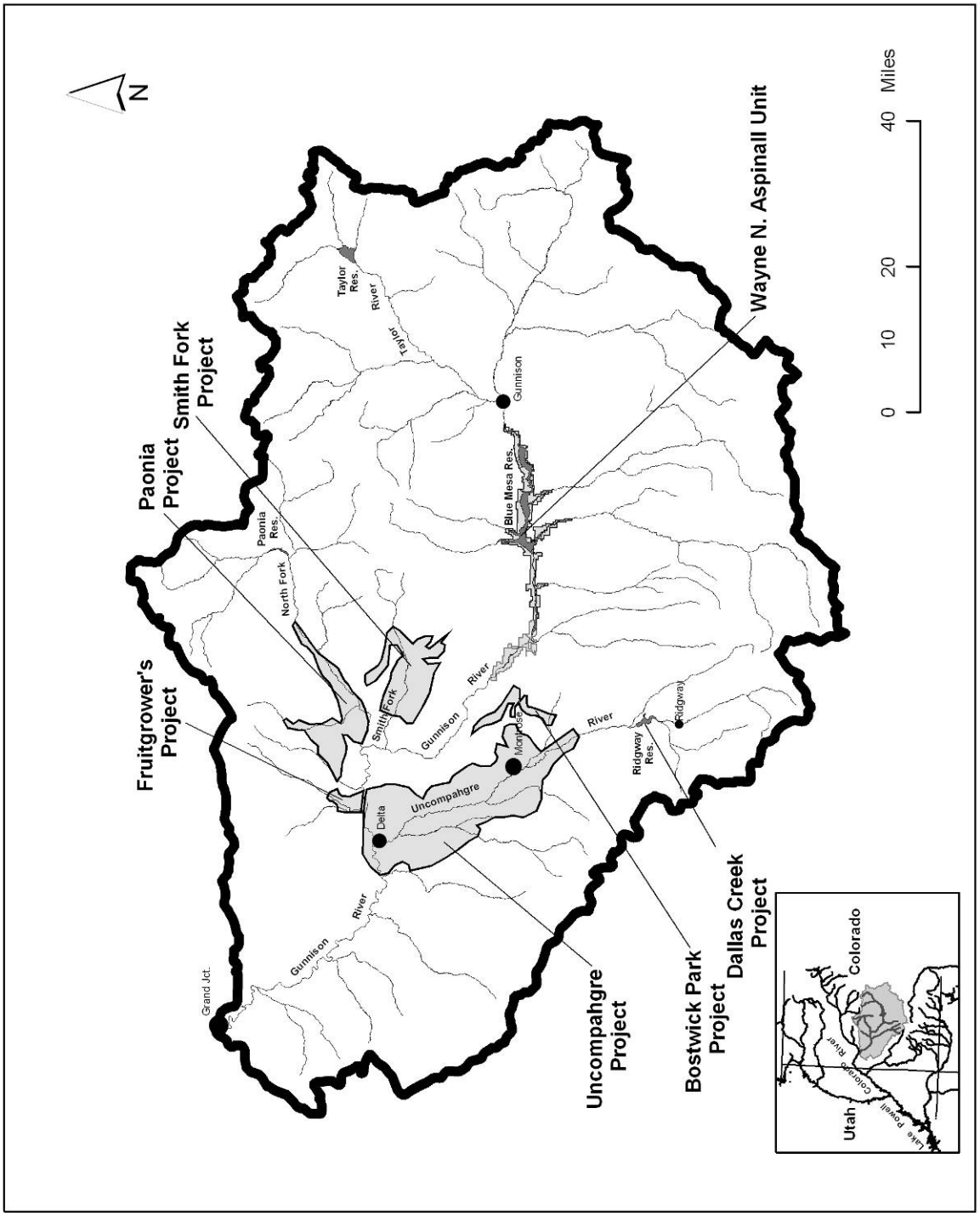
Attachment 1--Description of Gunnison Basin Reclamation Projects



DESCRIPTION OF OTHER RECLAMATION PROJECTS IN THE GUNNISON RIVER BASIN

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Bostwick Park Project

General Description
The Bostwick Park Project is in west-central Colorado near the city of Montrose. The project develops flows of Cimarron Creek, a tributary of the Gunnison River, for irrigation and for benefits to sport fishing and recreation. A full and supplemental supply of irrigation water is available for 6,100 acres of land. Recreation opportunities and important fishery benefits are provided at Silver Jack Reservoir.

Unit descriptions and facilities
Water storage is provided by Silver Jack Dam and Reservoir, constructed on Cimarron Creek. Project water is released from the reservoir to Cimarron Creek. The releases, along with usable natural flows, are diverted from the creek into the existing Cimarron Canal 2.5 miles below the dam, and conveyed 23 miles to the vicinity of the project land. Some water is released from the canal and used on lands in the Cimarron area. Most of the water is conveyed to the end of the canal at Cerro Summit and then delivered to the Hairpin and Vernal Mesa Ditches. The project-constructed Bostwick Lateral diverts water from the Vernal Mesa Ditch and conveys it across Bostwick Park through an 18-inch siphon to lands above the West Vernal Mesa Lateral.

Silver Jack Dam Silver Jack Dam is located on Cimarron Creek about 20 miles above the junction with the Gunnison River. The rolled-earthfill dam contains 1,278,140 cubic yards of material and has a structural height of 173 feet. Its crest is 1,050 feet long and 30 feet wide. The outlet works to Cimarron Creek in the right abutment has a capacity of 280 cubic feet per second with the reservoir at the normal water surface elevation of 8926.0 feet and a capacity of 160 cubic feet per second at the minimum water surface elevation of 8840.0 feet. The spillway on the right abutment is an uncontrolled ogee section with a capacity of 6,220 cubic feet per second at maximum water surface elevation. The reservoir has a total capacity of 13,520 acre-feet, including 12,820 acre-feet of active capacity and 700 acre-feet of inactive capacity. When filled to its normal water surface elevation, the reservoir has a surface area of 293 acres.

The 3.6-mile Bostwick Lateral was constructed to deliver water to full service lands above the West Vernal Mesa Lateral. Repair, extension, and some new construction of about 7.2 miles of drains were completed by the water users.

