than doubled the volume of park visits of 11 years ago, and tripled the statistics of 15 years back.

National Park Service statisticians forecast that the existing developed parks will experience 100 million visits during the Service's Silver Anniversary year, 1966. As new recreation areas and seashores are developed, a 1966 figure substantially greater than 100 million may be confidently expected.

The camp-use days—6,106,000 during fiscal 1963—were 21 percent above those recorded during the previous period. That camping is no longer the nearly exclusive preserve of the family under a canvas tent on the ground emerged from a special survey made during 1962. It showed that of every 100 camping parties, slightly more than 50 use this equipment. Nineteen camped in house-trailers, seven in tents erected on trailers, six in camper-coaches, six in station wagons or specially equipped buses, three in tiny sleeping trailers, and eight utilized more unusual equipment—or none at all.



Becoming more popular is the use of house trailers as a means of camping. Nearly all Park System areas provide for the camping families using house trailers.

Park concessioners and private in-holders operating commercial accommodations recorded 2,944,000 overnight stays, or 8.7 percent above fiscal 1962—the largest relative increase in more than a decade.

### **New Parks and National Seashores Authorized or Established**

Three new areas were established and six areas were authorized for addition to the National Park System during the year.

Petrified Forest National Park, Ariz., became the Nation's 31st national park December 9, 1962, when Secretary Udall issued an





One of the two new national seashores authorized by Congress during fiscal year 1963, Point Reyes National Seashore, Calif., will provide outdoor recreation for one of the most heavily populated and fastest growing regions in the Nation.

order redesignating the Petrified Forest National Monument as a national park. A 1958 act had provided that this be done as soon as the non-Federal holdings, totaling 8,174 acres, were acquired by the Federal Government.

Fort Clatsop National Memorial, Oreg., commemorating the Lewis and Clark Expedition to the Pacific coast, was established October 18, 1962.

The site of a historic fur-trading enterprise located on the mountain route of the Santa Fe Trail in Colorado—Bents Old Fort—was established on March 15, 1963, as Bents Old Fort National Historic Site.

Two national seashores were authorized by Congress in recognizing the need to preserve additional portions of our rapidly vanishing seashore. They were Point Reyes National Seashore, Calif.,



authorized September 13, 1962, and Padre Island National Seashore, Tex., authorized September 28, 1962.

Four historic sites were also authorized for inclusion in the National Park System. They are the Theodore Roosevelt Birthplace National Historic Site and Sagamore Hill National Historic Site, both authorized July 25, 1962, to preserve in Federal ownership these historically significant properties in New York State, which were associated with the life of President Theodore Roosevelt; the Frederick Douglass Home, District of Columbia, authorized September 5, 1962, as a unit of the National Capital Parks, to preserve the home of this noted Negro leader; and Fort Saint Marks National Historic Site, Fla., authorized October 10, 1962, to protect the site where several successive forts were built, starting about 1679.

## CONSERVATION, INTERPRETATION, AND USE GAIN

Park and visitor protection continued to receive the highest priorities in all areas of the National Park System. Conservation of the unique, natural, and primitive values, together with provision for public recreational enjoyment of the esthetic and historic values by more than 90 million visitors, were enhanced through intensive planning, organization, and development.

### **Wildlife Management**

Release of the Secretary's Special Wildlife Advisory Board Report, the subsequent acceptance of its recommendations, and implementation of activities highlighted the wildlife management program in the national parks. A review of current and future national park wildlife programs was prepared so that a stepped-up program of cooperative understanding, study, and management of migratory animals might be resolved through increased contacts with other conservation agencies.

There has been a significant need to preserve park values through increased wildlife management. These included the establishment of wildlife control programs which, in fiscal 1963, involved relocation of 2,079 large mammals and the necessary reduction of 4,992 animals.

Cooperative fisheries studies continued and fish planting programs were carried out in 13 areas.

### **Training Increases**

The Horace M. Albright Training Center (formerly the National Park Service Training Center) was relocated in new facilities at Grand Canyon National Park, Ariz. Nearly 300 members of the uniformed staff completed the concentrated 3-month orientation and indoctrination training program.

### **Forest, Soil, and Water Problems Attacked**

During fiscal 1963, a record 609 fires burned 79,252 acres inside park areas and 115,088 acres in protection zones outside

The Horace M. Albright Training Center was relocated in new facilities at Grand Canyon National Park, Ariz.



park boundaries. Approximately 50 percent of these fires were man caused. The Service spent \$261,029 in fire-suppression activities. To counter additional fire damage, the Service enjoyed the continuous and effective cooperation of other land-management agencies. An interdepartmental fire behavior school was held in California.

Control continued against epidemic outbreaks of forest pests in developed and concentrated visitor-use areas. The program included protection of outstanding or rare plant species and plant communities.

Soil and moisture conservation programs, undertaken to restore depleted or previously misused land, vegetation, and water resources and to restore natural conditions, were conducted in 20 parks. A conservation survey on 225,000 acres of depleted wildlife range in Yellowstone National Park started. Cooperative activities with local soil and water conservation districts and other agencies increased.

### **New Visitor Centers Opened**

Nine new visitor centers were opened: Antietam National Battlefield Site, Md.; Pea Ridge National Military Park, Ark.; Chancellorsville Battlefield, Va.; Lehman Caves National Monument, Nev.; Fort Clatsop National Memorial, Oreg.; Petrified Forest National Park, Ariz.; Christiansted National Historic Site, Virgin Islands; Vanderbilt Mansion National Historic Site, N.Y.; and Big Bend National Park, Tex.

### **Exhibit Installations Added**

Park visitors find exhibits—both in the visitor centers and along the roads and trails—help them understand and enjoy the parks. Durable, self-operating, accurate, and attractive exhibits afford an economical and effective aid to interpretation. During the year the Service installed over 150 exhibits in the 9 new visitor centers. It added, updated, or rehabilitated nearly 100 exhibits in 15 established visitor centers. At year's end, exhibits were in production for six more. The Service experimented successfully with new methods of improving the design and durability of outdoor exhibits. In the process, over 50 new ones were installed in 8 parks.

### **Interpretation Activities Gain Specimens**

The heart of good exhibits are the specimens they display. The Service's important collections of historic and scientific objects also





Park visitors find exhibits in the visitor centers and along the roads and trails help them to understand better and enjoy the parks. This unique outdoor exhibit at Badlands National Monument, S. Dak., is a glass-enclosed "fossils-in-place" display.

pay dividends in the preservation and administration of the parks in return for the expert care they require.

The Service continued to refine its collections by adding significant and necessary new material while disposing of specimens not useful to the parks. The outstanding accession was Benjamin Franklin's desk, purchased at auction for Independence National Historical Park with the aid of the Eastern National Park and Monument Association.

The Service received numerous gifts of specimens for the American Museum of Immigration, the Museum of Westward Expansion, and for other park museums across the country.

### **Training Programs Developed**

Improvement of opportunities for visitors to understand and enjoy their national parks increased. Sixteen new naturalist positions were filled during the year. Two new training programs for

improving the quality and effectiveness of performance in interpretive programs were started. One was the opening of the Stephen T. Mather Interpretive Training and Research Center at Harpers Ferry, W. Va.; the other was use of demonstrations and training sessions at campfire programs. Results will be evaluated as a possible continuing training method. A committee was established to develop and evaluate new ideas and devices for interpretation.

### **Concession Installations Improved**

New concession contracts were approved for Yosemite, Blue Ridge Parkway, and National Capital Region, in addition to Independence and Castillo de San Marcos. A major feature of the new concession contract at Yosemite was a \$2 million construction commitment for new and improved visitor accommodations. Offers were invited for concessions at Flaming Gorge, Glen Canyon, Great Smoky Mountains, and Cape Hatteras.

Important concessioner investments were made at Grand Canyon (South Rim), \$388,347; Lake Mead, \$134,264; Petrified Forest, \$116,038; Sequoia and Kings Canyon, \$388,403; Shenandoah, \$196,854; Grand Teton, \$334,581; Independence, \$207,269; Castillo de San Marcos, \$245,699; and Yosemite, \$622,412. Additional projects by concessioners were underway or were planned at Blue Ridge, Big Bend, Mammoth Cave, Olympic, and Glen Canyon.

### **Pilot Project Used**

An integrated training program for first- and second-line supervisors was developed and presented. Also, as a pilot project, students were hired from a 2-year technical school to evaluate education in fields of horticulture, construction, and engineering in terms of our needs and efficient manpower utilization. The Service believes that such graduates offer great potential to improve personnel.

### **Sanitation Poses Problem**

As the number of visits increases throughout the National Park System, the problems of littering and sanitation removal and disposal costs increase. During the year, the Park Service, along with the Forest Service, published a litterbug poster for use in all national parks and national forests. This seeks to develop a cooperative attitude toward keeping such areas clean. A study was





The National Geographic Society donated \$50,000 for Wetherill Mesa research at Mesa Verde National Park, Colo. This is the Cliff Palace at Wetherill Mesa.

started on disposal methods and practices to be used in national parks.

### **Historical Interpretation Advances**

The Sound and Light programs, started in fiscal 1962 at Independence National Historical Park and Castillo de San Marcos National Monument, were in full operation and awaited complete evaluation of public acceptance. Proposals to extend such service to other areas were held in abeyance pending evaluation.

### **National Survey of Historic Sites and Buildings Active**

Studies were completed in 6 basic themes of American history while 93 sites and structures were classified as having exceptional value and were approved as eligible for the Registry of National Historic Landmarks. They brought the total to 404.



## **Archeological Research Conducted**

Archeological research was carried out in 22 Service areas. Major projects were started at Grand Portage, Mound City, and Mount McKinley. Other projects began or were continued at Hopewell Village, Chalmette, and Mesa Verde. The National Geographic Society donated another \$50,000 for Wetherill Mesa research at Mesa Verde.

## **Salvage Archeology Widely Supported**

Extensive salvage archeology in reservoir areas continued through financial cooperation with other Federal agencies and State and local institutions. The Smithsonian Institution, with funds from the Service, operated 16 field parties in the Missouri River Basin. Under cooperative agreements, 41 other reservoir areas were investigated by 27 different institutions. Valuable scientific information is constantly being gathered by projects in the National Park Service areas and salvage areas. This is proved by the receipt of 91 research reports on such projects.

## **DESIGN AND CONSTRUCTION SET RECORD**

The construction program exceeded that of any previous year.

The Service has plans for 2,343 construction projects totaling more than \$152 million. These include recreational facilities in the Upper Colorado River Basin Reservoir areas. An additional \$2 million was programed for exhibits, interpretive devices, rehabilitation projects, and advanced planning. The Service managed 332 projects totaling \$7,936,000 under the Public Works Acceleration Act in 42 counties or election districts in 21 States, Puerto Rico, and the Virgin Islands. They were in 35 parks, monuments, or recreation areas administered by the National Park Service.

The close of fiscal 1963 marked the end of a most successful construction effort of the Office of Design and Construction. At that time, more than 90 percent of all programed projects either had been completed or were under construction. Those projects programed, but not underway at that time, were delayed because of unforeseen exigencies such as land acquisition, archeological research, and master plan preparation and approval.

Planning was completed for projects programed for construction during fiscal 1964. Emphasis was on providing more visitor facilities in established and newly acquired areas. Some of the more sig-

nificant projects will provide new or additional facilities to visitor developments in Blue Ridge Parkway, Dinosaur, Wind Cave, Grand Teton, Yellowstone, Big Bend, Saguaro, Zion, Death Valley, Lava Beds, and Sequoia-Kings Canyon; initial development of recently established areas as Fort Davis, Whiskeytown, and Cape Cod National Seashore; and complete programmed development in a single year of such areas as Fort Raleigh, Gila Cliff Dwellings, Glacier Bay, Sitka, and Hamilton Grange. Continuation of long-range construction projects, such as archeological surveys, excavation, and ruins stabilization in Mesa Verde and dune and beach stabilization at Cape Hatteras National Seashore, are also contemplated.

### **Architectural Appeal Stressed**

Completion of the Petrified Forest Community by the internationally known architects, Neutra and Alexander, is an example of outstanding environmental architecture. Faithful adherence to authenticity characterizes the continuing and most satisfactory restoration of buildings in Independence Square. The substantial contributions of individuals, universities, and municipalities in money, facilities, and drawings has increased the accomplishments of the Historic American Building Survey and the resulting archival material.

The prototype Wisconsin Catalog of historic buildings, designed for visual understanding and of broad interest to both the scholar and the lay public, approached its final stage. Interest by States and universities could result in a complete 50-State series.

### **Division of Construction Created**

The Division of Construction, responsible for construction policies and contract administration, was created late in the year and is expected to play an important role in the National Park Service.

### **Engineering**

The Division of Engineering supervised more than 1,600 projects, totaling \$41,730,300, in 168 areas in 40 States, the Virgin Islands, Puerto Rico, and the District of Columbia.

Of particular significance was participation with the Federal Aviation Agency in constructing public airports in the vicinity of Yellowstone National Park and Grand Canyon National Park (South Rim). Both airports will become operable during 1964 and will permit scheduled airline service to the parks. They also will aid in administration and protection of the areas. A survey

was being conducted to determine Service requirements for similar facilities in or near other areas it administers.

Development of recreation facilities at reservoirs in the Upper Colorado River Basin continued. Visitor facilities, such as campgrounds, picnic grounds, marinas, and boat-launching ramps and utilities systems, are included in the present construction program of 45 projects totaling more than \$1,980,181 at Crawford, Flaming Gorge, Glen Canyon, Paonia, Steinaker, and Navajo Reservoir Recreation Areas.

Provision of visitor facilities, including construction of campgrounds and picnic areas, was stressed. Underway were 376 projects, totaling more than \$12 million in 69 areas in 31 States. They will provide more than 9,000 new campground sites, approximately 2,400 picnic area sites, and the rehabilitation of 945 campground sites. Included in this total were 96 roads and trails projects, 108 utilities projects, and 27 miscellaneous projects to serve these visitor facilities. In addition to roads and trails projects to provide access to campgrounds and picnic areas, 440 roads and

Visitor facilities, including boat-launching ramps and marinas, are part of the construction program of 45 projects. Water skiing is a popular water sport on Lake Powell now filling above Glen Canyon Dam in the desert country of Utah and northern Arizona.





trails projects, totaling more than \$13,104,243, were scheduled for construction in 108 national parks, national monuments, and national recreation areas in 35 States. Storm damage repairs to dunes and beaches in Cape Hatteras National Seashore, and repairs to flood-damaged trails in Sequoia-Kings Canyon were also made.

The Service scheduled 509 projects totaling more than \$8,225,056 for miscellaneous construction items in 168 parks, monuments, and recreation areas in 40 States.

More than 300 utilities construction projects totaling \$8,527,873 in 114 national park areas, were underway or being readied.

Conversion of National Park Service radio systems to narrow band frequencies was completed or was underway at 15 parks, parkways, monuments, and the National Capital Region. Installation of new radio systems was completed or started at nine parks and monuments. Commercial electric powerlines were extended to supply power to the following: Colorado, Jewel Cave, Theodore Roosevelt, Capulin Mountain, Great Sand Dunes, Hovenweep, Death Valley, Mount Rainier, and Olympic. Construction of a commercial powerline into Death Valley National Monument culminated many years of negotiations.

### **Landscape Architecture Reaches Many Areas**

A \$16 million contract authorization for landscaping was distributed as follows: Baltimore-Washington Parkway, \$166,100; Blue Ridge Parkway, \$6,604,300; Colonial Parkway, \$343,200; Foothills Parkway, \$86,700; George Washington Memorial Parkway, \$1,480,500; Natchez Trace Parkway, \$4,185,400; Rock Creek and Potomac Parkways, \$2,933,800; and advance planning, \$200,000.

Fifteen major projects totaling \$10,900,000 were completed. They included 45 miles of paving, 29 miles of grading, 12 grade separations and bridges, and 1 tunnel. On the Blue Ridge Parkway, a 20-mile section was opened from Beech Gap to Balsam Gap, where the parkway road reaches its highest elevation, 6,050 feet, at Richland Balsam. Its opening provides continuous travel west of Asheville from Pisgah Inn through Wagon Road Gap 60 miles to the southern terminus at Great Smoky Mountains National Park.

Thirty-nine contracts totaling approximately \$25 million were in progress under the Bureau of Public Roads. They included 52 miles of paving, 63 miles of grading and base course work, 45 bridges and grade separations, 8 tunnels, and other road-improvement work. About \$4,874,000 worth of construction was concen-



Fifteen major parkway contracts were completed during fiscal year 1963, including paving of roads, grading, and construction of bridges and road separations. This bridge construction on the Blue Ridge Parkway was among those just completed.

trated on the final link of the Blue Ridge Parkway in Virginia around the city of Roanoke, and \$6,310,000 on the sections west of Asheville between Pisgah Inn and U.S. Highway 25. Both sections are expected to be ready for the 1965 travel season. Work started on 4½ miles of the 11-mile section around Asheville. The Asheville gap and the 5½ miles around Grandfather Mountain, for which right-of-way has not been acquired, are the only stretches of the 469-mile parkway not yet started. Reports prepared by the Bureau of Public Roads and the National Park Service were completed for the Great River Road in Iowa and for Parts I and II in Minnesota, containing recommendations for land acquisition, scenic easement, and control of access. Studies for similar reports were underway in Arkansas, Wisconsin, and Illinois.

### **Parkways Improved**

The Branch of Parkways, in collaboration with the Bureau of Public Roads, continued studies on several proposed national parkways:

**Blue Ridge Extension into North Carolina and Georgia (190 miles).**—A favorable report was prepared and submitted to Congress by the Departments of Interior and Commerce.

**Allegheny Parkway (550 miles), Maryland, West Virginia, Virginia, and Kentucky.**—Field studies started. The report is scheduled for completion in fiscal 1964.

**New River Parkway (99 miles), West Virginia.**—Field studies nearly completed and the report to the Area Redevelopment Administration is in preparation.

**George Washington Country Parkway (184 miles), Mount Vernon to Yorktown, Va.**—Field studies continued.

About \$6,850,000 of roadwork was contracted for.

Most of the 75 miles of roadwork completed was reconstruction of existing routes. Principal jobs completed were at Glacier, Grand Canyon, Crater Lake, and Mount McKinley. One outstanding section of new road was built as the through scenic highway at Capitol Reef.

### **Master Plan Coordination Developed**

A new concept, the "Package Master Plan," was adopted. It combines into one document all narrative and graphic material necessary to assure continuity in managing and developing a park. This system involves the simultaneous study by a team of men oriented and experienced in master plan concepts. They prepare this document in the park in conjunction with the park staff.

This method will help bring master plans up to date and keep them current. Following adoption of the system in fiscal 1963, five complete master plans were submitted and approved, while numerous others were under preparation. Among those completed are three for new parks so public use facilities can be provided soon after the areas have been established. These include Cape Cod, Bents Old Fort, and Fort Davis. In preparation are those for Hamilton Grange, Lincoln Boyhood, Padre Island, Point Reyes, Sagamore Hill, and Theodore Roosevelt Birthplace.

## **PLANNING PROGRAM ACTIVE**

The planning program seeks the selection for preservation—while still available—of those outstanding scenic, scientific, historic, and recreation areas which are of national significance so that park needs may be fulfilled. This program is urgent because the cost of the most desirable areas is rapidly increasing and the opportunities to preserve the best remaining areas are diminishing as such areas are taken for industrial, commercial, residential, and other forms of development.





Reports were completed on comprehensive planning studies of 16 major areas suggested for addition in the National Park System, including Big Horn Canyon, Montana-Wyoming.

Significant planning progress was made during the year. The extensive planning work required to prepare suggestions for legislative consideration continued on 37 proposed projects. Reports were completed on the comprehensive planning studies of 16 major areas suggested for addition to the National Park System. Among these were Bighorn Canyon, Mont.-Wyo.; Buffalo River, Ark.; Congaree Swamp, S.C.; Guadalupe Mountains, Tex.; John Muir Home, Calif.; and Longfellow House, Mass. Field investigations of about 30 additional areas were made, in various degrees of detail, to determine whether they were of national significance.

The Department announced its support for establishing the following: Allegheny Portage Railroad National Historic Site, Pa.; Canyonlands National Park, Utah; Fire Island National Seashore, N.Y.; Fort Bowie National Historic Site, Ariz.; Fort Larned National Historic Site, Kans.; Fort Union Trading Post National Historic Site, N. Dak.-Mont.; Great Falls Park (part of George Washington Memorial Parkway), Va.; Hubbell Trading Post National Historic Site, Ariz.; Ice Age National Scientific Reserve, Wis.; Johnstown Flood National Memorial, Pa.; Oregon Dunes National Seashore, Oreg.; Ozark National Rivers, Mo.; Poverty Point Na-

tional Monument, La. ; Prairie National Park, Kans. ; Sleeping Bear Dunes National Lakeshore, Mich. ; and Whiskeytown-Shasta-Trinity National Recreation Area, Calif.

In addition, Congress studied establishment of the Boston National Historic Sites, Mass. ; Channel Islands National Seashore, Calif. ; Chesapeake and Ohio Canal National Historic Park, Md. ; Great Basin National Park, Nev. ; Indiana Dunes National Lakeshore, Ind. ; Pictured Rocks National Lakeshore, Mich. ; Saint-Gaudens National Historic Site, N.H. ; Tocks Island National Recreation Area, N.J.-Pa. ; and Valle Grande-Bandelier National Park, N. Mex.

## LANDS ACQUIRED FOR PUBLIC USE

Congress appropriated \$13,622,000 in fiscal 1963 for purchase of privately owned lands urgently required for recreation, conservation, development, and construction purposes in 24 long-established areas and in 7 newly authorized national park areas to provide public areas for America.

Significant donations of lands and money helped in acquiring land in 15 areas. One donation was for \$500,000. This will be used to purchase lands in the Virgin Islands National Park. Exchanges of private lands for Federal lands benefited five areas, and transfers of Federal lands from other Government agencies helped add land to six areas.

Added to the National Park System by various means were 53,919.41 acres of land and water. Through boundary revisions, 4,196.92 acres were excluded, resulting in a net gain of 49,722.49 acres. Most of the excluded acreage reverted to the public domain.

Accessions were as follows : Purchased with appropriated funds, 4,533.98 acres ; donated, 24,815.17 acres ; transferred, 19,710.00 acres ; and exchanged, 4,860.26 acres.

Remaining were 673,400 acres of non-Federal lands and waters within national park areas. Such non-Federal holdings continued as an administrative handicap and prevented complete conservation and full utilization of adjoining Federal lands for public park purposes.

A land-acquisition program started at the new Point Reyes National Seashore, Calif., and land acquisition programs progressed at other recently authorized areas : Fort Smith National Historic Site, Ark. ; Lincoln Boyhood National Memorial, Ind. ; Mockley Point in Maryland, across the Potomac from Mount Vernon ; Minute Man National Historical Park, Mass. ; and Cape Cod National Seashore, Mass.

Land-purchase programs were underway at five Civil War sites to consolidate Federal holdings in time for centennial celebrations and for permanent preservation of historic scenes.

At year's end 170 contracts were pending for the purchase of lands in 19 areas of the National Park System. When completed, they will bring an additional 5,112.48 acres into Federal ownership. Also pending for title clearance were the gifts of 4,576 acres of land in three areas.

### **Boundary Adjustments Made**

During the year, Congress authorized additions of lands at Capulin Mountain National Monument, N. Mex.; additions of lands and submerged lands at Virgin Islands National Park in the Virgin Islands; additions of lands and name changes at Big Hole National Battlefield, Mont., and Petersburg National Battlefield, Va., and both additions and deletions of land at Vicksburg National Military Park, Miss.

Congress also directed that the Edison Laboratory National Monument and the Edison Home National Historic Site be combined into the Edison National Historic Site, N.J. Congress also changed Harpers Ferry National Monument, W. Va., to Harpers Ferry National Historic Site.

By Presidential proclamations, 5,361 acres were added to Craters of the Moon National Monument, Idaho; 2,882 acres were added to and 3,925 acres deleted from Bandelier National Monument, N. Mex.; and 5,236 acres of public land were added to and 320 acres were deleted from the Natural Bridges National Monument, Utah.

### **Economic Research**

Economic research during the year focused on measuring the impact of proposed parks on the basic economic structure of surrounding areas. An economic study of the proposed Buffalo National River was made by the University of Arkansas. A similar study was made by Michigan State University of the proposed Pictured Rocks National Lakeshore. Other completed studies were for the proposed Between-the-Lakes National Recreation Area, by the Tennessee State Planning Board, and for Northeastern Vermont, by the University of Vermont. An economic study of a proposed national park on the island of Kauai, Hawaii, is being conducted under contract.

### **Special Studies Underway**

The National Park Service is cooperating in a significant study of the North Cascades region of the State of Washington, being





Glacier Peak in the Wilderness Area of the North Cascades region, in Washington State, is a classic example of the serenity of wilderness.

conducted jointly by the Interior and Agriculture Departments. A second important study was being conducted by the Service of the Coast Redwoods region of California, made possible by a grant from the National Geographic Society. Another special study on recreation was being conducted in Hawaii under contract. In addition, the Service cooperated in a special Wild Rivers Study by the Departments of Agriculture and Interior.

### **Long-Range Requirements Studied**

The long-range requirements program entered a new phase during the year with the assignment of a six-man task force to make plans for the future course of both the National Park System and the National Park Service. The completed long-range plan, expected to be released in fiscal 1964, will form the basis for shorter range programs to meet constantly changing conditions imposed by natural growth and need.

The plan will develop long-range objectives and guidelines for the management, use, and development of a well-rounded and evenly distributed National Park System.

Such a long-range plan sees as a foremost challenge the impact of rapidly increasing public use on units of the National Park System. While it took 58 years to reach the one billionth visit, the Service estimates that the second billionth will be reached in 11 years.

## HEAVY PUBLIC DEMAND FOR REPORTS

Public interest in the National Park System was reflected in an unprecedented demand for reports and publications regarding all areas administered by the National Park Service.

### **Publications and Services Grow**

The National Park Service has a large and varied publication program. Three areas of work are involved: informational folders, student booklets, and books. In fiscal 1963, the National Park Service printed 17,508,000 folders for 175 areas and 70,000 copies of 4 general informational folders. Four student booklets were added to a library of over 40 such works. Four reference or research documents were under preparation.

The public inquiries function of the National Park Service is closely aligned with the Service's publishing program. Each year the number of inquiries for general information increases. In fiscal 1963, almost 65,000 inquiries were received by letter, telephone, or personal visit. More than 90 percent of these requests were answered in some way with printed material.

### **Audiovisual Services Improved**

More emphasis was placed on the quality of audiovisual program materials. Two recording technicians were added to the staff of the Branch of Audiovisual Services to improve the fidelity of Service-recorded material. New audiovisual program materials created during the year included production of 11 sound-slide film programs for visitor centers and a 16-mm. motion picture film for Fort McHenry's new Visitor Center, completion of 8 new cabinet installations using captioned slides, and production of 39 recorded messages for new audio stations. As a result of the audiovisual installations during the past several years, the work of providing replacement tapes increased tremendously.

Efforts to increase interpretive service to visitors from other countries continued. Audio messages in six languages were prepared through the cooperation of the Voice of America for use at Congress Hall (Independence National Historical Park) in Philadelphia, Pa.

The Branch of Still and Motion Pictures was reorganized. A new system was set up for filing and distributing still pictures, motion pictures, slides and transparencies. This makes such materials more accessible to its users and saves money.

Plans were made to obtain more photographs from field units and regional offices to insure a steady flow of quality material to meet the steadily increasing number of requests.

At year's end, a contract was awarded for production of a National Park Service film for public distribution.

### **International Cooperation Increased**

The Division of International Cooperation held conferences on park projects with representatives from England, Norway, Denmark, Germany, Italy, Switzerland, Katanga, Ghana, East and South Africa, India, Thailand, Malaya, the Philippines, New Zealand, and Australia.

An outstanding event was the First World Conference on National Parks held in Seattle June 30 to July 7, 1962. Field trips in connection with the conference were made to Mount Rainier, Olympic, Yellowstone, Yosemite, and Glacier National Parks. Nearly 300 delegates from 63 countries participated in the conference.

During the past year more than 2,000 letters of inquiry from abroad were received and were answered by the Division of International Cooperation. The Service estimated that 2,500,000 foreign visitors from 92 countries were received by personal contact by staff members of the National Park Service outside the National Capital Parks area.

Technical assistance projects were undertaken in Rhodesia, Tanganyika, Kenya, England, and South Africa. Specialized, inservice, and on-the-job training was extended to 31 persons from Kenya, Uganda, the Congo, South Africa, Nyasaland, Venezuela, Argentina, Philippines, Thailand, Israel, Pakistan, Lebanon, and Costa Rica. Special programs were arranged for groups of teachers and educators from 15 different countries. Special schedules in National Park Service areas were arranged for photographic, radio, and communications teams from Indonesia, Kenya, Japan, Austria, and France.





Jefferson Memorial, and other National Capital Region areas, attracted nearly 7,000,000 visitors during fiscal year 1963. A new feature was the floodlighting of several of the memorials at night.

## NATIONAL CAPITAL REGION CREATED

Region Six became the "National Capital Region" when the regional offices of the National Park Service were given geographical designations instead of numbers. Construction of a new "home" for the National Capital Region offices in East Potomac Park was

virtually completed during the fiscal year, providing a central site to unify activities of the region. Construction of the Park Police Headquarters wing to the Operations Building started and was expected to be completed before the end of fiscal 1964.

### **Memorials**

Visits reached a record high of nearly 7,100,000, an increase of 12.7 percent over 1962. Visiting hours at the Jefferson Memorial were extended and floodlighting of the memorial at night created much favorable comment.

### **Recreational Opportunities Increased**

Due to increased public use of recreational facilities in the park system, the maintenance force conditioned and placed into use a record number of athletic fields. Several additional recreational programs, such as track meets, were scheduled. Considerable work was undertaken to condition the grounds of the new District of Columbia Stadium and develop practice football fields.

Fifty picnic sites at Fort Washington and 60 sites at Fort Hunt were completed and opened. Development of 200 additional picnic areas at Turkey Run Recreational Area, 50 at Greenbelt Park, and 220 at Carderock Recreational Center started. Sixty new picnic sites neared completion at Prince William Forest Park; others were improved.

Additional park facilities were provided and the channel dredged for a boat-launching ramp at Daingerfield Island Marina. A boat-launching site was opened at Gravelly Point on the George Washington Memorial Parkway.

The Potomac Park Motor Court was closed December 31, 1962, because of sewer construction and other factors, thus making the need for increased camping facilities in the National Capital Region more evident than ever. At Prince William Forest Park, construction of 120 new fully equipped family tent campsites was virtually completed. Plans were laid for constructing a trailer village in the park. This facility should be ready for use by the beginning of the 1964 camping season. Work started on 50 new tent campsites at Greenbelt Park. Early completion was planned. Additional sites will be developed if requirements increase.

### **Park Police Enlarged**

The authorization of 31 new positions on the U.S. Park Police Force and retirement of several experienced men necessitated an accelerated recruitment and training program. Specialized train-

ing received by supervisors and trainees contributed greatly to a higher level of performance and effectiveness of the protective forces.

**Proposed Memorials**

Designs and locations of the Taras Shevchenko Memorial and the Mary McLeod Bethune Memorial, authorized by Congress for location in the park system, were approved. The Boy Scout Memorial on the grounds south of the White House neared completion. A contract was let for constructing the Theodore Roosevelt Memorial on Roosevelt Island.

**ADMINISTRATION**

The following is a comparison of the 1963 appropriations with those for 1962:

Appropriation item	1962 fiscal year	1963 fiscal year	Increase
Service appropriations:			
Management and protection.....	\$22, 548, 851	\$25, 383, 304	\$2, 834, 453
Maintenance and rehabilitation of physical facilities.....	18, 094, 000	20, 578, 550	2, 484, 550
General administrative expenses.....	1, 581, 000	2, 055, 200	474, 200
Construction.....	37, 976, 000	45, 775, 500	7, 799, 500
Construction (liquidation of contract authorization).....	30, 000, 000	27, 000, 000	-3, 000, 000
Total cash appropriations.....	110, 199, 851	120, 792, 554	10, 592, 703
Construction (amount by which roads and trails and parkways contract authorization exceeded cash appropriation).....	4, 000, 000	7, 000, 000	3, 000, 000
Total new obligational authority Service appropriations.....	114, 199, 851	127, 792, 554	13, 592, 703
Appropriation transfers from other agencies.....	8, 346, 416	16, 220, 644	7, 874, 228
Grand total, new obligational authority.....	122, 546, 267	144, 013, 198	21, 466, 931

Of the total increase for fiscal 1963, \$996,000 was for increased salary costs as authorized by the Congress; \$1,615,000 was for a share of the cost of constructing airports in the vicinity of Grand Canyon and Yellowstone National Parks; \$5 million for starting land acquisition for Point Reyes National Seashore, Calif.; and \$7,976,000 for various projects under the Accelerated Public Works program. The remainder, \$5,879,931, was for strengthening the various Service programs, including Mission 66 developments.

**Financial Management Improved**

A study was made during the year of the accounting and payroll operations at Mount Rainier and Olympic National Parks, Wash., to determine whether such functions should be transferred to the



Western Regional Office in San Francisco, Calif. On the basis of the study findings, the Service is planning to abolish these two field finance offices during fiscal 1964. This will reduce the number of field finance offices to 20 with an annual savings of approximately \$18,000. At the start of the financial management improvement program in 1954, there were 46 field finance offices.

A new financial management system to serve the three field Design and Construction Offices was developed during the year and installed on a pilot basis in the Western Office in San Francisco, Calif. The major feature of the system is a new chart of cost accounts designed to meet specific needs. Other features include elimination of certain duplications of effort that had evolved over a period of time, the streamlining of fiscal document review, and more meaningful financial reporting to management. The system will be installed in the Eastern Office of Design and Construction, Philadelphia, and the National Capital Office of Design and Construction, Washington, D.C., during fiscal 1964.

During the year a task force study was made of the Service's cost accounting classifications, other than those for the Design and Construction Field Office operations, in the light of management needs for cost data. As a result, the chart of cost accounts was modified, effective at the beginning of fiscal 1964, eliminating and combining many of the classifications with a net reduction of about 47 percent in the number of cost accounts comprising the chart. This modification will bring about better use of manpower and will provide more meaningful cost data to management.

### **Management Appraisal Program Approved**

A management appraisal program was approved and should help assure top management of the effective and proper use of delegated authority, manpower and funds, and the efficiency and coordination of all activities. A major periodic management review is to be conducted in each regional office at least once every 2 years and of every park in the region at least once every 3 years. Thus, over a 3-year period each park will have been appraised. The management appraisal program is a vital tool in the management of the Service and should produce significant economies in manpower and fund utilization.

### **Personnel and Employment Programs Advanced**

Fiscal 1963 was of considerable significance in the training field. The Branch of Employee Development and Training, in the Division of Personnel, conducted 1-week supervisory training courses for a total of 150 first-line supervisors in 4 of our 6 regions. These

courses were unique in that this was a new training area for the Washington Office (previous management training has been conducted at upper management levels) ; and one-half the participants in each course were "blue-collar" supervisors. The coaching phase of the Service's Management Development Program started. A booklet, "A Plan for the Man," was distributed to all managerial employees. The goal to be attained with the use of guidance presented in the booklet is the preparation of an individualized development plan, mutually agreed upon by the supervisor and his subordinate, for each service employee in a leadership position.

Increased attention was devoted to the equal employment opportunity program and to the employment of women in types of positions for which they are particularly suited, such as park guide and park interpretive positions.

### **Safety Improvements Noted**

Substantial improvements in most of the 20 categories of the accident record continued. The significance of this contribution to good management and efficiency is that this accomplishment was made during a period of recordbreaking visitor use and a tremendous increase in variety of activities in the Service programs.







# Bureau of Outdoor Recreation

Edward C. Crafts, Director

## **The First Year**

Fiscal year 1963 was the first complete year of operations for the Bureau of Outdoor Recreation. The Bureau was established April 2, 1962, by Secretary Udall at the direction of President Kennedy and upon recommendation of the Outdoor Recreation Resources Review Commission.

The Bureau functions as a focal point of responsibility in outdoor recreation within the Federal Government. It manages no land. Its major responsibilities involve long-range nationwide planning, promotion of Federal coordination, and stimulation and assistance to the States, their political subdivisions, and the private sector in outdoor recreation.

Faced with the problems of organization and staffing, plus the demands of a full workload, the pace established by the Bureau in its first year of operations has been strenuous. The number of employees reached 135 toward the end of the fiscal year, too few to accomplish all assignments, yet enough to achieve considerable progress on several sorely needed projects.

Among other accomplishments, the Bureau performed several specific assignments for the Recreation Advisory Council; investigated and made recommendations concerning several potential recreation areas; started limited operations in six regional offices; and cooperated on numerous occasions with Federal, State, local, and private agencies in the interest of fostering and promoting outdoor recreation opportunities.

## **Organic Act Approved by Congress**

On May 28, 1963, legislation defining basic responsibilities of the Federal Government in outdoor recreation was signed by President

Kennedy. The legislation, Public Law 88-29, is regarded as the Bureau of Outdoor Recreation's organic act.

The bill that received final congressional approval had been submitted to the Congress in January 1963 and provides the Bureau with ample authority in the outdoor recreation field.

## RECREATION ADVISORY COUNCIL

The President's Recreation Advisory Council, established by Executive Order on April 27, 1962, and made responsible for providing broad policy advice to the heads of Federal agencies on important matters affecting outdoor recreation, facilitates coordination of outdoor recreation efforts of the various Federal agencies.

The Executive Order establishing the Recreation Advisory Council made the Secretary of the Interior responsible, in consultation with other members, for developing methods and procedures for improved interagency coordination in carrying out national recreation policies.

During fiscal 1963, the Secretary of Commerce was added to the Council's membership. Other members are: The Secretary of the Interior, the Secretary of Agriculture, the Secretary of Defense, the Secretary of Health, Education, and Welfare, and the Administrator of the Housing and Home Finance Agency.

The Council met twice during the year. It adopted Policy Circular No. 1, which established criteria for national recreation areas. It concurred in plans involving the proposed Whiskeytown-Shasta-Trinity National Recreation Area in California, the Oregon Dunes National Seashore in Oregon, and the Flaming Gorge National Recreation Area in Utah and Wyoming.

The Council also authorized staff studies of a national system of parkways and scenic roads, a national recreation policy, a national public health and water pollution policy with special relation to outdoor recreation, and a national policy on recreation costs and benefits at Federal multiple-purpose reservoir projects.

### **Policy Circular No. 1—Recreation Advisory Council**

A major accomplishment of the Council during the year was the issuance of Policy Circular No. 1 on a relatively new category of Federal lands—national recreation areas. It sets forth criteria for selecting, establishing, and administering such areas throughout the Nation.



The magnificent Oregon Dunes, consisting of 35,000 acres along the central Oregon coast, have been proposed for National Seashore status as part of the Department's program of preserving our vanishing shoreline.

The new national recreation area category is designed to help meet the Nation's mounting needs for outdoor recreation. The areas will include lands possessing above-average natural endowments, but of less significance than the unique scenic and historic elements of the National Park System.

Establishment of a national recreation area will require an act of Congress. Criteria set forth by the Council for this new-type Federal recreation facility include :

1. *Spaciousness.*—National recreation areas should include not less than 20,000 acres of land and water surface, except along riverways, narrow coastal strips, or areas where population density within a 250-mile radius is in excess of 30 million people.

2. *High carrying capacity.*—Such areas should be located and designed to serve large numbers of people in relation to the type of recreation offered.



3. *Interstate use.*—Such areas should provide recreation opportunities significant enough to assure interstate patronage within the region of service, and should attract patronage from outside the normal service region.

In addition, the scale of investment and development should require Federal participation; the areas should not be located more than 250 miles from urban centers; the use of natural resources should be compatible with the recreation mission; and such areas should be established only in regions where other programs will not fulfill high-priority recreation needs in the foreseeable future.

### **Parkways and Scenic Roads**

A study to determine the feasibility of a national system of scenic roads and parkways was ordered by the Recreation Advisory Council during the year.

A task force, composed of representatives of the Bureau of Public Roads, National Park Service, Forest Service, the Housing and Home Finance Agency, and the Bureau of Outdoor Recreation was appointed to conduct the study. The group was expected to submit its recommendations later in 1963.

Proponents point out that establishment of a network of scenic routes and parkways could serve millions of persons each year, relieving travelers of the necessity of going great distances on highways and superhighways to enjoy a few miles of scenic driving.

The findings of the Outdoor Recreation Resources Review Commission as to the widespread popularity of pleasure driving, and the experience of the heavily used Blue Ridge Parkway and other scenic ways, underscore the necessity of developing new concepts and facilities to provide for this type recreation.

### **New National Recreation Area Planned**

In June 1963, the Tennessee Valley Authority announced plans to develop a demonstration national recreation area in Kentucky and Tennessee. The Recreation Advisory Council had participated in an agreement leading to the project.

President Kennedy announced that the Between-the-Lakes National Recreation Area will be undertaken as a demonstration in resource development. It lies in the 170,000-acre Between-the-Lakes region between TVA's Kentucky Reservoir on the Tennessee River and the Army Corps of Engineers' Barkley Reservoir across the divide on the Cumberland River.

The shorelines of the two lakes are only 6 to 12 miles apart for some 40 miles above each dam. They enclose a narrow strip of wooded ridges rising up to 300 feet above the reservoirs on either side.

Development of the project will demonstrate how an area with limited timber, agricultural, and industrial resources can be converted into a national recreation asset and thereby stimulate economic growth of the region. It also will help establish and define guidelines for the acquisition, development, and operation of other outdoor recreation areas.

The area will include provision for developing new waterfowl wintering grounds in cooperation with the Bureau of Sport Fish-

The population explosion and the tensions of modern life require the preservation of open spaces where our citizens can maintain a contact with nature.



eries and Wildlife and for managing upland game, including improvement of public hunting.

President Kennedy noted that the Between-the-Lakes area is within 200 miles of nearly 10 million people living in the Midwest and that the development of a national recreation area in that location thus meets the Outdoor Recreation Resources Review Commission recommendation that recreation facilities for more densely populated areas merit high priority.

TVA planned to start the project immediately. It will administer the area for an estimated 10 years, the period required to complete the demonstration. At the end of that time, arrangements for permanent administration of the area for outdoor recreation will be determined, looking toward a Federal-State partnership.

### **Assateague Island Suggested for National Seashore**

Assateague Island, one of the last remaining undeveloped stretches of shoreline on the Middle Atlantic, was recommended for national seashore status by the Bureau of Outdoor Recreation in an April 1963 report. Legislation authorizing the project has been introduced in both Houses of Congress.

The report emphasized the need for early action before Assateague is preempted for other uses. More than 33 million people live within 250 miles of the island. The Bureau estimated that more than 3 million persons would visit the island annually in the initial period following its establishment.

The report recommends that the island, a sandy barrier reef, be managed for public recreation use. A balance between high-density and low-density recreation use would be encouraged. The north portion of the island would be under the jurisdiction of the State of Maryland and would be developed as a State park. Chincoteague National Wildlife Refuge, in the southern portion of the island, would also retain its identity, but would be managed to provide recreation opportunities consistent with its primary objective.

Assateague, stretching some 33 miles along the Maryland and Virginia coastline, is the largest undeveloped seashore between Cape Hatteras, N.C., and Cape Cod, Mass.

The mainland opposite Assateague Island is 130 miles from Baltimore, 140 miles from Washington, and is readily accessible to motorists via the Bay Bridge and U.S. Route 50.

A clean sand beach, the island's outstanding feature, is wide and gently sloping. With a minimum of development it could provide



unexcelled opportunities for swimming, surfing, sunbathing, and other popular beach activities.

The island offers extensive opportunities for fishing, swimming, and boating. Marshes on the bay side provide superb habitat for a large variety of shorebirds and waterfowl, as well as for numerous other birds and wildlife.

Assateague's natural values, coupled with its proximity to large centers of population and accessibility to large interstate areas, make it appropriate for national seashore status.

## AGRICULTURE-INTERIOR AGREEMENT ON RECREATION

In January 1963, Secretary of Agriculture Orville L. Freeman and Secretary Udall announced a significant agreement between the two departments to help implement the administration's outdoor recreation program.

In a letter to President Kennedy, the two Secretaries reported they had developed a new conservation policy. This will further development of Federal recreation resources, eliminate costly competition, promote cooperation, and recognize the major roles that both departments have in administering Federal lands under their jurisdiction for recreation purposes. Many recreation benefits may result from their joint action.

Secretary Freeman and Secretary Udall agreed on a broad range of issues to enable their departments to enter into "a new era of cooperation" in managing Federal lands for outdoor recreation.

"This agreement settles issues which have long been involved in public controversy," they said. "We have closed the book on these disputes and are now ready to implement harmoniously the agreed-upon solutions."

President Kennedy hailed the new policy as "an excellent statement of cooperation representing a milestone in conservation programs."

The two Secretaries announced that the following principles would govern their new policy of cooperation:

1. Mutual recognition for the distinctive administrative functions of the Forest Service and the National Park Service.
2. No disturbance of jurisdictional responsibility among the agencies of the two departments managing and developing lands for public recreation except for existing administration

proposals, proposals covered by the agreement, or routine boundary adjustments.

3. No unilateral new proposals to change the status of lands under the jurisdiction of the other department. Joint studies will be the rule.

4. Each department, with the support and cooperation of the other, will endeavor to develop fully and manage effectively recreation lands now under its administration.

In line with the agreement, the two Secretaries announced they would recommend two new national recreation areas—the Whiskeytown-Shasta-Trinity Area in northern California and the Flaming Gorge Area in Wyoming and Utah—as well as a new national seashore—the Oregon Dunes—along the Oregon coast.

They also said a joint study would be made of Federal lands in the North Cascade Mountains of Washington to determine the management and administration of those lands which would best serve the public interest.

### **Proposed National Recreation Areas and National Seashore**

The two new national recreation areas and the new national seashore in Oregon which Secretary of Agriculture Freeman and Secretary of the Interior Udall have agreed to recommend to Congress would provide recreation seekers with opportunities for a broad and challenging range of outdoor experiences. Establishment of all three areas depends on congressional action.

#### **Whiskeytown-Shasta-Trinity**

The proposed Whiskeytown-Shasta-Trinity National Recreation Area of about 200,000 acres in northern California would consist of three noncontiguous units surrounding reservoirs constructed by the Bureau of Reclamation. Portions of the proposed national recreation area border Shasta Lake and the Trinity-Lewiston Reservoirs within the boundaries of Shasta and Trinity National Forests. These portions would be administered by the Forest Service.

The new recreation area also would include about 40,000 acres around the Whiskeytown Reservoir. This land is outside the national forest and would be administered by the National Park Service.

#### **Flaming Gorge**

The proposed Flaming Gorge National Recreation Area of about 160,000 acres is on the Green River in northeastern Utah and adjacent areas at Wyoming. It is upstream from the Bureau of

Reclamation dam under construction at Flaming Gorge. The Department of the Interior and the Department of Agriculture agreed that the 40,000 acres lying within the national forest boundary would be administered by the Forest Service, with the National Park Service managing the other 120,000 acres.

### **Oregon Dunes**

The proposed Oregon Dunes National Seashore, consisting of about 35,000 acres of sand dunes along the central Oregon coast, has for the most part been under the protection and management of the Forest Service. Under the Secretaries' agreement, administration of this area would be the responsibility of the National Park Service.

## **SPECIAL STUDIES**

The Bureau of Outdoor Recreation started several special studies during the year. These were assigned by Secretary Udall, by the Recreation Advisory Council, and, in some instances, by the Secretaries of the Interior and Agriculture acting jointly.

### **Wild Rivers Study**

Appointment of a five-man group to study the need for preserving a nationwide system of wild rivers particularly suited to outdoor recreation was announced in May 1963 by the Secretary of the Interior and the Secretary of Agriculture.

The two Secretaries selected Director Crafts of the Bureau of Outdoor Recreation to head the study. Department of Agriculture members were Byron B. Beattie, Director of the Division of Watershed Management, Forest Service, and Dr. Laurence I. Hewes, Jr., assistant to the Director, Office of Rural Areas Development. Department of the Interior members were Ben H. Thompson, Assistant Director of the National Park Service, and A. Heaton Underhill, Assistant Director of the Bureau of Outdoor Recreation. Dr. Hewes was later replaced by John H. Sieker, Director, Division of Recreation and Land Uses, Forest Service.

Secretary Udall and Secretary Freeman requested the study team to identify those portions of wild streams and rivers which have the highest outdoor recreation potential. The team's report and recommendations were to be submitted to the two Secretaries and later to the Recreation Advisory Council.

"The fish, wildlife, and outdoor recreation functions inherent in our natural rivers certainly rank among the finest of our outdoor





The Allagash River flows for nearly 100 miles through the heart of Maine's backwoods. This classic wilderness canoe route—the last of the eastern and lake wilderness—has been proposed as a National Riverway.

resources,” the Secretaries said in a joint statement. “Many such rivers already flow through national parks and national forests and consequently are accorded some degree of protection.”

### **North Cascades Mountain Study**

The resource potential of Federal lands in the magnificent North Cascade Mountains in Washington and the form of management best suited to the public interest are being studied by a group appointed jointly by Secretary Freeman and Secretary Udall.

Appointed in March 1963, the study team was headed by Director Crafts. Serving with him were Dr. George A. Selke, consultant to Secretary Freeman; Arthur Greeley, Deputy Chief of the Forest Service; Henry Caulfield, Jr., Assistant Director of the Department of the Interior's Resources Program Staff; and George B. Hartzog, Jr., Associate Director of the National Park Service. Mr. Caulfield was later replaced by Dr. Owen S. Stratton, Consultant to the Department of the Interior.

A series of resource substudies was started to provide a factual basis for recommendations. These included: Regional Economy, Water and Power, Recreation, Timber, Minerals and Geology, Fish and Wildlife, and Forage.

The study team scheduled a field investigation of the North Cascades in the summer of 1963 and announced that field hearings would be held in the fall of 1963.

The North Cascades area in Washington State long has been the subject of conflicting proposals for development by outdoor, commercial forestry, and other interested groups. The area involved lies within national forests and contains some of the most rugged and majestic scenery in the Nation. Much of it is high country, with the mountain peaks towering well above the timberline. Portions of the area designated as wilderness and primitive by the Forest Service exclude logging and most other commercial operations.

Plans call for the study team to submit recommendations to the two Secretaries who, in turn, will make recommendations to the President. No time limit was set for the group to submit its report, but the two Secretaries urged it to "proceed with due deliberation and haste."

Because of the history and the complex issues involved, the study team does not expect to complete its report before December 1964.

### **Fire Island Study**

Establishment of a new Fire Island National Seashore to help serve the recreation needs of the New York metropolitan complex was recommended by Secretary Udall in a statement urging congressional approval of authorizing Federal legislation. As recommended by Secretary Udall, the new national seashore would extend from Fire Island Inlet to the junction of Meadow Lane and Halsey Neck Lane in the village of Southampton.

Fire Island National Seashore would encompass about 8,000 acres of land and include 52 miles of relatively undeveloped barrier reef seashore. Land acquisition costs have been estimated as not exceeding \$20 million.

The west end of the proposed area is within 50 miles of the center of New York City. More than 16 million people in several States live within a 100-mile radius. Fire Island proper is a narrow 32-mile-long sand reef varying from several hundred yards to one-half mile in width. Fire Island State Park now occupies the western 4 miles of the island, but it is undeveloped. Two other





Intensive development and dune erosion leads to extensive loss of property and life when high tides and storms hit the Atlantic coast, such as on Long Island shown above, underscoring the necessity of stabilizing existing undeveloped areas—Fire Island and Assateague Island—as National Seashores in public ownership.—Courtesy, Newsday.



stretches of barrier reef, one attached to Long Island, would comprise the remainder of the 52-mile-long proposed area.

"Nowhere else in the country is there a greater need by so many people for additional outdoor recreation opportunities that can be supplied in abundance and variety," Secretary Udall stated. "Unless early action is taken to protect this area for public use, it will inevitably be developed for more limited use and the opportunity lost forever."

### **Allagash River Study**

A study of outdoor recreation potentials of the famous Allagash River in northern Maine was begun by the Bureau of Outdoor Recreation in 1963 upon assignment from Secretary Udall.

The Bureau was to report whether unusual natural recreation opportunities associated with the Allagash would warrant taking necessary action to maintain the opportunities for backcountry canoe travel characteristic of the early days of America.

The Bureau's report was to consider—

1. The Allagash River as a unique recreation resource, assessing which portions of the waterways and adjoining lands would be suitable for inclusion in a national recreation area.
2. Which agency, or combination of agencies, would be best suited to administer the area.
3. The need for legislation to designate the Allagash as a national riverway.

The Allagash is one of the few remaining free-flowing streams in the eastern United States and is a major recreation resource of great potential significance to the Nation.

The report will be prepared by the Bureau of Outdoor Recreation in consultation with the National Park Service, State agencies, and private interests.

### **Pictured Rocks Study**

Also at the direction of Secretary Udall, the Bureau began studying a proposal for a new approach to possible establishment of a Pictured Rocks National Lakeshore in Michigan.

Director Crafts of the Bureau of Outdoor Recreation was instructed to consult with the National Park Service, other Department of the Interior agencies, the Forest Service, and State and local officials and private individuals in connection with the assignment.

The proposal would provide for commercial as well as recreation use of resources in the Pictured Rocks Area and would protect tenure of landowners in the proposed area. It also would permit commercial forestry on private lands if carried out under management guidance of the Forest Service.

## GENERAL POLICY, PLANNING, AND COORDINATION

### **Federal Coordination**

During the year, the Bureau of Outdoor Recreation, in carrying out its responsibilities for Federal coordination, established contacts with Washington and field offices of most of the Federal agencies concerned with outdoor recreation.

Particular consideration was given to establishing a working relationship with those agencies and interagency groups responsible for the planning and development of water and related land resources. The aim was to develop and put into effect procedures leading to cooperation with these agencies.

Tentative agreement was reached with the Public Health Service, Soil Conservation Service, Federal Power Commission, and with the Corps of Engineers regarding the type and scope of services the Bureau of Outdoor Recreation would provide those agencies in

Lake Michigan's eroded Grand Portal is an arch in the proposed Pictured Rocks National Lakeshore. This is one of the few remaining wild areas on the Great Lakes.



developing comprehensive river basin plans and in the technical review of specific project proposals.

An agreement dividing responsibility for recreation planning at Bureau of Reclamation projects was reached between the Bureau of Outdoor Recreation and the National Park Service.

An agreement was also developed with the Bureau of Land Management to review applications for lands for recreation purposes under the Recreation and Public Purposes Act.

Main activities of the Bureau of Outdoor Recreation in connection with its support of the Recreation Advisory Council involved several policy studies on user charges, national recreation policy, disposal of surplus military lands, public health policy for outdoor recreation, scenic roads and parkways, and recreation benefit and cost allocation formulas.

Policy Circular No. 1, "Federal Executive Branch Policy Governing the Selection, Establishment, and Administration of National Recreation Areas," was completed and distributed to interested persons.

The Bureau also began working on a way to evaluate the total annual Federal investment in outdoor recreation. This step was preliminary to providing Federal budget guidance and review of long-range plans.

## **Outdoor Recreation Research**

The Bureau instituted its Division of Research in fiscal year 1963 by cosponsoring the first National Conference on Outdoor Recreation Research at the University of Michigan, Ann Arbor, May 6-8, 1963. It was attended by 170 local, State, and national educators, research personnel, and outdoor recreation officials.

First of its kind in the Nation's history, the conference contributed significantly to broader understanding of recreation research by public, private, and university research agencies. This ultimately will help solve critical outdoor recreation problems confronting the Nation.

Both Secretary Udall and Secretary Freeman addressed the Ann Arbor session.

In connection with its research responsibilities, the Bureau of Outdoor Recreation began a comprehensive review of outdoor recreation literature and evaluated the problem of developing a data-retrieval system. The objective is to develop a clearinghouse and abstracting service for persons working in outdoor recreation research.



A "Directory of Federal and State Agencies Concerned With Outdoor Recreation" was compiled and distributed during the year by the Bureau. At the request of the National Conference on State Parks, the Bureau continued collecting statistics on State parks and enlarged the scope of the survey to include other State outdoor recreation areas. A compilation, "State Outdoor Recreation Statistics, 1962," was scheduled for publication in the fall of 1963.

### **Cooperative Services**

The Bureau of Outdoor Recreation also broadened its State cooperative, consulting, and advisory services to cover all State agencies and their local counterparts concerned with outdoor recreation. Such services had been oriented largely to State park agencies before the function was transferred to the Bureau of Outdoor Recreation from the National Park Service in April 1962.

In addition, the Bureau furnished cooperative services to agencies and organizations on a variety of subjects. Representative of this assistance were: a report on the recreation development potential of a water catchment area at the city of Palm Beach, Fla.; a proposal for Elmer Park Development submitted to the Director of the Museum of the Great Plains, Lawton, Okla.; a study on a proposed Lake Phelps Recreation Area, North Carolina Division of State Parks; and a report on "Interpretation in the Michigan State Parks."

Among other projects involving State cooperative services, the Bureau of Outdoor Recreation reviewed applications, made inspections, and furnished recommendations to the General Services Administration on 19 surplus Federal properties requested by the States or their political subdivisions for park, recreation, or historic monument purposes. These properties involved 2,086 acres valued at \$4.2 million. Compliance reviews were made on 254 transferred Federal surplus properties. Eighty-one applications by State and local agencies to acquire public domain lands for public park and recreation purposes were reviewed, with recommendations furnished to the Bureau of Land Management.

The Bureau also investigated and prepared reports concerning the recreation potential of various military lands in widely scattered sections of the country and attended and participated in numerous national, regional, and State recreation meetings.

### **Planning and Surveys**

In discharging its responsibilities for nationwide planning and surveys, the Bureau conducted field studies regarding recreation at Allegheny Reservoir in Pennsylvania and New York; Fire Is-

land, N.Y.; Clinchfield Coal Co. Lands and Coal River Area, West Virginia; Assateague Island in Maryland and Virginia; Buffalo River, Ark.; Oregon Dunes, Oreg.; Islandia, Fla., and the Deschutes River, Oreg.

The Bureau also participated in other planning and survey studies. Among these were a joint Army-Interior study of the Upper Missouri River between Fort Peck Reservoir and Fort Benton, Mont.; comprehensive surveys of the Susquehanna River Basin and the Ohio River Basin in cooperation with the Corps of Engineers; and a comprehensive survey of the Illinois River-Great Lakes Basin in cooperation with the Department of Health, Education, and Welfare.

Impressive rock formations, such as the Druid Arch, typify the landscape at the proposed Canyonland National Park in southeastern Utah.



The Bureau was responsible for issuing reports related to the tourist and recreation potential of eastern Kentucky, northern Alabama, and Middle Island Creek, W. Va., as well as for preparation of "Guidelines to Statewide Recreation Planning" for use by States in connection with Area Redevelopment Administration projects.

Guidelines for statewide recreation planning and procedures for nationwide planning were being drafted at year's end.





# Office of Territories

Richard F. Taitano, Director

The development of non-self-governing areas is receiving worldwide attention and the administration of the territories of the United States becomes increasingly important. During fiscal 1963, significant achievements were made in all areas of activity in Guam, American Samoa, the Virgin Islands, and in the Trust Territory of the Pacific Islands (administered by the United States under an agreement with the Security Council of the United Nations).

An important step was taken by the Legislature of the Virgin Islands during the year in passing a new Election Code establishing primary elections for the first time in the history of the islands and facilitating the establishment of a two-party system of government. The Virgin Islands also made a major achievement in higher education with the opening of the College of the Virgin Islands. Of prime importance to the community, this college will serve the needs of the citizens of the territory as well as the entire Caribbean area.

In American Samoa, significant strides were made when the legislature passed a tax-reform measure. This adopted as a Samoan tax the U.S. Federal income tax schedules, plus a 2-percent tax on wage earners who, because of low income or dependency, would not be taxable under the U.S. schedules. In passing the measure the Samoan Legislature indicated its desire to have the Samoan people assume proportionately as much of the budget of running the government of American Samoa as is contributed by U.S. taxpayers to

the Federal Treasury. Another forward move in the development of the territory was the inauguration in December 1962 of weekly jet airline service from Honolulu to Sydney via Pago Pago by Pan American Airlines, making American Samoa much more attractive to industry and to tourists. Construction of new terminal facilities was underway at year's end.

In the Trust Territory of the Pacific Islands, the administration was unified July 1, 1962, with the transfer of the Saipan District from the Navy Department to the Department of the Interior. The provisional capital of the Trust Territory was established on the island of Saipan. Marked progress developing a competent self-government was evidenced by steps being taken to transform the Council of Micronesia into a legislative body.

An important action aimed at boosting the development of Guam's economy was the lifting by the President on August 21, 1962, of the security requirements formerly in effect regarding the entry of U.S. and foreign nationals into Guam. Another forward step was the expansion of the College of Guam from a 2-year junior college to a 4-year institution.

## AMERICAN SAMOA HOST TO CONFERENCE

During July 1962, the government of American Samoa was host to the Fifth South Pacific Conference. Secretary Udall and a large group of officials from Washington, D.C., and Hawaii arrived for the conference in the first commercial jet to land on Samoa's new Pago Pago International Airport. Secretary Udall dedicated the airport, with delegates from all over the South Pacific participating. The group then proceeded to the new Polynesian-style civic auditorium that had been rushed to completion in time for the conference. After a brief dedicatory ceremony, the Fifth South Pacific Conference was opened with a message from President Kennedy and the address of welcome by Secretary Udall. The highly successful conference covered 2 weeks. Various delegates were impressed by the recent developments.

After the conference, various departments of Government were returned to planning and starting further development projects in the fields of education, health, roads, electrification, and sanitation, and other areas. Various consulting and engineering firms were brought to Samoa to assist in the planning and engineering.



In traditional ceremony, a Samoan chief watches the setting of the first post for a new jet terminal building at Tafuna Airport in American Samoa. The building will be an authentic Samoan thatch-roof fale, part of a three-building terminal complex at the new jet field.

### Education Grows

In September 1962, the High School of American Samoa opened with adequate stateside certified teachers and classrooms for all students who had been graduated from junior high school. This was the first time in Samoa's history that more than one-third the qualified students had been accepted.

At the same time, 6-year-olds were taken into the school system for the first time. This greatly increased the number of students in public schools in American Samoa.





Samoaans employed by accelerated public works poured the first concrete in May 1963 in constructing for the educational television consolidated elementary school program at Nua Village on American Samoa's main island of Tutuila.

Engineering studies were completed for 20 new consolidated schools which, when completed, will supply new schools for all the elementary school system. By the end of the fiscal year, the first consolidated school was well underway, materials were en-route for the remainder of the schools, and suitable sites were being negotiated in the various villages. Recruitment was completed for an additional 30 qualified teachers and several educational technicians. Plans were completed for an educational television studio and contracts were let for most of the television equipment.

### **Health Advances**

The Hawaii Medical Association continued to support Samoa's medical program by providing several outstanding surgeons and

other medical doctors. A team of doctors from the University of California at Los Angeles also spent several months starting the filariasis-control program. By year's end, three additional doctors had been recruited and plans were begun for building a new hospital.

## AGRICULTURE TO EXPAND

Due to the lack of trained personnel, little additional progress was made in the field of agriculture. However, by the end of the fiscal year a new director and entomologist and several other employees reported for duty and plans were laid for a greatly expanded agriculture program.

### Legislature Meets

During the late fall and winter months, a tax expert from the U.S. Treasury made a comprehensive study in this territory. This was followed by conferences with the Government, and the Departments of the Interior and Treasury officials in Washington, and a far-reaching tax-reform bill was completed. The legislature was called into special session in early January and the tax-reform bill was presented. In general, the tax-reform measure called for the repeal of oppressive import duties on food, clothing, and other essential items that were responsible for the high cost of living. It also adopted the U.S. income tax as the major revenue-producing tax for the government of American Samoa. The tax measure was opposed by a few businessmen, but the Samoan people wholeheartedly supported it. The reform measure was passed by a 14-1 majority in the senate and a 12-5 majority in the house of representatives. While opponents of the bill had predicted that the cost of foods and other essential items would rise greatly as a result of the tax program, by year's end prices had begun to drop and purposes of the tax-reform measure were beginning to have the desired effect.

## ECONOMIC DEVELOPMENT SPURRED

During the year, lease arrangements were completed with four new industries and all of them were under construction. These included a fish-processing firm, a can company, a coconut processing corporation, and a soft-drink bottling company. The Samoan Development Corporation, while slow in obtaining the necessary capital, finally added over 1,000 Samoan stockholders



Major shareholders signed papers for the Samoan Development Corporation at Legislative Hall in Fagatogo, American Samoa, as Governor H. Rex Lee and Congressman Wayne Aspinall (first row, third and fourth from left) watched.

and a quarter of a million dollars in subscriptions. The corporation was completely organized, an architect was hired, and preliminary plans were made for a hotel.

### **Public Works Undertaken**

With completion of the agreements for the four new industries that were to occupy the old public works compound, it was necessary to build a completely new compound in the airport area. This was completed with money paid by the companies for the original site and was in full operation by the end of the fiscal year. Also during the year the government supported the construction of Federal Aviation Agency facilities at the new airport by providing heavy equipment and personnel. It gave substantial support to a special Federal Government project centering on construction, housing, and related facilities.

## **GUAM BESET BY STORMS**

Fiscal 1963 was a tragic one for Guam, the Nation's westernmost territory, which still struggled to recover from the ravages of enemy occupation and bombardment of World War II.



The island was battered November 11–12, 1962, by Typhoon Karen, with winds of over 235 miles per hour, strongest ever to lash a landmass. Devastation was compared by military men to that from a nuclear bomb without the heat or fallout. Nine persons were killed, public facilities were demolished, and more than 7,000 homes and buildings were destroyed.

Acting Governor Manuel Guerrero launched an ambitious rehabilitation program designated to erase the scars of Karen and to upgrade living standards generally. And then another storm struck.

Typhoon Olive, with winds of over 100 miles an hour, raked the island for almost 48 hours April 28–29, destroying to a great extent all facilities which had been restored after Karen.

Many Federal agencies became closely involved in Guam's recovery program and an extensive loan-grant request was made to Congress for financing long-range redevelopments.

The Office of Emergency Planning allocated about \$14 million for repairs of public facilities and this money was programed for construction of a more permanent nature to withstand future typhoons.

Extensive surveys of Guam's problems by officials of the territorial and Federal Governments after the typhoon developed a firm conclusion that about 80 percent of the island ills could not be blamed on the storms, but have existed for years.

Buildings, homes, and public facilities leveled by bombardment in 1944 had, for the most part, been replaced on a piecemeal, tempo-



Buildings such as this one in Agana are sprouting up all over Guam to replace typhoon destroyed structures.

rary basis, although \$25 million had been spent in capital improvements since the civil government was formed in 1950.

Prewar villages had never been properly replanned and most of the island's housing was substandard.

Guam closed the fiscal year on a note of optimism with a determination to rebuild on modern standards and make the island truly an American community. Many commercial firms were constructing new buildings. Plans for a new high school and other school facilities were being drawn. The Guam Legislature passed several emergency measures regarding the recovery program and was studying several measures for reorganizing some departments, including Medical Services and Education, the latter designed primarily to strengthen the College of Guam, which had just been accredited as a 4-year institution.

Passage of a bill extending urban renewal programs to the island was sought in Congress, and the Housing and Home Finance Agency was preparing to aid in planning redevelopment of villages.

The Small Business Administration, which opened a disaster office in Agana following Typhoon Karen, had approved over \$6 million in disaster loans, chiefly for homes.

The legislature authorized the sale of territorial land below market value to subdividers, and major contractors submitted proposals for large developments to include concrete homes within the price range of Guam residents.

The government was completing an agreement with the Navy for a survey of Apra Harbor in order to relocate the commercial port where facilities can be expanded and an industrial area developed.



This model home in a Guam subdivision is setting the pattern for a vast housing program.

Negotiations also were underway for transfer of Navy land adjoining the naval air station for constructing a badly needed civilian air terminal.

The military announced plans to spend \$70 million on rehabilitation construction and this, coupled with an expected expenditure of over \$60 million by the government and the civilian community, insures a stable economy for Guam for about 5 years. From this should emerge a more substantial community and greatly improved living standards.

But government officials at all levels are turning their attention to development of a firm economy which will not depend solely on construction. This would prevent an economic collapse after the stepped-up construction programs end.

In the past 2 years the island had made strides in redeveloping agriculture, which had become almost a lost art. Despite setbacks from the typhoons, this program is being revitalized by the Government of Guam Department of Agriculture.

The entire community is pushing for development of tourism. An Australian tour ship began calling at Guam each month with visitors who were enthralled by the island's beauty. New motel units were being built and construction of a resort hotel appeared probable.

Extensive experiments were being conducted in the seas around Guam, aimed at development of a fishing industry.

Efforts were being made to encourage establishment of industrial enterprises which could operate in Guam despite the lack of natural resources.

A concerted drive was underway to improve medical services and other governmental operations which would attract investors and developers.

## TRUST TERRITORY OF THE PACIFIC ISLANDS SCHEDULES SCHOOL CONSTRUCTION

A major event of the year was the passage by Congress in July 1962 of an authorization bill setting a new appropriation ceiling of \$17,500,000 for the Trust Territory, with \$15 million authorized for fiscal 1963. A supplemental budget was passed May 17, 1963, bringing the 1963 budget total to the new level. This was an increase of more than 100 percent over the prior year's appropriation. Of the increased appropriation, \$4 million was earmarked



for the accelerated elementary school construction program and \$3,300,000 in other construction.

Jurisdiction of the former Saipan District was transferred from the Secretary of the Navy to the Secretary of the Interior July 1, 1962, thus unifying the entire Trust Territory under civilian administration. This transfer also made possible the amalgamation of the former Saipan and Rota Districts into the Marianas Islands District. Also, Saipan Island was designated the first provisional capital of Micronesia following the move of the Trust Territory Headquarters from Guam to Saipan July 1, 1962. These long-sought events created increased cooperation among the people of the territory and stimulated greater political cohesion.

Transportation service in the territory was improved with the addition of a DC-4 aircraft with 60-passenger capacity and sizable cargo capacity. An additional 3,500-ton vessel (former *North Star II*, renamed *Pacific Islander*) was acquired from the Bureau of Indian Affairs. A new 4,800-foot airstrip was completed in Yap. Construction of another airstrip in Babelthuap, Palau, began.

Security regulations governing entry of U.S. citizens to the Trust Territory were removed, except for those areas still under the control of the Department of Defense, thus stimulating U.S. financial interest in the area.

A major accomplishment of the year was the signing, by the Trust Territory Government and a seafood company of a basic agreement under which the company will establish a commercial fishing industry in the Palau District. The agreement calls for sizable shore installations for freezing tuna as well as training of Micronesians in both ashore and afloat fishery operations. At year's end, an additional branch bank was to be opened on Ponape. A Micronesian Products Center, a nonprofit handicraft outlet sponsored by the Trust Territory Government which was opened in Guam in July 1962, sparked the formation of Palau Woodworkers' Guild and has reactivated various women's organizations in the territory in making handicraft and appreciably increasing handicraft sales.

Exportation of vegetable produce and marine products, especially to Guam, reached a new record.

With the technical assistance provided by the newly created Political Affairs Office on the High Commissioner's staff, political development in the territory received new attention. The Council of Micronesia met twice during fiscal 1963. At its first session, the council adopted an official Trust Territory flag and approved



The Special Session of the Council of Micronesia convened in Saipan, Mariana Islands, in March 1963 to discuss the composition and functions of the proposed Territorial Legislature for the Trust Territory of the Pacific Islands.

a resolution calling for a territorial legislature. At a special session in March 1963, the council recommended creation of a bicameral legislative body. The council's recommendation was taken under consideration by the High Commissioner. The Mariana Islands District Legislature was formed in early 1963. A move to strengthen district congresses was underway.

An accelerated elementary school construction program was fully underway. This calls for the construction of 240 classrooms and the recruitment of 140 elementary school teachers for fiscal 1964. Except for the Yap District, which expects to add a 10th grade to its junior high school program, all Trust Territory districts were scheduled to add the 11th grade to their secondary school program at the start of the 1963-64 school year. District scholarship awards were increased from three to five scholarships for each district.

Recruitment of six American doctors to be stationed in the district hospitals to augment existing medical staff was underway. A poliomyelitis epidemic in the Marshalls affected over 200 persons, mostly children. As a preventive measure, all residents of the territory were being vaccinated with oral vaccine.

Typhoon Olive swept over the Marianas District April 30, 1963, leaving in its wake damage estimated at over \$2 million. The President immediately declared the affected islands a "major disaster area" and Federal financial assistance was requested. By year's end, \$1,300,000 in Federal aid had been authorized for rehabilitation work.

## VIRGIN ISLANDS DEVELOP RAPIDLY

Fiscal 1963 was a year of remarkable progress in the Virgin Islands. A new pay plan for territorial employees was adopted by the legislature, providing better recruitment and holding potential, general salary increases and substantial salaries for teachers, doctors, nurses, and other professional personnel.

The first class of the Virgin Islands College consisted of 46 full-time freshmen and 190 part-time students. The faculty is composed of leading educators. Supporters hope that the college will



Public works crew is shown replacing the roof of Torres Memorial Hospital in Saipan after Typhoon Olive unroofed the hospital buildings.





R. Sargent Shriver, Jr., Director of the United States Peace Corps, is shown dedicating a three-room school building in St. Thomas, Virgin Islands, one of two such buildings constructed by members of the Peace Corps who were in training here for work in Gabon.

bring a new level of educational experience to every island resident and will enhance the cultural level of the entire area.

In elementary and secondary education, dimensions of progress were many and varied. Instructional programs were improved substantially and teacher-pupil ratio was reduced. With employment of a qualified professional staff, it was possible to start the massive tasks of coordinating curriculum development, stepped-up training programs, and improved school administration. The Secondary Commission of the Middle States Association of Secondary Schools and Colleges evaluated the secondary schools of the islands and its report spoke of progress in many areas as well as recommendations for improvement. By year's end, 38 new classrooms had been added, 24 were under construction, and funds were appropriated for 28 additional classrooms in public schools throughout the islands.

Health conditions in the Virgin Islands continued to be excellent. There was an overall improvement in mortality statistics, with new lows being reached in the death rate (9 per thousand population); infant death (29.1); neonatal death rate (20.4); maternal death rate (0); and fetal death rate (35.6). The live birth rate increased from 34.7 to 38.8 per thousand population. Medical and Public

Health services were expanded and improved as a new professional staff was recruited. Extensive remodeling was accomplished at the Charles Harwood Memorial Hospital in St. Croix. Construction of residence quarters for house physicians in St. Thomas started. In St. John, work began on extensive renovation and remodeling of a clinic, and plans were completed for construction of nurses' quarters.

Funds were made available late in the year for remodeling and reassignment of areas in the Knud Hansen Memorial Hospital in St. Thomas to provide badly needed additional medical beds. Funds also were provided for a survey of and planning and designs for completely new hospital facilities in St. Thomas and St. Croix projected to start within 5 years.

In the Department of Social Welfare, the Herbert Grigg Home for the Aged continued to improve and expand its program. Funds were appropriated for an addition to the Queen Louise Home for the Aged in St. Thomas. Plans were prepared by a Swedish architectural specialist for a public housing facility for the aged in St. Thomas.

The Department of Housing and Community Renewal was organized, effectively coordinating all public housing and urban renewal activities in a single cabinet-rank agency. Under the Virgin Islands Housing Authority, the Oswald Harris Court, a 300-unit federally financed public housing development in St. Thomas, was dedicated. Another federally financed public housing project consisting of 264 units in St. Croix to be known as the Ralph de Chabert Place was to be ready for partial occupancy during August 1963.

Four projects totaling 480 units were in the planning stage, one of them being almost ready for advertisement. In locally financed public housing, 8 middle-income homes were completed in St. Thomas and 16 units of emergency housing in St. Croix. At year's end, 88 additional units of emergency housing were under construction and a contract was executed for 50 additional middle income homes. Under the Federal Housing Act of 1961, plans were in preparation for 129 apartment units to be financed by a low-interest Federal mortgage loan.

Tourism, industrial development, and commerce were at a record high. Bank deposits and bank loans reached a new high of \$52 million and \$32 million, respectively. Revenues from tourism increased from \$35 million to \$40 million. Some 319,000 visitors arrived in the Virgin Islands, compared with 291,000 in the previous year. A record of 64,239 cruise-ship passengers visited St. Thomas, an increase of 6,440, while 1,864 cruise-ship passengers



One of the largest and best run charter fleets in the world operates from St. Thomas in the Virgin Islands offering exciting opportunity for sea voyages.



came to St. Croix. The islands' industrial development program was deterred by legislation introduced into the U.S. Congress. Such legislation was designed to eliminate certain advantages accorded to the Virgin Islands under section 301 of the Tariff Act of 1930. Even so, eight new manufacturing industries were established. By year's end the territorial government had taken positive steps to plug loopholes in the operation of such industries so as to maintain the economic stability as well as the commercial relations of the islands.

In the agricultural program of the islands, new crop trials were highly successful with emphasis on market developments, to provide a more diversified agricultural economy. Losses in the sugar-cane industry and the almost certainty of the phasing out of sugar in the next few years caused new emphasis to be placed on agricultural programs.

In the Department of Public Works substantial improvements were made in basic responsibilities of housekeeping. Garbage collection was increased fourfold. One mile of the Centerline Road on St. John was reconstructed and paved as well as several streets on St. Croix and St. Thomas. Designs were completed and construction started on nine school projects, seven road projects, a wharf at Christiansted, St. Croix, and a dredging and bulkhead project in St. Thomas.

Revenues of the territory were at a new high of nearly \$12 million, an increase of nearly 8 percent over fiscal 1962. To meet the ever-increasing cost of new and expanded government operations and the new pay plan, an increase in local gross receipts taxes from 1 percent to 2 percent was passed by the legislature to become effective July 1, 1963. Considerable improvement was made in reorganizing the Tax Division of the Department of Finance to strengthen enforcement and collections.

The Department of Law functioned effectively in drafting legislation, preparing legal opinions, and representing the government in 5,000 matters in the municipal courts, 21 in the district court, and two appeals before the Circuit Court of Appeals for the Third Circuit.

In the Department of Public Safety, a rise in the crime rate due to increasing population has sparked establishment of new methods and techniques and the addition of several new police specialists who should be available early in fiscal 1964. A training program in modern law enforcement techniques was conducted in conjunction with the Cincinnati Police Department.

The Department of Property and Procurement completed an inventory of all government-owned property and full accountability therefor was established.

### **Virgin Islands Corporation Active**

Two far-reaching major policy decisions, affecting both the economy of the Virgin Islands and the future of the Virgin Islands Corporation (VICORP), were reached during the year.

The VICORP Board of Directors, after many meetings and much discussion, decided to phase out the sugar operation in St. Croix by determining that the final grinding season of the sugarmill would be 1966. Meanwhile, 1,700 acres of sugarcane land were put out for public bid with the hope of attracting either a new industry or a new type of agricultural crop. Although all bids were rejected, negotiations were in progress with the most promising of the bidders for long-term lease of the land. Congress turned down a \$4,030,000 request by the VICORP Board to expand power facilities in St. Thomas and St. Croix. They supplemented this action by suggesting that the entire operation be turned over to the local government. A thorough study of this possibility was undertaken by the board.

The combination of a heavier-than-usual rainfall and a higher-than-usual sales price produced a good sugar season and will result in a net profit of approximately \$150,000 (as opposed to a loss in the previous crop of \$433,689) in the sugar operations for the first time in many years. A flat 15-cent wage increase was given over 200 mill-employees at the start of the 1963 season. Grinding started February 6, 1963, and ended June 18, 1963, with 151,199 tons of sugarcane ground, resulting in 15,353 tons of raw sugar.

Both divisions of the Power Department showed substantial profit increases during the year despite 10 to 30 percent wage increases given all power employees. The increase of peakload in St. Thomas continued at a rate of 16 percent while in St. Croix the increase was 12.3 percent. Two new diesel generators were installed, a 3,000-kw. on St. Thomas and a 2,216-kw. on St. Croix. Both operated successfully, but additional generation is badly needed immediately if future power shortages are to be avoided.

The salt water distillation plant, with an average daily output of 325,000 gallons, operated with a minimum of shutdowns. However, the increase of use in St. Thomas still leaves the island with the need for an additional 500,000 gallons per day. For the calendar year 1962, costs were approximately \$2.37 per 1,000 gallons.



Magens Bay at St. Thomas, Virgin Islands, offers a fine white beach and clear blue water for swimming and water sports.

A survey which produced better management for the land and buildings handled by VICORP for the U.S. Navy in St. Thomas was made during the year, and this, coupled with new rental schedules, wiped out the Development Department deficit and created a surplus for future use. This money will be used for renovating the low-rent housing project at Bourne Field. Plans which would transfer all Navy land on St. Thomas to VICORP for commercial development were underway.

The water and soil conservation program was transferred to the local government. The forestry program was turned over to the U.S. Forest Service. The lumber and fencepost program were leased temporarily to private interests. VICORP contemplates discontinuing the cattle program.



**Comptroller's Office Increases Audits**

The Office of the Government Comptroller of the Virgin Islands is a Federal agency under the general supervision of the Secretary of the Interior. It is responsible for auditing the income and expenditures of the Territorial Government of the Virgin Islands.

As a result of increased use of limited audits during fiscal 1963, this office submitted 29 reports of audit, 16 more than during the preceding fiscal year. Several of these pointed out deficiencies in the handling of receivables by the Government of the Virgin Islands, which in turn should result in increased recoveries by the local government.

In addition, as required by law, the certification of the net amount of government revenues which form the basis for Federal grants for the civil government of the Virgin Islands, for the fiscal year 1962, was submitted to the Secretary of the Interior, and the annual report of the fiscal condition of the Government of the Virgin Islands was submitted to the Governor, the Comptroller General of the United States, and the Secretary of the Interior.



# The Alaska Railroad

John E. Manley,  
General Manager

Net income for The Alaska Railroad in fiscal 1963 was \$285,406.48, an increase of \$32,306.07 over the previous fiscal year. During the year the railroad had total revenues of \$14,893,839.09 and expenses of \$14,608,432.61. The expenses included \$2,154,729.43 in depreciation charges.

The railroad carried 1,449,133 revenue tons of freight in fiscal 1963, an increase of 1,137 tons over 1962. Passenger traffic declined, revenue passengers totaling 63,682, compared with 67,417 in fiscal 1962. Revenue per passenger increased, however, with the result that total passenger revenues for the year were approximately \$14,000 higher than in 1962.

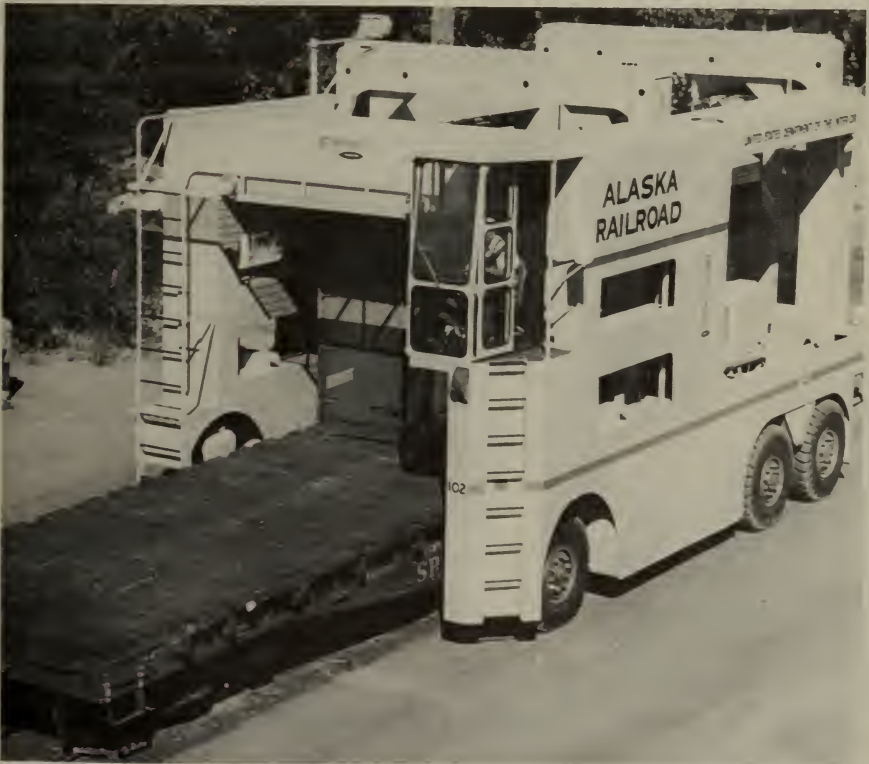
A program to improve operating methods continued. Track maintenance was accelerated through use of an electromatic tamper. This machine, with a 4- or 5-man team, is capable of performing work that with older machines required 20-man teams. Four other machines, each capable of extracting and inserting ties, were placed in service. Assigned in pairs, one machine extracting and the other inserting ties with 15-man gangs, work now is accomplished that formerly required 40-man gangs.

Protection against service interruptions was provided by installing an air dryer that pressurizes communications cables.

To cut the cost of delivering bulk grain to feed-mixing plants in the Matanuska Valley, a tilt hoist was acquired for use with self-dumping containers. Movement of freight in containers over the Seward Dock was accelerated by using "straddle trucks" or van carriers. Further improvements in freight handling will be pos-



Placed in service during May 1963, this 2,250 horsepower diesel locomotive replaced another severely damaged by a snow slide in November 1961.



Movements of freight containers away from shipside are made rapidly with specially-designed straddle trucks.



sible when three modified revolving gantry cranes are installed on the dock.

A 2,250-horsepower diesel-electric locomotive was placed in service in May 1963. It replaces a locomotive damaged beyond economical repair in a snowslide during November 1961, but it also marked the beginning of a program to "phase out" old, obsolete locomotives acquired from surplus after World War II. Purchase of a similar locomotive during fiscal year 1964 has been approved.

With the signing of Executive Order 11107 by the President April 23, 1963, The Alaska Railroad was placed under Interstate Commerce Commission regulation for purposes of ratemaking. Thus, independent review of the reasonableness of railroad tariffs may be obtained should questions arise concerning rate applications.

Office of the  
Assistant Secretary  
Water and Power  
Development

Kenneth Holum, Assistant Secretary







# Office of the Assistant Secretary Water and Power Development

Kenneth Holum, Assistant Secretary

The Assistant Secretary for Water and Power Development acts for the Secretary in implementing the Department's water and power programs. He exercises secretarial direction over five bureaus—the Bureau of Reclamation, Bonneville Power Administration, Southeastern Power Administration, Southwestern Power Administration, and the Office of Saline Water.

The Bureau of Reclamation is the oldest and largest of these agencies. It constructs water-use projects primarily for the reclamation of arid and semiarid lands in the West and, excluding the Bonneville Power Administration's area, markets electric power in the 17 Western States from projects built by itself, the International Boundary and Water Commission, and the Corps of Engineers.

The Bonneville, Southeastern, and Southwestern Power Administrations have a single function—the marketing of power. Along with the Bureau of Reclamation, they sell all electric power generated by Federal water-resource development projects and facilities.

Toward the end of fiscal 1963, Bonneville's operations were extended by Secretary Udall to southern Idaho, so that Bonneville's marketing area now includes all of Idaho, Washington, and Oregon, plus that part of Montana west of the Continental Divide. Southeastern sells power in Southeast States. Southwestern sells in the Central Southwest States.

The Bureau of Reclamation, Bonneville and Southwestern Power

Sailboating is one of many water sports enjoyed by visitors to Colter Bay, Bureau of Reclamation reservoir on the Minidoka Project, on Wyoming's Snake River in the shadow of the Grand Teton Mountains.

Administrations operate extensive high-voltage transmission systems. Activity continued through the year toward the Department's goal of interconnecting certain Federal systems, including a high-voltage intertie between the Pacific Northwest and Pacific Southwest and an interconnection between the Southwestern Power Administration and the Bureau of Reclamation. Bonneville continued its experiments with direct-current, high-voltage transmission, expected to provide much greater efficiency over long distances than the alternating-current transmission now used in this country.

Power is marketed under the following set of principles established by Congress and by policy :

1. Preference in power sales shall be given public agencies and cooperatives.
2. Domestic and rural consumers shall have priority over other consumers in the disposal of power.
3. Power shall be sold at the lowest possible rates consistent with sound business principles.
4. Power disposal shall be such as to encourage widespread use to prevent monopolization.

The Department's search for low-cost methods of producing acceptable fresh water from sea water, or from other saline waters, moved to the threshold of economically practical utilization during the year. A preliminary feasibility study by the Office of Saline Water of a sea-water conversion plant for the lower Florida Keys indicated a product water cost of 65 to 70 cents per 1,000 gallons, compared with \$1 to \$1.05 per 1,000 gallons for water supplied by a new pipeline of equal capacity. Based on this apparent competitive advantage of the potential desalting plant, the Department started detailed engineering and financial feasibility studies leading toward construction of such a plant.

The Office of Saline Water continued to expand and accelerate its basic and applied research. A brackish-water conversion demonstration plant, with a capacity of 1 million gallons a day, began operating at Roswell, N. Mex., and a contract was awarded for constructing a freezing-process conversion plant, with a capacity of 200,000 gallons a day, at Wrightsville Beach, N.C. A Research and Development Test Station was completed at Wrightsville Beach for the experimental operation of new or improved processes at the pilot-plant level.

Certain defense functions regarding electric power have been delegated to the Department. These are discharged by the Assist-

ant Secretary for Water and Power Development through his direction of the Defense Electric Power Administration. Under this program, a field organization stands ready to handle specific

## MAJOR CONSTRUCTION CONTRACTS

FISCAL YEAR 1963



power problems in case of enemy attack. The Defense Electric Power Administration consists of 16 power areas in the continental United States and 3 others—Alaska, Hawaii, and Puerto Rico-Virgin Islands—each headed by a director with a deputy and alternate deputy, all serving on an unpaid basis. Power liaison personnel have been appointed to each of the Office of



Emergency Planning-Office of Civil Defense regional offices. There also is a liaison man in every utility in the nation, public and private, and in most of the local civil defense offices.

During the year, the Office of the Assistant Secretary for Water and Power reviewed 67 reports of the Corps of Engineers, Department of the Army, primarily for flood-control and navigation improvements; 45 Federal Power Commission applications for permits and licenses to build hydroelectric projects; and 61 Department of Agriculture watershed work plans.

*Power production and marketing data, fiscal year ended June 30, 1963*

Marketing agent	Installed capacity as of June 30, 1963 (kilowatts)	Net energy generated (million kilowatt-hours)	Energy marketed (million kilowatt-hours)	Gross revenue (thousands of dollars)	Percent of power marketed to preference customers
Bureau of Reclamation.....	16,984,985	29,117	216,178	362,291	485.9
Bonneville Power Administration.....	4,237,000	19,838	30,183	79,536	742.4
Southwestern Power Administration.....	791,000	1,417	1,747	17,605	64.6
Southeastern Power Administration.....	1,612,000	3,939	3,898	22,559	46.8
Total.....	13,624,985	54,311	52,006	181,991	

<sup>1</sup> Of this total, 5,373,450 kilowatts in Bureau of Reclamation plants; 1,580,035 kilowatts in Corps of Engineers plants; and 31,500 kilowatts in the International Boundary Water Commission plant.

<sup>2</sup> Excludes 11,987,000 kilowatt-hours delivered at Grand Coulee, Hungry Horse, Chandler, and Roza powerplants by Bureau of Reclamation to Bonneville Power Administration.

<sup>3</sup> Excludes \$12,095,000 in revenue received by Bureau of Reclamation from Bonneville Power Administration.

<sup>4</sup> Excludes energy delivered to Bonneville Power Administration.

<sup>5</sup> Excludes capacity from Bureau of Reclamation powerplants from which Bonneville Power Administration markets power. This capacity totals 2,252,250 kilowatts at Grand Coulee, Hungry Horse, Chandler, and Roza powerplants.

<sup>6</sup> Does not include generation at Bureau of Reclamation projects.

<sup>7</sup> Excludes deliveries to Federal agencies.

<sup>8</sup> Capacity in Corps of Engineers projects.

<sup>9</sup> In addition, 43.3 percent of the total energy was marketed to the Tennessee Valley Authority.



## Bureau of Reclamation

Floyd E. Dominy,  
Commissioner

In New Mexico, a little Navajo girl, who had never seen a large body of water, happily frolicked away the hot summer afternoons by a cool lake created in the desert. In Arizona, a young boy, fishing in the Colorado River below the nearly completed Glen Canyon Dam, experienced the great thrill of catching his first trout. In Moline, Ill., a father found employment in a factory making earth-moving machinery. A family in a suburb of Phoenix, Ariz., had ample water for drinking, washing, and other household uses in a new home on a plot of ground that was formerly uninhabitable desert. A trucker in California bought several new vehicles for his fleet to carry produce to market. A general store and a cafe were opened near the site of Yellowtail Dam to serve construction workers on the big Reclamation job. Youngsters in Chicago got their vitamin C during the sunless winter months from oranges and other citrus fruits grown in the Pacific Southwest. And a farmer in far-off Afghanistan had his first good wheat crop in several years because his land was properly irrigated.

All these events, matched by countless similar ones, resulted from Bureau of Reclamation activities during fiscal 1963.

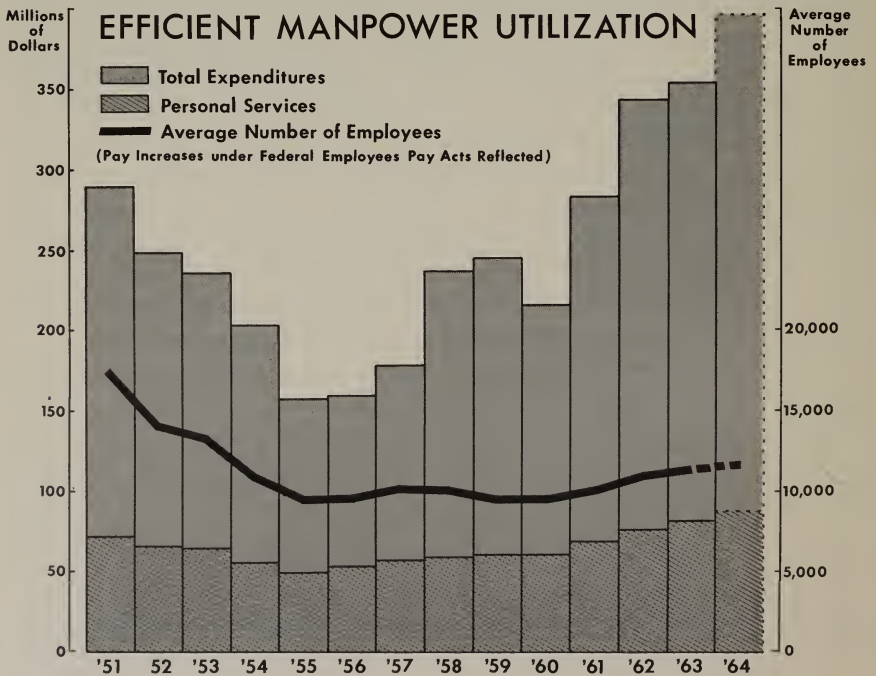
The same activities are also responsible for many things that will happen in the future—the delight of thousands of tourists who will have the opportunity to view Rainbow Bridge above Glen Canyon Dam and engage in camping and water sports along the 186-mile-long Glen Canyon Reservoir, the growing of better pineapples on the island of Molokai in Hawaii, the generation of reasonably priced electric energy for further industrial development of the Missouri River Basin and the Upper Colorado River Basin, the settlement of towns in presently arid localities which have had

no assured municipal water supply, and many other results that occur when the priceless resource of water is controlled and put to beneficial use by map.

## NEW PRODUCTIVITY RECORD SET

In carrying out its 1963 program, the Bureau of Reclamation set a new record in achievement. Both in construction accomplished and in efficient utilization of manpower, the Bureau reached a pinnacle of performance never before attained in its 61-year history. Work completed reached 88 percent of the scheduled financed program, topping the previous high of 87 percent effected in 1962. The 1963 record came gratifyingly close to Reclamation's ultimate goal of 90 percent production.

More than \$360 million were converted into useful Reclamation works and services, compared to \$347 million in fiscal 1962. This 1963 work record was accomplished with an average of 11,402 Reclamation employees, a modest increase of 426 over the 10,976 of 1962. The slight increase in agency personnel was more than offset by the greater production of 1963, plus the services rendered on the authorized unscheduled work.





The 1963 employment figure represents 65.3 percent of the peak employment of 1951, when an average of 17,455 persons completed work valued at only \$289.6 million. In other words, 11 years ago the Bureau accomplished work at the rate of \$16,591 per man-year, while in 1963 the rate was \$31,230 per man-year. In 1955, the lowest postwar year in dollar volume of work produced, 9,712 employees did work valued at \$157.9 million, at the rate of \$16,260 per man-year. Since then, Reclamation's productivity has much more than doubled, measured in current dollars, while its employment has increased only 17 percent.

The sum of over \$360 million invested during fiscal 1963 covered all expenditures financed from Federal and non-Federal funds, including Federal funds transferred to other Government agencies, as provided in the Appropriations Act. Of the total, some \$350 million represented work performed by the Bureau on its own program scheduled in the amount of \$412.4 million, but financed to the extent of \$399.3 million. It excluded expenditures from permanent appropriations, as well as other authorized work by Bureau forces adding up to about \$5 million, and expenditures of approximately \$5 million incurred by other agencies from transferred funds.

### **Many Construction Highlights**

The major role of the Bureau of Reclamation in developing water resources of western United States during fiscal 1963 is evident from a summary of construction accomplishments. The agency completed irrigation facilities to serve 362,665 acres of land (in crop year 1962) and installed 80,500 kilowatts of hydroelectric generating capacity. Construction was completed on six storage dams having a combined capacity of 2,402,000 acre-feet; six diversion dams; 469 miles of canals, pipelines, laterals and drains; and 1,079 miles of high-voltage transmission lines.

The investment of about \$135 million represented by 305 construction contracts completed for these and other Reclamation features brought the Bureau's total investment in project facilities to nearly \$4 billion.

Awarded during the year were 942 construction, material, equipment, and supply contracts, valued at about \$209 million. Contracts solely for construction were about \$189 million, or about 90 percent. The 158 contracts for construction work in progress at the end of fiscal 1963 represented a total value of approximately \$548 million.

Construction costs on Bureau of Reclamation projects increased about 1 percent during the year. For the same period, construction wage rates increased about 4 percent. Most construction material costs remained quite stable.

Bidding interest in Reclamation construction work averaged 7.1 bids per schedule, the highest since fiscal year 1960. This compared with an overall average of 6.4 bids per schedule for the past 10 years.

The total of all low bids received for construction schedules was about 97½ percent of the total for the engineers' estimates, with the average of the three low bids for each schedule about 102 percent of the engineers' estimates.

Unparalleled in any period of Reclamation construction history was the number of dams under construction—21—and the number completed—6. Of the 21 dams, 5 were being built in Utah, 4 in California, 3 in Colorado, 2 each in Kansas and Montana, and 1 each in Arizona, Texas, Nebraska, Oklahoma, and Wyoming. Two of the completed structures are in California, and one each in Oregon, New Mexico, Colorado, and Texas.

A significant event of 1963 was the award of a contract for construction, starting early next fiscal year, on the first of three sections of high-voltage transmission lines that will carry electricity to be generated at new powerplants in the Missouri River and Colorado River Basins. The lines will also interconnect the Federal transmission systems of the eastern and western divisions of the Missouri River Basin Project with the Colorado River Storage Project and the Parker-Davis Project on the lower Colorado River. The lines, which will total more than 500 miles, will extend from Oahe Dam and Powerplant on the Missouri River in South Dakota to a substation of the Colorado River Storage Project transmission system in western Colorado, interconnecting Federal power facilities from Montana to Arizona, from California to Minnesota.

### **San Luis Unit of Central Valley Project Starts**

Another highlight of 1963 was the start of major construction on the Central Valley Project's San Luis Unit, a unique Federal-State arrangement for joint use of the most feasible site for large-scale water storage on the western side of the San Joaquin Valley. Construction will provide facilities for storing a million acre-feet of water to irrigate project lands on the west side of the San Joaquin Valley, and an additional 1,100,000 acre-feet of water for use by the State of California.

The \$85,926,608 contract for the three major features of the San Luis Unit is the second largest single contract awarded in Reclamation history, exceeded only by the \$107,955,522 contract for construction of the Glen Canyon Dam and Powerplant in June, 1962.

One of the outstanding construction events of the Reclamation program during 1963 was start of work in February on San Luis Dam, which will be the world's third largest earthfill dam. A 78-million-cubic-yard, 3½-mile structure, it will be a major feature

President John F. Kennedy and California Governor Edmund G. Brown press the plungers to detonate two explosive charges and thus break ground for the joint Federal-State San Luis Unit near Los Banos, California in mid-August 1962.





of the San Luis Unit. Also started under the contract was construction of the San Luis Pumping-Generating Plant and the San Luis Forebay Dam, a 3-million-cubic-yard, 2½-mile earthfill structure. The pumping-generating plant will be capable of lifting water 320 feet from the forebay and discharging it into the main reservoir at the rate of 11,000 cubic feet per second, and will have a generating capacity of 380,000 kilowatts when used to produce power from water releases.

Importance of the San Luis Unit to water-resource development in the West was emphasized by the participation of President Kennedy in the groundbreaking ceremonies at the damsite August 17, 1962. That month President Kennedy also demonstrated

Tourists watch water cascading down the spillway of Shasta Dam on the Sacramento River in California as the Central Valley Project dam spills over for the first time in 5 years.



his interest in Reclamation by visiting the area in which the \$170 million Fryingpan-Arkansas Reclamation project will be located in Colorado. During the 2-day aerial trip to the West, the President attended power-delivery ceremonies at the Oahe Powerplant on the Missouri River near Pierre, S. Dak.

Late in the year, construction started on the first 16 miles of the giant 103-mile San Luis Canal, a river-size waterway (bottom width 110 feet, top width 260 feet, depth 37 feet, capacity 13,000 cubic feet per second) which will convey vitally needed irrigation and municipal water to the San Joaquin Valley and southern California area.

Elsewhere on the Central Valley Project, construction proceeded according to schedule on major features of the project's Trinity River Division, with several powerplants and dams, as well as the Trinity River fish hatchery at Lewiston Dam, completed. The earthfill Lewiston Dam (height 80 feet, volume 429,000 cubic yards) was completed in May 1963; the same month saw the start of storage in the 253,200-acre-foot reservoir behind the earthfill Whiskeytown Dam (270 feet high, volume 4,463,000 cubic yards), and installation of outlet gates and controls.

Additions to the 230-kilovolt switchyard at Keswick Powerplant to tie in the three Trinity River Division powerplants were completed in November 1962, and the 26-mile-long, 230-kilovolt transmission line connecting the three powerplants with the Keswick Switchyard was put into operation the following month. Also completed in December was the 22-mile-long section of the 230-kilovolt Keswick-Gas Point Road-Cottonwood Transmission Line. At year's end, construction reached the 90-percent point on the Gas Point Road-Elverta, Elverta-Hedge, and Hedge-Tracy 230-kilovolt transmission lines, totaling 222 miles in length.

In the American River, Sacramento, and Friant Divisions of the Central Valley Project, numerous construction projects were finished during the year.

All this development contributed to the increased benefits accruing to California and the Nation from the 25-year-old Central Valley Project, one of the most extensive water conservation systems in the world—a vast complex of dams, reservoirs, hydroelectric powerplants, canals, transmission lines, and other features extending from the Trinity River watershed and Shasta Dam in northern California across more than two-thirds the length of the State—nearly 500 miles—to Bakersfield at the southern end of the San Joaquin Valley.

### **Washoe Project Dam Completed**

Progress on the Washoe Project, California-Nevada, was marked by completion of the Prosser Creek Dam in December 1962. This is an earthfill structure 157 feet high with a volume of 1,738,000 cubic yards. Its reservoir will have a capacity of 29,900 acre-feet.

### **Colorado River Storage Project Feature Completed**

The first principal storage feature of the Colorado River Storage Project was completed in 1963, Navajo Dam on the San Juan River in New Mexico, a 408-foot-high earthfill structure having a volume of 26,250,000 cubic yards. Relocation of the Denver & Rio Grande Western Railroad around the 1,709,000-acre-foot reservoir behind the dam was accomplished in September 1962, setting the stage for a recreation area which will bring pleasure to thousands of visitors and income to the Navajo Indians and other local residents.

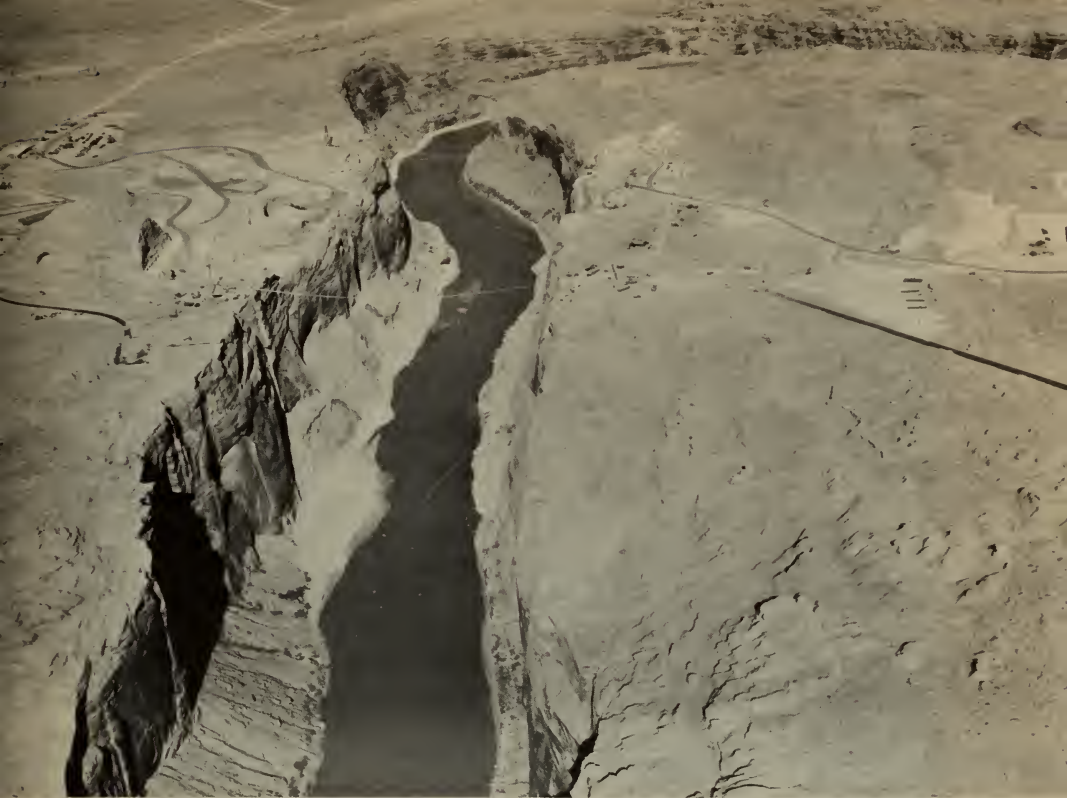
A major milestone in developing the Colorado River Storage Project was the "toppin out" of Flaming Gorge Dam on the Green River in Utah. A thin-arch concrete structure, it is 502 feet high. Storage of water in the 3,789,000-acre-foot reservoir began in November 1962, and by the end of the fiscal year more than 350,000 acre-feet of water had been impounded. Also at year's end, work on the 108,000-kilowatt Flaming Gorge Powerplant had progressed to the extent that two of the plant's three turbines had been installed and the first of the three 36,000-kilowatt generators was ready for testing.

In March 1963 Lake Powell, the 28,040,000-acre-foot reservoir behind Glen Canyon Dam on the Colorado River in northern Arizona, was beginning to fill. By the end of June more than 2 million acre-feet of water had been impounded in what will be the second largest manmade lake in the United States.

The principal storage feature of the Colorado River Storage Project, concrete-arch Glen Canyon Dam, is to be "topped out" to its full height of 710 feet early in the next fiscal year. At the end of June 1963, the concrete placement had reached close to its total volume of nearly 5 million cubic yards. Construction continued on the 900,000-kilowatt Glen Canyon Powerplant, Switchyard, and appurtenant works, as well as on the dam itself.

Another of the Colorado River Storage Project's initial four storage units, the Curecanti Unit in western Colorado, was the scene of considerable activity in 1963. Blue Mesa Dam and Powerplant, first major features to be undertaken on the unit, were





Beginning of work at Glen Canyon damsite, Arizona, in November 1957 can be seen in the above upstream view of the Colorado River. The aerial view of the damsite below in May 1963 shows the dam, powerplant and other works close to completion. Nearly 2 million acre-feet of water have been stored as Lake Powell starts to fill behind the dam.



about 40 percent completed by the end of the fiscal year, comfortably ahead of schedule. The earthfill dam will be 340 feet high, with a volume of 3 million cubic yards, and the powerplant will house two 30,000-kilowatt generating units.

Work started in May on the Morrow Point Dam and Powerplant, landmark structures in the application of modern concepts and design by the Bureau of Reclamation. They incorporate three "firsts" for the Bureau: a thin-arch, doubled curvature concrete dam, only 12 feet thick at the top and 52 feet thick at the base; a free-fall, orifice-type spillway, which will allow water to fall from four openings in the top central part of the dam to a stilling pool more than 350 feet below; and the location of the 120,000-kilowatt powerplant underground in an arched-roof cavern in the canyon wall, rather than at the toe of the dam.

Further progress on the Colorado River Storage Project was noted during the year by considerable advancement of the project's Transmission Division which embraces more than a thousand miles of high-voltage transmission lines to be interconnected in an extensive power grid, transmitting power from the project's powerplants to farflung areas throughout the Upper Colorado River Basin States.

Construction of the participating projects of the Colorado River Storage Project was highlighted by completion in October 1962 of the 160-foot-high, 855,000-cubic-yard, earthfill Crawford Dam on the Smith Fork Project, followed by completion in December, 1962 of the Smith Fork Diversion Dam, Feeder Canal, Aspen Canal, and Clipper Canal.

Material progress was made on four other participating projects of the storage project—Florida in Colorado, Seedskaelee in Wyoming, Hammond in New Mexico, and Central Utah in Utah. And in June 1963, groundbreaking ceremonies were held at Price, Utah, signaling beginning of construction on Joes Valley Dam, the first major feature to be undertaken on an additional participating feature, the Emery County Project. The earthfill dam will be about 195 feet high and have a volume of 1,200,000 cubic yards.

Irrigation water was delivered on Paonia and Smith Fork, the Vernal Unit of Central Utah, and Hammond projects.

In western Colorado, the Bonham and Cottonwood pipelines on the Collbran Project were completed in October 1962, thus providing water for testing and operation of the Upper Molina Powerplant (8,640 kilowatts) and Lower Molina Powerplant (4,860 kilowatts). Both plants were placed in commercial operation





This aerial view shows the Bureau of Reclamation's newly constructed service canal carrying supplemental irrigation water from Steinaker Dam to fertile farmlands of the Vernal Unit, Central Utah Project.

December 15, 1962. Also completed on the project were the East Fork Diversion Dam, East Fork Feeder Canal, and the rehabilitation of the Bonham Dam.

### **Pacific Northwest Work Advances**

Reclamation construction in the Pacific Northwest advanced with completion during the fiscal year of all work on the river and booster pumping plants, the 2.4-mile discharge pipeline, reservoirs, relift pumping plants, and lateral system for the East Unit, Greater Wenatchee Division of the Chief Joseph Dam Project in Washington. On the Howard Flat Unit, similar work on a smaller scale was essentially completed, and some minor work was in progress at year's end on the Brays Landing Unit.



On the Columbia Basin Project, also in the State of Washington, extension of irrigation facilities brought to a total 458,000 acres available for irrigation.

Construction on the Vale Project in Oregon was distinguished by completion in one-half the allotted contract time of Bully Creek Dam and Feeder Canal. This resulted in storage for irrigation and in material flood control benefits 1 year earlier than would have been the case had the full performance period been utilized. Bully Creek Dam is an earthfill structure 104 feet high and has a volume of 1,025,000 cubic yards.

Construction of the Mill Creek Pumping Plant, discharge line, and regulating reservoir A on The Dalles Project began in December 1962 and had reached about 60 percent completion by the end of June 1963—in 26 percent of the allotted contract time.

### **Utah Construction Progresses**

Accelerated construction also marked progress at the Willard Dam on Weber Basin Project in Utah. The second-stage construction completed in August 1962, the third and final stage of building the earthfill dam started immediately. By June 1963, the contract was about 60 percent completed in 39 percent of the scheduled time. The dam will have a total volume of 13 million cubic yards and will be more than 14 miles long.

A section of Willard Canal, Willard Pumping Plants Nos. 1 and 2, and the intake channel were completed in June 1963, and considerable additional progress was accomplished on other structures of the Weber Basin Project water system. Work on the Causey Dam, about 30 percent completed by the end of the fiscal year, had been concentrated on excavation and placing of concrete lining for the outlet works tunnel in preparation for diversion expected in July 1963. This dam will be an earthfill structure 200 feet high and will have a volume of 1,400,000 cubic yards. The project's Ogden Valley Diversion Dam was started in December 1962 and was about 15 percent completed by the end of June 1963.

### **Texas Dam Completed**

An auspicious construction event in Texas was the completion in February 1963 of the 134-foot-high, 21-million-cubic-yard, earthfill Twin Buttes Dam on the San Angelo Project. Also completed were the San Angelo Main Canal and San Angelo Distribution System.

Additional progress of Reclamation development in Texas was evident in November 1962, when the flow of the Canadian River was diverted into its prepared channel at the site of earthfill San-

ford Dam on the Canadian River Project, thus releasing all the remaining flood-plain area for foundation work. By the end of June 1963, more than 6 million cubic yards of the 228-foot-high, 14,800,000-cubic-yard embankment had been placed, concrete lining of the river outlet works tunnel was about half completed, and some concrete had been placed in the flood-control outlet works. By the end of the fiscal year, work on the dam was about 40 percent completed.

Another "new start" in the Reclamation program was made when construction began on the first 56 miles of what will be, by far, the Bureau's longest aqueduct. Three hundred and twenty-two miles long, the main aqueduct of the Canadian River Project will carry water for municipal and industrial use from Sanford Dam to 11 cities in northwest Texas, underscoring a phase of Reclamation which becomes increasingly important year by year through rapid urbanization of the West.

### **Norman Dam Starts in Oklahoma**

In Oklahoma, on the Washita Basin Project, construction of Foss Pumping Plants Nos. 1, 2, and 3 was completed in November 1962. In the same State, construction of Norman Dam on the Norman Project began in August 1962, and was about 25 percent completed by the end of June 1963. The earthfill dam will be 101 feet high and will have a volume of 2,673,000 cubic yards. Construction of 29 miles of pipelines to deliver municipal and industrial water from Norman Dam to three communities adjacent to Oklahoma City was started late in the fiscal year.

### **Missouri Basin Jobs Underway**

On the Missouri River Basin Project in Montana, work began on Yellowtail Dam. The Bighorn River, which the dam will control, was diverted around the site in January. On March 15, the first concrete was placed for what will be a 520-foot-high, 1,460,000-cubic-yard dam. The contract for construction of the arch dam and the 250,000-kilowatt Yellowtail Powerplant was about 35 percent completed at the end of the fiscal year.

On the East Bench Unit of the Missouri River Basin Project, also in Montana, construction of the 158-foot-high, 1,845,000-cubic-yard, earthfill Clark Canyon Dam advanced following diversion of the river through the partly completed outlet works in February 1963. By the end of June, about 40 percent of the embankment was in place. The unit's Barretts Diversion Dam was completed in January 1963, and construction of the first section of the East Bench Canal and Laterals was about 95 percent com-





Yellowtail Dam begins to rise from the floor of the Bighorn Canyon in southeastern Montana. At the end of the fiscal year the average height of the structure was about 65 feet; when completed it will be 520 feet high.



pleted by the end of June. The second section of East Bench Canal and Laterals reached about 65 percent completion by the end of the fiscal year, and the third section was started in April 1963.

On the Frenchman-Cambridge Division of the Missouri River Basin Project in Nebraska, the Red Willow Creek Diversion Dam and Red Willow Canal settling basin were completed in March, and the first section of the Red Willow Canal and Lateral System was completed 2 months later. Construction of the second section started in May 1963.

On the Farwell Unit, the Sherman Feeder Canal was substantially completed in November 1962, at which time the first water from the Arcadia Diversion Dam was fed through the canal to begin filling Sherman Reservoir. The first section of the Farwell Main Canal and Farwell Central Canal and Laterals was completed in April 1963, and work continued on other sections of canals and laterals on the unit.

TABLE 1.—Major Bureau of Reclamation contracts awarded in fiscal year 1963

Feature	Project	Amount of award
San Luis Dam and Pumping-Generating Plant and Forebay Dam.	Central Valley .....	\$85, 926, 608
16 miles of San Luis Canal.....	do.....	16, 493, 785
Morrow Point Dam and Powerplant.....	Colorado River Storage.....	15, 436, 066
56 miles of main aqueduct.....	Canadian River.....	11, 927, 550
Norton Dam.....	Missouri River Basin.....	5, 579, 026
Constructing foundations and furnishing and erecting steel towers for 146 miles of Fort Thompson-Sioux Falls 230-kv transmission line.	do.....	4, 253, 200
Joes Valley Dam.....	Emery County.....	3, 562, 260
8 pump-turbines for San Luis Pumping-Generating Plant.	Central Valley.....	3, 221, 813
8.16 miles of Willard Canal.....	Weber Basin.....	3, 173, 328
29 miles of Norman, Midwest City, and Del City pipelines.	Norman.....	2, 759, 547
Multichannel microwave radio system.....	Colorado River Storage.....	2, 278, 364
Lost Creek Dam.....	Weber Basin.....	2, 053, 000
6 pumps for Mile 18 Pumping Plant.....	Central Valley.....	1, 950, 000
13.6 miles of Farwell South Canal and 38 miles of laterals.	Missouri River Basin.....	1, 931, 466
37 miles of East Bench Canal and laterals.....	do.....	1, 731, 365
14 miles of Ainsworth Canal Section 3.....	do.....	1, 702, 428
61 miles of Archer-Stegall 230-kv transmission line.....	do.....	1, 702, 384
Hayden Substation.....	Colorado River Storage.....	1, 571, 000
Stringing conductors and overhead ground wires for 160 miles of Dawson County-Custer Section of Yellowtail-Dawson County 230-kv transmission line.	Missouri River Basin.....	1, 534, 920
64 miles of Ainsworth Laterals Section 1, wasteways and 5 miles of drains.	do.....	1, 519, 426
Fontenelle Powerplant and Switchyard.....	Seedskaadee.....	1, 335, 677
34.8 miles of Eltopia Branch Canal and Block 17 laterals, wasteways, and drain.	Columbia Basin.....	1, 292, 259
16 miles of pipelines, and reservoirs and pumping plants for Brays Landing Unit Lateral System.	Chief Joseph Dam.....	1, 252, 244
43 miles of Farwell Central Canal, laterals, wasteway, and drains.	Missouri River Basin.....	1, 195, 033
Curecanti Substation, Stage 01.....	Colorado River Storage.....	1, 164, 000
30.5 miles of Red Willow Canal, laterals and drains.....	Missouri River Basin.....	1, 144, 566
4 hydraulic turbines for Yellowtail Powerplant.....	do.....	1, 138, 900
9 345-kv power transformers for Glen Cayon Powerplant.	Colorado River Storage.....	1, 093, 790

Construction of Merritt Dam on the Ainsworth Unit in Nebraska was about 70 percent complete by the end of June 1963. This earthfill structure will be 140 feet high and contain 1,500,000 cubic yards.

Norton Dam on the Almena Unit in Kansas was started in October 1962 and the work was about 15 percent complete by the end of June 1963. The earthfill dam will have a height of 167 feet and a volume of about 3,600,000 cubic yards.

On the project's Cedar Bluff Unit, construction of the third and final section of the Cedar Bluff Canal and Cedar Bluff Laterals was essentially completed by year's end; completed portions were placed in service immediately to assist in alleviating extreme drought conditions in the area.

Considerable progress was made during the year in construction of high-voltage transmission lines, substations, and related electrical facilities of the Transmission Division of the Missouri River Basin Project. Nearly 750 miles of newly strung wires were carrying electric energy to basin customers by year's end, and construction of more than 200 miles of additional major lines had started.

TABLE 2.—Principal features completed on Bureau of Reclamation projects in fiscal year 1963

Feature	Project	State
River and Booster Pumping Plants for East Unit, Greater Wenatchee Division Distribution System.	Chief Joseph Dam...	Washington.
Earthwork, pipelines, and structures including 3 pumping plants and 2 regulating reservoirs for Laterals 1 through 10 and sublaterals for the East Unit Distribution System.	...do.....	Do.
Earthwork, pipelines, storage reservoir, Relift and North and South Booster Pumping Plants, discharge line and sublaterals for Howard Flat Unit.	...do.....	Do.
Earthwork and structures for Block 23 laterals and wasteways, Wahluke Branch Canal laterals.	Columbia Basin.....	Do.
Bully Creek Dam and Feeder Canal.....	Vale.....	Oregon.
Earthwork, pipelines, and structures, and 3 reservoirs for El Dorado Main and laterals.	Central Valley.....	California.
Earthwork, pipeline, structures, and 6 reservoirs for Diamond Springs Main, Feeder Line, and laterals for El Dorado Distribution System	...do.....	Do.
Earthwork, pipelines, and structures for El Dorado Main and laterals, and laterals for Diamond Springs Main, El Dorado Distribution System.	...do.....	Do.
Earthwork, structures, and concrete pipelines for Madera Distribution System Part 3 extension.	...do.....	Do.
Spring Creek power conduit, Tunnels Nos. 1 and 2 and Rock Creek siphon.	...do.....	Do.
Construction of Spring Creek Powerplant (structure).....	...do.....	Do.
Construction of Lewiston Dam.....	...do.....	Do.
Earthwork, structures, and surfacing for Trinity County Road, Trinity Dam to Buckeye Creek.	...do.....	Do.
Construction of 26 miles of Trinity-Clear Creek, Clear Creek-Keswick, and Spring Creek-Keswick 230-kv transmission line.	...do.....	Do.
Construction of 22 miles of Keswick-Gas Point Road-Cottonwood 230-kv transmission line.	...do.....	Do.
Clearing 3,240 acres of Whiskeytown Reservoir site.....	...do.....	Do.
Construction of Clear Creek Powerplant (structure).....	...do.....	Do.
Earthwork, structures, and surfacing for relocation of 2.2 miles of Shasta County Brandy Creek road.	...do.....	Do.
Prosser Creek Dam.....	Washoe.....	Nevada-California.

TABLE 2.—Principal features completed on Bureau of Reclamation projects in fiscal year 1963—Continued

Feature	Project	State
Earthwork and structures for Steiner Service Canal.....	Central Utah.....	Utah.
Earthwork, pipelines, and structures for Bonham and Cottonwood pipelines.	Collbran.....	Colorado.
Completion of Upper and Lower Molina Powerplants and Switchyards.	do.....	Do.
Earthwork and structures for East Fork Diversion Dam and East Fork Feeder Canal and rehabilitation of Bonham Dam.	do.....	Do.
Navajo Dam and access roads.....	Colorado River Storage.	New Mexico.
Laying track and ballasting for relocation of 11.65 miles of D&RGW Railroad for Navajo Dam and Reservoir.	do.....	Do.
Construction of 85.2 miles of Flaming Gorge-Vernal-Rangely 138-kv transmission line.	do.....	Utah-Colorado.
Construction of 115 miles of Rangely-Oak Creek and 10 miles of Kremmling-Green Mountain 115-kv transmission line and 8.3 miles of Kremmling-Gore Tap 69-kv transmission line.	do.....	Colorado.
Construction of 22.5 miles of Blue Mesa-Gunnison 115-kv transmission line.	do.....	Do.
Construction of 39.17 miles of Blue Mesa-Curecanti, Morrow Point-Curecanti, and Curecanti-Montrose 115-kv transmission line.	do.....	Do.
Earthwork, concrete lining, and structures for San Angelo Distribution System.	San Angelo.....	Texas.
Construction of Foss Pumping Plants Nos. 1, 2, and 3....	Washita Basin.....	Oklahoma.
Stringing conductors and overhead ground wires for 138 miles of Garrison-Jamestown 230-kv transmission line.	Missouri River Basin.	North Dakota.
Construction of 213 miles of Sioux City-Spencer and Sioux City-Denison-Creston 161-kv transmission line.	do.....	South Dakota.
Stringing conductors and overhead ground wire for 58 miles of Oahe-Fort Thompson 230-kv transmission line, 230-kv switchyard approaches, and 1.42 miles of 115-kv Oahe-Midland transmission line.	do.....	Do.
Construction of 88 miles of Rapid City-Newell-Maurine 115-kv transmission line.	do.....	Do.
Construction of 75 miles of Oahe-Eagle Butte 115-kv transmission line.	do.....	Do.
Construction of 65 miles of Eagle Butte-Maurine 115-kv transmission line.	do.....	Do.
Construction of 95 miles of Winner-Mission-Martin 115-kv transmission line.	do.....	Do.
Earthwork and structures for Florida Farmers Ditch Diversion Dam and ditch enlargement, and enlargement of Florida Canal.	Florida.....	Colorado.
Earthwork and structures for Main Canal, and laterals and gravity extension East Highline and West Highline laterals.	Hammond.....	New Mexico.
Crawford Dam.....	Smith Fork.....	Colorado.
Earthwork and structures for Smith Fork Diversion Dam, Smith Fork Feeder Canal, Aspen Canal, and Clipper Canal.	do.....	Do.
Construction of M and D Diversion Dam.....	Uncompahgre.....	Do.
Construction of second stage of Willard Dam.....	Weber Basin.....	Utah.
Earthwork and structures for Willard Canal, Willard Pumping Plants Nos. 1 and 2, and intake channel.	do.....	Do.
Earthwork and pipelines for North Davis laterals, Unit 2B, Davis Aqueduct lateral system.	do.....	Do.
Earthwork, pipelines, and structures for Woods Cross lateral system	do.....	Do.
Twin Buttes Dam.....	San Angelo.....	Texas.
Earthwork, concrete lining, and structures for main canal.	do.....	Do.
Earthwork and structures for Red Willow Canal and laterals and drains.	Missouri River Basin.	Nebraska.
Construction of Red Willow Creek Diversion Dam and Red Willow Canal and settling basin.	do.....	Do.
Arcadia Diversion Dam and Sherman Feeder Canal.....	do.....	Do.
Earthwork and structures for Sherman Feeder Canal.....	do.....	Do.
Earthwork and structures for Sherman Feeder Canal, including tunnel.	do.....	Do.
Earthwork and structures for Farwell Main Canal, Farwell Central Canal, and laterals, wasteways, and drains.	do.....	Do.
Earthwork, concrete lining, and structures for Section No. 1 of Ainsworth Canal.	do.....	Do.
Earthwork and structures, Cedar Bluff Canal, Second Section.	do.....	Kansas



## PROJECT DEVELOPMENT

The Bureau's project development program involves preparation of plans for developing river basin resources and investigating and planning potential projects to meet requirements of the fast-growing population of the West for optimum utilization and conservation of its limited water resources. It also includes detailed preconstruction studies on newly authorized projects.

### **Seven Projects Authorized**

During fiscal 1963, Congress authorized seven Federal Reclamation projects: Fryingpan-Arkansas in Colorado, Mann Creek in Idaho, Arbuckle in Oklahoma, Spokane Valley in Washington (amendatory authorization), Upper Division of the Baker Project in Oregon, Agate Dam and Reservoir of the Rogue River Basin Project in Oregon, and Oroville-Tonasket Unit of the Okanogan-Similkameen Division of the Chief Joseph Dam Project in Washington.

In addition, the Crater-Long Lakes Division of the Snettisham Project in Alaska was authorized by the Flood Control Act of 1962 for construction by the U.S. Army Corps of Engineers, with operation and maintenance and power marketing assigned to the Bureau of Reclamation.

### **Basin Surveys Underway**

The Bureau was conducting surveys during 1963 in 17 river basins throughout the West, including 5 subbasins of the Missouri River Basin. The report on the Yellowstone Division of the Missouri River Basin Project was completed.

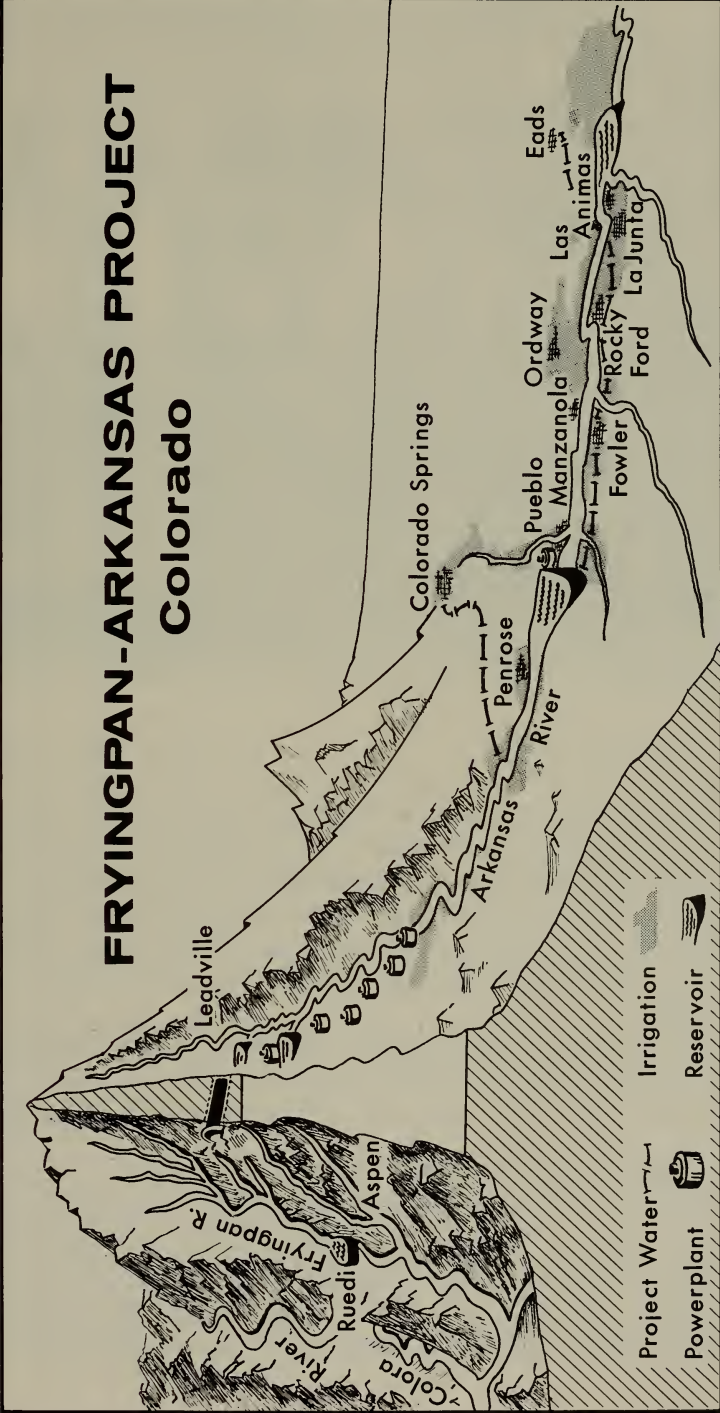
### **Project Planning Reports Sent To Congress**

Project planning reports were submitted to Congress during the year on: the Middle Gila River Project in Arizona; Bostwick Park Project in Colorado; Fruitland Mesa Project in Colorado; the Dixie Project in Utah; and the North Loup Division of the Missouri River Basin Project in Nebraska.

The Secretary's supplemental report and certification of economic justification on the Crystal Dam and Reservoir of the Curecanti Unit, Colorado River Storage Project in Colorado, was transmitted to the President and to Congress. Planning reports on the Whitestone Coulee Unit of the Chief Joseph Dam Project in Washington, and on the Merlin Division of the Rogue River

# FRYINGPAN-ARKANSAS PROJECT

## Colorado



Basin Project in Oregon, were sent the Bureau of the Budget for advice as to their relationship to the President's program prior to submission to the Congress.

Reports of planning on the Lower Teton Division of the Teton Basins Project in Idaho, the Auburn-Folsom South Unit of the Central Valley Project in California, and the Animas-La Plata Project in Colorado-New Mexico were under review by the affected States and interested Federal agencies before submittal to the Bureau of the Budget.

### **Definite Plan Reports Written**

Definite plan reports for authorized projects were completed on the Chestnut Valley Unit, Missouri River Basin Project in Montana; the Lyman Project in Wyoming; the Western Division of The Dalles Project in Oregon; and Cow Creek Unit of the Trinity River Division of Central Valley Project, California.

### **Alaska Projects Studied**

Review was completed by interested Federal agencies and Alaska on the planning report for the Devil Canyon Project. Co-operative activities with Corps of Engineers on Rampart Project were started.

### **Loan Program Active**

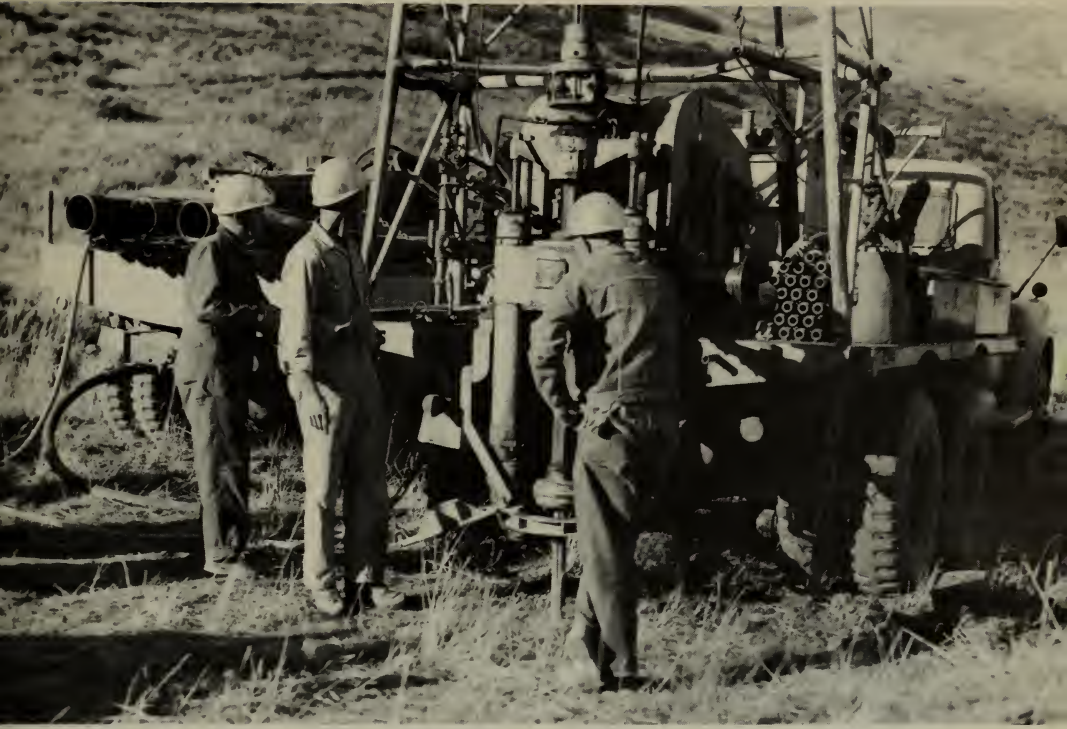
The loan program continued very active. During the year, three Small Reclamation projects and one distribution system were completed with total loans of \$2,004,000; construction was initiated on five Small Projects and two distribution systems with total loans of \$54,819,000; seven Small Project loans were approved totaling \$10,912,000; and pending were three Small Project applications and one distribution system application, requesting loans of \$4,211,000.

From the start of the program to June 30, 1963, Small Project loans totaling \$68,088,000 and distribution system loans totaling \$72,072,000 have been approved by the Secretary of the Interior.

### **River Compacts Formulated**

A form of contract for the Columbia River Basin Compact, approved in 1960 by the Compact commissioners of the several basin States, was agreed upon in October 1962 by all State-appointed negotiating commissioners. The compact has been ratified by Montana, Idaho, Wyoming, and Utah; however, the Washington





Drillers sink the first core drill bit into the earth at Ruedi Damsite on the newly authorized Frying Pan-Arkansas Project, Colo.

and Oregon Legislatures did not act on bills introduced for this purpose at their sessions, and no action was initiated in Nevada.

The California-Nevada Interstate Compact Commission arrived at a tentative allocation of the waters of the Lake Tahoe Basin.

The Engineering Advisory Committee's report for the Arkansas River Compact between Kansas and Oklahoma was completed and a draft of the compact was under consideration at year's end.

The Upper Niobrara River Compact between the States of Wyoming and Nebraska was ratified by both States and was awaiting consent action by Congress.

The Lower Niobrara and Ponca Creek Compact between the States of Nebraska and South Dakota was ratified by both States and was awaiting consent action by Congress.

When called upon, the Bureau continued to provide technical assistance regarding negotiations on the following unperfected interstate compacts: Arkansas River (Arkansas and Oklahoma) ;

Cheyenne River (Wyoming and South Dakota); Little Missouri River (Wyoming, Montana, and North Dakota); Red River (Arkansas, Louisiana, Oklahoma, and Texas); Truckee-Carson-Walker Rivers and Lake Tahoe (California and Nevada); and Big Blue River (Kansas and Nebraska).

### Hydrology Studies Progress

The Hydrology Branch has continued its specialized studies of proposed water-resource development projects. These studies included, but were not limited to, evaluation of the quantity and quality of water supply in relation to the multiple-purpose requirements, determination of the amount of sediment load and its deposition, and potential flood magnitudes and frequencies as the basis of design.

Study of flood hydrology problems associated with proposed Reclamation projects was continued by preparing design storm studies, reviewing the inflow design flood and frequency studies prepared in the regions, and, at the request of the regions, preparing additional inflow design flood and frequency studies.

As a part of this program, a study was made of the seasonal variation in design flood potential for the Crooked River Basin above Prineville Dam in Oregon to establish a revised seasonal requirement for flood-control space reservation. Also, revised studies of flood potential were made for several old Bureau dams to assist the Division of Design in evaluating the need for rehabilitation or proposed modifications.

Recent large flood events were studied in detail to verify or suggest changes to existing design storm and design flood criteria.

During the year the Project Development Division of the Bureau reported on the study of various sedimentation phases, including the unit weight of deposited sediments, stable channels, sediment transport, distribution of sediment in a reservoir, unit sediment yield rates, and sediment excluder devices.

Studies also were started on the determination of degradation rates below a dam and the delta buildup pattern above a reservoir. An electronic computer was used extensively to reveal total sediment loads by the Modified Einstein Procedure and to compute water surface profiles for both tailwater and backwater conditions.

Cooperative studies continued with the Geological Survey on the measurement of water use by phreatophytes in the Yuma and Buckeye areas of Arizona. The construction of evapotranspirometers was expanded during the year to include those for measur-

ing evaporation from bare soil. The Bureau constructed evapotranspirometers in the Bernardo area of New Mexico to measure water use by phreatophytes and to develop methods for estimating the water which can be salvaged by eradication or control of the phreatophytes.

### **International Streams Investigations Undertaken**

The Bureau of Reclamation was represented on three International Engineering Boards of the International Joint Commission. Under the Reference of January 12, 1948, the Souris-Red Rivers Engineering Board continued the systematic collection and study of hydrologic data and related flood control and irrigation investigations in the Souris, Red, and Missouri River Basins.

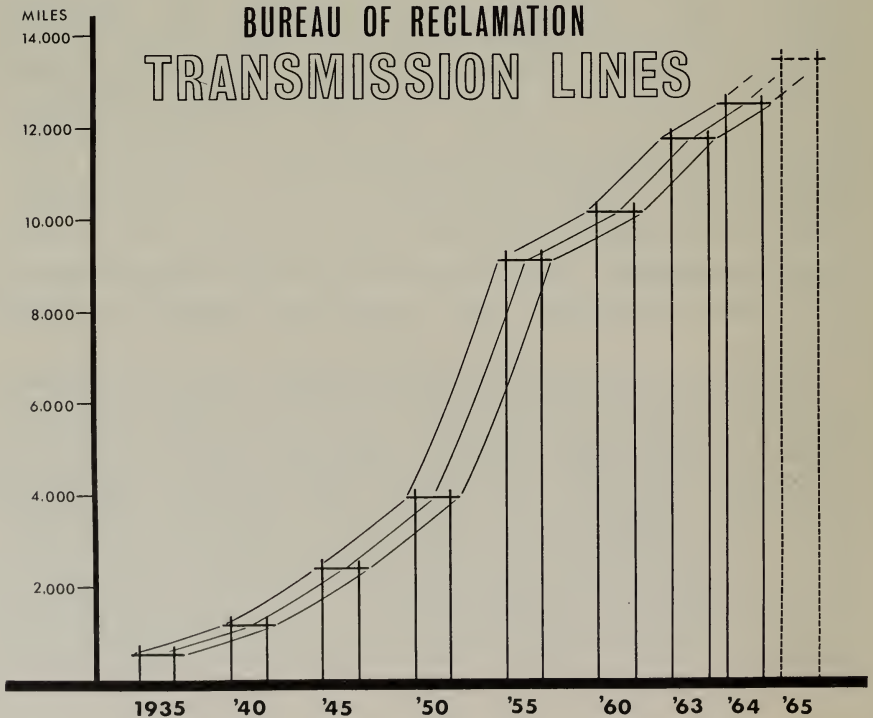
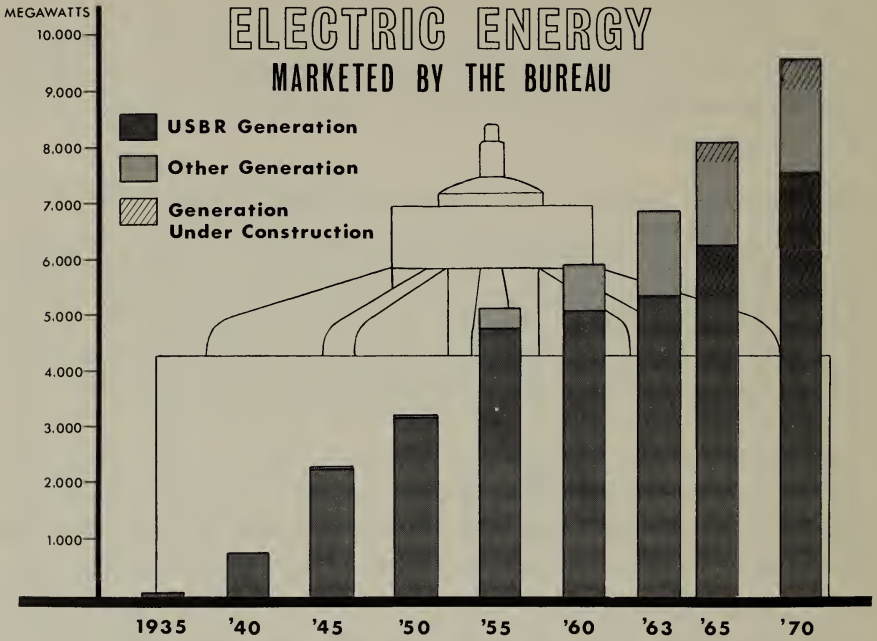
Pursuant to the Reference of April 3, 1962, the International Pembina River Engineering Board continued investigation of possible ways to develop the water resources of the Pembina River in the State of North Dakota and the Province of Manitoba.

## **HYDROELECTRIC POWER DEVELOPMENT**

As of June 30, 1963, the Bureau of Reclamation had constructed and was operating 44 hydroelectric powerplants with an installed nameplate capacity of 5,373,450 kilowatts. This was an increase of 78,900 kilowatts over the 1962 figure. In addition, the Bureau was responsible for marketing the power generated at five U.S. Army Corps of Engineers' powerplants with an installed nameplate capacity of 1,580,035 kilowatts, an increase of 510,000 kilowatts over the 1962 figure, and for marketing the output of the Falcon powerplant, constructed by the International Boundary and Water Commission, with a nameplate capacity of 31,500 kilowatts.

Completion of the Collbran Project added 13,500 kilowatts and the first unit of the Clear Creek powerplant added 67,000 kilowatts to the Bureau's generating facilities. Siphon Drop, with an installed nameplate capacity of 1,600 kilowatts, was turned over to the Yuma County Water Users' Association for operation. (The organization also took over the Yuma Main Canal and other facilities of the Yuma Project.) The Oahe powerplant installations resulted in the Corps of Engineers' generating capacity increases.





At year's end, Bureau power was being delivered to customers over 12,161 circuit-miles of transmission lines, including the 1,079 miles of high-voltage lines constructed during the preceding 12-month period.

The installed transformer capacity of the 318 individual substations being operated by the Bureau on June 30, 1963, was 12,433,724 kilovolt-amperes. This was a reduction of 2 substations and an increase of installed capacity of 852,136 kilovolt-amperes since June 30, 1962.

Sales of electric power by the Bureau during the fiscal year aggregated 28,165,095,456 kilowatt-hours, an increase of 5.4 percent over 1962. Revenues from these sales, plus other income realized from operation of the Bureau's power facilities, were \$74,385,513, an increased of 1.0 percent over the 1962 figure.

### **New Power Contracts Written**

During the year, the Bureau of Reclamation executed 322 contracts, memorandums of agreement, or contract supplements for the sale of power, transmission service, or for other types of electric service. In addition to these contracts, negotiations were started with more than 150 municipalities, Government installations, and cooperatives in the Colorado River Storage Project, Missouri River Basin Project, and Central Valley Project areas, in connection with firm power allocations to be available from these projects.

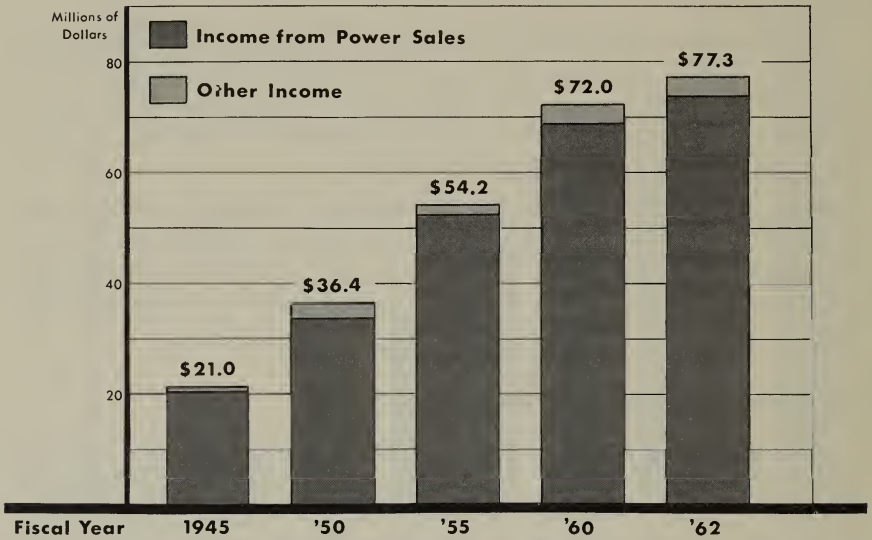
Classes and number of customers included in the 322 contracts were: municipalities, 158; REA cooperatives, 47; private utilities, 38; Federal agencies, 31; irrigation districts, 21; State agencies, 19; public utility districts, 5; non-REA cooperatives, 2; and industrial, 1.

The year saw the conclusion of several important allocations and contractual arrangements for generation and transmission, sale and purchase of power.

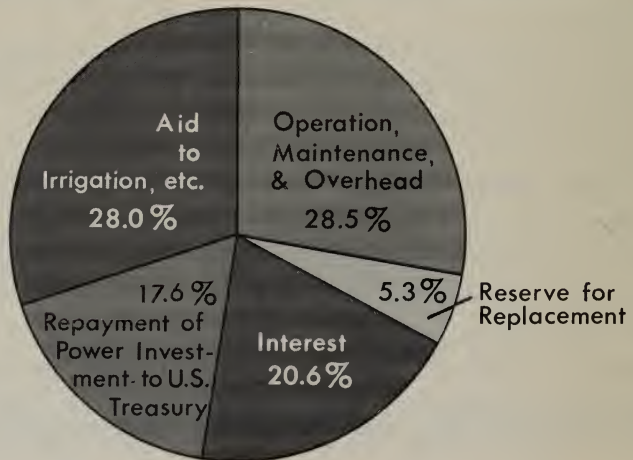
### **Missouri Basin Eastern Division Pooling Starts**

The Missouri Basin systems pooling agreement, which became effective January 31, 1963, provides better utilization of existing and future generating and transmission facilities of participating members. The agreement culminated work of a committee appointed in 1961 representing the Department of the Interior and preference systems. It was the first instance where the Federal Government worked out areawide arrangements with preference

## BUREAU OF RECLAMATION Revenue from Electric Power Operations



## Bureau of Reclamation GROSS POWER REVENUE DISTRIBUTION (Based on Complete Payout of Projects)





customers for use of the capacity in the Federal transmission system, to deliver thermal power generated by preference customers, on an assured transmission capacity basis.