Operating agencies
Project irrigation facilities were turned over to the Bostwick Park Water Conservancy District for operation and maintenance on January 1, 1976.

Development History
The Bostwick Park area was settled in the early 1880's, followed by a second influx at the time of irrigation development in 1910. By 1930, the population had reached a peak of 75 to 80 families, but in 1960 decreased to about 40

families because of the trend toward larger farm units, use of modern labor-saving farm equipment, and drought conditions.

Investigations
The Bureau of Reclamation first reported on the Bostwick Park Project in a 1951 reconnaissance report on the Gunnison River Project. The plan presented in the 1961 feasibility study, upon which authorization was based, was essentially the same as the 1951 plan.

Authorization
The project was authorized as a participating project of the Colorado River Storage Project by Public Law 88-568, September 2, 1964 (78 Stat. 852). The primary purposes of the project are agriculture, recreation, and fish and wildlife.

Construction
Construction began at Silver Jack Dam late in 1966 and was completed in 1971. Silver Jack Reservoir was filled on June 10, 1971, and project water was available to supplemental service lands from existing ditches on a water rental basis during the 1971, 1972, and 1973 irrigation seasons. A negative declaration of environmental impact was filed July 21, 1972, for drainage rehabilitation and for replacement of the Vernal Mesa conduit. Construction of these facilities was completed during fiscal year 1974.

Benefits

Irrigation
The project furnishes a dependable late-season supply of irrigation water. Non-project supplies are generally abundant until the latter part of the irrigation season, but then fall off resulting in serious curtailment of crop yields. Project water from Cimarron Creek, and in small part from tributaries of Cedar Creek, is used as a full irrigation supply for lands not previously irrigated and as a supplemental supply for lands inadequately served.
Raising beef cattle and sheep are the major enterprises in the project area. Irrigated lands are used chiefly for the production of alfalfa, grass hay pasture, and small grains for livestock feed.

Recreation and Fish and Wildlife
The U.S. Forest Service developed recreation facilities under a cooperative arrangement with the Bureau of Reclamation. Facilities include access roads, campgrounds, a boat dock, trails, fences, landscaping, and an administration site. There were 84,500 visitor days to the reservoir area in 1996.

Flood Control
Bostwick Park Project has provided an accumulated $34,000 in flood control benefits from 1950 to 1999.

Dallas Creek Project

General Description
The Dallas Creek Project is located in west-central Colorado near the town of Ridgway. It is named after the Dallas Creek tributary of the Uncompahgre River, which in turn is a tributary of the Gunnison River in the Upper Colorado River Basin. The project area includes most of the Uncompahgre River Basin covering portions of Montrose, Delta, and Ouray Counties.

Unit descriptions and facilities
Ridgway Dam of the Dallas Creek Project was constructed on the Uncompahgre River in 1987 to increase water supplies for irrigation and municipal and industrial purposes, and to provide flood control. The project also includes recreational development at the reservoir and measures to enhance fishing opportunities on the Uncompahgre River, improve wildlife habitat, and mitigate wildlife losses caused by the reservoir development. No distribution facilities were constructed as part of the project. Water supplies are distributed through existing facilities or facilities constructed by the Tri-County Water Conservancy District or the water users.

Ridgway Reservoir is formed by Ridgway Dam on the Uncompahgre River about 6 miles north of Ridgway, Colorado, and 1 mile upstream from the confluence with Cow Creek. The reservoir has a capacity of 84,410 acre-feet of water and extends southwardly up the Uncompahgre River for 4.6 miles, with a 1-mile branch up the drainage of Alkali Creek. Active storage capacity is 59,396 acre-feet; dead and inactive capacity is 25,000 acre-feet. The surface area of the reservoir at the normal water surface elevation of 6,871.13 feet is 1,030 acres. Ridgway Dam is a rolled earthfill structure with a volume of 10,900,000 cubic yards and a height of 234 feet above streambed. The dam crest, at elevation 6886, is 2,460 feet long and 30 feet wide.

Operating agencies
The Tri-County Water Conservancy District is the general administrative agency for the project and is the contracting and marketing agency for all project water.

Development History
When the Ute Indians were moved to reservations in 1881, a rush of settlers poured into the Uncompahgre Valley attracted by new farming and ranching opportunities. The town of Delta was founded that year, followed by Montrose in 1882, Olathe in 1883, and Ridgway in 1890. Irrigated agriculture expanded rapidly throughout the valley with the construction of small, privately financed diversion structures. Restrictions imposed by private financing limited these developments to lands close to the streams.
In 1912, the Uncompahgre Project, one of the first Federal reclamation developments, began delivering water from the Gunnison River through the Gunnison Tunnel to lands around Montrose, Olathe, and Delta. After the successful irrigation of lands in the lower Uncompahgre Valley, interest developed in constructing a water delivery system for

potential farmlands on Log Hill Mesa, south of Ridgway, and along the upper Uncompahgre River and its tributaries.

Investigations

Soon after World War II, the Bureau of Reclamation began to study the possibility of a water project for the upper Uncompahgre River Basin. Early planning was directed toward irrigation. One of the first plans, called the Ouray Project, was never formally published, but it was the starting point for ensuing years of study. In February 1951, Reclamation published a reconnaissance report on the Gunnison River Project. One part of this extensive project was the Dallas Creek Unit, which included many of the features of the Ouray Project. After publication of the 1951 report, Reclamation studied a number of alternative plans. A plan to produce hydroelectric power in addition to irrigation power generation would not have interfered with irrigation proposals being considered, so it was added to the 1951 reconnaissance plan. Investigation of a dam site in Ironton Park indicated that it was not a geologically satisfactory site. This fact and the possibility of a conflict over water rights caused the proposal to be dropped from consideration.

The cost of the project, to eventually be repaid, was a problem for proposed irrigation developments in high elevation valleys like the upper Uncompahgre Basin because the cash value of crops produced per acre was comparatively low. This problem was largely alleviated for Dallas Creek in 1956 when the Congress passed the Colorado River Storage Project (CRSP) Act. One of the features of this act was to provide money from power revenues from CRSP facilities to assist designated participating irrigation projects in their repayment. The Dallas Creek Project was designated as one of these participating projects and was given priority for feasibility studies and financial assistance if authorized by the Congress.