In addition to Federal agencies, there are 101 preference customers consisting of cooperatives, cities, towns, and other units in Montana, North Dakota, South Dakota, Minnesota, Iowa, and Nebraska.

Advantages of pooling transmission resources has been well established throughout the power supply field. It postpones the necessity for expenditures required for construction of additional facilities by the individual members through apportioning the responsibility for the construction program among the members. The agreement also provides for orderly planning of future generation facilities when needed, and allows the preference customers to combine their resources so as to permit installation of larger and more efficient thermal electric generating units. The United States will benefit by the installation of such thermal units, since they will provide an economical source of firming energy to combine with the output of the hydroelectric generating facilities.

### **Basin Contract Written**

The Bureau executed a contract November 29, 1962, with the Basin Electric Power Cooperative of North Dakota, covering the use of joint transmission system and mutual services. This contract provides for the wheeling of basin-generated power over U.S. transmission lines to basin members; the power will be produced at a steam electric generating plant to be installed by basin near Stanton, N. Dak. It also provides for the sale to the United States of surplus energy at a net cost lower than heretofore considered likely.

This contract culminates work begun by the Department a year ago to meet a critical power shortage for preference customers in the Missouri River Basin in 1965.

### **Missouri River Basin Western Division Allotments Made**

In connection with the contracts with preference customers in the Western Division of the Missouri River Basin Project, the Bureau on December 21, 1962, announced allotments of power for both summer and winter in the total amounts of 384.004 mw and 345.749 mw, respectively.

### **Colorado River Storage Allotments Announced**

The initial allotments to the Northern Division customers of the Colorado River Storage Project were made in total amounts of 627.11 mw summer and 666.50 mw winter. Tentative allotments were made to customers in the Southern Division in total amounts of 344.20 mw summer, 328.25 mw winter. The total capacity of the project is expected to be approximately 1,200 mw.

### **Central Valley Project Power Starts**

Additional and initial allotments of power to the Central Valley Project preference customers, made available with the advent of the Trinity Division power, were announced September 4, 1962. The initial power available from Trinity and allocated is 287.1 mw. However, it has been determined that this amount can be increased to 425 mw, bringing the total supported Central Valley power up to 875 mw capacity. Contracts with preference customers were being prepared at year's end.

## **IRRIGATION, LAND AND WATER USE**

The 1962 crop year established a new record in the production of high-value nonsurplus crops on irrigated lands served by Reclamation's multipurpose water resource projects in the 17 Western States. Gross farm value of all crops produced on the 7,185,736 acres, which received a full, supplemental, or temporary water supply from projects in 1962, was a record \$1.22 billion, marking the fourth successive year in which the value of crops grown exceeded \$1 billion.

The cumulative value of all crops produced on Federal Reclamation projects since 1906 reached \$18.87 billion. This is a return from the irrigation phase alone, of almost five times the entire Federal cost of plant, property, and equipment associated with all Reclamation projects (including construction in progress) for hydropower generation, flood prevention, navigation, fish and wildlife conservation, recreation, river regulation, and other public needs in addition to irrigation.

Irrigation service from Reclamation works was available in 1962 to 8,597,346 irrigable acres, an increase of 362,665 acres over the previous year. However, 93 percent of this increase was represented by supplemental and temporary services, indicating

the current stabilizing of local economies which have developed around Reclamation projects.

Full irrigation water supplies were available to 4,384,822 irrigable acres, an increase of 25,335 acres over the equivalent 1961 figure. Eighty percent of these lands, or 3,529,748 acres, was irrigated and produced crops valued at \$603,665,891, an increase of \$36.7 million over the previous year.

Supplemental water service was available to 3,954,409 irrigable acres, up 134,526 acres over 1961, and 3,468,319 acres were irrigated. Lands receiving supplemental service embrace those areas where regular water supplies have been found inadequate. The value of crops produced on these lands in 1962 was \$563,207,353, an increase of \$27,193,655 over the 1961 crop year.

Lands receiving temporary water service showed the largest increase for the year; irrigable acreage expanded by 202,804 acres to reach a total of 258,115 acres, and acreage irrigated jumped from 48,264 acres to 187,669 acres, a net increase of 139,405 acres over the previous year. Lands in this category receive water from Reclamation project facilities under temporary arrangements while contracts are pending. Nearly all the increase in temporary service lands occurred along the Friant-Kern and Delta-Mendota Canals of the Central Valley Project in California. The value of all crops produced on the temporary service lands rose to \$56,065,114, or \$47,708,087 over the previous year total of \$8,357,027.

### **New Crop Areas Added**

Six new projects or units reported initial production during the 1962 irrigation season. Among these were the Collbran Project, Colorado, with 22,210 acres of irrigable area for service; Hammond Project, New Mexico, 1,316 acres; Pleasant Valley Project, California, 11,152 acres; and San Benito Project, California, 24,694 acres. The latter two projects were constructed under the authority of Public Law 984, also known as the Small Reclamation Projects Act of 1956.

Water supplies were provided also to additional acreages in 1962 on projects included in previous reports. The area for service of the Central Valley Project increased 263,896 acres over 1961, representing primarily the firming up of water supplies for land developed under private initiative. Other increases in-



cluded Columbia Basin Project, Washington, 10,334 acres; Solano Project, California, 9,962 acres; Cachuma Project, California, 8,536 acres; and Crooked River Project, Oregon, 7,140 acres.

### **Vitamins and Vigor Provided for America**

There were 129,682 irrigated farms on Reclamation projects in 1962, with a total farm population of 530,926.

More than 150 different kinds of irrigated crops were grown on Reclamation farms during the year. As in 1961, the high-value specialty crops made substantial gains in 1962. Despite serious weather setbacks in several Western States, vegetables, nursery and seed crops, fruits, nuts, and sugarbeets accounted for \$626 million, or more than half the total value of all crops produced on Reclamation projects. The value of vegetable crops alone increased 23 percent over 1961, accounting for more than \$253 million, or one-fifth the value of total crop production.

Sugarbeet acreage, which experienced an increase in the previous year of about 65,000 acres, gained only 17,257 acres in 1962, despite the present sugar shortage. While Reclamation project farmers are able and anxious to expand sugarbeet acreage to meet the Nation's sugar requirements, a lack of processing facilities seriously retards further expansion.

In response to the rapid western population and urban growth, water deliveries from Reclamation projects for municipal, industrial, and domestic purposes continue to be an ever more important phase of the Reclamation program. During 1962, a total of 474.2 billion gallons of water was delivered to 84 primary contracting entities, which in turn serve a population of 10.1 million people. The expansion of towns and cities within or adjacent to project areas in 1962 brought the total urbanized project land area to 236,450 acres, with more than a million persons now residing on these once-farmed lands.

### **Operational Activities**

Operation and maintenance of irrigation facilities during fiscal 1963 related to 216 storage reservoirs, 131 diversion dams, 27,810 miles of canal and lateral distribution systems, and 9,767 miles of drains and ditches.

Approximately 57 percent of the storage reservoirs and 83 percent of the water carriage and distribution facilities were operated and maintained by local entities in keeping with the continuing and longstanding policy of transferring the care, operation, and



Workers harvest lettuce on a Yuma Project farm on the lower Colorado River in the Pacific Southwest. There were 129,682 irrigated farms on Reclamation projects in 1962.

maintenance of irrigation works to local water users' organizations. During the year certain facilities on mine projects moved from the construction to operational status, and facilities on eight projects were transferred to water users' groups.

### **Use of Water Increases**

Every year competition for the available supply of water becomes keener, intensifying the need to make the best possible use of the Nation's precious natural resource.

For this reason, the Bureau of Reclamation has launched a program to provide a detailed evaluation of the use of water on existing irrigation projects. The results of these studies are needed to determine more precisely the optimum farm irrigation requirements, to determine optimum sizing of distribution systems and control works, and to determine measures of obtaining efficient distribution and application of water. The information thus gained will be useful in planning new projects and will assist in

developing means of achieving more efficient use of water on existing projects.

Today's Reclamation projects deliver water to approximately 130,000 farms and to 84 municipal and industrial contractors, providing direct benefits to over 1,664,000 people on irrigated lands and to almost 10 million people living in municipal areas.

## DEVELOPMENT FARMS

Development farms on new irrigation projects not only demonstrate more efficient and economical irrigation practices, but also stress the value of conserving soil and water through better use of these important natural resources. In view of the Nation's burgeoning population and the decreasing areas suitable for agriculture, such conservation is considered by the Bureau to be of ever-increasing importance.

Development farms are established as far as possible in advance of settlement, usually 2 to 5 years, so newly arrived settlers will have the benefit of the experience and information gained. The major portion of each farm is devoted to field scale demonstrations of approved farm irrigation systems, irrigation methods, kinds and varieties of adapted crops, cultural practices, most effective fertilizers, weed control, farm drainage, and solutions to other problems with which new irrigation farmers are faced. From 10 to 25 percent of most of the farms is set aside for research, which is conducted by State college experiment stations and cooperating agricultural agencies such as the Agricultural Research Service and the Soil Conservation Service. Methods developed from research are thoroughly tested and demonstrated on the farms, some of which have served the additional purpose of aiding in determining the feasibility of projects.

Two development farms were established by the Bureau in fiscal 1963 in the Missouri River Basin Project, bringing the total number in operation to six. Twenty-five have been discontinued, having served their purpose. The Bureau will continue to establish these development farms on areas opened to settlement because of their proven value in helping to overcome many factors which had caused hardship and often failures of settlers on earlier projects.

The Bureau of Reclamation and other agencies responsible for the development farms work closely with the State college exten-



sion services to be certain that the information resulting from research and demonstrations is properly disseminated to the new settlers. Hundreds of farmers attend the annual field days and tours at which representatives of the Bureau and cooperating agencies explain the work in detail. The settlers are encouraged to visit the farms at any time during the year to obtain information and they are joined by college and high school students with their instructors.

## IMPORTANT DOCUMENTS APPROVED

During fiscal year 1963, the Bureau adhered to the prevailing policy of the Congress, the Department, and the Bureau itself in securing executed and validated repayment contracts for an appropriate share of the reimbursable costs of projects before initiation of construction. Recognizing that the emphasis and need for water in the West is changing, the Bureau is tailoring its repayment and water service contracts to these altered municipal and industrial requirements. It was necessary in 1963 to amend several existing contracts to provide relief to the irrigation districts from financial difficulties occasioned by unprecedented droughts, agriculture prices and production problems, disparity between farm costs and income, and such developments. Consequently, contracts were executed adopting variable repayment plans consistent with the water users' ability to pay, some construction charges were deferred or rescheduled, and, in a few instances, development periods were extended.

Two history-making documents were approved by the President in a ceremony at the White House on January 28, 1963. One was the Nation's largest water-service contract, signed with the Westlands Water District, Fresno, Calif. It covers service to nearly 400,000 acres, and revenues therefrom will be sufficient to cover the costs associated with construction of irrigation facilities and operation and maintenance of the San Luis Unit of the project and will be in excess of \$1¼ billion over the 40-year term of the contract.

In the Columbia Basin Project of Washington, final agreement was reached on terms of a short-form repayment contract covering 472,000 acres of the East Columbia Basin Irrigation District. The two other irrigation districts in the basin had previously signed short-form contracts. Negotiations were toward transferring operation and maintenance of this project to the districts and to a long-form amendatory contract.



On January 28, 1963, President Kennedy approved a water service contract with Westlands Water District, San Luis Unit, Central Valley Project, Calif., and a repayment contract with East Columbia Basin Irrigation District, Columbia Basin Project, Wash.

Efforts to work out a permanent solution to the problems of the Riverton Project in Wyoming continued. As a result of studies by a board of consultants appointed by the Secretary, and on recommendations of the House Interior and Insular Affairs Committee, a Reclamation Projects Survey Team was appointed to study and analyze conditions associated with problems being experienced on all Reclamation projects in Wyoming. Consideration of the report and recommendations of the team is currently underway.

### **Varied Developments Financed by Loans**

A \$7,150,000 rehabilitation and betterment loan to the Coachella Valley County Water District, Central Valley Project, California, was approved.

During the last month of the fiscal year the first Small Reclamation Projects Loan repayment contract to be negotiated between the United States and the State of Hawaii was executed in Washington, D.C. The \$4,514,000 loan will finance completion of an irrigation project on Molokai Island, which was already under construction by our newest State.

Also during the last month of the fiscal year, contracts were executed with the Middle Rio Grande Conservancy District and the city of Albuquerque for repayment of reimbursable costs of the initial stage of the San Juan-Chama Project, New Mexico-Colorado. The district's share of the project cost is \$12,401,200.

However, approximately \$9 million of this is to be returned to the United States from New Mexico's share of power revenues from the Colorado River Storage Project. The contract with the city of Albuquerque provides that the city is to pay construction costs of \$30,926,000. Construction of the project is scheduled to begin early in 1964, and when completed, San Juan-Chama is expected to yield about 101,800 acre-feet annually to the water-deficient areas in the Rio Grande River Basin in the vicinity of Albuquerque, N. Mex.

At the close of the fiscal year, negotiations were nearing completion with the Arbuckle Master Conservancy District for repayment of the reimbursable portion of the \$13,340,000 Arbuckle Project in Oklahoma. This project will consist of a dam and reservoir and an aqueduct system, and will supply water for municipal and industrial purposes. In addition, it will provide flood control, fish and wildlife, and recreational benefits.

The value of all repayment contracts on June 30, 1963, was \$1,171,470,817. Of this, \$178,085,192 has been paid and delinquencies were insignificant. In addition, the outstanding repayment obligations under the Small Reclamation Projects and Distribution System Loan programs was \$62,962,318.

## ENGINEERING "FIRST" ESTABLISHED

Utilizing advanced techniques of analysis, coupled with use of sophisticated methods of electronic control and communication and automatic computer procedures, Bureau designers opened up new vistas in technical development during fiscal 1963. The results were manifested in improved performance of project equipment, increased efficiency of project operation and maintenance, and substantial savings in construction, operation, and maintenance costs. Designs of project structures and facilities proceeded on schedule during the year, as evidenced by the issuance of specifications for 74 construction contracts, 84 major supply contracts, and by preparation of 4,300 new drawings and revision of more than 1,500 "as-built" drawings.

Bureau designers incorporated three Reclamation "firsts" in the power-dispatching system for the Colorado River Storage Project—first use of an on-line electronic (digital) computer for control of a power system; first application of automatic dispatch and water optimization to a power system; and first dispatch of



power from an integrated system embracing both hydroelectric and thermal (steam) powerplants.

The complex dispatching facilities, which will be housed in the project's Power Operations Center at Montrose, Colo., will provide automatic tieline load frequency control for the vast interconnected power system. The digital computer will provide automatic allocation of generator loading on an economic basis with due consideration to maximum use of the project water and transmission facilities. The computer dispatching system will also automatically log kilowatt-hours, perform energy accounting, solve system problems, and determine power flows and system characteristics.

Another Reclamation design "first" was inclusion of "solid state" devices (transistors, magnetic amplifying devices, and related electronic facilities) in equipment which will remotely control the Vernal Substation of the Colorado River Storage Project in Utah from the Montrose Power Operations Center. Use of the solid-state equipment will reduce the ever-increasing costs of maintenance of supervisory control and telemetering equipment by eliminating electromechanical relays and various devices having moving parts. In addition, the equipment will provide automatic logging of system data, at periodic intervals, allowing the operators at the center time for more important duties. The solid-state supervisory control equipment will also be installed to control the project's Pinnacle Peak, Shiprock, and Curecanti Substations.

To assure maximum efficiency of service, Bureau experts incorporated in their designs of the Colorado River Storage Project a multichannel microwave radio system to serve the project's power facilities in the States of Utah, Wyoming, Colorado, Arizona and New Mexico. The microwave communication system will provide up-to-date supervision and control. Coded information and orders, embracing electrical power needs and loads throughout the extensive service area of the project, as well as in adjoining regions interconnected with Reclamation's power facilities, will flow through the microwave network connecting powerplants, substations, and power dispatch centers.

To expedite radio propagation test of the extensive radio system of the Colorado River Storage Project, Bureau engineers developed two 80-foot collapsible portable test towers. Each tower has a bracket which allows the complete assembly to be bolted to a station wagon. The towers are transported in a horizontal position and pivot on the bracket into an upright position for erection.

Since access to remote mountainous areas is thus possible with the four-wheel-drive station wagons, the towers can be erected to an 80-foot elevation in about 15 minutes, providing an efficient and rapid means of performing radio propagation tests.

Patent application was made during the year for a novel power device which utilizes the effect of the electrostatic field surrounding high-voltage transmission lines. The device, developed by a Reclamation electrical engineer, was tested on the 230-kilovolt Dawson County-Bismarck transmission line, providing a source of power for aircraft warning lights. A modified version of the device is to be installed on a transmission line near Glen Canyon Powerplant to supply power for aircraft warning lighting.

### **Computer Used in Design**

Increased emphasis on the application of electronic computers to engineering analyses and design problems gave additional thrust to the Bureau's program to improve designs, while lowering costs. The electronic computer in the Bureau's engineering offices in Denver was used about 300 hours a month to expedite solutions to many complex engineering and scientific problems.

As a corollary to the use of computers in design, selected staff members received special training in the use of CPM (Critical Path Method) and PERT (Program Evaluation Review Technique). These relatively new techniques facilitated planning and execution of work programs. They consist of the analytical appraisal of all work to be performed and logical determination of their timing and sequence. As the process is complex, involving many computational steps, electronic computers expedite the identifying of the "critical path" of work. To encourage expedition of construction schedules, a new provision was added to Bureau specifications to allow contractors the choice of scheduling their work by these or similar refined types of scheduling, in lieu of the usual bar-graph construction program.

### **"Seeing Eye" Probes Deep**

A significant technical event of the year was the use of a closed-circuit, bore-hole television telescope to investigate foundation conditions at the site of the Morrow Point Dam and Powerplant—the first application of the device to small-size drill holes in dam foundation exploration in the United States. With the TV-telescope lowered in 3-inch-diameter holes at the damsite, Bureau geologists observed in-place geologic features visible in the walls of the holes, such as bedding planes, faults, and joint conditions.

The new geologic exploration device will assist in solving many foundation problems at other construction sites which formerly would have required expensive large-diameter drill holes or exploration shafts.

Another technical advancement in geologic investigations was the Bureau's first use of airborne magnetometer surveys in connection with standard surface geologic deep drill hole investigations of the 25 miles of tunnels proposed for the San Juan-Chama Project, a transmountain diversion project in New Mexico. The magnetometer profiles revealed by "high" and "lows" the probable location of igneous rock masses as contrasted with low magnetic sedimentary rocks. The results—coupled with comparative ground magnetometer surveys—will influence the determination of locating deep drill holes, and together with the drill hole data, will widen the Bureau's technical bases for sound tunnel design.

### **Flexible Pumping Units Designed**

In hydraulic machinery design, an outstanding event of the year was the Bureau's first design of large-size, variable-pitch pumping units. The units are to be installed in the Forebay and Mile 18 Pumping Plants on the San Luis Unit of the Central Valley Project. The technical significance of the design is that the blades of the pumps can be rotated to obtain variable water discharge, thus making possible flexibility in pumping operation for peak efficiency.

### **Systems Compared for Economy**

A major step forward in irrigation system design having significant bearing on conservation of water resources of the western United States was the start of a comprehensive study to determine relative annual costs of the construction and operation of pipe distribution systems as compared with open ditch distribution systems. The study embraces such factors as all annual costs inherent in each type of system, including costs of rights-of-way, maintenance, loss of water by seepage and evaporation, and difference in crop production on rights-of-way taken out of production.

In mechanical design, economies in maintenance will be achieved by the design of four large surge tanks for the main aqueduct of the Canadian River Project. The tanks, ranging up to 25 feet in diameter and 192 feet high, will have stainless-steel-clad plates for shells, obviating the need for future interior maintenance. Economies also will be realized by adopting a new-type structural steel for gates of hydraulic structures. Higher strength and improved





This artist's conception shows one of the three 345-kilovolt towers being erected on the west rim of the Canyon at Glen Canyon Dam, Ariz., believed to be the first towers in the United States to use extra high strength structural steel shapes.

welding properties of the steel will permit reduction of weights and lower fabrication costs of large gates.

Three high steel towers, of unusual proportions for electric power use, were designed for the west rim of the canyon at Glen Canyon Dam. Each tower will support a 345-kilovolt transformer circuit from the 900,000-kilowatt Glen Canyon Powerplant at the dam. The towers are believed to be the first in the United States using new extra-high-strength structural steel shapes. Two are 210 feet high and the third is 190 feet. Weight saved by the extra-high-strength steel shapes will be 50 percent where used. Weight reduction will save 20 percent.

## VARIED RESEARCH PROGRAM DEVELOPED

Research on a wide variety of investigations in new materials and improved methods for application to Reclamation projects was carried forward during the year.

Establishment of an electrical power branch in the Bureau's Division of Research in Denver, Colo., gave new dimension to studies. This unit is to solve problems originating from the unusual aspects of the Bureau's electrical power generation and transmission developments for which available apparatus and techniques are not adequate.

A mobile electrical testing laboratory was designed and placed under contract for fabrication. This laboratory, which will have facilities for a wide range of field testing and performance studies on installed electrical equipment, will be used initially for on-site testing of electrical power features on the Colorado River Storage Project. Subsequently it will be available for testing transmission lines, substations, and other equipment throughout the Reclamation West.

### **Weather Modification Uses Computer**

Progress was made during the year in the Bureau's weather modification research which has as its goal the increase of water supply on Reclamation projects through artificially induced precipitation. The Bureau's electronic computer accelerated reconnaissance-type correlations of historic data from several drainage basins in California; the computer technique will continue to be employed to expedite statistical methods in analysis and correlation of hydrologic and meteorological data from other areas under consideration for possible weather modification activities. Simultaneously, research continued at three universities, under contracts with the Bureau, in support of the program. At the University of Wyoming, promising results came from cloud studies; at the South Dakota School of Mines and Technology, results of artificially nucleating convective clouds were documented; and the University of Nevada, in cooperation with the Bureau, proceeded with a long-term research program on the Humboldt Project in Nevada.

### **Evaporation Reduction**

The objective of this major research is to develop practical techniques to reduce evaporation from reservoirs by using a 1-molecule-thick chemical layer (monolayer) to retard evaporation. Under intensive investigation during the year were chemical analyses of commercial fatty alcohols to form monolayers. The goal is the

development of Federal specifications for purchasing fatty alcohols so that selected compounds will be tasteless, colorless, and wholly harmless to all life. A full-scale evaporation reduction field test will occur in 1964.

### **Benefits Counted From Hydraulic Research**

Several developments in hydraulic research during the year were expected to help improve performance and economy in project structures. A significant achievement was development of a method of handling free fall of spillway discharges up to 40,000 cubic feet per second at Morrow Point Dam. The enormous energy of the water falling more than 350 feet will be dissipated in a concrete-lined pool at the toe of the dam.

Operation of the Mile 18 and Forebay Pumping Plants in California will be improved by the highly efficient suction inlet developed from hydraulic models. By using carefully shaped passages and a greater degree of curvature than in the usual 90-degree tubes, better entrance and exit conditions will result in the pumping plants. Much less forebay excavation will be required.

Other advances in hydraulic research included improvement of designing large concrete-lined canals for flat slopes. Also underway during the year were studies utilizing radioisotopes to measure waterflows in large canals; studies of salinity in ground-water aquifers; testing and evaluation of small water-measuring devices aimed at developing devices that are useful, economical, and trouble free on irrigation projects; and comparative investigations of full-size and models of regulating gates for controlling flow in closed conduits.

### **Sedimentation in Lake Mead Studied**

The Bureau engaged the U.S. Coast and Geodetic Survey to conduct a hydrographic survey to determine the quantity of sediment deposited in Lake Mead above Hoover Dam since the first such study was completed 14 years ago. The survey, begun in May, will be particularly meaningful because of the closing of the gates at Glen Canyon Dam, which will impound in Lake Powell 75 percent of the sediment now flowing down the Colorado River.

Glen Canyon Dam can be expected to prolong the life of Lake Mead indefinitely, affording the opportunity to develop a more stable area-capacity formula for it. The actual study of sedimentation in Lake Mead will be preceded by initial investigations of crustal movement of the earth in the area due to the load imposed by the tremendous weight of the lake—over 40 billion tons when the lake is at maximum capacity.





A hydraulic engineer in the Bureau of Reclamation's research laboratories in Denver, Colo., checks the model of the new improved suction inlet tube developed for use in large pumping plants.

### **New Test Devised in Soils Research**

An outstanding achievement in soils research was the development of a unique laboratory test method of measuring capillary pressures (considerably below atmospheric pressure) of cohesive soils. The values of the pressures thus determined can be applied as major corrections in determining effective grain-to-grain stress

which influences the strength of a cohesive soil. The advancement is expected to have significant influence on the design of earth structures of cohesive soils, with a resulting economy in construction.

Also in field soils research, instruments were installed in a moderately high embankment along a reach of the Farwell Main Canal in Nebraska to analyze the distribution and flow of canal water through the soil and to determine the effect of water on the stability of the embankment. Such analyses of soil pore-water pressures and moisture content, checking arbitrary design assumptions that had been previously adopted, are expected to cut costs in designing and constructing canal embankments.

A simple and fast method to test the cement content of freshly mixed soil-cement was developed for field use. The chemical test method is important in rock-scarce areas where soil-cement is used as slope protection for earth dams in lieu of conventional rock rip-rapping. The method is to be used in fiscal 1964 as a field control measure during construction of soil-cement facing on Merritt Dam in Nebraska.

Under development during the fiscal year were laboratory equipment and test procedures to simulate effects of earthquakes on laboratory soil specimens. The tests, in conjunction with standard soil tests to determine soil-strength characteristics, are significant because the effects of earthquakes can be included as part of the complete evaluation of soils for use in earth structures.

### **Concrete Studies Cut Costs**

Research in concrete construction will reduce costs of placing mass concrete for Morrow Point Dam. Investigations to determine the influence of maximum-size aggregate (stones and cobbles) on compressive strength of concrete indicated that it may be more economical to use smaller size aggregates, depending on the compressive strength desired. As a result of these investigations and because concrete with smaller cobbles is easier to handle and has better workability, it was possible to reduce the maximum aggregate size from the usual 6 inches to 4½ inches for the concrete in the dam, thus cutting handling and placing costs.

Significant economies in concrete pipe construction are expected to be attained from research conducted during the year on the distribution of soil pressures around concrete pipe.

Other research in concrete in 1963 included measurement of progressive deterioration of concrete subjected to repeated cycles of freezing and thawing, utilizing ultrasonic testing techniques;

testing of epoxy, neoprene, and sprayed polyester coatings for possible use in protecting concrete surfaces from damage caused by erosion of sediment carried in high-velocity water, by freezing and thawing, and by other forces; investigations of admixtures to improve the overall quality of concrete; field research in determining the frictional resistance values of a large concrete-lined tunnel; and aerodynamic studies to provide a design criterion for more accurate prediction of resistance of concrete surfaces to fluid flow.

## TECHNICAL REPORTS ISSUED

Published during the year were the technical records on the design and construction of the earthfill Prineville Dam, the thin-arch, concrete Anchor Dam, and the 48,000-kilowatt Fremont Canyon Powerplant and the 3-mile-long power conduit. The comprehensive book, "Linings for Irrigation Canals," describing the Bureau's technical advances in developing and utilizing lower cost materials and methods for lining canals conveying irrigation water to irrigable lands, was completed and was scheduled for publication early in fiscal 1964. Also issued were an engineering monograph on stress analysis of hydraulic turbine parts and more than 270 laboratory reports on research activities.

Requests for the Bureau's publications and informational materials increased 13 percent, as indicated by the 7,300 requests received from individuals in this country and in foreign countries. More than 36,000 copies of technical publications and informational pamphlets were sold or distributed. About half of the sales were to foreign countries.

A western distribution center was established in Denver to facilitate distribution of motion picture films on Bureau engineering accomplishments in water resource development. By year's end, more than 2,200 prints of films were made available for showing before a wide audience in the western half of the United States.

### **Weed and Seepage Control Progresses**

The comprehensive weed-control program of the Bureau of Reclamation proved effective during 1963 in reducing problems caused by various types of undesirable vegetation. Operation and maintenance costs caused by weeds have been decreased, and the program is aiding materially in reducing water losses resulting from transpiration, evaporation, and seepage.

More efficient and economical methods of controlling weeds infesting banks and channels of irrigation and drainage systems



are being developed through research conducted in cooperation with the U.S. Department of Agriculture. This phase of the program is being accomplished at four field stations in the West, and in the Chief Engineer's weed-control laboratory in Denver.

From a recent survey the Bureau estimated nearly 2 million acre-feet of water is lost each year due to weeds on irrigation systems in the 17 Western States. It was similarly estimated that the total costs and losses caused by these weeds were about \$5 $\frac{3}{4}$  million. The relatively small investment in research and education in weed control has prevented an additional \$15.8 million in costs and losses. While the research program is being continued, more studies are needed to aid in solving this major irrigation problem.

### **Water Thievery by Plants Fought**

The year saw some progress in developing more effective methods for controlling woody phreatophytes, including saltcedar, where they have invaded irrigation systems, natural water courses, reservoirs, and other areas. These growths usurp millions of acre-feet of water greatly needed for irrigation, municipal, and industrial purposes, and they also increase flood hazards and take over lands needed for grazing and agriculture. The Bureau estimates that in the 17 Western States, undesirable phreatophytes infest over 15 million acres and steal from useful purpose at least 25 million acre-feet of water annually, nearly enough to fill Lake Mead every 12 months. Department of Agriculture and the Department of the Interior committees are working on this and other weed-control problems common to Government agencies.

Special studies for developing economically feasible methods for controlling aquatic vegetation in large canals are being conducted in cooperation with the Agricultural Research Service in the Denver Laboratory and on the Columbia Basin Project, Washington, and Central Valley Project, California.

### **Poison on the Prairie Battled**

A halogeton control program has been developed in cooperation with other agencies under provisions of the Halogeton Glomeratus Act in the interest of increasing the land use value of the lands under the jurisdiction of the Bureau and of protecting the livestock grazing on these lands. It is known that this poisonous weed infests Bureau lands in Utah, Nevada, Colorado, Wyoming, and Idaho. Surveys to locate halogeton infestations and cooperative investigations to determine the most effective and economical control methods continued. The actual control programs, including chemical spraying and grass seedings, were conducted pri-

marily through agreements with the Bureau of Land Management.

The distribution of motion pictures, slide lectures, manuals, special releases on new equipment, and articles in the *Reclamation Era* are used to advise project personnel on new and more economical methods for controlling weeds.

### **Seepage Losses Reduced**

Another major aspect of water conservation is reduction of seepage through canals and laterals of irrigation systems. Since man's first attempts to transport water through canals, seepage has been a major problem. Such water losses increase the cost of that delivered to the consumer and often cause waterlogging of lands adjacent to the canals. Enough water to cover the entire State of Massachusetts to a depth of 1 foot is probably lost every year by seepage, since frequently the amount of irrigation water delivered to Bureau of Reclamation projects exceeds 20 million acre-feet and losses are estimated at from 25 to 50 percent. Since these losses occur in 90 percent of the canals and laterals involved, it is obvious that lining the distribution systems will effect a tremendous saving of water. Canal lining costs have been reduced considerably through research by the Bureau in cooperation with other Federal agencies, educational institutions, and industry.

Among the materials being investigated under the Lower-Cost Canal Lining Program are waterborne chemical soil sealants and stabilizers, compacted earth, plastics, asphalt membranes, pre-fabricated asphaltic linings, asphaltic concrete, and sediments. Each of these materials is being field and laboratory tested for comparison with methods and materials now used. Use of these materials, as well as the more expensive conventional linings, is explained in detail in the Bureau's recently released 1963 edition of "Linings for Irrigation Canals."

### **Soil and Moisture Conservation Programs Advance**

In keeping with its policy of conserving natural resources, the Bureau of Reclamation has continued its program of conserving soil and water on lands under its jurisdiction. These operations are being directed primarily toward erosion control, reduction of water losses, and the protection of Reclamation-built works.

The program objectives are accomplished in cooperation with other Federal agencies, as well as State, local, and water users' organizations. During 1963, there were 124 individual soil and moisture conservation programs on 71 Federal irrigation projects or units.

### Cooperation With Other Agencies Stressed

The Bureau's activities in planning, developing, and operating Federal irrigation projects and in conserving natural resources on lands under its jurisdiction have been greatly facilitated through cooperation with other agencies and organizations.

During 1963 there were in effect over 400 cooperative agreements with agencies in the Department of Agriculture with State colleges and extension services of the 17 Western States and Alaska, as well as many other Federal, State, and local organizations. They included studies and investigations on development farms, conservation activities, efficient use of soil and water, crop and cropping problems, assistance to county agricultural agents, and weed control. They covered also the development and management of reservoir, recreational, and wildlife areas, and assistance in solving many other problems pertaining to irrigation projects.

Cooperation with other agencies also includes participation in numerous departmental, indepartmental, basin, State, local, and other committees whose functions are related to the Bureau's interests and responsibilities.

Nearly completed Glen Canyon Dam is the backdrop for the preliminary flight of Project Polariscope, conducted by the University of Arizona and the National Center for Atmospheric Research to determine the polarization and scattering of radiation from the planets. The Bureau of Reclamation is cooperating with NCAR in the experiments.





### **Vigorous Safety and Health Program Conducted**

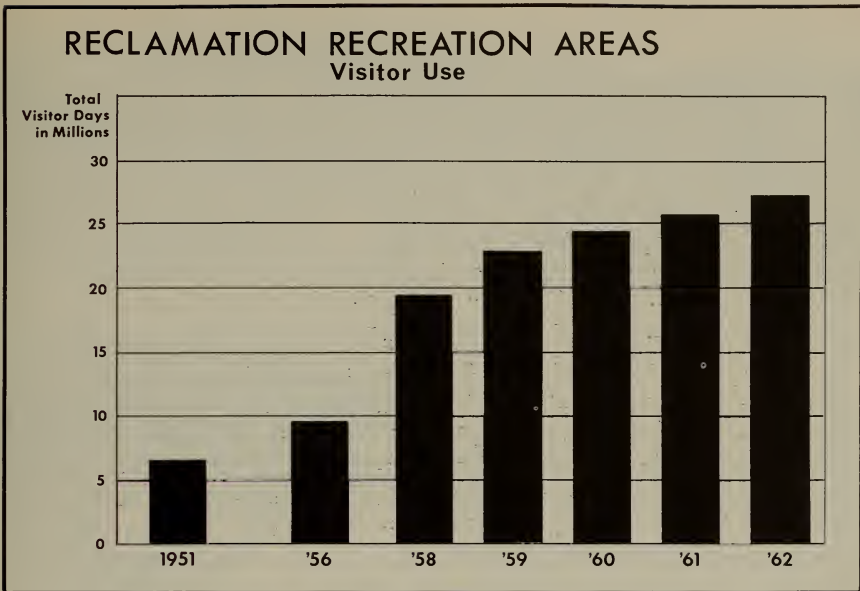
The Bureau's conduct of its vigorous and effective safety and health program was reflected in the fact that Reclamation completed fiscal 1963 with the lowest Government and contractor accident frequency rates in its history. Government forces completed the year with a cumulative accident frequency rate of 5.2, a 31.6-percent reduction from the previous year. Contractors' forces completed the year with an accident frequency rate of 21.4, an 11.2-percent reduction. Contractors' forces completed the year with 4,652 calendar days lost per million man-hours worked, the fourth lowest loss in Reclamation history. This represented a saving of 13,363 man-days' production compared with the previous year.

Continuing emphasis was placed on public safety to provide maximum protection for visitors to Reclamation installations and persons exposed to the hazards of drowning in canals, laterals, and reservoirs. After a thorough inspection of Reclamation irrigation facilities to insure compliance with safety standards, hazardous conditions were corrected and provision was made for installing protective devices such as fences, barricades, and other facilities. Eleven additional water safety councils were organized in communities near Bureau irrigation projects. There were 19 active councils, sponsored by Reclamation and the American Red Cross and meeting criteria established under the program known as Operation Westwide. The new councils were organized in areas designated as critical because of an existing hazard or increased public recreational activity.

To improve the administration of the Bureau's safety program, a concerted effort was made during the year to staff Bureau safety positions with qualified career safety engineers.

## **RECREATION INCREASES**

Recreation use of Reclamation projects throughout the West increased greatly. In the early days of the Reclamation program a dam was built solely to regulate river flow and to provide irrigation for growing crops; the possibility of people's traveling to the often virtually inaccessible site for recreation purposes did not occur to the dam builders. But once a river was plugged by a dam and water began to fill the valley behind it, the public beat a path through the wilderness to the rim, to look at the expanse of impounded water and the works of the dam itself, and soon to use



the water and shoreline for fishing, camping, and other recreational activities especially valued in the water-starved West.

As a result of better transportation and more leisure time, and a burgeoning population, what was an unplanned, incidental by-product of Reclamation has ripened into a major fruit of the program. During calendar year 1962, a total of 27 million visitor-days was recorded at 191 Reclamation recreation areas.

In recent years provisions for public facilities have been included in plans for new Reclamation projects. However, one of the Bureau's most acute problems is the inadequacy of public facilities on older projects which were constructed without any provision for this function, and authority is being sought to provide such needed facilities. A breakthrough was made in fiscal 1963, when improvements were authorized for Elephant Butte and Caballo Reservoirs on the Rio Grande Project in New Mexico. Advance planning and surveying were undertaken, with construction scheduled for early fall of 1963.

Caballo Reservoir has virtually no public-use facilities, yet 62,000 recreation seekers visited it in 1962. At Elephant Butte, the limited facilities built before 1936, when 13,000 visitor-days were reported, were called upon in 1962 to accommodate 1,270,000 visitors. Such updating of facilities on other older projects is high on the priority list for Bureau needs if it is to meet the ever-increasing public demand for recreation.



Southwestern Wyoming boating enthusiasts enjoy an outing on the reservoir being formed by Flaming Gorge Dam on the Green River on the Utah-Wyoming border.

As development of the Upper Colorado River Basin Storage Project progresses, recreational benefits are included in the planning, since, for the first time in Reclamation history, the authorizing legislation for a large basinwide project listed recreation as one of the multiple purposes. When the long-range water resources development is finished, the entire 1,270-mile length of the Colorado will be the spine of a spectacular American playground for millions of sun worshipers, nature lovers, fishermen, and water sports buffs.

The self-guided tour program at leading Reclamation dams is being expanded by the Bureau. These tours, such as those now being conducted at Grand Coulee, Shasta, and Hungry Horse Dams, are proving very popular and they have the advantage of



low cost and high enjoyment value. More and more visitors are evidencing interest in the actual physical works of the dams and powerplants, as well as in the sports the impoundments make possible. The self-guided tour may be taken at the visitor's leisure and convenience, with the opportunity to spend as much time as he likes on the attractions of his own choice and without the admission charge, which is necessary where guide service is maintained.

Construction started late in fiscal 1963 on a visitors' facilities building at Hungry Horse Dam in Montana, and was expected to be completed before winter under the Accelerated Public Works program.

With recreation now recognized as a major function of Reclamation development, and with the demand for it increasing beyond expectations on all water resource projects, the Bureau of Reclamation is utilizing all available water and land for this purpose under existing authorizations.

By far the greatest number of visitors to Reclamation recreation areas last year went primarily to view the scenery. Visitor-days recorded for sightseeing enjoyment totaled 10.2 million. Another 5 million days were spent fishing in reservoirs and other waterways. Picnicking accounted for 3.3 million visitor-days, water skiing for 2.5 million, camping for 2 million, boating for 1.6 million, and hunting for 0.2 million visitor-days.

## MANY FOREIGN ACTIVITIES ARRANGED

Oversea activities of the Bureau of Reclamation during fiscal 1963 were highlighted by start of two new projects, the completion of fieldwork in the Blue Nile Basin in Ethiopia, and the completion of two short-duration project reviews, one in Brazil and one in India.

At the request of the Agency for International Development and the Government of the Philippines, a Reclamation group went to Manila to assist in preparing multipurpose river basin development plans for the seven major rivers of the Philippines. This program is expected to take a minimum of 2 years and may be extended.

The other new project is the first phase of the feasibility study of the Pa Mong Project on the Mekong River between Thailand and Laos. This is a portion of the overall study of the Mekong River being accomplished on a multination basis under general direction of the Economic Commission for Asia and the Far East,

a United Nations agency. It is also scheduled for two years, with additional phases dependent on the findings of this initial study. The Bureau's participation is under the sponsorship of AID.

Reclamation personnel and facilities continued to be in demand for short-term consultations and planning and design review. In addition, the Bureau assisted foreign governments in solving technical problems in construction, operation and maintenance, farm settlement, agricultural economics, drainage, and other related fields.

Although the major portion of the requests for assistance was received through the Agency for International Development, services also were provided to the United Nations, the International Bank for Reconstruction and Development, the Pan American Union, the Inter-American Development Bank, and, in some instances, directly to various foreign governments.

As in the past, technical training and observation programs were provided for a steady stream of professional personnel from all over the world. Most of the 111 individuals came to the United States under auspices of the Agency for International Development. Others were sponsored by the United Nations, the trainees' own governments, Eisenhower Exchange Fellowships, Inc., and similar organizations.

The Bureau provides training and technical assistance to trainees through giving them (1) the individual inservice experience of working side by side with personnel of the Chief Engineer's staff and the Denver laboratories; (2) by taking them to various regional and planning offices, as well as construction and operating projects for instruction and pertinent details; and (3) by assigning them to carefully selected projects for the purpose of "learning by doing."

The keen interest in these programs is reflected by the many visits of foreign officials to Bureau offices. Of particular note in 1963 was the State visit to the Denver facilities of His Excellency Dr. Sarvepalli Radhakrishnan, President of the Republic of India, whose party included the Honorable Kenneth Galbraith, then-Ambassador to India.

## SUPREME COURT DECIDES WATER ISSUES

Two matters of vital concern to the Bureau of Reclamation were subjects of Supreme Court decisions during 1963.

The *Arizona v. California* case, involving the rights of the two States to the waters of the Lower Colorado River and its tribu-

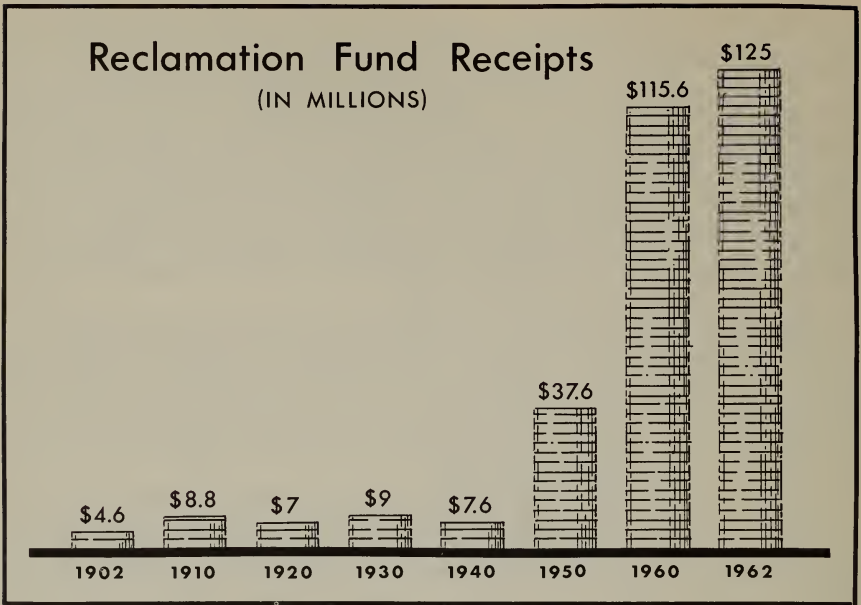
taries, was decided after 13 years' litigation. The Court held that the statutory apportionment of the waters of the Colorado River mainstream under the Boulder Canyon Project Act must be used as a guide in allocating the water of the Lower Colorado, having found that the Colorado River Compact was not controlling and having rejected the law of prior appropriations and the doctrine of equitable apportionment as a basis for resolving the water claims as between the States concerned. The Court left control of the tributaries with the States in which they flow, without charging the same to the apportioned water.

California was allotted 4.4 million acre-feet of water annually from the mainstream, Arizona 2.8 million acre-feet, and Nevada 300,000 acre-feet; and the Secretary of the Interior was found to have authority within the confines of the act to allocate and distribute water in times of shortage.

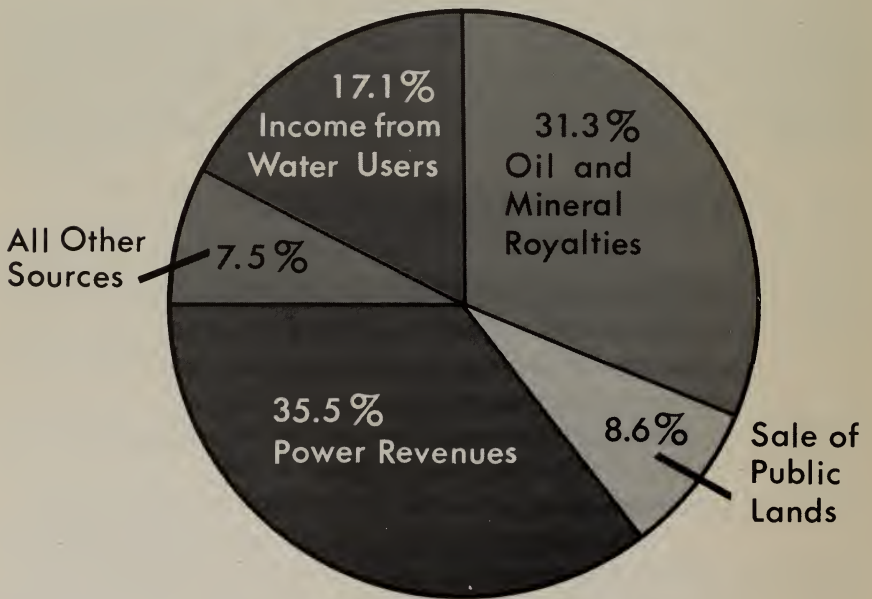
Regarding the cases of *Dugan v. Rank* and the *City of Fresno v. California et al.*, the Supreme Court affirmed the decision of the court of appeals that the injunction against the United States be dismissed. This case resulted from the impounding and diversion of San Joaquin River water by the Federal Friant Dam for use elsewhere in the Central Valley Project for Federal irrigation of lands, which diversion terminated prior uses of the water on acreage from Friant Dam to Mendota Pool. Several of those users so affected had been seeking since 1947 to enjoin diversion and storage of water there.

The Court held that the injunction would not lie against either the United States or local officials of the Bureau of Reclamation, stating that any relief to which the water users might be entitled by reason of the taking by the United States of the water involved would be by suit against the United States under the Tucker Act.





## Sources of Reclamation Fund





# Bonneville Power Administration

Charles F. Luce, Administrator

On May 21, 1963, the Bonneville Power Administration became the marketing agency for power generated at all Columbia River Basin Federal hydroelectric projects in the Pacific Northwest. A secretarial order, which became effective immediately, extended the Administration's marketing area to the 61,000-square-mile Upper Snake River drainage, including all of southern Idaho and small adjoining areas in Wyoming, Utah, and Nevada.

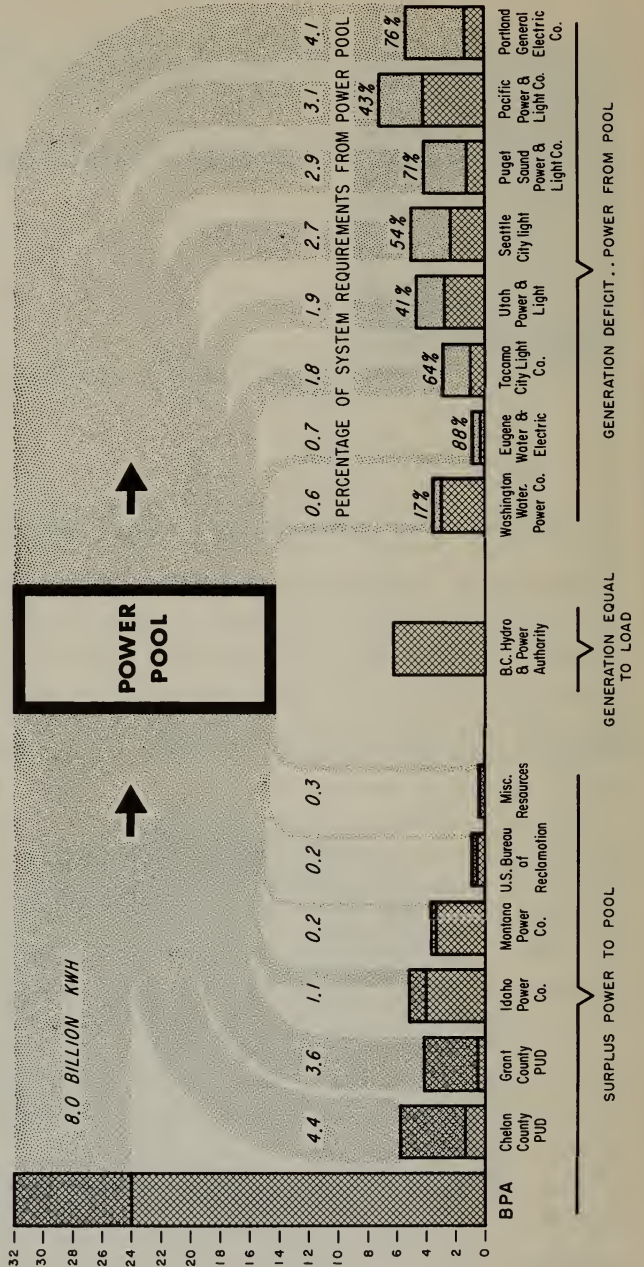
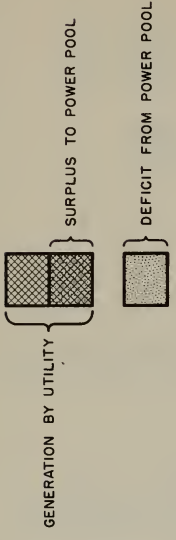
The order directed BPA to integrate the Upper Snake Federal hydroelectric plants with those in the rest of the Columbia River Basin, to make its standard wholesale rates effective in the area and transfer the Bureau of Reclamation power and transmission facilities, personnel, and accounts as soon as possible. The Bureau of Reclamation will continue to operate its projects for irrigation and related purposes.

All preference customers in the southern Idaho area—municipalities and rural electric cooperatives—formerly purchasing power from the Bureau of Reclamation, became customers of BPA. The lower wholesale rates of the BPA are expected to result in savings of approximately 40 percent in the first year and provide low-cost power for development of phosphate and other industrial resources.

## **Federal Generation Increases**

The U.S. Columbia River Power System, with addition of the Snake River Basin plants in southern Idaho, increased its installed generating capacity to 6,653,150 kilowatts. The Idaho plants have a nameplate rating of 163,900 kilowatts. An additional 38,860 kilowatts of Federal generation produced by isolated Navy,

NET OPERATIONS ENDING JUNE 30, 1963  
**Northwest Power Pool**  
 BPA SUPPLIED 44.2% OF NET ENERGY REQUIREMENTS





Bureau of Reclamation, and Bureau of Indian Affairs plants is not marketed by BPA.

Completion of plants under construction—Cougar, Green Peter, Foster, John Day, Lower Monumental, Little Goose, and Bruces Eddy—will give the Federal system an installed capacity of 9,248,150 kilowatts. Construction of authorized Federal projects would increase the nameplate rating to 10,319,650 kilowatts.

Construction funds were appropriated in October 1962 for the Little Goose and the newly authorized Bruces Eddy Projects in the Snake River Basin. Projects authorized at the same time were Asotin on the Snake River, Strube on the South Fork McKenzie River, and Lost Creek on the Rogue River.

Storage capacity in Federal reservoirs usable for power was 12,171,300 acre-feet. Projects under construction will add 2,487,000 acre-feet, and Libby Dam, an authorized project, could add 5,010,000 acre-feet when a treaty with Canada is ratified.

### **Non-Federal Generation Also Gains**

Non-Federal generation in the expanded area served by Bonneville Power Administration totaled 6,632,810 kilowatts of installed capacity, including the addition in fiscal 1963 of 120,000 kilowatts at the Mayfield plant of the city of Tacoma and 10,000 kilowatts at the Trail Bridge plant of the city of Eugene. Scheduled additions, under construction, or licensed projects would add about 3,861,330 kilowatts.

### **Northwest Power Pool**

Generation by principal electric utility systems of the Pacific Northwest during fiscal 1963 is shown in an accompanying chart.

Fifty percent of the energy generated by the major utilities of the region was provided by the U.S. Columbia River Power System. In addition to its other load, the Bonneville Power Administration provided 8 billion kilowatt-hours of energy to meet the net requirements of 8 other pool utilities.

Table 2 summarizes Federal and non-Federal generation in the Pacific Northwest.

### **Non-Federal Power Wheeled**

The Bonneville Power Administration wheeled or transferred for other utilities 10.7 billion kilowatt-hours of energy in fiscal 1963.

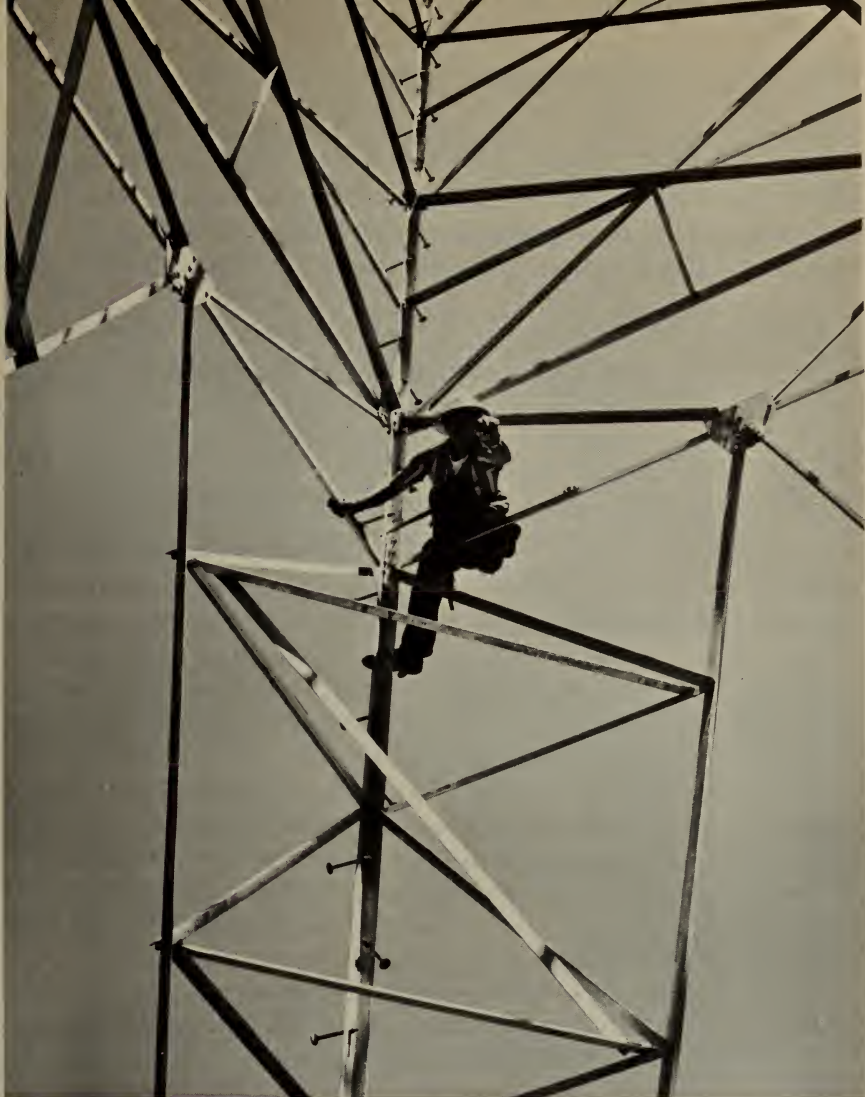
This compares to 11 billion kilowatt-hours wheeled or transferred during fiscal 1962.

Power is being delivered under long-term firm capacity contracts from the Pelton Project of the Portland General Electric Co., the Box Canyon Project of the Pend Oreille County Public Utility District, the Rocky Reach Project of the Chelan County Public Utility District, and the Carmen-Smith project of the city of Eugene.

Excess capacity contracts cover power from the Swift Project of the Pacific Power & Light Co., the Rock Island Project of the Chelan County Public Utility District, the Mayfield Project of the city of Tacoma, and from the Priest Rapids Project of Grant County Public Utility District and into the region from the Idaho Power Co.



An artist's sketch depicts the Hanford, Wash., new production reactor and electric power generating facilities which will add 800,000 kilowatts to the region's power resources.



A line crew foreman is directing steel assembly on a BPA light steel tower in the Willamette Valley area.

### **Hanford Steam Generation Authorized**

In fiscal 1963, congressional legislation authorized the Washington Public Power Supply System to contract with the Atomic Energy Commission for lease of land, purchase of reactor byproduct steam, and other necessary arrangements for producing electric power by utilizing nuclear fuel at the Hanford Works. The power output of the reactor-fueled generation is estimated at 800,000 kilowatts. Exchange agreements among the BPA, WPPSS, and purchasers of the project output were completed to permit the



interchange of power and effectively integrate the NPR with West Group Area resources.

### **Transmission System Reaches 8,910 Miles**

The Bonneville Power Administration, since it placed its first line into operation 25 years ago, has grown into a network of 8,910 circuit-miles of high-voltage transmission lines and 248 substations of 14,895,345-kilovolt-amperes transformer capacity. This reflects an average yearly growth of 356 miles of lines and 595,810 kilovolt-amperes transformer capacity. Latest additions included 238 miles of transmission lines and 24 substations of 223,850-kilovolt-amperes transformer capacity in southern Idaho. The present system reactive capacitance is 2,752,000 kilovolt-amperes.

### **Construction Progresses**

Key facilities under construction at year's end included:

A second 33-mile, 230,000-volt line between Chehalis and Longview, Wash., to reinforce the Administration's system in the Longview area of southwestern Washington.

A 70-mile, 500,000-volt line between Arlington and Blaine, Wash., to provide transmission capacity for delivery to the Canadian border of secondary power for sale to British Columbia and to carry a portion of Canada's share of the downstream benefits resulting from the Canadian storage treaty. Initially, this line will be operated at 230 kv.

A 93-mile, 230,000-volt line between the Administration's Bell substation, near Spokane, Wash., and the Canadian boundary north of Metaline Falls to provide an interconnection with the West Kootenay Power & Light Co., Ltd., to interchange energy and to permit regulation of water resources. This line also will enable the Administration to deliver to Seattle a portion of the output of the city of Seattle's Boundary hydroelectric plant.

A 110-mile, 500,000-volt line between Big Eddy, near The Dalles, Oreg., and Keeler, near Portland, to be operated initially at 230,000 volts. This line will reinforce the Portland and Willamette Valley transmission system, transmit power to the Portland area, initially from The Dalles and later from the John Day hydroelectric plants, and wheel from non-Federal plants on the Columbia River.

A 120-mile, 500,000-volt line between Vantage, Wash., and Covington to serve the load growth in the Puget Sound area and to provide a normal level of reliability.

A 73-mile, 230,000-volt line between Alvey substation, near Eugene, Oreg., and Tahkenitch, near Reedsport, Oreg., to serve increasing load in the central part of the Oregon coastal area.

A 47-mile, 230,000-volt line between Olympia, Wash., and Aberdeen, Wash., to prevent overloading of existing lines when outages occur.

A 13-mile, 115,000-volt line between Kitsap, near Bremerton, Wash., and Bangor to provide additional power to the U.S. Naval Ammunition Depot at Bangor, Wash., and the Naval Torpedo Station at Keyport, Wash.

A 10-mile, 115,000-volt line between North Bonneville and Stevenson, Wash., to serve the load growth in the Stevenson area.

### **Intertie Proposals Studied**

During the year, analyses were made of seven non-Federal proposals for constructing Pacific Northwest-Pacific Southwest interties.

The proposals included transmission plans similar to those in the study completed by a Departmental task force in November 1961.

The Bonneville Power Administration recommended to the House and Senate Appropriations Committees:

A 750,000-volt direct-current transmission line from the Columbia River to the Los Angeles area through western Nevada, constructed jointly by the BPA and the Bureau of Reclamation; and

A 500,000-volt alternating current transmission line from the vicinity of John Day Dam to the Oregon-California border, constructed by the BPA and connected with a similar line to be constructed in California by non-Federal entities.

The BPA also presented the committees with detailed analysis of the non-Federal proposals. The BPA does not propose selling surplus power to California customers until Congress has enacted legislation defining the primary marketing area of the Bonneville Power Administration and establishing the ground rules for sale and exchange of surplus power outside the region.

Studies were in progress during fiscal 1963 on a proposed Missouri Basin-Pacific Northwest extra-high-voltage interconnection.

### **Storm Damages Heavy**

The Bonneville Power Administration's transmission system underwent one of its severest tests during the Columbus Day storm that swept western Oregon and Washington coastal areas October 12, 1962. A windstorm of hurricane force with wind veloci-



Hurricane force winds of up to 116 miles per hour reduced BPA's 500-foot Columbia River crossing to a mass of twisted steel, as pictured above, in October 1962.

ties up to 116 miles per hour struck Gold Beach, Oreg., at 2 p.m., and moved northward as far as Port Angeles, Wash. By 6 p.m., the system load dropped to 50 percent of normal.

There were one or more interruptions to 42 transmission lines, which resulted in over 60 power failures at 48 substations. Other electric utilities in the area suffered severe damage to their overhead distribution systems, causing extensive power outages of long duration.



## **BPA Service Restored Rapidly**

The BPA restored power to 75 percent of the substations within 8 hours, 90 percent within 24 hours, and all stations were in service within 48 hours. Some customers transferred part of their load to other BPA power sources, but in most cases complete restoration of service to their customers was delayed for several days, until distribution lines were repaired. BPA service was not interrupted to any major industrial customer during the storm. However, one aluminum plant was shut down because of damage to its facilities.

Following is a summary of the major damage to the BPA system, which totaled about \$1,200,000: Destroyed were two 550-foot transmission line towers on the Columbia River crossing at Vancouver, Wash., a 412-foot transmission line tower on the Washington side of the Columbia River crossing near Longview, a steel tower on one 230-kv transmission line and 2 steel towers on another 230-kv line; 17 wood structures on 115-kv transmission lines were blown down; conductors and steel towers on one 115-kv transmission line were damaged so badly by falling trees that 5 days were required for repairs; another 115-kv transmission line had about 30 trees in the line and 3 spans of conductor on the ground.

## **Gross Revenues Gain**

The Bonneville Power Administration's gross revenues for fiscal 1963, on the basis of preaudit figures, were \$77,704,000, a gain of \$3,221,000, or 4.32 percent, over 1962. Energy sales totaled 30.2 billion kilowatt-hours at an average rate of 2.38 mills per kilowatt-hour, for \$71,978,000. Miscellaneous revenues, principally charges for wheeling non-Federal power over the Federal system, were \$5,726,000.

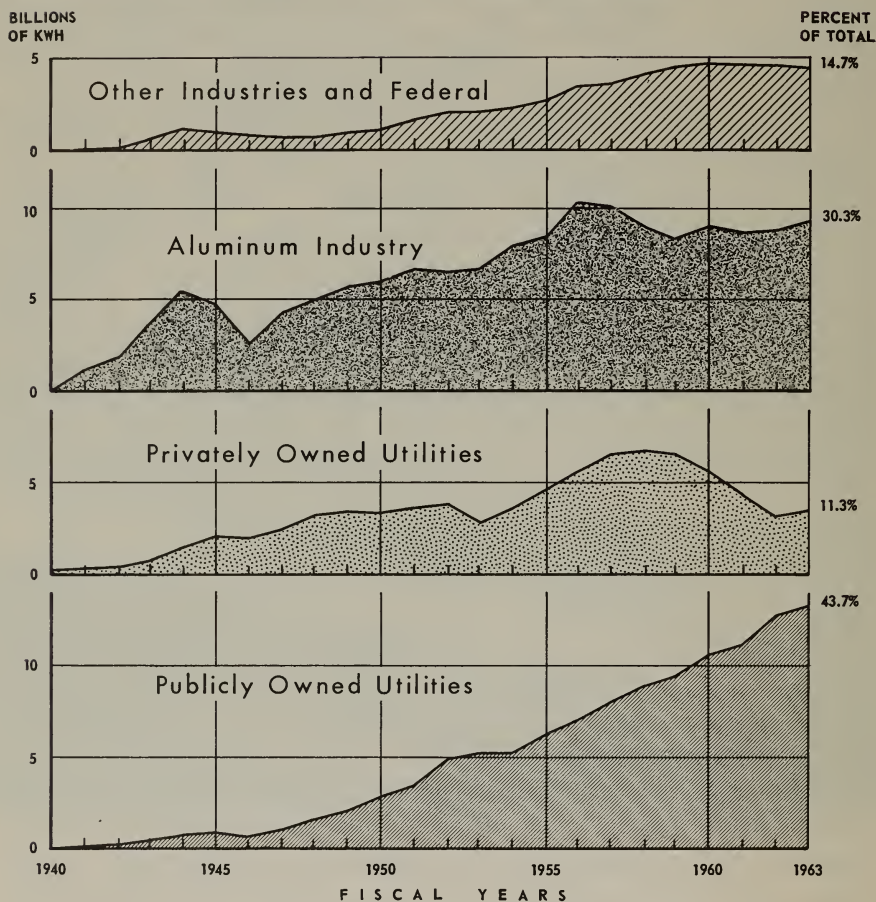
Since beginning operations in 1938, the Bonneville Power Administration has sold 393 billion kilowatt-hours of hydroelectric energy at an average rate of 2.35 mills per kilowatt-hour. Total sales revenues were \$926,000,000 and will pass the billion-dollar-mark during fiscal 1964.

## **Energy Sales and Revenue Trends Shown**

Trends in energy sales are illustrated in an accompanying chart. Comparative energy sales by classes of customers for fiscal 1962 and 1963 are shown in table 4.

Revenue and revenue trends for fiscal years 1956 through 1963 are presented in table 5. The table contains trend percentages for each class of customer and for miscellaneous power revenues to show more clearly the annual variations and longer term trends.

# Sales of Electric Energy by Class of Customer



Total sales of electric energy increased 20 percent during the 8-year period. More significant, however, is the reduction in sales to the aluminum industry and privately owned utilities, compared to the continuous growth in sales to the publicly owned utilities. A 20-percent gain for total sales obscures the fact that firm power sales rose 36.8 percent during the 1956-63 period, but nonfirm sales fell 50 percent.

Firm power sales of \$66,321,000 in 1963 represented a gain of 6.9 percent over 1962. However, nonfirm sales of \$5,657,000 in 1963 were down 19.5 percent from the preceding year. Nonfirm sales often show wide fluctuations from year to year. For example, 1962 was considerably above 1961, due to increased purchases by the industries and both private and public utilities. In 1963, on the other hand, both classes of utilities substantially reduced nonfirm purchases. Streamflow conditions and demands for aluminum are basic factors affecting nonfirm sales.

### **Sales to Aluminum Plants**

Firm sales to the aluminum industry continued to rise through 1960. This represented the addition of potlines by the industry. At the same time, beginning with 1958, some of the aluminum plants curtailed their firm power loads. In fact, curtailment during the period 1958 to 1963 represented an aggregate loss of \$5,500,000 in revenue to the Administration. An additional revenue loss resulted when the Aluminum Co. of America switched part of its service from the Federal system to the Chelan County PUD's Rocky Reach Dam Project when it was completed. This was in accordance with previously arranged contracts and had been anticipated.

Nonfirm sales to the aluminum industry showed a small drop in 1957 and then fell very rapidly to a low point in 1961, which was only about 28 percent of the 1956 level. Some recovery of interruptible sales to this industry occurred in the 2 years following 1961.

However, aluminum operations increased during the past 2 years due to somewhat improved market conditions for the industry. At the end of fiscal 1963 there was little firm power curtailment and plants were operating at about 65 percent of their interruptible power capacity. Prospects for further improvement in aluminum power sales appear to be good.

Pacific Northwest aluminum companies were producing 52 percent of the Nation's primary aluminum in 1948, but in 1962 were producing only 26 percent of that total.

### **Sales to Private Utilities Drop**

Firm power sales to privately owned utilities decreased rapidly after fiscal year 1959, with some recovery in 1960. The decrease can be attributed primarily to the development of sources of supply other than the BPA. These provided power supply in



excess of the load growth requirements of the privately owned utilities. The new sources of supply include construction of private generating projects and purchases of substantial power from publicly owned utilities which have constructed large hydroelectric plants on the main stem of the Columbia River. These same sources of supply also have provided large amounts of secondary power which has resulted in decreasing BPA's nonfirm sales to the privately owned utilities.

### Public Utility Sales Up

Sales to publicly owned utilities have shown a steady increase, amounting to \$16,600,000, or 85 percent over the 7-year period.

Miscellaneous revenues increased severalfold over the 1956-63 period. This growth has resulted primarily from two factors: charges for wheeling non-Federal power and payments for coordination and storage benefits. The major portion of the generation at the new non-Federal plants is "wheeled" over the Federal transmission network to avoid duplication of facilities. The non-Federal utilities in each of the past 2 years have made substantial payments for benefits from coordination with the Federal system and from upstream Federal reservoirs.

### Unfavorable Trends Listed

Even though 1963 revenue represented a new peak, net financial results have declined during the past 6 years.

Sales of energy have not kept pace with the increase in installed capacity. This is shown in the following table:

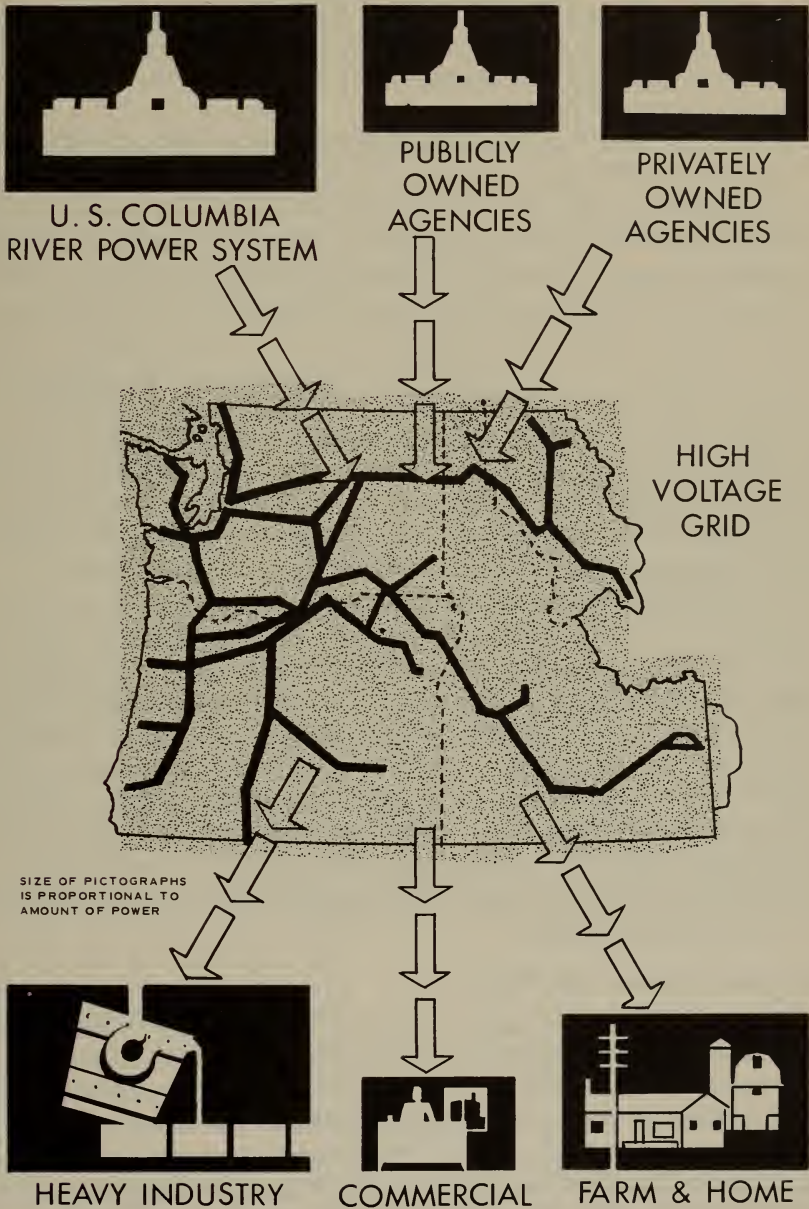
*Bonneville Power Administration: Sales of electric energy and June 30th installed capacity*

Fiscal year	Sales of electric energy (\$1,000)	Installed capacity (kw)	Percent annual change from previous year	
			Sales	Capacity
1954	\$44,127	3,145,400	15.0	20.7
1955	51,259	3,588,800	16.2	14.1
1956	59,790	4,151,000	16.6	15.7
1957	64,972	4,702,000	8.7	13.3
1958	64,704	5,334,000	(.4)	13.4
1959	66,860	5,721,250	3.3	7.3
1960	68,944	6,033,250	3.1	5.5
1961	66,995	6,189,250	(2.8)	2.6
1962	69,054	6,489,250	3.1	4.8
1963	71,978	6,489,250	4.2	.0

( ) Decrease.

NOTE: The sales data do not include revenues from miscellaneous sources, such as wheeling of non-Federal power over the Federal transmission network.

# ESTIMATED PACIFIC NORTHWEST POWER GENERATION & USE, 1963



Energy sales for the 1954-7 period increased an average of 14.1 percent per year, compared with an annual increase of 16 percent for installed capacity. Except for some faltering in 1957, the sales average and capacity figure would have been almost identical. Since 1957, energy sales have shown an average annual increase of only 1.8 percent, compared to 6.3 percent for installed capacity. Sales in 1963 were 10.8 percent over those of 1957, but installed capacity increased 38 percent.