After designation as a CRSP participating project, concentrated feasibility investigations were made of the project, which became a refinement of the 1951 reconnaissance plan, and published in a 1966 feasibility report. Municipal water was included in the plan for the first time. This plan was the basis for congressional authorization of the project in 1968. A definite plan report, published in November 1976, presents results of studies made since the project was authorized and outlines revisions of the project plan brought about by changing conditions. The final environmental impact statement was filed with the Council on Environmental Quality in September 1976 after a public hearing on the draft statement in Montrose, Colorado, on April 17, 1976.

Authorization

The Dallas Creek Project was authorized by the Colorado River Basin Act of September 30, 1968 (Public Law 90-537), as a participating project under the Colorado River Storage Project Act of April 11, 1956 (Public Law 84-485), based on the feasibility report of the Secretary of Interior transmitted to the Congress on May 3, 1966, and published as House Document 433, 89th Congress, 2nd Session. The project was constructed for municipal, industrial, agricultural, recreation, flood control, and fish and wildlife purposes.

Construction
Construction started in 1978, was completed in 1987, and Ridgway Reservoir first filled in 1990.

Benefits

Irrigation
Production of livestock, predominantly cattle and sheep, is the leading enterprise in the area. Crops consist primarily of livestock feeds such as alfalfa, meadow hay, pasture, and small grains. Irrigated lands in the area also produce pinto beans, malt barley, shelling and ensilage corn, alfalfa, onions, and some fruit. Project water supply for irrigation purposes totals 11,200 acre-feet, the largest portion of which is supplemental supplies for the Uncompahgre Project.

Domestic, Municipal, and Industrial
A water supply of 28,100 acre-feet is available for municipal and industrial uses in Colona, Montrose, Olathe, Delta, and surrounding rural areas.

Recreation and Fish and Wildlife
Recreational development includes facilities for picnicking, camping, boating, hiking, and enjoyment of the scenic setting. Measures to protect and enhance the fish and wildlife resources have been incorporated into the project plans. They include minimum flows in Uncompahgre River, a deer fence along a relocated highway, and acquisition of a wildlife range to offset losses associated with the reservoir. The Ridgway Recreation Area is administered by Colorado State Parks In 1996, visitation totaled 629,298.

Flood Control
Ridgway Reservoir is operated to aid in controlling snowmelt floods. Reservoir storage is evacuated to provide space for flood flows if heavy snowmelt is predicted. Although the reservoir is not operated specifically for control of rain floods, it aids in control as storage space is available in the reservoir in late summer when such floods normally occur. From 1950 to 1999, Dallas Creek Project had $53,000 in accumulated actual flood control benefits.

Dolores Project

General Description
The Dolores Project, located in the Dolores and San Juan River Basins in southwestern Colorado, uses water from the Dolores River for irrigation, municipal and industrial use, recreation, fish and wildlife, and production of hydroelectric power. It also provides flood control and aids in economic redevelopment. Service is provided to the northwest Dove Creek area, central Montezuma Valley area, and south to the Towaoc area on the Ute Mountain Ute Indian Reservation. A full and supplemental supply of irrigation water is available for 61,660 acres.

Unit descriptions and facilities

Primary storage of Dolores River flows for all project purposes is provided by McPhee Reservoir, formed by McPhee Dam and Great Cut Dike. Dawson Draw Reservoir, located west of McPhee Reservoir, was constructed specifically for fish and wildlife enhancement and is supplied primarily from irrigation return flows.

An average annual supply of 90,900 acre-feet of water is provided to 27,860 acres of full service land in Dove Creek, 7,500 acres of full service land in Towaoc, and 26,300 acres of supplemental service land in Montezuma Valley. Water for the Dove Creek area is pumped from McPhee Reservoir by the Great Cut Pumping Plant and conveyed 39.5 miles through the Dove Creek Canal and its 7.6-mile branch, the South Canal. Water for the Towaoc area is conveyed 48 miles from the reservoir by the Dolores Tunnel and the Dolores and Towaoc Canals. Both areas are served by sprinkler irrigation systems. The Montezuma Valley area is served by releases at Great Cut Dike and the Dolores Tunnel and Canal to an existing gravity distribution system.

Powerplants are located on McPhee Dam and the Towaoc Canal to generate an annual average of 36,578,000 kilowatt-hours, which enters the Colorado River Storage Project power transmission system. The McPhee Dam facility operates year-round on fishery releases from McPhee Reservoir, while the Towaoc Canal plant operates from April to October on the irrigation water supply conveyed through the canal.

McPhee Dam, located on the Dolores River, is a rolled earth, sand, gravel, and rockfill structure with a volume of approximately 6,230,000 cubic yards. The crest of the dam is 270 feet high above streambed, 1,300 feet in length, and 30 feet wide. A gated spillway located in the right abutment includes a concrete chute leading to a stilling basin. The outlet works, located in the left abutment of the dam, has two separate intake structures, and a total capacity of 5,000 cubic feet per second. Great Cut Dike is a rolled earthfill structure with a crest length of 1,900 feet, and crest width of 30 feet. It has a maximum height of 64 feet above original ground surface. The embankment has a volume of about 189,000 cubic yards.

McPhee Reservoir was created with the construction of McPhee Dam and the Great Cut Dike in a saddle on the Dolores-San Juan Divide. The reservoir has a total capacity of 381,195 acre-feet, including 229,200 acre-feet of active capacity, 151,900 acre-feet of inactive capacity, and 95 acre-feet of dead storage. The water surface area totals 4,470 acres at the top of the active capacity at an elevation of 6924.0 feet. The reservoir extends approximately 10 miles up the Dolores River, 4 miles up Beaver Creek, 1 mile up Dry Creek, 2 miles up House Creek, and 2 miles up the Great Cut saddle to the dike.

Great Cut Pumping Plant at Great Cut Dike consists of ten vertical, mixed-flow pumping units. Eight of the pumps are multi-stage and lift water from the reservoir through a discharge line into the Dove Creek Canal. The two remaining pumps lift water through a discharge line into the "U" lateral if the reservoir water surface is too low for gravity releases. Annual energy requirements for the eight pumps average about 5,800,000 kilowatt-hours. The additional two require an annual average of 99,000 kilowatt-hours.

Six pumping plants, including four along the Dove Creek Canal and two along the South Canal, provide water to pipe laterals for sprinkler irrigation. The average annual energy requirement for operating the plants is approximately 10,890,000 kilowatt-hours.

The Dove Creek Canal heads at the end of the pump discharge line at Great Cut Dike and extends northwest for 39.5 miles to Monument Creek Reservoir. It has an initial capacity of 380 cubic feet per second and a terminal capacity of 30 cubic feet per second. It includes a turnout to the South Canal and to the four sprinkler pumping plants.
The South Canal heads on the Dove Creek Canal near Pleasant View and extends 7.6 miles to the south and west. It has an initial capacity of 150 cubic feet per second and a terminal capacity of 35 cubic feet per second. It includes turnouts to three pressure pipeline sprinkler irrigation systems.

The Dolores Tunnel was drilled through the Dolores-San Juan divide about 2 miles west of the town of Dolores and 1 mile downstream from the existing tunnel of the Montezuma Valley Irrigation Company. Maximum capacity is 520 cubic feet per second.

The Dolores Canal heads at the outlet of the Dolores Tunnel and extend for 1.3 miles to the south and east. The canal replaced approximately 0.5 mile of the existing West Lateral and 0.8 mile of the existing East Lateral. Initial capacity is 520 cubic feet per second; the terminal capacity is 475 cubic feet per second.

The Towaoc Canal heads on the Dolores Canal 1.1 miles below the outlet of the Dolores Tunnel and extends southward for 45.4 miles to the full service lands in the Towaoc area. The canal is earth lined for 32.8 miles and concrete lined for 7.5 miles. It has an initial capacity of 135 cubic feet per second and a terminal capacity of 86 cubic feet per second.

The Cortez-Towaoc Pipeline heads just above the terminus of the Dolores Canal and extends southward 19.5 miles to near Towaoc. The initial section to Cortez carries 17.3 cubic feet per second and the remainder extending to Towaoc carries 2.9 cubic feet per second.

Twelve lateral systems with a total of 84.7 miles were constructed to deliver water to farms in the Dove Creek and Towaoc areas. Project drainage facilities were provided for both areas.

The McPhee Dam Powerplant consists of a penstock located within the outlet tunnel of the dam, a single turbine and generator at the base of the dam, and a 4.5 mile, 13.8-kilovolt transmission line to Great Cut Switchyard. Plant capacity is 990 kilowatt-hours, and produces an average of 6,260,000 kilowatt-hours annually.

Towaoc Canal Powerplant capacity is10.5 megawatts, and produces an average of 30,318,000 kilowatt-hours annually. A 78-inch-diameter, buried concrete pipe penstock heads at a project works on the Dolores Canal and extends southwest for about 11,700 feet into Hartman Draw to the powerhouse. The powerhouse consists of two turbines

connected to two 4.5-megawatt generators and one turbine connected to a 1.5-megawatt generator.

Operating agencies
The Dolores Water Conservancy District administers project and joint-use facilities within its boundaries, and the Ute Mountain Ute Indian Tribe and the Bureau of Indian Affairs administer facilities serving the reservation. The Forest Service, Bureau of Land Management, and Colorado Division of Wildlife participate in managing recreational and cultural facilities and wildlife lands.

Development History
In 1873, modern development began in southwest Colorado when the Federal Government opened the nearby San Juan Mountains to mining. In the early 1880's, settlers moved into the Montezuma Valley. These early settlers began farming the land but soon realized that to ensure good harvests they would need more water than was available from the small streams in the Montezuma Valley. To meet this need, they built irrigation canals that conveyed water from the Dolores river to the fertile but dry valleys in the San Juan river Basin. The canals did help, but they carried too little water and shortages continued to plague the farmers and residents. The Dolores Project ensures an adequate supply of water to meet existing and future agricultural and municipal needs.

Investigations
Definite plan studies were made and published in April 1977. The report updated the physical data and included revised financial and economic analysis of the project, based on the feasibility report transmitted to the Congress on March 17, 1966, which led to authorization.

Anticipated environmental impacts were detailed in the final environmental statement filed with the Council on Environmental Quality on May 9, 1977. Included in the studies were analyses of water resources, water quality, fisheries, wildlife, threatened or endangered species, scenery, economic and social conditions, historic and archeological sites, recreation, and a summary of unavoidable adverse impacts with short-term losses compared to long-term gains.

Archeological investigations disclosed that although the project would not affect any properties listed on the National Register of Historic Places, it could disturb about 487 known archeological sites, either within proposed rights-of-way or in other areas that would be altered by project construction. An excavation program preceded each stage of construction to remove and preserve all significant findings.

Authorization
The Dolores Project was authorized by the Colorado River Basin Act of September 30, 1968 (Public Law 90-537), as a participating project under the Colorado River Storage Project Act of April 11, 1956 (Public Law 84-485).

Construction
A ground breaking ceremony for the project was held September 24, 1977, at the site of the Great Cut Dike, northwest of Cortez.

Benefits

Irrigation
Project water is available for 61,660 acres and benefits the area's economy by increasing agricultural production, and strengthening service-related enterprises dependent on agriculture. Main crops are alfalfa, pasture, barley, oats, and corn silage for livestock feed.

Domestic, Municipal, and Industrial
The annual municipal and industrial water supply of 8,700 acre-feet will permit a moderate but healthy future growth in the area.

Recreation and Fish and Wildlife
Water releases from McPhee Reservoir created a downstream fishery. Releases from the reservoir in anticipation of snowmelt flows are managed to benefit white-water boaters. The project reservoirs and facilities provided new recreation opportunities for the public. Land acquired and managed for wildlife conservation created valuable and unthreatened habitat for a variety of wildlife species.

Hydroelectric Power
The average annual energy production of McPhee Dam and Towaoc Canal Powerplants is in excess of that needed by the project. Rather than draining the nation's energy resources, the Dolores Project generates environmentally clean power which helps alleviate the problems caused by dwindling fossil fuel supplies.

Flood Control
McPhee Reservoir provides flood protection for downstream landowners. The Dolores Project has provided accumulated actual benefits of $2,000 between 1950 and 1999.