One of the most important underlying causes for the unfavorable trends since 1957 has been the failure to construct new projects on a schedule permitting orderly marketing of firm power. Even though for the first time in many years there was no increase in the installed capacity of Federal Columbia River generation in 1963, several large non-Federal plants are scheduled for service in the near future or have been placed in service in recent years. These displace sales of Federal power and create temporary surpluses of firm power on the Federal system. Inability to find markets for this firm power, which is only temporarily surplus, and for a large quantity of surplus secondary power on the Federal system resulted in unsold Federal power representing a potential additional revenue of \$157 million during the past 6 years, ranging from \$12,700,000 to as high as \$32 million in individual years of the period.

Adverse economic conditions which developed in 1958 slowed the load growth of the Administration's power distributors and resulted in substantial curtailment by BPA's large industrial customers during portions of the past 6 years. There was considerable improvement in the rate of industrial operations near the end of the fiscal year. As an example, the largest aluminum reduction plant in the Northwest had only three of its eight potlines in operation at times in recent years, but was operating at full capacity at the end of fiscal 1963. The improved conditions in the aluminum industry came too late to show substantial gains in 1963, but should be evident in fiscal 1964.

### **Revenues Cover All Costs**

Despite unfavorable sales trends, revenues of the power system from 1958 to 1963, inclusive, have covered all power operation, maintenance, and interest expenses, and repaid approximately \$100 million of power construction costs to the Treasury. Even though substantial returns have been made on construction costs, the amounts have not come up to the previously established "benchmark" schedules for amortization of the capital investment.



The U.S. Columbia River Power System therefore has reported "deficits" during the 1958-63 period, even though the system was "in the black" as of June 30, 1963, on an accumulative basis. The reported deficits have not been "out-of-pocket losses," since all expenses have been covered by a substantial margin. They have been deficits only when measured by an arbitrary yardstick as to the requirements or schedules for amortization of the capital investment.

### **Repayment Policy Reviewed**

Confronted with the possibility that present wholesale power rate levels may have to be raised, an analysis of amortization policies becomes necessary. A policy governing the rate and manner of repaying the power investment has not been critically re-examined since the completion of the first 2 dams of what is now a 15-dam system.

### **Consolidated System Payout Announced**

A consolidated system 50-year payout plan was announced by the Secretary of the Interior April 17, 1963. Prior to that, requirements were arrived at by a simple summation of the annual payout obligations computed over a 50-year period separately for each dam. The new plan follows that being used by most of the other major river basin power systems of the Department of the Interior, including the Central Valley Project in California and the Missouri River Basin Project.

While the revised payout schedule will reduce BPA's present repayment obligations by \$7 million to \$9 million annually, there will be no change in total obligations. A consolidated system approach is used to provide for repayment of the system investment over a combined period extending 50 years after completion of the last project in the system. Revenues and repayment requirements are pooled on a system basis so that as earlier units complete their payout periods, their revenues become available to assist in the repayment of newer projects.

### **Reporting Format Studied**

Concurrent with the adoption of a system payout plan, the Administration started a thorough review of the manner in which financial results of the operations of the U.S. Columbia River Power System are to be reported. The financial statements that have been published in the past in the annual auditors' reports have necessarily been substantially pro forma in character. This follows from the facts that for several of the generating projects the cost allocations have been and continue to be tentative or obsolete

and for a few of the projects the data were based upon memorandum accounts rather than official accounts of the projects.

Studies are being made of revised formats for financial statements that will give full and proper disclosure to the official accounts and to the status of repayment of the power investment.

### **All Costs Rise**

The Administration's wholesale power rate, lowest in the Nation for large blocks of power, has remained unchanged for 25 years, predating World War II, even though costs of all kinds rose substantially during this period. Construction costs, salaries, wages, materials and services—all affecting annual charges—have been offset to a large degree by technological advances in power transmission but have resulted in substantial increases in the cost of power supply.

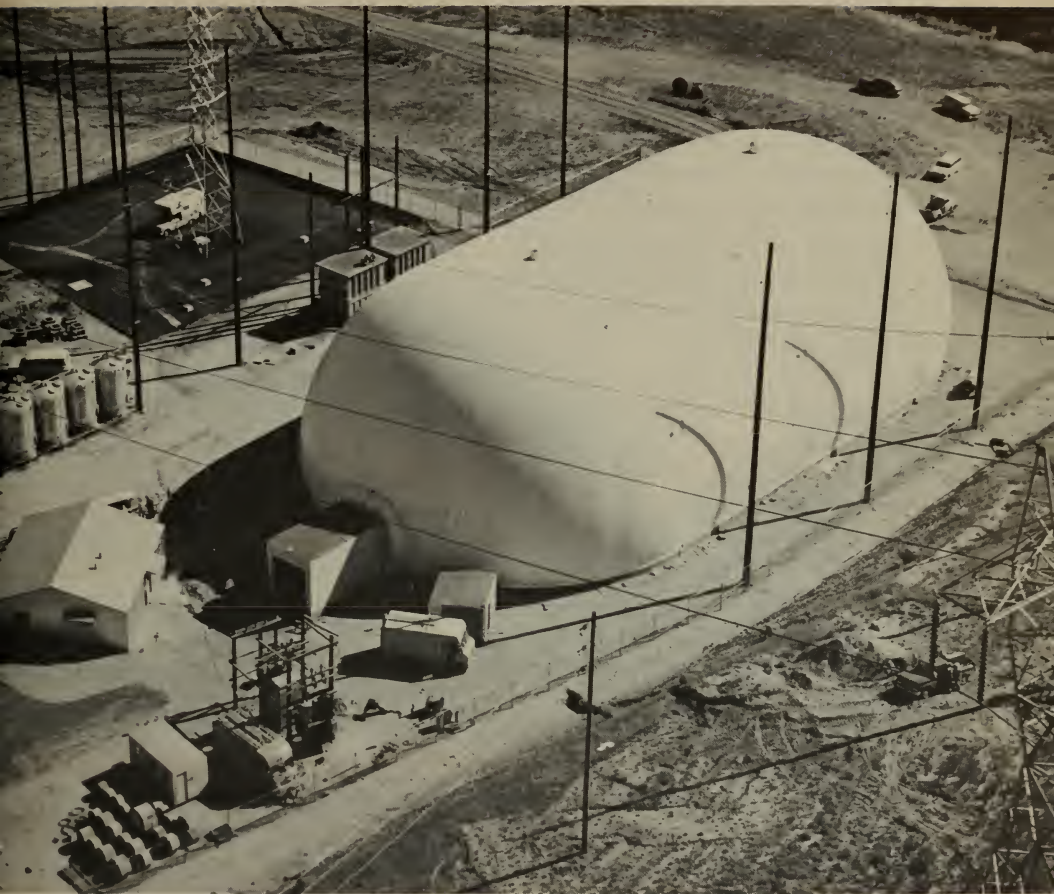
The BPA's cost per kilowatt-hour of power handled has been about 1 mill for several years, but is now significantly less than 1 mill per kilowatt-hour. This is the result of engineering improvements, including high-capacity, large-volume transmission facilities and the more intensive use of transmission investment brought about by the increased volume, particularly the wheeling of non-Federal power. There is less room, on the other hand, for technological improvement in hydroelectric generation because of the present high stage of efficiency. Some of the new power sites have been less favorable than the first ones developed, resulting in cost increases.

### **High-Voltage Laboratory Completed**

Two important steps were taken during the year in advancing the technology of high-voltage power transmission in both alternating and direct current.

Clearing operations started on the right-of-way for the first 500,000-volt alternating-current transmission line, and construction started on a \$2 million direct-current transmission test center.

Continuing engineering and economic studies have demonstrated conclusively the advantages of a 500,000-volt alternating current grid overlay for the future transmission system. The transition to 500,000-volt transmission has required extensive investigation of conductor design and configuration, tower requirements, corona phenomena, insulation levels, radio interference, and similar problems. Completion of the Charles E. Carey high-voltage laboratory at the J. D. Ross substation has made it possible to conduct many of the tests and investigations with BPA equipment and facilities.



An air supported plastic dome—200 feet long, 100 feet wide and 58 feet high—completed in June 1963, houses the power supply and equipment for BPA's \$2,000,000 direct-current transmission test center.

### **Direct-Current Test Center Starts**

Construction was well underway on Bonneville Power Administration's high-voltage direct-current test center, first of its kind in the United States. A huge air-supported plastic dome housing the direct-current power supply and testing equipment is 200 feet long, 100 feet wide, and 58 feet high. The plastic dome, costing a third less than a comparable rigid structure, was completed in June 1963 and work was begun on installing the massive rectifier units. Completion of the test equipment and test line was scheduled for September.



A contemplated two-year test program is an important element in America's contribution to technological leadership in direct-current power transmission. The new technique of power transmission will make transportation of large blocks of energy over distances of 1,000 to 2,000 miles economically feasible.

Power from the adjacent Big Eddy substation, near The Dalles, Oreg., will be converted from 13,800 volts alternating current to 1,100,000 volts direct current. Combined with the test line, the facility will produce the electrical voltage stresses associated with actual long-distance direct-current transmission. Data will be provided to establish standards for insulation and conductor spacing and size, together with investigation of conductor radio noise problems, insulator contamination, leakage, and flashover phenomena.

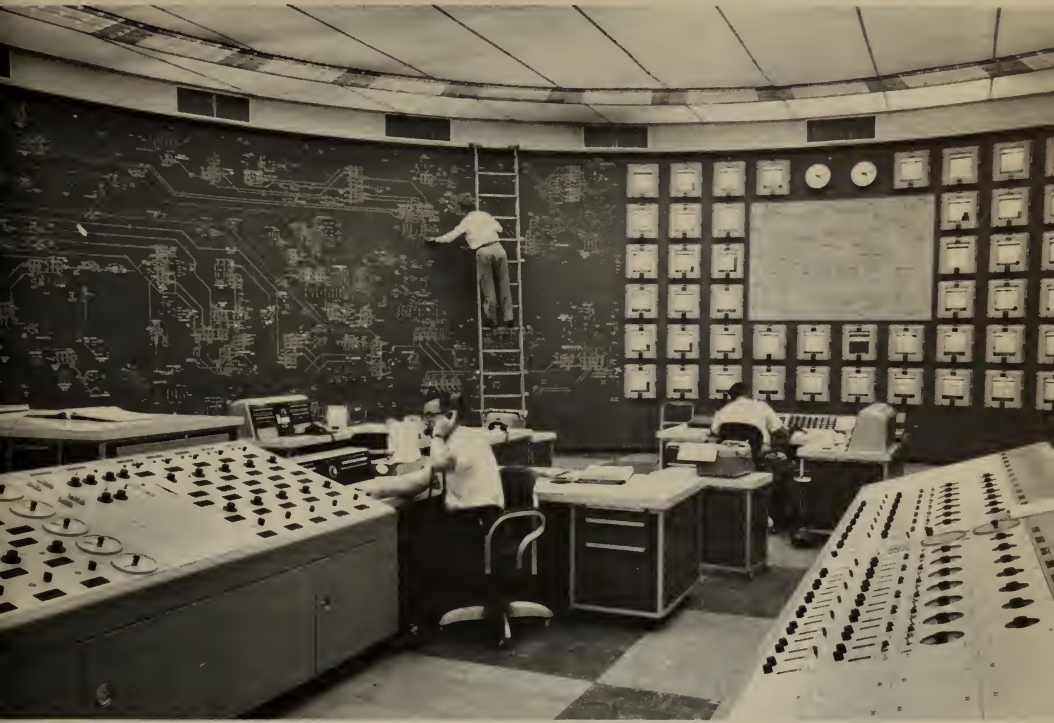
### **New Control Equipment Installed**

New load-frequency control equipment for the U.S. Columbia River Power System was installed at the Portland system control center in July 1962. It provides automatic regulation of generation at Bonneville, The Dalles, McNary, Chief Joseph, and Grand Coulee powerhouses in accordance with system electrical conditions and manually set schedules of participation. System control based on constant frequency with automatic time correction, or tieline bias, may be selected.

Present plans for interregional transmission lines include the requirement for tieline bias control to limit the magnitude of power fluctuations during normal operating conditions on such lines. Full use of tieline bias control cannot be realized until new telemetering and control equipment is placed in service. Benefits from the installation have already included a less severe duty cycle at the regulating powerhouse, rapid automatic recovery from some kinds of system emergencies, and close control of system time.

### **Radio Noise Telemetry**

A radio noise telemetry system was developed for detecting radio influence current in an energized transmission line. The information detected during the test period is transmitted via low power, very-high-frequency radio to the place where it will be recorded on a punched tape so that information can be analyzed on automatic data-processing equipment. The radio telemetry system will play an important part in the radio noise investigation associated with the high-voltage direct-current test program and in future high-voltage development work.



This new load frequency control equipment, installed at the Portland control center of the U.S. Columbia River power system during 1963, provides automatic regulation of generation at Bonneville, The Dalles, McNary, Chief Joseph and Grand Coulee powerhouses.

### **Canadian Treaty Liaison Maintained**

Continuing liaison and exchange of technical information was maintained during the year on various aspects of the pending Columbia River storage treaty with Canada.

A long-term coordination agreement was being negotiated with the principal non-Federal generating utilities of the region, representing operation of some 100 projects. A second 1-year coordination contract with BPA was signed during 1963 and will provide further experience and knowledge for coordination of operations when the Canadian treaty is implemented.

TABLE 1.—U.S. Columbia River Power System—General specifications, projects existing, under construction and authorized June 30, 1963

Project	Operating agency <sup>1</sup>	Location	Stream	Plant installations		Date in service (initial unit)
				Number of units	Total capacity kilowatts <sup>2</sup>	
Existing:						
Primary system:						
Bonneville.....	CE	Washington-Oregon.....	Columbia.....	10	518, 400	June 1938.
Grand Coulee.....	BR	Washington.....	do.....	18	1, 944, 000	September 1941.
Hungry Horse.....	BR	Montana.....	South Fork Flathead.....	4	285, 000	October 1952.
Detroit.....	CE	Oregon.....	North Santiam.....	2	100, 000	July 1958.
McNary.....	CE	Washington-Oregon.....	Columbia.....	14	980, 000	November 1958.
Big Cliff.....	CE	Oregon.....	North Santiam.....	1	18, 000	June 1954.
Lookout Point.....	CE	do.....	Middle Fork Willamette.....	3	120, 000	December 1954.
Albani Falls.....	CE	Idaho.....	Pend Oreille.....	3	42, 600	March 1955.
Dexter.....	CE	Oregon.....	Middle Fork Willamette.....	1	15, 000	May 1955.
Chief Joseph.....	CE	Washington.....	Columbia.....	16	1, 024, 000	August 1955.
Chandler.....	BR	do.....	Yakima.....	2	12, 000	February 1956.
The Dalles.....	CE	Washington-Oregon.....	Columbia.....	16	1, 119, 000	May 1956.
Roza.....	BR	Washington.....	Yakima.....	1	11, 250	August 1958.
Ice Harbor.....	CE	do.....	Snake.....	2	270, 000	December 1961.
Hills Creek.....	CE	Oregon.....	Middle Fork Willamette.....	2	30, 000	May 1962.
Upper Snake River System: <sup>3</sup>						
Minidoka.....	BR	Idaho.....	Snake.....	7	13, 400	1909.
Boise Diversion.....	BR	do.....	Boise.....	2	1, 500	1912.
Black Canyon.....	BR	do.....	Payette.....	2	8, 000	1925.
Anderson Ranch.....	BR	do.....	South Fork Boise.....	2	27, 000	1950.
Pallsades.....	BR	do.....	Snake.....	4	114, 000	February 1957.
Subtotal.....					6, 653, 150	
Under construction:						
Cougar.....	CE	Oregon.....	South Fork McKenzie.....	2	25, 000	
Green, Peter.....	CE	do.....	Middle Santiam.....	2	80, 000	
Foster.....	CE	do.....	South Santiam.....	2	30, 000	
John Day.....	CE	Washington-Oregon.....	Columbia.....	10	1, 350, 000	
Lower Monumental.....	CE	Washington.....	Snake.....	3	405, 000	
Little Goose.....	CE	do.....	do.....	3	405, 000	
Bruce Eddy.....	CE	Idaho.....	North Fork Clearwater.....	3	300, 000	
Subtotal.....					2, 595, 000	



Authorized:					
Libby <sup>4</sup>	CE	Montana	Kootenai	4	344,000
Lower Granite	CE	Washington	Snake	3	405,000
Asotin	CE	Washington-Idaho	do	3	288,000
Strube	CE	Oregon	South Fork McKenzie	1	4,500
American Falls <sup>3</sup>	BR	Idaho	Snake	3	30,000
Subtotal					1,071,500
Total, 32 projects					10,319,650

<sup>1</sup> CE—Corps of Engineers; BR—Bureau of Reclamation.

<sup>2</sup> Nameplate rating.

<sup>3</sup> Incorporated into the U.S. Columbia River Power System by Departmental Order No. 2860 dated May 21, 1963.

<sup>4</sup> Construction of the Libby project is dependent upon ratification of the United States-Canadian treaty relating to development of storage in the Canadian portion of the Columbia River Basin.

TABLE 2—Pacific Northwest generation: Nameplate rating of plants existing, under construction, and authorized or licensed June 30, 1963

Ownership	Existing		Under construction		Licensed or authorized		Total	
	Number of plants	Nameplate rating	Number of plants	Nameplate rating	Number of plants	Nameplate rating	Number of plants	Nameplate rating
Federal:								
Hydro.....	24	6,674,010	7	2,595,000	6	1,129,500	37	10,392,510
Fuel.....	1	18,000					1	18,000
Total Federal.....	25	6,692,010	7	2,595,000	6	1,129,500	38	10,410,510
Public agencies:								
Hydro.....	32	2,948,080	7	1,617,370	2	767,010	41	5,332,460
Fuel.....	16	188,370	1	860,000			17	1,048,370
Total public agencies.....	48	3,136,450	8	2,477,370	2	767,010	58	6,880,880
Private utility:								
Hydro.....	89	3,240,530	2	616,950			91	3,857,480
Fuel.....	14	255,830					14	255,830
Total private utilities.....	103	3,496,360	2	616,950			105	4,113,310
Total:								
Hydro.....	145	12,862,620	16	4,829,320	7	1,890,510	169	19,582,450
Fuel.....	31	462,200	1	860,000			32	1,322,200
Total.....	176	13,324,820	17	5,689,320	7	1,890,510	201	20,904,650

TABLE 3.—*Electric energy account for fiscal year 1963*

Energy received (millions of kilowatt-hours):	
Energy generated for BPA:	
Bureau of Reclamation.....	12, 118
Corps of Engineers.....	19, 838
Power interchanged in.....	13, 754
	<hr/>
Total received.....	45, 710
	<hr/> <hr/>
Energy delivered (millions of kilowatt-hours):	
Sales.....	30, 202
Power interchanged out.....	13, 533
Used by Administration.....	37
	<hr/>
Total delivered.....	43, 822
	<hr/> <hr/>
Energy losses in transmission and transformation.....	1, 888
Losses in percent of total received (percent).....	4. 1
Maximum demand on Federal plants (kilowatts) Jan. 11, 1963, 5-6 p.m., P.s.t.....	5, 403, 000
Load factor, total generated for BPA, percent.....	67. 5

*Percentage distributed by classes of customers for fiscal year 1963:*

	<i>Number of</i>	<i>Energy sale</i>
	<i>customers,</i>	<i>by percent</i>
	<i>June 1963</i>	<i>of total</i>
Publicly owned utilities.....	83	43. 7
Privately owned utilities.....	7	11. 3
Aluminum industry.....	9	30. 3
Other industries and Federal agencies.....	19	14. 7
	<hr/>	<hr/>
Total.....	118	100. 0



TABLE 4.—Sales of electric energy by classes of customers

Class of customer	Fiscal year 1963		Fiscal year 1962		Percent increase
	Millions of kilowatt-hours	Mills per kilowatt-hour	Millions of kilowatt-hours	Mills per kilowatt-hour	
Publicly owned utilities:					
Firm.....	12,940	2.73	12,133	2.69	6.7
Nonfirm.....	274	2.49	536	2.50	-48.9
Total.....	13,214	2.72	12,669	2.68	4.3
Privately owned utilities:					
Firm.....	3,252	2.11	2,654	2.12	22.5
Nonfirm.....	164	2.50	541	2.50	-69.7
Total.....	3,416	2.13	3,195	2.18	6.9
Aluminum plants:					
Firm.....	7,085	2.03	7,046	2.03	.6
Nonfirm.....	2,055	1.81	1,719	1.78	19.5
Total.....	9,140	1.98	8,765	1.98	3.9
Other industries: <sup>1</sup>					
Firm.....	4,033	2.39	4,078	2.31	-1.0
Nonfirm.....	398	2.26	485	2.20	-18.8
Total.....	4,431	2.37	4,563	2.30	-2.9
Total energy:					
Firm.....	27,310	2.42	25,911	2.39	5.4
Nonfirm.....	2,891	1.97	3,281	2.08	-12.0
Total.....	30,201	2.38	29,192	2.36	3.4

<sup>1</sup> Includes Federal agencies.

TABLE 5.—Sales of energy, firm and nonfirm, by class of customer and miscellaneous power revenues

[Thousands of dollars]

Class of customer	Fiscal year 1956	Fiscal year 1957	Fiscal year 1958	Fiscal year 1959	Fiscal year 1960	Fiscal year 1961	Fiscal year 1962	Fiscal year 1963
Aluminum industry:								
Firm	\$13,119	\$13,693	\$13,980	\$14,227	\$15,293	\$14,978	\$14,341	\$14,382
Nonfirm	6,979	6,333	3,512	2,384	2,168	1,981	3,042	3,715
Total aluminum	20,998	20,026	17,492	16,611	17,461	16,959	17,383	18,097
Trend percentages <sup>1</sup>	100	100	87	83	87	84	86	90
Other industry:								
Firm	2,569	2,836	3,006	3,138	3,163	3,205	3,194	2,927
Nonfirm	1,313	748	407	680	868	613	855	625
Total other industry	3,882	3,584	3,413	3,818	4,031	3,818	4,049	3,552
Trend percentages <sup>1</sup>	100	92	88	98	104	98	104	92
Publicly owned utilities:								
Firm	19,324	21,384	22,593	24,861	28,304	29,520	32,598	35,466
Nonfirm	181	660	981	768	357	583	1,340	682
Total publicly owned utilities	19,505	22,044	23,574	25,629	28,661	30,103	33,938	36,148
Trend percentages <sup>1</sup>	100	113	121	131	147	154	174	185
Privately owned utilities:								
Firm	9,226	10,476	11,526	11,846	9,907	8,338	5,678	6,900
Nonfirm	2,773	3,974	2,645	2,552	2,659	1,301	1,536	3,332
Total privately owned utilities	11,999	14,450	14,171	14,398	12,566	9,639	7,214	7,232
Trend percentages <sup>1</sup>	100	120	118	120	105	80	60	60
Federal agencies:								
Firm	4,253	4,777	5,860	6,015	5,986	6,194	6,217	6,646
Nonfirm	52	90	194	388	239	281	303	306
Total Federal agencies	4,305	4,867	6,054	6,403	6,225	6,475	6,470	6,949
Trend percentages <sup>1</sup>	100	113	141	149	145	150	150	161
Total sales of electric energy:								
Firm	48,491	53,166	56,965	60,087	62,653	62,235	62,028	66,321
Nonfirm	11,298	11,805	7,739	6,772	6,291	4,760	7,026	5,657
Total sales of energy	59,789	64,971	64,704	66,859	68,944	66,995	69,054	71,978
Trend percentages <sup>1</sup>	100	109	108	112	115	112	115	120
Miscellaneous power revenues:								
Firm	1,045	1,299	1,871	1,615	2,054	2,707	5,429	5,726
Nonfirm	100	124	179	155	197	259	520	548
Total revenue	60,834	66,270	66,575	68,474	70,998	69,701	74,483	77,704
Trend percentages <sup>1</sup>	100	109	109	113	117	115	122	128

<sup>1</sup> Fiscal year 1956 base year.  
<sup>2</sup> Restated—Richland Village reclassified from "Federal agency" to "publicly owned utility."



BPA Supervising Safety Officer Merl L. Bassett developed a mechanical man to demonstrate safe ways for "Your Back at Work," part of a regional campaign to reduce back injuries.





# Southeastern Power Administration

Chas. W. Leavy, Administrator

During fiscal 1963, the Southeastern Power Administration marketed 1,507,500 kilowatts of capacity (with peak generation of 1,987,870 kilowatts) and 3,898,394,997 kilowatt-hours of energy. It was sold to 54 public bodies, 75 rural electric cooperatives, 1 Federal agency, and 4 privately owned utilities.

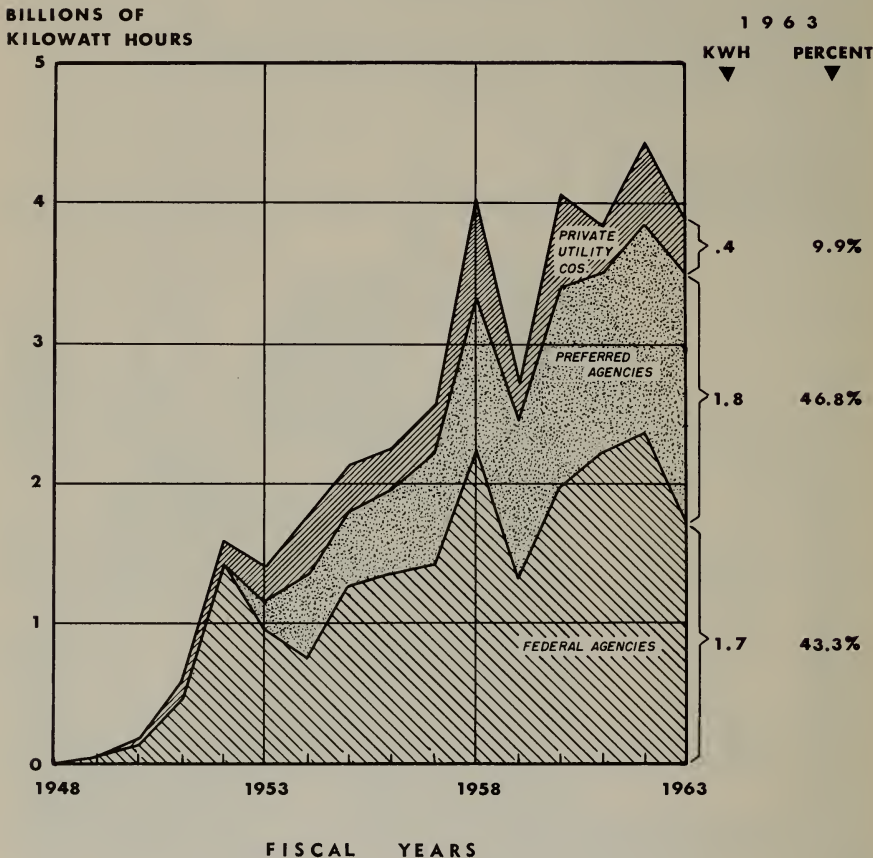
Energy sales during the year earned \$22,559,269, compared with \$23,211,812 for fiscal 1962, bringing the total revenues earned in all years to \$176,752,823.

Electricity marketed by Southeastern Power was generated at 13 Corps of Engineers projects. They were Wolf Creek, Dale Hollow, Center Hill, Old Hickory, and Cheatham Projects in Kentucky and Tennessee; the Allatoona and Buford Projects in Georgia; the Clark Hill and Hartwell Projects in Georgia and South Carolina; the Walter F. George Project in Georgia and Alabama; the Jim Woodruff Project in Florida; and the John H. Kerr and Philpott Projects in Virginia.

The installed generating capacity of 1,612,600 kilowatts included two 32,500-kilowatt units which were placed in commercial operation at Walter F. George Project during the year. Construction by the Corps continued on three projects—Walter F. George in Georgia and Alabama, Hartwell in Georgia and South Carolina, and Barkley in Kentucky. Construction underway will add 261,000 kilowatts of installed capacity.

Output of Wolf Creek, Center Hill, Dale Hollow, Old Hickory, and Cheatham Projects continued to be sold under two contracts with the Tennessee Valley Authority. A third contract with TVA was executed during the year. This provides for delivery of power from the Barkley Project into the TVA system, for the retention

Sales of Electric Energy  
By Class of Customer



of peaking and standby power from the Cumberland system by Southeastern for sale to customers other than TVA, and for a change in the terms of the two previously existing contracts.

Output of Philpott and two-thirds of the Kerr Project output were sold to the Virginia Electric & Power Co. and 17 cooperatives in Virginia and North Carolina; the remainder of the Kerr output continued to be sold under long-term contracts to Carolina Power & Light Co. and 16 public bodies and cooperatives in North Carolina.

Part of the Clark Hill Project output was sold to two public bodies in South Carolina. Approximately one-half of the output of the Clark Hill, Hartwell, and Walter F. George Projects, and the output

*Southeastern Power Administration: Status of projects*

Project	State	Plant installations				Generation <sup>2</sup> fiscal year 1963 (M kwh)
		River basin	Number of units	Total capac- ity (kw)	Date in service (initial unit)	
<b>Existing:</b>						
Philpott.....	Virginia	Roanoke	3	14, 000	September 1953	24
John H. Kerr.....	Virginia-North Carolina	do.	7	204, 000	November 1952	411
Hartwell.....	Georgia-South Carolina	Savannah	4	264, 000	April 1962	445
Clark Hill.....	do.	do.	7	280, 000	January 1953	691
Buford.....	Georgia	Appalachicola	3	86, 000	June 1957	171
Walter F. George.....	Georgia-Alabama	do.	1	130, 000	March 1963	178
Jim Woodruff.....	Georgia-Florida	do.	3	30, 000	February 1957	229
Allatoona.....	Georgia	Alabama	3	74, 000	January 1950	162
Wolf Creek.....	Kentucky	Cumberland	6	270, 000	October 1951	773
Dale Hollow.....	Tennessee	do.	4	54, 000	December 1948	100
Center Hill.....	do.	do.	3	135, 000	December 1950	304
Old Hickory.....	do.	do.	4	100, 000	April 1957	428
Cheatham.....	do.	do.	3	36, 000	November 1959	159
Subtotal.....				1, 677, 600		3, 975
<b>Under construction:</b>						
Carters.....	Georgia	Alabama	2	100, 000	September 1968	
Millers Ferry.....	Alabama	do.	3	66, 000	December 1967	
Cordell Hull.....	Tennessee	Cumberland	3	100, 000	April 1969	
J. Percy Priest.....	do.	do.	1	28, 000	July 1968	
Bankley.....	Kentucky	do.	4	130, 000	May 1965	
Subtotal.....				424, 000		
<b>Authorized active:</b>						
Salem Church.....	Virginia	Rappahannock		64, 000		
Gathright-Falling Springs.....	do.	James		68, 000		
West Point.....	Georgia-Alabama	Appalachicola		72, 000		
Jones Bluff.....	Alabama	Alabama		68, 000		
Laurel.....	Kentucky	Cumberland		47, 000		
Subtotal.....				319, 000		
Total, 23 projects.....				2, 420, 600		

<sup>1</sup> 2 units operating and 2 units under construction.

<sup>2</sup> Gross generation (M kwh).



of the Allatoona and Buford Projects were sold to Georgia Power Co. and 88 public bodies and cooperatives in Georgia. Power from the George Project was also sold to a generation and transmission cooperative in Alabama.

Output of the Jim Woodruff Project was sold to the Florida Power Corp. and six public bodies and cooperatives in Florida.

Congress appropriated \$350,000 for the fiscal year for headquarters operation and maintenance, and \$450,000 for purchasing firming energy and the payment of wheeling fees. Southeastern had 39 employees at year's end.

*Southeastern Power Administration: Comparative statement of revenues and expenses, fiscal years 1962 and 1963*

[Cost basis]

[Rounded to thousands of dollars]

	Total to June 30, 1963	Fiscal year 1963	Fiscal year 1962	Increase or decrease
Operating revenues: Sales of electric energy	\$176,799,000	\$22,547,000	\$23,206,000	(\$659,000)
Less revenues allocated to generating projects:				
Allatoona	13,364,000	1,333,000	1,214,000	119,000
Buford	8,836,000	2,014,000	1,801,000	213,000
Clark Hill	30,322,000	3,726,000	3,778,000	(52,000)
Walter F. George	122,000	122,000		122,000
Hartwell	2,755,000	2,670,000	85,000	2,585,000
Cheatham	2,969,000	796,000	956,000	(160,000)
Old Hickory	9,645,000	1,426,000	1,712,000	(286,000)
Jim Woodruff	7,061,000	1,224,000	1,225,000	(1,000)
Center Hill	14,406,000	826,000	1,733,000	(907,000)
Dale Hollow	10,628,000	553,000	1,167,000	(614,000)
Wolf Creek	24,537,000	1,556,000	3,251,000	(1,695,000)
John H. Kerr	28,984,000	3,039,000	3,347,000	(308,000)
Philpott	2,372,000	333,000	388,000	(55,000)
Total revenue allocated to generating projects	156,001,000	19,618,000	20,657,000	(1,039,000)
Operating revenues available to Southeastern Power Administration	20,798,000	2,929,000	2,549,000	380,000
Less operating expenses:				
Purchased power	5,598,000	552,000	525,000	27,000
Operation, maintenance, administration, etc.	15,158,000	2,304,000	1,922,000	382,000
Total operating expenses	20,756,000	2,856,000	2,447,000	409,000
Less interest and other deductions:				
Interest on Federal investment	54,000	3,000	4,000	(1,000)
Less amount capitalized	46,000	1,000	2,000	(1,000)
Miscellaneous income deductions	(17,000)			
Total interest and other deductions	(9,000)	2,000	2,000	
Net available for depreciation	51,000	71,000	100,000	(29,000)
Depreciation	46,000	5,000	5,000	
Net revenue	5,000	66,000	95,000	(29,000)
Adjustment of prior years expenses		(95,000)	(77,000)	18,000
Net revenue for period	5,000	(29,000)	18,000	(47,000)
Cumulative net revenue beginning of year		34,000	16,000	18,000
Cumulative net revenue end of year	5,000	5,000	34,000	(29,000)



# Southwestern Power Administration

Douglas G. Wright,  
Administrator

The Southwestern Power Administration is scheduled to mark its 20th anniversary August 31, 1963. On August 31, 1943, the Secretary of the Interior, by Order No. 1865, created SPA as an agency in the Department to carry out the marketing functions and duties assigned him by Executive Order 9373. Since its creation, SPA has been assigned the power marketing functions of 17 Federal multipurpose projects in the Arkansas, White, Brazos, Red, and Angelina River Basins. Nine of these projects were in operation in fiscal 1963 and eight additional projects were under construction.

For fiscal 1963, Southwestern Power Administration received \$1,479,450 by direct appropriation for operation and maintenance and \$7,210,000 for construction. An additional \$586,100 remained available for completing previously approved construction. Authorization by the Congress made \$5 million available from receipts to cover all costs for purchasing power and energy and for renting transmission facilities.

Gross revenues for fiscal 1963 were \$17,621,707, an increase of \$1,668,315, or 10½ percent, over the gross revenue for fiscal 1962. During 1963, sales to private electric utilities accounted for 32 percent of the revenue dollar; defense industry (aluminum), 12 percent; electric cooperatives, 44 percent; municipalities, 9 percent; and public authorities, 3 percent.

At year's end, the original cost of SPA transmission facilities totaled \$30,124,344.

## Marketing

A three-way contract was completed under which firm electric service will be supplied by SPA to the city of Thayer, Mo. The Arkansas-Missouri Power Co. will provide transmission service

TABLE I.—*Southwestern Power Administration: Source and application of funds*

Funds provided:	June 30, 1962	June 30, 1963
Congressional appropriations (net)---	\$44,745,409.96	\$53,404,763.99
Accountability for transfer of cost or property to or from other Government agencies (net)-----	884,456.07	1,038,522.32
Gross operating revenue and other income-----	116,060,081.78	133,785,026.23
<b>Total funds provided-----</b>	<b>161,689,947.81</b>	<b>188,228,312.54</b>
<b>Funds applied:</b>		
Returned to U.S. Treasury <sup>1</sup> -----	45,122,524.95	51,147,774.48
Accumulated operating expenses---	93,268,236.58	98,840,966.39
Less: Nonfund depreciation and amortization expense-----	(6,846,809.03)	(7,596,610.82)
Electric plant-----	28,753,575.60	30,124,343.58
Special and trust funds-----	5,280,800.49	6,867,273.24
Cash-----	3,348,076.66	9,110,476.63
Accounts receivable-----	1,247,567.57	1,240,051.92
Other current and accrued assets---	25.00	25.00
Material and supplies-----	661,375.38	690,214.08
Prepayments and advances-----	1,048.25	1,273.00
Deferred debits-----	2,372.27	1,914.20
Less: Accrued and other non-fund items-----		
Accounts payable-----	(550,633.68)	(751,681.16)
Accrued payroll-----	(26,024.45)	(33,474.22)
Accrued leave-----	(133,581.26)	(146,881.62)
Contributions in aid of construction--	(65,032.20)	(70,888.56)
Accrued interest on invested capital--	(8,373,574.32)	(1,196,463.60)
<b>Total funds applied-----</b>	<b>161,689,947.81</b>	<b>188,228,312.54</b>

<sup>1</sup> Total funds returned to the U.S. Treasury. No allocation of revenue has been made to the Corps of Engineers to date.

through its system for the city from the point of interconnection between the company and SPA.

Steps were taken to develop standard standby reserve contracts, where appropriate, with preferred customers owning generating facilities. Under such arrangement the customer will receive emergency standby service for some of its plant capability and the Government will receive into its system for the standby pool a block of capacity and energy for schedule and the right to bank energy for future utilization. Negotiations were nearing completion with the city of Springfield, Mo., for the sale of peaking power and energy and the inclusion of such standby provisions.



SOURCE OF FUNDS

DISPOSITION OF FUNDS

TOTAL FUNDS AND PROPERTY  
FOR WHICH ACCOUNTABLE  
INCEPTION TO JUNE 30, 1963

TOTAL DISBURSEMENTS AND APPLICATION  
OF FUNDS AND PROPERTY FOR  
WHICH ACCOUNTABLE  
INCEPTION TO JUNE 30, 1963

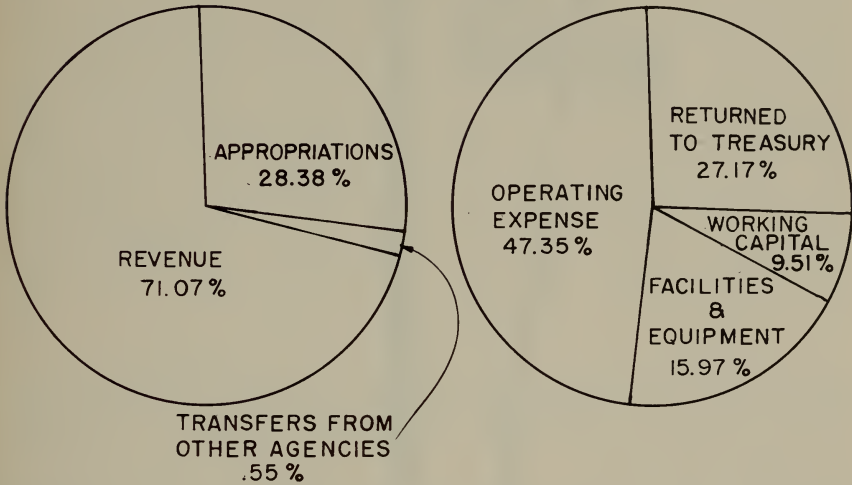


TABLE II.—*Fiscal Operations*

**Sales**

Electric power sales in fiscal 1963 increased to 847,406 kilowatts from 689,793 kilowatts in fiscal 1962, a gain of 22.8 percent. Deliveries were made to 31 public bodies, 8 REA electric distribution cooperatives, 9 REA generation and transmission cooperatives, 1 defense industry (aluminum), and 9 private electric utilities. Because of low-water conditions at reservoir projects, there was a notable decrease in secondary energy sales in 1963.

**SPA SALES**

	<i>Millions of kilowatt-hours</i>	
	<i>Fiscal year 1963</i>	<i>Fiscal year 1962</i>
Municipalities.....	200.6	262.6
REA electric cooperatives.....	851.0	1,359.5
Public authorities.....	76.9	69.3
Defense industry (aluminum).....	393.4	549.0
Private electric utilities.....	224.9	125.2
<b>Total.....</b>	<b>1,747.0</b>	<b>2,365.6</b>



Southwestern Power Administration's "snorkel" truck is an example of efficient application of the machine for greater manpower utilization.

## POWER PRODUCTION

### Resources

Hydroelectric powerplants whose output is marketed by SPA have a total installed capacity of 791,000 kilowatts. The Narrows Project in Arkansas and the Whitney Project in Texas, 17,000 and 30,000 kilowatts, respectively, are not interconnected with remaining projects and their output is marketed separately. The Blakely Mountain Project in Arkansas is integrated with the other projects which are interconnected by contract with the Arkansas Power & Light Co. The installed capacity and current capability of the hydro and steam plants in the system and the schedule of construction are shown in an accompanying table. Location of operating plants and those under construction are shown on an accompanying map.

Van Buren switching station, near Van Buren, Ark., is a key point for future power transformation as power projects are completed in the scheduled development of the Arkansas River basin.

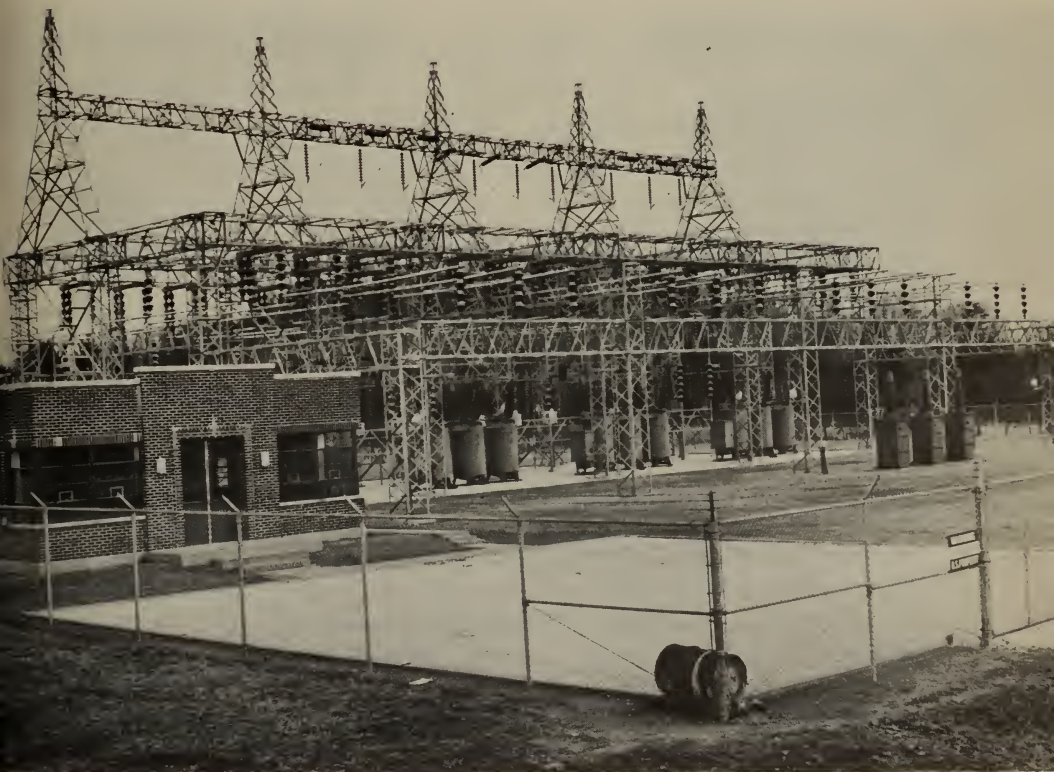






TABLE III.—*Capability data*

Project of plant	State	River	Installed capacity	Dependable capacity	Capability June 30, 1963
<b>Hydroelectric:</b>					
<b>Interconnected system:</b>					
Bull Shoals.....	Arkansas.....	White.....	250,000	162,000	281,000
Denison.....	Oklahoma-Texas..	Red.....	70,000	54,000	80,000
Fort Gibson.....	Oklahoma.....	Grand.....	45,000	45,000	48,000
Norfolk.....	Arkansas.....	White.....	70,000	56,000	80,000
Table Rock.....	Missouri.....	do.....	200,000	138,000	230,000
Tenkiller Ferry.....	Oklahoma.....	Illinois.....	34,000	28,000	39,000
Subtotal.....			669,000	483,000	758,000
<b>Isolated plants:</b>					
Blakely Mountain <sup>1</sup> .....	Arkansas.....	Ouachita.....	75,000	75,000	75,000
Narrows.....	do.....	Little Missouri.....	17,000	14,000	19,000
Whitney.....	Texas.....	Brazos.....	30,000	24,000	28,000
Subtotal.....			122,000	113,000	122,000
Total hydroelectric.....			791,000	596,000	880,000
<b>Steam:</b>					
Western Farmers Electric Co-op.....	Oklahoma.....		30,000	31,000	31,000
Total steam.....			30,000	31,000	31,000
Grand total.....			821,000	627,000	911,000

<sup>1</sup> By contract.

*Capacities and tentative on-line dates for power generating units in multiple-purpose projects under construction by the Corps of Engineers in the Southwestern Power Administration Area*

Project	State	River	Number of units	Installed capacity (kw)	On-line date (last unit)
Eufaula.....	Oklahoma.....	Canadian.....	3	90,000	November 1964.
Bull Shoals.....	Arkansas.....	White.....	17 and 8	90,000	October 1963.
Dardanelle.....	do.....	Arkansas.....	4	124,000	August 1965.
Greers Ferry.....	do.....	Little Red.....	2	96,000	March 1964.
McGee Bend.....	Texas.....	Angelina.....	2	52,000	June 1965.
Beaver.....	Arkansas.....	White.....	2	112,000	Do.
Keystone.....	Oklahoma.....	Arkansas.....	2	70,000	September 1967.
Narrows.....	Arkansas.....	Little Missouri.....	<sup>2</sup> 3	8,500	March 1968.
Broken Bow.....	Oklahoma.....	Mount Fork.....	2	85,000	September 1968.
DeGray.....	Arkansas.....	Caddo.....	2	66,000	May 1969.

<sup>1</sup> 2 additional units.<sup>2</sup> 1 additional unit.

## Energy Production

Inflows to the interconnected system projects were approximately 169 percent of median for the first 5 months of the 1963 fiscal year and only 54 percent of median for the last 7 months. Average flow for all fiscal 1963 was approximately 102 percent of median. This is 59 percent of the inflows received by these projects during fiscal 1962. Record, or near-record, drought conditions have existed in the area since December 1962. The reservoir system was 90 percent of full pool at the beginning of fiscal 1963 and was approximately 75 percent full at the end. The total net hydro-

TABLE IV.—SPA total system net hydro generation, fiscal years  
[Millions kilowatt-hours]

Year	Bull Shoals	Denison	Fort Gibson	Norfolk	Tenkiller	Table Rock	Inter-connected system	Narrows	Blake-ly Mountain <sup>1</sup>	Whitney	Grand total
1945		101.7		102.6			204.3				204.3
1946		244.4		174.9			419.3				419.3
1947		247.6		195.8			443.4				443.4
1948		165.6		142.0			307.6				307.6
1949		165.4		185.4			350.8				350.8
1950		174.3		265.9			440.2	3.1			443.3
1951		254.6		207.6			462.2	29.4			491.6
1952		142.6		338.9			481.5	42.5			524.9
1953	270.2	92.4	32.1	126.8			521.5	47.4		0.4	563.0
1954	334.7	192.4	39.5	132.8	43.3		742.7	17.8		20.2	780.7
1955	241.1	140.2	70.7	23.7	54.6		530.3	29.2		30.1	589.6
1956	386.6	197.0	74.8	105.5	38.4		802.3	21.2	66.1	48.6	938.2
1957	651.5	144.5	72.6	204.3	61.9		1,134.8	39.8	219.3	71.2	1,465.1
1958	991.7	245.4	146.7	248.2	118.0		1,750.0	45.8	177.0	83.2	2,056.0
1959	488.1	109.4	161.3	208.8	106.7	10.2	1,084.5	25.2	175.8	37.7	1,323.2
1960	418.6	266.9	271.8	174.4	126.3	212.8	1,471.2	30.4	155.6	69.4	1,726.6
1961	546.1	223.8	209.7	196.5	104.7	385.1	1,665.5	39.8	198.9	83.0	1,987.2
1962	743.9	213.3	308.5	164.8	138.8	431.7	2,001.0	37.7	171.6	64.3	2,274.6
1963	366.1	210.8	148.8	95.1	58.8	248.1	1,127.7	16.1	83.4	80.3	1,307.5
<b>Total</b>	<b>5,438.6</b>	<b>3,532.3</b>	<b>1,536.5</b>	<b>3,294.0</b>	<b>851.5</b>	<b>1,287.9</b>	<b>15,940.8</b>	<b>425.4</b>	<b>1,247.7</b>	<b>588.4</b>	<b>18,202.3</b>

<sup>1</sup> Generation delivered into Arkansas Power & Light Co. system. By contract, 142 million kwh per year of firm energy is delivered into SPA system.

electric generation from all projects during fiscal 1963 was 1,307.5 million kilowatt-hours. Generation, by projects, for the period of operation is shown in a table.

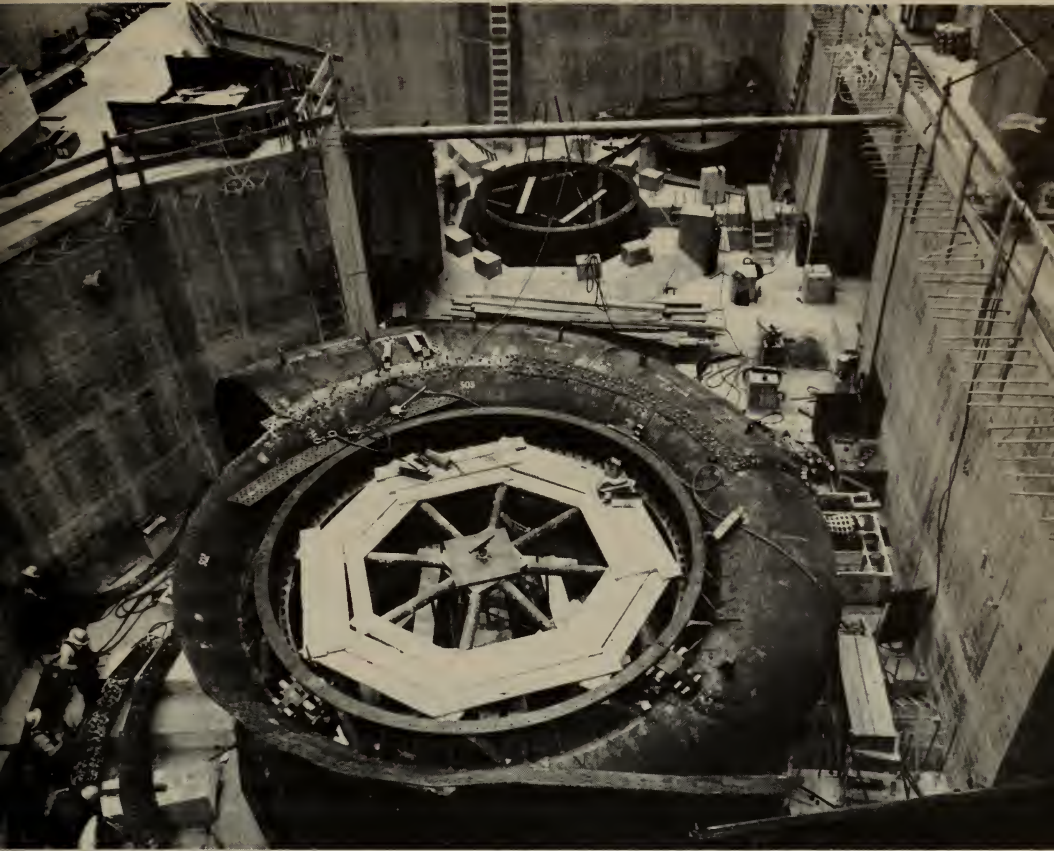
The Missouri Companies and Associated Electric Cooperative contracts were to be effective August 1, 1963; consequently, generation from the Central and N.W. Electric Power Cooperative plants marketed by SPA was 33,117,000 kilowatt-hours for July 1962. The Western Farmers Electric Cooperative plant generated 97,144,500 kilowatt-hours for marketing by SPA during fiscal 1963. In addition to the generation from the hydroelectric and fuel electric plants whose output is marketed by SPA, additional energy totaling 244,548,000 kilowatt-hours was received from other sources for delivery to SPA customers during the year.

## MAJOR PROGRAM ACCOMPLISHMENTS

### Pumped Storage

Cooperative study of two pumped storage projects associated with projects in the Arkansas River navigation system was conducted with the Corps of Engineers. Two 500,000-kilowatt plants are being considered. One would be on Petit Jean Mountain immediately above Lock and Dam 9 on the Arkansas River, which would serve as an afterbay. The other site would be on White Oak Mountain immediately upstream from the Ozark Lock and Dam on the





Installation by the Corps of Engineers of two additional 45,000 kilowatt generators in Bull Shoals Dam on the White River brings the total power at this project to be marketed by Southwestern Power Administration to 340,000 kilowatts.

Arkansas River. Preliminary investigations indicate that these installations would be economically feasible. Studies underway will determine design and operation criteria for the projects. Of particular interest in the studies of these two sites is the optimum utilization of secondary energy from run-of-river plants and other hydroelectric projects for off-peak pumping. This utilization of energy would greatly increase the value of secondary generation from projects in the SPA area.

#### **SPA-MRB EHV Intertie Investigations**

Cooperative studies by the Bureau of Reclamation and SPA are being conducted to determine the feasibility of an extra-high-voltage interconnection between the Missouri River Basin and

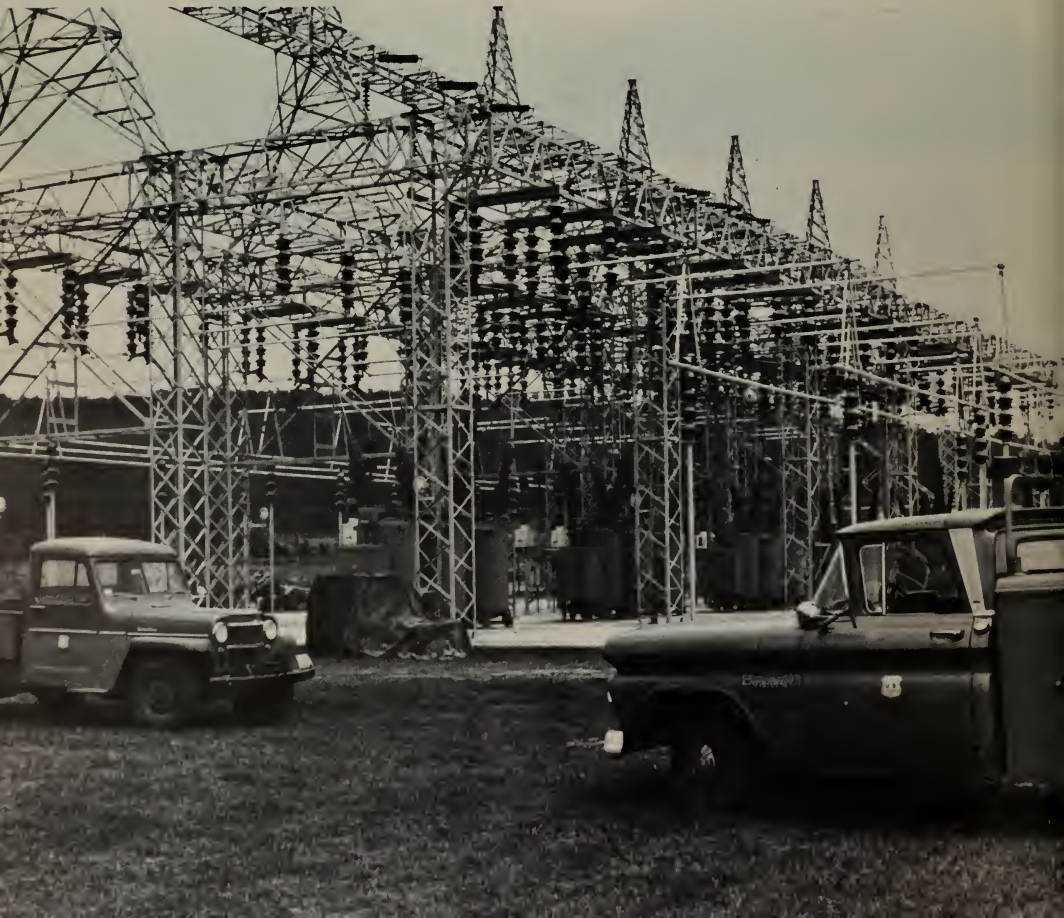
Arkansas River Basin. A report of the study is scheduled to be submitted to the Secretary of the Interior in 1964.

## FUTURE PROGRAM

### Hydroelectric Power Potential Inventory

The inventory of potential hydroelectric power sites, including pumped storage sites, will be extended. The increasing scarcity of conventional, economically feasible hydroelectric power sites lends impetus to investigations of pumped storage sites. Conventional projects under construction in the SPA area will increase its total installed capacity to 1,584,500 kilowatts by 1970. Sites which appear feasible for conventional plants have potential installed capacities totaling 2,980,500 kilowatts, which may be developed by 1980. The total potential of pumped storage which might be eco-

Electric power interconnections, Southwestern Power Administration, such as the Gore, Okla., switching facilities below, bring more effective and efficient power to public, private, and municipal electrical companies and cooperatives.





nomically developed in the SPA area is tremendous, but sufficient data are not available for an accurate estimate of that potential capacity. Three to five million kilowatts in only four or five sites could be developed before 1980. Study of these sites and their development costs is going forward. Collection of data on costs and engineering problems encountered in developing pumped storage plants in the United States and abroad is continuing.

### **Expanded Study of System Operational Procedures**

The capacity to be available from projects under construction and potential sites considered feasible by 1980, has created the need for broader studies of operating procedures for a large system. Much investigation must be made to provide SPA with criteria for optimum integration of pumped storage and conventional hydro installation into the agency loads. Probability of flow and pool elevation occurrence, as well as determination of guide curves for different conditions, are included in this expanded investigation. Primary effort will be directed at determining the hydraulic diversity among the hydro plants of the interconnected system and the diversity of expected loads.



Southwestern Power Administration employees are shown using the IBM 1620 digital computer for development of information on generation and transmission planning and projection of marketing programs.



## DATA-PROCESSING ACTIVITIES

Southwestern Power Administration now has a computer used principally as a tool for developing information regarding generation and transmission planning and for developing marketing programs. Major areas of use are: (1) hydraulic engineering—for synthetic reservoir operation; (2) power marketing and planning—for projecting existing loads, developing load growth trends, and application of future generation to the projected loads; and (3) electrical engineering—for synthetic operation of transmission lines and systems, which are encompassed in a geographic area composed generally of Arkansas, the major part of Oklahoma, Missouri, and Louisiana, and a portion of Texas and Kansas. The computer is being modified to increase its capabilities.



# Office of Saline Water

C. F. MacGowan, Director

The Administration's desire to develop low-cost processes for desalting water was emphasized by marshaling the Department's technical resources to the task. The goal: more economical ways to produce fresh water from the sea and from brackish water. Agencies enlisted to assist the Office of Saline Water in various phases of research and development activity or the utilization of desalted water included the Bureau of Reclamation, the Bureau of Mines, the Geological Survey, the Office of Coal Research, and the Office of Oil and Gas.

During fiscal 1963, fresh water from ocean water moved toward economic practicality. On May 28, the Department reported to the Key West Aqueduct Commission and other interested Florida officials that a preliminary survey of the feasibility of locating a 6- to 8-million-gallons-per-day conversion plant in Key West indicated a product water cost of 65 to 70 cents per 1,000 gallons, compared with \$1 to \$1.05 for fresh water delivered from a new aqueduct of equal size.

The Department proceeded with plans to request congressional approval for participation in construction of such a desalting plant which would be combined with a thermal electric generating plant. The Atomic Energy Commission, in cooperation with the Department, was studying the possibility of constructing an atomic reactor as the power source for the combination plant.

Earlier in the year, at a hearing before the Interior and Insular Affairs Committee of the House of Representatives, the Department described progress of the Office of Saline Water. On the

basis of then-present information, there was outlined some of the water desalting costs the Department expects to attain.

The committee was told that the Department's two largest plants, the one in Freeport, Tex., and the one at San Diego, Calif., both having a 1-million-gallons-per-day capacity, were producing fresh water from sea water for \$1 to \$1.25 per 1,000 gallons. By increasing the size of conversion plants to 25 to 30 million gallons per day, with known processes, the cost of water can be reduced to about 50 cents per 1,000 gallons.

The committee also was told of the Department's studies of the economic potential of combining water desalting plants with thermal electric plants. A 10-million-gallons-per-day water conversion plant combined with a 50,000-kilowatt plant, using fuel cost of 10 cents per million Btu's, would produce electric power for  $5\frac{1}{4}$  mills per kilowatt-hour and fresh water for 30 cents per 1,000 gallons. A larger thermal-electric plant, designed to produce 120,000 kilowatts of power, could be combined with a water conversion plant of 25 million gallons per day, again using fuel costs at 10 cents per million Btu's, would produce power for  $4\frac{1}{2}$  mills per kilowatt-hour and fresh water for approximately 25 cents per 1,000 gallons.

Research, development, and construction responsibilities of the Office of Saline Water are assigned respectively to the Division of Research, the Division of Processes Development, and the Demonstration Plants Division. Under the Anderson-Aspinall Act (Public Law 87-295), activities of the Research and Processes Development Divisions were expanded and accelerated during the year. Progress made it increasingly clear that the gap between the cost of water production from saline plants and the conventional methods for municipal and industrial uses was closing rapidly.

## DIVISION OF RESEARCH PROGRESSES

The primary objective of the Division of Research is to increase knowledge and understanding in scientific fields regarding the recovery of pure water and valuable byproducts from saline waters. The Division conducted exploratory research to support programs of the Processes and Demonstration Divisions. Further, it maintained liaison with the scientific community and other agencies to insure that significant advances in improving water resources and obtaining minerals from saline water were integrated with Department interests.



The scope of the program was broad and encompasses the following research categories :

### **Properties of Water and Solutions Studied**

The Division of Research continued its quest of a comprehensive theoretical understanding of water and its solutions. This included investigations in the following areas concerning recovery of water: ions, aqueous systems, chelates, hydrates, crystalline and polymeric materials, and the chemistry and kinetics of water systems.

### **Less Costly Separation Processes Sought**

Further rapid reduction in costs of pure water from saline sources requires new approaches that are not incremental improvements on present processes. These approaches require new scientific information and understanding. Division of Research activities on separation processes were concerned with new concepts and ideas that are generally applicable to any process of saline water conversion. These involved studies of fundamental concepts in all relevant areas of science and engineering.

There was good reason to believe that the basic research program underway in fiscal 1963 could lead to the practical development of low-cost desalination processes, because nearly all the present processes require more than 30 times the minimum theoretical energy for completely reversible separation. Specifically, studies on the thermodynamics, electrochemistry, phase and chemical equilibria, and mass and energy transport in both physical and biological systems were conducted.

### **Interactions at Boundaries of Water Systems**

The Division studied the theory of the liquid state and gas, liquid, and solid-phase transitions. Special emphasis was on physical and chemical processes on surfaces and at interfaces. Studies on colloidal systems and adsorption were included. Specific investigations concerned corrosion, transference across phase boundaries, and materials.

### **Economic Research Important**

The Division's economic research program is designed to predict where in the United States, when, and to what extent, unlimited quantities of sea water and considerable reserves of brackish water can be tapped profitably by desalination processes to meet growing fresh water requirements. Studies will include an analysis of

economic, geologic, geographic, demographic, and other factors influencing the supply of and demand for potable water in the coming decades. And since the prospects of demineralization are highly cost sensitive, pertinent cost determinations will be an integral part of such investigations.

During the past year, in studies to learn the conditions for minimum temperature and pressure losses in evaporation and condensation, particularly with relatively old surfaces, a new general property of liquids was explained: the formation of floating drops or boules on superheated liquids. The separation of potable water from salt solutions by reverse osmosis was investigated. Pressure desalination by using cellulose acetate membranes was shown to have a most promising future.

## PROCESSES DEVELOPMENT ADVANCES

The Division of Processes Development is engaged in applied research activities. It develops practical uses of scientific knowledge for application to the production of devices, systems, materials, or processes for converting saline water to fresh water at low cost. It is responsible for translating research data and results into bench-scale equipment, pilot units, and complete pilot plants.

Under the processes development program, pilot plant and other studies were conducted on distillation, electrodialysis, and freezing processes prior to their selection for demonstration plants. Applied research was directed toward lowering the three main categories of water costs: capital, equipment maintenance, and energy.

Processes development emphasized the major process groups of distillation, membranes, freezing, hydrates, humidification, and solvent extraction. Research and development was conducted by laboratory projects, pilot plant operations, testing of prototype units, and a variety of applied research related to the various processes, such as heat transfer, scale prevention, and byproduct recovery.

### Distillation Processes Reviewed

The Branch of Distillation investigated several distillation processes having promise for saline water conversion. Although these processes have been under development far longer than other processes, their full potential is yet to be realized. Distillation provides the principal commercial method for obtaining fresh water from sea water. One of the characteristics of distillation technology is

the wide variety of designs and cycles employed. Much new research was directed toward improvements in multistage flash design, liquid-liquid heat exchanger, vapor-reheat, thin films, and secondary heat transfer media. A 37,000-gallons-per-day thin-film pilot plant is now in operation at the Research and Development Test Station, Wrightsville Beach, N.C.

Scale formation is still a principal problem in distillation processes. Although various procedures have been employed to prevent scale, and others are now under development, the effects on the process efficiency and design are so important that continued development of improved scale prevention is necessary. Effective and economical means of scale prevention will conserve heat and permit greater economy and efficiency through higher temperature operation and higher brine concentrations.

Control of both calcium sulfate and alkaline scales through internal stabilization or sludge recirculation continued during the year with a forced circulation evaporator, an experimental multistage flash evaporator, and the modified pilot plant equipment used originally for the LTV process. Additives for scale prevention and ion exchange softening, in which the waste brine concentrate is used to regenerate the ion exchange resin, was also under study. The development of these procedures has progressed to the point where both ion exchange and sludge recirculation are being used as methods for scale prevention in the Roswell, N. Mex., demonstration plant.

Tests were conducted on the use of acid for preventing scale in multistage flash plants. Tests indicate that this method will be effective in plants operating at much higher temperatures than now possible.

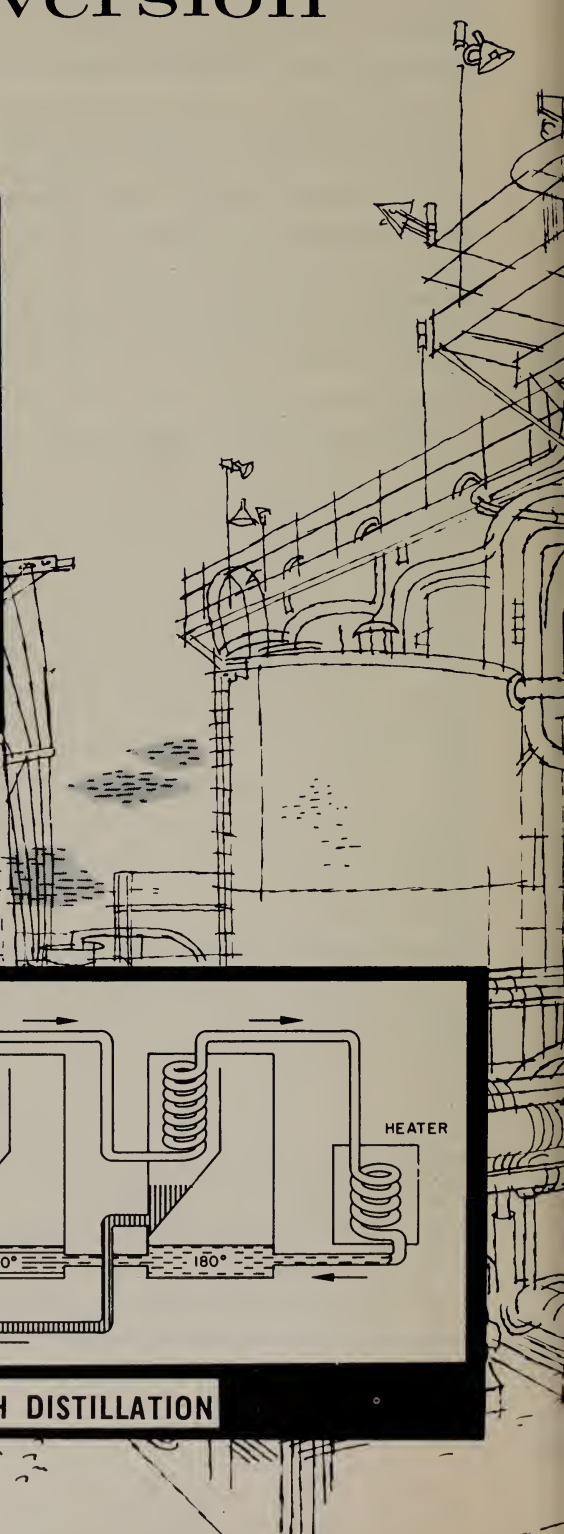
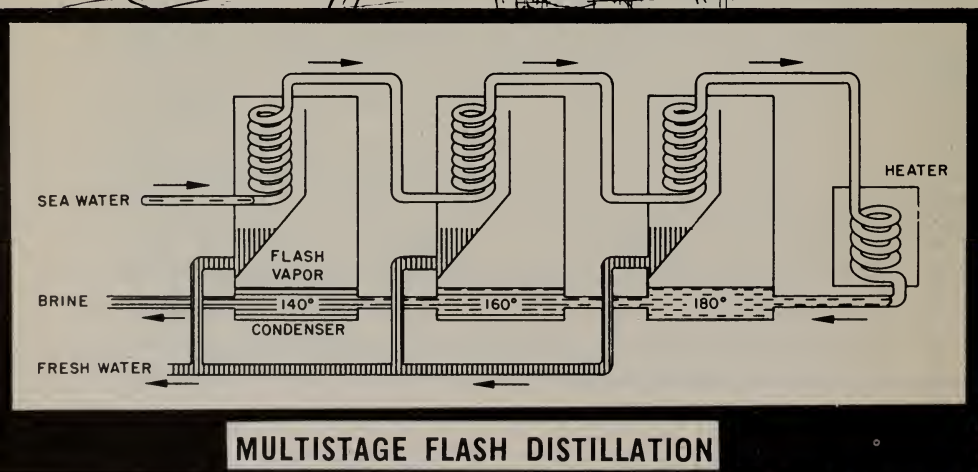
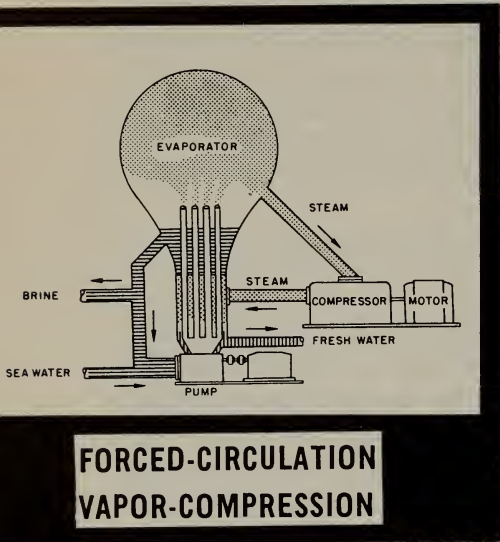
### **Heat Transfer Studies Seek Lower Costs**

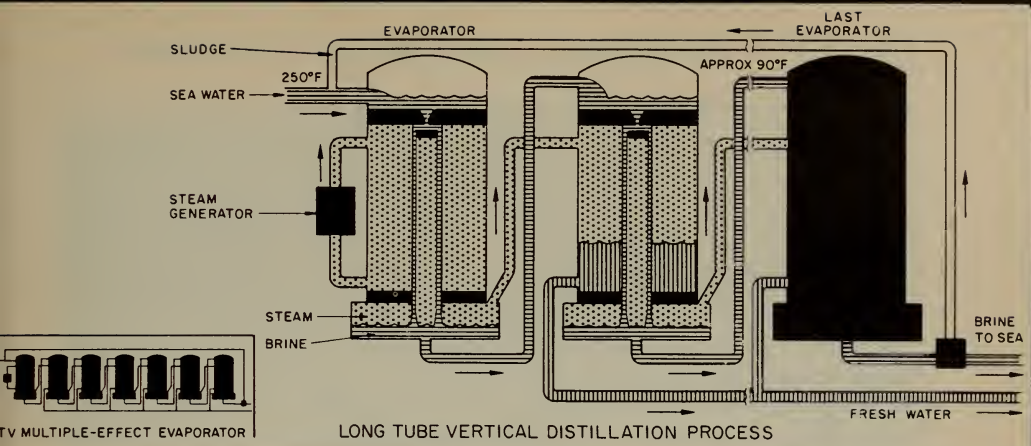
The Branch of Heat Transfer is concerned with the efficient transmission of heat. Research was conducted on the use of dropwise promoting coatings, such as copper and silver sulfides on base metals and on admiralty, copper-nickel, and aluminum brass. If dropwise condensation of steam can be accomplished, the overall heat transfer will be increased substantially, thus decreasing both the energy and heat transfer surface required in a plant. A study was underway on the use of electrical fields to improve liquid-liquid heat transfer.

This branch also conducted preliminary studies on the development of a mobile desalting unit.