Fruitgrowers Project

General Description
The Fruitgrowers Dam Project in southwestern Colorado furnishes irrigation water to nearly 2,700 acres of land immediately downstream from the dam. Structures built by the Bureau of Reclamation are Fruitgrowers Dam, Dry Creek Diversion Dam, and Dry Creek Diversion Ditch. Other diversion structures and the canal and lateral system were constructed by private interests.

Unit descriptions and facilities
Fruitgrowers Reservoir is filled from the natural flow of Alfalfa Run and by diversions from Surface and Dry Creeks. The flow of Dry Creek is diverted by the Dry Creek Diversion Dam, and conveyed through the Dry Creek Diversion Ditch. Surface Creek water is carried through the privately owned Alfalfa Ditch. Water stored in Fruitgrowers Reservoir is released and delivered to project lands through a privately owned system of canals and laterals.

The dam, located on Alfalfa Run, is 3 miles north of Austin, Colorado. It is an earthfill, rock-faced structure, 55 feet high and 1,520 feet long, containing 136,000 cubic yards of material. The reservoir stores a total of 4,540 acre-feet of water. The spillway, located on the left side of the dam, is an uncontrolled structure (meaning flows aren't regulated). A 76-foot-long concrete-lined channel discharges into a stilling basin which slows the velocity and reduces the energy of the water. The outlet works consists of one 3-foot diameter pipe controlled by two slide gates. This diversion dam is 13 feet high and 36 feet long. It contains 200 cubic yards of concrete. The Dry Creek Diversion Ditch is about 3 miles long and has a capacity of 100 cubic feet per second.

Operating agencies
The Orchard City Irrigation District assumed operation and maintenance of the project works in March 1940.

Development History
Irrigation of lands now encompassed by the Fruitgrowers Dam Project was initiated about 1890. In 1898, settlers built a small dam on Alfalfa Run to provide water storage for their irrigation system. This dam failed on June 13, 1937, resulting in extensive damage. Since the highly developed agricultural area could not be sustained without storage of the late summer water supply, the settlers requested that the Bureau of Reclamation investigate building a new dam.

Investigations
On the basis of their studies, Reclamation began work on the project in May 1938.

Authorization
Under section 4 of the act of June 25, 1910 (36 Stat. 835), the Secretary of the Interior recommended, and the President approved, construction of the project in January 1938. The primary purpose of the project is agriculture.

Construction
Reclamation completed construction of the new dam in time for stored water to be delivered to project lands for the 1939 irrigation season.

Benefits

Irrigation
The project provides supplemental irrigation for nearly 2,700 acres of land. Principal crops are fruit, small grains, corn, alfalfa, and pasture.

Recreation and Fish and Wildlife
When full, Fruitgrowers Reservoir has a surface area of 476 acres. It receives very little recreation use; however, bird watching is becoming increasingly popular. The reservoir is a major migration stop and nesting site for a variety of shorebirds and waterfowl.

Flood Control
Although there is no specific reservoir capacity assigned for flood control, the Fruitgrowers Project has provided an accumulated $4,000 in flood control benefits from 1950 to 1999.

Paonia Project

General Description
The Paonia Project, in west-central Colorado, provides full and supplemental irrigation water supplies for 15,300 acres of land in the vicinity of Paonia and Hotchkiss. Project construction includes Paonia Dam and Reservoir and enlargement and extension of Fire Mountain Canal. Paonia Dam controls and regulates the runoff of Muddy Creek, a tributary of the North Fork of the Gunnison River. No new irrigation laterals have been provided by the project.

Unit descriptions and facilities
Paonia Reservoir stores the flows of Muddy Creek upstream of its confluence with the North Fork of the Gunnison River. Downstream, the Fire Mountain Diversion Dam and Canal divert flows from the river for delivery to project lands in the Fire Mountain Division. Leroux Creek Division water, used downstream of the Fire Mountain Canal extension, is exchanged with the Fire Mountain Canal and Reservoir Company. These shares are used as project water by the Leroux Creek Water Users Association for irrigation of Leroux Division lands above the Fire Mountain Canal. Fire Mountain Division water is then used by the Leroux Division lands on Rogers Mesa downstream of the Fire Mountain Canal system. Improvement of existing small reservoirs in the Leroux Creek Division was accomplished independently by water users.

Paonia Dam is on Muddy Creek about 1 mile upstream of its junction with Anthracite Creek, which in turn forms the North Fork of the Gunnison River. The dam is an earthfill structure containing 1,302,000 cubic yards of embankment with an interior impervious zone, blanketed upstream and downstream by zones of sand, gravel, and cobbles. The upstream face is protected by a layer of riprap and the downstream face by a layer of rockfill. The crest of the dam is 35 feet wide and 770 feet long; the structure stands 199 feet above foundation.

The outlet works on the right abutment of the dam consists of a concrete intake tower, concrete-lined tunnel, gate chamber near the dam axis, and a combination stilling basin for both the outlet works and spillway. The outlet works also includes a concrete shaft house and concrete-lined shaft and add it between the gate chamber and access shaft. The capacity of the outlet works is 1,250 cubic feet per second at maximum water surface elevation.

The spillway, also on the right abutment, consists of an uncontrolled ogee crest and open chute having a design capacity of 12,500 cubic feet per second. The chute joins the combined outlet works-spillway stilling basin.

Paonia Reservoir has a surface area of 334 acres with a total capacity of 20,950 acre-feet and an active capacity of 18,150 acre-feet.

Fire Mountain Diversion Dam, located on the North Fork of the Gunnison River near Somerset, is a timber sheet-piling, rockfill structure. It has a height above streambed of 11 feet. Fire Mountain Canal extends 34.7 miles along the north side of the valley. It has an initial capacity of 200 cubic feet per second, reducing to 100 cubic feet per second at the Leroux Creek crossing.

Operating agencies
Operation and maintenance was assumed by the North Fork Water Conservancy District on June 1, 1962. By contract, the district transferred the physical operation and maintenance of the project to the Fire Mountain Canal and Reservoir Company.

Development History
Mining led to the early settlement of western Colorado and brought the area's first railroad service. The Ute Indians originally occupied west-central Colorado, including the valley of the North Fork of the Gunnison River. Early efforts to penetrate the area were resisted by the Utes until a compromise agreement with the Government was reached on September 4, 1881, and the Utes were moved to the Uintah Reservation in the Territory of Utah.

Water rights in the valley date from 1882. The development of irrigation facilities proceeded rapidly until, by the turn of the century, the late summer natural flow of the river had become heavily appropriated. Settlement and population growth were rapid in early years, but development of the area slowed by 1920. Agricultural settlement has remained more or less static since that time, although the population has increased.

Investigations
In 1934, the State of Colorado began investigating a number of reservoir sites, including five in the North Fork watershed. As a result of these investigations and activities of the local water users, the Bureau of Reclamation commenced investigation of storage possibilities in the North Fork Valley in 1936. A report issued by the Bureau of Reclamation in August 1938 suggested development of a reservoir at the Horse Ranch site on Anthracite Creek to serve lands of the Fire Mountain Canal and also of a reservoir

at the Beaver dam site on the East Fork of Minnesota Creek to supplement the water supply for ditches diverting from Minnesota Creek. Anthracite Creek and Minnesota Creek are tributaries of the North Fork of the Gunnison River. On the strength of this report, the Paonia Project was authorized on March 18, 1939, by Presidential approval of the findings of feasibility of the Secretary of the Interior, dated March 16, 1939. Subsequent findings prompted issuance of a revised report in 1940 dealing only with the Fire Mountain Division. This report proposed that the Spring Creek Reservoir site on East Muddy Creek, another tributary of the North Fork, be developed by the Bureau of Reclamation and that the Fire Mountain Canal be enlarged by the water users in a 10-year development period during which no payments would be required for the storage dam. Funds for the canal enlargement were to be derived from charges made for the use of Spring Creek Reservoir water and from revenues from the sale of Leroux Creek water rights in the area to be served by an extension of the Fire Mountain Canal. This plan, however, was not favored by water users and authorization was not requested.

In 1946, the project plan was further revised to include a total of 14,750 acres of land to be benefited, to provide 4,000 acre-feet of surplus reservoir capacity, to provide for enlargement and improvement of the Overland and Fire Mountain Canals, and to provide for transfer of the use of water to upstream lands on Leroux Creek under two alternative plans. The project was authorized on June 25, 1947, by the 80th Congress. When bids for construction of Spring Creek Dam were opened on August 3, 1948, the low bid was 54 percent above the engineer's estimate and exceeded the total expenditure authorized for all features. No justification could be found for such high bids, and all bids were rejected. It was determined, however, that enlargement and extension of the Fire Mountain and Overland Canals were feasible undertakings independent of the storage feature. Because repayment contracts had been executed between the Government and the water users, construction of the Fire Mountain Canal was commenced.

In a February 1951 report, the project plan was revised to include an 18,000 acre-foot reservoir at the Paonia site, additional extension of the Fire Mountain Canal, enlargement of Overland Ditch, and construction of a siphon and pumping plant to convey irrigation water from the Fire Mountain Canal to 2,010 acres of land along Minnesota Creek. This plan would have provided irrigation service for 14,830 acres of irrigated land and 2,210 acres of unirrigated land. Development was authorized in 1956 as a participating project with the Colorado River Storage Project.

Since the 1956 authorization, water users in the Minnesota Creek area have withdrawn from the project in favor of private development of a reservoir on that stream. Therefore, the Minnesota Siphon and Pumping Plant and service to the Minnesota Creek lands were eliminated from the plan. It also was determined that existing ditches from Leroux Creek were adequate to convey usable flows of that stream, and enlargement of Overland Ditch was deleted from the plan. In the definite plan studies, it was determined that the total reservoir capacity should be increased to 21,000 acre-feet to provide more space for sediment retention. Irrigable acreages were reduced to 15,300.

Authorization
Construction under the 1938 plan was authorized by the President under Reclamation law on March 18, 1939.

The revised plan was authorized by the Congress on June 25, 1947. The project was reauthorized as a participating project under the Colorado River Storage Project by the act of April 11, 1956 (70 Stat. 105). The primary purpose of the project was for agriculture.

Construction
The contract for the construction of Paonia Dam was awarded January 7, 1959, and work was completed in January 1962. Contracts for extension and lining of Fire Mountain Canal were awarded in 1959 and 1960, and work was completed in 1962.

Benefits

Irrigation
The project assures a full supply of water for irrigated lands. The general type of farming formerly practiced in the area has been continued with project development, but the additional irrigation supplies make possible more intensive crop production. Livestock feed and apples, peaches, and cherries are the major crops grown. Dairy and beef cattle are the principal livestock of the area.

Recreation and Fish and Wildlife
Fishing, hunting, picnicking, and water sports are available at Paonia Reservoir. Recreation facilities are administered by Colorado State Parks. Visitor days totaled 8,345 in 1996.

Flood Control
Flood dangers on North Fork River are reduced by emptying the reservoir each year and by reserving storage space through forecasts of snowmelt runoff, and regulation of flood flows. The Paonia Reservoir has 2,280 acre feet of capacity assigned to flood control. The Paonia Project has provided an accumulated $253,000 in flood control benefits from 1950 to 1999.

Smith Fork Project

General Description
Flows of Smith Fork, Iron, Mud, and Alkali Creeks are regulated and utilized by the Smith Fork Project in west-central Colorado. The project, about 30 miles southeast of Delta, Colorado, supplements the irrigation water supply for approximately 8,200 acres in Delta and Montrose counties and provides a full water supply for 1,423 acres of land previously not irrigated. Construction features of the project include Crawford Dam and Reservoir, Smith Fork

Diversion Dam, Smith Fork Feeder Canal, Aspen Canal, Clipper Canal, and recreation facilities.

Unit descriptions and facilities

Crawford Dam is on Iron Creek, a tributary of the Smith Fork about 1 mile south of Crawford, Colorado. The Crawford Reservoir regulates flows of Iron Creek and its tributaries as well as the surplus flows of the Smith Fork of the Gunnison River, diverted to the reservoir by the feeder canal. Small quantities of reservoir storage water are released to Iron Creek and diverted by several small private ditches. The remainder is released to Aspen Canal for conveyance to private ditches for distribution. Some of the storage releases through Aspen Canal replace former direct flow diversions from Smith Fork, permitting additional direct flow diversions for project land higher on the stream.