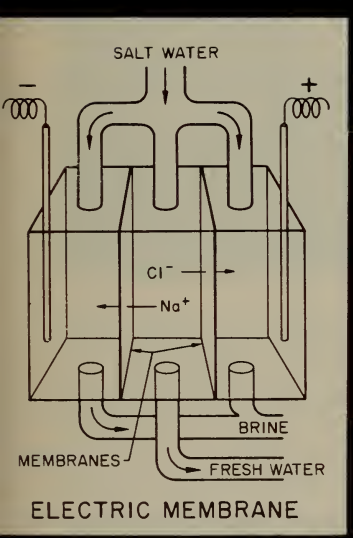
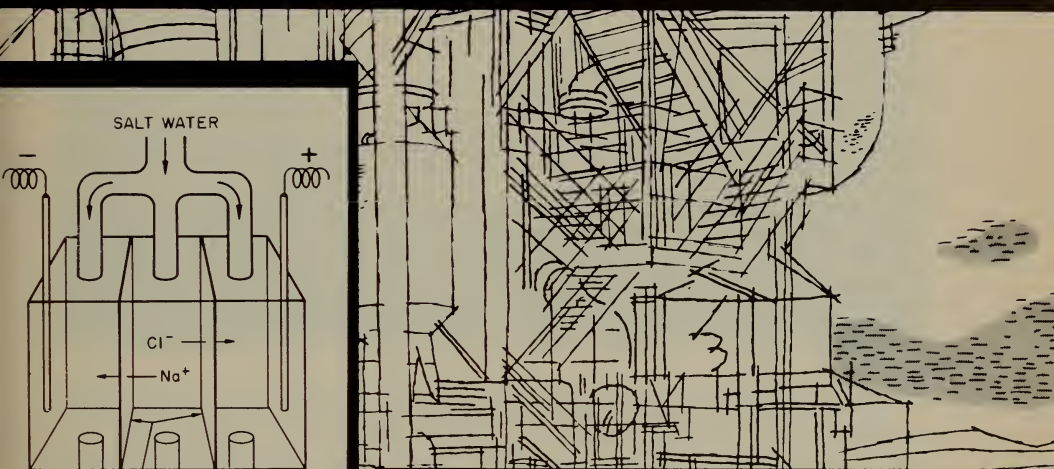


# Some Typical Saline Water Conversion Processes

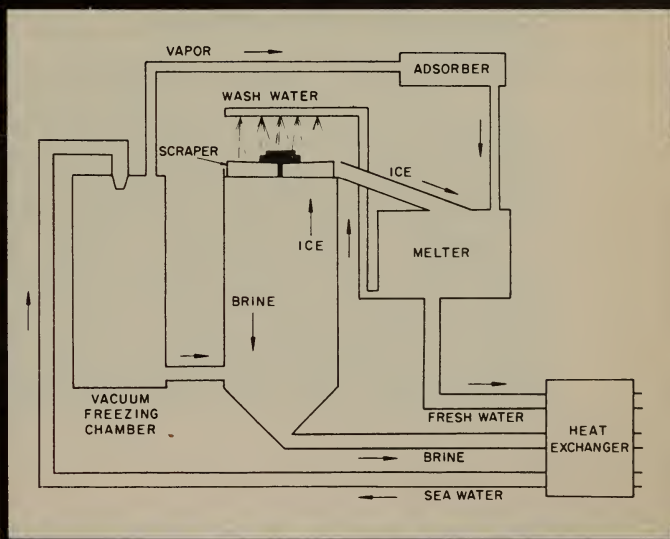
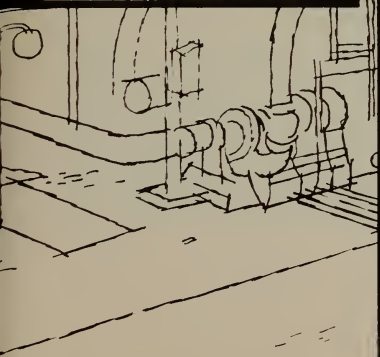




**LONG TUBE-VERTICAL (LTV) MULTIPLE EFFECT DISTILLATION PROCESS**



**ELECTRODIALYSIS**



**FREEZING**

## **Membrane and Ion Exchange Explored**

The Branch of Membrane Processes continued the development of the two major membrane conversion methods: electro dialysis and reverse osmosis. Electro dialysis is one of the leading methods for converting brackish waters and is further advanced in its development than reverse osmosis; however, rapid progress was made during the year in developing the reverse osmosis method. Membrane processes have their greatest promise in the conversion of brackish waters because the amount of current for electro dialysis and the amount of pressure for reverse osmosis increase with the concentration of salts to be separated.

A general program of electro dialysis process studies continued for the purpose of evaluating current developments, improving process operations, and guiding future development work. Much of the work was at Bureau of Reclamation laboratories in Denver, Colo., under a program supported by the Office of Saline Water. A brackish water well of about 3,400 parts per million salinity was available for the test work. Studies covered evaluation of commercial membranes and cell designs, preparation of a laboratory membrane test manual, the effect of water composition, and polarization problems.

In reverse osmosis, extensive laboratory research has been sponsored by the Division of Research on the basic characteristics of the reverse osmosis membranes. Results of this work justified an initial pilot plant on the process and a 1,000-gallons-per-day unit has been built. Testing with sea and brackish water are planned for fiscal 1964.

Possibilities for economical conversion by the conventional ion exchange procedures depend on recovering the regenerants. A limited laboratory study was conducted on the use of carbon dioxide as a recoverable regenerant.

## **Many Special Projects Undertaken**

The Branch of Special Projects is conducting research and development on processes not covered by the other branches. Major areas to which emphasis was directed in fiscal 1963 were freezing, hydration, humidification; and solvent extraction.

Freezing of saline solutions results in the formation of pure water ice crystals which, after separation from the mother-liquor, may be melted to fresh water. This principle forms the basis for two direct freezing processes: the first uses flash evaporation of precooled sea water, the vapor being absorbed by a chemical ab-





Basic research in saline water conversion entails many laboratory investigations to develop new knowledge that may lead to new or improved desalination processes.

sorbent; and the second involves the flashing of a hydrocarbon refrigerant in direct contact with precooled sea water. The resulting ice crystals are washed free of brine and melted either by the heat of absorption or by the condensation of refrigerant vapors.

The feasibility of flash evaporation was studied in a 15,000-gallons-per-day pilot plant at Wrightsville Beach, and the resulting data were used to prepare a design of a 165,000-gallons-per-day plant. The second type of freezing process uses a secondary refrigerant and is being evaluated in a pilot plant initially designed to produce 35,000 gallons per day. Modifications to the pilot plant increased daily production to 54,000 gallons. The process will also be tested in a 200,000-gallons-per-day pilot plant which will differ from the smaller one in that the evaporation of the refrigerant is

specifically controlled to induce large crystal growth and thus facilitate separation of ice-brine mixtures by a centrifuge. These pilot plants will provide facts needed for large freezing plants.

The hydrate process underwent considerable development at the bench-scale level and was ready for evaluation in pilot plants. Two units were in the design stage and will be built in the near future at Wrightsville Beach. They will use propane as the hydrate former, but will feature different wash-separation methods. Since the density of the hydrate crystal is less than that of ice, separation has been created experimentally by cyclones.

Use of liquid-liquid extraction for saline water conversion has been shown to be theoretically feasible and potentially practical, especially for brackish waters in the range of 5,000 to 10,000 parts per million total solids. The process is based on the principle that fresh water is extracted from saline solution by an organic solvent or mixture of solvents to form a separate phase from which fresh water is recovered by a moderate increase in temperature. A pilot unit of 2,000-gallons-per-day capacity has been designed and built.

A reduction of about 50 percent in construction costs of glass covers for basin-type solar stills at the Daytona Beach site resulted by using standard-size single-strength glass and better sealing techniques. Tests showed that butyl rubber has great promise as a basin liner. Continued studies based on a humidification process using solar energy for heating, separate condensers, and packed column evaporators led to construction of a small pilot plant in Sonora, Mexico, to determine the economics of this system.

### **Engineering Analysis and Evaluation Important**

The Branch of Engineering Analysis and Evaluation is conducting studies on byproduct recovery, preparing an engineering data book, and is responsible for coordinating development activities at the Research and Development Test Station at Wrightsville Beach.

Studies were made to determine to what extent the recovery of salable byproducts from saline water effluents offers a practical way to reduce costs of saline water conversion. A uniform and objective method of comparative engineering analysis applicable to various processes also is being developed.

### **Research and Development Test Station Constructed**

One of the major projects of the Office of Saline Water during fiscal 1963 was construction of a Sea Water Conversion Research and Development Test Station at Wrightsville Beach. The station is on a portion of a 25-acre tract of property donated to the Department of the Interior by the State of North Carolina. It will



As part of its research and development activities, the Office of Saline Water has conducted a preliminary survey of the brackish water inland resources of the United States to discover new water supplies. Shaded areas on the above map indicate sources of brackish water from the preliminary survey.

provide a central location for the operation, evaluation, and further development of various conversion processes.

Facilities at the test station include reinforced-concrete slab areas for the erection of as many as nine experimental pilot plans, utilities, maintenance and administrative services, and other necessary equipment for research and development. At year's end, six experimental units for testing or developing different processes or process improvements were under construction.

## DEMONSTRATION PLANTS

Demonstration plants authorized under Public Law 85-883 are programmed as follows :

Long tube vertical multiple-effect distillation.....	Freeport, Tex.
Multistage flash distillation.....	San Diego, Calif.
Electrodialysis .....	Webster, S. Dak.
Forced circulation.....	Roswell, N. Mex.

The million-gallons-per-day saline water conversion plant at Freeport, after recovering from effects of Hurricane Carla in 1961, has since been in almost constant operation. The material testing



and evaluation program established the fact that carbon steel tubing is not durable for this type of process. As a result all such metal in the long tube vertical multieffect evaporators and heat exchangers was replaced with aluminum brass.

The 250,000-gallons-per-day demonstration plant designed to desalt the brackish water of Webster, S. Dak., established an excellent operations record. The plant utilizes a membrane process to reduce the salinity of brackish well water from approximately 1,800 dissolved parts of salt per million parts of water (ppm) to less than 275 ppm. As a result of improved instrumentation and perfection of current-reversing pulsation which helps eliminate polarization of the membranes by permitting higher current density, the plant was able to maintain unattended operation on the daily third shift.

The million-gallons-per-day multistage flash distillation plant at Point Loma, near San Diego, Calif., was able to produce 40 percent over design capacity at higher operating temperatures (240°-



Secretary Udall dedicated the new Department of the Interior saline water conversion plant at Roswell, N. Mex., in July 1963, which will convert brackish water to fresh to supplement the supplies of the city of Roswell.

250° F) utilizing the pH technique. This plant has been plagued by seaweed which hampers efficient operation of the intake system. Construction improvements were started, following an engineering study, to redesign and revamp the intake complex before testing the slurry technique of scale prevention at higher temperatures (250°-350° F).

Two giant vapor domes, rising 92 feet above the barren New Mexico landscape near Roswell, are the dominant feature of the largest brackish water conversion plant in the United States. It is the fourth large plant built by the Department of the Interior as part of its continuing effort to develop low-cost desalting processes.

More than 1,000 spectators, including several Members of the Congress, State and local officials were present July 1, 1963, when Secretary Udall placed the new plant in operation. It is designed to produce fresh water from presently unusable brackish well water at the rate of a million gallons per day. While the plant was built primarily to advance saline water conversion technology, it also provides the city of Roswell with water to supplement limited sources of natural fresh water.





Office of the  
Assistant Secretary  
for Fish and Wildlife

Frank P. Briggs, Assistant Secretary







# Office of the Assistant Secretary for Fish and Wildlife

Frank P. Briggs, Assistant Secretary

The Department of the Interior is active in many fish and wildlife conservation programs, national as well as international in scope.

The Assistant Secretary for Fish and Wildlife represents the Secretary of the Interior in carrying out these programs and in establishing policies of the Fish and Wildlife Service.

Much of the Assistant Secretary's time was devoted to problems dealing with migratory waterfowl. A U.S. delegation, with the Assistant Secretary serving as chairman and consisting of two representatives from the Department of the Interior and two from the Department of Agriculture, met with the representatives of the Canadian Government to plan and execute proposals for improving waterfowl nesting and rearing habitat.

The Assistant Secretary was active in the battle to save the prairie potholes in the United States from agricultural drainage. These potholes are important waterfowl nesting sites. While the movement to purchase and lease existing potholes has been deterred in some States by the lack of "in lieu" tax legislation, considerable progress was made in fiscal 1963 in the campaign.

The pollution of lakes and streams is having a serious effect on the Nation's fish and wildlife resources, and pollution abatement is rapidly becoming another important program of the Department of the Interior. The Assistant Secretary for Fish and Wildlife recently joined officials of the Department of Health, Education, and Welfare and the Army Corps of Engineers in a conference with Governors of Minnesota and Wisconsin to work out anti-pollution plans for the Upper Mississippi River.

These Hawaiian fishermen use the pole method to catch tuna from the resource-rich sea.



The widespread use of chemical pesticides and their effects on fish and wildlife species represents a major threat to these living resources. Because of its position of leadership in wildlife-pesticide research, the Fish and Wildlife Service has expanded its facilities in an effort to keep abreast of the extremely rapid development of new and deadly chemicals.

The Fish and Wildlife Service's Bureau of Sport Fisheries and Wildlife established a new wildlife-pesticide laboratory at the Patuxent Wildlife Research Center near Laurel, Md. This is the first Federal installation built specifically for such studies. With this new laboratory, the Nation has, for the first time since the use of pesticides became a major factor in agriculture, a research facility designed to determine ways and means of using chemicals to protect agricultural crops without sacrificing fish and wildlife.

Increased interest in the sea and accelerated utilization of its products are creating new and more complex problems for the Assistant Secretary for Fish and Wildlife. Fishing fleets from other countries operate near U.S. shores and in some cases compete directly with American fishermen. In an effort to find untapped resources of the sea, interagency oceanography work was increased during the year, but more intensive research still is needed to solve many of the riddles of the "deep frontier."

The National Fisheries Center and Aquarium moved nearer to reality with the appointment of an Advisory Board to determine the policies of the new installation. The Assistant Secretary is an ex officio member of this Board. The Advisory Board recommended to the Secretary of the Interior that the new research and educational facility be located on Hains Point in Washington, D.C.

Better coordination between the Secretary of the Interior and the component bureaus of the Fish and Wildlife Service was achieved during the past year by closer liaison through the office of the Assistant Secretary. Critical problems were quickly brought to the attention of the Secretary and policy decisions were made available to the bureaus in record time.

# Fish and Wildlife Service

Clarence F. Pautzke, Commissioner

The Fish and Wildlife Service is administered by the Commissioner of Fish and Wildlife, under supervision of the Assistant Secretary for Fish and Wildlife.

The Commissioner directs and coordinates the policies and programs of the Service's two bureaus—the Bureau of Sport Fisheries and Wildlife and the Bureau of Commercial Fisheries. His contact with Bureau operations on both the national and international level is through the Directors of each of the two Bureaus and through staff assistants for legislation, program review, international relations, and conservation education.

The Office of the Commissioner is vitally concerned with the many international problems affecting fish and wildlife resources. During the past year increased attention was devoted to such problems.

The tremendous growth of foreign fisheries in waters close to the U.S. coast—Soviet fisheries in the North Atlantic and Japanese and Soviet fisheries in the North Pacific off the coast of Alaska—has created difficult problems. Large Soviet fleets now fish on grounds off the coast of New England. In the past, these grounds have been fished almost exclusively by American fishermen, and although the foreign operations have offered little competition for American fishermen for most species, the potential for competition for many species of importance to the American fishermen is great. In the North Pacific and Bering Sea, which until recently was virtually a Canadian-American lake, some 360 to 400 Soviet and Japanese fishing vessels were operating—in some instances competing directly with American fishermen. Conflicts between incompatible forms of gear used in the fisheries of the Northwest Atlantic and the North Pacific have also posed serious problems and have resulted in losses to American fishermen of fishing gear of substantial value. Soviet whaling vessels also

appeared off the Washington-Oregon coasts and fishing vessels of the Soviet Union were observed in the conduct of fishing operations off the Middle Atlantic coast and in the Gulf of Mexico.

Both to the north and to the south, foreign governments have asserted claims to jurisdiction over fisheries in waters off their coasts beyond the three geographical-mile territorial belt historically recognized by the United States, thereby posing a threat to longstanding U.S. fisheries in those waters. During the year, Canada announced its intention to extend its jurisdiction over fisheries to a 12-mile zone off its coasts. Should this have the effect of excluding American fishermen from the zone, the impact on American fisheries would be substantial.

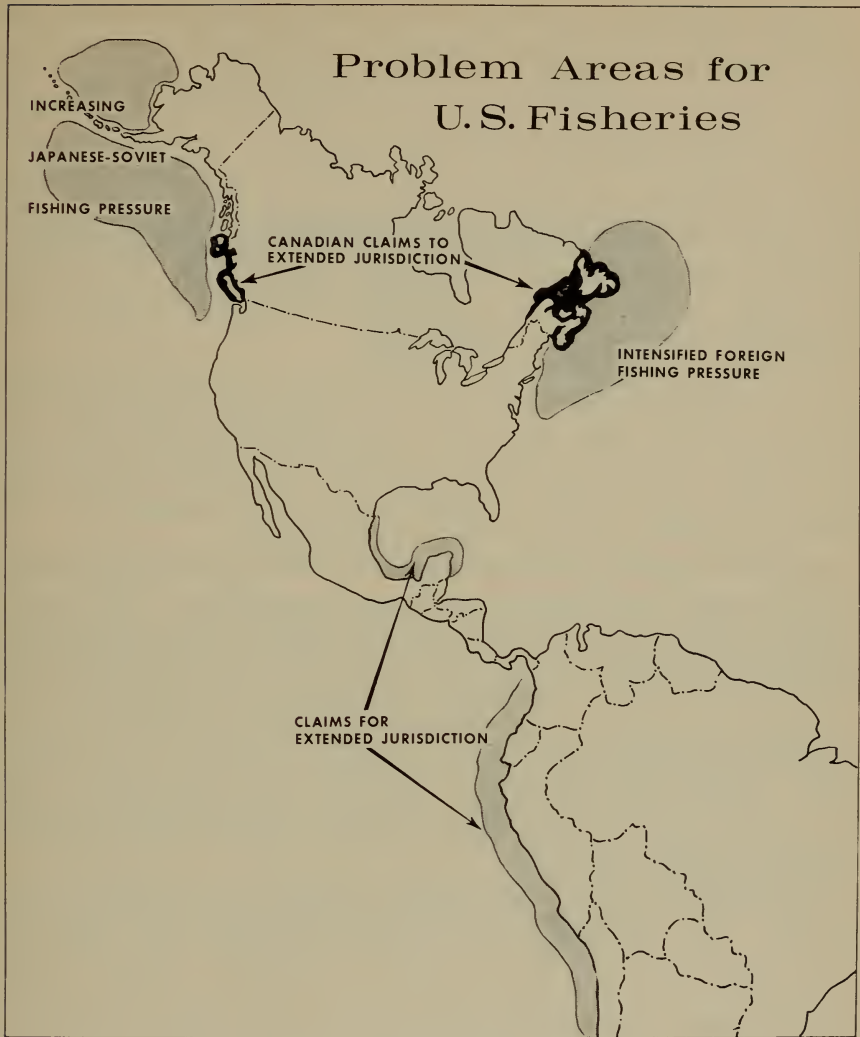
Various governments in Latin America claim jurisdiction over fisheries in extended zones off their coasts. Both the shrimp and tuna industries of the United States are threatened by such claims. During the past year, seizures of vessels by Ecuadorean authorities on the basis of such claims resulted in a major incident and the start of negotiations that were still in progress at year's end. Solving the resulting disputes in a mutually satisfactory way requires long preparation and careful, time-consuming negotiation.

Virtually every important segment of the fishing industry in the United States is affected by the activities of foreign fishermen and the policies of foreign governments regarding fisheries. Foreign fishermen exploiting resources that are harvested by American fishermen present a complicated international conservation problem and also compete with American fishermen for the resource, often with considerable advantage. The products of foreign fisheries compete with the products of American fisheries in both foreign and domestic markets. Foreign governments, in implementing claims to jurisdiction over vast areas of the high seas, threaten to deprive American fishermen of important, traditional fishing areas.

The United States is a member of a number of international fishery commissions aimed at bringing about cooperation in the conservation of resources harvested by the fishermen of many countries. The Commissioner of Fish and Wildlife is a U.S. representative on two of these organizations and his staff provides advice and assistance to officers of the Service who serve on other organizations.

Major accomplishments during the past year in connection with these organizations have been the negotiation of a protocol amending and continuing the convention between the United States, the U.S.S.R., Canada, and Japan for the conservation of the fur seal





resources of the North Pacific Ocean; and agreement among the 13 member nations of the International Commission for the Northwest Atlantic Fisheries which will eventually bring into force a system of international enforcement of the Commission's conservation regulations.

A major problem, yet unsolved, involves the renegotiation of the convention between Canada, Japan, and the United States for the conservation of the fisheries of the North Pacific Ocean. Renegotiation began with a conference in Washington in June 1963 and was expected to continue for some time.

The development of measures to provide protection to American fishermen in these trouble areas and to anticipate future problems resulting from the growth of foreign fisheries has been and will continue to be a complex task for the Office of the Commissioner.

The wise management of natural resources depends on an informed public. Keeping the public abreast of the latest developments concerning the Nation's migratory bird populations as well as meeting the growing demand for information on the vital pesticide-fish and wildlife problem are only two of the many tasks carried out by the Service's conservation-education program centered in the Office of the Commissioner.

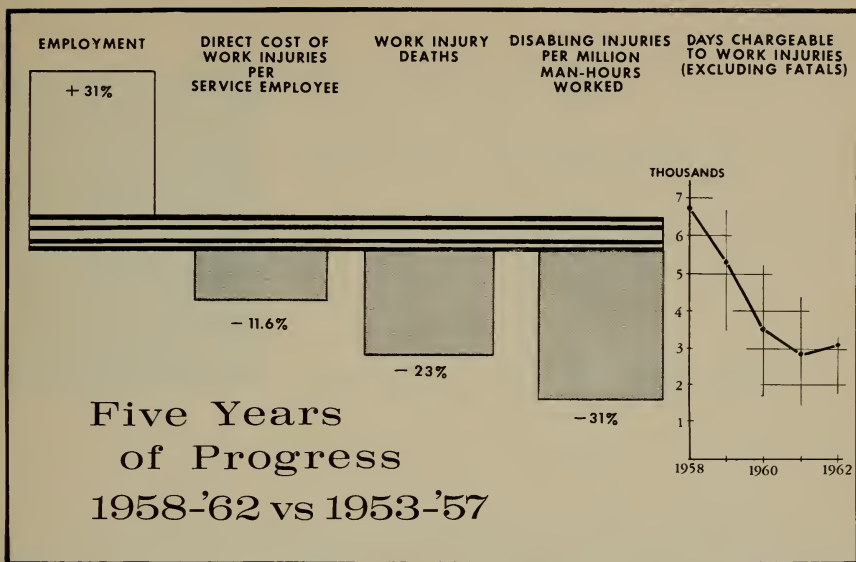
The restrictive duck hunting regulations of the 1962-63 hunting season would probably have been unacceptable to many waterfowl hunters without some explanation of the basic reasons behind the regulations. Various public announcements were used to point out the serious plight of the continent's duck population and to familiarize hunters with the protective regulations.

America's largest and rarest migratory bird, the whooping crane, has for some years been on the brink of extinction. This bird's dramatic fight for survival is of great interest to the conservation-minded public and an educational campaign to provide additional protection for these birds during migration was intensified.

Public awareness of the effects of pesticides on fish and wildlife resources has created new demands for information in this field. An expanded educational program will be necessary to meet the serious threat that the unwise use of pesticides poses for the Nation's wildlife resources.

A vital part of any Government program is the safety of employees. The calendar year of 1962 completed 5 full years of administration of the Service's safety program. Despite rising compensation and medical costs due to inflation and legislation, the estimated direct cost of work injuries, motor vehicle accidents, fires, property damage from accidents, and tort claims for the 5-year period was \$321,231. For the calendar year 1962, it was estimated at \$106,000. A statistical comparison with the preceding 5-year period, 1953-57, is shown on the following chart.

The safety program gives attention to the safety and health of employees and of the public who use Service facilities. It is concerned with loss reductions and more effective manpower utilization. Employee programs are directed at on- and off-the-job safety. They cover such diverse activities as construction, maintenance, and farming; laboratory analysis and field use of highly toxic chemicals for the control of mammals, birds, fish, insects,



and vegetation; underwater activities with scuba, diving cylinders, small submarines and other devices; the use of electrical fish sampling equipment; fire control; and work with radioactive isotopes as tracers and for irradiation purposes.

More than 11 million visitors used Service facilities during the year. This public use is increasing along with the responsibilities for providing a safe environment for such visitors.

The majority of the activities administered by the Office of the Commissioner are reflected in the accomplishments of the Bureau of Commercial Fisheries and the Bureau of Sport Fisheries and Wildlife. The reports of these two bureaus follow.







# Bureau of Sport Fisheries and Wildlife

Daniel H. Janzen, Director

Alarm over the hazards of pesticides and other poisons to wildlife resources and to humans as well was a notable development in fiscal 1963. The Department's Bureau of Sport Fisheries and Wildlife has studied the effects of pesticides on wildlife and fish for many years; in the past year such efforts were greatly intensified.

Notable also has been widespread concern over the growing recreational needs of a burgeoning population. Providing recreational fishing and hunting for the greatest number of Americans is an important objective of the Department. Congressional authorization for increased public recreational use of areas managed by the Bureau of Sport Fisheries and Wildlife and additional funds from the Accelerated Public Works program for developing public-use facilities on these areas gave strong assistance to the Department's contributions to public recreation.

A less obvious but still perceptible development of the year was an increasing awareness of the importance of research in determining how to protect, manage, conserve, and use America's fish and wildlife resources. Bureau research in these resources was enhanced by new laboratories and research stations and by new cooperative wildlife research units and cooperative fishery units established at several State universities.

## **Pesticides and Wildlife Studied**

National awakening to the necessity for safety in pesticide use, highlighted by the President's Science Advisory Committee report, led to new research facilities and expanded studies of pesticide-wildlife relations.



Proper management of fish and wildlife resources enhances recreation opportunity for the sportsman or outdoorsman.

### **New Laboratory Dedicated**

At the Patuxent (Md.) Wildlife Research Center, April 25, 1963, the Secretary dedicated the Biochemistry and Wildlife Pathology Laboratory, the first Federal installation constructed specifically for research on pesticide-wildlife relations.

“The work done here may prevent or halt the threat of the ‘silent springs’ that stalk the earth—for this laboratory marks the beginnings of a new national awareness of the present and potential danger we have almost thoughtlessly brought to the world in which we live,” the Secretary said.



### **Reproduction Rates Affected**

Tests at Patuxent showed that reproductive rates in pheasants, quails, and mallards are lowered by pesticides in the food supply. Quantities varying from 10 to 50 percent of the lethal dose of certain pesticides markedly inhibited reproduction and changed coloring of the feathers.

The unknown, but potentially calamitous, chronic effects of pesticides on fishes were under study at Bureau laboratories and field stations. Their effects on future generations of fishes are of special concern. Trout and salmon eggs at various hatcheries were found to contain up to 0.43 parts per million (ppm) DDT and its derivatives. One year after exposure, cutthroat trout contained relatively high residues of DDT, particularly in the brain, although no pathology attributable to the chemical was detected. Work on chronicity of the increasing number of pesticides involved chemical analyses and long-term observations of successive generations of exposed fishes.

### **Cumulative Effects Examined**

Evidence is increasing that pesticides used in wide-scale pest control are concentrated in sump areas by runoff and irrigation water. Poisoning of pelicans and other fish-eating birds on the Tule Lake National Wildlife Refuge in California indicated that transmission was through aquatic organisms, which showed a progressive increase in pesticide concentration from the lower to the higher animals making up the food chain.

A disconcerting aspect of the pesticide problem is the cumulative deposition of toxins in living animals. Ducks, geese, bald eagles, deer, fish, and other wildlife species are known to hold pesticide residues in their body tissues. Following spraying with DDT for spruce budworm control in Montana, Colorado, and New Mexico, some mule deer killed by hunters showed pesticide levels higher than the 7 ppm prescribed by the Food and Drug Administration as the maximum concentration allowable in meats entering interstate commerce. The longtime effects of these residues on the Nation's wildlife is a matter of vital concern to the Bureau.

### **Pollution Problems Combated**

Recognizing that land and water must be intensively managed and well protected to provide more fishing and hunting for coming generations, the Bureau studied the control and prevention of various kinds of pollution in aquatic wildlife environments.

Emergency action was required in fiscal 1963 to prevent widespread loss of waterfowl in the Upper Mississippi River Wildlife and Fish Refuge when great volumes of oil entered the Minnesota and Mississippi Rivers at upstream points. The Bureau was concerned also about the pollution-caused losses of fish in the Roanoke River in North Carolina. It also noted unsatisfactory conditions for fish in the lower Delaware River.

Discussions were held with officials of the Bureau of Mines to learn what studies of mutual benefit might be made of acid mine-water drainage into streams, control of oilfield brine pumping, and evaluation of hydrocarbon effects on fishes. The Bureau of Sport Fisheries and Wildlife participated in meetings of the Department's surface mining committee to mitigate destructive effects of strip mining. Every Bureau field installation now has sewage-treatment facilities. No domestic wastes are discharged into local streams or lakes.



In April 1963, Secretary of the Interior Stewart L. Udall dedicated the new Biochemistry and Wildlife Pathology Laboratory at the Patuxent Wildlife Research Center, Laurel, Md. Here the Bureau of Sport Fisheries and Wildlife will increase investigations of wildlife diseases.



Pesticide poisoning of pelicans, bald eagles, and other fish-eating birds from residues in water or transmitted by certain aquatic organisms is a matter of vital concern to the Bureau of Sport Fisheries and Wildlife.

Statements on pollution were prepared for the many congressional committees studying contamination of air and water. A member of the Bureau's staff was a member of the Ohio River Valley Water Sanitation Commission.

### **New Source of Botulism Found**

Studies disclosed unsuspected sources of botulism in the aquatic environment and hitherto unknown means of toxin transmission to birds. Aquatic invertebrates appear to be a reservoir and under certain conditions transmit the disease to feeding waterfowl. When blowflies were fed type-C toxin and then were eaten by ducks, increased infection rates resulted. Prompt destruction of dead and dying birds appears a necessary control measure.

### **Diseases of Fish Challenging**

Early in 1960, Federal and State fish hatcheries throughout the Nation experienced a severe outbreak of liver tumors in rainbow trout, resulting in mortalities and debilitation of epidemic proportions. Bureau pathologists identified the disease as hepatoma and provisionally eliminated contagious disease organisms as the probable cause. Nutritionists started a laboratory search. Experiments revealed that some fat-soluble component in the trout food is



a precursor of hepatoma. This pioneer work fixed the enemy for further attack by many cooperating research institutions. Bureau scientists have coordinated their efforts with seven universities, three cancer research institutes, and four international agencies in studying the disease. Prevention of trout hepatoma drew nearer during the year. By working closely with the National Cancer Institute, the Bureau also made important contributions in the broad field of cancer research.

Other trout diseases attacked by Bureau pathologists include serious outbreaks of whirling disease, presumably introduced from Europe, and infectious pancreatic necrosis (IPN). Whirling disease has increased in government and private hatcheries in Pennsylvania and Connecticut. Efforts are being made to stop its spread and to define the life cycle of the parasite so that prophylactic methods can be devised.

IPN also reached serious proportions in western hatcheries. A test for diagnosing the disease was developed. Tissue cultures were inoculated with the untreated virus, with the virus after heat treatment, and with the virus mixed with immune serum (anti-IPN). Results were positive only with the untreated virus inoculation. Transmission of the virus disease is effected with or by trout eggs, and infection-free female broodstock is being selected to eliminate the disease.

## RECREATION GROWS ON FISH AND WILDLIFE AREAS

Public Law 87-714, of September 28, 1962, authorized the Secretary of the Interior to develop and manage national wildlife refuges, game ranges, national fish hatcheries, and other conservation areas for "appropriate or secondary use for public recreation, to the extent that such use is compatible with the primary purposes of such areas."

In providing increased recreational opportunity under this new law, the Bureau gave initial consideration to programs of interpretation, including construction of refuge and hatchery visitor centers. These centers will have facilities for exhibits, auditoriums for lectures, and facilities for dispensing leaflets, maps, and tour information. Where public recreation needs are particularly heavy, consideration is being given to other recreational facilities as long as uses are compatible with the areas' primary purposes.



Control and prevention of various kinds of pollution are needed to preserve the aesthetic and recreational value of such scenes as this trout stream in the wilderness.



### **New Recreational Facilities Provided**

The Accelerated Public Works program, providing employment in distressed areas, contributed significantly to development of certain national wildlife refuges. Projects covered construction of dikes and other water-control structures, leveling and other land-improvement operations, habitat betterment, service buildings, and public recreation features such as roads and trails, picnic areas, fishing accesses, and swimming beaches. Accelerated Public Works funds permitted construction of visitor centers on the Moosehorn National Wildlife Refuge in Maine, Blackwater National Wildlife Refuge, Maryland, Seney National Wildlife Refuge, Michigan, and Kentucky Woodlands National Wildlife Refuge, Kentucky. Projects were developed on 18 refuges under total allotment of \$3,241,000.

### **Fishing on Federal Areas Increases**

Technical assistance given to 239 military and other Federal installations and 39 Indian reservations by the Bureau of Sport Fisheries and Wildlife during 1962 furthered recreational fishing on these lands. In 1962, waters on such areas produced about 3 million man-days of sport fishing directly traceable to this program. Assistance to non-Federal areas brought this total to 3.2 million man-days of fishing. Some of the benefits to sportsmen from the cooperative fishery management program during the past year included reclaiming or improving 592 miles of streams and 5,422 acres of fish habitat, development of 2,844 acres of new fishing waters, and the stocking of 15,900,000 hatchery fish.

### **Hunting Regulations Studied**

Effects of hunting regulations on the kill of waterfowl and mourning doves now are being measured with an adequacy that provides information useful in setting seasons to produce a desired level of harvest. Findings indicate that the timing of seasons affects the size and, for some species, the sex and age classes of birds killed. Differentials in time of migration among species, in age classes, and in sexes may to some degree open the way to larger harvests with less loss of breeding stock—a consideration of importance in an era of expanding demand and diminishing supply.

Reliable comparisons of mourning dove population and production trends by years and areas are essential to establishing equitable and biologically sound hunting regulations. To this end, the Bureau has defined standards that insure greater uni-





Scientists measure the clarity of water to determine the need for improvement of waterfowl and fish habitats. Submerged aquatic plants, many of which are key waterfowl food, require water clear enough for light penetration.

formity in breeding-population counts over the entire mourning dove range, resulting in more accurate prediction of fall populations.

### **Annual Surveys Conducted**

The Bureau again carried out its annual surveys to obtain facts on population status and distribution of waterfowl. These were the duck-wing collection survey during the hunting season to obtain information on age ratios in the hunting kill; the survey among waterfowl hunters immediately after the season to measure the size and species composition of the kill and the effect of hunting regulations on hunter activity and success; the survey of wintering areas in early January to measure the distribution and relative number of birds remaining after the shooting season; the survey of major breeding areas in May, June, and July to measure size and distribution of the breeding population and the relative number of young produced; and a major endeavor to band young birds on the breeding grounds for the purpose of establish-

ing a relation between breeding grounds and harvest areas so that data from breeding ground surveys can be associated properly with the four flyways.

### Law Enforcement Reveals Violations

Combined enforcement activities of U.S. game management agents in fiscal 1963 resulted in apprehension of 6,609 persons for violation of Federal or State game and fish laws. Enforcement activities are summarized in the accompanying table. In addition, Federal game management agents, in cooperation with State conservation officers, assisted in the apprehension and prosecution of 2,275 violations of State laws and regulations involving resident game and fish. Of these cases, 2,215 were found guilty.

*Table of cases involving violations of wildlife conservation laws enforced by the Bureau of Sport Fisheries and Wildlife, fiscal year 1963*

	Pending July 1, 1962	New cases	Pending June 30, 1963	Termin- ated	Fines and costs	Jail sen- tences (days)	Proba- tion
Migratory Bird Treaty Act.....	460	3, 530	432	3, 558	\$126, 738. 96	6, 456	130, 679
Migratory Bird Conservation Act.....	63	440	39	464	12, 196. 60	923	4, 740
Bald Eagle Act.....	1	12	2	11	536. 30	-----	-----
Lacey Act.....	4	51	2	53	4, 311. 50	120	4, 380
Black Bass Act.....	-----	7	2	5	550. 00	120	-----
Migratory Bird Hunting Stamp Act.....	41	299	37	303	6, 777. 80	35	4, 380
Assault Act.....	1	4	2	3	-----	2, 920	-----
Total.....	570	4, 343	516	<sup>1</sup> 4, 397	<sup>2</sup> 151, 161. 16	<sup>3</sup> 10, 574	144, 179

<sup>1</sup> Includes 271 cases on which prosecution was declined; 126 actions dismissed; and 58 acquitted.

<sup>2</sup> Includes \$12,992.20 suspended.

<sup>3</sup> Includes 6,275 days suspended.

### Foreign Game Birds Introduced

Cooperative agreements on foreign game introduction were in force in 45 States. Trial liberations of introduced birds were underway in 16 States and the Territory of Guam. All but 2 of the 16 species or subspecies under study were being reared in appreciable numbers on game farms in 21 States.

### Waterfowl Land Acquisition

To preserve migratory waterfowl resources for the future, the Department of the Interior has a long-range goal of 4.5 million additional acres of wetlands for refuges under the Migratory Bird Conservation Act and for waterfowl production areas under the Migratory Bird Hunting Stamp Act. Since fiscal 1961, all receipts from duck stamps, except expenses incurred by the Post

Office Department in selling these stamps, have been available for land acquisition.

Because duck stamp funds are not sufficient to acquire the needed lands while they still are available and reasonably priced, Congress, in the Wetlands Loan Act (Public Law 85-585, 1961), authorized appropriation of not to exceed \$105 million for a 7-year period beginning with fiscal 1962. These funds are a loan to be repaid from duck stamp receipts beginning with fiscal 1969. No money was appropriated under this authorization for fiscal 1962, but Congress appropriated \$7 million for fiscal 1963 and \$10 million for fiscal 1964.

The Department's 7-year program proposes acquisition of some 2.5 million acres of land, about 56 percent of the ultimate goal. Of this, about 1 million acres would be for new refuges or additions to existing refuges, and 1.5 million acres would be for waterfowl production areas in the Prairie States, of which about 465,000 acres would be acquired in fee and the remainder by easements to prevent destruction of their wetlands character. The program in the Prairie States has been slowed by reluctance of State Governors to grant the approval required by the Wetlands Loan Act because of the removal of land from local tax rolls.

In fiscal 1963, funds were obligated for acquiring 63,227 acres of land for national wildlife refuges. These lands were in 30 separate units in 23 States. In addition, funds were obligated for acquiring 25,328 acres of land for waterfowl production areas in Minnesota, Nebraska, North Dakota, and South Dakota. Of this total, 12,554 acres will be acquired in fee and 12,774 acres will be covered by easements to assure preservation of the wetlands from drainage, filling, or burning.

### **Wetlands Inspection Program Starts**

With enactment of Public Law 87-732 in 1962, the Department started a new program in Minnesota, North Dakota, and South Dakota of inspecting wetlands for which technical assistance or drainage cost-sharing has been requested. Lease or purchase offers are made to landowners for areas of high wildlife value before Federal drainage assistance is granted.

The program is conducted in cooperation with agencies handling Agriculture's drainage assistance program. It implements policies voiced by the President in his special message to Congress February 23, 1961, in which he expressed the hope that coordinated Federal leadership could expand fish and wildlife opportunities



without the conflicts whereby one department pays to have wetlands drained while another is purchasing such areas for wildlife.

The law applies to all counties in the three "pothole" States, and the inspection program is concentrated in the counties where wetlands are of critical importance for wildlife habitat. During the first 6 months of the program, October 2, 1962, to March 25, 1963, a total of 5,630 applications for drainage assistance were referred to the Bureau for inspection by county committees in the three States.

Drainage referral inspections are integrated with acquisition of small wetlands under the Wetlands Loan Act.

### **New Waterfowl Refuges Authorized**

In fiscal 1963, the Migratory Bird Conservation Commission approved acquisition of land for nine new waterfowl refuges as well as the addition of 22,857 acres of land to eight existing national wildlife refuges in nine States. The new refuges approved by the Commission included :

**Toppenish National Wildlife Refuge** in the lower Yakima Valley, Yakima County, Wash., with an eventual area of 12,379 acres, will preserve and protect a remaining waterfowl habitat, permit restoration of drained and reclaimed areas, and increase the utility



The Silver Trail, a road to the Kentucky Woodlands Refuge Headquarters, was reditched and regaveled under the accelerated public works program to provide access to a visitor center to be constructed on the refuge.

of the area to waterfowl through development and management of water, nesting cover, and resting and feeding areas.

**Pahranagat National Wildlife Refuge** in Lower Pahranagat Valley, Lincoln County, Nev., will assure maintenance of habitat well located to serve waterfowl using this part of the Pacific Flyway. The total area is 4,826 acres, of which 944 acres will be reserved from the public domain.

**Willamette National Wildlife Refuge** in Benton County, Oreg., will have an acreage of 5,371. It will provide some protection for the western Canada goose which has been subjected to heavy hunting pressure in this area, and will also serve ducks, swans, and water birds.

**Oconee National Wildlife Refuge** on the Oconee River in Wilkinson County, Ga., will fill a need for a waterfowl refuge in central Georgia. Because of insufficient and undependable habitat, ducks migrate through this area but do not winter there in appreciable numbers. The Bureau anticipates that after development, peak populations of 15,000 to 25,000 ducks will use the area during the fall and winter.

**Sudbury National Wildlife Refuge** is along the Sudbury and Concord Rivers, Middlesex County, in eastern Massachusetts about 14 miles west of Boston. The 3,879 acres proposed for acquisition include the most important areas of flood-plain waterfowl habitat in the locality. Major objective will be production of waterfowl, principally wood ducks, black ducks, mallards, and blue-winged teal. The area will also provide for migrants.

**Lake Woodruff National Wildlife Refuge**, Volusia County, on the St. Johns River in east-central Florida, will have an eventual area of about 19,000 acres. It will provide feeding and resting habitat for puddle ducks and diving ducks and other migratory birds.

**Pungo National Wildlife Refuge** in Washington and Hyde Counties, N.C., is in an area that plays an important role in the use pattern of waterfowl migrating through and wintering in eastern North Carolina. This refuge with an eventual acreage of 12,287 will provide protection for the large numbers of geese and ducks utilizing this area and will alleviate crop depredations in this agricultural region.

**Primehook National Wildlife Refuge**, Sussex County, Del., is along Delaware Bay. The 11,233 acres approved for acquisition are in an area of major importance to the waterfowl populations

of the Atlantic Flyway. The Bureau estimates that after development the refuge will produce 1,500 waterfowl annually and will serve 75,000 birds during migration.

**Lake Nettie National Wildlife Refuge**, McLean County, N. Dak., with a total of 3,300 acres, will increase the nesting potential for mallards, pintails, blue-winged teals, and shovelers in this important breeding and feeding area.

Establishment of the **Eufala National Wildlife Refuge**, in connection with the Walter F. George Lock and Dam Project in Alabama and Georgia, was authorized by the Rivers and Harbors Act of 1962. This project is under construction by the Corps of Engineers. The refuge authorization is an excellent example of how a multipurpose water development project can be planned to provide substantial benefits to migratory waterfowl at moderate cost, since most of the land would be purchased for the project with or without a refuge.

The new refuge will have 10,755 acres, including 8,440 acres of project lands to be purchased in fee title, 453 acres of project lands to be converted from easement to fee title, and 1,858 acres of lands additional to project lands. The refuge will be administered by the Bureau of Sport Fisheries and Wildlife. Public hunting opportunities will be provided on and near the refuge. Other types of outdoor recreation also will benefit.



Under the accelerated public works program, new recreation facilities such as this picnic shelter with tables and charcoal grills were provided on Blackwater National Wildlife Refuge.



### **Three New Refuges Activated**

Three new refuges were placed under active administration. They are:

**Clarence Rhode National Wildlife Range**, an area of 1,871,400 acres on the Bering Sea coast between the Yukon and Kuskokwim Rivers, is the primary nesting area for the cackling Canada goose, a major nesting ground of the black brant, and the home of much of the total population of the emperor goose. A headquarters station was constructed at Bethel, Alaska, on the Kuskokwim River.

**Ottawa National Wildlife Refuge**, in north-central Ohio bordering on Lake Erie, will encompass 5,500 acres of valuable marsh and crop lands expected to accommodate large numbers of nesting and migrating waterfowl.

**Choctaw National Wildlife Refuge**, 4,250 acres, is above Jackson Dam on the Tombigbee River in southeastern Alabama. Its combination of farmland and open water will make it an important wintering area for waterfowl in the Mississippi Flyway.

In addition to their value to migratory birds, these new refuge areas will produce large numbers of upland game birds and big-game animals. They will also provide recreation, especially fishing and hunting.

### **National Wildlife Refuge Renamed**

Fort Peck Game Range in Montana was renamed Charles M. Russell National Wildlife Refuge, in honor of Montana's famous naturalist-artist. The Bureau of Sport Fisheries and Wildlife was designated primary administrator of the area, which for several years had been managed jointly with the Bureau of Land Management. The new development plan provides for major wildlife management with programs of recreation and land-use development on this area—one of the Nation's outstanding undeveloped wildlife areas.

## **MANAGEMENT PROGRAMS WIDESPREAD**

### **Soil and Moisture Conservation**

The Bureau's soil and moisture conservation program received considerable emphasis during the year. While there was still a backlog of soil depletion and erosion problems, many of the most urgent projects were being controlled. Soil and moisture funds increased from \$207,000 in fiscal 1961 to \$705,000 in 1963; the number of refuges participating in the program increased from 64,



These rainbow trout were reared at Norfolk National Fish Hatchery, Ark., to stock water in Arkansas and Missouri and enhance recreational fishing for thousands of anglers.

with over 2 million acres, to 96 totaling 9 million acres. Soil and moisture conservation plans were prepared for approximately 100 refuges and 15 other plans were amended.

### **Forest Planning and Development Progress**

In his first natural resources message to Congress, and later in his message on conservation, President Kennedy cited the need for completing forest development and planning on Department lands.

In response to these messages, a report by the Department recommended four essentials for a balanced program on Interior forest lands, the first of which was "expansion in the forest inventory and management planning programs and an increase in the forest capital investments related to the national wildlife refuges." Pursuant to this recommendation, a report, "Forest and



Wildlife on the National Wildlife Refuges," was submitted to the Secretary. It outlined contributions that Bureau of Sport Fisheries and Wildlife forests can make to the Nation's forest wildlife, recreation, and economic future. It also described management needs, based on an analysis of timber volume, growth, and values. This program started in fiscal 1963. Allocation of funds for this purpose in fiscal year 1964 will expand the program.

### Wildlife Conserved

Trumpeter swans have demonstrated that they can establish themselves when transplanted into suitable environments. Four pairs nested on the Malheur National Wildlife Refuge, Oregon, and newly hatched cygnets and one pair of incubating swans were seen at Ruby Lake National Wildlife Refuge, Nevada. Successful nesting of at least one pair of these swans on Lacreek National Wildlife Refuge, South Dakota, represents the first hatching of trumpeters in the Great Plains in nearly 80 years. These swans were introduced from Red Rock Lakes National Wildlife Refuge, Montana.

Two nests of the Everglade kite were found on Loxahatchee National Wildlife Refuge in Florida. During the past two decades, the Everglade kite has become one of the rarest birds in the



Extensive banding operations provide valuable management information for determining waterfowl migration routes, obtaining population characteristics, and associating specific flocks with their breeding and wintering grounds.



United States, with fewer than 10 known pairs surviving, all in the Lake Okechobee district to the north of Loxahatchee. Discovery of these nests on the refuge raises hopes that the kite, which feeds primarily on the *Ampullaria* snail, will become established in another location. The Bureau hopes that suitable water levels in the refuge on which the existence of snails and kites depends can be maintained by the Central and Southern Florida Flood-Control District.

The national bird, the bald eagle, is a prominent part of the birdlife on Kodiak National Wildlife Refuge, Alaska. A recent survey showed that the birds were incubating eggs on 148 nests in the area. Forty-nine of the nests were built on cliffs; the rest were in cottonwood trees. In addition to the occupied nests, 156 unoccupied nests were observed. Only 368 bald eagle nests were reported in the 48 contiguous States—257 of them in Florida.

Field studies on Buldir Island in Aleutian National Wildlife Refuge, Alaska, disclosed that Aleutian Canada geese were nesting on that island. This small, dark form of the Canada goose has been greatly reduced as a result of introduction of blue foxes in the Aleutians in an attempt to increase the natives' fur catch. Since foxes were not released on Buldir and are now being controlled on some islands where they were introduced, the Bureau hopes that goslings captured on Buldir will play a part in reestablishing Aleutian Canada geese on many other islands in the refuge.

The maximum number of whooping cranes on Aransas National Wildlife Refuge, Texas, during the past winter was 32, or 6 less than counted the previous year. It was the first season in several years that no young cranes were produced in northwest Canada.

Five musk ox bulls were collected on Nunivak National Wildlife Refuge, Alaska, for display by museums. These musk ox are descendants of a herd of 34 brought from Greenland in 1930, and are the only musk ox in Alaska. Aerial census showed the population to be 360.

## WILDLIFE CONSERVATION GAINS

### Fish and Wildlife Restoration Advances

The 25th anniversary of the Pittman-Robertson Act (approved September 2, 1937) was observed in fiscal 1963. State fish and game departments have an impressive list of accomplishments, due to Federal excise tax funds made available for fish and wildlife



Thousands of Americans will enjoy good fishing as a result of this cooperative fish stocking program at Lake Powell on the Upper Colorado River.

restoration by the Pittman-Robertson and Dingell-Johnson Acts. Species that were low in numbers have been reintroduced and are now providing or will provide additional sport. More than 2.4 million acres of land and waters have been acquired, and 11.5 million acres leased for refuges, production areas, or public access. Existing habitats have been improved and new ones have been created. Excellent research studies have led to more effective management of fish and game and better harvesting regulations.

Regular program funds apportioned to States and territories in fiscal 1963 were nearly \$13¾ million for wildlife restoration and over \$5½ million for fish restoration.

A new departure in financing occurred through the availability of more than \$6½ million of Accelerated Public Works funds. State fish and game departments matched this Federal investment. These funds, part of the direct-action program by the Federal Government to reduce unemployment, were the first to be appropriated by the Congress directly for State fish and wildlife projects under this emergency act. The money was to be spent in distressed areas to provide local employment through capital improvements (excluding land acquisition) for the betterment of hunting and fishing.

### **Wildlife Fed Grain**

Commodity Credit Corporation grains were made available to States for wildlife feeding programs, as provided for by Public Law 87-152. Due to milder weather, the amount fed wintering wildlife was much smaller than the previous year.

### **Cooperative Action Safeguards Fish and Game**

Cooperative planning by the Bureau of Sport Fisheries and Wildlife and State fish and game agencies assures that development of the Upper Colorado River will cause a minimum of damage to fish and wildlife. In some instances there will be improvement in conditions for these resources. The Colorado River Storage Project, a basinwide water-development project, authorized in 1956 for construction by the Bureau of Reclamation, is progressing rapidly. Three of the four major storage units are nearing completion.

The authorizing act emphasized the importance of fish and wildlife conservation. Measures in response to this authorization include at least two national fish hatcheries, a national wildlife refuge, development of State-managed big-game and waterfowl areas, purchase of access areas and easements, and development of reservoir fishery programs. The Department expects that these actions will create many benefits to the five upper-basin States by increasing outdoor recreation opportunities and expenditures.

### **Susquehanna River Shad Restoration Studied**

During the year, the Pennsylvania Fish Commission approved a resolution requesting the Department of the Interior to ask the Federal Power Commission to require the owners of Conowingo Dam on the Susquehanna River to construct a fishway at that dam. Consultants of the Pennsylvania Fish Commission previously had concluded that properly constructed and operated fishways at the Susquehanna River dams were feasible and would successfully pass runs of anadromous fish.

Interior Department representatives held several meetings with representatives of Maryland, New York, and Pennsylvania to consider the biological problems associated with the restoration of anadromous fish.

It was decided that before construction of fishways was undertaken that a 2½-year biological study be made to determine suitability of the Susquehanna to support anadromous fish. The four power companies involved agreed to assume the costs of the bio-



logical investigations (\$196,500) and the Department and the power companies signed a contract to this effect. This contract was approved by the Federal Power Commission.

### Cooperative Education Increases

Two new cooperative wildlife research units were activated during the year—one at Cornell University in New York and one at Louisiana State University—and a unit was authorized for South Dakota State College. These brought to 18 the number of such cooperative units for training career workers in wildlife ecology and management.

The supply of trained fishery biologists has never equaled demand. To help meet this deficiency, six new cooperative fishery units were established in fiscal 1963. They are at Colorado State University, University of Georgia, Louisiana State University, University of Maine, University of Missouri, and North Carolina State College. With the unit established at Utah State University in 1962, there were seven such units in fiscal 1963.



The Bureau of Sport Fisheries and Wildlife seeks control techniques that avoid undue hazard to wildlife and to humans. A safety device of a crossed wire guard over the open top of the humane coyote getter prevents the paper seal of the trapping cartridge from harming humans who accidentally pull the triggering mechanism.

## CONTROL TECHNIQUES ADVANCE

As competition between man and wild animals increases, the problems of animal damage inevitably become more acute. The Bureau seeks control techniques that are specific for the animals concerned and that avoid undue hazard to other wildlife species, to domestic stock, and to humans.

### **New Snare Developed**

A new-type snare for capturing destructive bears catches high on the leg without breaking the skin and holds the animal relatively quiet. Unwanted wild animals as well as livestock can be released unharmed.

In some trapping areas, bait containing a tranquilizer is placed beside a steel trap so the trapped animal remains peaceable and can be released unharmed if desired.

A crossed wire guard over the open top of the humane coyote getter prevents the paper seal of the trapping cartridge from harming humans. In addition, a plastic sign is placed beside each "getter set" to warn persons who might be tempted to tamper with it. Reproductive inhibitors were tested as a method of coyote control. The most effective chemical tested, synthetic estrogen, was readily accepted in food by penned animals. Field trials with specially prepared baits were underway at year's end.

The mechanical burrow builder developed by the Bureau several years ago to control pocket gophers by placing baits underground has proved so successful that several commercial companies now manufacture it. A new toxicant, with low hazard to domestic birds and animals, has been developed for use with the bait dispenser.

The nutria problem is acute in coastal Louisiana and Texas, where water-control structures and crops are being damaged by this introduced rodent. New studies on methods of nutria control were begun in fiscal 1963 at Houma, La., and Beaumont, Tex.

Several hundred chemicals were tested during the year to determine their effectiveness as repellants of animals that annually cause great damage in nurseries, orchards, and forests. As a result of more efficient methods developed at the Bureau's Denver Wildlife Research Center, the time required to test these new materials was reduced from 100 days to 15, making it possible for the researchers to examine far more compounds. Of the several hundred chemicals tested, 10 showed promise in the control of depredating deer, porcupines, field mice, mountain beavers, and hares. They are undergoing field tests in the northwestern United States.

Rabies in wildlife has continued in many areas. The Bureau cooperated closely with the Pan American Sanitary Bureau in establishing a coordinated control program with Mexico and sev-

eral governments in the Caribbean area. Rabies is present along the entire United States-Mexico boundary from the Gulf to the Pacific, and in mongooses in several of the Caribbean islands.

### **Birds Controlled**

Under certain weather conditions, as when crops cannot be harvested because of rain or the season is late, great damage may result to farmers' crops from migrating or wintering waterfowl. Government-owned grain is available for feeding these concentrations of birds to reduce damage to agricultural crops. During the year, only 28,753 bushels of grain was fed in waterfowl depredation control, compared with 65,826 in fiscal 1962.

Lethal baits and specially designed traps showed promise in controlling starlings and blackbirds at feedlots and other trouble spots. Tests of chemosterilants indicate the effectiveness of these agents as controls, but there are unsolved technical difficulties related to their use.

Pocket gophers, range pests over much of the forage-producing public lands, have been the object of intensive control studies by the Bureau of Sport Fisheries and Wildlife.





### **Fish Control Laboratory Opens**

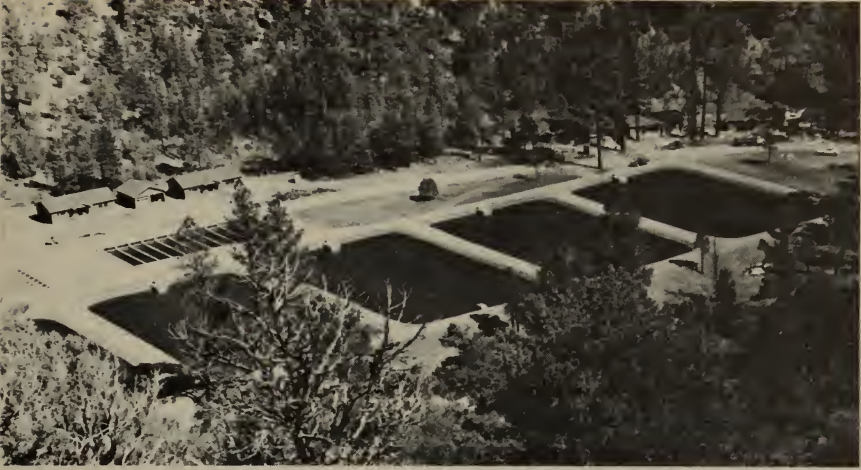
The Bureau's new Fish-Control Laboratory, La Crosse, Wis., was dedicated October 25, 1962. Research is being conducted on methods and materials for general and selective control of undesirable fishes. Toxicants receive preliminary tests in the laboratory. Promising ones then are tested in outdoor plastic pools.

## FISH HATCHERY PRODUCTION AT NEW HIGH

Fish hatchery production was at a record high of 3,462,000 pounds of all species. The production of fish per man-year reached 6,841 pounds, and the conversion rate of 2.15—pounds of food required to produce 1 pound of fish—was the best yet attained. This continuing improvement results from better design of facilities, improved diets, intensified disease diagnosis and control, better fish-cultural practices, and more highly trained personnel, both academically and through inservice training. Thus far, 204 Federal employees, principally from national fish hatcheries, have completed one or more of the inservice schools in fish nutrition, fish pathology, or fish-cultural techniques.

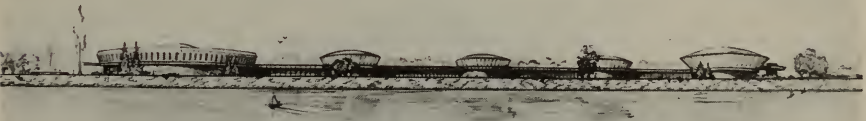
Regular construction funds were made available in fiscal 1963 to complete Alchesay National Fish Hatchery in Arizona, which was dedicated October 20, 1962, and to complete Bowden National Fish Hatchery in West Virginia. Both are for trout. Funds were provided to begin construction of a new unit at Dale Hollow National Fish Hatchery (for trout) in Tennessee, and to continue development of four other trout hatcheries—Greers Ferry National Fish Hatchery, Arkansas; Norfolk National Fish Hatchery, Arkansas; Garrison Dam National Fish Hatchery, South Dakota; and Wytheville National Fish Hatchery, Virginia; and to continue work on Jordan River National Fish Hatchery, Michigan, for lake trout.

Funds also were appropriated to the Bureau of Reclamation, for transfer to the Bureau of Sport Fisheries and Wildlife, to begin construction of two new hatcheries authorized by the Colorado River Storage Project Act. These units will be at Jones Hole, Utah, and on Reclamation's Curecanti Unit in western Colorado.



Alchesay National Fish Hatchery, Ariz., located on the Fort Apache Indian Reservation on land made available by the White Mountain Apache Tribe, was dedicated October 1962. This modern hatchery has a potential annual production of 150,000 pounds of trout, principally for distribution to waters on Indian reservations.

The Accelerated Public Works program provided urgently needed funds to undertake or to speed work on several hatcheries. Projects included acceleration of work at Jordan River National Fish Hatchery, Michigan, and development of Hiawatha Forest National Fish Hatchery, Michigan, both for lake trout; expansion of production and related facilities at Craig Brook National Fish Hatchery, Maine, for Atlantic salmon propagation; construction of production facilities at the Tylersville Unit of Lamar National Fish Hatchery, Pennsylvania; rehabilitation of facilities at Tishomingo National Fish Hatchery, Oklahoma, one of the most important pondfish stations in the Southwest; and rehabilitation and expansion of the important hatchery and research center at Leetown, W. Va.



Above is an architect's exploratory sketch for the National Fisheries Center and Aquarium authorized in October 1962 and to be located in Washington, D.C.

### **National Fisheries Center and Aquarium**

The new National Fisheries Center and Aquarium was authorized by Public Law 87-758, October 9, 1962. This Center in the Nation's Capital will have facilities for research in fisheries and for appropriate display of fresh-water and marine fishes and other aquatic resources. Cost of building and maintaining the Center will be repaid from visitor and user fees.

## **SPORT FISH STUDIED**

### **Fish Growth Enhanced**

Methods were developed for artificial stimulation of spawning in channel and flathead catfish.

Studies of the effect of food on growth and condition of 12-year-old brook trout from an alpine lake show that even at this age, growth can be accelerated. Reducing the population of trout appeared to have little effect on the growth of the remaining fish. Poor mineralization, low temperatures, and limited food resulted in 12-year-old trout averaging 7.6 inches in length. One fish kept in a hatchery trough with adequate food doubled its weight in 6 months.

Stamina tests in standard hatchery raceway ponds have shown declines in performance of salmon fingerlings as they grow from 5 to 20 grams in weight, but in specially designed recirculating raceways, swimming performance increases gradually during the same growth period. Tests in a specially designed stamina tunnel indicate that lack of exercise prevents development of full swimming capabilities in conventional raceways. Modifications may be needed if hatchery salmon survival on release is to reach optimum levels. Swimming performance of fry has not yet been shown to be a factor influencing hatchery returns.

### **Fish Farming Station Dedicated**

The Fish Farming Experimental Station at Stuttgart, Ark., was dedicated October 21, 1963. Major research at this station is concerned with problems of fish production on flooded land in rotation with rice and other field crops.

### **Fish Genetics Laboratory To Be Built**

A site was acquired in northeastern Wyoming for a new fish genetics laboratory. Funds were appropriated for the planning and construction at this station in fiscal 1964.



## Reservoir Fishing To Grow

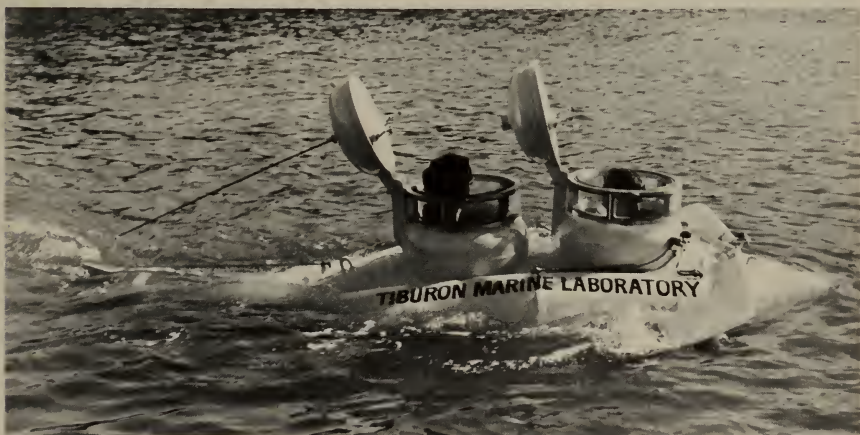
By 1976, half of all fresh-water angling is expected to be on reservoirs. This implies doubling of fishing pressure on these manmade waters.

Some new approaches to the study of fish populations in big impoundments are being made in the White River chain of reservoirs in Arkansas and Missouri, including coordinated use of modified trawls and electrofishing gear. University scientists, under contract to the Department of the Interior, are studying preimpoundment conditions in a river valley that contribute to reservoir fertility.

On the upper Missouri River, new automatic monitoring systems are being used which continuously measure water temperature, acidity, dissolved oxygen, turbidity, conductivity, and sunlight intensity of reservoir waters.

## Small Submarine Used

Bureau laboratories at Sandy Hook, N.J., and Tiburon, Calif., sought solutions to several of the many problems of sport fishes in coastal waters. A small, two-man submarine was used on the west coast to study distribution and behavior of fishes. In another new approach, aerial surveys of water surface temperatures are facilitating near-simultaneous observations over large ocean areas on both coasts for correlating surface temperatures with fish movements and concentrations.

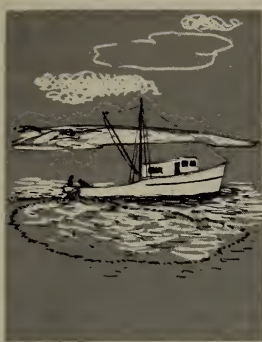


The Bureau of Sport Fisheries and Wildlife's new two-man submarine aids studies on the distribution and behavior of fish off the west coast.

Studies on the vitamin content of inshore waters and its relation to plankton and fish production were underway at the Sandy Hook laboratory. A marlin and sailfish tagging program was started on the west coast.

## RESEARCH REPORTED

Research findings and other information concerning the work of the Bureau were presented in 125 technical reports, circulars, and leaflets published by the Department during the year. More than 300 articles also were written by the Bureau's staff for scientific and professional journals.



# Bureau of Commercial Fisheries

Donald L. McKernan, Director

The Bureau of Commercial Fisheries of the Fish and Wildlife Service has a responsibility for carrying out a national fishery policy. This policy has three principal objectives: To increase and maintain America's fishery resources at a level to yield a maximum annual harvest; to strengthen and maintain a vigorous fishery industry; and to perform these duties in partnership with the States and in accordance with America's international obligations, without sacrificing the free enterprise system.

To discharge these responsibilities to the Nation, the Bureau engages in a wide range of activities. Its research and development programs concern many fields of science and technology, ranging from studies of the basic productivity of salt and fresh water to investigations of the methods of preserving fishery products. Included are such fields as biological and physical oceanography, ecology, physiology, parasitology, serology, atomic energy applications, refrigeration engineering, food technology, economics, fishing gear engineering and chemistry.

In addition to its research and development programs, the Bureau provides many services to industry. It collects information on foreign fishing activities and helps promote fish consumption. It also provides market news reporting, statistical surveys, and programs of financial assistance to the fishing industry.

For the benefit of the Nation and the fishing industry, the Bureau also operates the fur-seal industry in the Pribilof Islands, supervises the Columbia River Development Program, and participates in many international meetings on natural resources.

Significant progress was made during fiscal 1963 by Bureau scientists in research and development of the fishery resources, thus





Last year America's fishermen landed some 5¼ million pounds of fish and shellfish worth nearly \$381 million at dockside—an important contribution to the Nation's economy.

strengthening the role of the fishing industry as an important contributor to the national economy.

### **Oceanography Studies Progress**

During the year marked progress was made in many phases of marine science: Physical and chemical oceanography, physiology and behavior of fishes, definition of fish stocks, and the interrelation of fish stocks and environmental factors.

Published during the year was an "Atlas of the Oceanographic Climate of the Hawaiian Islands Region," which included calculations of heat transfer and energy systems related to ocean currents and atmospheric conditions in that region. Detailed analysis of North Pacific sea surface temperature conditions during the winter of 1962-63 revealed large masses of unusually warm water in the central Pacific that, as judged by meteorologists, may have been a factor in the far-from-average weather conditions that prevailed over much of the North American Continent in the winter of 1962-63.

Bureau scientists at the San Diego, Calif., biological laboratory, in cooperation with Scripps Institution of Oceanography, prepared a series of topographic charts of the eastern Pacific showing locations of seamounts and other features of the ocean floor. Fish appeared to accumulate around seamounts, presumably due to abundant food. This laboratory also issued monthly temperature charts for a wide area of the eastern Pacific and 15-day charts

for the principal tuna fishing grounds. The charts assisted fishermen in locating fish and also were useful to biologists, oceanographers, and meteorologists.

The Department participated in two international oceanographic expeditions. Members of the Bureau of Commercial Fisheries biological laboratory, at Washington, D.C., played a major role in planning the International Cooperative Investigations of the Tropical Atlantic. The first cruise of the multiple-vessel expedition (EQUALANT I) was carried out in the spring of 1963; a second cruise (EQUALANT II) followed in the summer. Staff members of laboratories at Honolulu, Hawaii, and Seattle, Wash., planned many of the biological and fishery studies of the Indian Ocean Expedition and participated in Cruise I of the *Anton Bruun* in the Indian Ocean in March and April of 1963. They also were scheduled to participate in several other cruises to follow. Both the tropical Atlantic and Indian Ocean studies will contribute to greater knowledge of the location and size of fish stocks of interest to U.S. fishermen and to the underdeveloped countries bordering those oceans.

New and improved instruments are one of the most critical needs of the oceanographic program. An instrumentation unit was added early this year to the Bureau's Biological Laboratory at Washington, D.C., to keep Bureau scientists apprised of developments in this field and to coordinate development and procurement of oceanographic equipment in the Bureau. This unit served also as a liaison between the Bureau of Commercial Fisheries and other agencies in the Department of the Interior and in other Federal departments.

Efforts were increased in the field of taxonomy, particularly identification of marine organisms. Taxonomic studies have a high priority in the National Oceanographic Program because they are basic to biological investigation. A new field station for taxonomic studies in the Pacific was established early in 1963 at Stanford, Calif., and the research program of the Brunswick, Ga., laboratory was reorganized to give greater emphasis to basic taxonomic and life history studies.

### **Fish Physiology and Behavior**

Department scientists continue to add to the mass of information on the development, physiology, and behavior of fish. Studies were underway on tuna reactions to purse seines and the relation between purse-seine catches and water temperatures below the surface of the sea. Department scientists have learned that there



A California tuna purse seiner sets her net at full speed.

is a close relation between the catches by purse seiners and the temperature structure of the water. At the Honolulu laboratory, captive tuna were trained to react to underwater sound and to striped patterns as a prelude to measuring their audio and visual response, which undoubtedly influences their reactions to various fishing methods.

An interesting advance was made by biologists at the La Jolla, Calif., biological laboratory in their study of the early development of fishes. They employed an apparatus to investigate fish development at 18 different temperatures simultaneously. The overall effects of many temperatures on the development of one group of fish eggs were determined in a single experiment.



## Forecasts for Fish Abundance Developed

Intensive research in fiscal 1963 developed reliable methods predicting where and when fish will concentrate. Since 1959, annual predictions based on changes in ocean circulation have been made for the catch of the Hawaiian skipjack fishery. The prediction technique has been refined by recent research; however, the mechanisms involved are not yet completely understood. A major inter-agency study is being planned for fiscal 1964 to obtain information for answering many of the "why" questions. In the eastern Pacific, predictions can now be made of the distribution and relative abundance of albacore and bluefin tuna during the summer on the basis of rates of warming of sea water during early spring. In the northwest Atlantic, the year-class strength and general abundance of groundfish stocks and sea scallops of the New England banks are now being predicted annually.

## Salmon Research Heartening

High dams, existing and proposed, on the middle Snake River in Idaho present difficult problems regarding salmon passage and maintenance of salmon runs in a changing river environment. Progress on these problems has resulted from the efforts of Bureau scientists in the fish passage research program and from cooperative studies by the State fisheries agencies of California, Idaho, Oregon, and Washington. Particularly encouraging are advances in disease control by the Oregon Fish Commission that increased survival of adult chinook salmon. Chemical treatment at two holding ponds showed a decrease in adult salmon losses from 62 percent to 20 percent.



To reduce natural losses and to bring the herd to the point of highest sustained yield, Bureau of Commercial Fishery biologists take a predetermined number of female fur seals each year during sealing operations on the Pribilof Islands.

Construction required for research projects of the accelerated fish passage studies was nearly completed. A large test flume facility at Troy, Oreg., will soon be in operation to test the behavior of juvenile salmon under various conditions of water velocity and pressure.

Tests of the 1-on-10 slope fish ladder at Ice Harbor Dam were completed and the final report was submitted to the Corps of Engineers. It was concluded that the steeper slope design is as satisfactory for the passage of salmon as the 1-on-16 slope used at existing dams, while construction costs are about one-half those of the conventional ladder.

Salmon research in the North Pacific continued. Acquisition and conversion to ocean research by the Department of a 176-foot Navy vessel made year-round, high-seas research possible and added greatly to knowledge of the ocean and the distribution of salmon and areas of major abundance. This information is being correlated with related physical and chemical oceanographic data. Identification of North American and Asian stocks of salmon and the definition of areas of intermingling continued as a primary objective of high-seas salmon research.

Within the past 3 years, much valuable information has been collected on the carrying capacity of red salmon lakes and spawning grounds in Alaska, ocean migration patterns of tagged salmon, and numbers of young salmon migrating to the ocean. This information has helped improve predictions of the salmon runs and has strengthened U.S. proof of full utilization by Americans of red salmon stocks—an important point in our country's position relating to the renegotiation of the North Pacific Fisheries Convention with Canada and Japan.

### **Foreign Fishing Increases**

Fiscal 1963 witnessed greatly increased fishing activities by foreign vessels off the New England and Middle Atlantic coasts. Investigations were underway to determine the effects of this great increase in fishing effort on fish stocks. Historically, these are very productive areas, and it is essential to the American fishing industry that ways be found to conserve these resources.

### **Sea Lamprey Control Advances**

Great strides were made in controlling the destructive sea lamprey in the Great Lakes with a chemical toxicant lethal to lamprey larvae but harmless to game fish. Lamprey control operations are carried out under the Great Lakes Fishery Commission in which



Incline-plane traps, such as this one on the Garlic River in Michigan, are used to capture and observe the downstream drift of sea lamprey ammocetes and developing sea lampreys.

the United States (through the Department of the Interior), the Canadian Government, and the Provinces and States abutting the Great Lakes, are represented. In 1963, an index of the adult lamprey population in Lake Superior was obtained at electric barriers on a number of streams tributary to the lake. As in 1962, the lamprey population remained at a level approximately 85 percent below that noted before control operations began.

Catches of juvenile lampreys in fyke nets in treated streams of Lake Superior and untreated streams of Lake Michigan were additional evidence of the effectiveness of chemical control. Biologists report that treated streams contained 97½ percent fewer young lampreys than untreated streams. Encouraging also was the reduction in the incidence of lamprey wounds on lake trout in Lake Superior and the increase in numbers of larger trout.

Because of the evidence that control methods had been successful in reducing the lamprey population in Lake Superior to a low level, the Commission recommended expansion of the control program in Lake Michigan. Fifty-four lamprey-infested streams in northern Lake Michigan have been treated successfully.



### **Whitefish Research Reveals New Facts**

Excellent progress was made during the year in increasing knowledge of the coregonids of the Great Lakes, including lake whitefish, river whitefish, and eight species of ciscoes. As a group, these fish have at different times been the backbone of the commercial fishery in each of the Great Lakes.

One of the difficult problems confronting fishery scientists has been the identification of juvenile coregonids. To understand the dynamics of the fish populations it is essential that measures of the abundance of various species be obtained throughout their lives. In fiscal 1963, biologists witnessed the spawning act of whitefish which had been reared from fertilized eggs at the Bureau's experimental hatchery at Northville, Mich. The event was unusual, for whitefish had never been reared to maturity nor had anyone ever observed the spawning act. This breakthrough was made possible through development of a system of temperature control and the application of antibiotics as a disease preventive. Such research is helping solve the problem of identifying young fish.

### **Walleye Research Progresses**

In Lake Erie and in Green Bay waters of Lake Michigan, trawling was conducted at several stations at regular intervals to measure the success of the reproduction of walleyes and other fish. This information is useful to the fishing industry, which needs an estimate of how much fish may be available in the future. An analysis of walleye tagging experiments in northern Green Bay and western Lake Erie established that walleyes return to their birthplace to spawn and provided information on the migratory patterns of the species and fishing intensity for it. This new knowledge provides a better basis on which to formulate management measures for the optimum utilization of the walleye resource.

### **Pesticide Research**

Possible damage to fish and wildlife from widespread use of pesticides has become of increasing concern to Federal, State, and private agencies. Greater numbers of people are now aware of the pesticide problem and have demanded measures to minimize its dangers to humans as well as wildlife and fish. Increased research on the effect of pesticides on living resources was demanded from all conservation agencies, including the Bureau of Commercial Fisheries. Fortunately, studies of the accumulation and effect of pesticides on fish and shellfish were begun several years



A gill net is hauled aboard the Department research vessel *Siscowet* during studies of the commercially important deep-water fishes of the Great Lakes.

ago, when biologists of the Fish and Wildlife Service recognized the potential danger to the Nation's commercial fisheries.

Small-scale field studies started in Florida and Washington during 1963 to determine the occurrence of pesticides in nature, observe the effects on marine species, and develop methods for more extensive research.

Laboratory experiments at the Gulf Breeze, Fla., laboratory show that very small quantities of many kinds of pesticides can



be harmful to commercial fish and shellfish. These studies are designed to determine the lethal and sublethal effects of common pesticides on representative commercial species, such as oysters, shrimp, and crabs.

The insecticides, particularly the stable chlorinated hydrocarbons, were the most hazardous of the pesticides studied. For example, DDT at concentrations of 0.1 part per million (ppm) caused 60 percent of the test oysters to die within 36 hours. In the same test time, 0.001 ppm DDT caused a 38-percent decrease in shell growth of treated oysters compared with untreated oysters. Results in the same general order of magnitude were obtained with shrimp and crabs. Other pesticides, such as heptachlor, had somewhat similar effects. Pesticides may also be harmful to the food supplies of commercial species.

King crabs were taken by the merchant vessel *Yaquina* off Kodiak Island during studies of this valuable shellfish in Alaska waters.





The stable pesticides also were found to accumulate in the tissues of animals at concentrations many times greater than the concentration in the surrounding environment. Thus, the concentration of pesticides can build up through the food-chain to quantities which may be harmful to the commercial fish or shellfish or to humans using these animals as food. In laboratory studies, adult oysters exposed to 0.01 ppm DDT continuously for 7 days contained 132 ppm DDT at the end of the exposure period. This concentration decreased very slowly when the oysters were put in water without the pesticide. After 50 days DDT was still found in the oyster tissues in a concentration of 44 ppm.

### **Fish Protein Concentrate Research Contracts Awarded**

Congress appropriated approximately \$450,000 for a program to develop methods for the manufacture of fish protein concentrate (FPC). This program is designed to provide a highly nutritious protein supplement to the predominantly vegetable and starch diets of peoples of developing nations and to provide American fishermen with a new industry that could utilize about 7 billion pounds of underutilized species of fish found in U.S. traditional fishing grounds.

Research contracts were awarded four groups to work with the staff at the Bureau's technological laboratory in College Park, Md. Texas Agricultural & Mechanical College has a contract to select and evaluate methods of preparing the raw fish. The Battelle Memorial Institute of Columbus, Ohio, has a contract to determine the most suitable of the solvent extraction processes, while Artisan Industries, Inc., of Waltham, Mass., will determine the best biological process method. The Ohio and Massachusetts research groups are to design and construct model scale units capable of processing 500 pounds per day of raw fish into FPC. The Massachusetts Institute of Technology has a contract to study the flavor and odor components of FPC and how to control them.

The College Park Laboratory will prepare FPC to determine the theoretical nutritional limit of FPC. This limit will be used as a standard for evaluating the actual processes developed by the contractors. Through the efforts of these laboratory organizations and the guidance of a panel of experts provided by the National Academy of Sciences, a wealth of information on this needed and valuable protein supplement will be available to other research groups and U.S. manufacturers of fish protein concentrate.

### **Blue Crab Processing Machine Designed**

Mechanization of blue crab processing is needed if its meat is to be competitive with other fishery products. Efforts are being made to devise machines that can reduce the amount of hand labor now necessary. A blue crab debacking and cleaning machine designed, under Department contract, by American Scientific Co., Inc., has shown promise in field trials. This machine, the first unit of a fully automated processing line, debacks and cleans the crabs at a rate of 40 to 60 per minute. The cost of the debacking and cleaning has been substantially reduced from the original estimate to a point that makes the machine attractive to a plant with a minimum of 10 to 12 pickers. On-the-job production testing of the unit was to continue throughout the 1963 season.

### **Fish Oil Research Underway**

Years ago fish oils were used in many industrial processes, such as in the preparation of soap, insecticides, foods, and paints; however, increased production by the vegetable oil industry and the advent of chemical detergents have drastically reduced domestic markets for fish oils. For the past several years foreign oleomargarine producers have been the chief users of domestic fish oils. Recently, the increased production of fishmeal and oilseed meals and the attendant increase in oil production resulted in accumulation of large stocks of these products, causing some alarm in the domestic fish oil industry.

New research of the Bureau of Commercial Fisheries seeks to utilize the unique chemical features of fish oils. For example, most vegetable oils are unsaturated at the end of the molecule while fish oils are unsaturated in the midpoint of the molecule. If specific chemical uses can be found for this characteristic, then other unsaturated oils could not replace fish oils in manufacturing processes.

### **Radiation Preserves Fishery Products**

Low-level radiation preservation holds great promise for the fishing industry. Commonly called radio pasteurization, it delays spoilage of refrigerated fresh sea foods by destroying large numbers of spoilage organisms normally present. Studies of its practicality are being made at Bureau technological laboratories in Ann Arbor, Mich., Gloucester, Mass., and Seattle, Wash.

Radio pasteurization studies showed that irradiated, skinless pollock and ocean perch fillets can be stored satisfactorily for 30 days at 33° F. Quality of ocean perch was slightly better than of

pollock. Similar work completed on Dungeness crab meat and petrale sole fillets showed that the storage life of Dungeness crab meat can be extended to 4 to 6 weeks at 33° F. and the storage life of sole fillets to 5 weeks.

The Atomic Energy Commission has funds to build a \$600,000 irradiator on land adjacent the Bureau's technological laboratory in Gloucester. To be known as the Marine Products Development Irradiator, this unit will be operated by Department fishery technologists. It will be used for semiproduction scale tests and to provide a volume of irradiation preserved fishery products for further scientific and marketing studies.

Small boats such as this Gloucester dragger shown unloading ocean perch are not always economical to operate.





## Exploratory Fishing Conducted

In meeting its responsibilities to the fishing industry, the Bureau of Commercial Fisheries conducts exploratory fishing in its constant search for new fishing grounds and ways of improving fishing gear.

Exploratory fishing along the Atlantic coast extended from off Nova Scotia to the northeast coast of South America, including the Caribbean Sea and Gulf of Mexico. In the North Pacific, operations ranged from the Gulf of Alaska to California, while in the Great Lakes area, efforts were concentrated in Lakes Michigan and Erie.

Two new shrimp grounds of commercial importance were discovered off the northeast coast of South America by the research vessel *Oregon*. Information about the new shrimp beds was relayed to the growing fleet of U.S. shrimp vessels operating out of various ports in the Guianas. Oceanographic and biological observations recorded during the *Oregon's* cruise off South America were part of the Bureau's participation in the International Cooperative Investigations of the Tropical Atlantic.

During cooperative work with a vessel chartered by the Woods Hole Oceanographic Institution, several good catches of swordfish were made with longline gear off Cape Cod, Mass. This method was quickly adopted by commercial vessels and has resulted in a year-round fishery. Longline explorations of the research vessel *Delaware* extended from off New England to the Azores and provided additional information on the distribution of swordfish and various species of tuna.

In the Gulf of Alaska, the chartered fishing vessel *Yaquina* located commercial stocks of king crab in two areas near Kodiak Island. Both areas, one off Cape Chiniak and the other off Marmot Island, are closer to port than the established offshore commercial grounds. This discovery shortens trips and also adds new fishing areas.

In the search for improved types of commercial fishing gear, new pelagic trawls were designed, constructed, and tested. Off the west coast of the United States a giant pelagic trawl was used from the research vessel *John N. Cobb* and was found to have good commercial possibilities. It also proved extremely efficient as a gross biological sampling tool for fish at surface and midwater depths.

The possibility of using electricity to assist fishing was studied further. With equipment developed and supplied by private industry, researchers aboard the *Delaware* tested the effect of an



This trim, 150-foot tuna purse seiner was converted from a 148-foot cargo vessel that had been severely damaged by an explosion and fire. Under the fishing vessel mortgage program, the Federal Government insured over 75 percent of the total reconstruction and conversion costs.

electrical field in front of a New England-type otter trawl on its fish-catching efficiency. Preliminary results were considered excellent, with significant increases occurring in the catches of several species of fish when the electrical current was flowing. In the Gulf of Mexico, the *George M. Bowers* was used for experiments on electrofishing methods for shrimp.

### **Economics Research Improved**

Proper utilization of America's fishery resources does not depend entirely on the size of the fish stocks and U.S. fishermen's ability to harvest them. Of great importance to the industry is the role of economics. In a free economy a fishery must be profitable or it will cease.

Realizing that the knowledge of fishery economics must be augmented, the Bureau paid special attention to improving its research in this field. A committee of five non-Bureau economists reviewed the economics program of the Bureau of Commercial Fisheries and made recommendations on the appropriate structure

and scale of economics effort in operations of the Bureau. The committee recommended that a Division of Economics be established and that basic research be undertaken to produce a meaningful flow of economics information.

Implementation of the committee's recommendations was rapid with the development of an effective commodity analysis program, a positive program for improvement of transportation rates and facilities, and an integrated program leading to the development and subsequent physical operational review of cooperative marketing associations in the domestic fisheries.

The economics work was divided into line and staff functions. The Central Office staff performs the staff or administrative management functions and the economics laboratory handles the line or field activities. An extensive recruitment campaign was conducted to employ qualified economists necessary to staff these operations. Work of reorganizing the Bureau's economics programs will continue in fiscal 1964 with the further training of personnel and development of the research and services program.

Cooperation was maintained with the Area Redevelopment Administration and project proposal and overall economic development plans (OEDP) involving commercial fisheries were reviewed. These increased about twofold during the year, with approval of 10 projects totaling \$3,091,957.



Scientists, visiting a Bureau of Commercial Fisheries biological laboratory, view an enclosed pond containing an established marine community and radioactive substances. The cycling of the radioactive substances is observed by measuring the radioactive content of the plants, animals and water in the pond.



Several fishery commodity situation reports, basically for administrative use, were prepared on tuna, menhaden, shrimp, and groundfish. These reports were used in the Fish and Wildlife Service and Bureau of Commercial Fisheries in reaching administrative management decisions affecting the fishing industry. Future reports will cover salmon, scallop, crab, and oyster fisheries. Such reports analyze current conditions in these fisheries and provide management with the best information possible as an aid to decision making.

### **Training Program Aids Research**

One handicap to the rapidly developing oceanographic and fishery program in the United States has been the shortage of qualified scientists. To help alleviate this need, a fund for graduate education grants was established in 1962. During the 1962-63 school year, 17 students were supported at 12 universities. The students pursued studies and research in some aspect of basic marine science. In addition, the Bureau continued its policy of encouraging and supporting further specialized training for its scientists, technicians, and administrators.

## **SERVICES PROVIDED INDUSTRY**

The program of the Bureau of Commercial Fisheries includes several services to the fishery industry. These are provided because one of the responsibilities of the Department of the Interior is to strengthen and maintain a vigorous fishery industry. In fiscal 1963, this assistance included the following activities:

### **Market Promotion and Consumer Education Provided**

In line with its duty of promoting and expanding the use of domestically produced fishery products, the Bureau of Commercial Fisheries continued its aggressive marketing program. The program has close cooperation with the domestic fishing and allied industries and with State and Federal agencies concerned with resource utilization.

The Maine sardine industry—faced with heavy inventories, depressed prices, little market demand, vastly increased imports, and heavy landings—requested assistance from the Bureau, which responded with a consumer and food-trade education program. More than 30 food-trade associations were asked to assist the Maine sardine industry. Contacts also were made with home economists, dietitians, school lunch supervisors, in-plant feeders, and



Large numbers of high school and college biology students visit the Department's biological laboratories each year as part of their studies of fish and shellfish resources.

representatives of radio, television, and newspapers. As a result, the Maine sardine market was considerably strengthened.

The Bureau received a request for marketing assistance from the natural sponge industry at Tarpon Springs, Fla. In the retail market, synthetic sponges have largely displaced the natural sponge. Again the Department, through its Bureau of Commercial Fisheries, responded to an industry request for marketing assistance by planning a joint pilot marketing and promotional program scheduled to begin in October 1963.

Other industrywide promotional efforts also engaged marketing specialists. To stimulate seafood use both by homemakers and institutions, public-service-type consumer educational materials were distributed nationally to newspapers and magazine food editors, radio and television public service directors, extension specialists, the mass-feeding industry, retail food trade, and others in a position to publicize and merchandise fishery products. Mar-

keting personnel worked with food-chain merchandisers, industry-paid advertising agencies, and other cooperators in developing advertising, merchandising, and promotion programs to full advantage of various promotional opportunities.

Industry was assisted during the past year in the following promotional programs:

“National Fish and Seafood Parade,” “The Wonderful World of Tuna,” “The Chive Festival,” “August Is Sandwich Month,” Fifth International Food Congress, “Fish ’n Seafood Time,” Maine Seafood Festival, New Bedford Scallop Festival, and the special promotions on Maine sardines and natural sponges.

Conventions in which the Department sponsored fishery educational exhibits of the Bureau included the Fifth International Food Congress, American Dietetics Association, American Home Economics Association, American School Food Service Association, National Restaurant Association, and various regional food conventions throughout the Nation.

### **Motion Pictures Distributed**

Twenty fishery educational motion pictures, produced by the Bureau of Commercial Fisheries and mostly industry financed, were given national distribution through 200 cooperating film libraries and government distribution channels. The films were seen by over 2 million persons. The major portion of the latest motion picture, “Watermen of Chesapeake,” was completed. This picture is scheduled for release before the end of 1963. Since 1946, 21 international and national film festival awards have been presented to the Department as the result of Bureau-produced films.

### **Fish Cookery Demonstrations Presented**

As part of a continuing program to promote the greater use of seafoods in the American diet, Department home economists presented over 250 fish cookery demonstrations for television food shows, restaurant operators, institutional dieticians, school lunch managers, in-plant feeders, extension agents, and club leaders. It conducted more than 500 palatability tests in developing kitchen-tested recipes for consumer use.

### **Market News Reporting**

For a quarter of a century the Bureau’s Fishery Market News Service has provided the fishing industry of the United States with current information on supplies, movement, distribution, demand, prices, and market conditions. Daily reports were issued in seven important fishing centers. They provided better under-



standing between buyers and sellers at every point in the marketing chain from fisherman to consumer.

Special articles and news of fishery trends and developments in all phases of fishery research in the United States and abroad were presented in the monthly periodical, "Commercial Fisheries Review."

News of trends and developments in foreign fisheries, transmitted by the Department of State from foreign reporting posts, were published in the daily Fishery Products Reports and Commercial Fisheries Review. More detailed reports on foreign fisheries were distributed to U.S. fishing interests upon request.

### Inspection and Standards Improve Quality

To improve the quality of seafoods, fishery product inspectors in the Department's voluntary Inspection and Certification Program examined and certified about 210 million pounds of fishery products during the past year. This work, paid for by the users of the inspection service, was by well-trained Federal inspectors. Forty-three fishery product processing plants contracted for voluntary U.S. Department of the Interior continuous inspection during the year. The services of the inspectors also were available to anyone at nine Bureau lot inspection offices conveniently located throughout the country.



During the summer of 1962, nearly 225,000 people viewed this exhibit and many other at the marine aquarium maintained by the Bureau of Commercial Fisheries at Woods Hole, Mass.

The U.S. standards for grades of fishery products serve as yardsticks by which the inspection service measures the quality of fishery products. Twelve U.S. fishery product standards are now available for use. Two new standards were published in fiscal 1963 and three existing standards were being revised.

### **Statistical Reporting Helped**

Installation of more sophisticated data-processing equipment made it possible, for the first time, for the Bureau of Commercial Fisheries to use detailed Bureau of the Customs vessel data in assembling information on the age of the U.S. fishing fleet by State, area, and type of vessel. The information revealed that much of the U.S. fishing fleet is outdated. Of the 7,142 vessels in the Atlantic and Gulf fleet, 1,697 were built before 1940. The Pacific fleet consists of an even greater proportion of older craft. Of the 4,740 vessels operating in California, Oregon, Washington, and Alaska, 1,800 (or 38 percent) were built before 1940. The oldest vessel in the U.S. fleet was built in 1865—nearly 100 years ago.

Because of increased interest in the domestic consumption of fishery products, a survey was undertaken during the year to determine current and historical information on U.S. per capita consumption of fish and shellfish by major species and type of product. The study revealed that consumption has remained remarkably constant during the past 30 years, averaging 10 to 11 pounds, edible weight basis. Consumption of such items as canned tuna, groundfish fillets and blocks, and most shellfish, except oysters, has increased sharply; however, consumption of canned salmon and Pacific sardines and fresh and frozen oysters has declined.

In 1961, the year covered in the study, nearly half the cured products consumed were imported, while 43 percent of the fresh and frozen items and 39 percent of the canned products were of foreign origin.

### **Financial Assistance Given Fisheries**

Three programs of financial assistance to the commercial fishing industry continued during the year.

The Fisheries Loan Fund, authorized by the Fish and Wildlife Act of 1956, financed 21 replacement vessels and provided loans to 34 other vessel owners who could not obtain funds on reasonable terms from other sources. The loans were for repairs, equipment, and maintenance of vessels and gear. Total loans for the year were \$827,000. Over \$15 million has been loaned fishermen since the program began.

Under the Fishing Vessel Mortgage Insurance program, 11 contracts for \$779,619 were issued during the year; 10 contracts for \$1,349,366 were outstanding from previous years; and 7 applications for \$1,357,665 were pending. Forty new fishing vessels are involved.

The Fishing Vessel Construction Differential Subsidy program under Public Law 86-516 expired June 12, 1963. Six applications had been approved for \$546,102, and seven were pending for \$55,667. The purpose of the program was to provide financial assistance to those who wished to build fishing vessels in the United States, where construction costs are nearly twice those in foreign shipyards. The subsidy corrected the inequity between foreign and domestic costs of fishing vessel construction.

## FISHERY EDUCATIONAL ACTIVITIES CONTINUE

At many of the laboratories, bases, and offices of the Bureau of Commercial Fisheries, special attention was given to educating the public in general conservation activities of the Department and in the work performed by it in oceanography and the fisheries. Open houses for the public were held by some installations. In several laboratories special aquarium exhibits drew hundreds of thousands of visitors. Many Bureau seminars were open to the public, and often special programs were presented for high school and university classes.

The contact with university students and faculty members was particularly important because they are the source of our new scientists and technicians and also are inclined to be the most effective advocates of conservation.

## DEVELOPMENTS IN FOREIGN FISHERIES AND TRADE

The U.S. fishing industry competes with other fishing nations, not only for the harvest of fish in the sea but also for a share of the world market. Information on the fishing activities of other countries must be available if the United States is to operate successfully in the competition for these resources and the markets. During fiscal 1963, the Department's Bureau of Commercial Fish-





Bureau of Commercial Fisheries scientists haul spiny lobsters aboard the research vessel Pelican while assisting the Republic of Panama in its studies of this important shellfish resource.

eries collected such information and made it available to industry and government.

### **Foreign Fishing Activities Increase**

World fisheries continued to increase in 1963. Their landings have doubled since 1950 and they established a new record of 41,200,000 metric tons in 1961. Figures for 1962 were not yet available at year's end, but another record catch was anticipated. This increased production has created problems for the U.S. fishing industry in the areas of resource management, resource development, competition on the high seas for important commercial species, and in domestic and international trade.

The Department continued to achieve wider coverage of foreign fishery developments to meet industry and government requests and needs for foreign fishery information. Information obtained enabled American firms to find market outlets for their fishery

products in foreign countries, to evaluate fishery investment opportunities in various countries, and to meet competition in domestic markets. Such information also was most useful in determining U.S. policy regarding problem areas.

Three regional fishery attachés—in Copenhagen, Mexico City, and Tokyo—continued to report on fishery developments from Europe, Latin America, and Japan. Specialized data on costs of construction and operation of foreign factoryship stern trawlers were obtained from Copenhagen. A report was prepared on a survey of the shrimp fisheries of Guatemala, El Salvador, and Nicaragua.

U.S. industry was kept advised of fish meal and oil developments in Peru and throughout the world. A new fishery attaché post in Abidjan, Ivory Coast, was approved by the Department of State. It should improve fishery reporting from the west and south African area.

The Department of the Interior also followed closely the activities of foreign craft off the U.S. coasts. Locations and activities of Soviet fishing fleets and exploratory fishing vessels were reported regularly. In addition, current reports covering Soviet, Japanese, and African fishery developments were released.

### **International Programs Grow**

Participation of the Department in international fishery affairs increased in 1963. Two new regional fishery commissions were established under FAO sponsorship, one in the west African area and the other in the southwest Atlantic area.

The Regional Fisheries Commission for west Africa held its inaugural session at Tunis, Tunisia, in November. The United States, because of its interest in African fisheries development, sent a Department observer and a fishing industry adviser to Tunis.

The inaugural session of the Regional Fisheries Advisory Commission for the southwest Atlantic was held at Rio de Janeiro, Brazil, in December. The United States, keenly interested in establishment of successful fishery commissions in this area, both from the viewpoint of regional economic development and in the interest of the U.S. fishery industries, also sent a Department and an industry representative to Rio de Janeiro.

The Department, through the U.S. FAO Interagency Committee, participated in June in the U.S. hostship of the FAO-sponsored World Food Congress in Washington, D.C., and also represented the Federal Government in activities of the Fisheries Division of FAO.

United Nations Special Fund projects for fishery development in Caribbean and Central America areas are being developed. The Department recognizes the feasibility of these projects and may eventually participate by providing manpower and technical assistance. Bureau technical experts were sent to Colombia and Brazil to advise on commercial fishery developments. A specialist in exploratory fishing was instrumental in locating commercial quantities of spiny lobster resources off the east and west coasts of Panama and in assisting the local government and industry develop these resources.

Officials of the Bureau of Commercial Fisheries continued to participate in international commissions concerned with aquatic resources and their utilization. These commissions include the Inter-American Tropical Tuna Commission, International Commission for the Northwest Atlantic Fisheries, International Pacific Halibut Commission, International Whaling Commission, Great Lakes Fishery Commission, North Pacific Fisheries Commission, and North Pacific Fur Seal Commission. At commission meetings, every effort is made to provide for wise exploitation of the resources, along with safeguarding the traditional rights of U.S. fishermen.

### **Trade and Tariff Studied**

Specialists in trade and tariff matters in the Department's Bureau of Commercial Fisheries assisted in developing policies designed to move U.S.-produced fishery products in domestic and foreign markets. The Trade Expansion Act of 1962 had granted the President broad authority to enter into trade agreements with other countries during the 5-year period ending June 30, 1967. Preparations for coming tariff negotiations with the European Common Market and with other members of the General Agreement on Tariffs and Trade began in fiscal 1963 and a Department representative was detailed to work with the Office of the Trade Agreements Negotiator.

The Department was represented by the Bureau at the second United States-Japan Tuna Conference in Tokyo, October 1962. Frank exchanges of views and a better understanding of the problems relating to trade in tuna and to the expanding utilization of the resource resulted from this conference.

### **International Tuna Conference Held**

The United States was host to the FAO World Scientific Meeting on the Biology of Tunas and Related Species in July 1962. This meeting was attended by 249 scientists and industry members



from 18 countries and 8 international organizations. Bureau scientists played a major role in planning the conference, which was concerned with the status of present biological knowledge of these fishes and the need for further information in the future. The tunas represent a worldwide resource of tremendous importance, and their conservation is a matter of international interest. The meeting focused attention on tuna problems and encouraged further research and cooperation among the nations that harvest them.

## COLUMBIA RIVER DEVELOPMENT PROGRAM EMPHASIZES SALMON

Extensive Federal water-use developments in the Columbia River Basin led to start of a program in 1949 known as the Columbia River Fishery Development Program. Fishery agencies felt that such a program was needed to maintain the valuable and world-famous migratory salmon and steelhead runs that might be damaged by the water-use developments. The Department, through its Bureau of Commercial Fisheries, is responsible for coordinating and administering this cooperative program, which involves the fish and game agencies of the States of Idaho, Oregon, and Washington.

Since inception of the program, obstructions have been cleared from streams to permit passage of fish, fishways have been constructed at natural falls, and screens have been placed at points of irrigation diversion to prohibit entry of fish in those diversions. Hatcheries and other artificial propagation facilities for salmon have been constructed and operated to replace lost habitat, and studies have been developed to improve management procedures and evaluate various facets of the program.

During the past year the success of the Columbia River program was demonstrated by an exceptionally fine run of steelhead that returned to the Eagle Creek National Fish Hatchery in Oregon and by a large run of spring chinook salmon that used the Shipperd Falls Fishway on the Wind River in Washington and returned to the Carson National Fish Hatchery upstream. Some 13 million spring chinook salmon eggs, 75 million fall chinook salmon eggs, and 52 million silver salmon eggs were taken at hatcheries connected with the Columbia River program. The take of silver salmon eggs was the highest on record and resulted from an unusually large run of silver salmon in the lower Columbia River.

Evaluation of the contribution of hatcheries to maintenance of the river's salmon resources continued with the marking and release of approximately 7 million juvenile salmon.

The screening of irrigation diversions continued during the year, more than 500 screens being operated in Oregon and Idaho. A total of 34 new screens was constructed and placed in the Salmon River drainage, Idaho, thus bringing to 165 the number of screens operating in that drainage. Many of the young fish saved from irrigation diversions will return later as adult fish.

Eventually improvement in production of fish is being sought, in part, by operational studies. Some 28 investigations were underway during the year, embracing improvement of natural habitat, predator control, natural rearing, and improvement in fish cultural techniques. Five State fish and game agencies, three universities, and several research groups of the Department's Fish and Wildlife Service participated in the studies.

Good progress was made in studies regarding rearing of fish in natural or seminatural ponds, production of young fish in artificial incubation channels, and physiological changes associated with seaward migration of the young fish. A salmon compendium, a monumental compilation of all salmon literature by subject pub-



This fish screen prevents entry of young fish into an irrigation diversion on the North Fork of the Salmon River near Salmon, Idaho, where they soon would be stranded and die.—  
Courtesy Idaho Department of Fish and Game.

lished since 1900, was nearing completion. Thus far 108 volumes have been written.

A new major fishway was completed on the Lostine River in Oregon. This fishway aided passage of adult migrant salmon and steelhead upstream to areas suitable for spawning. Fishways constructed in the past in Idaho, Oregon, and Washington were operated successfully during the migration seasons.

Extensive assistance in planning and inspection of fish passage and protective facilities was given various government agencies and private power companies. Good progress was made in planning fish facilities at new projects and in negotiations for improving passage facilities and their operation at dams. The effects of water development projects upon fish may be extensive and were carefully analyzed. During the year, 309 water resource development projects of a size that they might affect fisheries resources were investigated and reported.

## FUR SEAL OPERATIONS

In administering the U.S. fur seal industry, the Department harvested 77,915 sealskins during the summer of 1962 from the Pribilof Islands, Alaska. Under the Interim Convention on Conservation of North Pacific Fur Seals, Canada and Japan each received 15 percent of the sealskins taken, plus 375 additional skins.

During fiscal 1963, 54,820 U.S.-owned sealskins were sold, grossing \$3,566,764. Under the Alaska Statehood Act, 70 percent of the net proceeds from the sale of sealskins is payable annually to the State of Alaska. The fourth annual payment to the State, based on net proceeds accruing during fiscal 1962, was made late in 1962. It totaled \$702,852.

The contract for the processing and selling Alaska sealskins for the Federal Government, held by the Fouke Fur Co. for 40 years, was terminated December 31, 1962.

In June 1962 the Department invited proposals for processing and selling Alaska sealskins. They were distributed to many fur-processing firms, individuals, and organizations. In March 1963, the Department awarded a contract for processing and selling such sealskins harvested to Supara, a joint venture partnership in Chicago, Ill. The firm will locate its processing plant in St. Louis, Mo.

Loss of large numbers of pup seals during the past several years was of considerable concern to biologists of the Bureau of Com-





The fishery-oceanographic vessel *Albatross IV* is one of the world's most modern research ships.

mercial Fisheries, and the object of intensive research. Intestinal infections from hookworms appear to be the major factor in the losses. Research at Colorado State University revealed that newly born pups are infected with hookworm larva they ingest with milk of their mothers when nursing.

## CONSTRUCTION ACTIVE

The construction program provided the Bureau with new research tools. One new research vessel was completed, one vessel was converted to fishery purposes, and contracts were let for two new ships. Construction of a new laboratory started.

### **New Research Ships Operate**

One of the world's most modern fishery-oceanographic research vessels began operating in the northwest Atlantic. The 187-foot, 1,000-ton sternchute trawler, *Albatross IV*, fully equipped with the latest underwater TV, underwater sonar, and experimental fishing



This scale model represents the Bureau's new fishery-oceanographic research laboratory to be located on the northern boundary of the Scripps Institution of Oceanography on and deeded to the Government by the Regents of the University of California.

gear, is based at the Department's Woods Hole, Mass., biological laboratory. The new vessel will help accelerate needed research in the northwest Atlantic region, where an intense fishery by many nations is taking an increasing toll of the resources.

A 147-foot surplus Navy vessel was converted to a fishery-oceanographic ship, the *Geronimo*, which began operating during the year. Urgent need for a ship to participate in investigations of the tropical Atlantic eliminated the possibility of waiting for a new ship to be built.

Designs for two new research vessels were completed and contracts were awarded for their construction. One ship will be the *Townsend Cromwell*, a 158-foot vessel to be used for oceanographic and tuna research in the central Pacific. The other, to be called the *David Starr Jordan*, will be a 171-foot ship for use in the eastern Pacific in oceanographic investigations and studies of anchovy, jack mackerel, tuna, and related species.

### **New Laboratory Started**

A ground-breaking ceremony was held in June 1963, marking the start of construction of a \$2½ million laboratory on the campus of Scripps Institution of Oceanography in California. This laboratory will provide a greatly improved working environment for the Department's fishery research staffs in the southern California area and will constitute one of the major fishery research centers in the United States.

# Office of the Assistant Secretary Mineral Resources

John M. Kelly, Assistant Secretary







# Office of the Assistant Secretary Mineral Resources

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Minerals, basic to every nation's economy, are essential both for America's conquering outer space and for creating an environment in which America's "inner space" may be conserved and enjoyed. Interior's responsibilities for research, development, and utilization of minerals center in the Office of the Assistant Secretary for Mineral Resources.

In fiscal 1963, policy and program organization and liaison were expedited in several areas of increased public interest, including oil shale development proposals for the Rocky Mountain region, Area Redevelopment Administration plans involving mineral resources, a demonstration program for rehabilitating strip mine areas, and acid mine water pollution problems.

Following two major coal mine disasters, and at the request of the President, a study of coal mine safety was started. Consultations were held with mine safety officials of several States and with labor and management organizations. At year's end, recommendations for legislative and administrative action to improve coal mine safety were being completed.

The office, together with the office of the Administrative Assistant Secretary and the Bureau of Mines, planned the reorganization of the Bureau. This was being put into effect as the fiscal year closed.

In cooperation with other executive agencies, the Department revised the program of import controls for petroleum and petroleum products to assure its fullest contribution to national security.

Wise development of the Nation's wealth of mineral resources will insure their continued abundance.

Heightened congressional and executive branch interest in water quality and water research was reflected in the leadership and coordination work of the office, in conjunction with other areas of the Department.

A noteworthy report, "Supplies, Costs, and Use of the Fossil Fuels," received worldwide distribution. The report was produced by the Departmental Energy Policy Staff, jointly created by the Assistant Secretaries for Water and Power Development and Mineral Resources. At year's end the Energy Policy Staff was coordinating the Department's participation in the Interdepartmental Energy Study requested by the President.

Reports on mineral resources for both the National Academy of Sciences and the Federal Council on Science and Technology were completed. The Assistant Secretary and a staff member participated in the Princeton Conference on Mineral Exploration and Development.

Precedent-setting sessions were held with representatives of several metal commodity industries and the petroleum industry to exchange briefings and background information on problems regarding specific minerals.

Department contacts with the Interstate Oil Compact Commission resulted in a Commission study of petroleum conservation practices.

During 1963 the worldwide ramifications of mineral policies attracted increased attention in the Assistant Secretary's office because of their effects on domestic mineral resources. Involved were such special or continuing projects as—

- . . . Participation in the Organization for Economic Cooperation and Development, through its Energy, Coal, Oil and Non-Ferrous Metals Committees;

- . . . Extensive discussions, in cooperation with the Department of State, with representatives of foreign governments on matters regarding fuels;

- . . . Organization and presentation of the U.S. contributions on minerals and related subjects before the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas;

- . . . Participation in the work of the NATO Petroleum Planning Committee;

- . . . Representation at meetings of the International Lead-Zinc Study Group and its standing committee—of which a member of the staff is chairman—and participation in meetings of the Special Working Party of the Study Group;



. . . Continuation of work aimed at expanding the market for export of U.S. coal—an activity which was marked by a substantial rise in coal exports during the year;

. . . Guidance for U.S. participation in minerals and geologic activities of the Economic Commission for Asia and the Far East;

. . . Participation in special United Nations consultations on tungsten;

. . . Preparation, together with the Resources Program Staff, of departmental material for use in implementing the administration's trade program.

Other work of the Assistant Secretary's office involved the continuing supervision of organization and programs of eight bureaus and offices of the Department: The Geological Survey, Bureau of Mines, Office of Oil and Gas, Office of Geography, Office of Minerals and Solid Fuels, Office of Minerals Exploration, Oil Import Administration, and Office of Coal Research.





# Geological Survey

Thomas B. Nolan Director,

In February 1963, nearly 2,000 delegates from more than 80 nations gathered at Geneva to discuss natural resource conservation and development.

It was the first major international effort to mobilize the world's scientific and technical knowledge to stimulate the economic and social progress of developing areas.

The assembly reflected, in a sense, a "return to earth" of scientific inquiry if seen as a counterbalance to the dramatic advances in the exploration of outer space. Geological Survey earth, water, and mapping scientists who presented papers at the international gathering emphasized that the strength and wealth of any nation is built on its properly surveyed, developed, and researched natural resources—a truism regarding the United States as well as for the most newly emerged sovereign nation.

In 1963, the Geological Survey's research on natural resources reached new highs, accentuating the link between the Nation's well-being and its natural resources, of which land and water are vital.

The Survey has been asked: "Why are your research efforts on natural resources always increasing? Shouldn't phases of our resources inventory terminate?"

The questions are based on a common misconception: that a resource is a fixed quantity and hence is exhaustible according to a predetermined schedule. The fact is that most resources are practically as limitless as man's imagination, ingenuity, skill, and knowledge permit. Resources used by man are created largely by human inquiry—by research that finds new uses for previously valueless materials, that finds resources that could not be found before, and that provides ways to extract and refine materials that



formerly could not be exploited profitably. Prospectors, geologists—or Indians—during an earlier era of American history did not seek uranium deposits in the Rockies, ground-water supplies beneath the plains, or oil beneath the Williston Basin, because of a lack of need. But even if these substances had been sought, most of them would not have been found, because the knowledge needed for wise and successful prospecting was still undeveloped.

The quest for knowledge about our resources must be a never-ending one. And, because our population and per capita consumption of raw materials and energy are growing, we must increase our research to meet the Nation's aims of economic growth.

The Geological Survey has chief responsibility for determining the distribution and quality of the Nation's water resources, minerals, and fuels; for surveying and mapping the land surface; for establishing, by mapping and other studies, the character and structure of the rocks that underlie the surface; and for supervising the development of fuels and minerals on Federal lands under leasing laws.

In its investigations, the Survey always seeks the competence and knowledge necessary for the long-range development, management, and wise use of all types of natural resources, whether these resources be on the continents or in the subocean crust.

The theme, "Conservation Through Research," can be found throughout the Survey's accomplishments for 1963.

## WATER RESOURCES DIVISION STUDIES ESSENTIAL

Through its Water Resources Division, the Survey's function is to assess the Nation's total water resource and to find out more about water itself. Wise management of water resources requires a fundamental understanding of the water system and all its processes, including the relationship between surface and subsurface systems, between flowing streams and storage reservoirs, and between water quality and geologic environment.

Water resources cannot be managed wisely unless we know how much water circulates through rivers and aquifers and how much is being withdrawn for use. Those responsible for water management depend largely upon the Survey to provide the facts and research findings on which new management techniques can be based.

Water investigations by the Survey fall into three general categories: a network of thousands of stations for measuring and

evaluating the water resources of the country; interpretive studies of areas of existing or potential water problems; and research on hydrology. Armed with current water facts and with scientific understanding of water occurrence and quality, the Survey can help the States and the Nation manage water resources with prudence and foresight.

### Cooperative Program Helps States

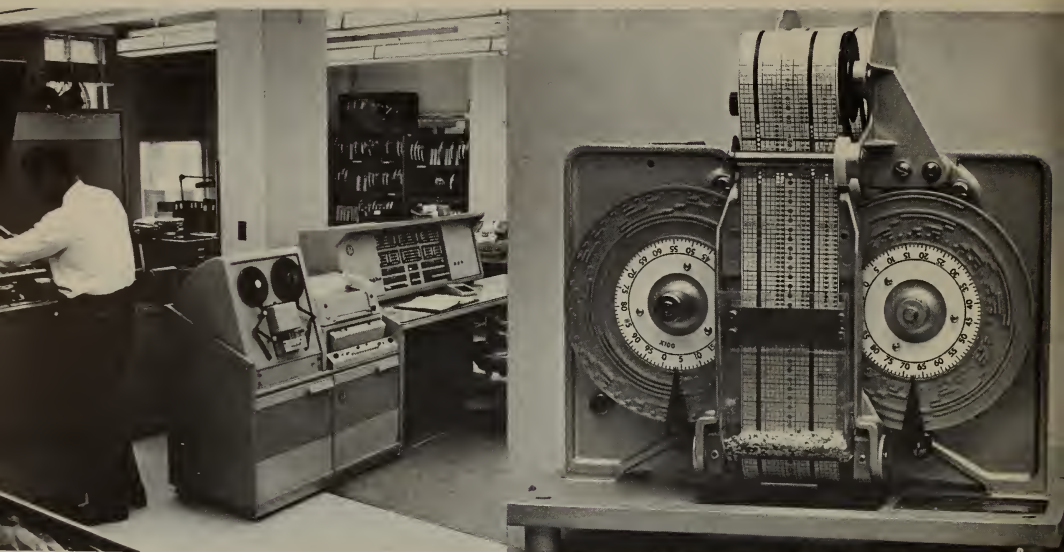
Since its inception, the Geological Survey has maintained a close relationship with the States. This Federal-State cooperation has grown steadily and now constitutes about 55 percent of the total water resources investigation conducted by the Survey.

As shown in the accompanying table, the Survey cooperates with State and other Government units in water resources investigations on a matching-funds basis.

Work is performed chiefly in cooperation with State engineers and State geological surveys, but cooperative projects also are undertaken with State conservation departments, highway departments, water and power boards, fish and game departments, and public health departments. Counties, cities, educational institutions, and water users' organizations also, from time to time, cooperate in the Survey water program. Such cooperation promotes local initiative and interest in regional water situations, so important to the solution of local water problems.

*State and municipal offerings for water resources investigations*

STATE	1963	STATE	1963
Alabama	\$143, 507	Montana	\$95, 037
Alaska	48, 044	Nebraska	126, 597
American Samoa	7, 500	Nevada	115, 960
Arizona	303, 008	New Hampshire	31, 595
Arkansas	102, 365	New Jersey	218, 672
California	830, 428	New Mexico	236, 016
Colorado	221, 681	New York	378, 798
Connecticut	105, 395	North Carolina	313, 288
Delaware	51, 767	North Dakota	110, 365
District of Columbia	3, 500	Ohio	191, 228
Florida	395, 913	Oklahoma	119, 790
Georgia	194, 401	Oregon	137, 966
Guam	12, 000	Pennsylvania	283, 452
Hawaii	215, 072	Puerto Rico	107, 826
Idaho	98, 194	Rhode Island	33, 987
Illinois	137, 771	South Carolina	46, 711
Indiana	200, 564	South Dakota	88, 872
Iowa	161, 055	Tennessee	109, 067
Kansas	253, 681	Texas	522, 535
Kentucky	160, 074	Utah	214, 554
Louisiana	310, 837	Vermont	41, 499
Maine	39, 577	Virgin Islands	31, 127
Maryland	83, 236	Virginia	56, 122
Massachusetts	115, 640	Washington	304, 465
Michigan	154, 097	West Virginia	48, 681
Minnesota	103, 557	Wisconsin	107, 293
Mississippi	93, 413	Wyoming	124, 527
Missouri	78, 183		
		Total	8, 820, 490



A hydraulic engineer uses the Survey's general-purpose computer to process streamflow records. The automation process starts with the newly developed digital recorder (above right) which produces a continuous record of river stage punched on paper tape later translated by machine into computer tape eliminating hand computations.

### Significant Achievements in Water Resources

Progress toward automation of streamflow records was an important achievement in fiscal 1963. Nearly 1,000 gaging stations have been automated, and more stations will be automated in the near future. Based on 10 years of research, the system uses digital recorders, translators, and an electronic computer to permit "gage to page" processing of streamflow records.

The first seven hydrologic "benchmark" stations were installed in 1963. They are in Texas, Ohio, New York, Missouri, North Carolina, Tennessee, and Colorado, in areas where water resources have not been, and hopefully will not be affected by the works of man. This network will permit assessment of changes occurring as a result of the vagaries of climate and other natural factors, and it also will provide a frame of reference against which hydrologic changes induced by man's activities may be evaluated.

About 50 Survey engineers and chemists from four States and Washington, D.C., participated in a complex data collection effort on the tidal estuary of the Delaware River. This information, to be processed by electronic computer, will be used in pollution studies.



A special project was set up to develop emergency water supplies for Guantanamo Naval Base in Cuba. Holding structures to induce recharge of the ground-water reservoir from rainfall were constructed and are working well. Aquifer tests were conducted to determine the extent of the water available and to help evaluate possible methods of improving supply.

A small-diameter bore-hole television camera for geologic and hydrologic exploration work was designed and constructed. This camera offers many advantages over those previously used. It allows scanning up to 147 degrees and is one through which the operator has complete control over the field of vision. Geologic and hydrologic condition of materials penetrated by wells may be observed in place at depths up to 1,000 feet.

### **Basic Data Collection Speeded**

Basic data are the raw materials with which all water management, whether by State or Federal agencies, has to work. In 1963 basic data collection comprised about 50 percent of the total program. The amount of work done in basic data collection increased about 25 percent from 1956 to 1963.

Streamflow and other surface-water facts were obtained at more than 7,500 continuously recording sites in the 50 States, Puerto Rico, Guam, and Samoa. In addition, partial records at more than 5,500 sites were collected to provide additional information on floods and droughts. Collection of streamflow data is rapidly being automated. To make the basic streamflow information more promptly available to the public, a system of issuing annual streamflow reports by States was started. In 1963, reports for the first year, 1961, were completed as well as several for 1962.

During 1963, a network of about 3,500 privately and publicly owned wells were monitored for changes in ground-water conditions. Measurements of depth to water and samples of water were collected continuously or periodically to assess changes in ground-water conditions produced either by natural causes or by man's development of the water. Several thousand additional wells were measured in conjunction with project investigations.

The water quality basic data network included 1,372 river-sampling stations throughout the United States and Puerto Rico. Chemical quality was measured at 942 of these sites, sediment concentration and loads at 306 sites, and water temperature at 1,127 locations.



Geological Survey engineers explain the operation of equipment used to measure the streamflow of the tide-affected Delaware River. Streamflow and other hydrologic data, measured continuously for a complete tide cycle, are used in a variety of engineering studies.

### **Interpretive Studies Progress**

As part of its continuing program for mapping flooded areas, the Survey published 11 new hydrologic investigations atlases that show areas inundated at Columbus, Warren, and Youngstown, Ohio; Mount Clemens, Mich.; Bayamon-Catano, P.R.; Des Moines, Iowa; Atlantic City, N.J.; Wichita, Kans.; Arlington Heights and Elmhurst, Ill.; and Tampa, Fla. Flood-inundation maps covering 12 metropolitan areas in 4 States were nearing completion and work was in progress on 17 additional flood-inundation maps.

Flood-frequency analyses, parts of a nationwide study, were continued in fiscal 1963. Work started on reports covering four other basins and reports were published during the year for areas covering Utah, New Mexico, Kentucky, Georgia, and southeastern Michigan.

Compacts for apportioning interstate waters usually include provision for measurement of streamflow by the Geological Survey. Seventeen such agreements are in effect and eight others are under negotiation. In addition, water-resources investigations progressed along the Canadian border as required by the Boundary Water Treaty of 1909.

Work in 46 States advanced on over 500 ground-water projects during the year. Geologic and hydrologic conditions were studied in project areas concerned with problems such as salt-water encroachment, changes in chemical character resulting from waste disposal, and the balance between development and availability of ground water.

### **Advances Counted in Water Research**

The early requirements for water were simple: Where is the water and how much is available? However, as a gigantic national industrial structure has developed, water problems have become much more complex. Questions about water supply and quality have arisen for which there are no immediate answers because the scientific principles are not sufficiently understood or have not yet been established.

Modern electronics has helped solve many problems that resist ordinary analytic techniques. Based on the similarities between the behavior of fluid flow and electric-current flow, an electric analog model was constructed to simulate rainfall, drainage basin characteristics, and flood runoff. Determination of flood frequency is a specific objective, but other basic hydrologic relationships also will be studied.

Gross annual evaporation from exposed water surfaces in the 17 Western States has been estimated to be greater than 23 million acre-feet. Reduction of this evaporation loss would mean an increase in the available water supply. A research project underway seeks to develop practical methods of measuring evaporation loss and reducing evaporation from open water surfaces. Plastic films spread on the water and the injection of air to eliminate thermal stratification were two of the methods tested in 1963 with encouraging, but not conclusive, results.

Collection of information on peak streamflow is difficult in arid regions where flashy runoff occurs in normally dry gullies. A radar system was designed to track the movement of clouds and locate areas receiving rainfall. This information then can be used to direct stream gagers to the scene of rainfall for collecting facts on stream discharge.





This small diameter TV camera is used for subsurface geologic and hydrologic exploration.

An investigation is underway in the Potomac River Valley of Maryland and Virginia to determine the dates of historical floods and to establish flood-frequency patterns by observing effects on trees and shrubs in the flood plain.

Time-of-travel measurements with Rhodamine B and sensitive fluorometers were made on many streams. This new activity supplied needed information for studies of stream pollution.

A recent development in the direct recording of streamflow is the acoustic velocity meter. Successfully tested in 1963 after several years of work, the system generates a large-amplitude sound wave and records the time it takes the wave to travel to the opposite bank and return. The cycle is repeated continuously, and the recorded data are used to compute the mean velocity of the stream for each cycle. Cost of the equipment probably will limit its use to special projects.



Water Resources Division chemists collect water samples from the Delaware River. Analytical equipment for determination of dissolved oxygen and specific conductance is in the background.—Courtesy City of Philadelphia.

It is imperative that new concepts and principles be developed to enhance the accuracy of predicting ground-water trends. Studies of the movement of water above the water table and the movement of water in clays are designed for this purpose.

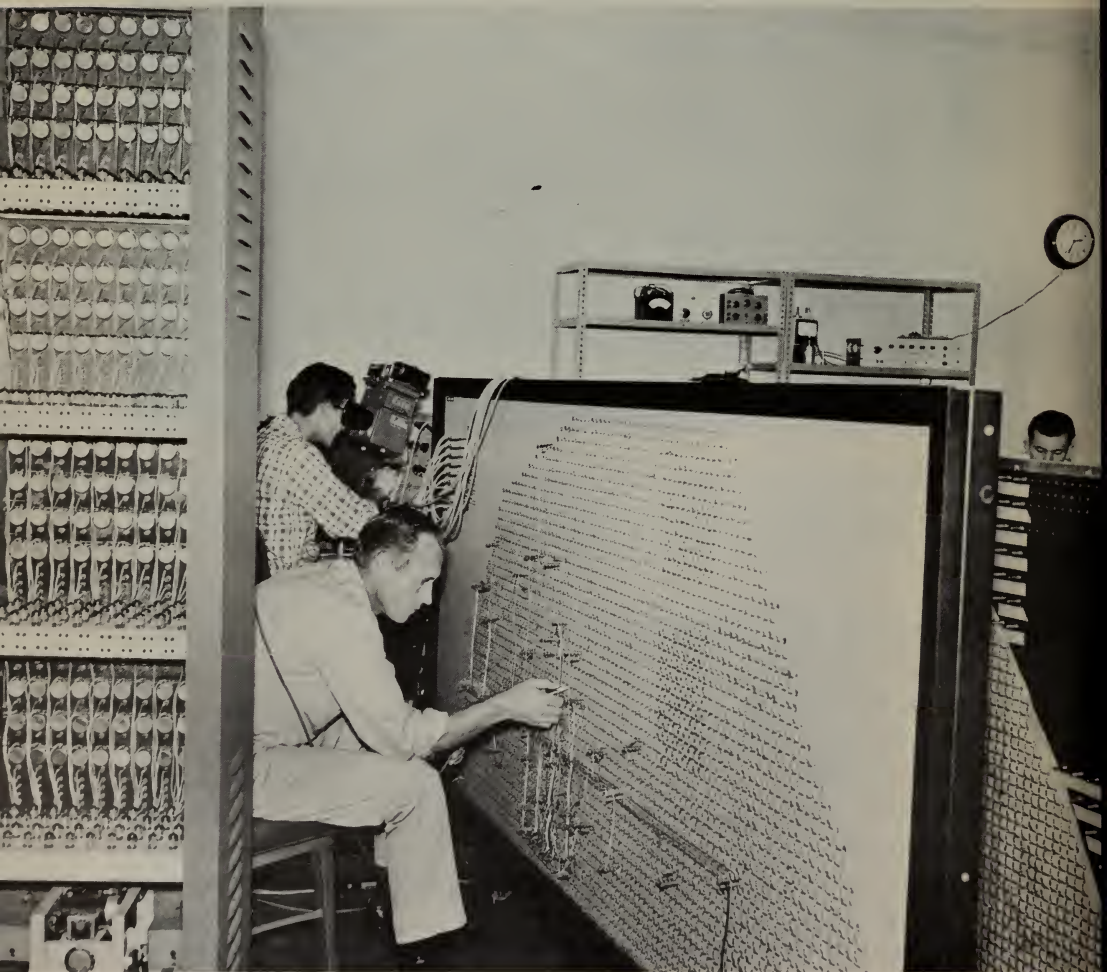
A computer facility has been constructed for analyzing ground-water problems. It converts the geological and engineering information into quantitative data. The computer techniques developed can handle detailed analysis of complex ground-water systems. In many cases it now is possible to predict the results of ground-water removal over large areas well into the future.

In association with a research project, a sensitive differential permeameter (an apparatus for measuring the capacity of ma-

terials to transmit water in different directions) has been designed and constructed. The design of the permeameter is analogous to a wheatstone bridge in which microvalves are used as three arms of the bridge, and the porous media sample the fourth. A highly sensitive pressure transducer meter is used as the null-measuring device.

The measurement of water used by riparian vegetation and direct evaporation has been a difficult problem throughout the history of the science of hydrology. A project is in progress to

This electric analog model and equipment is used for analyzing specific water problems. The tall rack of electronic equipment simulates the characteristics of evaporation and plant use.





refine techniques for measuring evaporation and nonbeneficial use of water by plants. Instruments for measuring evapotranspiration losses have been modified for airborne use and for data processing through a radar station equipped with an analog computer.

Investigations of effects of vegetation on ground-water supplies in semiarid regions of Arizona continued. The water requirements of saltcedar, willow, greasewood, and other brush were studied along with the long-range Gila River phreatophyte project.

For many years, water scientists have had an imperfect understanding of how iron and manganese occur in water and the natural controls associated with these metals. Although it was early known that iron and manganese were objectionable in water supplies, the practical problems of treatment and prediction were less understood.

In the past year, Survey research chemists made substantial progress in fathoming the chemistry of manganese in water.

Since the introduction of synthetic detergents for cleaning, much trouble has been experienced with their undesirable characteristics at both water-supply and waste treatment plants. By their nature, the synthetic detergents are not readily removed at treatment plants. Studies of ground-water pollution by the Survey show that foams from the more common types of detergents are unstable at concentrations of less than 2 parts per million. If other organic substances, such as soaps or proteins are in solution, however, these low concentrations of detergents may foam. Quantities of detergents in streams in urbanized areas are regularly reported in analyses of water samples taken by the Survey.

When water is withdrawn from a stream, used for cooling in an industrial process, and returned to the same stream, its most obvious change in quality is an increase in temperature. This temperature increase can be serious during summer low-flow conditions, for as temperature increases, dissolved oxygen decreases and the oxidation of wastes declines coincidentally with lower flows for dilution of wastes. Fortunately, Survey studies have shown that thermal loading is a local problem because the added heat is rapidly diffused and dissipated. Progress has been made in determining thermal die-away patterns and ecological effects in heated streams of industrial areas in Tennessee, Pennsylvania, and Maryland.

A study began in the Patuxent River estuary to assess the effects of urbanization in general and also the effects of hot water releases from an electric generating plant on the physical, chemical, and geological character of a tidal river. Special equipment for continuous monitoring and periodic analysis of dissolved oxygen was



A Geological Survey scientist checks wind velocity in a thermal die-away study.

designed in cooperation with Johns Hopkins Chesapeake Bay Institute. Initial trials of this equipment were promising.

The radiohydrology program, supported in large part by the Atomic Energy Commission, included about 30 continuing projects such as: hydrology of radioactive waste disposal to the environment at eight nuclear sites, with supporting laboratory and model studies; effects of nuclear explosions on water-bearing characteristics of earth materials; natural radioactivity in ground and surface waters of the United States; use of radioisotopes as tracers of water movement in specific hydrologic environments; principles governing the transport of radionuclides in the hydrologic environment.

### **International Cooperation Aids Hydrology**

During the year, through the auspices of the Agency for International Development, 25 Geological Survey hydrologists worked overseas with 14 host governments, sharing knowledge of recent advances in hydrologic research and methods and techniques of

water-resources investigations. In addition, training in the United States was given 25 specialists from 15 countries.

Hydrogeologic investigations and training in Chile, in progress for the past 7 years, were completed. An investigation and ground-water development program begun in 1959 under Survey guidance continued in the Western Desert of Egypt. In the Punjab region of Pakistan an investigation seeks to evaluate historic irrigation practices that have led to the present salinity problems, and to develop guidelines for reclamation practices, salinity control, and optimum use of available water.

### **New Water Resources Reports Issued**

In response to increased public interest in water and water problems, the Survey intensified its program of reports. "Water in Alabama," the first of several reports on the total water resources of individual States, was published in 1963. Similar reports were in preparation.

A new series of folders on water investigations in each State is being issued. The folders enable a reader to determine quickly what information on water in that State is already published, or is being collected. The folders include pertinent facts about water



A Geological Survey engineer in Egypt conducts field tests on Gormashin well water for carbon dioxide at Kharga Oasis—part of the Department's program to assist other nations in natural resource development.



resources and a list of publications available. In addition, a map of the State shows where additional information is being obtained through Survey investigations.

Of special interest was the publication of a comprehensive report, "The Role of Ground Water in the National Water Situation." This report follows a similar but less comprehensive summary written a decade ago and published in 1951 as Geological Survey Circular 114. The report summarizes the occurrence and development of water in 10 ground-water regions covering the 48 conterminous States. Detailed description of the situation in each of the 50 States and Puerto Rico and the Virgin Islands forms the major part of the report.

During fiscal 1963, the Survey prepared 76 water-supply papers, 9 circulars, 18 professional papers, 54 maps, and 3 bulletins concerning water. In addition, 80 reports on water were prepared for public reference, and 472 reports on water were prepared for publication as cooperative State reports or as articles or abstracts for scientific journals.

## GEOLOGIC DIVISION PROJECTS VARIED

Geologic Division projects in fiscal 1963 were characterized by an impressive range of subject matter, some of which a decade or so ago might have appeared to be in the realm of science fiction. Localities under study, either directly or by interpretive techniques, were on every continent of the world and also deep in the earth's crust and outward to the moon.

The broad goals of the Survey's Geologic Division are to determine the materials the land is made of (regional geology) and how they were formed (experimental geology), to appraise their mineral resource potential (economic geology), and to determine some of the factors that affect use of the land for construction and similar activities (engineering geology).

The areas studied ranged from the Arctic to the Antarctic; from the United States to Indonesia (and other foreign nations in both hemispheres); from the depths of the Atlantic Continental Shelf to Karakoram in the Himalaya; and from charting of the earth's crust to an interpretation of the lunar crust.

Most of these studies were financed by the Survey's direct appropriation from Congress; some were undertaken in behalf of, and supported by, other Federal agencies, including the Department of Defense, the Atomic Energy Commission, the National Aeronautics and Space Administration, the National Science



A Geological Survey geologist prepares to examine horizontal sandstone beds and diabase sills in an Antarctic mountain group discovered during 1962-63 about 300 miles from the South Pole. Gasoline-powered motor toboggan pulls sleds carrying equipment and supplies for the month-long field trips from the base camp.

Foundation, the Agency for International Development, and the Interior Department's Bureau of Mines, Office of Minerals Exploration, and Bureau of Reclamation. Other studies were made in cooperation with 16 States, the Commonwealth of Puerto Rico, the county of Los Angeles, and the municipality of Metropolitan Seattle.

### **Physical Inventory of the United States Continues**

A fundamental study of the kinds of rocks at the earth's surface and how they are related to each other at the surface and at depth (areal geology) is basic to scientific prospecting of the earth for

its mineral and fuel resources, to industrial and civil planning, and to efficient use of the land for countless other purposes. This knowledge gained about a particular area or region is best summarized by a geologic map, which uses line or color patterns and various symbols to show the kinds of rocks that are exposed at the surface (or are reasoned to lie beneath the soil), and the probable shapes and structures of the various rock masses at depth. Geologic mapping, therefore, is a "physical inventory" that must be taken to provide the basis for intelligent use of the land for any purpose.

The areas being mapped geologically by the Survey during 1963 comprised many different types of geologic terranes ranging over the entire United States and extending from Alaska to Antarctica. In most areas the mapping was supplemented by laboratory study and paleontological, geophysical, and geochemical investigations to provide a geologic map and an understanding of the geologic history—how each rock formation originated and what changes it has undergone to bring it to its present form and position.

In addition to this program of large-scale geologic mapping, studies and compilations of maps of large regions or of national scope continued in 1963 as a small but important function of the Geologic Division. Such maps depend on data from mapping and topical studies by Geological Survey personnel, on published data, and on unpublished data generously provided by State geological surveys, private companies, and universities. Collaborative maps now in preparation include a geologic map of North America, scale 1:5,000,000; a basement map of North America from latitude 20°–60° N., scale 1:5,000,000; a Bouguer gravity anomaly map of the United States, scale 1:2,500,000; and a tectonic map of North America.

The long-term program to produce paleotectonic maps—maps that summarize what is known of the rocks of a given period of geologic time over the whole United States—continued. The maps and report on the Permian System have been compiled and were being prepared for publication; compilation was well advanced on the Pennsylvanian System. The Mississippian System was started.

A new program in marine geology and hydrology, being coordinated with other Government agencies and private institutions, will yield significantly additional knowledge of offshore land areas and will provide a better understanding of sedimentary rocks and other features that were once formed in marine areas and subsequently raised above sea level. Emphasis is being placed on a 5-



year study of the east coast Continental Shelf, from New England to Florida, in cooperation with the Woods Hole Oceanographic Institution.

### **Minerals and Mineral Fuels Resources Studied**

Research in economic geology has immediate application in filling current and anticipated needs for mineral raw materials, by delineating areas favorable for the occurrence of additional deposits in known mining districts, by delineating areas beyond the limits of known districts that are broadly favorable for the occurrence of concealed deposits, by defining sources of previously little-used elements for which new uses have created or are likely to create important demands, and by developing new exploration methods and tools.

Highlights of the Geologic Division's 1963 accomplishments in economic geology include—

. . . Several new maps were published in the Mineral Resources series showing the locations of important mineral-bearing areas in the United States. The new maps, printed at a scale of 1: 3,168,000, are MR 35, beryllium; MR 36, niobium and tantalum; and MR 37, high alumina clay. This series of maps will be useful in the search for additional ore deposits and districts as well as serving as a basis for testing regional concepts of ore deposition.

. . . An elaborate study in eastern Nevada indicated the possibility of important new base-metal ore deposits in the Egan Range, near the Ely mining district. An account of the discovery was published and was followed by exploration by the mining industry.

. . . Mapping on Big Chief Creek, in the Yellow Pine quadrangle, Idaho, showed bulges in a major silicified zone that are considered favorable sites for prospecting for gold, antimony, and tungsten.

. . . In Ontonagon County, Mich., aeromagnetic surveys disclosed an abnormal magnetic field that may be caused by iron formation lying under a thin cover of sandstone.

. . . Reconnaissance studies in parts of northern peninsular Florida suggest that phosphatic sands and clays of Miocene and younger age are sufficiently widespread and abundant to be of interest as potential resources of phosphate and uranium.

. . . A report on the mineral and water resources of Montana, prepared in cooperation with the Montana Bureau of Mines and Geology and published as a committee print of the Senate Committee on Interior and Insular Affairs, describes the known and potential sources of minerals and mineral fuels, and discusses them in terms of the economic and geologic factors that may affect their further development and use. Similar reports are now being prepared for several other States.

. . . New beryllium deposits were discovered in the Lost River area, western Seward Peninsula, Alaska. Systematic stream sediment sampling indicated that other areas in the Seward Peninsula have an unusually high content of beryllium in the stream sediments and that more discoveries of ore deposits in nearby rocks may be anticipated.

. . . The tin locality at Irish Creek, Va., showing some geologic similarities to the Lost River tin-beryllium area, has been sampled to ascertain its potential for beryllium. Results show that there is enough beryllium to warrant more thorough exploration.

. . . Geologic mapping in St. Lawrence County, N.Y., led to the discovery and delineation of several tremolite-rich deposits somewhat similar to those now being mined for industrial talc.

. . . Survey geologists reported a hitherto undescribed alunite deposit at Aspen Mountain, Sweetwater County, Wyo. Analyses indicate that parts of the deposits have 60 to 90 percent alunite and may be potentially valuable for preparing commercial sulfates or alumina refractory materials.

. . . Field investigations in the Western Raton coalfield, 8 miles southeast of Vermejo Park, N. Mex., led to the discovery of a potentially commercial coal zone about 15 feet thick.

. . . Geological mapping in southwestern Virginia revealed that a major anticline beneath the Powell River Valley may extend about 15 miles northeast of the limit previously recognized. This knowledge affords an excellent opportunity to test the oil and gas potential of the pre-Devonian rocks in the area by shallow drilling. Oil was recently discovered in a test well drilled on the southwestern part of the anticline, which was mapped and recognized as favorable by the Survey in 1954.



Geological Survey conducts studies in several major urban areas on geologic aspects of various construction problems. Here a geologist inspects an earth embankment in a suburban development near Washington, D.C., for earth slide which may endanger homes if unchecked.

### **Geology Applied to Construction Activities**

The field of engineering geology presents ever-increasing opportunities for beneficial application of geologic knowledge and concepts to problems of urban development and land utilization. The Survey's geologic studies of urban areas in many parts of the country have proved useful in providing information on special problems of excavation, foundation stability, and drainage, and on local availability of construction materials. Some of the 1963 accomplishments in this field were:

. . . A new geologic study of the Rapid City area, South Dakota, showed that shales underlying much of the older parts of the city are highly expansive and are therefore a major factor in causing failures in engineering structures of many



kinds. A geologic map of part of the city and test data on some of the geologic units were released for public inspection.

. . . Studies of the glacial history of western Massachusetts revealed isolated bodies of gravel and sand, only about a third of which have been or are being exploited for construction materials.

. . . A study of 195 landslides in a suburban area east of San Francisco Bay yielded information on factors that contribute to landsliding and suggested means by which the effects of some of these factors might be reduced.

. . . In Colorado, preliminary results were announced of a geologic study to develop new techniques by which highway builders would predict in considerable detail the problems that might arise in driving tunnels.

### **Experimental Geology Provides New Facts**

While geologic maps reveal what kinds of rocks occur in a particular place at the earth's surface, a full understanding of how the rocks of the crust were formed or deformed and how they got where they are requires knowledge of natural processes many of which take place deep within the crust. Detailed geochemical and geophysical experiments—both in the laboratory and in the field—help provide the basis for understanding how these processes operate and how their results may be used advantageously.

Experimental investigations in geochemistry and mineralogy in 1963 continued to provide new data on the processes of formation of a variety of rocks and mineral deposits and to improve analytical methods useful in the laboratory and the field.

. . . The team of earth scientists at the Survey's Hawaiian Volcano Observatory, situated on the rim of Kilauea Crater Hawaii, continued detailed observation and interpretation of volcanic processes by using a variety of geochemical and geophysical techniques. In one phase, a ceramic probe was inserted 4 feet into liquid lava in the crater, through a hole drilled 45 feet through the hardened lava crust, to permit measurement of the rate of cooling of the lava by recording its temperature at short periodic intervals. The highest temperature recorded at that depth is 1095° C (2003° F).

. . . A spectacular development in the study of ore-forming processes was provided by a deep well drilled by a private company for geothermal power near Salton Sea, in the Imperial Valley of California. A Survey geologist reported



Measuring the temperature of liquid lava in the cooling lava lake of Kilauea Crater, Hawaii, is part of Geological Survey's continuing studies at Hawaiian Volcano Observatory. Steam jetting from a hole drilled into the crater is from water being hosed into the hole to cool the hot lower portion.

that the well encountered a hot, very saline brine, extraordinarily high in heavy metals and rare elements, which appears to be an unusual sample of an active ore solution.

. . . Isotope and nuclear investigations find many applications in geology by providing quantitative measurements that frequently indicate new methods of attacking old problems.

As one example of the scores of such studies carried on during fiscal 1963, carbon 14 analyses were used to determine the age of rocks from an eruption of Mount Rainer, Wash., as about 550-600 years.

. . . A portable instrument to detect beryllium, designed and constructed in the Geological Survey's Denver laboratories, was being adapted for use in drill holes.

. . . In the field of rock analysis, a new X-ray fluorescence method, when used with a nine-channel X-ray quantometer, permits simultaneous analysis for nine major rock constituents. The results are comparable in accuracy with those obtained by rapid chemical procedures, but may be obtained much more rapidly with substantially smaller samples. As many as 30 rock samples a day can be analyzed by the new method.

Research in geophysics during 1963 also covered a wide range. Among the more significant findings were:

. . . Completion of detailed paleomagnetic studies of rocks from the island of Hawaii showed that the direction of the magnetic field in the central Pacific area has changed very little since 1750, in contrast to other areas.

. . . Aerial infrared reconnaissance of parts of the island of Hawaii revealed several previously unknown fresh water springs, both cold and hot, flowing into the ocean in areas close to the shoreline. Because of the water-supply problems on the island of Hawaii, these springs may be of significant economic value.

. . . In the Geological Survey's crustal studies program, major objectives of which are to evaluate seismic methods of detecting nuclear tests and to determine the thickness, composition, structure, and physical properties of the earth's crust and upper mantle, the network of recordings of seismic waves from underground nuclear and chemical explosions was expanded to cover most of the western United States. From a total of about 2,000 recordings it has been possible to deduce variations in the thickness of the crust and in the seismic velocities of the upper mantle rocks in this broad region.

### **Geology Applied to Human Welfare**

Directly related to human welfare were several investigations of geology applied to problems in the field of public health. En-



vironmental studies have received increased attention in recent years. The rocks on which we live, the soils in which our foods grow, and the water we drink are highly significant factors in the human environment. Accordingly, the Geological Survey is participating in many investigations of how these factors affect health.

. . . One such investigation is a comparison of the water, soils, and rocks of Washington County, Md., and San Juan County, N. Mex. This work is designed to aid medical investigators in their study of the relation of incidence of cancer and heart disease in the respective areas to natural environmental differences.

. . . A study of the intensity of natural radiation and distribution of radioactive minerals in the rocks, soils, and waters of the United States is of special interest to environmental health investigators because of the known relation of artificial radiation to the incidence of cancer.

. . . A map was published showing the maximum fluoride content of ground waters for about 90 percent of the conterminous United States.

Underground testing of nuclear devices and the generation of power by nuclear reactors release radioactive products. To safeguard the public, the distribution, movement, and concentration of these products must be determined and the potential danger evaluated. Since 1956 the Geological Survey has provided geologic and hydrologic information and evaluations of such facts on behalf of the Atomic Energy Commission for its testing facility at the Nevada Test Site and at sites for Plowshare and other experiments elsewhere in the United States.

### **Military Geology Aids Defense**

The Geologic Division's Branch of Military Geology conducts geologic studies of selected areas throughout the world in response to specific requests from the Department of Defense for information applicable to military engineering, such as rock types, soils, vegetation, water resources, construction materials, and suitability of the ground for constructing roads, underground installations, and airfields. Other portions of the continuing program provide geological consulting services to the Army in Europe and the Pacific area. Among the unclassified studies underway in 1963 were investigations of surficial geology of numerous areas in Alaska and Greenland.

## **Geology Helps Other Countries**

Scientific and technical assistance in geology to foreign governments has been carried out for the past two decades by the Geological Survey, with the primary aim of providing advisory services and helping train earth science specialists gain better understanding of their natural resources. This assistance, under the auspices of the Department of State (Agency for International Development), included in fiscal 1963 the training, advisory, and service functions of 47 Geologic Division scientists working in cooperation with their host country counterparts in 10 nations, and the training in this country of 47 earth scientists and technicians from 21 countries. Some of the accomplishments of these programs in fiscal 1963 were:

. . . A new report by the Geological Survey (published in Spanish) on the geology of La Paz Valley, Bolivia, supplies the construction engineer with new basic data about ground conditions which will greatly aid future city planning and development.

. . . Discoveries were made of a large field of shallow, easily minable coal 100 miles northeast of Karachi, Pakistan, and of deposits of high-grade phosphate rock in southeastern Turkey.

## **Geology of the Moon and Other Extraterrestrial Bodies Studied**

The major immediate objective of the Survey's studies in astrogeology, on behalf of the National Aeronautics and Space Administration, is to determine and map the composition and structure of the rocks that make up the moon's crust, in preparation for manned and unmanned landings. Three main approaches are being followed: geologic mapping of the moon by means of information obtained from visual, photographic, and photometric studies with telescopes; investigations of natural and artificial impact craters on the earth's surface, and study of extraterrestrial materials, such as meteorites and tektites, that may originate from or occur on the moon.

Geologic maps of the Kepler and Letronne areas of the moon at a scale of 1:1,000,000 were published in fiscal 1963, each covering about 100,000 square miles.



Stereoscopic examination of two slightly different photographs permits Survey astrogeologists to interpret the geology of a part of the lunar surface. Such studies of photographs and telescopic observations help unravel the complex geologic history of the lunar surface.

New data are being obtained on the landforms on the moon's surface, the depth of layers of material that cover much of the surface, the origin of the moon's craters, the physical and chemical properties of tektites (glassy materials thought to have originated from impacts on the moon's surface), and the design of instruments to be used in lunar exploration.

### **Many Geologic Publications Issued**

Results of the Geologic Division's investigations were published during fiscal 1963 in 122 professional papers and bulletins, 1 water supply paper, 2 circulars, 206 geologic maps, and some 286 technical papers in scientific journals. An additional 77 reports were made available in files open for public reference.



“Geophysical Abstracts,” previously published from time to time as a Geological Survey Bulletin, became a monthly periodical in January 1963. Important findings and a synopsis of current research were published in Professional Paper 450-A, “Geological Survey Research 1962,” and 139 short papers summarizing results of individual Geologic Division studies in progress were published in chapters C, D, and E of that report. To present new findings as rapidly as possible, the first chapter of short papers for “Geological Survey Research 1963” was published separately as Professional Paper 475-B. It includes 46 additional short papers on current research in the Division’s studies.

## TOPOGRAPHIC DIVISION PREPARES MANY MAPS

The primary objective of the Topographic Division is the preparation and maintenance of the national map series covering the United States and its outlying areas. This series has become an essential tool for the most effective development of projects vital to national progress and economy, and an important factor in the public’s growing appreciation of its outdoor heritage.

Other functions of the Division include preparation of related maps and publications of national interest; periodic revision of all published materials; and constant research and development to improve map products, operating methods, and plotting equipment. Information regarding map products and mapping activities of Federal agencies is available to the Government and the public through the Map Information Office maintained by the Topographic Division in Washington, D.C.

### **International Cooperation Stressed**

Many nations of the world have benefited from technical assistance provided by the Geological Survey in cooperation with the Agency for International Development (AID) and other technical assistance programs.

During fiscal 1963, the Topographic Division provided technical inservice training in topographic mapping procedures to accredited representatives of Argentina, Brazil, Cyprus, Egypt, Guatemala, Indonesia, Liberia, Nigeria, Philippines, Spain, Sudan, and West Germany.



Members of the Brazilian Geophysical, Photogrammetric, and Cartographic Study Team receive instruction in electronic distance-measuring equipment as part of their 6-week tour of United States surveying and mapping facilities.