Crawford Dam is an earthfill structure 162 feet high and 580 feet long, with a volume of 1,006,000 cubic yards. The uncontrolled overflow spillway is in the left abutment of the dam and has a capacity of 1,400 cubic feet per second. The outlet works in the right abutment of the dam carries water through a 34-inch-diameter steel pipe controlled by four 2.25-foot-square high-pressure gates. Maximum discharge capacity to Aspen Canal is 125 cubic feet per second. Crawford Reservoir has a total capacity of 14,395 acre-feet and an active capacity of 14,064 acre-feet. The reservoir has a surface area of 406.2 acres.

Smith Fork Diversion Dam, at the head of Smith Fork Feeder Canal, consists of a concrete ogee weir and embankment wings. The dam is about 3 miles northeast of Crawford, stands 10 feet above streambed, has a total crest length of 790 feet, and a weir crest length of 34.6 feet. Diversion capacity of the structure is 80 cubic feet per second.

In the vicinity of Crawford, the earth-lined Smith Fork Feeder Canal originates at Smith Fork Diversion Dam and runs southwesterly to Crawford Reservoir. The 2.4-mile-long canal has an initial capacity of 80 cubic feet per second.

Aspen Canal heads at Crawford Dam and runs 5.8 miles in a northerly direction. The canal has an initial capacity of 125 cubic feet per second.

Clipper Canal feeds from Aspen Canal and runs to the west a distance of about 0.5 mile. The initial capacity of the canal is 60 cubic feet per second.

Operating agencies

Operation and maintenance of the project was turned over to the Crawford Water Conservancy District on January 1, 1964.

Development History

Delta County, along with most of western Colorado, was originally inhabited by the Ute Indians. Early settlement of the area was retarded by hostility between the Utes and the immigrants. In 1881, a compromise agreement was reached between the Federal Government and the Utes which required the Indians to locate in the Uintah Reservation

in the Territory of Utah. After this agreement, settlement of the area progressed rapidly. Most of the impetus of the initial settlement period was provided by discoveries of rich deposits of gold, silver, and other minerals in the mountainous areas near the Continental Divide. Agricultural development proceeded at a slower rate but was much more uniform and stable. Farms were developed along the valleys, towns were established near the mines and the agricultural communities, and construction of railroads to the trade and mining centers was begun.

Investigations
The Smith Fork Project was mentioned briefly in Reclamation's basin-type report of March 1946 on the Colorado River. In 1951, Reclamation issued a detailed report on the Smith Fork Project as a supplement to the 1951 report on the Colorado River Storage Project and participating projects. This second report, amended in October 1953, was the basis on which the project was authorized.

Authorization
The project is one of the initial participating projects authorized with the Colorado River Storage Project by the act of April 11, 1956 (70 Stat. 105). The primary purpose of the project is agriculture.

Construction
Construction was begun on Crawford Dam in 1960 and on all other major features in 1961. All construction was completed in 1962.

Benefits

Irrigation
An improved irrigation supply permits new lands to be irrigated and permits better crop yields on lands previously inadequately watered. Predominant crops include alfalfa, grass hay, pasture, barley, oats, wheat, and corn. Feed production is used for livestock, primarily cattle and sheep.

Recreation and Fish and Wildlife
Recreation at Crawford Reservoir is administered by the Colorado State Parks and consists of fishing, boating, and camping. Visitor days in 1996 totaled 109,704. In 1997, the State of Colorado and Bureau of Reclamation upgraded facilities at Crawford State Park to include accessible features for people with disabilities. There are 45 campsites with hookups and 21 without. Showers and flush toilets are available. A fishing trail with platforms and an accessible dock are also available.

Flood Control
Although there is no specific reservoir capacity assigned for flood control, the Smith Fork Project has provided an accumulated $14,000 in flood control benefits from 1950 to 1999.

Uncompahgre Project

General Description
The Uncompahgre Project is on the western slope of the Rocky Mountains in west-central Colorado. Project lands surround the town of Montrose and extend 34 miles along both sides of the Uncompahgre River to Delta, Colorado. Project features include Taylor Park Dam and Reservoir, Gunnison Tunnel, 7 diversion dams, 128 miles of main canals, 438 miles of laterals, and 216 miles of drains. The systems divert water from the Uncompahgre and Gunnison Rivers to serve over 76,000 acres of project land.

Unit descriptions and facilities
The project plan provides for storage in Taylor Park Reservoir on the Taylor River, which is a part of the Gunnison River Basin, and diversion of water from the Gunnison River by the Gunnison Diversion Dam through the Gunnison Tunnel and the South Canal to the Uncompahgre River. To distribute the waters of the Gunnison and Uncompahgre Rivers, the South and West Canals were constructed and the larger existing private canals, that take water directly from the Uncompahgre River, were purchased, then enlarged and extended. Laterals were constructed to deliver water from the South Canal to project lands.

Taylor Park Dam is on the Taylor River, a tributary of the Gunnison River. The dam is a zoned earthfill structure 206 feet high, with a crest length of 675 feet and a volume of 1,115,000 cubic yards. It creates a reservoir with a storage capacity of 106,200 acre-feet. The spillway is an overflow-type weir crest 180 feet long with a capacity of 10,000 cubic feet per second. The outlet works is a horseshoe tunnel with a diameter of 10 feet, and a capacity of 1,500 cubic feet per second.

The Gunnison Diversion Dam on the Gunnison River, about 12 miles east of Montrose, is a timber-crib weir with concrete wings and a removable crest. The dam has a structural height of 16 feet. It diverts Gunnison River direct flows, as well as releases from the Taylor Park Dam into the Gunnison Tunnel. The Gunnison Tunnel was designed as a rectangular section 11 feet wide and 12 feet high, with an arch roof. A number of modifications have been made since the original construction. It is 5.8 miles long and has a capacity of 1,300 cubic feet per second.

The South Canal extends from the end of the Gunnison Tunnel generally southwest 11.4 miles to the Uncompahgre River. Part of the canal is concrete lined; the remainder is unlined. The canal has an initial capacity of 1,010 cubic feet per second.

West Canal extends generally northwest about 21 miles from the Uncompahgre River beginning at the terminal structure of the South Canal with the river. This unlined canal as an initial capacity of 172 cubic feet per second. The West Canal is diverted directly from the South Canal and a timber and metal flume carries the canal across the Uncompahgre River. There is a small diversion for winter flows directly from the Uncompahgre River.