In addition to training provided within the Division technical experts in photogrammetry, cartography, geodetic control, and electronic distance-measuring equipment were supplied to AID for extended assignments. They are assisting the mineral exploration program of Pakistan, a water supply development program in Egypt, and gaging operations on the Amazon River in Brazil.

A topographic map of the United Kingdom of Libya, scale 1:2,000,000, with bilingual legends in English and Arabic, was published and a geologic edition was underway. Reception of this map by the Libyan people and interested oil companies was excellent. On October 16, 1962, President Kennedy presented a copy to Crown Prince Hasan Al-Rida Al-Sanusi.

### Surveying and Map Preparation Active

The total land area of the United States and its outlying areas comprises 3,558,387 square miles. At the close of fiscal 1963, 66 percent of this area was covered by topographic surveys at scales of 1:24,000 and 1:62,500 (1:63,360 in Alaska). These surveys have been published as standard quadrangles for 57 percent of the total area. Advance copies, prior to map publication, are available upon request for the remaining 9 percent.

During the year, 543 maps of previously unmapped areas equivalent to 1.6 percent of the total area were published. Another 0.7 percent, formerly covered by 15-minute maps (1:62,500-scale) at obsolete standards, was replaced by 439 new maps at 1:24,000-scale standards.

Each year adds to the growing backlog of 10-year-old 7½-minute maps which probably require revision, and mapping added to this list during fiscal 1963 totaled 56,237 square miles. In 1963, the backlog was reduced by 10,400 square miles, leaving approximately 318,400 square miles of 7½-minute mapping requiring revision at year's end.



The latest electronic distance measuring equipment is used to obtain mapping control in rugged mountain terrain.



The Topographic Division completed the first full year of its long-range mapping plan. The aim is to complete coverage of the United States with standard topographic quadrangles in either the 7½- or 15-minute series by fiscal 1976, and 7½-minute coverage for all of the conterminous United States and the islands by 1981. During this period, a program of revision and maintenance of published maps will be conducted and small-scale maps or other special maps will be produced as they are needed in the national interest.

As part of the national topographic mapping program, a survey of American Samoa was essentially completed during the fiscal year for publication at 1:24,000 scale. Topographic mapping of the Alaska Peninsula at 1:63,360 scale (1 inch to the mile) started and will cover some 11,700 square miles extending from Unimak Island to Ugashik, including the offshore islands.

Urban area maps were published for the metropolitan areas of Boston, Mass., and Wichita, Kans.

Except for a few remaining quadrangles, now in reproduction, the 3-year cooperative mapping program to provide complete 7½-minute coverage for Ohio was completed. A cooperative program was increased with the State of Virginia for complete coverage with modern large-scale quadrangle maps and is scheduled for completion in 1969. Reflecting the increasing interest in uniform map coverage, New York State appropriated funds to expand their cooperative mapping program with first priority to provide 7½-minute coverage for the entire State.

The Geological Survey reached an agreement with the Army Map Service to complete the revision of 22 maps in the 1:250,000-scale series, and to finish work on 19 additional maps which the Army had in progress. In addition, the Survey's regular program of maintenance of this map series during the year included the limited revision of 106 maps.

Reflecting the growing interest of the public in wildlife and recreational areas, the Topographic Division has authorized new maps covering national parks, monuments, and wildlife areas in six States. These include the Badlands National Monument, S. Dak.; Assateague, Md.; Bad River Indian Recreation Area, Wis.; and the Okefenokee Swamp National Wildlife Refuge. This mapping was specifically requested by the National Park Service, the Bureau of Outdoor Recreation, and the Bureau of Sports Fisheries and Wildlife.

Following is a detailed summary of map publication during fiscal 1963:

*Number of maps published during fiscal year 1963 and areas surveyed to produce these maps*<sup>1</sup>

	Area (sq. miles)	Number of maps	
		7½-minute	15-minute
<b>LARGE-SCALE MAPS</b>			
Standard quadrangle maps:			
New:			
Mapped at 1:24,000 scale standards .....	36,997	379	69
Mapped at 1:62,500 scale <sup>2</sup> .....	19,042		95
Replacement of 1:62,500 maps by mapping at 1:24,000 standards .....	25,166	428	11
Revised .....	16,244	184	30
Reprinted without revision .....		413	467
Special editions:			
Series conversion .....	1,643		8
Scale conversion .....	10,020	73	30
Total large-scale maps .....	109,112	1,477	710
			Number of maps
<b>SMALL-SCALE AND SPECIAL MAPS</b>			
New maps:			
Metropolitan area .....			2
Shaded relief .....			1
Antarctica .....			6
Map revision:			
Metropolitan area .....			1
1:250,000 scale .....			85
State base .....			5
Shaded relief .....			7
1:1,000,000 scale .....			9
Topographic indexes .....			71
Reprinted .....			82
Total small-scale and special maps .....			269
Total maps .....			2,456

<sup>1</sup> The area of Antarctica maps is not included.

<sup>2</sup> Includes 1:63,360 mapping, Alaska only.

## Antarctic Mapping Continues

The Geological Survey again participated in mapping operations in Antarctica conducted as part of the U.S. Antarctic Research Program of the National Science Foundation. During the austral summer of 1962-63, the Division assigned seven topographic engineers to the ice continent to establish geodetic control for mapping.

A four-man party, using the most modern electronic distance-measuring equipment and transported by helicopters, obtained map control for 90,000 square miles of hitherto inaccessible terrain in northern Victoria Land and the mountainous area between the Beardmore Glacier and the Horlick Mountains.



Control surveys for topographic mapping in rugged western mountains employ helicopters and two-way shortwave radio.

Other members of the Survey team, in conjunction with their control activities, assisted as navigators for geologic exploration parties in the Ellsworth and Pensacola Mountains.

Stellar observations for geodetic positions were made by Survey engineers at the U.S. South Pole Station and at McMurdo Base as well as at critical points along the traverse routes.

The U.S. Navy Air Development Squadron Six (VX-6) obtained about 44,000 square miles of aerial photography for use in the Survey's mapping program. To assist in flight planning and to advise on the quality of photography required for mapping, a Survey photographic technician again was assigned to the squadron's photographic laboratory in Christchurch, New Zealand.

The Topographic Division maintains the U.S. Antarctic Map and Aerial Photographic Library to provide reference and consultant services to technical and scientific visitors.





A Geological Survey team obtained map control for 90,000 square miles of hitherto inaccessible terrain in northern Victoria Land, Antarctica. Their campsite is shown above.

During fiscal 1963, topographic maps in shaded relief editions at 1:250,000 scale were published of Antarctic areas in the Thiel Mountains, the Executive Range, and for parts of the Horlick Mountains. Maps at the same scale are in progress for the Queen Alexandra Range, the Britannica Range, the McMurdo Sound area, and other areas in the Horlick Mountains.

A contract was completed during the year for a unique two-layer plastic relief model of the Antarctic Continent at a scale of 1:10,000,000, or 1 inch equals 160 miles, with the vertical scale exaggerated 25 times. The base section shows the submarine floor, the sub-ice topography, and the ice-free mountain areas of the continent. The semitransparent upper and removable section shows the sea-level surface and the vast continental ice mass. A limited number of these experimental models has been made for scientific study.

Through modern topographic maps, aerial photography, and this three-dimensional model, the Antarctic frontier emerges from mystery and obscurity for study and evaluation.

### **Research Facilities Concentrated**

Major research efforts in the Topographic Division in fiscal 1963 were devoted to improving the accuracy and economy of control surveys and to developing better techniques for mapping

in dense evergreen woods, for revising quadrangle maps, and for preparing a series of planimetric maps.

The Division moved most of its research facilities to McLean, Va., near Washington, D.C., early in the year. The concentration of research activity is expected to improve coordination of development effort, especially on complex projects requiring the cooperation of many different specialists.

### **Second-Order Control Surveys**

Six test projects were undertaken in cooperation with the Coast and Geodetic Survey to determine whether the control surveys executed by the Geological Survey for topographic mapping could be strengthened to meet second-order standards economically through the use of modern equipment and to ascertain how much extra cost would be involved.

As a result of these tests, the two agencies agreed on a policy regarding future control surveys for mapping by the Geological Survey. This agreement provides: that, as much as is feasible, horizontal control will be completed by the Coast and Geodetic Survey prior to the beginning of mapping operations by the Geological Survey, and that any horizontal control which cannot be completed in time by the Coast and Geodetic Survey will be performed by the Geological Survey to second-order standards, with final adjustments into the national network being made in all cases by the Coast and Geodetic Survey; and that the basic vertical control required for mapping will continue to be executed by the Geological Survey to third-order standards.

### **Airborne Control-Survey System Tested**

The Topographic Division is experimenting with an airborne control-survey system for extending geodetic control by a combined system of ground-to-air measurements. In this system, known as the ABC system (to signify "airborne control"), a helicopter serves both as an aerial platform above ground points on which geodetic position is desired and as a transportation medium for ground-support crews. When hovering over a desired ground position, the craft serves as a target for angle measurements from one or more ground stations and as the "remote" station for the electronic distance-measuring equipment.

The ABC system was used experimentally on a mapping project in Arizona during January and February 1963. Tests were conducted for comparison of the ABC system and the conventional ground-survey methods, with respect to time, costs, and accuracy.



Survey engineers in a helicopter supported geodetic traverse in Antarctica using electronic equipment to measure the distance to a companion unit on a distant mountain peak.

Comparison of the results obtained by the two methods indicates a difference of about 0.6 foot in the vertical data. The horizontal control data still was under analysis.

### **Map Revision Techniques Explored**

Map revision, wherein existing topographic maps are updated, is becoming an increasingly important part of the topographic mapping program. Studies have been started to explore map obsolescence factors, evaluate revision needs and requirements, and investigate the most efficient techniques and instrumentation for accomplishing the revision task. The cartographic presentation of revision data by printing in a distinctive color is also being investigated.

### **Visual Fatigue Studies Made**

Based on the favorable findings of a pilot research project, an expanded study of visual fatigue of 60 stereoplotter employees in various age groups is being conducted in the Topographic Division's Rocky Mountain Area office. The participants have re-



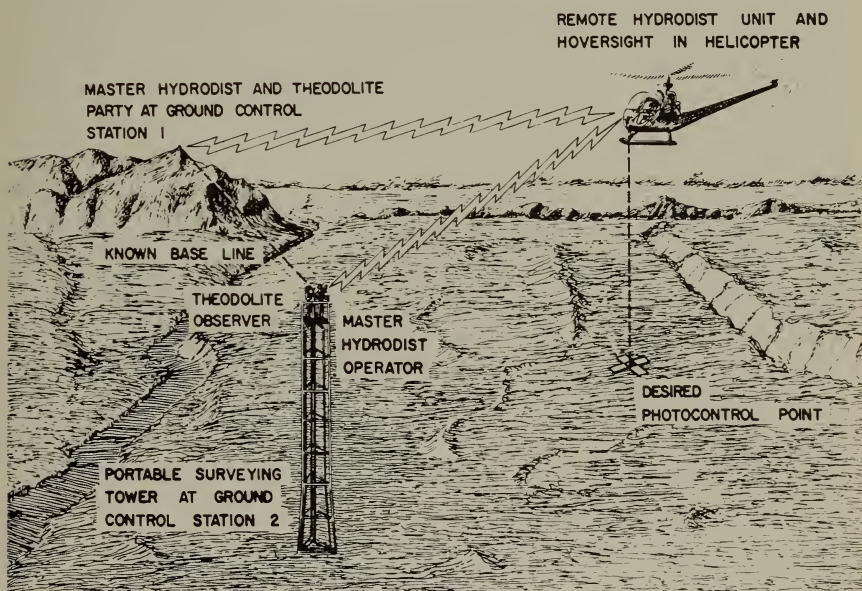
ceived refractive corrections for normal visual defects and have been assigned to stereoplotter operations under controlled optimum conditions of ambient light.

The resulting physiological and psychological effects are being studied. In addition to possible improvements in stereoplotting efficiency in all age groups, these tests may reveal whether extended assignment of experienced personnel in the older age group can be expected.

### Analytical Aerotriangulation Uses Computer

Development neared completion on a fully analytical system of aerotriangulation and the associated computational program. The computer program has the capability of solving blocks of up to 22 photographs in any configuration. It embodies provisions for correcting for the systematic lens-distortion and film-distortion errors and for a least-squares adjustment of random errors in the measured photo coordinates.

Tests are planned to verify the soundness of the mathematical principles involved and the fidelity of the computer program and to determine the accuracy characteristics and optimum control configurations. Substantial savings in field survey costs are possible when the system becomes operational.



This sketch illustrates the basic operations of the control surveys of the Geological Survey Airborne Control system.

### **Super-Wide-Angle Photogrammetric System Examined**

In investigating the possibilities for economy offered by the super-wide-angle photogrammetric system in mapping, the Topographic Division successfully completed flight testing of its RC-9 aerial camera. This camera has an angular coverage of 120 degrees, compared to 90 degrees for present mapping cameras, with a corresponding reduction in control requirements. It was used over Los Angeles, Calif., where the wealth of planimetric detail and abundant ground control will permit evaluation of the resolution and flatness of stereomodels projected from super-wide-angle photography. Flight designs have been formulated for super-wide-angle photography at a variety of flight heights; these will be used to evaluate the super-wide-angle photogrammetric system in map compilation. The operational tests are planned for 1964.

### **Dense Evergreen Wooded Terrain Poses Problem**

The magnitude of the problems involved in achieving accurate maps in densely wooded areas was confirmed by recently completed initial studies. Research is aimed at determining the consistency of compilation under various combinations of photogrammetric parameters and establishing, if possible, the most effective techniques for compiling in dense evergreens. Plans for a more extensive research program are being formulated. New techniques for obtaining a dense pattern of detailed ground information to assist the photogrammetrist in compiling from both panchromatic and infrared photographic coverage will be tried.

### **Experimental Map Published**

An experimental map publication, a four-color orthophotomosaic print of the Roanoke SW, Virginia, 7½-minute quadrangle, was completed in 1963. The consensus of those who reviewed this orthophotomap was that it represented a significant improvement in presenting orthophotography in map form. Press plates prepared from negatives processed by photo-image enhancement techniques permitted reproduction without halftone screening. The general appearance of the experimental publication was quite pleasing. The product complies with the National Map Accuracy Standards for horizontal position.

Detailed drawings and specifications for a new orthophotoscope have been completed. Investigations are continuing in the feasibility of digitizing the X, Y, and Z data derived during the scanning process. These data may be used subsequently both to control



This new-model printer makes glass plate photographic transparencies with improved contrast for use in stereoscopic plotting instruments.



the exposure of orthophotography and to determine elevations for contouring or profiling.

### **Quality Control Stressed**

In cooperation with other Government agencies, the Geological Survey has developed and applied new and more rigid specifications for diapositive plates supplied by commercial firms. Based on these specifications, a program of quality control was started to detect small differences in emulsion characteristics. With plates of uniform quality assured, the diapositive technician can select the material and procedure that will extract the greatest amount of information from the aerial mapping film. This objective is becoming more important with the increased emphasis on orthophotography, edge enhancement, and other procedures where the image structure itself plays a vital role in the final map display.

### **Map Information Office Serves Public**

Facilities for supplying information on maps, aerial photography, and geodetic control surveys to government agencies and the public are maintained at the Map Information Office in Washington and at the Division's four Area Offices in Arlington, Va.; Rolla, Mo.; Denver, Colo., and Menlo Park, Calif.

The 13th edition of the index map, "Status of Aerial Photography," was published during the year, and material was assembled for the 9th edition of the index map, "Status of Aerial Mosaics." These indexes show all areas known to have been photographed and those for which aerial mosaics or photomaps are known to have been compiled by Federal, State, or commercial agencies. The aerial photography index shows complete coverage for the 50 States, Puerto Rico, the Virgin Islands, and American Samoa.

A supplement to the aerial photography index for the calendar year 1962 was published for administrative use. This index map shows areas for which photography was contracted for or delivered during the year.

Forty-seven sheets in the 1 : 250,000-scale series of geodetic control diagrams were published in cooperation with the Coast and Geodetic Survey. These diagrams, of which 88 have been published, show the location of horizontal and vertical control surveys accomplished by the two agencies and provide information essential to planning topographic mapping projects, to engineers establishing electronic facilities, to land surveyors making connections to the Federal net, and to those engaged in scientific investigations.

The Office was distributing center for the Survey's training films on topographic mapping, photointerpretation, geology, water resources, and safety programs. More than 17,000 bookings were scheduled during the year for use by other Federal agencies, educational institutions, and specialized groups.

Public interest continued in maps of Civil War battlefield areas. Circular 462, a bibliography of government maps and charts covering areas in which the major battles of the Civil War took place, was revised and reprinted.

The floating drilling barge "Ocean Driller," commissioned in New Orleans in April 1963, can drill in water depths up to 600 feet and is capable of drilling to depths of 20,000 feet.



## CONSERVATION DIVISION

The Conservation Division has broad responsibilities in the application of conservation practices for the protection and development of the mineral and water resources of Federal and Indian lands. The Division also supervises the administration of the Connally Act of February 22, 1935.

### Oil and Gas Operations Active

Supervision of oil and gas activities includes operations for the discovery, development, and production of crude oil, natural gas and products extracted from natural gas, on Federal, Indian, and certain military and naval petroleum reserve lands.

Unitization activities of oil and gas operations involving public and acquired land were reflected in the approval of 83 new unit plans during the year and the termination of 60 that had been previously approved, leaving 478 approved plans covering 7,816,019 acres outstanding. About 64 percent of the petroleum, 29 percent of the natural gas, and 55 percent of the gasoline and liquefied petroleum gases obtained from public and acquired lands during the year were produced under approved unit agreements.

*Table showing supervised oil and gas activities, fiscal 1963*  
*PRODUCTION, VALUE AND ROYALTY*

Lands	Oil (barrels)	Gas, (1,000 cubic feet)	Gas, liquids (gallons)	Value	Royalty
Public.....	173, 040, 000	503, 798, 000	440, 187, 000	\$544, 164, 000	\$67, 788, 000
Acquired.....	6, 093, 000	308, 831, 000	1, 432, 000	22, 261, 000	2, 807, 000
Indian.....	41, 949, 000	88, 092, 000	118, 202, 000	125, 655, 000	17, 225, 000
OCS.....	93, 929, 000	532, 563, 000	-----	388, 182, 000	68, 959, 000
Military and miscellaneous	2, 814, 000	82, 981, 000	68, 067, 000	23, 213, 000	4, 872, 000
Naval Petroleum Reserve No. 2.....	3, 851, 000	6, 450, 000	12, 702, 000	14, 500, 000	1, 964, 000
<b>Total .....</b>	<b>321, 676, 000</b>	<b>1, 522, 715, 000</b>	<b>640, 590, 000</b>	<b>1, 117, 975, 000</b>	<b>163, 615, 000</b>

### LEASES AND WELLS UNDER SUPERVISION

Lands	Number of leases	Acres	States affected	Wells spudded	Wells completed	Completions productive	Wells as of June 30, 1963	
							Productive	Total
Public.....	115, 266	76, 274, 296	29	1, 721	1, 827	1, 130	21, 386	37, 337
Acquired.....	6, 836	5, 004, 595	35	94	88	38	450	1, 210
Indian.....	10, 675	3, 964, 679	15	464	448	285	6, 993	12, 092
OCS.....	838	3, 649, 567	2	535	712	515	3, 319	4, 630
Military and miscellaneous...	22	19, 818	5	18	28	25	324	367
Naval Petroleum Reserve No. 2....	17	9, 226	1	9	8	7	536	791
<b>Total .....</b>	<b>133, 654</b>	<b>88, 927, 181</b>	<b>-----</b>	<b>2, 841</b>	<b>3, 111</b>	<b>2, 000</b>	<b>33, 008</b>	<b>56, 427</b>



On the Outer Continental Shelf no unit plans were approved and none was terminated during the year. The total now stands at 15, embracing 348,253 acres.

On Indian lands, 11 new units were approved and 3 were terminated; the total number of plans in effect at year's end was 92, involving 204,972 acres.

The Department approved 197 drilling units, or communitization agreements, during the year and 2 were terminated, leaving 1,533 outstanding. Two development contracts were approved and five were terminated. A total of 18 such contracts were outstanding, involving 7,392,571 acres.

## MINING

Supervisory control is exercised by the Survey over mining activities concerned with prospecting, development, and production of minerals under permits and leases on public, Indian and acquired lands.

At year's end there were under supervision 2,158 properties involved in leases, permits, and licenses in 28 States, of which 1,220 were on public land, 238 on acquired land, and 700 on Indian land. Production from such lands during the fiscal year is estimated at 26,450,715 tons, valued at \$162,358,000. Royalties were \$7,879,600.

In order of magnitude of production, potash ranked first with 13,531,800 tons, valued at \$86,595,200, followed by coal, 5,536,400 tons, valued at \$27,122,300; sand and gravel, 3,006,300 tons, valued at \$2,926,200; and phosphate, 1,882,800 tons, valued at \$5,120,000. Other production in substantial quantity included uranium ore, 781,400 tons, valued at \$13,353,100, and sodium compounds 1,028,700 tons, valued at \$24,925,200.

### **Many Mineral Classifications Made**

During fiscal 1963, a total of 45,700 cases were processed by the Survey, including 6,355 cases involving the outright disposal of Federal lands either with no reservation of minerals or with the reservation of one or more specified minerals. There were 36,822 cases involving the exercise under Federal leasing laws of the Government's right to lease a mineral substance to private enterprise.

Initial or revised definitions were made of 100 producing oil and gas fields on, or affecting, Federal leaseholds; 476 reports were made on the mineral potentialities of federally owned lands for various agencies of the Federal Government; and 485 reports were



Supervisory function of the Geological Survey include enforcement of mine safety regulations. Here two Survey engineers inspect potash mines on leased Federal lands in New Mexico.

made to industry or individuals in connection with activities on Federal lands involving unit plans, participating areas, productive limits of oil and gas fields, and associated matters. Geologists from field offices of the Branch made investigations and prepared reports and maps as needed to assist engineers in planning the development of petroleum and mineral deposits and in the administration of Federal leases.

Approximately 1,700 square miles were mapped geologically to aid in the classification of the public lands. Geologic investigations were completed and classification data submitted covering a total of 8,389,737 acres. Final action was taken on approximately 1 million acres of this land and the resultant classifications, as to value for leasable minerals, were published in the Federal Register.

Fifty-three maps were completed; eight were in the process of being published and five have already been published or released

in open file. These are: Geologic map of Cooper Cove and Dutton Creek oil fields and vicinity, Albany and Carbon Counties, Wyo.; Geology of the Hot Sulphur Springs 4 NE quadrangle, Colorado; Garnes Mountain SE quadrangle, Utah; Geology of the Paradise quadrangle, Utah; and Geologic Notes on the Delaware Basin.

New maps, or revisions of old maps, showing areas considered to be valuable prospectively for oil and gas, coal, oil shale, phosphate, sodium, potash, and bitumens were made for several States during fiscal 1963.

### **Water Resources Classified**

Investigations were continued to determine the potential of streams on the public lands for waterpower and the conservation storage of water. The program is largely confined to the western United States and Alaska, where most of the remaining public lands are located. A map of 130 miles of the Clark Fork River, Mont., was published. Reports on reservoir site investigations in northern Nevada and on glacier observations, Glacier National Park, 1962, were released in open file. Geological Survey Circular No. 400, "History of Land Classification Relating to Waterpower and Storage Sites," was revised and reprinted.

Estimates of the waterpower potential of the United States were revised and will be published by the Geological Survey along with estimates of the Nation's reserves of other energy producing resources.

The review of public land withdrawals for waterpower and water storage purposes was continued. One report, "Review of Waterpower Withdrawals, Kern River, California," was completed in which 60,000 acres were reviewed and 38,000 recommended for restoration from withdrawal.

Acting on a request by the Army Corps of Engineers, the Geological Survey submitted to the Secretary for approval, a power site classification covering the public lands in the reservoir area of the proposed Rampart Dam, on the Yukon River, Alaska. This is noteworthy because it affects nearly 9 million acres of land lying mostly in the Yukon Flats.

One hundred and sixty-four reports were submitted to the Bureau of Land Management on the waterpower value of lands affected by applications for rights-of-way easements and 6,355 reports were made on applications for land acquisition.

Thirty-nine waterpower reports were made on applications to the Federal Power Commission for restoration of lands in power-site withdrawals.



### Connally Act Administered

The Connally Act supports conservation activities of oil-producing States by prohibiting the interstate shipment of oil produced in violation of certain State oil and gas conservation laws. It is administered by the Geological Survey through the Federal Petroleum Board with headquarters at Kilgore, Tex.

While the Connally Act is applicable wherever State laws limit the rate of production and prescribe conditions for producing and handling petroleum and its component parts, its chief application has been in Texas, Louisiana, and New Mexico. Violations of the Connally Act by producers outside designated areas have also been prosecuted and penalties imposed, notably in Mississippi, Oklahoma, Arkansas, and Kansas.

Unless exempted by the Board in writing and by notice, producers within designated areas are required to maintain and file correct and complete monthly and semiannual reports. A separate report must be made by the operator for each pool of field.

At the beginning of the year, 24 cases of alleged violation of the act were pending on the docket of the Board and 305 new cases were formalized during the year. Four cases, resulting in fines of \$54,600, were settled. At year's end, 318 cases were on the Board's docket.

## PUBLICATIONS ISSUED

Results of research and investigations by the Geological Survey are made available to the public through a variety of reports and maps. Of the formal reports published by the Survey, books are printed and sold by the Government Printing Office and maps are printed and sold by the Survey.

During the year, 247 technical book reports were published. Maps printed totaled 3,155, comprising nearly 9,500,000 copies, as follows:

Kinds of maps	Number printed
Topographic map:	
Standard .....	2,380
Other .....	107
Geologic maps:	
Geologic quadrangles and miscellaneous investigations .....	74
Mineral resources .....	34
Geophysical investigations .....	108
Water resources maps: Hydrologic atlases and other maps .....	69
Maps for inclusion in book reports .....	290
Maps for other agencies .....	93
<b>Total .....</b>	<b>3,155</b>

Geological Survey maps were distributed by mail from bulk stocks at Silver Spring, Md., Denver, Colo., and Fairbanks, Alaska. Over-the-counter map sales are made at these and 13 other Survey offices. In addition, 580 commercial agents throughout the United States sell these maps to the public.

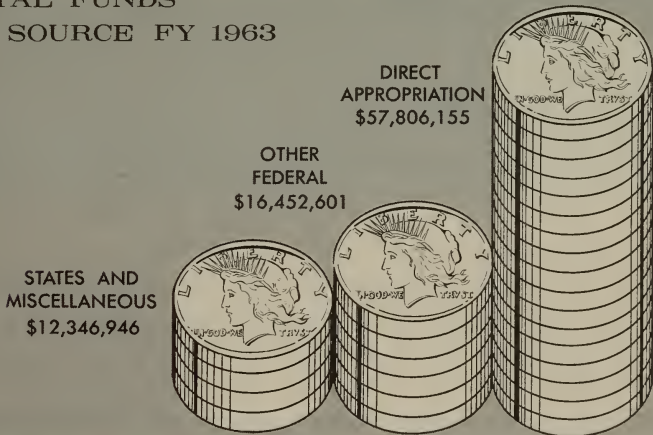
In addition to approximately 46,275,000 maps and books on hand at the beginning of the year, 8,606,800 copies of new and reprinted maps and 480,100 copies of book reports were received. Distribution of 5,306,650 copies of maps was a 13-percent increase over fiscal 1962. Also during fiscal 1963, the Geological Survey distributed, free and for official use, 360,700 book reports and pamphlets, 138,200 copies of the monthly announcement of new publications, and 245,000 topographic map descriptive folders and symbol sheets.

The total distribution was implemented by 294,400 individual orders. Seventy-four percent of the maps distributed were sold, and \$739,871.20 was deposited to miscellaneous receipts in the U.S. Treasury.

The following table shows a comparison between Geological Survey map and book distribution during fiscal 1962 and 1963:

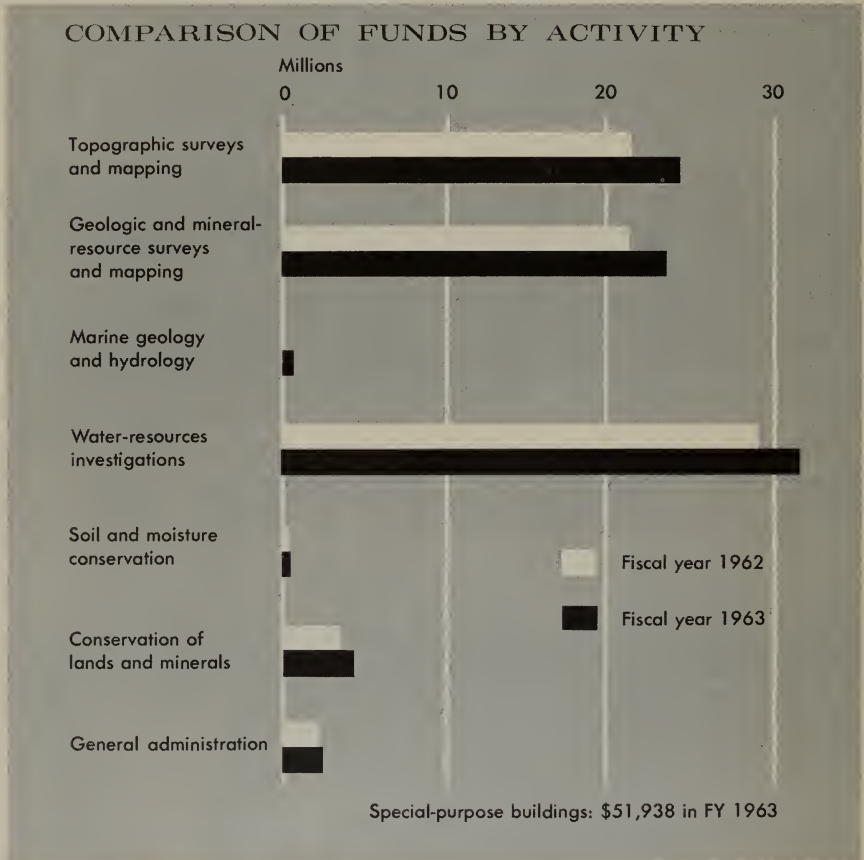
	1962	1963	Percent change
Washington.....	2,864,350	3,513,100	+23
Denver.....	1,675,750	1,740,250	+4
Fairbanks.....	43,050	45,950	+7
Other offices.....	415,350	368,050	-11
<b>Total.....</b>	<b>4,998,500</b>	<b>5,667,350</b>	<b>+13</b>

TOTAL FUNDS  
BY SOURCE FY 1963



## FUNDS

During fiscal 1963, operating funds of the Geological Survey were \$86,605,702. Charts show sources of incurred obligations and compare expenditures by various Survey activities.







# Bureau of Mines

Marling J. Ankeny, Director

Research remained the major concern of the Bureau of Mines during fiscal year 1963: Research so varied and comprehensive that it embraced virtually all the minerals and fuels required to sustain and advance modern civilization as well as the safety and health of those who mine and process the Nation's mineral wealth . . . research so far reaching that it touches the lives of all Americans and affects much of the free world. Such was the Bureau's challenge and opportunity.

Studies by the Bureau during the year ranged from the complex technological problems posed by marginal resources of metals, nonmetals, coal, oil, and gas to the life-or-death necessities of astronauts, who enter outer space in metal ships powered by exotic mineral fuels.

Of immediate interest were new projects to develop patterns for turning strip-mined land into recreational areas and for intensifying the attack on mineral-related pollution of America's rivers and streams. Of importance to the future was the Bureau's entry into marine research—recovery of mineral resources from the sea.

Not all the Bureau's objectives were fully realized, nor can they ever be in a conservation field where the problems far outnumber the apparent solutions. Nevertheless, significant advances were made in research and also in promoting health and safety among mineral industry workers, in studies of economic and technological developments in minerals at home and abroad, and in other important phases of the varied programs of the Bureau. Many are described in the following pages.

## BITUMINOUS COAL AND LIGNITE

Continuing success in hydraulic-mining experiments, advances in techniques for transporting coarse coal, and significant progress in the search for new markets for abundant lignite resources were among the highlights of Bureau research on bituminous coal and lignite during the 1963 fiscal year.

Hydraulic mining with high-pressure water jets—particularly adaptable to extracting coal from inclined or pitching coalbeds—has been developed by the Bureau to a point where future research can be devoted primarily to determining the best combination of volume of water, pressure of water, and shape of water nozzle required to mine coal at a particular site. The Bureau's small (40 gallons per minute) high-pressure (4,500 pounds per square inch) equipment was moved from an operating mine at Roslyn, Wash., to an even more steeply pitching coalbed in an active mine near Carbondale, Colo. Preliminary tests at the close of the fiscal year showed the equipment to be superior in productivity compared with the hand-mining methods previously employed at Carbondale. The Bureau's larger equipment was moved from Lebanon, Pa., to the Roslyn mine and will be used there during fiscal 1964.

In the related field of hydraulic transportation, the Bureau drew nearer its goal of establishing the feasibility of carrying broken coal from working faces to a surface preparation plant—and perhaps to the ultimate consumer. Among other developments, it completed the design of a mile-long experimental pipeline 6 inches in diameter that will convey lumps up to 2 inches in size.

### **New Horizons Seen for Lignite**

Significant progress was made in searching for new markets for lignite and in solving problems associated with its present use as a solid fuel. Producers of lignite for use as a powerplant fuel have adopted as a commercial practice the Bureau-developed system for freezeproofing winter shipments: 10 percent of dried lignite fines are mixed with untreated lignite before it is loaded into railroad cars.

The Bureau's pilot high-pressure slagging lignite gasifier operated at increased pressures up to 400 pounds per square inch with the anticipated improved efficiency in producing synthesis gas. This gasifier, the Bureau hopes, may eventually make it possible to convert lignite to high-Btu pipeline gas, chemicals, and synthetic fuels.

Promising experiments were conducted to produce a combination fertilizer and soil conditioner—equivalent to naturally oxi-



Identifying the complex ingredients of coal tars leads to more efficient ways to utilize the Nation's coal resources. Here a Bureau of Mines scientist looks for clues as to the nature of tar ingredients in a graph that records the reactions of a tar sample to infrared radiation.

dized lignite or leonardite—by oxidizing lignite artificially to increase its humic acid.

### **Explosives Research Has Space-Age Impact**

The traditional role of the Bureau of Mines as the Federal authority on industrial explosives and explosions has given it several special tasks in connection with space flight and missiles. At the





Valuable products, including chemicals and cokelike fuels, have been made from high moisture coal in the Bureau of Mines carbonizing reactor to the left. Costs are low, and the process holds promise of opening new markets for coals that would otherwise be more limited in their usefulness.

request of the U.S. Army's Ballistics Research Laboratory, the Bureau's Explosives Research Center at Pittsburgh, Pa., conducted experiments in which thin metal plates were perforated by "hyperballistic" projectiles traveling at speeds of 2 to 3 miles per second. Information on correlation between spalling from the rear surface of the target and the size and speed of the projectile is expected to improve future methods of shielding space vehicles from meteors. The Bureau's experience in designing and using low-pressure tanks—in connection with explosion studies—was called upon by the Air Force in seeking a solution to the problem of extinguishing fires in space vehicles. The Bureau designed special low-pressure chambers that simulate a space capsule operating at altitudes of 100,000 feet. The chambers have been used for experiments in which fires were put out when vented into a low-pressure atmosphere.

## ANTHRACITE

A three-pronged anthracite research and conservation program was carried on by the Bureau of Mines during fiscal 1963. It was aimed at improving mining and preparation methods, stimulating demand, and protecting reserves not now being mined. Supplementing these efforts were fundamental studies of anthracite's physical, chemical, electrical, and surface properties. Bureau personnel continued to work closely with representatives of the Commonwealth of Pennsylvania in carrying on the jointly financed, Federal-State mine-water-control program and in controlling or extinguishing fires in inactive anthracite mines.

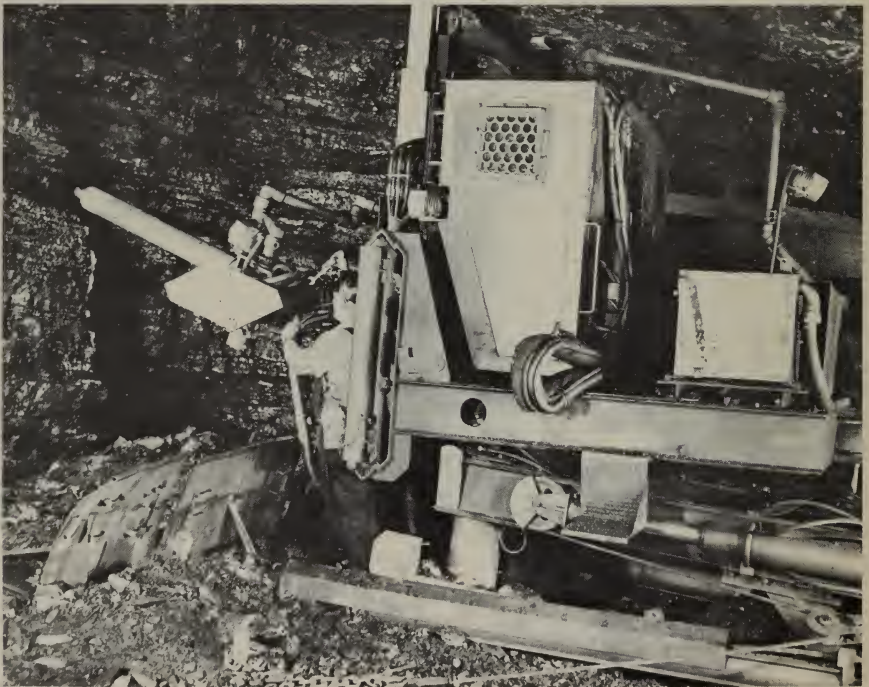
### **Hydraulic-Mining Experiments Continue**

Underground tests of the Bureau's hydraulic-mining system—adapted to use slightly higher pressures in hard anthracite than are needed in bituminous coal seams—continued through the year in an operating mine at Sugar Notch, Pa., resulting in significant changes and improvements. The mobile "jumbo" that supports and controls the 5,000-pound-per-square-inch stream of water used to cut the coal was modified to improve safety, increase productivity, and reduce power consumption. The conveyor system also was improved so removal of mined coal could keep pace with the fast cutting action of the hydraulic monitor. Plans were completed at year's end for continuing tests with various water pressures and with varying volumes of water and nozzle openings.

### Methods Sought for Making Anthracite "Fines"

Ultra-fine-grinding techniques were studied during the year as a means of obtaining a product that can hold or extend certain markets that have long been served by anthracite "fines" dredged from the Susquehanna River. Standard procedures for sampling, screening, determining density, and analyzing particle size were being developed at year's end, and the suitability of heavy-medium equipment for cleaning mixed fine sizes was being investigated.

In continuing studies aimed at developing metallurgical uses for hard coal, calcined anthracite briquets, prepared at the Bureau's Anthracite Research Center, Schuylkill Haven, Pa., were used with various burdens and at varying air rates in the Bureau's experimental blast furnace at Bruceton, Pa. Extensive tests in which these briquets were used successfully to melt iron in cupolas were reported during the year.



Designed by the Bureau of Mines, this experimental hydraulic equipment eliminates the need for dangerous blasting and also promises increased efficiency in mining of anthracite and bituminous coal. The equipment cuts hard coal from anthracite seams with a jet of water with a force of 5,000 pounds per square inch.



## Mine-Water Control Program Extended

Congress broadened the scope of the Federal-State mine-water control program in October 1962 by authorizing the sealing or filling of abandoned mines in the interest of public health and safety. Several new projects were being considered at the close of the year. Ultimate expansion of this program is expected to be aided by information gained during an intensive study of all underground mine workings in the anthracite region of Pennsylvania. This last, now more than 70 percent complete, is being performed at the request of the Corps of Engineers to determine the effect of these workings on the stability of levees, impounding basins, and other surface flood-control structures.

## AIR-POLLUTION CONTROL

As national concern over air-pollution problems mounted during the year, Bureau studies were speeded in its traditional area of authority—those aspects of pollution related to production and use of minerals and mineral fuels. Cooperation continued with the Public Health Service of the U.S. Department of Health, Education, and Welfare. During the year the Bureau laid particular stress on identifying the causes of air pollution and on various methods of controlling, reducing, or eliminating such pollution at its source—before contaminating gases enter the atmosphere.

Research continued or expanded at various coal and petroleum research centers and laboratories and—in cooperation with State agencies and with private industry—in field studies. Equipment and techniques previously developed to study ways in which smog is created from engine exhaust gases were in use at the end of the year. Saturation sprinkling was tested for extinguishing a burning coal-refuse pile.

Preparations were completed for new studies of the effects of catalytic afterburners in changing the composition of exhaust gases from automobile engines and making them less objectionable. The role of a major antiknock chemical (tetraethyl lead) and other gasoline additives in fouling catalytic afterburners was studied. Another study was performed in cooperation with the Atomic Energy Commission on the use of depleted uranium in catalytic exhaust afterburners. A uranium oxide catalyst was developed and is being tested.

Flue gases from two large coal-fired electric utility boilers were analyzed, and potential ways of removing sulfur dioxide from

such gases were advanced. Initial tests of one such means—dropping a granular absorbent into the ascending gases within the flue—proved it capable of eliminating 70 to 98 percent of sulfur dioxide.

## FOREIGN ACTIVITIES

Bureau reporting on international mineral developments that vitally affect the mineral economy of the United States was substantially expanded during the past year. This increased activity was in line with a study of research needs in the natural resource field, made by the National Academy of Sciences at the request of the President. A 40-percent increase in appropriations noted by the Congress enabled the Bureau to intensify its work in this area.

### Thousands of Inquiries Answered

Bureau analyses and economic evaluations of statistical material regarding foreign minerals were used extensively by Government agencies, industry, and the public. Over 6,000 inquiries from American industry and Government sources were answered.



A Bureau of Mines engineer measures the combustion rate of a smoldering coal refuse pile during studies on how to control such sources of air pollution. Vapors in the background show clearly in this photograph but most atmospheric pollution is invisible.



Holding his child up for a look, a Nepalese mine owner inspects the first ingot of copper from a new furnace designed by a Bureau of Mines metallurgist (center) as part of the Government's technical assistance program for friendly foreign countries. The Bureau scientist is on loan to Nepal under the auspices of the Agency for International Development (AID).

### **Contributions Made to International Science and Trade**

Bureau participation in international conferences was notable during the year. In Geneva, its specialists contributed five well-received technical papers to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less-Developed Areas. The author of one of these papers was the official U.S. delegate at the natural resources phase of the conference.

Bureau specialists often are chosen for assignment to foreign countries as mineral attachés in the Department of State. The



Bureau nominates technologists, usually from its own staff, who then become Foreign Service officers for periods of 4 to 6 years. During fiscal 1963, Bureau personnel were performing in this capacity in Australia, Bolivia, Brazil, England, Ghana, India, Peru, the Republic of South Africa, and Turkey. An expansion of this program was authorized during the year, and candidates soon will be selected for posts in Belgium, Libya, and Mexico.

### **Foreign Technical Assistance Gains**

Under the sponsorship of the Agency for International Development, the Bureau participated in technical phases of the foreign aid program of the United States; 17 Bureau technologists gave technical assistance in all phases of the mineral industry in eight countries—Afghanistan, Bolivia, Indonesia, South Korea, Mexico, Nepal, Pakistan, and Taiwan. The support of Bureau laboratories and staff members at home contributed to these and other AID projects abroad.

One of the most important of foreign-aid activities is the training of foreign nationals in the United States. During the year the Bureau helped train 78 foreign mineral technicians, and at year's end 37 were still training under Bureau auspices. In all, 19 countries were represented.

To date, eight Bureau publications on mine safety have been translated into Spanish by the Regional Technical Aids Center of AID in Mexico. These publications have been widely distributed in Latin America, where the especially popular "First Aid Manual" has already sold about 20,000 copies.

### **Reports on Foreign Developments**

Results of the Bureau's examination of anthracite deposits in Antarctica, sponsored by the National Science Foundation, were published. A definitive report on the importance of minerals in Japan's industrial economy was published along with a similar one on the petroleum industry of Iran.

## **MINERALS DEVELOPMENT**

New and better ways for increasing efficiency and economy in the Nation's mineral industries continued to flow from Bureau of Mines research in fiscal 1963, a year that saw advances in many different branches of mineral investigation. The year also marked the Bureau's entrance into a new scientific field—marine minerals research. A ton of manganese-bearing nodules, dredged

from the ocean floor near Baja California, was sent to a Bureau laboratory for analysis as a possible new source of metal to fill the Nation's growing needs. From this modest beginning, the Bureau plans ultimately to expand its technological studies into such promising areas as marine prospecting, underwater mining, and problems of sea-water pollution. Thus, mineral resources as yet untapped can be made accessible to help meet requirements of the future.

### **Explosive Rockbolt Developed**

Mining of deposits in soft rock, traditionally a difficult and hazardous enterprise, was made both easier and safer by the Bureau's development of an explosively anchored rock bolt. With a holding power in soft ground superior to that of conventional bolts, the new rock bolt will reduce the danger of rock falls, offering better protection to men and equipment and conceivably permitting development of deposits that cannot now be mined economically. Interest has already been expressed in commercial markets for the device.

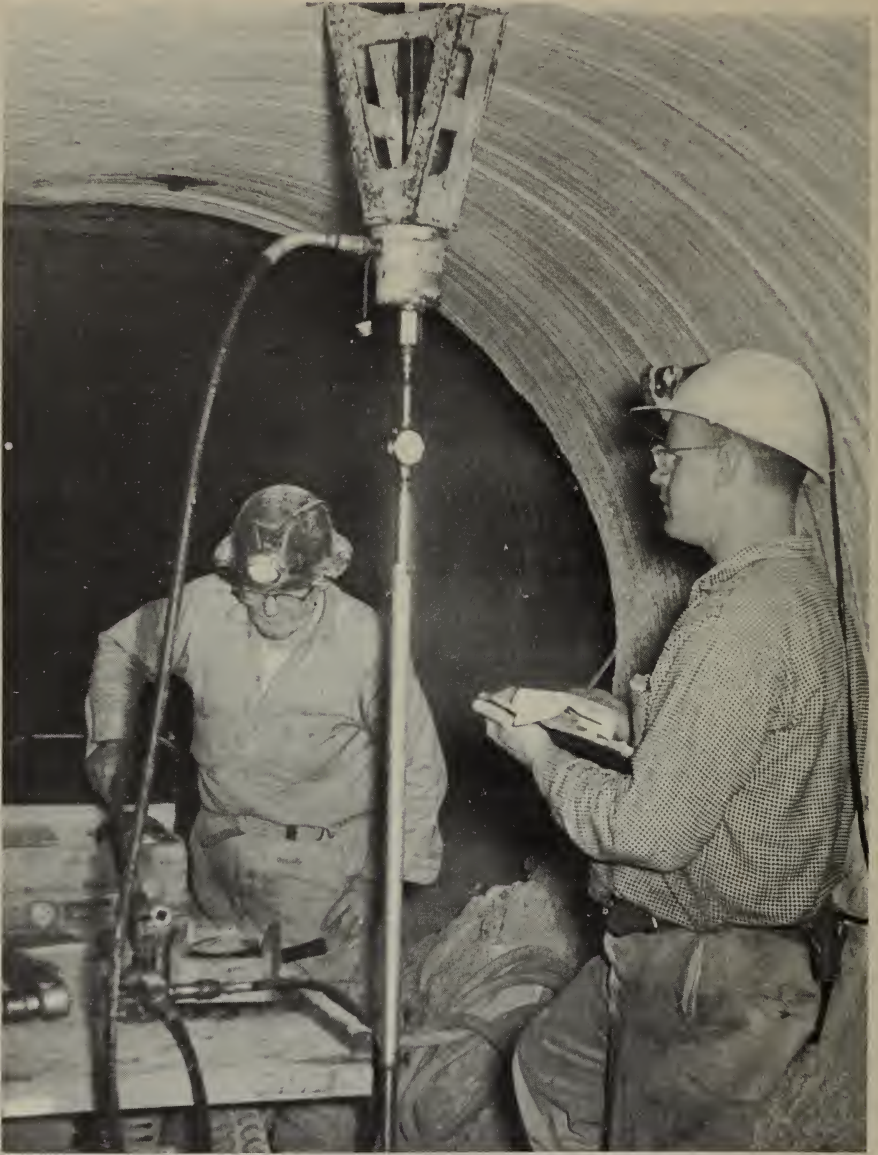
Ingeniously constructed laboratory models were used in studies of rock bolting mine roofs composed of "beds," or layers of rock. As a result, Bureau engineers developed a theory relating the friction between such rock strata to a so-called suspension effect—a tendency of less flexible rock layers to lend support to the more flexible ones when they are bolted together.

### **Blasting Phenomena Studied**

Research also continued on the problem of vibration damage to buildings from blasting, and criteria were set up for predicting probable damage by measuring the velocity of individual earth particles caught in vibration waves. To increase efficiency in the use of explosives, the Bureau developed a method for determining the point at which rock under sudden stress will shatter. Results of one study on the importance of matching certain physical qualities of explosives to the rock in which they are to be used have already been applied by industry to achieve lower costs and increased productivity in quarrying.

### **Industry Helped by Drilling Studies**

Knowledge obtained in Bureau research on the measurement and significance of noise from pneumatic rock drills was disseminated to industry during the year. Meanwhile, detailed reports on the design of mufflers for abating this noise were being readied for publication.



Anchored explosively in the ceiling of this mine chamber, a new Bureau of Mines rock bolt resists thousands of pounds of pull exerted hydraulically by the engineer with the pump. Such tests have demonstrated the superior holding power of the new bolt in loose rock formations.



Basic research in drilling progressed at the Minneapolis Mining Research Center in Minnesota, where scientists used plastic "model rocks" to study the distribution of stresses during drilling. By learning more about the fundamental forces involved, the Bureau hopes to find new ways for increasing drilling efficiency. A high-speed computer system is also used by the Bureau to speed complex calculations in basic research on rock mechanics and other aspects of mining engineering.

Other mining studies during the year led to development of a more precise method for classifying waste material that can be transported hydraulically. Such material often is used to fill mined-out areas underground. The new system, which relates the density of the substance to the rate at which water percolates through it, will allow mine operators to use the various grades of this material more effectively.

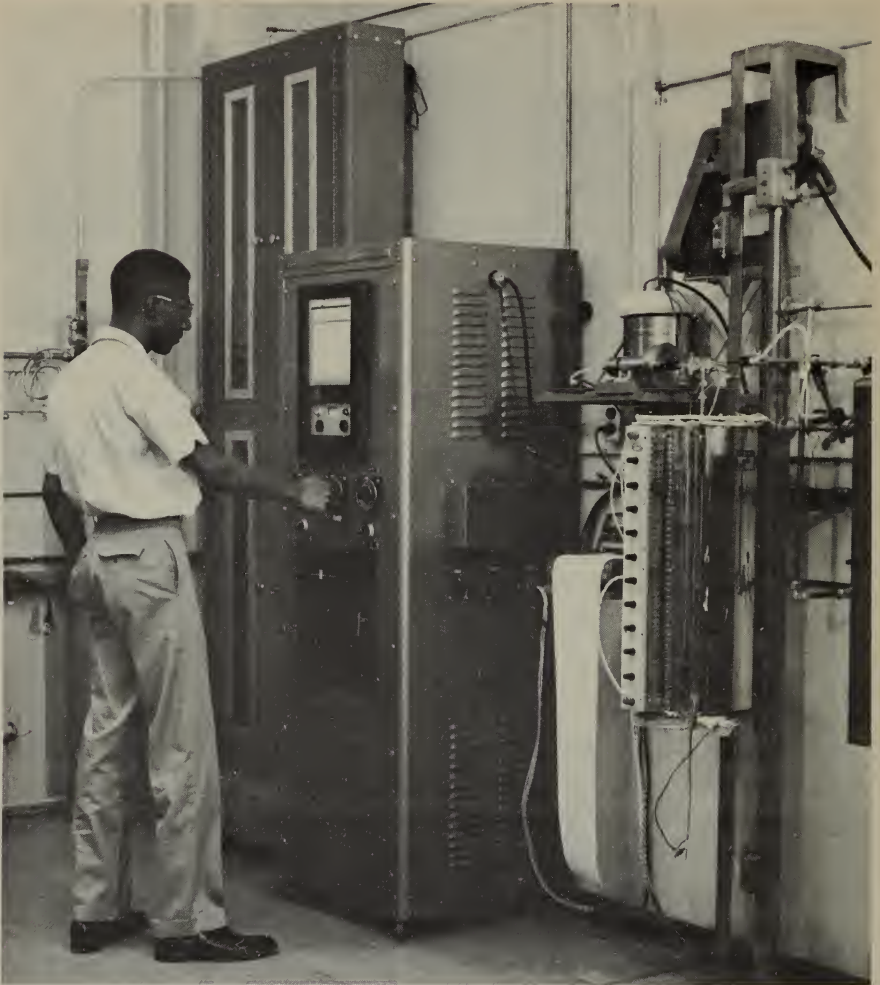
### **Blast-Furnace Technology Advanced**

Imaginative research conducted in recent years by the Bureau to increase blast-furnace efficiency and improve pig-iron quality gained new impetus early in the year with the signing of a cooperative agreement between the Bureau and Blast Furnace Research, Inc. This organization, composed of 22 major iron and steel producers, is contributing \$2 million toward a 2-year research program using the Bureau's unique experimental blast furnace at Bruceton, Pa. Cooperative experiments are underway there on injecting many types of fuels into the furnace smelting zone, and additional studies are scheduled on operation at higher-than-normal furnace temperatures and pressures. This joint effort, proposed by the steel and iron firms, represents the determination of industry and Government to retain North American leadership in steelmaking technology.

### **Low-Grade Materials Investigated**

High-purity manganese was successfully obtained from Georgia amber, a low-grade source of the metal, using a simulated steel-mill waste product to extract the desired metal. Essentially all the iron occurring as a contaminant in this ore was separated in a laboratory-scale study, one of several aimed at evaluating promising processes for extracting manganese from the Nation's large low-grade and refractory resources.

About 90 percent of the phosphorus in a typical subgrade western ore was recovered as a high-grade concentrate in batch-scale flotation tests by the Bureau. Several western phosphate-rock



Metallurgists of the Bureau of Mines use this automatic equipment to measure and record the vapor pressures of certain metal compounds. A technician adjusts the recording unit, connected electrically to the measuring device at right.

producers have shown considerable interest in the results, offering full cooperation in supplying samples and in conducting tests to determine the acceptability of concentrates. Some companies have even demonstrated interest in testing on a larger scale in their own pilot plants.

Evaluation of several acid processes for recovering alumina from clay was completed in continuing Bureau research on domestic materials that constitute the probable aluminum ores of the future. These materials, and the processes selected through

careful evaluation as most economic, will doubtless be used when present, higher grade deposits are exhausted.

### **Lead-Bismuth Separation Promised**

Preliminary tests were made of a method for removing bismuth from lead, using a submersible centrifuge at elevated temperatures. With this system better separation resulted than with standard hand-skimming methods. In another experiment, 95 percent of the copper and 97 percent of the lead were recovered from roasted lead blast-furnace matte by water and brine leaching. The resulting residues were relatively pure iron oxides.

Work began on a new metallurgical process for recovering and separating minerals with small differences in specific gravity, such as ilmenite, rutile, and zircon. Important to the process is a new way to recover almost all the acetylene tetrabromide, a relatively expensive heavy liquid used as a separation medium.

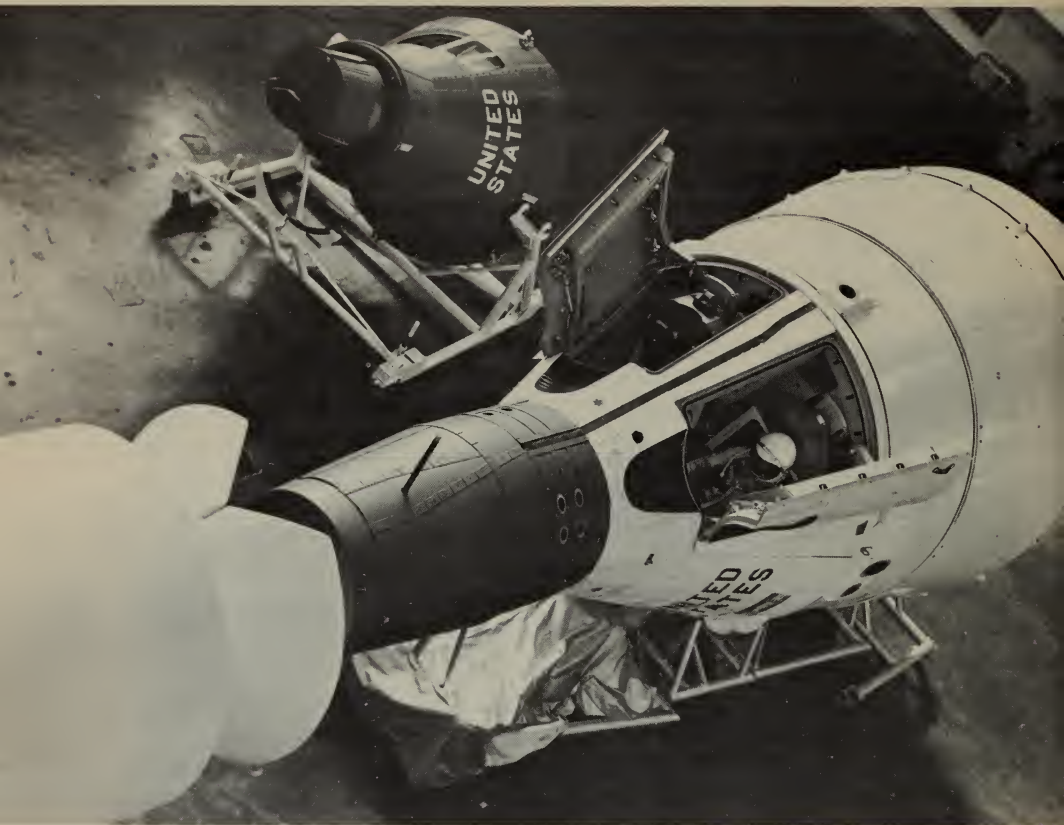
### **Purer Metals Produced**

Bureau metallurgists continued a search for ultrapure metals needed to help meet growing demands for materials with exceptional properties. A method for producing superpure nickel, developed last year, was successfully enlarged to commercial scale, and the cobalt content of the nickel was reduced to less than 1 part per million. Another process for making pure nickel electrolytically from ferronickel was improved, while progress was made in removing iron from ferronickel by solvent extraction, and on arc melting electrorefined nickel to reduce carbon and other contaminants.

Vanadium metal much purer than that available commercially was produced in 50-pound ingots after successful scaling up of a process, developed earlier, that effectively utilizes such techniques as bomb reduction, chloride reduction, and electrorefining. Studies of vanadium compounds, conducted at very low temperatures, developed background information for future investigations of superconductor vanadium materials.

The purest beryllium ever made by the Bureau—so pure that all metallic impurities except calcium were below the limits of detection—was obtained using a double-electrorefining procedure with high-purity beryllium, refined from scrap, as feed material. Electrorefining also was employed successfully in producing high-purity titanium, a metal made available for important uses in U.S. spacecraft through Bureau research. The near-pure titanium was electrorefined from an alloy that was maintained as a liquid throughout the process.





Alloys containing Bureau-developed titanium are vital components of the space capsules MERCURY and GEMINI, pictured here side by side. The pressure vessels and the spars or structural members between the pressure vessels and the outer skins are of titanium in both capsules.—Courtesy NASA.

A method was devised for obtaining relatively pure cadmium from a scrap cadmium-zinc alloy; the crude alloy was reacted with magnesium to form a refractory magnesium-zinc compound and quantities of free cadmium, which then was distilled from the mixture.

Columbium with an oxygen content of less than 1 percent was successfully electrodeposited from an open cell. Previously, columbium of this quality could be electrodeposited only in closed cells containing inert atmospheres—a much more cumbersome and expensive method.

Research on the little-known rare-earth and yttrium metals was directed toward producing pure rare-earth compounds and ultra-high-purity metals. Near-pure neodymium metal was prepared

that had high coalescence—that is, the metal formed relatively small, adhesive particles instead of loose flakes.

### Needs of Space Programs Emphasized

Other metallurgical research was directed toward separating metals whose similar properties make this process difficult. A new and simplified method was developed for separating columbium and tantalum; it promises to be commercially feasible. Columbium oxide is converted to volatile columbium oxychloride, leaving tantalum unaffected and facilitating recovery of both metals, which are in demand for important experimental applications in the Nation's space program. A patent was granted on a new Bureau process that fills a longfelt need for efficient and economical separation of molybdenum from tungsten—two other metals that are candidates for outer space. A new technique, developed for alloying thorium with nickel, is regarded as an important preliminary step toward production of higher purity thorium by electrorefining the alloy. Research on electrowinning uranium led to substantial increases in production and electrical efficiency.



In the tall, cylindrical cell a protective coating of molybdenum metal is being electro-deposited at  $900^{\circ}$  C. Guarded by a safety screen against accidental exposure to the high temperature, a Bureau of Mines scientist takes notes while another checks a recording device.

## PROGRESS IN NONMETALLICS

In nonmetallics, additional emphasis was placed on fundamental work with synthetic micas. A novel method for determining mica melting points was developed, and initial determinations were made of the surface tension and density of molten fluorphlogopite to help scientists learn more about the properties of this type mica. Another variety of mica was successfully synthesized, and new data were reported on the melting temperatures of fluormicas, and on the preparation of synthetic mica from abundant, low-cost materials.

### **Synthetic Mica Paper Improved**

The search for ways to improve the electrical properties of reconstituted mica paper made from water-swelling synthetic micas resulted in development of an improved heat-treating cycle. A second commercial plant has adopted a Bureau method, developed in cooperation with industry, for recovering fine mica particles.

### **Industry Adopts Kyanite Process**

Cooperative research with private industry on kyanite-processing methods led to the construction of a flotation plant at Washington, Ga., for producing this valuable refractory material. About 9,000 tons of high-quality kyanite concentrate a year can be produced, using ore from the Graves Mountain deposit in Georgia's Lincoln County.

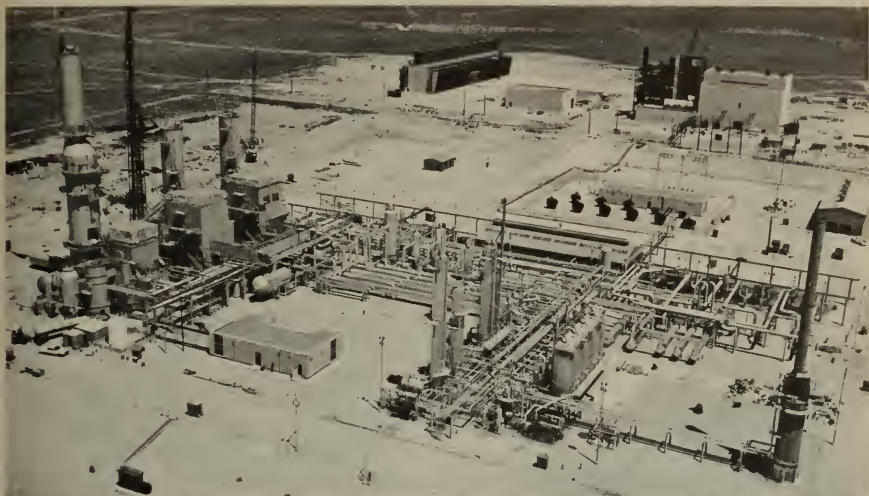
## HELIUM

A supply of helium for future needs was virtually assured during the year as the national helium conservation program went into effect.

### **First "Conservation" Helium Delivered**

Three private companies extracted 320 million cubic feet of crude helium from their natural gas and sold it to the Bureau of Mines under terms of 22-year contracts. The helium was delivered through a 425-mile pipeline to the Bureau's Cliffside gas-storage field near Amarillo, Tex. Ultimately, at least five privately owned and operated extraction plants will participate in the program, conserving helium that would otherwise have been wasted when natural gas containing small percentages of it was burned for fuel. The Nation's helium resources are more than adequate for now.





This Kansas installation, one of the privately owned and operated plants that extract crude helium from natural gas and sell it to the Bureau of Mines, can produce more than a billion cubic feet of crude helium a year.

However, demand for this element has quadrupled over the past 10 years and is still rising, while domestic reserves are both limited and irreplaceable.

### **Bureau Output Remains High as Demand Continues**

Production of helium at the five plants operated by the Bureau totaled 714.3 million cubic feet during the year. More than 600 million cubic feet of this grade A helium, 99.995 percent pure, was delivered to customers, mostly Government agencies. Approximately 60 percent was for missile and space programs, 14 percent for atomic energy applications, 2 percent for other Federal agencies, and the remaining 24 percent for non-Federal customers. Sale of helium at \$35 per thousand cubic feet ultimately will pay for the entire conservation program.

### **Helium Research Advanced**

Studies during the year at the Bureau's Helium Research Center in Amarillo were directed toward discovering more about the properties of helium so that the wisest and most effective use may be made of limited resources. An important phase of the program is a worldwide search for all original papers, dating back to the beginning of the century, on helium's thermodynamic properties. Refined measuring techniques now enable scientists to detect gaps

and errors in this fundamental knowledge. Further research can then be conducted to supply what is missing and correct what is wrong.

During the year the Bureau completed long-term research with the publication of phase-equilibrium data for helium-bearing natural gases. Begun in 1952, this work provided information used in designing the privately owned plants that now recover helium from natural gases for conservation. Also reported was the application to multiple-fluid mixtures, like crude helium, of the Burnett method of compressibility determinations. This technique makes possible the derivation of heat capacity values for gases and gas mixtures without using direct calorimetric measurements, which are less satisfactory and extremely difficult to make.

Also published was a table of supercompressibility factors for helium-nitrogen mixtures. This table sets standards for correcting volume measurements of crude helium purchased by the Bureau under the conservation program, thus contributing to the accuracy of calculations on which payments for crude helium deliveries are based.

## PETROLEUM, NATURAL GAS, AND OIL SHALE

Intensified research was carried out during the year toward the Bureau's goal of petroleum and natural gas conservation. Development of better ways for producing, processing, and using these fuels was stressed, and laboratory studies continued on oil shale, which remains a promising future energy resource.

### **Breakthrough in Production Research**

Of major significance in the search for better ways to recover oil was the development of rapid, accurate methods for predicting the results of waterflooding—the secondary-recovery technique in which water is pumped into energy-depleted underground reservoirs to force oil toward producing wells. Bureau scientists developed procedures for using advanced physical and mathematical principles to perform calculations that once were too complex to be accomplished economically. As a result, the computer time required to arrive at final predictions has been greatly reduced.

A comprehensive study completed during the year also developed a more scientific approach to the problem of estimating the productive capacity of oil reservoirs. By analyzing reservoir per-



This map-model shows the 425-mile Bureau of Mines pipeline built to deliver crude helium to the cliffsides gas storage field. Three Bureau helium extraction and purification plants—labeled "Helium Activity"—are tied into the pipeline. Three of the five private plants scheduled to feed the pipeline with crude helium were operating by the end of fiscal year 1963.

formance and production decline in California fields operating at or near their maximum efficient rate, it now is possible to predict the performance of fields that are prorated—that is, restricted in production on a monthly basis.

### Experimental "Fireflood" Well Underway

Near Reno, Pa., a second field test of thermal recovery continued in cooperation with an oil-refining company. This method, sometimes called fireflooding, involves igniting part of the oil trapped in the porous rock of an underground reservoir and allowing the heat and pressure generated to drive the rest of the oil toward producing wells. The technique, also undergoing tests in other regions, is being examined for possible application to Appalachian oilfields where natural energy, once used to force oil into producing wells, has long since become depleted. At the Pennsylvania test site an observation well was cored 20 feet from the ignition well so that progress of the fireflood could be observed. Heavy crude oil will be injected later as a supplementary fuel during a second



ignition test. Successful development of thermal recovery could achieve increased production from the Appalachian area, which contains the Nation's oldest oilfields.

### **Economy Stimulated**

Engineering studies performed on other reservoirs in the Appalachian area were responsible for increased drilling activity and oil production in Warren County, Pa. The Bureau's work indicated that the oil-bearing Glade sandstone formation in that region could be fractured by applying hydraulic pressure, thus permitting the oil to flow more freely. Use of this technique subsequently increased production and brought definite economic benefits to the area.

In other production studies during the year, an effective way was sought to remove oil and water that were blocking the porous sandstone of some natural gas reservoirs. Results indicated that methyl alcohol will remove such blocks without the aid of any other chemical additive, and can possibly be used to increase gas-well productivity.

### **Oil-Analysis Work Gains**

Joint research by the Bureau and the American Petroleum Institute on the identification of sulfur compounds in crude oil passed an important milestone during the year with publication of a comprehensive Bureau report on these compounds. Besides listing sulfur compounds thus far identified, the report reflects a shift in the interest of refiners from thiols, which are the most obnoxious of the sulfur compounds, to thiophenes, which account for the greatest amount of sulfur. The report is expected to be a valuable guide to areas for future research.

Identification of new compounds in crude oil also gives scientists additional knowledge of the origin, history, and characteristics of this versatile natural resource. Significant contributions were made to this knowledge during the year when a class of sulfur compounds was identified for the first time in crude oil.

### **File of Oil Analyses Grows**

During the year, 300 crude oil analyses were completed and added to the Bureau's open file. Containing over 6,000 separate analyses, this file now comprises the world's largest collection of analyses prepared according to a single standard. Eventually, the Bureau hopes to be able to correlate these data with geological reports so geological formations can be used as clues to predict the



An engineer operates equipment designed by the Bureau of Mines to deal with one of the hazards of oilfield waterflooding—premature breakthrough of injected water into oil-producing wells. The portable device injects a plugging material to minimize or prevent such accidents.

types of crude oil with which they might be associated. As part of this project, 1,225 crude oil data cards were delivered to the University of Wyoming's Data Processing Center for preparation of computer punchcards.

Noteworthy progress was made in obtaining thermodynamic facts needed by the petroleum and chemical industries for basic and applied research, and in designing and developing commercial processes. An especially significant achievement was the design of a gage for measuring extremely low vapor pressures with accuracy never before possible. Research also progressed toward developing superior rocket fuels for the Nation's space and defense efforts.

In January of 1963 the Bureau began gathering, compiling, and publishing data on refinery production of feedstocks used in manufacturing petrochemicals. Over half the Nation's chemical production consists of petrochemicals, and publication of detailed, comprehensive data on this subject is expected to fill a longstanding need of Government, the oil industry, and the general public.

## Oil-Shale Research Reported

During the past year work on oil shale was confined almost entirely to laboratory and bench-scale experimentation. Among the valuable results of this work was the discovery that the specific gravity of oil recovered from oil shale decreases uniformly as sample depth increases. This refers to shales in the Piceance Creek basin of Colorado, where several large oil companies propose to conduct in situ (in-place) combustion experiments in recovering oil from the shale.

In the field of shale-oil processing, Bureau studies focused principally on hydrogenation and hydrocracking with the expectation that these techniques will find commercial application in producing fuels and chemicals from shale oil.

On April 9, 1963, the Bureau dedicated its new Engineering and Physical Sciences Building at the Bartlesville (Okla.) Petroleum Research Center. Valued at over \$2 million, the structure contains 55 laboratories, 36 offices, and a 300-seat auditorium

Practicing petroleum conservation, this crew is fracturing the rock of an underground oil reservoir to permit recovery of oil that might otherwise remain trapped. The Bureau of Mines studies such industrial operations to gain knowledge that will lead to improved oil-recovery methods.





where scientists from all over the world can meet to exchange information.

## COOPERATION WITH OTHER AGENCIES

The Bureau of Mines cooperated with various other Government agencies and participated in many significant Federal activities during fiscal 1963.

Among the most important of its cooperative efforts was participation in an interagency evaluation of future growth and employment opportunities in the national economy. This study, being coordinated by the Department of Labor's Bureau of Labor Statistics, utilizes an interindustry table in tracing the flow of goods and services through the economic system from the producers of raw materials to final consumers.

The Bureau is carrying out that part of the study regarding mining industries. Thus far, estimates have been prepared of the value of materials, services, labor, and power purchased by mining companies and the distribution of mine output to the various consuming sectors of the economy in 1958, the latest year for which comprehensive data are available. At year's end, projections were being made for 1970 of the inputs of material, services, labor, and power that will be required for each unit of mined (and milled or concentrated) product, and also of the percentage distribution of that product.

Other important cooperative work with Federal agencies during the year included:

*For the Department of Justice:* Examination of a tungsten mine in Thailand. The Bureau prepared a report for use in defense of litigation by a Thai company to recover damages for alleged breach of contract by the United States. Successful defense could save as much as \$2 million;

*For the Office of Civil Defense:* Guidance of necessary research and preparation of a report on techniques and equipment recommended for rescue of personnel from nuclear-bomb-damage areas;

*For the Army Research Office:* Assistance in selecting appropriate participants for a series of five unusual meetings on rapid excavation. Bureau staff members participated in all the meetings and also arranged for the presence of research personnel required for successful discussions of the subject;

*For the Department of the Navy:* Consulting services on a deep excavation project;

*For the Atomic Energy Commission:* Research on producing hyperpure uranium and beryllium, on metallurgical problems relating to materials used in nuclear weapons systems, on disposal of radioactive wastes, and on the use of nuclear explosives for mining and excavation, of nuclear process heat for gasifying bituminous coal, and of radioisotopes in secondary-petroleum-recovery operations.

Additional cooperative work with the AEC and certain other agencies is discussed under the heading "Mineral Resource Activities."

Under the Accelerated Public Works program, the Bureau of Mines is cooperating with the Commonwealth of Pennsylvania in a strip-mine rehabilitation experiment. Located entirely on State-owned mined-out coal lands in the Appalachian highlands, the project is providing badly needed jobs in an economically depressed area. It is also a realistic model—showing the Nation how land scarred in extracting valuable minerals can be reclaimed so soil erosion will be controlled and stream pollution minimized. In this way, too, areas of natural beauty will be restored to help supply growing demands for healthful outdoor recreation.

The Bureau also cooperated with many nongovernmental organizations in such scientific events as the 25th Joint Solid Fuels Conference of the American Institute of Mining, Metallurgical, and Petroleum Engineers and the American Society of Mechanical Engineers; the American Carbon Conference (sponsored by the Bureau and the American Carbon Committee); the Gordon Research Conference on Coal Science; the Sixth International Mineral Processing Congress; the International Peat Congress; and a meeting of the International Standards Organization.

In addition, the Bureau participated in functions of the National Science Foundation, in the Interior Committee for Research and Development, and in AGARD, the NATO-sponsored advisory group for research and development.

## MINERAL RESOURCE ACTIVITIES

The Bureau of Mines program for conserving and developing mineral resources requires more than research on extraction, processing, and utilization. Bureau personnel must also investigate specific resources, study operating methods and costs, and conduct economic research on various aspects of the mineral industries. Besides helping to guide the Bureau's own research, these activi-



A Bureau of Mines technician breaks samples of low-grade iron ore from a Michigan outcrop. The Bureau is seeking ways to concentrate these ores for commercial use.

ties provide technical services and information to other Federal, State, and local agencies, to industry, and to citizens.

### **Many Resources Inventoried**

Bureau resource investigations during fiscal 1963 encompassed a wide range of minerals in many parts of the Nation. Among typical projects were:

Investigations of beryllium deposits in the West and Northeast;

Cooperative studies of promising deposits of clay and other industrial minerals in California;

A study of coal deposits in Boulder and Weld Counties, Colo. Nearly completed at year's end, this project was designed to aid in selecting thermal-power plant sites contiguous to possible future coal mines.



Bureau personnel also undertook special projects for other agencies, including the U.S. Army Engineers, the Bureau of Reclamation, the Bonneville Power Administration, the Area Redevelopment Administration, and the Atomic Energy Commission.

### **Data on Old Oilfields Aid Search for New Reserves**

Growing energy requirements have reawakened interest in eastern oilfields, particularly the Appalachian fields. Many petroleum companies have engaged in deeper drilling in established fields in the hope of encountering additional reserves of petroleum and natural gas. In cooperation with industry and with State agencies, the Bureau is accumulating, coordinating, and publishing detailed data on old oilfields, State by State. A report on West Virginia oilfields discovered before 1940, recently issued, contains comprehensive petroleum data for 79 fields, including maps, discovery date, size, formations, crude oil analyses, reservoir content, and rock characteristics, and describes secondary-recovery methods. Such information is especially helpful to small independent companies and to individual operators who cannot afford libraries or record-searching services, enabling them to conduct knowledgeable investigations for recoverable reserves that remain in the older oilfields. An equally comprehensive report is being compiled on the older oilfields of Ohio.

### **Economic Research Reported**

Growth of the national economy and increased industrialization have stimulated demand for detailed economic analyses. Recent mineral economic studies by the Bureau have covered aluminum fabrication in the Pacific Northwest, secondary nonferrous metals in California and Nevada, rare-earth metals in Western States, and the Pacific Northwest steel industry.

### **River Basin Studies**

The Bureau also participated in continuing studies of the Missouri River Basin. Reservoir sites were investigated, water uses were analyzed, and conservation methods employed by the mineral industry in the southern part of the basin were described. A comprehensive evaluation was made of the mineral resources of the Missouri River Basin between Fort Peck and Fort Benton, Mont.

The Bureau has nearly completed laboratory research on methods of sealing canal linings—part of the Missouri River Basin program. On the basis of successful bench-scale tests, the Bureau of Reclamation is planning comprehensive tests on actual canals.

Mineral deposits on selected Indian reservations in the Missouri River Basin are being investigated to determine if they can be developed to provide remunerative employment. As a result of previously completed Bureau studies, private industry is considering exploiting leonardite (naturally oxidized lignite) on the Fort Berthold Reservation in North Dakota and other minerals on the Blackfeet, Rocky Boys, and Fort Belknap Reservations in Montana and on the Standing Rock Reservation in South Dakota. Preliminary mineral examinations were completed on the Cheyenne River Reservation and the Lower Brule-Crow Creek Reservation in South Dakota.

## ADMINISTRATIVE ACCOMPLISHMENTS

The Bureau of Mines Automatic Data Processing Plan, 1963, based on five special studies and encompassing a 5-year plan for ADP systems in research, statistics, economics, and general administration, was completed and submitted to the Department for consideration.

An Arizona company practices conservation techniques by using water leaching to recover low-grade copper minerals from the soil of this hillside, once part of an underground copper mine. The Bureau of Mines studies such techniques so that new knowledge can be disseminated throughout the industry.





Newell Terry, Director of Personnel for the Department of the Interior, presents the Department's Annual Safety Award for 1962 to Marling J. Ankeny, Director of the Bureau of Mines. The award is given to the Bureau with the greatest annual percentage improvement in its accident frequency rate.

### Patents Granted

During the year, 12 new patents were granted to the Department of the Interior on inventions by Bureau of Mines technologists. In addition to methods for recovering zinc from scrap alloys, for recovering beryllium minerals from low-grade ores, and for making high-purity titanium, these patents covered a method for producing zirconium diboride, a high-temperature electrostatic precipitator, an apparatus for studying phase relationships of gases and gas mixtures, and a method for tracing the flow of reservoir fluids in which the tracer substances used are made radioactive after being injected underground, thus minimizing radiation-exposure hazards. Scores of inquiries were received from the public on the radioactive-tracer technique alone.



## **Manpower Utilization Enhanced**

The Bureau of Mines Manpower and Fund Utilization Committee was established to review Bureau activities relating to staffing, management controls, and work measurement. The purpose was to focus special attention on obtaining the most effective manpower and fund utilization.

## **MOTION PICTURES**

### **12 Films Break Previous Showing Records**

The industry-sponsored motion-picture program of the Bureau retained its nationwide popularity throughout the year. Approximately 4,250 prints were in circulation during fiscal 1963. They were shown more than 196,000 times to audiences totaling nearly 10 million, in addition to a reported television audience of almost 5 million. The year's most popular production was "California and Its Natural Resources," with films on uranium, the natural resources of Alaska, copper, and sulfur following in that order. Twelve films attained record high showings for the year.

One new film, "The World of Phosphorus," was completed during the year, but too late for circulation in fiscal 1963. However, prints were expected to be available for loan early in fiscal 1964.

### **International Prizewinner**

After winning first prize at the Columbus, Ohio, Film Festival, the Bureau's recent production, "Copper, The Oldest Modern Metal," went on to win first prize as the best film on chemistry in the Seventh International Exhibit of Scientific Films at the Venice Film Festival, Italy, for 1962. In the 13th International Exhibit of Documentary Films of the Venice festival, it received a Special Award of Honor.

### **New Films in Production**

In addition to the motion picture on phosphorus, six other informational films telling the story of the U.S. mineral heritage and potential were in various stages of production during the year. The subjects of these 16-mm motion pictures, all sponsored by private industry and produced under Bureau supervision, include cast iron, potash, coal, helium, synthetic rubber from petroleum, and the natural resources of Washington State.



A Bureau of Mines technician uses portable equipment to block off a mine passage with waterproof, fire-resistant rigid foam. Developed by the Bureau last year, the plastic foam has recently proved its usefulness in such applications as mine-water control and firefighting.

## PUBLIC REPORTS

In fiscal year 1963, Bureau scientists and engineers wrote 753 technical manuscripts describing research in metallurgy, mining methods, health and safety, explosives, and other subjects concerned with conservation and development of minerals and with health and safety in the mineral and allied industries. Of these, 281 were articles for scientific journals, technical societies, and similar organizations.

## HEALTH AND SAFETY ACTIVITIES

Investigative, research, and educational programs in the health and safety field were again intensified during fiscal 1963 to keep pace with changing practices and methods in the mineral industries.

Field investigations were completed in the 2-year study of working conditions in metal and other noncoal mines required by Public Law 87-300, and the Bureau submitted data to the Secretary of the Interior's Mine Safety Study Board for its use in preparing the final report.

Further improvements were made in techniques for generating and applying rigid urethane foam, a substance that already is finding many important uses in mining. Other research continued on mine ventilation, on prevention of dust explosions, and on monitoring the concentration of combustible methane gas in underground mine atmospheres.

### **Primary Hazards Attacked**

An important research achievement promises a reliable method for forecasting failures of pillars, roofs, and ribs in mines subject to bumps and rock bursts. Bureau engineers designed encapsulated hydraulic-load cells that can be inserted in specially drilled holes in coal or rock that is under strain. Once in place, the cells monitor significant pressure changes on remotely located gages, giving sufficient advance warning of danger to permit precautionary action. Tests of the cells in several operating coal mines troubled with bumps and bursts were highly encouraging.

Studies of roof failures continued. At several operating coal mines gas pressures were measured within the roof strata in an effort to correlate high pressures with high failure rates. A hydraulically operated pressure-indicating apparatus with multiple packing rings was designed and constructed by Bureau technicians



to measure gas pressures simultaneously at 1-foot intervals in a 14-foot borehole.

Encouraging progress also was made in detecting hidden fractures and inconsistencies in mine-roof strata using a compact, portable, transistorized sonar device. A treacherous coal mine roof was stabilized by injecting polyester resins to consolidate weak areas surrounding strata separations, fractures, and other voids. A similar project in a metal mine was undertaken to consolidate massive, fractured, metamorphic rocks.

### **Rigid Foam Improved**

New chemical formulations, spraying equipment, and application techniques were developed for safer and more effective use of rigid foams in mines. These foams expand when sprayed and "cure" within seconds, providing a tough cellular coating that adheres strongly to most mine surfaces, has low heat conductivity, and is highly resistant to the passage of air and water vapor. Thus, it is an effective aid to ventilation, prevents corrosion of metals, provides thermal insulation, and can be used for rapid construction of mine seals and non-load-bearing walls.

Comprehensive tests during the year provided assurances that the foam as now formulated has good flame-retarding qualities and that its toxic properties can be controlled. Chemicals and equipment developed in rigid foam research have now been adopted by industrial manufacturers, and Bureau-recommended systems for applying and using this remarkable material have been adopted in numerous coal and noncoal mines in the United States and foreign countries.

In a continuing cooperative study of mine air conditioning at a western copper mine, tests were begun to determine the insulating effectiveness of rigid foam applied to mine surfaces. Ventilation surveys were conducted in eight coal mines and one noncoal mine. The Bureau's fluid network analyzer (a special-purpose analog computer) was used to help plan major changes in the primary ventilation systems of four coal mines.

### **Methane-Monitoring Progress**

Two prototype detectors for monitoring underground concentrations of the combustible gas, methane, were tested in an operating coal mine. Results proved valuable in helping prepare specifications for five commercial methane-monitoring systems that will use different amplifying circuits to signal increases in methane concentration detected by gas-sensing elements called pellements. Another Bureau-developed detector operated successfully in con-

trolled laboratory tests and field tests were scheduled. Continuous methane recorders performed satisfactorily for several months during a Bureau experiment in draining methane from a coal mine in advance of mining.

### **Commercial Mining Equipment Tested**

Improvements and innovations in mechanized mining equipment continued to require the Bureau's technical services and testing facilities to determine permissibility or acceptability of many types of machines. During the year permissibility approvals were issued for 85 electric-powered machines and devices and for 16 diesel-powered machines, all of which had been tested rigorously by the Bureau and found safe for underground use. Explosion-proof certifications were issued for 45 electrical enclosures and 2 diesel-powered units.

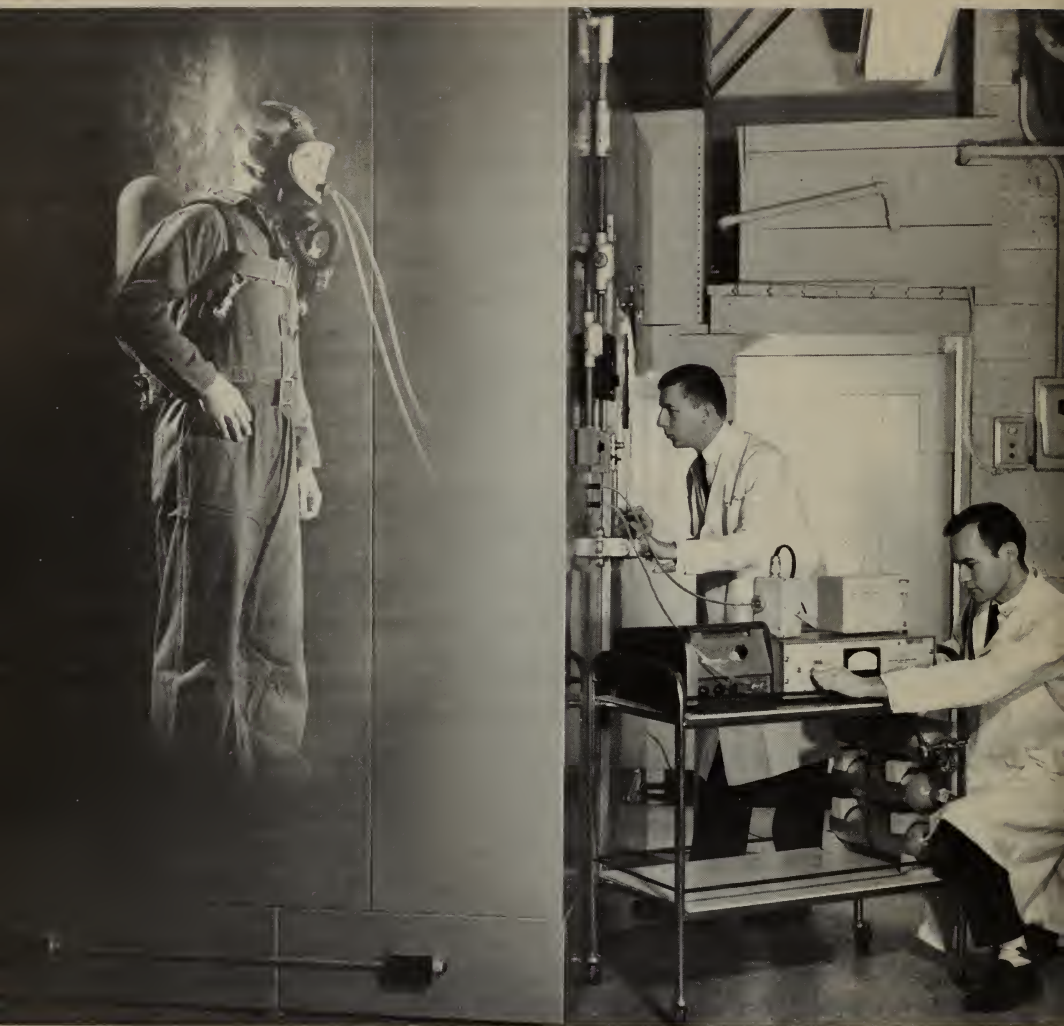
Hundreds of other approvals and certifications were extended during the year, and the Bureau conducted thousands of tests of equipment in explosive mixtures of natural gas and air. Other mining equipment and accessories tested for approval included conveyor belts, electric cables, roof drills with integral dust-collecting systems, and respiratory-protective devices.

### **Health Studies Center on Dust Problems**

A study of dust generation by mining equipment, in which different types of continuous-mining machines working in several coalbeds were observed, showed a need for continuing research on more effective dust control. Research on respiratory-protective devices were aided by the acquisition of improved and novel testing facilities, designed by Bureau scientists. Among these new facilities is a unique gas chamber where extreme changes in temperature and humidity can be made, thus making it possible to study physiological changes in simulated mine atmospheres.

### **Fire-Control Research Combats Pollution**

An experiment to determine the effectiveness of saturation sprinkling in controlling a burning mine-refuse dump was begun during the year at an active coal-mining property in Westmoreland County, Pa. The Department of Health, Education, and Welfare, the Commonwealth of Pennsylvania, and mine management are cooperating in the project, which will also be aimed at developing methods for abating air pollution caused by culm-bank fires, and controlling the acidity of water that runs off the pile after sprinkling.



Temperature and humidity extremes often found in deep mines can be simulated in this Bureau of Mines test chamber, built to evaluate respiratory-protective devices. This composite view shows a test in progress, with scientists studying the man's physiological reactions by analyzing samples of his breath.

### **Silicosis Problem Studied**

Data collected during 1958-61 in joint field studies by the Bureau of Mines and the Public Health Service to evaluate the silicosis problem in underground metal mines were analyzed during the year. Investigations were conducted in 67 representative underground metal mines and included physical examinations by the





Under the direction of the Bureau of Mines, a protective trench is being dug between these Pennsylvania homes and a fire in an abandoned coal mine. More than 30 such projects have been carried out in recent years under a cooperative agreement between the Department and the Commonwealth of Pennsylvania.

Public Health Service of approximately 15,000 workers. A joint report on the findings neared completion at the end of the year.

Investigations and inspections also continued in uranium mines, under Public Law 87-300, to evaluate health and safety hazards with particular attention to exposure of workers to radiation hazards. More than 200 inspections were conducted in underground uranium mines.

Bureau of Mines competency in research on mine and tunnel ventilation, mine gases, and internal combustion engines—based on experience dating back to the 1920's—was utilized in consultations held with representatives of the Bureau of Public Roads, Department of Commerce, to aid that agency in designing a proposed vehicular tunnel at Loveland Pass, Colo. More than 11,000 feet above sea level, it will be at a higher altitude than any other known vehicular tunnel; hence the danger from carbon monoxide in engine exhausts is enhanced, and more effective ventilation is required.

### **Fires Controlled in Inactive Coal Deposits**

During fiscal 1963, eight fire-control projects were completed—one on the public domain, two on Indian land, and five on private property. Work on three of these fires was begun earlier. At year's end work was in progress to control or extinguish six other fires—one on the public domain, one on Indian land, and four on private property.

Under Bureau guidance, 115 fires in inactive coal deposits have been extinguished or controlled since 1949, when funds were first appropriated for this purpose. Of these fires, 62 were on the public domain, Indian lands, or other properties where federally owned coal was threatened, and 53 were on private property, mostly in residential areas. This program has conserved an estimated 350 million tons of coal, about three-fourths of which is federally owned.

### **Safety Education Forwarded**

More than 5,200 mineral-industry workmen and officials completed training in the Bureau's various accident-prevention courses during the year. Continued emphasis on the nontechnical, psychological approach to accident-prevention training won outstanding endorsement from metal- and non-metal-mining industries, as well as from the coal-mining industry. At several operations 100 percent participation of the supervisors and workmen was attained. Workers completing Bureau of Mines first-aid and mine-rescue training during the year totaled 27,000.

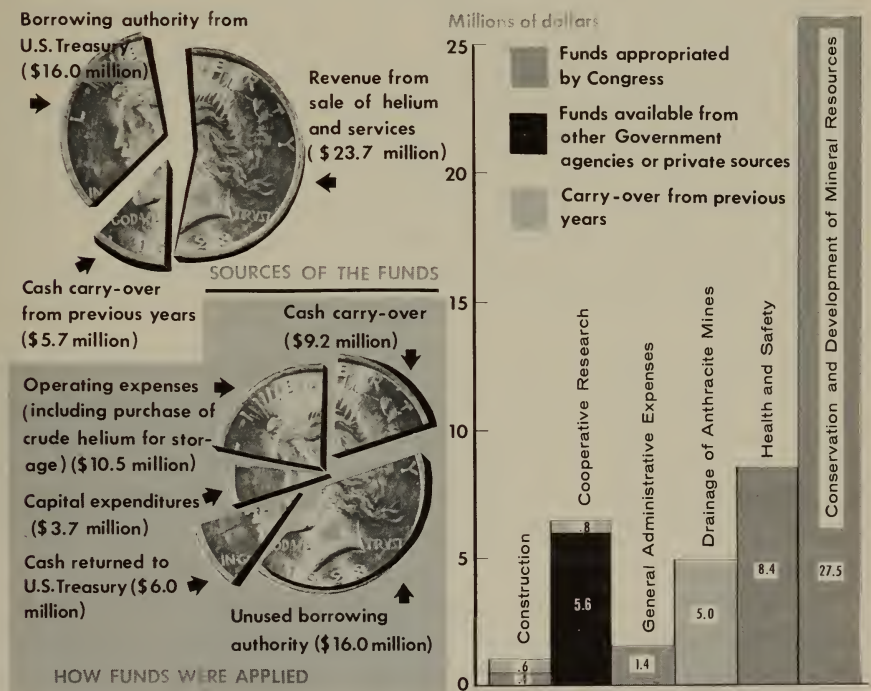
Motion pictures were produced during the year, as were numerous slides, posters, and other visual aids to safety training. Films in the Bureau's safety series were viewed by more than 70,000 mineral-industry workmen, and lecture demonstrations of fire, explosion, and mine-gas hazards were attended by approximately 60,000.

The Bureau continued leadership in the Holmes Safety Association by sponsoring 683 chapter and council meetings, at which total attendance exceeded 26,000.

### Safety Contest Sponsorship Extended

Participation increased in each of seven annual nationwide safety competitions conducted by the Bureau for the mineral-extractive industries. Nearly 2,000 mines, quarries, and other mineral-industry operations were enrolled.

The American Mining Congress became a cosponsor with the Bureau of the 38-year-old National Safety Competition. A new contest, sponsored jointly with the National Limestone Institute, was begun during fiscal 1963.



HELIUM ACTIVITY FUNDS  
 TOTALED \$45.4 MILLION  
 IN FISCAL 1963  
 (None appropriated directly by Congress)

OTHER FUNDS AVAILABLE  
 TO THE BUREAU OF MINES IN FISCAL 1963  
 \$49.7 MILLION



Periodic industrywide reports on injury experience in the various mineral industries were issued during the year. Injury and employment data for 1962 were collected from coal, metal, non-metal, stone, and sand and gravel producers on a mandatory basis, and were submitted voluntarily by members of the oil and gas, coke, peat, and slag industries.

### **Coal Mine Inspection Accomplishments**

Fiscal 1963 marked the completion of almost 11 years of Federal coal mine inspection work authorized by the Federal Coal Mine Safety Act, which empowers Federal inspectors to inspect coal mines, report on hazards, recommend correction, and—in mines regularly employing more than 14 workers underground—enforce specific (title II) provisions designed to prevent major disasters.

During the year, 2,473 routine inspections were made of coal mines subject to title II. In addition, numerous followup inspections were made to determine whether previously cited violations of the mandatory provisions had been corrected.

Federal inspectors observed 7,874 violations of the mandatory safety provisions, many of which were corrected immediately and thus required no formal action. They issued 1,098 notices giving reasonable time to correct hazards, 150 granting time extensions, and 1,070 certifying that the dangers had been totally abated.

During the year, 102 orders were issued requiring withdrawal of men from all or part of 65 mines—76 orders at 52 mines because of imminent danger, and 26 at 13 mines because of failure to abate violations within a reasonable time. By comparison, 117 withdrawal orders were issued at 64 mines during fiscal year 1962.

Nine mines, previously considered nongassy, were reclassified as gassy.

More than 10,000 routine inspections were made of smaller title I mines (including 1,226 inspections at strip mines and 221 at auger mines); also conducted were numerous electrical, ventilation, dust, blasting, and related surveys, and investigations of all fatal accidents and of others resulting in severe injuries, mine fires, gas and dust ignitions, and miscellaneous hazardous conditions.

Preliminary reports show 287 coal mine fatalities in calendar year 1962, compared with 294 in calendar year 1961. Despite the drop in number of deaths, the fatality-frequency rate per million man-hours of exposure increased slightly, from 1.21 in 1961 to 1.22 in 1962. Two major coal mine disasters (five or more persons

killed) occurred in fiscal year 1963. Both were explosions. One, in Pennsylvania, killed 37. The other, in West Virginia, killed 22.

In response to President Kennedy's concern over these two major coal mine disasters, the Secretary of the Interior organized a special task force to determine what additional measures can be taken to provide increased assurance against such disasters and their attendant loss of life. The Bureau worked closely with the task force, which had nearly completed its study by the end of June.



# Office of Oil and Gas

Jerome J. O'Brien, Director

The Office of Oil and Gas has primary responsibility for providing leadership and information on petroleum and natural and manufactured gas to Government agencies. Concurrently, it maintains liaison with those advisory committees established as channels of communication to obtain advice and information, as needed, from the petroleum and gas industries.

## **Planning for Emergencies Occupied Staff**

Planning to assure a state of readiness for any national emergency is a continuing assignment from the Secretary of the Interior.

Leadership of the Office in emergency preparedness was tested when a strict quarantine on the shipment of offensive military equipment to Cuba, aimed at halting development of Soviet nuclear missile bases there, was announced October 22, 1962, by the President. In support of the President, a stepup of readiness actions was put into effect to cope with possible oil- and gas-supply problems. A small group of Office of Oil and Gas employees was relocated to a special site with authority to exercise operational control over oil and gas supply, if necessary; Executive Reservists in the Petroleum and Gas Unit were alerted to be available for emergency service on short notice, and the remaining staff on duty in the Washington office prepared for possible establishment of an Emergency Petroleum and Gas Administration. Oil supply did not become a problem, but the United States was more adequately prepared to meet defense requirements than at any time in the past.

Recruitment and training of the Petroleum and Gas Executive Reserve has continued since the Interior Executive Reserve pro-



gram was authorized in August 1956. At the close of the fiscal year, 117 individuals from oil and gas companies were designated Executive Reservists. Each reservist is qualified to participate in an executive capacity in the EPGA, which would be activated in a national emergency.

During the fiscal year, these reservists attended the third national training conference sponsored by the Office of Emergency Planning. Part of the session was devoted to a briefing by the Office of Oil and Gas on their role in the oil and gas emergency program. In December 1962, about 60 members of the Petroleum and Gas Executive Reserve from all parts of the country participated in a 3-day intensive training exercise conducted by the Office of Oil and Gas, at Battle Creek, Mich. A workshop was held involving the development of oil- and gas-supply requirements estimates based on damage factors used in a civil-military defense exercise. Reservists also were told about the possible impact of a nuclear attack on the country, its effect on oil and gas operations, and the nature of their duties following an attack.

Guidance was provided by the staff in Washington and by regional mobilization representatives to State officials and company personnel in developing and testing plans for protecting their employees and facilities in a national emergency.

### **Other Defense Planning Accelerated**

Besides work aimed at developing and staffing a standby Emergency Petroleum and Gas Administration, the Office is responsible for developing worldwide studies of petroleum and gas supply and demand under peacetime and emergency conditions.

In December 1962, the Office completed a study of the probable effect of a nuclear war upon the petroleum capabilities of the free world. This was requested by the Office of Emergency Planning and the Department of Defense. A supplemental analysis of petroleum supply and demand by U.S. regions and an evaluation of the transportation capabilities for movement of crude oil and petroleum products also were prepared.

Reports on nine other studies required by the Department of Defense in its defense planning were made by the Office. These concerned the ability of U.S. refineries to produce new fuels for military use or fuels having changed specifications. Additional reports concerned special foreign petroleum-supply problems.

With staff support from the Office of Oil and Gas, the Assistant Secretary—Mineral Resources was chairman of the U.S. Delegation for several international organizations regarding energy, including petroleum.

## **Government-Industry Understanding of Petroleum Problems Sought**

The Office of Oil and Gas relies on advice and cooperation from the petroleum and gas industries.

The National Petroleum Council, established 17 years ago to provide advice and counsel on petroleum and gas matters of national importance, completed four reports during fiscal 1963. Through the Council's work, the Federal Government had for the first time a consolidated report of factual information on the effects on the free world of the oil exports from the Soviet bloc, together with conclusions of the oil industry. Also, for the first time, the NPC reported on its survey of 86 chemicals produced by the petroleum and natural gas industries. Another report covered the status of domestic facilities for carrying natural gas and the movement of crude oil and petroleum products, by pipelines, barges, tank cars, and tank trucks. One report contained data on usable and nonusable oil inventories as related to petroleum storage capacity. The Office of Oil and Gas provided Government cochairmen for each of the NPC committees preparing these reports.

The Petroleum Security Subcommittee of the Foreign Petroleum Supply Committee gave technical advice to the Office in preparing some of the worldwide defense studies. This subcommittee was established early in 1962 to meet the need of U.S. defense agencies for information on petroleum requirement potentials of specific national security programs and for technical assistance in evaluating petroleum resources available to support such plans and programs.

In October 1962, a U.S. petroleum industry advisory committee was established to assure that information available to the U.S. oil industry was brought to bear on oil problems of the Organization for Economic Cooperation and Development. U.S. petroleum companies with international operations have representation on the Committee. They are appointed by the Assistant Secretary—Mineral Resources, who is chairman. The Office of Oil and Gas gave staff assistance. Committeemen were consulted on material contributed by the Office of Oil and Gas in drafting sections of an OECD report on oil.

The Secretary of the Interior approved the establishment of an Emergency Advisory Committee for Natural Gas to study and make recommendations which will assure an adequate supply of gas in a national emergency. The Committee, composed of 29 gas company officials, was appointed in November 1962.

Liaison with the oil-producing States is conducted through the Interstate Oil Compact Commission, the established forum for interstate cooperation to conserve oil and gas. The Assistant Secretary—Mineral Resources, or his alternate, who is the Director of the Office of Oil and Gas, participate in the IOCC meetings.

At the request of the Department of State, the Office of Oil and Gas prepared oil- and gas-supply and demand data as reference material for discussions between the United States and the United Kingdom.





# Office of Coal Research

S. G. Lasky, Acting Director

The goal of the Office of Coal Research is to expand the use of coal—to the end that more coal is mined, more coal is sold, more miners and coal workers are restored to jobs and coal-mining communities are restored to health, and that coal makes its optimum contribution to the Nation's welfare.

The Office of Coal Research continued in fiscal 1963 to seek this goal through contract research with competent and recognized groups, including trade associations, research organizations, educational institutions, and agencies of States and political subdivisions of States, and by the encouragement of others to do similar research. OCR's present and contemplated contractors include the elite of American research capabilities, many of whom are, for the first time, turning their resources and energies to the problems of coal. The results of contract effort are made available to the public as promptly as possible, in the form of contractor's reports and presentation of scientific and technical papers at professional meetings and in the general and scientific press.

A General Technical Advisory Committee consisting of 20 leaders from the coal and associated industries, including the railroads and electric utilities, and from educational institutions advises the Secretary of the Interior and the Office of Coal Research on the development and direction of the program. Advice on individual projects is obtained both from this general committee and from recognized experts who assist the Office on strictly technical matters.

## 1963 RESEARCH PROGRAM

Seven contracts were in effect at the start of fiscal 1963. Six additional contracts were executed during the year and one was

completed—leaving 12 contracts still active at year's end. The nature of the research, and the progress made, follow:

### **Continuing Contracts From Fiscal 1962**

*Bituminous Coal Research, Inc.*—Grinding and classifying equipment were installed and experiments were conducted to determine methods and costs of grinding a variety of coals to the fineness of flour, or talcum powder, for greater ease in pipeline transport, ash removal, and convenience of utilization. The experimental work is still under way and results are being analyzed.

*FMC Corp.*—Laboratory research to date has indicated that the goal of 80 gallons of usable liquids per ton of coal, plus usable solid fuel and gas having a high Btu value, may be produced. Further work is needed to determine economic feasibility.

*General Electric Co.*—The initial part of this project for converting coal into liquid and gaseous fuels by electrical discharges was substantially completed. Work was proceeding on the design of larger equipment that will obtain data required for an eventual scaleup to a design of pilot-plant operation. The results thus far indicate a potentially commercial process.

*Georgia Institute of Technology.*—This contract was completed. Indications are that very short-time high-temperature treatment of coal does not produce significant yields of useful products. Nevertheless, the resulting information will be useful in guiding research on other conversion processes.

*The Ralph M. Parsons Co.*—The first phase of this contract, evaluation of a new process for producing gasoline from coal, was completed. Results indicate a price about one-half that of any previous coal-to-gasoline process. Negotiations with another contractor for constructing and operating a pilot plant were nearing completion.

*Pope, Evans & Robbins.*—Preliminary designs for a new, automated, completely integrated, coal-fired industrial heating plant for factories, apartments, and other large buildings were completed. Certain engineers believe that plants of this design can be built at two-thirds the cost of conventional coal equipment of equivalent capacity and that the new design can be shop constructed, rather than field erected, for capacities about three times the capacity of available "packaged" units.

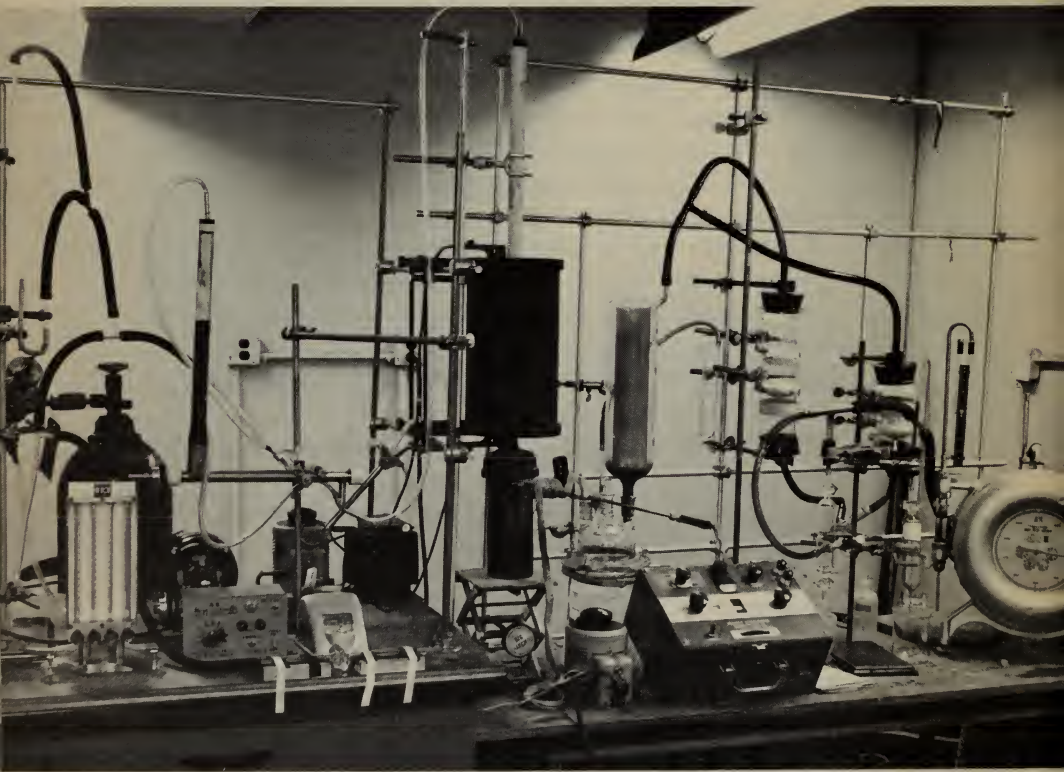
*Virginia Polytechnic Institute.*—The contractor has developed preliminary mathematical formulas and models that permit computer simulation of underground coal-production operations with a high degree of accuracy. Observers believe that this work, when

completed in fiscal 1964, will be useful in reducing the cost of mining coal and improving the accuracy and usability of mining engineering technology.

### New Contracts in Fiscal 1963

*Montana State College.*—This project is determining the yield and composition of liquid and gaseous products obtained from carbonizing a variety of coals. The equipment used is of a unique type designed and built at Montana State College. This contract supports continuing work that could lead to extraction of valuable byproducts from western coals.

*Robert R. Nathan Associates.*—The contractor had nearly completed a study of the worldwide export potential for U.S. coal and the identification of impediments to the full achievement of that potential. The report will recommend Government and industry actions helpful in expanding coal exports and will include detailed studies of potentially attractive foreign markets.



This coal-pyrolysis reactor, used in research, operates at temperatures up to 2200° F with residence times of 100 milliseconds.



*Spencer Chemical Co.*—The contractor is conducting bench-scale and pilot-plant scale experiments to determine the feasibility of upgrading coal by dissolving the coal, separating the various constituents (including ash), and then reconstituting the solids. Among the objectives are the preparation of a coal free of ash and low in sulfur and one than can be transported readily in a finely divided state, and also the recovery of useful minerals from the ash and other impurities. Bench-scale work has shown that the ash content can be reduced to approximately 0.1 percent at commercially attractive prices. Equipment is being constructed to validate the data on a larger scale.

*University of Utah.*—This project, cosponsored by the State of Utah, is determining the economic yield of gases, liquid fuels, and chemicals from a wide variety of western coals. Among the reactions to be investigated are electric arc and flash photolysis. This work could be the basis for adapting various coal-conversion processes to western coals.

*West Virginia University.*—The contractor is determining and evaluating the economics and methods of mining and recovering metals, minerals, and other byproducts contained in coals or located in strata immediately adjacent to the coal seam. Several such materials were tentatively assessed as being commercially exploitable.

*Westinghouse Electric Co.*—This contract is concerned with developing a fuel cell operating on coal or a coal-derived gas. Bench-scale experimental work, if successful, will lead to construction and operation of a unit capable of powering a 100-watt light bulb, and eventually to the construction of a commercial prototype 1,000 times larger.

## SMALL STAFF COORDINATES PROGRAM

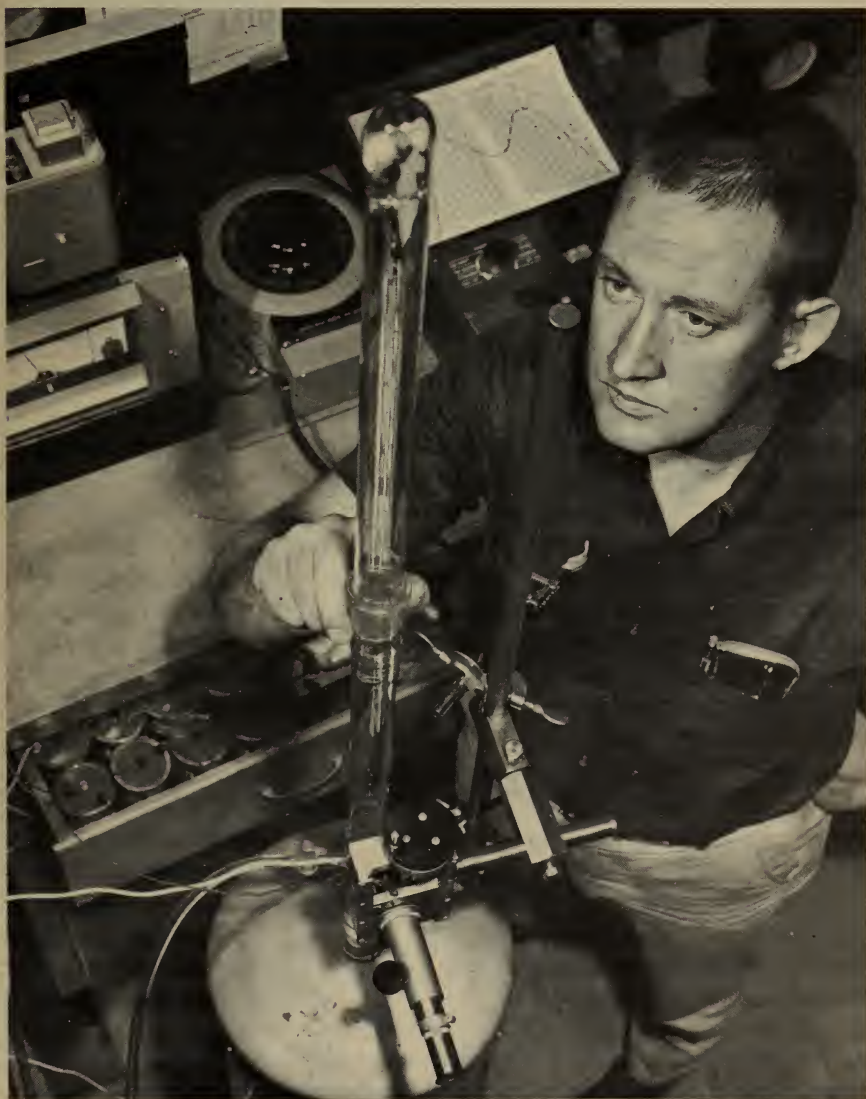
The Office of Coal Research program is directed toward commercialization of results—of benefit to large and small coal producers alike. Under the guidance of Congress, the Office recognizes the potential importance of coal in the American energy market. The program now in effect is administered and controlled with a staff of less than 25 persons. Despite the relatively uncertain nature of research and development work, it appears that some of OCR's present contracts will succeed in achieving breakthroughs



This experimental 4-inch diameter rotating-disc corona reactor is used for conversion of coal to liquids and gases.

of significance to the future of the coal industry and the U.S. economy. Future plans include economic, marketing, and transportation studies to help coal find its full place in the economy, studies to bolster its position in existing combustion markets, and, through projects to determine the true nature of coal, to develop new products and new markets not dreamed of today.

A quartz-spring balance is used to determine time-weight loss characteristics of a coal-catalyst mixture being reduced in a hydrogen atmosphere.









# Office of Minerals Exploration

George Fumich, Jr., Director

Revived interest by the mining industry seeking new sources of gold and silver made fiscal 1963 another record-breaking year for the assistance program of the Office of Minerals Exploration. Eighteen new contracts were executed authorizing \$1,635,605 in exploration work. Mercury, molybdenum, and iron ore also figured in the 1963 contracts.

With the certification of possible production on one more OME project, the number certified stood at three and the value of recoverable minerals in the inferred ore reserves found on these projects was estimated at \$15 million. This value was more than four times the total of \$3,700,000 committed to the OME since its beginning in 1958.

Royalty payments during the year on production from the former Defense Minerals Exploration Administration (DMEA) and OME exploration projects were \$284,067.

Stabilization payments totaling \$1,417,702.89 were made to 71 small domestic producers of lead and zinc who qualified under Public Law 87-347.

## PROGRAM FUNCTIONS

The OME is presently responsible for two programs—one for exploration assistance, the other for lead and zinc mining stabilization.

### **Exploration Assistance**

Financial assistance is provided private industry under Public Law 85-701 to encourage exploration for domestic mineral reserves, except organic fuels. The OME contracts with qualified

applicants to explore for one or more of the 35 eligible mineral commodities. It pays one-half the cost of approved exploration work not exceeding \$250,000 on any single contract. The Government's share of the cost is repayable with interest by a royalty of 5 percent on production from the property. If there is no production, no repayment is required.

The OME also administers projects with royalty obligations remaining from a similar program conducted by the Department's former Defense Minerals Exploration Administration, under the Defense Production Act of 1950, as amended.

### Lead and Zinc Stabilization

Under the lead and zinc mining stabilization program authorized by Public Law 87-347, qualified small domestic producers of lead and zinc may receive stabilization payments on their production of each metal up to specified tonnages and within the total amount authorized by the act for each calendar year 1962 through 1965. Responsibility for operating this program has been delegated to the General Services Administration.

## OME OPERATIONS

During fiscal 1963, OME received 57 applications requesting financial assistance for exploration estimated to cost \$6,384,695. These brought the totals for the program to 317 applications received proposing projects in 28 States to explore for 31 minerals and estimated to cost \$28,672,810. Actions taken on these applications are shown in the following tables:

*Disposition of OME applications*

Action	Number	
	Fiscal year 1963	Program total
Received.....	57	317
Denied.....	30	128
Withdrawn.....	28	95
Contracts executed.....	18	69
Pending on June 30, 1963.....	25	-----

Of the 18 contracts executed during the year, 10 were for gold, 4 for silver, 1 for iron ore, 1 for molybdenum, and 2 for mercury.



Program totals are now 69 contracts for 13 mineral commodities in 18 States. Details of contract actions are summarized in the following tables:

*Summary of the OME program*

Contracts	Fiscal 1963			Program through June 30, 1963				
	Number	Total cost	Government participation	Number	Total cost	Government participation		
						Approved	Spent	Repaid
Executed, as amended.....	18	\$1, 635, 605	\$817, 802	69	\$4, 438, 691	\$2, 219, 345	\$763, 488	\$34, 196
Certified as possible production.....	1	48, 186	24, 093	3	95, 486	47, 743	31, 683	10
Terminated, not certified.....	7	548, 465	274, 233	23	966, 345	483, 172	210, 542	99
Canceled.....	2	129, 260	64, 630	7	328, 370	164, 185		
In force as of June 30, 1963.....				36	3, 048, 490	1, 524, 245	521, 263	34, 087

## DMEA OPERATIONS

Obligations to pay royalty on production were outstanding on 293 DMEA projects at the close of the year. The royalty obligation was removed on 73 projects during the year, including 3 which completed repayment of the Government's share. A total of 74 projects had completed repayment by the end of the year. Royalty payments for the year were \$263,736, bringing the total for the DMEA program to \$4,587,351.

*Summary of DMEA contract data*

Contracts	Number	Total cost	Government participation		
			Approved	Spent	Repaid
Executed, as amended.....	1, 159	\$56, 770, 493	\$34, 805, 244	\$23, 346, 029	\$4, 587, 351
Certified as discoveries.....	399	30, 347, 376	18, 634, 520	14, 941, 006	4, 391, 617
Terminated, not certified.....	677	24, 177, 658	14, 802, 234	8, 405, 023	195, 784
Canceled.....	83	2, 245, 459	1, 368, 490		

## LEAD AND ZINC STABILIZATION OPERATIONS

During the year, 121 applications for participation in the Lead and Zinc Stabilization Program were received from 13 States. Of these, 60 were certified as eligible for payments on calendar year 1962 production and 96 for payments on calendar year 1963

through 1965 production. Payments were made to 55 participants on 1962 production and to 56 on 1963 production. The following table shows the activity under this program to date:

*Summary of the lead and zinc stabilization program, June 30, 1963*

Calendar year	Maximum eligible tonnage			Production (tons)			Payments		
	Lead	Zinc	Com- bined	Lead	Zinc	Com- bined	Lead	Zinc	Total
1962 (12 months)-----	19, 413	24, 994	44, 407	8, 241	12, 910	21, 151	\$602, 010	\$410, 571	\$1, 012, 581
1963 (6 months)-----	24, 699	31, 565	56, 264	3, 170	6, 452	9, 622	192, 219	212, 903	405, 122
Total-----	44, 112	56, 559	100, 671	11, 411	19, 362	30, 773	794, 229	623, 474	1, 417, 703



# Office of Minerals and Solid Fuels

William E. S. Flory, Director

The Office of Minerals and Solid Fuels is responsible for planning and programming to assure an adequate supply of minerals and solid fuels for essential civilian and military requirements in a defense emergency. The Office also provides advice and staff assistance to the Secretary on policy matters affecting the minerals and solid fuels industries. During fiscal 1963, mobilization base studies, supply studies, and other special evaluations were made on minerals and solid fuels which presented problems of concern to the Department.

The Office represented the Department on the Interdepartmental Materials Advisory Committee reviewing stockpile objectives and other problems regarding stockpiling. The Office also represented the Department on the Supplemental Stockpile Advisory Committee for Barter and its subcommittee on materials, and on the Interdepartmental Committee on the Soft Coal Industry.

Staff work was supplied the Department on metals and minerals export control matters for the Operating Committee of the Advisory Committee on Export Policy chaired by the Department of Commerce.

## **Stockpiling Studies Undertaken**

The OMSF likewise is responsible for formulating departmental recommendations on proposed disposals of metals and minerals from Government stockpiles and represented the Department in interagency consultations and in consultations with industry on disposal problems.

At year's end, supply studies were being made for 26 stockpiled materials for transmittal to the Office of Emergency Planning for



interagency review to determine the adequacy of existing stockpile objectives.

### **Supply-Requirements Data Provided**

Requirements of the minerals and solid fuels industries for controlled materials for maintenance, repair and operations, for construction and for manpower, under conventional wartime conditions were supplied to OEP for a national supply-requirements study being conducted by that agency.

### **Industry Evaluation Board Analyses Aided**

The OMSF worked on preparation and review of Industry Evaluation Board analyses of metals and minerals for which the Office is responsible. A new format for the presentation of pertinent information on certain categories of mineral raw materials was developed by the staff of OMSF for the Board.

### **Executive Reserve Program Continues**

The senior staff of OMSF and 19 of its Executive Reservists attended the National Defense Executive Reserve Conference, after which the Office conducted an indoctrination program for the OMSF reservists.

During the Cuban crisis, all the reservists in the minerals and solid fuels units of OMSF were alerted and instructed on the measures which would be put into effect should a defense emergency be declared.

### **Input Data Prepared**

The OMSF assembled and maintained basic input data on metals, minerals and solid fuels for use in computing machines for assessing surviving resources and industrial facilities in the event of an enemy attack. Input data for anthracite use was completed and data for byproduct and beehive coke were updated. A revision was underway for approximately 750 metals and minerals facilities.

### **Security Publications Issued**

To stimulate disaster preparedness and to control and maintain continuity of production of minerals and solid fuels and capacity for essential users in an emergency, two publications on industrial security were sent all major producing companies and associations.



## Office of Geography

Meredith F. Burrill, Director

More than 280,000 foreign names were processed according to policies of the Board on Geographic Names for standardization by the Board and the Secretary of the Interior and for publication in gazetteers of Brazil, Cuba, Sweden, Belgium, Laos, Cambodia, China, and North Korea.

In 1963 substantial progress was made toward international standardization of geographic names through consultations with the Permanent Committee on Geographical Names for British Official Use (London) and participation in the United Nations Technical Conference on the International Map of the World on the Millionth Scale (Bonn). Work progressed on a joint Board on Geographic Names-Survey of Kenya gazetter of Kenya. Romanization systems for Hebrew, Greek, and Amharic were reviewed and steps were taken to modify them with a view toward wider international use.

# Board on Geographic Names

Edward P. Cliff, Chairman

Meredith F. Burrill, Executive Secretary

In 1963 the Board and its standing committees took appropriate actions to establish or modify nomenclature policies and to standardize the foreign and domestic geographic names required by the Federal Government. Through its staffs it maintained inquiries services providing official names and names information and also provided related services to the general public.

An Advisory Committee on Undersea Features was established in 1963 to develop policies for standardizing ocean-bottom nomenclature and to recommend undersea feature names to the Board. The Board's Advisory Committees on Antarctic Names and on Arabic and Persian continued active in their special fields of interest.





# Oil Import Administration

J. Cordell Moore,  
Administrator

The Oil Import Administration was established in the Department as the result of a Presidential proclamation issued March 10, 1959.

In administering the oil import program, the Department seeks to insure a stable, healthy petroleum industry in the United States capable of exploring for and developing new domestic petroleum reserves necessary for the national security.

During the year, the Oil Import Administration received and processed over 6,200 reports from importing firms submitted in compliance with section 18 of the oil import regulations. It extracted and tabulated oil import data from these reports for statistical and administrative purposes. The Administration prepared 20 detailed documents, which were released to the public, showing oil import facts on an individual company basis by importing areas and including refinery and terminal "inputs" of crude oil and residual fuel oil, respectively. It also prepared and released semi-annual bulletins on total oil imports, listing the country of origin of all imports and the percentage ratio each exporting country shares in the U.S. oil import market.

In addition, the agency received, analyzed, and recorded 530 "exchange agreements" covering planned action by authorized crude oil importers to exchange foreign oil for domestic oil for processing in their own refineries. This type exchange is permitted by the oil import program subject to restrictions and provisions under the oil import regulations. Analyses of these exchange agreements are necessary to assure regulation compliance.

Under section 8 of the oil import regulations, the Administration prepared and forwarded 174 letters of authorization to collectors of customs granting approval for small quantities of foreign oil to enter without an import license. Authorization requests were received covering individual cases and were evaluated and acted upon on the basis of facts presented in each case.

The agency held one public hearing during the year in Los Angeles, Calif., concerning the oil import program for the west coast.

Under an invitation extended by the Chairman of the Oil Import Appeals Board, dated April 10, 1962, the Oil Import Administration submitted detailed written comments to the Board on 31 petitions for modifications of allocations which the Board had received.

During the year, the Oil Import Administration issued 1,575 licenses to eligible importers for importation of crude petroleum and its derivatives according to commodity type.

Prior to the close of the year, the Administrator announced overall oil import levels for the allocation period July 1, 1963, through December 31, 1963, and issued individual oil import allocations to 196 eligible importers for crude oil and finished products other than residual fuel oil to be used as fuel. For the allocation period April 1, 1963, through March 31, 1964, individual import allocations were issued to 52 eligible importers of residual fuel oil to be used as fuel.


The agency prepared and promulgated new oil import regulations and three amendments to the oil import regulations, and made changes in the broad policy of the existing Presidential proclamation which involved adjustments in the method of allocating crude oil, unfinished oils, and residual fuel oil to be used as fuel.

# Office of the Administrative Assistant Secretary

D. Otis Beasley, Administrative  
Assistant Secretary





A black and white photograph of the facade of the Department of the Interior building. The image shows a section of the building with three large, dark, rectangular windows on the upper level. Below the windows, the words "DEPARTMENT OF THE INTERIOR" are inscribed in large, bold, capital letters across the stone wall. At the bottom of the image, there are three doorways, each framed by a classical architectural surround. A set of wide stone steps leads up to the rightmost doorway, which is equipped with a simple metal handrail. The overall appearance is that of a grand, classical government building.

DEPARTMENT OF THE INTERIOR



# Office of the Administrative Assistant Secretary

D. Otis Beasley, Administrative  
Assistant Secretary

The Administrative Assistant Secretary directs seven staff divisions: Administrative Services, Budget, Management Research, Personnel Management, Property Management, Security, and Survey and Review.

## **Administrative Services**

During the year, the Division of Administrative Services provided staff guidance for all administrative services programs and activities of the Department, and operated these services for all units of the Department in the Washington metropolitan area. Operations continued to increase with expanded program activities of the Department.

The Central Library enlarged the volume of its holdings and services by more than 5 percent over 1962, established new procedures to expedite translations of foreign-language publications, selected six libraries to serve as official depositories (as defined in Public Law 579 of the 87th Cong.), installed rapid-copy facsimile reproduction equipment for better service, and assumed responsibility for compiling certain scientific information for the Federal Council of Science and Technology.

Installation of a multistation collator, plus improvement to other equipment, enabled the central duplicating plant to reduce delivery times and increase output without corresponding increases in personnel costs.

More than 2,100 Department employees in the Washington, D.C., metropolitan area received a total of 3,918 injections in the De-

Created by Act of Congress in 1849, the Department of the Interior is responsible for a wide variety of programs concerned with the intelligent management, sound conservation, and wise development of America's natural resources.

partment's first mass influenza inoculation program at a cost of 50 cents each.

### **Budget**

The Division of Budget continued to hold primary staff responsibility for budget activities of the Department.

Budget activities for the year included the processing of two regular budgets: one for the Bureau of Reclamation and power marketing agencies, and one for the other bureaus. In addition, supplemental budgets were written.

The Division developed procedures and revised presentation for budget review by the Secretary and Assistant Secretaries. This presentation provided a means whereby functional programs which cross bureau responsibilities were consolidated to allow for policy analysis and decision. It also provided for a clear presentation of long-range programming. The Division provided leadership and staff assistance to participating bureaus in the reporting aspects of the Accelerated Public Works program, as required by the Area Redevelopment Administration of the Department of Commerce.

### **Survey and Review**

The Office of Survey and Review was established during the year to strengthen management processes in the Department with special emphasis upon financial policies and methods, procedural modernization, auditing policies, contract review, and other potentially sensitive subjects. Creation of this Office was one of the most significant management improvements during the year. Through direct audit and analysis, this Office provided essential facts and professional advisory assistance to the secretariat. Complementing the audit and analysis responsibilities was an investigative division which provided usual administrative services as well as those investigations related to complaints of employee misconduct and serious irregularities.

The Office of Survey and Review also assumed responsibility for functions formerly identified with the Division of Inspection. They included establishment and enforcement of ethical standards for employee behavior and official operations. A departmentwide systematic inspection activity was administered for this purpose. The responsibilities also extended to developmental and compliance activities regarding Federal employment phases of the equal employment opportunity policy under Executive Order 10925, as amended. In applying this policy, the Department placed increased



emphasis on policy understanding and motivation at all levels of supervision. It is the Department's aim to promote affirmative application of equal opportunity concepts without neglecting fair and impartial prosecution of complaint actions.

### **Management Research**

The varied activities of the Division of Management Research during the past year were highlighted by new emphasis on its responsibility for staff supervision over automatic data-processing (ADP) activities of the bureaus and offices. A staff member, with assistance from bureau and office representatives, completed an inventory of the status of ADP development in the Department and analyzed and projected departmental requirements and goals. A special study also was made of the feasibility of creating a Natural Resources Data Center, and several proposed administrative and program ADP applications and developments were reviewed. As a result, a special central ADP coordinating and systems planning staff is to be established in the 1964 fiscal year to control and guide the accelerating departmentwide ADP program.

As part of its general responsibility for providing staff leadership in a continuing program of management improvement in bureau and office operations, the Division furnished a major portion of the staff support for the Department's role under the Government-wide manpower utilization program sponsored by the Bureau of the Budget. An important objective of this program is establishment of means to assess or measure the productivity and effectiveness of operations. The Division also conducted a special conference on the role of management analysts in manpower utilization.

Management analysts of the Division studied organizational, procedural, and other administrative management problems. Typical were: A study of the role and functions of the Office of the Science Adviser; a major reorganization of the Bureau of Mines; organization and management plans for the prospective Youth Conservation Corps; revision of civil defense and emergency mobilization plans; and a review of the regional office organization and staffing of the Bureau of Commercial Fisheries.

Staff supervision over the incentive awards and work improvement activities of the bureaus and offices was provided by the Branch of Incentive Awards. This included honor awards, as well as awards for suggestions and inventions, superior performance, and special acts or services.

## Personnel Management

The Division of Personnel Management maintained primary staff responsibility for the Department's policies and programs for establishing and maintaining a qualified and efficient working force. For the second consecutive year, a special team of recruiters visited 40 Negro colleges to interest promising young men in semiprofessional summer employment in the Department. The primary purpose was to encourage such persons to establish a career in conservation of the Nation's resources. Ninety-two summer jobs in several bureaus of the Department were filled by students from Negro colleges. These candidates had been recommended by officials of the colleges and were interviewed by a recruiter of the Department. College officials responded enthusiastically to this program.

Emphasis was given to implementing Executive Order 10988 on "Employee-Management Cooperation in the Federal Service." At the outset of the year, a pamphlet was issued embodying all the Department's instructions on the subject. This was for departmental use as well as for answering public inquiries regarding employee-management relations policies of the Department. Each employee received a pamphlet, "Facts About Employee-Management Relations." Copies were supplied, on request, to many Government agencies and employee unions.

Sixty employees completed the Department management training programs of 5 or 7 months' duration in Washington. The number of departmental employees participating in interagency training programs throughout the country increased along with departmental employees taking part in long-range programs including university-level training. In Washington, D.C., 104 employees completed foreign-language courses conducted by the staff of the George Washington University.

New reporting techniques and procedures were developed to refine Department analysis of accidents to people and to property and to identify the management problems involved. For the seventh consecutive year since the inception of the safety function under personnel management, the rate of disabling work injuries decreased.

## Property Management

The Department's contracting and procurement activities continued to stress a policy of advancing economic benefits to labor-surplus areas and to small business firms. The requirement for

bonding Property Accountability Officers was discontinued during the year, thus saving the cost of premiums.

During the year, personal property acquired at a cost of approximately \$675,000 was found surplus to Interior programs and was donated to public schools and hospitals through the Donable Property Program of the Department of Health, Education, and Welfare.

In accordance with a request from the Chairman, Committee on Government Operations, House of Representatives, a survey was conducted to determine the estimated current-day value of real property held by the Department in Idaho, Oregon, and Washington. Survey results will be used to determine the feasibility of a project to determine the estimated current-day value of real property holdings on a Government-wide basis.

During the year, approximately 50,000 cubic feet of records were disposed of, releasing space and filing equipment for other use. This was accomplished through the destruction of valueless records and the transfer to Federal records centers of inactive records of continuing value. Use of open-shelf filing instead of more expensive filing cabinets was expanded. Considerable progress was achieved in converting bureau radiotelephone equipment to "narrow-band" or "single-side-band" type of emission. This created significant economy in frequency spectrum space. The Division's communications engineer helped prepare the final U.S. proposals for the International Telecommunications Union Conference. This will allocate frequencies for space services.

Almost 400 radio frequency assignments were made for bureaus and offices.

### **Security**

The Division of Security was responsible for maintaining security throughout the Department and played a major part in coordinating the Department's defense activities. The Division also was concerned with departmental direction and coordination of a radiological defense training program and coordination under the Federal Disaster Act of 1950.



# Office of the Solicitor

Frank J. Barry, Solicitor

All the legal work of the Department of the Interior is performed under direction of the Solicitor. In discharging his duties the Solicitor is assisted by the Deputy Solicitor and a staff of attorneys in Washington, D.C., and in strategically located field offices.

During fiscal 1963, the number of matters considered in the Office of the Solicitor reached a new high. During the year, 159,611 items were disposed of and approximately 62,000 hours were spent in giving oral advice and attending meetings and conferences.

Because of an extremely high backlog of public land appeals which reached a peak of 798 cases on July 31, 1962, and mounting criticism over long delays in disposing of cases, substantial efforts were made to work out procedures which would help reduce the backlog of appeals. One of the steps was a delegation of authority to the Assistant Solicitor, Land Appeals, to sign decisions and to refer all land classification and similar discretionary cases to the Office of the Assistant Secretary for Public Land Management for direct disposal by letter decisions. The backlog of 792 cases at the beginning of the fiscal year was reduced to 624 cases at the close of the year.

The Division of Legislation, under the direction of the Legislative Counsel, is responsible for coordinating the preparation of all legislative materials of the Department, except appropriations, and the testimony of departmental witnesses before the various congressional committees. During the first 6 months of the 88th Congress the Office prepared reports on 418 bills and prepared 81 legislative proposals for submission to the Congress. Included among the new laws enacted during this period is the statute providing basic authority to the Secretary of the Interior for research, planning, and coordination with respect to Federal outdoor recreation activities.

The June 3, 1963, decision of the Supreme Court in *Arizona v. California* culminated an original action which has been pending since 1952, involving the rights of the States of Arizona, California, and Nevada and of the United States in the waters of the Lower Colorado River and its tributaries. The Court said that the Boulder Canyon Project Act (43 U.S.C., sec. 617 *et seq.*), embodies a comprehensive scheme for apportioning the mainstream waters of the Lower Colorado River among California, Arizona, and Nevada. The Secretary of the Interior is authorized to allocate mainstream waters among the States of the Lower Colorado River Basin and to determine which water users within each State shall receive water under the standards prescribed in section 5 of the Boulder Canyon Project Act (43 U.S.C., sec. 617d). The Court held that in any year when 7,500,000 acre-feet of mainstream Colorado River water is available for lower basin consumptive use, the prescribed allocation had been made by the Secretary in the basic water-delivery contracts with the States of Arizona and Nevada and with water users in California. The Court further held that the Secretary “. . . is free to choose among the recognized methods of apportionment or to devise reasonable methods of his own” in apportioning shortages (in years when less than 7,500,000 acre-feet of water are available for beneficial consumptive use), although he must follow the standards set forth in the act, including the requirement that he respect “present perfected rights” (i.e. water rights perfected as of June 25, 1929, the effective date of the Boulder Canyon Project Act). At year’s end, the final decree was yet to be formulated and the Court also had before it a petition for rehearing filed by California. However, the opinion was a major step in delineating the rights of the States and the United States to take water for existing and new uses and in removing the uncertainty which, since 1951, had prevented congressional consideration of Lower Colorado River Basin development.

*Dugan v. Rank* and *City of Fresno v. California et al.*, arose out of the operation of Friant Dam on the San Joaquin River in California. Water of the San Joaquin River is impounded by Friant Dam and devoted to uses elsewhere in the Central Valley Project for the irrigation of lands. Certain landowners below Friant Dam contended that they were deprived of water that would have been available but for the existence of the Federal dam and brought suit in 1947 seeking to enjoin diversion and storage of water.

The Supreme Court ruled that an injunction would not lie against either the United States or local officials of the Bureau of

Reclamation, and that any relief to which affected interests may be entitled is limited to suit for damages under the Tucker Act.

The Court concluded that the Government, through its officers acting under authorization of Congress, had the power “. . . to seize the whole or respondent’s rights in carrying out the Congressional mandate,” and that “. . . the federal officers *a fortiori* had authority to seize less.” 372 U.S. at 623. The Court also rejected the contention that the Government was required to announce that it was taking water rights to a specified number of gallons or inches of water. The Court ruled that this qualitative uncertainty does not preclude the ascertainment of the value of the taking.

In *Best v. Humboldt Placer Mining Co.*, the United States had sued in a Federal district court to condemn certain property needed for construction of a dam. The property was subject to outstanding mining claims. While seeking immediate possession, the United States sought to reserve authority to determine the validity of the claims in administrative proceedings before the Department. The district court allowed the United States a writ of possession but decided no other issues in the case. The Supreme Court, after emphasizing the plenary authority of the Department of the Interior and its broad authority to issue regulations concerning the administration of public lands, stated that the institution of the condemnation suit in the district court was not inconsistent with the administrative remedy for determining the validity of mining claims.

The Court upheld the issuance of the writ of possession and ruled that the district court had acted properly in “. . . holding its hand until the issue of the validity of the claims has been resolved by the agency entrusted by Congress with the task.”

In *Boesche v. Udall*, the Court upheld the authority of the Secretary of the Interior to cancel, in an administrative proceeding, a noncompetitive oil and gas lease on public land where the lessee, in making application, had failed to comply with a departmental regulation. The Court rejected the contention that section 31 of the Mineral Leasing Act (30 U.S.C., sec. 188), limits the Secretary’s powers of administrative cancellation to instances where a lessee fails to comply with the terms of the lease, and requires judicial action to cancel a lease for the lessee’s failure to comply with a departmental regulation.

Some of the more significant legal opinions rendered by the Office of the Solicitor are summarized as follows:



In an opinion dated March 18, 1963 (M-36653), the Solicitor held that the Secretary was without authority to defer closing the water diversion tunnels at Glen Canyon Dam until works were constructed for the protection of Rainbow Bridge National Monument.

The Solicitor, in an opinion dated December 18, 1962 (M-36643), advised that water-project construction agencies were authorized to acquire lands for fish and wildlife conservation purposes in connection with projects not substantially completed as of the date of the enactment of the Fish and Wildlife Coordination Act.

In Solicitor's Opinion M-36644, dated November 29, 1962 (69 I.D. 203), it was held that executory lease agreements with competent Crow Indians which purport to cancel existing leases between the same parties as of a date 12 or 18 months in the future and to take effect themselves as 5-year leases at the future date violate the act of March 15, 1948 (62 Stat. 80), and are void.

During the year the Supreme Court decided four cases of great importance to the Department: *Arizona v. California*, 373 U.S. 546 (1963); *Dugan v. Rank*, 372 U.S. 609 (1963), and its companion case *City of Fresno v. California et al.*, 372 U.S. 627 (1963); *Best v. Humboldt Mining Co.*, 371 U.S. 334 (1963); and *Boesche v. Udall*, 373 U.S. 472 (1963).

# Resources Program Staff

Henry P. Caulfield, Jr., Director

The Resources Program Staff, Office of the Secretary, performs two major functions: Central staff services and departmental coordination.

In its first area of responsibility, the Resources Program Staff assists and advises the Secretary and secretariat in the development and implementation of departmental policy and in the formulation of long-range objectives and programs regarding natural resources. The Staff also executes a variety of special assignments concerning development and conservation. In the area of departmental coordination, the Staff performs this function for activities which cut across major administrative lines defined generally by the type of resource—minerals, water and power, public lands, fish and wildlife. Staff members represent the Secretary on various departmental, interagency, national, and international committees, commissions, and similar bodies.

During fiscal 1963, until June 1, Charles H. Stoddard was Director. Henry P. Caulfield, Jr., Assistant Director under Mr. Stoddard, became Director July 11, 1963.

Principal areas of responsibility of the Resources Program Staff during fiscal 1963 follow :

## **Program Planning Coordinated**

Long-range planning and programing, instituted in 1962, was augmented to include concern for program matters related to preparation of the annual budget of the Department. The Secretary assigned the Staff, subject to the direction of the Under Secretary, the establishment of criteria, projections, and procedures for bureau programing. Long-range program plans were developed for soil and moisture conservation and range improvement and forestry. During the year the Staff was directed, in collaboration with the Division of Budget and Finance, to assist in review by the

secretariat of the programs of the Department in conjunction with preparation of the Department's annual budget.

### **Water Resources Planning and Coordination Emphasized**

At the direction of the President, the Secretaries of the Interior, Army, Agriculture, and Health, Education, and Welfare—the four Secretaries who would compose the President's proposed Water Resources Council—continued to pursue matters of mutual concern. The Assistant Director represented the Department on the Interdepartmental Staff Committee established to advise the Secretaries in this regard and was Committee Chairman. Work progressed during the year on development of standards to supplement the Policies, Standards, and Procedures for the Formulation, Evaluation, and Review of Plans for the Use and Development of Water and Related Land Resources, approved by the President May 15, 1962.

Major accomplishments for the year were agreement on a four-department coordinated river basin planning budget report for fiscal 1964 and concurrence on new procedures designed to provide an improved coordinated budget report for fiscal 1965.

### **Water Research Report Completed**

A Task Group on water research coordination, on which the Staff is represented, completed its report, which was submitted to the Federal Council on Science and Technology. At year's end, the report was presented to the President and the Congress.

### **Resource Economics Guided**

The senior economist of the Staff was departmental liaison officer with the Council of Economic Advisers and the Consumers' Advisory Council and was a member of the Department Energy Policy Staff and chairman-secretary of various ad hoc interbureau work groups designated to assemble data required by the Secretary in responding to requests from congressional committees and others for economic information. He conducted special economic studies, as requested by the Secretary and Under Secretary, and advised other economists and economics units throughout the Department.

### **International Activities Varied**

The Staff provided departmental support for interagency efforts toward implementing the Trade Expansion Act of 1962 and represented the Department in preparations for the sixth round of



tariff negotiations for the General Agreement on Tariffs and Trade (GATT).

Coordinated departmental efforts in support of the interagency United Nations Economic Committee were provided so that the natural resources expertise of the Department would be available to U.S. delegations to meetings of international organizations.

Work progressed with the Agency for International Development (AID) seeking modernization of the relationship between the two agencies and to give maximum support to AID under the Humphrey amendment to the Foreign Assistance Act of 1961.

The Staff continued to provide the support for the Secretary's participation in the Cabinet-level Joint United States-Canada Committee on Trade and Economic Affairs and the counterpart committee with Japan.

### **Field Activities Coordinated**

The Staff coordinated the regional field activities of the Department through regional coordinators, who are chairmen of six field committees. Regional coordinators, in conjunction with field committees, coordinated bureau programs in their regions, reconciled overlap and conflict problems, identified and developed project and program plans, and provided liaison with other Federal departments on interagency committees. A major reappraisal of this coordination function was accomplished during the year, resulting in restatement by the Secretary of responsibilities and procedures for its performance.

### **Area Redevelopment Projects Reviewed**

The Staff coordinated the Department's activities under the program of the Area Redevelopment Administration relating to areas of chronic unemployment and underemployment, where water, minerals, forestry, recreation, and fish and wildlife have an important role. A majority of the project proposals reviewed were for technical assistance, industrial or commercial loans, and public facility loans or grants. Projects approved by the Area Redevelopment Administration were monitored. The Staff participated in the activities of numerous interagency technical teams and task forces in reviewing resource projects in depressed areas, particularly in the southern Appalachian region, now the object of special concern of the President's Appalachian Regional Commission.

### **Staff Active in Appalachian Studies**

The Resources Program Staff has an active role in developing proposals for relief and development of the southern Appalach-

ians, the most chronically depressed region in the United States. Subcommittees for which the Department has chief responsibility are those concerning power, coal and other minerals, and recreation. The Staff also was represented on subcommittees regarding water, forests, manpower and training, comprehensive program, transportation and finance. A comprehensive regional program is being developed.

### **Accelerated Public Works Program Assisted**

Since start of the Accelerated Public Works program, departmental participation has been coordinated by the Resources Program Staff. The Staff, through negotiation with the Area Redevelopment Administration, prepared allocation requests and obtained approval for construction projects for eight bureaus of the Department to the amount of \$63 million. Major accomplishments of the Department under the program are described in reports of its several agencies.

### **Strip Mine Reclamation Studied**

The problems created by unrestored surface mining involve several bureaus of the Department. These concern erosion, sedimentation, stream pollution, loss of vegetation, destruction of wildlife and its habitat, destruction of scenic and recreational values, flood damage and economic loss in terms of land values, income, and taxable base. The Staff coordinated preliminary review studies of strip mining on private lands and on public lands under the control of the Department. These were preparatory to a possible nationwide and more intensive study.

### **Plans Laid for Youth Conservation Corps**

The Staff provided representation for the Department on the Interagency Committee established to plan a Youth Conservation Corps. It also coordinated and directed an extensive planning effort of the five bureaus which would participate in such a program. Comprehensive plans were developed so they can be made operational on short notice if the Corps were authorized by Congress.

### **Special Staff Assignments Met**

Additional major Staff duties include the assignment of various members to study teams, committees, and boards. The Director was a member of an Agency for International Development survey of agricultural development in Honduras. Staff members repre-

sented the Department on a variety of groups, in addition to those mentioned earlier, such as the International Champlain Waterway Board, the Commission on Conservation of the American Association of School Administrators, the North Cascades Study Team, and the Joint United States-Japan Committee on Trade and Economic Affairs.

Bureau of Land Management  
Library  
Bldg. 50, Denver Federal Center  
Denver, CO 80225



# Office of the Science Adviser

John C. Calhoun, Jr., Science Adviser

The Department's recognition of the importance of scientific and engineering research in the conservation and development of the Nation's natural resources increased the role of the Science Adviser during the year. He continued to serve as the Secretary's immediate consultant on the role of research to meet departmental objectives. This called for special reviews and studies on such subjects as pesticides and wildlife relationships, scientific manpower requirements, and the balance between research and operational programs. The Science Adviser's Office has undertaken increased responsibility for coordinating departmental research plans with other governmental and nongovernmental agencies. Extensive cooperation in this effort has been continued with the Office of Science and Technology, the National Science Foundation, the National Academy of Sciences, and other agencies.

Representation on the Federal Council for Science and Technology and cooperation with its various committees resulted in major departmental contributions to reports on water resources, natural resources, oceanography, energy, and scientific and technical information. The Science Adviser continued as Chairman of the Federal Council's Committee on Natural Resources, which is completing studies requested by the President on natural resources development and applications to meet national needs.

The Department's present and future programs of research on natural water systems to assure adequate supplies for domestic, power, agricultural, recreational, and other uses received primary attention from the Science Adviser. In this work departmental responsibilities were considered in relation to pending legislation on water resources research, interagency program planning and coordination, and in relation to State and university interests.

Dr. John C. Calhoun, Jr., of Texas Agricultural and Mechanical College succeeded Dr. Roger Revelle of the University of California as the Science Adviser in May 1963.







Created in 1849, the Department of the Interior—a Department of Conservation—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.