Montrose and Delta Diversion Dam is on the Uncompahgre River about 8 miles south of Montrose. The dam is a concrete gate structure with radial control and sluiceway gates. The unlined canal extends generally northwest about 40 miles from the diversion point and has a diversion capacity of 563 cubic feet per second. The original dam and canal were privately constructed and later purchased and rehabilitated by Reclamation as part of the Uncompahgre Project. A new structure was built in 1963 with a diversion capacity of 550 cubic feet per second.

Loutzenhizer Diversion Dam is on the Uncompahgre River about 2 miles south of Montrose. It was a pile-and-timber weir with a concrete apron but was rebuilt by the water users into a concrete weir and apron with radial gates. The dam has a structural height of 24 feet. The canal extends generally northwest 14.5 miles from the diversion dam and has a diversion capacity of 120 feet per second. The original dam and canal were privately constructed and purchased by Reclamation in 1908.

Selig Diversion Dam is on the Uncompahgre River about 5 miles northwest of Montrose. It has a timber-gated sluiceway with uncontrolled concrete overflow weir and concrete stilling basin. Its structural height is 25 feet. The canal extends generally north about 20 miles from the diversion dam. This unlined canal has a diversion capacity of 320 cubic feet per second. The original dam and canal were privately constructed and purchased by Reclamation in 1914.

Located on the Uncompahgre river about 8 miles northwest of Montrose, the Ironstone Diversion Dam is a concrete structure with radial control and sluiceway gates with a concrete wing. The structural height is 17 feet. The unlined canal runs 14 miles northwest from the diversion dam. The diversion capacity of the canal is 400 cubic feet per second. The original dam and canal were privately constructed and were acquired by Reclamation in 1915.

Located on the Uncompahgre river about 10 miles northwest of Montrose, the East Canal Diversion Dam is a concrete and timber weir with an earth embankment wing. The structural height is 16 feet. The unlined canal extends 10.6 miles north from the diversion dam. Its diversion capacity is 165 cubic feet per second. The original dam and canal were privately constructed and were acquired by Reclamation in 1911.

The Garnet Diversion Dam is on the Uncompahgre River about 15 miles northwest of Montrose. The dam is a concrete-surfaced rockfill weir, and has a structural height of 8 feet. Garnet Canal is unlined and extends 10.7 miles northwest from the diversion dam. Its diversion capacity is 75 cubic feet per second. The original dam and canal were constructed by private interests and purchased by the Bureau of Reclamation in 1914.

There are 438 miles of laterals which distribute water to project lands. A system of subsurface drains totaling 216 miles has been constructed.

Operating agencies
The project is operated and maintained by the Uncompahgre Valley Water Users Association.

Development History
The lands comprising the project area were formerly part of the Ute Indian reservation. Settlement rapidly followed cession of the land by the Indians to the United states. By 1903, about 30,000 acres in the Uncompahgre Valley were irrigated by private systems which included five diversion dams on the Uncompahgre River. As the possibilities for greater use of irrigation water were evident, a larger development by the State of Colorado was started in 1901 but was abandoned. Work by the Reclamation Service began in 1903.

Active support for driving a tunnel from Gunnison River to the Uncompahgre Valley to obtain additional water was solicited as early as 1890. In 1894, the Geological Survey completed a reconnaissance survey and found it was too expensive an undertaking for local interests, but in 1901 the state of Colorado appropriated $25,000 to start the tunnel. Only 900 feet were driven before the funds were exhausted. In 1901, construction surveys of the project were begun by the Geological Survey, and the general scheme of the project was outlined in its first report. After the passage of the Reclamation Act in 1902, the Uncompahgre Valley was selected for immediate development. The original surveys by the Geological survey, plus the investigational work carried out by the Reclamation Service, served as a basis for authorization of the project in 1903.

Authorization
The Uncompahgre Project (originally called the Gunnison Project) was authorized by the Secretary of the Interior on March 14, 1903, under the provisions of the Reclamation Act. Rehabilitation of the project and construction of Taylor Park Dam was approved by the President on November 6, 1935.

Construction
Construction began in July 1904, and the first water for irrigation was available during the season of 1908 from the Uncompahgre River. The Gunnison Tunnel was completed in 1909, and the Gunnison Diversion Dam was completed in January 1912. The project was transferred to the Uncompahgre Valley Waters Users Association for operation and maintenance in 1932. Taylor Park Dam, built from funds allotted under the National Industrial Recovery Act, was completed in 1937. Other improvements made during the same period included enlargement, lining, and smoothing portions of the Gunnison Tunnel, constructing concrete and steel structures to replace some of the worn out wooden structures in the privately constructed irrigation systems, relining portions of the canals, and constructing a drainage system to relieve and prevent water logging of land.

Recent Developments
This project is within the Colorado River basin and is part of the Colorado River Basin Salinity Control Program., specifically The Lower Gunnison Basin Salinity Control Unit

Benefits

Irrigation
Almost 76,300 acres of land receive a full irrigation water supply from the facilities of the project. Principal crops are alfalfa, wheat, corn, oats, potatoes, beans, barley, onions, and fruit.

Recreation and Fish and Wildlife
Free camp and picnic grounds have been provided by the Forest Service at Taylor Park Reservoir. Cabins are available at privately owned resort developments in the area. Camping, picnicking, swimming, and boating are popular activities, and fishing is good for rainbow, and brown trout. Some brook and native trout also are caught.
Flood Control
Although there is no specific reservoir capacity assigned for flood control, the Uncompahgre Project has provided an accumulated $639,000 in flood control benefits from 1950 to 1999.

Table 1-Average Annual Project Depletions

Project	Average Annual Depletion (Acre-feet)	Existing Section 7 Coverage
Wayne Aspinall Unit (Evaporation)	7,000-9,000	No
Wayne Aspinall Unit (Water Service Contracts)	<1,000	Yes
Bostwick Park Project	4,000	No
Dallas Creek Project	17,200	Yes
Dolores Project*	99,200	Yes
Fruitgrowers Project	4,100	No
Smith Fork Project	6,000	No
Paonia Project	10,000	No
Uncompahgre Project	155,000	No
Total	**335,300-337,300**	

*Existing Biological Opinion for the Dolores Project references release from upstream projects.